MITSUBISHI ELECTRIC

Mitsubishi Electric Industrial Robots

CR800/750/700/500 series

RT ToolBox3 / RT ToolBox3 mini

User's Manual

(3F-14C-WINE/3F-15C-WINE)

MELFA FR

BFP-A3495-J

⚠ Safety Precautions

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

A. These show precautions based on the Ordinance on Industrial Safety and Health (Articles 36, 104, 150, 151).

⚠Caution For the sake of safety, teaching work should only be performed by workers who have undergone special training.
(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 During 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 possible.
If cables are brought too close to noise sources, this can cause positional deviation and malfunction.

⚠Caution Do not apply excess force to connectors or bend cables excessively.
Doing so can cause a contact defect or cut line.

⚠Caution Set work masses, including hands, so as not to exceed the 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 personal 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 rights 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 due to an external command, causing personal 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 the workpiece and peripheral devices.

⚠Caution After completing program editing, but before starting automatic operation, always check operations in a step run. Failure to do this may cause a collision with a peripheral device due to a programming error 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 make alterations on your own judgment or use maintenance parts other than those designated. Doing so can cause breakdown and malfunctions.

⚠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 stop the robot or perform an emergency stop by switching the robot controller's main power supply OFF.
If the robot controller's main power supply is switched OFF during automatic operation, this can reduce the robot's precision. It could result in collisions with peripheral device or the like due to arm drop or inertia.

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

⚠Warning For using RH-5AH/10AH/15AH series or RH-6SH/12SH/18SH series.
While pressing the brake release switch on the robot arm, be aware of the arm dropping under its own weight.
Dropping lead to a collision of the hand with the peripheral equipment or catching of hands or fingers.

⚠ Caution

At shipment, the robot controller is set to English (ENG).
To use it in Japanese, change "LNG" parameter to "JPN".
For the setting method, please refer to **"13.1Editing from parameter list"**

User's Manual Revision History

Printing Date	Manual No.	Revision Contents
2017/03	BFP-A3495-*	First edition
2017/06	BFP-A3495-A	Corresponds to the Ver.1.01B (Refer to the software revision history.)
2017/10	BFP-A3495-B	Corresponds to the Ver.1.10L (Refer to the software revision history.)
2018/04	BFP-A3495-C	Corresponds to the Ver.1.20W (Refer to the software revision history.)
2018/08	BFP-A3495-D	Corresponds to the Ver.1.30G (Refer to the software revision history.)
2018/12	BFP-A3495-E	Corresponds to the Ver.1.32J (Refer to the software revision history.)
2019/03	BFP-A3495-F	Corresponds to the Ver.1.40S (Refer to the software revision history.)
2019/04	BFP-A3495-G	Corresponds to the Ver.1.50C (Refer to the software revision history.)
2020/01	BFP-A3495-H	Corresponds to the Ver.1.62Q (Refer to the software revision history.)
2020/04	BFP-A3495-J	Corresponds to the Ver.1.70Y (Refer to the software revision history.)

Software Revision History

Version	Release Date	Revision Contents
1.00A	2017/03	Initial release
1.01B	2017/06	[Parameter] - Add the function of additional axis cooperative control parameters.
1.10L	2017/10	[Workspaces] - Add removing file history function. - Change so that options can be set separately for each category. - Add screen layout mode to option. - Add setting of saving and loading position variables to option. - Add presence / absence of message when you get current position. [Project Editing] - Add additional axis, tool, weight and size. [Program Editing] - Add label jump function in command edit area. - Add explanatory display corresponding to reserved word as input candidate. - Changed to be able to select joint interpolation, linear interpolation, direct movement by position jump at simulation. [Parameter] - Add CC-Link IE Field Basic. [Monitor] - Add auto-complete function when monitoring variables are input. [Tool] - Move the operation button of the oscillograph to the ribbon. - Added function to change graph update time and number of display points on oscillograph screen. - Add function to take specified time log when a certain time has passed. - Add function to jump from the oscillograph detailed data screen to the maximum value and minimum value - Add function to display maximum and minimum values in screen to detailed screen of oscillograph. - Add program / signal monitor screen to oscillograph. [3D Monitor] - Add bulk editing function of boxes. - Add tube object to layout. - Add display function of strings. - Add function to attach objects to each axis of the robot. - Add display function of work coordinate. [Others] - Add function to jump to corresponding page of user’s manual.
1.20W	2018/04	[General] - Add CR800-Q series. [Workspace] - Added function that delete multiple projects. - Added function that can use RT Toolbox 2 simulation and offline parameters. - Added setting to display 3D monitor always in front of option. [Monitor] - Added general purpose signal monitor and register monitor on program monitor. [Restore] - Added function of restoring parameters offline. [Tool] - Function safety items added for acquisition of oscillograph data. [Operation panel] - Add function to switch base. - Added function that display in docking window. [3D Monitor] - Added function that display user mechanism. - Adde function that output layout object in PLY format.

Version	Release Date	Revision Contents
1.30G	2018/08	[OS] Windows 10 IoT Enterprise 2016 LTSB is supported. [Communication setting] - Added Ethernet (TCP/IP) to the communication path of CR800-R/CR800-Q. [Tool] - Add preset request data to the oscillograph. [Parameter] - Added parameter setting function of backup data. - Added initial setting function of force sensor. - Added function not to teach posture in user defined area. - Added sort function of parameter list. - Added function that write offline parameters to robot controller at the online mode. [Program Editing] - Added function that convert blank lines to comments. - Added function that save program in form of no number. [Setting Origin Data] - Added detailed work procedure. [3D Monitor] - Added function that can set TCP (hand tip) at hand editing. - Added function to write TCP (hand selection) to tool parameter from hand property. - Added function that plane can also be output when layout objects are output in PLY format. - Added function that move the robot by grasping the tool. [Backup] - Added function that display event history, error history, error record from backup data. [Project] - Add pseudo input mode to project status item. [Q&A] - Added a description about the enable of Window7 Aero.
1.32J	2018/12	[Parameter] - Add EtherCAT. [Monitor] - Register monitor corresponded to EtherCAT.

Version	Release Date	Revision Contents
1.40S	2019/03	[Product] - Change the storage disc of product software to DVD-ROM. [Program] - Added function that auto indent with sepcific commands. - Added function that line break after instertion. - Added function to set breakpoints during online editing - Added function that batch editing of structure flags on XYZ position variables / work position variables batch editing screen. - Added program template function. [Parameter] - Added parameter initialization function. - Corresponding to tool number setting. [Monitor] - Added function that automatic saving of signal number and line number of input / output of general purpose signal monitor at the end of screen,it will be valid from next start. - Add [Change] button to program monitor. [Tool] - Add menu button and jog button to user definition screen. [Operation panel] - Corresponding to arch motion with position jump. - Add [P.jump] button to operation panel. - Corresponding to the operation panel of the large jog button. [3D Monitor] - Added function that distance measurement can be used on each monitor. - Added function that restore the object setting contents of the layout and the robot arrangement position. - Added function that double-click the title name to open the editing screen in the file manager of the hand/robot parts/user mech. - Add object rotation function. - Add the function of robot rotation by grabbing tool. [I / O simulator] - Explain the version of HG device of GX Works 3 of I / O simulator. [Help] - Added [Detailed explanations of functions and operations] and [Troubleshooting] items in help of the manual.
1.50C	2019/04	[Tool] - Changed the constitution of the tree under the Tool.
1.62Q	2020/01	【Parameter】 ・ Added safety diagnostic function 【Monitor】 ・ Added external variable monitor function ・ Add the function that display event history on error monitor screen. 【Restore】 ・ Added the function of writing history files during restore 【Tool】 ・ Added preset function for users to oscillograph
1.70Y	2020/04	【Operation panel】 ・ Added direct teaching function

PREFACE

Thank you for purchasing this MELFA Mitsubishi Electric industrial robot.
This document is the user's manual for the MELSOFT "RT ToolBox3", "RT ToolBox3 mini" and "RT ToolBox3 Pro".
This document will help you to maximize the functions of this software over a wide range of stages, from initial robot startup 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 "RT ToolBox3", "RT ToolBox3 mini" and "RT ToolBox3 Pro", and supports the following robot controllers.

- CR800-R/ CR800-Q/CR750-Q/CRnQ-700 series controllers
- CR800-D/CR750-D/CRnD-700 series controllers
- CRn-500 series controllers
  In this manual, these components may also be written as “CR800/750/700/500 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 serious injury.
⚠Warning	This indicates an item for which incorrect handling could present a danger of death or serious injury.
⚠Caution	This indicates an item for which incorrect handling could present a danger of injury. It could also present a danger of just physical damage.

This document uses the following general terms and abbreviations

General Term/Abbreviation	Contents
RCPU	General term for Mitsubishi PLC CPU modules of R04CPU, R04ENCPU, R08CPU, R08ENCPU, R16CPU, R16ENCPU, R32CPU, R32ENCPU, R120CPU, R120ENCPU, R08PCPU, R16PCPU, R32PCPU, R120PCPU, R08SFCPU, R16SFCPU, R32SFCPU and R120SFCPU.
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 Works 2 / 3	Abbreviation of SW1DNC-GXW2-E / SW1DND-GXW3-E type of Mitsubishi PLC programming software package.

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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 DVD-ROM as the Adobe PDF file.
D:/Doc/RT3Manual.pdf (Example for the DVD drive is “D :”.)

For reading the manual in the DVD-ROM, Adobe Reader is required.
If Adobe Reader isn’t installed, please download from the following Adobe Systems Incorporated URL (As of November, 2019)
URL: http://www.adobe.com/

1.2. Checking the Product

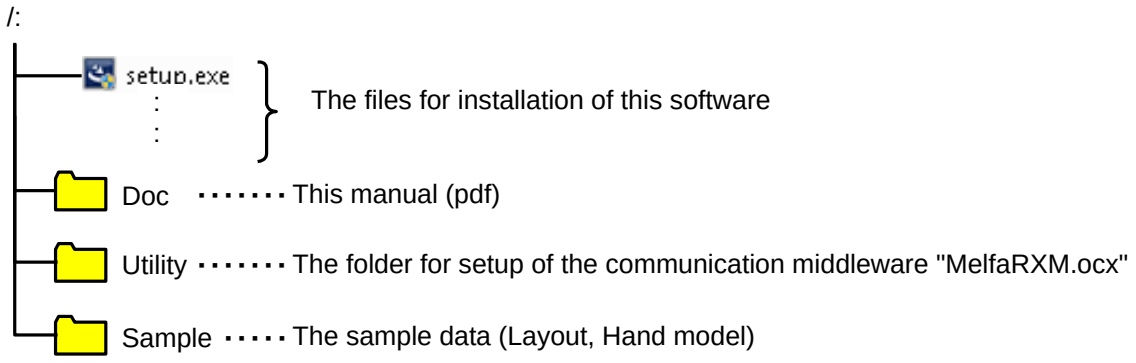
1.2.1. Checking the package

Please check if all items shown below are included in the package.
- DVD-ROM "RT ToolBox3"
- 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 DVD-ROM contents

The DVD-ROM has the following configuration.



1.2.3. About the "MelfaRXM.ocx" communications middleware

MelfaRXM.ocx is the ActiveX control that communicates with the robot-controller. You can create the Windows Application of "MELFA ROBOT" by using this control.
You can use "MelfaRXM.ocx" in the standard version of this software only.
For information on how to set up "MelfaRXM.ocx", refer to **"26 MelfaRXM.ocx Communications Middleware Setup"**.
If using only the function of “RT ToolBox3”, 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 CR800-D/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 CR800-R/CR800-Q/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., Ltd.
		USB-M53	Elecom Co., Ltd.
		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

Normal operation not guaranteed with USB to RS-232 cable

Normal operation is not guaranteed when using the USB to RS-232 cable. When using the RS-232 as a communication port, use of a computer with a serial port is recommended.

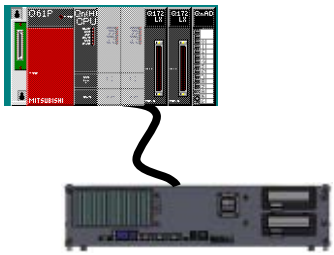
1.4. Operating Environment

This explains the operating environment.

1.4.1. Connectable robot controllers

This software can connect to the robot controllers shown below

Table 1-3 Connectable Robot Controllers and Communications Types

Robot controller	Communications (*1)		Remark
CR800-D/CR750-D/ CRnD-700 series (The photo is the robot controller for CR800-D.)	USB (*2)		Commercial items such as computers and cables might be incompatible with our equipment or the FA environment such as temperature and the noise, etc. When using, 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 CR800-D/CR750-D/ CRnD-700 series controller connected with the GOT via Ethernet by USB / RS-232. GOT 2000/1000 series and the Ethernet communication unit (GT25-J71E71-100/ GT15-J1E71-100) are needed.
CR800-R/CR800-Q/ CR750-Q/CRnQ-700 series  (The photo is the robot controller for CR800-R.)	CRnQ_R communications	USB (*2)	
		Ethernet (TCP/IP)	The PLC RCPU, Ethernet interface module or Built-in Ethernet port QCPU is required.
		RS-232	
	Ethernet (TCP/IP)		Only can be used for CR800-R/CR800-Q
CRn-500 series	Ethernet (TCP/IP)		The robot controller must have the "Ethernet interface" option.
	RS-232		

(*1) The computer must have the respective communication ports.
(*2) When using a USB connection, 1 computer can connect to only 1 robot controller.

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	Mini/standard edition: Intel® Core™2 Duo processor 2 GHz or faster recommended Standard edition: When multiple simulators are started up Intel ® Core™i7 series or faster recommended, VRAM 1 GB or more video card recommended Pro edition: Environment in which SolidWorks can run (64-bit OS only supported)
Main memory	Mini/standard edition: 1 GB or more for a 32-bit OS and 2 GB or more for a 64-bit OS recommended Pro edition: Environment in which SolidWorks can run
Hard disk	Free space when RT ToolBox3 is installed: 5 GB or more
Virtual memory	Free space when RT ToolBox3 is running: 512 MB or more
Display	XGA (1024x768) or higher SXGA (1280 x 1024) or higher recommended *When the screen layout crashes, set the display to 100% before use
Optical device	DVD-ROM drive
Keyboard	PC/AT compatible keyboard
Pointing device	Must operate on Windows
Communications functions Communications port	- USB2.0 (Note: This cannot be used for connection with the CRn-500 series as there is no USB) - LAN: 100Base-TX/10Base-T - RS-232 communication port that operates on Windows (Minimum 9600bps: 1 port) Must have one of the above interfaces
OSs for which operation is warranted	Windows XP (32-bit version) Windows Vista (32-bit version) Windows 7 Starter (32-bit version) Windows 7 Home Premium (32/64-bit version) Windows 7 Professional(32/64-bit version) Windows 7 Enterprise (32/64-bit version) Windows 7 Ultimate (32/64-bit version) Windows 8 (32/64-bit version) (*1) Windows 8 Pro (32/64-bit version) (*1) Windows 8 Enterprise (32/64-bit version) (*1) Windows 8.1 (32/64-bit version) (*1) Windows 8.1 Pro (32/64-bit version) (*1) Windows 8.1 Enterprise (32/64-bit version) (*1) Windows 10 Home (32/64-bit version) (*1) Windows 10 Pro (32/64-bit version) (*1) Windows 10 Education (32/64-bit version) (*1) Windows 10 Enterprise (32/64-bit version) (*1) Windows 10 IoT Enterprise 2016 LTSB

*1: 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 current status confirmation and enabling.

1.5. Installation, Uninstallation

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

Caution

Uninstall RT ToolBox3 before installing.

If "RT ToolBox3" has already been installed in the personal computer, it is necessary to uninstall it before "RT ToolBox3" is installed.

1.5.1. Installation

Caution

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

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

Caution

Please input the product ID attached to RT ToolBox3 again when you install the standard version of RT ToolBox3 in the personal computer in which "iQ Works (MELSOFT Navigator)" is installed.

When RT ToolBox3 is installed in a personal computer in which "iQ Works (MELSOFT Navigator)" is installed, the product ID for "iQ Works (MELSOFT Navigator)" is displayed on "Input Product ID" screen. RT ToolBox3 is installed in the personal computer as mini version when this software is installed with this Product ID. Please input the product ID attached to RT ToolBox3 product again when you install a standard version of RT ToolBox3.

Install this software with the procedure below.

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

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

1) Display the [Run] dialog.

Table 1-4 Displaying the [Run] dialog

OS	Start method
Windows 8 / 8.1 / 10	Keyboard + R
Windows 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].

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

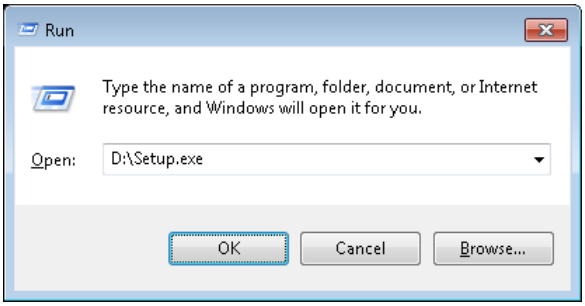
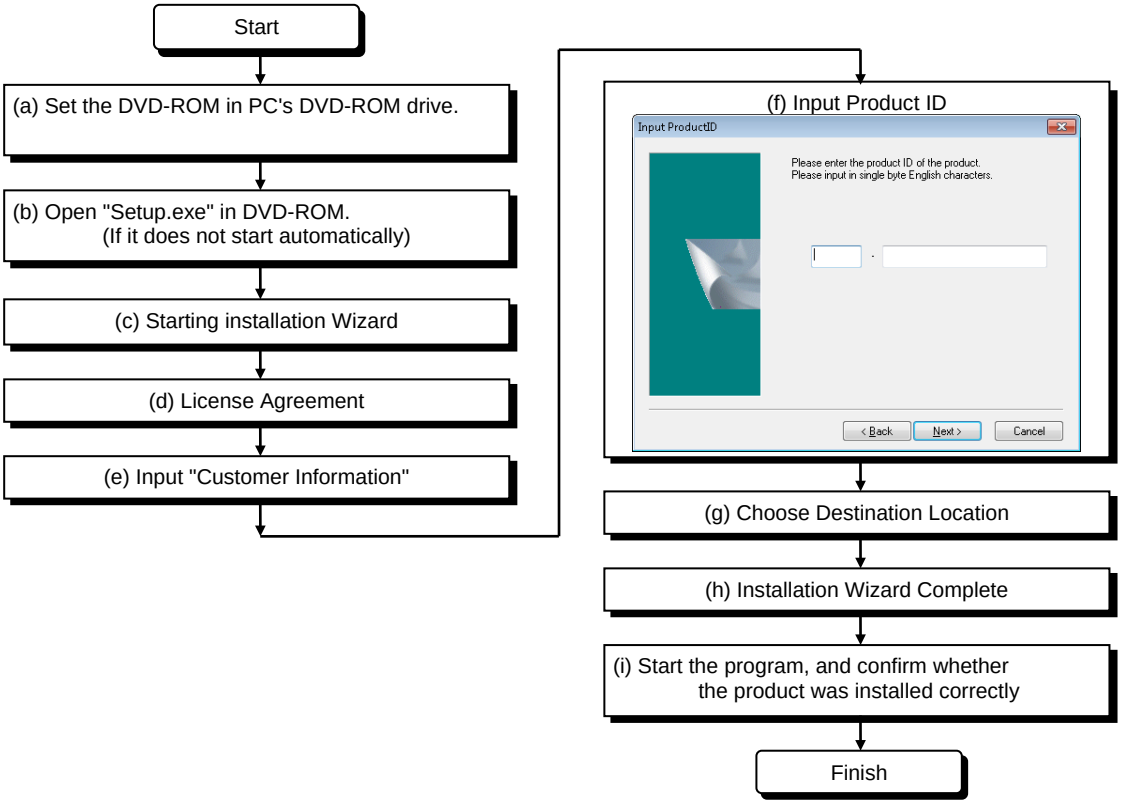


Figure 1-1 Specify the File Name and Execute

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.



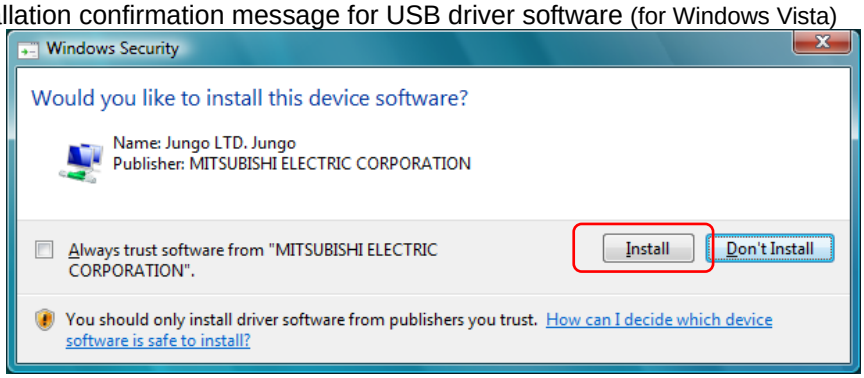
* The Product ID is printed on the License Certificate
* After the installation is completed, the computer may need to be rebooted.

⚠ Caution

About the confirmation and warning message displayed during installation

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

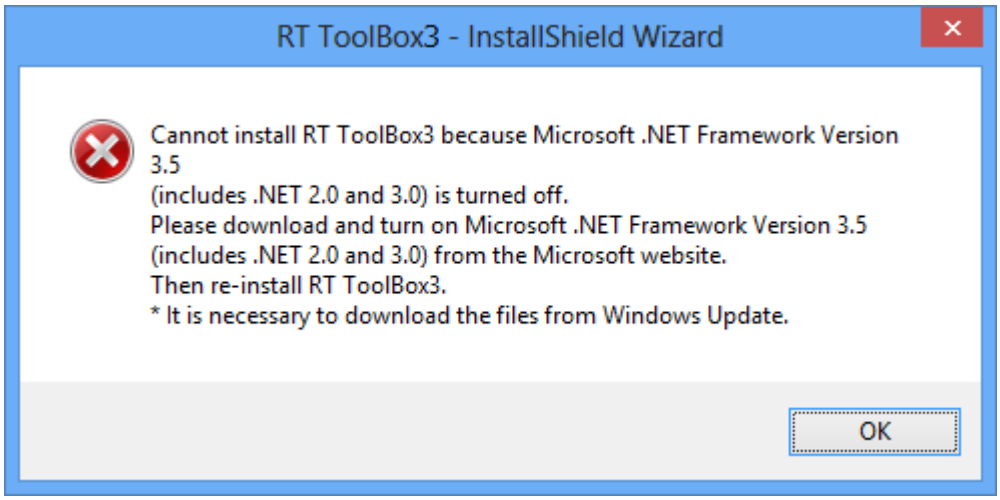
Installation confirmation message for USB driver software (for Windows Vista)



When "Always trust software from MITSUBISHI ELECTRIC CORPORATION" is checked, the alert message will not be displayed after next time. We have confirmed operation at our company. No problem occurs after installation.

1.5.1.1. Installation on Windows 8 / 8.1 / 10

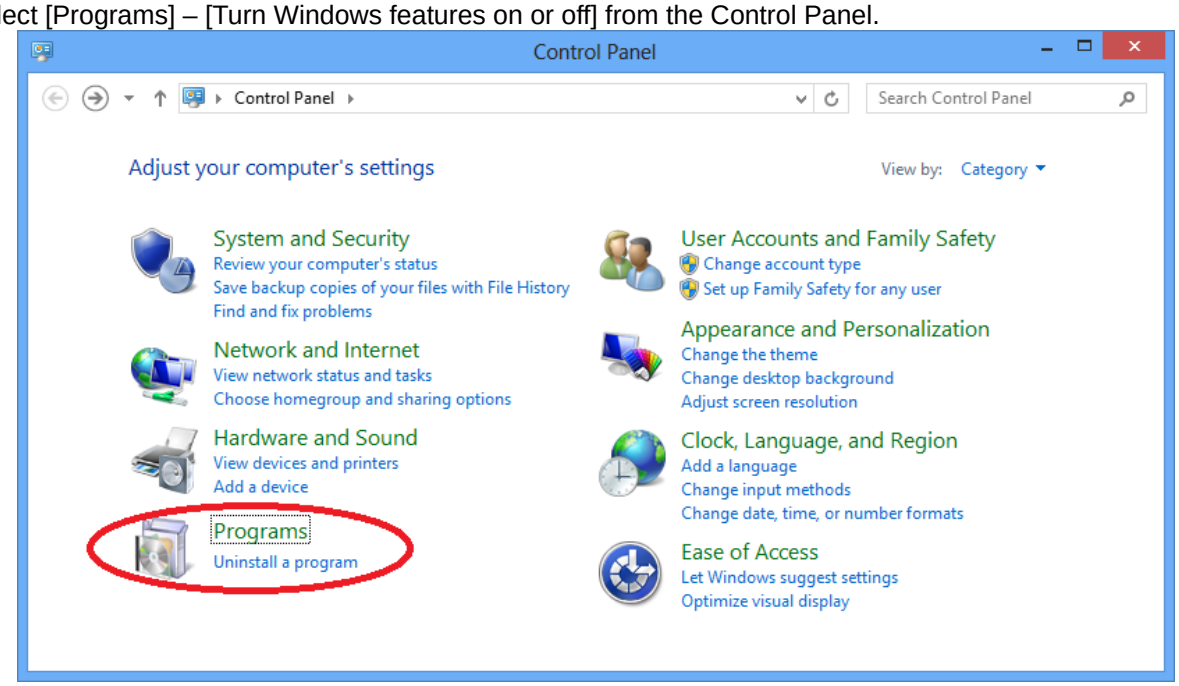
When you install this software on Windows 8 / 8.1 / 10, you will need to turn on the ".NET Framework Version 3.5 (includes .NET 2.0 and 3.0)" feature of the PC you want to install. If you install this software with this feature turned off, the installation will stop and show the following dialog.

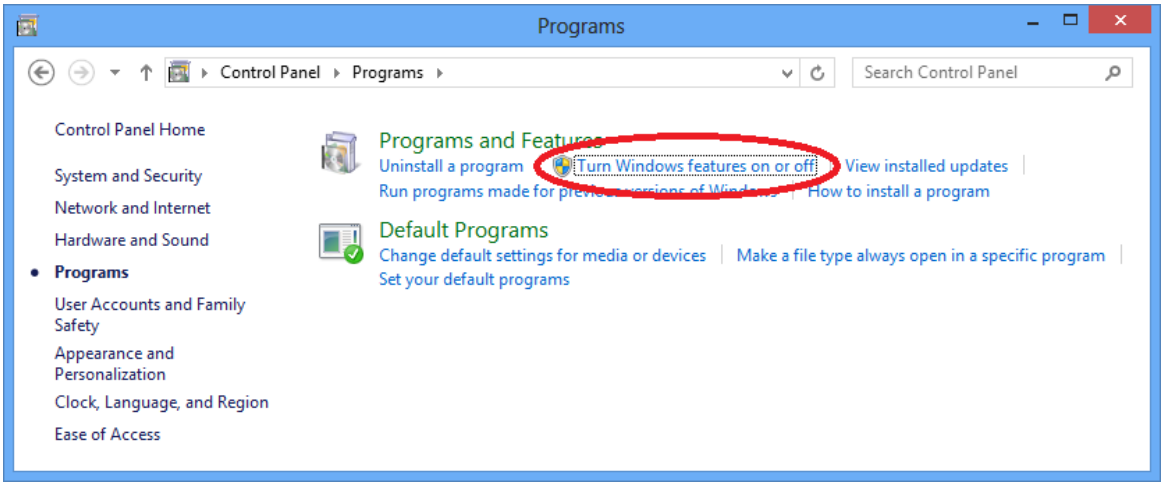


If the dialog is shown, install this software again after you turn on ".NET Framework Version 3.5 (includes .NET 2.0 and 3.0)" feature as follows.

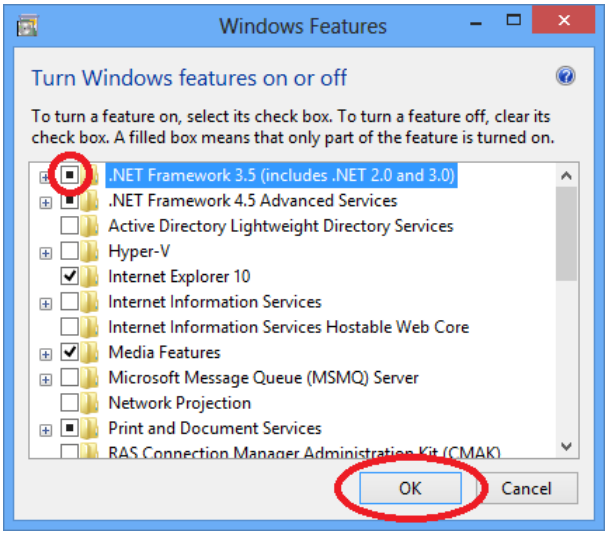
(1) Be ready to connect the PC to the Internet.

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

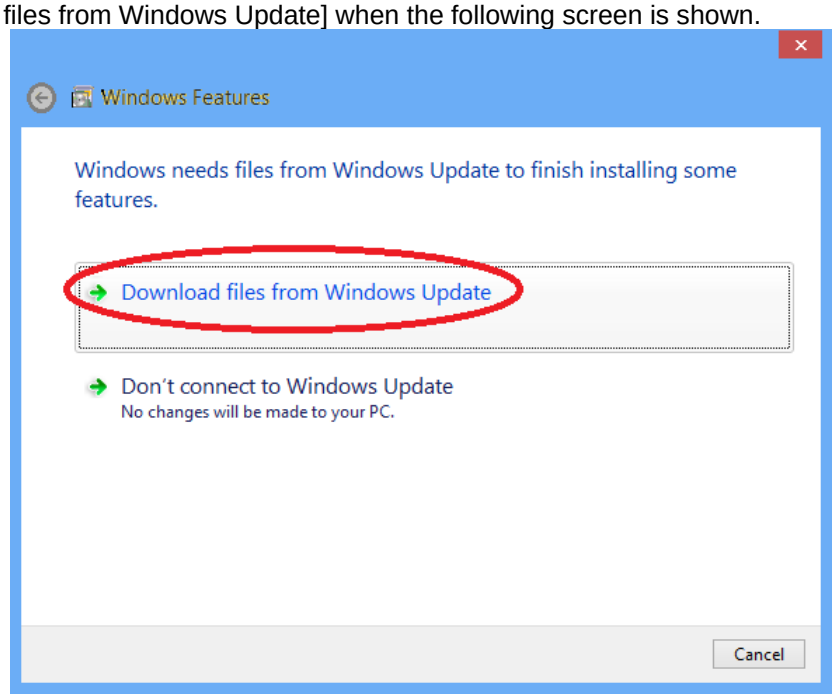




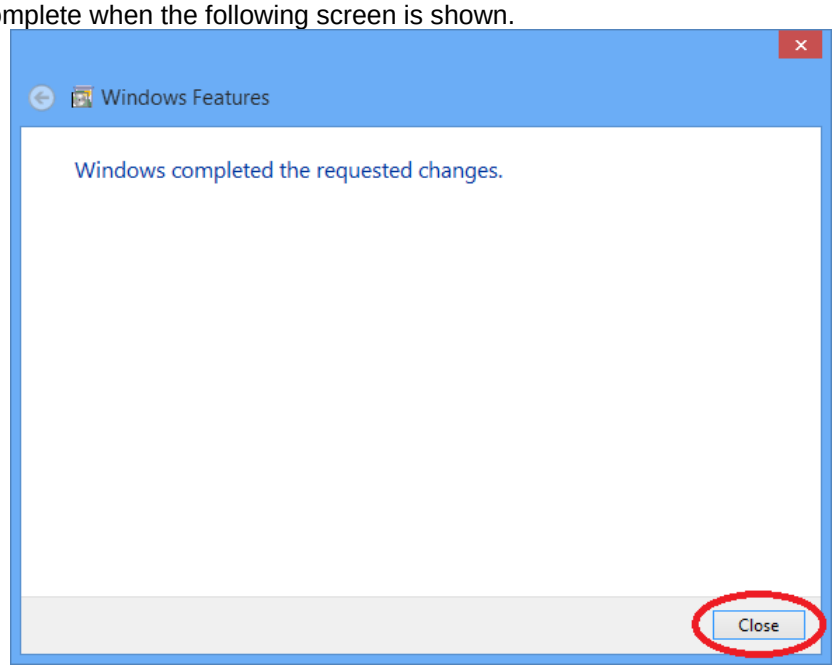
(3) Check the [.NET Framework 3.5 (includes .NET 2.0 and 3.0)] check box on the Turn Windows features on or off screen and click [OK].



(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 by the following method.

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

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

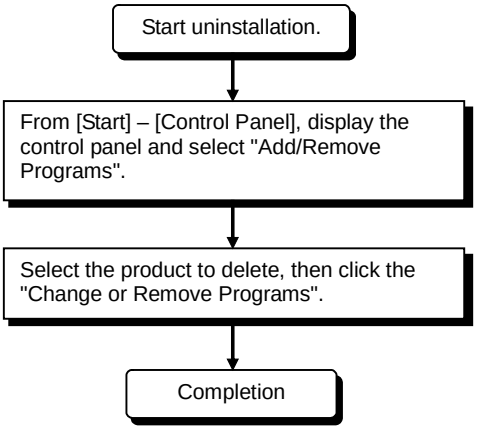
  When not using the classic display
  With [Control Panel] [Program], execute [Uninstall Program].

  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 / 10
  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.



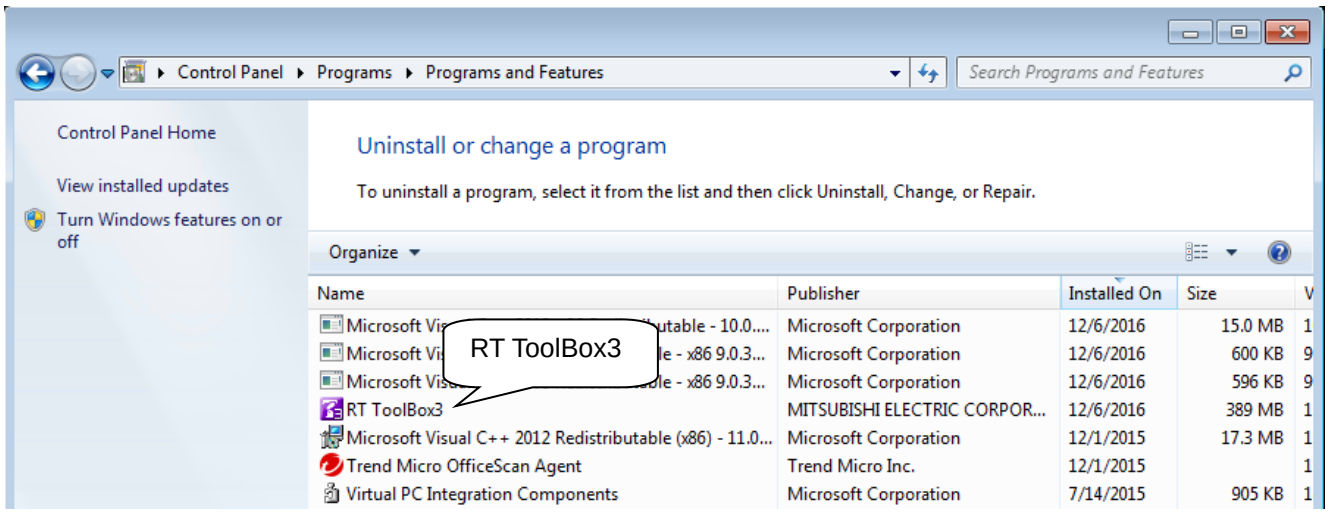


Figure 1-2 Uninstalling Applications (Windows7)

1.5.3. USB driver (CR800-D/CR750-D/CRnD-700 series robot controller) installation

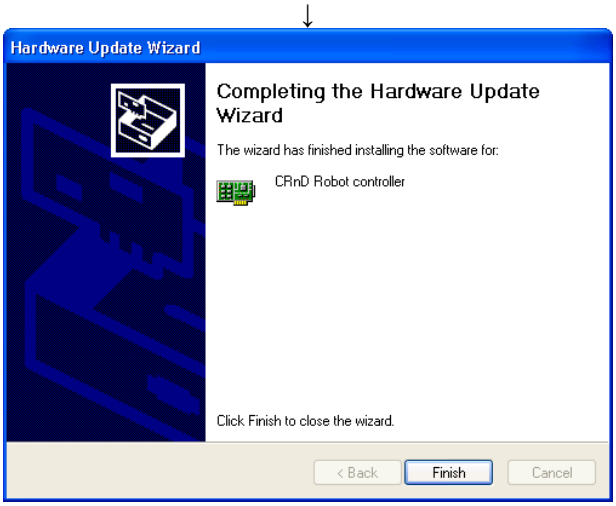
Connecting the CR800-D/CR750-D/CRnD-700 series robot controller by USB requires installation of the robot USB driver. Install by the following procedure.

1.5.3.1. When Using Windows XP

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

1) When you connect the computer and CR800-D/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)

1.5.3.2. When using Windows Vista

When you connect the CR800-D/CR750-D/CRnD-700 robot controller and the computer with a USB cable, installation starts and completes automatically.

1.5.3.3. When using Windows 7 / 8 / 8.1 / 10

When you connect the CR800-D/CR750-D/CRnD-700 robot controller and the computer with a USB cable, installation starts and completes automatically.

⚠ Caution

When the communication becomes unstable

If you connect the computer and CR800-D/CR750-D/CRnD-700 series robot controller with a USB cable, the communication may become unstable due to noise.
In this case, we recommend changing to LAN communication.

If you cannot communicate with the CR800-D series robot controller with USB in Windows 7 (64-bit version)

Please perform Windows Update and update Windows to the latest state.

* When communicating with the robot controller of the CR800-D series with USB in Windows 7 (64-bit version), Application of "Security Update for Windows 7 for x64-based Systems (KB3033929)" is mandatory.

1.5.4. CRnQ_R communication USB driver installation

Connecting the CR800-R/CR800-Q/CR750-Q/CRnQ-700 series robot controller by USB requires installation of the robot USB driver. Install by the following procedure.

Caution

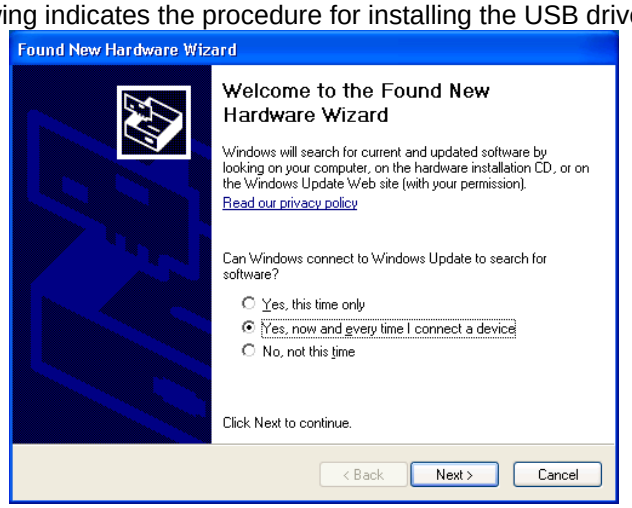
If the USB driver cannot be installed, check the following setting.

<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.

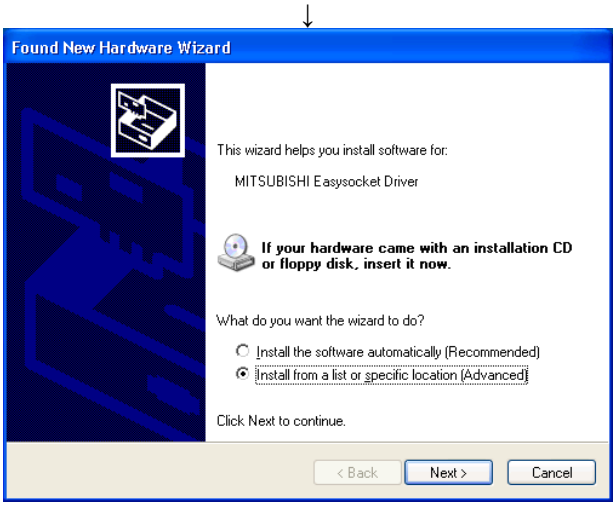
1.5.4.1. When using Windows XP

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



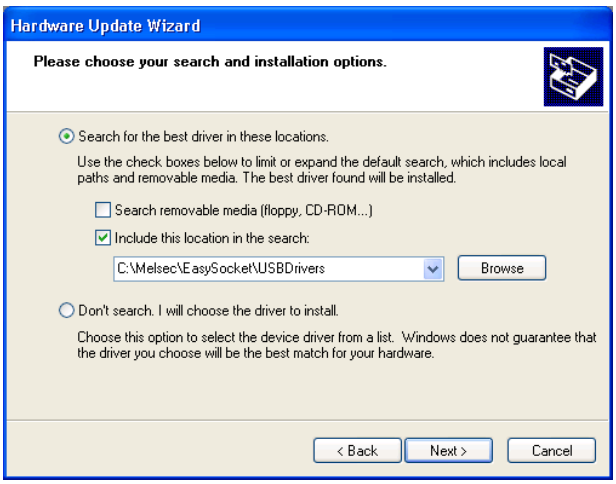
1) The screen shown on the left appears when you connect the personal computer and Universal model QCPU by a USB cable.
Choose "Yes, now and every time I connect a device" and click the [Next] button.

↓



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

↓

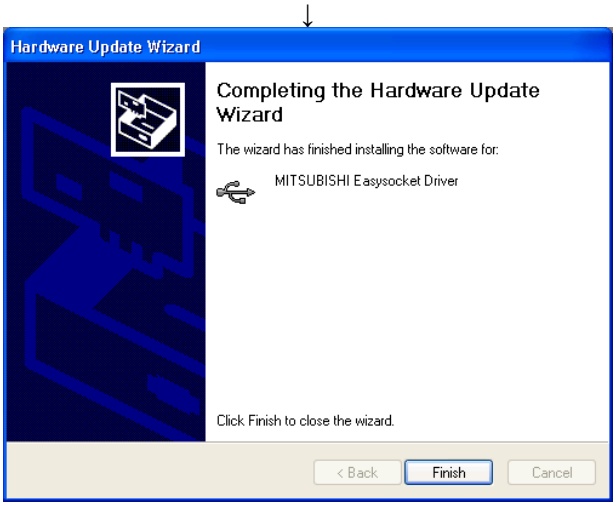


3) The screen on the left appears.
Choose "Search for the best driver in these locations".
Check "Include this location in the search" and set the "C:\Melsec\EasySocket\USBDrivers".
If volume MELSOFT products have been installed, browse the installation destination "EasySocket\USBDrivers" of the first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

↓

4) 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.)

↓



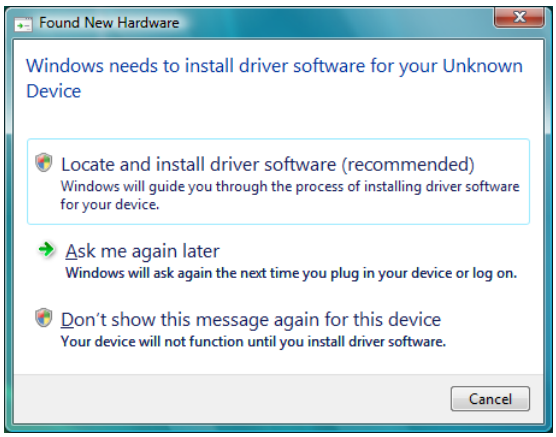
5) The screen on the left appears to indicate completion of installation.
Click the [Finish] button.

↓

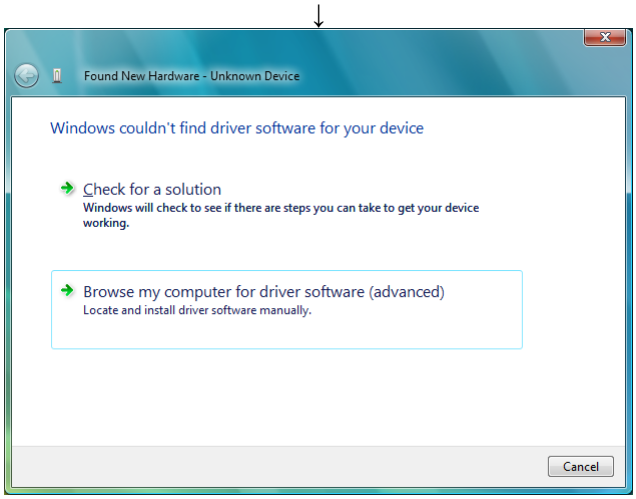
(Completed)

1.5.4.2. When using Windows Vista

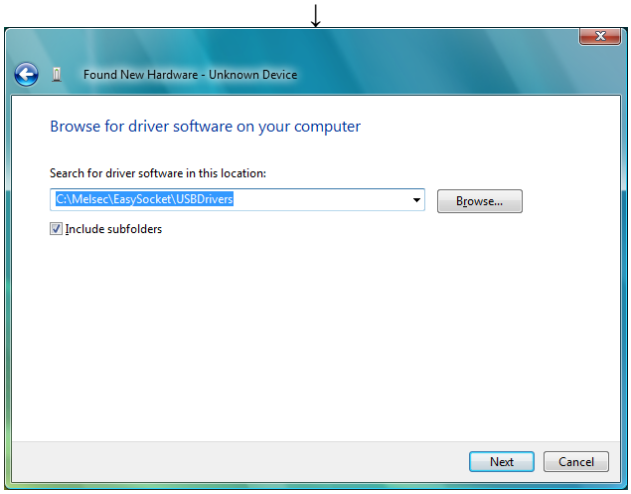
The following indicates the procedure for installing the USB driver when using Windows Vista (Business).



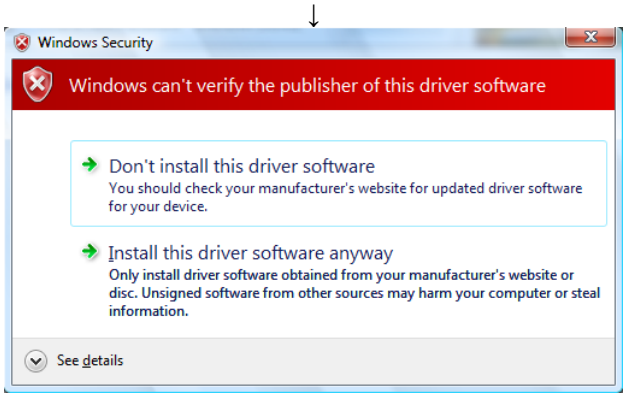
1) The screen shown on the left appears when you connect the personal computer and Universal model QCPU by the USB cable.
Select "Locate and install driver software (recommended)" and wait for the search to end.



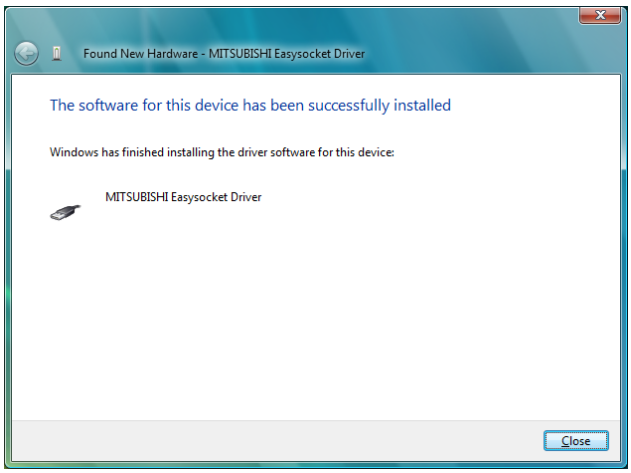
2) The screen on the left is displayed. Select "Browse my computer for driver software (advanced)".



3) The screen on the left is displayed. 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. Select "Install this driver software anyway".

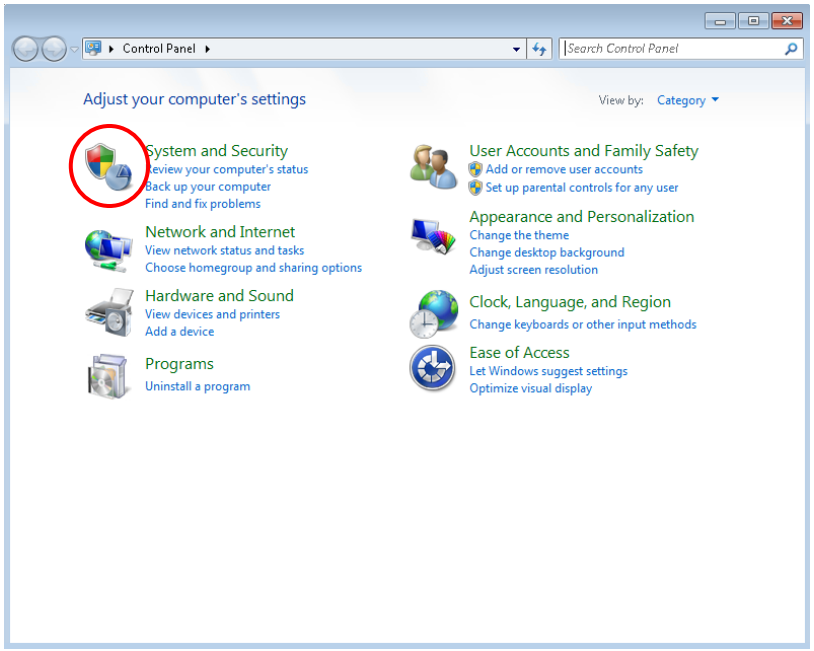


↓
(Completed)

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

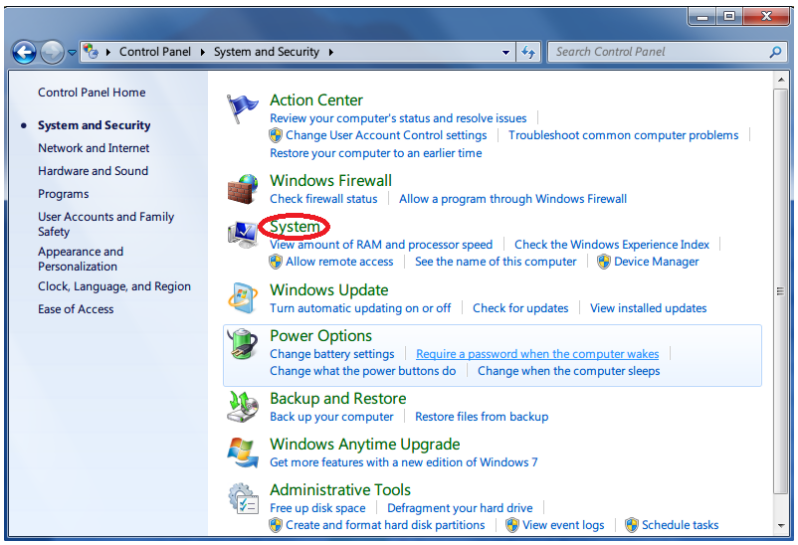
1.5.4.3. When using Windows 7 / 8 / 8.1 / 10

The following indicates the procedure for installing the USB driver when using Windows 7 / 8 / 8.1 / 10

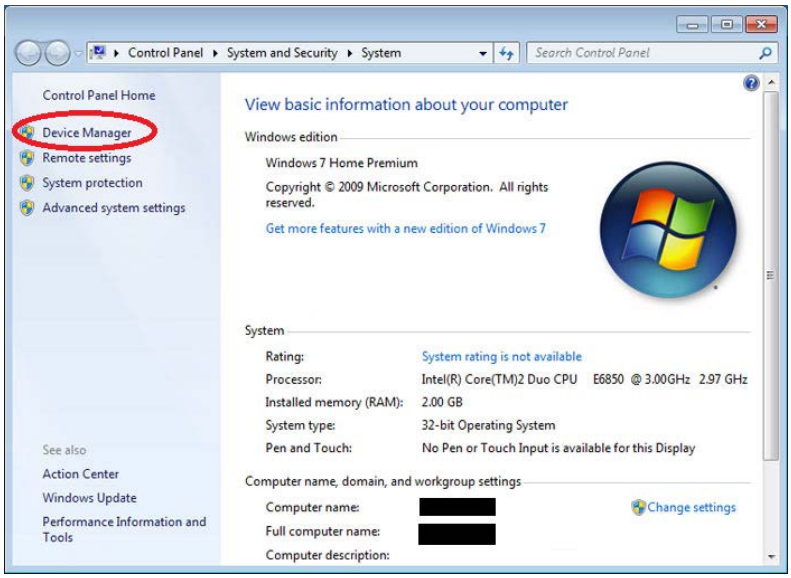


↓

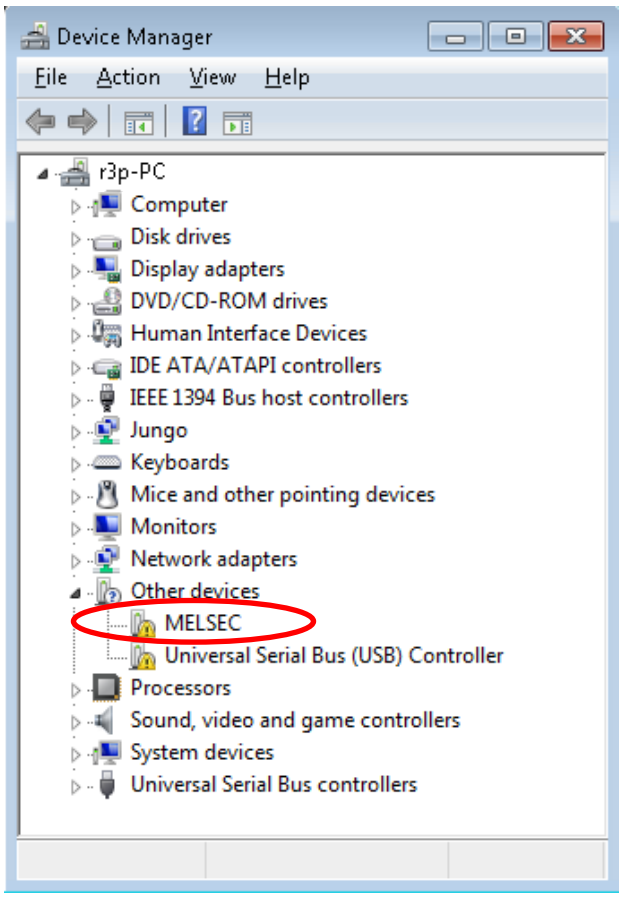
1) When "Control panel" is selected from the start menu with the USB cable connected, the following screens are displayed.
The screen on the left is displayed. Click the part circled in red in this screen.



2) The screen on the left is displayed. Click the part circled in red in this screen.

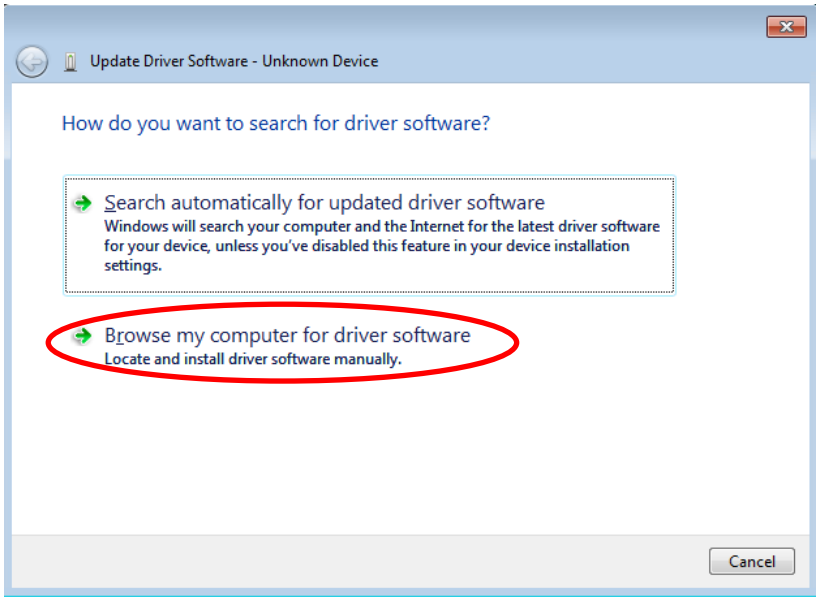


3) The screen on the left is displayed. Click the part circled in red in this screen.



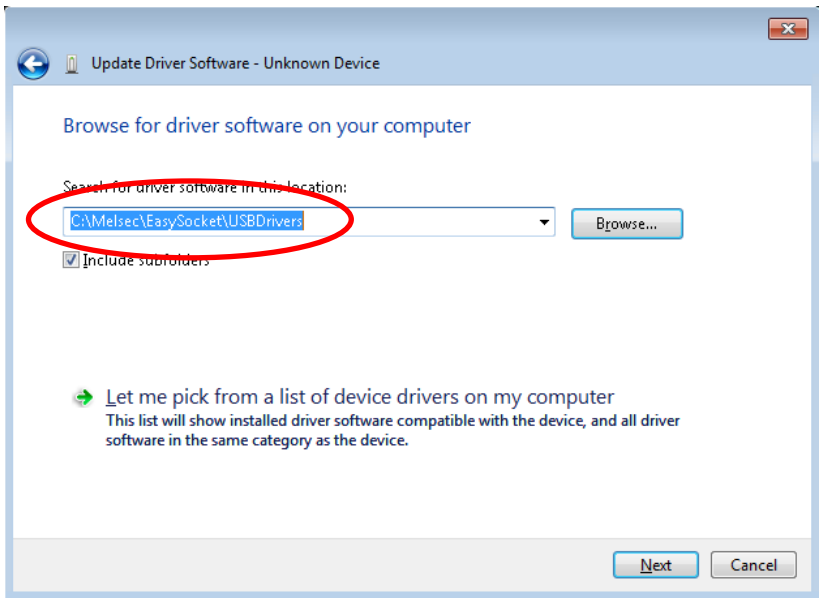
4) The screen on the left is displayed. Right-click on the “MELSEC” displayed on this screen.
Select "Update Driver Software" in the menu displayed upon right-clicking this item.

↓



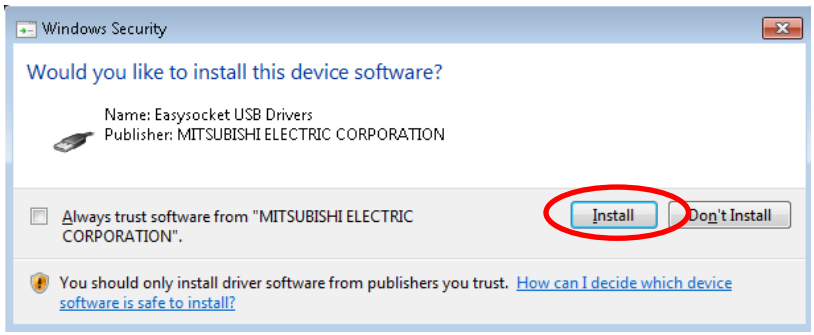
5) The screen on the left is displayed. Click "Browse my computer for driver software" on the bottom.

↓



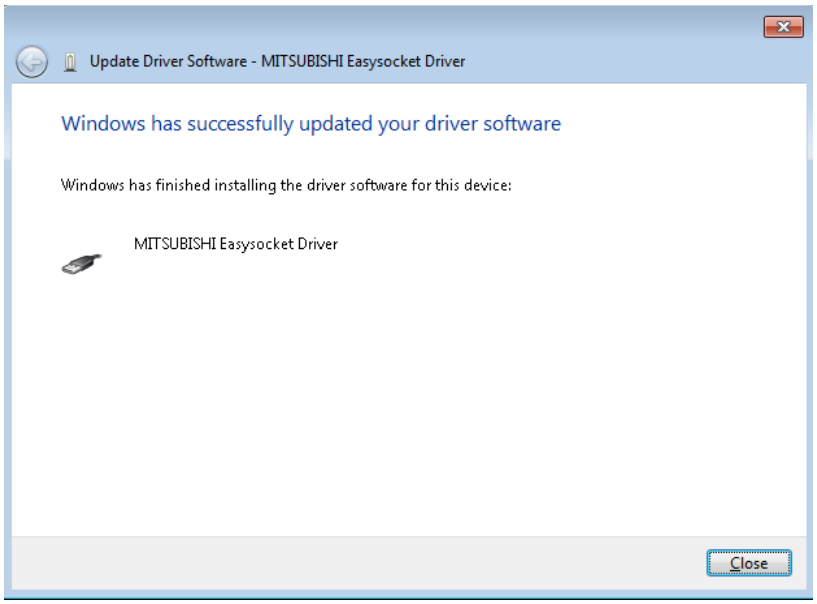
6) The screen on the left is displayed, set to "C:\Melsec\Easysocket \USBdrivers".
If multiple MELSOFT products have been installed, browse the installation destination "EasySocket\USBDrivers" of the first installed product.
After setting, click the "Next" button.

↓



7) The screen on the left is displayed. Click "install".

↓



8) The screen on the left appears, indicating completion of installation. Click the [Finish] button.

↓
(Completed)

1.5.5. CRnQ_R Communication USB driver for GOT transparent function / GOT communication installation

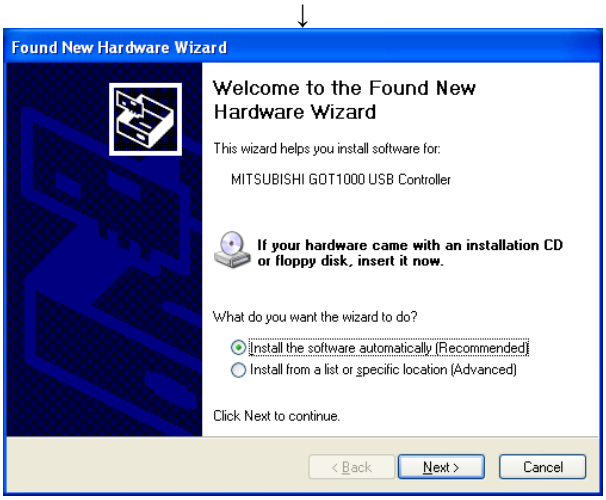
Connecting the CR800-R/CR800-Q/CR750-Q/CRnQ-700 series robot controller by USB via the GOT transparent mode (Bus, Direct coupled or Ethernet) and connecting the CR800-D/CR750-D/CRnD-700 series robot controller by USB via GOT communication requires installation of the USB driver for the GOT transparent function. Install by the following procedure.

1.5.5.1. 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 with a USB cable. Choose "Yes, now and every time I connect a device" and click the [Next] button.

↓

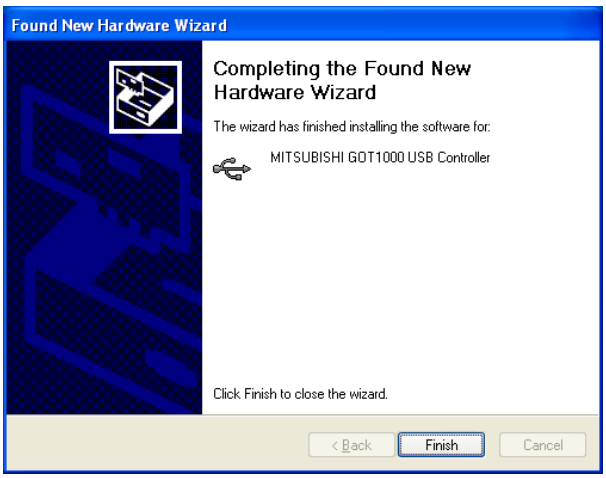


2) The screen on the left appears. Select "Install the software automatically (Recommended)", then click the [Next] button.

↓

3) The screen on the left appears. Click the [Continue Anyway] button to continue the installation of the USB driver.
(No problems will occur after installation of the USB driver.)

↓



↓
(Completed)

4) The screen on the left appears, indicating 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.

1.5.5.2. When using Windows Vista

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

1.5.5.3. When using Windows 7 / 8 / 8.1 / 10

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 precautions. 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 VisualBox	MELFA ASSISTA software	Cannot be used at the same time as this software
RT ToolBox computer support software	Older version of this software	Cannot be used at the same time as this software
RT ToolBox 2	Older version of this software	Cannot be used at the same time as this software
MELFA-Works	3D robot simulator	Cannot be used at the same time as this software
MELFA-Vision	Network vision sensor software	Start this software first.
E/EN series computer support software for Windows	E/EN series software	Cannot 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 the MITSUBISHI ELECTRIC FA site where information on MITSUBISHI ELECTRIC Corporation FA equipment products is offered.

https://www.mitsubishielectric.com/fa/

It is necessary to register as FA members to download software.

2. Changes from RT ToolBox2

In RT ToolBox3, the following content has been changed from RT ToolBox2.

2.1. Changes to Save Format in Workspaces and Compatibility

The save format for the layout settings for workspaces differ in RT ToolBox2 and RT ToolBox3.
When a workspace saved in RT ToolBox2 is opened in RT ToolBox3, the layout that was last opened in the 3D monitor of the entire workspace, the robot layout, etc. are automatically converted to the saving format of RT ToolBox 3, and a layout file is created. In addition, if you want to display the layout created by RT Toolbox 2, you need to convert it to the saving format of RT ToolBox 3 using the layout conversion function.
Workspaces created in RT ToolBox3 can also be opened in RT ToolBox2. However, note that layouts set in RT ToolBox3 cannot be displayed.

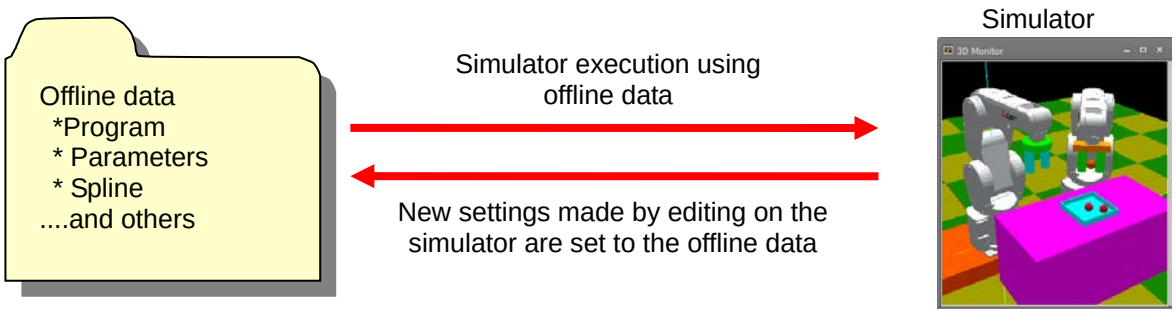
2.2. Operations Using the Ribbon

Instead of the tool bar and menus that were used in RT ToolBox2, in RT ToolBox3, a ribbon interface is made available that allows the user to quickly find the required commands.
For an explanation on the ribbon, refer to **"6 Ribbon"**.

2.3. Linking Between the Offline and Simulation Environments.

In RT ToolBox2, the environments for offline editing and simulator tasks were independent from each other. For this reason, program transfer or parameter restore operation was needed to reflect new programs and parameters made by offline editing in the simulator.

In RT ToolBox3, common data is used offline and on the simulator. For this reason, operations for reflecting new programs and parameters made by offline editing in the simulator are no longer needed.
As a result, in RT ToolBox3, programs and parameters can be edited without having to be aware of any differences in the offline and simulator environments.



In addition, a backup / restore function for projects in the personal computer has been added, enabling the environment within the robot controller (online) and the environment in the personal computer (offline / simulation) to cooperate as described below.

(1) Build environment of robot controller in personal computer.
(2) Reflect the contents set in the personal computer to the robot controller.

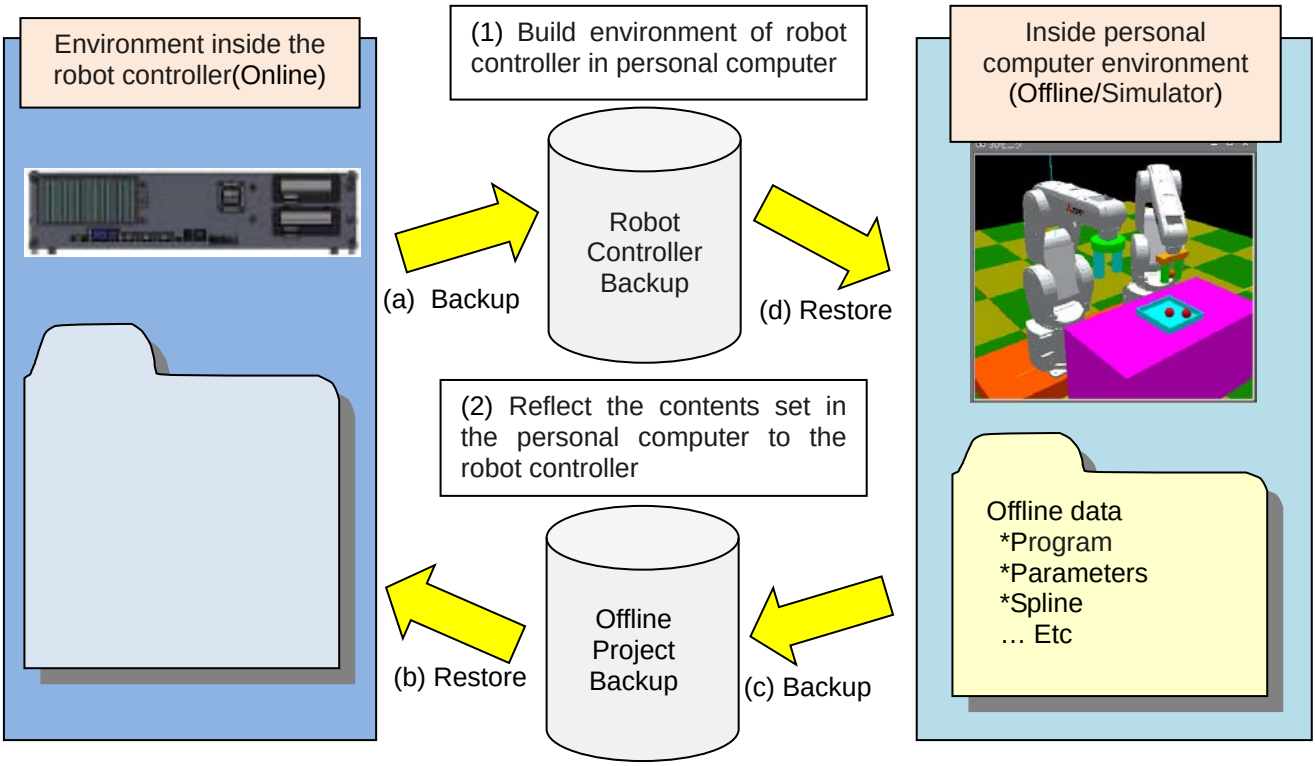


Figure 2-1 Cooperation between robot controller environment and simulation

For each backup / restore method (a) - (d) above, please refer to the following chapters respectively.

Symbol	Operation contents	References
(a)	Robot controller back up	**17.1** Backup(Robot -> PC)
(b)	Restore to robot controller	**17.2** Restore (PC -> Robot)
(c)	Offline project back up	**17.6** Deleting Backup Data
(d)	Restore to offline project	**17.7** Open Backup program

2.4. Support of Program Language MELFA-BASIC VI

In RT ToolBox3, the program language "MELFA-BASIC VI" that has been added on CR800 series controllers is now supported. For details, refer to **"10 Robot Programming Language Setting"**.

2.5. Discontinuation of Robot Individual Display in 3D Monitor

In the RT ToolBox2 3D monitor, displays for individual robots by each project and all robots in workspaces were displayed. However, in RT ToolBox3, to avoid confusion among users due to the two different available displays, only all robots in workspaces are displayed.

2.6. Memory of screen display position and size

In RT ToolBox3, remembers the display position and size of each screen. Next time, the same screen is displayed with the same position and size as the previous time.

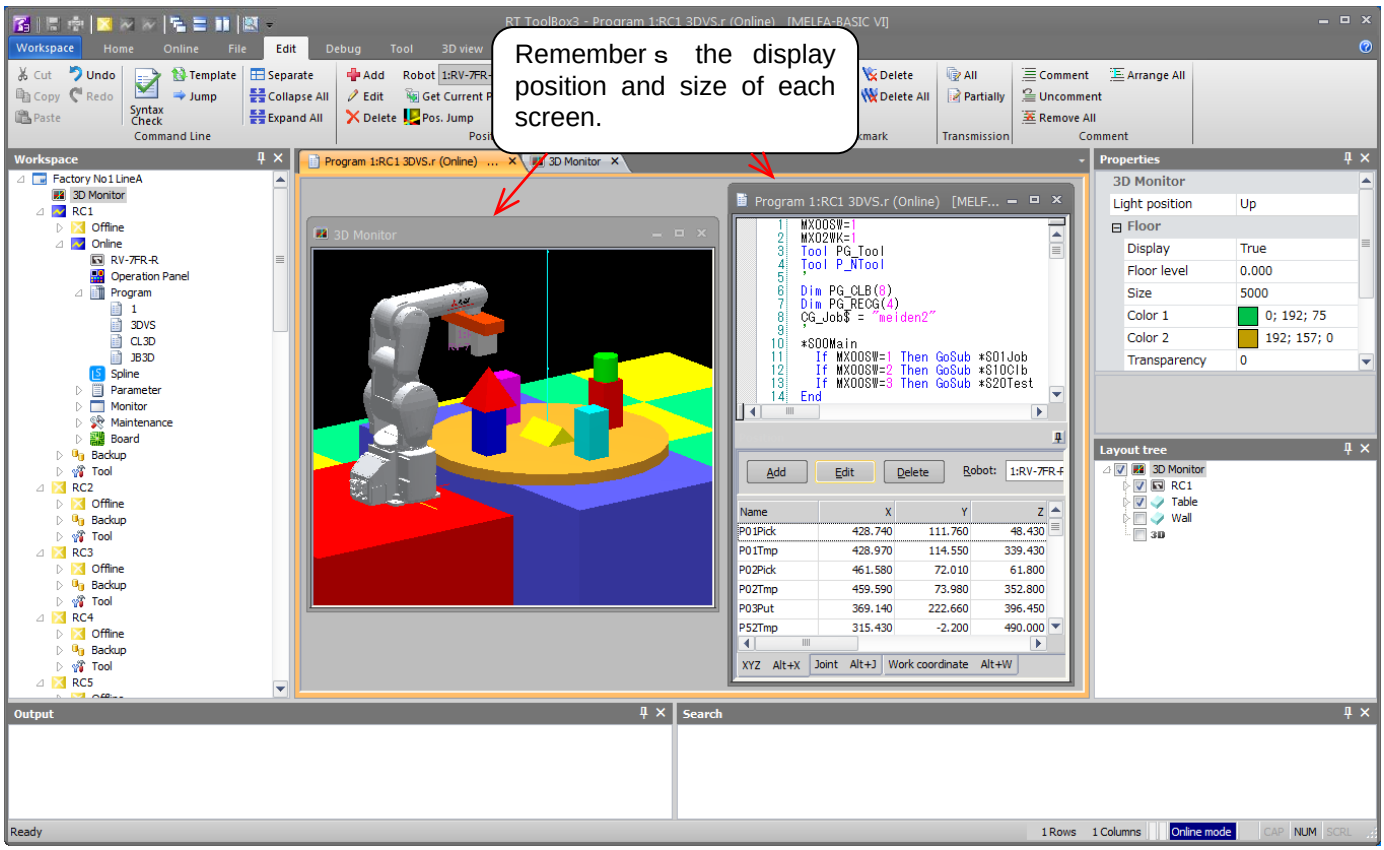


Figure 2-2 Memory of screen display position and size

In RT ToolBox3, remembers the display position and size of each screen. Next time, the same screen is displayed with the same position and size as the previous time.

Caution

Please be careful, if initialized by this method, display position and size of all screens are initialized.

3. RT ToolBox3 Usage

This explains the usage of this software simply.

3.1. Starting RT ToolBox3

When you install this software, a shortcut is prepared on the desktop. Start RT ToolBox3 by double clicking this short cut.

Figure 3-1 RT ToolBox3 Shortcut

From [Start] button -> [All Programs] -> [MELSOFT], select [RT ToolBox3] and start it.

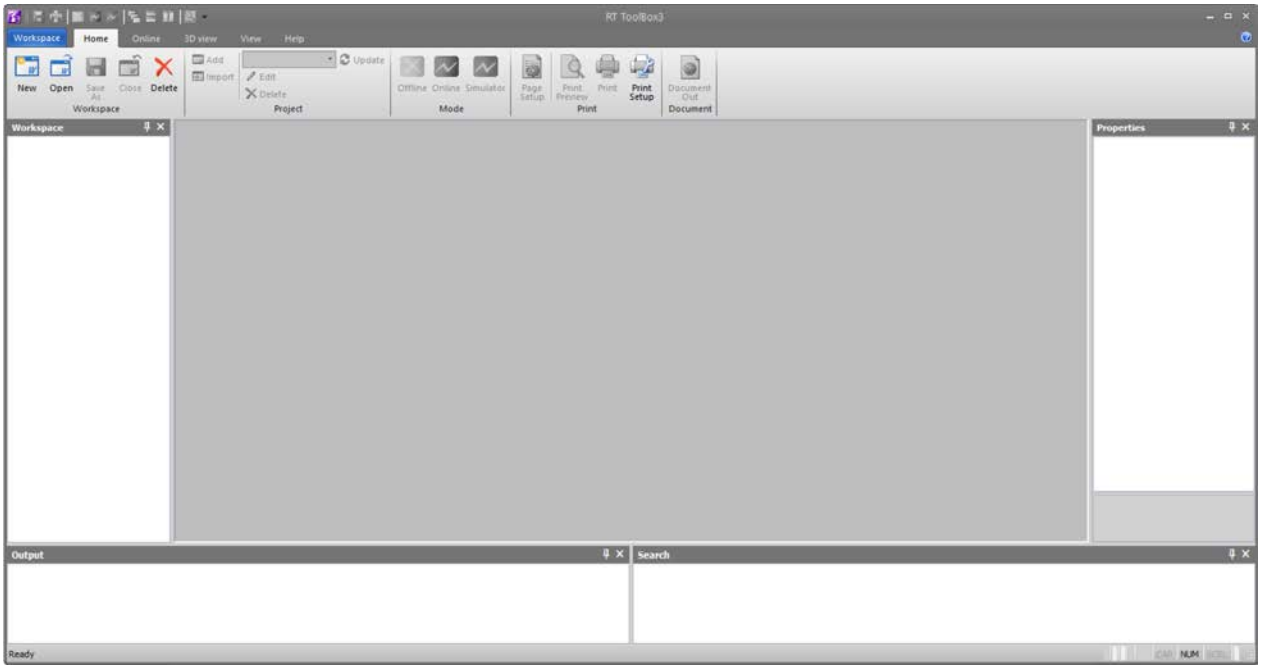


Figure 3-2 RT ToolBox3 Initial Screen

When you start RT ToolBox3, "Communication Server 2" is started up as an icon.
This Communication Server 2 has functions for connecting with a robot controller or, during a simulation, a virtual controller. Do not close Communication Server 2.

Figure 3-3 Communication Server 2

3.2. Explanation of RT ToolBox3 Screens

The composition of the main RT ToolBox3 screen is as follows.

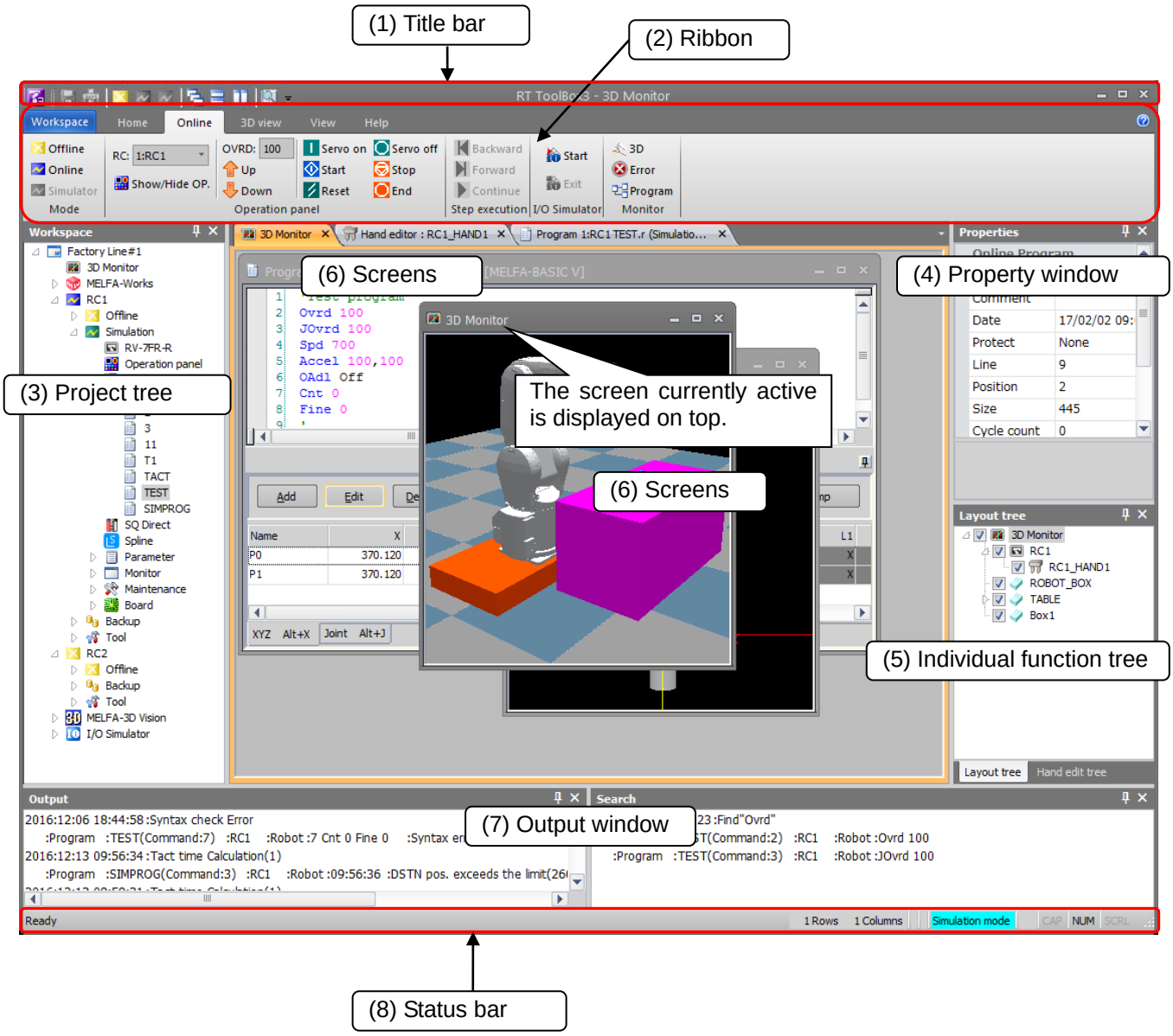
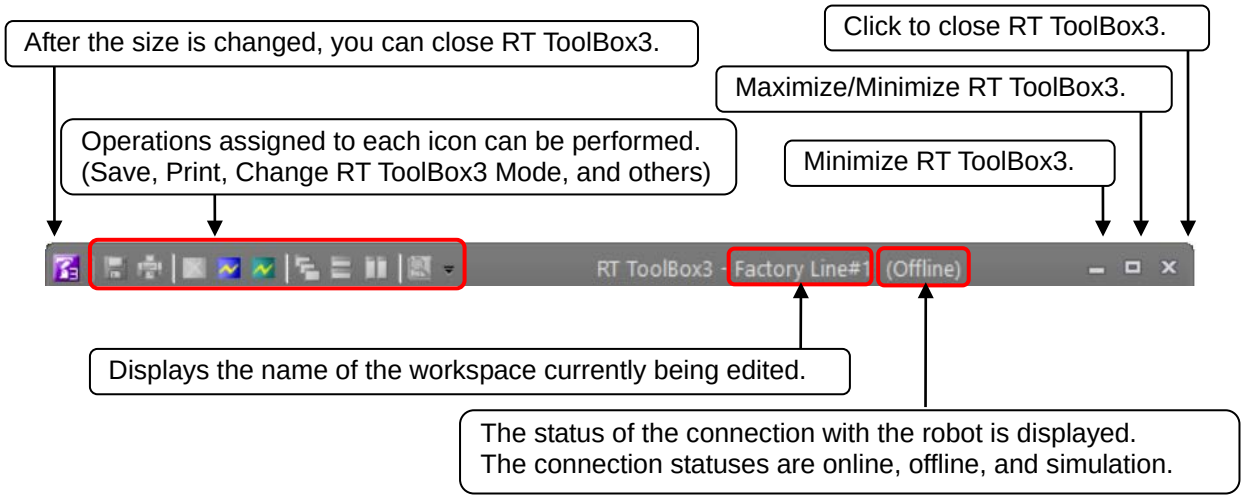


Figure 3-4 Explanation of Main Screen

(1) Title bar

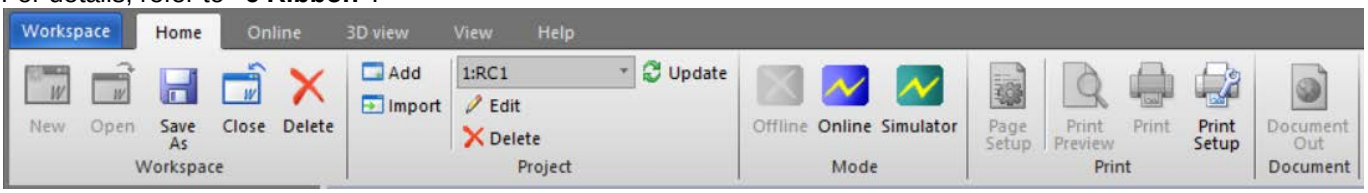
Displays the name of the workspace currently being edited.



(2) Ribbon

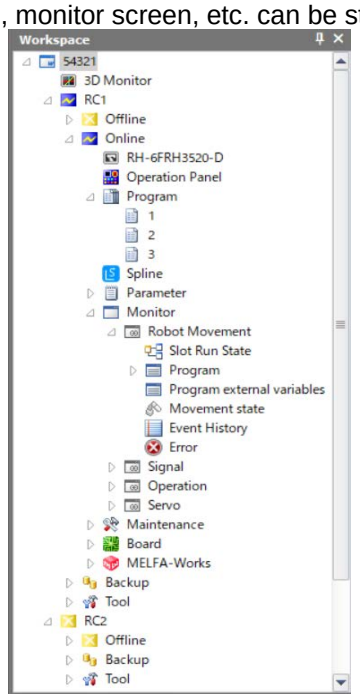
Command groups available in RT ToolBox3 are displayed.

For details, refer to **"6 Ribbon"**.



(3) Project tree

This 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.

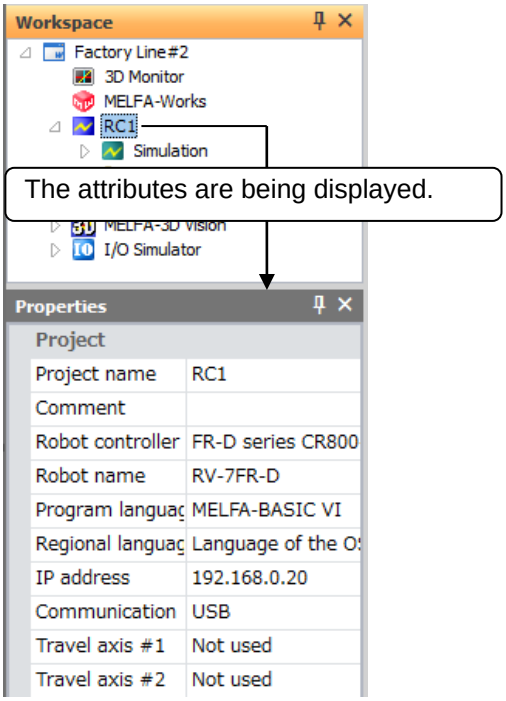


The project tree is a docking window. By dragging the title section with the mouse, you can dock the project tree at the top, bottom, left, or right edge of the main screen. For details on the docking window, refer to **"7 Docking Window"**.

When the project tree is closed, it can be redisplayed by checking [Workspace] in the [View] tab -> [View] group on the ribbon.

(4) 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.

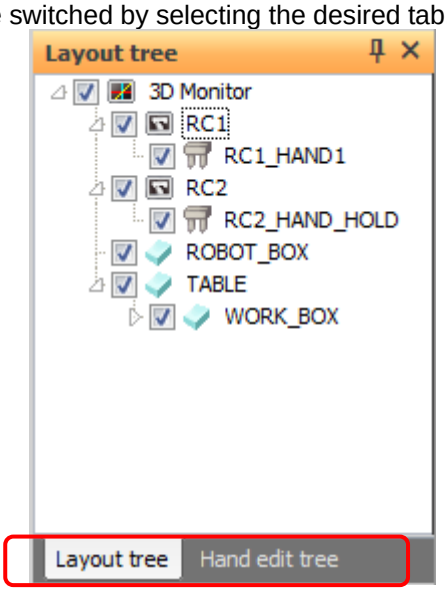


The property window is a docking window. For details on the docking window, refer to **"7 Docking Window"**.

When the property window is closed, it can be redisplayed by checking [Properties] in the [View] tab -> [View] group on the ribbon.

(5) Individual function tree

When a specific screen (e.g. 3D monitor) is displayed, this exclusive tree is displayed. When multiple trees are displayed, the displayed tree can be switched by selecting the desired tab.

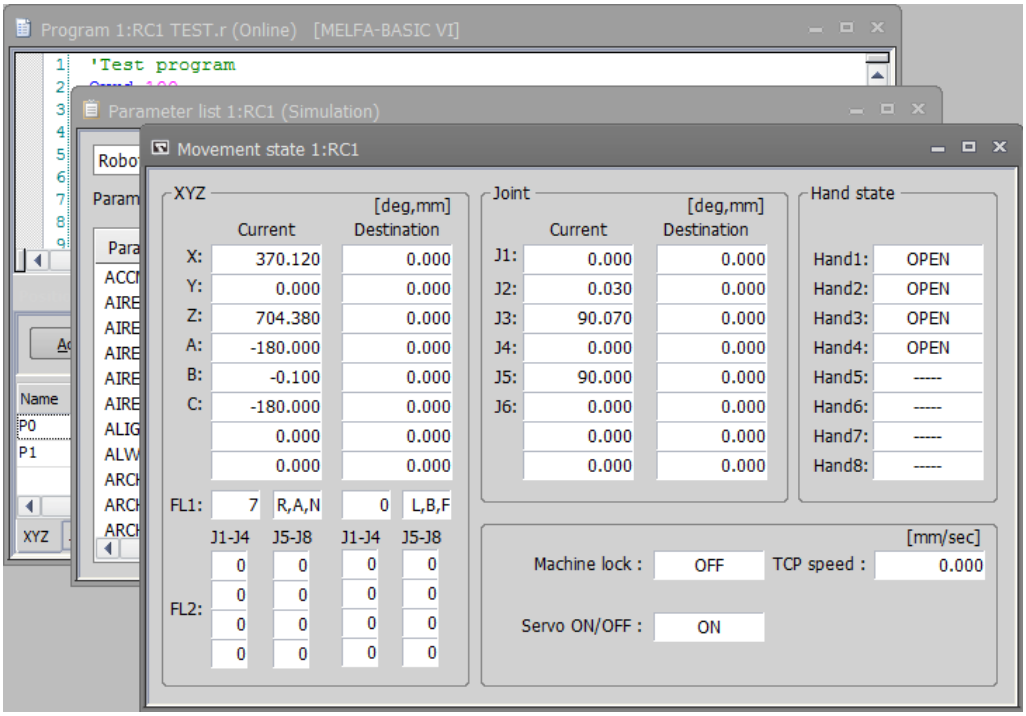


The window of the individual function tree is a docking window. For details on the docking window, refer to **"7 Docking Window"**.

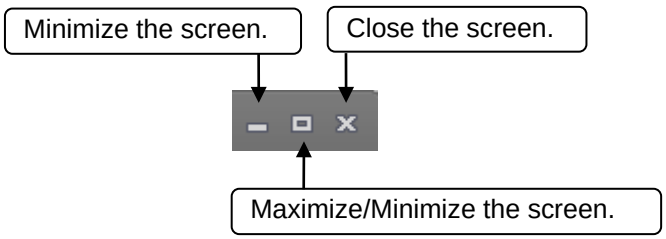
When the individual function tree is closed, it can be redisplayed by clicking the [Reset the window layout.] button in the [View] tab -> [View] group on the ribbon.

(6) Screens

This 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.



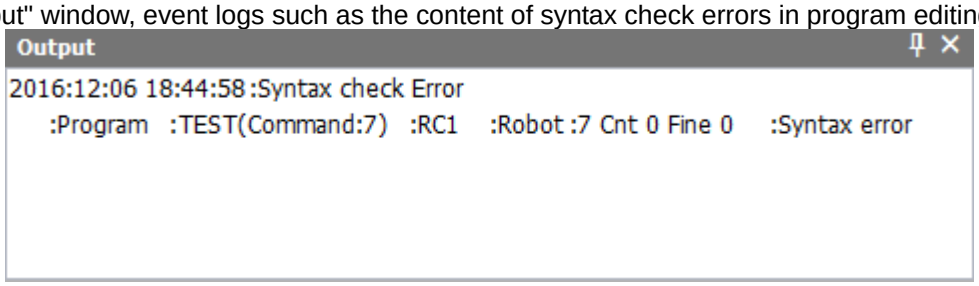
To close a screen, click the [✕] button in the upper-right corner of the screen.
You can also change the screen size with the button in the upper-right of the screen.



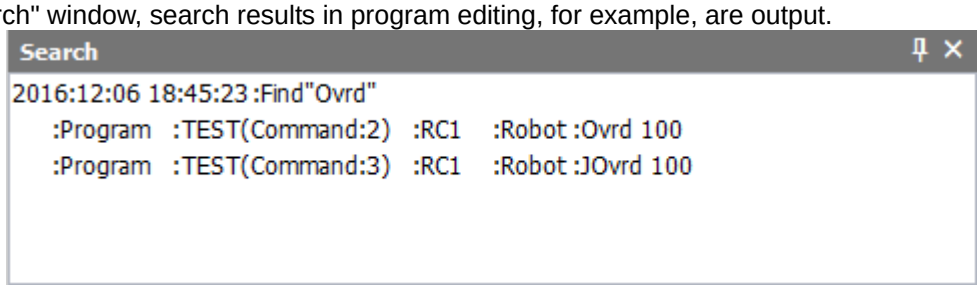
(7) Output window

RT ToolBox3 event logs and search results, for example, are displayed in this window.
There are two types of output window, "Output" and "Search".

In the "Output" window, event logs such as the content of syntax check errors in program editing are output.



In the "Search" window, search results in program editing, for example, are output.



The exclusive context menu is displayed by right-clicking on the output window. The following operations can be performed from this menu.

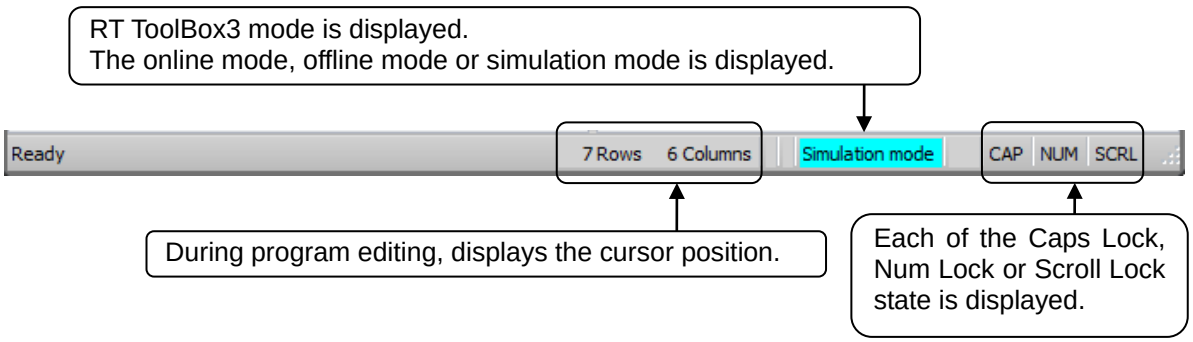
Menu item	Description of operation
Copy	The text string within the selected range can be copied.
Save As	The content displayed in the output window can be saved as a .txt format file.
Clear All	This clears the content displayed in the output window.

The output window is a docking window. For details on the docking window, refer to **"7 Docking Window"**.

When an output window is closed, the respective output window can be redisplayed by checking [Output] or [Search] in the [View] tab -> [View] group on the ribbon.

(8) Status bar

Displays RT ToolBox3 status information.



(9) Context menu display

The context menu can be displayed by clicking the mouse right button. This is a handy menu depending on work contents and it improves work efficiency.

For example, [Copy], [Cut] and [Paste] operations can be executed when performing program editing.

3.3. Changes in RT ToolBox3 Display Format

The display language and display style of RT ToolBox3 can be changed.

3.3.1. Changing the display language

The screen for changing the RT ToolBox3 display language can be changed by clicking the [Select Display Language] button in the [View] tab -> [View Settings] group on the ribbon.

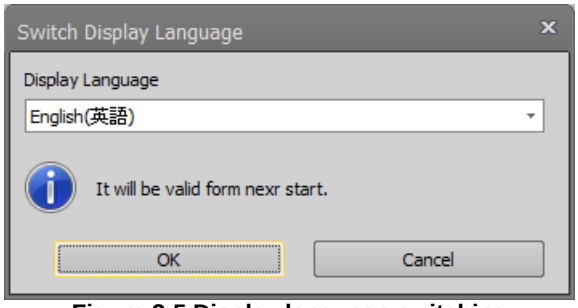


Figure 3-5 Display language switching

When the display language has been changed, the display will be in the newly set language when RT ToolBox3 is next started up.

A list of languages that can be selected as follows.

Languages
English(英語)
Japanese(日本語)
Chinese Simplified(简体中文)
Chinese traditional(繁體中文)

Version 1.01B or later, when non-Japan has been selected, regardless of the "LNG" parameter setting, the controller turns on the language of communication in English. Sets the Japan and switch to Japan.
This function can be used with Version 1.01B or later of the CR800/750/700 series controller.

3.3.2. Changing the display style

The screen for changing the RT ToolBox3 display style can be changed by clicking the [Select Display Language] button in the [View] tab -> [View Settings] group on the ribbon.

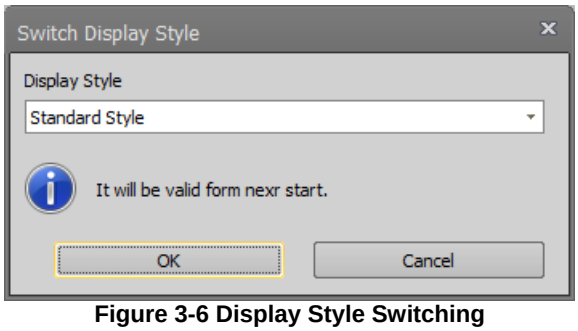


Figure 3-6 Display Style Switching

When the display style has been changed, the display will be in the newly set style when RT ToolBox3 is next started up.

3.4. Help Display

Explanations and information about RT ToolBox3 operation can be displayed in the Help display.

3.4.1. Displaying language help

Help for each individual program language can be displayed by selecting from the [Help] tab -> [Language Help] drop-down menu on the ribbon.
For details on program languages, refer to **"10 Robot Programming Language Setting"**.

3.4.2. Displaying the instruction manual

The instruction manuals for the robot controller and RT ToolBox3 can be displayed by selecting from the [Help] tab -> [Instruction Manual] drop-down menu on the ribbon.

Also, when the screen or tab is open, clicking the [ ] button (display and jump to the manual page of this screen) on the title bar will display the items of the manual for the currently selected screen.

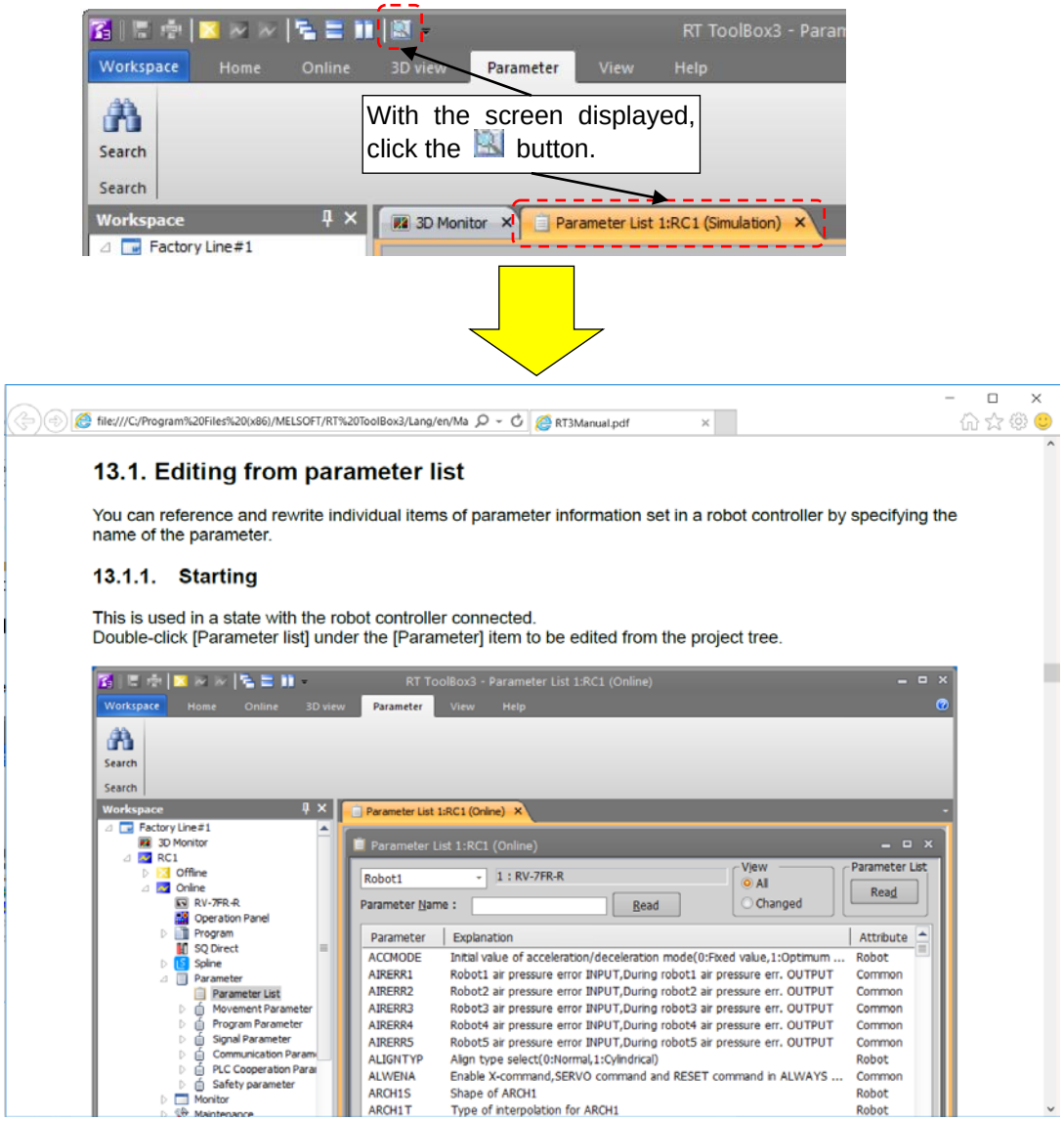


Figure 3-7 Display Manual from Title Bar

Caution

- The [ ] button (display and jump to the manual page of this screen) on the title bar does not become effective on screens where tabs are not displayed.
- Depending on the software installation status of the personal computer, items related to the manual may not be displayed. The relationship between the software installation status of the personal computer and the display status of the manual is as follows.

Table 3-1 Display status when displaying the manual from the [ ] button

software installation status	Display state of manual
Internet Explorer and Adobe Reader are installed.	The corresponding item is displayed.
AcroRd32.exe is associated with the PDF file.	The top of the page containing the corresponding item is displayed.
Acrobat.exe is associated with the PDF file.	The top of the page containing the corresponding item is displayed.
PDF files other than AcroRd32.exe and Acrobat.exe are associated.	The first page of the manual is displayed.

3.4.2.1. Detailed explanations of functions and operations

By clicking the series name of the robot controller from the [Help] -> [Manual] -> [Detailed explanations of functions and operations] dropdown menu, you can display detailed explanation of functions and operations corresponding to the series of controllers.

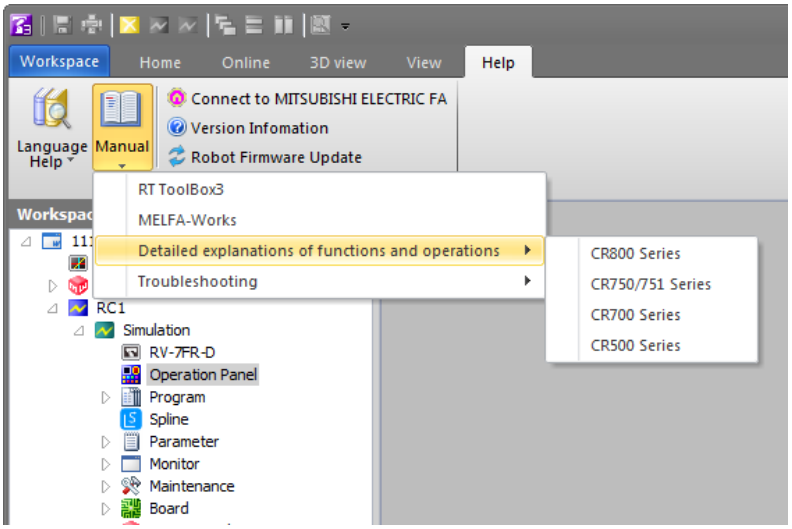


Figure 3-8 Detailed explanations of functions and operations

3.4.2.2. Troubleshooting

By clicking the series name of the robot controller from the [Help] -> [Manual] -> [Troubleshooting] dropdown menu, you can display troubleshooting corresponding to the series of controllers.

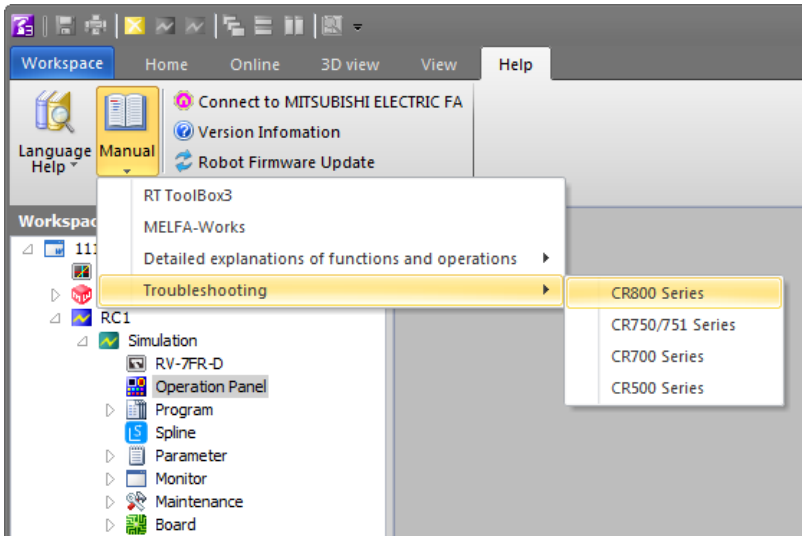


Figure 3-9 Troubleshooting

3.4.3. Connecting to the Mitsubishi Electric FA site

You can connect to the Mitsubishi Electric FA site by clicking the [Help] tab -> [Connect to FA Site] button on the ribbon. To be able to connect to the Mitsubishi Electric FA site, your personal computer environment must be able to support an Internet connection.

3.4.4. Displaying version information

The screen for checking the version and product ID of RT ToolBox3 is displayed by clicking the [Help] tab -> [About] button on the ribbon.

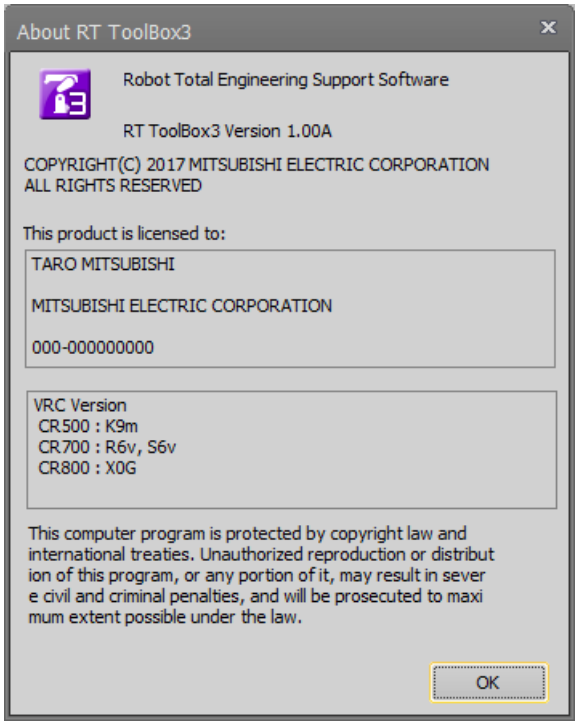


Figure 3-10 Checking Version Information

3.5. Communication Server 2

When you start RT ToolBox3, "Communication Server 2" is started up as an icon.
This Communication Server 2 has functions for connecting with a robot controller or, during a simulation, a virtual controller.

Figure 3-11 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 ToolBox3 is closed.

Turn Communication Server 2 into an icon.

Turn Communication Server 2 into an icon with the button.

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

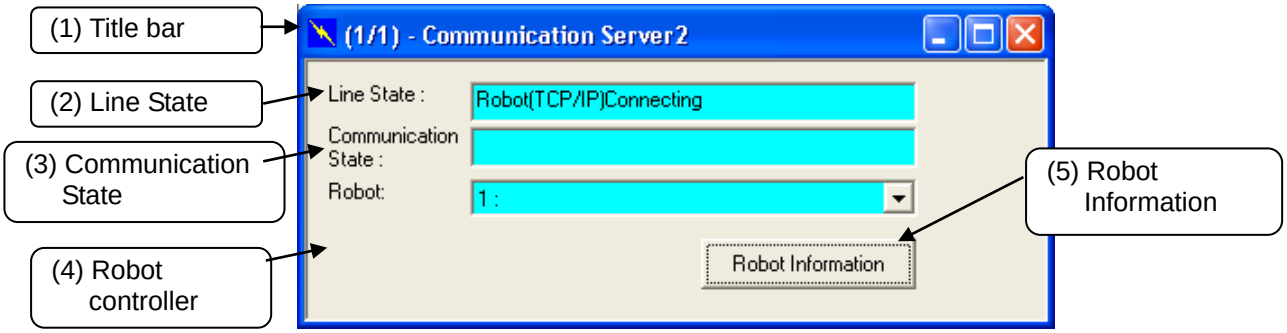


Figure 3-12 Communication Server2

(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 3-2 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

Status	Content	Color
Communication Setting error	Displayed when the communication port cannot be opened in the case of RS-232 connection. This is not displayed in the case of TCP/IP connection	Red
Waiting	Indicates the idling status displayed at the start of remote maintenance.	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.

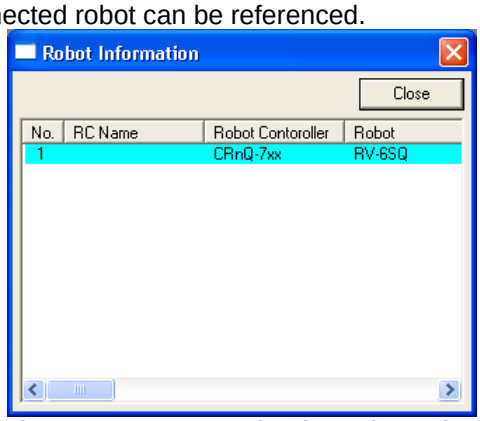


Figure 3-13 Connected Robot Information

Caution

Points to note when using the USB connection in CRnQ_R Communication

After connection success using a USB connection in CRnQ_R communication, when communication is disconnected due to external factors such as the following, the line state may remain "connected". In such a case, please return offline once and remove the factors then return online again.

- When the power of the robot controller is turned off
- When the communication cable is disconnected

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

Table 3-3 Combination of higher reliability communication

	Robot controller software version					
	CR800-D/R/Q	CR750-D/CRnD-700		CR750-Q/CRnQ-700		CRn-500
	All versions	Ver.P8 or later	Ver.P7a or earlier	Ver.N8 or later	Ver.N7 or earlier	All versions
Combination with this software	◎	◎	○	◎	○	○

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

Caution

Cautions on higher reliability communication by TCP/IP

When connected higher reliability TCP/IP communication, connect only one line per port number.
If two or more lines are connected to the same port number, a communication error may occur.

3.6. Closing RT ToolBox3

To exit RT ToolBox3, click the [Workspace] tab -> [Exit] menu on the ribbon. You can also close with the [×] button in the upper-right of the screen.
When you close RT ToolBox3, Communication Server 2 also closes automatically.

4. Notes of when RT ToolBox3 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 ToolBox3 is started from iQ Works (MELSOFT Navigator). Please refer to the following notes when you use iQ Works (MELSOFT Navigator).

4.1. Notes of when RT ToolBox3 is installed

Notes 1-1: ***Please input product ID attached to the product again when you install a standard version of RT ToolBox3 in the personal computer in which "iQ Works (MELSOFT Navigator" is installed.***

When RT ToolBox3 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 ToolBox3 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 ToolBox3 product again when you install a standard version of RT ToolBox3.

4.2. Notes concerning workspace operation

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

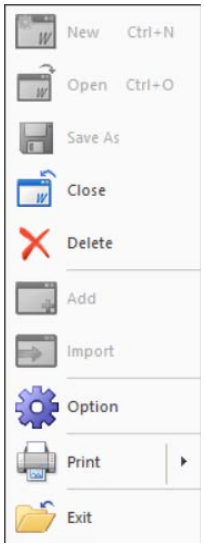
When RT ToolBox3 is started from iQ Works (MELSOFT Navigator), the workspace name and the workspace title cannot be changed. "Edit workspace" in the dropdown menu of the workspace name is displayed in the gray and cannot be selected. (Refer to **"Figure 4-1 Menu of [Workspace] and Dropdown-menu of the** Workspace**"**)

Notes 2-2: ***Please close RT ToolBox3 once when you edit another workspace.***

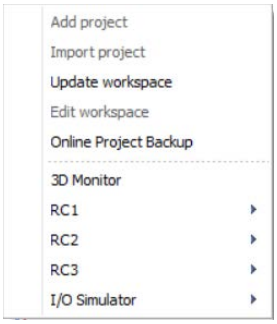
Another workspace cannot be opened after closing the editing workspace when RT ToolBox3 is started from iQ Works (MELSOFT Navigator). [New] of the [Workspace] menu and [Open] are displayed in the gray, and cannot be selected. (Refer to **"Figure 4-1 Menu of [Workspace] and Dropdown-menu of the** Workspace**"**) When you edit another workspace, please exit RT ToolBox3 once and start RT ToolBox3 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 ToolBox3 is started from iQ Works (MELSOFT Navigator). [Save As] in [Workspace] menu is displayed in the gray and cannot be selected.



Menu of [Workspace]



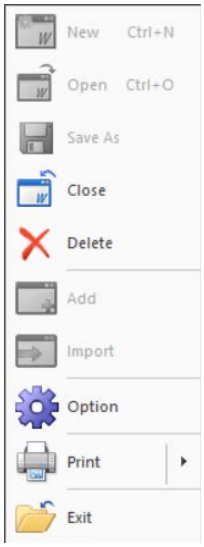
Dropdown-menu of the Workspace (Online)

Figure 4-1 Menu of [Workspace] and Dropdown-menu of the Workspace

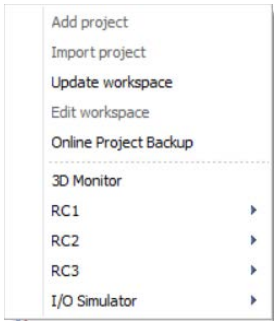
4.3. Notes concerning Project operation

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

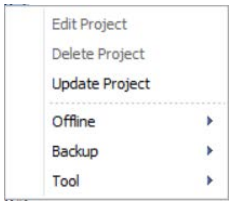
When RT ToolBox3 is started from iQ Works (MELSOFT Navigator), it is not possible to add a new project, import a project, or delete an existing project. [Add project] and [Import project] (in the dropdown menu by selecting a workspace name) and [Delete project] (in the dropdown menu by selecting a project name) are display in the gray and cannot be selected.



Menu of [Workspace]



Dropdown-menu of the Workspace (Online)



Dropdown-menu of Project

Figure 4-2 Menu of [Workspace] and Dropdown-menu of the Workspace

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

When RT ToolBox3 is started from iQ Works (MELSOFT Navigator), it is not possible to change the project in the editing workspace. "Project name" in "Edit project" screen is displayed in the gray, and cannot be selected.

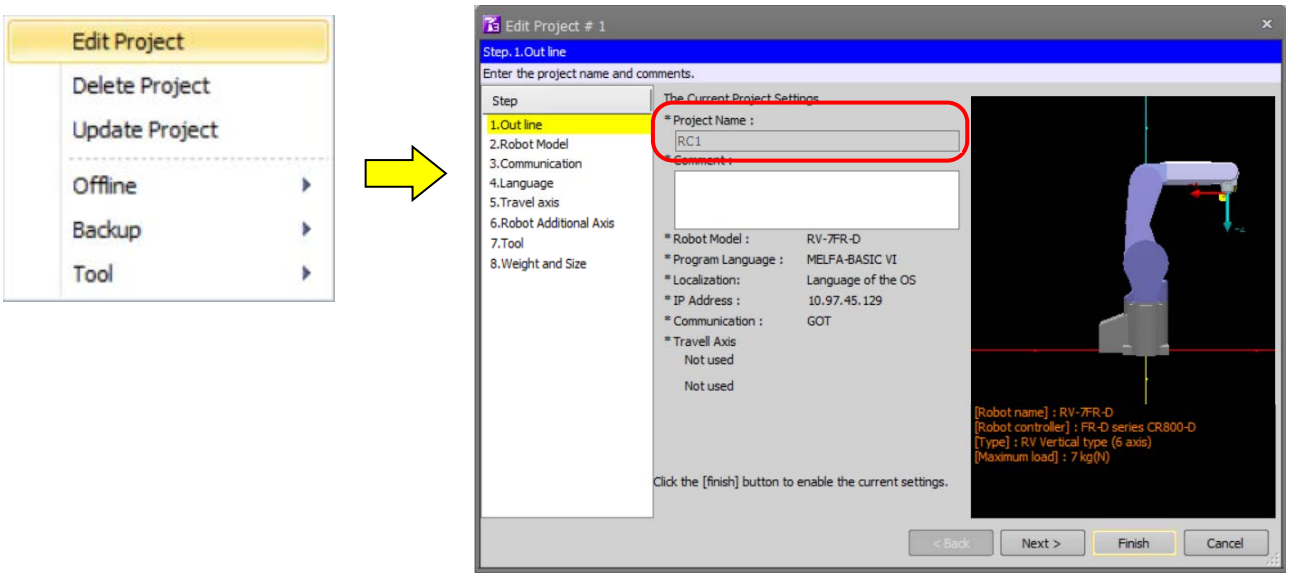


Figure 4-3 Edit project

4.4. 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 ToolBox3 started from iQ Works (MELSOFT Navigator). These information can be edited with RT ToolBox3 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 ToolBox3 started directly.

Prohibited matter in RT ToolBox3 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.

5. Basic Functions

The basic functions of this software are shown below.

Table 5-1 RT ToolBox3 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.
	Spline		Displays the numbers of the spline files written on the computer.
	Parameter		It is possible to set the parameters offline and save them to the files. 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.
	Spline		Displays the numbers of the spline files stored on the robot controller.
	Parameters		It is possible to set the parameters and save them to the file without connecting the robot controller. The saved 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 individually per robot function. 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 ・RS-232 setting ・Ethernet setting ・CC-Link setting ・CC-Link IE Field setting ・CC-Link IE Field Basic setting ・PROFIBUS setting ・PROFINET setting ・DeviceNet setting ・Ethernet IP setting ・EtherCAT setting ・IO unit ・Work coordinate ・Force control ・Collision avoidance ・Safety
	Monitors		
		Operation monitor	You can reference the slot status, program, monitor, program external variables, operation status, history of operation events, 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.
		Servo monitor	Monitors servo system information.
	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 remaining battery time, and sets the serial number for the connected robot.
		Maintenance forecast	Forecasts the time for maintenance.

Function			Explanation
		Position repair	Supports recovery from home position deviation
		Password Setup	Registers, changes, or deletes the password to limit controller access rights.
	Option card		You can check information on option cards mounted in the robot controller.
Tool			
	Oscillograph		The various robot controller data are displayed in a graph.
	DXF File Import		Imports DXF files for conversion into robot program / spline files.
	User definition screen		It is possible to edit the user definition screen which can be operated by the high-functionality T/B.
	File Manager		You can copy, delete and rename the files in the robot controller.
	2D Vision Calibration		Run the 2D vision calibration.
	Force sensor calibration		This Function calculates the weight and center of gravity position of robot hand attached to the force sensor to be used for the gravity offset cancel in Force sensor.
	Force control log viewer		This function can display force control log data graph in the PC and robot controllers.
	Tool automatic calculation		The tool length is calculated automatically and the value of a tool parameter is set up.
Simulation			This can be used in connection with a virtual robot. *This can only be used in 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 calculation		The tact time for the robot program with the specified contents can be calculated in the simulation.
	MELFA-Works		You can be used the function of MELFA-Works (as 3D robot simulator). *This can only be used with the Pro edition.
Backup, restore			You can back up the information in the robot controller and restore backed-up information to the controller.
MELFA 3D-Vision			You can do a setup of MELFA-3D Vision.
I/O Simulator			Simulates the signal communication between robots.
Document out			You can output the each information in robot controller and offline setting to the HTML document.
Robot firmware update			You can update the firmware of the robot controller. Since this function is a function for maintenance, not open to the public.

6. Ribbon

The ribbon is displayed at the top of the RT ToolBox3 screen.
The various operations of RT ToolBox3 can be performed by selecting the commands provided on the ribbon.

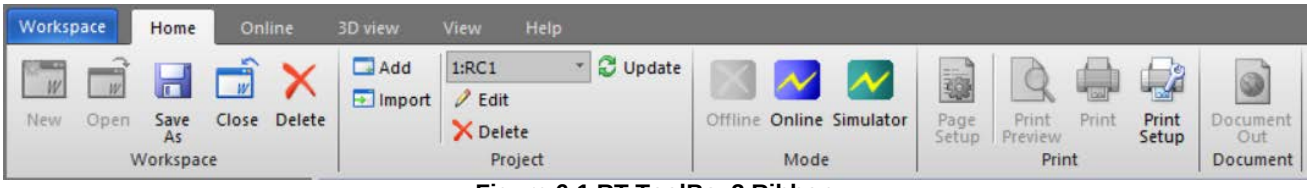


Figure 6-1 RT ToolBox3 Ribbon

6.1. Selecting the Tab

The ribbon is divided into tabs which each correspond to a specific command. Clicking the desired tab displays a list of commands registered to that tab.
The following tabs are provided on the ribbon.

Table 6-1 Operations Available on Each Tab on the Ribbon

Tab Name	Description
Workspace	This differs from other tabs in that a drop-down menu appears when it is clicked. Various operations can be performed by selecting the desired item from the drop-down menu.
Home	Editing operations can be performed on workspaces and projects and the RT ToolBox3 mode can be changed. When a screen that supports printing functions is active, the print command can be used.
Online	The RT ToolBox3 mode can be changed, and operation commands in the online and simulator modes are available.
View	RT ToolBox3 view related settings can be performed. Settings for displaying docking windows such as the project tree and window layout commands for the currently displayed screen are available. Select this tab also when changing the RT ToolBox3 display language.
3D View	Commands for performing settings and operations relating to 3D monitor functions are available. For an explanation of 3D monitor functions, refer to **"21 3D Monitor"**.
File	This is used for file reading, saving and performing other operations in program editing and in the spline editing functions. This tab is displayed only when the screen for a related function is active.
Edit	Operation commands for editing file contents are available in program editing and in the spline editing functions. This tab is displayed only when the screen for a related function is active.
Tool	Commands for displaying simple tool screens used in program editing and in the spline editing functions are available. This tab is displayed only when the screen for a related function is active.
Parameter	This tab is displayed only when the parameter list screen given in **"13.1 Editing from parameter list"** is active. Commands for searching the text strings of parameter names in the parameter list screen are available.
Monitor	This tab is displayed only when the one of the monitor screens given in **"14 Status Monitoring"** is active. Commands for selecting monitoring "Start/Stop" are available.
Oscillograph	This tab is displayed only when the oscillograph screen given in **"18.1 Oscillograph"** is active. Commands for operations such as recording and data playback are available.
MELFA-Works	Only when the screen related to the MELFA-Works is in the active state, this tab is displayed. In this tab, there are the commands for using each function for the MELFA-Works are prepared.

Help	Commands for displaying language help for robot programs and the RT ToolBox3 Instruction Manual are available.

6.2. Tool Tip Display of Ribbon Commands

An explanation for a command is displayed by moving the cursor over the command on the ribbon.

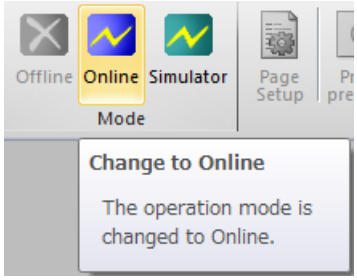


Figure 6-2 Tool Tip Display of Ribbon Commands

6.3. Minimizing the Ribbon

Minimizing refers to collapsing the command display area of the ribbon so that only the tab name is displayed. By minimizing the ribbon, the area for displaying the editing screen, for example, can be increased.
Even with the ribbon minimized, ribbon commands can be operated by clicking the tab.

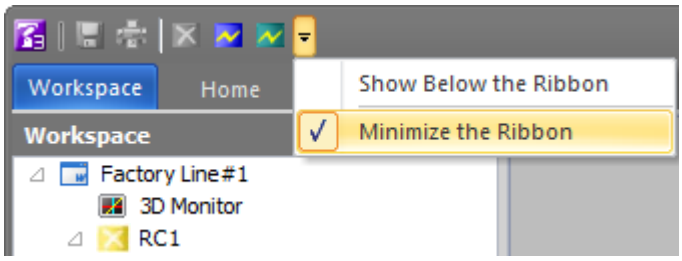


Figure 6-3 Ribbon in Minimized State

The ribbon can be minimized by either of the following operations:
・Select and check "Minimize the Ribbon" from the menu that is displayed by clicking ▼ at the ribbon top.
・Double-click one of the tabs.

To return a minimized ribbon to its original size, perform either of the following operations:
・Select and uncheck "Minimize the Ribbon" from the menu that is displayed by clicking ▼ at the ribbon top.
・Double-click one of the tabs.

7. Docking Window

Some of the windows displayed in RT ToolBox3 can be turned into a docking window and their display position can be customized as desired. The docking window can be placed at any position to the left, right, top or bottom of the main screen.
In the RT ToolBox3 default state, each of the docking windows is placed at any of the left, right, top or bottom positions.

7.1. Moving and Placing Docking Windows

A docking window becomes separated from the main screen by dragging the title area of the docking window. Docking windows in a separated state can be moved as desired inside and outside RT ToolBox3.
Docking windows can also be used as they are in a separated state.

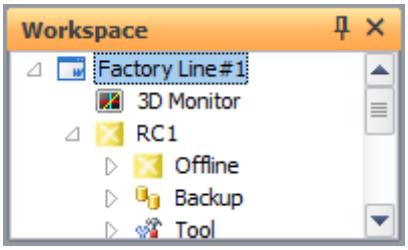


Figure 7-1 Docking Window in Separated State

While a separated docking window is being dragged and moved, marks with left, right, top or bottom arrows are displayed in the main screen.

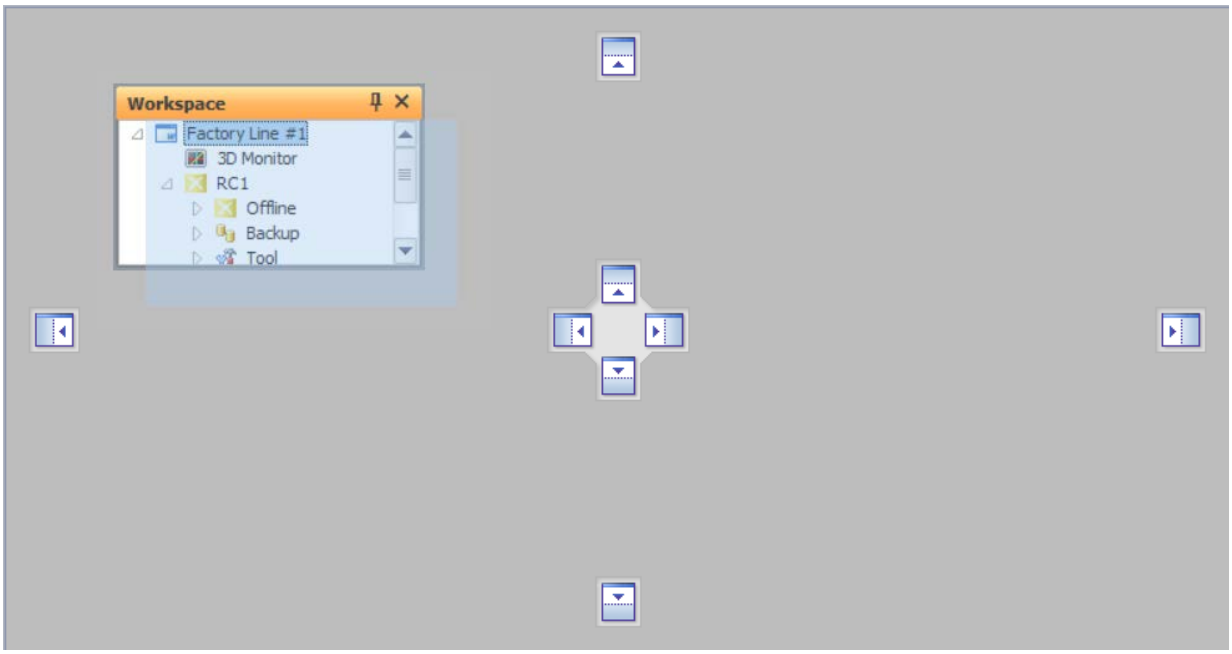


Figure 7-2 State During Movement of a Docking Window

The docking window is docked to the position indicated by the arrow by dropping the window over one of the marks.

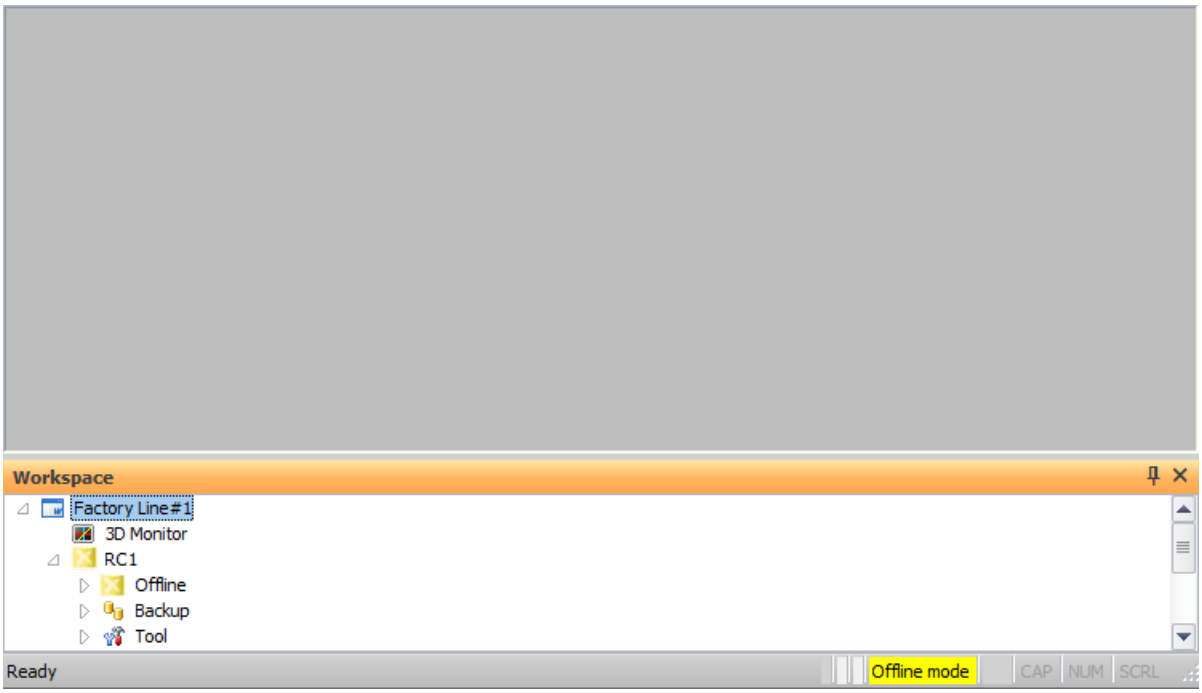


Figure 7-3 When a Docking Window Is Docked to the Bottom of the Main Screen

7.2. Aligning Side-by-side and Overlaying Docking Windows

When a window is moved to a position where another window is already docked, the left, right, top or bottom arrow marks appear on the already docked window.

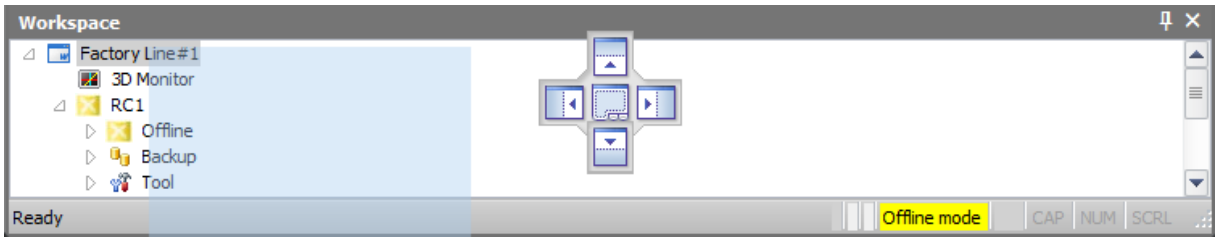


Figure 7-4 When a Window Is Moved Over a Docked Window

The docking window can be docked with it aligned side-by-side with the left, right, top or bottom of the docked window by dropping the window over one of the marks in this state.

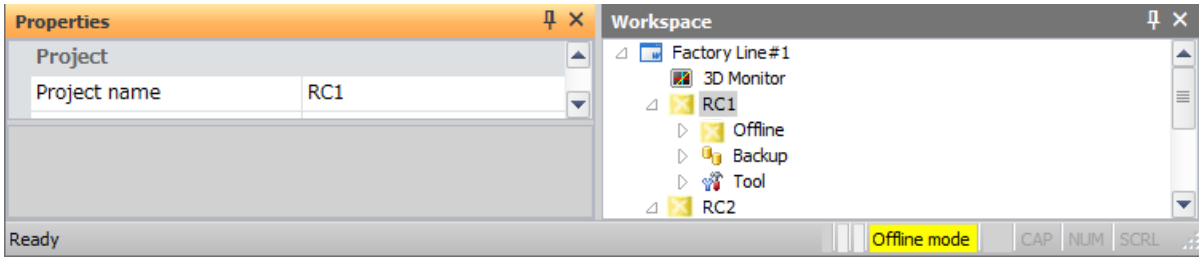


Figure 7-5 When a Window Is Aligned With the Left Side of the Docked Window

Also, the window can be placed overlaying a docked window when it is dropped on top of the mark.
When multiple windows are displayed overlaying each other, the currently displayed window contents can be switched by changing the selected tab. The currently selected window can be detached and moved by clicking and dragging the title area of the window.

Figure 7-6 When Docking Windows Are Overlaid

7.3. Minimizing Docking Windows

A docking window can be collapsed (minimized) by clicking the pin displayed at the top right of the respective docking window. By minimizing a docking window, the area for displaying the editing screen, for example, can be increased.

When a docking window is minimized, only the window name is displayed at the docking position. Window contents can be temporarily displayed by moving the mouse cursor to the position of the window name in this state. A minimized docking window is displayed by a side-facing pin .

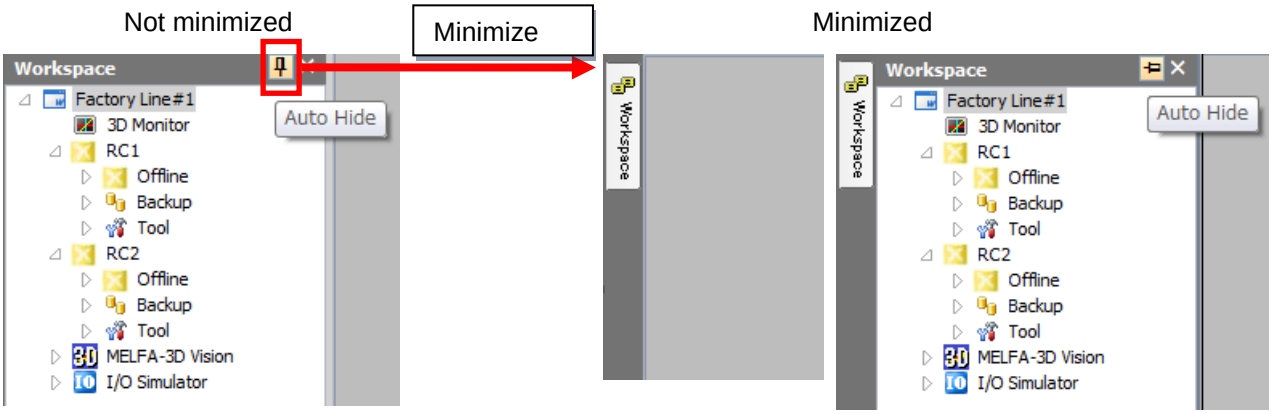


Figure 7-7 Minimizing Docking Windows

To return a minimized docking window to its original size, click the side-facing pin.

7.4. Resetting a Docking Window to Its Default Layout

A docking window can be reset to its default layout by clicking the [Reset the window layout.] button in the [View] tab -> [View] group on the ribbon.

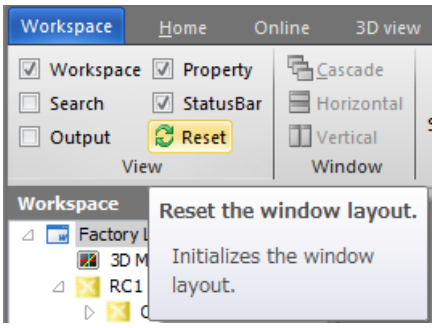


Figure 7-8 Resetting the Layout of a Docking Window

7.5. Screen Layout Mode of the Docking Window

In the [Screen Layout Mode] on [Option] on the [General] screen, you can set whether to keep the layout of the docking window for each workspace or always open it in the same layout.
Since the initial value is "Workspace", you need to select "Account" to always open in the same layout.
Option screen is displayed by clicking the [Option] button in the [Workspace] drop-down menu on the ribbon

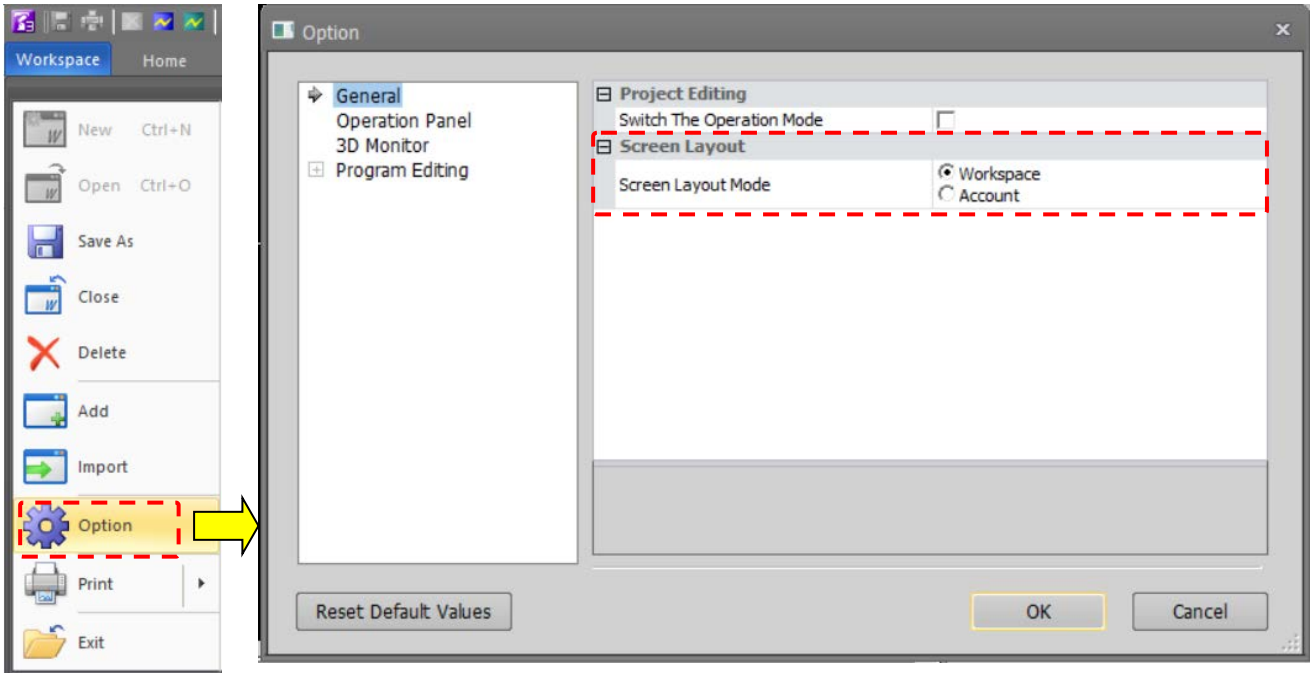


Figure 7-9 Setting of Screen Layout Mode

8. Workspaces and Projects

This describes workspaces and projects.

8.1. 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 communication, 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)

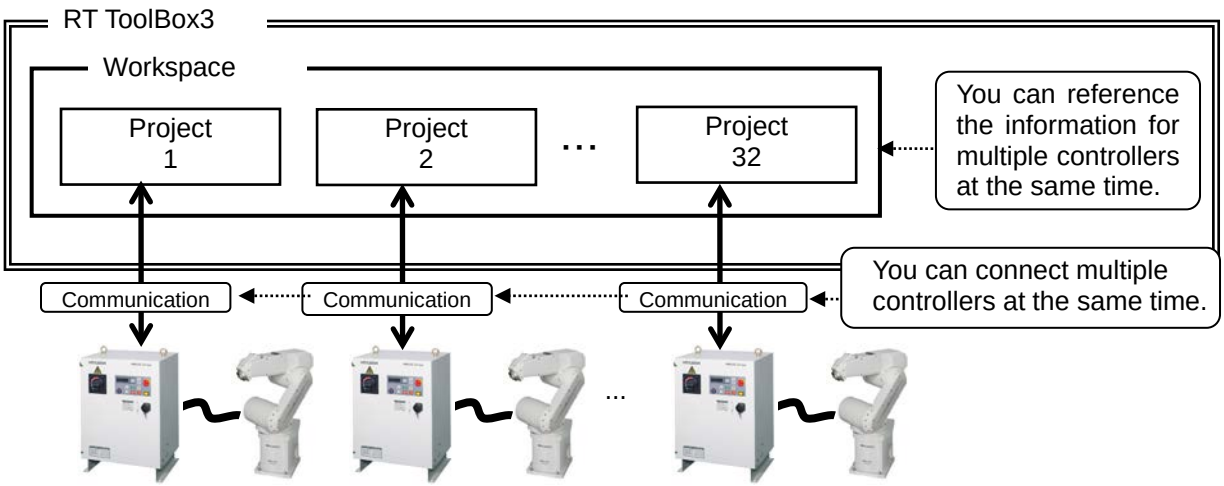


Figure 8-1 Using Multiple Robot Controllers

(2) Using 1 robot controller

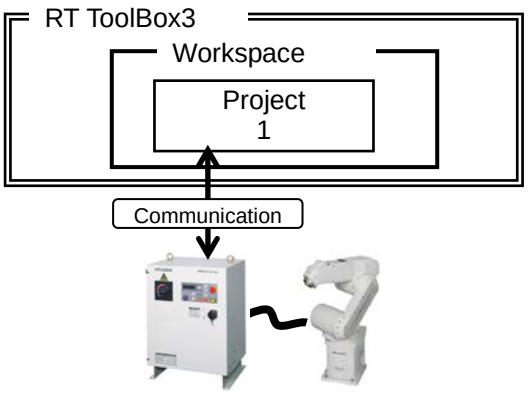


Figure 8-2 Using One Robot Controller

Caution

You cannot edit multiple workspaces at the same time.

With this software, you cannot edit multiple workspaces at the same time. Register to 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 onward.

Caution

Update workspaces and projects offline.

You cannot perform the following operations in the online status or while a simulation is running. 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 **"8.18 Offline/Online/Simulation".**

8.2. Creating a New Workspace

Click the [Workspace] tab -> [New] button or click the [Home] tab -> [Workspace] group -> [New] button on the ribbon. The New Workspace screen is displayed. Input the workspace name and title, and then click the [OK] button. The Edit Project screen is displayed, so set the project name (as desired), 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.
You can change the robot model of 3D monitor to a simple model. Please refer to **"21.13 Types of Robot Model"** for the content of the simple model.

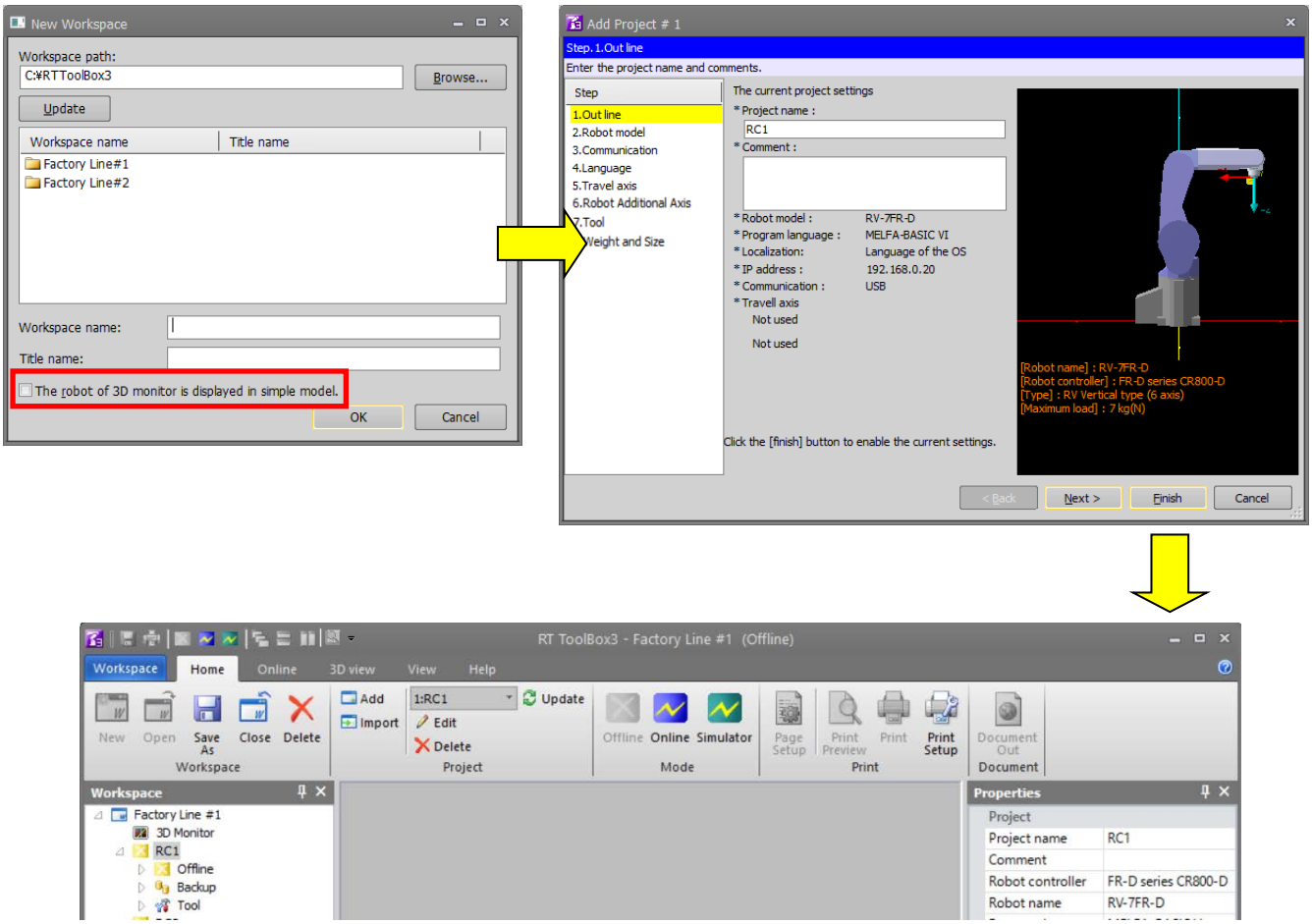


Figure 8-3 Creating a New Workspace

The project tree is displayed in the workspace and the "RC1" project is created as the default value.
This project name can be changed later. For details, see **"8.12 Editing Projects".**
If you want to display a simple model for the robot model in the 3D monitor, check the checkbox of the same label.

Caution

Workspace names

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

8.3. Opening an Existing Workspace

To open an already created workspace, click the [Home] tab -> [Workspace] group -> [Open] button on the ribbon. Select the workspace to edit and click the [OK] button.

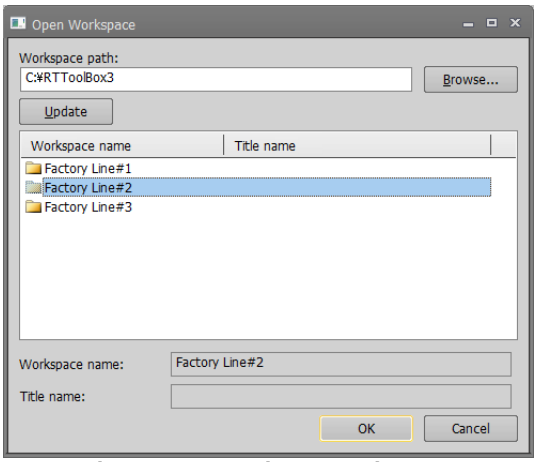


Figure 8-4 Opening a Workspace

The name of the last used workspace is added to the [Workspace] tab on the ribbon. You can open one of these workspaces by clicking its name here.

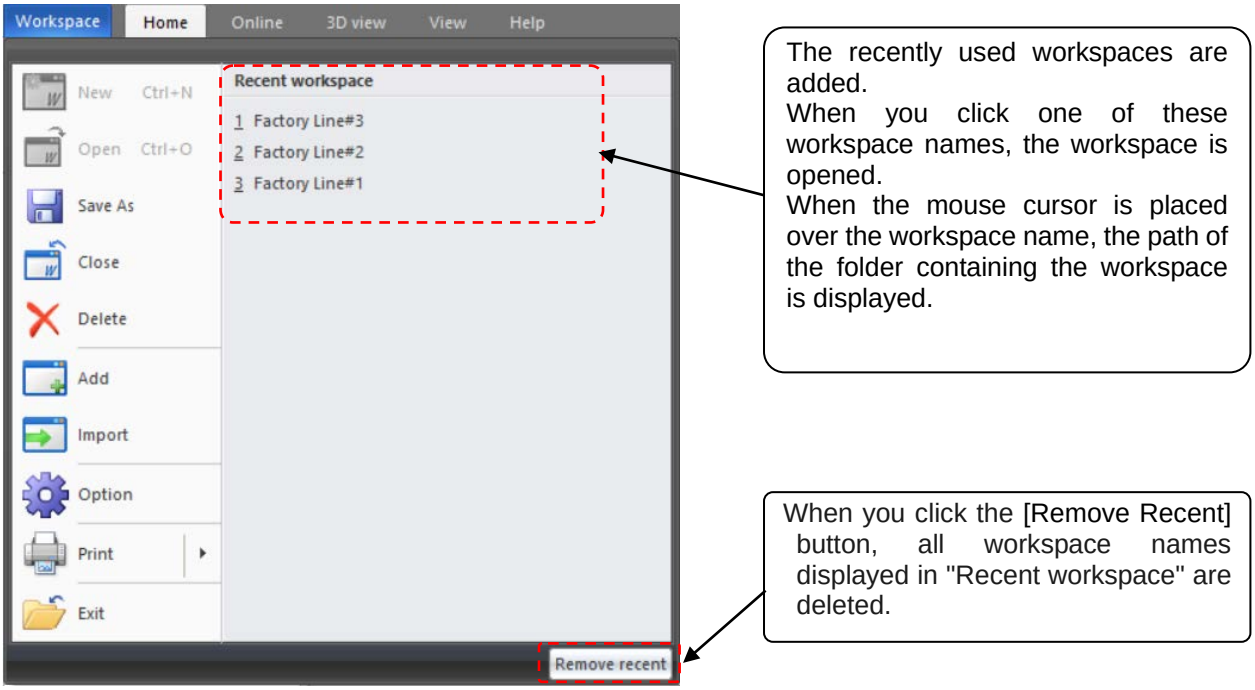


Figure 8-5 Recently Used Workspace Names

8.4. Open the RT ToolBox2 Workspace

As with the **“8.3Opening an Existing Workspace”**,you can open the workspace of RT ToolBox2.
When RT ToolBox 2 workspace is opened with RT Toolbox 3, a dialog is displayed to confirm whether to use RT Toolbox 2 parameters for the first time only.
Check the parameters to be used in RT Toolbox 3 and click the [OK] button.

RT ToolBox3 displays the following RT ToolBox2 parameter information.
Simulator parameters ⇒ Offline parameters
Offline parameters ⇒ Backup parameter information

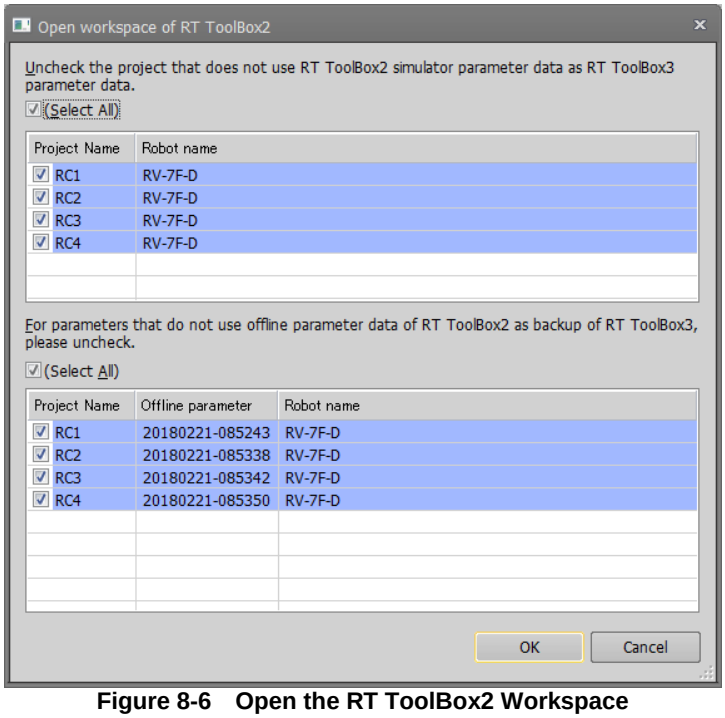


Figure 8-6 Open the RT ToolBox2 Workspace

Caution

[Open the RT ToolBox2 Workspace] is displayed only once

Displayed only when RT ToolBox2's workspace is opened for the first time in RT ToolBox3. The unchecked parameter information in the checkbox will not be available in RT ToolBox3.

8.5. Closing a Workspace

To close a workspace currently being edited, click the [Home] tab -> [Workspace] group -> [Close] button on the ribbon. Note that to delete a workspace, you must close it first.

8.6. Deleting a Workspace

Click the [Home] tab -> [Workspace] group -> [Delete] button on the ribbon. The "Delete Workspace" screen is displayed. Check the name of the workspace to delete, and then click the [OK] button.

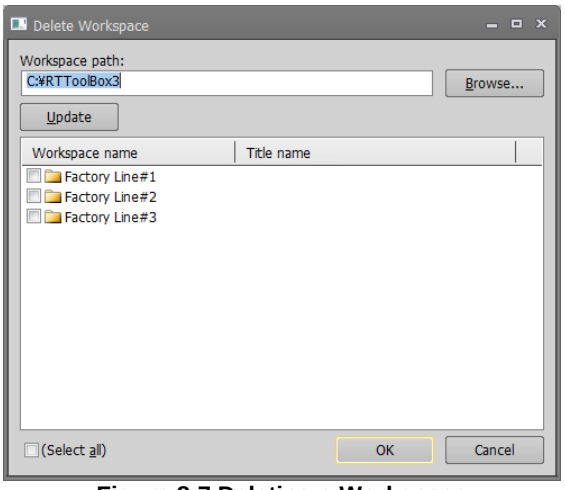


Figure 8-7 Deleting a Workspace

Caution

Deleting a workspace

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

8.7. Saving a Workspace

The information added to the workspace is saved automatically.

You can also save a workspace under a different name. Click the [Home] tab -> [Workspace] group -> [Save As] button on the ribbon, enter the new workspace name and title, and then click the [OK] button.

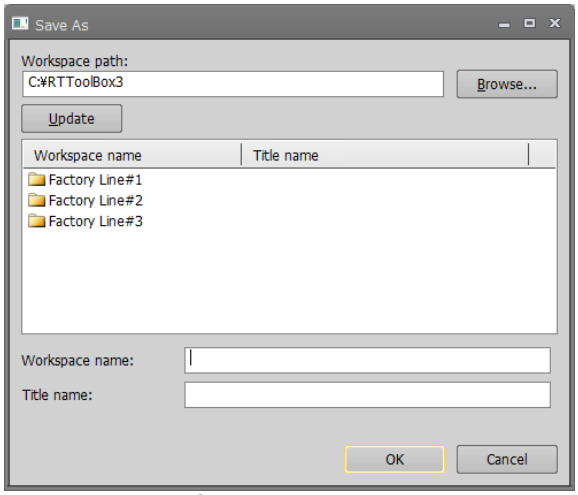


Figure 8-8 Save As

8.8. Changing a Workspace

Workspace names and workspace titles can be changed directly.

Caution

Don't change workspace names and workspace titles made with iQ Works (MELSOFT Navigator).

Don't change workspace names and workspace titles made with iQ Works (MELSOFT Navigator). Changing the structural informationof a workspace will break its conformance with iQ Works (MELSOFT Navigator).

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. Input the new workspace name and new workspace title, then click the [OK] button.

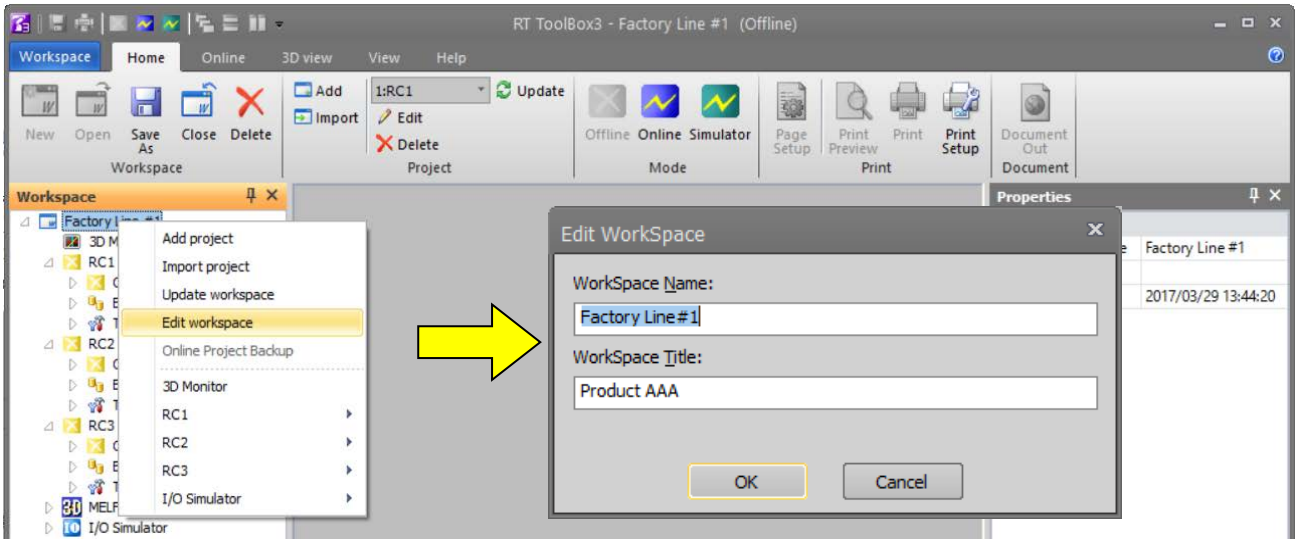


Figure 8-9 Changing the name of the workspace and workspace title

To change the workspace title, click the name of the workspace with the right mouse button, then click "Edit workspace title" on the right button menu. The workspace title screen is displayed. Input the new workspace title, and then click the [OK] button.

8.9. Adding a Project

You can create up to 32 projects in one workspace.
Click the [Home] tab -> [Project] group -> [Add] button on the ribbon.

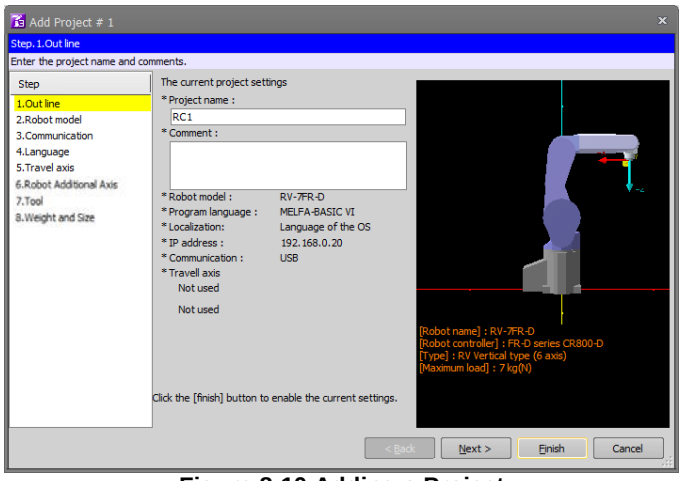


Figure 8-10 Adding a Project

A screen in Wizard format for setting protect details is displayed.
Set the project name, information of the robot to connect to and communication method in each of the pages of the Add Project screen, and then click the [Finish] button.
The project is added to the workspace.

Projects can also be added from a project tree.
After selecting the workspace, use the right mouse button to select [Add project], or double-click the workspace name on the project tree.

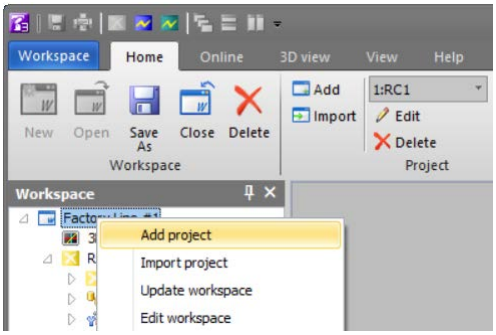


Figure 8-11 Adding a Project from a Project Tree

Caution

Adding a new project 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 a workspace made with iQ Works (MELSOFT Navigator).

Don't add a project to a workspace made with iQ Works (MELSOFT Navigator). Changing the structural information of a workspace will break its conformance with iQ Works (MELSOFT Navigator).

The following describes the details that are set in each of the pages of the Add Project screen.

8.9.1. Step 1. Outline

Set the project name. Any optional comments can be set to projects.

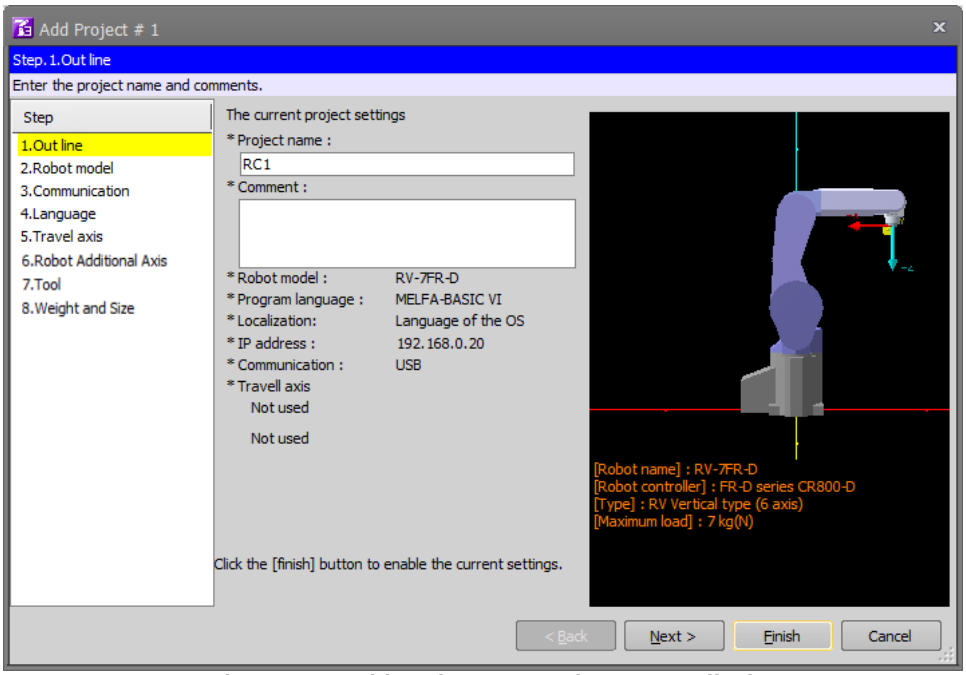


Figure 8-12 Add Project Screen (Step 1. Outline)

8.9.2. Step 2. Robot model

Select the robot model and series of robot controller to be used in the project.
You can narrow down candidate models by selecting "Type" and "Maximum load".

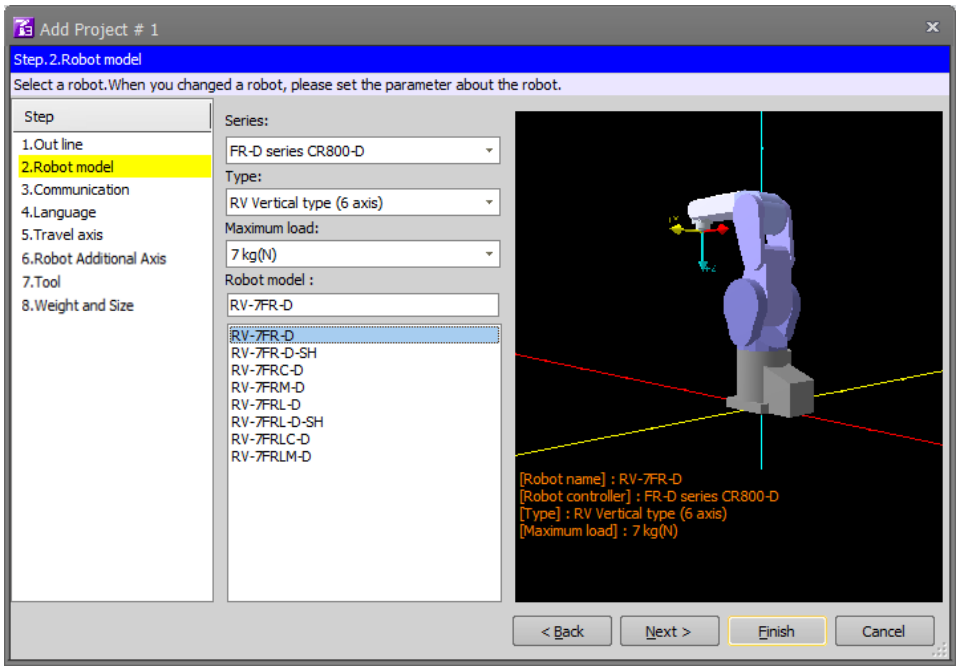


Figure 8-13 Add Project Screen (Step 2. Robot model)

8.9.3. Step 3. Communication

Set up communication with the robot controller to connect to the robot.
The network setup set on the personal computer can be copied to this screen by clicking the [Copy This PC Setting] button.
For details on how to set the communication method, refer to **"9.2 Connection Settings"**.

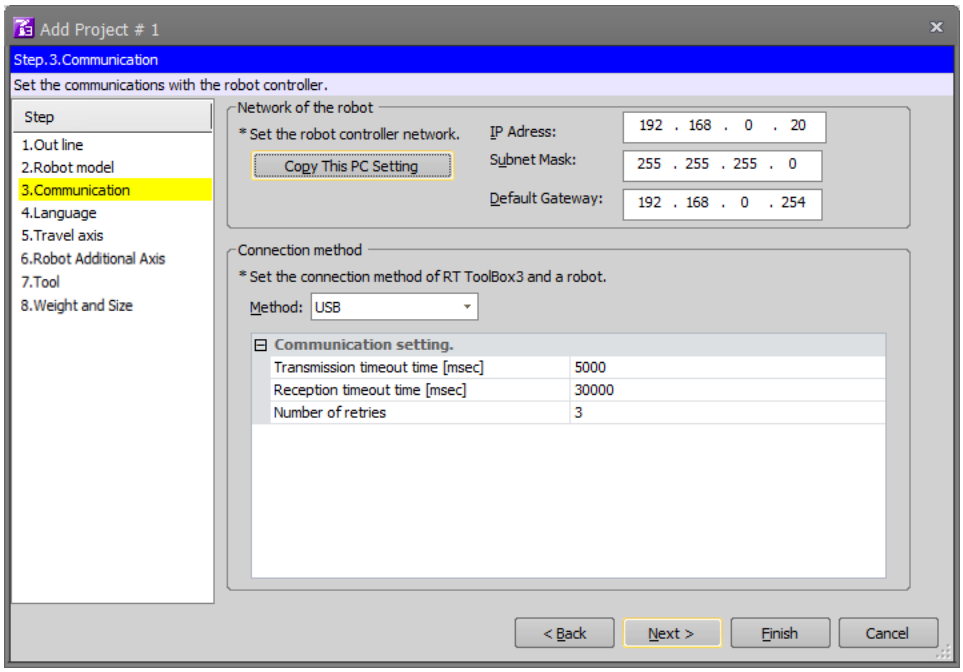


Figure 8-14 Add Project Screen (Step 3. Communication)

8.9.4. Step 4. Language

Select the program language that is used for programming the robot program. For details, refer to **"10 Robot Programming Language Setting"**.
Also, at "Regional language", set the language in which comment text in the robot program and messages set by the user errors are handled. As the default setting, it is set so as to match "Language of the OS".

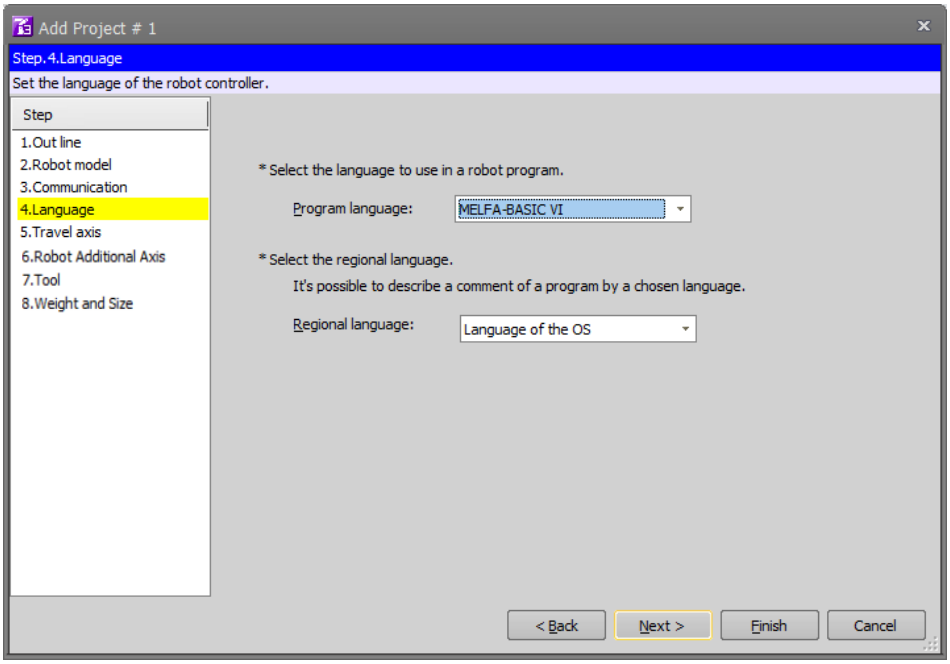


Figure 8-15 Add Project Screen (Step 4. Language)

8.9.5. Step 5. Travel axis

Set the travel base to be displayed in the 3D monitor. For details, refer to **"9.2.6 Travel base setting for display"**.

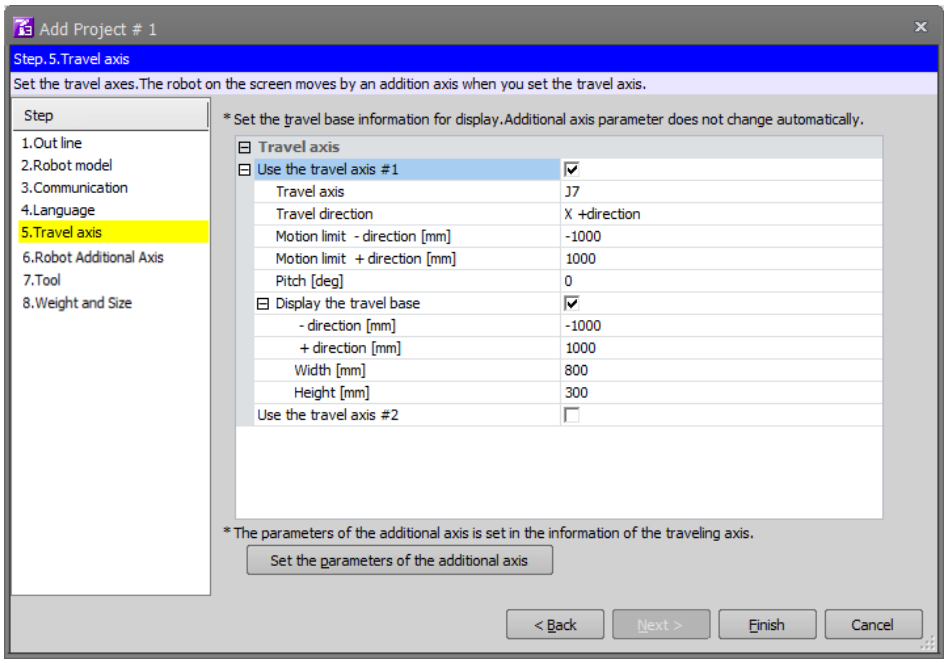


Figure 8-16 Add Project Screen (Step 5. Travel axis)

8.9.6. Step 6. Robot Additional Axis

Sets how to use the additional axis. For details, refer to **"13.3.9 Robot additional axis parameter"**.

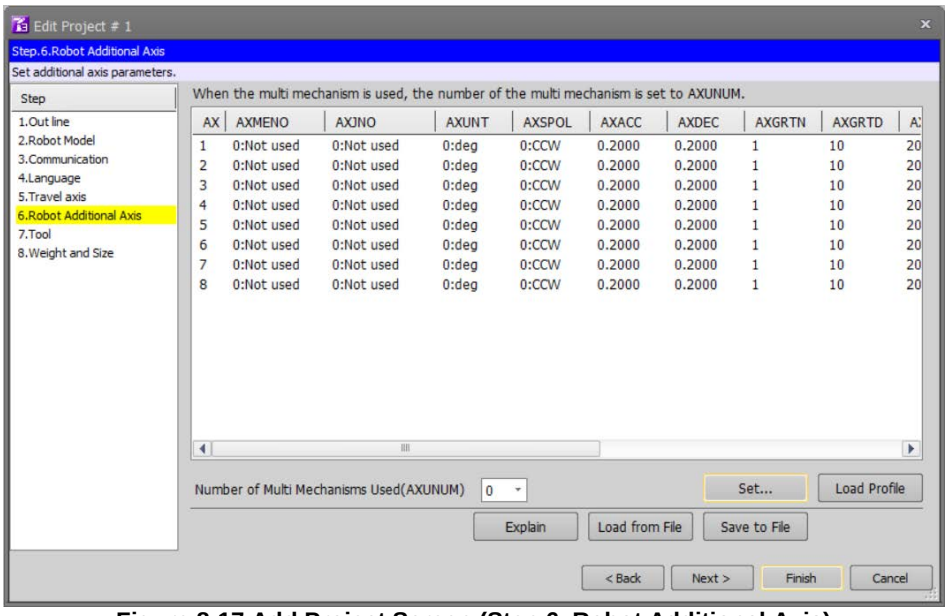


Figure 8-17 Add Project Screen (Step 6. Robot Additional Axis)

8.9.7. Step 7. Tool

Set the parameters of the tool of Robot 1. For details, refer to **"13.3.5 Tool parameter"**.

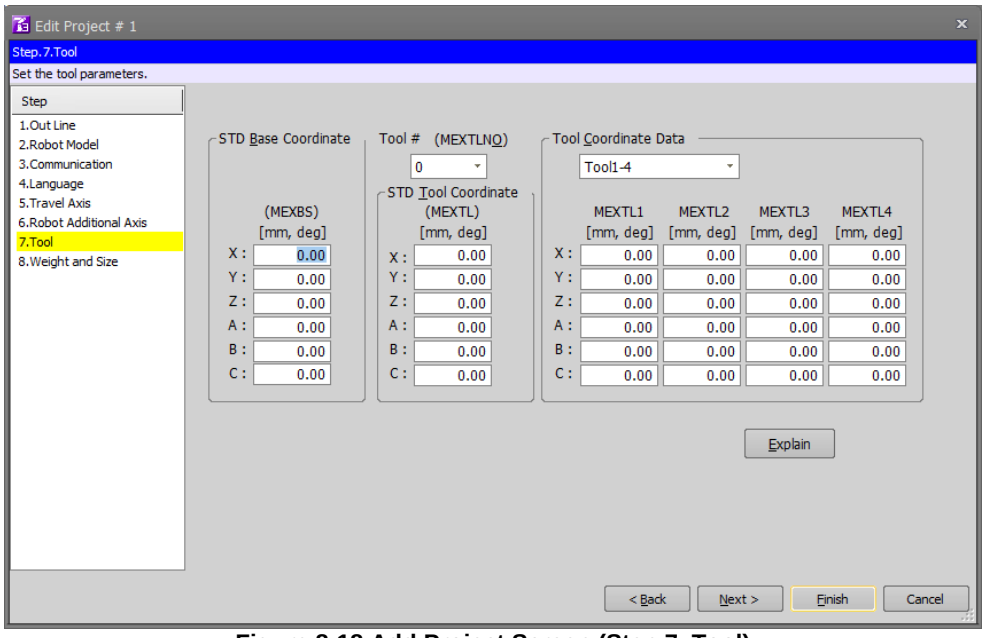


Figure 8-18 Add Project Screen (Step 7. Tool)

8.9.8. Step 8. Weight and Size

Set the parameters of the “Work” and “Hand and Weight” of Robot 1. For details, refer to **"13.3.4 Weight and size parameters"**.

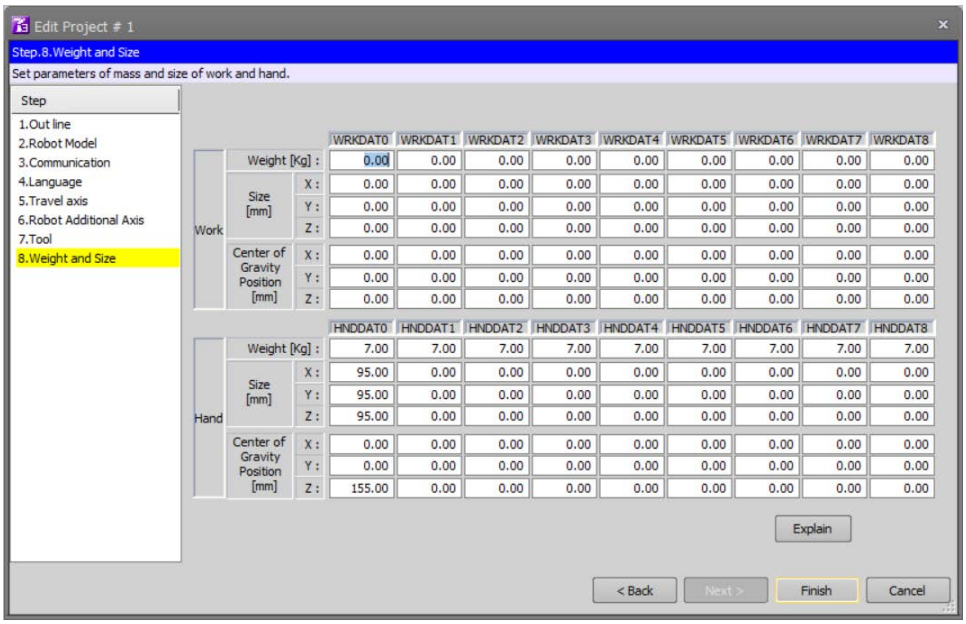


Figure 8-19 Add Project Screen (Step 8. Weight and Size)

The setting information here is registered in the **offline parameter**.

8.10. Transfer offline parameters to robot controller

The information setting on edit project screen is registered in the offline parameter. The offline parameters can be transferred to the robot controller by the following two methods.

Method(1)
1) Back up the project in offline mode.
2) After changing the online mode, restore the backed up project.
3) Select the parameters on the restore screen and execute the restore.

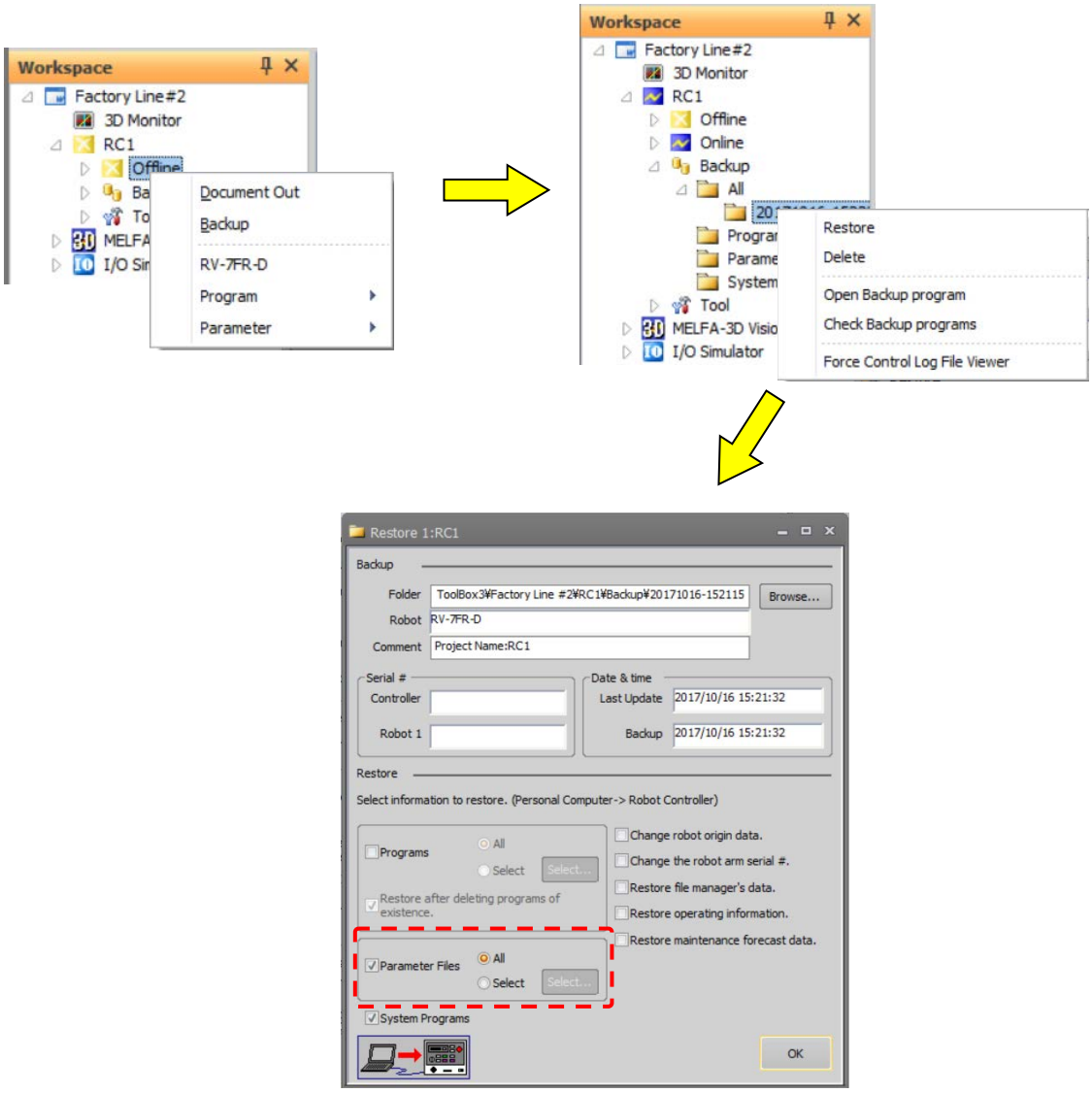


Figure 8-20 Parameter transfer procedure

Method(2)
1) Move to online mode, select the offline parameter item of the project and click the right mouse button. Select and click [Write to controller] in the displayed context menu.
2) After the parameter selection screen is activated, select the parameters to be transferred and click the [OK] button.

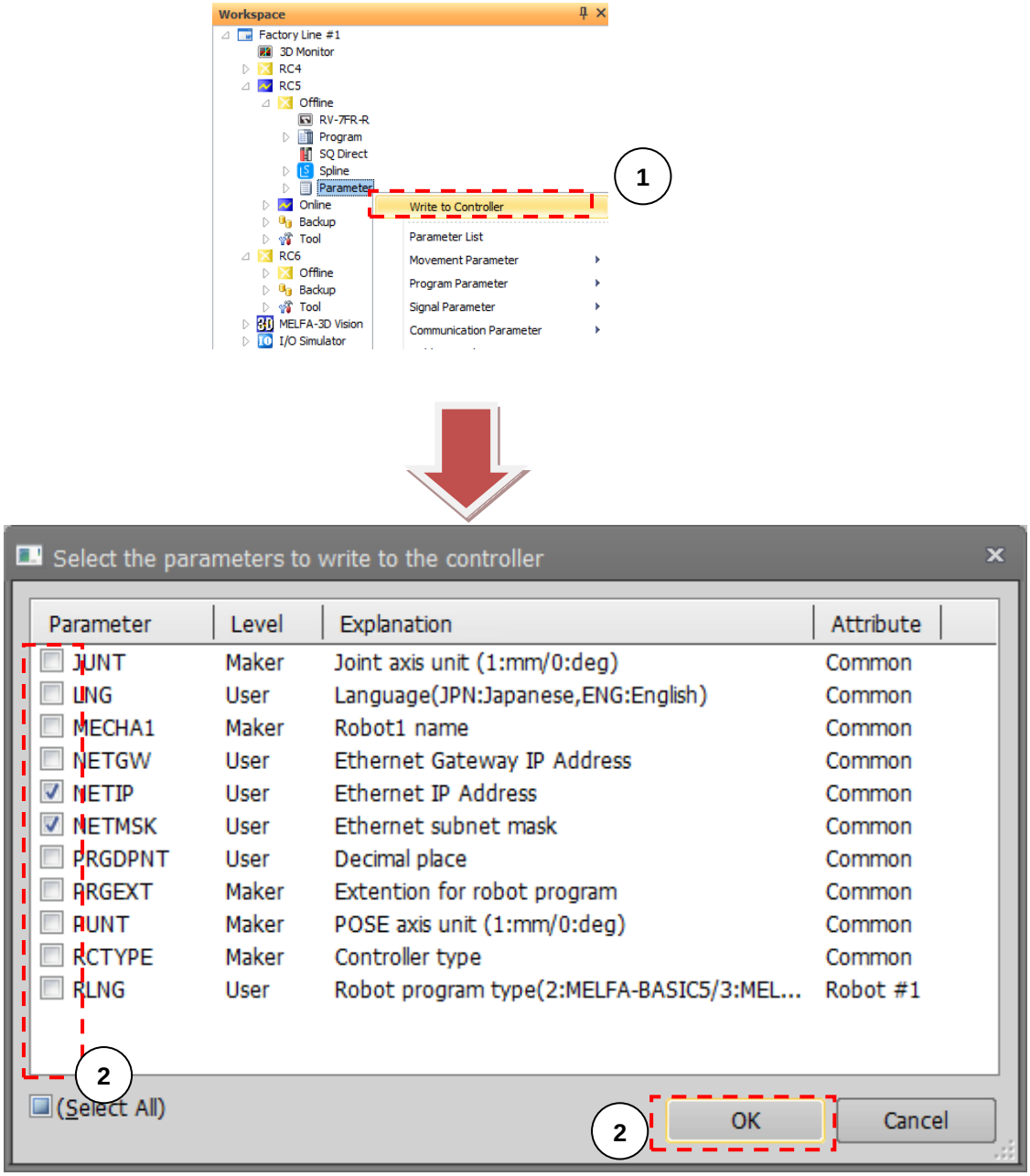


Figure 8-21 Parameter transfer procedure

8.11. Change of the operation mode after adding the project

After completed adding the project, a message of confirm about change the operation mode is displayed.
By click the [Online] button or [Simulation] button, you can change the operation mode in the RT ToolBox3.
If you don't want to change the operation mode, please click the [Cancel] button.

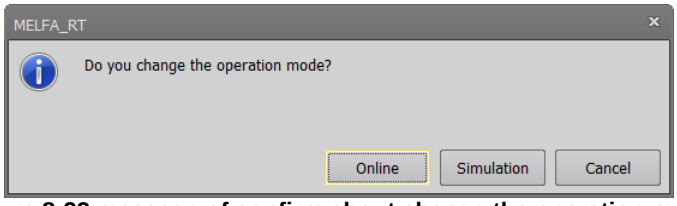


Figure 8-22 message of confirm about change the operation mode

If you don't want to display the message, you can set in the option screen below. To display the option screen, you will select the [Option] in [Workspace] tab from the ribbon.
When [General] category -> [Project Editing] -> [Switch the Operation Mode] is unchecked, the message of confirm will not be displayed after adding projects.

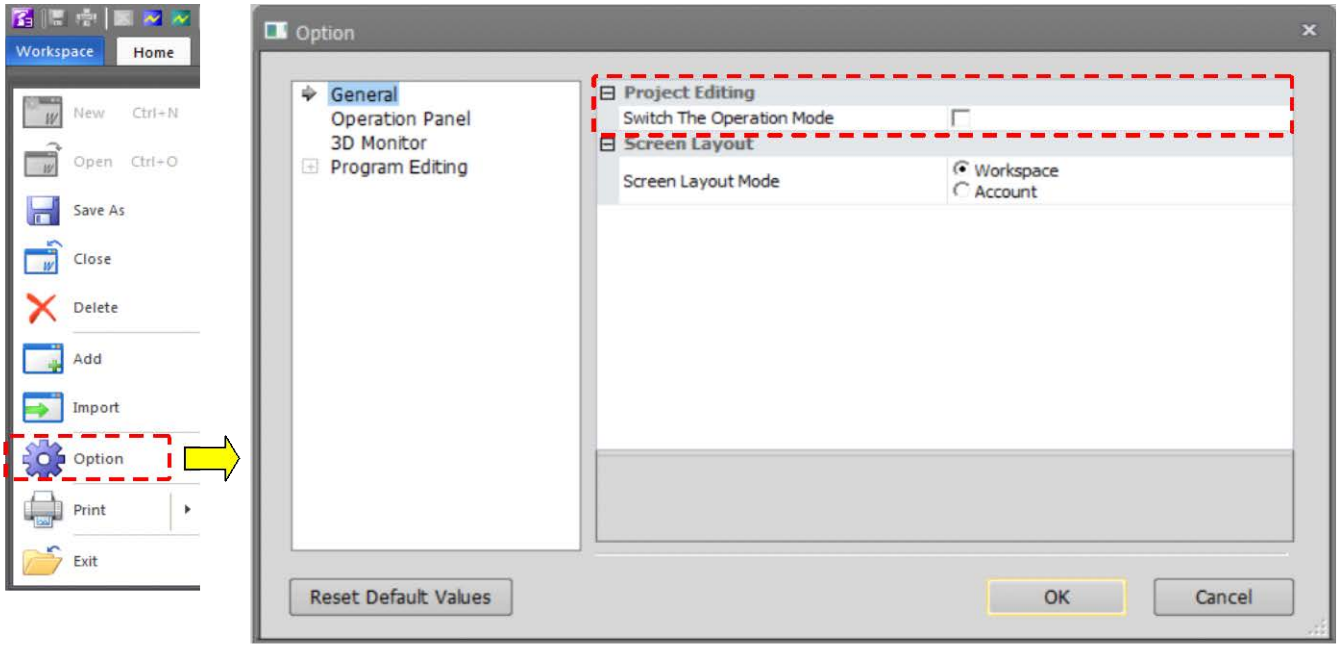


Figure 8-23 Display setting about the confirm change of operation mode

8.12. Editing Projects

You can edit the details of a project once it has been created.
Click the project name with the mouse right button, and click [Edit Project] in the right button menu. The Edit Project screen in the same screen configuration as the Add Project screen is displayed. In this screen, edit the project settings, and then click the [Finish] button.

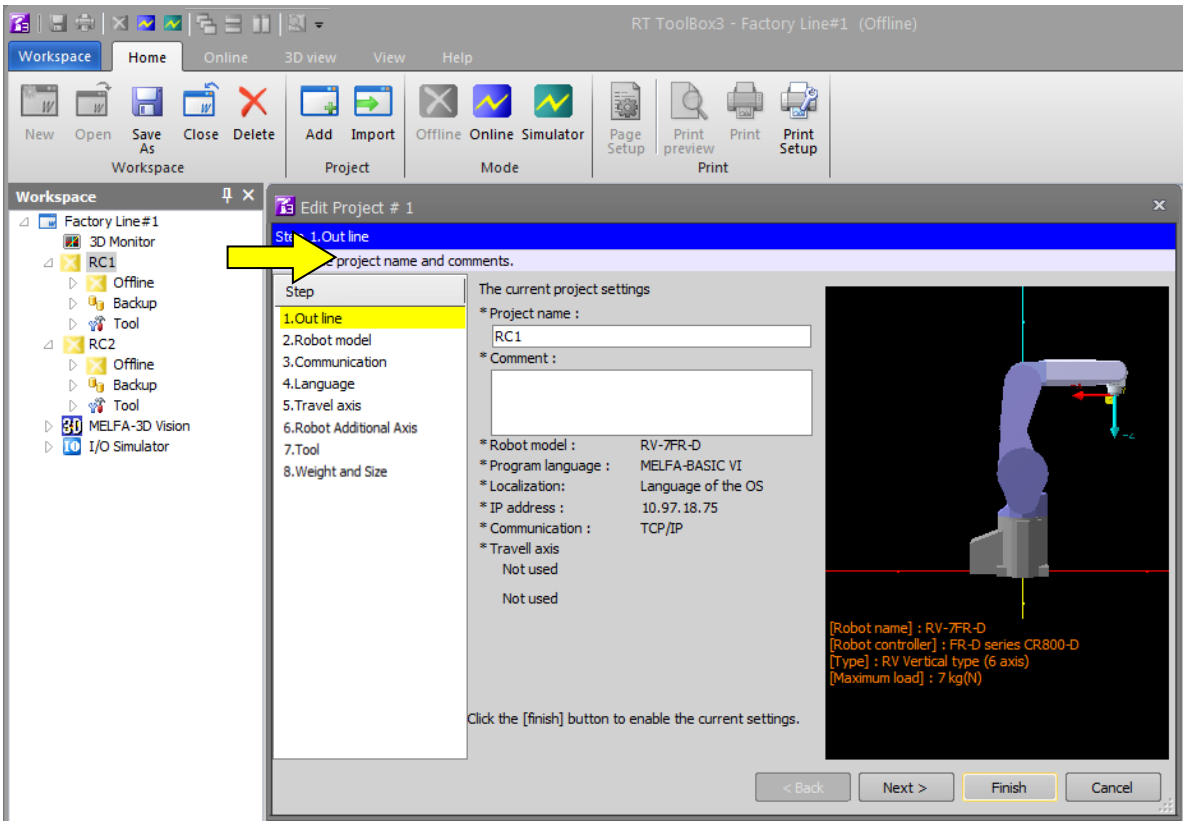


Figure 8-24 Editing Projects

Caution

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

Don't change a project name in a workspace made with iQ Works (MELSOFT Navigator). Changing the structural information of a workspace will break its conformance with iQ Works (MELSOFT Navigator).

8.13. Deleting a Project

A project cannot be deleted when it is running a simulation or has a robot connected online.
Click on the project you want to delete and press the Ctrl key while in batch delete and select it.
Click "Delete Project" on the right button menu.
The deletion confirmation message is displayed. Check that you have clicked the correct project name, then click the [OK] button.

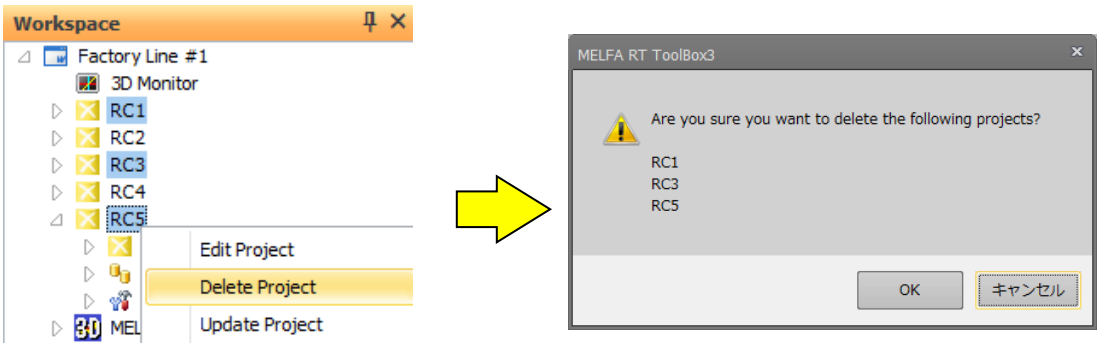


Figure 8-25 Deleting a Project

Caution

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

Don't delete a project in a workspace made with iQ Works (MELSOFT Navigator). Changing the structural information of a workspace will break its conformance with iQ Works (MELSOFT Navigator).

8.14. 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, monitoring, etc.
The contents of the project tree depend on the state of connection with the robot controller.

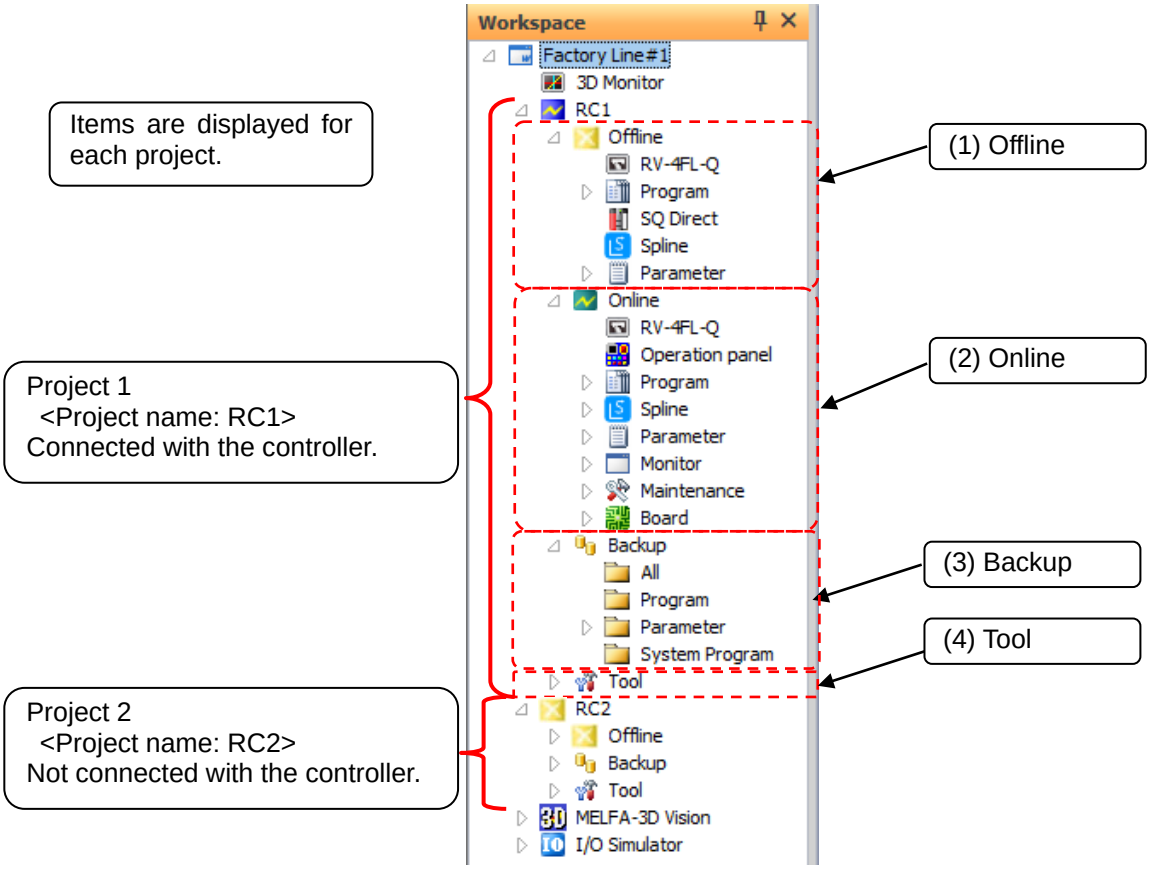


Figure 8-26 Structure of Project Tree in Workspace

(1) Offline/Simulation
Displays the information stored in computer. In the simulation mode, "Simulation" is displayed.
The name of the currently set robot model, name of the robot program/SQ direct file/spline file, and parameter items that can be referenced are displayed.

(2) Online
The "Online" area is displayed when the online mode is switched to after connecting to the controller.
The name of the currently connected robot model and information items that can be referenced in the controller are displayed.

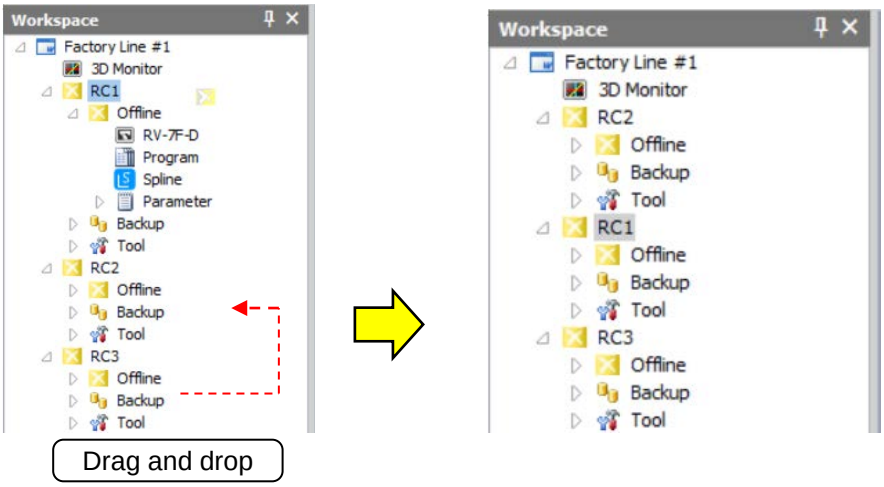
(3) Backup
Controls the information backed up from the controller.

(4) Tool
Other functions are displayed.

Memo

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

It is possible to change the display order of the projects in the tree.
Drag the project with the mouse, and drop it at the transportation destination. The project will move to the top of the dropped project.



8.15. Copying Programs Between Projects

Use program management to copy or move a created robot program to another project. For details on the operation method, see **"11.13 Program Management"**, **"11.13.2 Copy"**, or **"11.13.3 Move".**

It is possible to copy by drag and drop the project name in the project tree.
Please refer to **"11.13 Program Management"** in this manual for details.

8.16. Importing projects

It is possible to import projects in other workspaces to the current workspace.
The project can be imported only offline. Please operate after changing to offline when current mode is online or simulation.

Caution

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

Don't import a project to a workspace made with iQ Works (MELSOFT Navigator). Changing the structural information of a workspace will break its conformance with iQ Works (MELSOFT Navigator).

Select the [Home] tab -> [Project] group -> [Import] button on the ribbon. After the "Select Workspace" window is displayed, select the workspace including the project that you want to import, and click [OK] button. The list of the projects in the selected workspace is displayed in the "Select the projects" window. Check the project, and click the [OK] button.

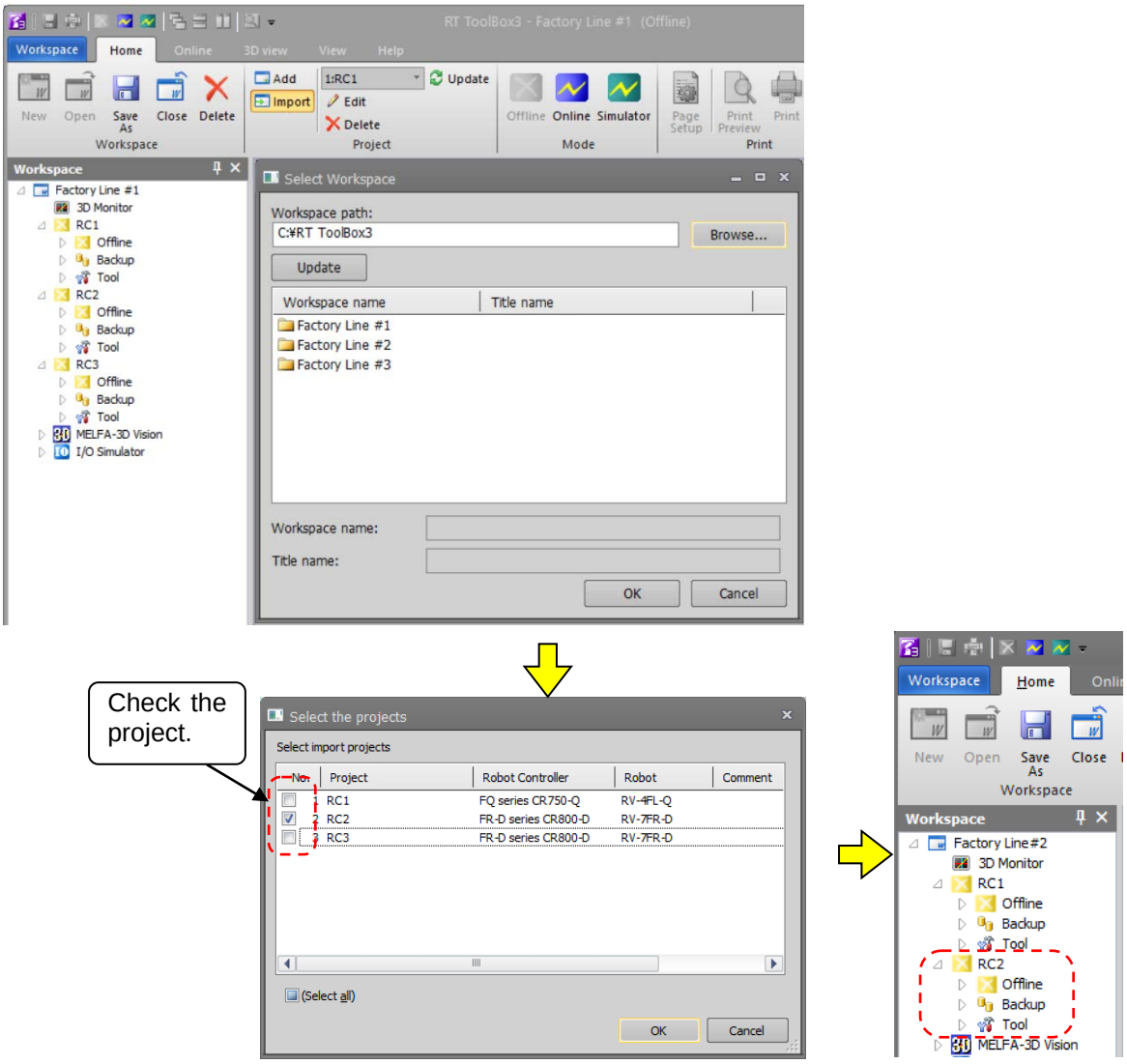


Figure 8-27 Import of project

Up to 32 projects can be registered to one workspace.

8.17. Option Setting

RT ToolBox 3 has options that allow you to customize the type of operation panel and the background color of program editing, etc. The options that can be set are as follows.

Table 8-1 What you can set with options

Category		Option Item	Contents	Reference
General		Project Editing	Sets whether to display the operation mode switching confirmation message after project edit.	8.11
		Screen Layout	Sets the position memory mode of each docking window.	7.5
Operation Panel		Operation Panel	Set the type of the operation panel.	19.3.1 19.4.2
3D Monitor		Object	Sets how to move the object using the mouse.	21.3.6
		3D monitor display method	Set whether or not to always display the 3D monitor on the front.	21.2
Program Editing	Display	Display Option	Make settings related to display, such as whether to display input candidates.	11.6.1 11.6.2 11.6.3 11.6.4 11.6.5 11.6.6 11.6.7 11.6.8
	Fonts and Colors	Design Option	Set font color and font.	11.6.10
	Background Color	Each robot language	Set the background color for each program language.	11.6.11
	General	Syntax Check Before Save	Set whether to check syntax and display results.	11.6.12
		Get Current Position	Whether to acquire the current position of the robot automatically or not.	11.6.13
		Save and Load of the Program	Sets the status of the check box when saving / loading the program.	11.6.14

Clicking the [Option] button in the [Workspace] tab on the ribbon, the option screen is displayed. When you click on an option item, the explanation of that item is displayed at the bottom of the screen.

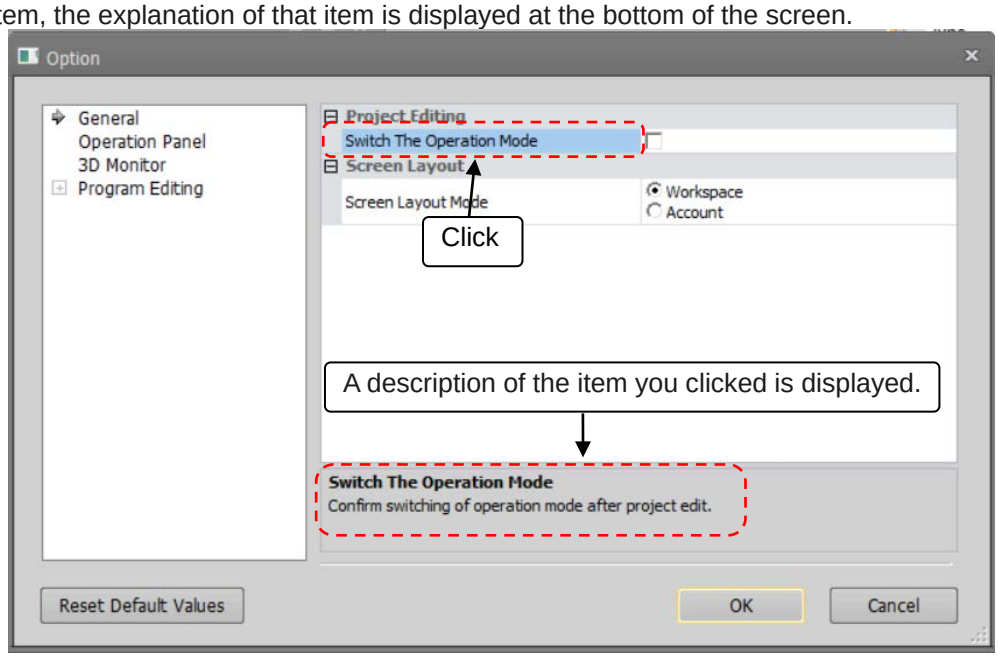


Figure 8-28 Item Description Screen

8.18. Offline/Online/Simulation

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

Table 8-2 RT ToolBox3 Status

Status	Explanation	Project tree display
Offline	Targets files stored on the computer. In the offline mode, the icon displayed at left of the project name in the project tree is green, and Offline, Backup and Tool are displayed in the project tree.	RC1 Offline Backup Tool
Online	The robot is connected to the robot controller and you can check and change the information in the controller In the online mode, the icon displayed at left of the project name in the project tree is blue, and Online, Offline, Backup and Tool are displayed in the project tree.	RC1 Offline Online Backup Tool
Simulation * This is available on the standard and Pro editions.	This targets a virtual robot controller running on the computer and you can check and change the information in the virtual controller In the simulation mode, the icon displayed at left of the project name in the project tree is blue, and Offline (*1), Simulation, Backup and Tool are displayed in the project tree.	RC1 Simulation Backup Tool
Pseudo input	Signals is input from the personal computer to the robot controller, not from external equipment. During pseudo input mode, the robot controller does not accept signal input from external equipment. Please refer to **“14.3.1.2Pseudo-input”.**	RC1 (Pseudo Input) Offline Simulation Backup Tool RC1 (Pseudo Input) Offline Online Backup Tool

(*1) This is displayed only when the virtual robot controller of the CR800-R/CR800-Q/CR750-Q/CRnQ-700 series is displayed. With the above series, offline SQ direct files can be edited even during a simulation.

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

Caution

Simulation functions are supported only on the RT ToolBox3 standard and pro editions. It cannot be used in the mini edition.
Also, note that simulation functions cannot be used when Movemaster commands are selected on the standard or pro editions.

You can switch between the offline, online and simulation modes by either the icons on the title bar or by the "Home" or "Online" tabs on the ribbon. With the tool bar, you can switch as follows.

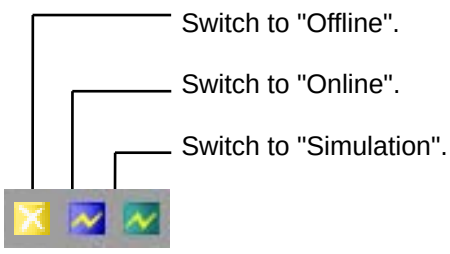
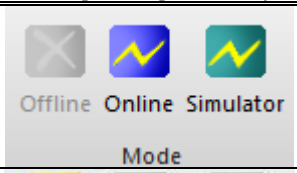
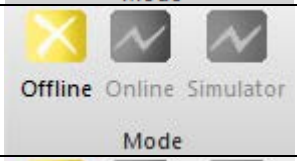
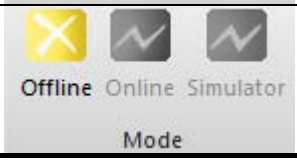


Figure 8-29 Explanation of Tool Bar

The current status and the statuses into which the current status can be switched are as follows:

Table 8-3 Current Status and Switchable Status

Current status	Switchable statuses	Title Bar Display	Ribbon [Home] Tab Display
Offline	Can be switched to online or simulation.		
Online	Can only be switched to offline.		
Simulation	Can only be switched to offline.		

Display the current status by checking [Online] in 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 8-30 Screen for Selecting Project to Switch Online"**. Check only the project to be switched to online or simulation, then click [OK]. Note, however, that up to eight projects can be switched to the simulation mode.
This screen is not displayed if the online mode is switched to when there is just one project in the workspace.

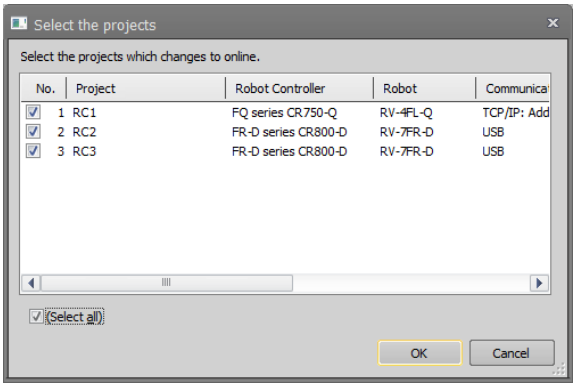


Figure 8-30 Screen for Selecting Project to Switch Online

Caution

In the project unconnected the robot controller, please do not switch to online.

If you switch to online in the project unconnected the robot controller, the execution speed decreases because the retry process is performed frequently. In the project unconnected the robot controller (or power is not turned on at the controller), please switch to offline.

Do not connect from many of projects to one robot controller.

Do not connect from many of projects to one robot controller. When many projects referring to the same data at the same time, some data may not be read correctly.

Do not connect with USB from one personal computer to many robot controllers.

In USB connection, can only connect from one personal computer to one robot controller. Even if you use a USB hub, can not connect to many robot controllers.

9. Connecting to 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

Do not pull out the cable during communication.

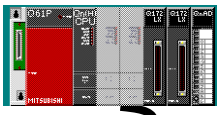
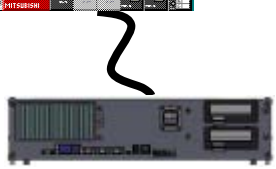
Please never pull out the cable during communication with the robot controller. If the communication cable is removed during communication, the status of the robot controller or the computer might become abnormal. Please remove the cable when the status is not “Online” or this software has been exited.

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

9.1. Robots Connected and Types of Communication

Connecting the robot controller and computer can be done by the following methods. Be aware that the available connection method is restricted according to the connected robot controller.

Table 9-1 Robot Controllers That Can Be Connected and Types of Communication

Robot Controller	Communication Type		Remarks
CR800-D/CR750-D/ CRnD-700 series (The photo is the robot controller for CR800-D.)	USB (*4)		Commercial items such as computers and cables might be incompatible with our equipment or unsuitable for the FA environment such as temperature, noise, etc. When using, please fully confirm operation as measures against noise such as EMI measure or addition of ferrite core may be needed.
	Ethernet(TCP/IP) (*1)		
	RS-232		CRnD-700 only
	GOT communications		Connect via a CR800-D/CR750-D/CRnD-700 series controller connected with the GOT via Ethernet by USB / RS-232. A GOT 1000 series and the Ethernet communication unit (GT15-J1E71-100) are needed.
CR800-R/CR800-Q/ CR750-Q/CRnQ-700 series   (Pictured is a CR800-R robot controller.)	CRnQ_R communication (*2)	USB (*4)	
		Ethernet (TCP/IP)	The PLC RCPU, Ethernet interface module or Built-in Ethernet port QCPU is required.
		RS-232	
	Ethernet(TCP/IP)		Only can be used for CR800-R/CR800-Q
CRn-500 series	Ethernet(TCP/IP) (*3)		The robot controller must have an "Ethernet interface" option.
	RS-232		

(*1) For details on the communication settings on the robot controller side for CR800-D/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 CR800-R/CR800-Q/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, use the “GX Developer” to set the PLC communication settings.

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

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

9.2. 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. Set connection settings in the "Step 3. Communication" page of the Edit Project screen.

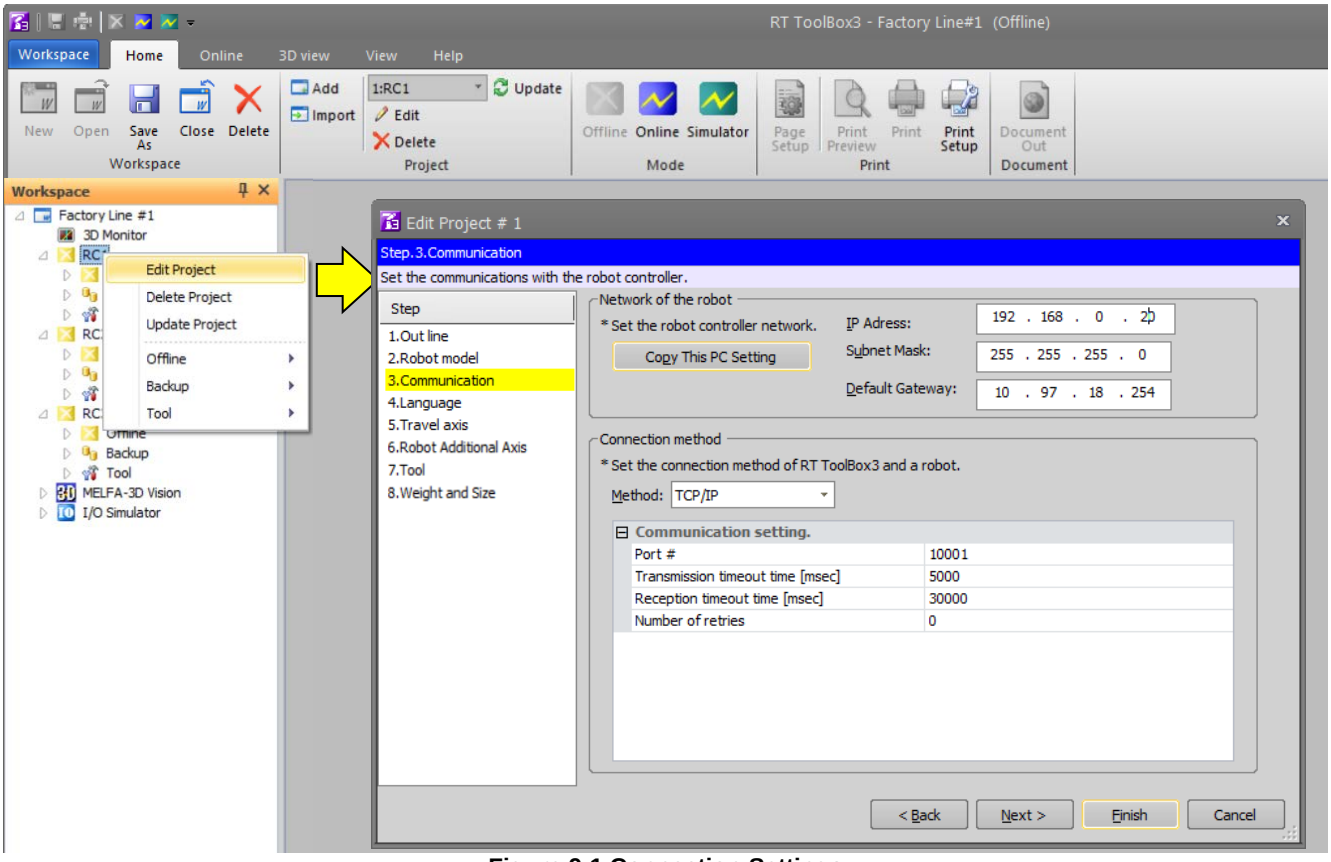


Figure 9-1 Connection Settings

Select the communication method, and set the details for each communication method in the [Communication] field. After setting the details, click the [Finish] button.

The content of the detailed settings for each communication method is explained from the following section onwards.

⚠ 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.
The same data may be referred to, and the data not read correctly.

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 using the USB hub.

9.2.1. USB Communication Settings

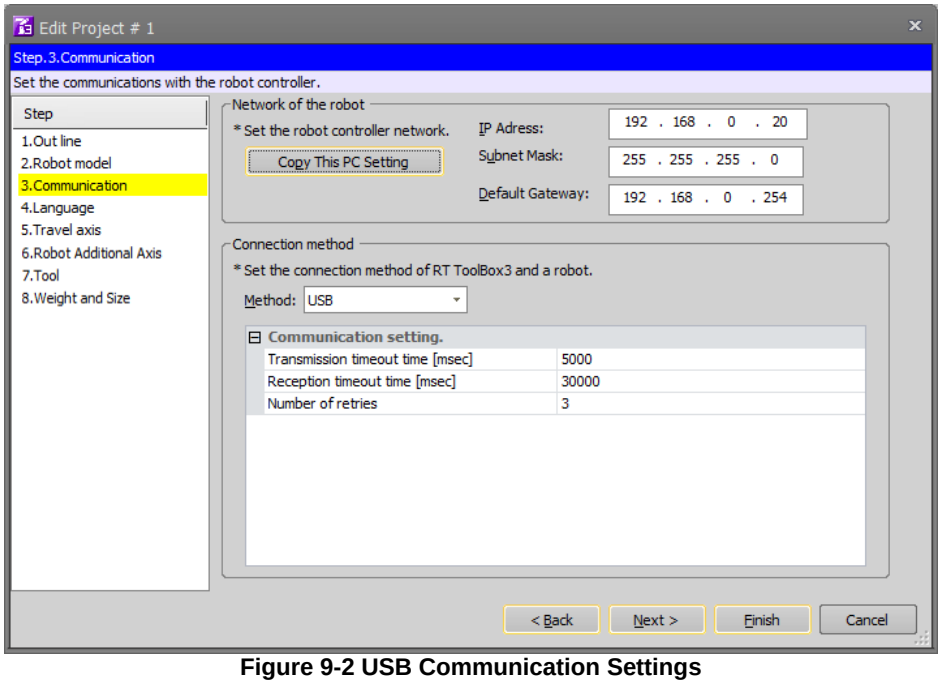


Figure 9-2 USB Communication Settings

Table 9-2 USB Communication Setting Items and Default values

Item	Explanation	Default value
Send timeout	Timeout time for sending Settable range Minimum value : 1000 msec Maximum value : 30000 msec	5000 msec
Receive timeout	Timeout time for receiving Settable range Minimum value : 5000 msec Maximum value :120000 msec	5000 msec
Retries	Number of communication retries Settable range Minimum value : 0 Maximum value : 10	3

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 (CR800-D/CR750-D/CRnD-700 series robot controller)** installation **"**.

9.2.2. TCP/IP (Ethernet) Communication Settings

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

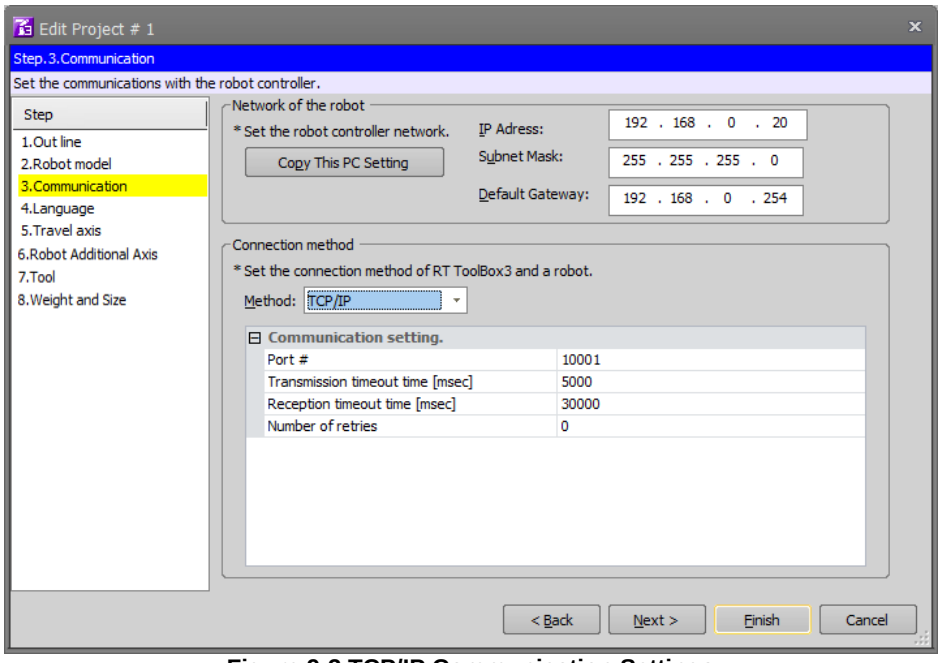


Figure 9-3 TCP/IP Communication Settings

Table 9-3 TCP/IP Communication Setting Items and Default Values

Item	Explanation	Default value
IP address	Sets the IP address of the connected robot controller.	Blank
Port used	Number of the port used for communication	10001
Send timeout	Timeout time for sending Settable range Minimum value : 1000 msec Maximum value : 30000 msec	5000 msec
Receive timeout	Timeout time for receiving Settable range Minimum value : 5000 msec Maximum value :120000 msec	30000 msec
Retries	Number of communication retries Settable range Minimum value : 0 Maximum value : 10	0

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

CR800/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 as the connection processing takes time.

⚠ Caution

Cautions when connecting to a CRn-500 robot controller by Ethernet

In the program edit function, change "Receive timeout" and "Retries" in the TCP/IP communication settings when all of the following use conditions apply, and the program is written to the robot controller.

<< Use conditions >>
1. Ethernet communication.
   (*Ethernet is an option in the CRn-500.)
2. Write "command line only" in program writing.
   (Uncheck the position variables write items and check "Command line only")
3. The number of command lines of the robot program is 1600 or more.
4. In the TCP/IP Communication Settings, the values of both "Receive timeout" and "Retries" are other than 0.

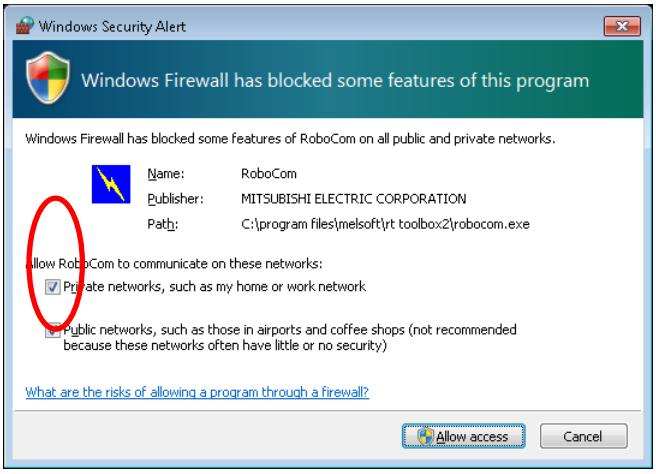
item	Value
Receive timeout (msec)	30000 or more
Retries	0

When using it on the condition of not changing the communication settings, errors might occur during robot program writing, or the robot program might not be correctly written. Therefore, it is necessary to check all content of the robot program. So be sure to change the communication settings.

⚠ Caution

When the following screen is displayed when connecting by Ethernet.

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



9.2.3. RS-232 Communication Settings

Change the RS-232 communication settings to match the robot controller side communications settings.
RS-232 communication can be used when connecting to a CR700 or CR500 series controller.

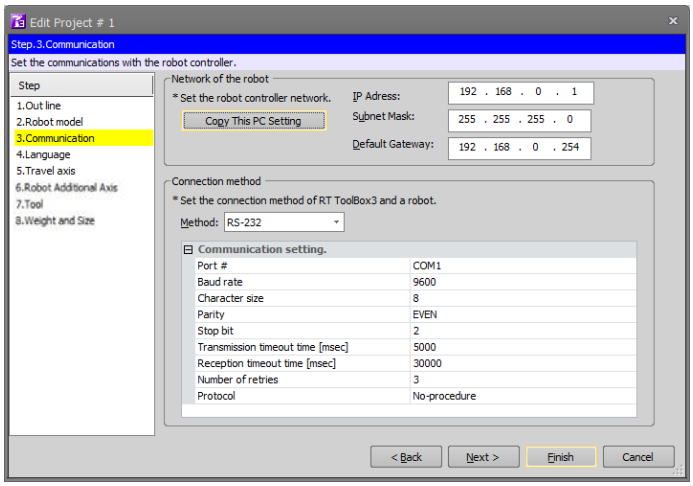


Figure 9-4 RS-232 Communication Settings

Table 9-4 RS-232 Communication Setting Items and Default Values

Item	Explanation	Default value
Port used	COM1 – COM10 can be selected.	COM1
Communication speed	Select from 4800, 9600, and 19200. + It is possible to select Baud rate 38400 only when connecting this software with the 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 Settable range Minimum value : 1000 msec Maximum value : 30000 msec	5000 msec
Receive timeout	Timeout time for receiving Settable range Minimum value : 5000 msec Maximum value : 120000 msec	30000 msec
Retries	Number of communication retries Settable range Minimum value : 0 Maximum value : 10	3
Usage protocol	Non-Procedural or Procedural can be selected.	Procedural

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

Normal operation not guaranteed with USB to RS-232 cables.

Normal operation is not guaranteed when using the USB to RS-232 cable. When using the RS-232 as a communication port, use of a computer with a serial port is recommended.

9.2.4. GOT Communication Settings

GOT communication is a communication method that uses the RS-232 and USB interfaces on GOT to establish a connection when a CR800-D/CR750-D/CRnD-700 series controller or GOT2000/1000 series is connected by Ethernet.

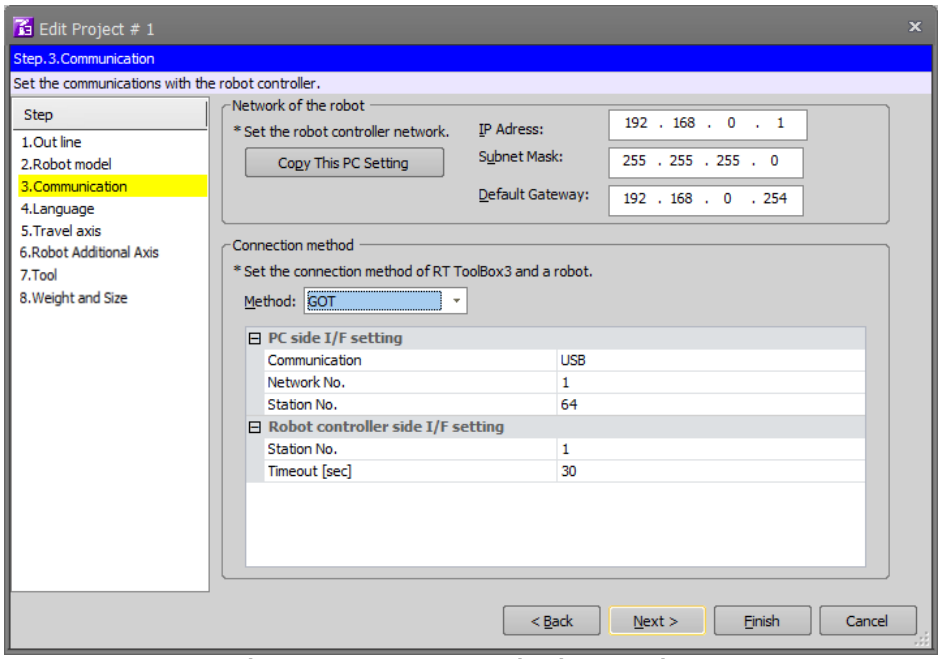


Figure 9-5 GOT Communications Settings

Table 9-5 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. (*2)	1 - 239 can be set. Match to Network No. of the GOT.	1
Station No. (PC side I/F setting) (*2)	1 - 64 can be set. Match to Station No. of the GOT. Set a value different from the Station No. of Robot controller-side I/F setting.	64
Station No. (Robot controller side I/F setting) (*2)	1 - 64 can be set. Match to Station No. set by GOT.	1
Timeout	1 - 9999 can be set. Set the timeout after transmission. Note: If too short a time is set, a timeout error occurs.	30 seconds

(*1) COM and Baud are available only that RS-232 is selected.
(*2) In case of CR800-D controller, it is not displayed because it is unnecessary.

9.2.5. CRnQ_R Communication Settings

CRnQ_R communication is a method to connect with a CR800-R/CR800-Q/CR750-Q/CRnQ-700 series controller by using a RCPU, a PLC Universal model QCPU module or a PLC Ethernet Interface module.

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

When using Ethernet, connect to the connector of the PLC RCPU, Ethernet Interface module or Built-in Ethernet port QCPU.

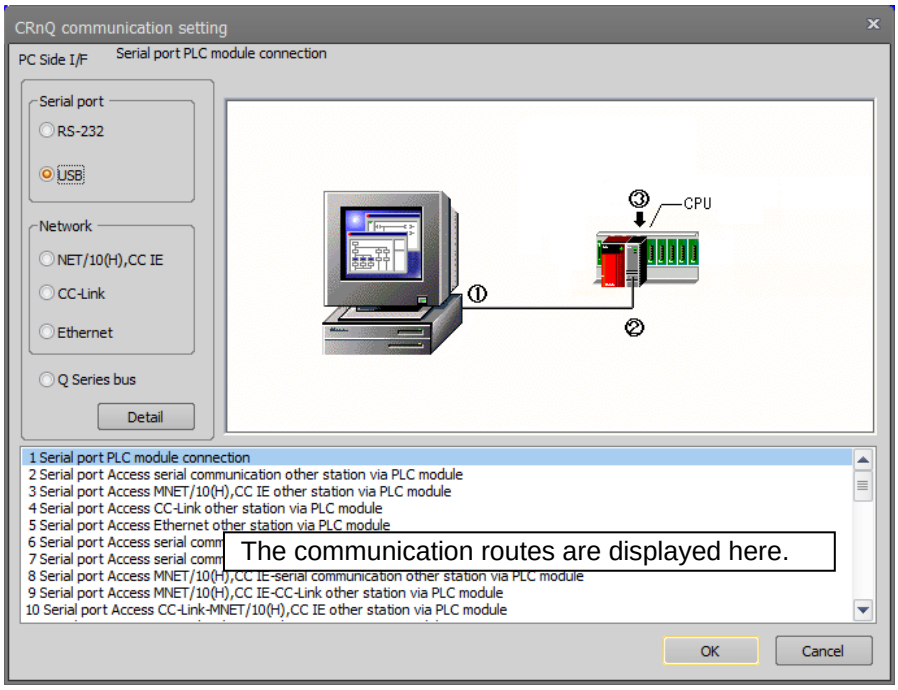


Figure 9-6 CRnQ_R Communication Settings

On the CRnQ_R communication setting screen, when you select the computer interface, the communication routes using the selected interface are displayed at the bottom of the screen. Select the communication 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.

9.2.5.1. 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 9-6 Communication Routes That Can Be Selected for "RS-232"

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

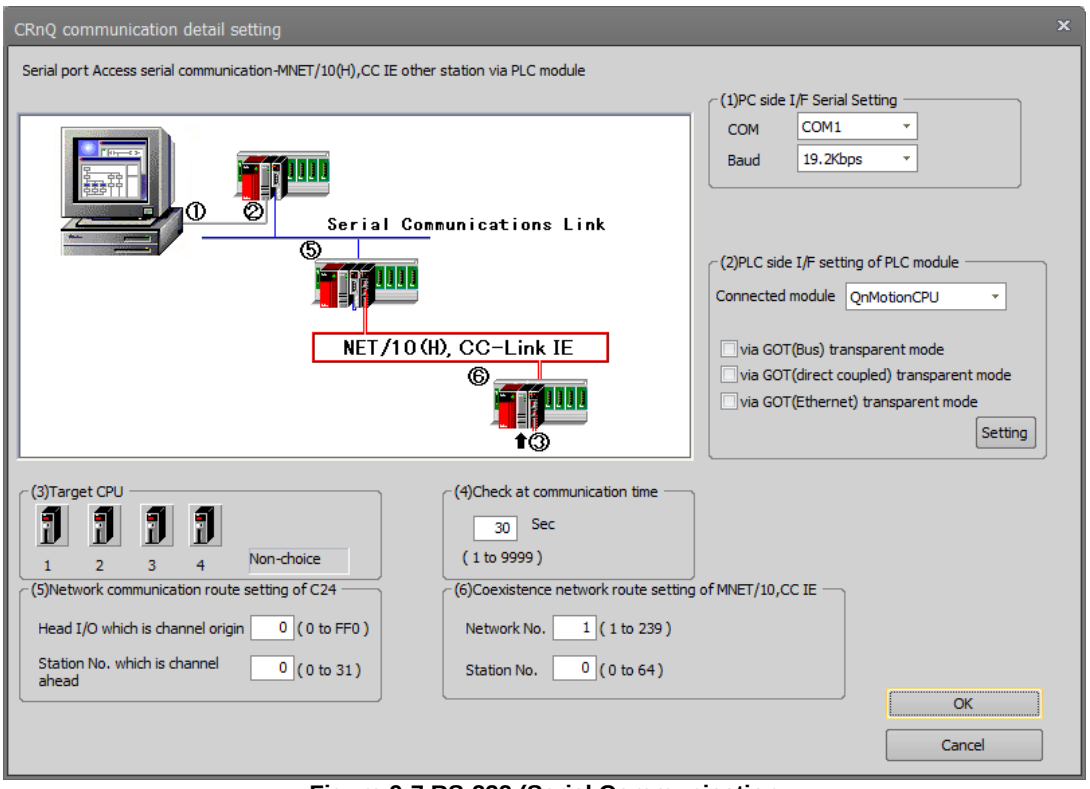


Figure 9-7 RS-232 (Serial Communication NET/10(H), CC IE through CPU Unit – CCLink Other Station Access) Detailed Settings

"(5) Network communication route setting of MNET/10" and "(6) Coexistence network route setting of C24" may not be settable depending on the network route selected.
GOT (Ethernet) transparent mode, display the setup screen by clicking the “Setting” button, and set the communication items.

⚠ Caution

CR800-R series controller has some communication paths that are not supported.

CR800-R does not support the communication routes from “27. Serial communication CC-Link other station access via G4” to “41. Serial communication Ethernet via NET/10(H), CC IE remote - CC-Link other station access” in Table 9-6. Please use other route for communication.

9.2.5.2. 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 9-6 Communication Routes That Can Be Selected for "RS-232"".**

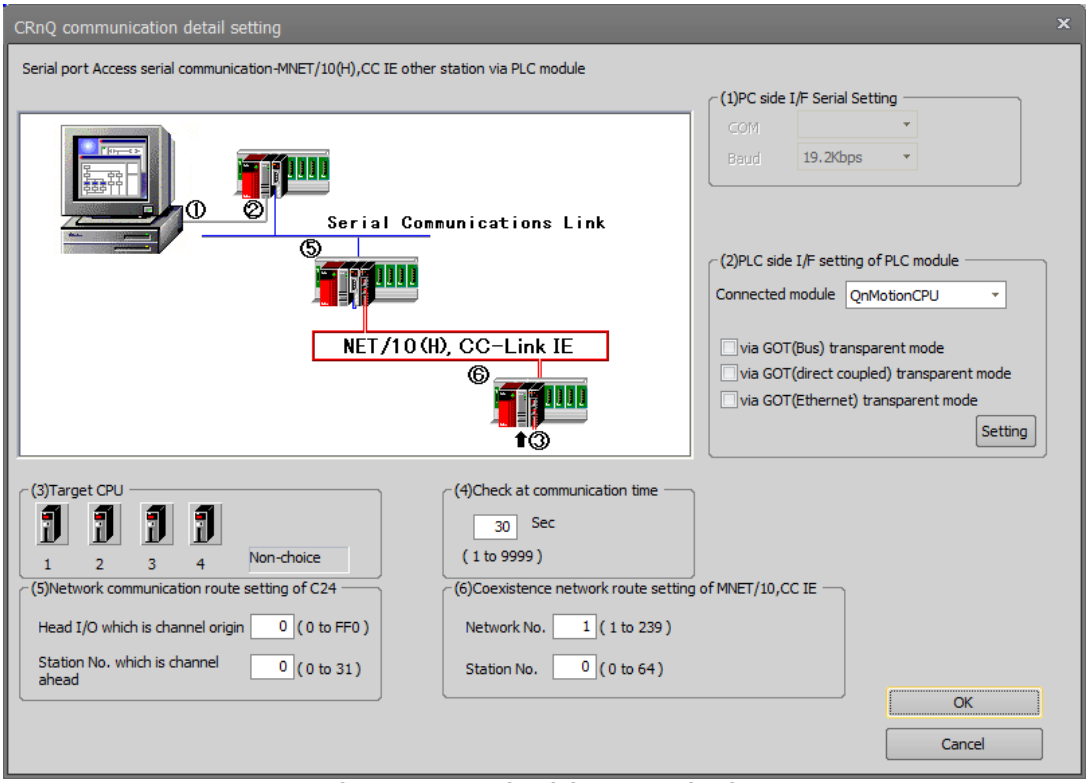


Figure 9-8 USB (Serial Communication NET/10(H), CC IE through CPU Unit – Serial Communication Other Station Access) Detailed Settings

"(5) Network communication route setting of MNET/10" and "(6) Coexistence network route setting of C24" may not be settable depending on the network route selected.
GOT (Ethernet) transparent mode, display the setup screen by clicking the “Setting” button, and set the communication items.

⚠ Caution

CR800-R series controller has some communication paths that are not supported.

CR800-R does not support the communication routes from “27. Serial communication CC-Link other station access via G4” to “41. Serial communication Ethernet via NET/10(H), CC IE remote - CC-Link other station access” in Table 9-6. Please use other route for communication.

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

It is possible to communicate using the "CC-Link IE controller network port" or "CC-Link IE field network port" newly established in the QnCPU.

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

Table 9-7 Communication 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 via NET/10(H), CC IE unit
2	NET/10(H), CC IE board communication NET/10(H), CC IE via NET/10(H), CC IE unit – CC-Link other station access
3	NET/10(H), CC IE board communication NET/10(H), CC IE via NET/10(H), CC IE unit - Serial communication other station access

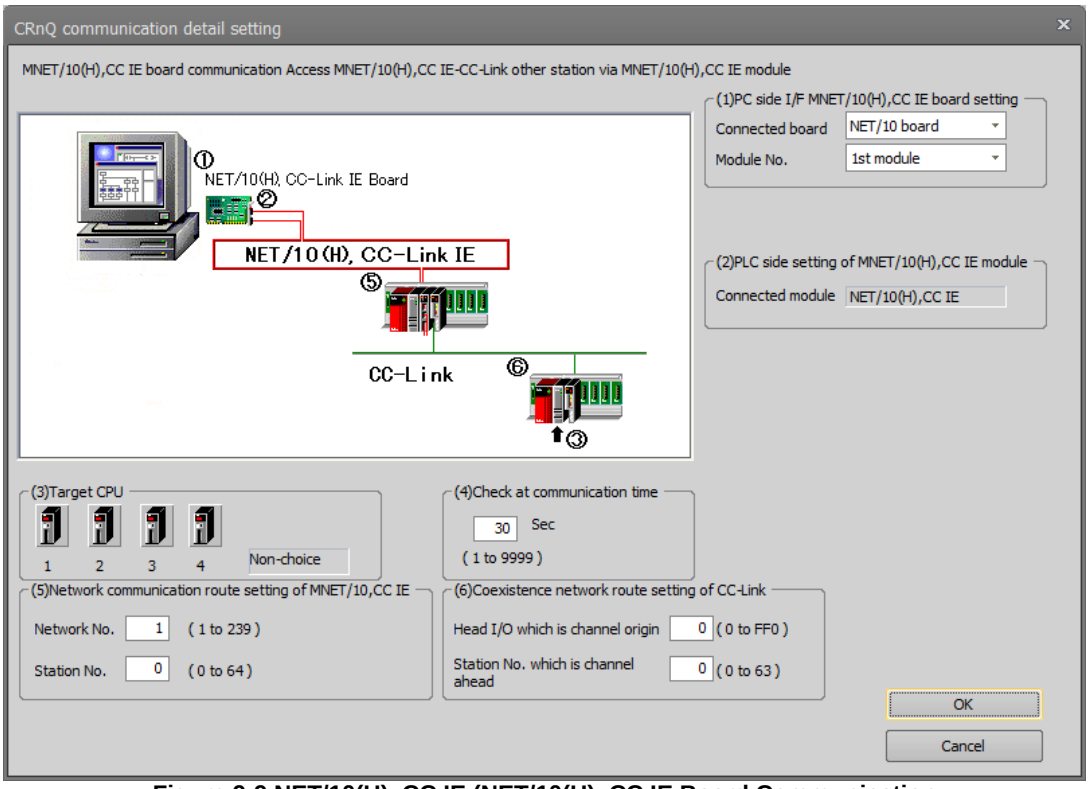


Figure 9-9 NET/10(H), CC IE (NET/10(H), CC IE Board Communication NET/10(H), CC IE through NET/10(H), CC IE Unit – CC-Link Other Station Access) Detailed Settings

"(5) Network communication route setting of MNET/10" and "(6) Coexistence network route setting of C24" may not be settable depending on the network route selected.

9.2.5.4. 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 9-8 Communication Routes That Can Be Selected for "CC-Link"

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

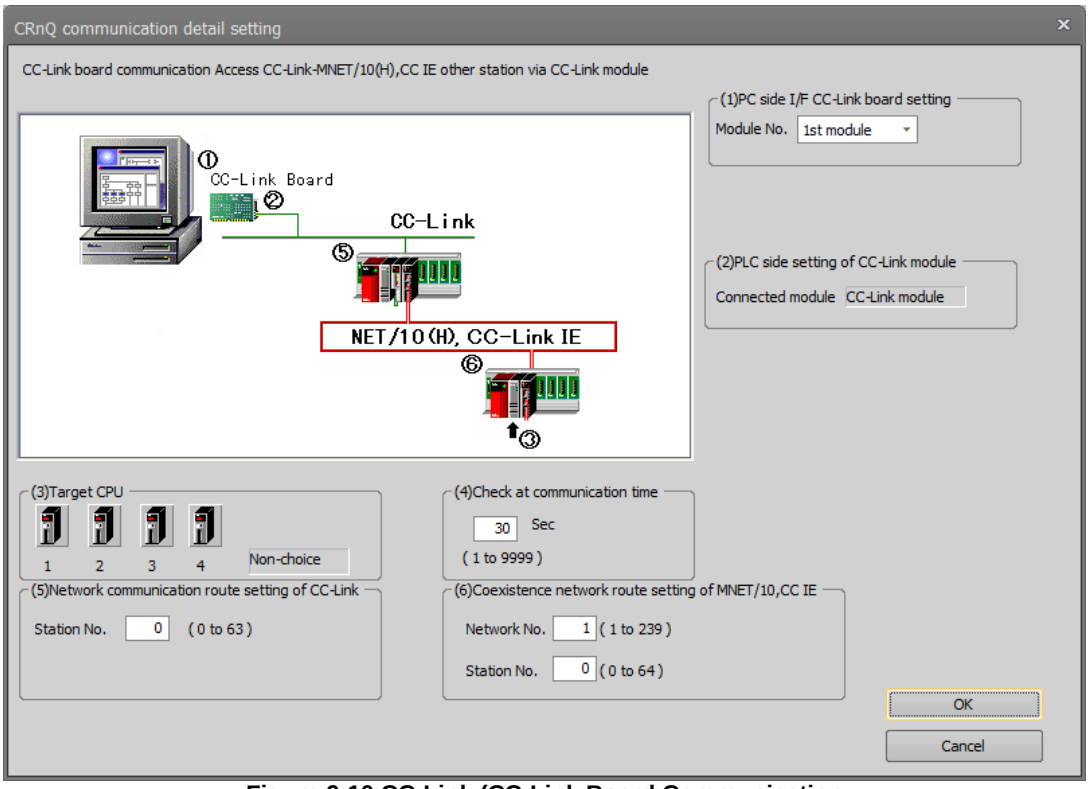


Figure 9-10 CC-Link (CC-Link Board Communication CC-Link through CC-Link Unit – NET/10(H), CC IE Other Station Access) Detailed Settings

"(5) Network communication route setting of MNET/10" and "(6) Coexistence network route setting of C24" may not be settable depending on the network route selected.

9.2.5.5. When Ethernet is selected

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

Table 9-9 Communication 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	
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	

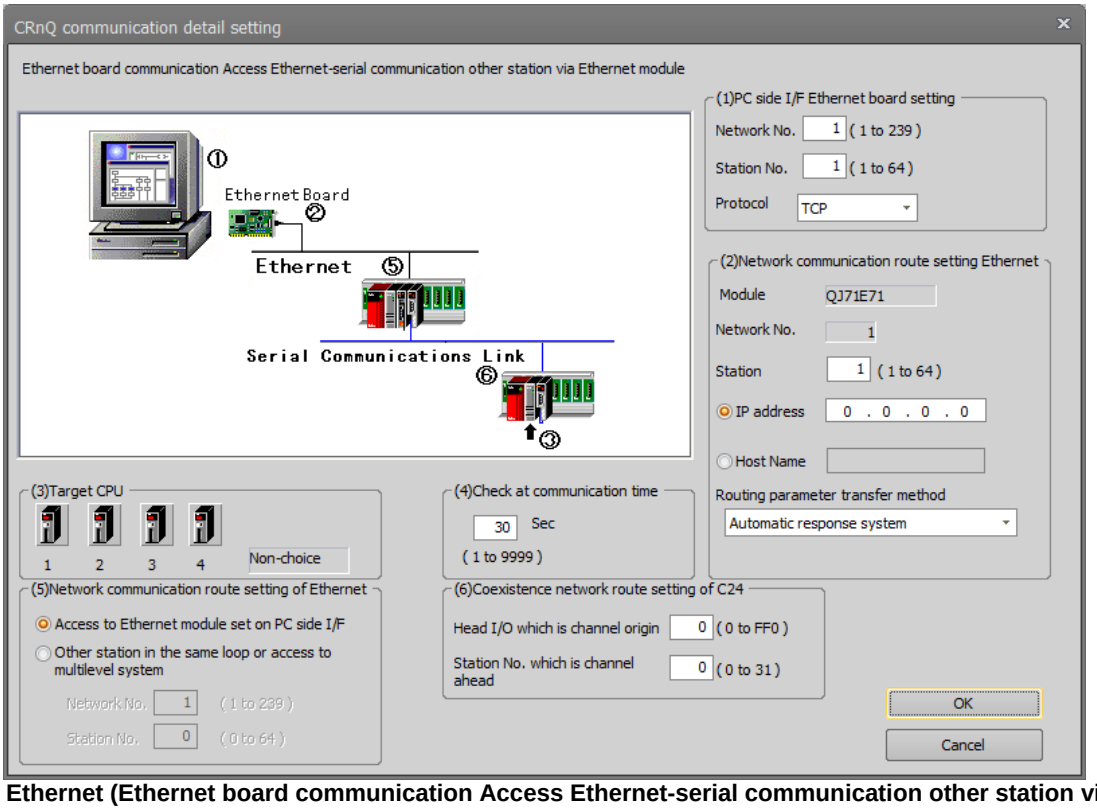


Figure 9-11 Ethernet (Ethernet board communication Access Ethernet-serial communication other station via Ethernet module) Detailed Settings

“(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" may not be settable depending on the network route selected.

⚠ Caution

CR800-R series controller has some communication paths that are not supported.

CR800-R does not support the communication routes from “4. Ethernet port direct communication PLC module connection” to “6. Ethernet port direct communication Access CC-Link other station via PLC module” in Table 9-9. Please use other route for communication.

⚠ Caution

Can not connect with two or more robot controllers in direct connection.

When two or more robot controllers are connected on the network, it does not support from “4. Ethernet port direct communication PLC module connection” to “6. Ethernet port direct communication Access CC-Link other station via PLC module” in Table 9-9. Please use other route for communication.

9.2.5.6. 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 9-10 Communication Route That Can Be Selected with the "Q Series Bus"

No.	Communications Route
1	Q bus communication CPU unit connection

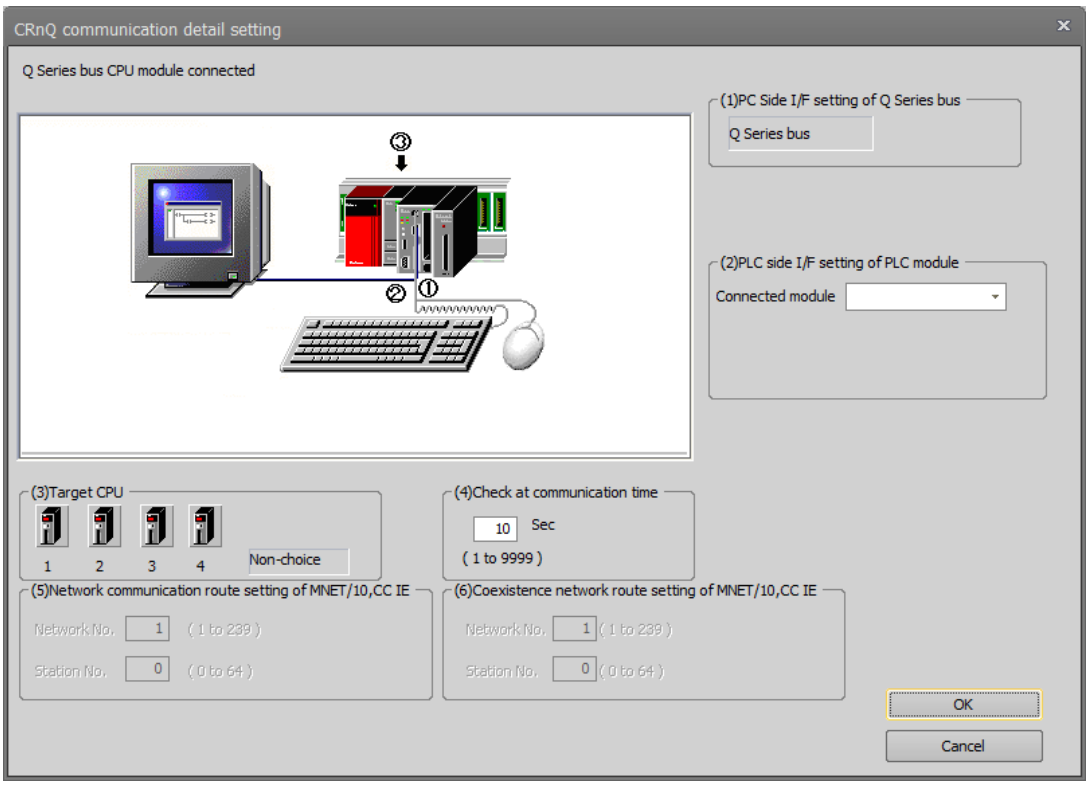


Figure 9-12 Q Series Bus (Q Bus Communications CPU Unit Connection) Detailed Settings

Caution

CR800-R series controller does not support Q series bus.

CR800-R does not support Q series bus communication. Please use other route for communication.

9.2.6. Travel base setting for display

Set the traveling axis for display. The travel axis is set in Step 5. of the "Add/Edit Project" screen.

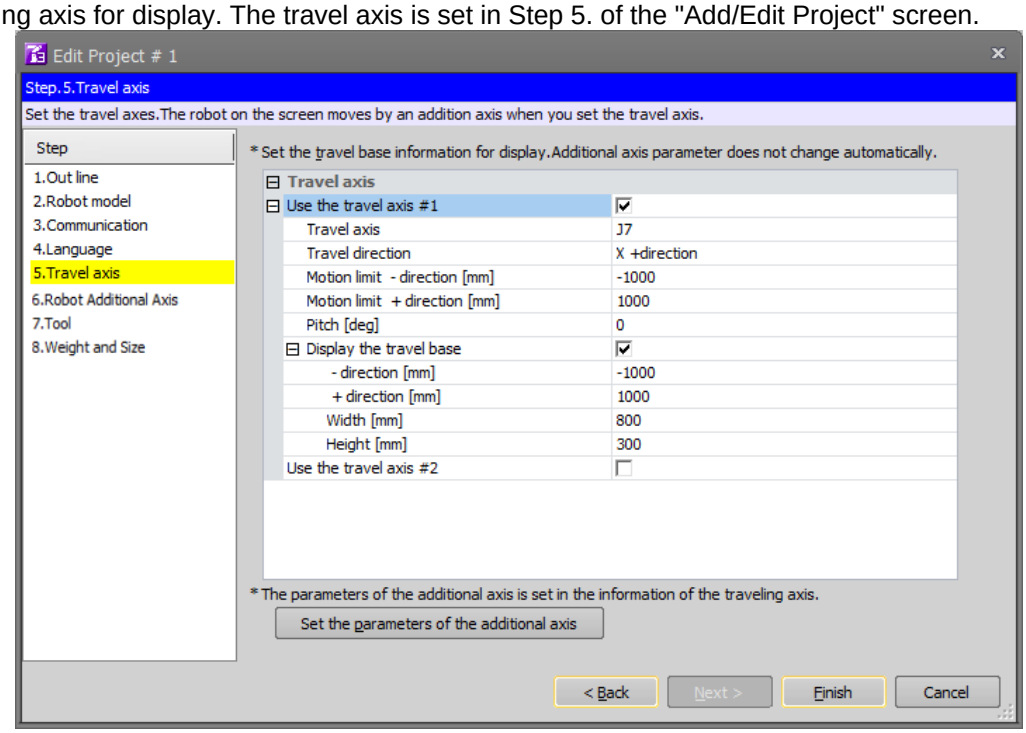


Figure 9-13 Travel base setting for display

9.2.6.1. Travel base setting

Set the travel base that is displayed in the [Travel axis] field of this screen.
Up to two travel bases can be used simultaneously.

When the [Use the travel axis] checkbox is selected, the travel axis, travel direction, motion limit, pitch, and travel base information can be set.
You can set J7 and J8 axes to the travel axis. When two travel bases are used, specify different axes to each of the travel bases.
The travel directions are as follows. When [**Z +direction**]/ [**Z -direction**] is set in the Travel direction, the travel base does not display.

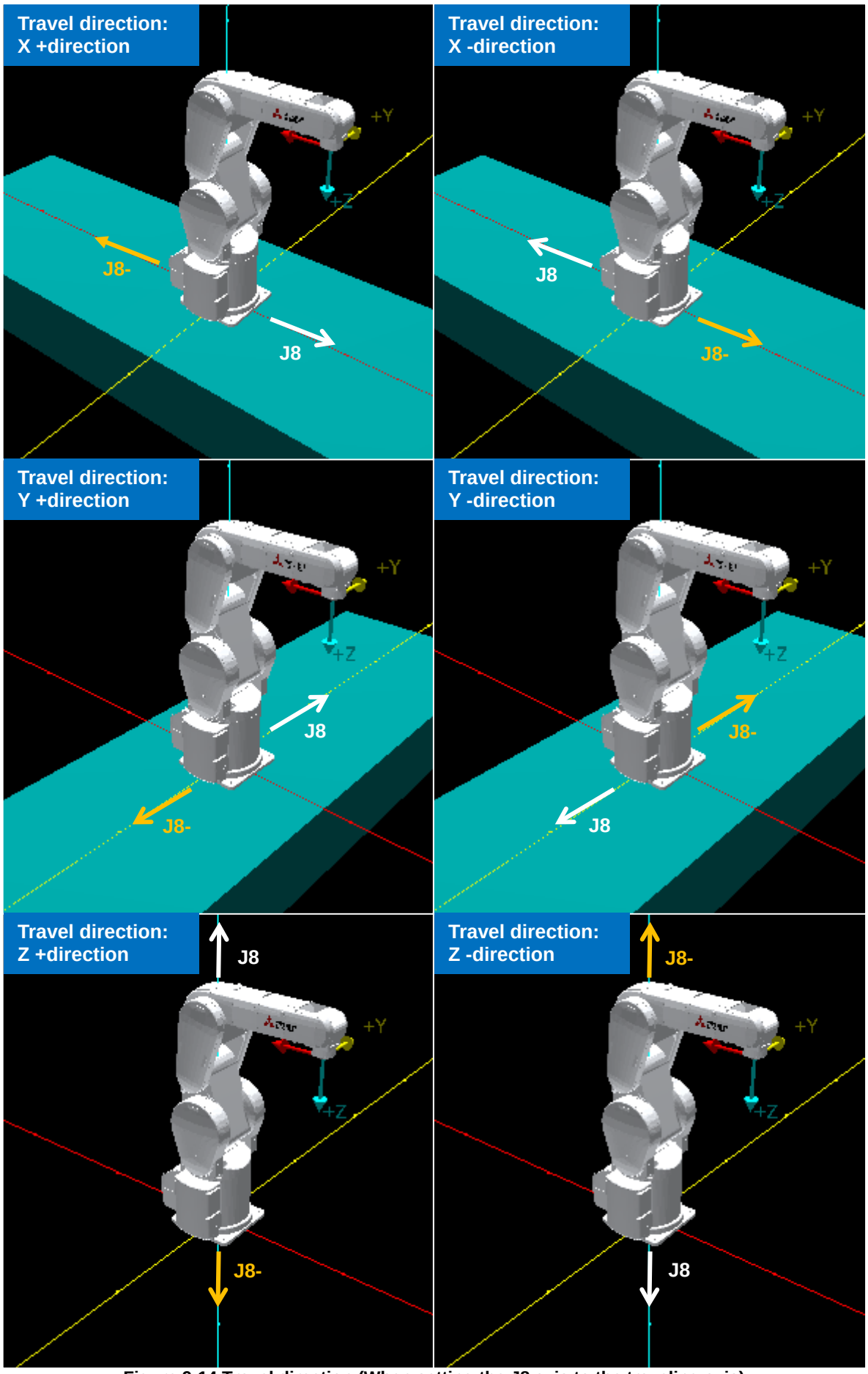


Figure 9-14 Travel direction (When setting the J8 axis to the traveling axis)

9.2.6.2. Robot additional axis parameter setting

Click the [Set the parameters of the additional axis] button. The content set to [Travel axis] is applied to the robot additional axis parameters of the simulation. Note that parameters are not automatically set if the above button is not clicked.

* The additional axis parameters include these parameters.
AXMENO,AXJNO,AXUNT,AXGRTD,AXGRTN,AXACC,AXDEC,AXMREV,AXJMX,AXENCR,MEJAR

10. Robot Programming Language Setting

Select the robot program language that is used. The languages you can select are as follows.

Table 10-1 Robot Programming Languages for Each Controller

Robot controller	Robot program language			
	MELFA-BASIC VI	MELFA-BASIC V	MELFA-BASIC IV	Movemaster commands
CR800-D/CR800-R/ CR800-Q	○	○	×	×
CR750-D/CRnD-700	×	○	○	○
CR750-Q/CRnQ-700	×	○	○	○
CRn-500	×	×	○	○

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

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. Set the language in the "Step 4. Language" page of the Edit Project screen.

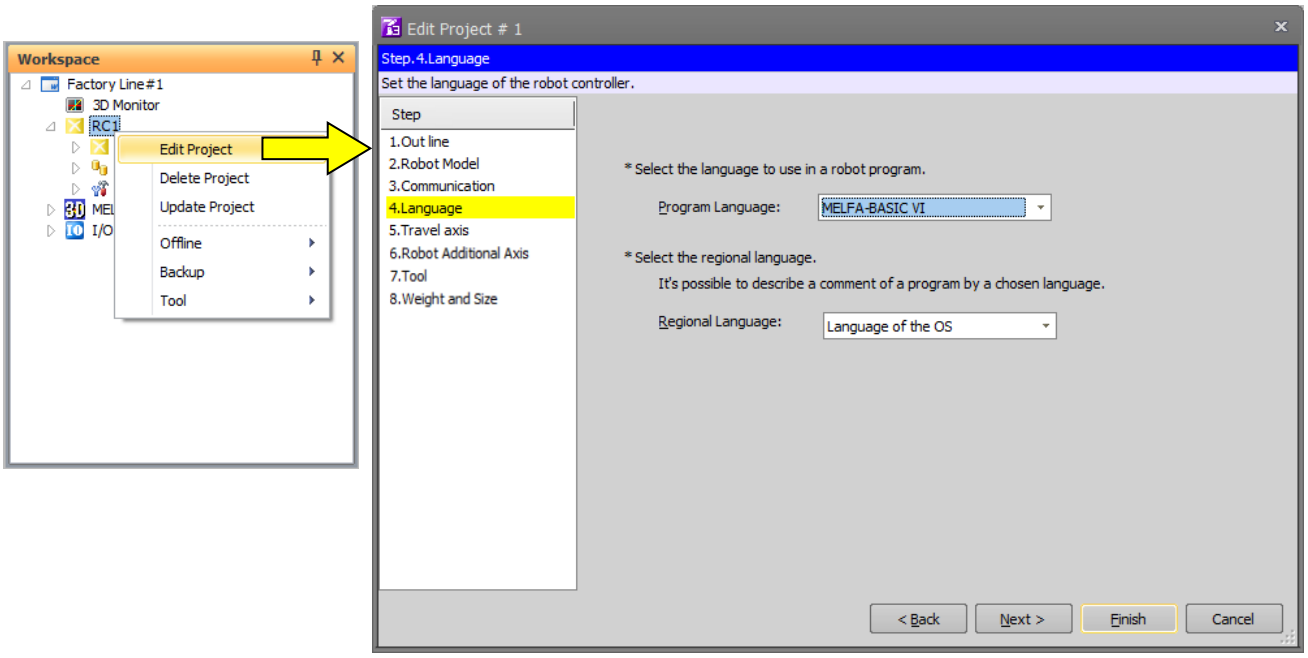


Figure 10-1 Setting the Language

Select the program language to be used and click the [Finish] button.

11. 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 cannot be handled by 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, an error will result 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 cannot be handled by the robot controller.

It is not possible to use the following program names:

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

A warning is displayed when you input the program name including these conditions in the following operations.

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

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

When the password is registered in a program by the robot controller's security function, the programs in the robot controller 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 robot controller's security function password when you perform these. Refer to **"15.5.3 Delete Password"** for the method of deleting the password.

For details on versions of robot controllers that support security functions, refer to **"Table 15-12 Compliant version of this function and controller"**.

11.1. Writing a New Program

11.1.1. 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].

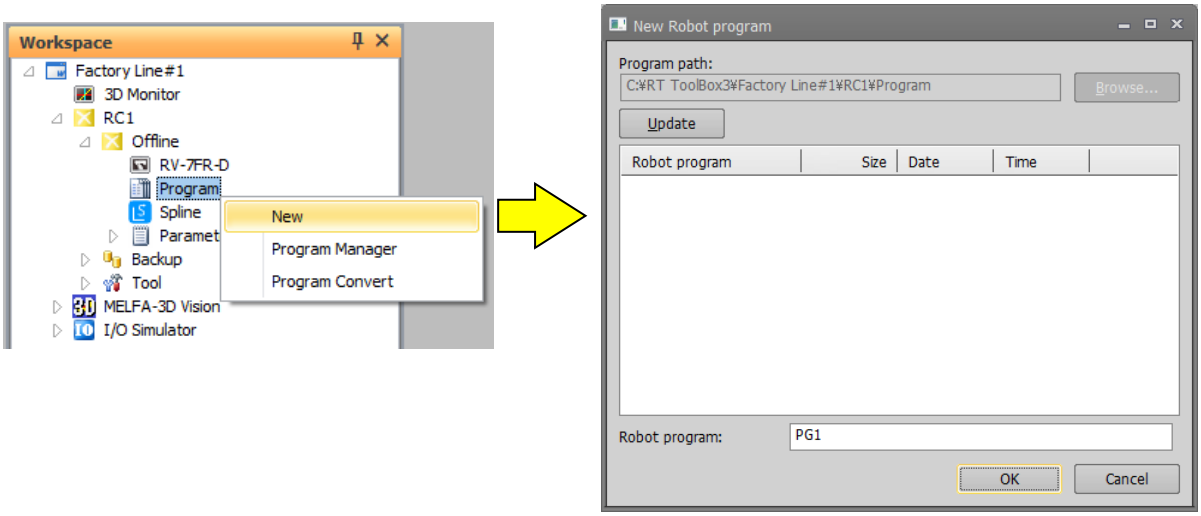


Figure 11-1 Writing a New Program on the Computer

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

Caution

Program storage folder

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 to the desired folder with the program management copy function.

11.1.2. Writing a new program in the robot controller

Select [Online] or [Simulation] -> [Program] for the new project to be created, and click the mouse right button. The right button menu is displayed, so click [New].

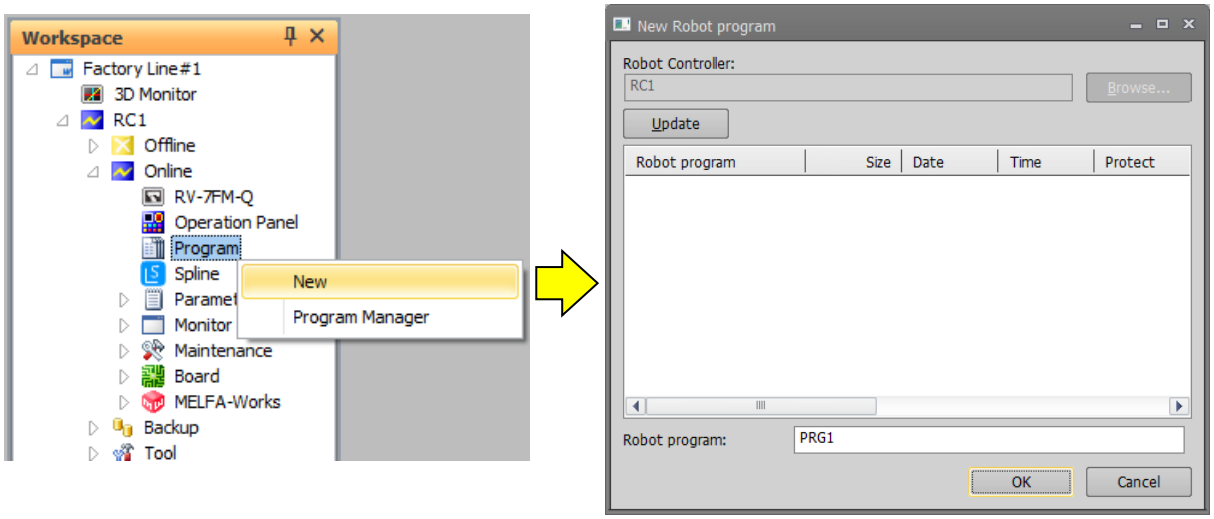


Figure 11-2 Writing a New Program in a Robot Controller

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 **"11.2.3 Read Items when opening program in robot controller".**

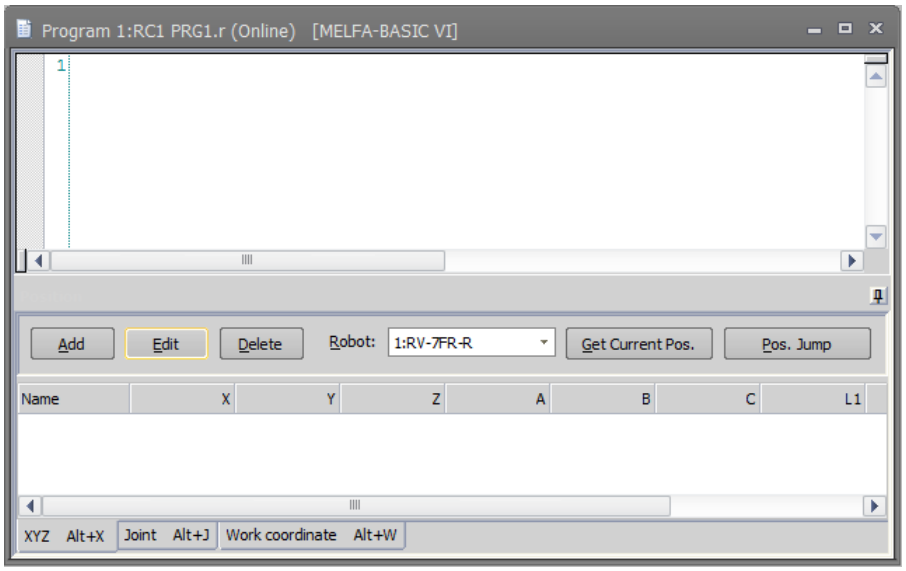


Figure 11-3 Editing a New Program

11.2. Opening an Existing Program

11.2.1. 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.

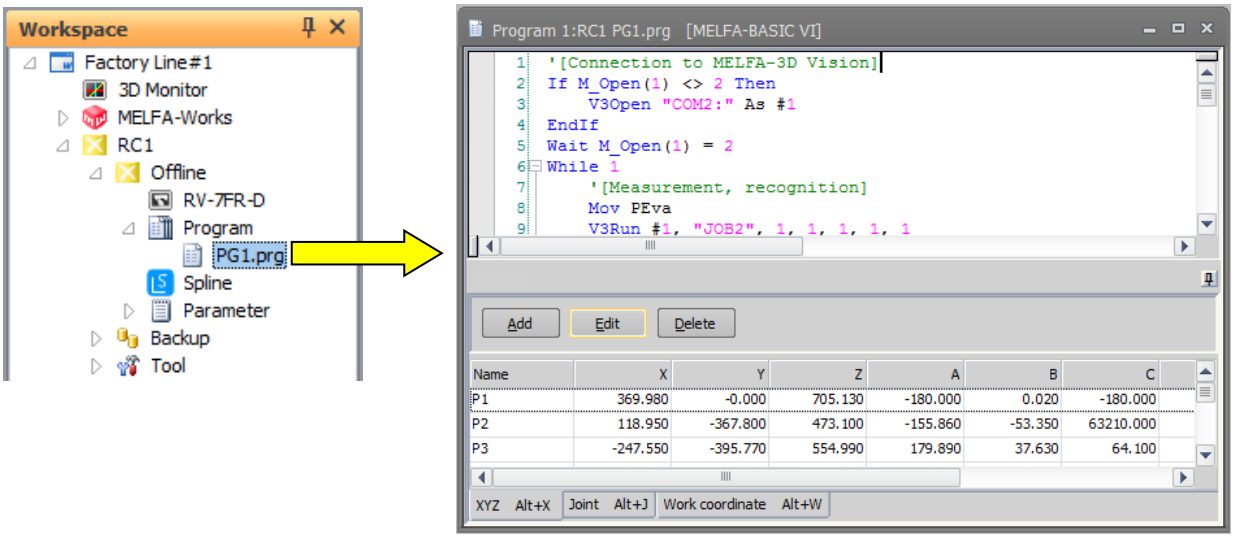


Figure 11-4 Opening a Program on the Computer

11.2.2. Opening a program in a robot controller

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

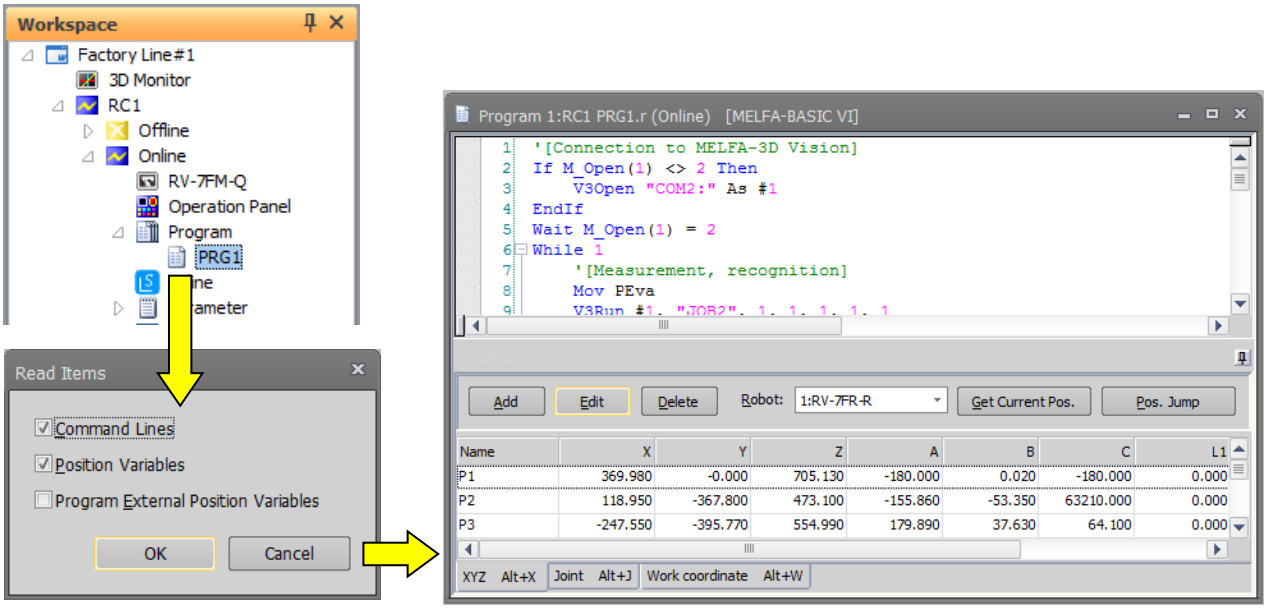


Figure 11-5 Opening a Program in a Robot Controller

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 **"11.2.3 Read Items when opening program in robot controller".**

If you open a program which is set “Reading protection” (displayed on the project tree), release it with reference to **“11.12 Set / Release read protection”** before you open the program.

11.2.3. 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.

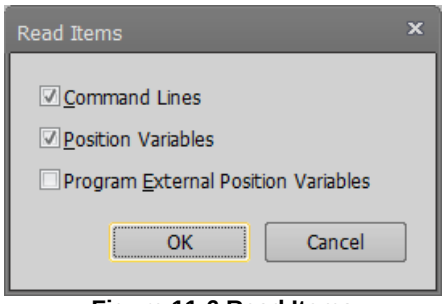


Figure 11-6 Read Items

The program external position variable read operations are shown in **"Table 11-1 Program External Position Variable Read Operations".** (For details on program external position variables, see **"Detailed explanations of functions and operations"** in the robot controller's user's manual.)

Table 11-1 Program External Position Variable Read Operations

		Read Item			Position variable, joint variable (P_01, J_02, etc.) (MOVEMASTER command : 901-999)	Position array variable, joint array variable (P_100( ), J_102( ), etc.)
		Command	Position	External position variable		
CR800/ CR750/700 series robot controllers		☑	☑	☑	Reads only the external position variables (position variables, joint variables) used in instruction statements. (*1)	Reads all elements used in instruction statements. (*2)
		☑	☐	☑		
		☐	☑	☑	Reads all external position variables (position variables, joint variables, position array variables, joint array variables).	
		☐	☐	☑		
CRn-500 series robot controller software version	Ver.J1 or later	☑	☑	☑	Reads only the external position variables (position variables, joint variables) used in instruction statements. (*1)	Reads all elements used in instruction statements. (*2)
		☑	☐	☑		
		☐	☑	☑	Reads all external position variables (position variables, joint variables, position array variables, joint array variables).	
		☐	☐	☑		
	Ver.H1 to H7	☑	☑	☑	Reads all external position variables (position variables, joint variables, position array variables, joint array variables).	
		☑	☐	☑		
		☐	☑	☑		
		☐	☐	☑		
	Ver.G9 or earlier	This screen is not displayed.				

*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.

11.2.4. Editing a program in the backup data

Program data backed up on the personal computer by the backup function can be edited in the Edit Program screen.

Open the target project in the project tree under [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. Select the program you want to edit, and click [OK] button.
The extension of program data file in the backup data is “*.MB6”, “*.MB5”, or “*.MB4”.

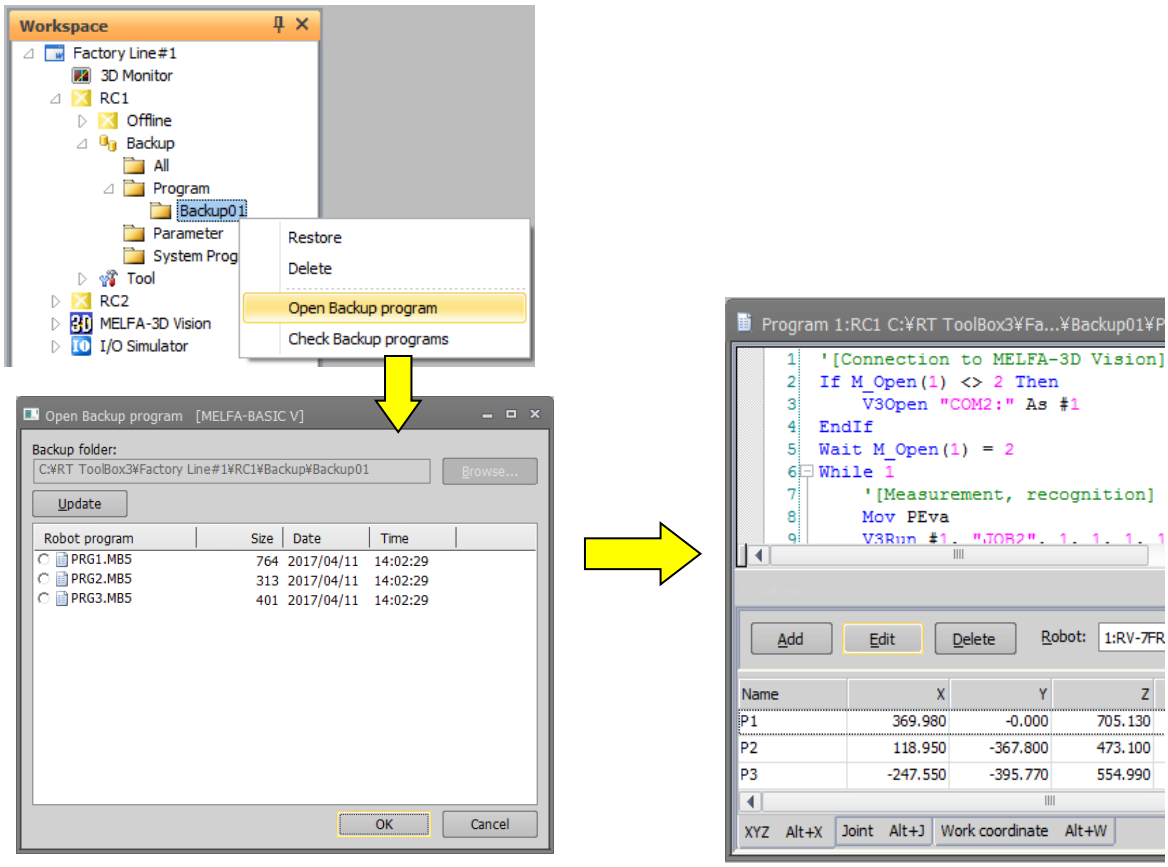


Figure 11-7 Opening a program in the backup data

If you open a program which is set with “Read protection”, the reading password input screen is displayed. You can open it by inputting the password set prior to backup.

Caution

Cautions on opening backed-up programs.

The cautions on opening backed-up programs are as follows,

(1) Only programs made in the robot program language specified by the current project can be opened.
(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) <u>If the program is opened from Program backup data or the data of an unsupported robot, the joint position variables, additional axis values, and direct-driven axis values used might be not converted correctly.</u>

11.3. Explanation of Program Edit screen

This explains the program edit screen.

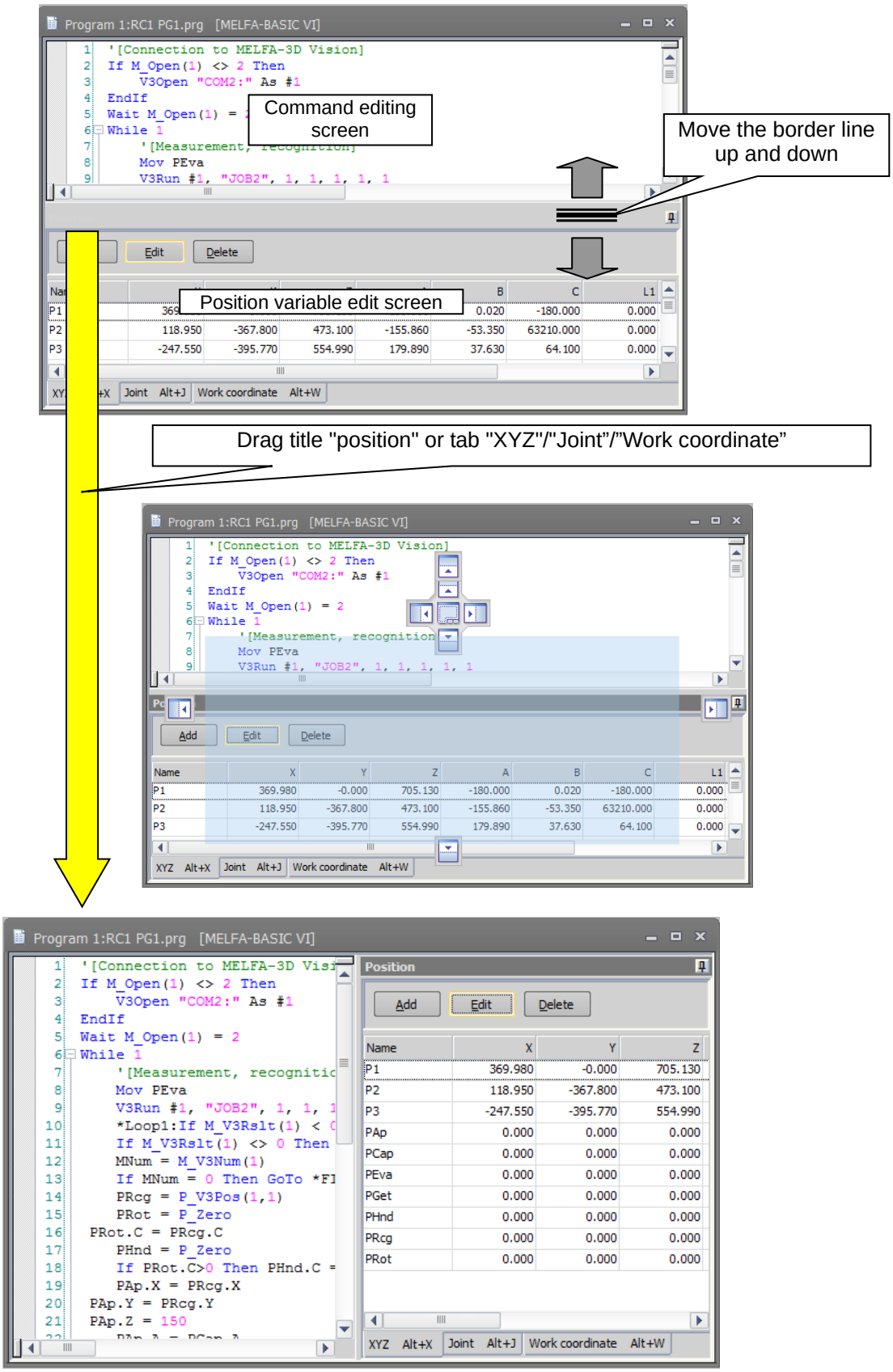


Figure 11-8 Explanation of Program Edit screen

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. Also, the display position of each editing screen can be changed by dragging the title "position" or tab "XYZ"/"Joint"/"Work coordinate". This is handy when you want to expand the command edit screen, for example because there are many lines of commands. For details, see **"11.5 Customizing the Display Position".**

The background color for the command edit screen depends on the robot language used. The background color can be changed from option screen. For details, refer to **"11.6.11Setting the background color of the program editor"**.

Table 11-2 Command Edit Screen Background Color (Initial color)

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

Debugging means when the program is opened in debugging status.

11.4. Ribbon During Program Editing

During program editing the "File", "Edit", "Debug" and "Tool" tabs are displayed on the ribbon.

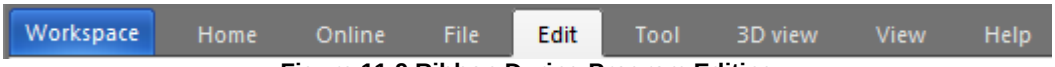
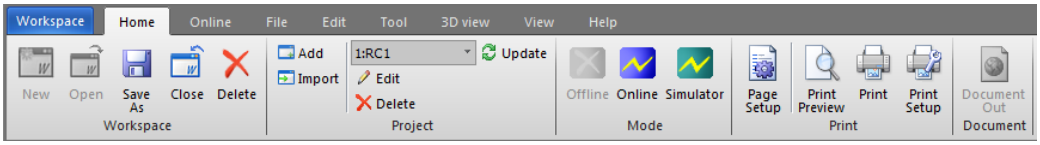
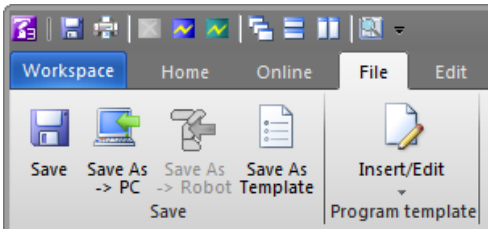
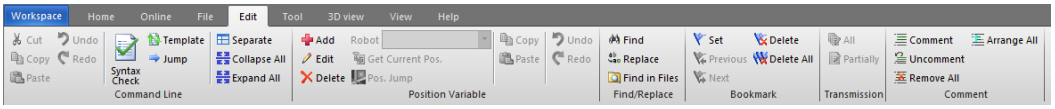
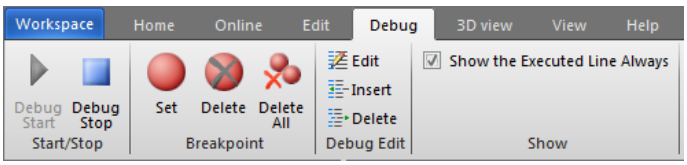
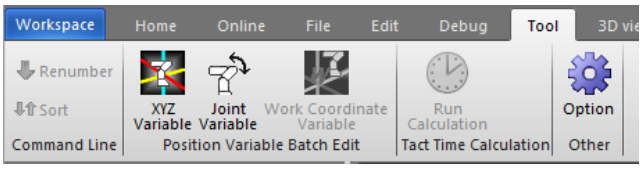


Figure 11-9 Ribbon During Program Editing

The button in each of these tabs are as follows.

Tab	Group	Button	Explanation	Menu item
Home				
	Print	Page Setup	Pages in the program to print can be customized.	11.10.3
		Print preview	You can preview how a printed page of the program will look.	11.10.1
		Print	This prints the program.	11.10.2
File				
	Save	Save	Saves the program being edited with its current name.	11.9.1
		Save As -> PC...	Saves the program being edited with its current name on the PC	11.9.2
		Save As -> Robot...	Saves the program being edited with its current name on Robot controller	11.9.3
		Save As -> Template	Save the editing program as a template to PC	11.9.4
	Program template	Insert/Edit	It is possible to insert template to editing program and edit template	11.7.4.1 5
Edit				
	Command line	Cut	Cuts a character string from the command being edited.	11.7.4.2
		Copy	Copies a character string in the command being edited.	11.7.4.1
		Paste	Pastes the copied or cut character string to the specified location.	11.7.4.3
		Undo	Cancels the command edit and return to the previous state	
		Redo	Redo the command edit	
		Syntax Check	You can check whether or not the edited robot program is syntactically correct.	11.7.4.13
		Template	You can display a list of the commands and make insertions on the program command edit screen.	11.7.4.14
		Jump	Jumps to the specified step number or label.	11.7.4.9

Tab	Group	Button	Explanation	Menu item
		Separate	Separates and displays the command editing screen.	11.5
		Collapse all	Collapses and displays all command blocks.	11.7.4.23
		Expand all	Expands and displays all command blocks.	11.7.4.23
	Position variable	Add	Add a position variable.	11.7.3.1
		Edit	Edit the selected position variable.	11.7.3.1
		Delete	Delete the selected position variable.	11.7.3.2
		Robot	Select the robot to be used in the "Get current Pos." and "Pos. Jump".	11.6.13 11.8
		Get current Pos.	Get the current position of robot to selected position variable.	11.6.13
		Pos. Jump	Move the robot to the coordinates of selected position variable.	11.8
		Copy	Copies the position variable.	11.7.4.4
		Paste	Pastes the copied position variable.	11.7.4.5
		Redo	Redoes the editing operation on the position variable.	
		Undo	Undoes the edited location of the position variable.	
	Find/Replace	Find	Searches for the specified character string.	11.7.4.6
		Replace	Replaces the specified character string with another character string.	11.7.4.8
		Find in Files	Searches for the specified character string in the program files.	11.7.4.7
	Bookmark	Set	Adds a bookmark to the selected program line.	11.7.4.22
		Delete	Deletes a bookmark from the selected program line.	
		Delete All	Deletes all bookmarks from the program.	
		Previous	Jumps to the line set with a bookmark immediately before the cursor.	
		Next	Jumps to the line set with a bookmark immediately after the cursor.	
	Transmission	All	Writes all lines of the program to the robot controller. This cannot be used when the program is opened in debugging status.	11.7.4.1 2
		Partially	Writes the selected program lines to the robot controller. This cannot be used when the program is opened in debugging status.	11.7.4.11
	Comment	Comment	Batch exchanged selected lines are commented-out.	11.7.4.19
		Uncommen t	The selected lines of the comment are batch released.	11.7.4.19
		Remove all	Removes all comments in the program.	11.7.4.20
		Arrange All	Arrange all comment in the program.	11.7.4.21
	Debug edit	Edit	Edits the program command lines opened in debugging status.	11.11.3
		Insert	Inserts the command lines into a program opened in debugging status.	
		Delete	Deletes the command lines in a program opened in debugging status.	
Debug				

Tab	Group	Button	Explanation	Menu item
	Start/Stop	Debug start	Reopens the program being edited in the debug mode.	11.11.1
		Debug stop	Reopens the program in the debug mode in an editable state.	11.11.6
	Breakpoint	Set...	Sets a breakpoint in a program opened in debugging status.	11.11.4
		Delete	Deletes a breakpoint in a program opened in debugging status.	
		Delete all	Deletes all breakpoints in a program opened in debugging status	
	Show	Show the executed line always	Sets display/non-display the executed line in the program opened in debugging status.	11.11.1
Tool * 				
	Command line	Renumber	The renumbering function can only be used with MELFA-BASIC IV and Movemaster commands. Batch-renumbers line numbers.	11.7.4.17
		Sort	The sorting function can only be used with MELFA-BASIC IV and Movemaster commands. Sorts edited programs in line number order.	11.7.4.18
	Position variable Batch edit	XYZ variable	Changes the position variables in the program being edited in a batch and can sum up all the values	11.7.4.16
		Joint variable		
		Work coordinate variable		
	Tact time Calculation	Run calculation	Tact time calculation can only be used in a simulation. You can calculate the tact time of the program.	20.3
	Other	Option	You can customize the syntax check before saving for example.	11.6

* When the program is opened in the debug mode, the [Tool] tab is not displayed.

11.5. Customizing the Display Position

The separation position of the screen can be customized by dragging the border line between the command editing screen and the position variable editing screen.

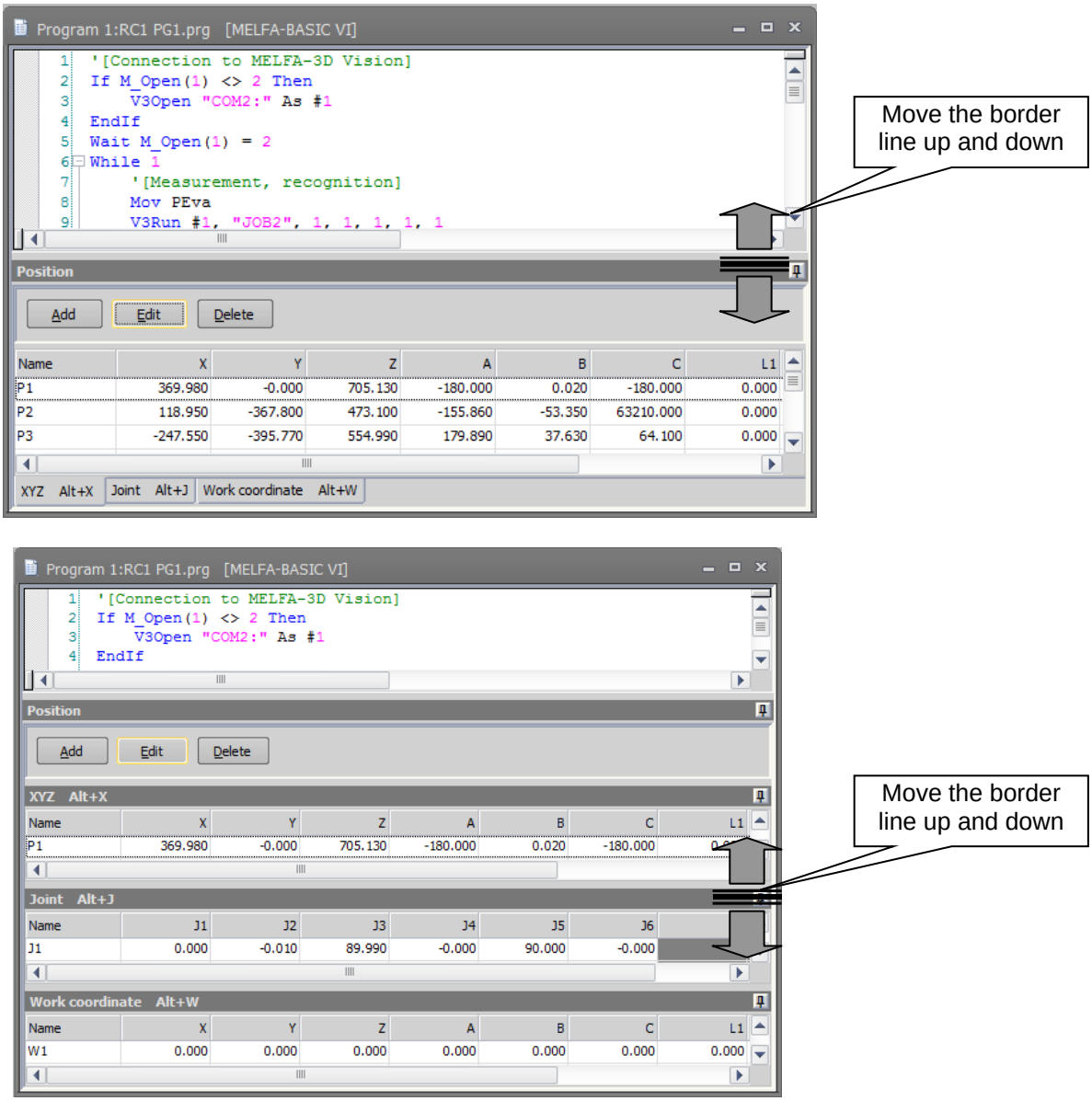


Figure 11-10 Customizing the Screen Separation Position by the Border Line

The separation position of the command editing screen can be customized by clicking the [Edit] tab -> [Command line] group -> [Separate] button on the ribbon.

The separation position of the command editing screen can also be customized by dragging the "" or border line on the scroll bar in the command editing screen.

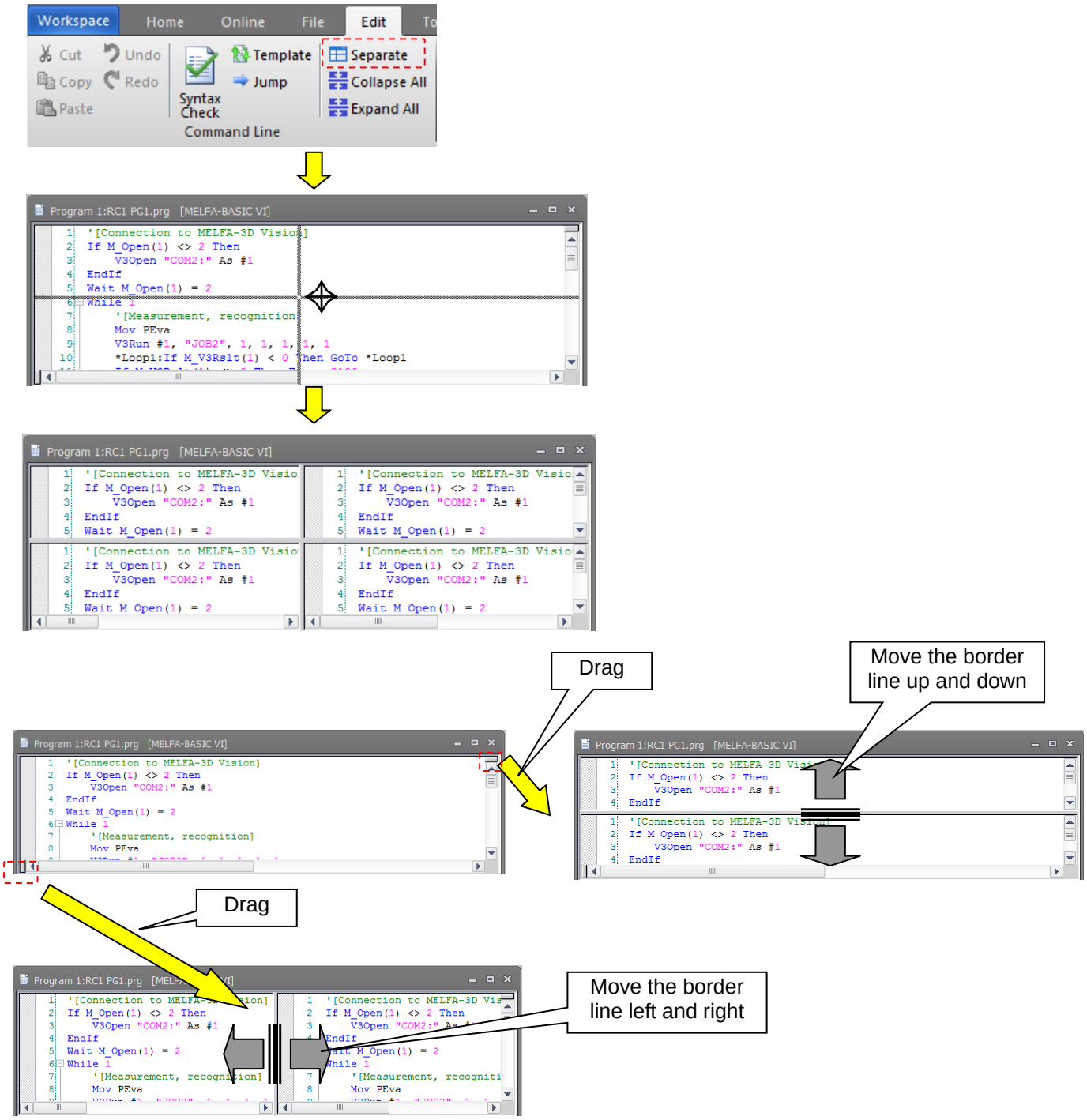


Figure 11-11 Customizing the Separation Position of the Command Editing Screen by the Border Line

You can customize the position editing screen itself and the display position of the XYZ data/joint data/work coordinate data of the position editing screen by dragging each of the "Position", "XYZ"/"Joint"/"Work coordinate" title and tabs in the position editing screen.

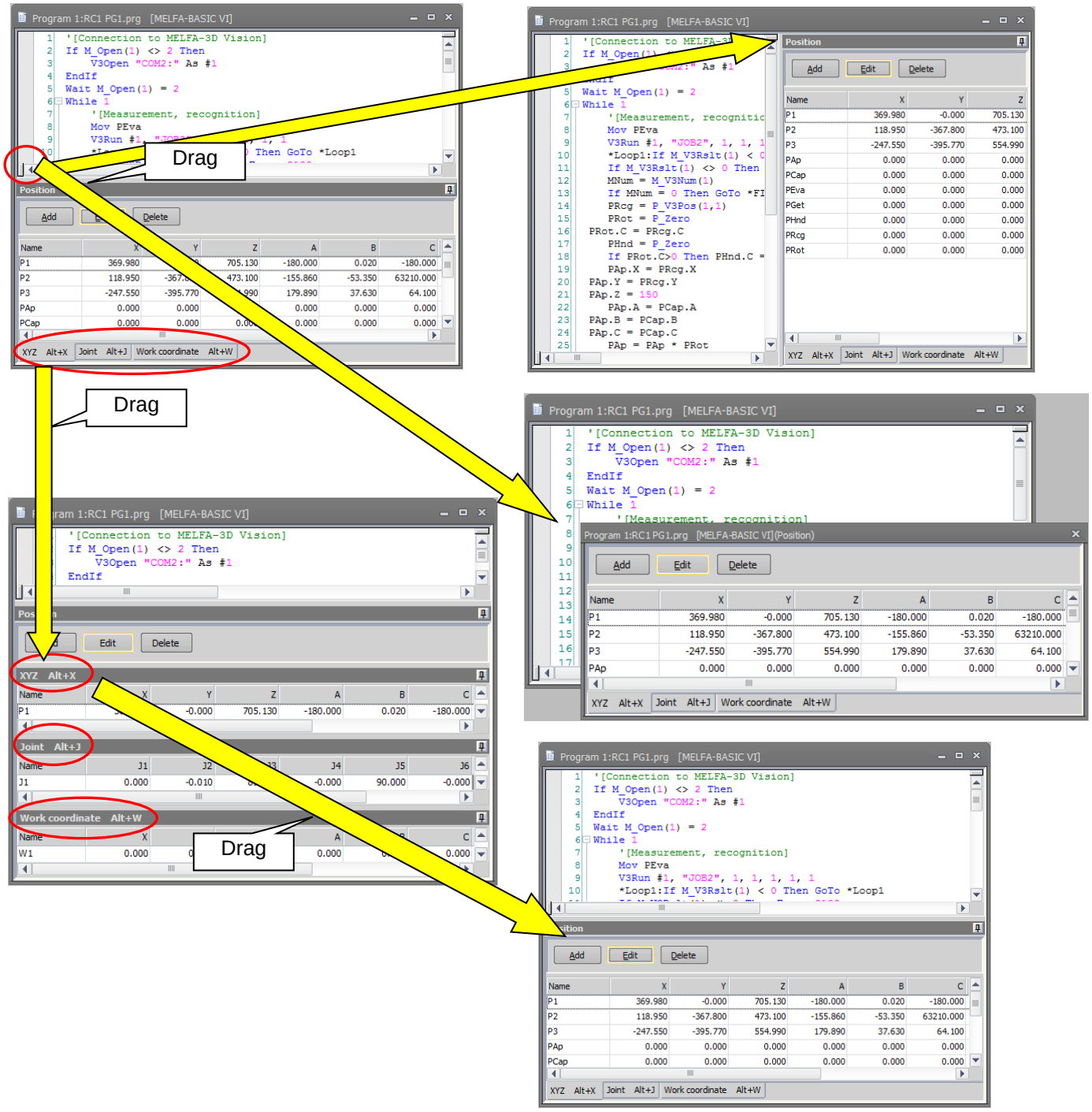


Figure 11-12 Customizing the Screen Separation Position by Title and Tabs

11.6. Customizing Other Than the Display Position

The program editing screen can be customized in various ways such as the syntax check before saving and color-coding of reserved terms in the robot program that is displayed in the command edit area.
With the program opened, click the [Tool] tab -> [Other] group -> [Option] button on the ribbon, and make the required setting in the Option screen that is displayed.
Clicking the [Reset default values] button returns settings to their default state.

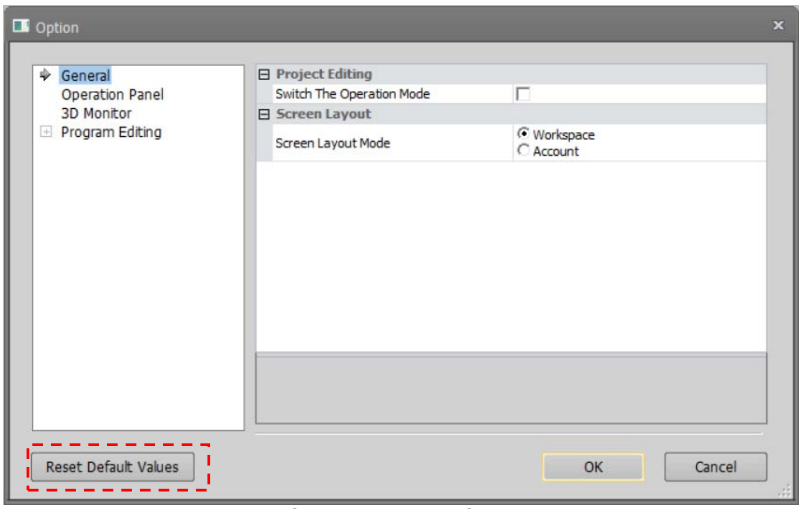


Figure 11-13 Option Screen

11.6.1. Displaying input candidates

Input candidates can be selected and input from a list when some of the commands, system functions and system status variables in the robot program have been input in the command edit area.

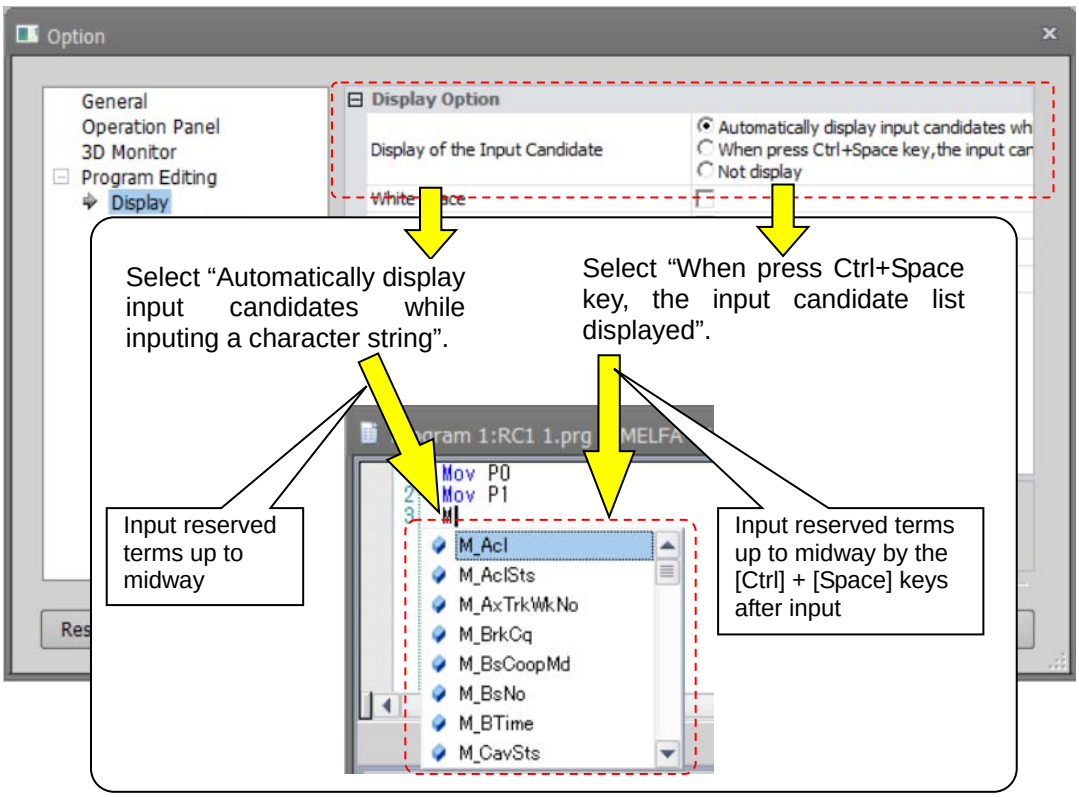


Figure 11-14 Setting Term Complementation

11.6.2. White space display

Space in the command edit area can be replaced with visible text and displayed.

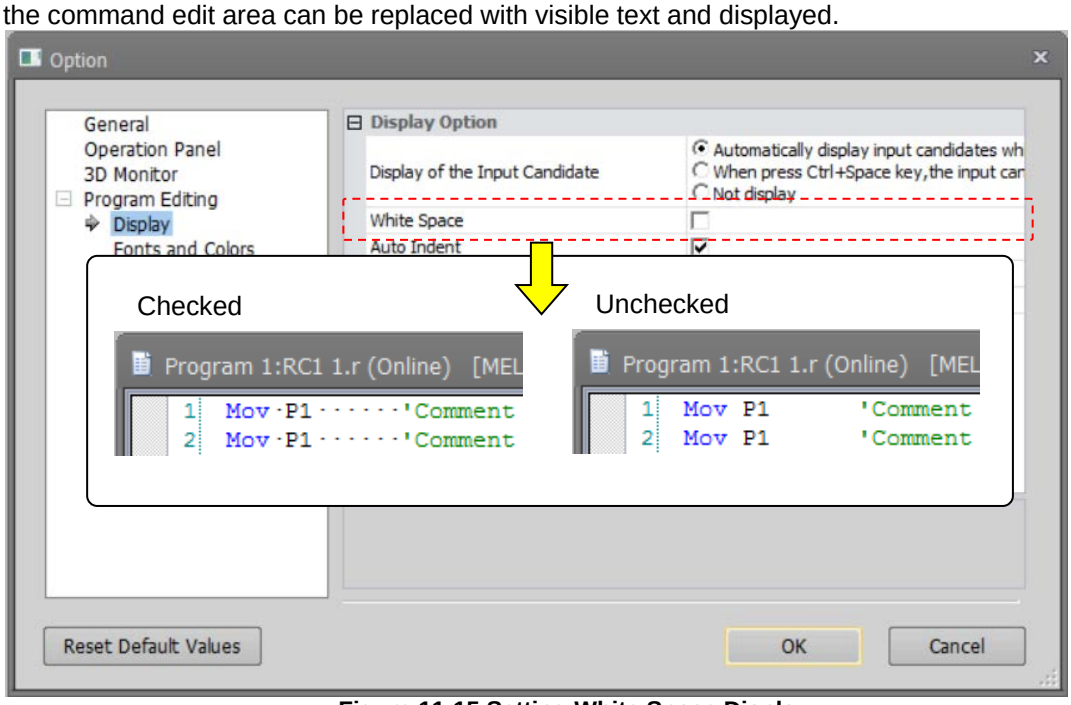


Figure 11-15 Setting White Space Display

11.6.3. Auto indent

The edit starting digit after the Enter key is pressed in the command edit area can be automatically aligned with the previous line.

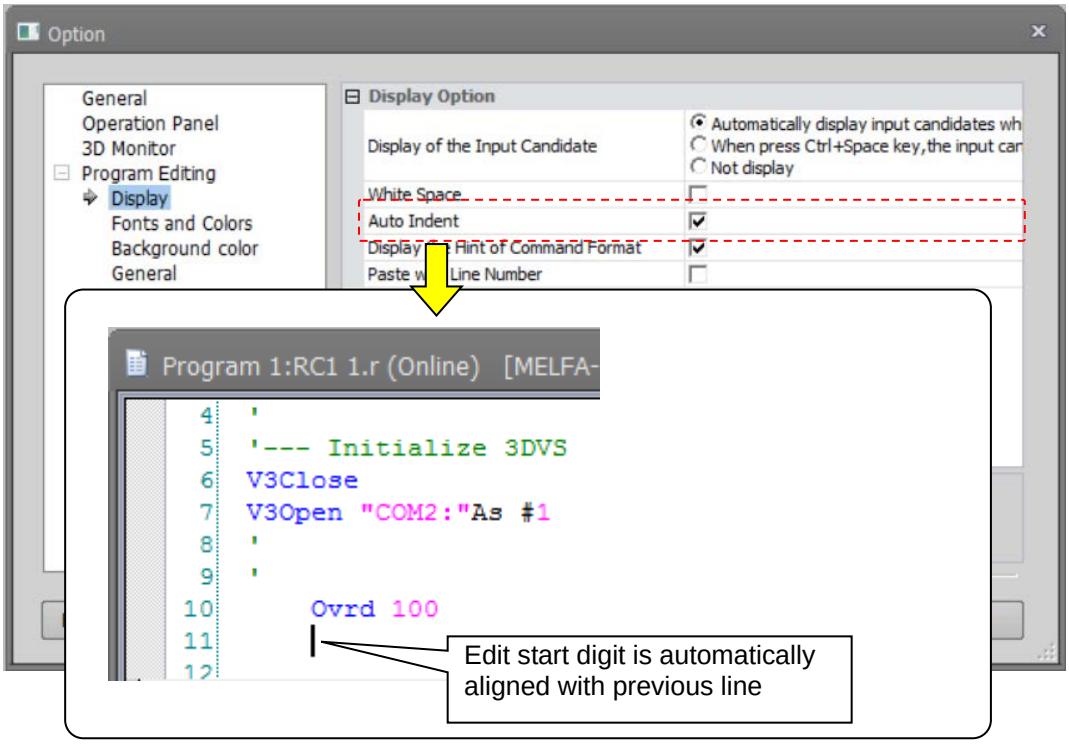


Figure 11-16 Setting Auto Indent

11.6.3.1. Auto indent with specific commands

Insert/align indent when there is a specific command line break in the command edit area. This function can be used only when "**11.6.3Auto indent**" is valid.

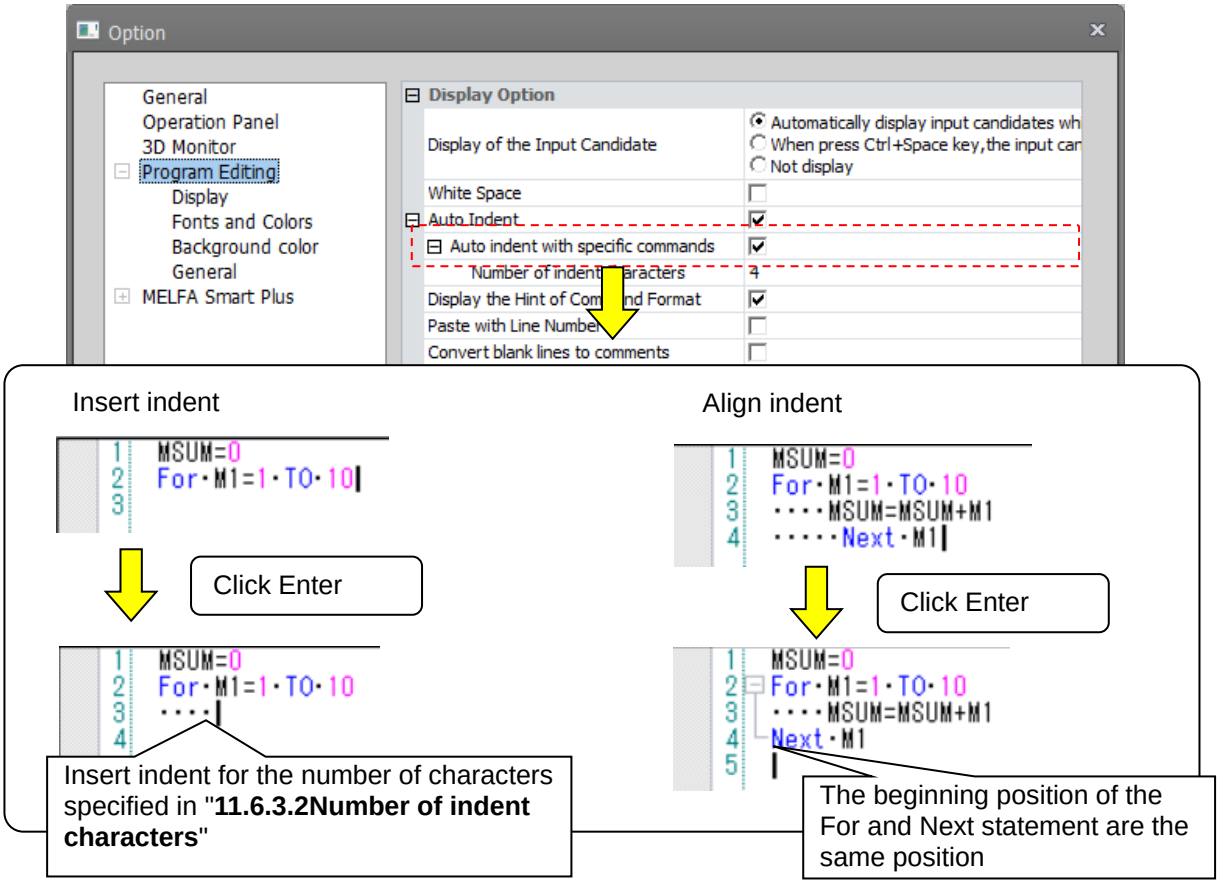


Figure 11-1 Auto indent with specific commands

The instructions for automatic indentation are as follows.

	Combination of corresponding instructions				
Indent of insert	If	For	Function	Select	While

Indent of align *1	ElseIf
	Else
	EndIf
		Next	FEnd	End Select	WEnd

*1The indentation is aligned with the start position of the commands.

11.6.3.2. Number of indent characters

You can set the number of characters when indenting is inserted in a specific command statement between 1 and 8 characters.

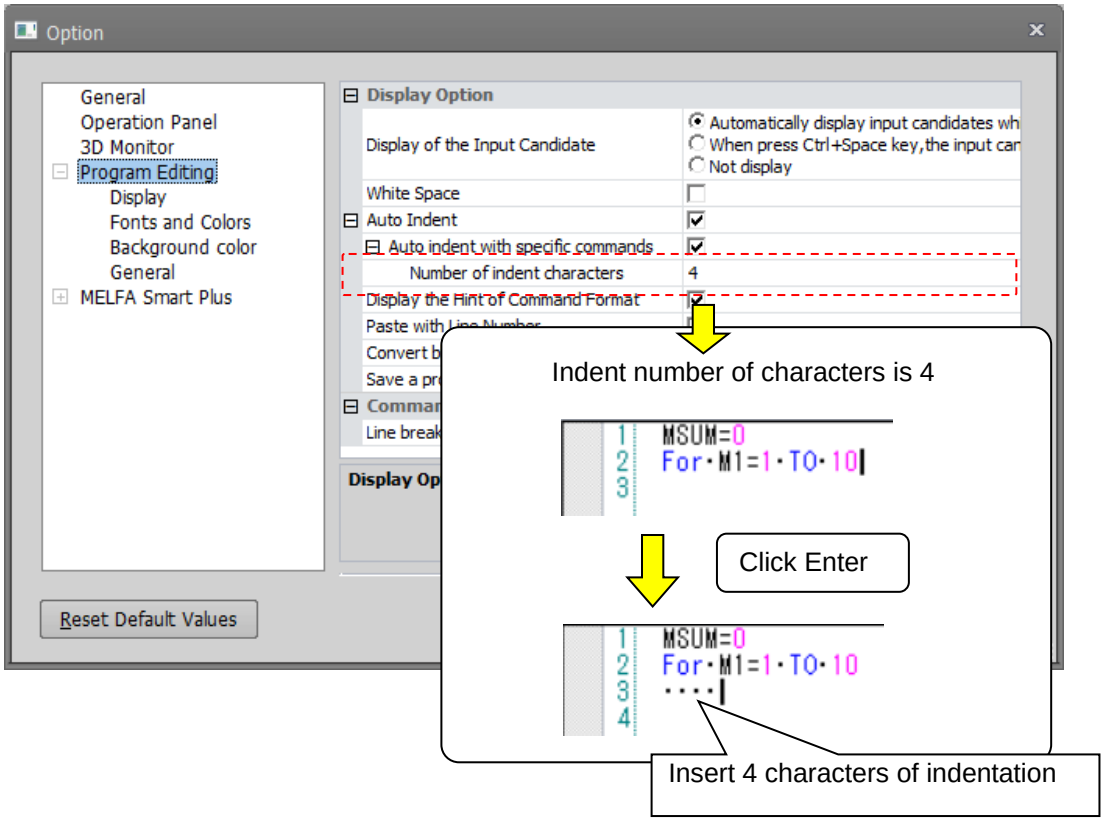


Figure 11-2 Number of indent characters

11.6.4. 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.

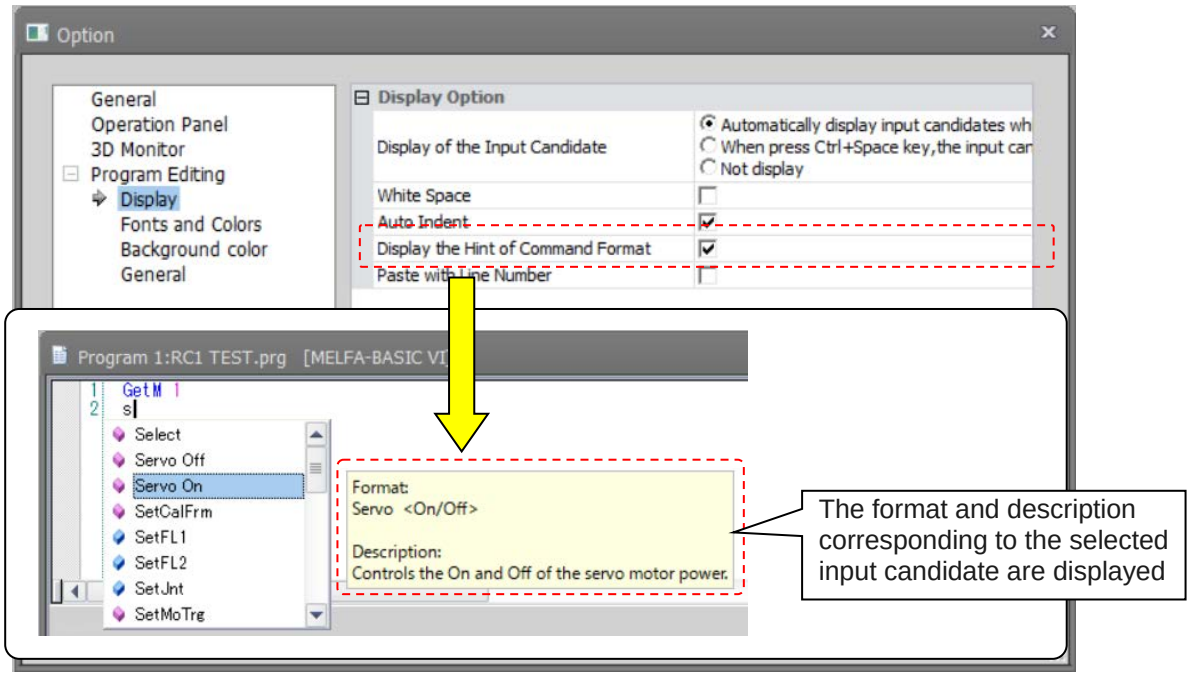


Figure 11-17 Command Edit Area Command Format Hint Display Settings

11.6.5. Pasting line numbers

To paste a copied robot program to a robot program created with MELFA-BASIC V or MELFA-BASIC VI, either delete or past the line number, or select [Page with line number]. This is handy when pasting and using programs created with MELFA-BASIC IV or examples of robot programs in Instruction Manuals.

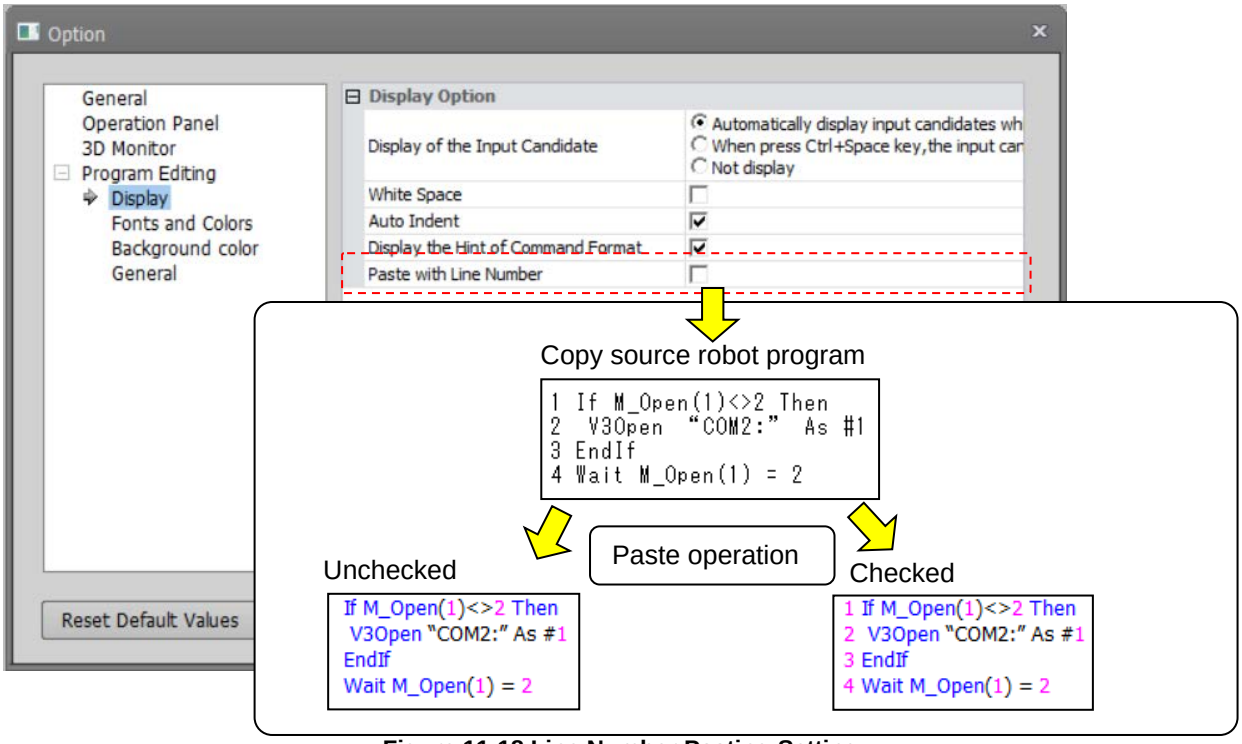


Figure 11-18 Line Number Pasting Setting

11.6.6. Convert blank lines to comments

Insert the comment (" ' ") for a blank line when saving the program or checking the syntax. Please use if you don't want to automatically delete blank lines .

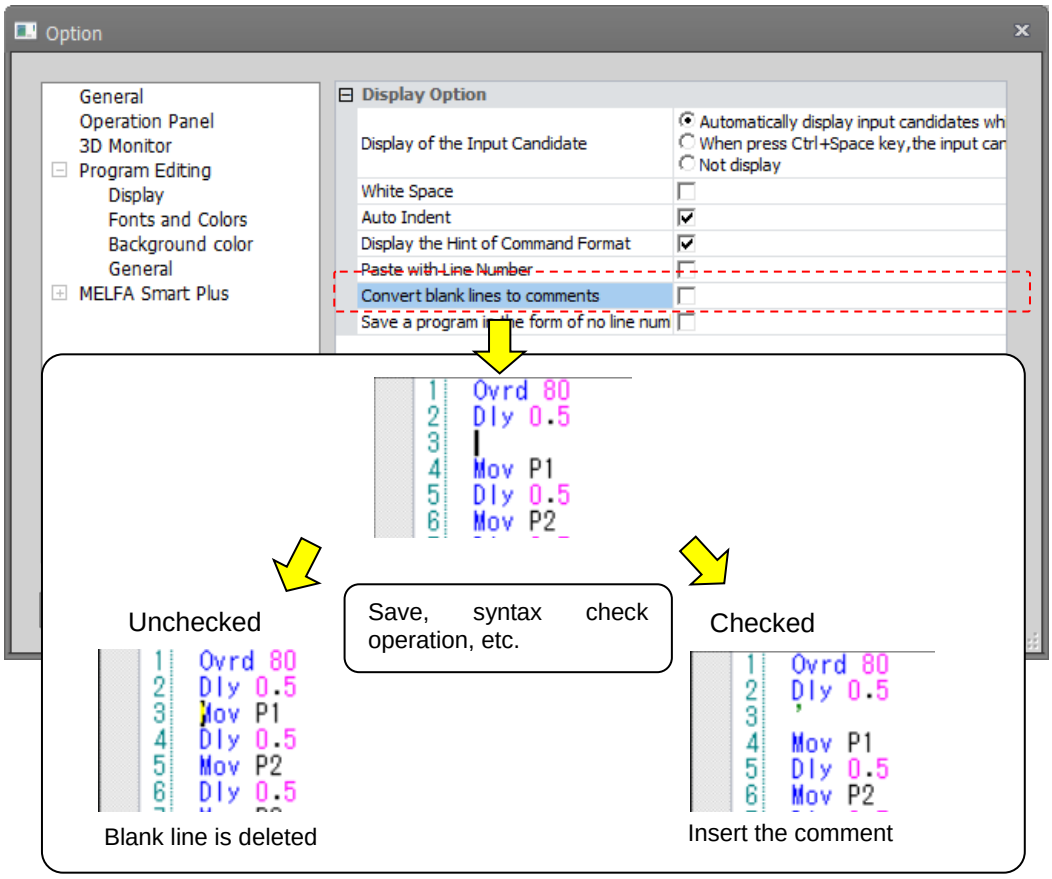


Figure 11-19 Convert blank lines to comments

11.6.7. Save a program in the form of no line number

Save the program in the format with no line number (MELFA-BASEC V / MELFA-BASEC VI only) when saving offline program etc.There is no display change on the program edit editor.

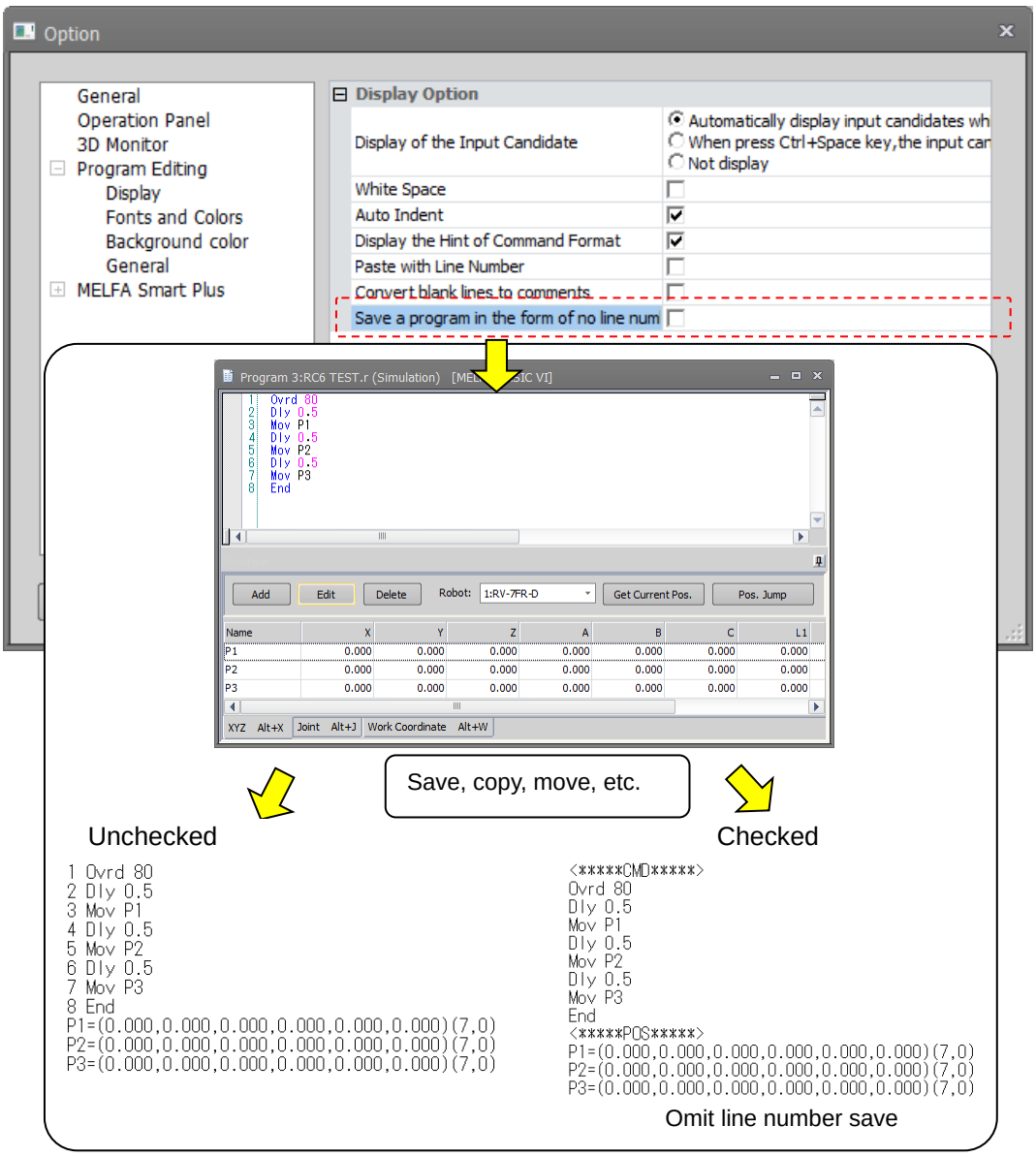


Figure 11-20 Save a progrma in the form of no line number

The saved document format is as follows

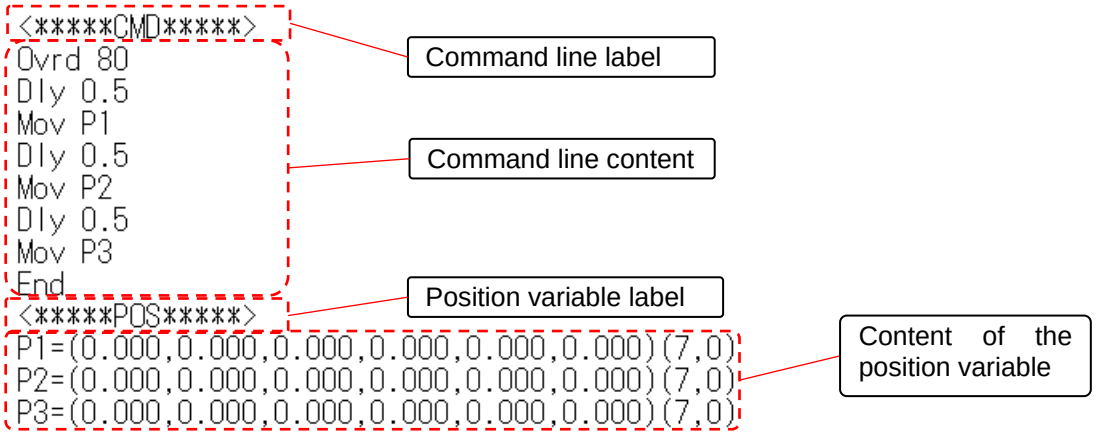


Figure 11-21 Save a progrma in the form of no line number

Points to note are as follows

1) It cannot be converted immediately after setting in the option, please save again.
2) Regardless of whether or not it is saved, all programs are converted to a format without line numbers when shifting from simulator to offline.

3) Only for MELFA-BASIC V / MELFA-BASIC VI. When a program saved without line numbers format is copied to a project other than the MELFA-BASIC V or MELFA-BASIC IV, the line number is automatically set.
4) Do not erase the tag indicating the command line / position variable. The program can not be read normally.

11.6.8. Line break after insertion

Wrap at the end of the command line when inserting the command template.

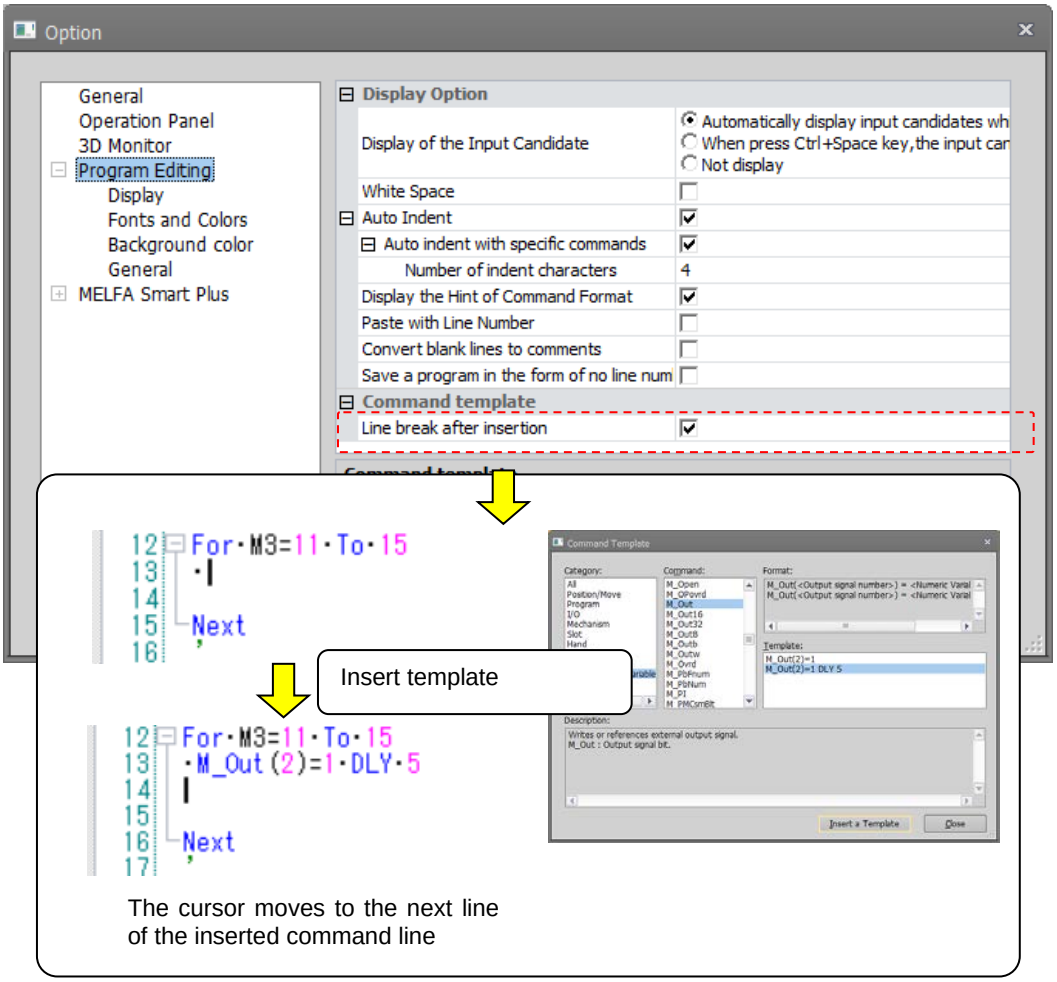


Figure 11-3 Wrap line when inserting the command template

11.6.9. Character colors

You can assign the colors for displaying robot program command, system functions, and system status variables displayed in the command edit area.
Click the item of the color you want to change on the option screen, the [...] button is displayed at the right end. When you click the […] button, the color setting screen is displayed. After setting the color, click the [OK] button.

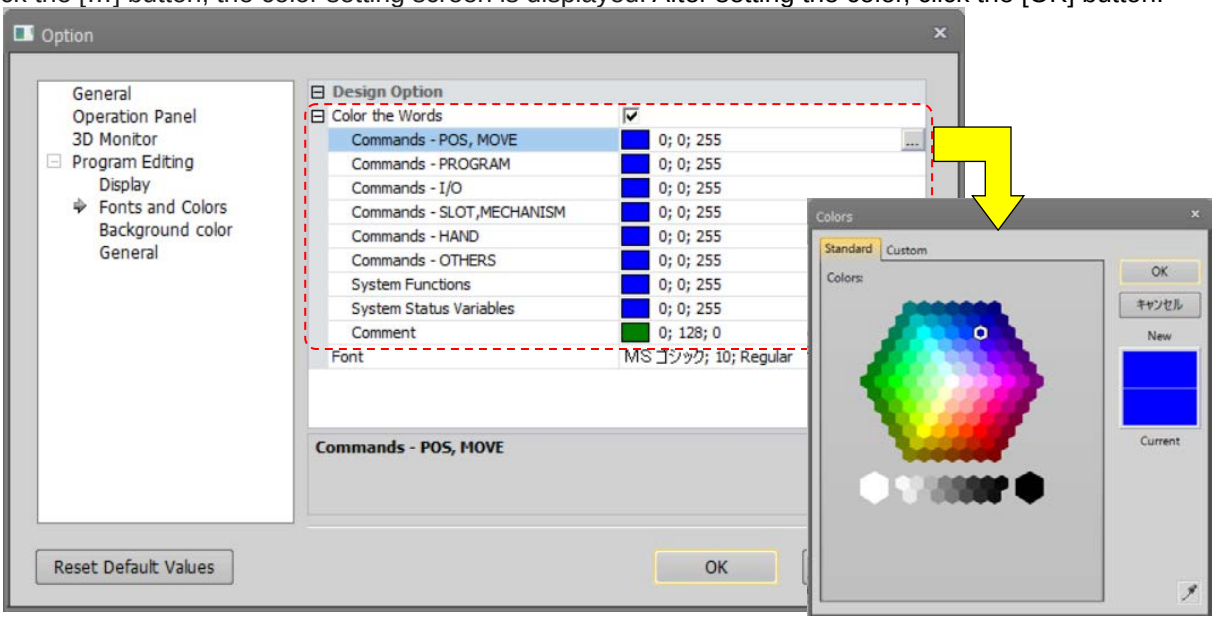


Figure 11-22 Command Edit Area Character Color Settings

11.6.10. Changing the font

You can change the font displayed in the command edit area.
Click the item of the font you want to change on the option screen, the [...] button is displayed at the right end. When you click the […] button, the font setting screen is displayed. After setting the font name, style, and size, click the [OK] button.

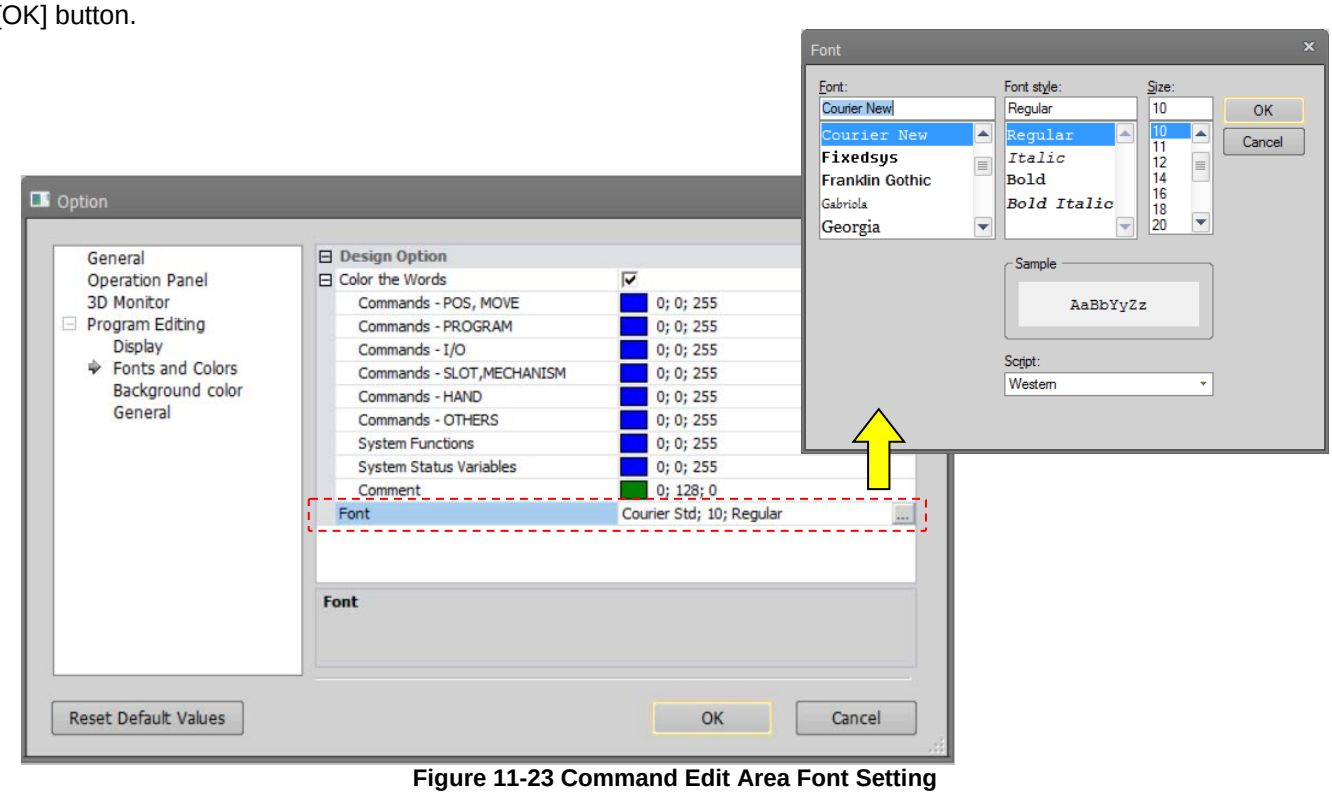


Figure 11-23 Command Edit Area Font Setting

11.6.11. Setting the background color of the program editor

It is possible to set the background color of the command area in the program editor.
For details on how to set the color, refer to **"11.6.9 Character colors"**.

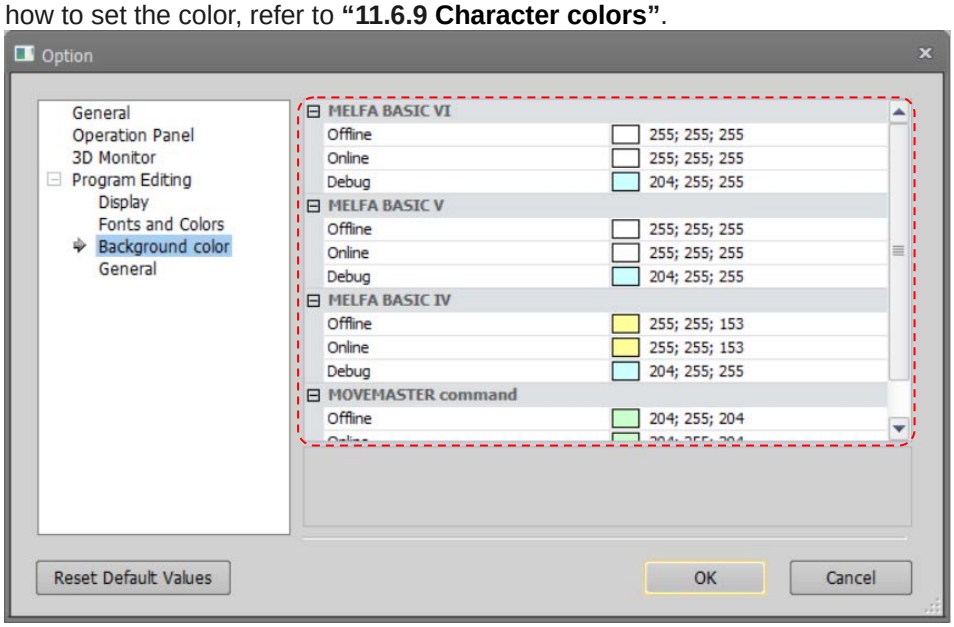


Figure 11-24Setting the background color of the program editor.

Caution

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

11.6.12. Setting the syntax check at program save

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.
The default setting is automatic syntax checks with no message displayed if there is no syntax error.

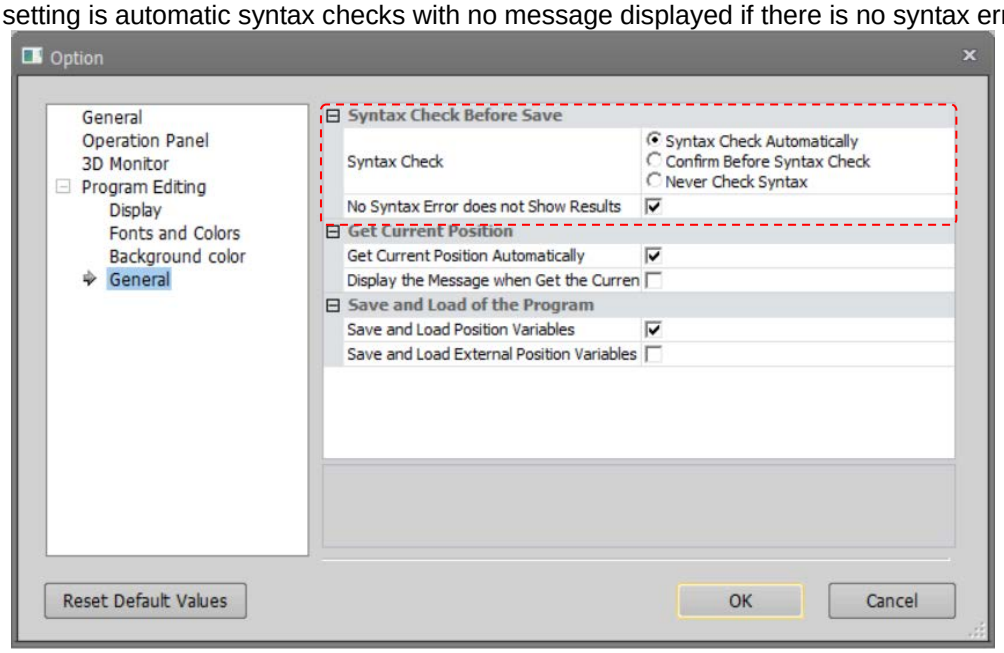


Figure 11-25 Settings for Syntax Check Before Saving

11.6.13. Get current position

When adding a position variable, the current position can be retrieved automatically if connected to the robot. At this time, a confirmation message will be displayed if "Display the Message when Get the Current Position" is checked.

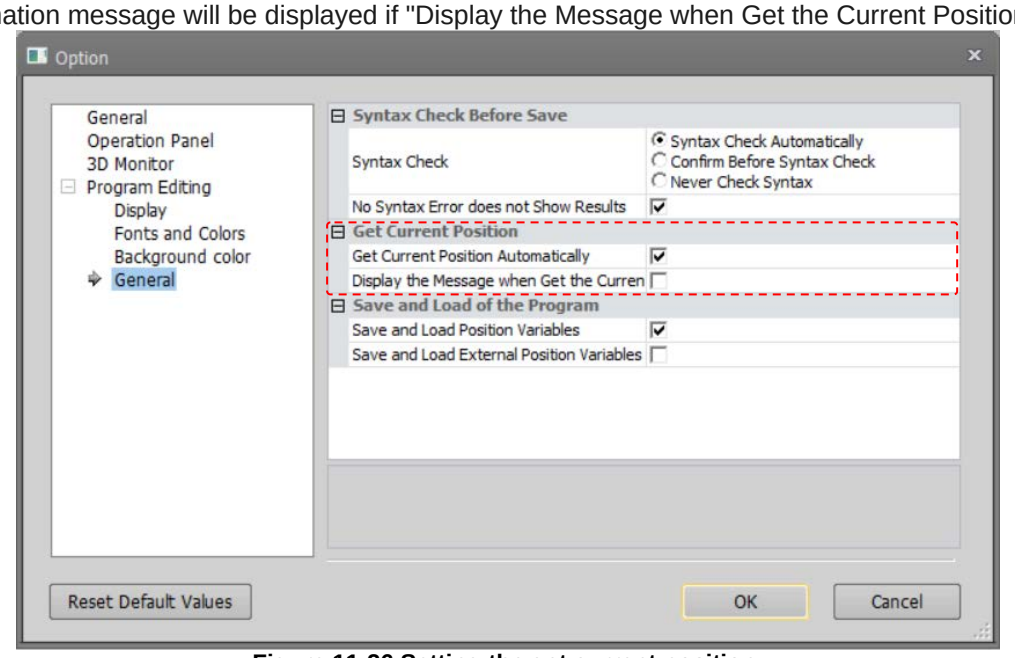


Figure 11-26 Setting the get current position.

11.6.14. Program Save and Read

You can start up the screen with "Position Variables" and "Program External Position Variables" checked in [Save item] when saving the program and [Read item] when reading.

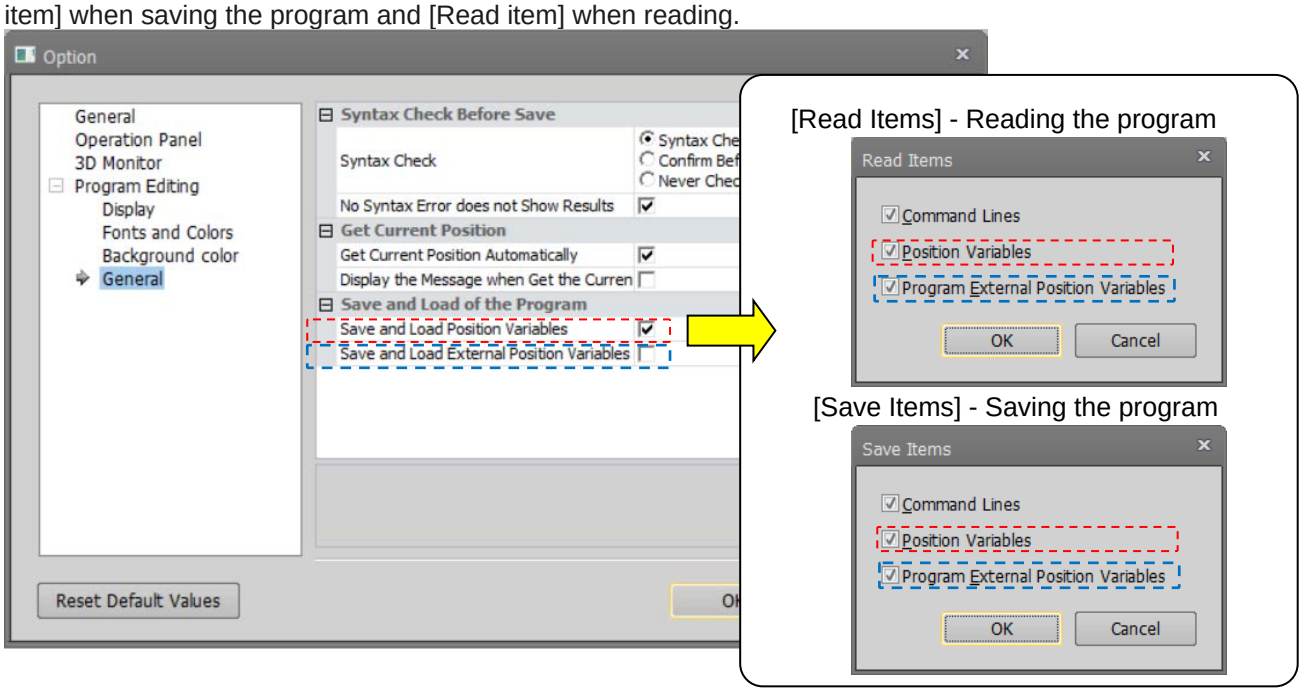


Figure 11-27 Initial setting of “Program external position variables” in the [Read Items] and the [Save Items].

11.7. Program Editing

This section explains how to edit programs created with MELFA-BASIC V or MELFA-BASIC VI.
For RT ToolBox3 command statement edits can be input in the same way as with a general editor like Notebook.

11.7.1. MELFA-BASIC V / MELFA-BASIC VI command statement editing

When using MELFA-BASIC V or MELFA-BASIC VI to create a program, the program does not have line Nos. as in MELFA-BASIC IV or Movemaster commands and instead this is indicated by a step No. at the left edge of the Program screen. These step numbers are automatically displayed with the keyboard [Enter] key.

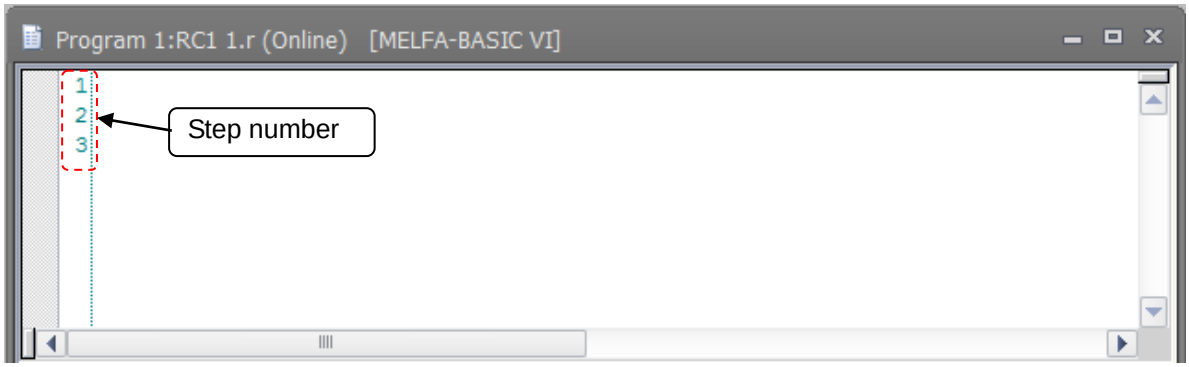


Figure 11-28 MELFA-BASIC V and MELFA-BASIC VI Command Editing Screen

Even if MELFA-BASIC V and MELFA-BASIC VI commands are entered using all lowercase characters, they are converted to the correct uppercase and lowercase characters when the program is written to the robot controller.

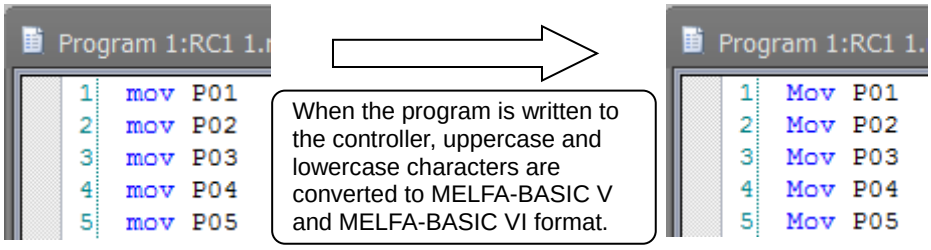


Figure 11-29 Character Input in MELFA-BASIC V and MELFA-BASIC VI

11.7.2. 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 / MELFA-BASIC VI are not displayed. Input the line number at the front of the command statement.

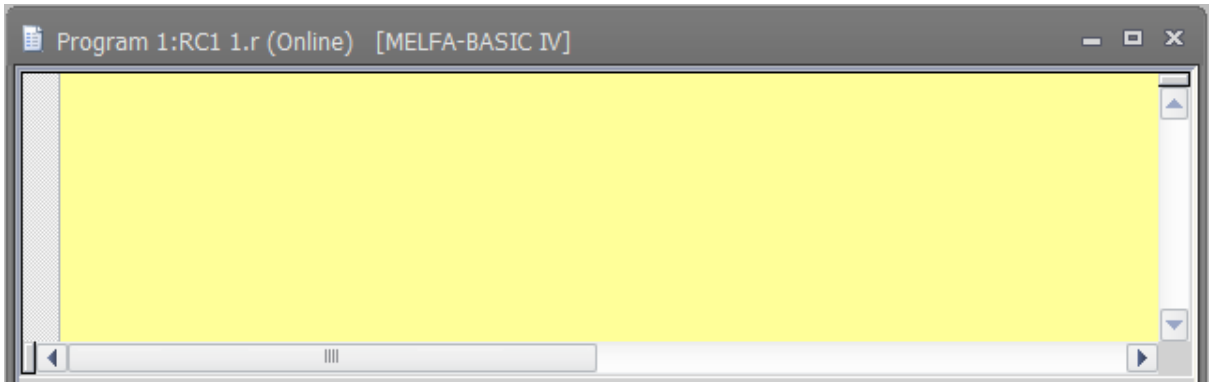


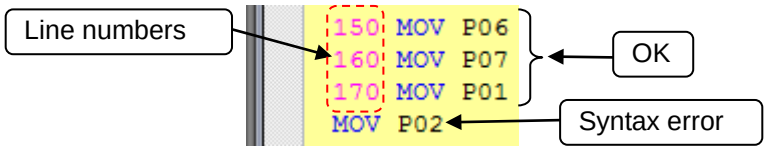
Figure 11-30 MELFA-BASIC IV Command Edit screen

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, a syntax error will result.



A function is provided for sorting lines in line number order even if lines are not entered in this order. For details, see **"11.7.4.18 Sort"**.

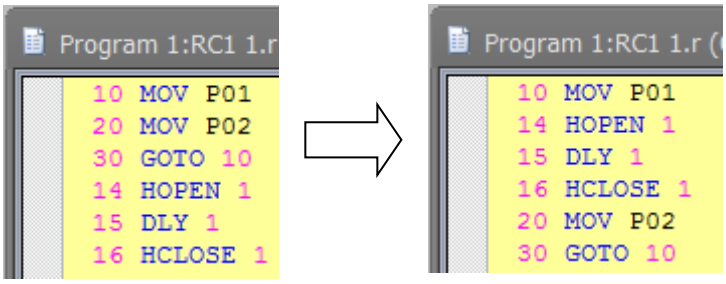


Figure 11-31 Sort

Even if the MELFA-BASIC IV, and Movemaster Command commands are all input in lower case, these shall be correctly converted to upper case in the robot controller when written to the robot controller.

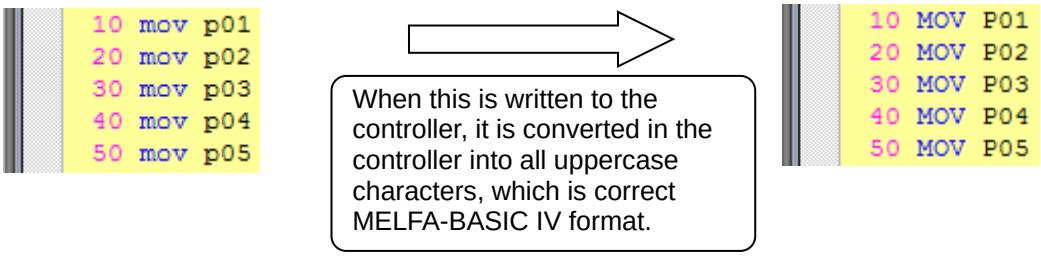


Figure 11-32 MELFA-BASIC IV Character Input

11.7.3. Position variable editing

Position variables are edited on the position edit screen. Clicking the "XYZ" tab switches to the list of XYZ coordinate type variables, and clicking the "Joint" tab switches to the list of joint coordinate type variables and clicking the "Work coordinate" tab switches to the list of work coordinate type variables.

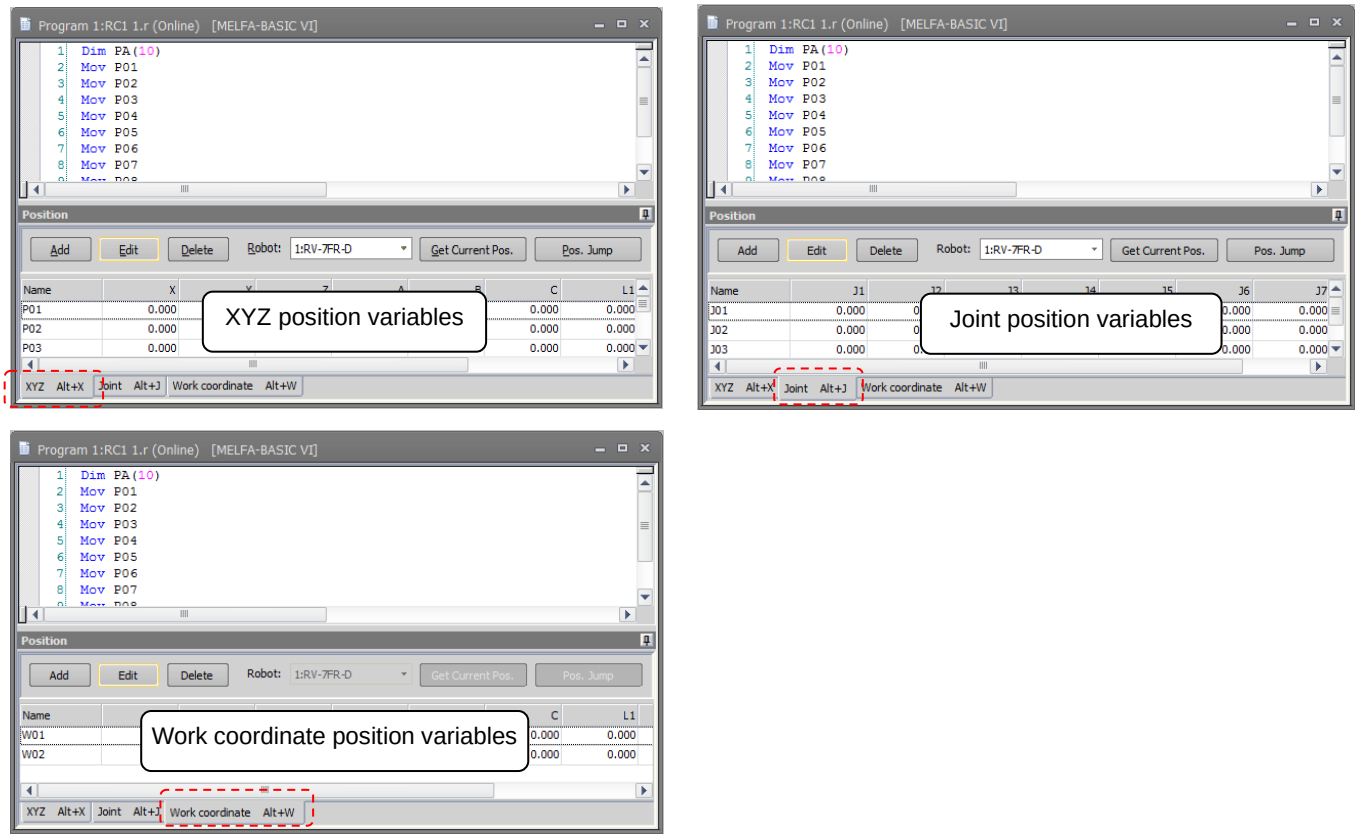


Figure 11-33 Position Variable Edit Screen

Array variables are displayed developed in their own lists.

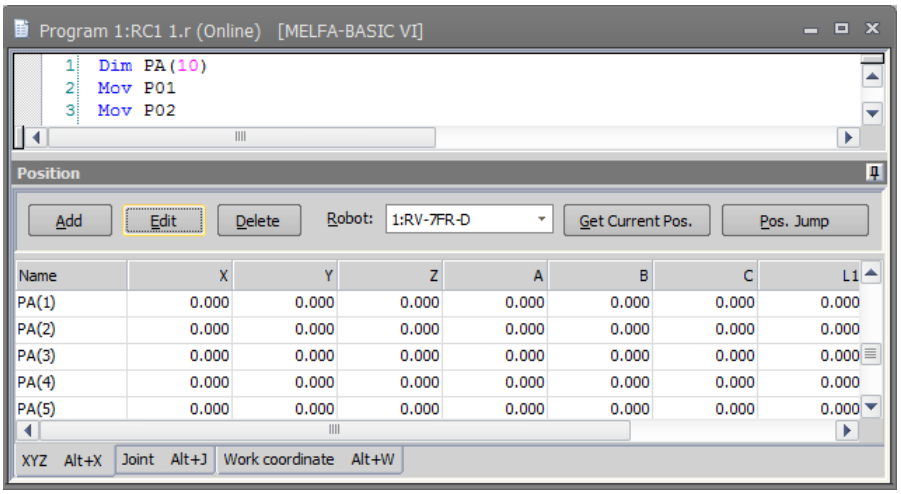


Figure 11-34 Array Variable Display

Kinds of position variable that can be used differ depending on the robot program language. The kinds that can be used in each robot program language are as follows.

11-3 Kinds of position variable that can be used in each robot program language

Robot program language	Kinds of variable that can be used		
	Position type variable	Joint type variable	Work coordinate type variable
MELFA-BASIC VI	○	○	○
MELFA-BASIC V	○	○	×
MELFA-BASIC IV	○	○	×
Movemaster command	○	×	×

⚠ Caution

About uppercase characters and lowercase characters in position variable names

In MELFA-BASIC V and MELFA-BASIC VI, lowercase characters can be used for 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.

11.7.3.1. Adding/changing position variables

To add a position variable, select one of the list of XYZ/joint/work coordinate type variables, and click the [Add] button on the program edit screen or click the [Add] button in the [Edit] tab -> [Position Variable] group from the ribbon. A new line is added to the end of the currently selected list and the screen is ready for input of the variable name.(*1)
At this time, if "Get Current Position Automatically" in the option screen is checked and there is a connection to the robot, the current position of the robot is displayed.
If you add a position variable that has already been selected, the selected position variable is copied and displayed.
When the variable name is entered, addition of the position variable is fixed.

Figure 11-35 Add Position Variable

There are two ways of changing the position variable.
[Method (1)] Directly change the list
Select the cell you want to change on the list, and enter the value directly.

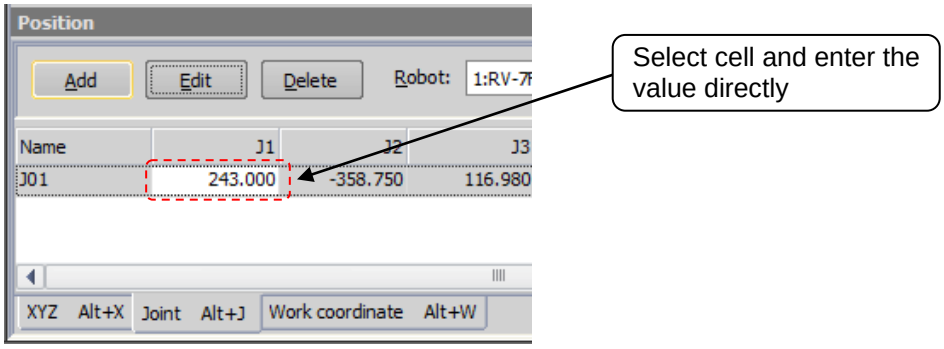


Figure 11-36 Changing the Position Variable by Directly Editing the List

[Method (2)] Change in the Edit Position data screen
Select the target position variable to be changed from the list and click the [Edit] button on the program edit screen or click the [Edit] button in the [Edit] tab-[Position Variable] group from the ribbon. The selected position variable is displayed in the Edit Position data screen. Enter each of the element values of the position variable and the position variable name, and click the [OK] button.

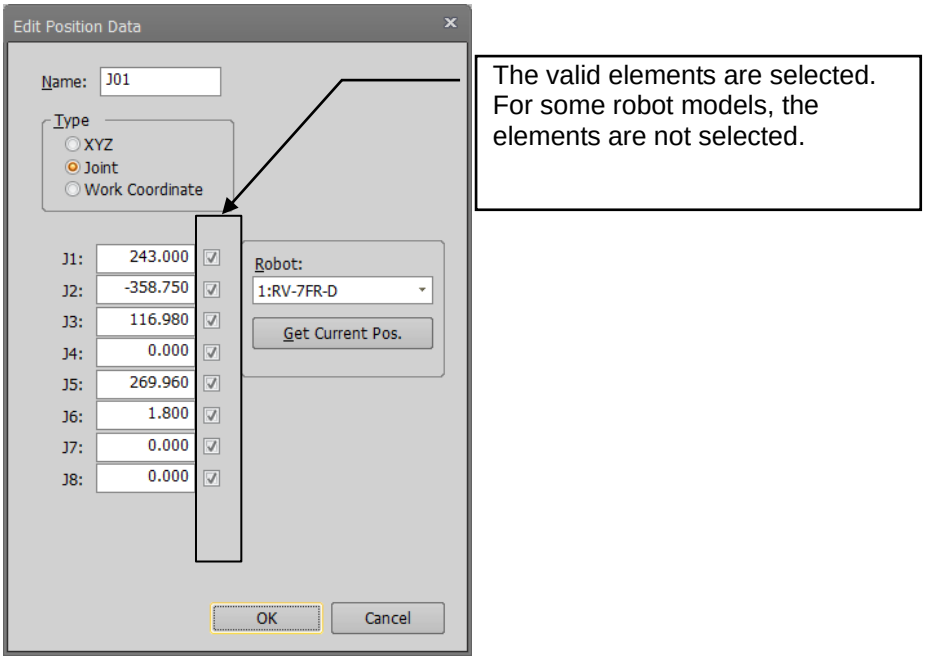


Figure 11-37 Changing the Position Variable in the Edit Position Data Screen

Although the variable name can be changed by either of these methods, it cannot be changed in the case of an SQ Direct File or when a program is opened for debugging.
When the program is being edited in the online or simulation mode, the current position of the robot can be read by the [Get current pos.] button. However, this function cannot be used for the work coordinate variable.
A confirmation message will be displayed if the "Display the Message when Get the Current Position" on the option screen is checked.

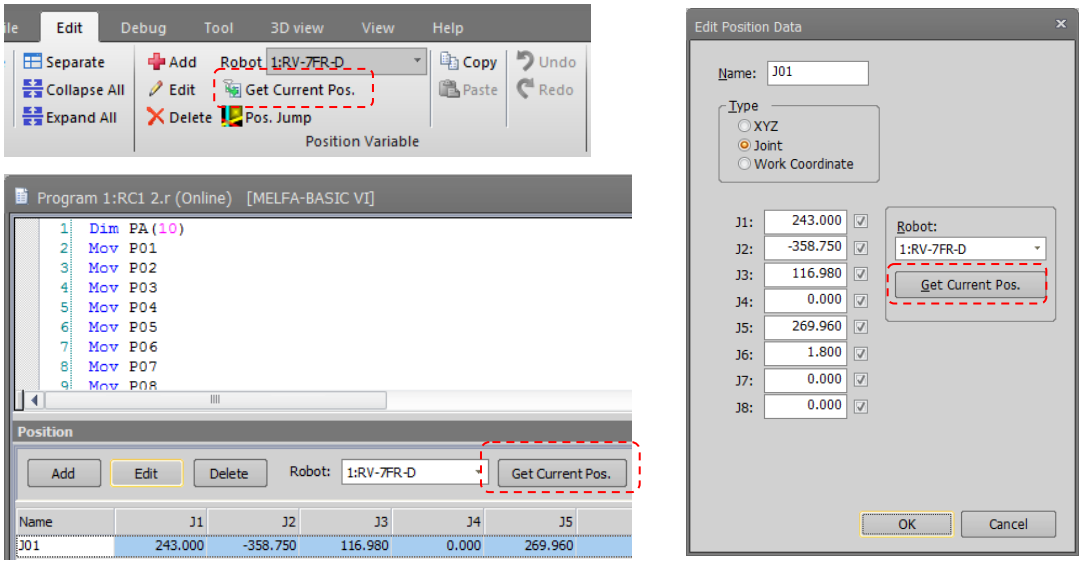


Figure 11-38 Getting the Current Position

Caution

To add a position array variable, specify the array name and element number in the variable name. Also, when writing to a robot, be sure to write the Dim declaration in the statement. If there is no Dim declaration, an error will occur in writing to the robot controller.

Caution

The unit of the element to be used differs for each robot used. Please refer to the operation manual of individual robot.

Caution

If you acquire the current position from a robot of a different model, you will get different position data from the assumed position, so be careful.

11.7.3.2. Deleting position variables

Select the target position variable and then click the [Delete] button on the program edit screen or click the [Delete] button in the [Edit] tab-[Position Variable] group from the ribbon. 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. However, it is not possible to delete two or more types of position variables, joint variables and work coordinate 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 at 0 for all their components.

11.7.4. Edit assist functions

This explains the edit assist functions, which help in command editing.
Auxiliary editing functions such as copy, cut, find, replace, and jump are used from the [Edit] and [Tool] tabs on the ribbon.

11.7.4.1. Copy

Copies a character string in the command being edited. You can also copy multiple lines.
Select the character string to copy, and then click the [Edit] tab -> [Command line] group -> [Copy] button on the ribbon.
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 **"11.7.4.4 Copying position variables"**.

11.7.4.2. Cut

Cuts a character string from the command being edited. You can also cut multiple lines.
Select the character string to cut, and then click the [Edit] tab -> [Command line] group -> [Cut] button on the ribbon.
You can use the paste function, explained below, to paste this cut character string to another location in the program.

11.7.4.3. Paste

Pastes the copied or cut character string to the specified location.
Place the cursor at the position to paste the character string, and then click the [Edit] tab -> [Command line] group -> [Paste] button on the ribbon. The copied or cut character string is inserted at the specified location.
For details on position data pasting, see **"11.7.4.5 Pasting Position Variables"**.

11.7.4.4. Copying position variables

Copies the position variable. You can also copy multiple position variables.
Select the position variable to copy, and then click the [Edit] tab -> [Position variable] group -> [Copy] button on the ribbon.

11.7.4.5. Pasting Position Variables

Pastes the copied position variable.
Activate the program to paste the position variable to, and click the [Edit] tab -> [Position variable] group -> [Paste] button on the ribbon.
The copied position variable is inserted in the designated program.
At this time, if there is already position data with the same name in that program, a confirmation message is displayed.

Figure 11-39 Paste Position Data Confirmation Message

11.7.4.6. Find

This searches for the specified character string.
Click the [Edit] tab -> [Find/Replace] group -> [Find] button on the ribbon. The find screen is displayed.

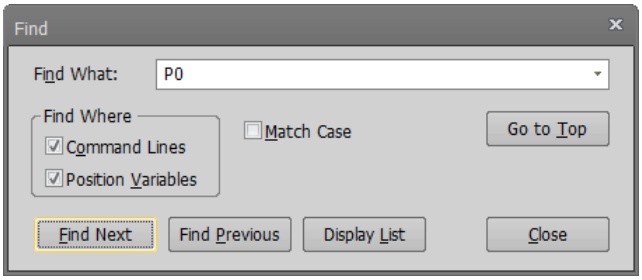


Figure 11-40 Find Screen

Input the character string to find, and then click [Find Next] or [Find Previous]. The character string search starts.
Clicking [Display List] searches for all designated character strings in the program and displays them as a list in the Find window.

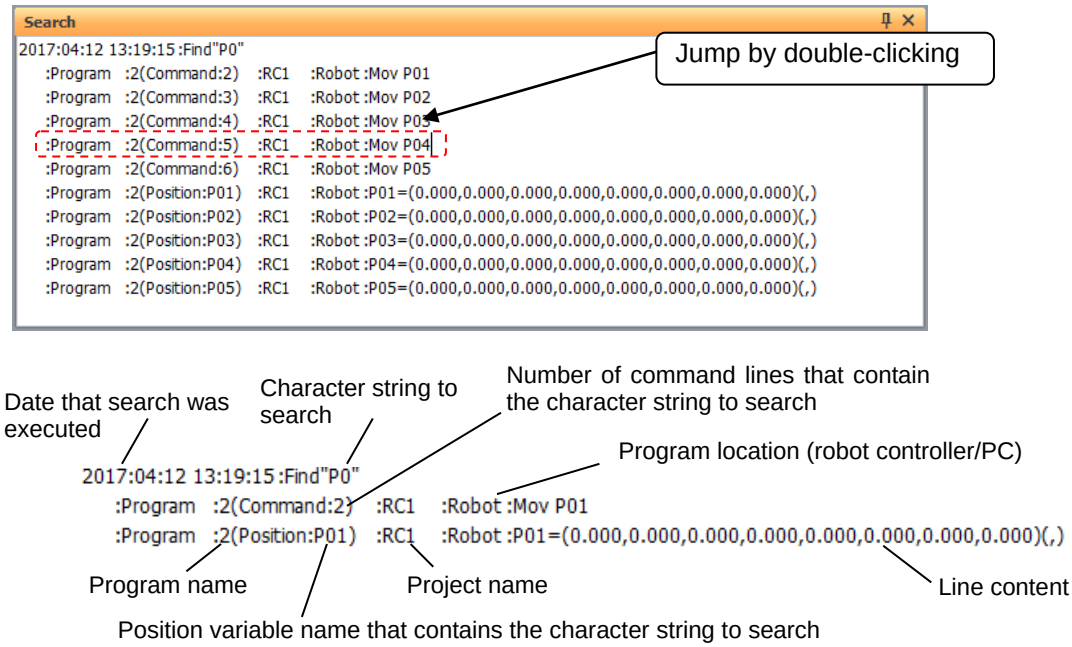


Figure 11-41 Find Results List Display

You can jump to a line containing the selected content by double-clicking the content from the list display in the Find window.

11.7.4.7. Find in Files

This searches for the specified character string in the "Online" or "Offline" program files registered in the current project.
Click the [Edit] tab -> [Find/Replace] group -> [Find in Files] button on the ribbon. The find in files screen is displayed.

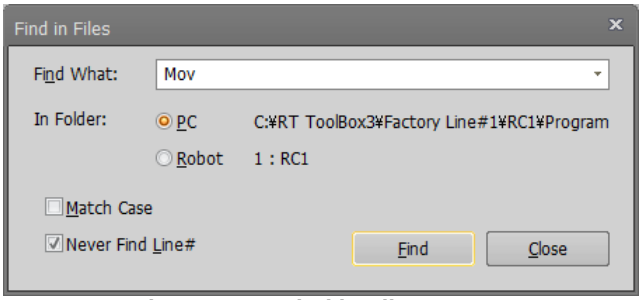


Figure 11-42 Find in Files Screen

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.

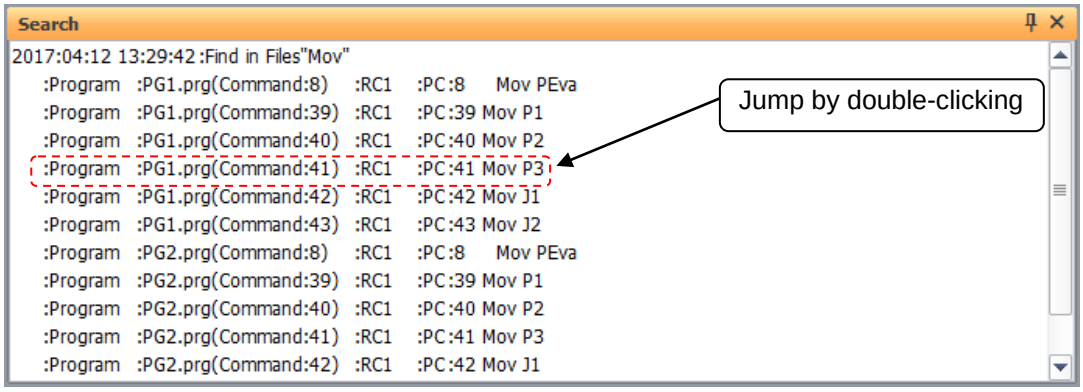


Figure 11-43 Results of Search from File

You can open a program containing the selected content and jump to the corresponding line by double-clicking the content from the list display in the Find window.

11.7.4.8. Replace

This replaces the specified character string with another character string.
Click the [Edit] tab -> [Find/Replace] group -> [Replace] button on the ribbon. The Replace Screen is displayed.

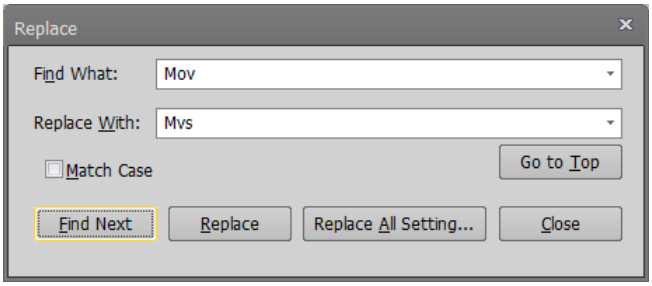


Figure 11-44 Replace Screen

[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.

In 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.

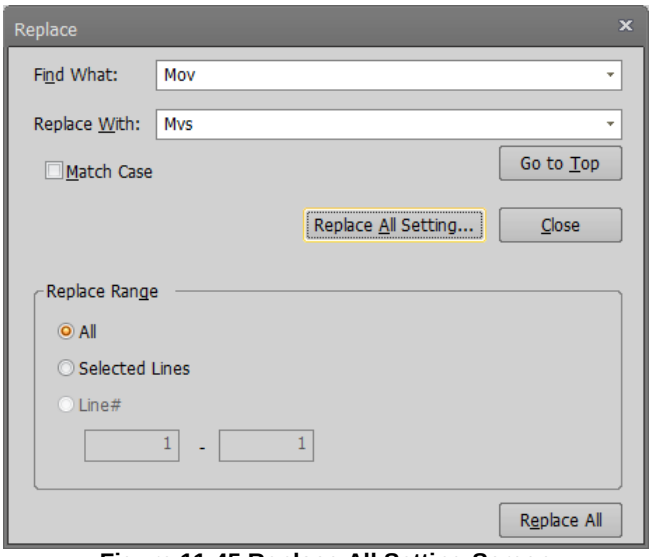


Figure 11-45 Replace All Setting Screen

11.7.4.9. Jump to specified line

Jumps to a specified step number or label.
Click the [Edit] tab -> [Command line] group -> [Jump] button on the ribbon. The jump screen is displayed.

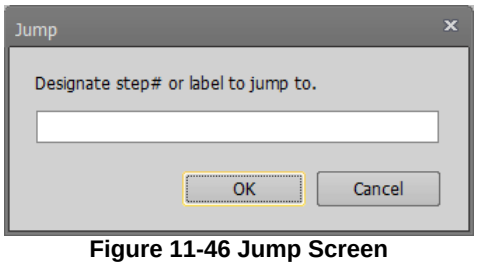


Figure 11-46 Jump Screen

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

11.7.4.10. Jump to label / procedure definition line

If you left-click while holding down the [Ctrl] key for the label name or the procedure name of the instruction editing area, jump to the corresponding definition line.
The robot program language corresponding to this function is as follows.

Table 11-4 Job correspondence table for robot program language

Program Language	Label	procedure
MELFA-BASIC VI	○	○
MELFA-BASIC V	○	×
MELFA-BASIC IV	○	×
Movemaster commands	×	×

○: Enable ×: Disable

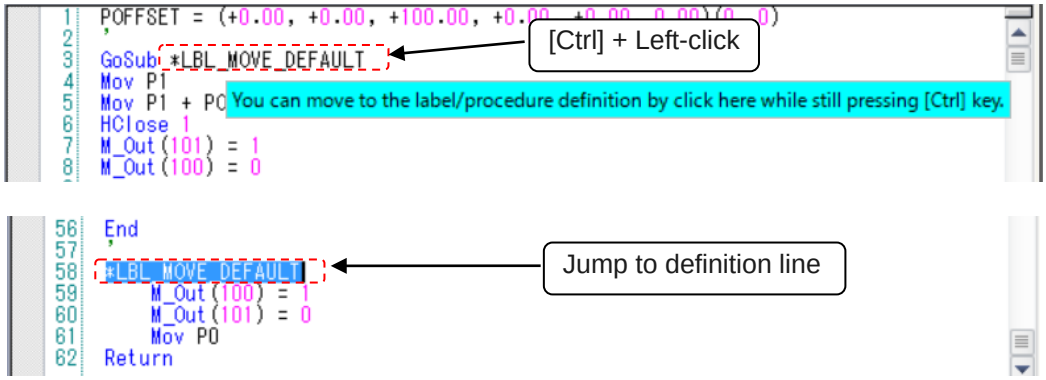


Figure 11-47 Jump screen to label definition line

11.7.4.11. Partial writing

Writes the selected program lines to the robot controller.
This is handy for reflecting the contents of a partially revised program in the robot controller. But be careful, only the selected part of the program is written.
Select the line to write to the robot controller, and click the [Edit] tab -> [Transmission] group -> [Partially] button on the ribbon.
Check the contents to be written, and then click [Yes].

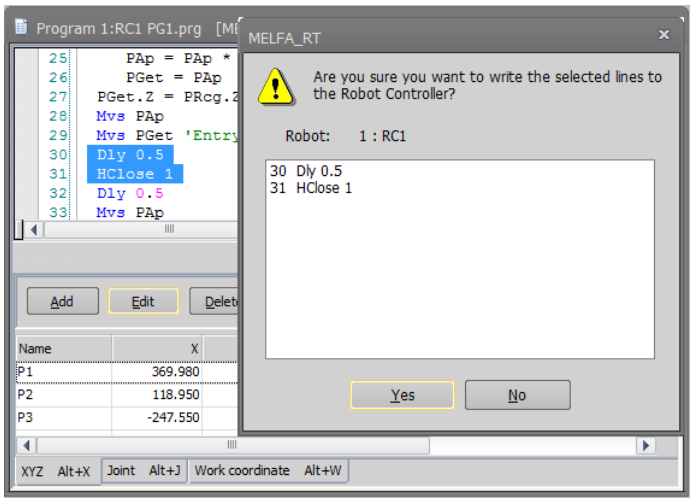


Figure 11-48 Partial Writing

11.7.4.12. Transfer all lines of the program

Write the all lines of the program to the robot controller.
With the program opened, click the [Edit] tab -> [Transmission] group -> [All] button on the ribbon. After displaying the confirmation message, and then click “Yes”.

11.7.4.13. Syntax check

You can check whether or not an edited robot program is syntactically correct. Execute this before writing a program to the robot controller.
Click the [Edit] tab -> [Command line] group -> [Syntax check] button on the ribbon. If there is a syntax error, the error location and details are displayed.

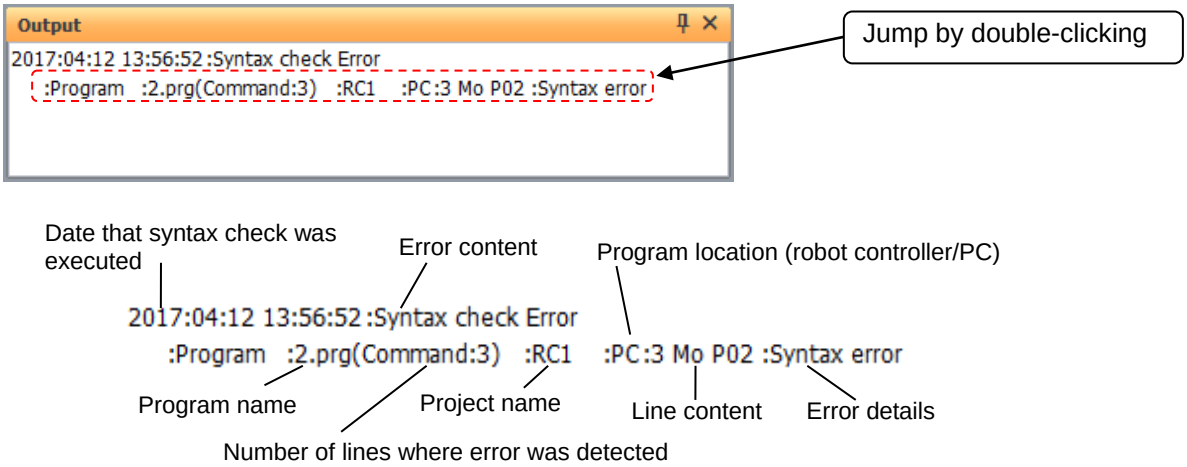


Figure 11-49 Syntax Check Results Screen

You can jump to the command statement containing an error by double-clicking the detected error.

11.7.4.14. Command template

You can display a list of the commands and make insertions on the program command edit screen.
Click the [Edit] tab -> [Command line] group -> [Template] button on the ribbon.

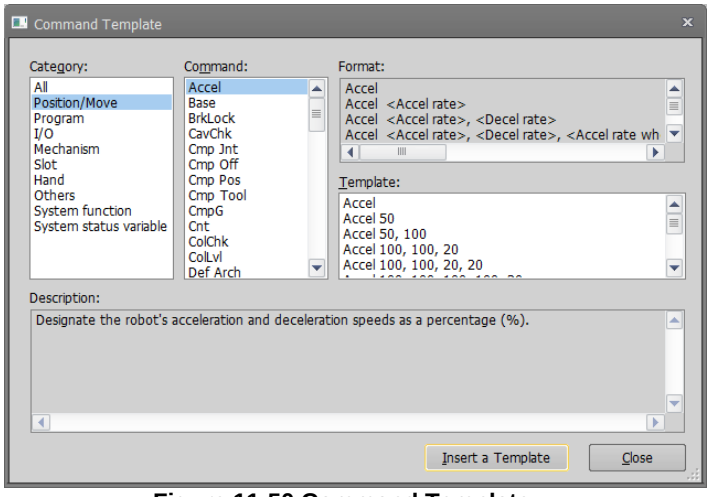


Figure 11-50 Command Template

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.

11.7.4.15. Program template

You can create a program template containing comments or commands and insert them into the program being edited.

11.7.4.15.1 Create a program template

When creating a program template, click the [File] tab on the ribbon -> [Insert/Edit] in the [Program Template] group to start the program template editing screen.

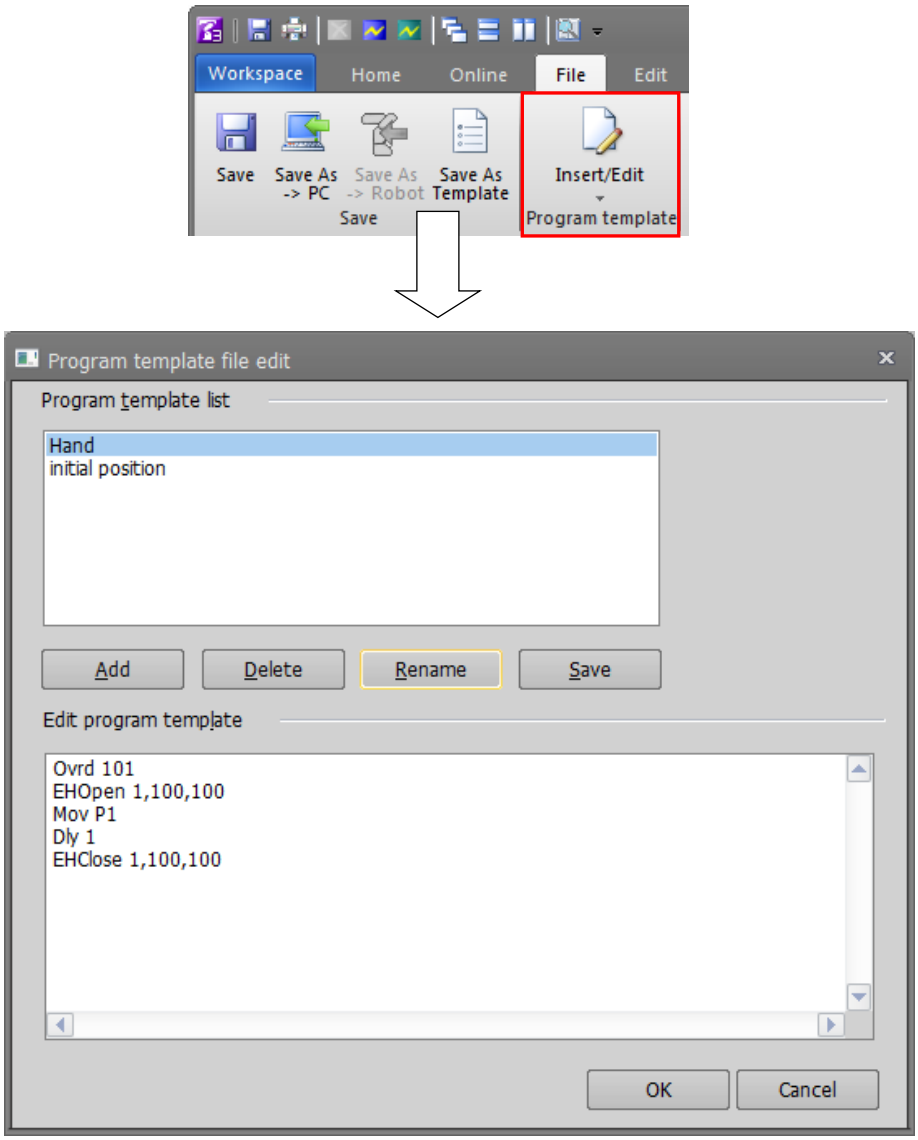


Figure 11-4 Program template file edit

Click the [Add] button and enter the template name. The created program template will be displayed in the template list.

When appending the comment or the command to the program template, edit it in the state where the template is selected in the program template list.

When the program being edited is saved as a template, please refer to "**11.9.4Save as template**".

11.7.4.15.2 Insert program template

You can insert the program template into the program being edited.
The template can be inserted into the program by clicking the template name from the [File] tab of ribbon-> [Insert/Edit] drop-down menu of the [Program Template] group.

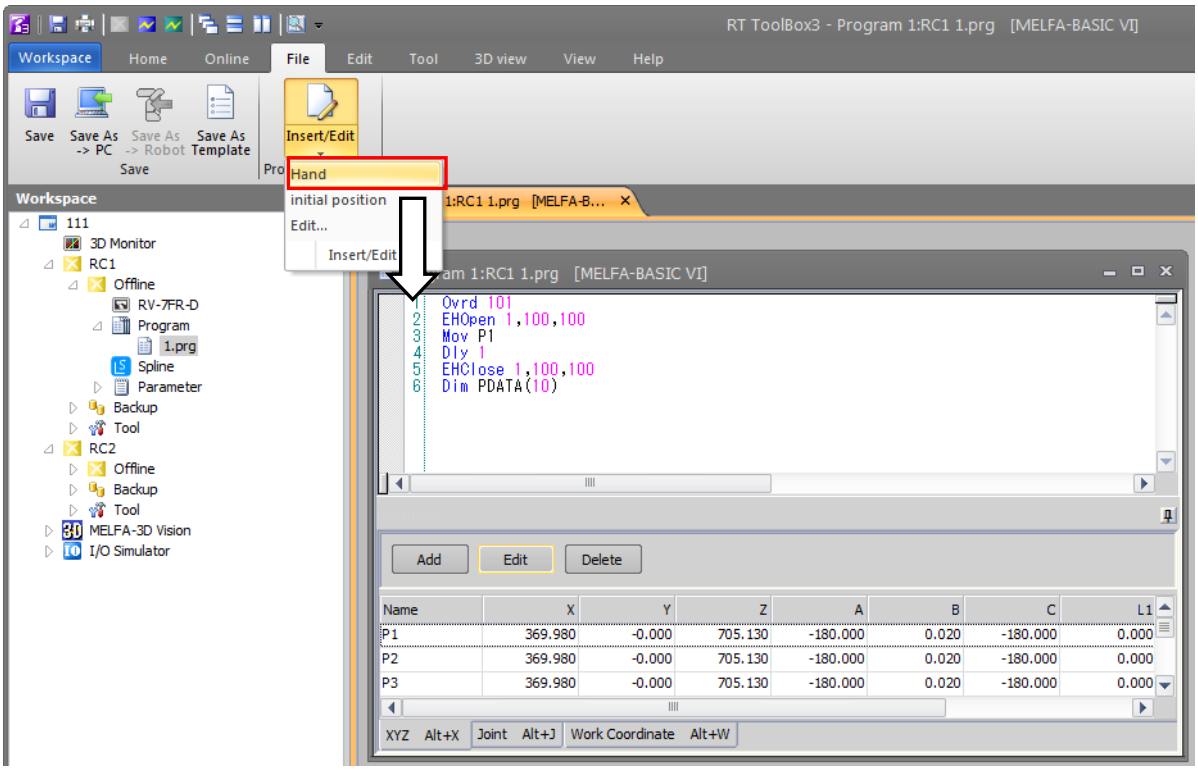


Figure 11-5 Insert program template file

Caution

Program template can only be used after MELFA-BASIC V.

Program template can only be used after MELFA-BASIC V.
MELFA-BASIC IV and MOVEMASTER are not available.

11.7.4.16. Batch editing of XYZ position variables and joint position variables

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

To perform batch editing using XYZ type position variables, click the [Tool] tab -> [Position variable Batch edit] group -> [XYZ variable] button on the ribbon.
To perform batch editing using joint type position variables, click the [Tool] tab -> [Position variable Batch edit] group -> [Joint variable] button on the ribbon.
To perform batch editing using work coordinate type position variables, click the [Tool] tab -> [Position variable Batch edit] group -> [Work coordinate variable] button on the ribbon.
All position variables contained in the respective program are displayed, and the currently selected position variables are displayed at [Target].

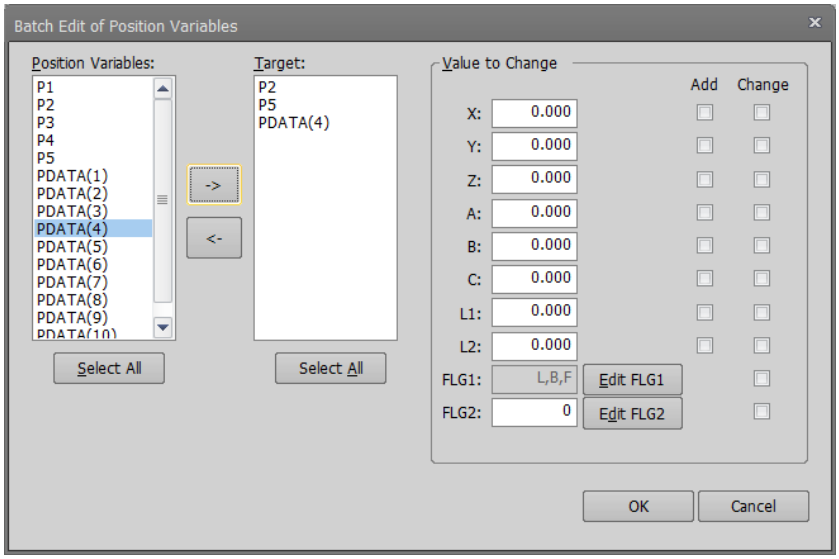


Figure 11-51 XYZ Position Data Variable Editing

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], and then click the [OK] button. You cannot set both [Add] and [Change] for the same element. FLG1 and FLG2 only corresponds to the setting of [Change].

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

11.7.4.17. 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 a range for renumbering.
With the setting dialog, you can specify the start and end line numbers, the new starting line number, and the line number interval.

During editing of programs created using MELFA-BASIC IV or Movemaster commands, click the [Tool] tab -> [Line#] -> [Renumber] button on the ribbon. The renumber set screen is displayed.

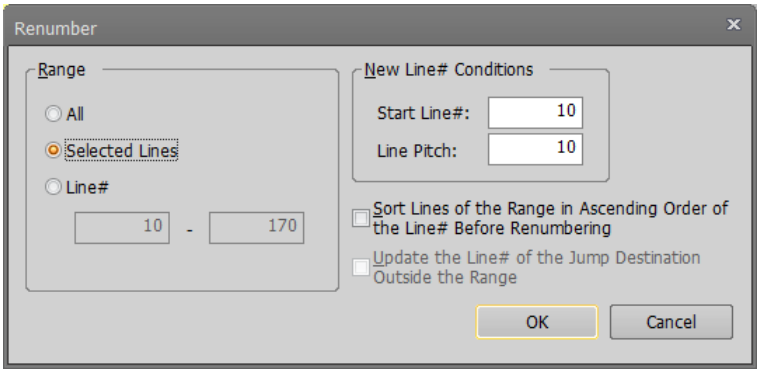


Figure 11-52 Renumber Setting Screen

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.
This function is not available in MELFA-BASIC V and MELFA-BASIC VI.

11.7.4.18. Sort

The sort function is available only with MELFA-BASIC IV and Movemaster commands.
This sorts the edited program by line number.
During editing of programs created using MELFA-BASIC IV or Movemaster commands, click the [Tool] tab -> [Line#] group -> [Sort] button on the ribbon. The confirmation message is displayed, then the line numbers are sorted in ascending order.

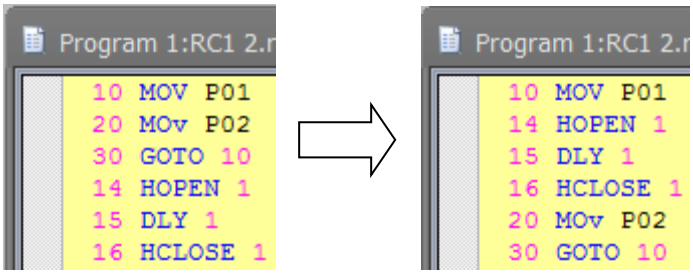


Figure 11-53 Sort

Caution

Sort is available only with MELFA-BASIC IV and Movemaster commands.

The sort function is available only with MELFA-BASIC IV and Movemaster commands.
This function is not available in MELFA-BASIC V and MELFA-BASIC VI.

11.7.4.19. 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.

In the command edit area, select the line to output comments from, and click the [Edit] tab -> [Comment] group -> [Comment] button on the ribbon. Comment character “' “is added to the head of the selected lines.
You can remove a comment from a selected line by selecting the line to remove the comment from, and clicking the [Edit] tab -> [Comment] group -> [Uncomment] button on the ribbon. However, even if you select the line where "Rem" command is included, "Rem" is not removed.

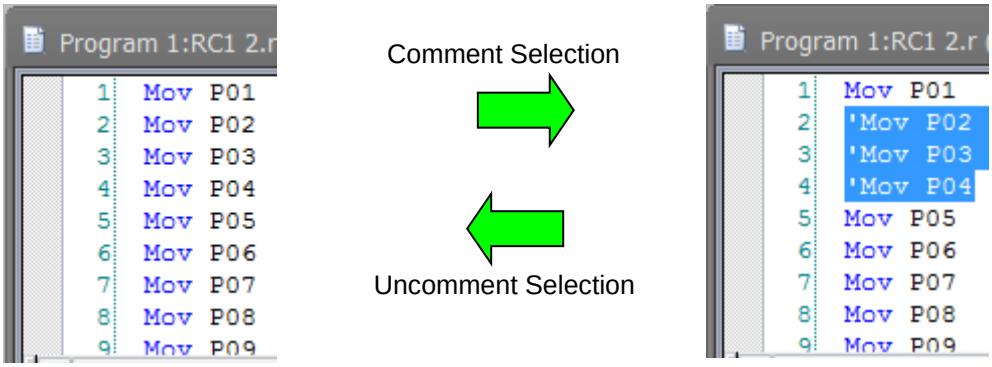


Figure 11-54 Comment Selection / Uncomment Selection

Example for setting / removing of comment is as follows;

Table 11-5 Example for setting / removing comment

program language	Set comment	Remove comment
MELFA-BASIC V MELFA-BASIC VI	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
Movemaster command 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

Cautions for comment setting/release in programs opened in debugging status

When the program is opened in debugging status, it is written to the robot controller as soon as the comment is set or removed. If continuous execution is underway, or the robot controller is running, an error will be generated.

11.7.4.20. Removing comments from all lines in the program

It is possible to remove comments from all lines in the program.

Click the [Edit] tab -> [Comment] group -> [Remove all] button on the ribbon.
All comments in the program are removed except "'" (single quotation) and "Rem" commands.

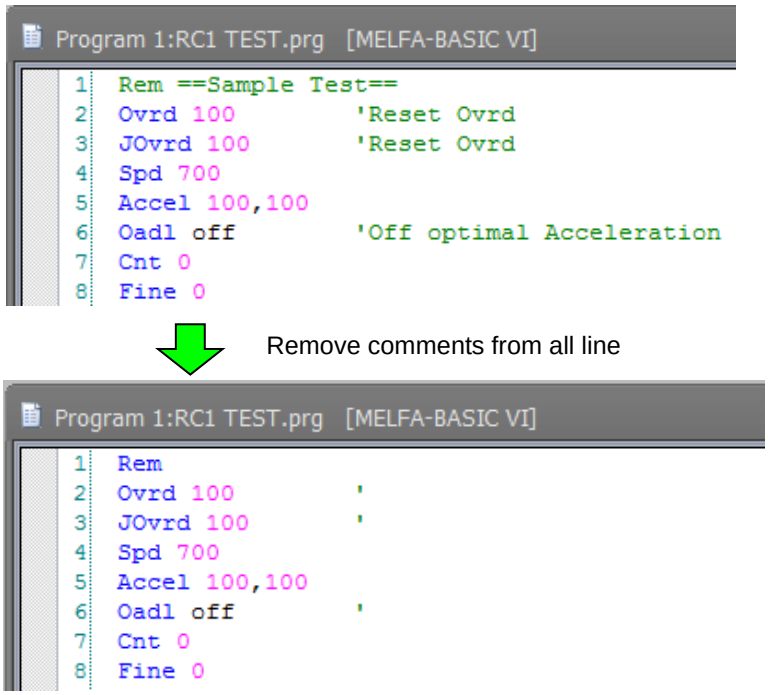


Figure 11-55 Removing comments from all lines in the program

Caution

Removal process for special comment command "Rem"

A space delimiter must be inserted between the comment command “Rem” and the line number or other command. In the case of a Robot Controller, it may judge the comment command “Rem” as a comment without space delimiter. But this software judges the comment command “Rem” to be a comment if “Rem” is delimited by a space.

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

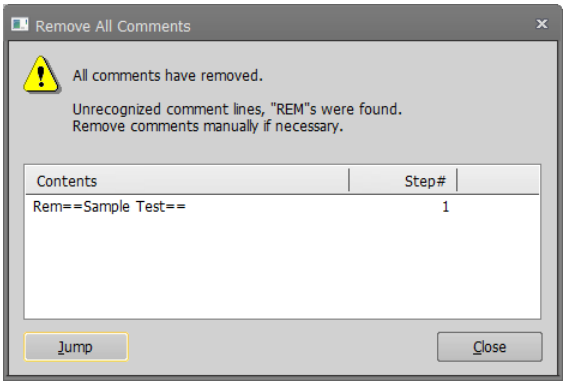


Figure 11-56 List of command line which includes “Rem” that cannot take as the comment

11.7.4.21. Automatically aligning comment start positions

All comment start digits currently set in the program being edited can be automatically aligned.

Click the [Edit] tab -> [Comment] group -> [Arrange all] button on the ribbon.
The start digits of all comments in the program are automatically aligned to the position that was set in the [Alignment comments start pos] dialog. Note, however, that lines containing only the comment command are excluded from this operation.

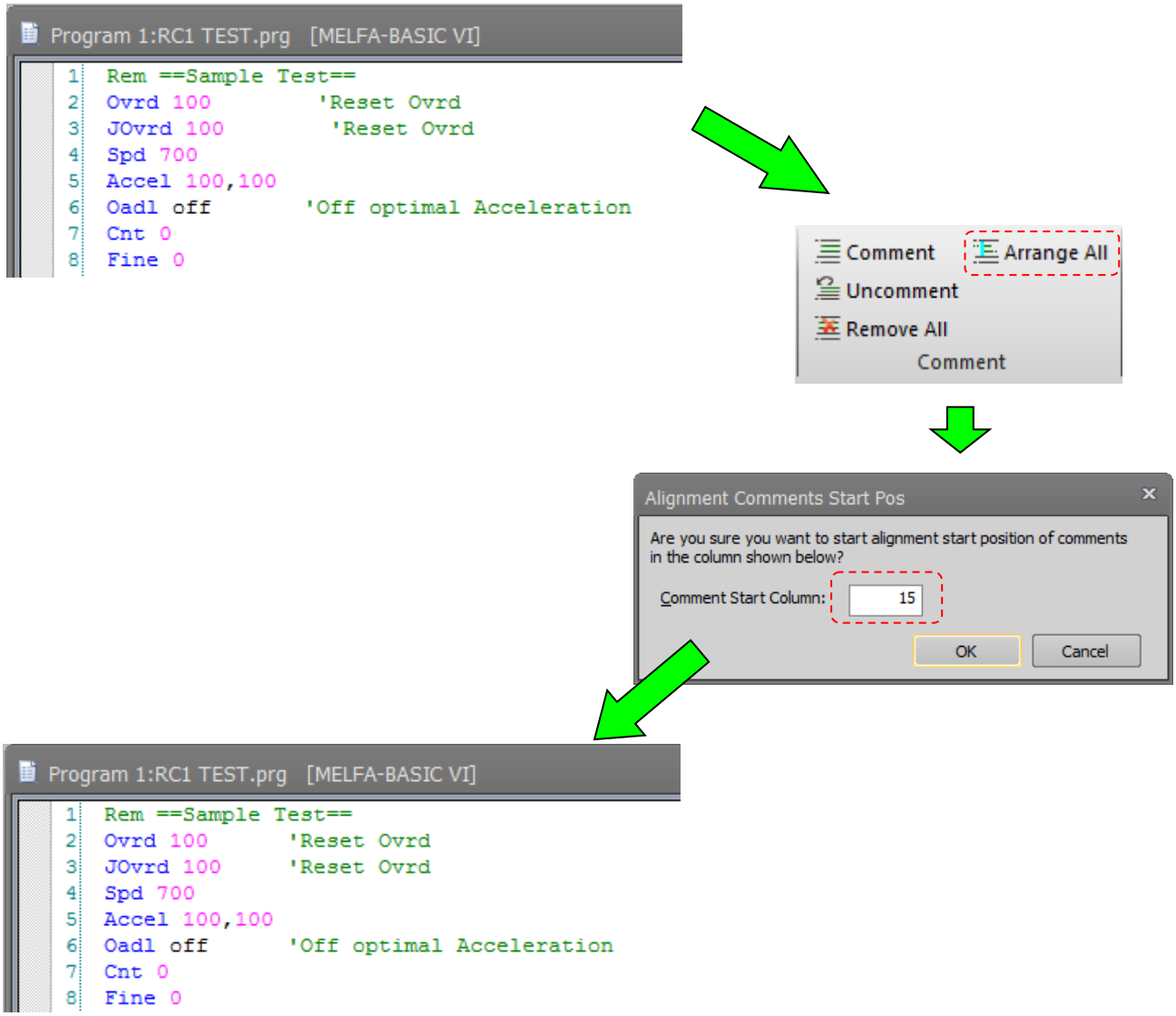


Figure 11-57 Automatically Aligning Comment Start Positions in a Program

11.7.4.22. Bookmark

You can make the cursor jump to a line set with a bookmark later by setting a bookmark to a program being edited. This feature is handy for temporarily making a note of lines in the process of being edited and label lines at jump destinations.

[Adding a bookmark]

Add a bookmark with the following procedure.

Click the command line to set the bookmark to with the mouse, and click the [Edit] tab -> [Bookmark] group -> [Add] button on the ribbon. Command lines set with a bookmark are prefixed with a "「」".

```
12      Ovrd 100
13      HOpen 1
14      Mov PHome
15      '--- Position recognition(3DVS)
16      GoSub *S02RCG3D
17      GoSub *S03WAIT3D
18  *S02RCG3D
19      V3Run #1,CJOB$,1,1,1,1,1
20  Return
21  '
22  *S03WAIT3D
23      While M_V3Rslt(1)=-1
24      WEnd
25      Hlt
26      M03Num = M_V3Num(1)
27  Return
```

Figure 11-58 Displaying Lines Set with a Bookmark

[Deleting a bookmark]

To delete a bookmark, click the command line to delete the bookmark from with the mouse, and click the [Edit] tab -> [Bookmark] group -> [Delete] button on the ribbon.

To delete all bookmarks set to a program, click the [Edit] tab -> [Bookmark] group -> [Delete All] button on the ribbon.

[Jumping to a line set with a bookmark]

With a bookmark set in the program, click the [Edit] tab -> [Bookmark] group -> [Previous] or [Next] button on the ribbon. The cursor will jump to the previous or next bookmark.

Bookmarks set to programs are valid only while the program edit screen is open. When the program edit screen is re-opened, all bookmarks set to the program will be deleted.

11.7.4.23. Collapsing command blocks

When the program being edited contains a command block or a procedure, blocks can be displayed in an easier-to-view format as "⊟└" (expand state) or "⊞" (collapsed state). The display can be changed to a collapsed state or expand state by clicking ⊟ or ⊞ button.

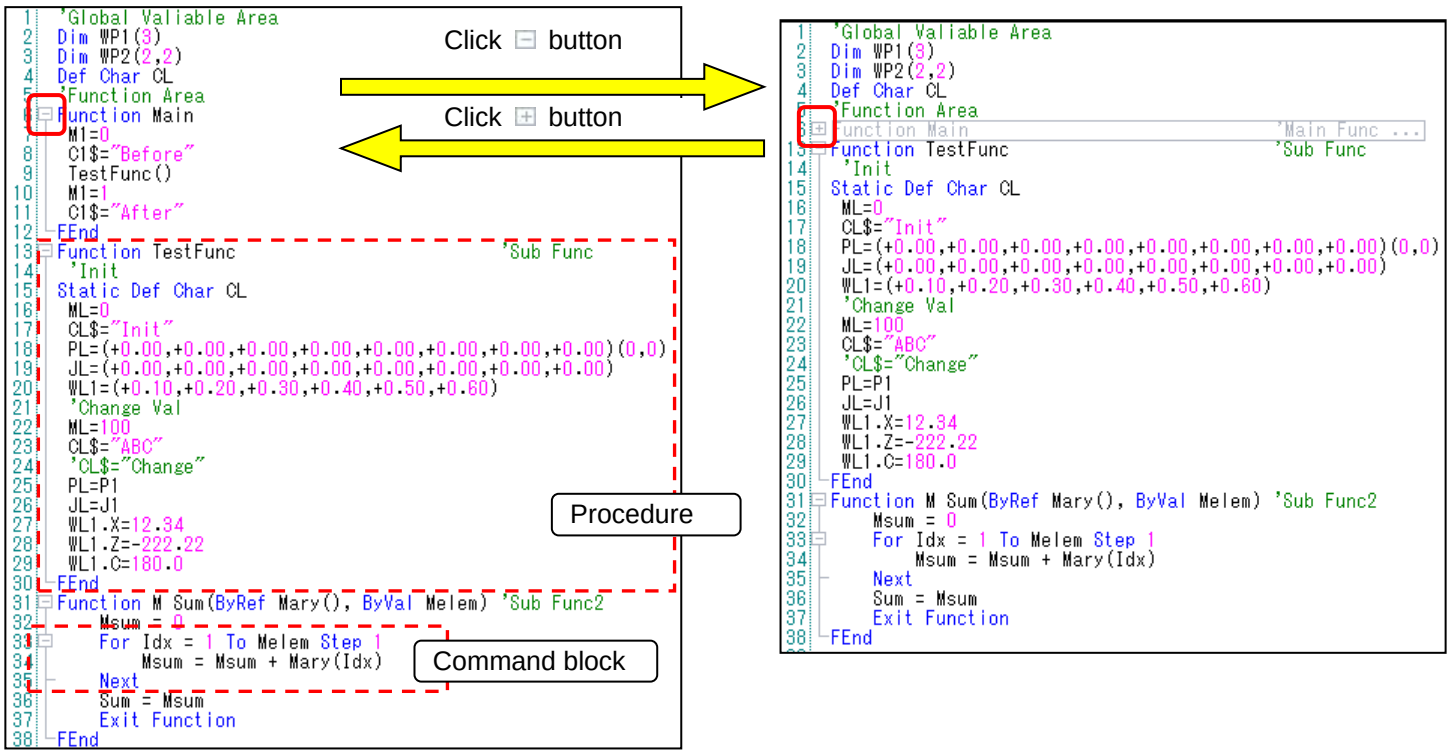


Figure 11-59 Collapsed Display of Command Blocks

All command blocks and procedures are displayed in a collapsed state by clicking the [Edit] tab -> [Command line] group -> [Collapse all] button on the ribbon.
All command blocks and procedures are displayed in an expand state by clicking the [Edit] tab -> [Command line] group -> [Expand all] button on the ribbon.

11.8. Position jump

It is possible to move the robot to a registered position variable with a specified interpolation movement.
This function is available when the program is being edited in the online or simulation mode.
The pair of robot model and robot controller software version that this function can use is as follows. However when the program is in the simulation/debug state, you can use this function regardless of the following.

Table 11-6 Robot model and robot controller software version that this function can use

No.	Robot model	CR800	CR750/700	CRn-500
1	Vertical type(6 axis)	All version	Ver.R3e/S3e or later	Cannot be used
2	Vertical type(5 axis)	Cannot be used	Cannot be used	
3	Horizontal type(4 axis)	All version	Ver.R3e/S3e or later	

However, this function cannot be used with the variable of work coordinate type.

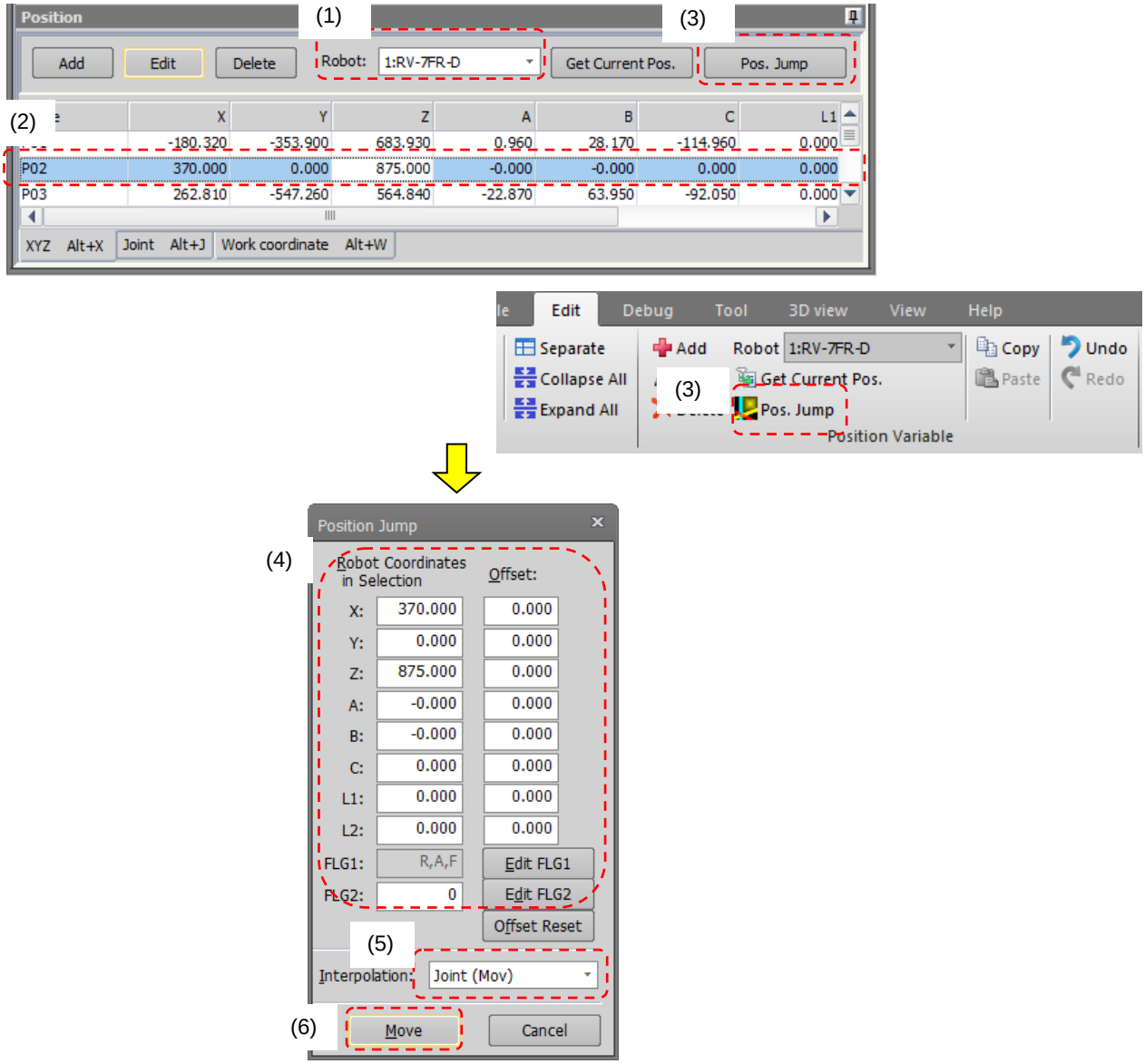


Figure 11-60 Position jump

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

(1) Select the robot. (In case of multiple robots)
(2) Select a position variable to move.
(3) Click the [Pos. Jump] button on the program edit screen or click the [Pos. Jump] button in the [Edit] tab ->

[Position Variable] group from the ribbon.

(4) Fine adjust the coordinate to be moved. By click the [Offset Reset] button, you can return the input value of the offset to 0.

(5) Select the interpolation movement. (MOV: Joint interpolation movement, MVS: Linear interpolation movement, Direct movement (only for simulation))

(6) Click the [Move] button.

(7) If moving the actual robot, a warning message is displayed. If moving the robot in a simulation, it is moved without a warning message.

11.9. Saving Programs

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

Caution

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

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 will be overwritten.

11.9.1. Save

Saves the program being edited under its current name.
To save a program, click the [File] tab -> [Save] group -> [Save] button on the ribbon.

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 "Save Items", see **"11.9.5 Items written when saving in robot".**

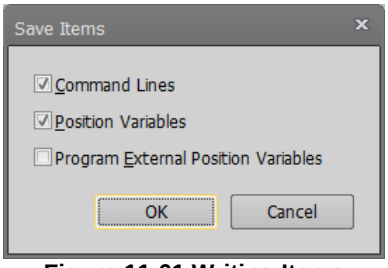


Figure 11-61 Writing Items

11.9.2. Saving on computer

Saves the program being edited to the computer. At this time, you can set a new program name.
Click the [File] tab -> [Save] group -> [Save As -> PC...] button on the ribbon.

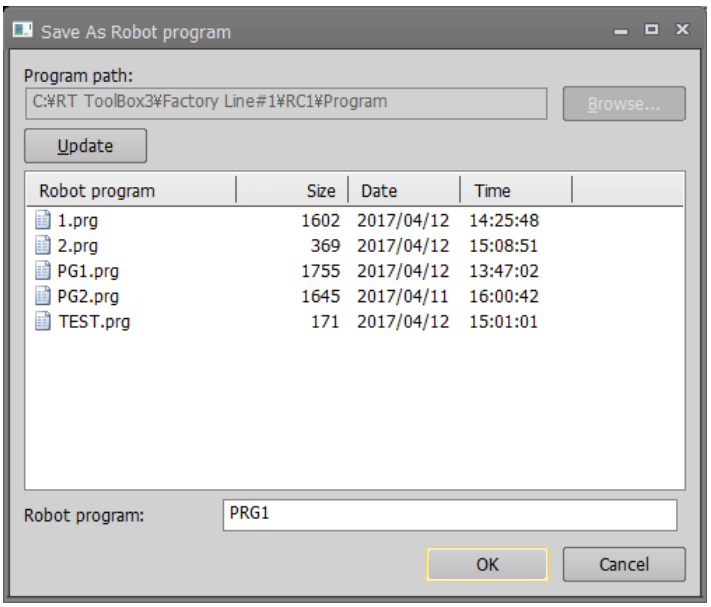


Figure 11-62 Saving on Computer

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 another folder, first store in this folder, then copy to the desired folder with the program management copy function.

Caution

About program names disabled on PC

A Windows error will occur when the name of a program in the robot controller has same name as a “reserved word” in Windows. To solve this problem, it is necessary to change the program name in the robot controller.

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

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

11.9.3. Saving in robot controller

Saves the program being edited to the robot controller under a new name. You can set a new program name at this time.
Click the [File] tab -> [Save] group -> [Save As -> Robot...] button on the ribbon. The "Save Items" setting screen is displayed, so set the save items, then click the [OK] button.
For details on the "save items", see "**11.9.5 Items written when saving in robot**".

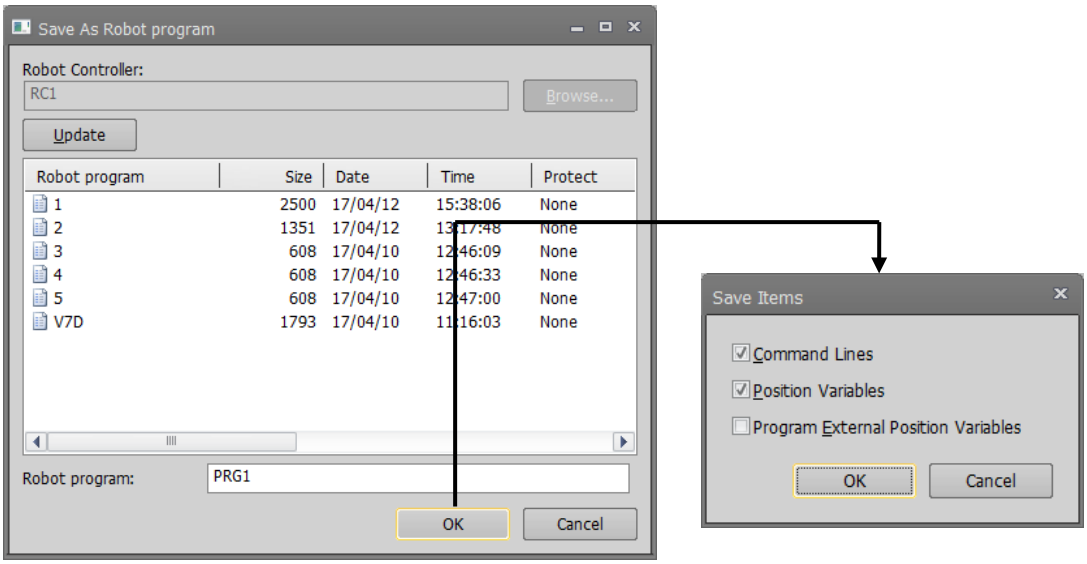


Figure 11-63 Saving on Robot Controller

11.9.4. Save as template

Save the edited program as a template. At this point, the program name can be newly created.
Click [File] → [Save] group on the ribbon - [Save As Template].

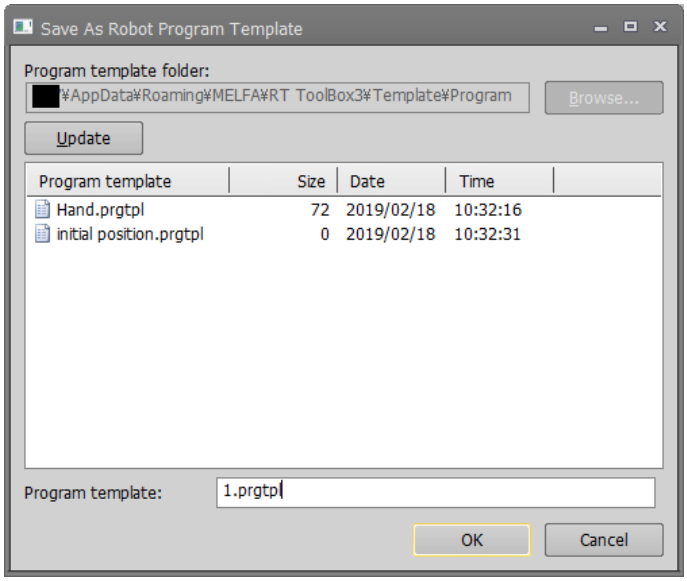


Figure 11-6 Save as template

Enter the program template name and click [OK].

Caution

About the computer cannot process the template name.

If the program template name is the same as "Windows reserved word", it will be wrong when saving.
"Reserved word" has the following character string.
AUX、COM1～COM9、CON、LPT1～9、NUL 、PRN

Caution

The program template can be used after MELFA-BASIC V.

The program template can be used after MELFA-BASIC V and it can not be used with MELFA-BASIC IV and MOVEMASTER.

11.9.5. 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 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 Item".**

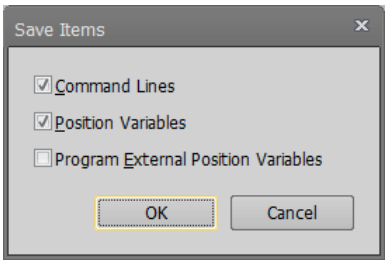


Figure 11-64 Save Items

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 at which program external position variables are written.

The timing at which the program external variables can be backed up is at the next time the power supply is turned ON.

Turn on the controller power again to use the program external position variable written in the controller.

11.10. Program Printing

You can print programs you have written.

11.10.1. Checking a print image

You can display a print image of the program on the screen.
Activate the program to print, and click the [Home] tab -> [Print] group -> [Print preview] button on the ribbon. The print image for currently active program is displayed.

11.10.2. Printing a program

Activate the program to print, and click the [Home] tab -> [Print] group -> [Print] button on the ribbon. The currently active program can be printed.

11.10.3. Program print settings

You can customize the pages the program is printed with.
Clicking the [Home] tab -> [Print] group -> [Print Setup] button displays the Page Setup screen.
In this screen, you can set the file name, print date, whether or not to print the page No., whether or not to perform position variable formatting, whether or not to print a variable list, line pitch, and margins.

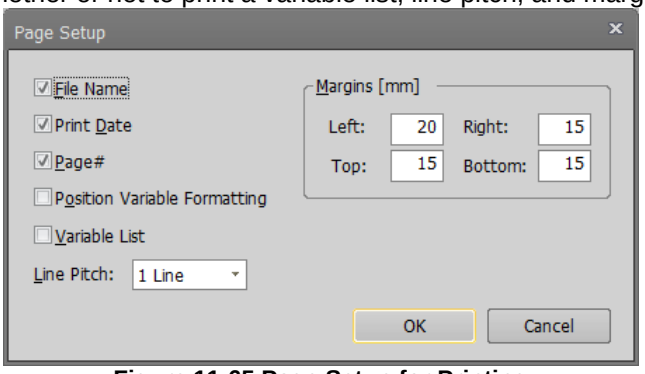


Figure 11-65 Page Setup for Printing

11.10.3.1. Position variable formatting

You can print position variables in the program to print formatted in an easy-to-view format the same as the screen.

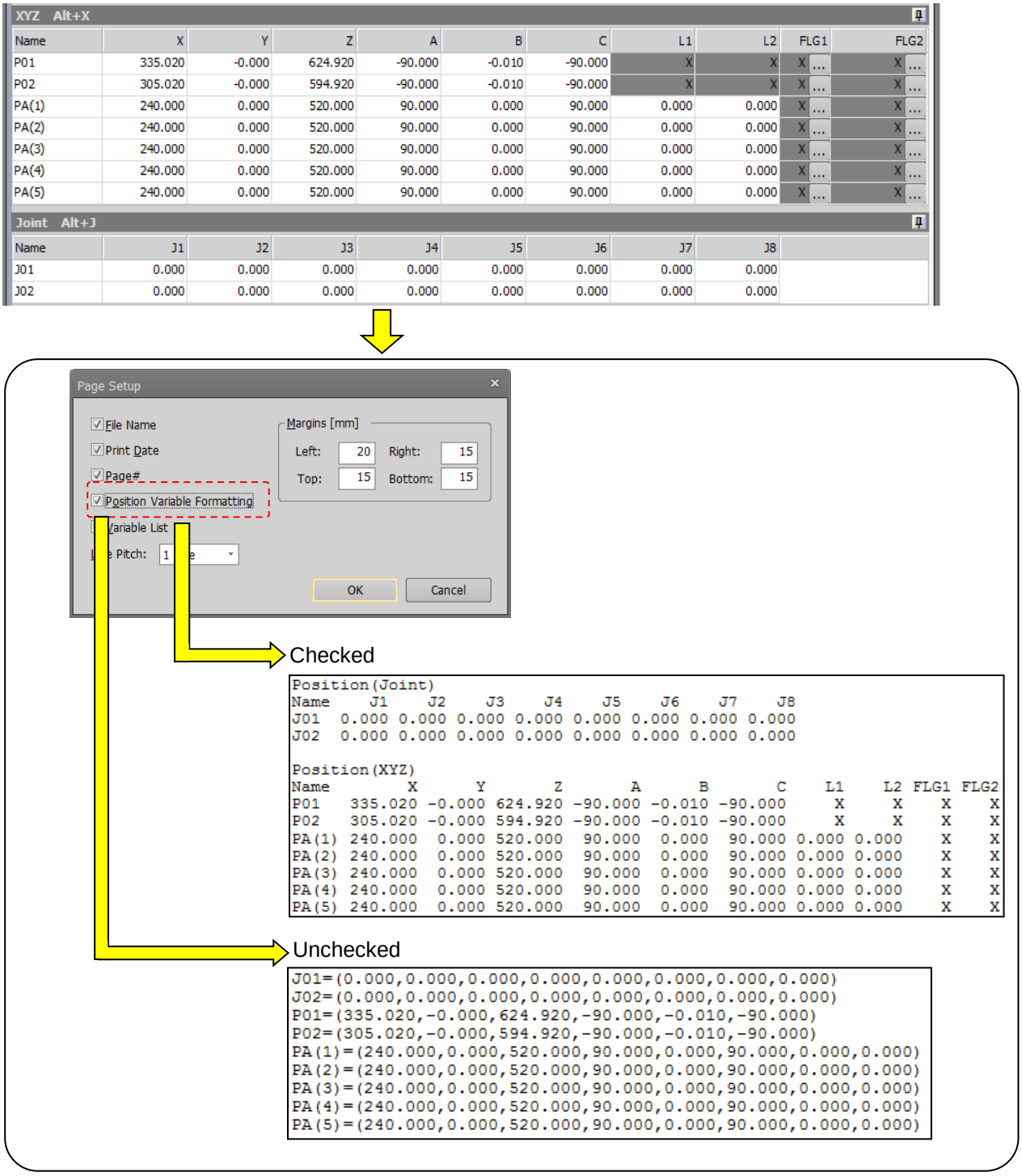
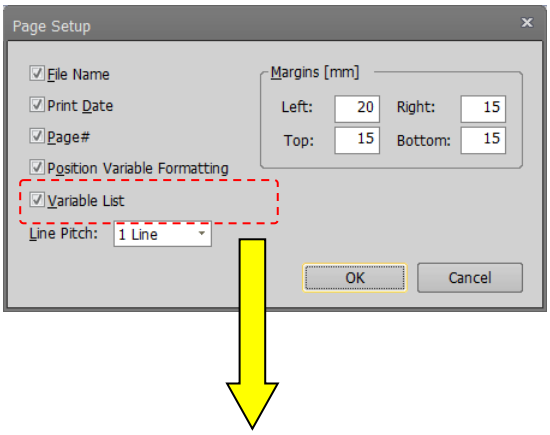


Figure 11-66 Printing Position Variables with Formatting

11.10.3.2. Variable list

Variable names and comments can be extracted from the program being edited and printed as a variable list.

```
1  Def Char MSG1, MSG2                'Message character
2  Def FNMAVE(MA,MB) = (MA+MB)/2      'Function
3  Def Inte WORK1, WORK2              'Inte variable
4  Def Float WORK3, WORK4             'Float variable
5  Dim MD6(2,3)                       'MD6 array
6  Dim PD1(5,5)                       'PD1 array
7  Def Pos P00                        'Start position
8  Def Jnt J01                        'Joint Pos. 1
```




```
Variable list
Name            Comment
MSG1            Message character
MSG2            Message character
FNMAVE(MA,MB)   Function
WORK1           Inte variable
WORK2           Inte variable
WORK3           Float variable
WORK4           Float variable
MD6(2,3)        MD6 array
PD1(5,5)        PD1 array
P00             Start position
J01             Joint Pos. 1
```

Figure 11-67 Printing the Variable List

11.11. 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.

11.11.1. Starting debugging

There are two ways of opening the robot program in the debug mode, from the project tree or by migrating the program being edited to the debug mode.

[Method (1)] Opening the program in the debug mode from the project tree

Select the program from [Online] or [Simulation] -> [Program] in the project tree, and click the mouse right button. If you click [Debug Open] from the right button menu, the program will be opened in the debug mode.

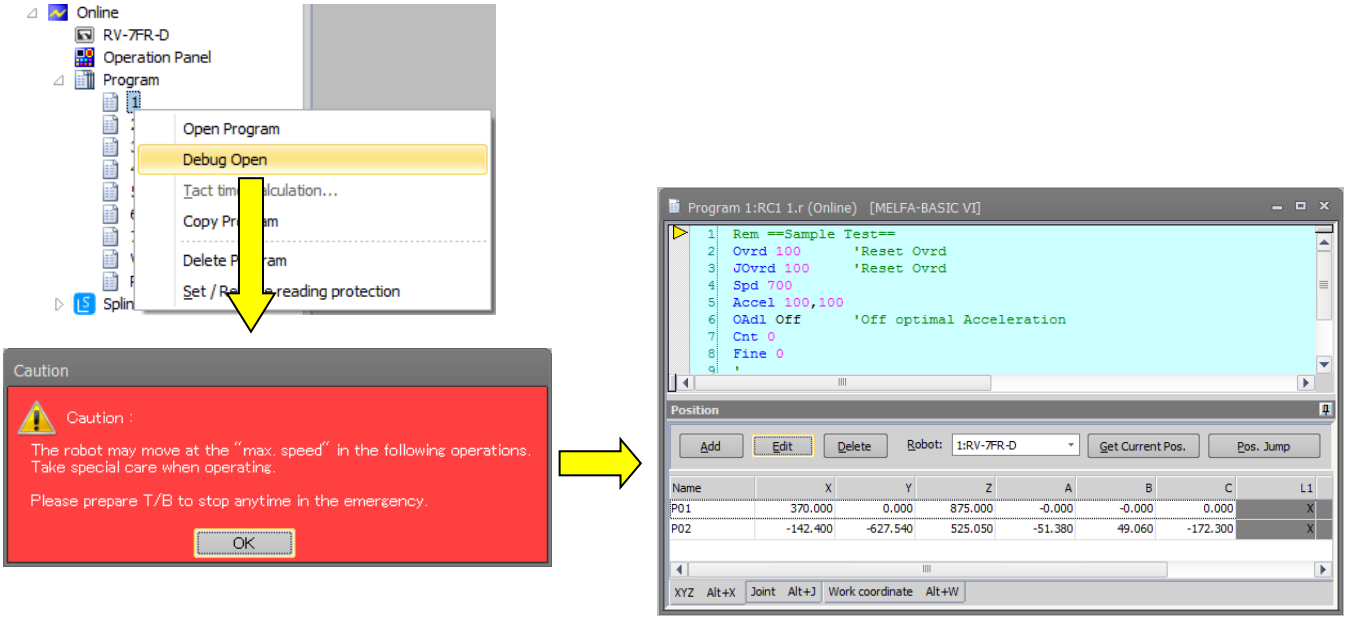


Figure 11-68 Opening a Program in the Debug Mode from the Project Tree

[Method (2)] Migrating the program being edited to the debug mode

During editing of the program, click the [Debug] tab -> [Start/Stop] group -> [Debug start] button on the ribbon. The program being edited will be saved once and then will migrate to the debug mode.

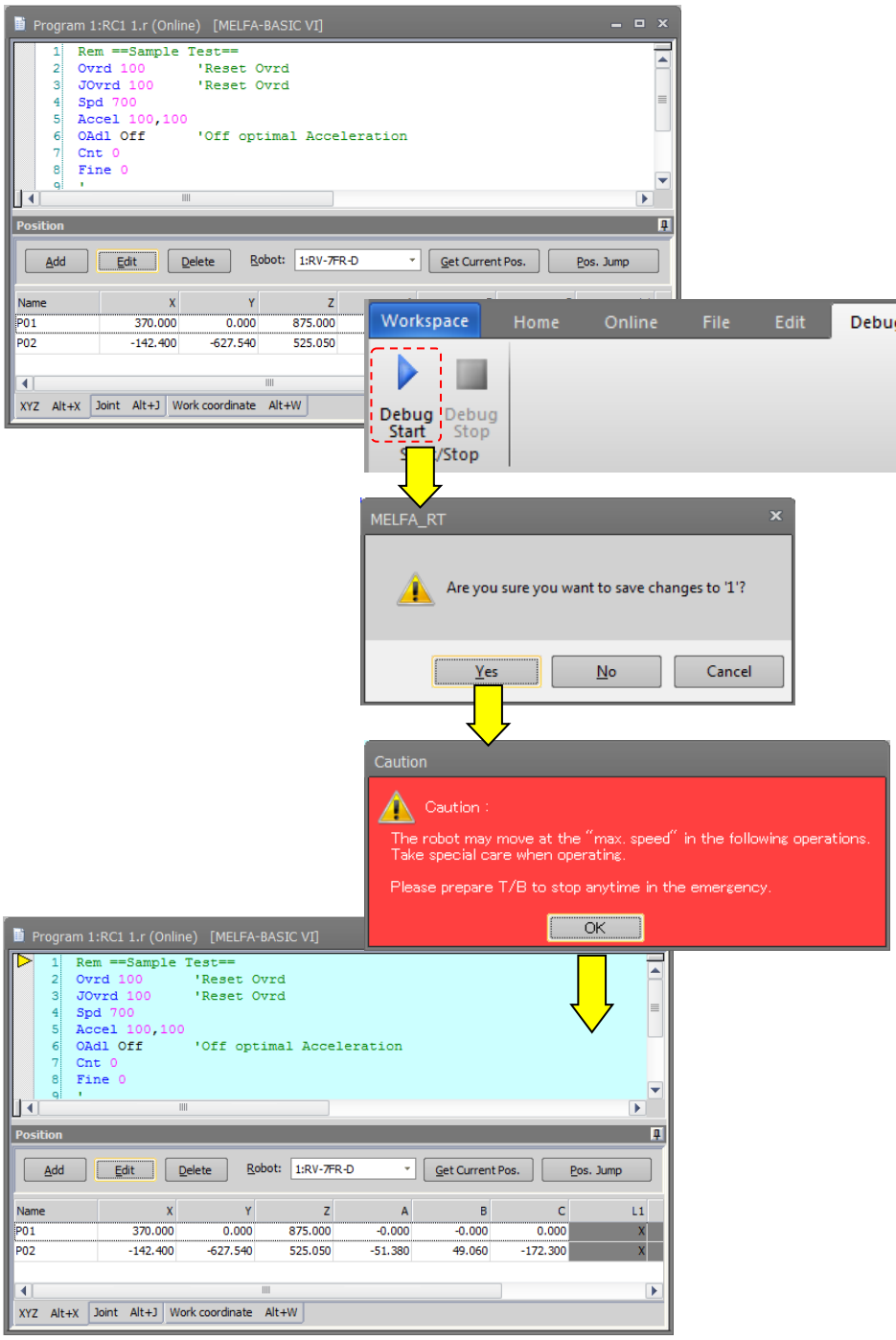


Figure 11-69 Migrating the Program Being Edited to the Debug Mode

Once a program is opened in the debug mode by either of these methods, the execution line cursor "▷" will be displayed at the left edge 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].

If you debug a program which is set with "Read protection" (displaying 🔒 on the project tree), release it with reference to **"11.12 Set / Release read protection"** before you open the program in debugging.

11.11.2. Executing programs step by step

Danger

In program debugging, the robot may operate at 100% speed.
Pay attention to safety around the robot.
Also, keep a T/B handy 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.
When a program opened in debug mode, operate with the [Operating panel] screen which is shown at the same time.

For details on step operation on the operation panel, refer to **"19.2.4 Step operation"**.

11.11.3. Revising programs

The command statements for a program that has been opened in debugging status cannot be edited in the command edit area. Command statements can be corrected from the [Edit] tab on the ribbon. Command statements can be edited by the [Edit] tab -> [Debug edit] group -> [Edit] button, [Debug edit] group -> [Insert] button and [Debug edit] group -> [Delete] button on the ribbon.
Position variables can be edited as usual.

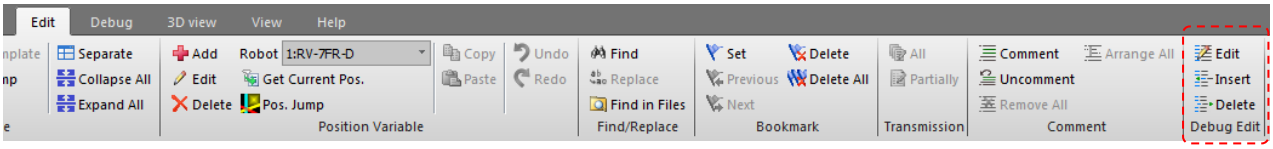


Figure 11-70 Ribbon [Edit] Tab -> [Debug edit] Group

(1) Edit command line
You can edit the contents of the specified command line.
Click the command line to edit with the mouse, and click the [Edit] tab -> [Debug edit] group -> [Edit] button on the ribbon. The screen for editing the command line is displayed.

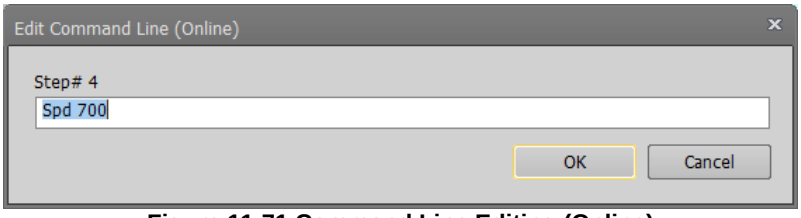


Figure 11-71 Command Line Editing (Online)

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 to insert the command statement into with the mouse, and click the [Edit] tab -> [Debug edit] group -> [Insert] button on the ribbon. The screen for inserting the command line is displayed.

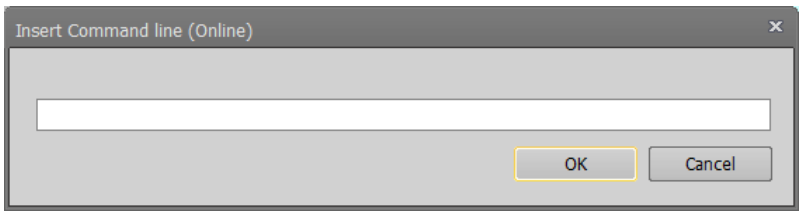


Figure 11-72 Command Line Insertion (Online)

(3) Delete command line

You can delete the specified command line.

Click the line to delete the command statement from with the mouse, and click the [Edit] tab -> [Debug edit] group -> [Delete] button on the ribbon. The confirmation screen for the command line deletion is displayed.

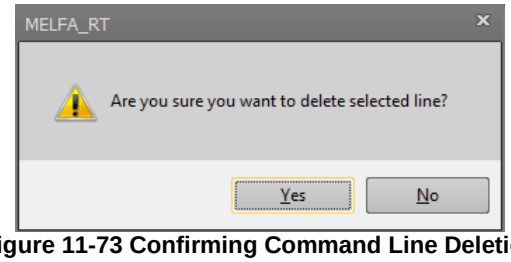


Figure 11-73 Confirming Command Line Deletion

(4) Edit position variables

For details on the method for editing the position variable, see **"11.7.3 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 cannot be performed while editing a program in debugging status.

11.11.4. Setting and deleting breakpoints

You can set breakpoints in the online program.
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 stopping, you can execute the program continuously.

Up to 128 breakpoints can be set. Even when you close the program, the settings are retained until you go offline.
There are the following two types of breakpoints.

Permanent breakpoint	:	The breakpoint is maintained after stopping.
One-time breakpoint	:	At stop, the breakpoint is automatically deleted at the same time as the stop. It will be canceled when you close the program.

Breakpoints can also be set during online program editing. (Continue breakpoint only) The breakpoint that is set will be handed over to debugging as well. All settings are canceled when you go offline.

Caution

Breakpoints are available only with MELFA-BASIC V and MELFA-BASIC VI.

11.11.5. Set a Breakpoint

Set a Breakpoint

Set a breakpoint by the following procedure.

1) Move the cursor to the command line where you want to set a breakpoint, click [Debug] -> [Breakpoint] group-> [Set] on the ribbon, or click the left side of the command line to be set.

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

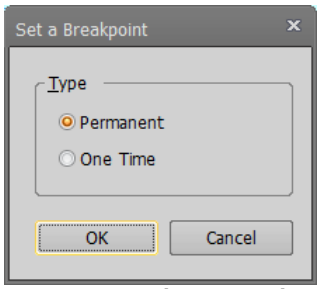


Figure 11-74 Setting a Breakpoint

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

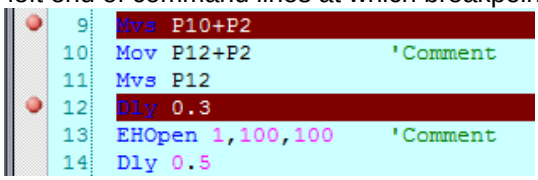


Figure 11-75 Display of Lines with Breakpoints Set

11.11.5.1. Delete a Breakpoint

Delete a Breakpoint

To delete the breakpoint, the cursor moves to the command line where the breakpoint is to be deleted.

Click [Debug] -> [Breakpoint] group -> [Delete] on the ribbon, or click on the left side of the command line to be deleted.

To delete all breakpoints set to a program, click the [Debug] tab -> [Breakpoint] group -> [Delete All] button on the ribbon.

The setting and delete of the breakpoint can also be operated through the buttons on the ribbon.

11.11.6. Ending debugging

When debugging is finished, click the "✕" button at the top right of the program edit screen opened in the debug mode or the [Debug] tab -> [Start/Stop] group -> [Debug stop] button on the ribbon to close the program. When debugging is stopped by the [Debug] tab -> [Start/Stop] group -> [Debug stop] button on the ribbon, the program is reopened in an editable state.

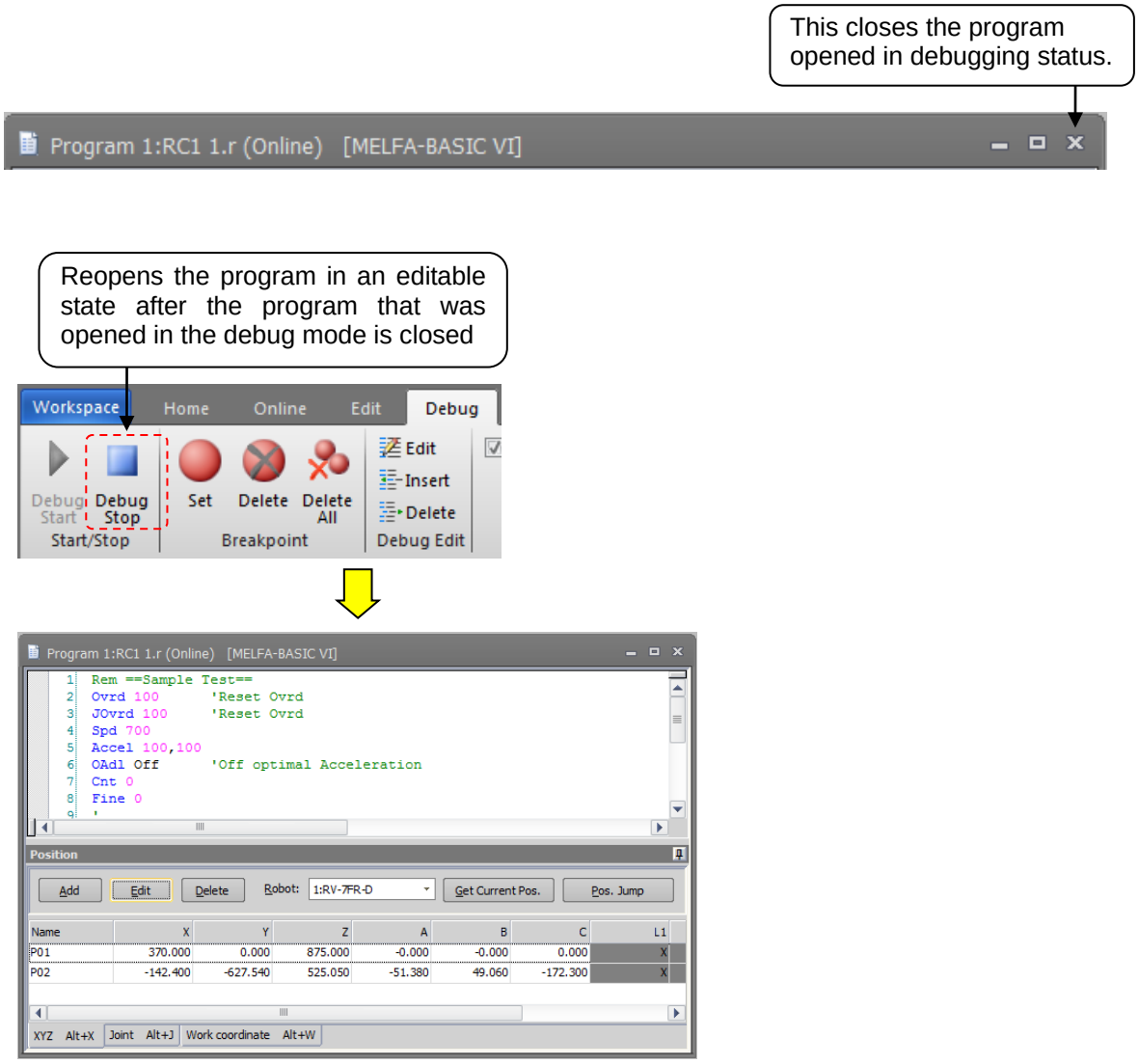


Figure 11-76 Closing a Program Opened in Debug Status

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

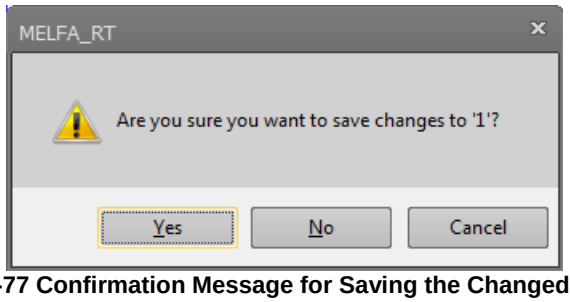


Figure 11-77 Confirmation Message for Saving the Changed Contents

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

11.12. Set / Release read protection

If you set read protection in the robot program, you can make sure a third party can't read it easily. This function is available in controller software Ver.R5n/S5n or later of CR750-D/Q and CRnD/Q-700 series and all controller software versions of CR800D/R/Q series.
is displayed on the project tree on programs set with read protection. If you set read protection, you can restrict the following operations.

- Opening a program (You can restrict the viewing or modification of the program content)
- Starting debug of a program
- Copy / Move / Delete / Rename / Compare a program

If you set / release reading protection of a program, use the program management screen with reference to **"11.13.6 Protect settings"** or select [Set / Release reading protection] on the project tree.

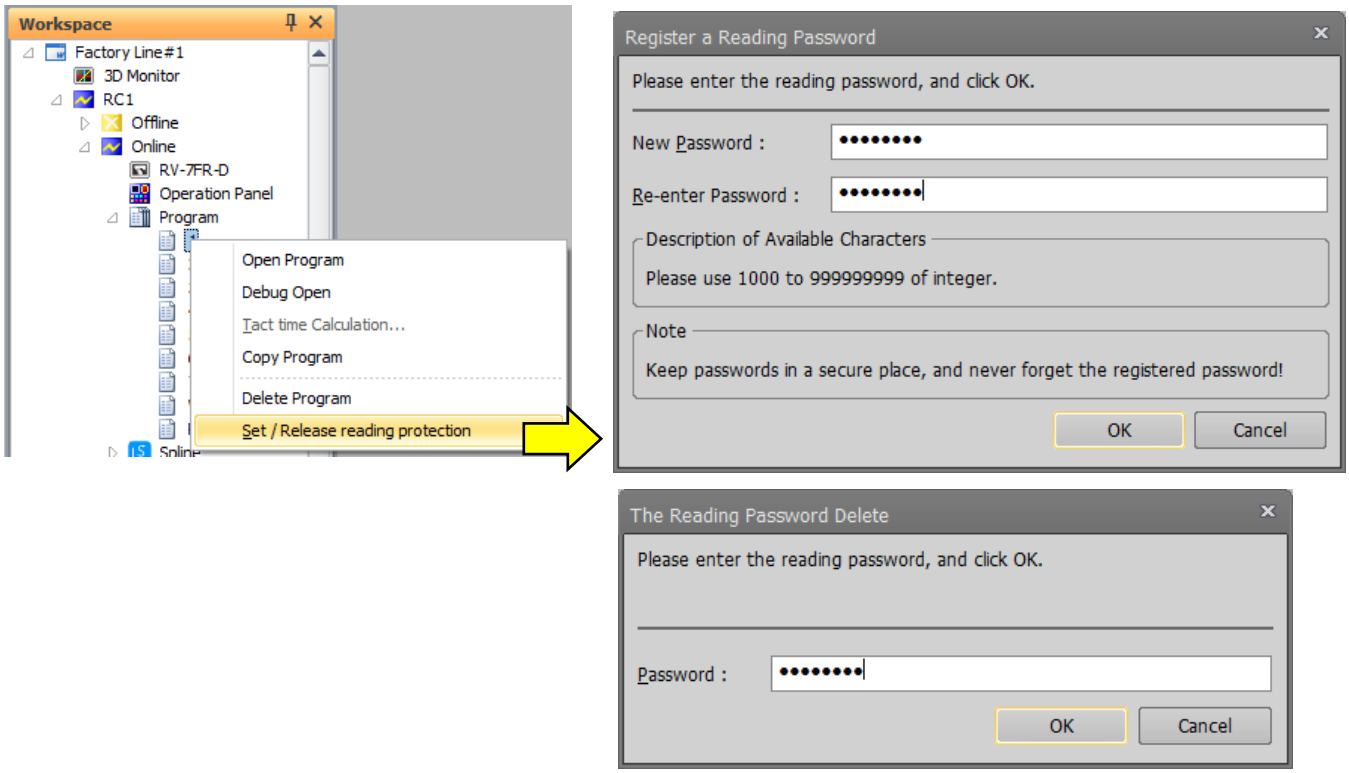


Figure 11-78 Set / Release reading protection operation on the project tree

11.13. 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. Select [Manage Programs]. The manage programs screen is displayed.

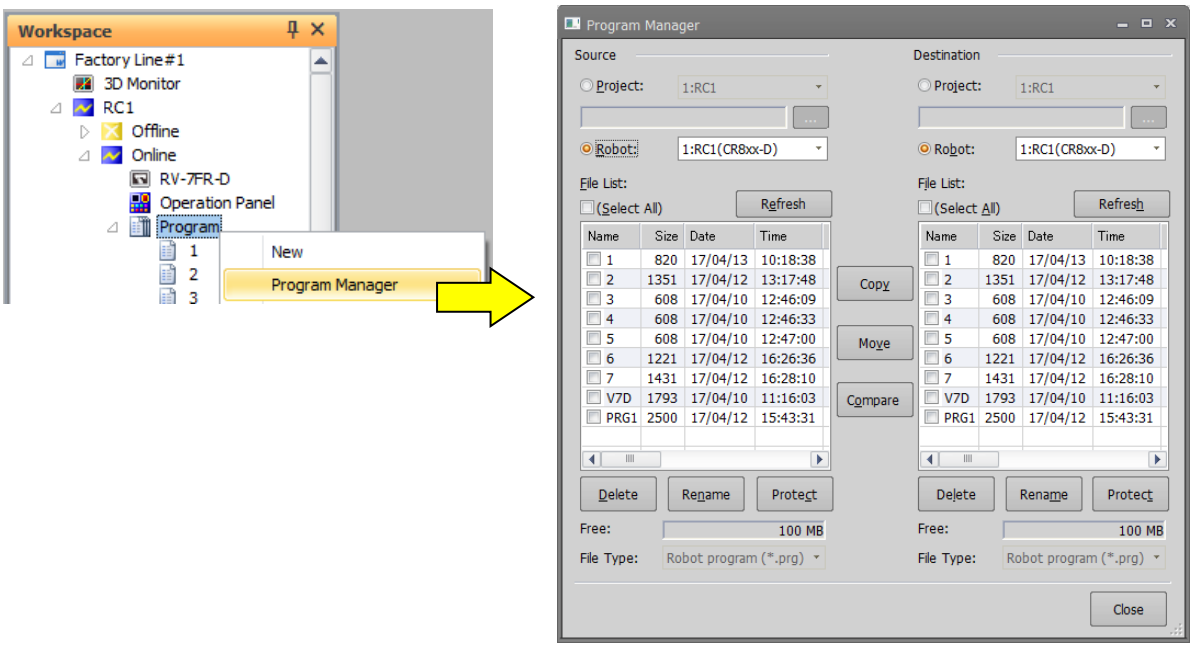


Figure 11-79 Starting Program Management

Caution

All the operations of these functions are for robot programs.

11.13.1. Program list display

The left and right lists display the designated folders and the programs inside the robot controller.

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

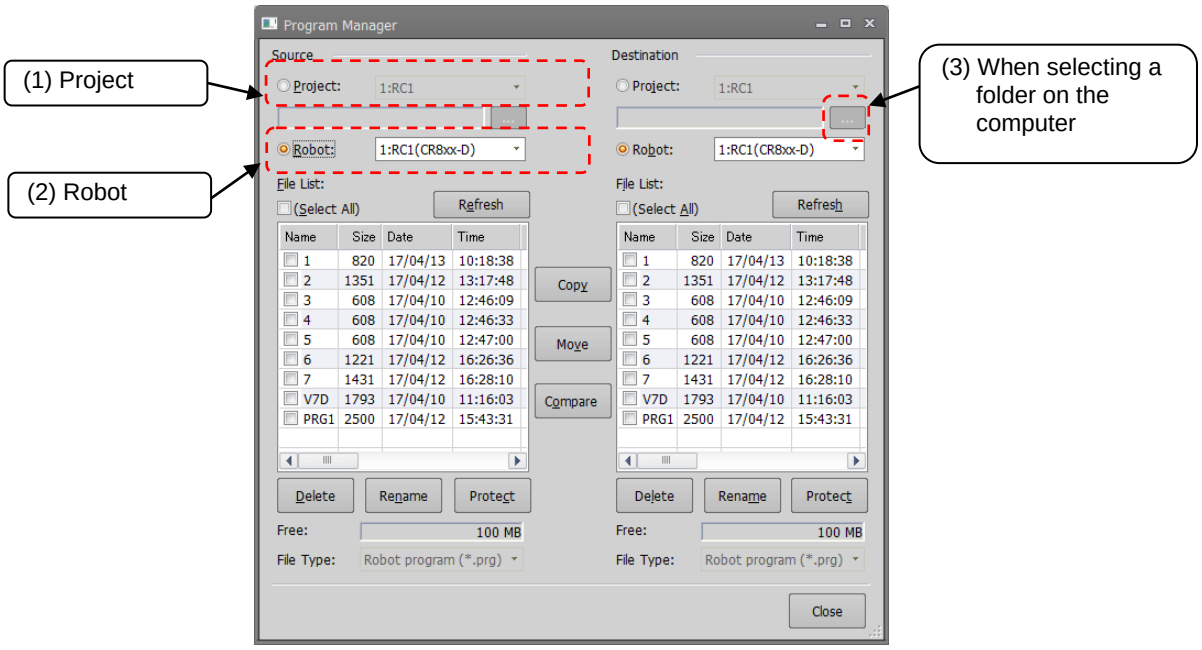


Figure 11-80 Program List Display

11.13.2. Copy

This copies program files. Copying of the entire program file or only the command statements or only the position variables are possible.
Select the transmission source program names from the list at the left, and designate the transmission destination folder on the right side. Multiple transmission source programs can be selected at the same time, but only one program must be selected when copying with a name change. Copying is executed when the [Copy] button is clicked and [Setting for copy] dialog is set.

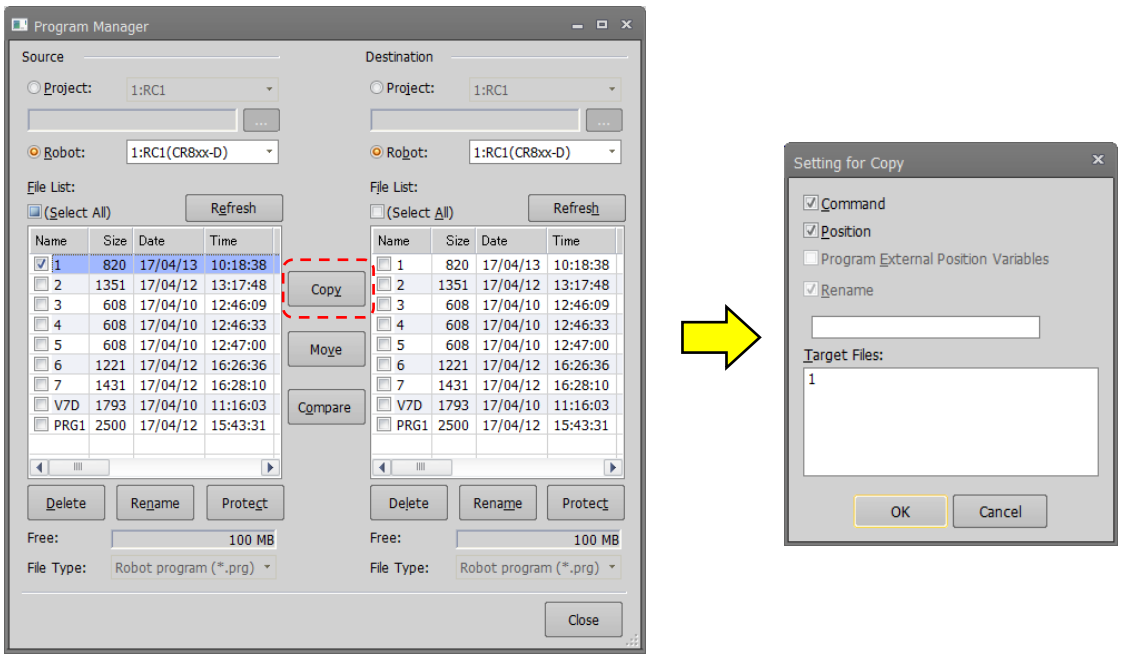


Figure 11-81 Copy Setting Screen

It is possible to copy by using the project tree.

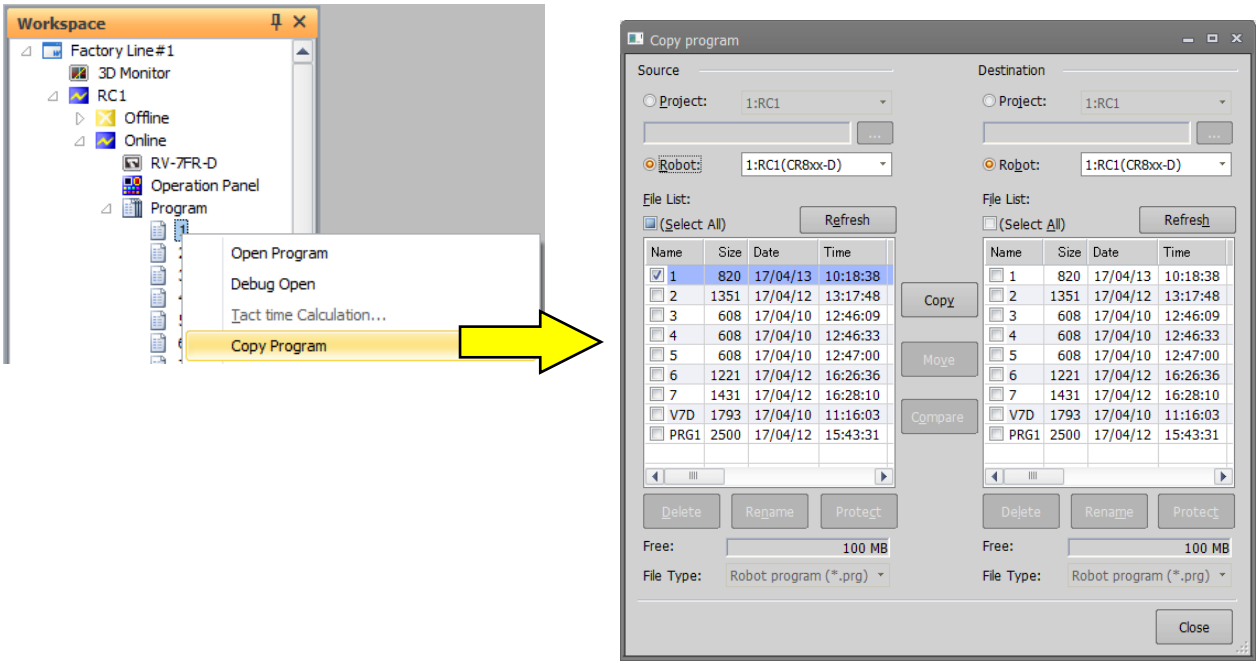


Figure 11-82 Copying the program by using the project tree

A program set with “Read protection” can only be copied to the identical controller.

It is possible to copy by drag and drop the project name on the project tree.

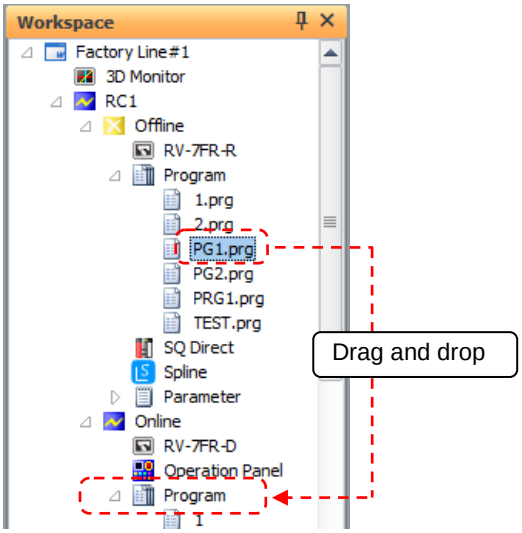


Figure 11-83 Copying the program by drag and drop in the project tree

Programs displayed on the desktop or in Windows Explorer also can be copied by dragging and dropping.

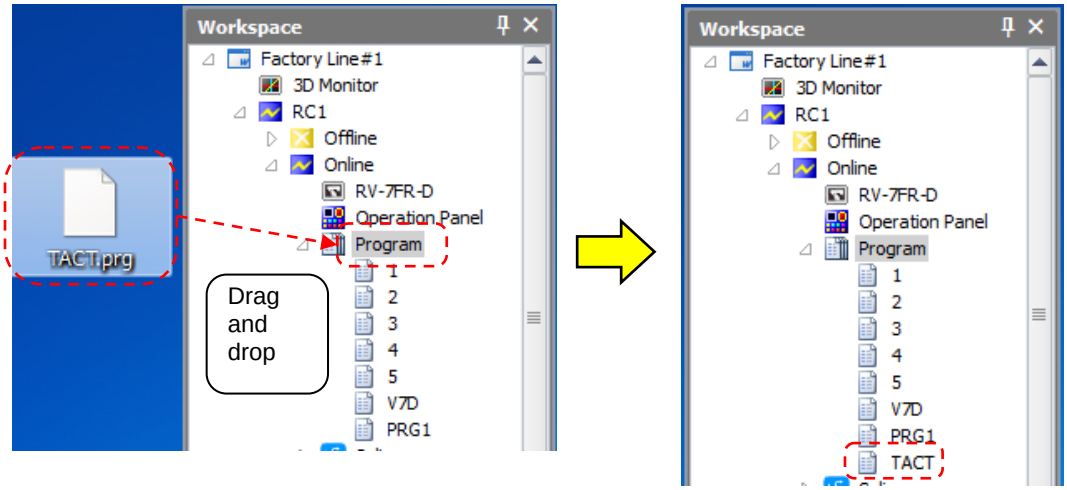


Figure 11-84 Copying Programs Outside of Workspace by Drag and Drop

Caution

Program copy is the only operation possible in drag and drop.
However, copying with name change cannot be done.

Program copying is the only operation possible by drag-and-drop. However, the copy that changes the name cannot be done.

When changing the program name and moving the program, do so on the program management screen. This operation is not possible for programs set with “Read protection”.

11.13.3. 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. Multiple programs can be selected at the same time. Movement is executed when the [Move] button is clicked.

Programs set with “Read protection” cannot be moved.

11.13.4. Delete

The program files can be deleted.
Select the names of the programs to be deleted from the lists. Multiple programs can be selected in the Source and Destination lists. Select the program name in the Source and Destination lists, and click the [Delete] button under these lists. The deletion confirmation message is displayed.

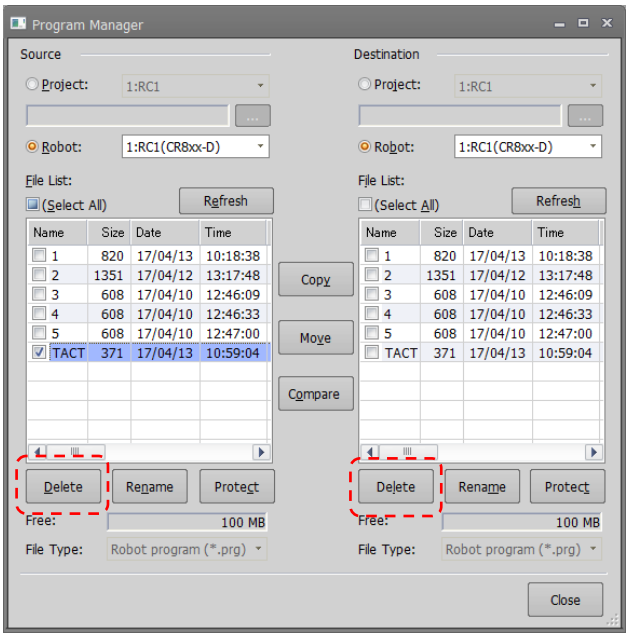


Figure 11-85 Deleting the program

It is possible to delete the program by operating shown blow.
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.

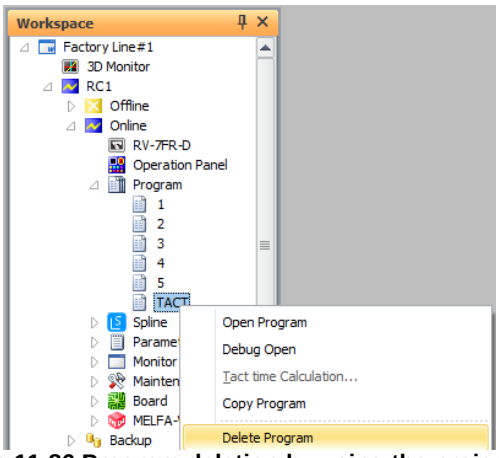


Figure 11-86 Program deletion by using the project tree

A program which is set with “Reading protection” cannot be deleted.

Caution

It is not possible to delete the program which is being edited.

When you delete the program which is being edited, an error message is displayed. Finish the edit before deleting the program.

Caution

Once the program files are deleted, they cannot be recovered.

11.13.5. Rename

This renames a program file name.
Select the name of only one program to be renamed from the lists. Programs can be selected in the Source and Destination lists. Click the [Rename] buttons under the Source and Destination lists, set the new name in the [Setup for Rename] dialog, and click the [OK] button to rename the program.

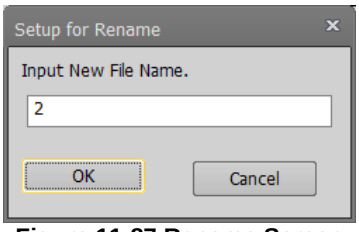


Figure 11-87 Rename Screen

A program which is set with “Reading protection” cannot be renamed.

11.13.6. Protect settings

The program files in the controller can be protected. Settings can be made to protect the entire program file or just the command statements or position variables, as well as protection against readout, and protection release is possible
You cannot move, delete, or rename a protected file. Release the protection prior to any of these operations.
Select the names of the programs to be protected from the lists. Multiple programs can be selected in the Source and Destination lists. Click the [Protect] buttons under the Source and Destination lists, set the protect details in the [Setting for protect] dialog, and click the [OK] button to protect the program details.

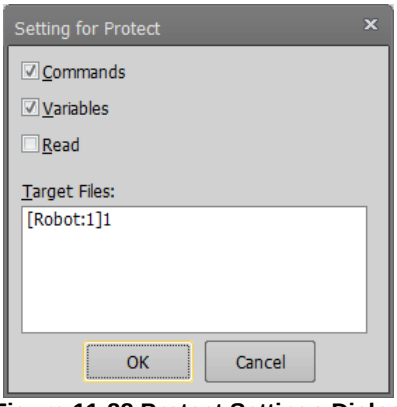


Figure 11-88 Protect Settings Dialog

Caution

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

If you change the “Read protection status, the following “Register a reading password” or “The reading password delete” screens are displayed. Input the password to register or delete and click the [OK] button.

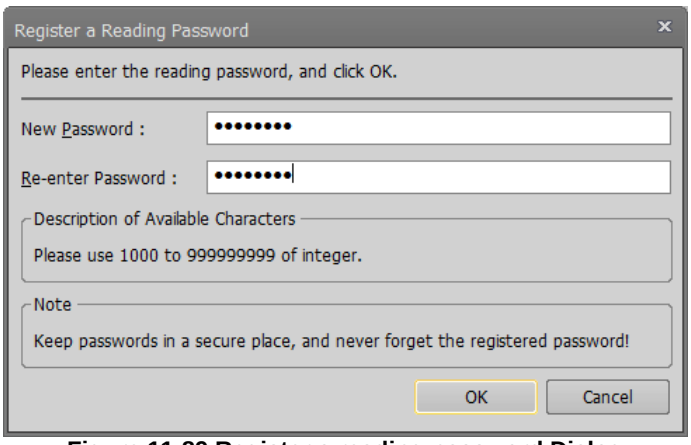


Figure 11-89 Register a reading password Dialog

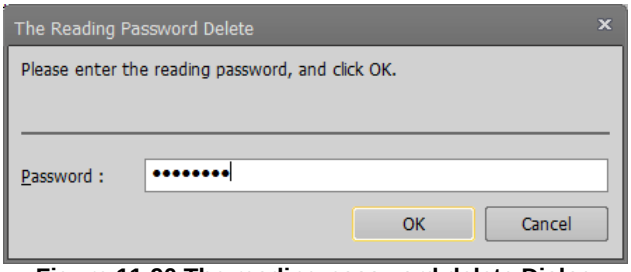


Figure 11-90 The reading password delete Dialog

11.13.7. 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 and the [Setting for compare] dialog set. The results are shown in the [Compare result] dialog.
The selected program can be opened in the program edit screen by selecting the program line by the list controls on either the left or right, and clicking the [Edit] button or double-clicking the program line.

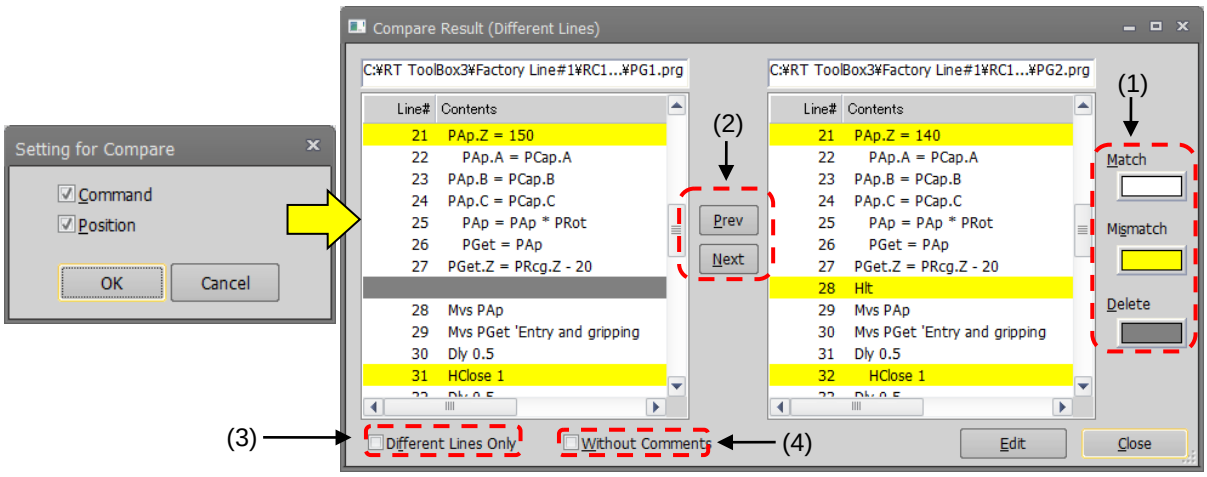


Figure 11-91 Program Comparison Settings and Comparison Results

A program which is set with “Read protection” cannot be compared.

You can select the background color of matching, mismatching and deleted lines.

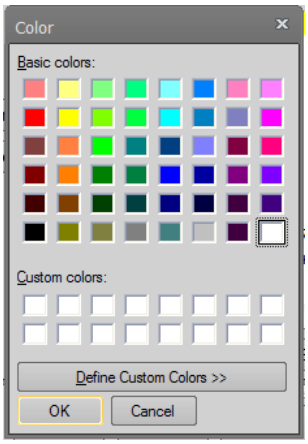


Figure 11-92 Setting the Color for Program Comparisons

Move the selected line to the change location (mismatch or delete).
Clicking the [Prev] button selects the change location in the line before the current position.
Clicking the [Next] button selects the change location in the line after the current position.

By the [Different lines only] checkbox, you can select to display all lines targeted for comparison or only different lines.

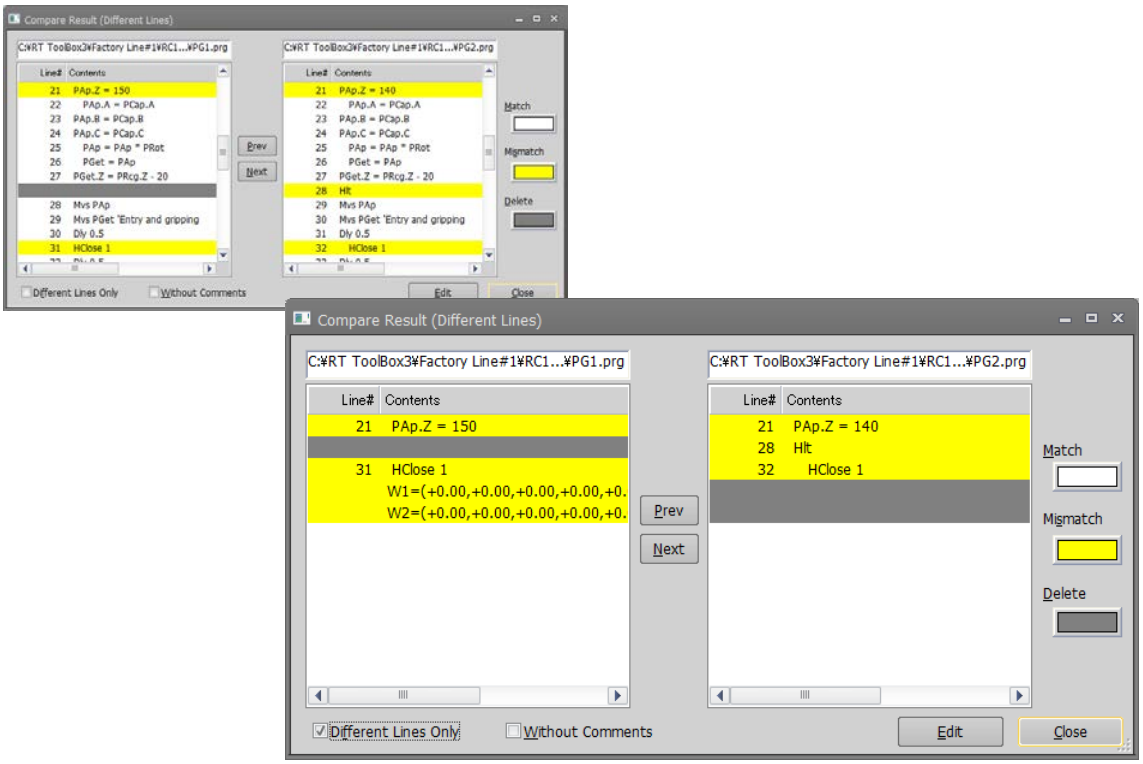


Figure 11-93 Compare Results (Different Lines Only Display)

By the [Without comments] checkbox, you can select to exclude or include comments in the compare result.

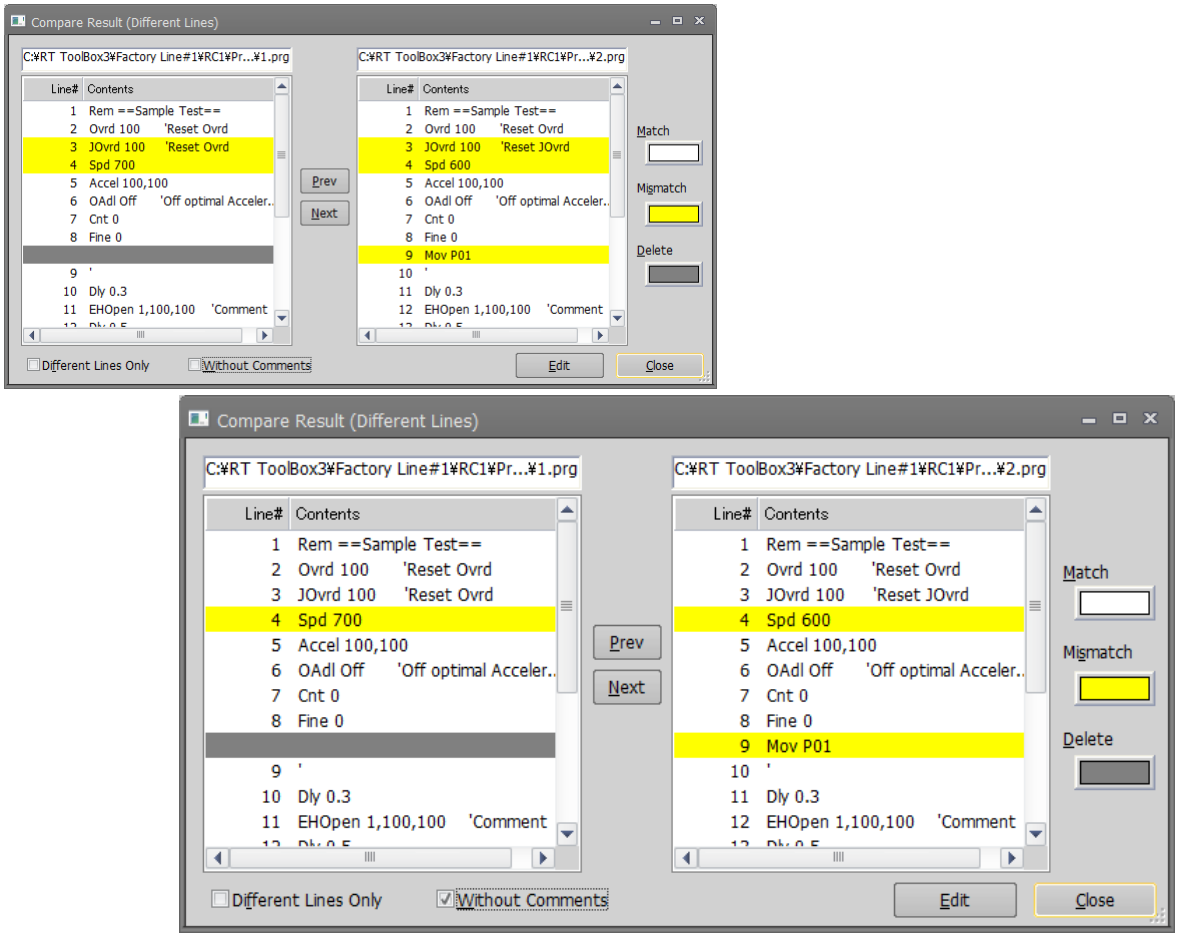


Figure 11-94 Compare Results (With Comments Excluded)

11.14. Program Conversion

Existing offline robot programs created in a different program language can be converted to the currently set program language.

Table 11-7 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/VI	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 **"11.14.2 Converting line Nos. (from MELFA-BASIC IV to MELFA-BASIC V or VI)", "11.14.3 Position data conversion (from E/EN/M1/M2 series to CR800/750/700/500 series)"**.

(1) Conversion of the line Nos.
Converts the line Nos. and relevant command line, because the handling of line Nos. in MELFA-BASIC IV is different from MELFA-BASIC V/VI.

(2) Conversion of the position data
Converts the format of position data and relevant commands, because the configuration of the E/EN/M1/M2 E/EN/M1/M2 series controller’s position data is different from the CR800/750/700/500 series controller’s.

11.14.1. 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.

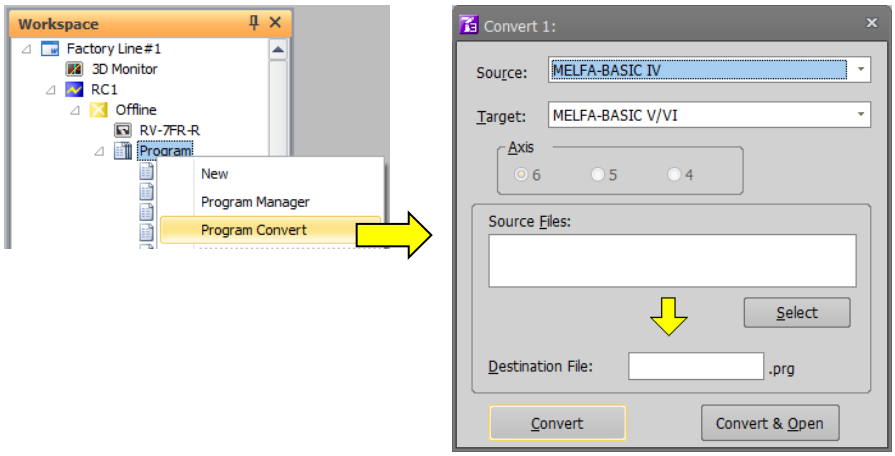
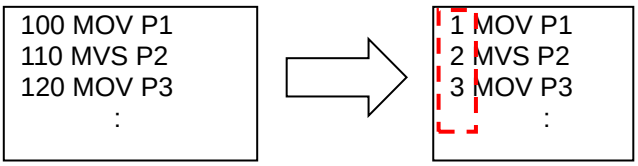


Figure 11-95 Starting Program Conversion

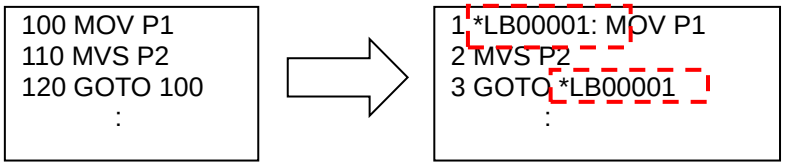
11.14.2. Converting line Nos. (from MELFA-BASIC IV to MELFA-BASIC V or VI)

Converts the line Nos. and relevant command lines, because the handling of line Nos. in MELFA-BASIC IV is different from MELFA-BASIC V/VI.

For the MELFA-BASIC V/VI, conversion is as follows.
- The line Nos. are converted to step Nos. (Sequential No. starting from 1).



- Line No. jumps are converted label jumps.



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

Convert the program according to the following procedure.

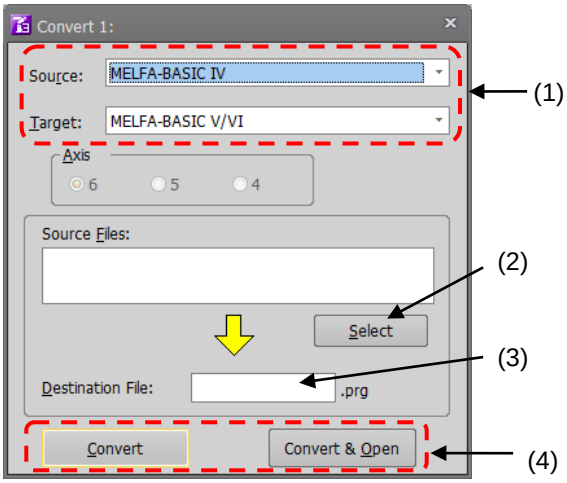
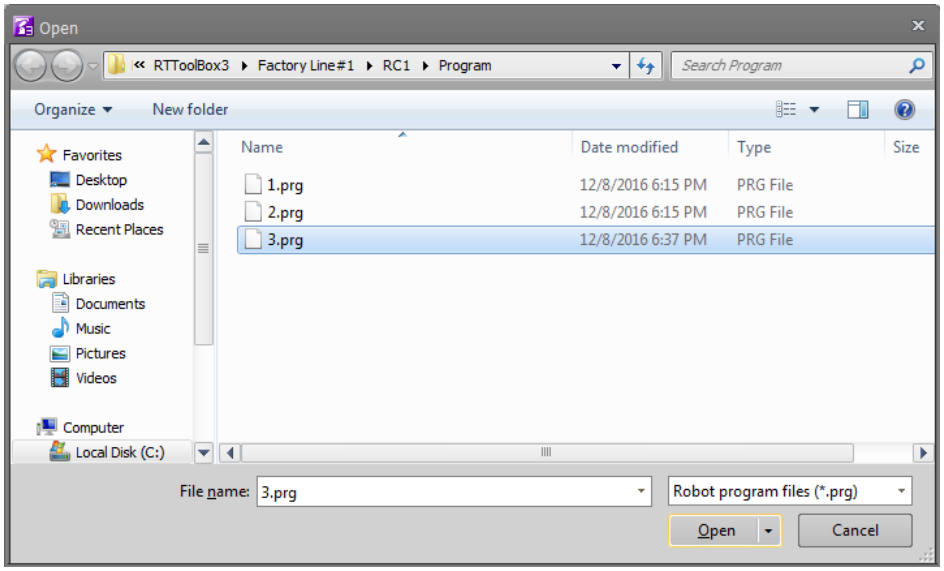


Figure 11-96 Conversion from MELFA-BASIC IV to MELFA-BASIC V/VI

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

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



(3) Input the name of the file to save the converted program into.

(4) 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 a Program edit tool.

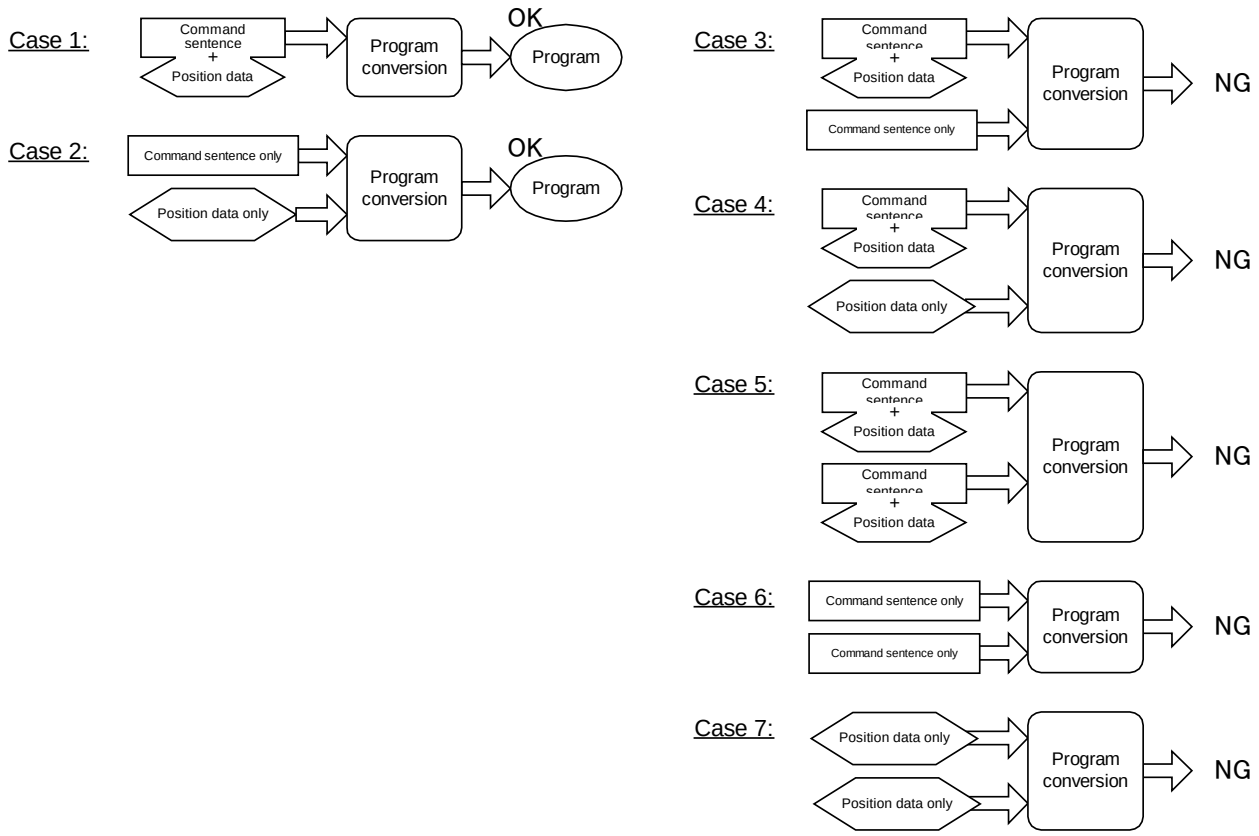
11.14.3. Position data conversion (from E/EN/M1/M2 series to CR800/750/700/500 series)

This function converts the format of position data and the relevant commands (DJ, MP and PD MOVEMASTER commands), because the configuration of the E/EN/M1/M2 series controller's position data is different from the CR800/750/700/500 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 a syntax check using this software before using the E/EN/M1/M2 series program with the CR800/750/700/500 series, and change the commands if necessary.

Note2: The position data of the MOVEMASTER command programs for the M1/M2 series has the base-coordinate rotated 90º. When using the program for M1/M2 with the CR800/750/700/500 series, convert M1/M2 program into an 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 PC support software 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.

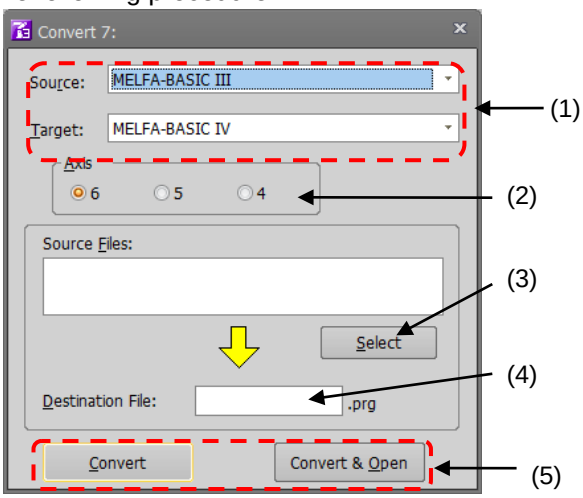
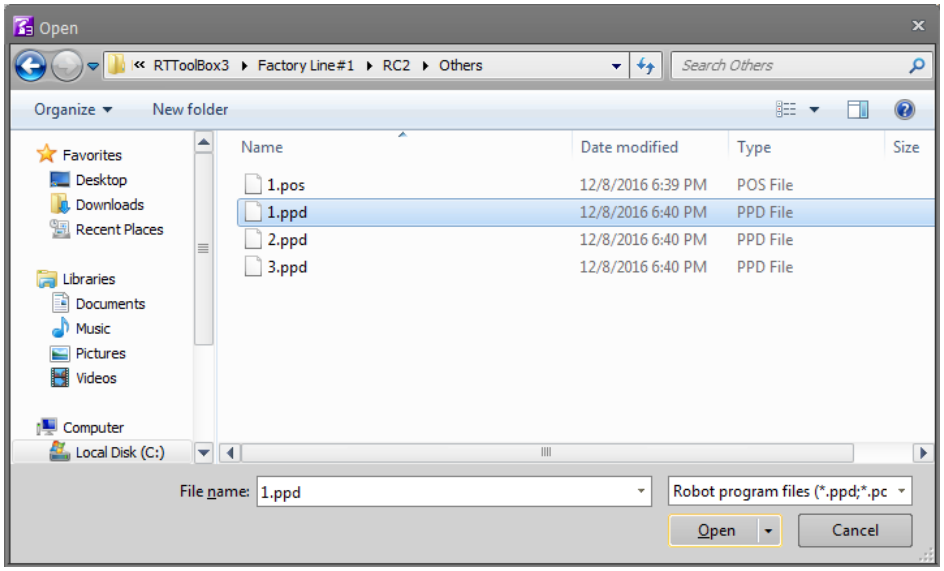


Figure 11-97 Conversion from MELFA-BASIC III to MELFA-BASIC IV

(1) Select the program language of the source and target for conversion.
Startup program conversion in the project set with one of "MELFA-BASIC VI", "MELFA-BASIC V" or "MELFA-BASIC IV", and set the copy destination.
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/VI” is chosen for the target, the line Nos. are also converted in addition to this conversion.

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

(3) Select the source file(s).
Click the [Select] button for the conversion source, and select the E/EN/M1/M2 series program file(s).
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 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 in the Program edit tool.

11.15. Position data editing for SQ Direct

SQ Direct File is available in all versions of CR800-R/CR800-Q series controllers and in software version N8 or later on CR750-Q/CRnQ-700 series controllers. 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.
In the position data editing screen for the SQ Direct, command lines and joint (J) /work coordinate (W) variable lists are omitted unlike the program edit screen.

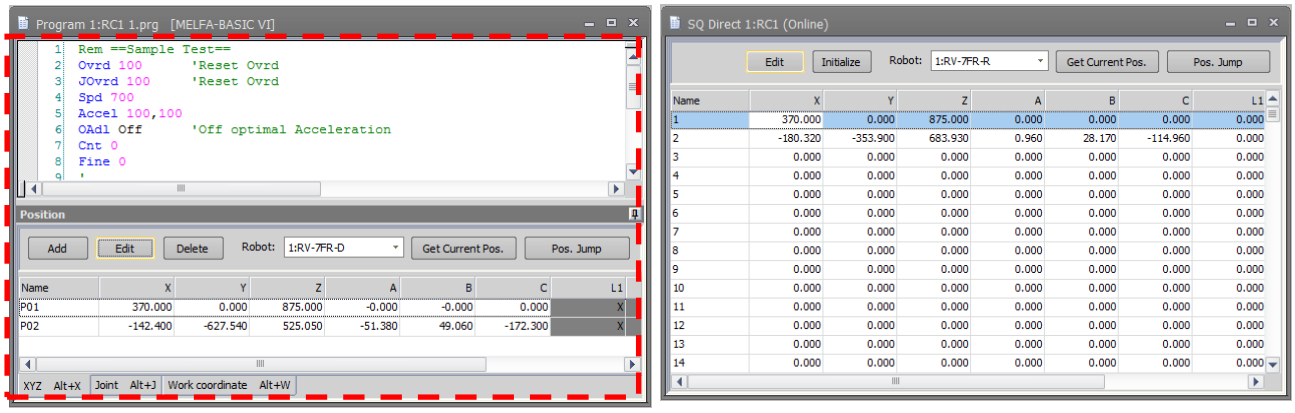


Figure 11-98 Program editing and position data editing screen for SQ Direct

Caution

As editing SQ Direct is similar to XYZ coordinate editing in program editing, the following page explains only the different function. For details on the operations for opening a program, see 11.7 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 written.

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

○ : Enable、 × : Disable

	Item to which password of security function is registered.		
	Program	Parameter	File
Position data writing Position data reading	×	○	○

Delete the password of the robot controller's security function when you operate these. Refer to **"15.5.3 Delete Password"** for the method of deleting the password.
For details on setting security functions (registering passwords) and releasing security functions (deleting passwords) on robot controllers, refer to "**Table 15-12 Compliant version of this function and controller**".

11.15.1. Differences with program editing

11.15.1.1. Edit position data

There are two ways of changing the position data.
[Method (1)] Directly change the list
Select the cell you want to change on the list, and enter the value directly.

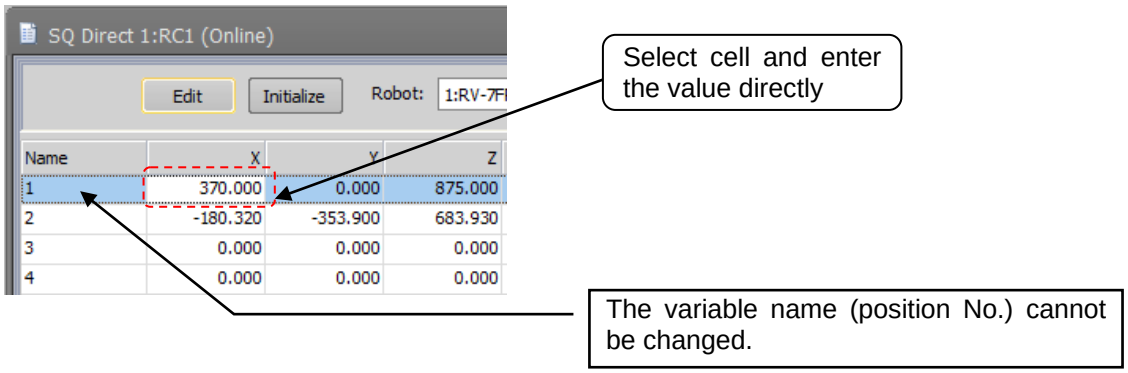


Figure 11-99 Changing the Position Data by Directly Editing the List

[Method (2)] Change in the Edit Position data screen
Select the target position data to be changed from the list and click the [Edit] button. The selected position data is displayed in the Edit Position data screen. Enter each of the element values of the position data, and click the [OK] button.

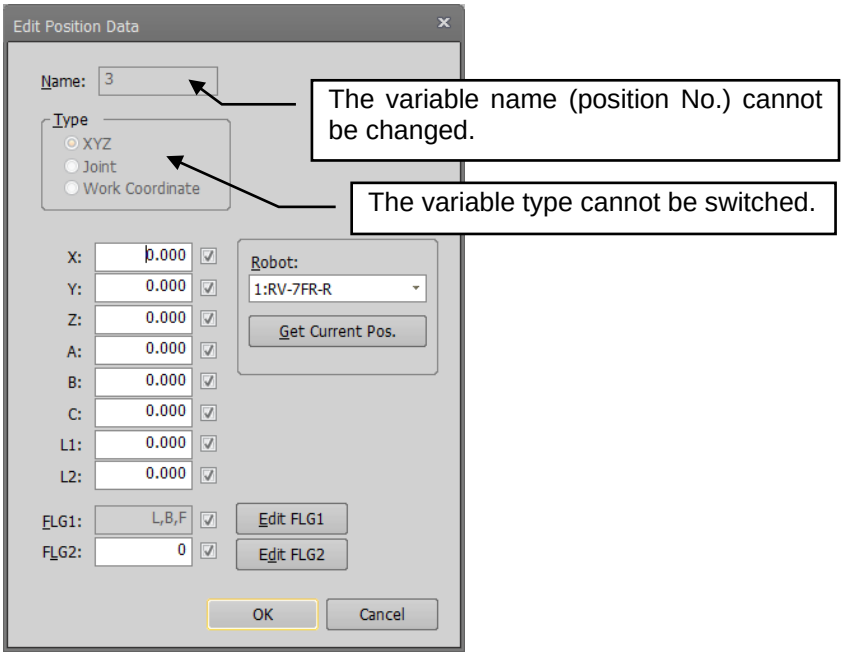


Figure 11-100 Changing the Position Variable in the Edit Position Data Screen

The variable name (position No.) cannot be changed by either method.
When the program is being edited in the online or simulation mode, the current position of the robot can be read by the [Get current pos.] button.

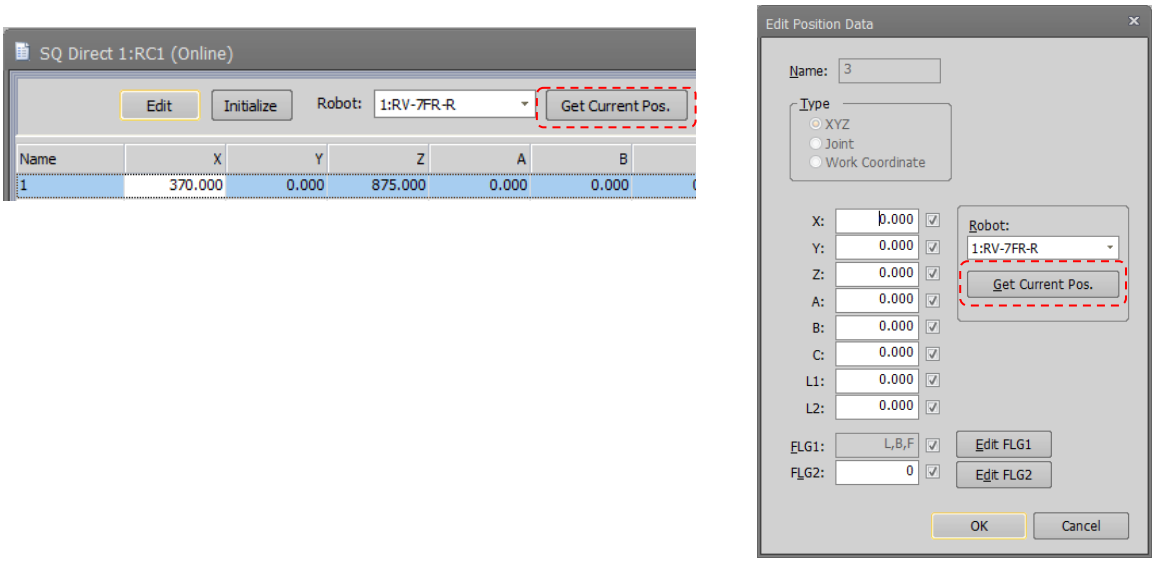


Figure 11-101 Getting the Current Position

11.15.1.2. Initializing position data

Select the target position data to be initialized and click the [Initialize] button. The selected position data is initialized. Multiple position data can also be initialized at the same time. When you click position number with [Ctrl] or [Shift] key pushing, you can select plural position data.

11.15.1.3. Editing support function

The editing support function supports only copying and pasting of position data.

11.15.2. Online editing

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

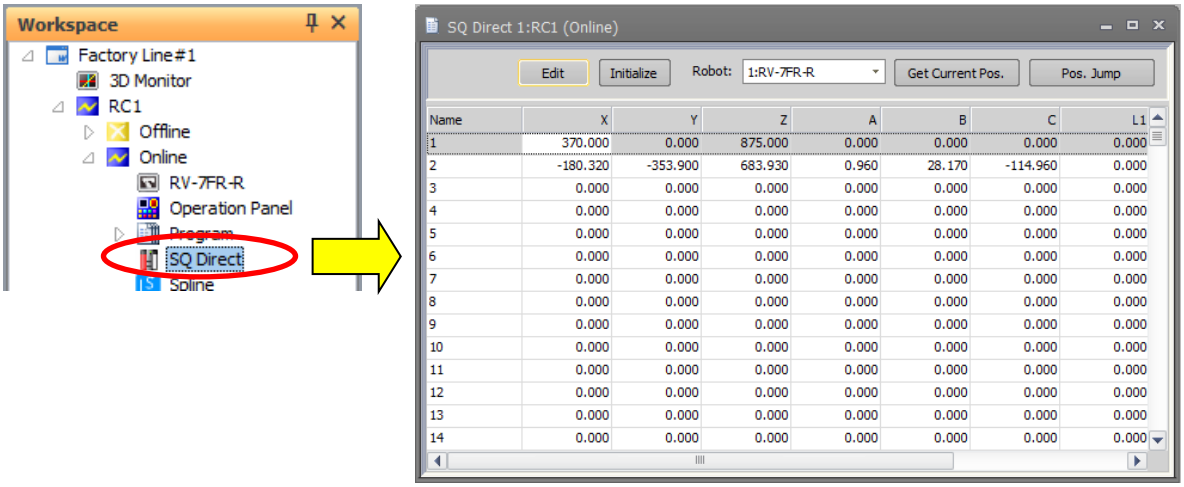


Figure 11-102 position edit screen for SQ Direct (Online)

Caution

Timing from which position data is written.

The timing at which the position data is written by the controller is at the next time the power supply is turned ON.
Turn on the controller power again to use the controller's position data after online edit.

11.15.3. Offline editing

You can edit SQ Direct position data in offline.
Set [R/C-Type] to [CR800-R/CR800-Q/CR750-Q/CRnQ-700] and set [Language] to [MELFA-BASIC V/MELFA-BASIC VI] 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.

11.15.3.1. Creating a 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].

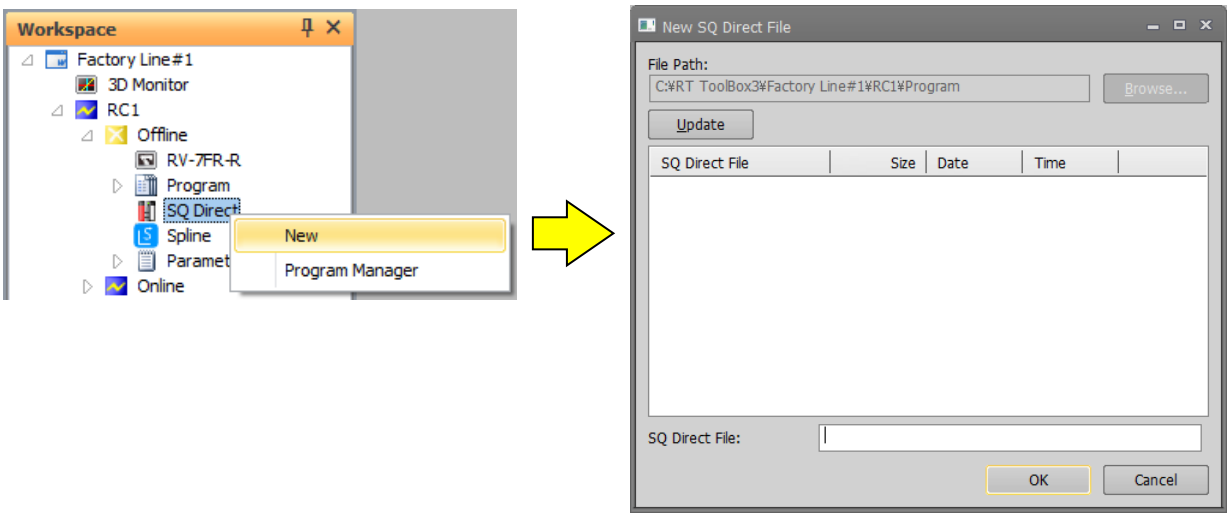


Figure 11-103 In the computer to create a new

Input the SQ Direct file name and click the [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, use the copy function in program management.

11.15.4. 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.

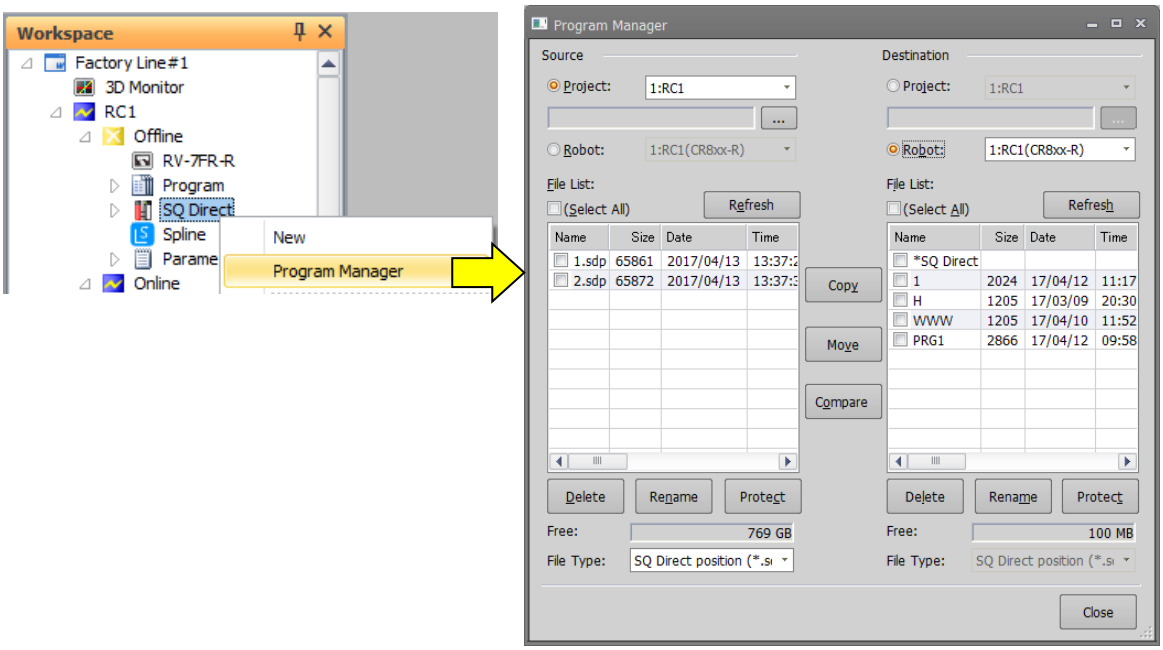


Figure 11-104 Launch program manager

Caution

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

Caution

Position data 1 to 999 in the robot files for SQ Direct is shown as [*SQ Direct] in the program manager.
“ * ” is to prevent customer from using as a file name by mistake.
Keep in mind that this differs in meaning from the “*” indicating “all”.

11.15.4.1. List of SQ Direct files

When using SQ Direct, there are some differences in the program management screen.

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

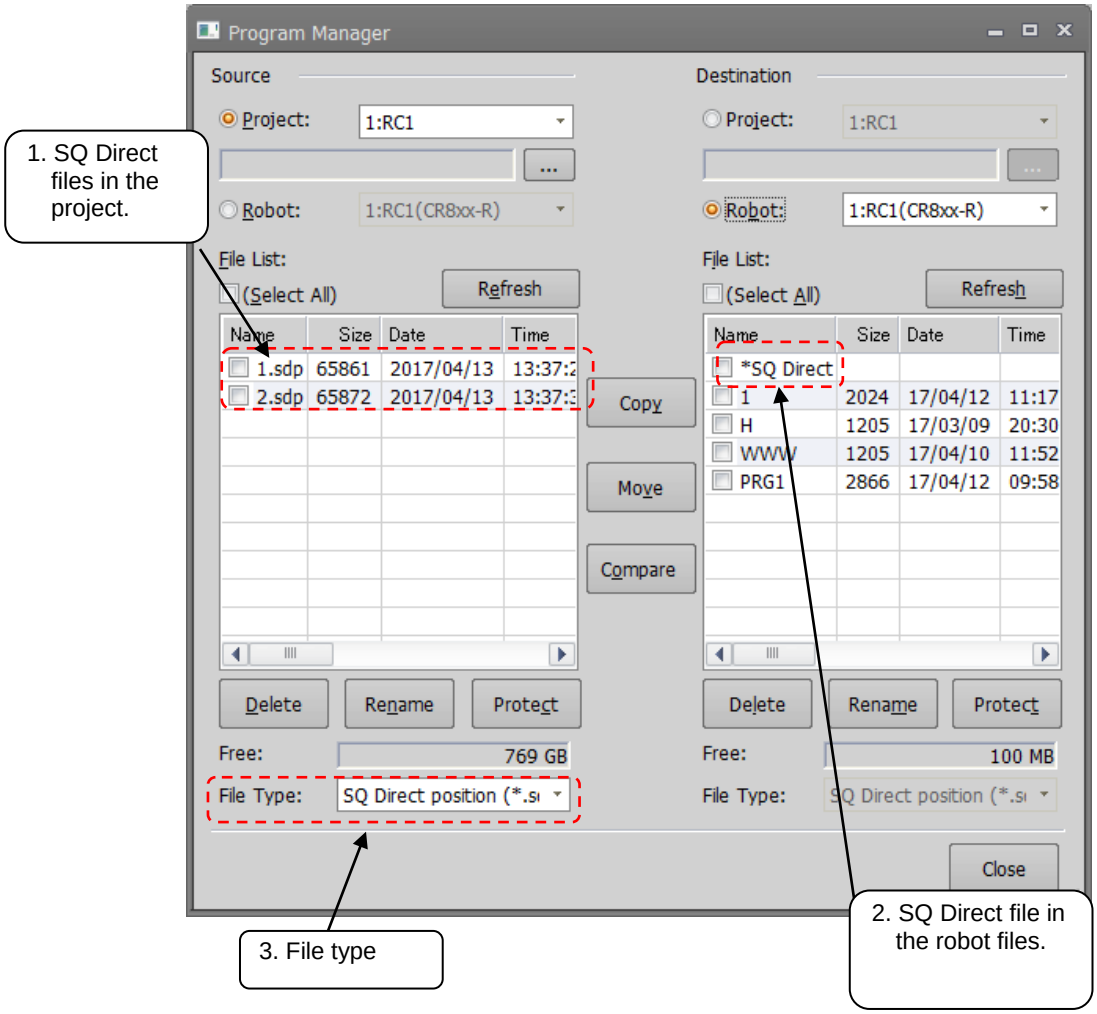


Figure 11-105 List of SQ Direct files indication

Restrictions

SQ Direct files in the personal computer are handled similarly to as robot program files, but there are some restrictions.

⚠ Caution

There are some limitations to operate SQ Direct Files.

SQ Direct file names are fixed as [*SQ Direct] in the controller.
File names can set freely in the project. But sdp is the only extension.

○ : Operable × : NOT operable

Function	Operable	
	Robot	Project
new	×	○
open	○	○
delete	×	○
init	○	×
protect	×	×
rename	×	○
compare	○	○

Function		Operable	Remarks
Copy	robot to robot	×	
	robot to project	○	Rename file to copy. Multiple files cannot be copied.
	project to robot	○	File name of controller is fixed as [*SQ Direct]. Multiple files cannot be copied.
	project to project	○	Rename the file to copy the same project.
Move	robot to robot	×	
	robot to project	×	
	project to robot	×	
	project to project	○	

12. Creating the spline files

The methods for creating the spline files for use in the spline interpolation function are explained below.
For details, refer to the instruction manual **"Detailed explanations of functions and operations 7.6 Spline interpolation"**.

12.1. New file

12.1.1. Creating a new file on the computer

Select [Offline] or [Simulation] -> [Spline] for the new project to be created, and click the mouse right button. The context menu will open. Click [New] and open the spline file edit screen.

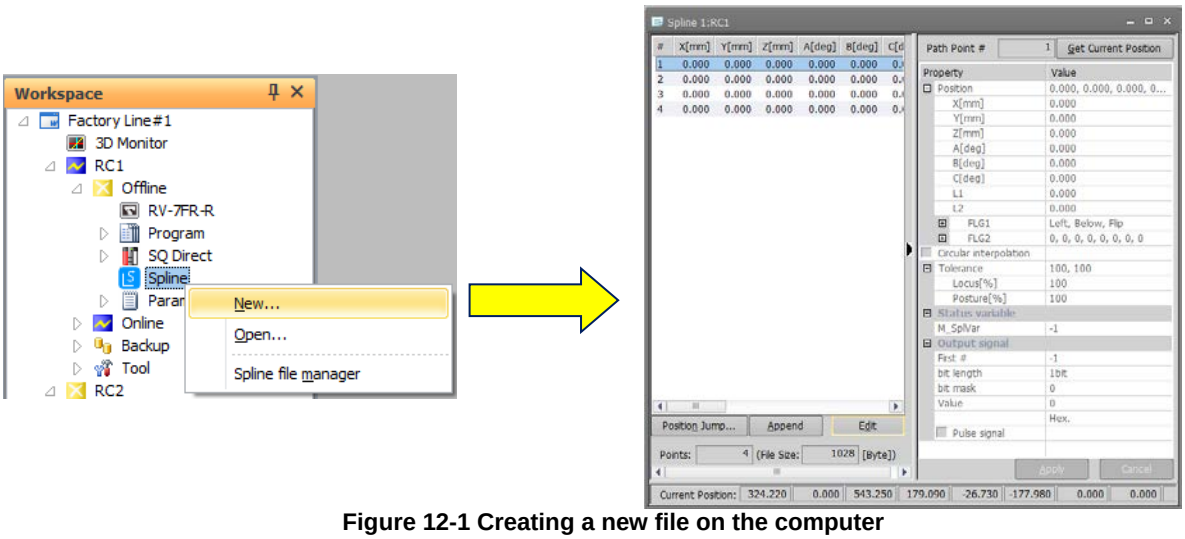


Figure 12-1 Creating a new file on the computer

12.1.2. Creating a new file in the robot controller

Select [Online] -> [Spline] for the project to be newly created, and click the right mouse button. The context menu will open. Click [New] and open the spline file edit screen.

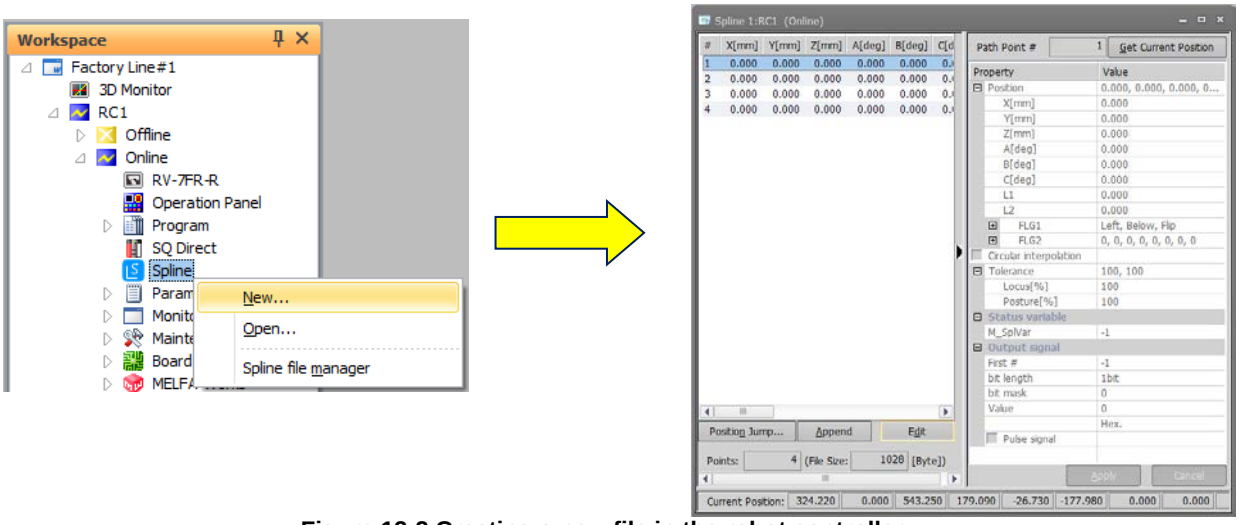


Figure 12-2 Creating a new file in the robot controller

12.2. Open file

12.2.1. Opening a spline file saved on the computer

Expand [Offline] or [Simulation] -> [Spline] for the target project. The saved spline files will appear in the project tree. Double-click the spline file to be edited.

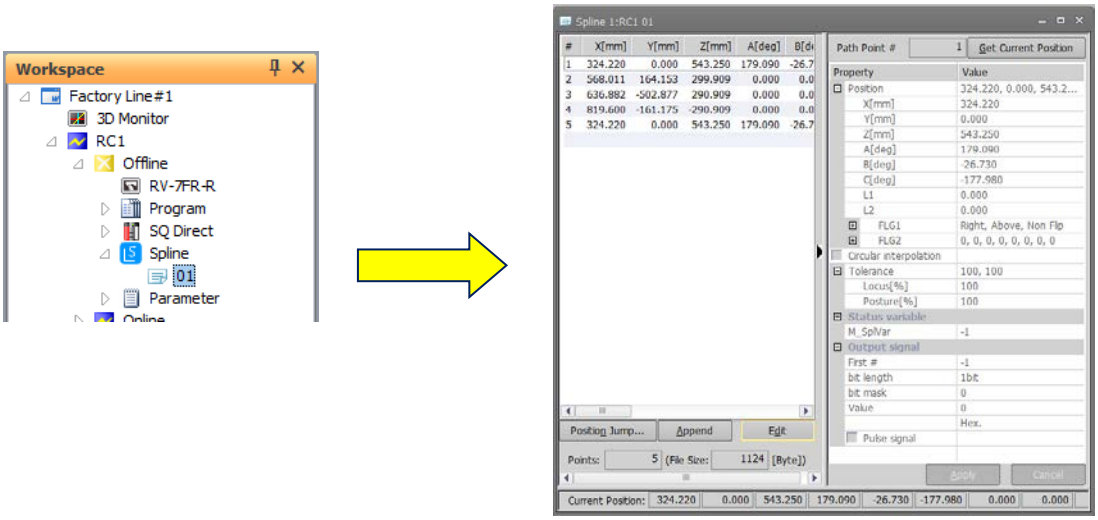


Figure 12-3 Opening a spline file saved on the computer

12.2.2. Opening a spline file saved in the robot controller

Select [Online] -> [Spline] for the target project and expand it. The spline files saved in the controller will appear in the project tree. Double-click the spline file to be edited.

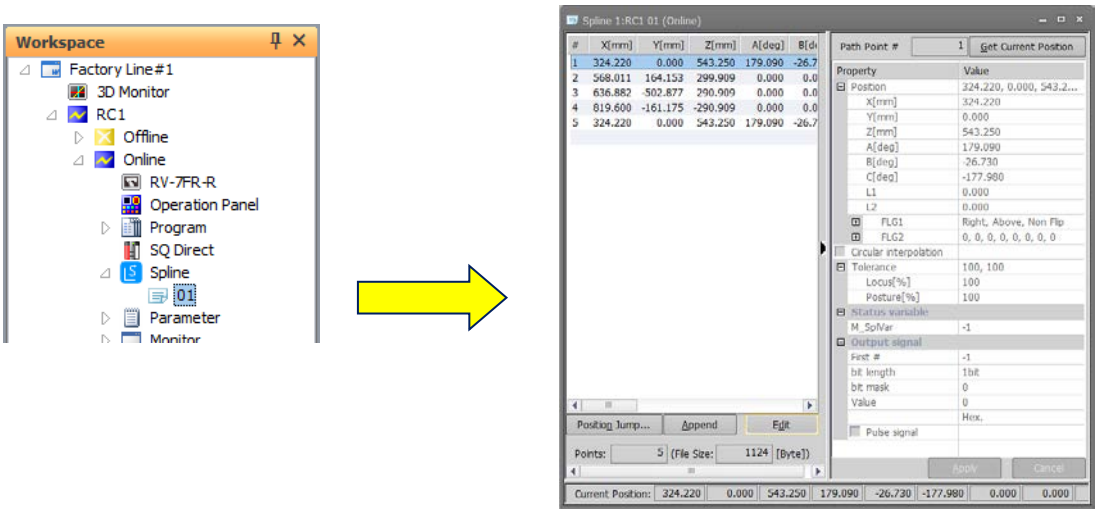


Figure 12-4 Opening a spline file saved in the robot controller

12.2.3. Selecting and opening a spline file from the list

Select [Spline] from the project tree and click the right mouse button. The context menu will open. Click [Open]. A list of saved spline files will appear. Select the target spline file and click the [Open] button.

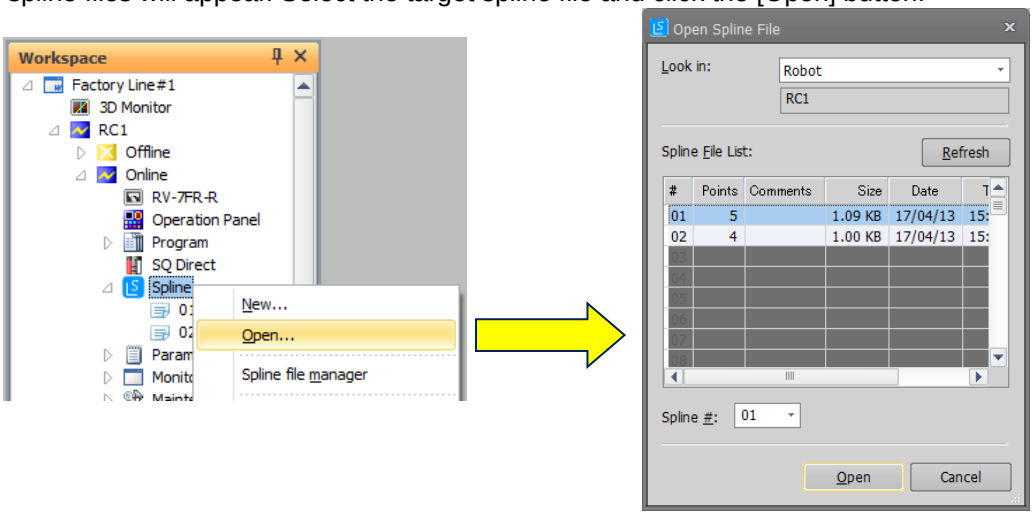


Figure 12-5 Selecting and opening a spline file from the list

12.3. Save file

12.3.1. Save

To save edits to a spline file, click the [File] tab -> [File] group -> [Save] button on the ribbon. The Save spline file screen will open when a new spline file is created.

12.3.2. Save as

By clicking the [File] tab -> [File] group -> [Save As] button on the ribbon, the Save spline file screen appears.

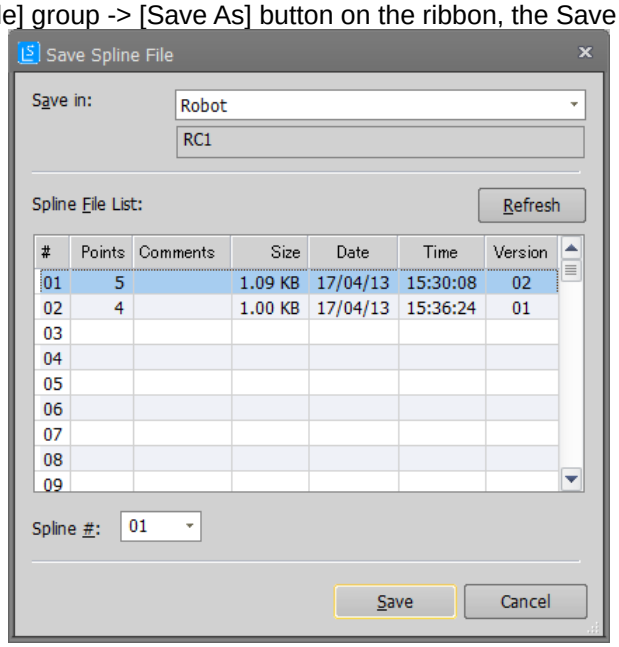


Figure 12-6 Save spline file screen

Select the destination from [PC] (save to the computer) or [Robot] (save to the robot controller). Select the number of the spline file to be saved from the [Spline file list], and click the [Save] button.

13. Setting Parameters

You can reference and rewrite parameter information set on a PC / a robot controller / back up data(*1).
You can set parameters by specifying parameter names and setting them or by making the settings on a per-function basis.

(*1) Parameter setting of backup data is supported in Ver. 1.30G or later.

⚠ Caution

When the password is registered in parameter by the robot controller security function, it is not possible to rewrite the parameters on the robot controller.

When the password is registered in parameter by the robot controller security function, it is not possible to rewrite the parameters on the robot controller.

○ : Enable、× : Disable

	Item to which password of security function is registered.		
	Program	Parameter	File
Rewrite of parameters on robot controller	○	×	○

Delete the password of robot controller's security function when you operate these. Refer to **"15.5.3 Delete Password"** for the method of deleting the password.
It is possible to read the parameters even if the security function has been turned on.
Refer to **"Table 15-12 Compliant version of this function and controller"** for the robot controller's compliant version.

To set parameters on a PC, select [Offline] or [Simulation] -> [Parameter] for the target project from the project tree. Parameters on the PC are handled in common at [Offline] and [Simulation].
To set parameters on the robot controller, select [Parameter] under [Online].
To set parameters on the back up data, select [Backup]->[All / Parameter]->[Parameter].
When [Parameter] item is expanded, items for starting up each parameter setting screen is displayed.

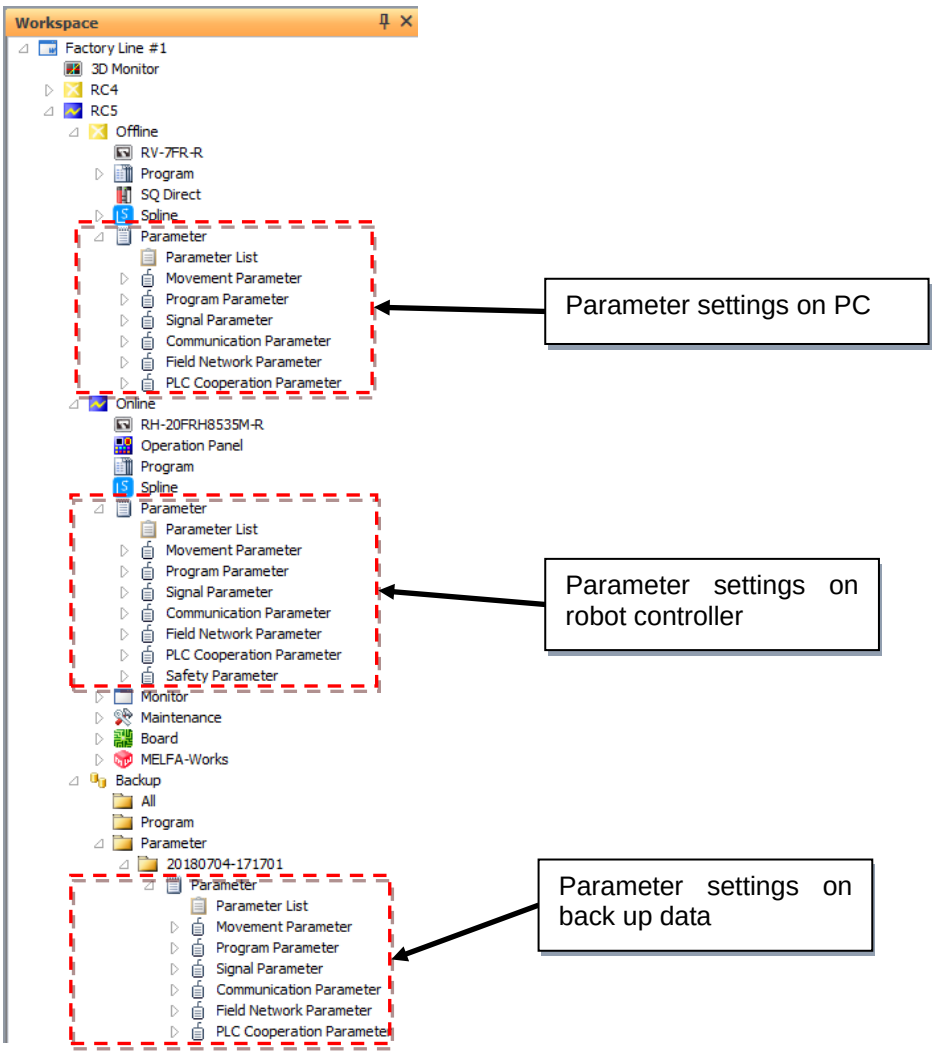


Figure 13-1 Items for Starting Up Parameter Setting Screens

13.1. 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.

13.1.1. Starting

This is used in a state with the robot controller connected.
Double-click [Parameter list] under the [Parameter] item to be edited from the project tree.

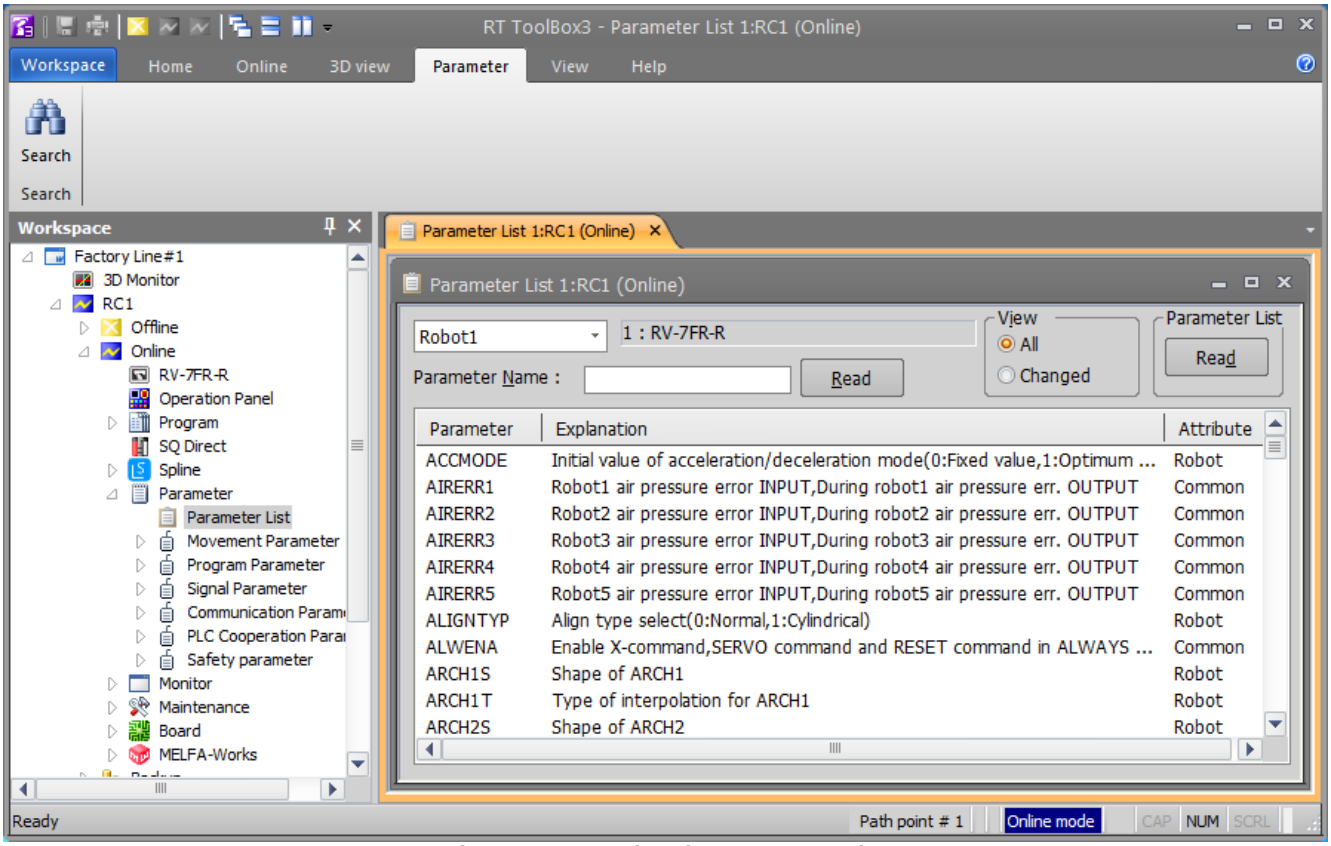


Figure 13-2 Starting the Parameter List

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

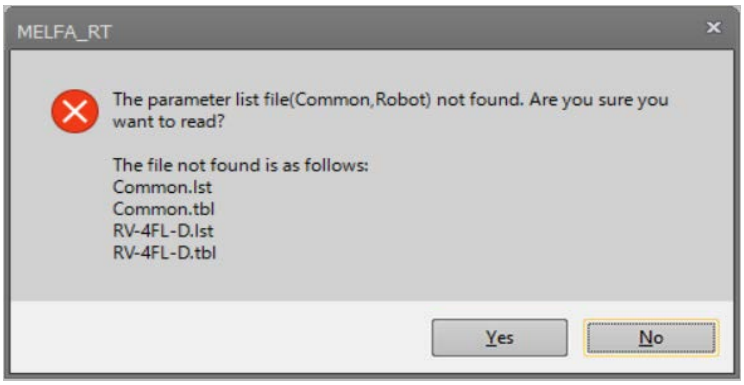


Figure 13-3 Confirmation Message for Parameter List

This window will appear in the following cases.

- When there is no parameter list information on 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 according to 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.

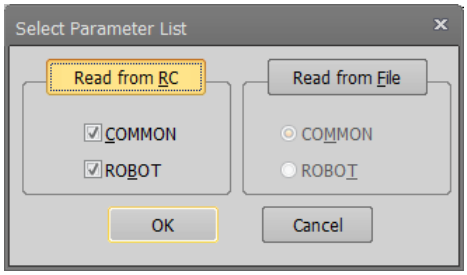


Figure 13-4 Parameter List Select Screen

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

13.1.2. 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.

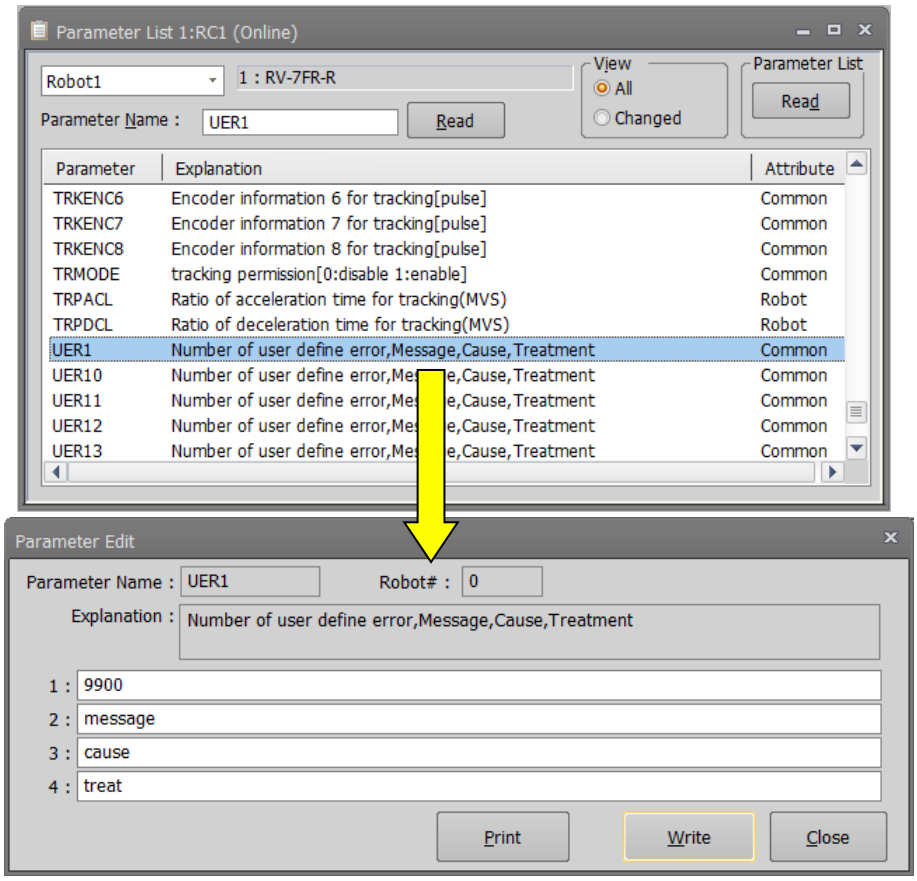


Figure 13-5 Parameter Editing

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.

13.1.3. Edit of parameter changed from default value

It is possible to confirm the changed parameter by displaying the list of parameter changed from a default value. This function is limited to this software version and the software version of the connected controller. Please refer to the table as follows.

Table 13-1 Compliant version of this function and controller

	Software version of robot controller			
	CR800-D/R/Q	CR750-D/CRnD-700	CR750-Q/CRnQ-700	CRn-500
Combination with this software	All versions	Ver.P6 or later	Ver.N6 or later	not used

The button for the display switch is not displayed in the upper part of the screen for “not used” combinations.

When the parameter list is displayed after connecting with a 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" is selected. When "Changed" is selected, the list of the parameters that have been changed from the default value is displayed.
(However, according to the specification of the robot type, some parameters might be changed before shipment.)

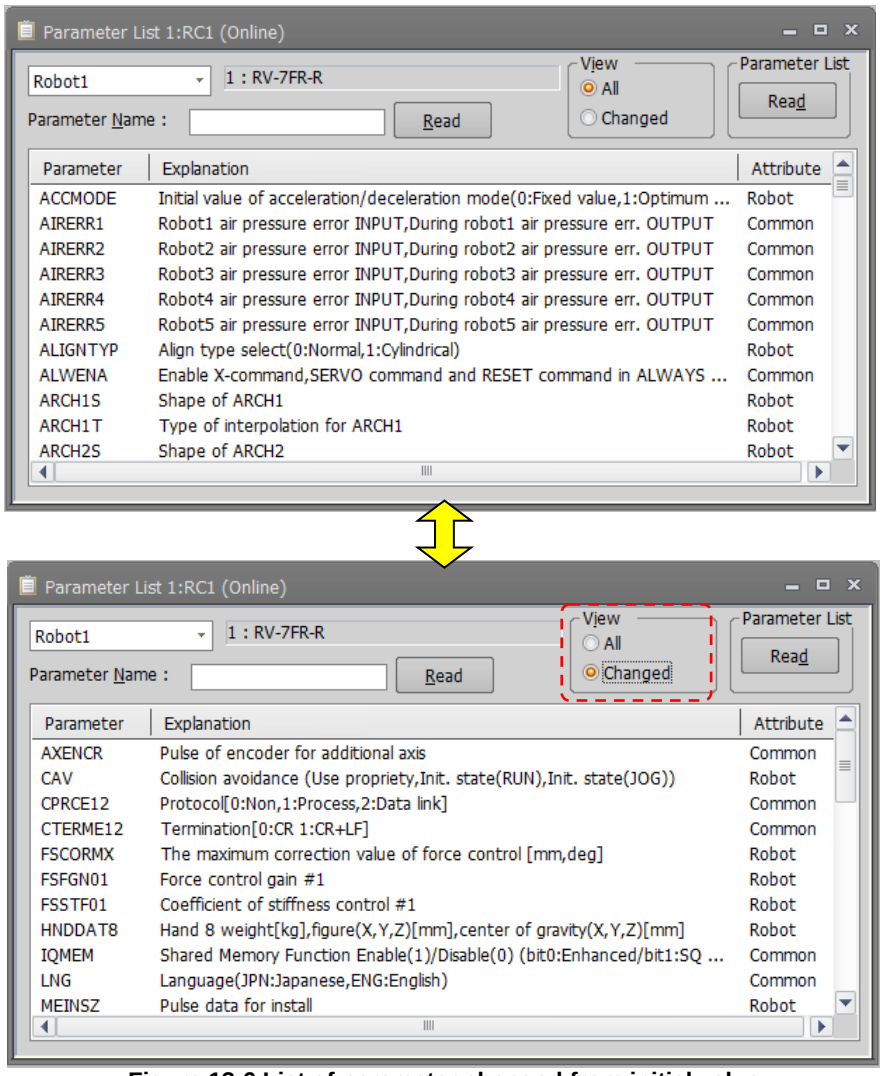


Figure 13-6 List of parameter changed from initial value

It is possible to print only the parameters changed from initial value. Please refer to **"13.11 Parameter printing”** in this manual for details.

13.1.4. 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 Select parameter list screen is displayed.

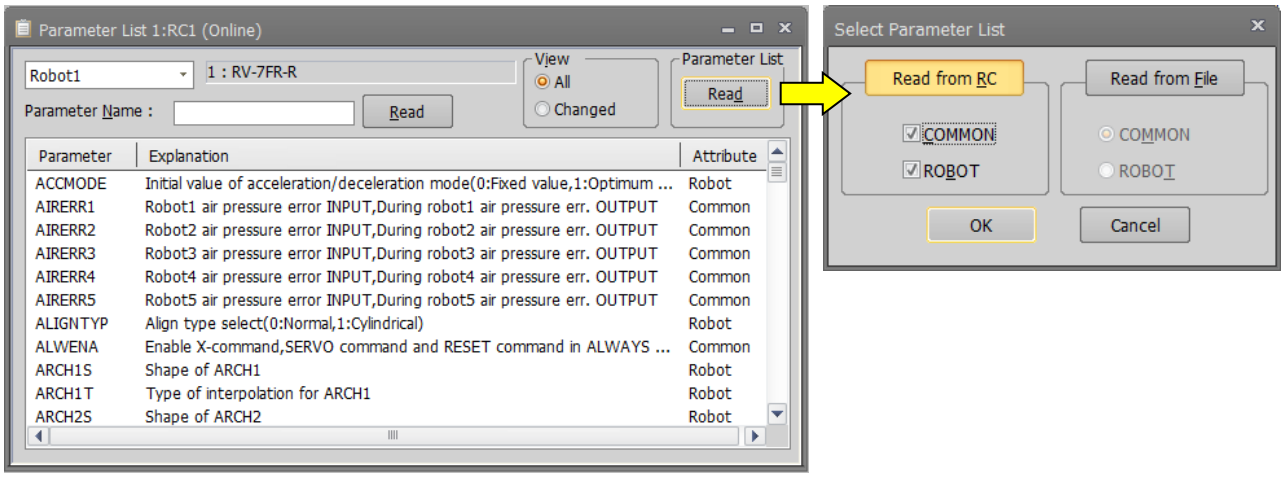


Figure 13-7 Parameter List Reading

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

13.1.5. Finding parameters

You can find a character string in the displayed parameter list. With the "Parameter list" screen active, click the [Parameter] tab -> [Find] group -> [Find] button on the ribbon. The character string Find screen is displayed.

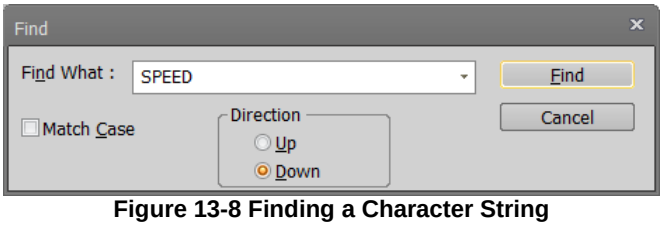


Figure 13-8 Finding a Character String

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

13.1.6. Sort parameters

By clicking an item in the parameter list, you can sort the items you clicked in ascending or descending order.

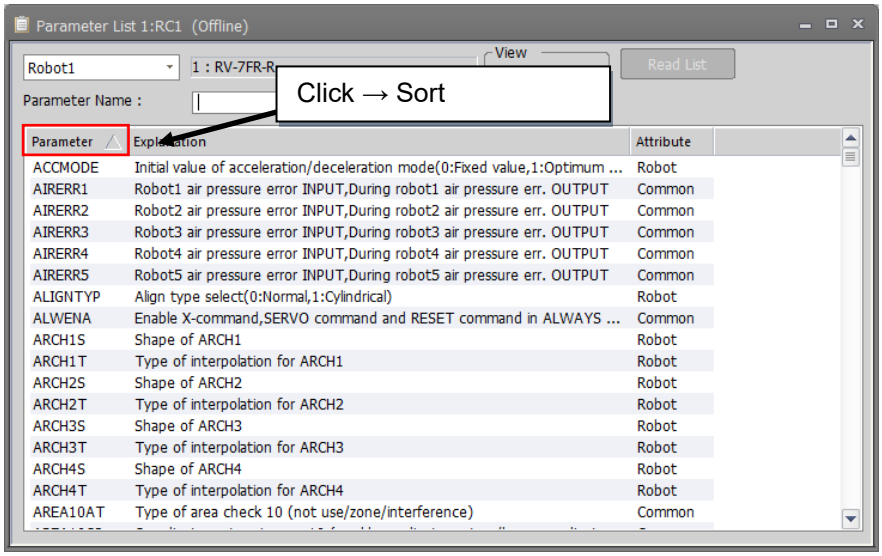


Figure 13-9 Sort parameters

13.1.7. Parameter initialization

The initialization of parameters can be implemented by two types of methods.

(1) Initialize individually
Select the parameter and open the parameter editing dialog. Click the initialization button at the bottom left of the dialog to initialize the parameter.

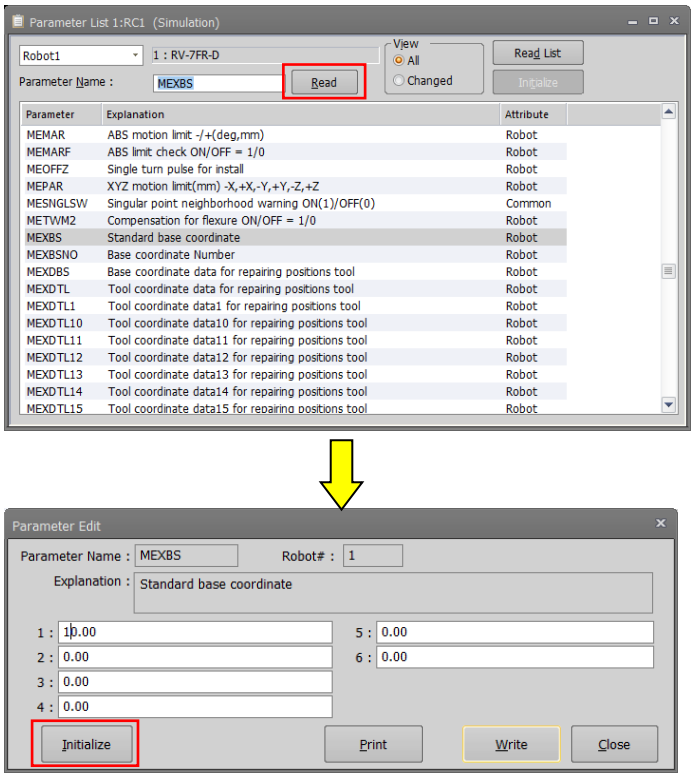


Figure 13-10 Parameter initialization

(2) Initialize the changes altogether

Select [Changed] and click the [Initialize] button. Select the parameters to be initialized and click the [OK] button.

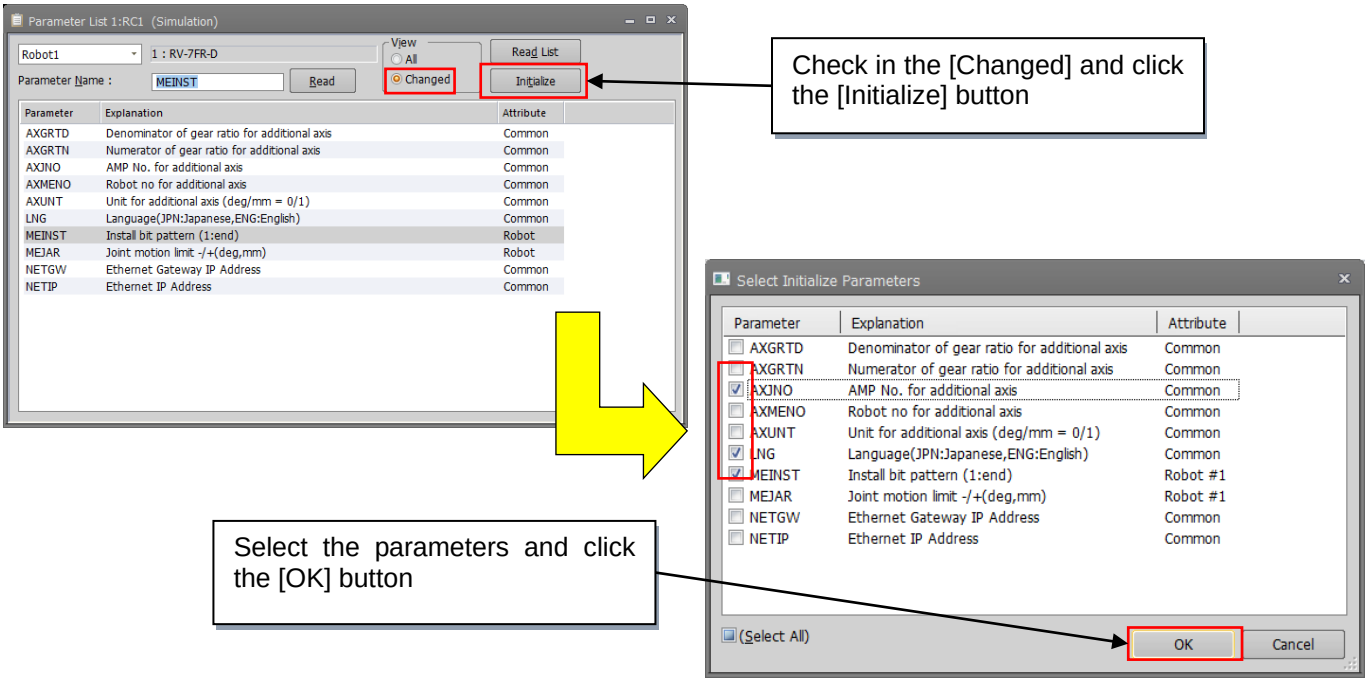


Figure 13-11 Initialize the changes altogether

13.2. Robot Controller Operation Modes for Parameter Writing

With CRn-500 series robot controllers, when you write parameters to the robot controller, the 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 where a startup condition other than Always has been started. In such a case, stop the program, then write the parameters.

Table 13-2 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

13.3. Movement Parameters

13.3.1. Motion limit parameter

This sets the operating range of the robot
Set the parameters while connected to the robot controller.
Double-click [Movement parameter] -> [Motion Limit] under the [Parameter] item to be edited from the project tree.
After you change the parameter value, you can rewrite the motion limit parameter in the robot controller by clicking the [Write] button.

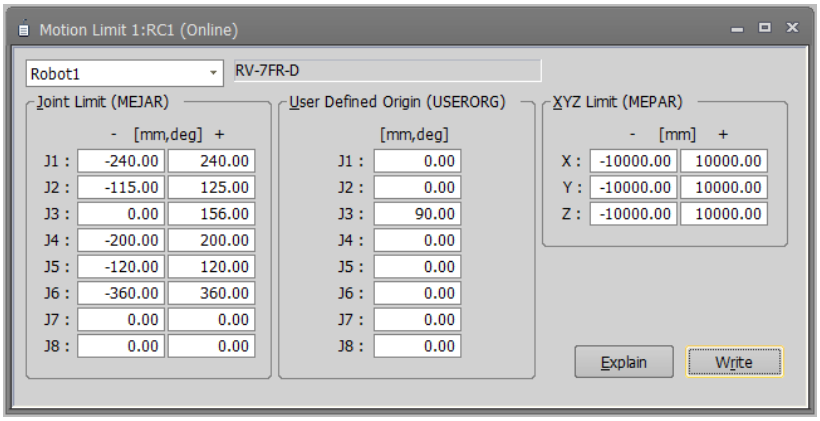


Figure 13-12 Motion limit parameter

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

13.3.2. Jog parameter

This sets the speeds for joint jogging and orthogonal jogging.
Set the parameters while connected to the robot controller.
Double-click [Movement parameter] -> [Jog] under the [Parameter] item to be edited from the project tree.
After you change the parameter value, you can rewrite the jog parameter in the robot controller by clicking the [Write] button.

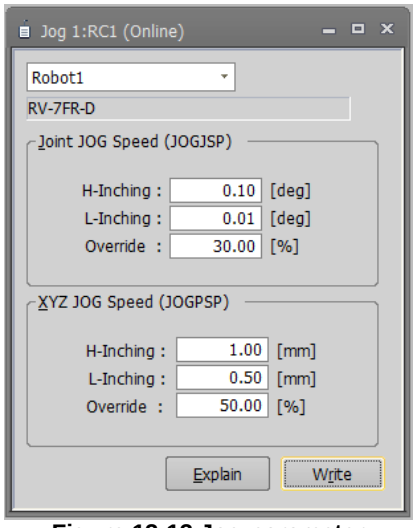


Figure 13-13 Jog parameter

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

13.3.3. Hand Parameters

This sets the parameters for the Hand of the robot.

13.3.3.1. Hand parameter

This sets 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.
Double-click [Movement parameter] -> [Hand] -> [Hand] under the [Parameter] item to be edited from the project tree.
After you change the parameter value, you can rewrite the hand parameters in the robot controller by clicking the [Write] button.

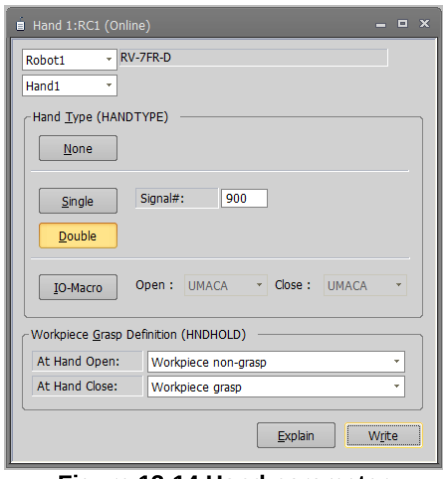


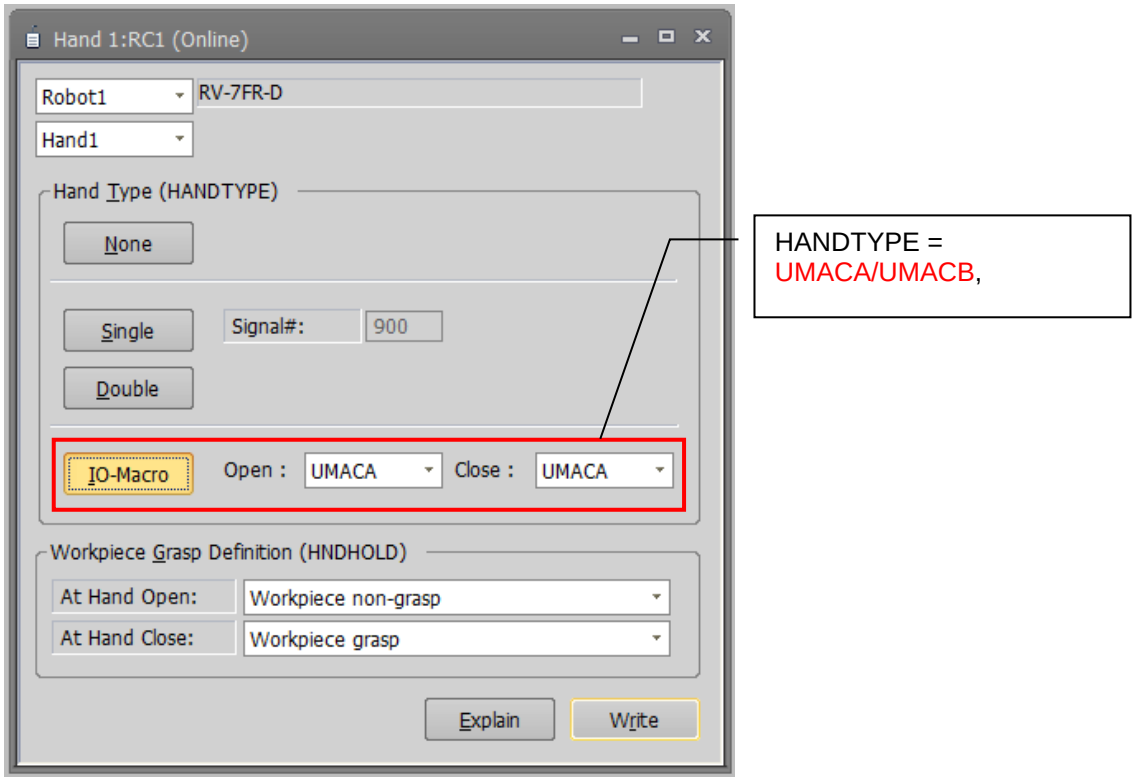
Figure 13-14 Hand parameter

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

Hand macro functions

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

1. Parameter setting



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

L_UMACB subroutine is executed on the close operation of hand 1

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

Figure 13-15 Hand macro settings

13.3.3.2. Multi-hand base parameter

You can set multi-hand base model name and standard coordinate values for each hand.
When connecting robot and the robot controller supports multi-hand function, items related to multi hand are displayed in the project tree.
For robots and robot controllers that can use multi hand base, please see"**Table 13-3 The controller that can use parameters about multi-hand tool"**.

Parameter settings are used while connected to the robot controller.
From the project tree, you double-click [Movement Parameter] -> [Hand] -> [Multi-Hand Base] under [Parameter] item to be edited.
After changing the parameter value, you click the [Write] button to write the parameters to the robot controller.

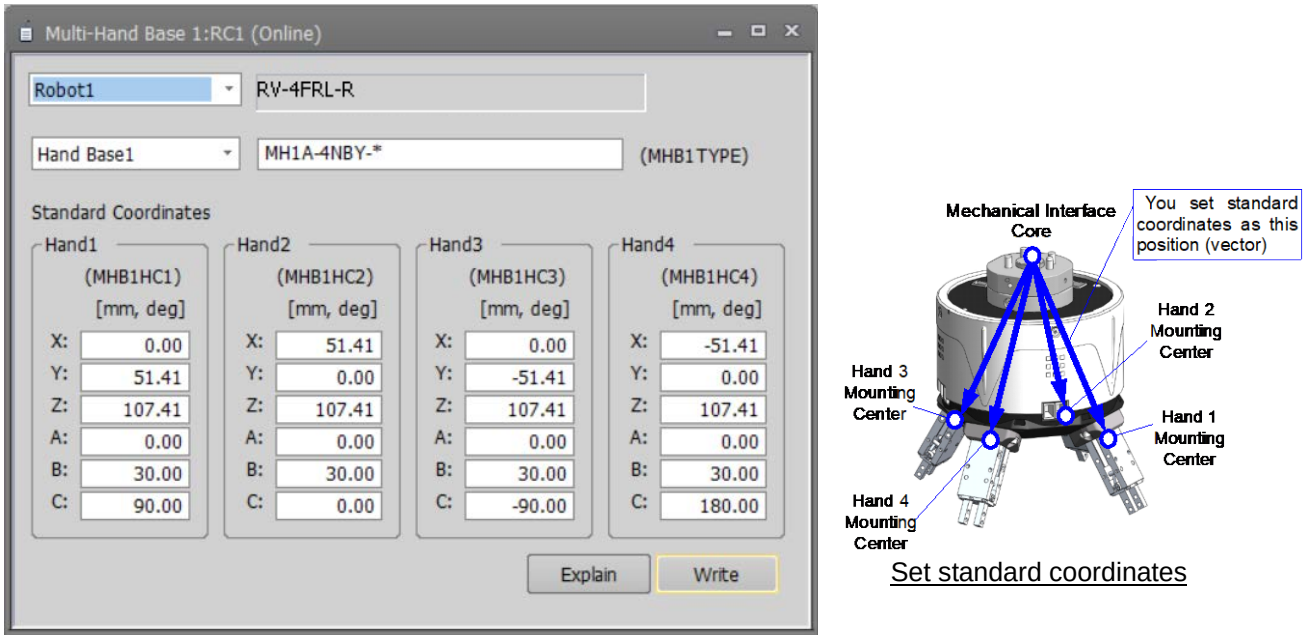


Figure 13-16 Multi-hand base parameter

You can refer to the explanation of the displayed parameter with the [Explain] button.

This parameter cannot be set by offline editing.

13.3.3.3. Multi-hand tool parameter

You can set multi-hand tool selections and the offset value of each hand with respect to the selected hand base.
The multi-hand tool can be connected to robot with remote I/O or parallel I/O.
When connecting robot and the robot controller supports multi-hand function, items related to multi hand are displayed in the project tree.
The robots and robot controllers that can use the multi-hand tool are as follows.

Table 13-3 The controller that can use parameters about multi-hand tool

Robot controller	Software version of robot controller
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S2a or later
CR750-Q/CRnQ-700	Ver.R2a or later

Parameter settings are used while connected to the robot controller.
From the project tree, you double-click [Movement Parameter] -> [Hand] -> [Multi-Hand Tool] under [Parameter] item to be edited.
After changing the parameter value, you click the [Write] button to write the parameters to the robot controller.

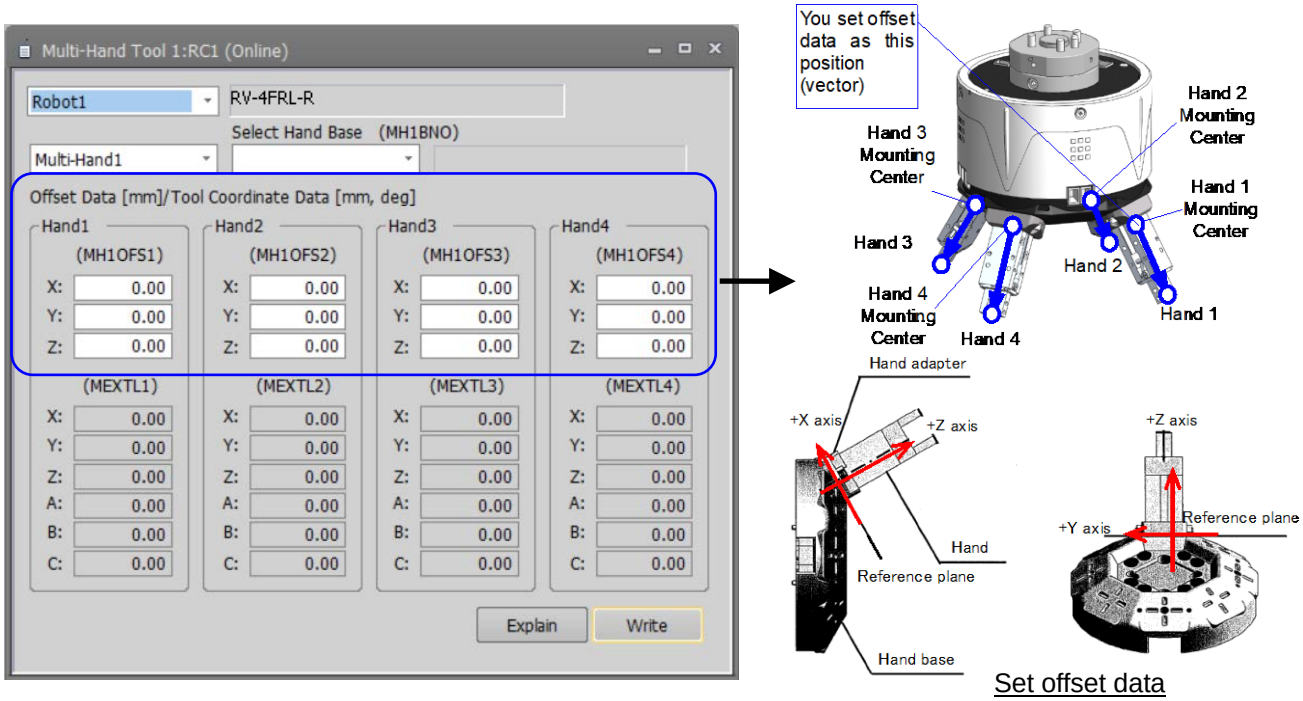


Figure 13-17 Multi-hand tool parameter

You can refer to the explanation of the displayed parameter with the [Explanation screen] button.

This parameter cannot be set by offline editing.

When multi-hand tool is connected to the robot using remote I/O, you can set behavior of output signal reset. You can set these parameters in output signal reset pattern parameter screen.
When multi-hand tool is connected using remote I/O, these information is displayed on Board.

13.3.3.4. Erectric hand parameter

You can set multi-function electric hand selection and these parameter.
Parameter settings are used while connected to the robot controller.
From the project tree, you double-click [Movement Parameter] -> [Hand] -> [Electric Hand] under [Parameter] item to be edited.

When you click [Initialize] button, initialize parameter is initialized to electric hand parameter of the model is selected.
After changing the parameter value, you click the [Write] button to write the parameters to the robot controller.

For robot controllers that can set parameters about multi-function electric hand, please see **"Table 13-4 The controller that can use parameters about electric hand".**

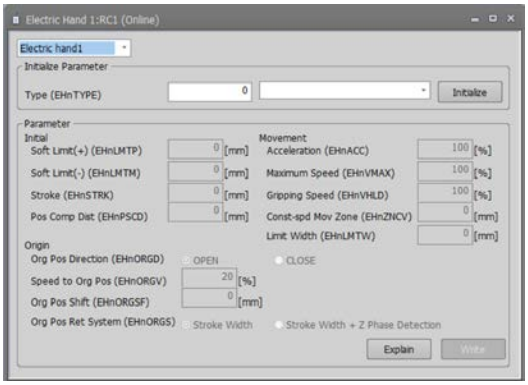


Figure 13-18 Electric hand parameter

You can refer to the explanation of the displayed parameter with the [Explain] button.

13.3.3.5. Erectric hand point parameter

You can teach multi-function electric hand.
Parameter settings are used while connected to the robot controller.
From the project tree, you double-click [Movement Parameter] -> [Hand] -> [Electric Hand Point] under [Parameter] item to be edited.

The robot controllers that can set the multi-function electric hand parameter are as follows.

Table 13-4 The controller that can use parameters about electric hand

Robot controller	Software version of robot controller
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S2a or later
CR750-Q/CRnQ-700	Ver.R2a or later

When you click [Get Current Position] button, you can set electric hand position to currently selected position number.

After you select point list, click [Set…] button. “Electric Hand Point Parameter Setting” screen is displayed. When you set position value and comments in this screen, click [OK] button. Point list of electric hand point screen is updated. You can also edit the parameters directly from the list.The robot controllers that can set comments are as follows.

Table 13-5 The controller that can use parameters about electric hand point comment

Robot controller	Software version of robot controller
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S3e or later
CR750-Q/CRnQ-700	Ver.R3e or later

After changing the parameter value, you click the [Write] button to write the parameters to the robot controller.

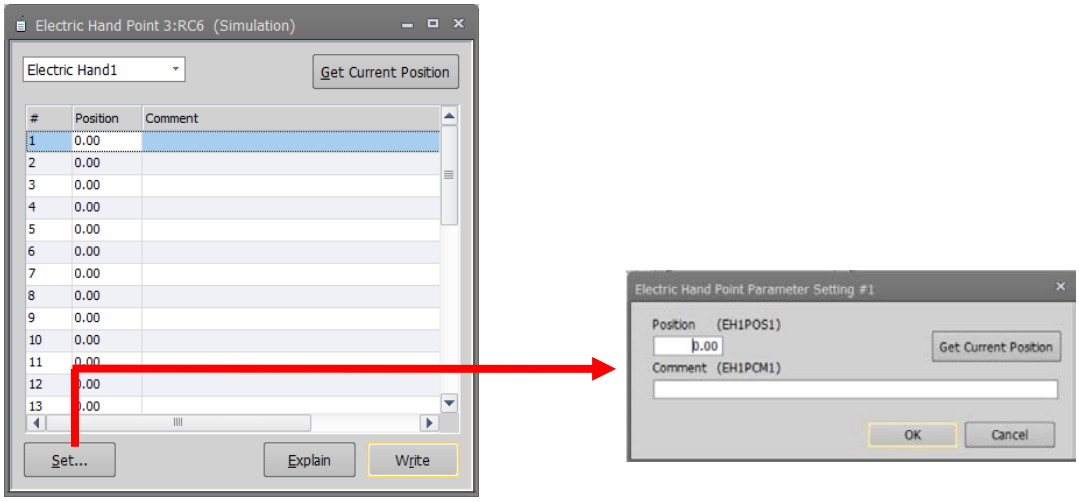


Figure 13-19 Electric hand point parameter

You can refer to the explanation of the displayed parameter with the [Explain] button.

13.3.3.6. Erectric hand table parameter

You can set multi-function electric handtable specified behavior.
Parameter settings are used while connected to the robot controller.

From the project tree, you double-click [Movement Parameter] -> [Hand] -> [Electric Hand Table] under [Parameter] item to be edited.

The robot controllers that can set the multi-function electric hand table parameter are as follows.

Table 13-6 The controller that can use parameters about electric hand table

Robot controller	Software version of robot controller
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S3e or later
CR750-Q/CRnQ-700	Ver.R3e or later

After you select electric hand and table list, click [Set…] button. “Electric Hand Table Parameter Setting” screen is displayed. You can also edit the table list directly. When you set parameters, click [OK] button. Table list of electric hand is updated.

When you click [Electric hand point] button, the target “Electric Hand Point” screen is displayed. For electric hand point parameter, please see **“13.3.3.5** Erectric hand point parameter**”.**

After changing the parameter value, you click the [Write] button to write the parameters to the robot controller.

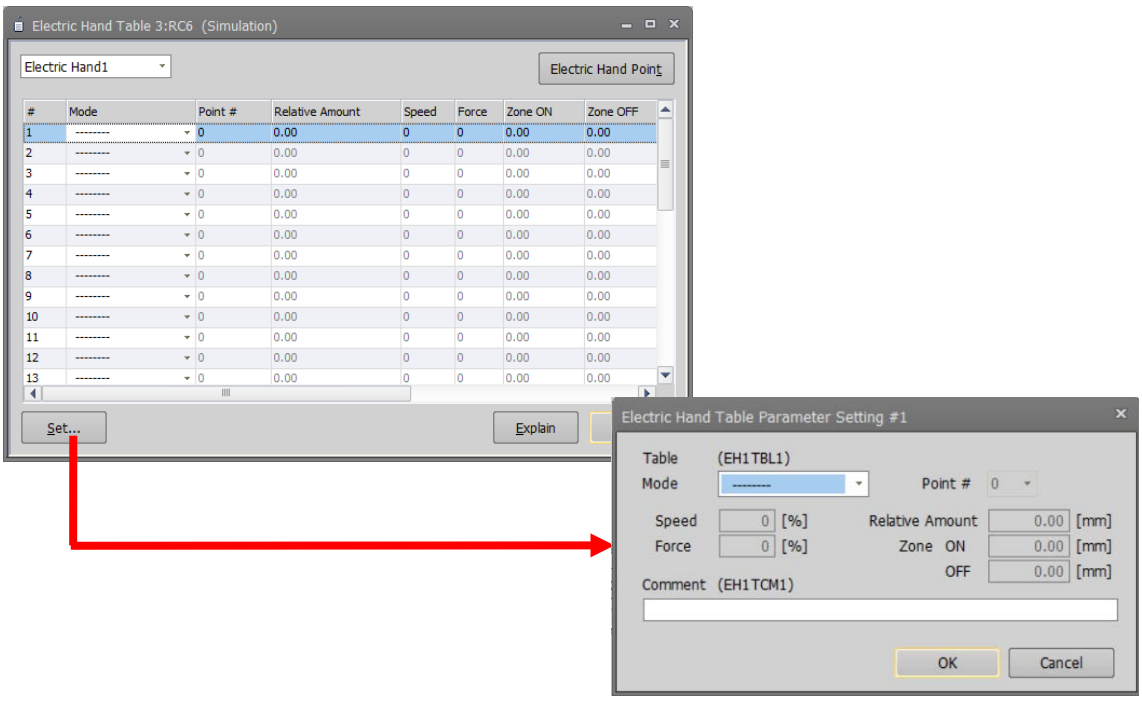
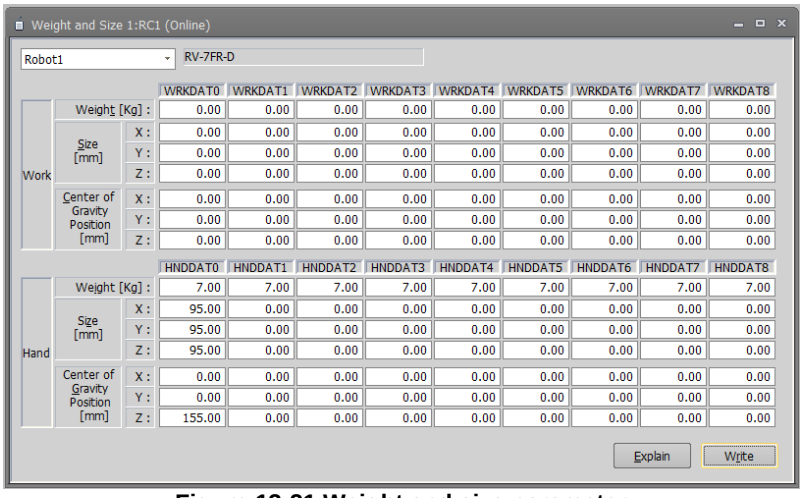


Figure 13-20 Electric hand parameter

You can refer to the explanation of the displayed parameter with the [Explain] button.

13.3.4. Weight and size parameters

You can set the conditions for the hand mounted on the robot and the conditions for the work grasped by the robot.
Set the parameters while connected to the robot controller.
Double-click [Movement parameter] -> [Weight and Size] under the [Parameter] item to be edited from the project tree.
After you change the parameter value, you can rewrite the weight and size parameters in the robot controller by clicking the [Write] button.



			WRKDAT0	WRKDAT1	WRKDAT2	WRKDAT3	WRKDAT4	WRKDAT5	WRKDAT6	WRKDAT7	WRKDAT8
Work	Weight [Kg] :		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Size [mm]	X :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Y :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Z :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Center of Gravity Position [mm]	X :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Y :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Z :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

			HNDDAT0	HNDDAT1	HNDDAT2	HNDDAT3	HNDDAT4	HNDDAT5	HNDDAT6	HNDDAT7	HNDDAT8
Hand	Weight [Kg] :		7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
	Size [mm]	X :	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Y :	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Z :	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Center of Gravity Position [mm]	X :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Y :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Z :	155.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 13-21 Weight and size parameter

You can reference explanations of the displayed parameters by pressing the [Explain] button.
It can also be set from "Step 8. Weight and Size" (**8.9.8 Step 8. Weight and Size**) on the project edit screen.

13.3.5. Tool parameter

You can set the robot's standard tool coordinates, standard BASE coordinates and tool number. Set parameters while connected to the robot controller.
Double-click [Movement parameter] -> [Tool] under the [Parameter] item to be edited from the project tree.
Multi-Hand is available in all versions of CR800 series controllers and in software version S2a/R2a or later on CR750/700 series controllers.

The tool coordinate system (MEXTL) can be input only when the TOOL number is "0". Also, when the tool number is changed from non-"0" to "0", the values of the tool coordinate system will all be set to 0. However, if the tool number on the screen is displayed as "0", when it is changed to non-"0" and then return to "0" again, the tool coordinate system will display the value before the changed.

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

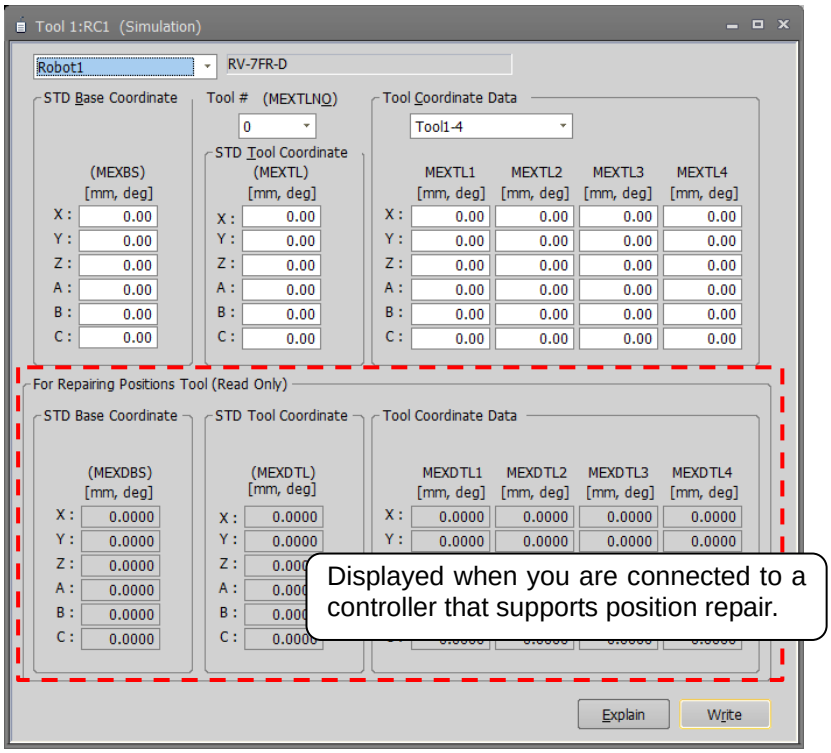


Figure 13-22 Tool parameter

It can also be set from "Step 7. Tool" (**8.9.7 Step 7. Tool**) on the project edit screen.

13.3.6. 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.

Set the parameters while connected to the robot controller.
Double-click [Movement parameter] -> [User-defined area] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

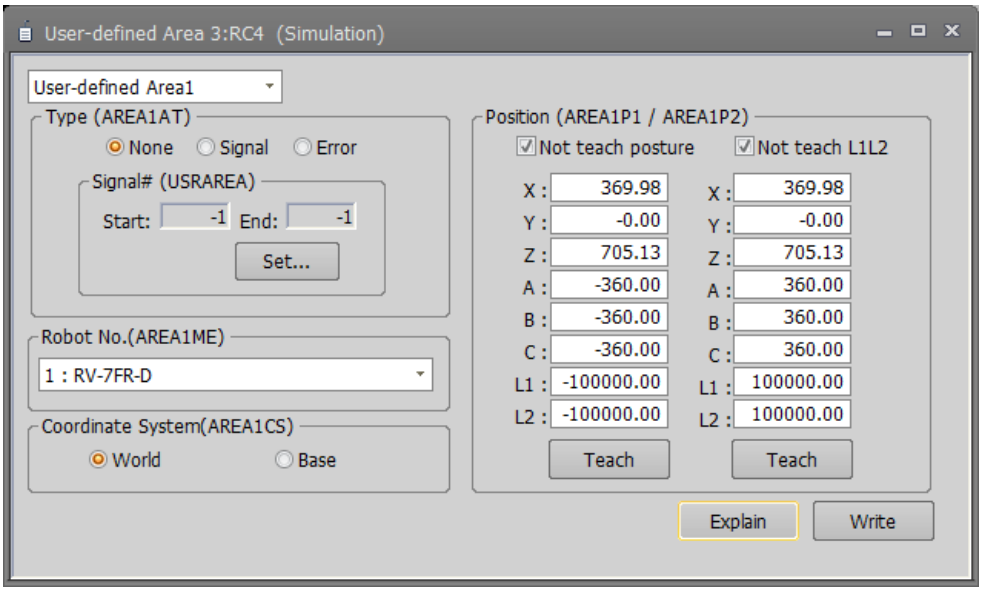


Figure 13-23 User-defined area parameter

The default is to select[Not teach posture][Not teach L1L2]. In this state, clicking each teaching button of AREA * P1 and AREA * P2, the following values are set for robot attitude (A, B, C) and additional axes (L1, L2).

Table 13-7 [Not teach posture][Not teach L1L2] values taught when checkbox is enabled

	AREA*P1	AREA*P2
Robot posture(A, B, C)	-360	360
Additional axes (L1,L2)	-100000	100000

If you want to teach the robot pusture and additional axes,please uncheck the checkbox.

Click the [Explain] button to refer to the parameter description.

13.3.7. Free plane limit parameters

You can set the overrun limit for using the robot on a free plane.
Set the parameters while connected to the robot controller.
Double-click [Movement parameter] -> [Free plane limit] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

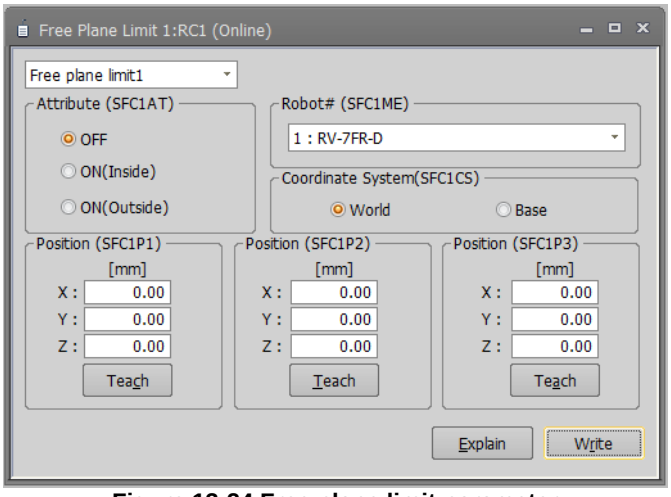


Figure 13-24 Free plane limit parameter

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

13.3.8. Home position parameters

This sets the position of the escape point.
Set the parameters while connected to the robot controller.
Double-click [Movement parameter] -> [Home position] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

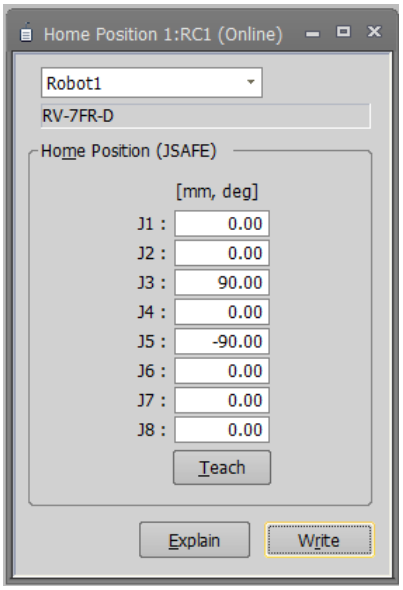


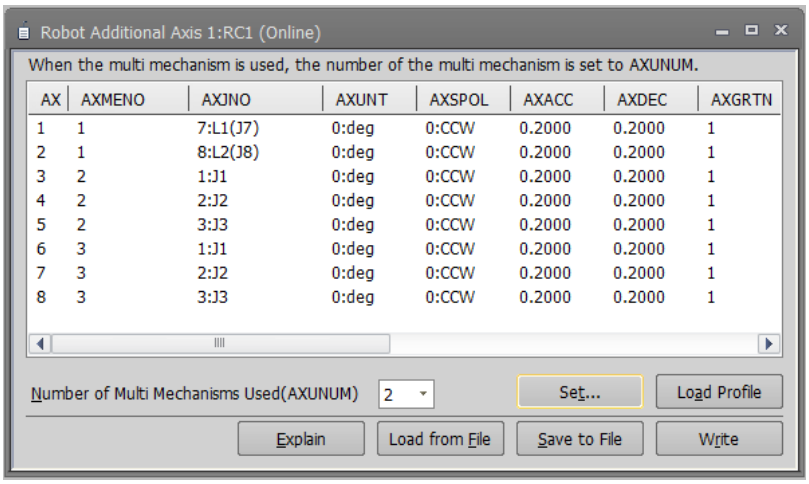
Figure 13-25 Home position parameter

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

13.3.9. Robot additional axis parameter

You can set information related to addition axes of robots.
Set the parameters while connected to the robot controller.
Double-click [Movement parameter] -> [Robot additional axis] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

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



AX	AXMENO	AXJNO	AXUNT	AXSPOL	AXACC	AXDEC	AXGRTN
1	1	7:L1(J7)	0:deg	0:CCW	0.2000	0.2000	1
2	1	8:L2(J8)	0:deg	0:CCW	0.2000	0.2000	1
3	2	1:J1	0:deg	0:CCW	0.2000	0.2000	1
4	2	2:J2	0:deg	0:CCW	0.2000	0.2000	1
5	2	3:J3	0:deg	0:CCW	0.2000	0.2000	1
6	3	1:J1	0:deg	0:CCW	0.2000	0.2000	1
7	3	2:J2	0:deg	0:CCW	0.2000	0.2000	1
8	3	3:J3	0:deg	0:CCW	0.2000	0.2000	1

Figure 13-26 Robot additional axis parameter

You can load the profile to selected axis by pressing the [Load profile] button.
You can reference explanations of the 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.

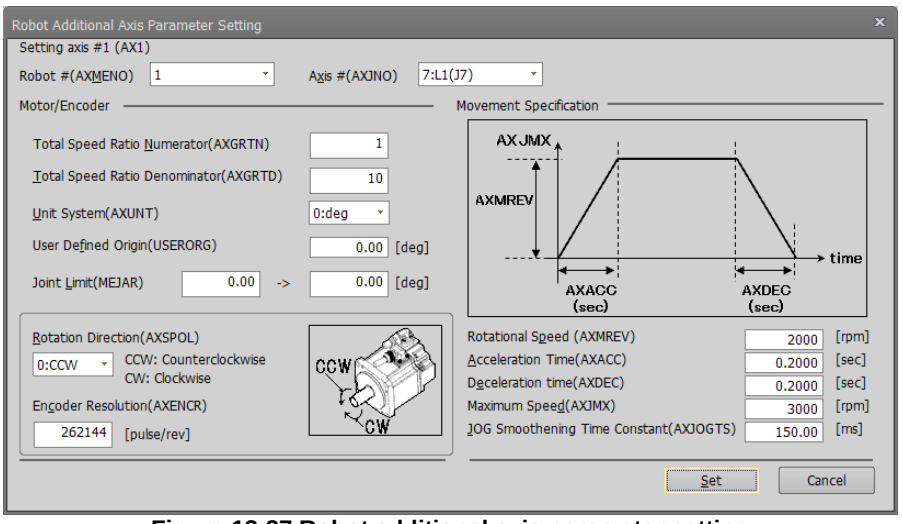


Figure 13-27 Robot additional axis parameter setting

It can also be set from "Step 6. Robot Additional Axis" (**8.9.6 Step 6. Robot Additional Axis**) on the project edit screen.

13.3.10. Collision detection parameters

You can set information related to the robot's collision detection functions.
Set the parameters while connected to the robot controller.
Double-click [Movement parameter] -> [Collision detection] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

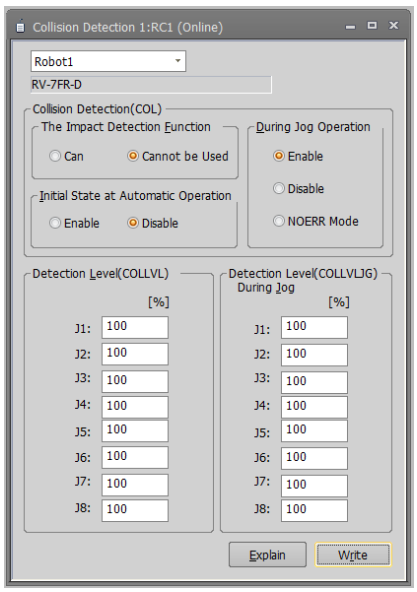


Figure 13-28 Collision detection parameter

The parameter setting values for the detection level during jog operation can be easily adjusted by displaying the "collision detection level reference value" data as a graph by the oscillograph function.
For details, refer to "**18.1 Oscillograph**".

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

13.3.11. Warm-up operation parameters

You can set information related to the robot's warm-up function.
Set the parameters while connected to the robot controller.
Double-click [Movement parameter] -> [Warm-up operation] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

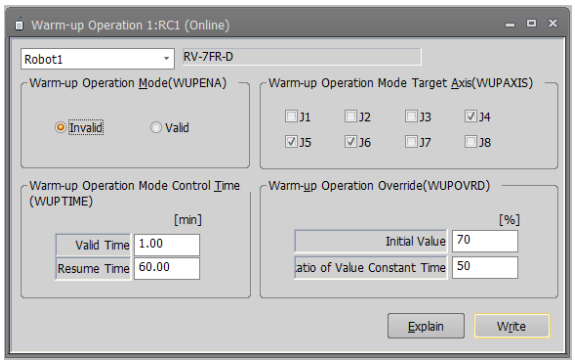


Figure 13-29 Warm-up operation parameter

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

13.3.12. Movement parameters

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 13-8 The controller which you can set information related to optimum acceleration/deceleration for robot operation and set compliance errors

	CR800/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.
Double-click [Movement parameter] -> [Movement] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

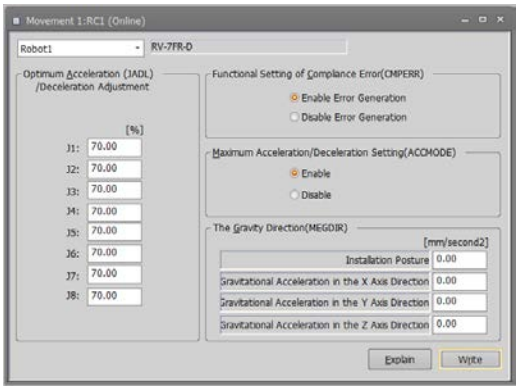


Figure 13-30 Movement parameter

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

13.3.13. Work coordinate paramaters

Work coordinate parameters define the coordinate system for the work jog.8 work coordinates can define. Controller software versions that allow use of the work jog function are as follows.

Table 13-9 The controller that can use the work jog

Robot controller	Software version of robot controller
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.P8 or later
CR750-Q/CRnQ-700	Ver.N8 or later

Set parameters while connected to the robot controller.
Double-click [Movement parameter] -> [Work coordinate] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

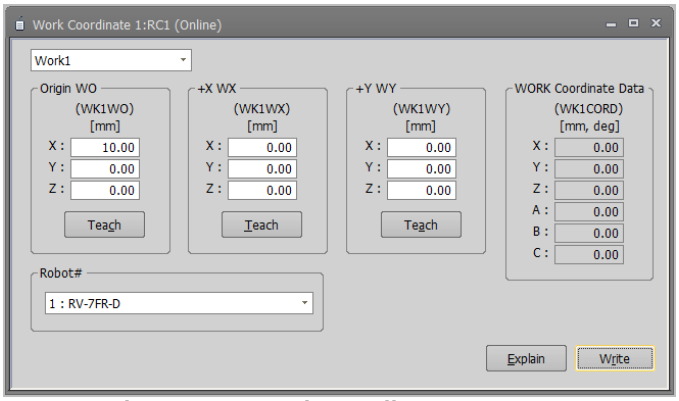


Figure 13-31 Work coordinate parameter

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

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

These parameters cannot be set in offline editing.

13.3.14. Force control parameters

You can set parameters related to force control in PC and robot controllers.
For details of these parameters, refer to the user's manual of the force control function.

13.3.14.1. Force sensor parameter

Double-click [Movement parameter] -> [Force control] -> [Force sensor] under the [Parameter] item to be edited from the project tree.
Set the parameters, [Assign sensor], [Sensor coordinates], [Filter time constant], [Restriction], and [Tolerance level] which are used by the force control function.

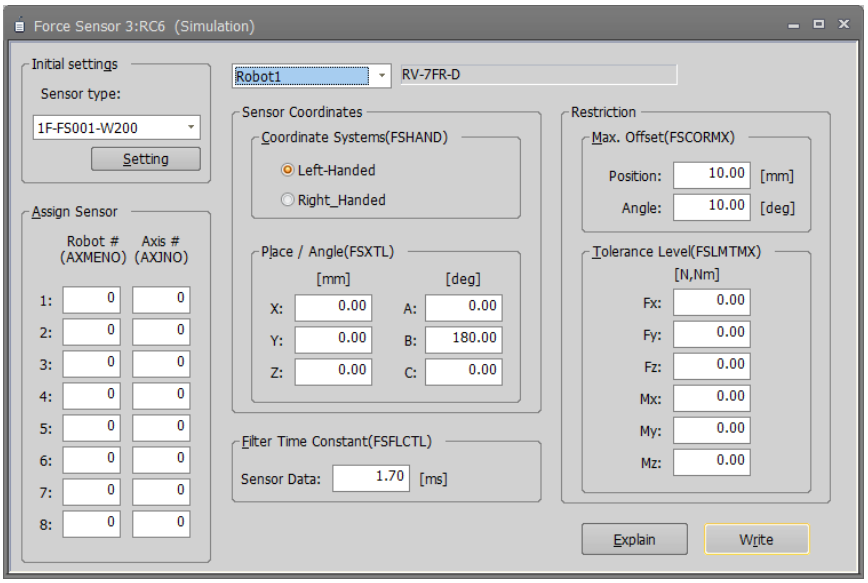


Figure 13-32 Force sensor parameter

You can use the [Setting] button to initialize the force sensor. Values set by initial setting are as follows.

Table 13-10 Sensor type initial setting value

Sensor type	Robot #	Axis #	Left-Handed/ Right-Handed	Place/Angle		Filter time constant	Max offset		Tolerance level	
1F-FS001-W200	The first element is 1 Otherwise 0	The first element is 9 Otherwise 0	Left-Handed	X	0.00	1.70	Position	200.00	Fx	200.00
				Y	0.00				Fy	200.00
				Z	32.00				Fz	200.00
				A	0.00				Mx	4.00
				B	180.00				My	4.00
				C	0.00				Mz	4.00
1F-FS001-W1000				X	0.00		Angle	150.00	Fx	1000.00
				Y	0.00				Fy	1000.00
				Z	34.00				Fz	1000.00
				A	0.00				Mx	30.00
				B	180.00				My	30.00
				C	0.00				Mz	30.00

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

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

13.3.14.2. Force control mode parameters

Double-click [Movement parameter] -> [Force control] -> [Force control mode] under the [Parameter] item to be

edited from the project tree.
Set the parameters, [Coordinate system], [Control mode of axes], [Stiffness coefficients], and [Dumping coefficients] which are used by the control mode of the force control function.

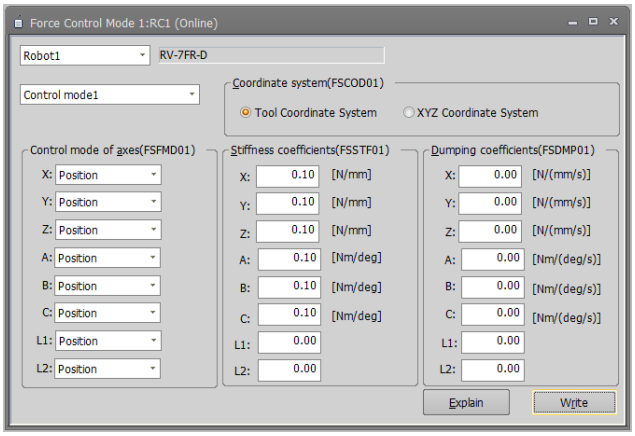


Figure 13-33 Force control mode parameter

You can reference explanations of the 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.

13.3.14.3. Force control characteristics parameters

Double-click [Movement parameter] -> [Force control] -> [Force control characteristics] under the [Parameter] item to be edited from the project tree.
Set the parameters, [Force gain], [Force cmd.], and [Force detection] which are used by the control characteristics of the force control function.
The controllers which can set the parameters [Mode switch judgment] and [Speed command] are as follows.

Table 13-11 The controller which can set the parameters [Mode switch judgment] and [Speed command]

Robot controller	Software version of robot controller
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S3g or later
CR750-Q/CRnQ-700	Ver.R3g or later

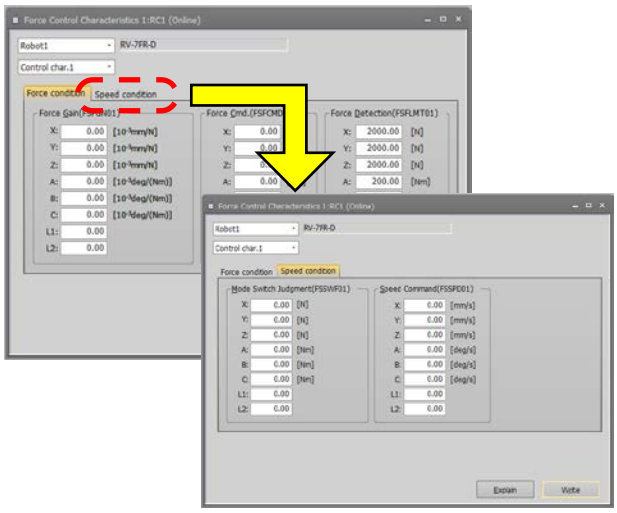


Figure 13-34 Force control characteristics parameter

You can reference explanations of the 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.

13.3.14.4. Force log parameters

Double-click [Movement parameter] -> [Force control] -> [Force log] under the [Parameter] item to be edited from the project tree.
Set the parameters, [Configuration] and [FTP setting] which are used by the force control function.

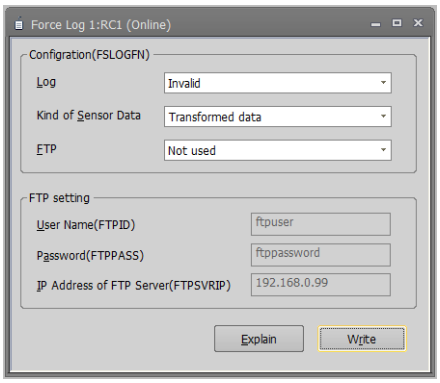


Figure 13-35 Force log parameter

You can reference explanations of the 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.

13.3.15. Collision avoidance parameters

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

13.3.15.1. Collision avoidance function parameter

Double-click [Movement parameter] -> [Collision avoidance] -> [Collision avoidance function] under the [Parameter] item to be edited from the project tree.
You can set information related to the Collision avoidance function.
The controllers which can set the parameters [Collision avoidance function] are as follows.

Table 13-12 The controller and the robot model which can set the parameters [Collision avoidance function]

Robot controller	Software version of the robot controller	Robot model
CR800-D(*1)/CR800-R/CR800-Q	All versions	RV-FR, RH-FR
CR750-Q/CRnQ-700	Ver.R3a or later	RV-F, RH-F
CR750-D/CRnD-700(*1)	Ver.S6b or later	RV-F, RH-F

(*1) You can't do the following operations.
- Click the [Multiple CPU parameter screen] button
- Set the common coordinates for collision avoidance
- Click the [Apply from robot arrange of 3D monitor] button
- Click the [Reflect to robot arrange of 3D monitor] button

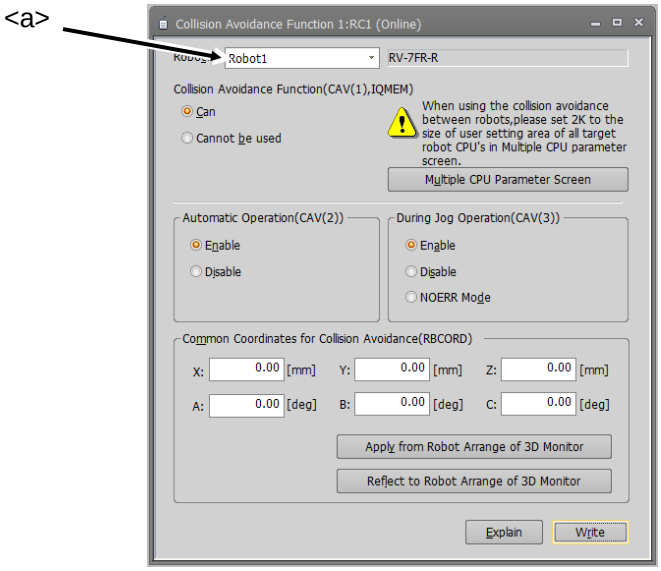


Figure 13-36 Collision avoidance function parameter

You can switch the robot with the combo box<a>.

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

You can show the “Multiple CPU parameter” screen by pressing the [Multiple CPU parameter screen] button.
(You can change the size of user setting area at the “Multiple CPU parameter” screen shown by the operation.)

You can set the coordinates in this screen from the **21 3D Monitor** by pressing the [Apply from robot arrange of 3D monitor] button.

You can update the **21 3D Monitor** from coordinates in this screen by pressing the [Reflect to robot arrange of 3D monitor] button.

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

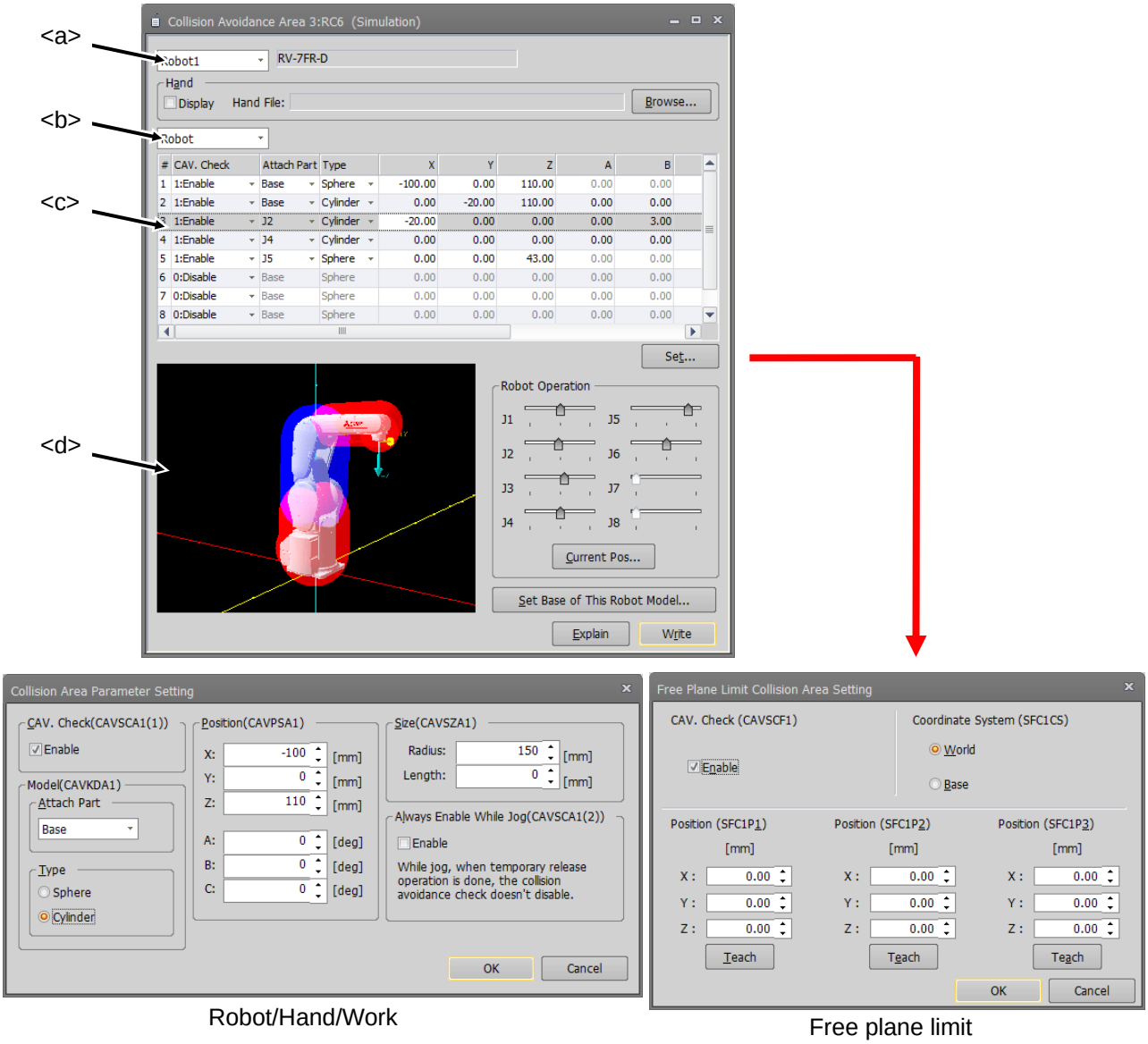
13.3.15.2. Collision avoidance area parameter

Double-click [Movement parameter] -> [Collision avoidance] -> [Collision avoidance area] under the [Parameter] item to be edited from the project tree.
You can set information related to the Collision avoidance area.
The controllers which can set the parameters [Collision avoidance area] are as follows.

Table 13-13 The controller and the robot model which can set the parameters [Collision avoidance area]

Robot controller	Software version of the robot controller	Robot model	Model
CR750-Q/CRnQ-700	Ver.R3a or later (*1)	RV-F, RH-F	Robot/Hand/Work
CR750-Q/CRnQ-700	Ver.R6b or later	RV-F, RH-F	Robot/Hand/Work/ Free plane limit
CR750-D/CRnD-700	Ver.S6b or later	RV-F, RH-F	Free plane limit
CR800-R/CR800-Q	All versions	RV-FR, RH-FR	Robot/Hand/Work/ Free plane limit
CR800-D	All versions	RV-FR, RH-FR	Free plane limit

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



Robot/Hand/Work

Free plane limit

Figure 13-37 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/Free plane limit) 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 is displayed in blue color on the 3D model<d>.

You can also edit parameters directly from the list.

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

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

Table 13-14 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.

Operating the [Robot Operation] slider moves the robot of the 3D model<d>.

When a tick mark (for true) is set in the [Display] checkbox and a hand file is set, the robot hand is displayed on the 3D model<d>. Refer to **"21.19 Hand Design"** for designing the robot hand.

You can give the robot in the 3D model <d> the same posture as the connected robot.

You can set the base coordinate value by clicking the [Set Base of this robot model] button. When displaying with [World] selected in the coordinate system, the base coordinates in actual use are set.

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

13.3.16. Safety Parameters(CR750/CR700)

You can set parameters of Robot Safety Option in the CR750/CR700 series robot controllers.
For details of these parameters, refer to the **"Robot Safety Option manual"** (BFP-A3372).
This function is available in CR750/CR700 controller software Ver.R6, S6 or later (robot safety option is needed).
The setting method of the safety parameters of the CR800 series robot controller is different. For details, refer to "**13.9 Parameters of Safety (CR800)**".

These parameters cannot be set by the offline editing.

Double-click [Movement parameter] -> [Safety] under the [Parameter] item to be edited from the project tree.

13.3.16.1. Enable Disable

You can set Enable / Disable of the safety monitoring function in Robot Safety Options, set the DSI signal, and change the password.

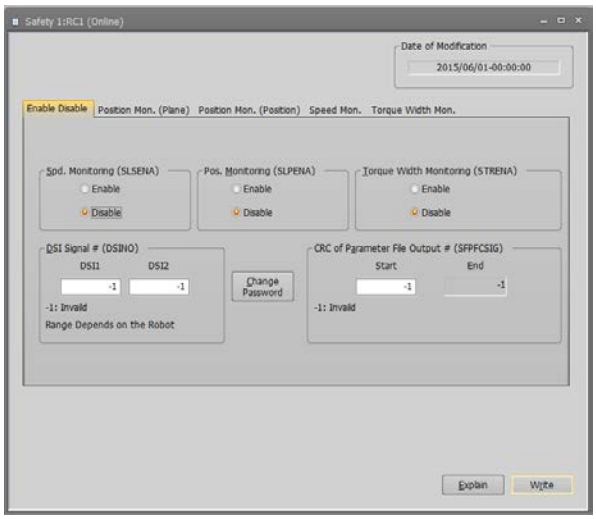


Figure 13-38 Safety parameter (Enable Disable)

You can reference explanations of the displayed parameters by clicking the [Explain] button.
After you change a parameter values, you can rewrite the parameter in the robot controller by clicking the [Write] button.
The [CRC of parameter file output #] item is displayed in CR750/CR700 controller software Ver.R6b/S6b or later.

13.3.16.2. Position mon. (Plane)

You can set the SLP function planes. The SLP function monitors that the “monitoring area” of the robot does not exceed the “Safety Limited Plane” defined by the user in advance.

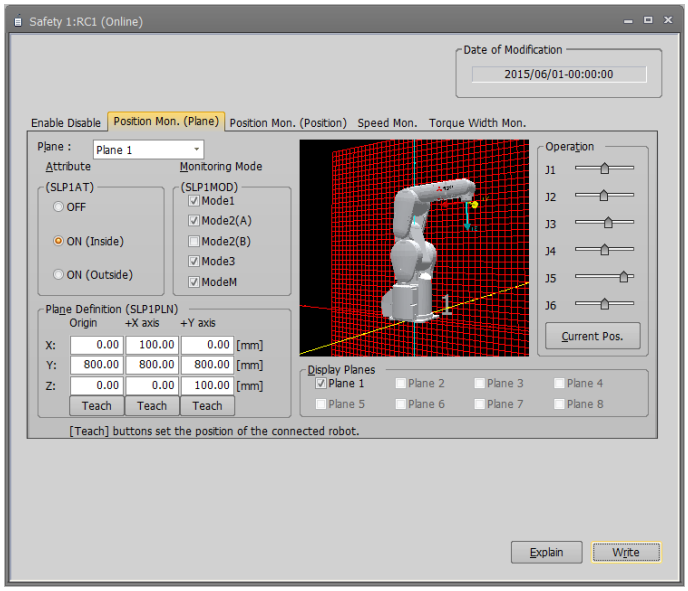


Figure 13-39 Safety parameter (Position mon. (Plane))

If you check [Display planes], the Position monitoring planes shown in the 3D display. You can check the relationship between the planes and the robot. This 3D display doesn't work with the 3D monitor.
You can adjust the posture of the robot in the 3D display and the connected robot by clicking the [Current pos.] button.
You can reference explanations of the displayed parameters by clicking the [Explain] button.

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

13.3.16.3. Position mon. (Position)

You can set the positions of the SLP function. The SLP function monitors that the “monitoring area” of robot does not exceed the “Safety Limited Plane” defined by the user in advance.

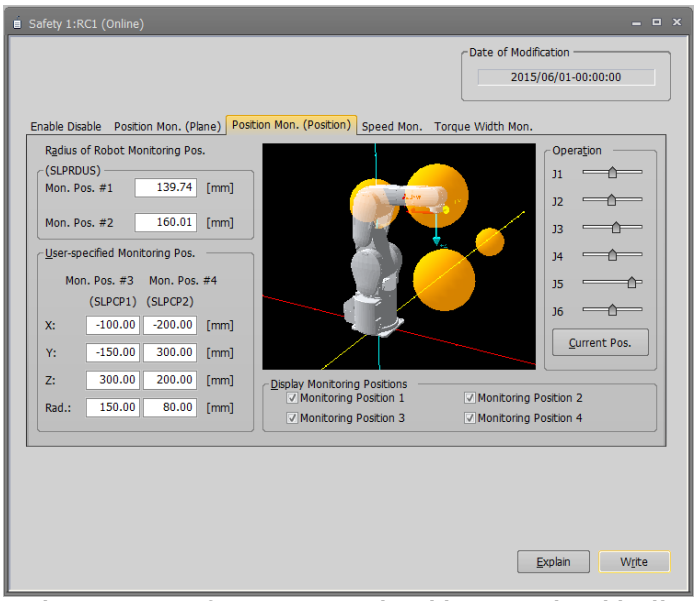


Figure 13-40 Safety parameter (Position mon. (Position))

If you check [Display monitoring positions], the Position monitoring spheres are shown in the 3D display. You can check the size of the sphere and relationship between the sphere and the robot. This 3D display doesn't work

with the 3D monitor.
You can adjust the posture of the robot in the 3D display and the connected robot by clicking the [Current pos.] button.
You can reference explanations of the displayed parameters by clicking the [Explain] button.

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

13.3.16.4. Speed mon.

You can set the speed of the SLS function. The SLS function observes the TCP Speed of the robot.

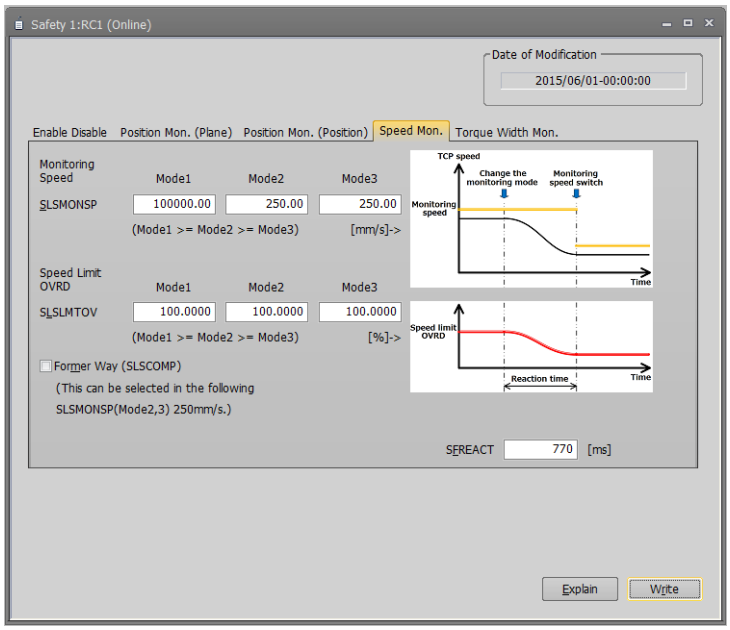


Figure 13-41 Safety parameter (Speed Mon.) A

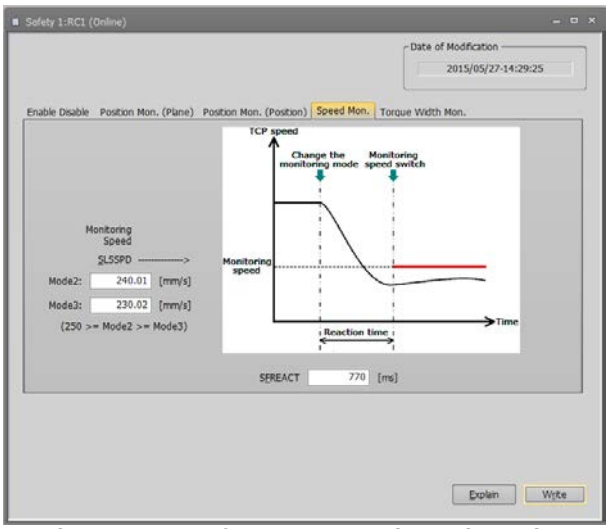


Figure 13-42 Safety parameter (Speed Mon.) B

You can reference explanations of the displayed parameters by clicking the [Explain] button.
After you change the parameter values, you can rewrite the parameters in the robot controller by clicking the [Write] button.
Screen A is displayed when all versions of the CR800 series controller and CR750/CR700 controller software Ver. R6b, S6b or later are used. In other instances, screen B is displayed.

13.3.16.5. Torque width mon.

You can set the “Safety Limited Torque” of the STR function. The STR function monitors that the difference of “Torque FB” and “Estimated torque” does not exceed the “Safety Limited Torque”.

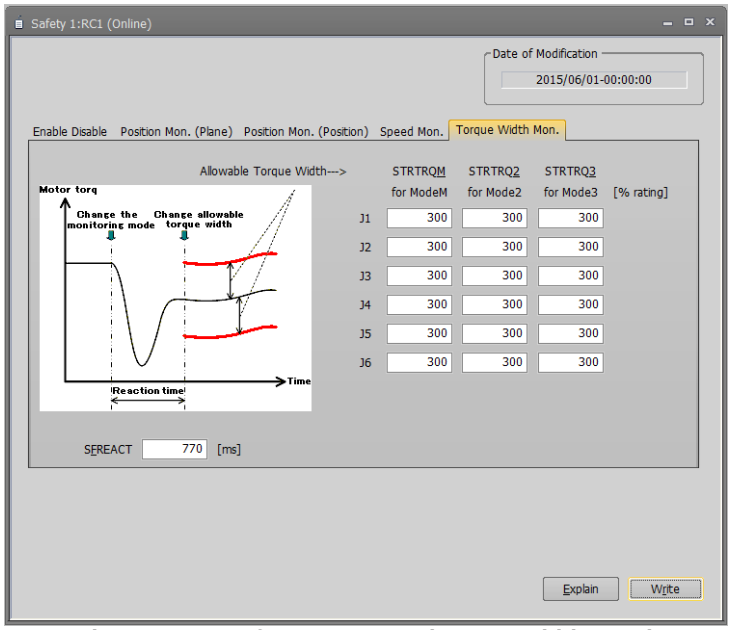


Figure 13-43 Safety parameter (Torque width Mon.)

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

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

13.4. Program Parameters

13.4.1. Slot table parameters

Slot tables set the operating conditions of each task slot during multi-task operation.
Set parameters while connected to the robot controller.
Double-click [Program parameter] -> [Slot table] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the operating range parameter in the robot controller by clicking the [Write] button.

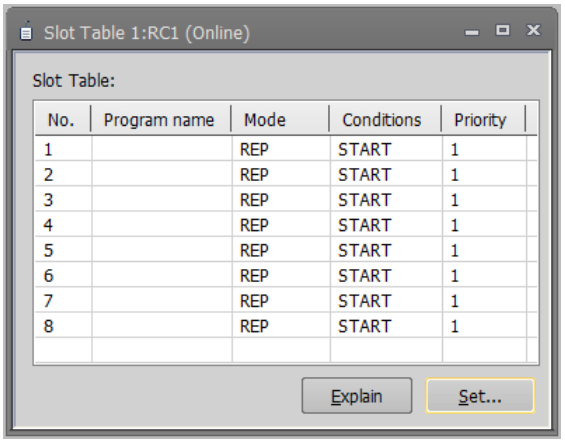


Figure 13-44 Slot table parameter

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

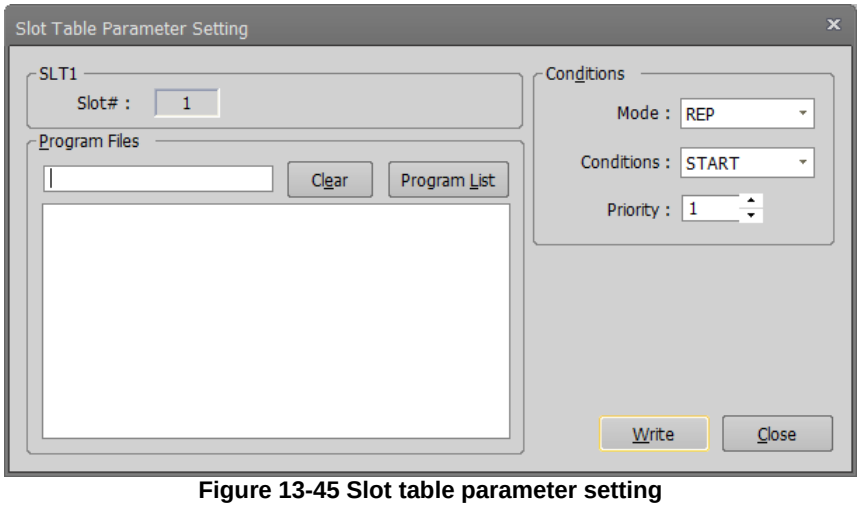


Figure 13-45 Slot table parameter setting

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 the displayed parameters by pressing the [Explain] button.

13.4.2. Program language parameters

You can set the robot program language used in a robot controller (MELFA-BASIC VI/MELFA-BASIC V/MELFA-BASIC IV/Movemaster commands).
Double-click [Program parameter] -> [Program language] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

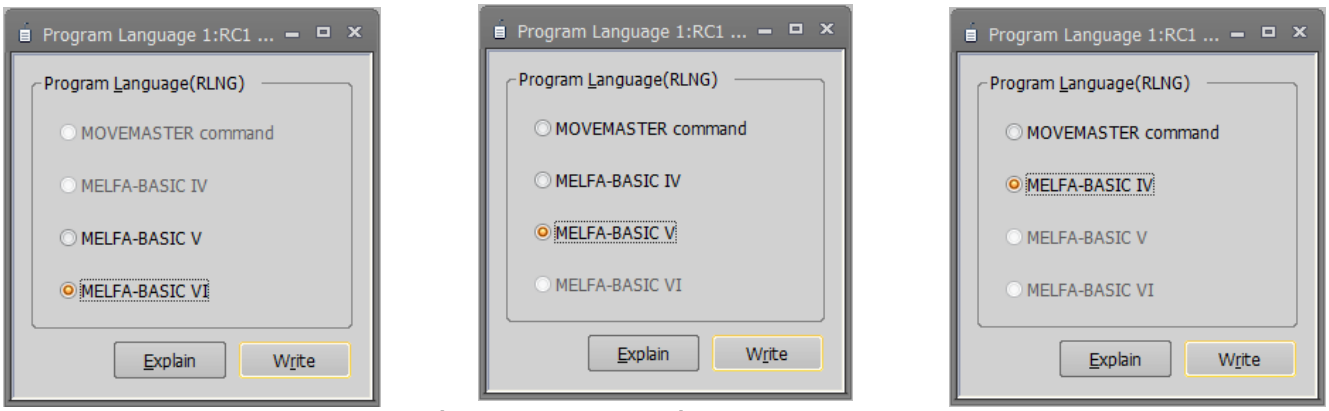


Figure 13-46 Program language parameter

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

For the usable robot program languages, see **"Table 10-1 Robot Programming Languages for Each Controller"**.

Caution

About Movemaster commands

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

13.4.3. Command parameters

You can set parameters related to robot programs.
Set parameters while connected to the robot controller.
Double-click [Program parameter] -> [Command] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

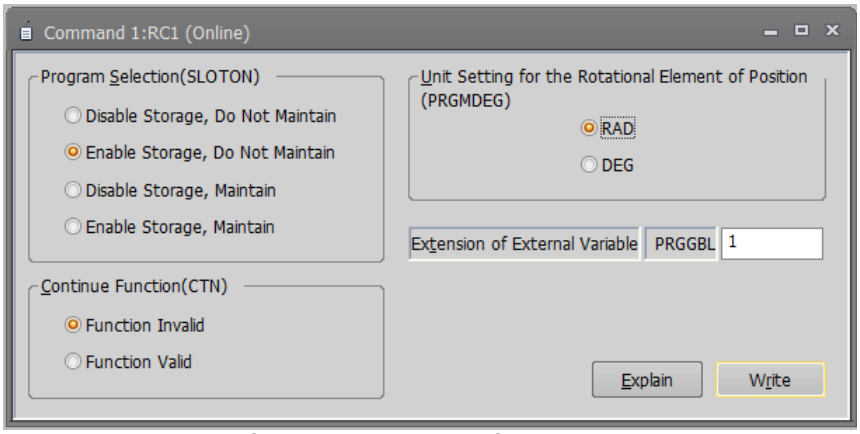


Figure 13-47 Command parameter

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

13.4.4. User error parameters

You can set the message, cause, and recovery method for user errors set with a program.
Set parameters while connected to the robot controller.
Double-click [Program parameter] -> [User error] under the [Parameter] item to be edited from the project tree.

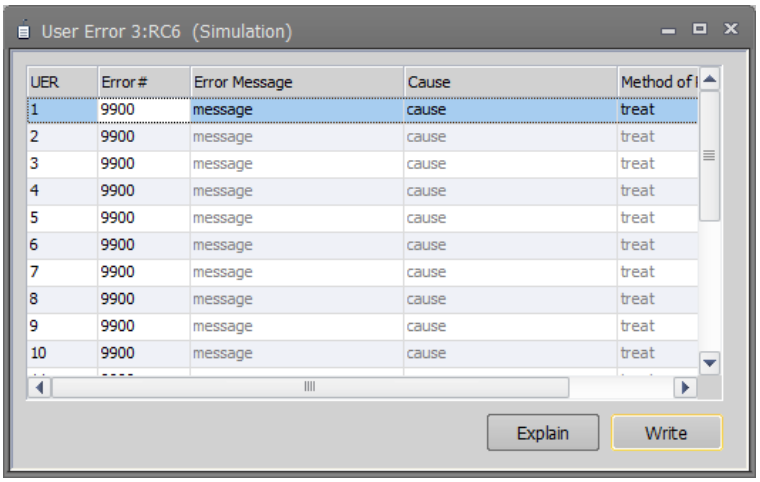


Figure 13-48 User error parameter

Double click the error number from the list. The "User error parameter setting" edit screen is displayed. You can also directly edit error numbers from the list.

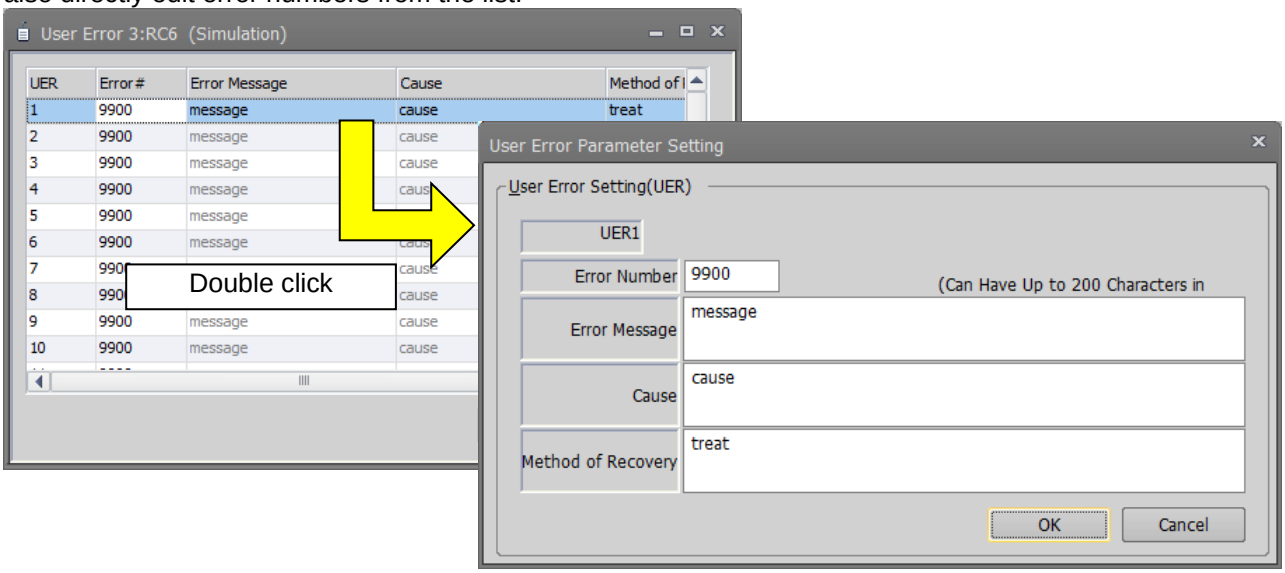


Figure 13-49 User error parameter setting

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" – "9299".
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 the displayed parameters by pressing the [Explain] button.

13.5. Signal Parameters

13.5.1. Output signal reset pattern parameters

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.
Double-click [Signal Parameter] -> [Output Signal Reset Pattern] under the [Parameter] item to be edited from the project tree.

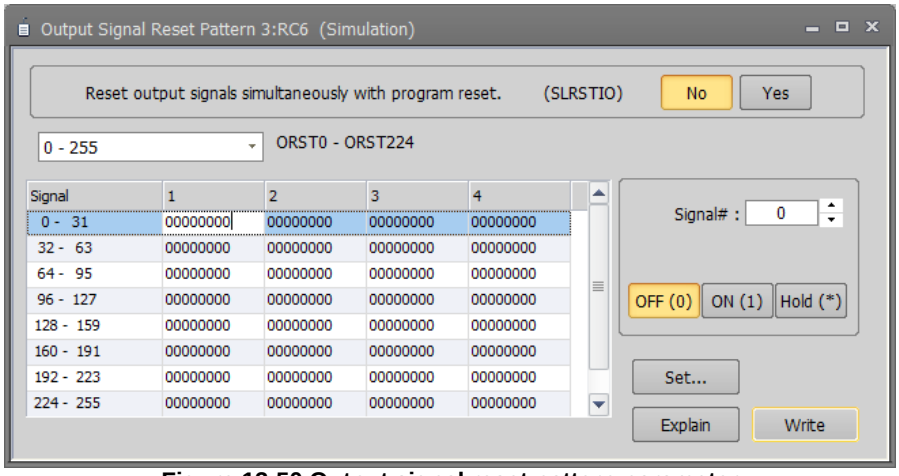


Figure 13-50 Output signal reset pattern parameter

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. You can also edit signal values directly from the list. 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.

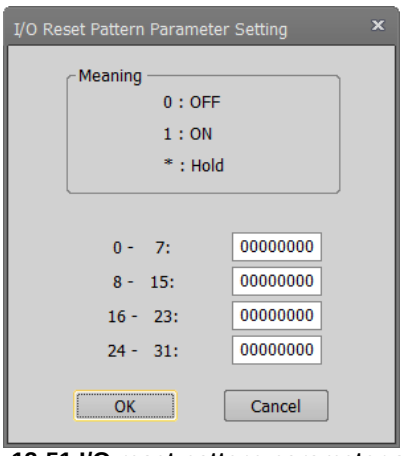


Figure 13-51 I/O reset pattern parameter setting

You can reference explanations of the 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 connected controller. You can see the output signals corresponding to the function of the connected controller. You can read the parameter list file on the “Parameter list” screen.

13.5.2. Assigning Dedicated Input/Output Signals

Assign signal numbers to functions in order to perform the remote operations such as running and stopping robot programs, and to display/operate the execution progress information and servo power supply status, etc.
Set parameters while connected to the robot controller.

13.5.2.1. General1 parameters

Double-click [Signal Parameter] -> [Dedicated Input/Output Signals Assignment] -> [General1] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

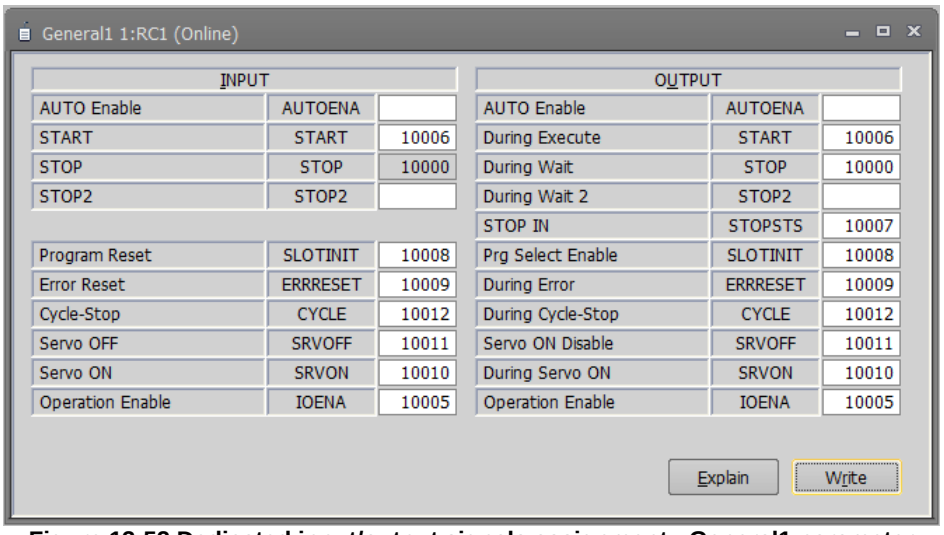


Figure 13-52 Dedicated input/output signals assignment - General1 parameter

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

13.5.2.2. General2 parameters

Double-click [Signal Parameter] -> [Dedicated Input/Output Signals Assignment] -> [General2] under the [Parameter] item to be edited from the project tree.
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

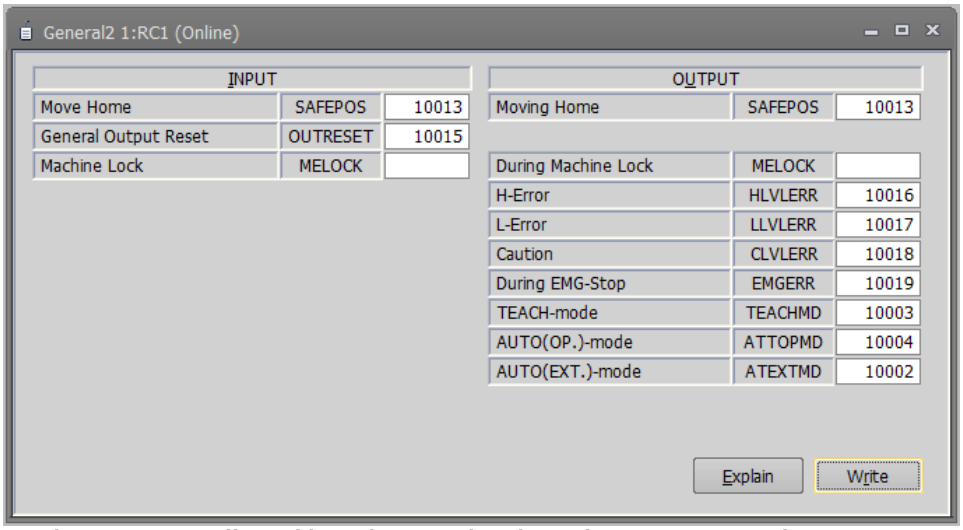


Figure 13-53 Dedicated input/output signals assignment - General2 parameter

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

13.5.2.3. Data parameter

Double-click [Signal Parameter] -> [Dedicated Input/Output Signals Assignment] -> [Data] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

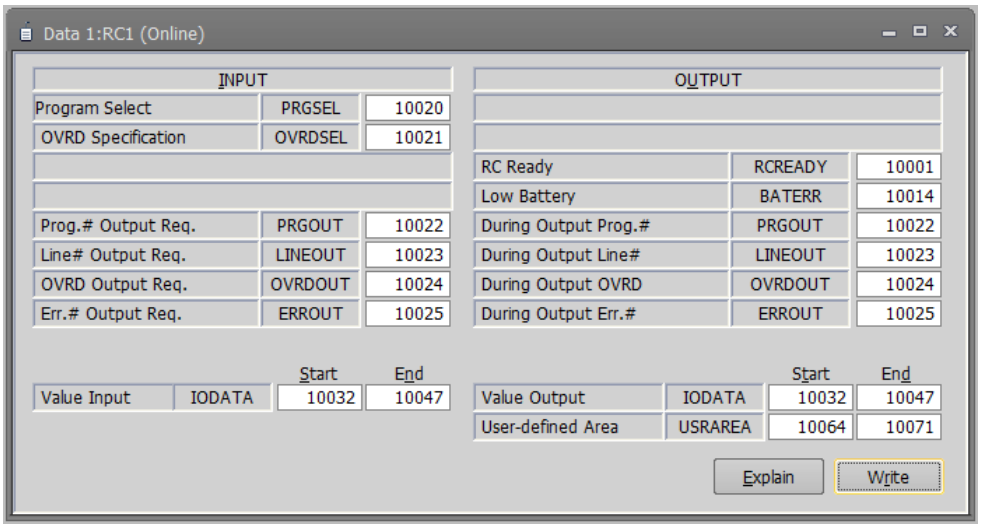


Figure 13-54 Dedicated input/output signals assignment - Data parameter

Controller software versions that allow use of the [Temp. in RC output req.] and [During output Temp. in RC] parameters are as follows.

Table 13-15 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
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S1c or later
CR750-Q/CRnQ-700	Ver.R1c or later

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

13.5.2.4. Jog parameters

Double-click [Signal Parameter] -> [Dedicated Input/Output Signals Assignment] -> [Jog] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

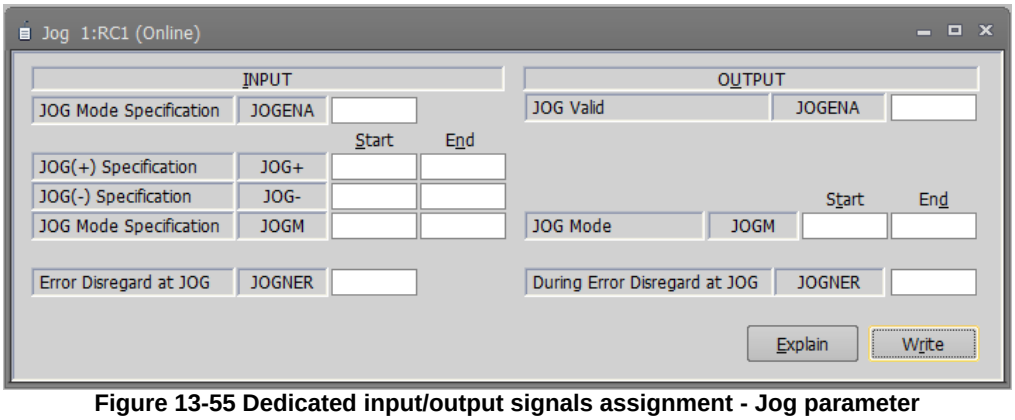


Figure 13-55 Dedicated input/output signals assignment - Jog parameter

You can reference explanations of the 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 CR800/750/700 series controller.

13.5.2.5. Hand parameters エラー! ブックマークが定義されていません。

Double-click [Signal Parameter] -> [Dedicated Input/Output Signals Assignment] -> [Hand] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

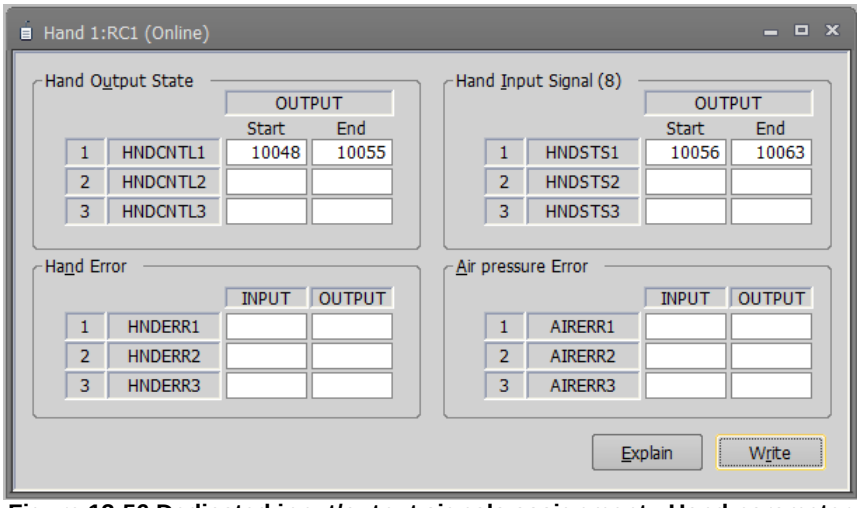


Figure 13-56 Dedicated input/output signals assignment - Hand parameter

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

13.5.2.6. Warm up parameters

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 CR800/750/700 series robot controller.
Double-click [Signal Parameter] -> [Dedicated Input/Output Signals Assignment] -> [Warm Up] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

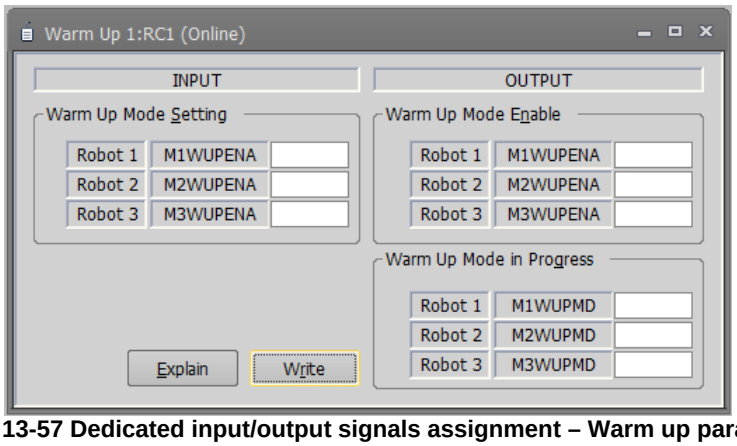


Figure 13-57 Dedicated input/output signals assignment – Warm up parameter

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

13.5.2.7. Start (each slot) parameters

Double-click [Signal Parameter] -> [Dedicated Input/Output Signals Assignment] -> [Start (Each Slot)] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

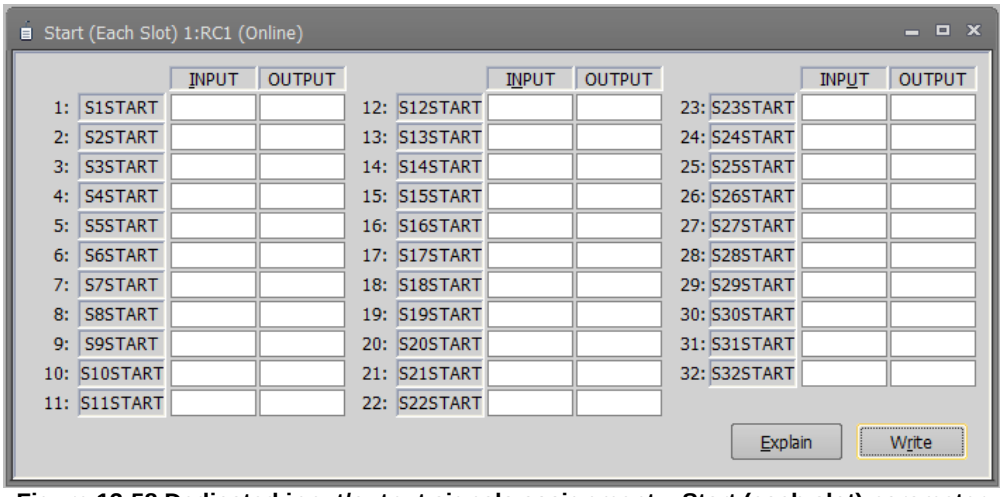


Figure 13-58 Dedicated input/output signals assignment – Start (each slot) parameter

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

13.5.2.8. Stop (each slot) parameters

Double-click [Signal Parameter] -> [Dedicated Input/Output Signals Assignment] -> [Stop (Each Slot)] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

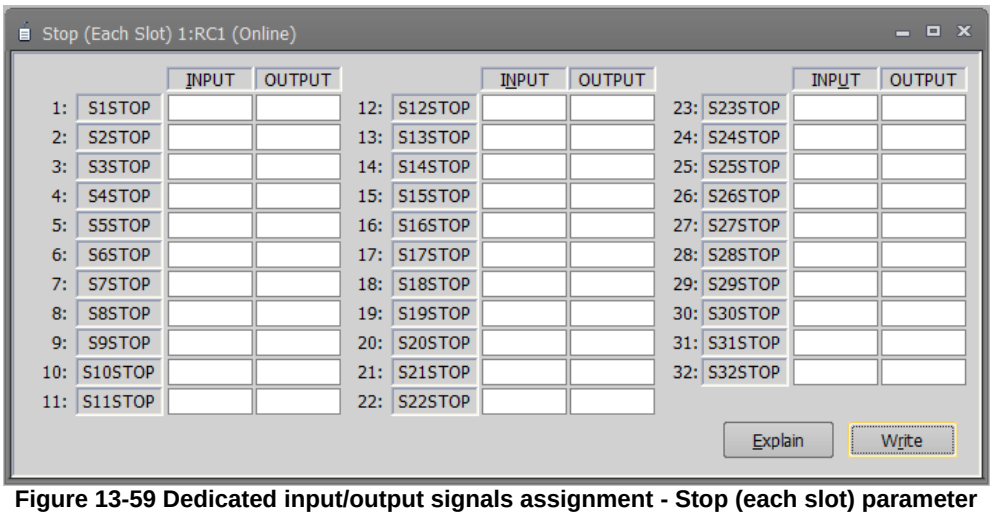


Figure 13-59 Dedicated input/output signals assignment - Stop (each slot) parameter

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

13.5.2.9. Servo On/Off (each robot) parameters

Double-click [Signal Parameter] -> [Dedicated Input/Output Signals Assignment] -> [Servo ON/OFF(Each Robot)] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

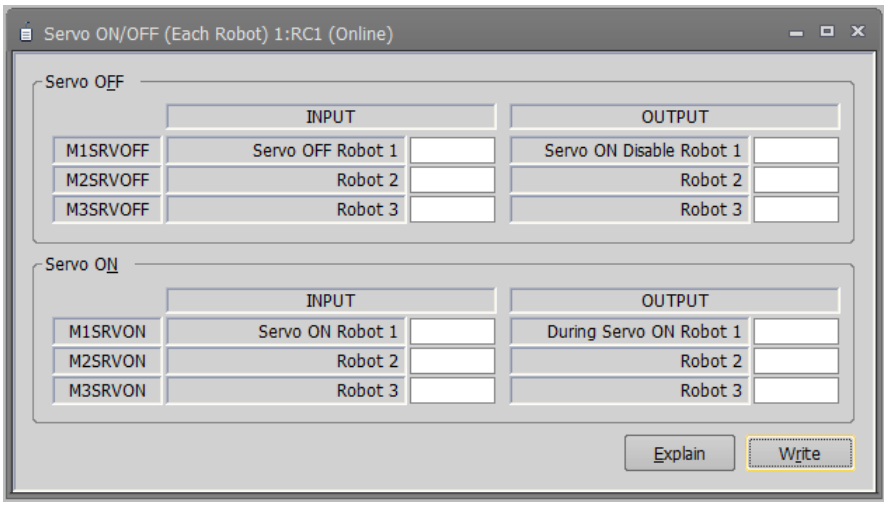


Figure 13-60 Dedicated input/output signals assignment – Servo ON/OFF (each robot) parameter

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

13.5.2.10. Machine lock (each robot) parameters

Double-click [Signal Parameter] -> [Dedicated Input/Output Signals Assignment] -> [Machine Lock(Each Robot)] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

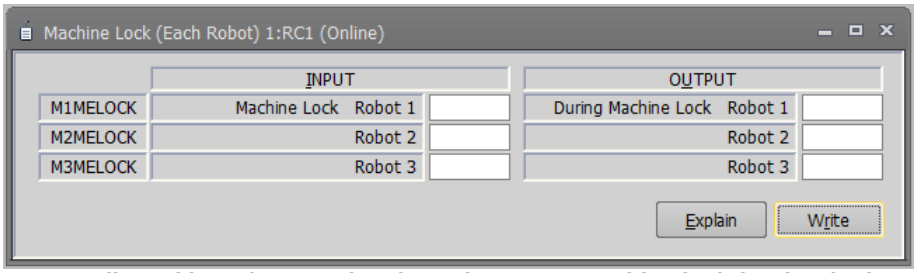


Figure 13-61 Dedicated input/output signals assignment - Machine lock (each robot) parameter

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

13.6. Communication Parameters

13.6.1. RS-232 parameters

These parameters set up the communication environment of the RS-232 interface of the robot controller.
Set parameters while connected to the robot controller.
Double-click [Communication Parameter] -> [RS-232] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

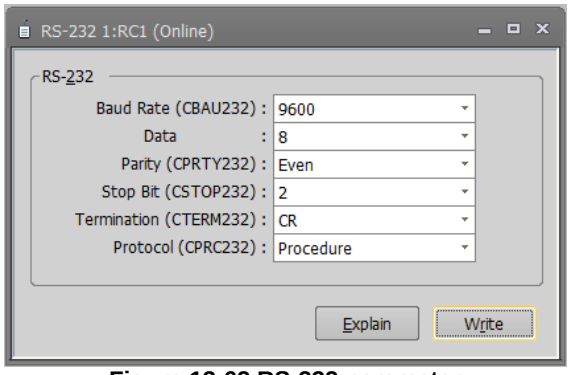


Figure 13-62 RS-232 parameter

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

13.6.2. Ethernet parameters

You can set robot controller Ethernet information.
Set parameters while connected to the robot controller.
Double-click [Communication Parameter] -> [Ethernet] under the [Parameter] item to be edited from the project tree.

Click a menu. The screen corresponding to the selected menu is displayed.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.
You can reference explanations of the displayed parameters by pressing the [Explain] button.

13.6.2.1. IP address

You can set the parameters related to the IP address in the robot controller.

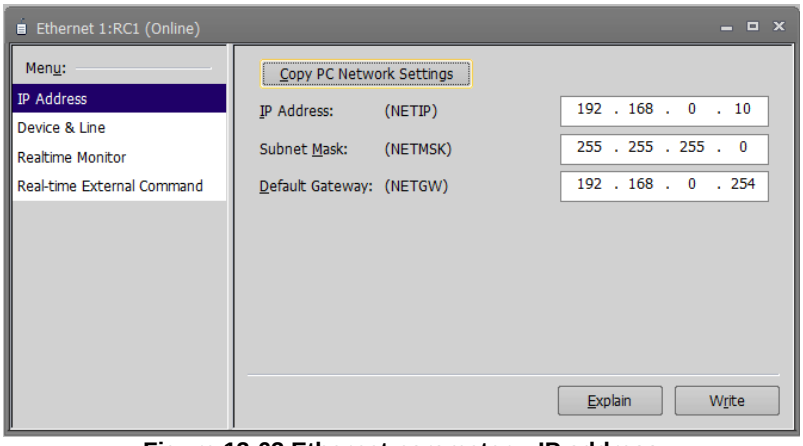


Figure 13-63 Ethernet parameter – IP address

You can copy network settings of the computer to the screen by clicking the [Copy PC network settings] button.

13.6.2.2. Device & Line

You can set the parameters related to devices and lines in the robot controller.

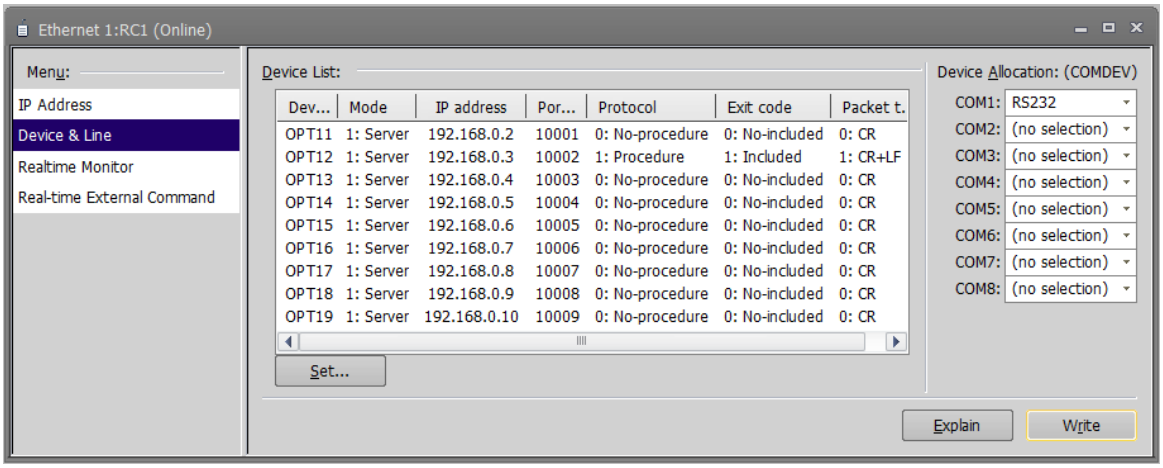


Figure 13-64 Ethernet parameter – Device & line

Select the device to edit and click the [Set] button. The “Device parameter setting” screen is displayed.

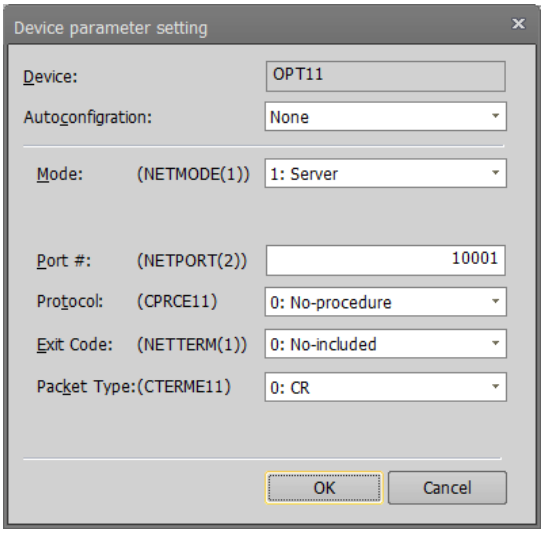


Figure 13-65 Ethernet parameter – Device parameter setting

If you select the [MELFA-3D Vision] or [Network Vision Sensor (2D)] item from the [Autoconfiguration] combobox, the contents of the screen take on the value corresponding to the selected item.

13.6.2.3. Realtime monitor

You can set the parameters related to the “Realtime monitor” function in the robot controller.
The controllers which can use the “Realtime monitor” function are as follows.

Table 13-16 Controller which can set the “Realtime monitor” function parameters

Robot controller	Software version of the robot controller
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver. S3q or later
CR750-Q/CRnQ-700	Ver. R3q or later

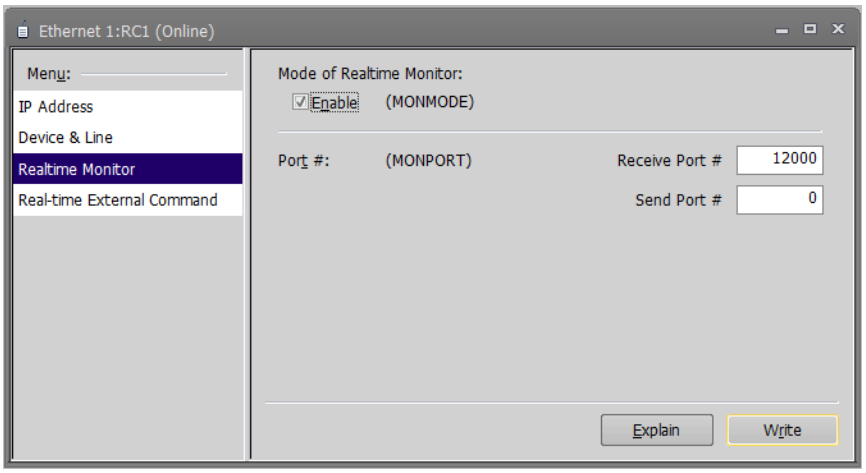


Figure 13-66 Ethernet parameter – Realtime monitor

13.6.2.4. Real-time external command

You can set the parameters related to the communication settings for the real-time external commands in the robot controller.

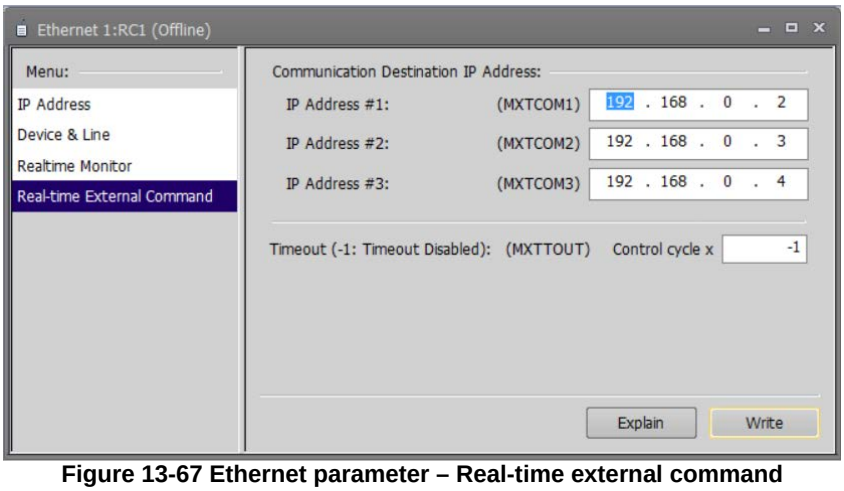


Figure 13-67 Ethernet parameter – Real-time external command

Caution

Using a CRn-500 series robot controller

When using Ethernet with a CRn-500 series robot controller, the "Ethernet interface" option is required.

13.7. Field Network Parameters

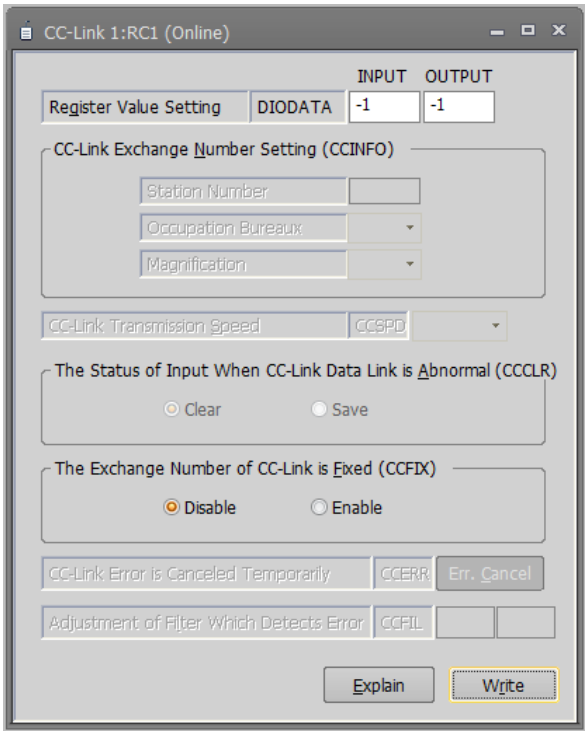
13.7.1. CC-Link parameters

This sets the CC-Link information in the robot controller.

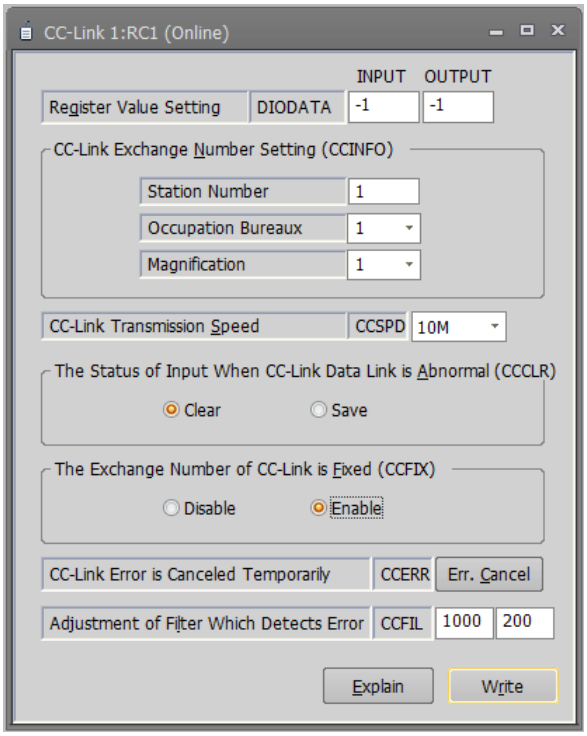
Caution

This function can only be used with CR800-D/CR750-D/CRnD-700/CRn-500 series robot controller.

Set parameters while connected to the robot controller.
Double-click [Field network parameter] -> [CC-Link] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.



CRn-500 series robot controller



CRnD-700 series robot controller

Figure 13-68 CC-Link parameter

You can reset CC-Link interface card errors by pressing the [Err. Cancel] button. After that the same error will not occur. It is valid while the power supply of the Robot Controller is ON. When the power supply is turned OFF, the error may occur again.

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

13.7.2. CC-Link IE Field Parameters

Set the information of CC-Link in the robot controller.

Caution

This function can only be used with a CRnD-800 series robot controller.

Set parameters while connected to the robot controller.

From the project tree, double click the target project [Online] -> [Parameter] -> [Field network parameter] -> [CC-Link IE Field].
After you change the parameter value, you can rewrite the parameter in the robot controller by clicking the [Write] button.

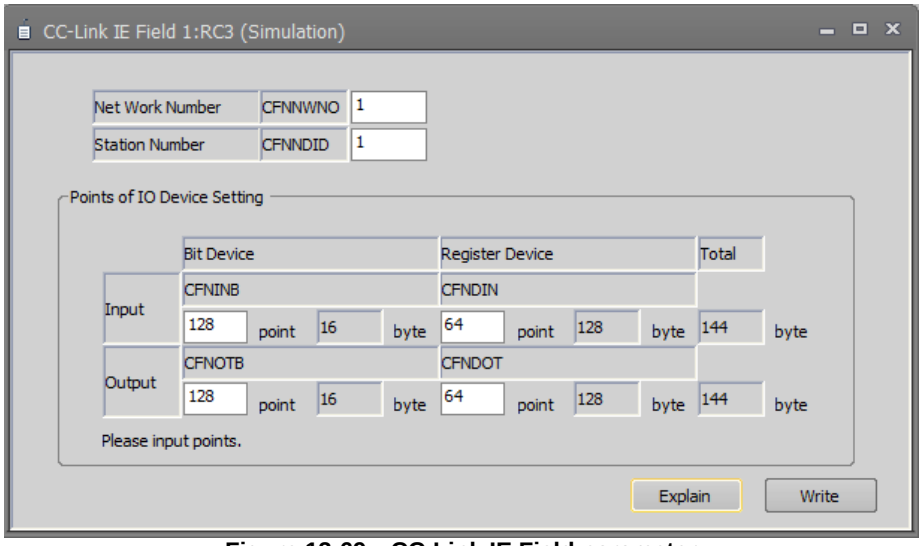


Figure 13-69 CC-Link IE Field parameter

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

13.7.3. CC-Link IE Field Basic parameters

This sets the CC-Link IE Field Basic information in the robot controller.

Caution

This function can only be used with CR800-D/CR800-R/CR800-Q series robot controller.

Set parameters while connected to the robot controller.
Double-click [Field network parameter] -> [CC-Link IE Field Basic] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

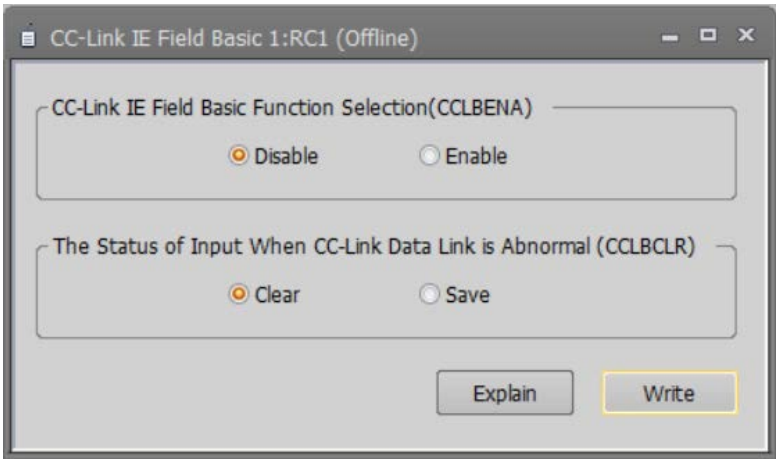


Figure 13-70 CC-Link IE Field Basic parameters

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

13.7.4. PROFIBUS parameters

This sets the PROFIBUS information in the robot controller.

Caution

This function can only be used with CR800-D/CR750-D/CRnD-700/CRn-500 series robot controller.

Set parameters while connected to the robot controller.
Double-click [Field network parameter] -> [PROFIBUS] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

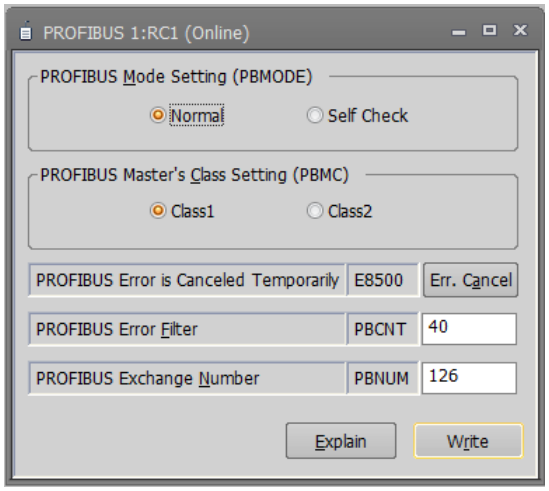


Figure 13-71 PROFIBUS parameters

You can reset PROFIBUS interface card errors by pressing the [Err. Cancel] button. After that the same error will not occur. It is valid while the power supply of the Robot Controller is ON. When the power supply is turned OFF, the error may occur again.

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

13.7.5. PROFINET parameters

This sets the PROFINET information in the robot controller.

Caution

This function can only be used with CR800-D/CR750-D/CRnD-700/CRn-500 series robot controllers.

Set parameters while connected to the robot controller.
Double-click [Field network parameter] -> [PROFINET] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

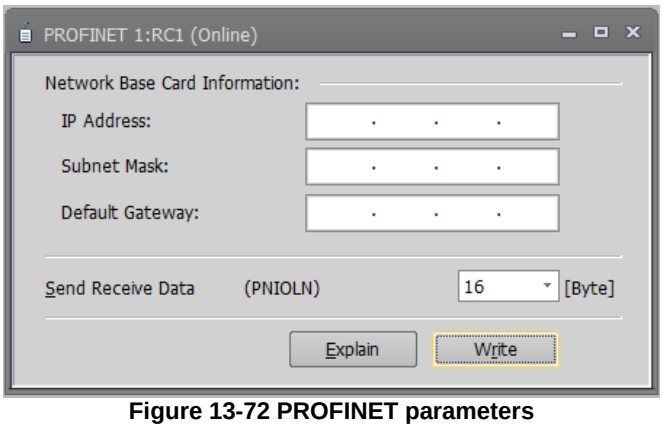


Figure 13-72 PROFINET parameters

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

When the PROFINET IO 2-Port module is mounted, the contents of the option card information are displayed in “Network base card information”. When the module is not mounted, nothing is displayed.

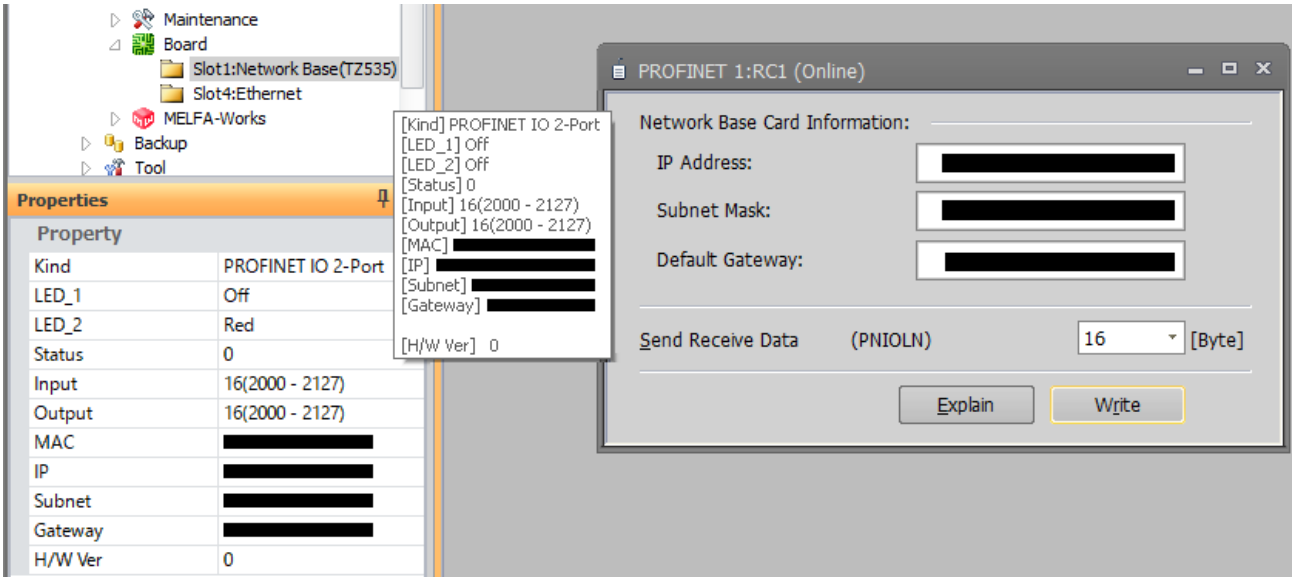


Figure 13-73 PROFINET parameters (Network base card information)

13.7.6. DeviceNet parameters

This sets the DeviceNet information in the robot controller.

Caution

This function can only be used with CR800-D/CR750-D/CRnD-700/CRn-500 series robot controllers.

Set parameters while connected to the robot controller.
Double-click [Field network parameter] -> [DeviceNet] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

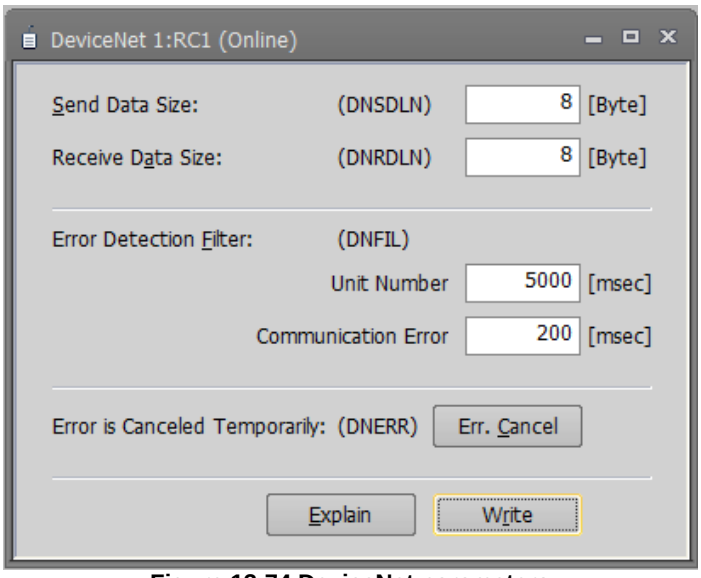


Figure 13-74 DeviceNet parameters

You can reset DeviceNet interface card errors by pressing the [Err. Cancel] button. After that the same error will not occur. It is valid while the power supply of the robot controller is ON. When the power supply is turned OFF, the error may occur again.

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

13.7.7. EtherNet/IP parameters

This sets the EtherNet/IP information in the robot controller.

Caution

This function can only be used with CR800-D/CR750-D/CRnD-700/CRn-500 series robot controllers.

Set parameters while connected to the robot controller.
Double-click [Field network parameter] -> [EtherNet/IP] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

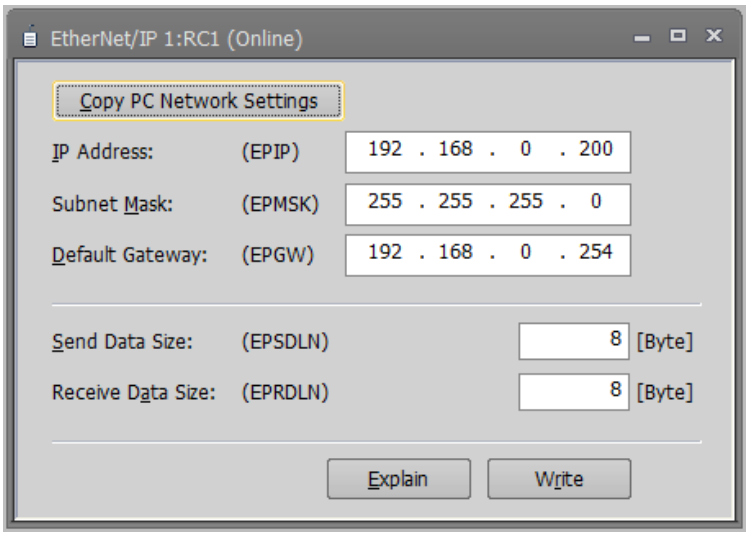


Figure 13-75 EtherNet/IP parameters

You can copy network settings of the computer to the screen by clicking the [Copy PC network settings] button.

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

13.7.8. EtherCAT parameters

This sets the EtherCAT information in the robot controller.

Caution

This function can only be used with CR800-D series robot controllers.

Set parameters while connected to the robot controller.
Double-click [Field network parameter] -> [EtherCAT] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

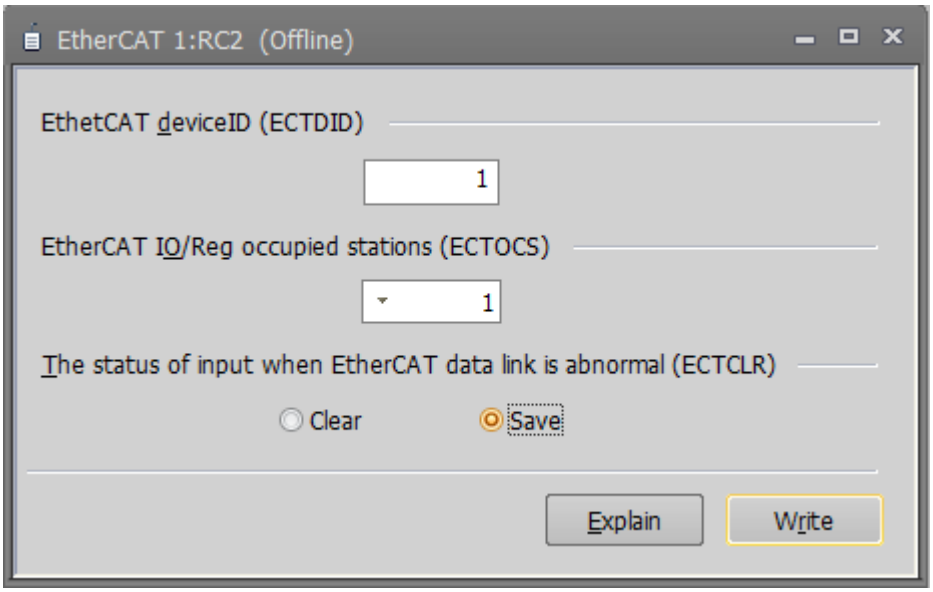


Figure 13-76 EtherCAT parameters

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

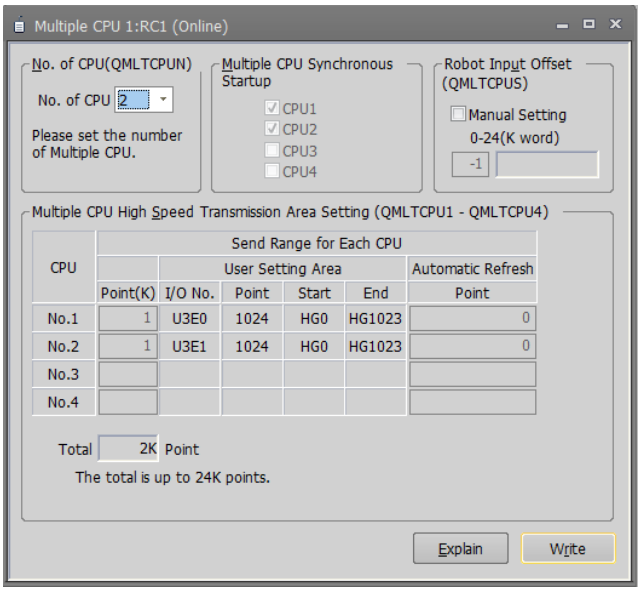
13.8. PLC Cooperation Parameters

13.8.1. Multiple CPU parameters

You can set the Multiple CPU-related parameters in order to use CR800-R/CR800-Q/CR750-Q/CRnQ-700 series robot controllers.
These parameters can be set when you are connected to a CR800-R/CR800-Q/CR750-Q/CRnQ-700 series robot controller.

Set parameters while connected to the robot controller.
Double-click [PLC cooperation parameter] -> Multiple CPU] under the [Parameter] item to be edited from the project tree.
After you change a parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

Connected with CR800-R series controller



Connected with CR800-Q/CR750-Q/CRnQ-700 series controller

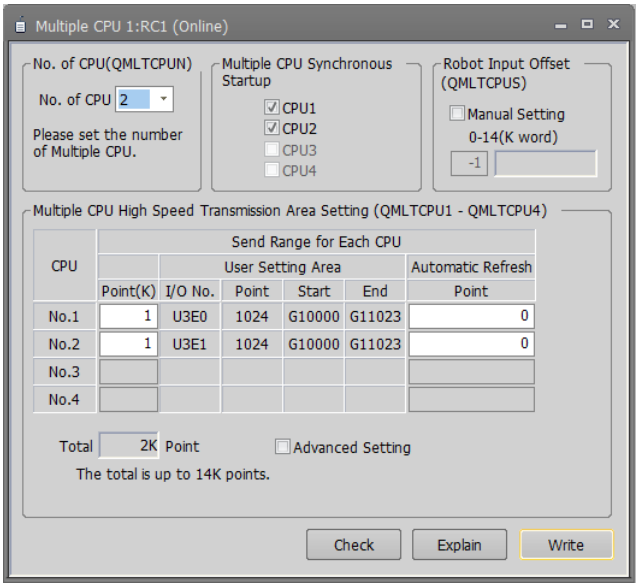


Figure 13-77 Multiple CPU parameters

CR800-R series controller, only the number of CPU settings.
When connecting to the CR800-Q / CR750-Q / CrnQ-700 Series Controller, click the [Check] button to check the number of points entered and the total range.
You can reference explanations of the displayed parameters by pressing the [Explain] button.

Please refer to the Universal model QCPU manual (QCPU User's Manual (Multiple CPU System)) for details on Multiple CPU setting.

13.8.2. IO unit parameters

You can set information related to the I/O unit of the PLC.
You can set when connected to CR800-Q / CR750-Q / CRnQ-700 series controller.
Set parameters while connected to the robot controller.
Double-click [PLC cooperation parameter] -> [IO unit] under the [Parameter] item to be edited from the project tree.

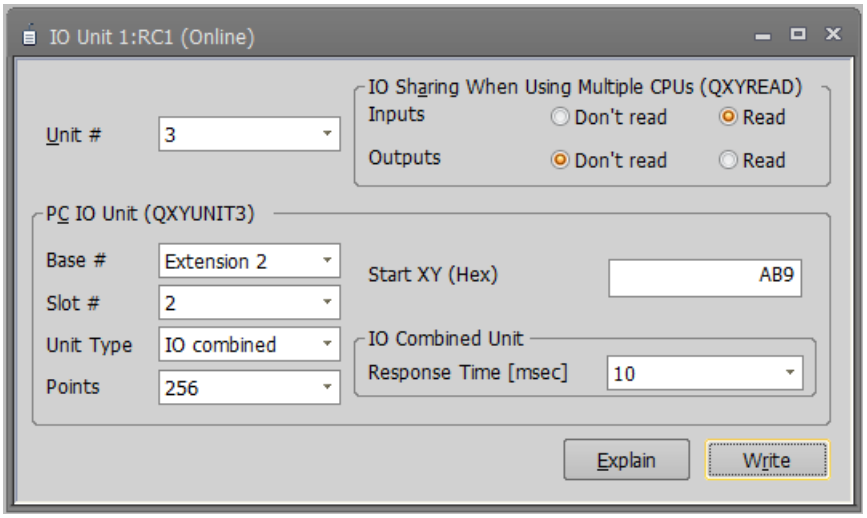


Figure 13-78 IO unit parameters

When a unit number in [Unit #] is specified, the parameter of the specified unit number is displayed in the PC IO unit.
[IO sharing when using Multiple CPUs], sets up whether XY signals are read or not

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

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

13.9. Parameters of Safety (CR800)

13.9.1. Safety diagnosis function

You can select the pulse output function of test pulse signal output from emergency stop (EXTEMG11, EXTEMG21).For the safety diagnosis function (test pulse diagnosis), please refer to the “Standard Specifications” of each series.

This function can be used with the CR800 series robot controller and the parameter cannot be set for offline editing.

Double-click [Safety Parameter] -> [Safety Diagnosis Function] under the [Parameter].

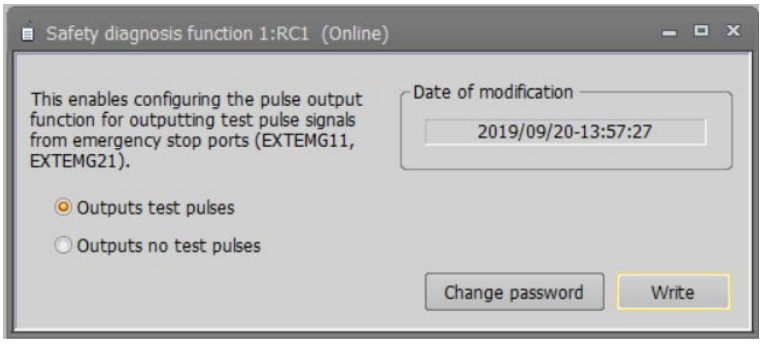


Figure 13-79 Safety diagnosis function parameter

After changing the parameter value, click the [Write] button to write the parameter to the robot controller.

This parameter requires a password to be written.Enter the correct password and press the [OK], the parameters will be written to the controller. If the password is wrong, the parameter will not be written.

The password is required only when writing the first parameter after displaying the parameter editing screen of the safety diagnosis function.

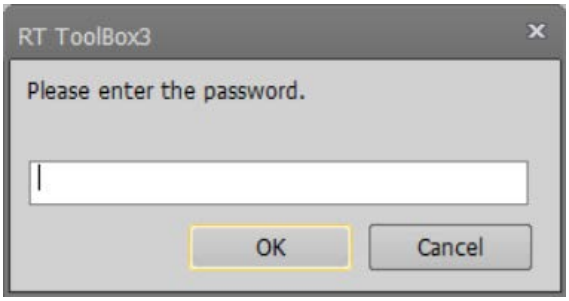


Figure 13-80 Password input screen

The default password is「MELFASafetyPSWD」.You can click the [Change Password] to change the password on the [Register / Change Password]. Enter the old and new password on this screen to change the password.

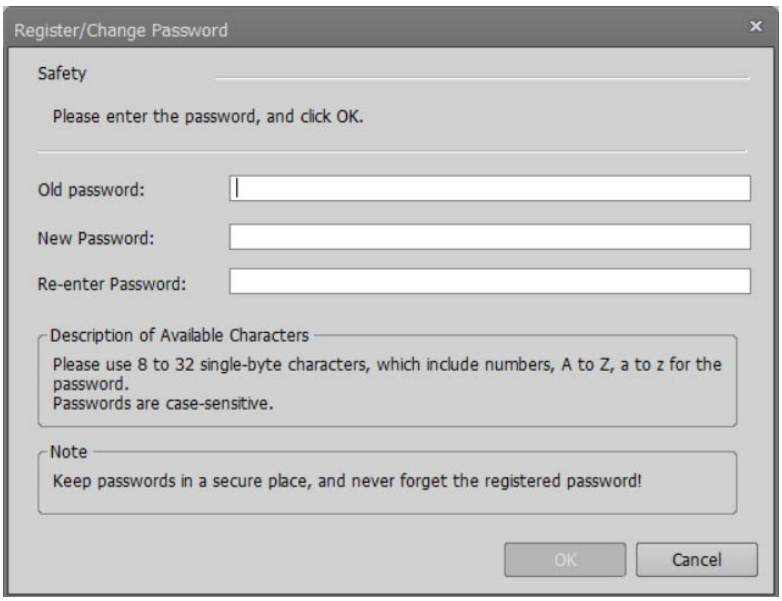


Figure 13-81 Register/change password

Please use 8 to 32 single-byte characters, which include numbers, A to Z, a to z for the password. Passwords are case-sensitive.

⚠ Caution

Please be careful about password management.

If you forget your password, you will not be able to change the settings of the safety diagnostic function. Please be careful when managing the set password. If you forget your password, you need to reset it to the default by resetting the model. Refer to “Detailed explanation of functions and operations” for model reset operations.

13.9.2. Safety option

You can set parameters of Robot Safety Option in the CR800 series robot controllers.
For details of these parameters, refer to the **"Robot Safety Option manual"** (BFP-A3531).

This function can be used with CRn800 series robot controller (robot safety option required).
CR750/CR700 series safety parameters of the robot controller are set differently. For details, refer to "**13.3.16 Safety Parameters(CR750/CR700)**".

These parameters cannot be set by the offline editing.

13.9.3. Basic Configuration Parameter

Set the basic safety function.
Double-click [Safety parameter] -> [Safety option] -> [Basic Configuration] under the [Parameter] item to be edited from the project tree.

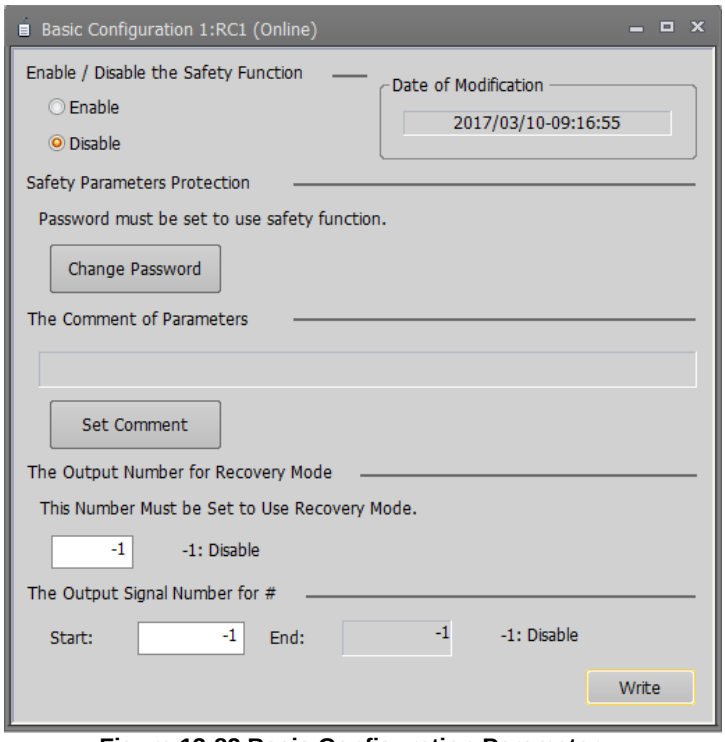


Figure 13-82 Basic Configuration Parameter

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

13.9.4. Robot Model Parameter

Set the robot model to be used for monitoring safety functions.
Double-click [Safety parameter] -> [Safety option] -> [Robot Model] under the [Parameter] item to be edited from the project tree.

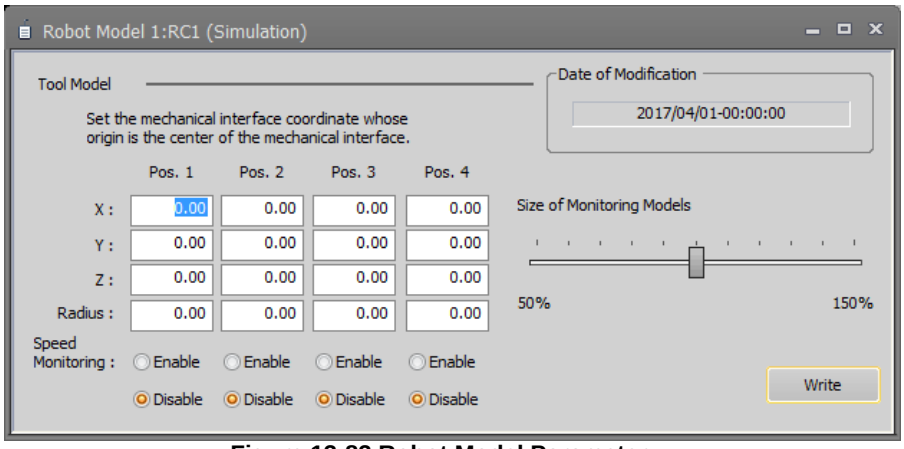


Figure 13-83 Robot Model Parameter

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

13.9.5. Safety Logic

Set parameters for safety logic.

13.9.5.1. Safety Input Parameter

Set parameters related to the input signal of the safety function.
Double-click [Safety parameter] -> [Safety option] -> [Safety Logic] -> [Safety Input] under the [Parameter] item to be edited from the project tree.

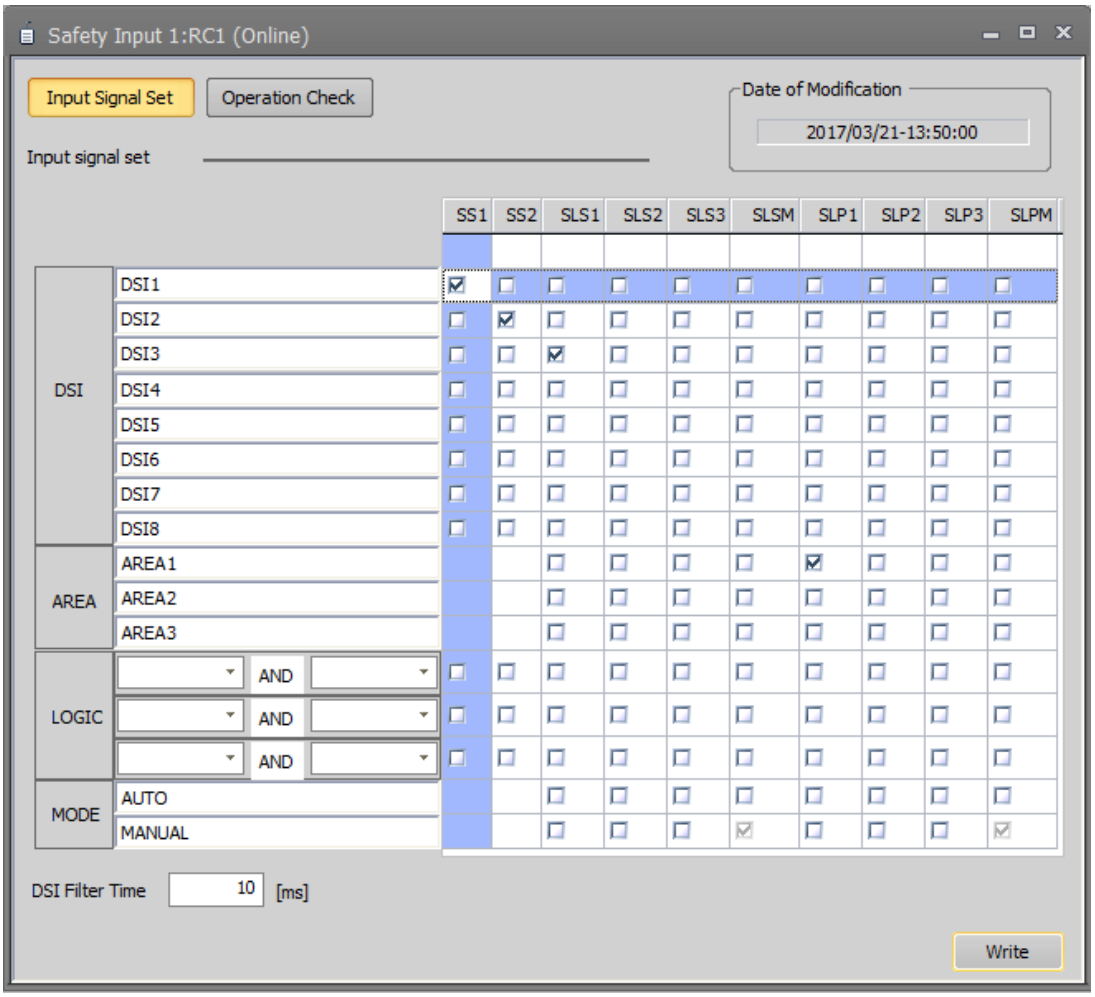


Figure 13-84 Safety Input Parameter

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

13.9.5.2. Area Input Parameter

Set the parameters for the area where safety is to be monitored.
Double-click [Safety parameter] -> [Safety option] -> [Area Input] -> [Safety Input] under the [Parameter] item to be edited from the project tree.

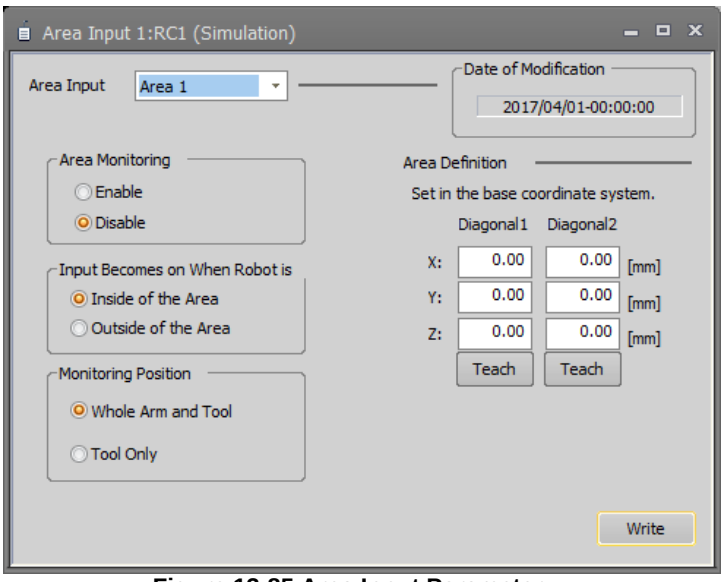


Figure 13-85 Area Input Parameter

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

13.9.5.3. Safety Output Parameter

Set parameters related to the output signal of the safety function.
Double-click [Safety parameter] -> [Safety option] -> [Area Input] -> [Safety Output] under the [Parameter] item to be edited from the project tree.

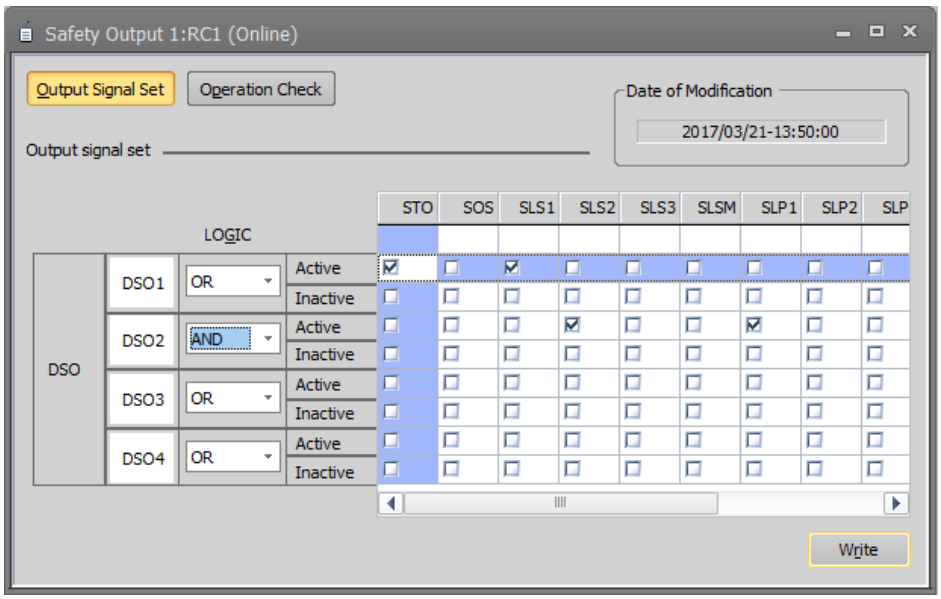


Figure 13-86 Safety Output Parameter

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

13.9.6. SOS Parameter

Set parameters related to stopping the operation of the robot when the safety function is activated.
Double-click [Safety parameter] -> [Safety option] -> [SOS] under the [Parameter] item to be edited from the project tree.

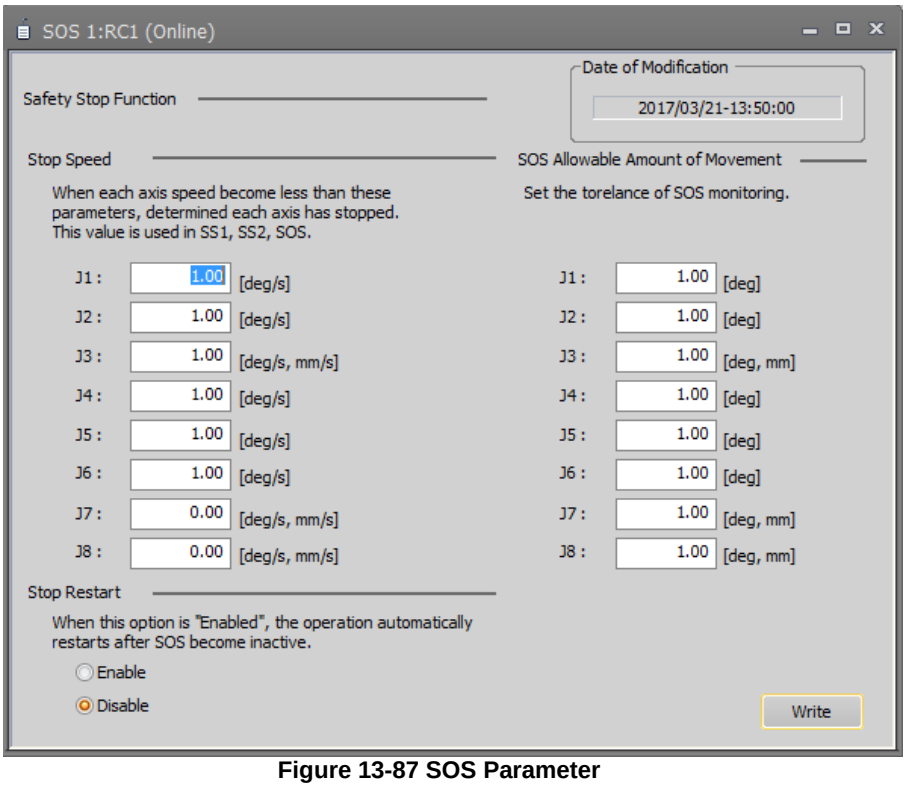


Figure 13-87 SOS Parameter

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

13.9.7. SLS

Set parameters related to SLS (Safe Limited Speed).

13.9.7.1. Speed Parameter

Set parameters related to speed control.
Double-click [Safety parameter] -> [Safety option] -> [SLS] -> [Speed] under the [Parameter] item to be edited from the project tree.

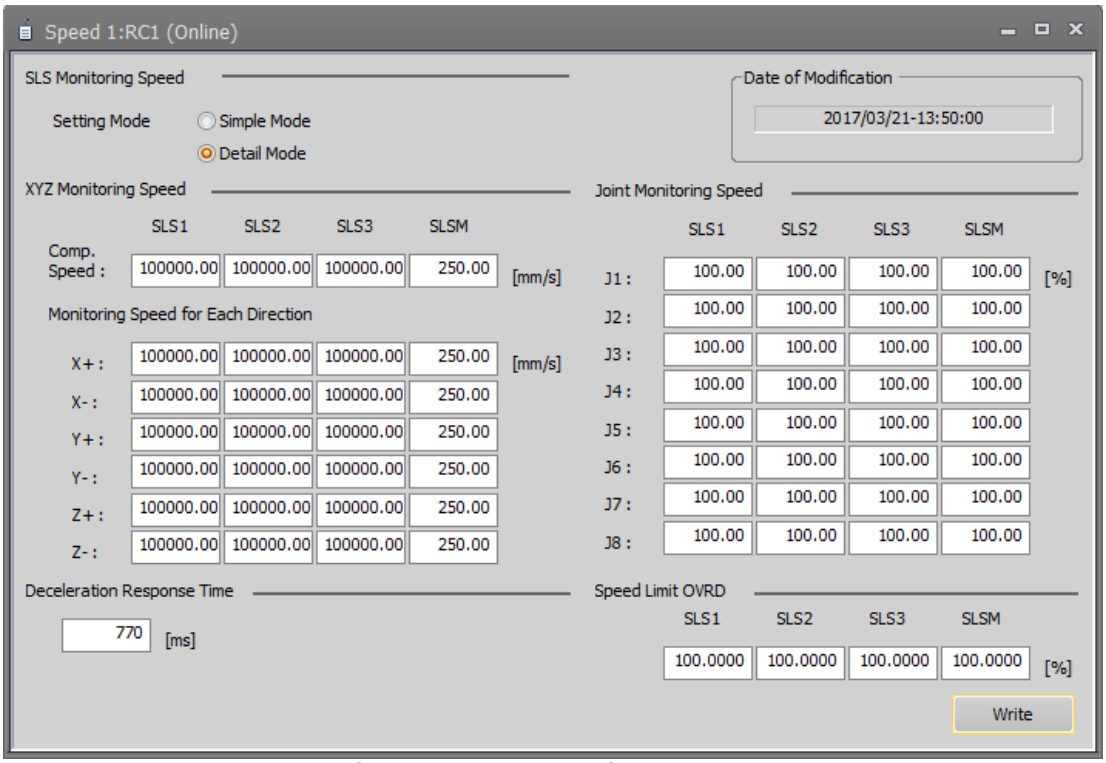


Figure 13-88 SLS Speed Parameter

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

13.9.7.2. Opearation Check

Check control operation of SLS.
Double-click [Safety parameter] -> [SLS] -> [Operation Check] under the [Parameter] item to be edited from the project tree.

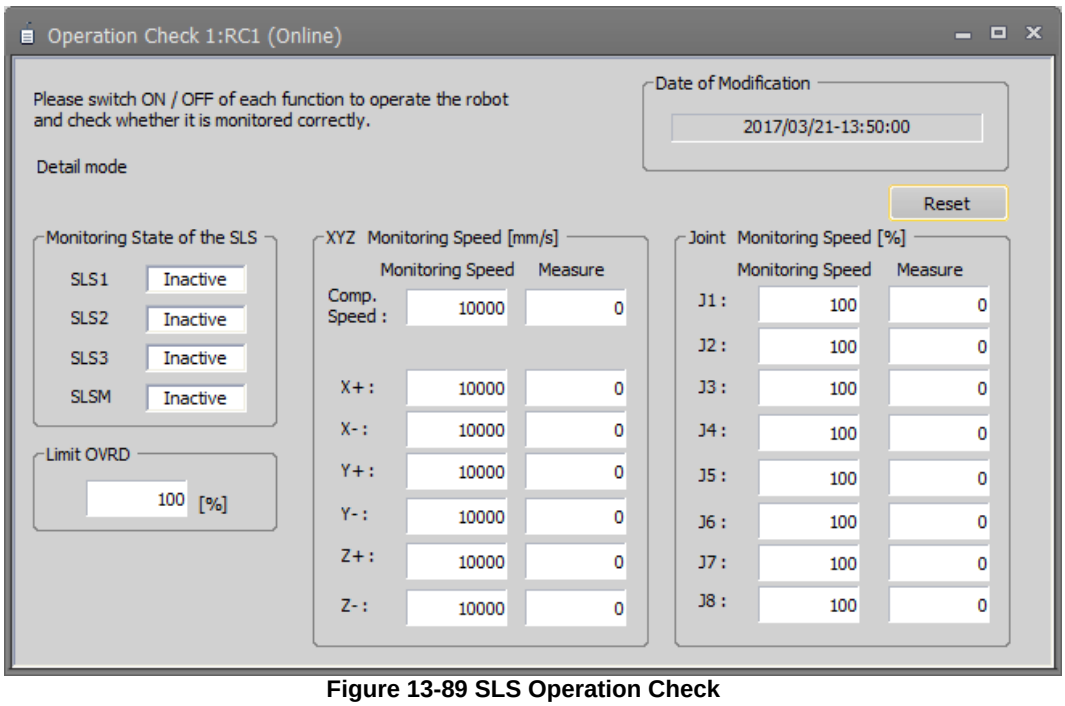


Figure 13-89 SLS Operation Check

Parameters are not set on this screen.
Click the [Reset] button to reset the maximum value of the measurement value.

13.9.8. SLP

Set parameters related to SLP (safety position limit).

13.9.8.1. Plane Parameter

Set parameters related to plane monitoring.
Double-click [Safety parameter] -> [Safety option] -> [SLP] -> [Plane] under the [Parameter] item to be edited from the project tree.

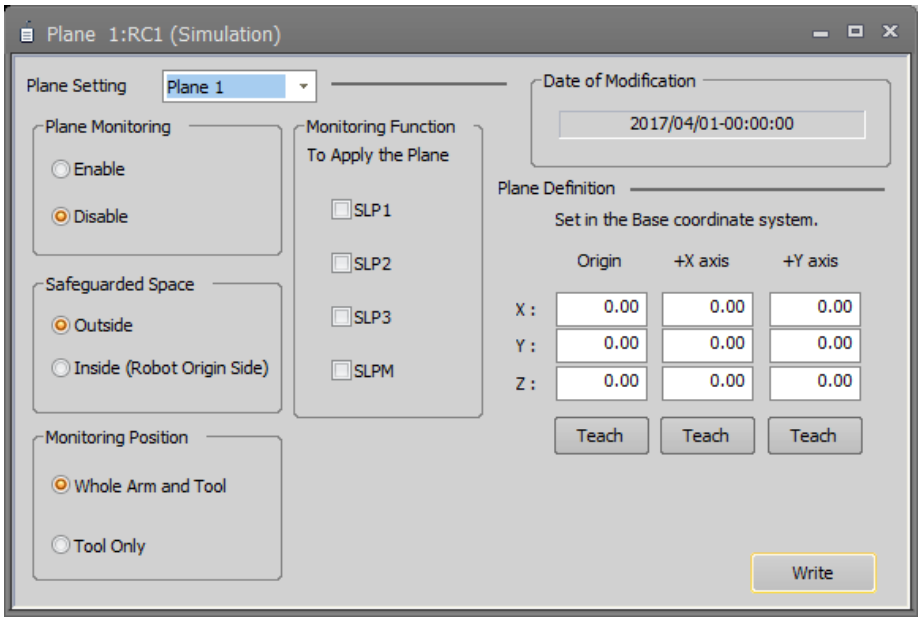


Figure 13-90 SLP Plane Parameter

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

13.9.8.2. Area Parameter

Set parameters related to area monitoring.
Double-click [Safety parameter] -> [Safety option] -> [SLP] -> [Area] under the [Parameter] item to be edited from the project tree.

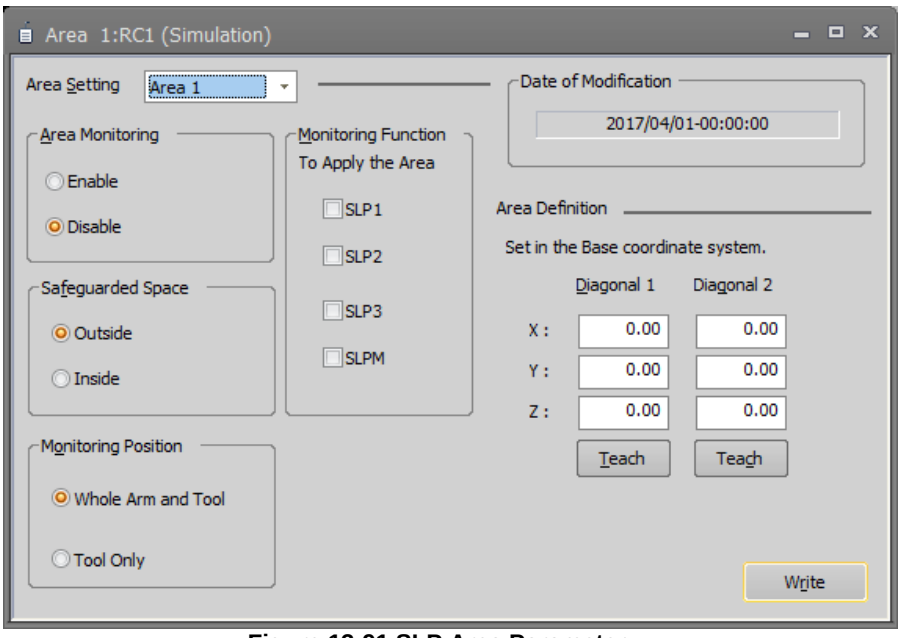


Figure 13-91 SLP Area Parameter

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

13.9.8.3. Operation Check

Check control operation of SLP.
Double-click [Safety parameter] -> [Safety option] -> [SLP] -> [Operation Check] under the [Parameter] item to be edited from the project tree.

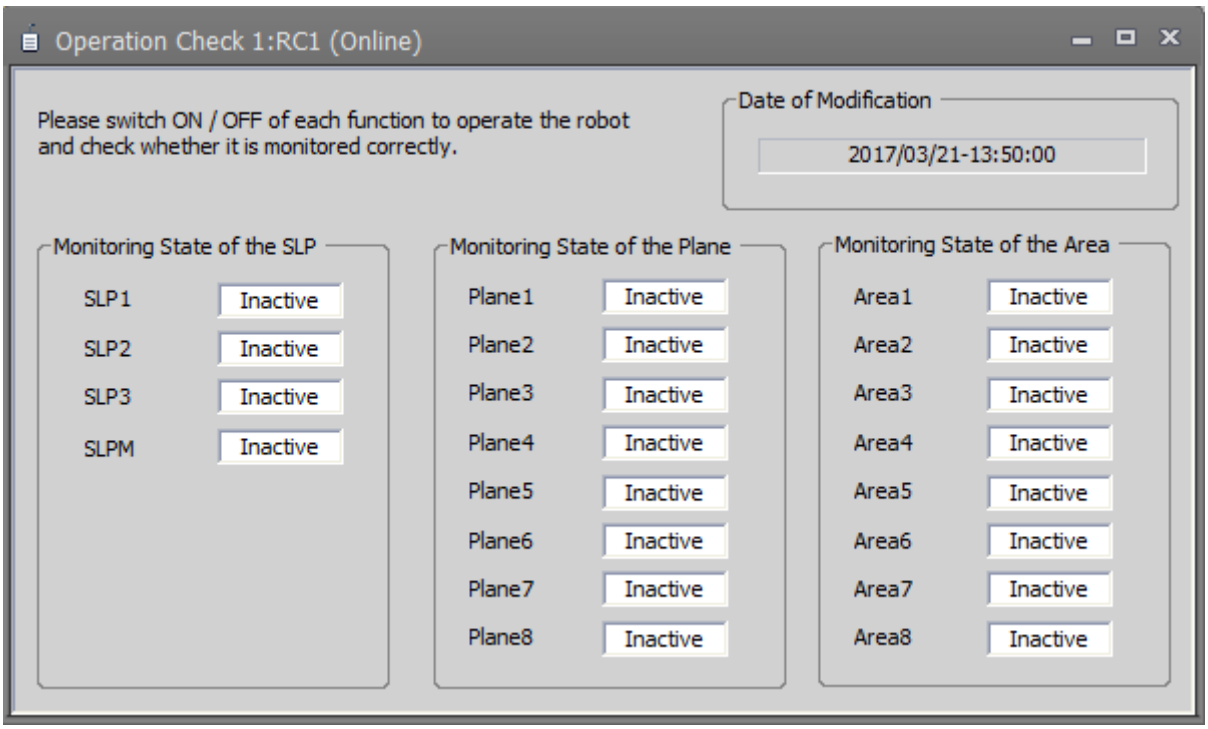


Figure 13-92 SLP Operation Check

Parameters are not set on this screen.

13.10. Additional Axis Cooperative Control Parameters

You can set parameters related to Additional axis cooperative control in PC and robot controllers.
This function can be used if the setting language is MELFA-BASIC VI and CR800 series robot controller and additional axis cooperative control of Melfa Smart Puls function is effective.

For more information see "**MELFA-Smart plus User's Manual**".

These parameters cannot be set by the offline editing.

13.10.1. Base Coordinate Offset Data parameter

Double-click [Movement parameter] -> [Additional Axis Cooperative Control] -> [Base Corrdinate Offset Data] under the [Parameter] item to be edited from the project tree.

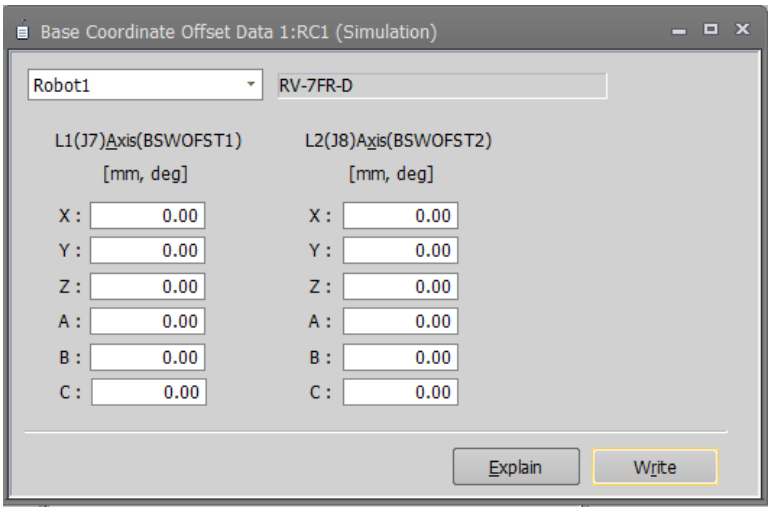


Figure 13-93 Base cordinate offset data parameter(Robot1)

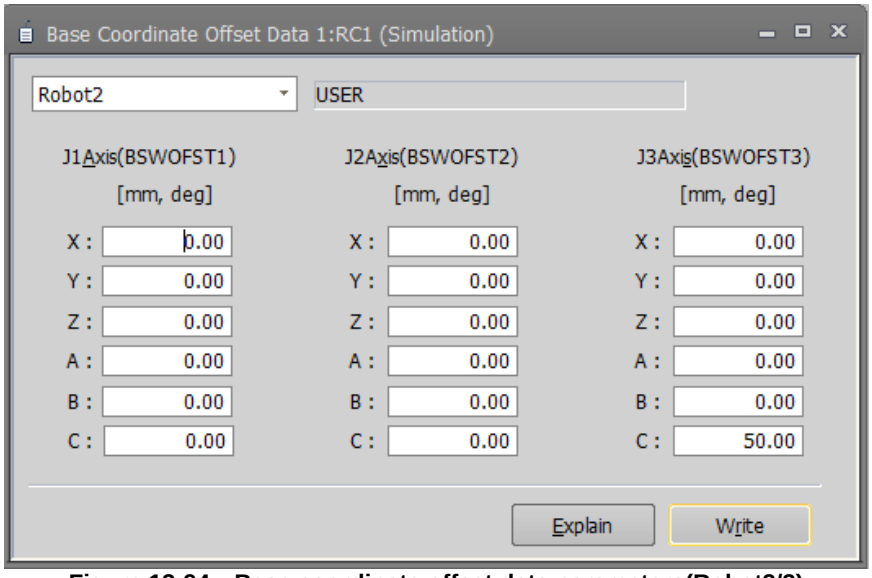


Figure 13-94 Base coordinate offset data parameters(Robot2/3)

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

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

13.10.2. Base Coordinate Cooperative parameter

Double-click [Movement parameter] -> [Additional Axis Cooperative Control] -> [Base Coordinate Cooperative] under the [Parameter] item to be edited from the project tree.

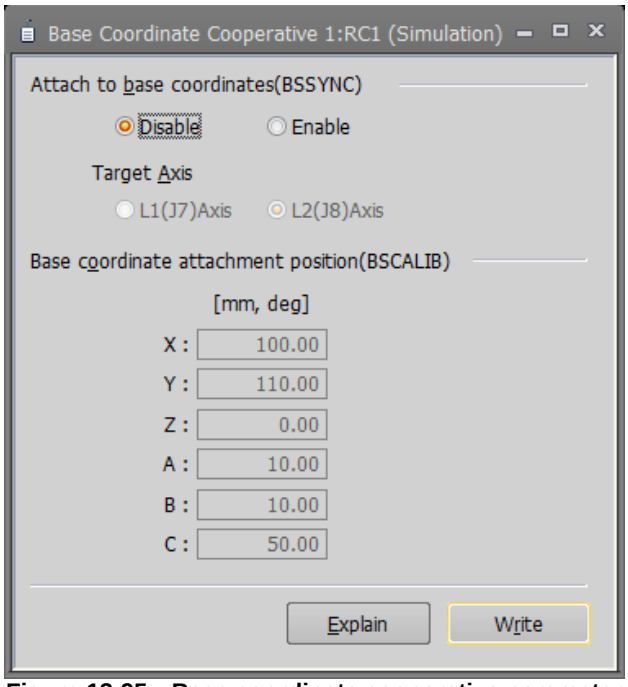


Figure 13-95 Base coordinate cooperative parameter

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

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

13.10.3. Additional Axis Tracking parameter

Double-click [Movement parameter] -> [Additional Axis Cooperative Control] -> [Additional Axis Tracking] under the [Parameter] item to be edited from the project tree.

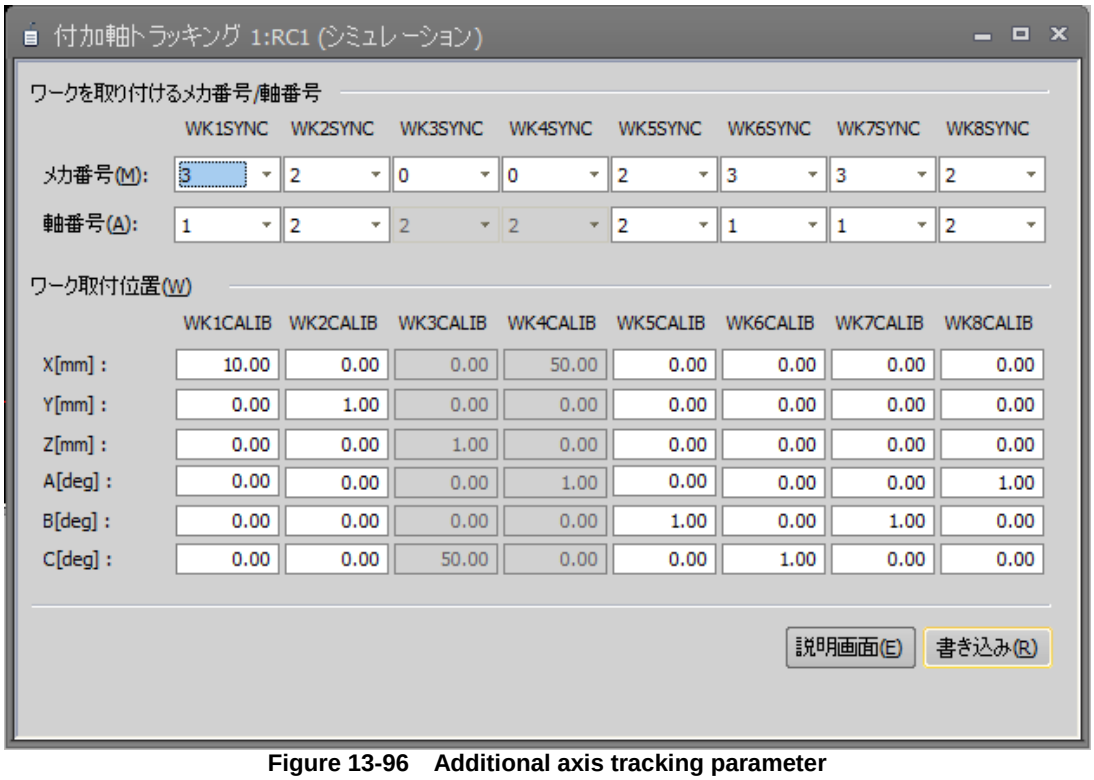


Figure 13-96 Additional axis tracking parameter

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

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

13.11. Parameter printing

You can print the parameter values held in a robot controller.

Display the parameter to print, and click the [Home] tab -> [Print] group -> [Print] button on the ribbon. The print screen is displayed, so check the printer, then click the [OK] button. Printing starts.
You can preview how a printed page will look by clicking the [Home] tab -> [Print] group -> [Print preview] button on the ribbon.

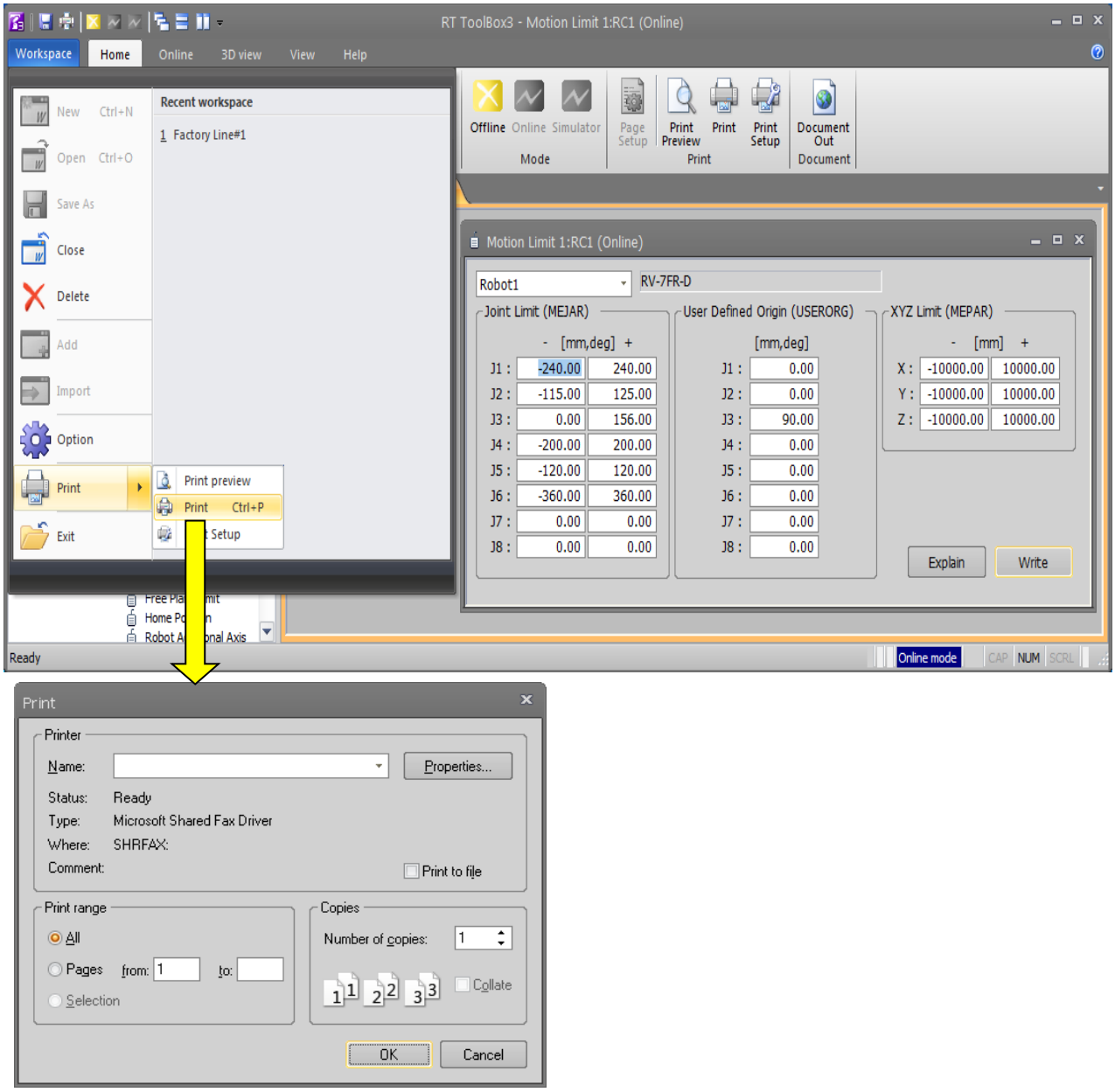


Figure 13-97 Parameter Printing

Caution

Install the printer beforehand.

Install the printer beforehand. For details on how to install printers, refer to the operation manuals for your printer and computer.

It is possible to print only the parameter changed from 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 13-17 Versions capable of printing a list of parameters changed from default values

	Robot controller			
	CR800-D/R/Q	CR750-D/CRnD-700	CR750-Q/CRnQ-700	CRn-500
Software version of robot controller	All versions	Ver.P6 or later	Ver.N6 or later	not use

Display "Changes" in the parameter list, and click the [Home] tab -> [Print] group -> [Print] button on the ribbon. The printing screen is displayed. Click [OK] button after confirming the printer to begin printing.
You can preview how a printed page will look by clicking the [Home] tab -> [Print] group -> [Print preview] button on the ribbon.

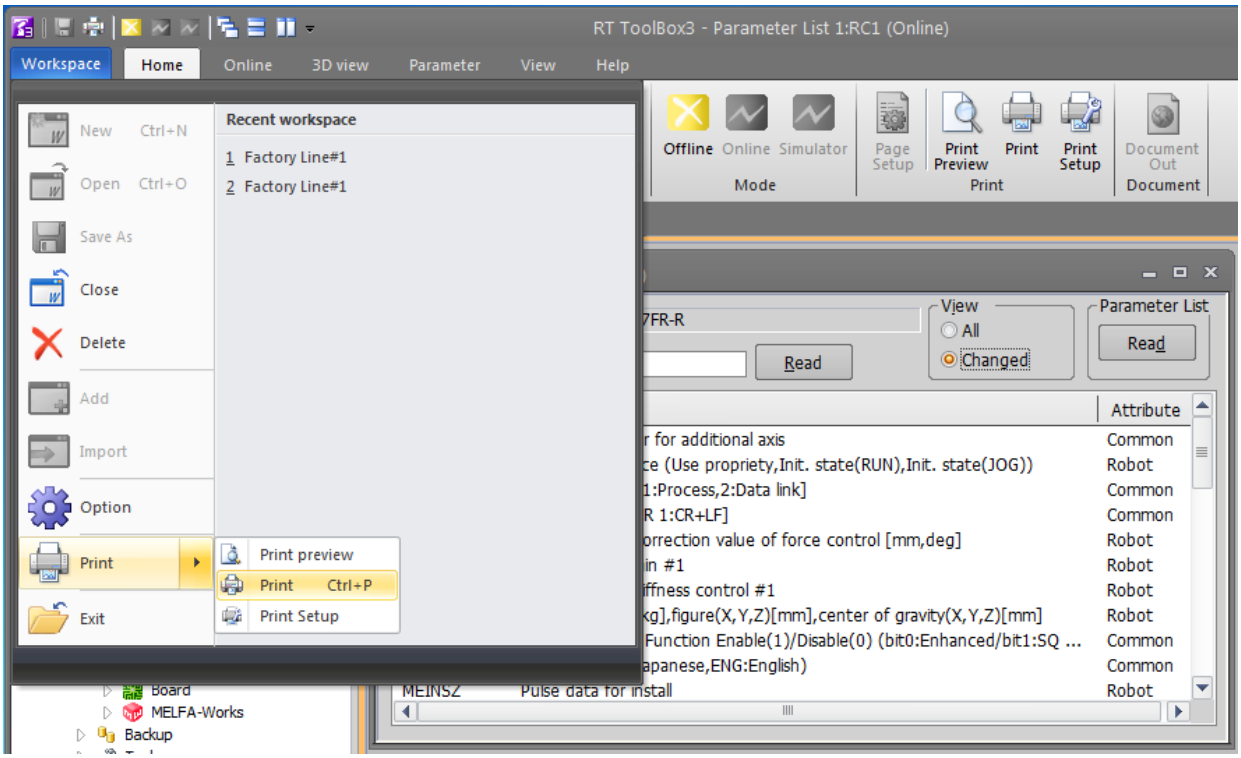


Figure 13-98 Printing the parameter changed from initial value

14. 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 14-1 Summary of Each Monitor

	Monitor name	Description
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. It can also monitor general-purpose signals and registers.
	Program external variables	Monitor the external variables of the program.
	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 for confirmation.
Signal monitor	General signals	You can check the status 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 a 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 the sequencer IO unit.
	DSI CNUSER2 input signal	You can monitor input signals related to safety monitoring function.
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.

14.1. Ribbon command for monitor screen

The [Monitor] tab is displayed on the ribbon when a monitor screen is active. Start and stop of monitoring can be changed by commands on the [Monitor] tab. When a screen is started up, monitoring is already started.

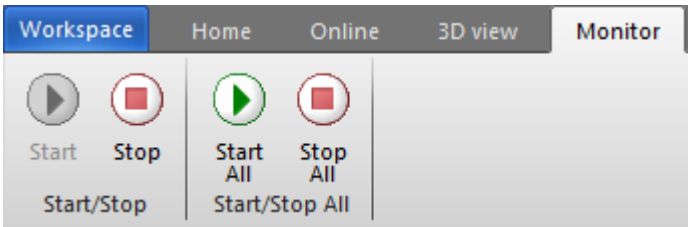


Figure 14-1 Ribbon Monitor Tab

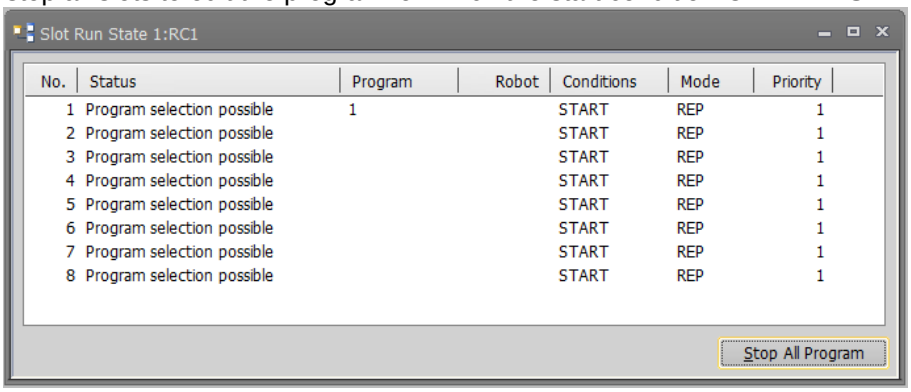
Table 14-2 Command on the Monitor tab

Command name	Description
Start	Start monitoring the active monitor screen.
Stop	Stop monitoring the active monitor screen.
Start All	Monitoring of all displayed monitor screens will start.
Stop All	Monitoring of all displayed monitor screens will stop.

14.2. Robot Movement Monitoring

14.2.1. 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.
It is necessary to stop all slots to edit the program for which the start condition is "ALWAYS".



No.	Status	Program	Robot	Conditions	Mode	Priority
1	Program selection possible	1		START	REP	1
2	Program selection possible			START	REP	1
3	Program selection possible			START	REP	1
4	Program selection possible			START	REP	1
5	Program selection possible			START	REP	1
6	Program selection possible			START	REP	1
7	Program selection possible			START	REP	1
8	Program selection possible			START	REP	1

Figure 14-2 Slot Run Status

The No. of displayed slots is determined by the parameters.

14.2.2. Program monitoring

Variables, general-purpose signals, and register information on the running program can be monitored.Please refer to the “14.2.3Program external variables” for monitoring program external variables.

From the project tree, click the target project [Online] -> [Monitor] -> [Movement Monitor] -> [Program Monitor], then double click the "Task slot" to monitor.

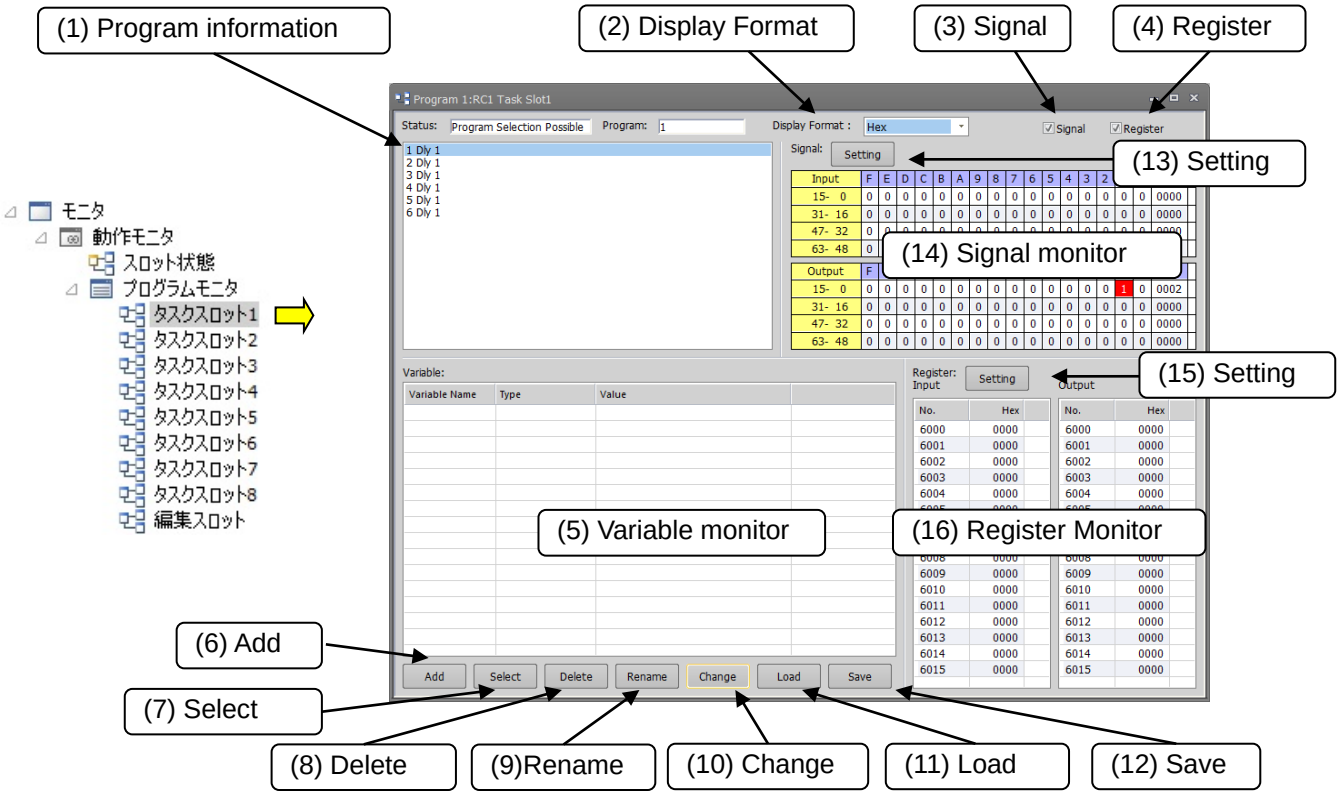


Figure 14-3 Program monitor(Signal monitor, register monitor display)

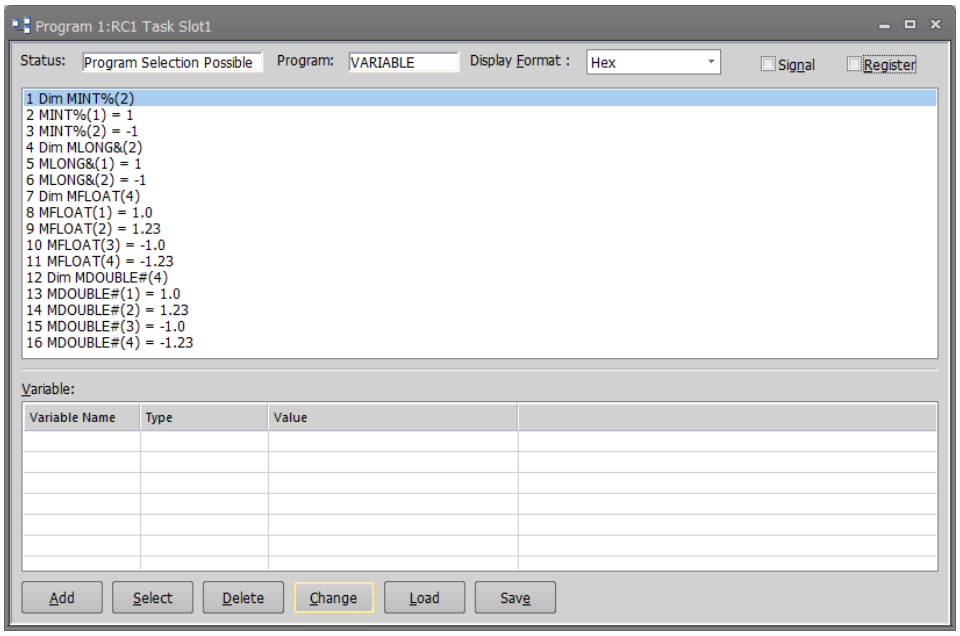


Figure 14-4 Program monitor（Signal monitor, register monitor not display）

(1) Program information

You can check the currently selected program, the operating status of the program, and the program name. The program will highlight the currently executed line.

(2) Display format

The value displayed in variable monitor, signal monitor, and register monitor can be switched.

Table 14-3 Change display of variable monitor, signal monitor, register monitor

Variable monitor	Integer	The displayed variable can be switched between hexadecimal / unsigned decimal / signed decimal.
	Real	It is possible to switch between hexadecimal / signed decimal if 0 under the decimal point. However, the value can only be displayed within a range of -9999999 - 9999999.This will be displayed as a floating point if this range is exceeded.
	String	Can not switch display.
	Position Data	Switching display is not performed for both orthogonal / joint / work coordinate
Signal		The displayed variable can be switched between hexadecimal / unsigned decimal / signed decimal.
Register		The displayed variable can be switched between hexadecimal / unsigned decimal / signed decimal.

As for the value displayed by the hexadecimal number, “&H” is added to the head of the value.

(3) Signal check box

Display / non-display of signal monitor by ON / OFF of check box.

(4) Register check box

Display / non-display of Register monitor by ON / OFF of check box.

Register check box is not displayed if option card is not installed.

(5) 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.

(6) Adding variables

This adds more variables to monitor.

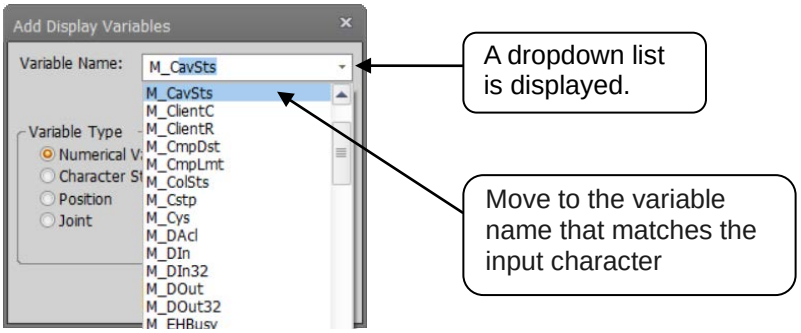


Figure 14-5 Add Variables

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. If you enter a variable name midway, it automatically moves to the variable name that matches the input character. When you select variables from the dropdown list, the variable type is automatically selected.

(7) Selecting variables

You can batch select variables to monitor from the variable list used in the program.

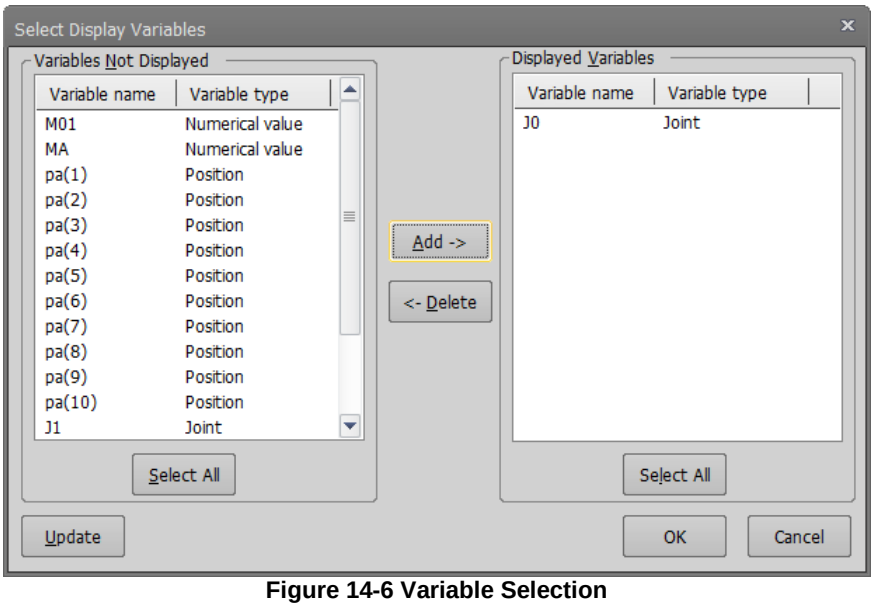


Figure 14-6 Variable Selection

The "Variables not displayed" are displayed in the list on the left side and the "Displayed variables" are displayed in the list on the right side. From the "Variables not displayed" list, select the variables to monitor, then click the [Add->] button. The selected variables are added to the "Displayed variables" list. If you select variables from the "Displayed variables to " list, then click the [<-Delete] button, the selected variables are deleted from the "Displayed variables" list and added to the "Variables not displayed" list.

When you click the [OK] button, the variables registered in the "Displayed variables" list are displayed on the variables monitor and you can reference their values.

(8) 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.

(9) Rename

You can change the variable to be monitored by changing the name of the variable registered in the variable monitor.

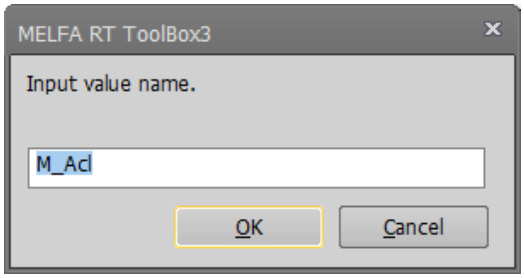


Figure 14-7 Rename

(10) 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.

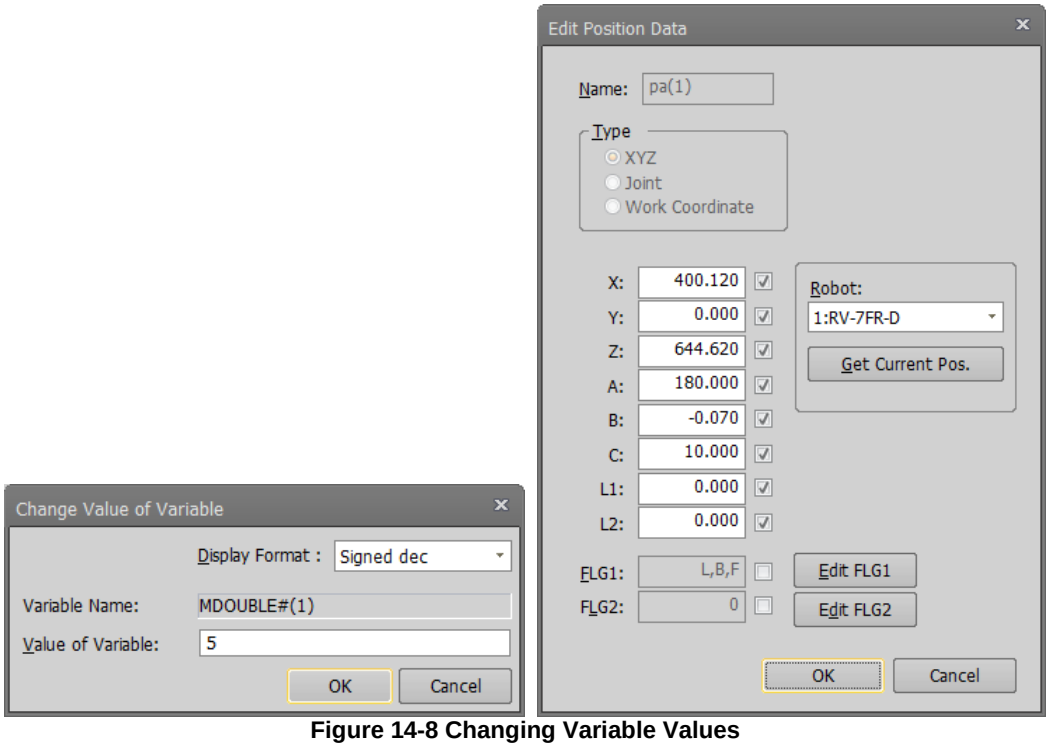


Figure 14-8 Changing Variable Values

After confirming the variable name, input the value of the variable, and 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 interference with the surroundings may result. This is particularly dangerous during robot operation, so check carefully before changing the value of a parameter.

Caution

Depending on the type of variable, the Format drop-down menu will not be displayed.

You can change the display format only when the type of the variable is "integer type" and the value after the decimal point is "real type".
However, "real type" can not be changed to "unsigned decimal".

(11) 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.

(12) Save

You can save a list of the variables being monitored on the variables monitor to a file.
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.

(13) Signal setting

The start number of input signal and output signal can be set within the range of 0 to 32703.

(14) Signal monitor

You can check the signal input from the external device to the robot controller or the state of the signal output to the external device.

Pseudo input and forced output of bits can be performed by double clicking on the signal list.

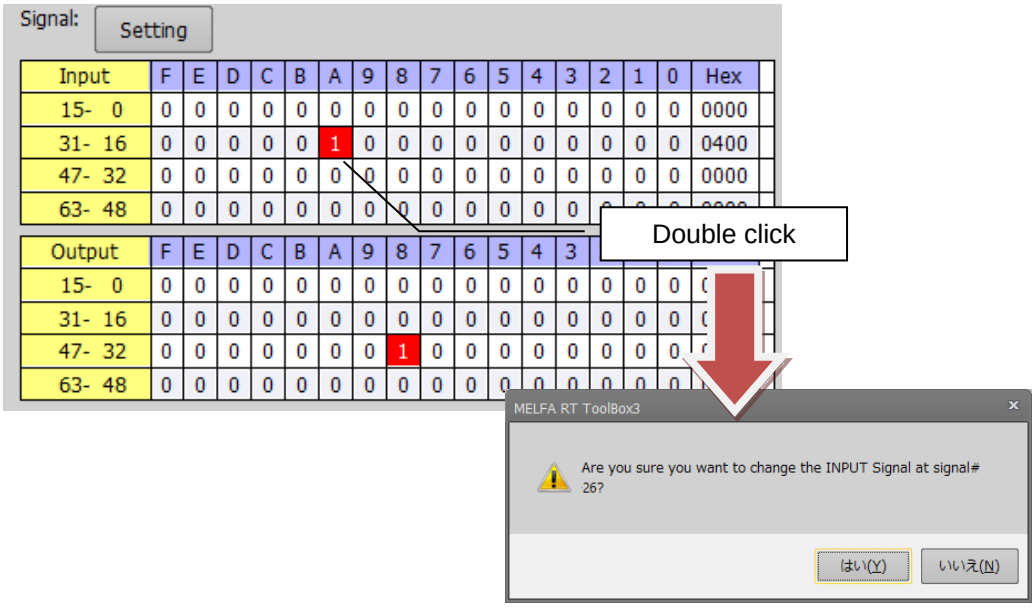


Figure 14-9 Double click pseudo input

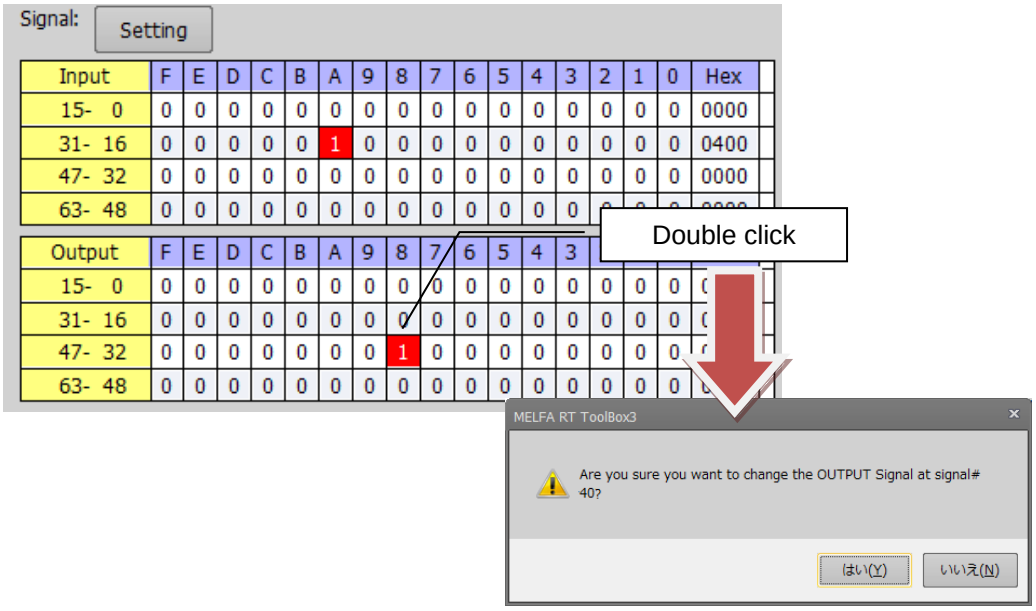


Figure 14-10 Double click forced output

(15) Register setting

The start register of input register and output register can be set within the range of 6000 to 6496.

(16) Register monitor

You can check the register value input from the external device to the robot controller or the state of the register value output to the external device.

At the end of the screen, the set display format, variables, signal number, register number are automatically saved and reflected at the next display.

The setting contents are saved for each task slot.

14.2.3. Program external variables

You can monitor program external variables.Please refer to ”14.2.2 Program monitoring” for monitoring of running programs.
Double-click [Online] -> [Monitor] -> [Robot Movement] -> [Program external variable] of the target project to start.

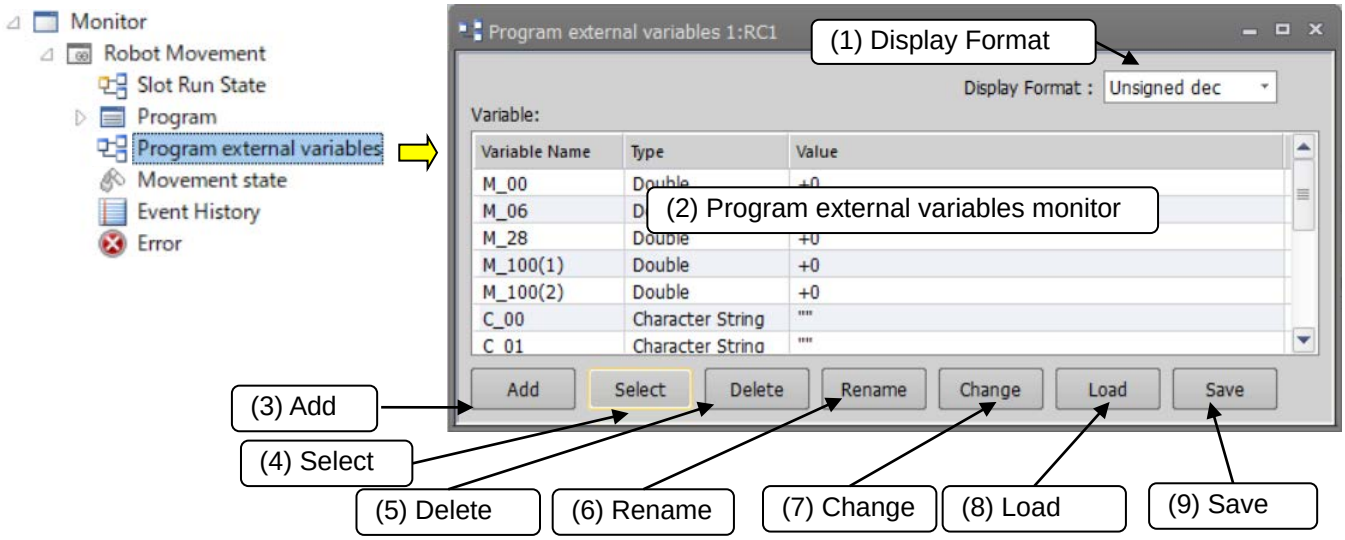


Figure 14-11 Program external variables monitor

(1) Display format
The value displayed in variable monitor, signal monitor, and register monitor can be switched.

Table 14-4 Change display of variable monitor, signal monitor, register monitor

Variable monitor	Integer	The displayed variable can be switched between hexadecimal / unsigned decimal / signed decimal.
	Real	It is possible to switch between hexadecimal / signed decimal if 0 under the decimal point. However, the value can only be displayed within a range of -9999999 - 9999999.This will be displayed as a floating point if this range is exceeded.
	String	Can not switch display.
	Position Data	Switching display is not performed for both orthogonal / joint / work coordinate.

As for the value displayed by the hexadecimal number, “&H” is added to the head of the value.

(2) Program external variables monitor
You can check the program external variables. You can select the variables to monitor with the buttons displayed at the bottom of the screen.

※For details on (3) to (9) below, refer to (6) to (12) of ”14.2.2 Program monitoring”.
(3) Adding variables
Add program external variables for monitoring.

(4) Selecting variables
You can batch select variables to monitor from the program external variable list used in the program.

(5) Deleting variables
This deletes variables registered on the program external variables monitor from the monitor list. This operation does not delete the program external variables themselves from the program.

(6) Rename

You can change the variable to be monitored by changing the name of the variable registered in the variable monitor.

(7) Changing variables

You can change the values of program external variables registered on the variables monitor.

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 interference with the surroundings may result. This is particularly dangerous during robot operation, so check carefully before changing the value of a parameter.

Caution

Depending on the type of variable, the Format drop-down menu will not be displayed.

You can change the display format only when the type of the variable is "integer type" and the value after the decimal point is "real type".

However, "real type" can not be changed to "unsigned decimal".

(8) Load

You can load variables to be monitored on the program external variables monitor from a file.

(9) Save

You can save a list of the variables being monitored on the program external variables monitor to a file.

At the end of the screen, the set display format, variables are automatically saved and reflected at the next display.

14.2.4. Movement status

You can check the current position, destination position, hand open/close status, etc., of the robot.

From the project tree, double click the target project [Online] -> [Monitor] -> [Movement Monitor] -> [Movement Status].

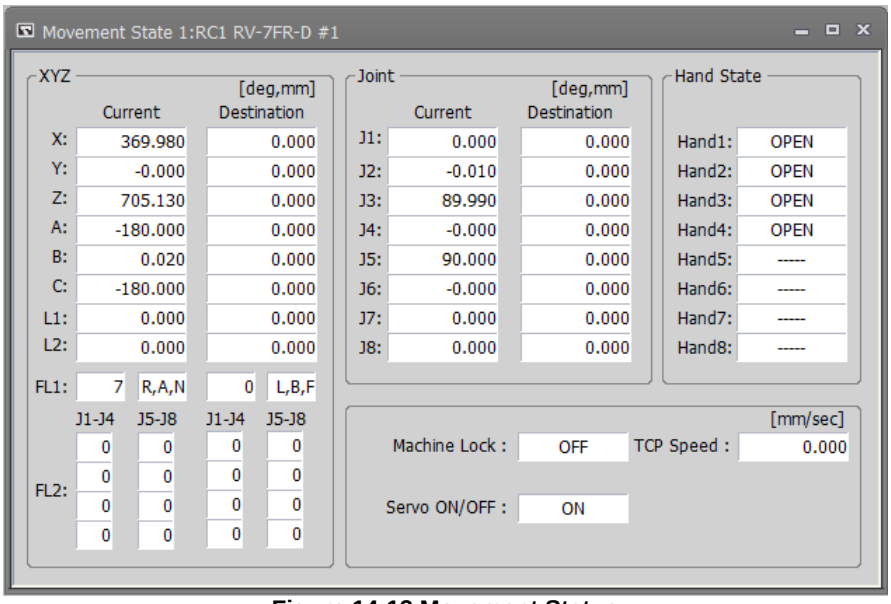


Figure 14-12 Movement Status

14.2.5. Event Hisyory

You can check the history information of the operation event of the robot controller. This function can only be used with a CRnD-800 series robot controller.
From the project tree, double click the target project [Online] -> [Monitor] -> [Movement Monitor] -> [Event History].
Right-click [All] of the ROBOT controller backup data of the CR800 series, select and click [Event History] in the Context menu to display the event history of the backup data.

14.2.5.1. Event Monitoring

It monitors events generated by the robot controller. The latest occurrence event is displayed in the first line.
Up to 10,000 events will be registered. If it exceeds 10,000, it will be deleted from the old event.

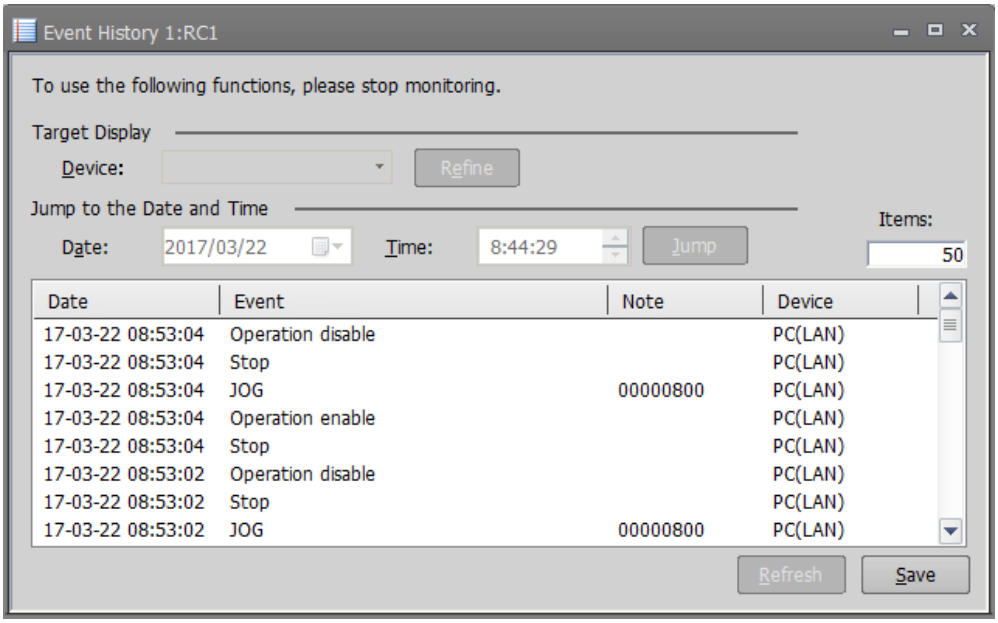


Figure 14-13 Event History(Monitoring)

For each event the following information is displayed.

Item	Explanation
Date	The date and time when the event occurred is displayed.
Event	The contents of the event that occurred is displayed.
Note	In the case of a specific event, additional information is displayed. (Selected program name, software connected on line, etc.)
Device	The device that issued the operation request to the robot controller is displayed. Details will be described later.

The types of devices displayed are as follows.

Device	Explanation
IO()	It means that it is an event by signal input of a sequencer or the like. The input signal number is displayed in ().
TB(422)	It means that it is an event by RS-422 communication of TB.
PC(LAN) PC(USB)	It means that it is an event by support software such as RT ToolBox of personal computer. The communication route is displayed in ().
none	It means that you manipulated the robot controller directly. (Power ON / OFF etc.)

By clicking the [Save] button, you can save the list of event information displayed in the list in text file format (. Txt).

14.2.5.2. Checking hisyory

By changing this screen to the "Monitor Stopped" state, it is possible to narrow down events and search for events that occurred near the specified date and time. To make the monitor stop state, click the [Monitor] group -> [Stop] button on the ribbon.

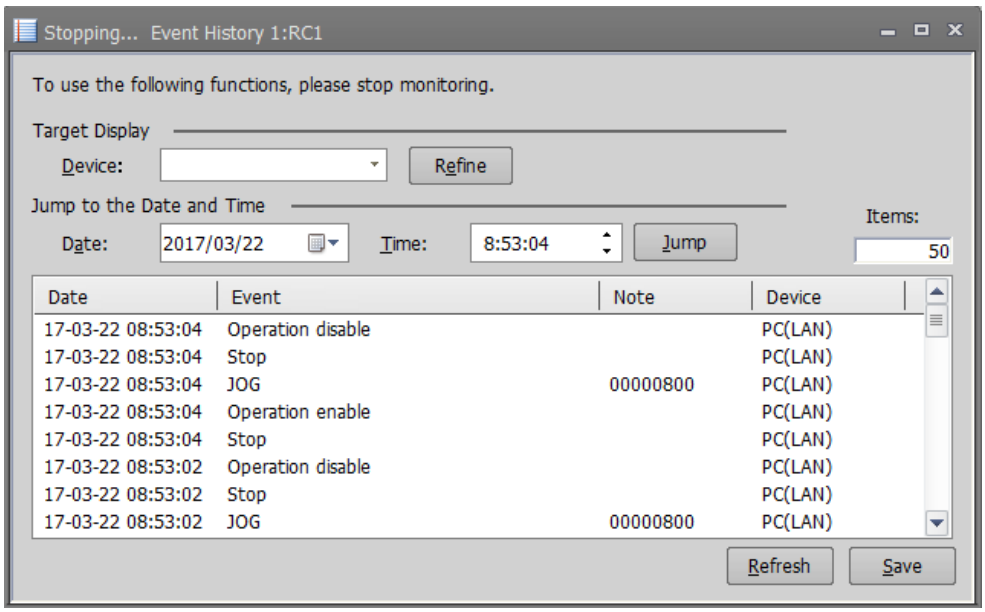


Figure 14-14 Event History(Monitor stopped)

The functions that can be used while monitoring is stopped are as follows.

(1) Refine

You can narrow down and display events with the specified device name.
Select the device you want to narrow down from the [Device name] dropdown and click the [Refine] button.
To display all events, select the blank at the top of the dropdown and click the [Refine] button.

(2) Jump to specified date and time

You can search for events that occurred in the vicinity of the specified date and time and jump to the corresponding line in the list.
Specify the date and time you want to search and click the [Jump] button.
Clicking the icon is convenient because you can select a date from the calendar.

(3) Refresh event history

If you want to get the latest event history while monitoring is stopped, click the [Refresh] button.

14.2.6. Errors

The errors currently occurring in the robot controller are displayed.

14.2.6.1. Referencing the current error

From the project tree, double click the target project [Online] -> [Monitor] -> [Movement Monitor] -> [Error].

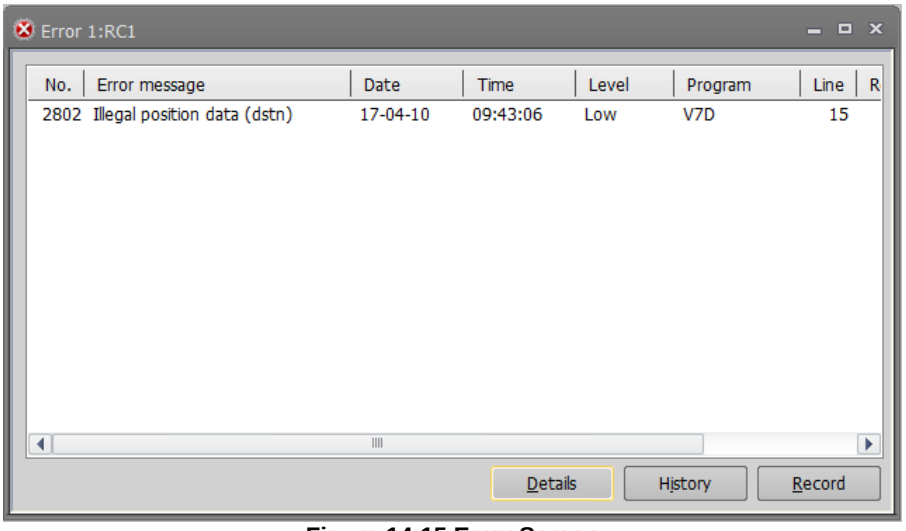


Figure 14-15 Error Screen

[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 records of the errors that have occurred. This function is available in all versions of CR800 controllers and in CR75n/CR700 controller software version R1j/S1j or later.

14.2.6.2. Details

You can check details (cause and recovery method) on errors that have occurred. On the error screen, select an error, then either click the "Details" button or double-click the error.

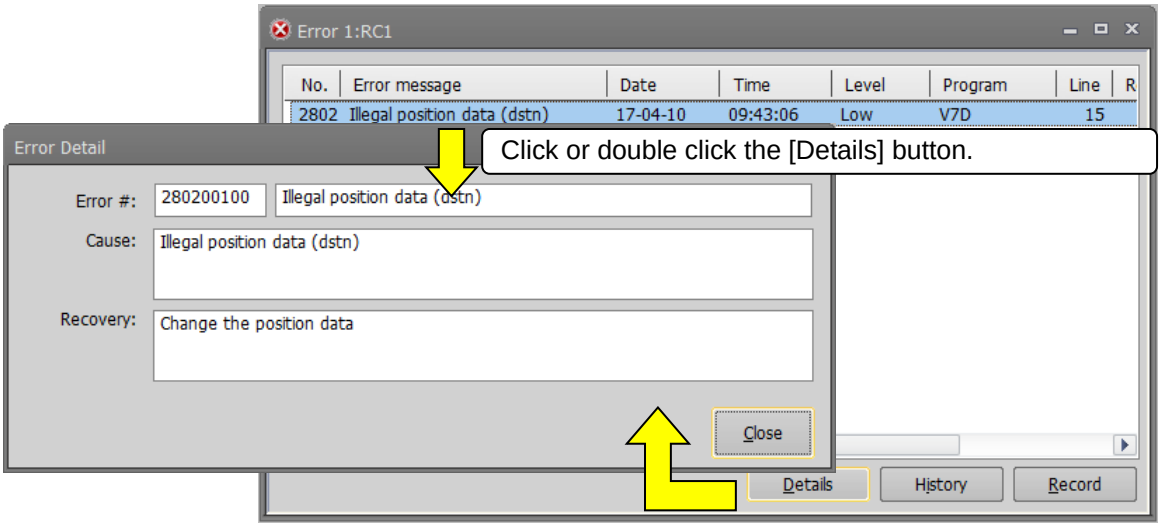


Figure 14-16 Error Details Screen

14.2.6.3. 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 to a file.

Click the [History] button. Select the level to reference and click the [OK] button.

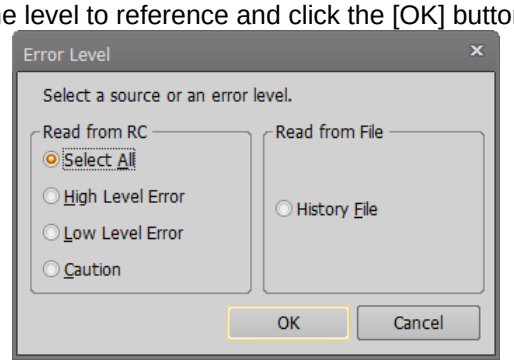


Figure 14-17 History Information Error Level Setting

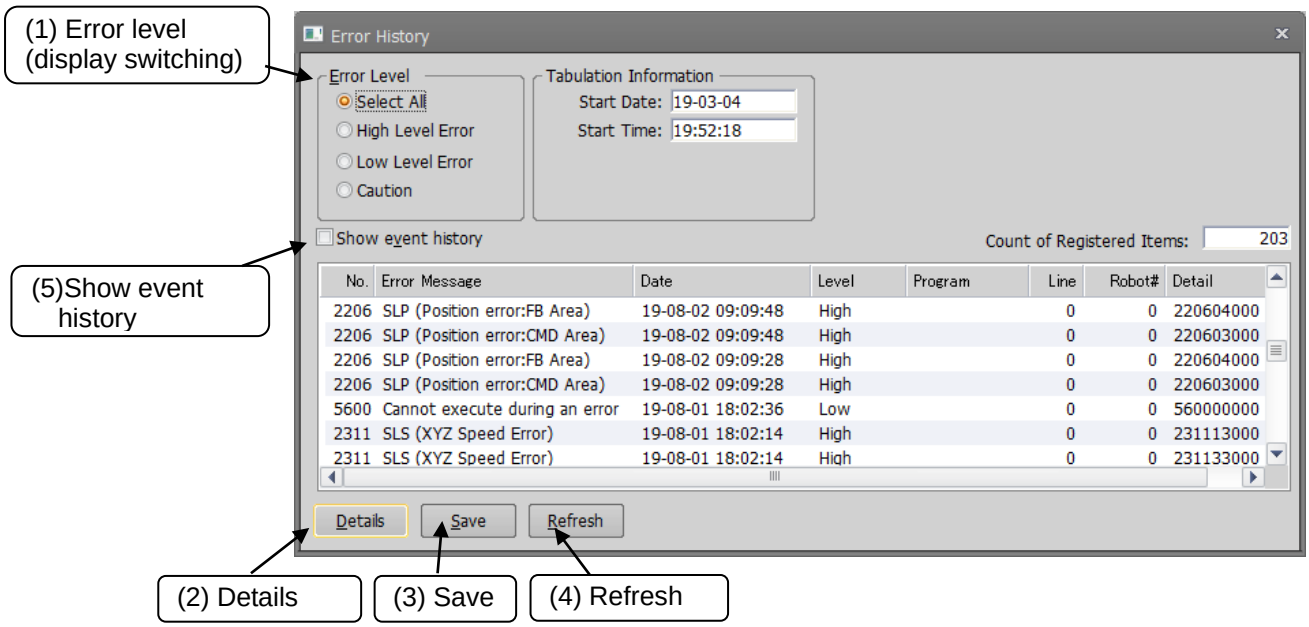


Figure 14-18 Error History

This display is not constantly displayed. To refresh the 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 clicking a displayed error.

(3) Save
This saves the displayed error history information to a file. For the saved error history information, select "Read from file" in **"Figure 14-17 History Information Error Level Setting"**. Refer to **"Figure 14-19 Error History Information Read from File"** on the screen, after you have selected “From history file”.
The 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 serial number “_”Present data “_”Present time".

Example of file name: AR0703001_20100924_092623.txt

(4) Refresh

To refresh the error history, click the [Refresh] button.

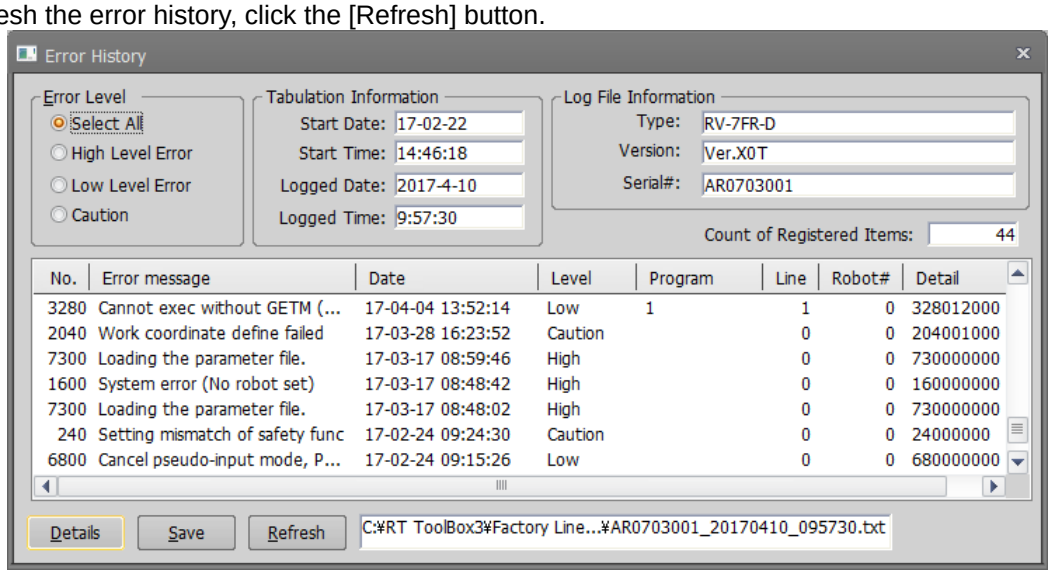


Figure 14-19 Error History Information Read from File

(5) Show event history

This function can only be used by CR800 series controller that supports the event history function. The event and error history can be displayed at the same time. (Event history after the date when error summarization starts will be displayed).

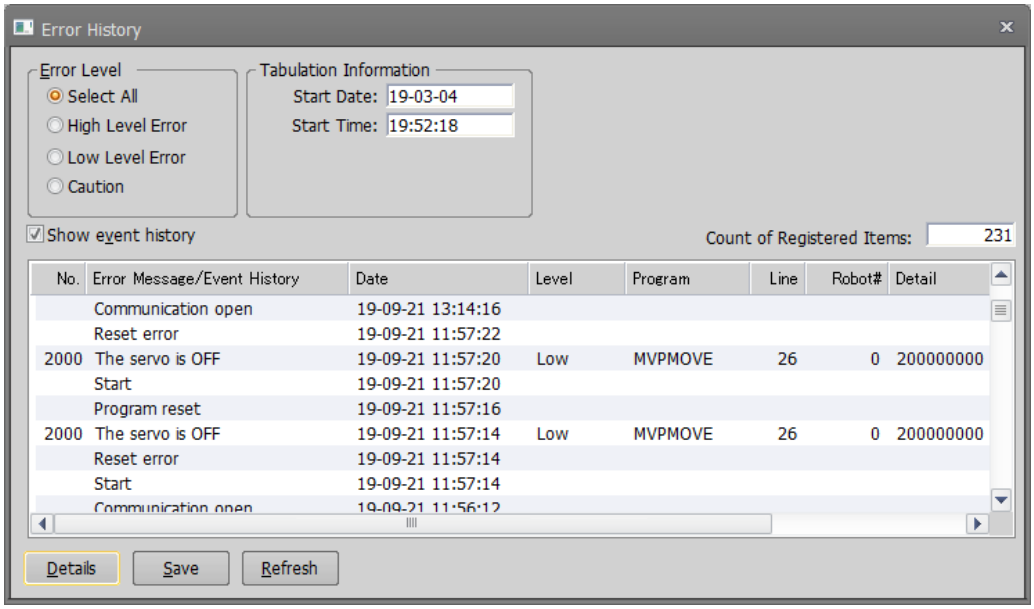


Figure 14-20 Display error and event history at the same time.

14.2.6.4. 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 to a file.

Caution

Timing from which error information is registered in the error record

When you reset an error, the error information is registered in the robot controller's error record file.
Note that an occurring error is not registered in error record when the power supply is turned off without doing error reset.

Controller software versions that allow use of the error record function are as follows.

Controller	S/W Ver. of the controller
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700	Ver.S1j or later
CR750-Q/CRnQ-700	Ver.R1j or later

Click the [Record] button. Select the level to reference and click the [OK] button.

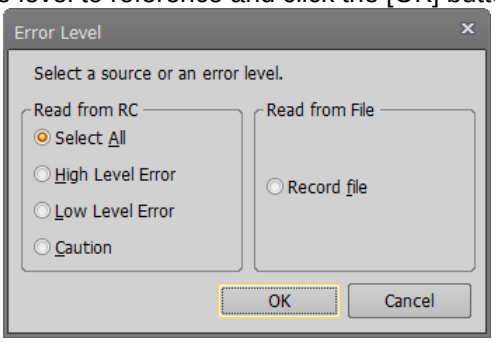


Figure 14-21 Record Information Error Level Setting

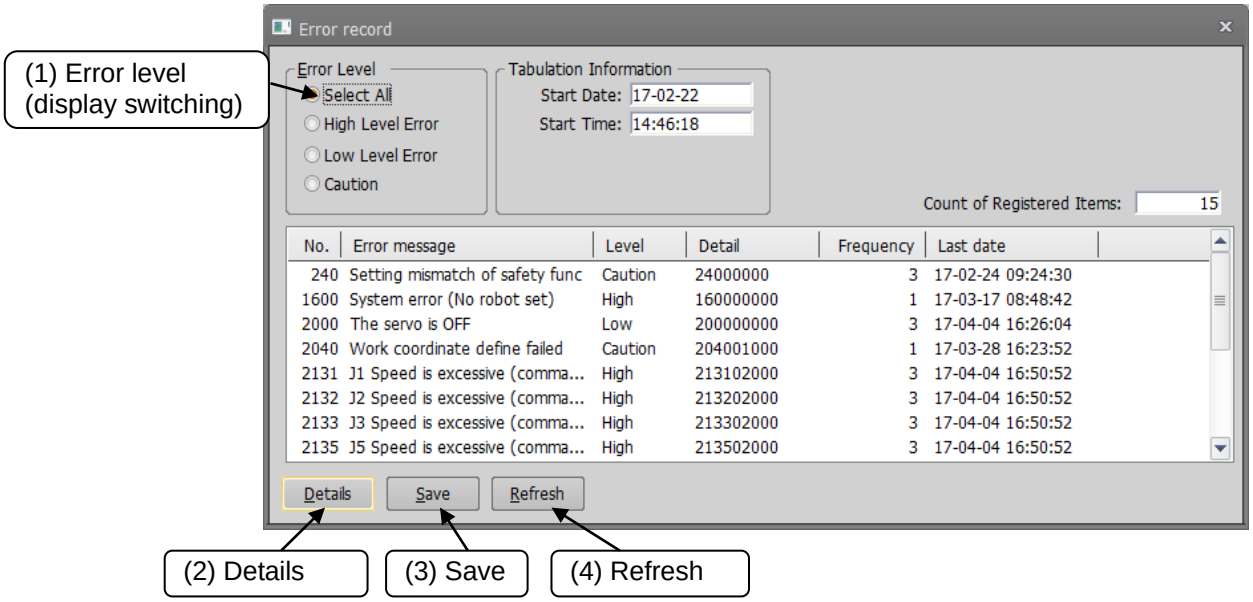


Figure 14-22 Error record

This display is not constantly displayed. To refresh the 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 the occurred history of the selected error can be confirmed by clicking this button.
You can also check details by double clicking a displayed error.
However, detailed information cannot be confirmed when reading from the error record file.

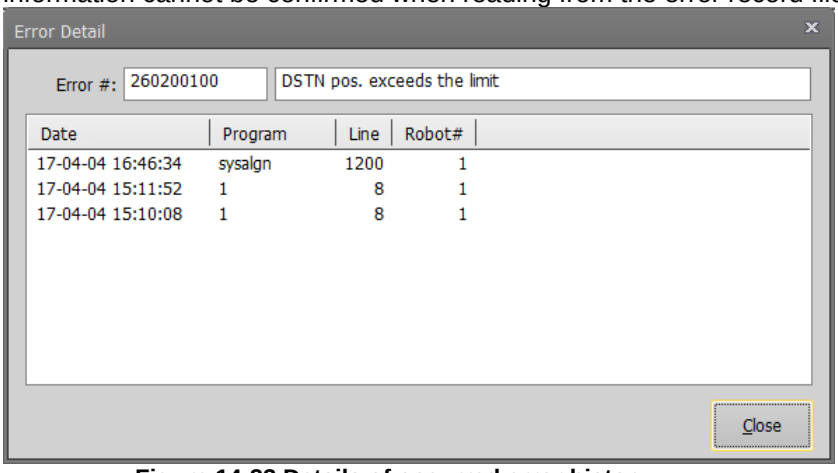


Figure 14-23 Details of occurred error history

(3) Save

This saves the displayed error record information to a file. For the saved error record information, select "Read from file" in **"Figure 14-17 History Information Error Level Setting**". Refer to **"Figure 14-24 Error Record Information Read from File"** on the screen, after you have selected “From record file”.
The 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

To refresh the error record, click the [Refresh] button.

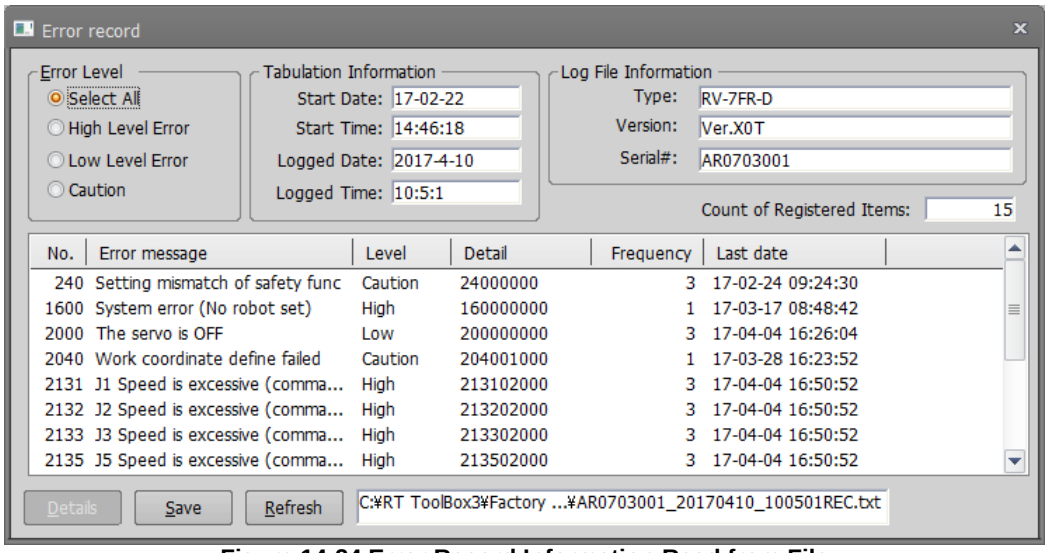


Figure 14-24 Error Record Information Read from File

14.3. Signal Monitoring

14.3.1. General signals

You can check the statuses of signals input to the robot controller from external equipment and signals output from the robot controller to external equipment.
From the project tree, double-click the target project [Online] -> [Monitor] -> [Signal Monitor] -> [General Signals].
The upper level displays the statuses of the input signals and the lower level displays the statuses of the output signals.
On the right end of each respective field, you will see the signal value in the notation selected in [Display format].
You can select display format from among hex, unsigned decimal, and signed decimal.
A continuous range for the display signals can be set freely in [Monitor Settings].
Pseudo-input and forced output of registers are also possible.

At the end of the window, the set input and output signal numbers and lines are automatically saved and reflected on the next display.

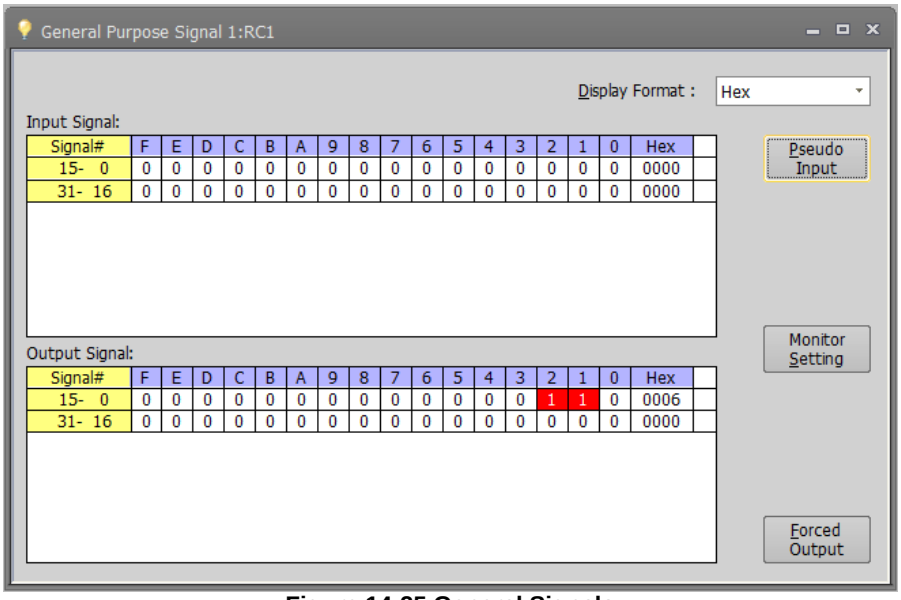


Figure 14-25 General Signals

14.3.1.1. 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.

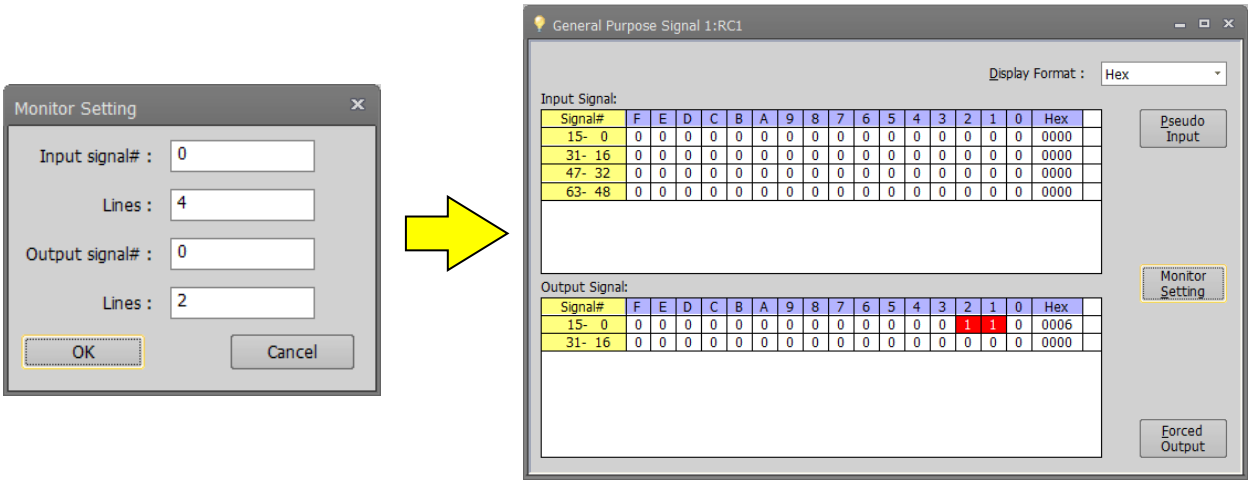


Figure 14-26 General Signal Monitor Settings

14.3.1.2. Pseudo-input

Pseudo-input means signals are input to the robot controller from the computer, not from external equipment.

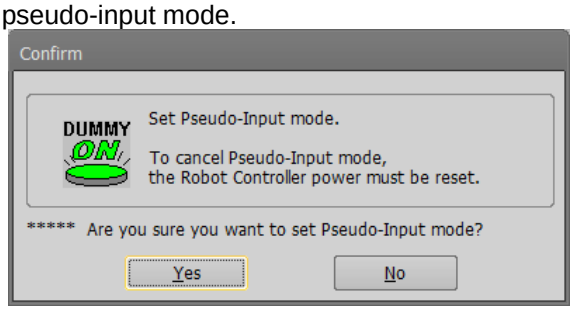
Click the [Pseudo-Input] button. A screen for inputting pseudo signals is displayed.

Caution

While the robot controller is in pseudo-input mode, signal input from external 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 inputs from external devices.

Click the [Pseudo-Input] button. The following confirmation message 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.

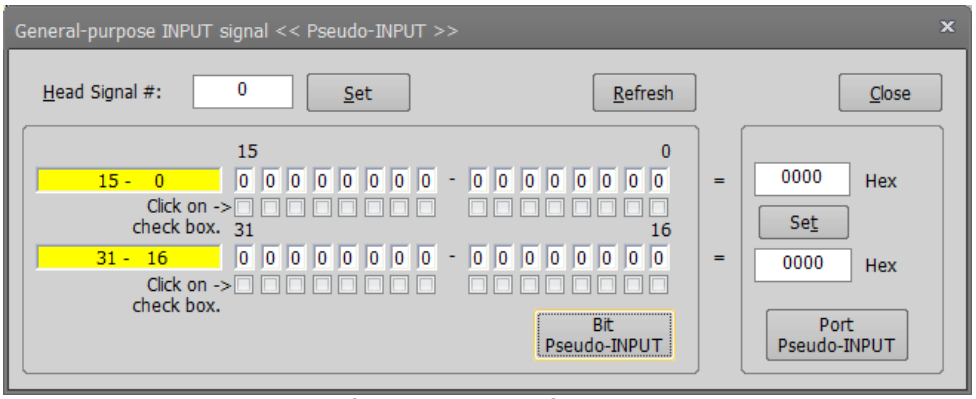


Figure 14-27 Pseudo-Input

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.(*1)

③ You can specify the values of signals and make pseudo input for the 32 signals starting from the head signal number.
Input the values of the signals, and then click the [Port Pseudo-INPUT] button.

You can enter the signal values in the notation selected in the display format of the General signal monitor.
The selected display format is displayed to the right of the signal value input field.
Hex: Hex Unsigned decimal: UDec Signed decimal: SDec

(*1) The [Bit Pseudo-INPUT] can also be set from the double click of the signal ist.

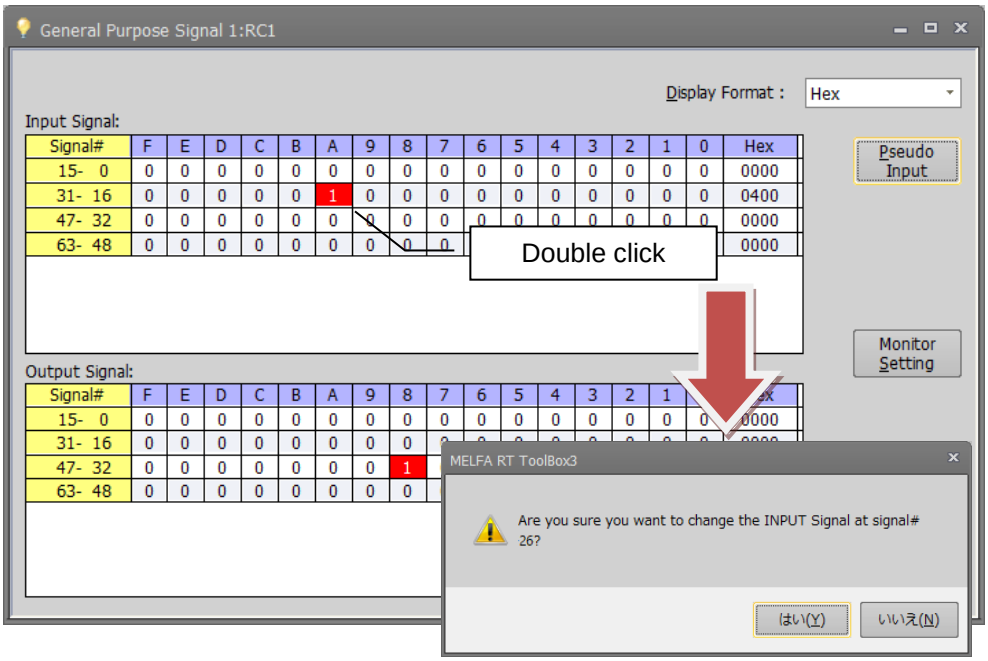


Figure 14-28 Pseudo input by mouse double click

14.3.1.3. Forced output

You can force signals to external equipment from the robot controllers.
Click the [Forced Output] button. The screen for forcibly outputting signals is displayed.

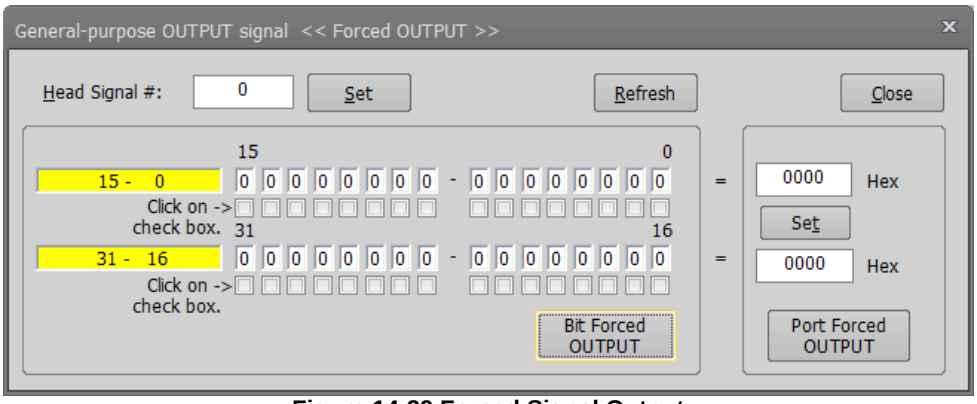


Figure 14-29 Forced Signal Output

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 starting from the specified head signal number are displayed. Set the output status, and then click the [Bit Forced OUTPUT] button.(*1)

③ You can specify the signal values and force output for the 32 signals starting from the head signal number. Input the signal values, then click [Port Forced OUTPUT] button.

You can enter the signal values in the notation selected in the display format of the General signal monitor. The selected display format is displayed to the right of the signal value input field.
Hex: Hex Unsigned decimal: UDec Signed decimal: SDec

(*1) The [Bit Forced-OUTPUT] can also be set from the double click of the signal ist.

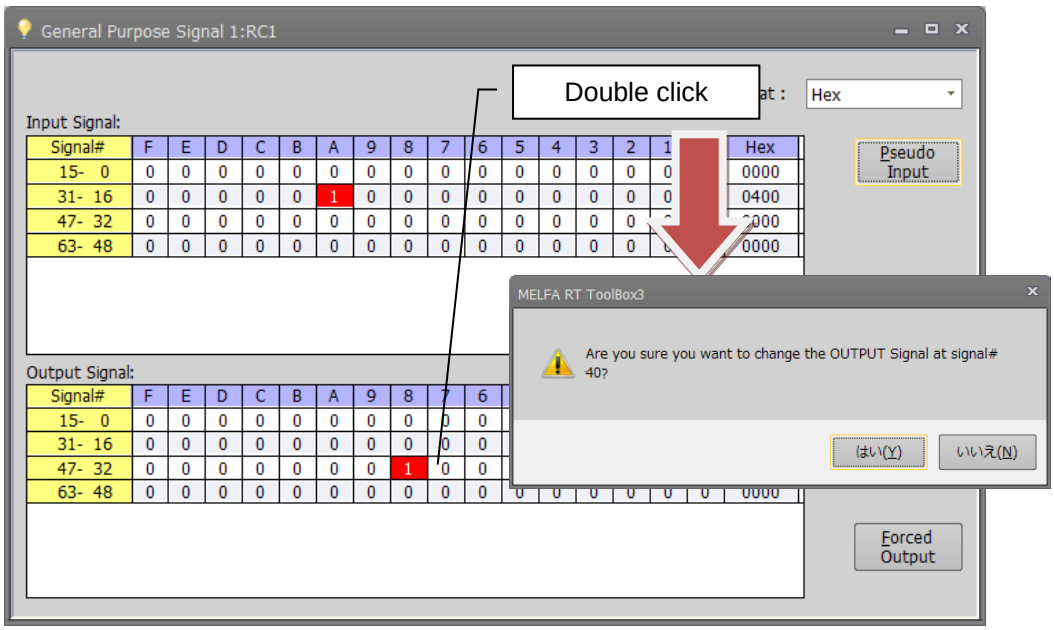


Figure 14-30 Forced output by mouse double click

⚠ 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 ALWAYS programs)

14.3.2. 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].

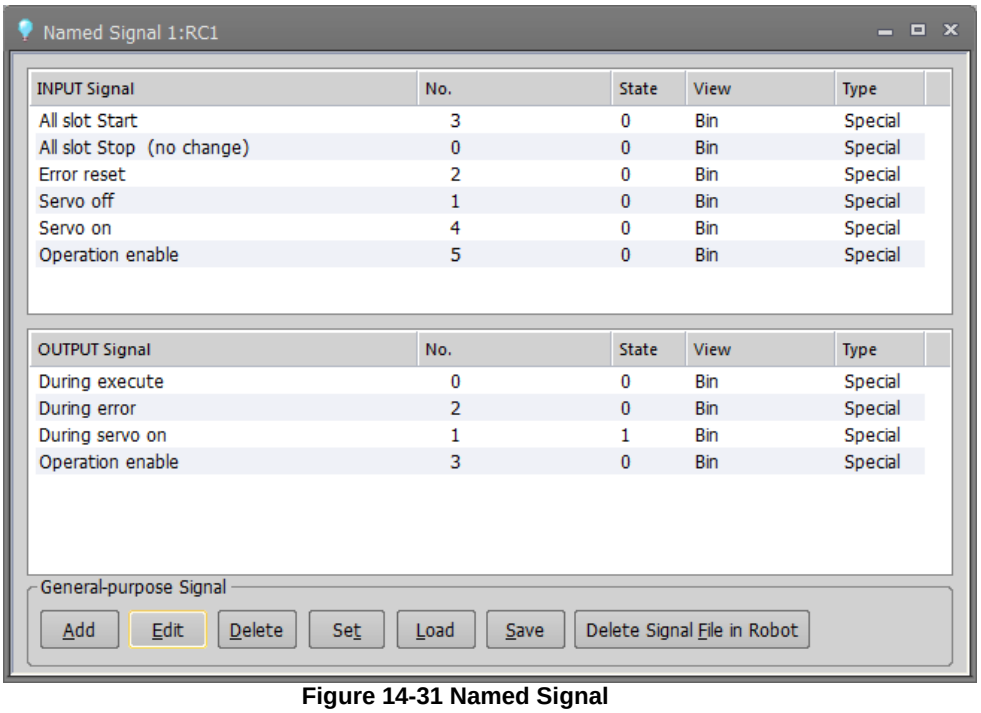


Figure 14-31 Named Signal

[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.
[Input/Output]	:	This input pseudo input or output forced output in the list.
[Load]	:	This loads a file defining named signals saved 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.

14.3.2.1. 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.

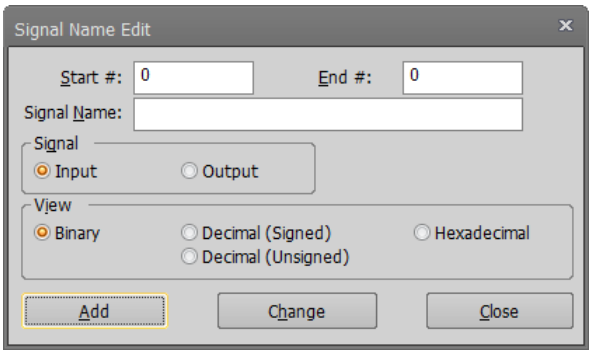


Figure 14-32 Signal Name Editing

Input the general signal numbers and names, and 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.

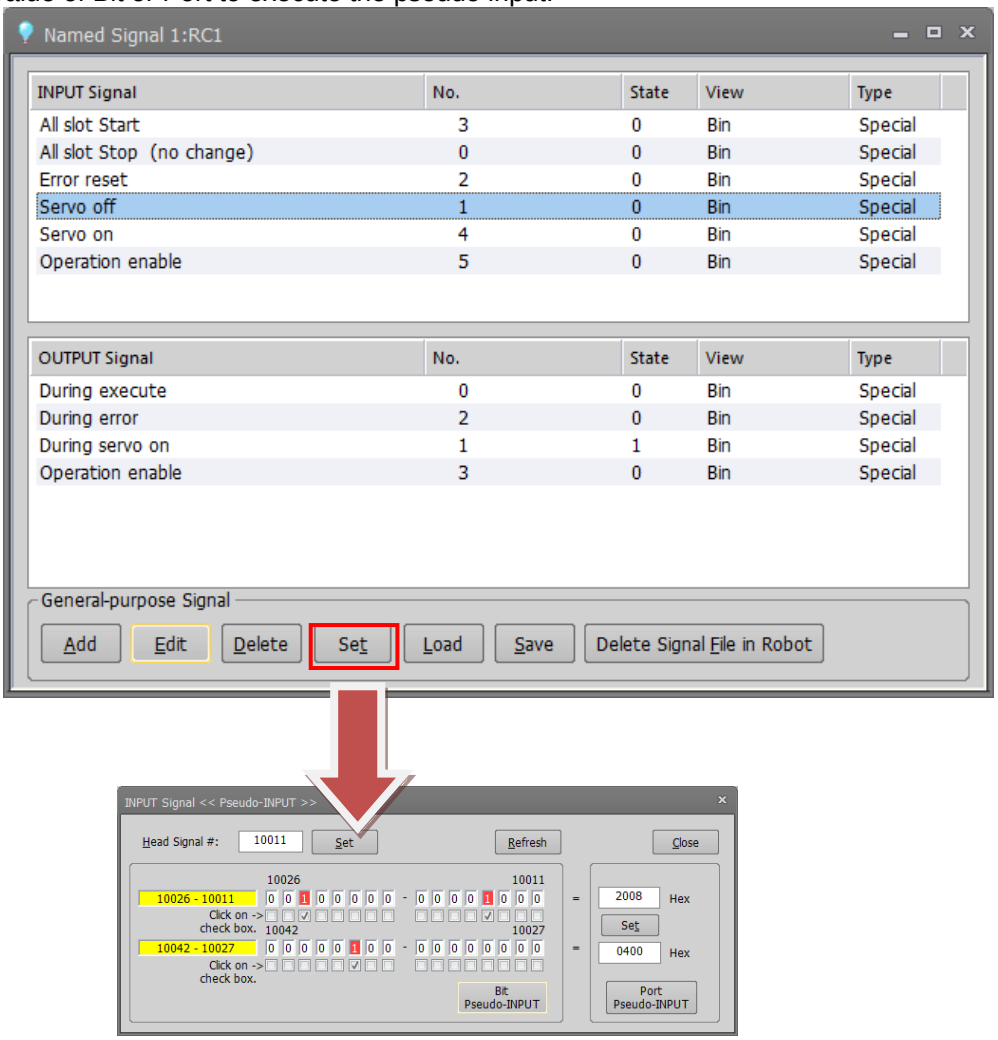
14.3.2.2. Deleting a named signal

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 cannot be deleted.
Also, you cannot delete input signals and output signals at the same time. Finally, delete the select signals in the list with a mouse click.

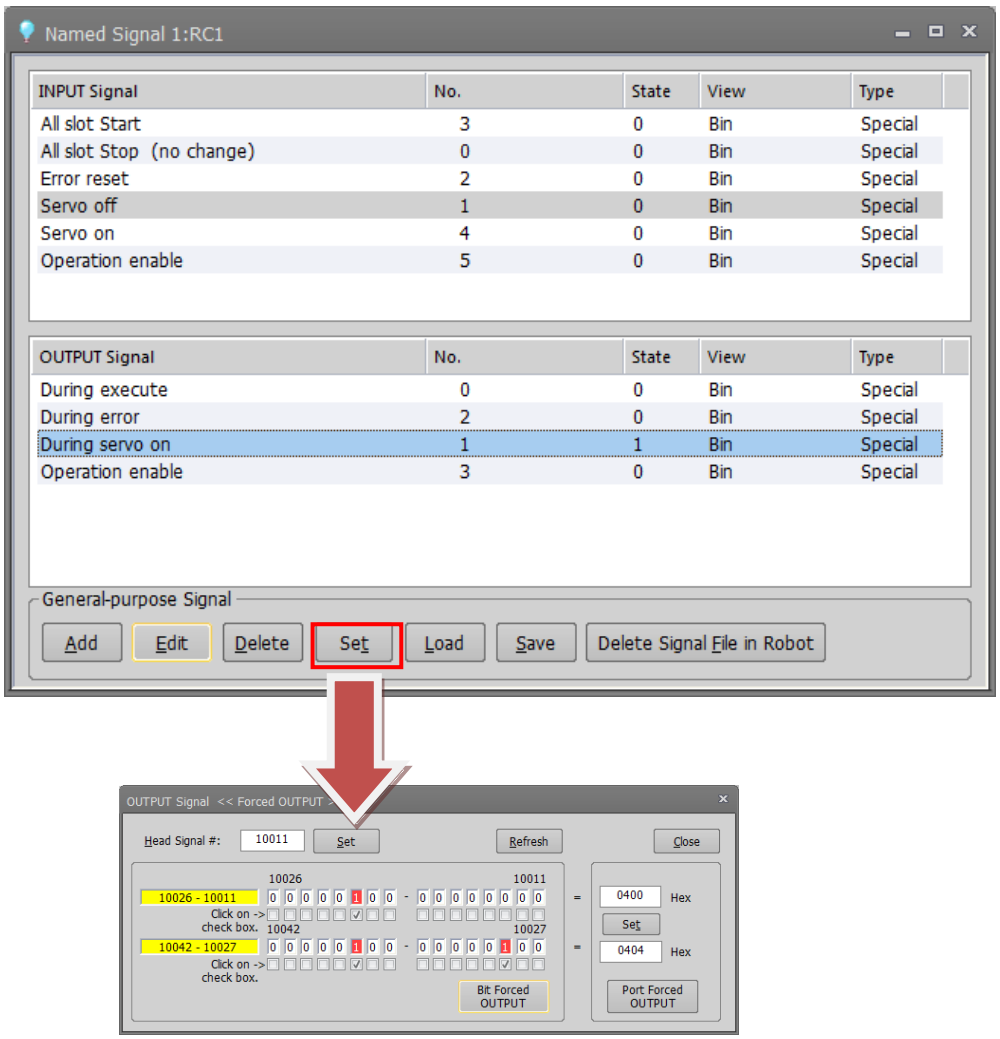
14.3.2.3. Pseudo-input / forced output of named signal

Pseudo input / forced output is executed for the I/O signal selected in the list.

If you select an input signal in the list and click the [Input/Output] button, the pseudo input setting screen will be opend.Set the value of Bit or Port to execute the pseudo input.



If you select an output signal in the list and click the [Input/Output] button, the forced output setting screen will be opend.Set the value of Bit or Port to execute the forced output.



14.3.2.4. 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.

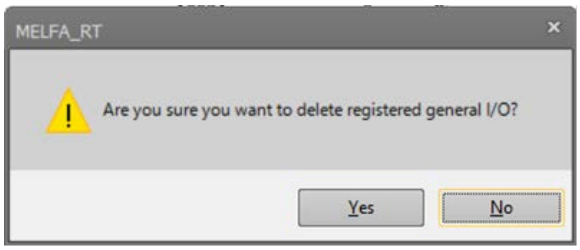


Figure 14-33 Deletion Confirmation Message for Registered General Input/Output Signal

If you select [Yes] on this confirmation screen, the "Select locate" screen asking you to select the load source is displayed.

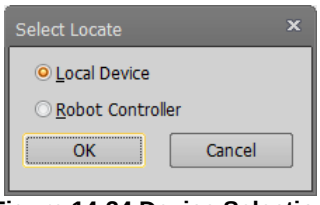


Figure 14-34 Device Selection

Select the device to load from, and then click the [OK] button.
When PC is selected, the screen for selecting files on the PC is displayed.

If you select the robot controller, the named signal definition file is loaded from the robot controller.

14.3.2.5. 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.

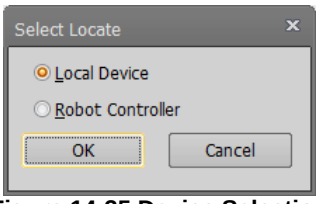


Figure 14-35 Device Selection

Select the device to save to, and then click the [OK] button.
When PC is selected, the screen for selecting files on the PC is displayed.
If you select the robot controller, the named signal definition file is saved to the robot controller.

14.3.3. 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].

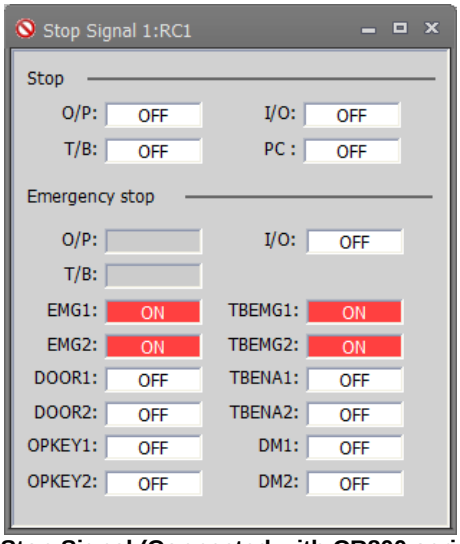


Figure 14-36 Stop Signal (Connected with CR800 series controller)

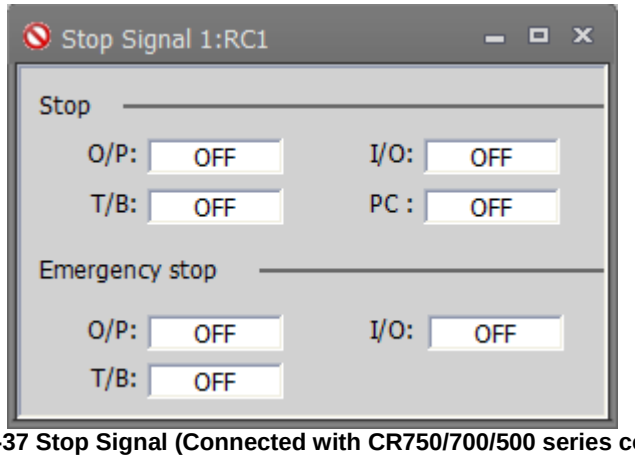


Figure 14-37 Stop Signal (Connected with CR750/700/500 series controller)

Stop	O/P	Operation panel
	T/B	Teaching box
	I/O	Dedicated input signal STOP and STOP 2, stop dedicated input（SKIP input）
	PC	Stop by communication from PC etc.
Emergency stop	O/P	Operation panel
	T/B	Teaching box
	I/O	External emergency stop input（CNUSR connector, EMGIN connector）
	EMG1/EMG2	Input state of external emergency stop (EXTEMG11/EXTEMG12)
	DOOR1/DOOR2	State of door switch connection（DOOR1/DOOR2）
	OPKEY1/OPKEY2	The state input of Mode selector switch（OPKEY1/OPKEY2）
	TBEMG1/TBEMG2	Input state of the emergency stop button switch of the teaching box
	TBENA1/TBENA2	Teaching box operation enable switch input state（TB ENABLS）
	DM1/DM2	Input state of the enable switch of the teaching box(3 position switch)

Pin name of CNUSR 11 connector of controller

14.3.4. Register (CC-Link/EtherCAT)

Caution

This can only be used if the CC-Link/EtherCAT option card is mounted on the robot controller or CC-Link IE Field Basic function is enable.

Table 14-5 Register (CC-Link) Screen Correspondence Table

Robot Contoroller	CC-Link	CC-Link IE Field	CC-Link IE Field Basic	EtherCAT
CRn-500	○	×	×	×
CR750-D/CRnD-700	○	×	×	×
CR750-Q/CRnQ-700	×	×	×	×
CR800-D	○	○	○(A1c or later)	○(A3b or later)
CR800-Q	×	×	○(A1c or later)	×

○ : Enable, × : Disable

You can check the statuses of registers input to the robot controller from external equipment and registers output from the robot controller to external equipment.
From the project tree, double-click the target project [Online] -> [Monitor] -> [Signal Monitor] -> [Register (CC-Link) or Register (EtherCAT)].
The left side of the screen displays the status of the input registers and the right side displays the status of the output registers.
A continuous range of registers to display can be set freely in [Monitor Settings].
Pseudo-input and forced output of registers are also possible.

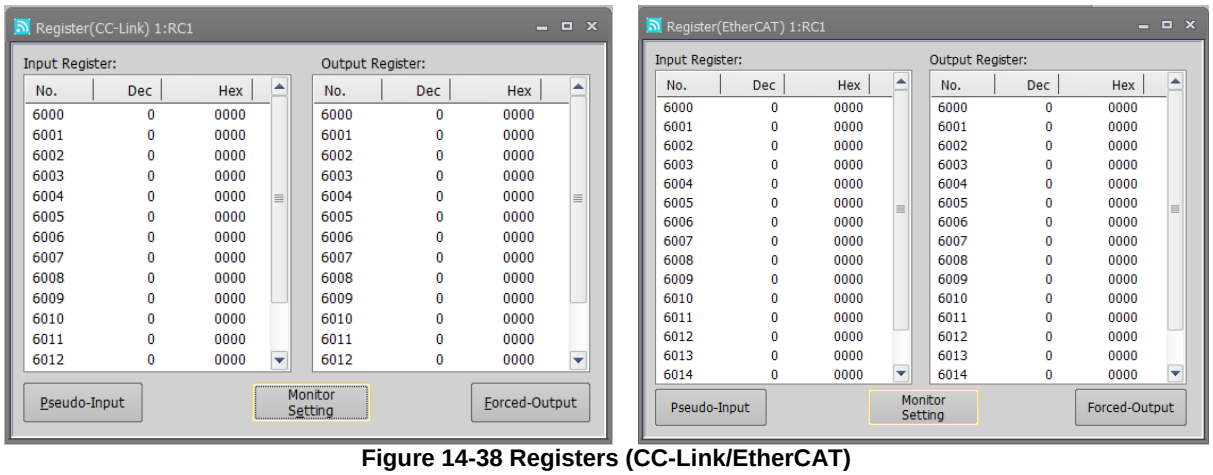


Figure 14-38 Registers (CC-Link/EtherCAT)

14.3.4.1. 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, and then click the [OK] button.

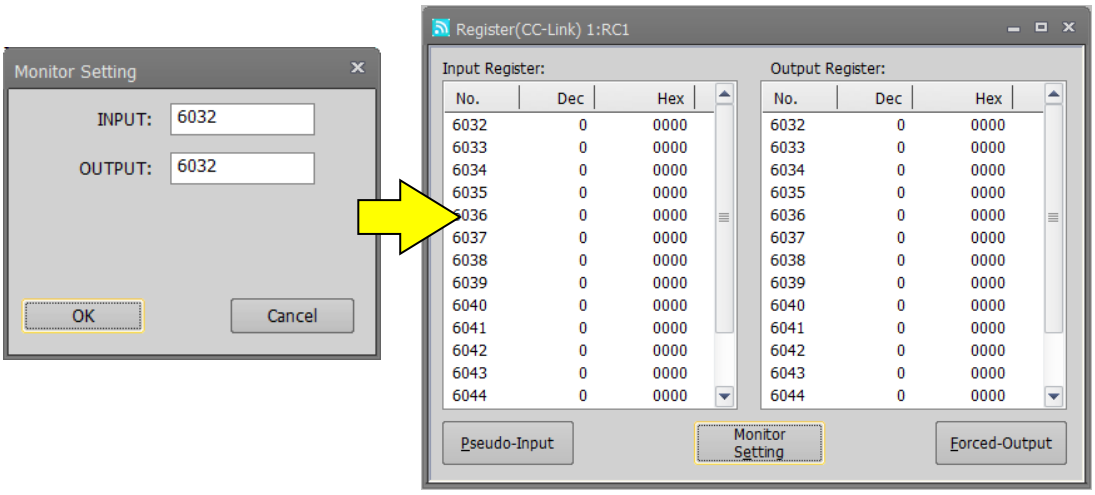


Figure 14-39 Registers (CC-Link/EtherCAT) Monitor Settings

14.3.4.2. Pseudo-input

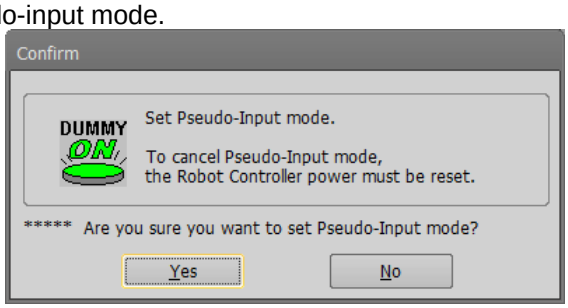
Pseudo-input means registers are input to the robot controller from the computer, not from external equipment. Click the [Pseudo-Input] button. A screen for inputting pseudo signals is displayed.

Caution

While the robot controller is in pseudo-input mode, register input from external 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 external devices.

Click the [Pseudo-Input] button. The following confirmation message 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.

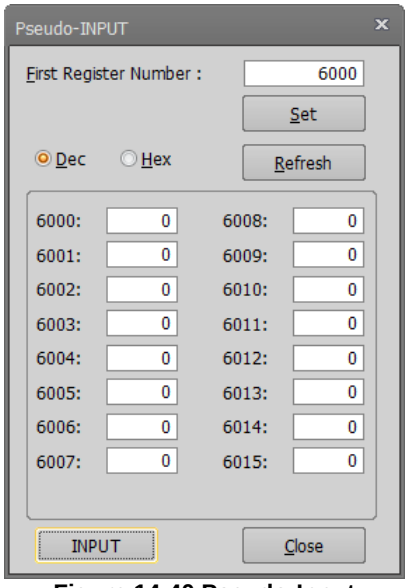


Figure 14-40 Pseudo-Input

(1) Read the signals 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, and 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 for 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.

14.3.4.3. Forced Output

You can forcibly output register values to external equipment from robot controllers.
Click the [Forced Output] button. A screen for forcibly outputting registers is displayed.

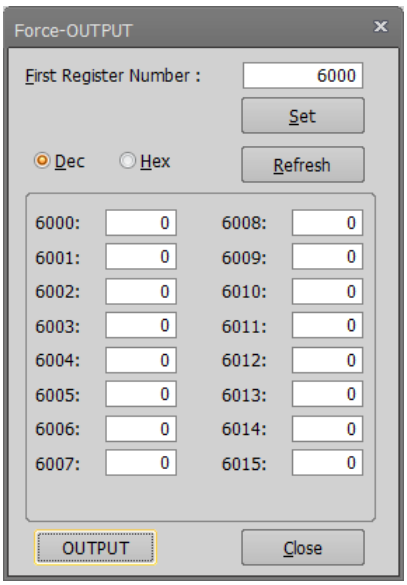


Figure 14-41 Forced Signal Output

(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, and 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, and 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.

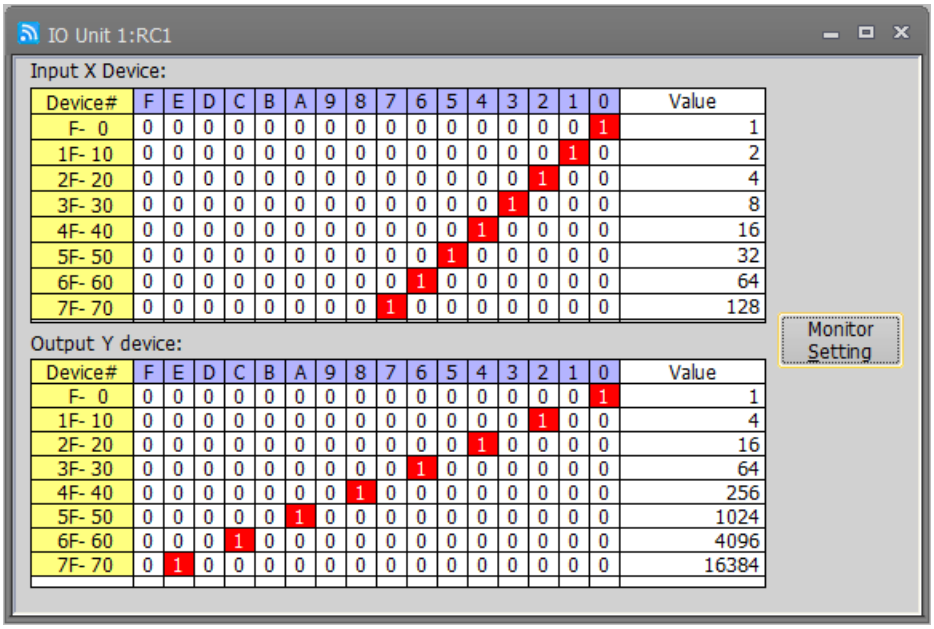
Caution

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 ALWAYS program)

14.3.5. IO unit monitor

You can monitor the XY device variables of the IO unit.
From the project tree, double-click the target project [Online] -> [Monitor] -> [Signal Monitor] -> [IO unit].
The statuses of the input signals are displayed on the upper table, and the statuses of the output signals are displayed on the lower table.
The signal values can display signed 16-bit integers or signed 32-bit integers in decimals or hexadecimals.
A continuous range for the display signals can be freely set in [Monitor setting].
This function is available in all versions of CR800-R/CR800-Q series controllers and in CR750-Q/CRnQ-700 controller Ver.R3 or later.



Input X 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	0	1	0	2
2F- 20	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4
3F- 30	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	8
4F- 40	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	16
5F- 50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	32
6F- 60	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	64
7F- 70	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	128

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	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16384

Figure 14-42 IO unit monitor

14.3.5.1. Monitor setting

Click the [Monitor setting] button. The PLC IO unit monitor setting screen is displayed.
Set the starting number of each device and indicate the number of lines to display also indicate the data size display method when displaying signals.
After setting, click the [OK] button.

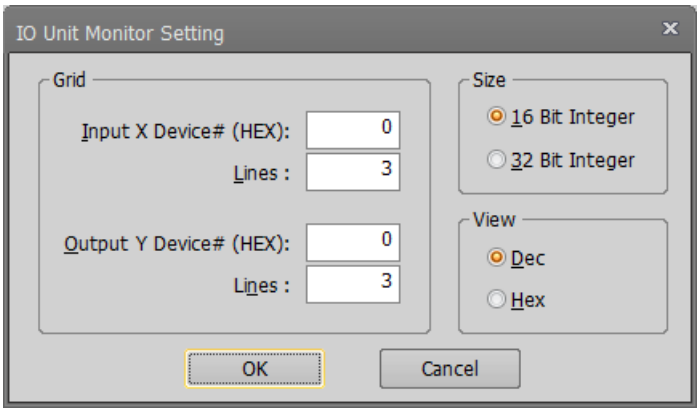


Figure 14-43 IO unit setting screen

14.3.6. DSI CNUSER2 input signal monitor

You can monitor the DSI1 and DSI2 input signals and the Monitoring mode. The DSI1 and DSI2 input signals are used for switching the monitoring mode of the safety monitoring function. For details of these parameters, refer to the **"Robot Safety Option manual"** (BFP-A3372).

This function is available in all versions of CR800 series controllers and in CR750/700 controller software Ver.R6, S6 or later. The items monitored by this connected controller differ on this screen.

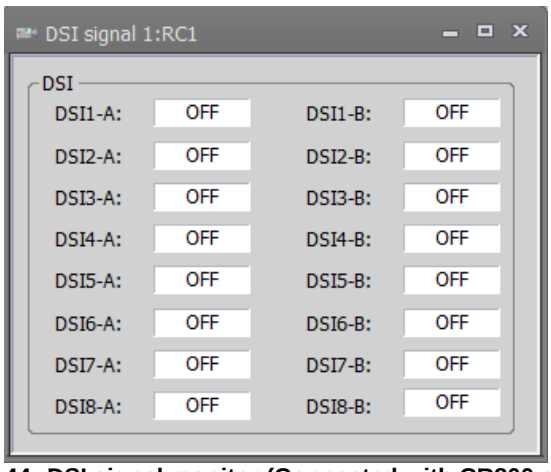


Figure 14-44 DSI signal monitor (Connected with CR800 controller)

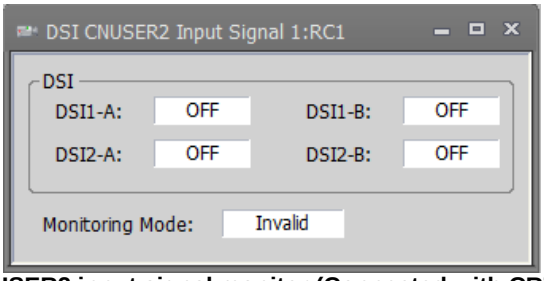


Figure 14-45 DSI CNUSER2 input signal monitor (Connected with CR750/700 controller)

14.3.7. Device Monitor

You can check the bit status of the device of the robot CPU (R16RTCPU) accessible from the external device.
This function can be used with CRn800 series robot controller.
From the project tree, double-click the target project [Online] -> [Monitor] -> [Signal] -> [Device].
Multiple screens can be launched from one project.

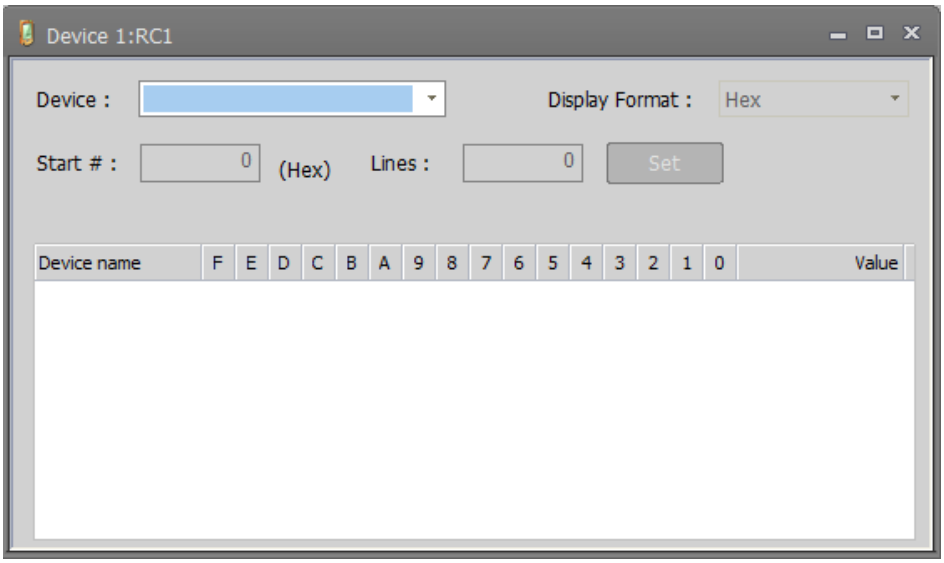
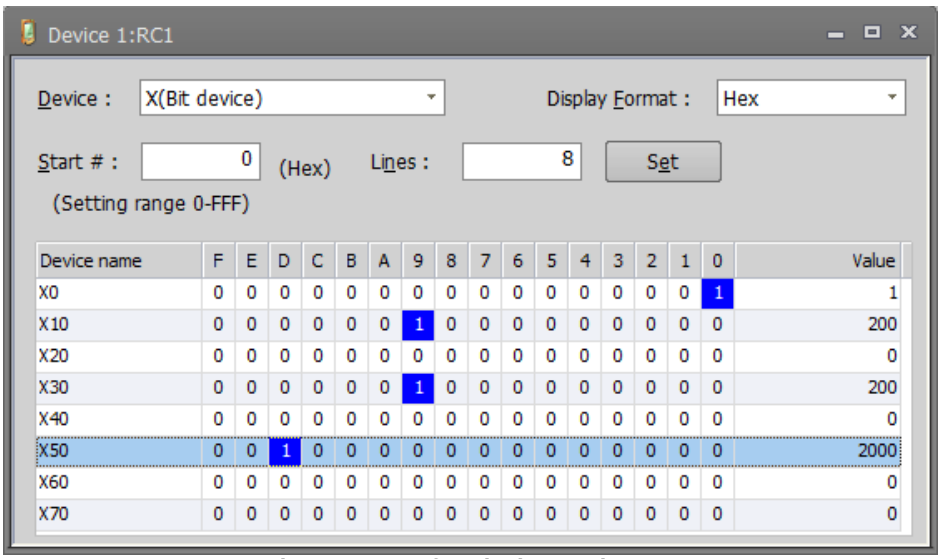


Figure 14-46 Device monitor start

For [Device name], a list of accessible devices is displayed. When you select a device, it will start monitoring the bit status of that device.

Selectable devices are as follows.

Connected with CR800-D series controller	Connected with CR800-R series controller	Connected with CR800-Q series controller
X(Bit device) Y(Bit device) D(Word device) SM(Bit device) SD(Word device) U3E0\HG(Word device) U3E1\HG(Word device)	X(Bit device) Y(Bit device) M(Bit device) D(Word device) SM(Bit device) SD(Word device) U3E0\G(Word device) U3E1\G(Word device) U3E2\G(Word device) U3E3\G(Word device) U3E0\HG(Word device) U3E1\HG(Word device) U3E2\HG(Word device) U3E3\HG(Word device)	X(Bit device) Y(Bit device) M(Bit device) D(Word device) SM(Bit device) SD(Word device) U3E0\G(Word device) U3E1\G(Word device) U3E2\G(Word device) U3E3\G(Word device)



Device name	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0	Value
X0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
X10	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	200
X20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	200
X40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X50	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2000
X60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 14-47 After device setting

On the right end of the field, in the rightmost column, in the notation selected in [Display format], the value of the bit of that line is displayed.
You can select display format from hex, unsigned decimal, signed decimal.

By double-clicking the bit value of the device or pressing the space key, the value of the bit at that position is changed.

By clicking (the space key) the bit value of the device, the value of the bit at that position is changed.

14.4. Operation Monitoring

14.4.1. Operating Information

You can check the robot work time, battery usage time, etc.
From the project tree, double-click the target project [Online] -> [Monitor] -> [Operation Monitor] -> [Operating Information].

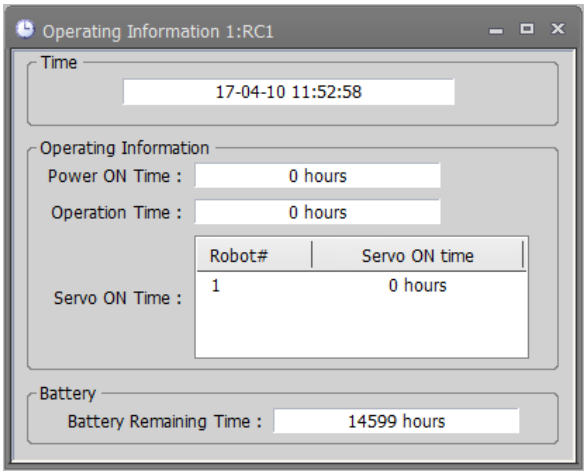
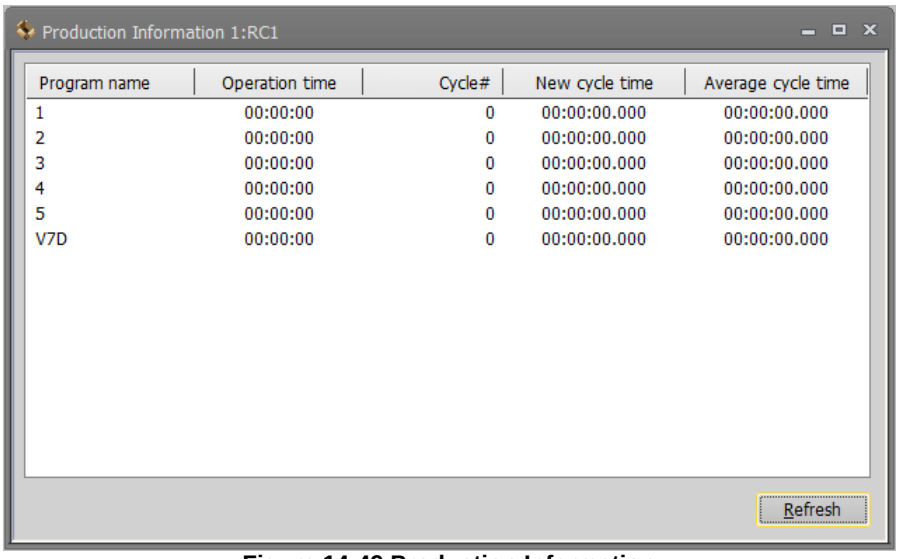


Figure 14-48 Operating Information

When connected to the CR800 series robot controller, the remaining battery time is not displayed.
You can initialize the battery remaining time with [Maintenance] -> [Initialize]. For details on operation methods, see **"15.2.4 Initializing the battery remaining time"**.

14.4.2. 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].



Program name	Operation time	Cycle#	New cycle time	Average cycle time
1	00:00:00	0	00:00:00.000	00:00:00.000
2	00:00:00	0	00:00:00.000	00:00:00.000
3	00:00:00	0	00:00:00.000	00:00:00.000
4	00:00:00	0	00:00:00.000	00:00:00.000
5	00:00:00	0	00:00:00.000	00:00:00.000
V7D	00:00:00	0	00:00:00.000	00:00:00.000

Figure 14-49 Production Information

The production information is not constantly updated. Click the [Refresh] button as necessary.

14.5. Servo Monitor

This monitors servo information.

Table 14-6 Supported robot

Supported robot		
CR800/750/700	CR500	Simulation
All robot	All robot	Not available
All robot	All robot	RV-F/RH-F series

The servo data items can be monitored by simulation as follows.

Table 14-7 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	×

14.5.1. 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 single motor rotation position of the encoder is displayed.
  (It is not displayed in the CR800/750/700 series controller. It is always 0.)
- Fdt command
  The amount of the change of the position command between the control cycles is shown.
  (It is not displayed in the CR800/750/700 series controller. It is always 0.)
- Position droop
  The amount of deflection at the motor rotation position relative to the position command is shown.
- Max. position droop
  The maximum value of position droop after robot controller's power supply is turned on is displayed.
- Position command
  The command of the motor rotation position for the servo is displayed by the pulse value.

Click the [Reset] button to reset all Servo Monitors.

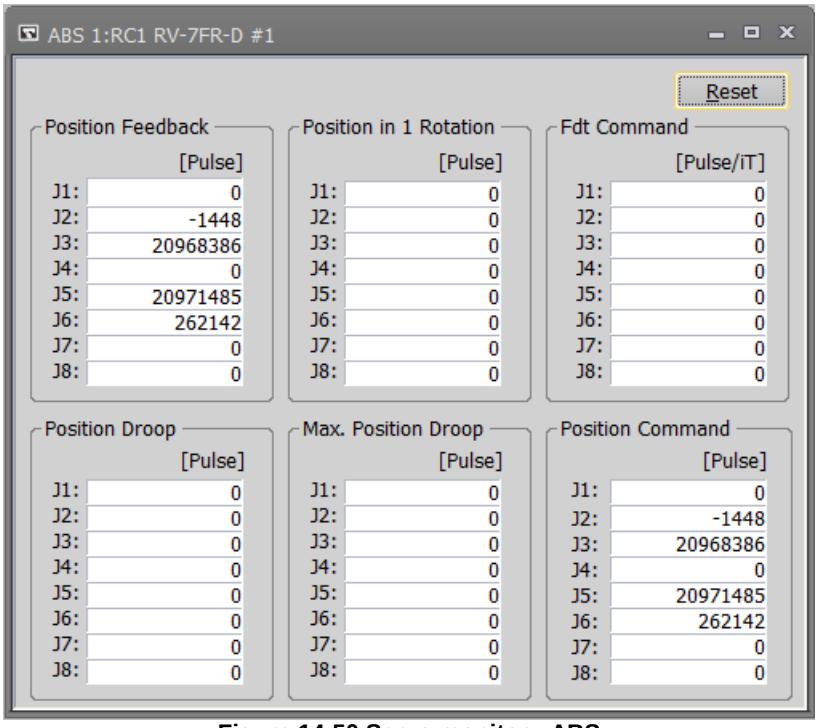


Figure 14-50 Servo monitor - ABS

14.5.2. Speed

The following data concerning the rotational speed of each axis motor can be monitored.

- Speed feedback
  A present motor speed is displayed in units of rpm.
- Speed MAX.
  The maximum value of the speed feedback after the robot controller power supply is turned on is displayed.
- Speed command
  The motor speed command is displayed by the unit of rpm.

Click [Reset] button to reset all Servo Monitor.

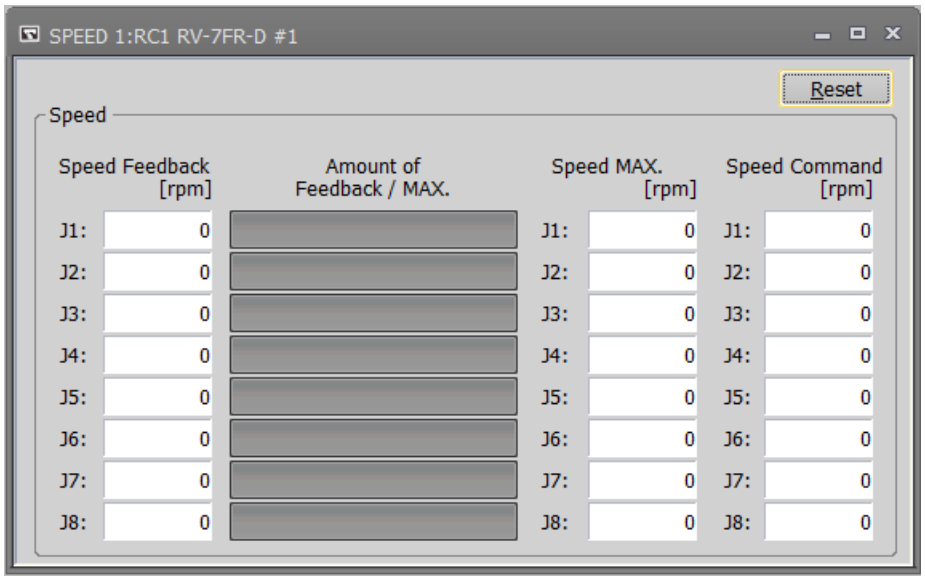


Figure 14-51 Servo monitor - Speed

14.5.3. Current

Data concerning the electrical 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 power supply is turned on is displayed.
- 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 limit 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.

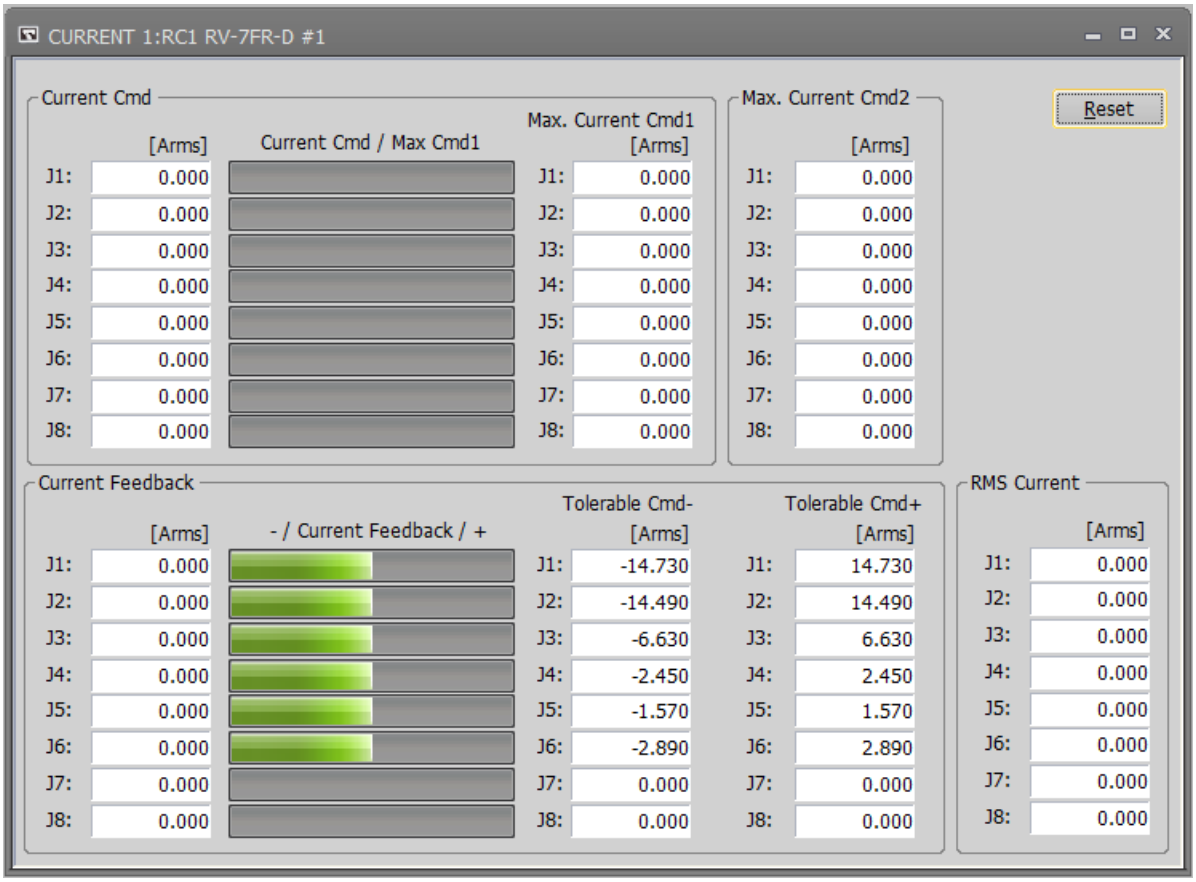


Figure 14-52 Servo monitor - Current

14.5.4. 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
  The present load ratio of each motor is displayed as an alarm level.
  An overload error occurs when this value reaches 100%.
- Max. axis load level
  The maximum value of the axis load level after the robot controller power supply is turned on is displayed.

Click the [Reset] button to reset all Servo Monitors.
The robot controllers supporting the encoder temperature function are as follows.

Robot controller	Software version of the robot controller
CR800-D/CR800-R/ CR800-Q	All versions
CR750-D/CRnD-700	Ver.S3 or later
CR750-Q/CRnQ-700	Ver.R3 or later

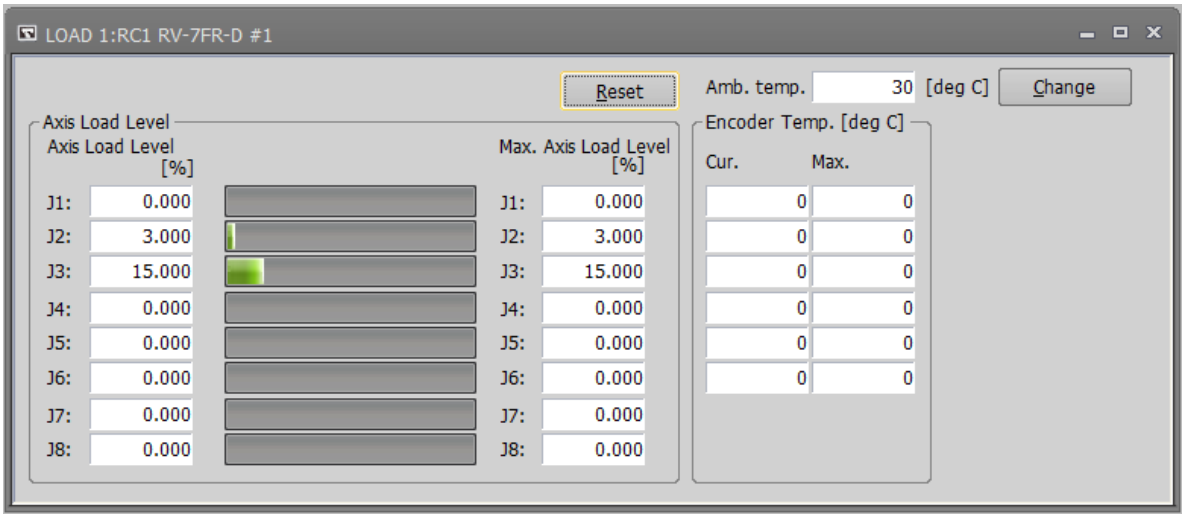


Figure 14-53 Servo monitor – Load

When the [Change] button is clicked, the following dialog for changing the ambient temperature is started up. The ambient temperature parameter can be changed in this dialog.

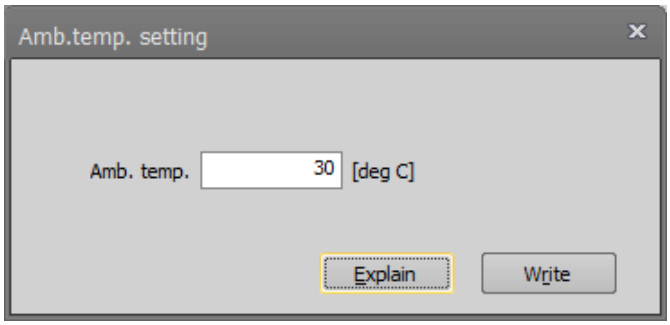


Figure 14-54 Screen of change ambient temperature

14.5.5. 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.
- Motor power voltage (MIN)
  The minimum value of the motor power voltage in servo ON is displayed.
- 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.

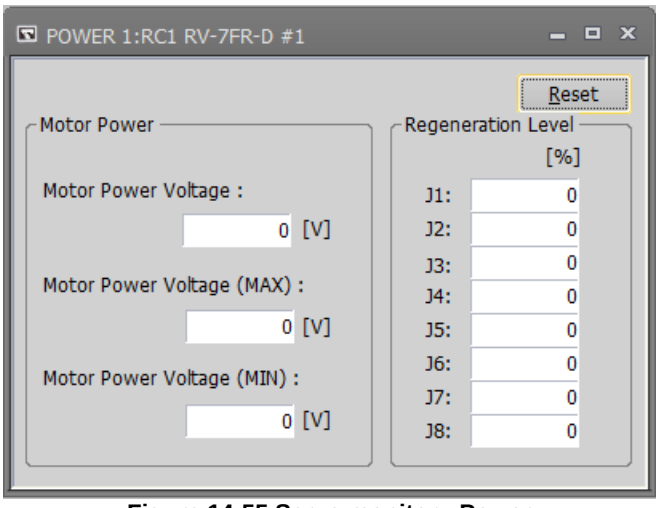


Figure 14-55 Servo monitor - Power

15. Maintenance

In maintenance, you can maintain the robot in various ways, including setting origin data and initializing various information.

15.1. 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].

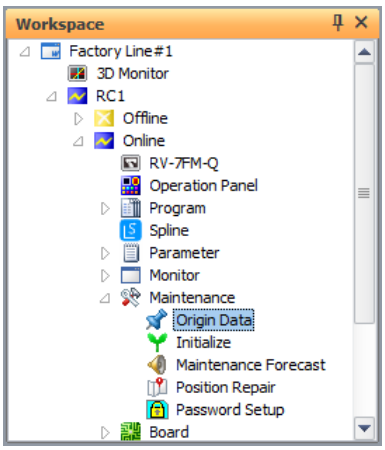


Figure 15-1 Starting up the Origin Data Setting Screen

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 15-1 Origin Data Reading Robot Control Operation Mode"** and **"Table 15-2 Origin Data Writing Robot Control Operation Mode"**.

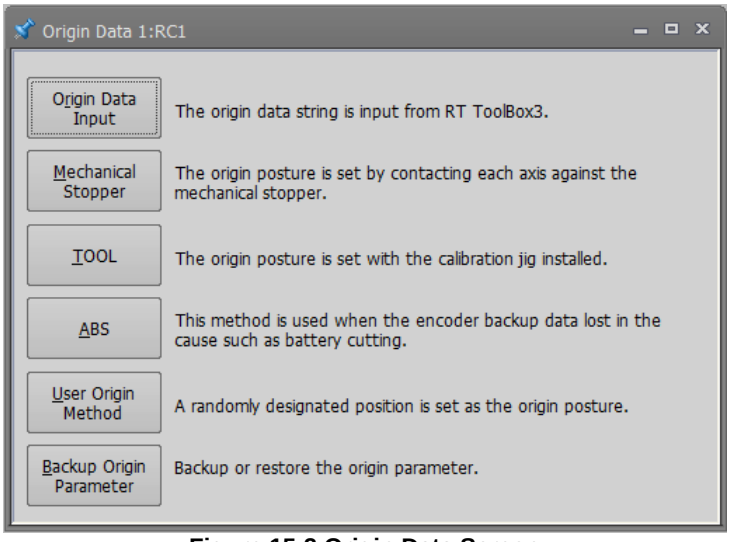


Figure 15-2 Origin Data Screen

** About robot controller run modes when origin data is read/written*

In 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.
See the table below.

(1) Reading

Table 15-1 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 15-2 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

15.1.1. Origin data input

You can save robot origin data to a file, edit it, and transfer it to a robot controller.
Click "origin data input" on the origin data screen to display the screen.

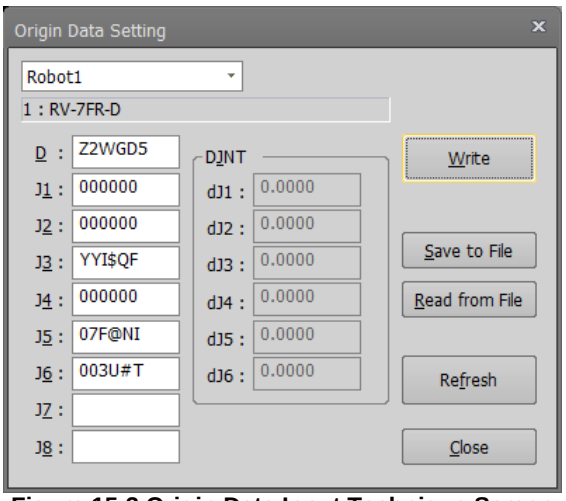


Figure 15-3 Origin Data Input Technique Screen

[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.

In this method, the origin is set by inputting the origin data of each axis. The origin data is pasted on the cover of the robot body. Please input the origin data by the following procedure.

1) Turn off the power and remove the robot cover that records the origin data.
2) Enter origin data in D, J1 - J8 by the above setting screen.
3) Click the write button.

The origin data position pasted on the robot body cover will vary depending on the model. Please refer to [Robot Setup to Maintenance].

⚠ 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, etc.).

15.1.2. Mechanical stopper

This uses the robot mechanical stoppers to set the robot origin.
Click the [Mechanical stopper] button on the origin data screen 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. This is sometimes not displayed for some robot controller software versions.

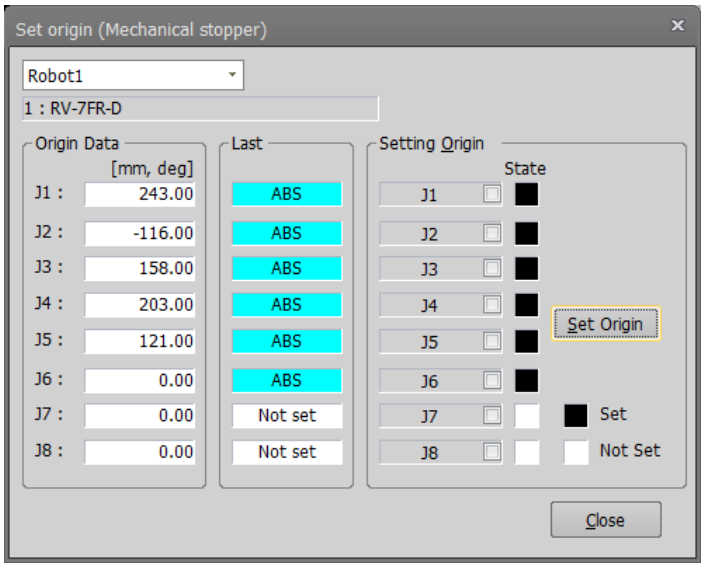


Figure 15-4 Origin Setting (Mechanical Stopper) Screen

In this method, we use the state where the robot arm is in contact with the mechanical stopper. Please follow the procedure below.

<Common to RH / RV series>
1) Release the brake and then use jog to bring the robot arm into contact with the mechanical stopper. Mechanical stopper is located on the + side and the - side, you can check which is to be contacted by the sign of the parameter. (MORG)
2) End brake release and servo OFF.
3) Select the axis form the above screen and click the [Set Origin] button.(Can be set simultaneously on multiple axes)
4) 1 - 3 correspond to the J1 - J2 axes of the RH series, and the J1 - J4 axes of the RV series.

< RH series >
5) Set the origin of the J3 and J4 axes at the same time. Release the brake of J3 and contacted with the + side of the machine stopper. In this state, align the J4 axis with the mark.
6) End brake release.
7) Select the J3 and J4 axes from above screen and click the [Set Origin] button.

< RV series >
5) Set the origin of the J5 and J6 axes at the same time. First, Fix the J5 axis by the procedure of 1 - 3. In this state, align the J6 axis with the mark.
6) Select the J5 and J6 axes from above screen and click the [Set Origin] button.

Caution

Release the brake, there is an axis falling by its own weight.

Depending on the posture of the robot, the arm falls by its own weight when releasing the brake. For safety reasons, take measures to prevent it from falling before releasing the brake.

15.1.3. Tool

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. This is sometimes not displayed for some robot controller software versions.

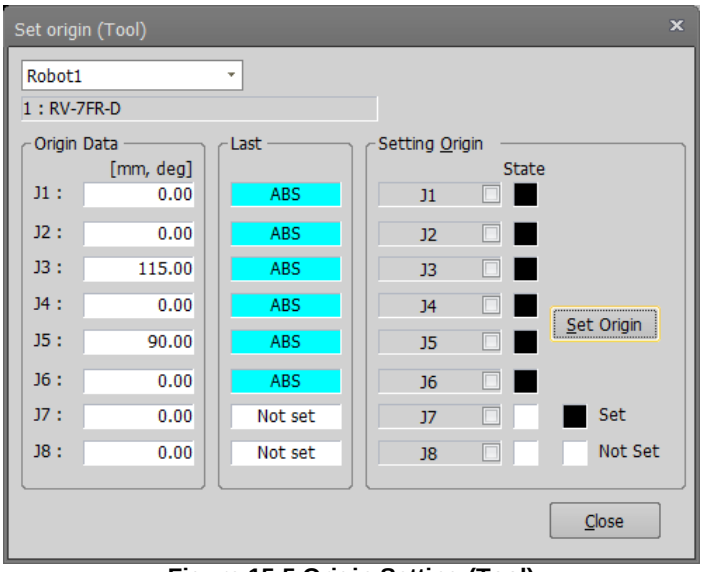


Figure 15-5 Origin Setting (Tool)

In this method, wo use the tool to set the origin data for each axis. The tool is used by inserting each axis into a pin hole for origin setting when each axis is moved to the origin position. Please follow the procedure below.

<Common to RH / RV series>
1) Release the brake and ues the jog to match the pin hole for origin setting.
2) Move the axis back and forth so that the tool passes through the pin hole.
3) End brake release and servo OFF.
4) Select the axis form the above screen and click the [Set Origin] button.
5) 1 - 4 correspond to the J1 - J2 axes of the RH series, and the J1 - J4 axes of the RV series.

< RH series >
6) Set the origin of the J3 and J4 axes at the same time. Release the brake of J3 and contacted with the + side of the machine stopper. In this state, align the J4 axis with the mark.
7) End brake release.
8) Select the J3 and J4 axes from above screen and click the [Set Origin] button.

< RV series >
6) Set the origin of the J5 and J6 axes at the same time. First, Fix the J5 axis by the procedure of 1 - 4. In this state, align the J6 axis with the mark.
7) Select the J5 and J6 axes from above screen and click the [Set Origin] button.

* If you need an origin setting tool, please contact our service department.
* The position of pin hole will vary depending on the model. Please refer to [Robot Setup to Maintenance].

⚠ Caution

Release the brake, there is an axis falling by its own weight.

Depending on the posture of the robot, the arm falls by its own weight when releasing the brake. For safety reasons, take measures to prevent it from falling before releasing the brake.

15.1.4. ABS

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. This is sometimes not displayed for some robot controller software versions.

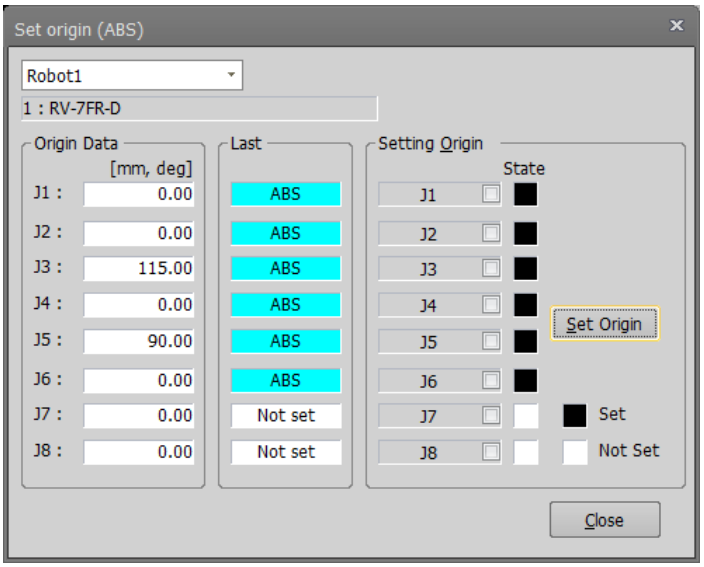


Figure 15-6 Origin Setting (ABS) Screen

In this method, we use the ABS mark to set the origin. The ABS mark is a triangular mark attached to each axis or Scribe line. The robot stores the position within one revolution of the encoder,you can set the exact origin by matching the ABS mark within 1mm of the deviation. Please follow the procedure below.

<Common to RH / RV series>
1) Move with jog so that the deviation amount of ABS mark is within 1 mm.
2) Select the axis form the above screen and click the [Set Origin] button.(Can be set simultaneously on multiple axes)
3) 1 - 2 correspond to the J1 - J2 axes of the RH series, and the J1 - J4 axes of the RV series.

< RH series >
4) Set the origin of the J3 and J4 axes at the same time. Release the brake of J3 and contacted with the + side of the machine stopper. In this state, align the J4 axis with the mark.
5) End brake release.
6) Select the J3 and J4 axes from above screen and click the [Set Origin] button.

< RV series >
6) Set the origin of the J5 and J6 axes at the same time. J5, J6 axis simultaneously execute 1 - 2.

* The position of ABS mark will vary depending on the model. Please refer to [Robot Setup to Maintenance].

15.1.5. User Origin Method

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.

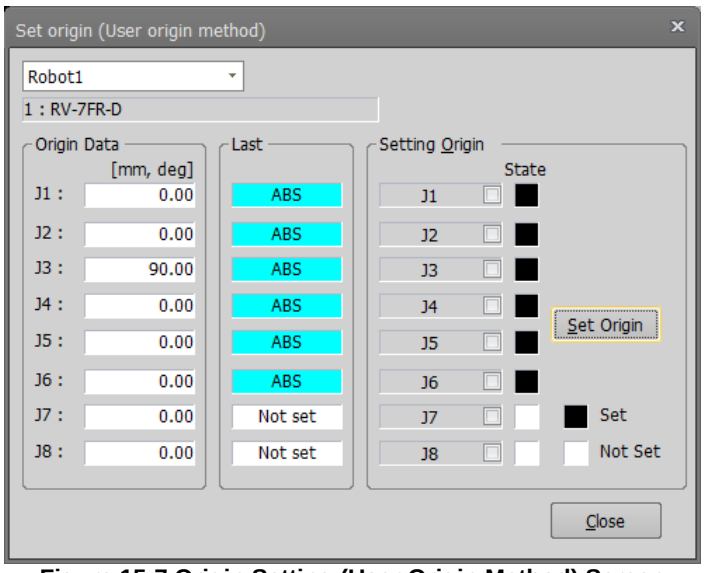


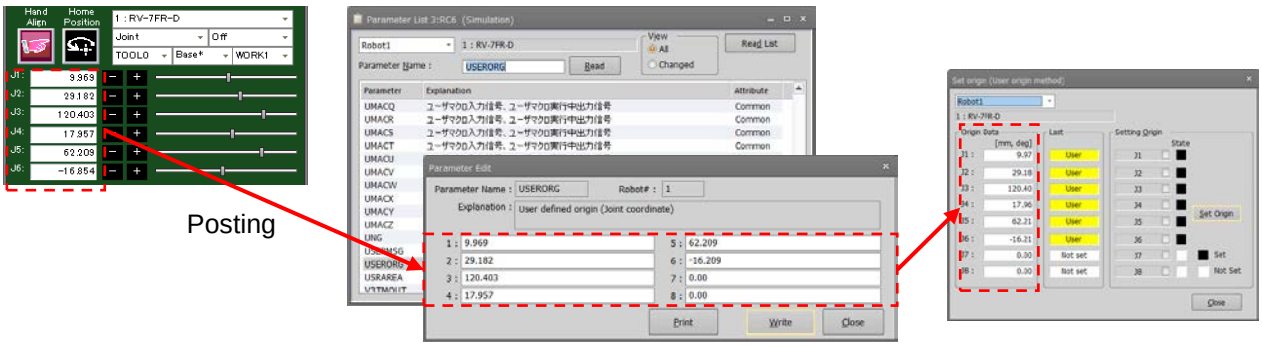
Figure 15-7 Origin Setting (User Origin Method) Screen

In this method, we use the user-determined origin position and the joint value at that time to set the origin. However, before using this method, you need to use other methods to preset the origin. Please follow the procedure below.

< When the origin setting is the first time >

1) Move the robot by jog operation and decide the posture to be the user origin. At this time, please put a landmark so that you can move to the same posture again by jog.

2) Write the user-specified origin position parameter (USERORG) after recording the current joint value read from T/B or RT ToolBox3. This operation associates the current pose with the joint value and displays it as the origin data on the origin setting (user origin method) screen.



< When the origin setting is the second time or later >

3) Move to the posture decided in 1.

4) Select the axis form the above screen and click the [Set Origin] button. By this operation, the current posture is set as the joint value determined in 2.

* Please refer to [Robot Setup to Maintenance].

15.1.6. 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.

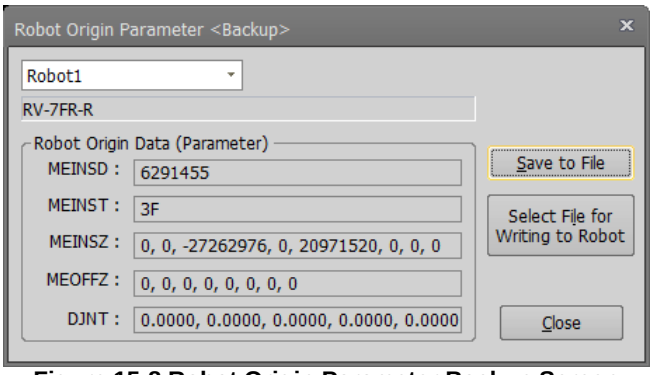


Figure 15-8 Robot Origin Parameter Backup Screen

[Save to file]	:	This saves origin parameters read from a robot controller (displayed parameters) to a file.
[Select file for writing to robot]	:	Transfers 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 a password is registered in “Parameters” by the robot controller's security function, it is not possible to restore backed-up origin data strings to the robot controller by the "origin parameter backup" screen.

When the password is registered in “Parameter” by the robot controller's security function, it is not possible to restore the origin data strings to the robot controller by the "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 in the robot controller's security function when performing restoration of backed-up origin data. See **"15.5.3 Delete Password"** for how to delete the password.
For details on setting security functions (registering passwords) and releasing security functions (deleting passwords) on robot controllers, refer to **"Table 15-12 Compliant version of this function and controller"**.

15.2. Initialization

This initializes information in a robot controller.
Here, you can initialize the following information in a robot controller.
(1) Setting the robot controller clock
(2) Initializing all programs in the robot controller
(3) Initialize the remaining battery time in the robot controller
(When connected to the CR800 series robot controller, the remaining battery time is not displayed.)
(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 CR800/750/700 series robot controllers.)

15.2.1. Starting

Use the initialization function while connected to the robot controller.
From the project tree, double-click the target project [Maintenance] -> [Initialize].

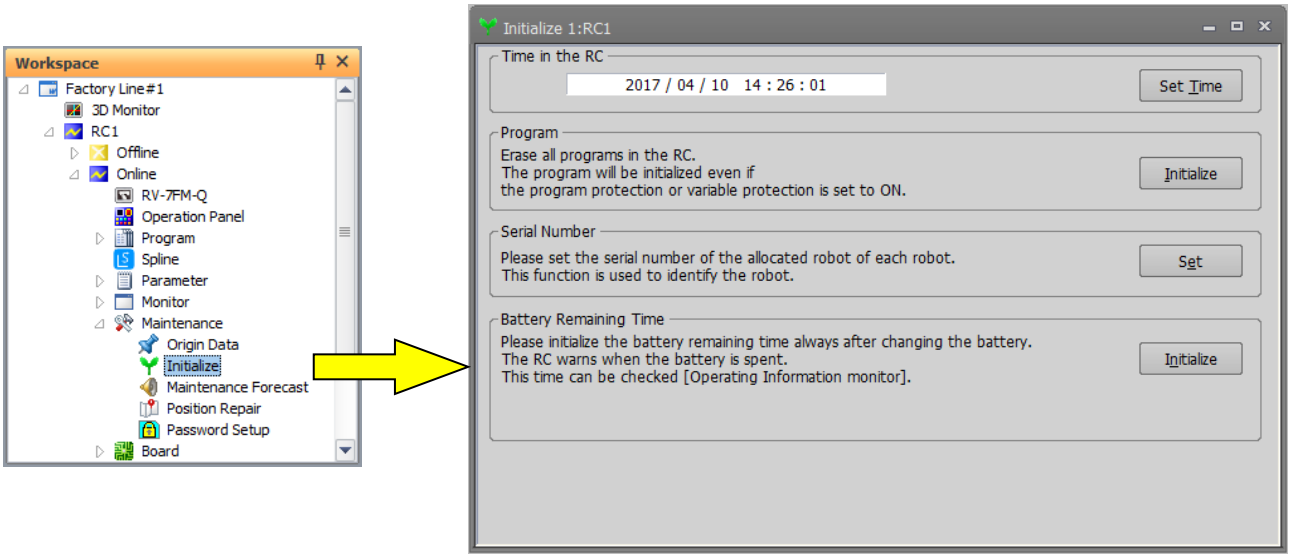


Figure 15-9 Starting Initialization Screen

15.2.2. Setting the time in the robot controller

You can set the robot controller clock.
On the initialization screen, click the [Set time] button.

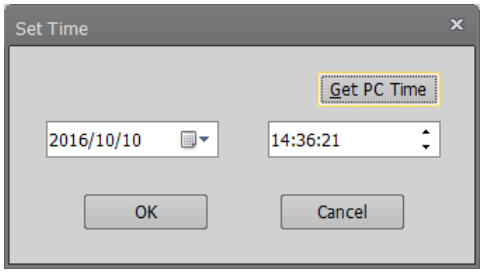


Figure 15-10 Time Setting Screen

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.

15.2.3. 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", and then click the [OK] button.

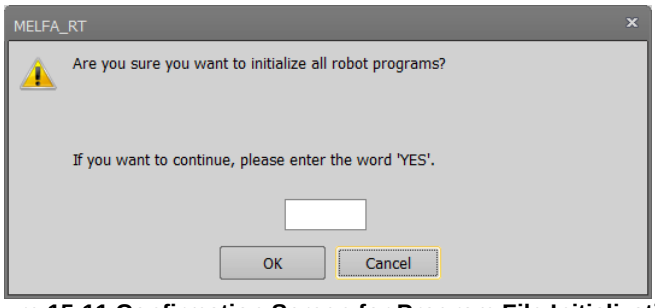


Figure 15-11 Confirmation Screen for Program File Initialization

Caution

When a password is registered in programs by the robot controller's security function, it is not possible to delete all the programs in the robot controller.

When a password is registered in programs by the 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.	×	○	○

Delete the password of robot controller's security function when you operate these. Refer to **"15.5.3 Delete Password"** for how to delete the password.

For details on setting security functions (registering passwords) and releasing security functions (deleting passwords) on robot controllers, refer to **"Table 15-12 Compliant version of this function and controller"**.

15.2.4. Initializing the battery remaining time

This initializes the remaining battery time in the robot controller. This function cannot be used when connected to the CR800 series robot controller.
On the initialization screen, click the remaining battery time [Initialize] button.
A confirmation screen is displayed. Input "Yes", then click the [OK] button.

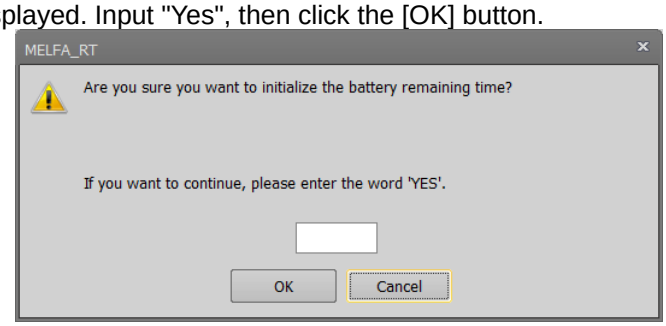


Figure 15-12 Confirmation Screen for Battery Time Remaining

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 will become impossible to reference a correct reading of the remaining battery time.

15.2.5. 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 CR800/750/700 series robot controllers.
The first time you start up a CR800/750/700 series robot controller after purchase, the C0150 or C0152 warning (robot main unit serial number not set) is generated. On this screen, set the robot main unit serial number.

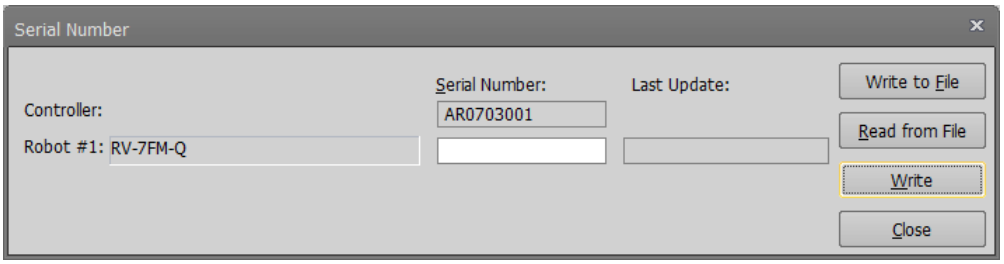


Figure 15-13 Serial Number Input Screen

15.3. Maintenance Forecasting

With "Maintenance forecasting", you can reference the parts replacement timing (re-greasing, battery and belt replacement) from the operation data collected up to now in the robot controller.

Caution

The results of calculations in Maintenance Forecast merely show reference values.
Perform daily inspection and periodic inspections to prevent breakdowns beforehand, and to ensure safety.

15.3.1. 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 15-3 Supported models and software versions

No.	Robot	CR800/750/700 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		-

15.3.2. Startup

Use the maintenance forecast function while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Maintenance] -> [Maintenance Forecast].

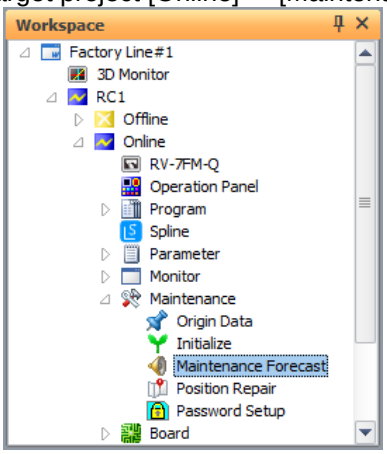


Figure 15-14 Maintenance Forecasting Startup

15.3.3. Forecasting

You can reference the "time until battery replacement", "time until re-greasing", and “time until belt replacement".

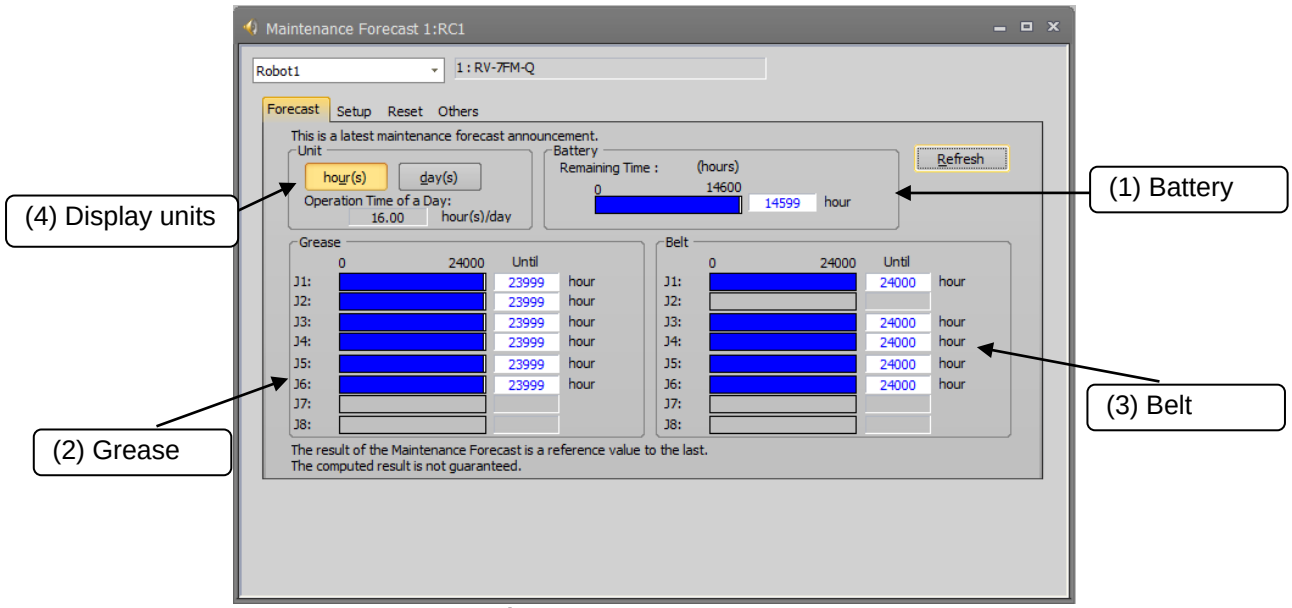


Figure 15-15 Forecast Screen

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

(Remaining time) < [Remaining days until expected maintenance time] on the Setup screen) x (24 - [Daily operation time])

the hours and bar graphs are displayed in orange.
(The battery replacement time is calculated during the time when the controller’s power is not on.)
When connected to the CR800 series robot controller, the remaining battery time is not displayed.

(2) Grease

If the hours until replenishment time has reached

(Hours until replenishment time) < ([Remaining days until expected maintenance time] on the Setup screen) x ([Daily operation time]),

the hours and bar graphs are displayed in orange.

(3) Belt

If the hours until belt replacement time has reached

(Hours until replacement time) < ([Remaining days of expected operational life] on the Setup screen) x ([Daily operation time]),

the hours and bar graphs are displayed in orange.

(4) Display units

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.

15.3.4. Settings

Here, you can set the timing for collecting information concerning maintenance forecasts, the notification method, etc.

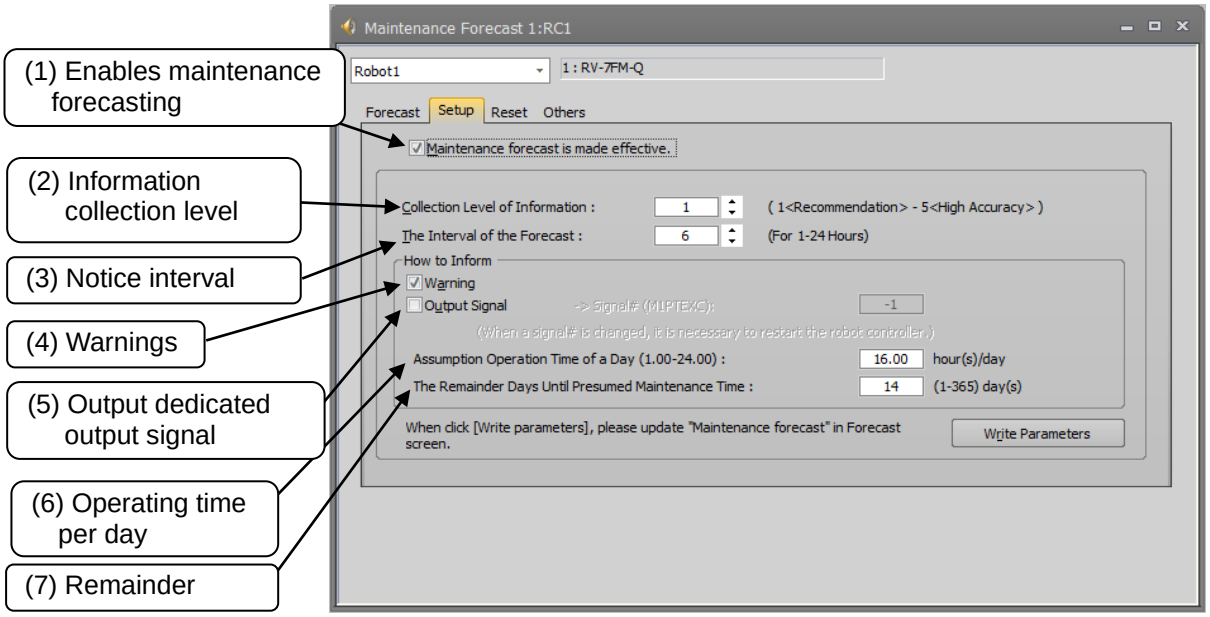


Figure 15-16 Setup

When the [Write parameters] button is clicked after setting each item, the setting values are written into the controller. All items take effect after they are written into the controller, except for signal numbers of dedicated outputs. 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 15-4 Description of the Setup Screen**".

⚠ Caution

Information needed for "Maintenance Forecast" is not accumulated while the Maintenance forecast is set to "disabled".

The default value is "disabled". When the Maintenance Forecast is disabled, Maintenance Forecast information is not accumulated. When switched again from disabled to enabled, and the reservoir of information is continued from the last value. If you have disabled the Maintenance Forecast for a long time the correct maintenance times cannot be calculated.

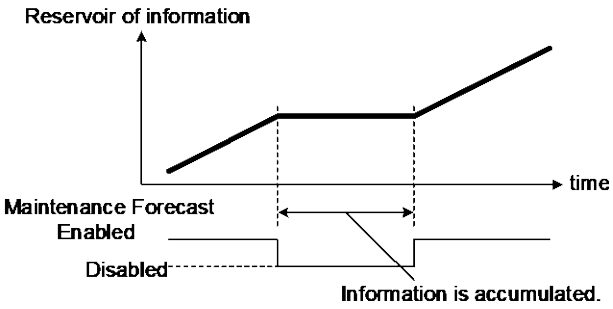


Table 15-4 Description of the Setup Screen

Item	Explanation	Factory preset value
(1) Maintenance Forecast is made effective.	If this is checked, the Maintenance Forecast function is enabled. * If the checkmark is removed, the collection of Maintenance Forecast information 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 on maintenance. * As the 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 of maintenance time notification.	6 hours
How to inform	When the grease replenishment, belt replacement, and other maintenance times have been 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. The warning 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 estimated maintenance time for use as a reference to notify the maintenance time.	14 days

MEMO

How to reset the generated warning and output warning signal

There are output of warning occurrence (C753 *, C754 * (* is the axis number)) and dedicated output signal (M * PTEXC (* is the robot number)) as a notification method of each part replacement time.
When both are set by the notification method, it is possible to turn off the warning occurrence and turn off the signal output by the error reset operation.

If you wish to invalidate "warning occurrence" and make only the output of the dedicated output signal valid with the notification method, even if you press the reset button on the front of the controller, the output signal will not turn OFF. In this case, if you press the [ERROR RESET] key of the teaching pendant or input the error reset signal (ERRRESET), the signal output turns OFF.

Notification method setting		Notification method	How to reset notification (warning occurrence or dedicated signal output)		
Warnings	Dedicated Output Signal		On the front of the controller [RESET]	T / B's [ERROR RESET]	From the outside Error reset signal
☑	☐	Warning occurrence	Possible	Possible	Possible
☑	☑	Warning occurrence Dedicated signal output	Warning, dedicated signal Resetable	Warning, dedicated signal Resetable	Warning, dedicated signal Resetable
☐	☑	Dedicated signal output	Can not reset	Possible	Possible

15.3.5. Reset screen

The information (about battery, grease and belt) for Maintenance Forecast kept in the controller can be reset.

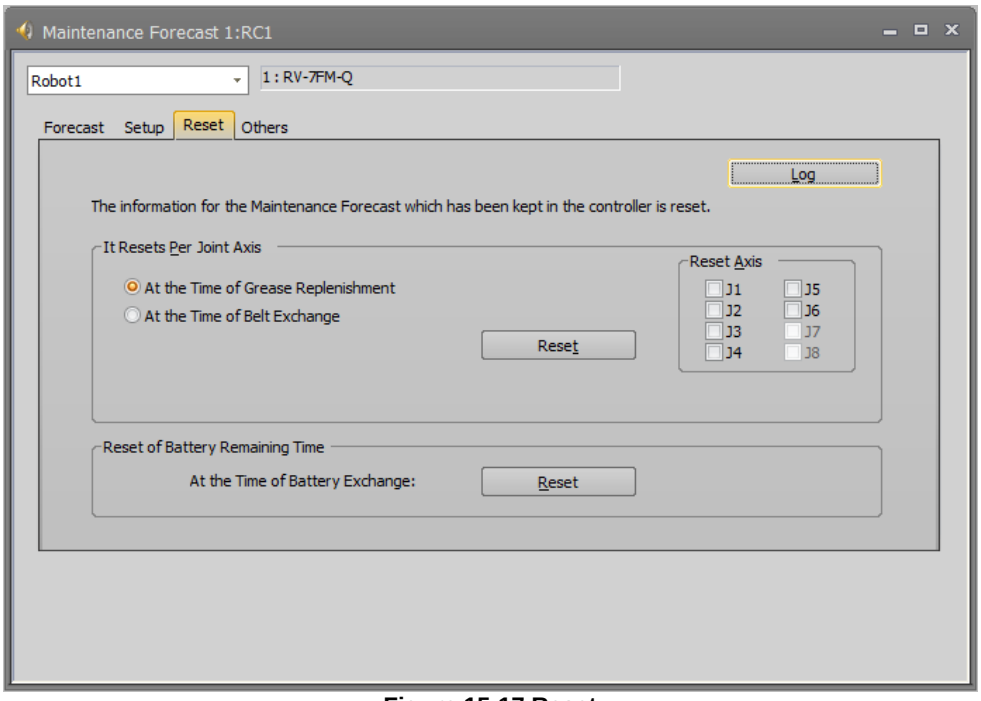


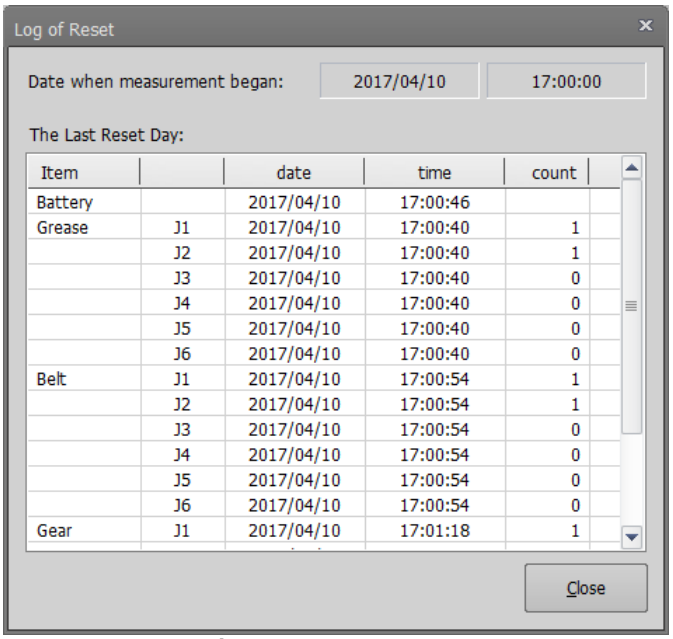
Figure 15-17 Reset

Table 15-5 Description about each reset

Type of reset	Explanation	Note
At time of battery replacement	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 remaining battery time after a battery has been replaced.	
At time of grease replenishment	When an alarm urging to perform periodic inspection and grease replenishment (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 inspection 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.



Item		date	time	count
Battery		2017/04/10	17:00:46	
Grease	J1	2017/04/10	17:00:40	1
	J2	2017/04/10	17:00:40	1
	J3	2017/04/10	17:00:40	0
	J4	2017/04/10	17:00:40	0
	J5	2017/04/10	17:00:40	0
	J6	2017/04/10	17:00:40	0
Belt	J1	2017/04/10	17:00:54	1
	J2	2017/04/10	17:00:54	1
	J3	2017/04/10	17:00:54	0
	J4	2017/04/10	17:00:54	0
	J5	2017/04/10	17:00:54	0
	J6	2017/04/10	17:00:54	0
Gear	J1	2017/04/10	17:01:18	1

Figure 15-18 Reset Log

15.3.6. Resetting maintenance forecast information in Teaching Box

When an alarm urging to replace the batteries, replenish the grease, or to replace the belt is issued 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 remaining battery time

Table 15-6 Resetting the time of battery remaining

	Explanation	Operation
Remaining battery time	This 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 remaining battery 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 how to initialize the remaining battery time using the teaching box, see **"Detailed explanations of functions and operations"** in the robot controller's operations manual.

(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 15-7 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 into Teaching Box unless the entire text is input.)

The grease or belt information will be reset immediately after a parameter name and the value are entered. (In this case, the controller power does not need to be restarted.) If a value other than 0 is entered, the reset process will be executed for each axis.
Repeat the parameter input operation when resetting information on two or more axes.
Also note that the value read is always 0 regardless of the previously entered value. If you continue the input operation in this state, all axes will be reset. Exercise caution.

See “Controller INSTURCTION MANUAL – Detailed explanations of functions and operations” for how to input parameters using the Teaching Box.

15.3.7. 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.

Perform Backup/Restore between controllers of the same version. If the version is different, an 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.

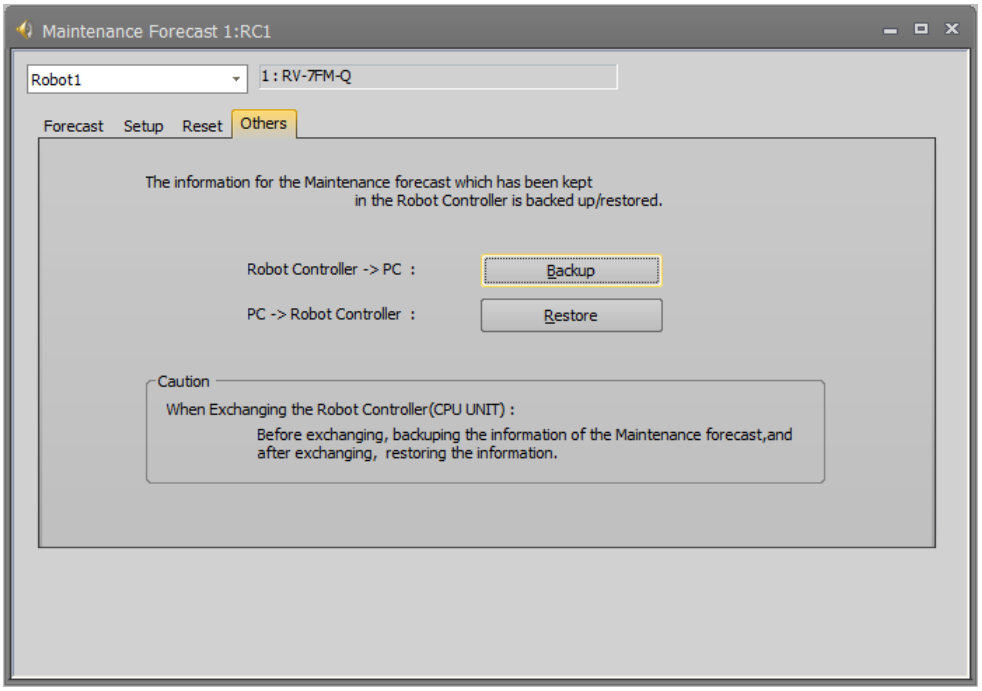


Figure 15-19 Others

15.4. Position Repair Function

The position repair function is restricted by the usable models and controller software versions. See **"Table 15-9 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. It is possible to use the previous position data in the controller simply by reteaching part of the position data within the robot program. (Position repair generates parameters to correct the position deviation and corrects all the position data in the robot controller.)
However, understand that there are some cases that position repair cannot 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 15-8 The limit by degree of freedom"**, positional deviations related to these restrictions cannot be corrected with this function. In this case, either reteach manually or correct the deviating section (for example, by replacing a bent hand).

Table 15-8 The limit by degree of freedom

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

⚠ Caution

The position repair function cannot be used with Movemaster commands.

The position repair function is only supported by MELFA-BASIC IV, MELFA-BASIC V and MELFA-BASIC VI. It cannot be used with Movemaster commands.

⚠ Caution

When a password is registered in parameters or files by the robot controller's security function, it is not possible to operate the Position repair Function.

When a password is registered in “parameters” or “files” by the robot controller security function, it is not possible to operate the Position Repair Function.

○ : Enabled、 × : Disabled

	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 **"15.5.3 Delete Password"** for how to delete the password.

For details on setting security functions (registering passwords) and releasing security functions (deleting passwords) on robot controllers, refer to **"Table 15-12 Compliant version of this function and controller"**.

15.4.1. Specifications

The robot models and robot controller versions with which the position repair function can be used are as follows.

Table 15-9 Supported Robot Controllers and Models

No.	Robot model	CR800/750/700 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.

15.4.2. Startup

Use the position repair function while connected to the robot controller.
From the project tree, double-click the target project [Online] -> [Maintenance] -> [Position repair].

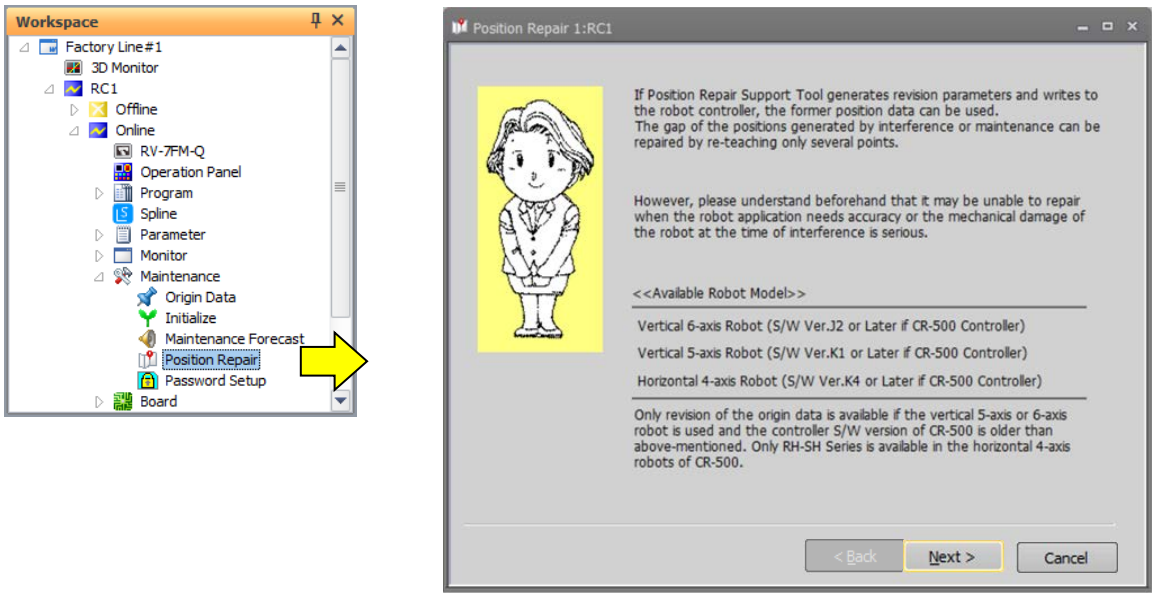


Figure 15-20 Starting Position Repair

15.4.3. 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 the parameter values.

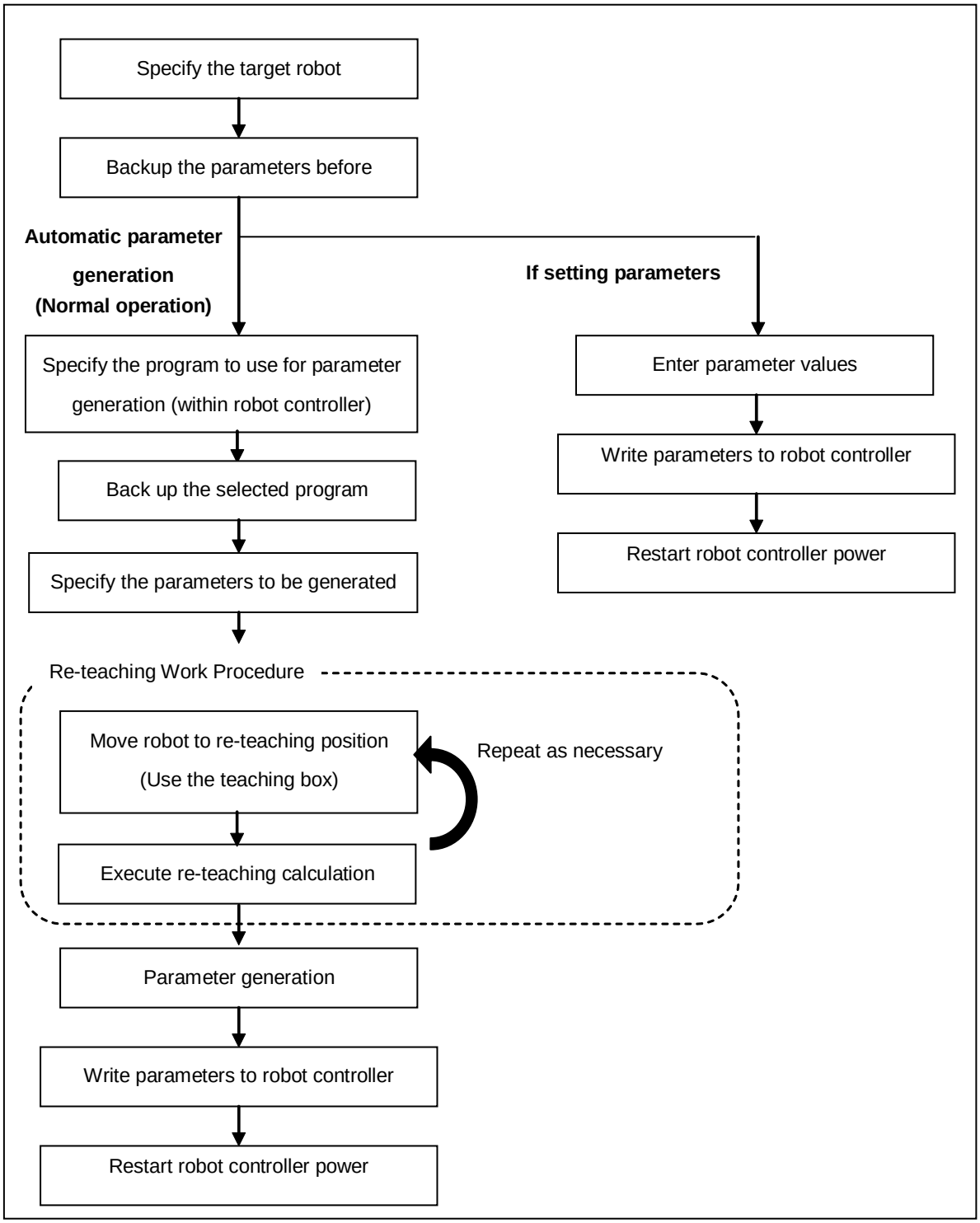


Figure 15-21 Operation Flow

The explanation follows the normal operations flow. For a description of parameter value setting, see **"15.4.16 Revision parameter editing".**

15.4.4. Introduction

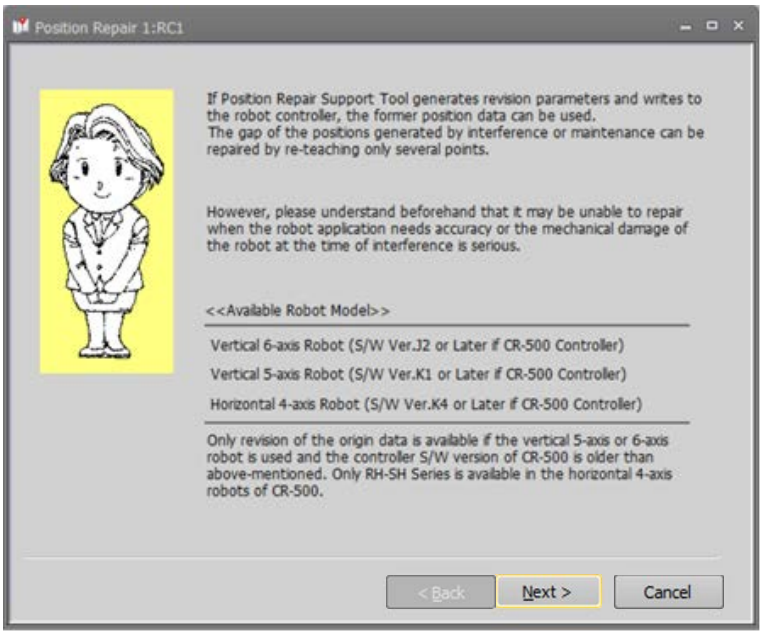
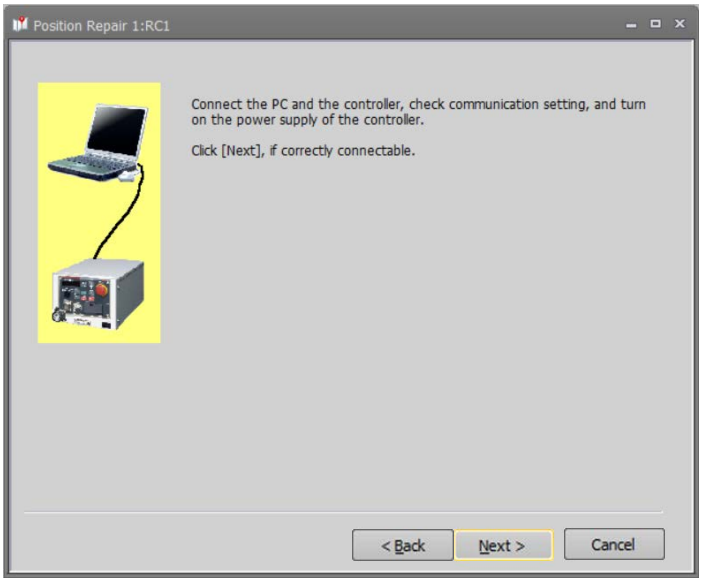


Figure 15-22 Starting Use Window

This is an explanation of the position repair function. Read it carefully, then click the [Next] button.

15.4.5. Communication settings



Check the communication settings and connected to the robot controller, click the [Next] button. For the setting method, see **"9 Connecting to the Robot".**

15.4.6. Robot selection and parameter backup

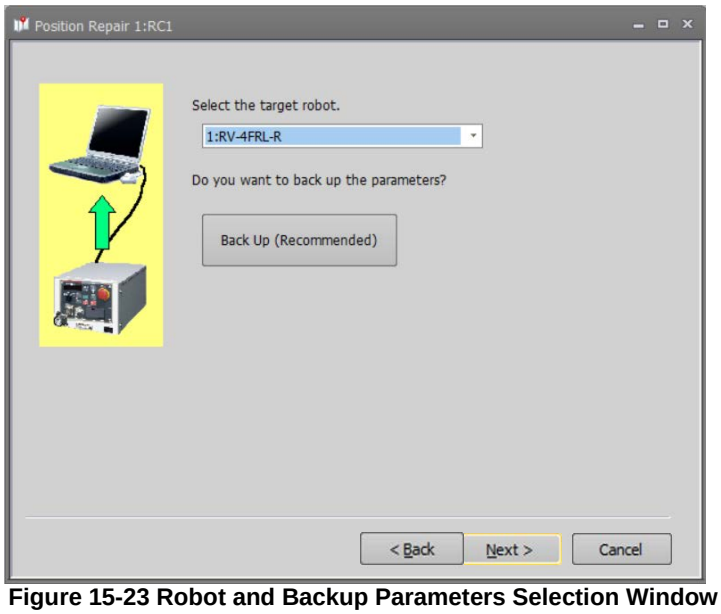


Figure 15-23 Robot and Backup Parameters Selection Window

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

Controller number : Controller Name + 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 **"17 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.

15.4.7. Selection of Revision parameter generation procedure

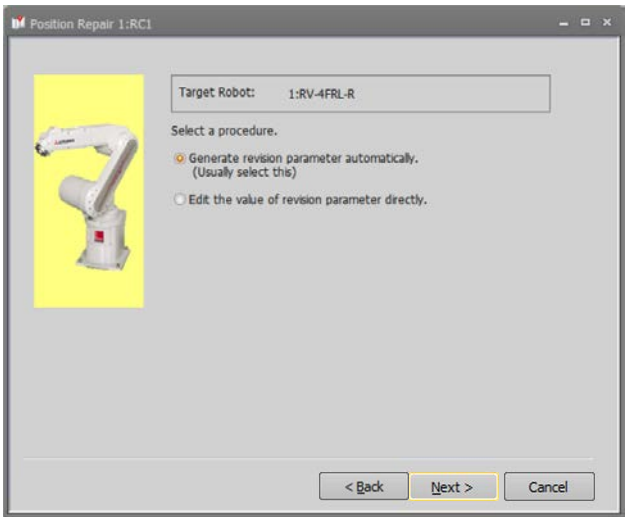


Figure 15-24 Select generation procedure of revision parameter Window

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 the **"Edit Revision Parameter"** window.

15.4.8. Program selection

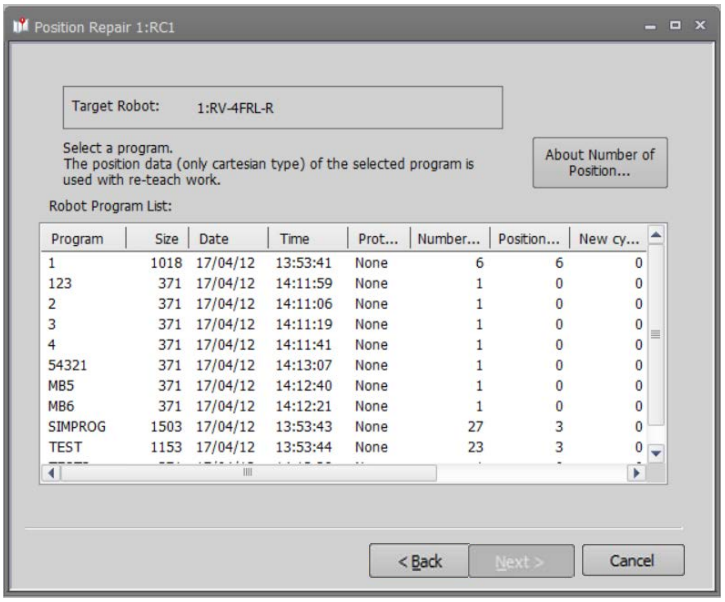


Figure 15-25 Program Selection Window

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 15-10 Selection of Revision Parameters"**.

Memo

Points on selecting the program

Select the program with the positions data on the various locations and postures.
Moreover, higher accuracy of revision parameters can be obtained by selecting the following type of position data programs.

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

15.4.9. Program reading and backup

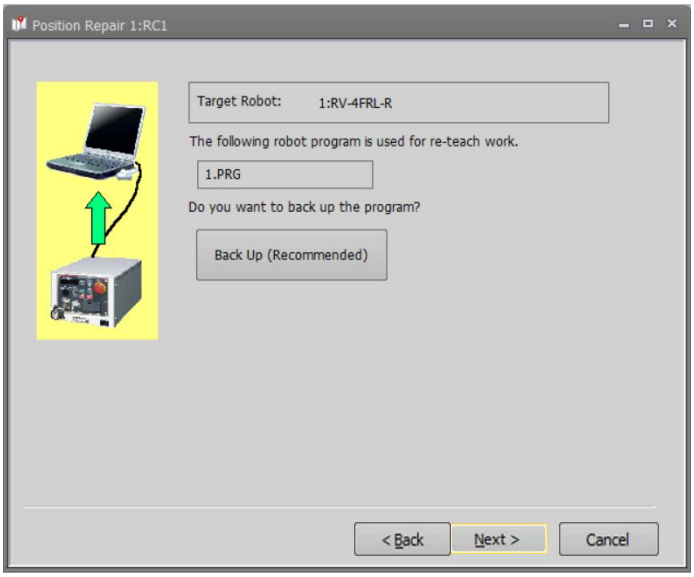


Figure 15-26 Program Read and Backup Window

To backup a program, click [Backup].
The special screen for backup is started. For details on backups, see **"17 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.

15.4.10. Tool setting check

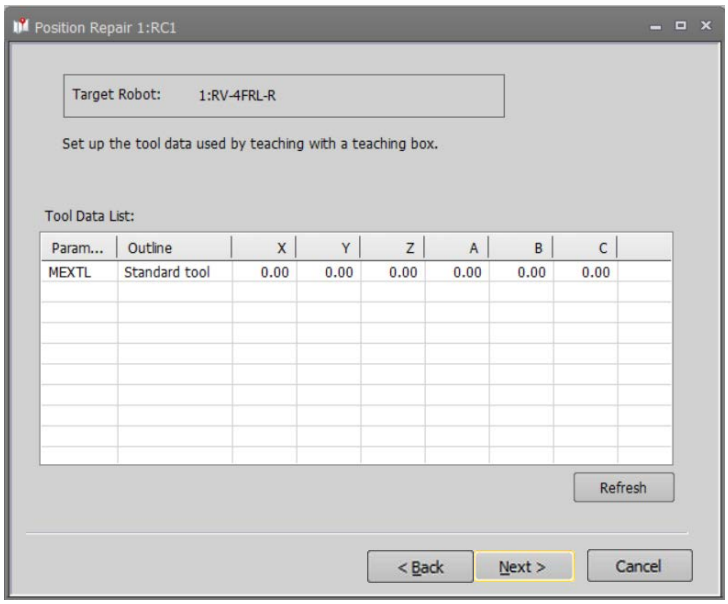


Figure 15-27 Tool Setting Check Window

Parameter values for tool data set in the present robot controller are displayed. The row for the tool selected by the tool number (MEXTLNO) is highlighted in red.
Please check whether 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 the re-teaching operation for each tool.

15.4.11. Revision parameter selection

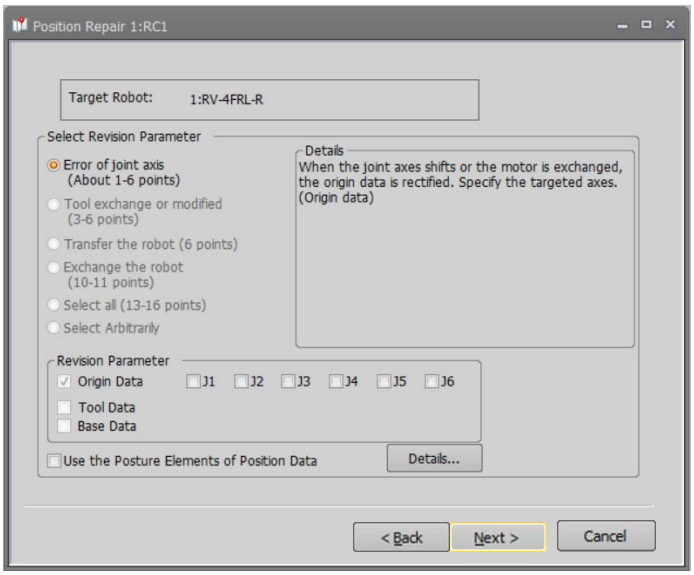


Figure 15-28 Revision Parameter Selection Window

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

The 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 the CR800/750/700 series robot controller.

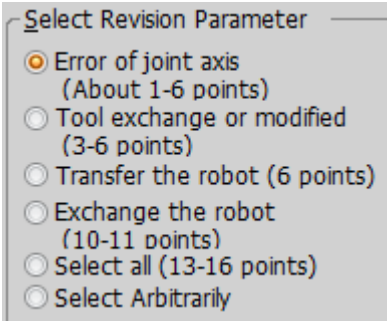
Click [Details] to see the description of the difference between checking and not checking [Use the posture elements of position data].

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

After choosing the revision parameters, click [Next].

15.4.11.1. Revision parameters

Parameters revised by items selected with "Select revision parameters" become as in **"Table 15-10 Selection of 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 robot deviation 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.

* Cases which cannot be calculated due to the degree of freedom limitations of the robot
Some elements of revision parameter cannot be reflected because Vertical 5-axis robots and horizontal 4-axis robots have limited degrees of freedom.

* Cases condensed by the combination of robot mechanism and revision parameters
Some revision parameter elements become the value on the same rotation axis due to the combination of the robot mechanism and revision parameters. In such cases, the calculated deviation value is condensed to the one element of the revision parameters.
At this case, though the correction parameters become 0, the others are condensed and corrected. So it is not necessary to correct it again.

Table 15-10 Selection of Revision Parameters

No.	Item	Description	Revised Parameter	Minimum number of teaching 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 differs according to how the axis was specified.	Origin data Revision Parameter ☑ Origin Data ☐ Tool Data ☐ Base 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 Revision Parameter ☐ Origin Data ☑ Tool Data ☐ Base 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 Revision Parameter ☐ Origin Data ☐ Tool Data ☑ Base Data	6 points	3 points	4 points
4	Exchange the robot	When a robot is exchanged using the original tooling, it rectifies origin data error and base data of the robot position setup. Attachment error is also rectified for horizontal 4-axis robots only. **Vertical 6-axis robot:** * Origin data J1 is included in base data. **Vertical 5-axis robot:** * For base data, only the 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 tool data and base data Z elements are not corrected at the same time. Z Element to Calculate ◉ Tool Data ○ Base Data	Base data Origin data Tool data (4-axis robot only) Revision Parameter ☑ Origin Data ☐ Tool Data ☑ Base Data (5-axis and 6-axis robot) Revision Parameter ☑ Origin Data ☑ Tool Data ☑ Base Data (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:** * For tool data, only the Z element is corrected. * For base data, only the 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 is to be requested because Z elements of tool data and base data are not corrected at the same time. Z Element to Calculate ◉ Tool Data ○ Base Data	Origin data Tool data Base data Revision Parameter ☑ 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 teaching 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:** * For tool data, only Z element is corrected. * For base data, only X, Y, Z elements are corrected. **Horizontal 4-axis robot:** * If base data is selected, turn off the Checkboxes of origin data J1 and J3. Origin data J1 and J3 are included in base data. * If tool data is selected, turn off the Checkboxes of origin data J3 and J4. Origin data J3 and J4 are included in tool data. * If tool data and base data are selected together, select which Z element to be requested, because Z elements of tool data and base data are not corrected at the same time. Z Element to Calculate Tool Data Base Data				

* Revision parameter names correspond to the following.

Origin data: DJNT
Tool data: MEXDTL, MEXDTL1 to 4 (Parameter of the tool selected by tool number)
Base data: MEXDBS

15.4.11.2. Position data posture components

The position data of MELFA-BASIC IV, MELFA-BASIC V and MELFA-BASIC VI 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.

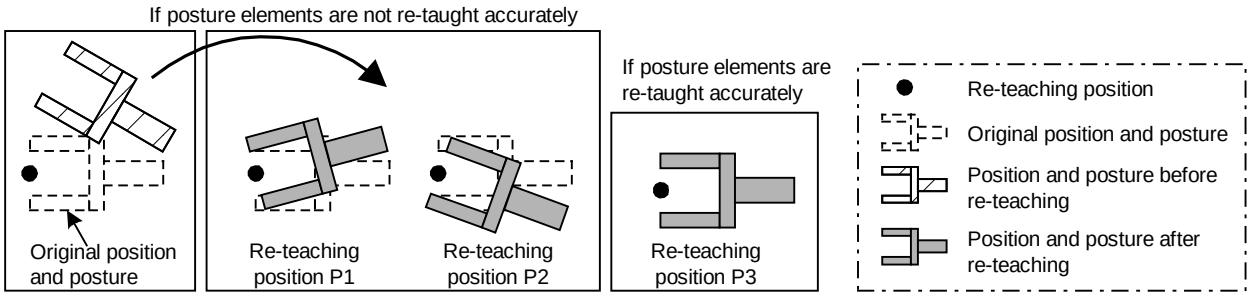
Memo

*(*1) The posture elements of position data*

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

(1) When [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.
The precision of generated revision parameters 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 the position correction calculation, decreasing the precision of the calculation result.



(2) When [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 exactly match the tip posture elements during re-teaching, clear the checkbox [Use the posture elements of position data]. In such a 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 15-11 About Posture Elements of Re-teaching Position Data".**

Table 15-11 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 vertical 6-axis robots:** * Posture elements (A, B, C) of tool revision parameters cannot be obtained. * The J6 axis of origin revision parameters cannot be obtained if both X and Y components of the tool parameter are 0.0.
		In vertical 5-axis robots: * The J6 axis of origin revision parameters cannot be obtained.
		In horizontal 4-axis robots : * Posture elements (C) of tool revision parameters cannot be obtained. * The J4 axis of origin revision parameters cannot be obtained if both X and Y components of the tool parameter are 0.0.

15.4.12. Reteaching work

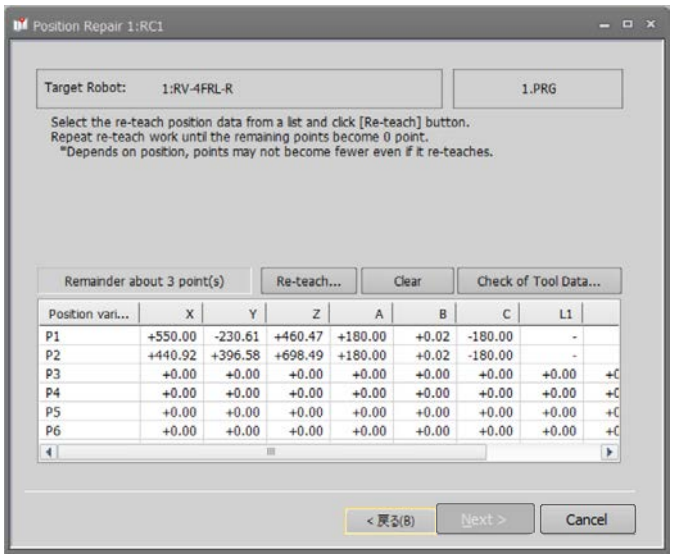


Figure 15-29 Reteach Work Window

[Remainder] Remainder about 1 point(s)	Displays the number of remaining points until revision parameters are generated. However, at some positions, re-teaching may not decrease the number of remaining points.
[Re-teach] button	Specifies the positions selected in the list and opens **"Re-teach the position"** screen.
[Clear] button	Clears the re-teaching information for positions selected in the list.
[Check of tool data]	Displays current tool data setting in the robot controller.

Caution

Position data of the targeted program is write-protected.

When displaying 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 protection cannot be released. Please release the protection using the Teaching Box or Program manager of this software.

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

The 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.

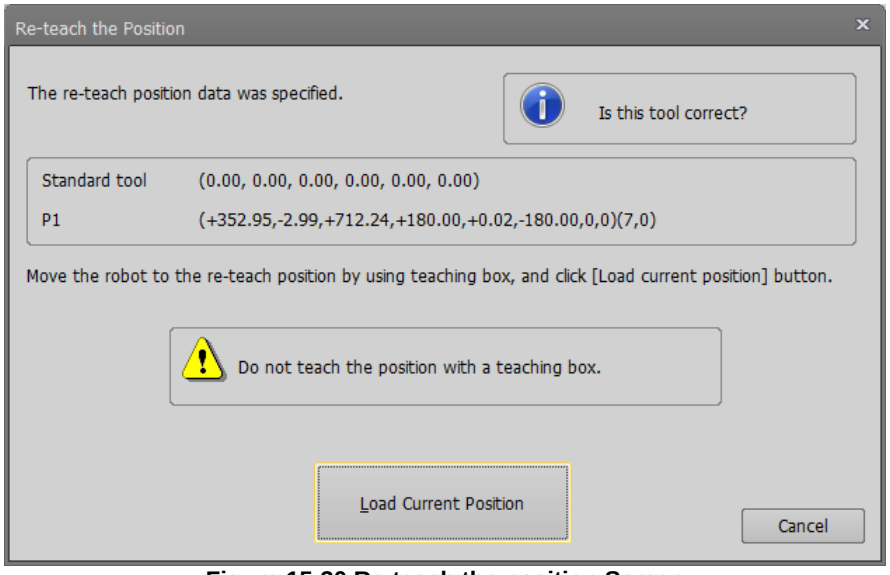


Figure 15-30 Re-teach the position Screen

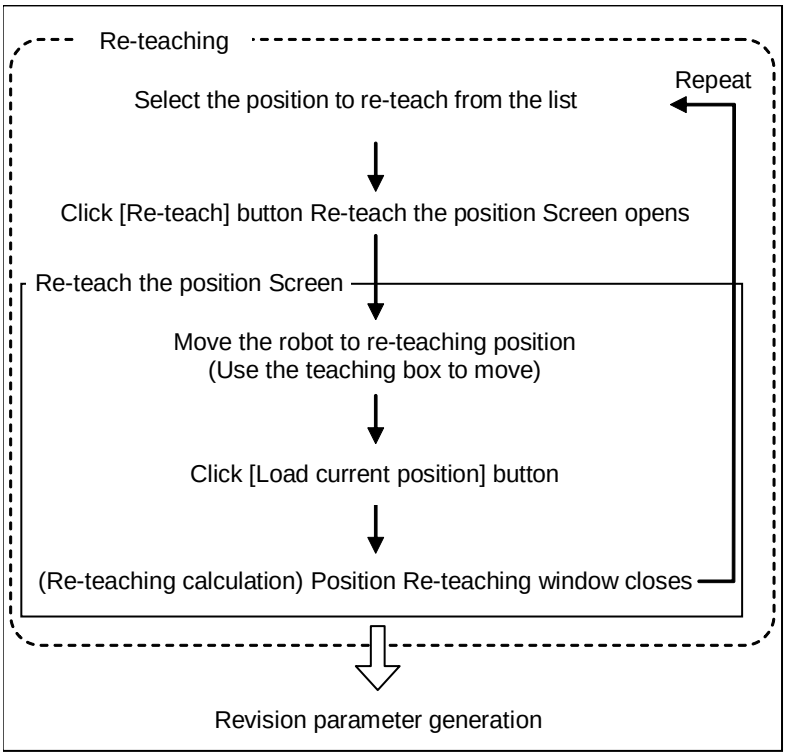


Figure 15-31 Re-teaching Work Procedure

The row of the 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, the position data of the applicable program in the controller is write-protected

Caution

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

Do not change tool data, tool number, or base data during re-teaching. Re-teaching calculation will not be performed correctly.
When correcting tool data, if teaching was performed switching back and forth between multiple tools, perform re-teaching operation for each tool.

Caution

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

Select position data with a different posture element, when re-teaching two or more positions.
When position data of the same posture element are selected, there is a possibility that the parameter is not correctly calculated.

Caution

Cautions on 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 **"Revision parameter selection"** window to change the setting. Note that if you go back one more step to the **"Tool Setting Check"** window, all information set by re-teaching work will be cleared.

Caution

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

15.4.13. Writing parameters

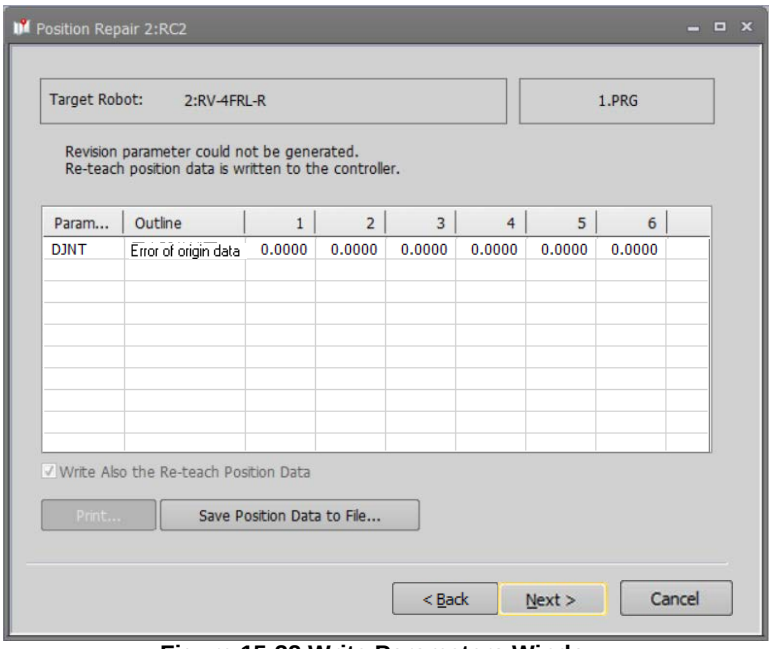


Figure 15-32 Write Parameters Window

[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. The position data will be the values converted by the revision parameters.

Revision parameters and their values generated by re-teaching are displayed.
Click the [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 will not be displayed in the list.
If you click the [Next] button, the position data used in re-teaching is written into the robot controller.
Since parameters were not generated, the 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.
Delete the re-teaching information for position data that meets one of the criteria mentioned above and perform re-teaching again.

15.4.14. Controller power supply Off, On

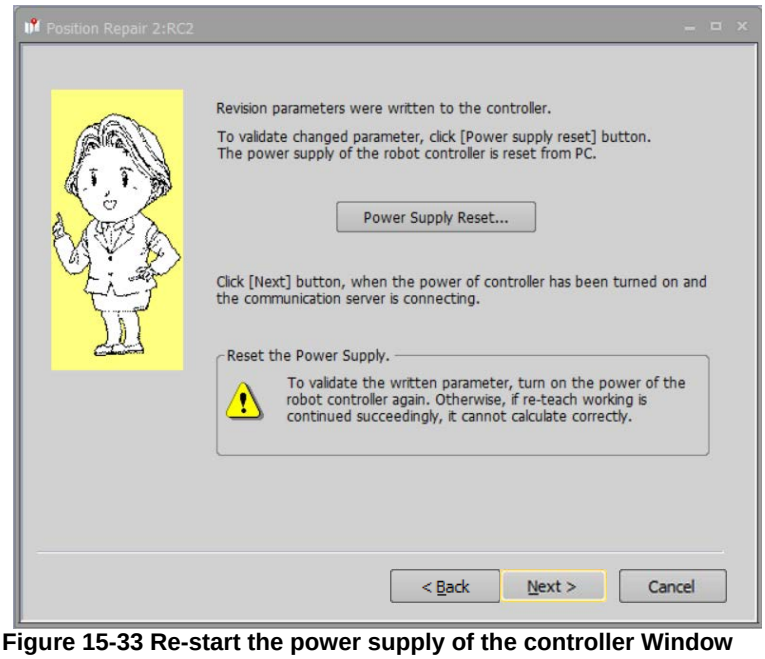


Figure 15-33 Re-start the power supply of the controller Window

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

15.4.15. Exit

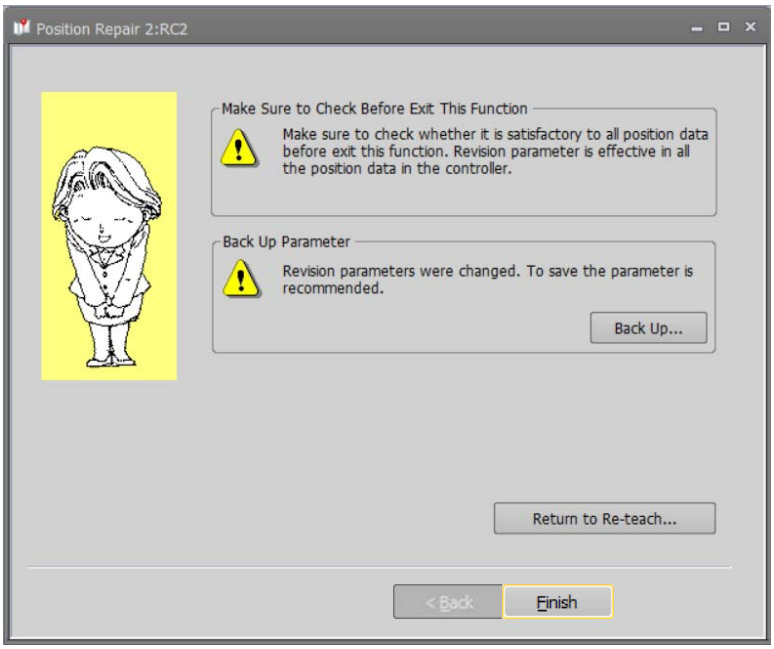


Figure 15-34 Finish Window (After Re-teaching)

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

Caution

Perform an operation check before exiting this function.

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

Caution

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

There may be cases near the border of the operation area, where position error may put a point outside the operation area, in which case this function cannot rectify the point.

15.4.16. Revision parameter editing

When you select "Edit the value of revision parameter directly" with **"15.4.7 Selection of Revision parameter generation procedure"**, this screen is displayed.

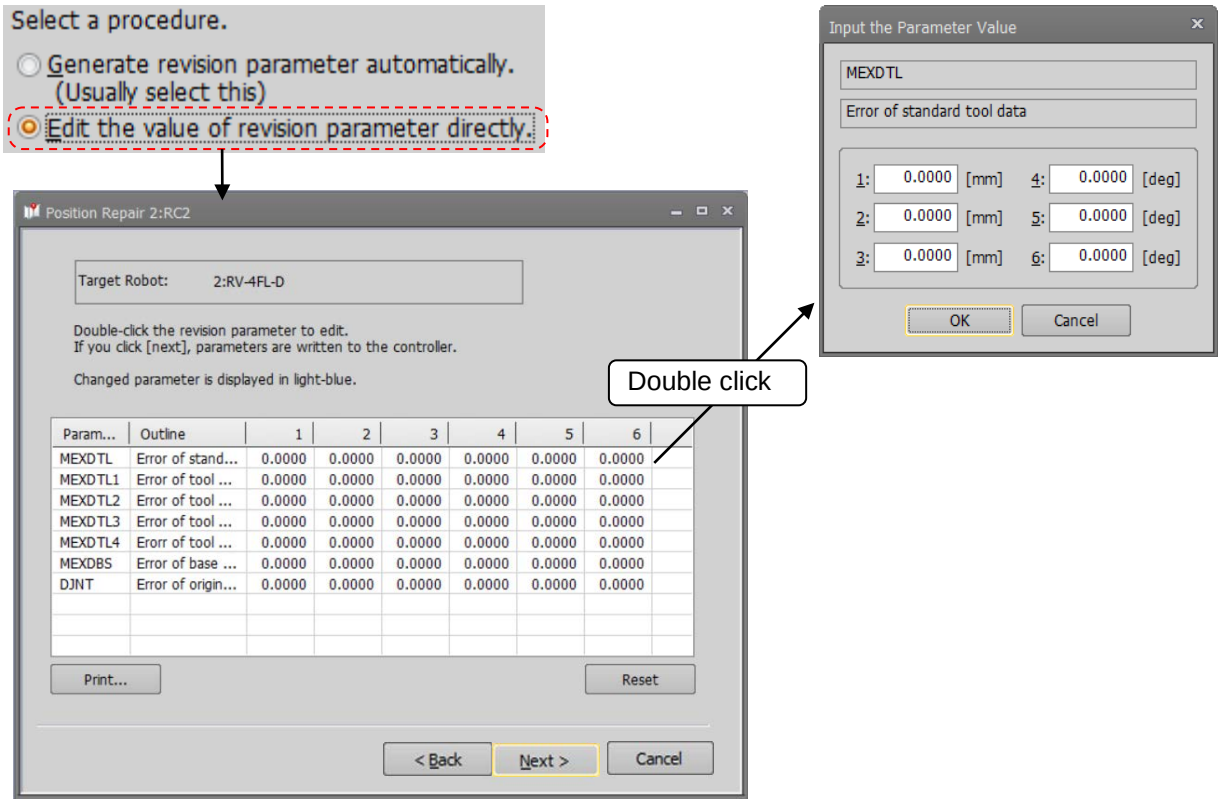


Figure 15-35 Edit Revision Parameters Window

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

This displays values of current revision parameters in the robot controller.
Select a parameter from the list and double-click it to display the setting screen. Set the parameter values.
(If the CRn-500 series robot controller 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 the **"Re-start the Power Supply of the Controller"** window.

15.5. Robot controller security function (Password Setup)

It is possible to forbid access to the robot programs, parameters, and files in the robot controller.
The security function can be achieved by setting a password in the robot controller. The robot controller software versions where this can be used are as follows.

Table 15-12 Compliant version of this function and controller

Robot Controller	Software version
CR800-D/CR800-R/CR800-Q	All versions
CR750-D/CRnD-700 series	Ver.S3 or later
CR750-Q/CRnQ-700 series	Ver.R3 or later
CRn-500 series	Unavailable

The functions where a password can be set are as follows. It is possible to individually set and release passwords for access to programs, parameters, and files. The factory default setting of "Password Setup" is “off”.

Table 15-13 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.	
	・ Initialization of robot programs.	
	・ File Manager	It is not possible to delete 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 backup data.	
	・ Restoring the program information	
File	・ Backup	
	・ Restore	
	・ Position repair function	

Perform registration, change, and the deletion of the password while connected to the robot controller. From the project tree double-click the target project [Online] -> [Maintenance] -> [Password Setup].

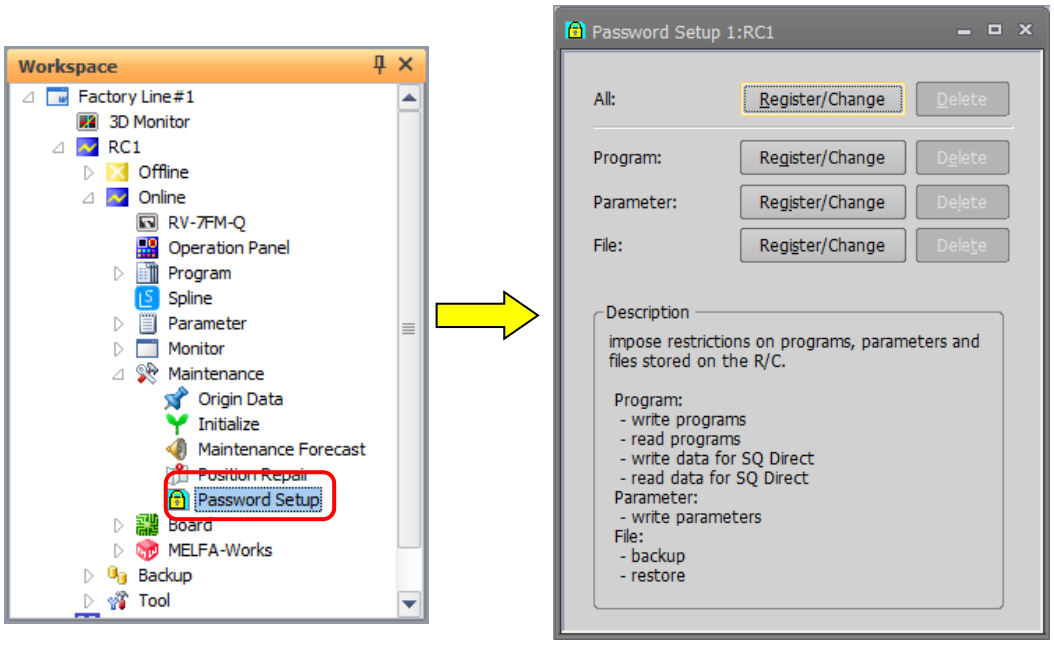


Figure 15-36 Password setup

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)

15.5.1. Register Password

The password is registered to the robot controller.
Click the "Register/Change" button of the item to which a password is to be registered in the "Password Setup" screen. After inputting the password in the "Register/Change Password" screen, click the [OK] button. The input password is displayed with "*" or "●".

Please input a password of 8 characters or more, and 32 characters or less. The characters that can be used are as follows

Table 15-14 Character that can be used by password

Characters that can be used by passwords (8 characters or more, and 32 characters or less)	
Numbers (from 0 to 9) Letters (from A to Z, and from a to z)	(Note) Upper case and lower case letters are differentiated.

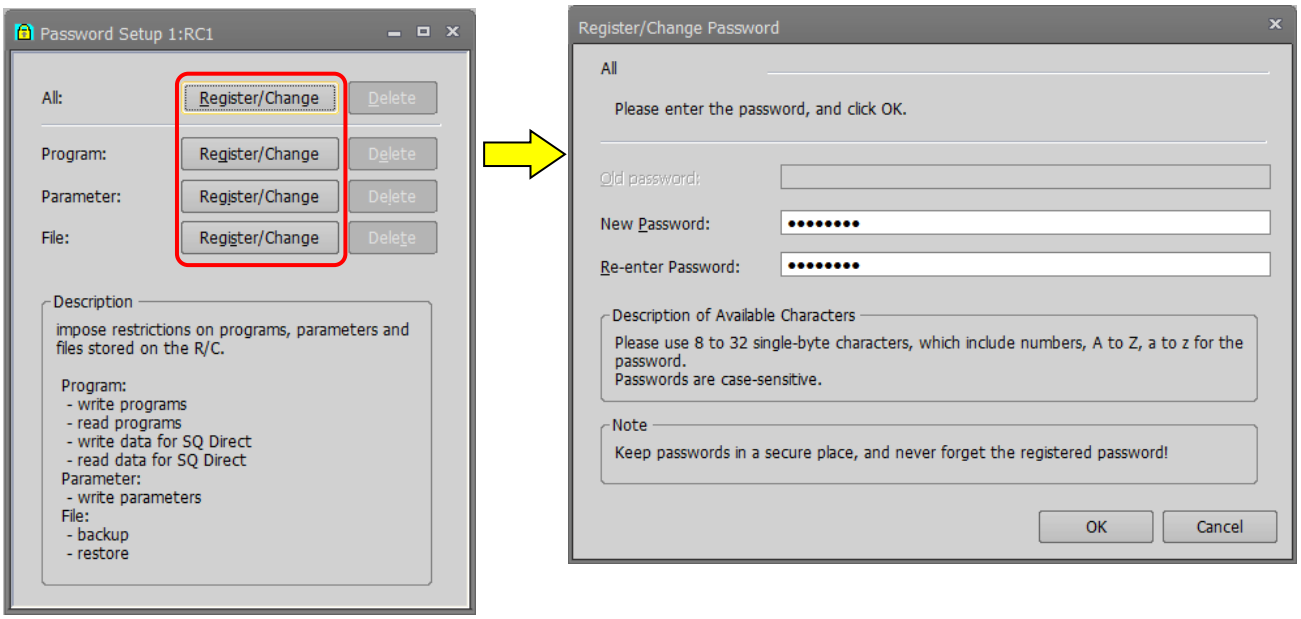


Figure 15-37 Register Password

Caution

Pay full attention to password management

It will be impossible to release the security function of the robot controller if the password is forgotten. Pay sufficient attention to password management.

15.5.2. Change Password

This changes the password set in the controller.
Click the "Register/Change" button of the item in which the password is to be changed in the "Password Setup" screen. Input the currently-set password set and the new password in the "Register/Change Password" screen, and click the [OK] button.

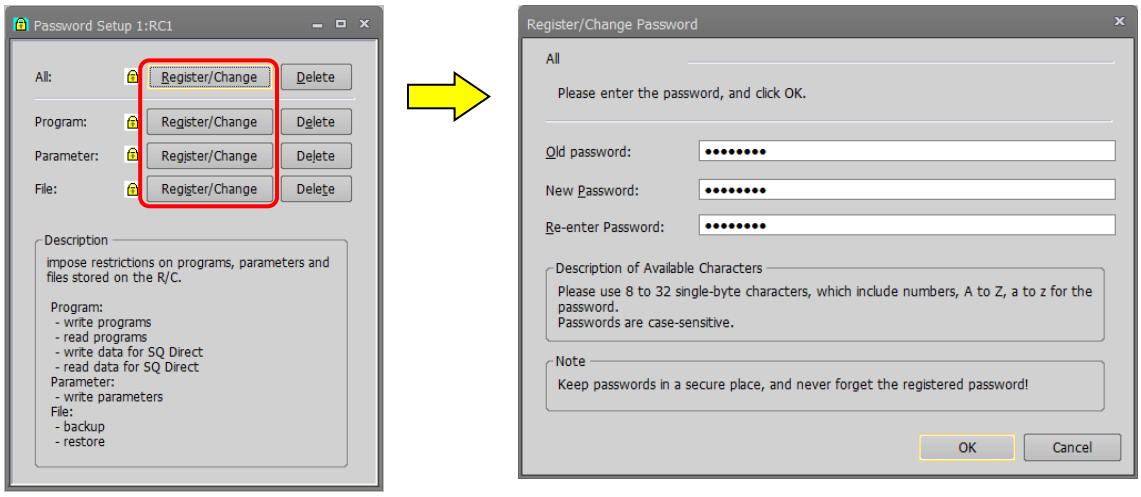


Figure 15-38 Change Password

When the password is changed with the "All" button, it is necessary to register the same password to all items.

15.5.3. Delete Password

This deletes the password set in the controller.
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.

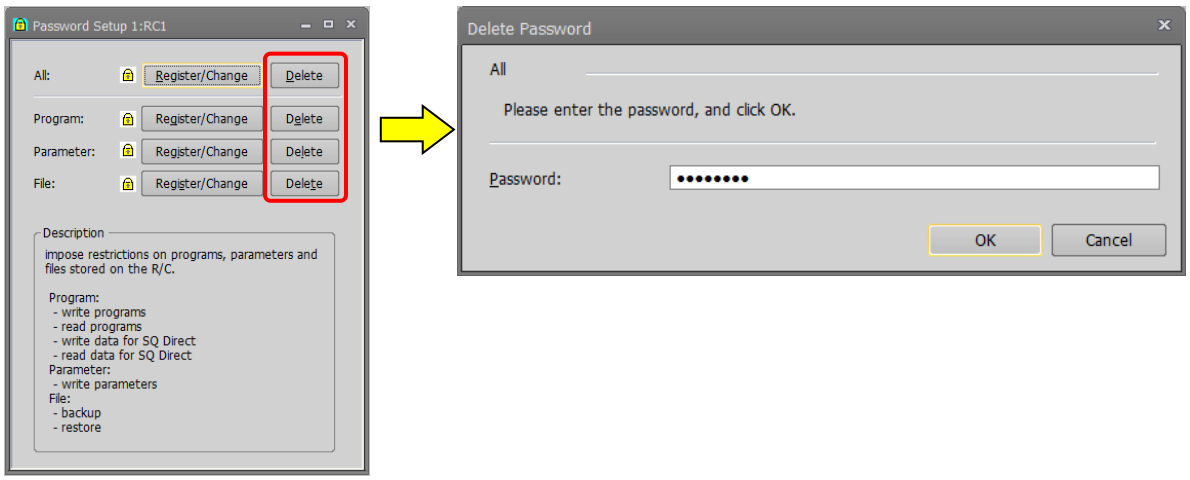


Figure 15-39 Delete Password

When a password is deleted by the "All" button, it is necessary to register the same password to all items.

16. Option Cards

You can check information on option cards mounted on 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. When the "Properties" window is displayed, the information is displayed in the "Properties" window also.
If no option card is mounted on the robot controller, nothing is displayed.

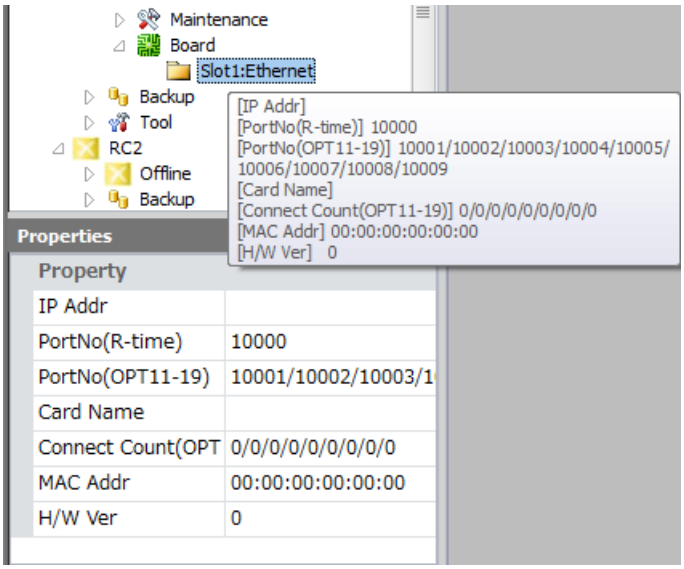


Figure 16-1 Option Card Information

17. 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

Do not pull out the cable during communication.

Never pull out the cable during communication with the robot controller. If the communication cable is removed during communication, the status of the robot controller or the personal computer may be affected. Please remove the cable when the status is not “Online” or this software exited.

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

In the RT ToolBox 3, you can back up the content that set in offline and you can restore the backup data to the offline project.
For details, refer to the “**17.3 Offline backup (Offline project -> PC)**” and “**17.4 Offline restore (PC -> Offline project)**”.

Offline backup (Offline project -> Personal computer)	Save the contents that set in offline as backup data to the personal computer.
Offline restore (Personal computer -> Offline project)	Rewrite the offline project with the backup data saved on the personal computer.

⚠ Caution

When a password is registered in “file” by the robot controller 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 a password is registered in “file" by robot controller 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	Parameter	File
Backup	All files	○	○	×
	Programs	○	○	×
	Parameter files	○	○	×
	System programs	○	○	×
Restore	All files	○	○	×
	Programs	○	○	×
	Parameter files	○	○	×
	System programs	○	○	×

Delete the password of the robot controller security function when performing backup and restore. Refer to "13.7.3 Delete the Password" for how to delete the password.

For details on setting security functions (registering passwords) and releasing security functions (deleting passwords) on robot controllers, refer to **"Table 15-12 Compliant version of this function and controller"**.

17.1. Backup(Robot -> PC)

You can save information in a robot controller to a file in the computer.
Use the backup function while RT ToolBox3 is 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.

Caution

Cautions on 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 aware that if you delete or rewrite these files, this may make it impossible to restore them to the robot controller.

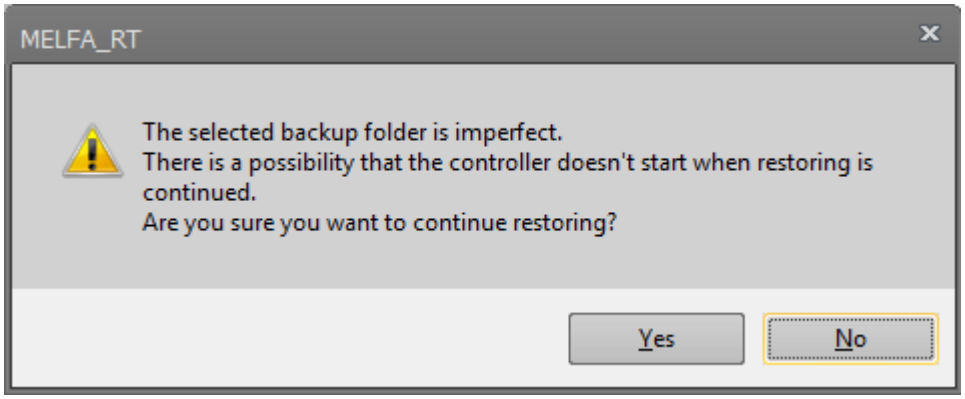
Although backup data is intended for backing up information on the robot controller, backed up programs can be opened for editing of programs. Refer to **"11.2.4 Editing a program in the backup data"** in this manual for details.

Caution

Cautions on when backup is interrupted

Backup again when a communication fault occurs during backup or when the backup is interrupted by 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 incomplete. There is a possibility that the controller won’t start if restore is performed. When you select a designated “[NG]” when restoring, the following warning dialog will be displayed. Select “No” in most cases.



17.1.1. Saving data from one robot controller

(1) From the project tree, open the target project [Backup]. In the backup tree, "All", "Program", "Parameter", and "System program" are displayed.

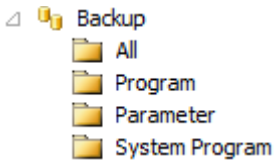


Figure 17-1 Backup Project Tree Diagram

All	Saves all files (robot programs, parameter files, etc.) in the robot controller into the designated folder. Performs batch backup during the backup and restore for the same robot.
Program	Saves the robot program file into the designated folder. It will back up only the robot program file. This is useful when you want to restore only the robot programs to another robot.
Parameter	Saves the parameter files into the designated folder. It will back up only the parameter file. This is useful when you want to restore only the parameters to another robot.
System Program	Saves the system base program file into the designated folder. The system based program files are included, such as program external variables. Use this when you want to back up only the program external variables.

(2) Double click the items to backup.

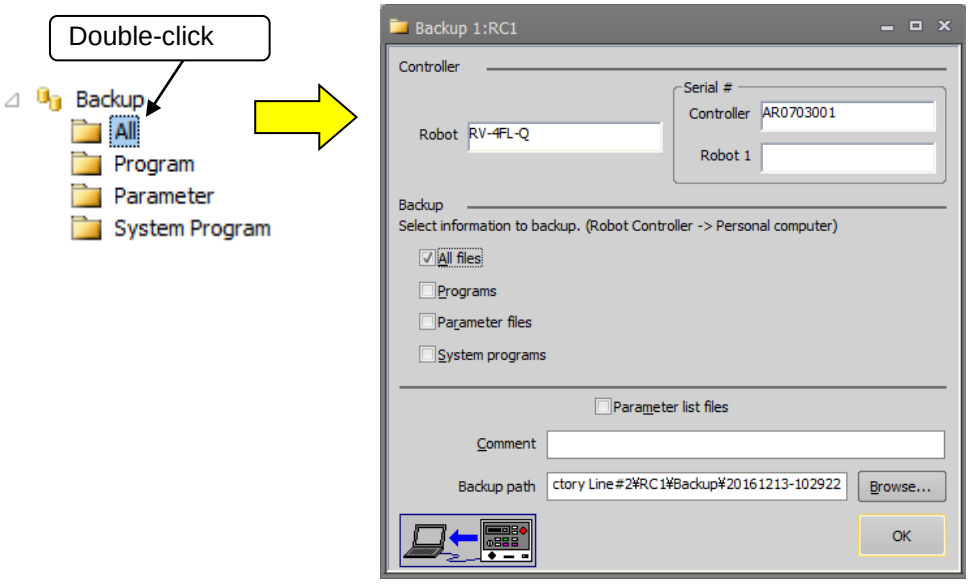


Figure 17-2 Backup (When Batch Is Selected)

The backup screen opens, and the check box of the selected backup will be ON.
With the subject check box ON, you can change the backup method.

[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 where the workspace was created/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 also back up other items at the same time by putting checkmarks in their checkboxes. In this case, the data is backed up to the selected backup destination, with the identifier added to the folder name according to the backup type. 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.

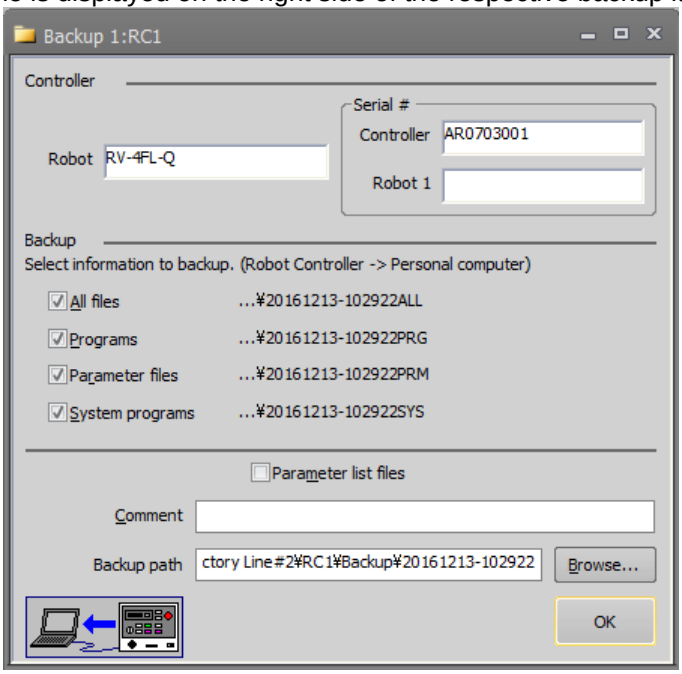


Figure 17-3 Backup (When Multiple Selected)

(4) Specify the back destination, then click the [OK] button. The confirmation screen is displayed. Confirm, then click [Yes], to start backup.

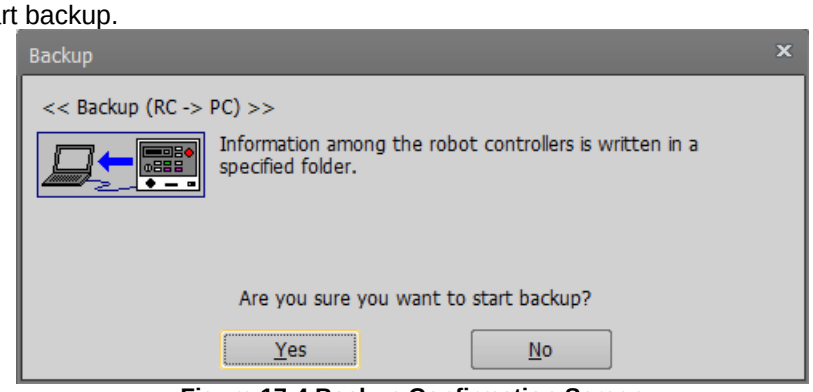


Figure 17-4 Backup Confirmation Screen

When backup is completed, the backup data is displayed under [Backup] in the project tree.

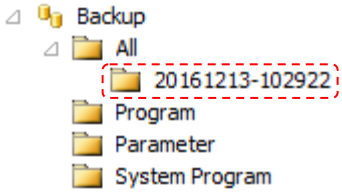


Figure 17-5 Display of Backup Information

17.1.2. 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 ToolBox3.

(1) Select the name of workspace and click the right mouse button. Or, select the "Backup" of the project that is online and click the right mouse button. Select "Online project backup" in the right mouse button menu. The backup item selection screen is displayed.

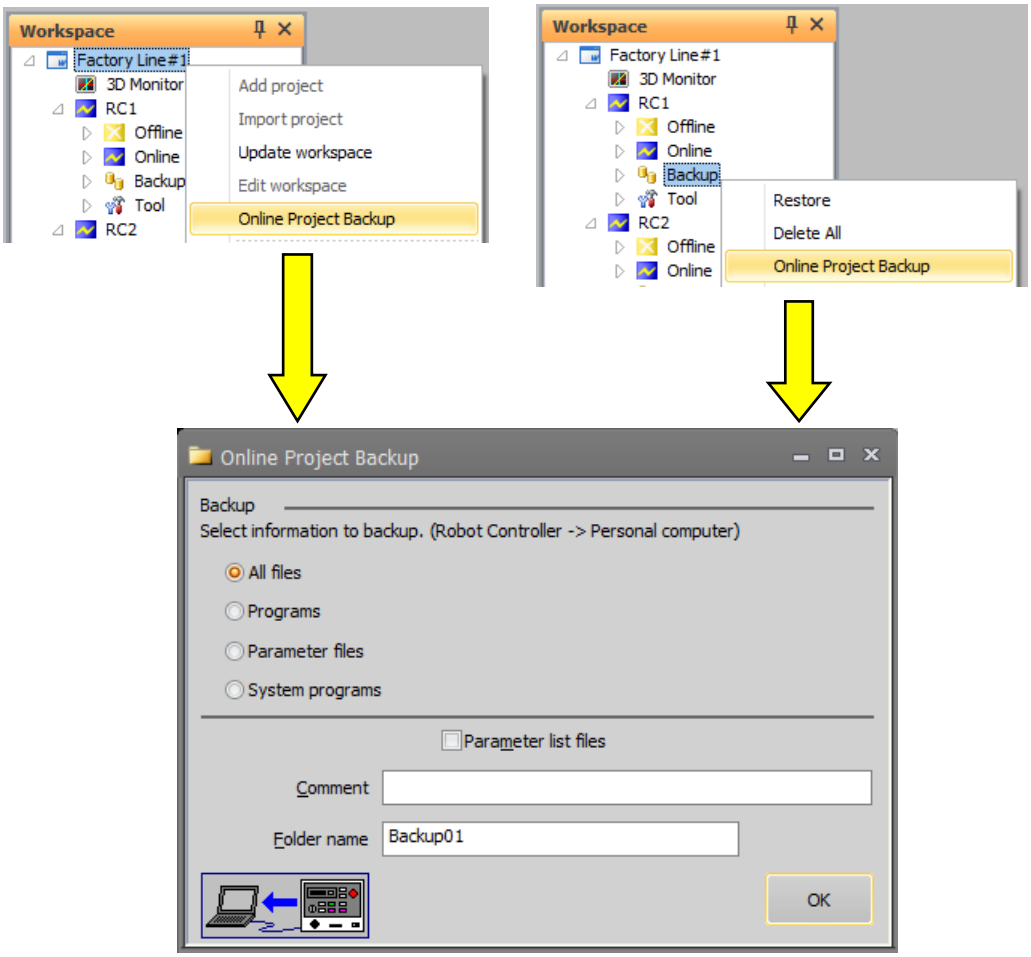


Figure 17-6 Online Project Backup

(2) Select the backup item in the "Backup" group. Input the backup destination folder name in "Folder Name", and click the [OK] button.
The input folder name is added to "Backup" of each project.

The backup confirmation screen is displayed. After confirming, click the [Yes] button. The backup will then begin.

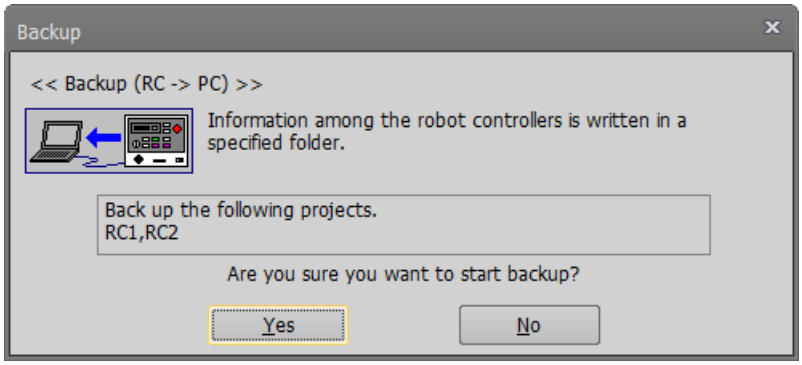


Figure 17-7 Confirmation screen of "online project backup"

(3) When the batch processing for saving data from all robot controllers is completed, the saved data is displayed under [Backup] in the project tree.

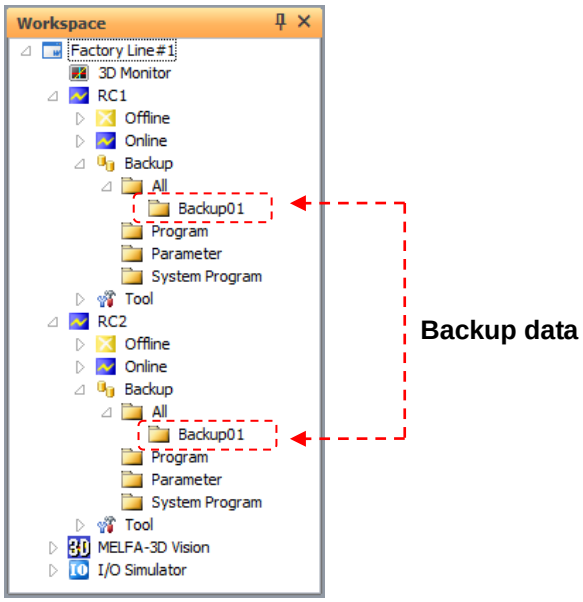


Figure 17-8 The information of saving data from all robot controllers by batch processing.

17.2. Restore (PC -> Robot)

You can transfer the backup information on the computer to the robot controller.
Use the restore function while connected to the robot controller.

⚠ Caution

Caution on individual restoration of individually backed up by selecting "All"

It is possible to restore each item (Program, Parameter files and System program) of the data backed up by selecting "All files".
At this time, the data files of the specified item are transferred to the robot controller, without clearing (initializing) all the information in the robot controller.

(1) From the project tree, open the target project [Backup]. In the backup tree, the information backups for "All ", "Program", "Parameter", and "System program", respectively, is displayed.

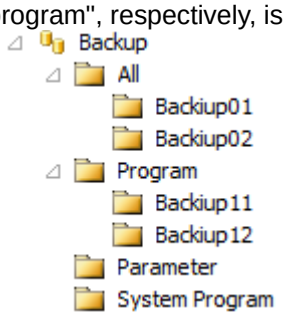


Figure 17-9 Backup Project Tree Diagram

(2) Select the information listed on the controller, then click the right mouse button. From the right mouse button menu, select [Restore].

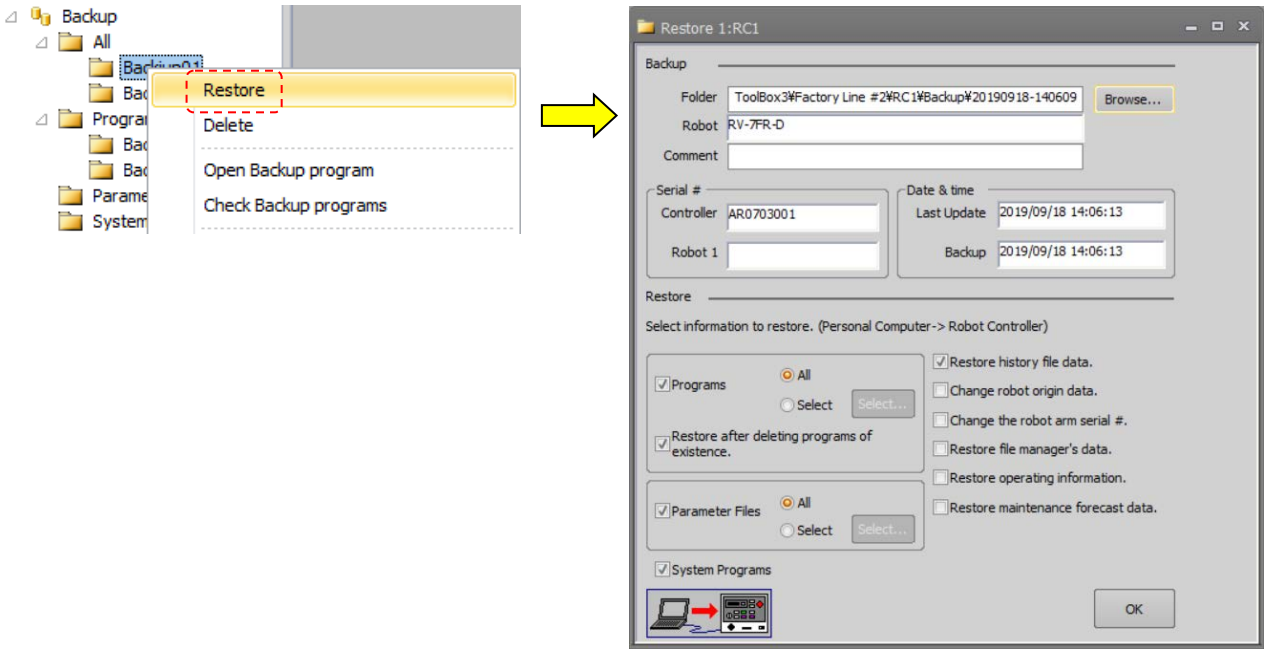


Figure 17-10 Restore

Program	:	When [All] is designated, all of the robot program files in the folder will be sent to the robot controller. When [Select] is designated, the specified robot program files in the folder will be sent to the robot controller. To specify which files to send, click the [Select...] button and specify the files in the screen that is displayed.
Restore after deleting programs of existence.	:	All robot programs in the robot controller are deleted, and then the restore is performed.
Parameter	:	When [All] is designated, all of the parameter files in the folder will be sent to the robot controller. When [Select] is designated, the parameters designated from among parameters in the folder will be sent to the robot controller. To specify which parameters to send, click the [Select...] button and specify the parameters in the screen (described later) t is displayed.
System Program	:	System base program files in the designated folder will be sent to the robot controller.
(All Files)	:	If batch backup information is restored with all programs, parameters, and system programs selected, all of the files (excluding BKUP.SYS and MECHA.SYS) in the designated folder will be sent to the robot controller.
Restore history file data		Restore the robot controller history file data. Only valid when the programs, parameter files, and system programs are all selected.
Change Robot Origin Data	:	This is valid only when parameter information is selected in the backup information. Operations for when this checkbox is checked and when it is not are as in **"Table 17-1 Operations for "Change Robot Arm Serial Number Too""**.
Change Robot Arm Serial Number	:	The robot arm serial number also is rewritten.
Restore the file manager's data	:	Files targeted by the file manager function (refer to **18.4**) also are rewritten.
Restore Operating Information	:	The operating information (power ON time, operating time, servo ON time, battery remaining time) of the robot controller is rewritten.
Restore maintenance forecast data.	:	Information relating to maintenance forecasts also is rewritten. (same information as the information restored at "**15.3.7 Others**")

By click the [Select...] button, the screen for selecting parameters for restore is displayed. Only select the parameters you want to transfer to robot controller and click the [OK] button.

By unselect the parameters related the kind of robot model, the backup data can be used to different kind of robot.

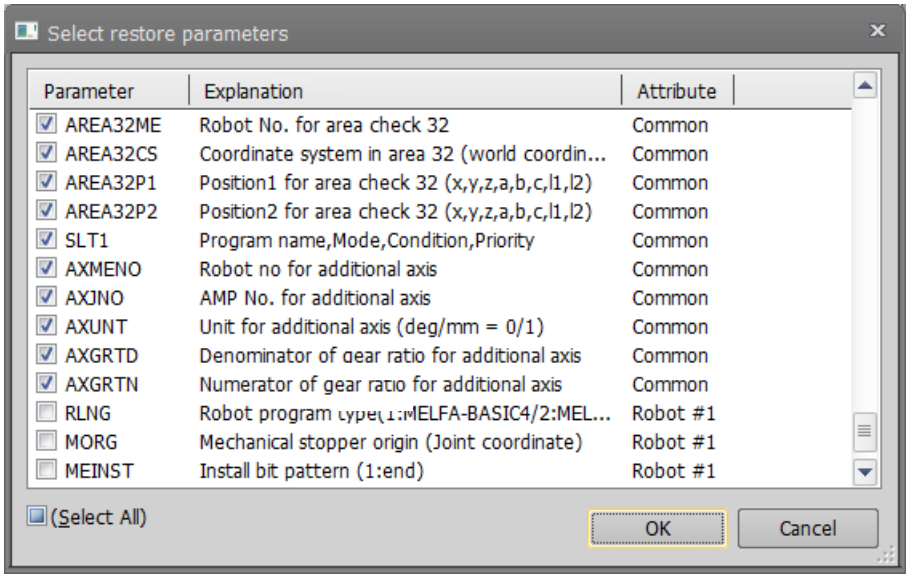
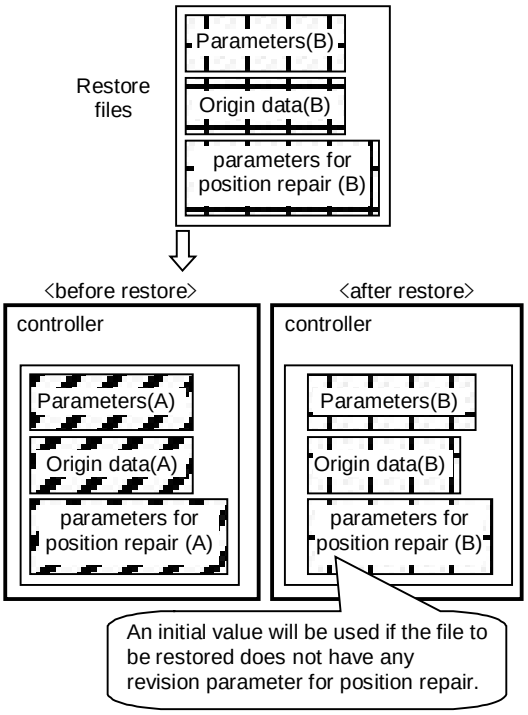
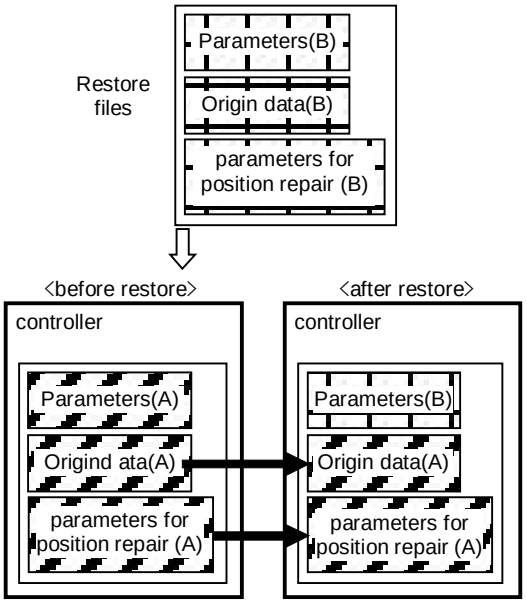
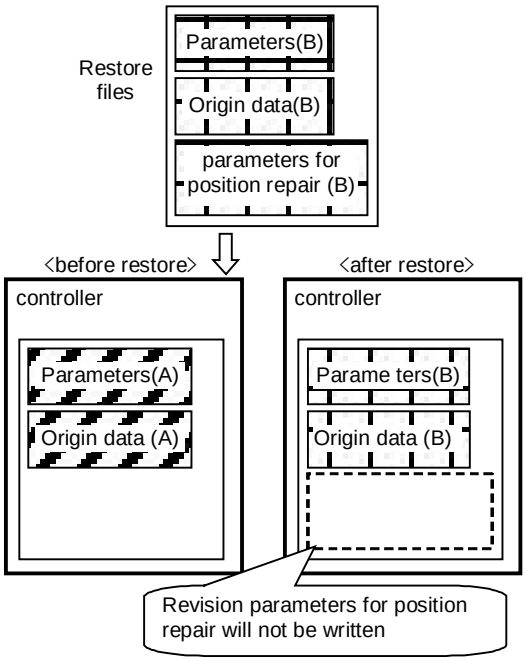
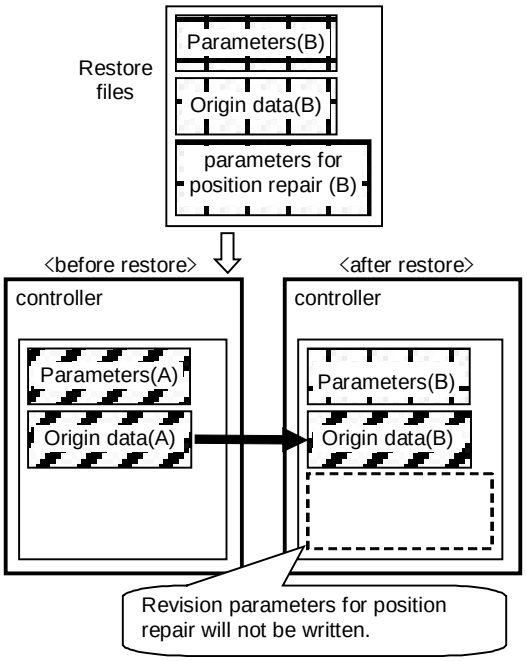


Figure 17-11 Backup Project Tree Diagram

Table 17-1 Operations for "Change Robot Arm Serial Number Too"

Controller	Check ON ☑ Change robot origin data.	Check OFF ☐ Change robot origin data.
CR800/ 750/ 700 series or CRn-500 series J2 edition or later	 Transfers the backed-up file as is. The origin data is overwritten.	 A backed-up file is transferred. However, for the origin data and the parameters for recovering positions, the information inside the controller is retained.
CRn-500 series H7 edition or earlier	 Transfers a backed-up file as is. The origin data is overwritten.	 A backed-up file is transferred. However, as for the origin data, the information inside the controller is retained.

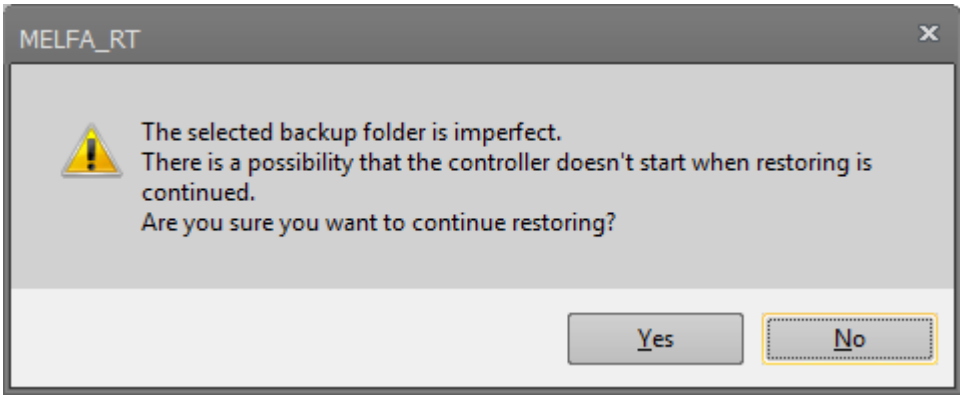
Be aware that if communication is cancelled during a series of restore processes, the position revision parameters generated with the "Position repair" function and the origin data may be changed.

Caution

Do not restore backup information with an “[NG]” on the folder name

Do not restore the backup information with an “[NG]” on the folder name because the backup information will be incomplete.

"[NG]" is added to the folder name when a communication fault occurs during backup or the backup is interrupted by clicking the “cancel” button. Do not restore this backup folder because the folder’s information is incomplete. The controller may not start if restoring is continued. When you select a folder with an “[NG]” is selected when restoring, the following warning dialog is displayed. Select “No” in most cases.



17.3. Offline backup (Offline project -> PC)

This function is save the offline setting/data as backup data to the personal computer. In this function, the kind of backup is fixed "All".
Use this function in the offline mode.

(1) In the project tree, select the [Offline] in the target project and right click, then the context menu will be displayed.
(2) Select the [Backup] in the context menu, then “New Backup folder” dialog will be displayed.
(3) In this dialog, specify the folder location and name for save the backup data, and click the [OK] button.
(4) After the backup is completed, the backup data is displayed in the [Backup] -> [All] in the project tree.

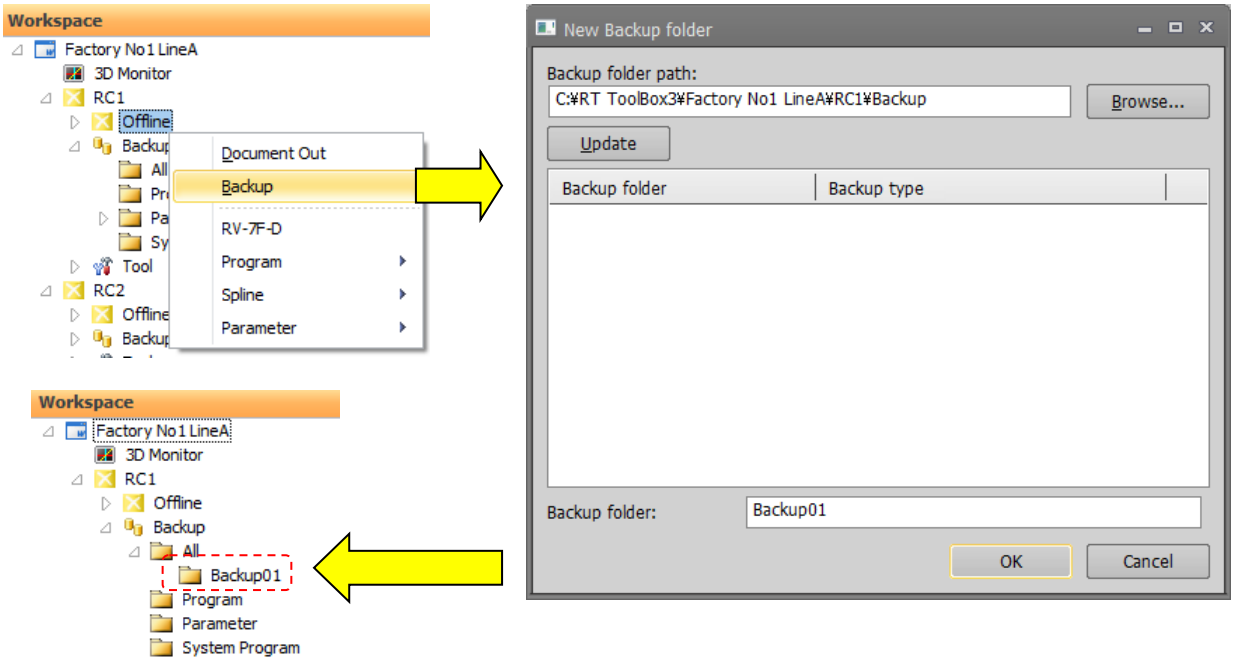


Figure 17-12 Offline backup

The backup data created by this function can be used not only for restore to the offline project described in "**17.4 Offline restore (PC -> Offline project)**" but also for restore to the robot controller described in "**17.2 Restore (PC -> Robot)**".
By restore the backup data to the robot controller, you can be reflected the contents of simulation setting to the robot controller.

17.4. Offline restore (PC -> Offline project)

You can rewrite the offline project with the backup data in the personal computer. For this restore function, only the backup data it kind is [All] and [Parameter] can be used.
Use this function in the offline mode.

(1) In the project tree, open the [Backup] in the target project and open the [All] or [Parameter].
(2) In there, right click the backup data for restore, then the context menu will be displayed.
(3) In this context menu, select the [Restore], then the message confirming restore to offline project will be displayed.
(4) By click [Yes] in this message, the offline project is rewritten with the backup data.

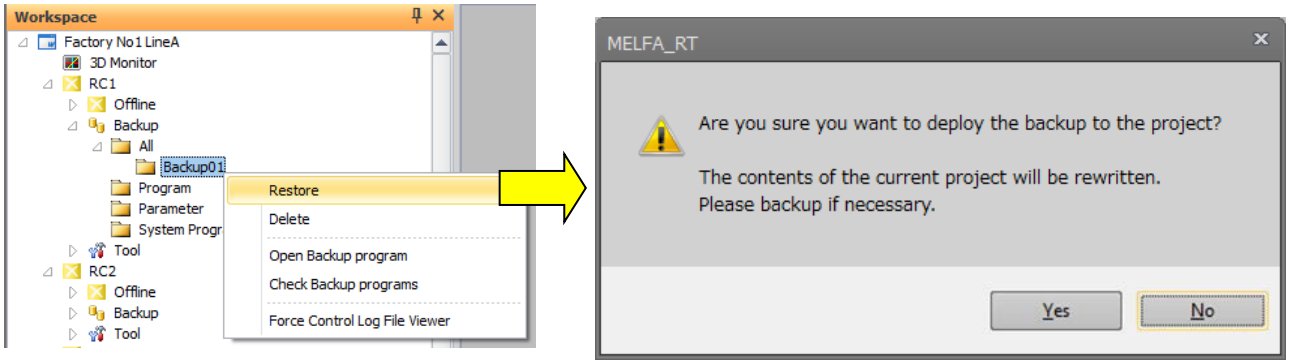


Figure 17-13 Offline restore

The backup data used in this function, not only the backup data described in "**17.3 Offline backup (Offline project -> PC)** " (back up from the offline) but also it described in "**17.1 Backup(Robot -> PC)**" (back up from the robot controller) can be used.
By restoring the backup data of the robot controller to the project, on the simulation you can check and edit the environment of the robot controller.

17.5. Property Display of Backup Data

By selecting the backup data displayed in the project tree, you can display the information of the backup data in the property.

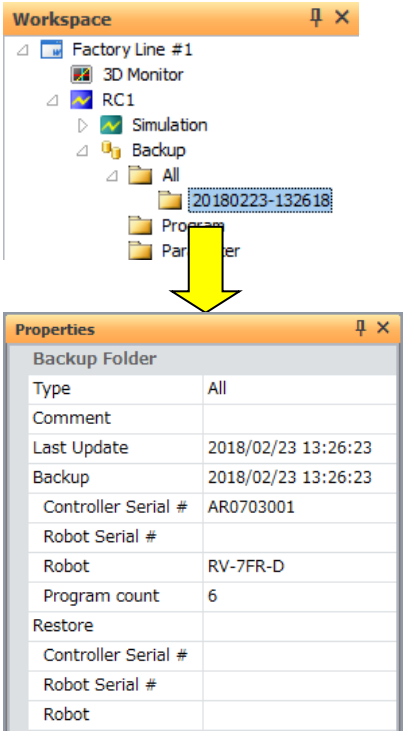
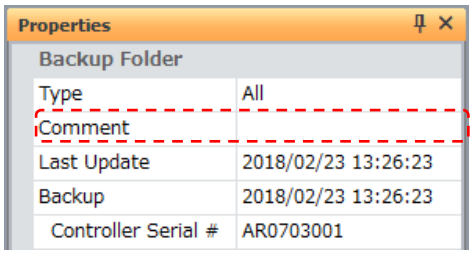


Figure 17-14 Property Display of Backup Data

By checking the contents of the [Comment] field of the property, you can check the backup data for either robot controller or offline project.

<For robot controller> Comments entered during backup (blank if no comment is entered)
<For offline projects> Project: (project name)

In the case of robot controller



For offline projects

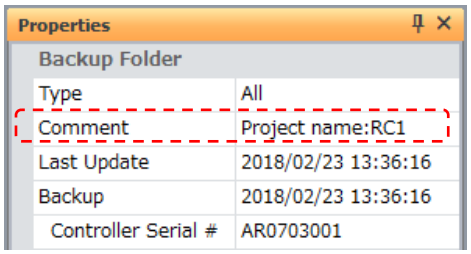


Figure 17-15 Confirmation of backup target

17.6. 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].

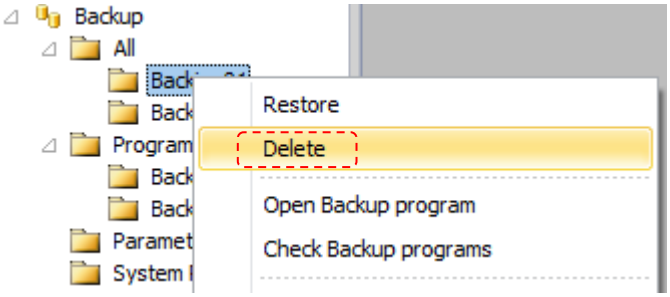


Figure 17-16 Deleting Backup Data

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".

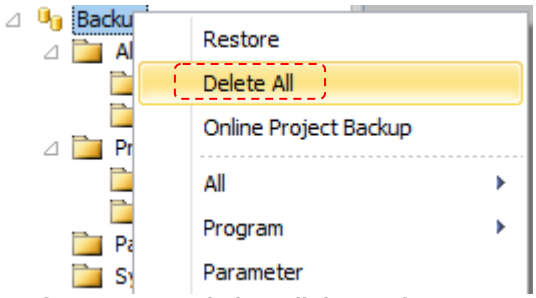


Figure 17-17 Deleting All the Backup Data

Caution

Be aware that once backup data is deleted, you can not restore it.

17.7. Open Backup program

Robot programs in backed up information can be opened and their content can be checked and edited.
For details, refer to **"11.2.4 Editing a program in the backup data"**.

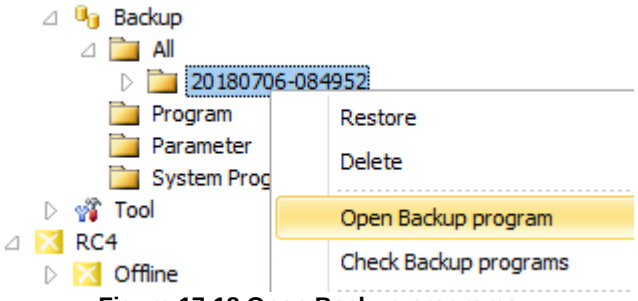


Figure 17-18 Open Backup programs

17.8. Check Backup programs

You can confirm that there are no errors in backed-up programs.
Select the backed-up information, and click the right mouse button. From the right mouse button menu, select [Check Backup programs]. You can use this function in “All”, “Program” and “System Program”.
If there is an error in the program the robot controller will not be able to execute the program. In this case, do the following:

1. Do NOT restore the backed-up information in which there is an error program.
2. After you restore the backed-up information, the error program from the controller.

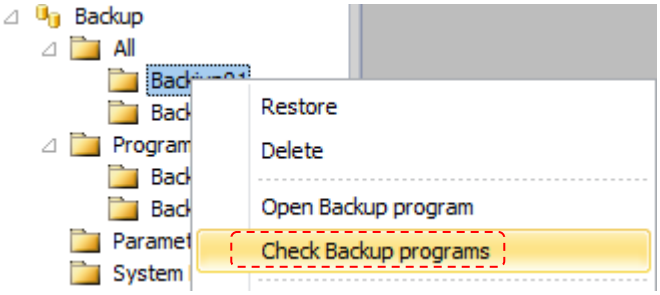


Figure 17-19 Check Backup programs

17.9. Open the event history from backup data

Click the right mouse button on the backup data and click "Event History" from the menu to open the event history of backup data. Display the event history up to the point when the backup was created.
This function is available only for "All" backup data of CR800 series robot controller. For details, refer to **"14.2.5Event Hisyory".**

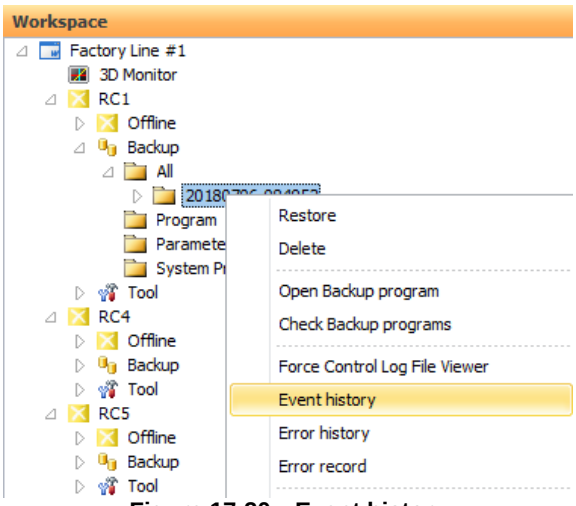


Figure 17-20 Event history

17.10. Open the error history form backup data

Click the right mouse button on the backup data and click "Error History" from the menu to open the error history of backup data. Display the error history up to the point when the backup was created.
This function is available only for "All" backup data of CR800 series robot controller. For details, refer to **"14.2.6Errors".**

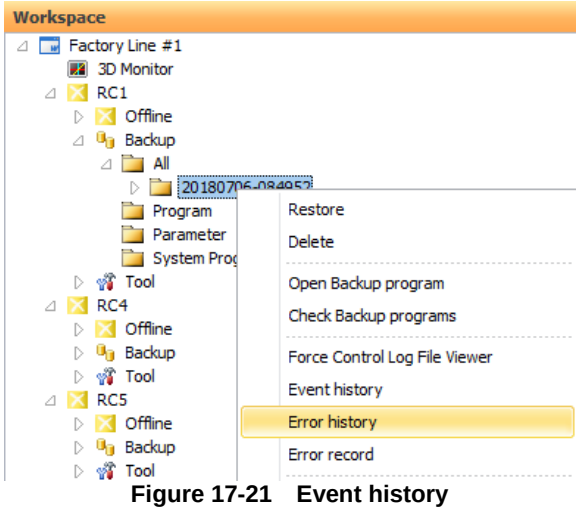


Figure 17-21 Event history

17.11. Open the error record form backup data

Click the right mouse button on the backup data and click "Error record" from the menu to open the error record of backup data. Display the error record up to the point when the backup was created.
This function is available only for "All" backup data of CR800 series robot controller. For details, refer to **"14.2.6.4Record information".**

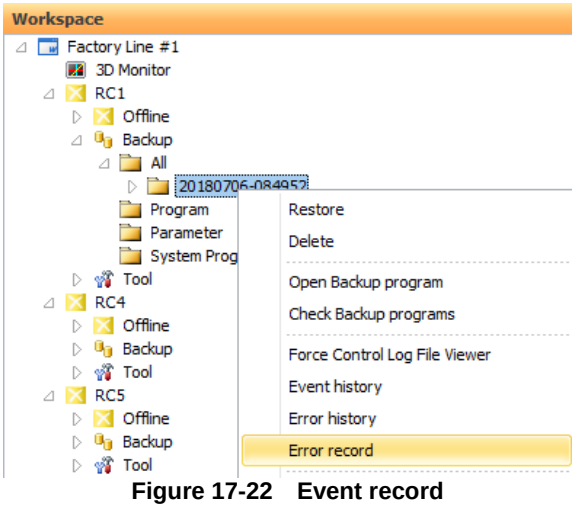


Figure 17-22 Event record

The software version of the controller that can use the error record function is as follows. Error record can not be displayed form all backup data acquired by controller other than the version below.

Controller	Software Version
CR800-D/CR800-R/CR800-Q	All
CR750-D/CRnD-700	Ver.S1j or later
CR750-Q/CRnQ-700	Ver.R1j or later

18. Tool functions

18.1. Oscillograph

The oscillograph function is explained.

⚠ Caution

With the oscillograph, the maximum number of screens that can be opened is limited to eight since this increases the load on the PC. Keep in mind that memory may be insufficient if many screens which need memory such as program editors and parameter editors are opened.

18.1.1. Outline

The oscillograph can display a graphical representation of a robot's various internal data.
The data acquired from the robot can be saved in a CSV file. Prolonged data recording is possible by specifying a storage interval. A program name, an execution row number, and an input-and-output signal are also simultaneously recordable in a CSV file.

18.1.2. Communication method

The communication methods which acquire various internal data from a robot include the following two systems are among.

18.1.2.1. Ordinary communication

This is a communication method which uses a communication server.
Therefore, it can be used in an environment where connection to a communication server is possible.
The characteristics of ordinary communications are shown below.

Table 18-1 Ordinary communication

Item	Explanation
Maximum number of data held	30,000 (About 50-minutes can be obtained at a data acquisition interval of 100msec.)
Acquirable data types	Fixed (See **18.1.3 Acquirable data**)
Data acquisition interval	50, 100, 200, 500, 1000, 2000, 5000, 10000, 30000msec

18.1.2.2. High speed communication

High-speed communication can use a real-time monitor function to acquire data at intervals of 3.5 msec or 7.1 msec. The real time monitor function cannot be used unless the environment allows the robot controller to **connect with a personal computer by Ethernet**.
If you cannot get data from a robot controller, see “Communications (Ethernet)” (4) in **“27.1 Q&A”**.
The feature is explained.

Table 18-2 High speed communication

item	explanation
Maximum recording data	80,000 (About 9-minute acquisition possible)
Acquirable data types	Maximum of 4 data selection (See **18.1.3 Acquirable data**) 32 points of a continuous signal (IN/OUT) can be acquired
Data acquisition interval	CR800 series : Maximum of 3.5 msec CR750/700 series : Maximum of 7.1 msec
Robot software version	CR800 series : All versions CR750/700 series : S4b, R4b or later

At the simulator start up, only the first project can use the real-time function.

⚠ Caution

When high-speed communication is used on the high-load PC、there is a possibility that Part of the monitor data will lose.
If the loss frequently occurs, please use normal-speed communication.

18.1.3. Acquirable data

The list of the data that can be acquired from the robot is shown below.

Table 18-3 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 previous 2 seconds.	-	○
Max current cmd1	[Arms]	The maximum value of the current command after robot controller 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 in encoder pulse value.	○	○
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	[N Nm]	The input value from a force sensor.	○	-
Force sensor(+resultants)	[N Nm]	The input value from a force sensor (The resultant force and resultant moment values exist).	○	-
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.	○	-
Ref. value of COL level	[%]	Show the gap between the estimated torque and actual torque by COL level (The values of COLLVL command, COLLVL and COLLVLJG parameters). The value is shown if COL is enabled and servo ON.	○	-
Error of presumed torque	[% rating]	The absolute value of the error between the estimated torque and actual torque of each axis. You can get this value only if the torque monitoring function of safety option is enabled.	○	-

Ex-T coordinates speed		[mm/s]	Speed of the Ex-T coordinates during execution of the Ex-T control/the Ex-T spline interpolation	○	-
Ex-T coordinates position		[mm deg]	The current position in the Ex-T coordinates	○	-
Spline path point of adjusted speed		-	The path point number that speed adjustment has occurred during execution of the spline interpolation/the Ex-T spline interpolation	○	-
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	○	○
Safety input		-	It turns ON when either safety input signal A or safety input signal B is OFF.	○	-
Safety input signal A		-	Input signals 128 to 135	○	-
Safety input signal B		-	Input signals 160 to 167	○	-
INPUT		-	Consecutive input signal for 32 points	○	-
OUTPUT		-	Consecutive output signal for 32 points	○	-
Predictive maintenance score (speed reducer abnormality)		-	Current abnormality score of reducer (wave gear device)	○	-
Predictive maintenance score (encoder data error)		-	Current abnormality score of encoder data	○	-
Predictive maintenance score (encoder communication error)		-	Current abnormality score of encoder communication	○	-

※High :High speed communication Ord :Ordinary communication

18.1.4. Starting

From the project tree, double-click [Tool] -> [Oscillograph]

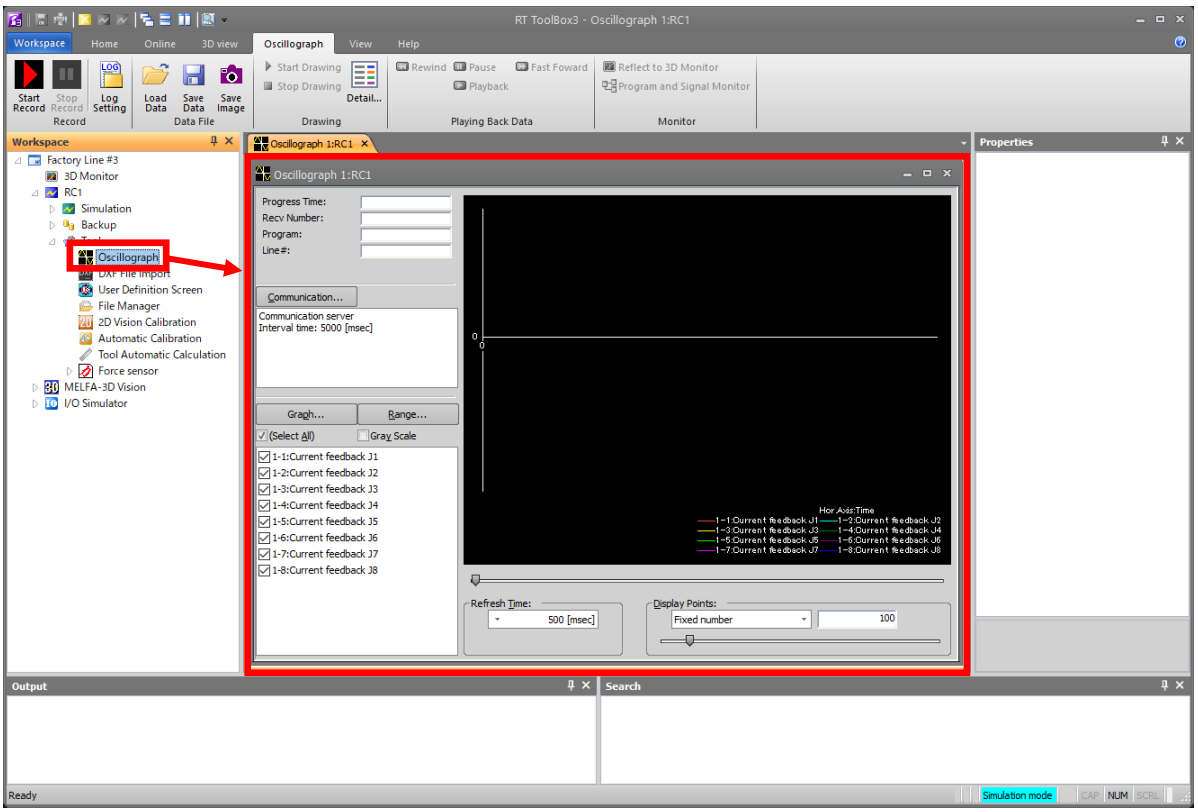


Figure 18-1 Starting the Oscillograph

18.1.5. Communication settings

Display the Communication setting dialog by clicking the [Communication…] button.
Ordinary communication can be used as choosing the [Communication server].
High speed communication can be used by choosing the [Real time monitor].

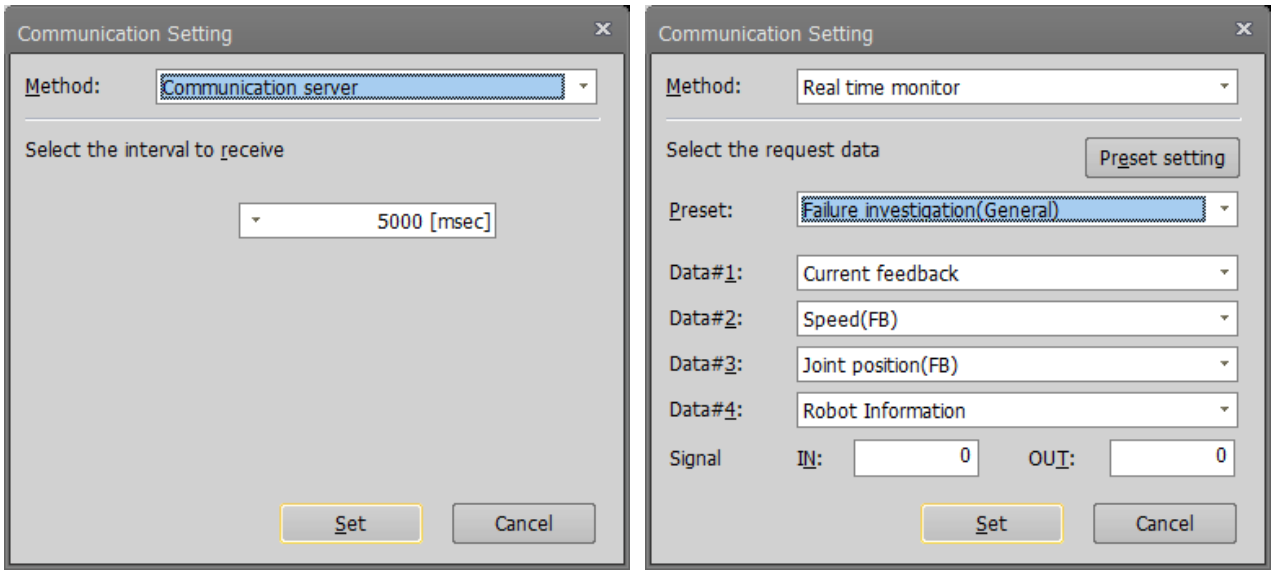


Figure 18-2 Communication setting dialog

Select the data reception interval in ordinary communication via the communication server.
In High speed communication which uses the real time monitor function, indicate the data acquisition type up to a maximum of 4, and the start numbers for the input signal/output signal, common preset data combinations are as follows.

Table 18-4 Real time monitor: Preset Data

Name	Data	usefulness
Force sense setting	Force sensor(+resultants)	Guess the optimum posture and motion while watching the value of the force sensor.
	Force pos CMD(XYZ)	
	XYZ position(FB)	
	Robot information	
Collision detection setting	COL torque	Adjust the optimum value of collision detection.
	COL threshold +	
	COL threshold -	
	Ref.value of COL level	
Collision detection error investigation	Speed(FB)	Investigate the cause of abnormality detection of collision detection.
	Current feedback	
	Ref.value of COL level	
	Robot information	
Failure investigation(General)	Current feedback	Investigate the cause of failure when the error occurred. (for general survey)
	Speed(FB)	
	Joint position(FB)	
	Robot information	
Failure investigation(Overload error)	Speed(FB)	Investigate the cause of failure in the event of an overload error.
	Current feedback	
	Axis load level	
	Robot information	
Failure investigation(Power supply voltage)	Speed(FB)	Investigate the cause of the failure in the event of a power supply voltage related error.
	Current feedback	
	Voltage	
	Regeneration level	
Predictive maintenance	Predictive maintenance score (reduction gear)	Early detection of abnormalities and deterioration of robot components. * Only available when the predictive maintenance function of MELFA Smart Plus is enabled.
	Predictive maintenance score (ENC data)	
	Predictive maintenance score (ENC communication)	
	-	

It is also possible to set the data combination and signal number that customers often use as a preset (up to 8). The preset is displayed in the format of "Digital: Preset Name" in the preset of the communication settings dialog box.

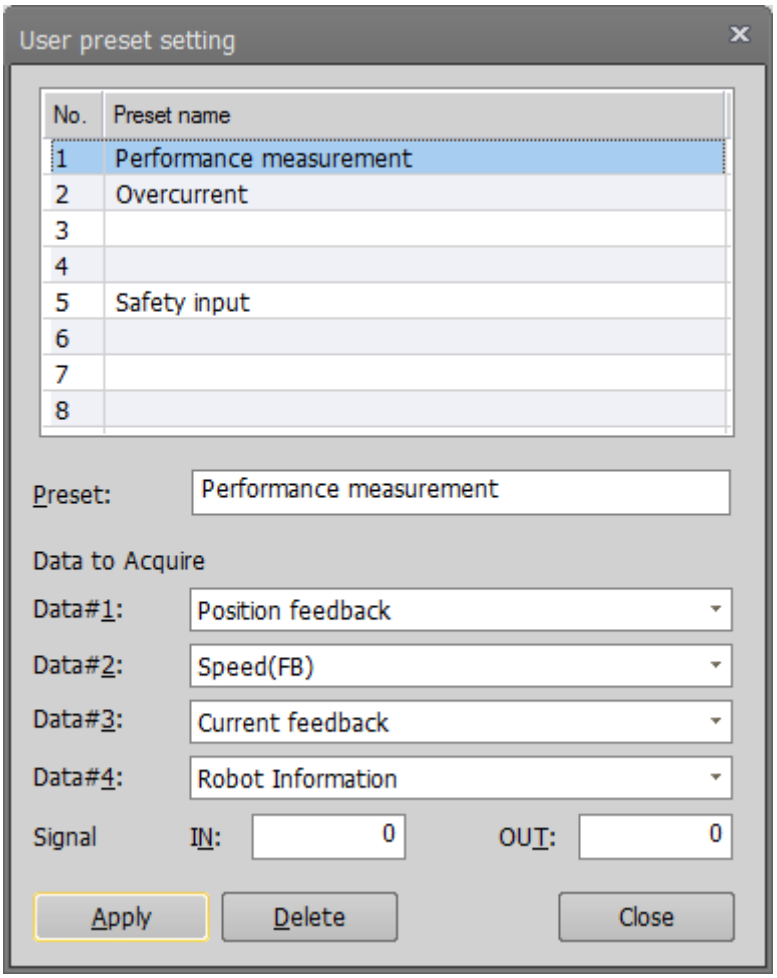


Figure 18-3 User preset setting dialog

Also, when using high-speed communication, it is necessary to enable the real-time monitor mode in the Ethernet parameter screen.

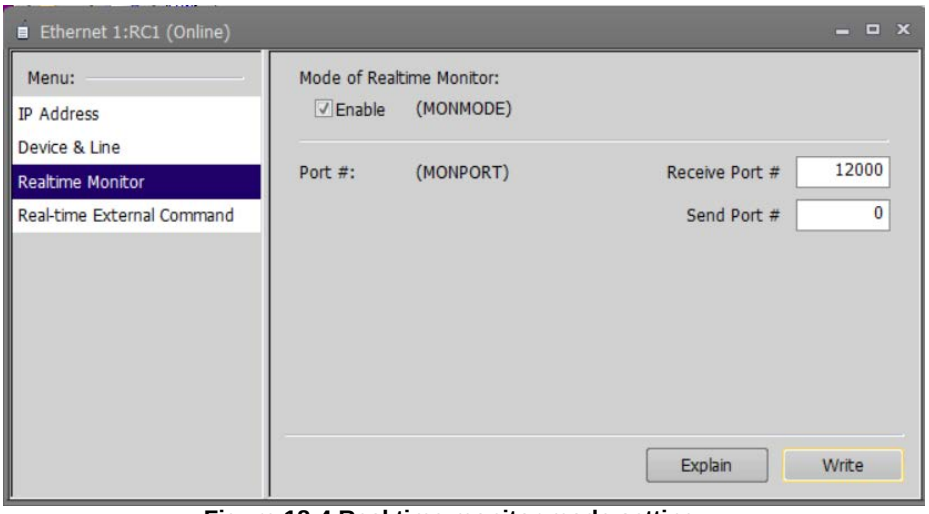


Figure 18-4 Real time monitor mode setting

⚠ Caution

・To display the program name and an execution row number in high-speed communication it is necessary to include "robot information" in the demand data.
・In "Ordinary communication", IN and OUT signals are unacquirable.

18.1.6. Start／Stop

Check before starting that the target project is in an on-line state.

Clicking the [Start Record] ( ) button in the [Oscillograph] tab -> [Record] group on the ribbon, data will be acquired from a robot and graph drawing will start.

Clicking the [Stop Record] ( ) button will stop acquisition of data.

Caution

The program name to be executed must be 6 characters or less. If it is set to 7 or more characters, the program will not be displayed on the "Program / Signal Monitor" screen even if "Robot Information" is included in the request data.

18.1.7. Graph setting

The [Graph...] button of the oscillograph screen can be clicked and the items displayed on a graph set up. The graph setup can also be changed in data acquisition.

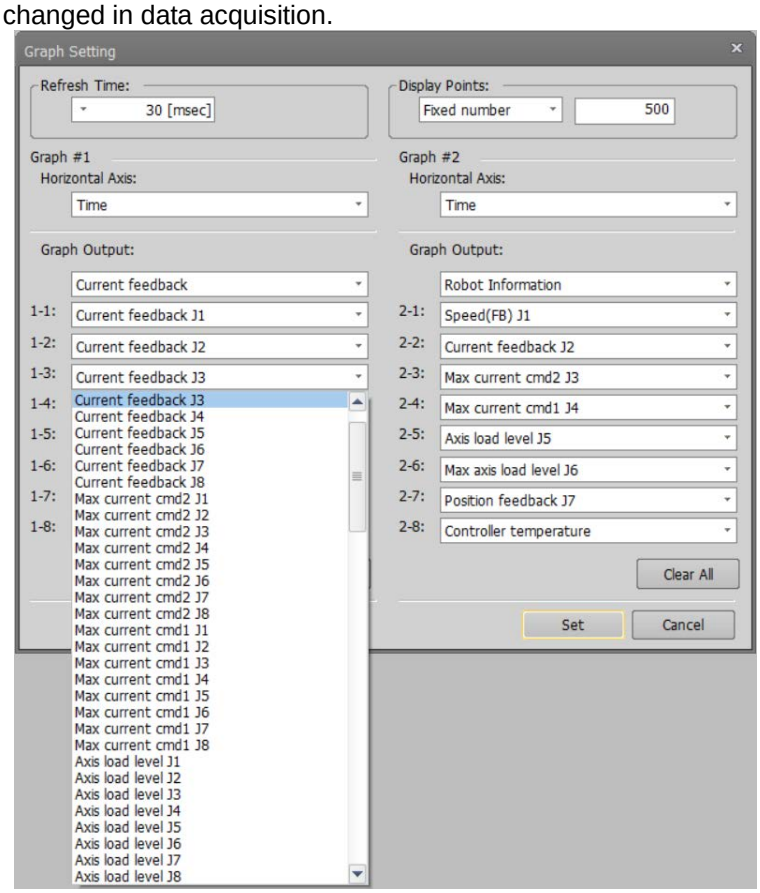


Figure 18-5 Graph setting dialog

Table 18-5 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.

In addition, a simple graph setting function is also provided on the oscillograph screen. Display/non-display of the data selected in the graph setting screen can be switched from the lower left list of the oscillograph screen.

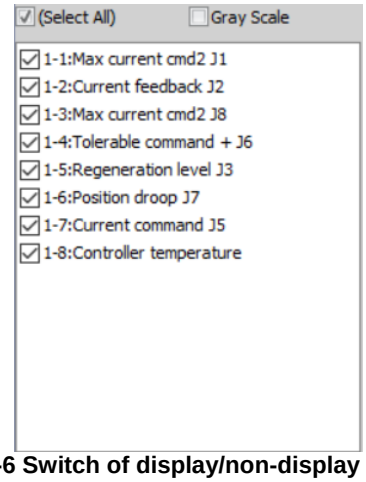


Figure 18-6 Switch of display/non-display of graph

You can change the graph drawing interval during data recording using the [Refresh time] drop-down list and the number of display points displayed on the graph in the [Display points] drop-down list. The number of points to display can be changed only by slider operation.
By using the [<-] [->] key on the keyboard, you can fine-tune the display range (horizontal axis) while looking at the graph.

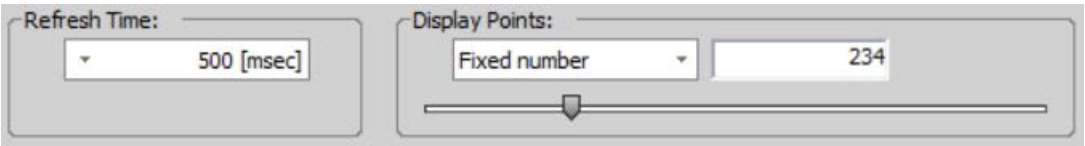
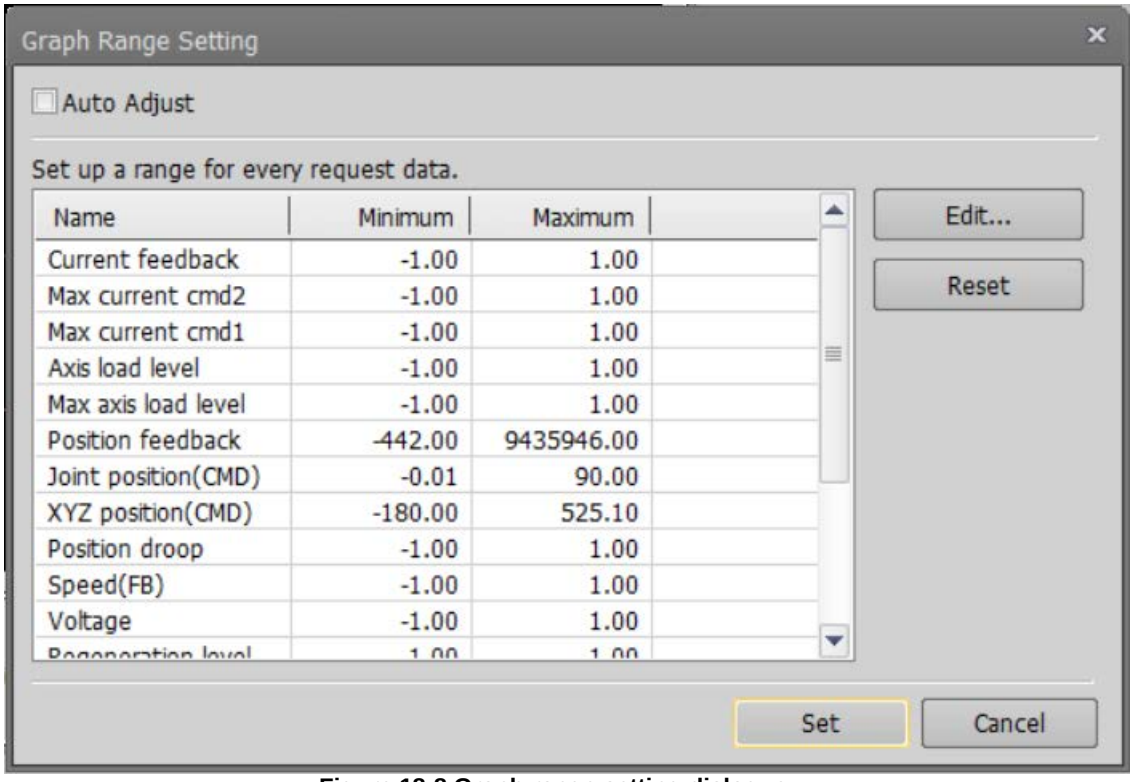


Figure 18-7 Switch of [Refresh time] / [Display points]

18.1.8. Graph range setting

The [Range...] button of the oscillograph screen can be clicked and the display ranges of the vertical data axes set. When [Auto adjust] is checked, the display ranges of the vertical axes in the graph are automatically adjusted.



Name	Minimum	Maximum
Current feedback	-1.00	1.00
Max current cmd2	-1.00	1.00
Max current cmd1	-1.00	1.00
Axis load level	-1.00	1.00
Max axis load level	-1.00	1.00
Position feedback	-442.00	9435946.00
Joint position(CMD)	-0.01	90.00
XYZ position(CMD)	-180.00	525.10
Position droop	-1.00	1.00
Speed(FB)	-1.00	1.00
Voltage	-1.00	1.00

Figure 18-8 Graph range setting dialogue

The [Edit...] and [Reset] can make two data or more a target at the same time.

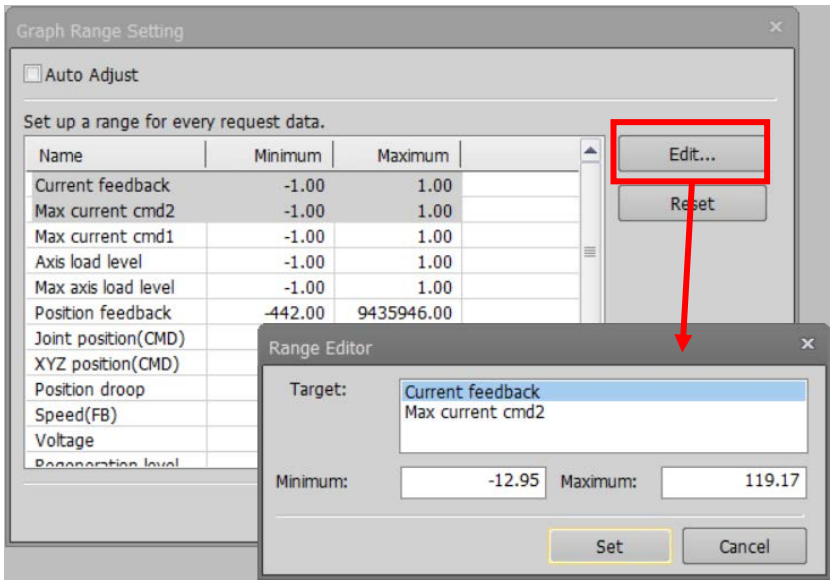


Figure 18-9 Range editor of the graph

18.1.9. Data confirmation

Clicking the [Detail…] ( ) button in the [Oscillograph] tab -> [Drawing] group on the ribbon, you can check the data displayed on the graph by numerical value. When acquiring data and playing back data, the current value is displayed in [Data].

You can change the acquisition range of [Minimum] [Maximum] by switching [Target Data].
“All Data”: The minimum and maximum values of the entire data (including the invisible range) displayed on the screen are displayed.
“In Screen”: The minimum and maximum values in the range displayed on the screen are displayed. However, when the number of display points of the graph is "Time Scale", “All Data" is automatically selected.

The data column is displayed in the same color as the graph.

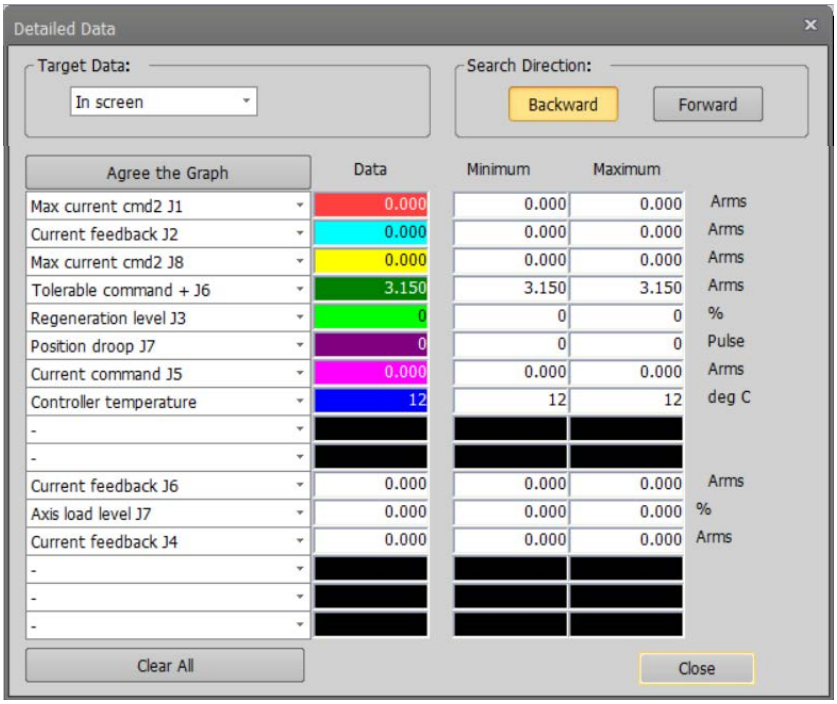


Figure 18-10 Detailed data dialogue

By clicking the [Stop Drawing] (Stop Drawing) button in the [Oscillograph] tab -> [Drawing] group on the ribbon while retrieving data from a robot, you can stop drawing of the graph and trace back the lines of the retrieved data by shifting the slider.

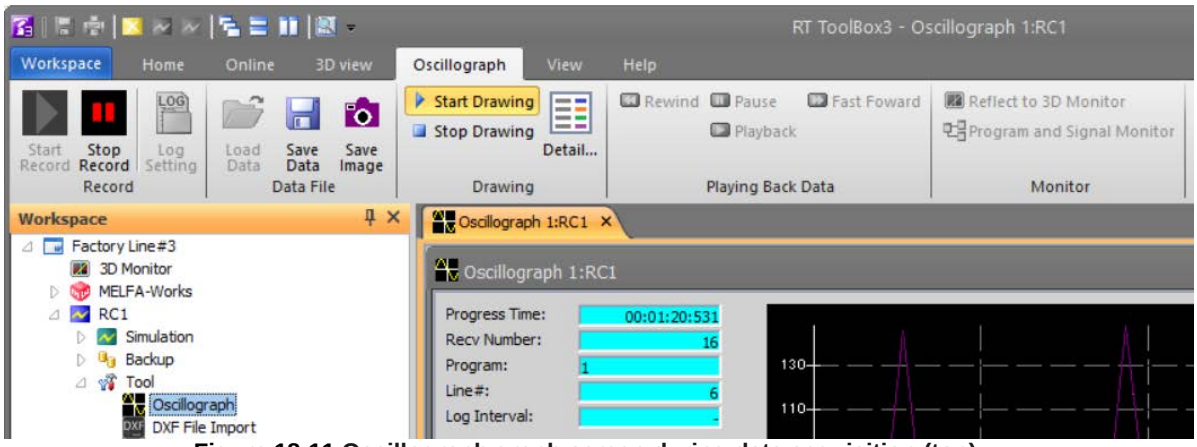


Figure 18-11 Oscillograph graph screen during data acquisition (top)

A cursor is displayed while operating the slider. The value at the cursor position is displayed in [Data] of the detailed data dialogue.

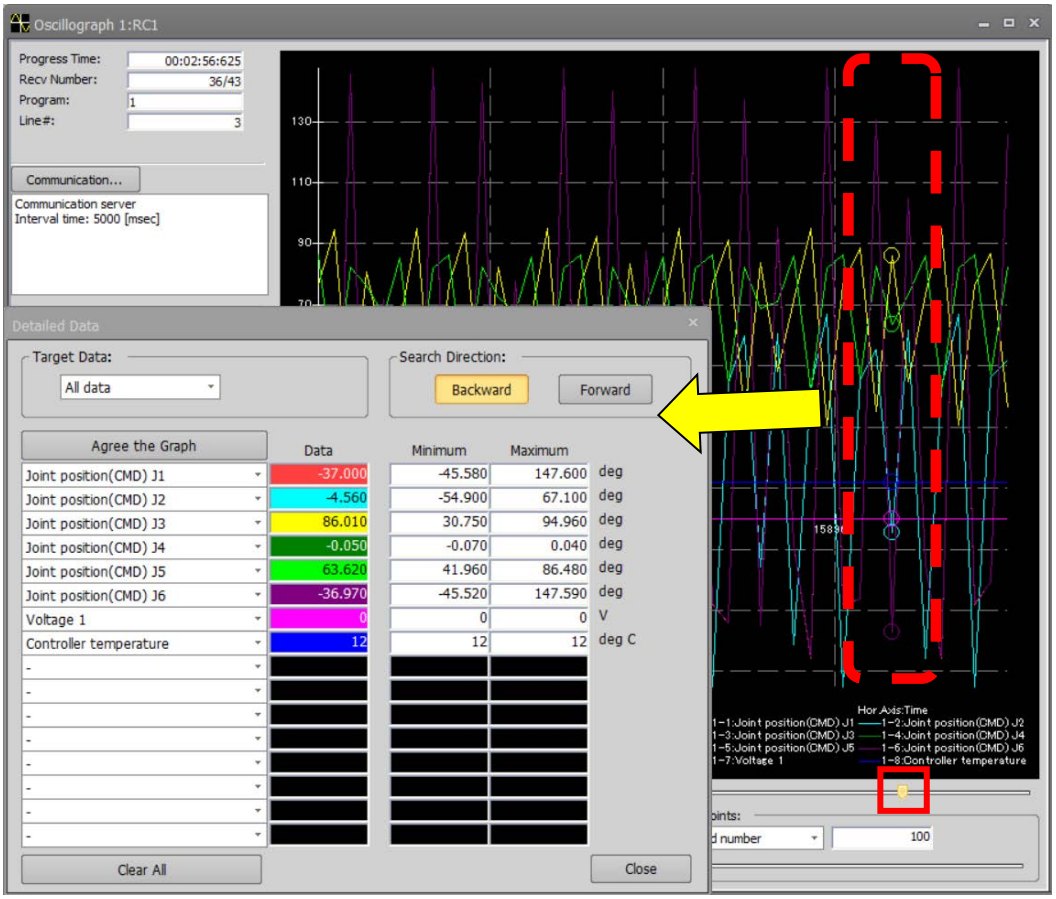


Figure 18-12 Cursor movement by slider operation

After acquiring data from the robot or after reading the data of the data file, double-clicking the value of [Minimum] [Maximum] will move the cursor to the corresponding part according to the specified search direction. However, it can not be used during data playback.

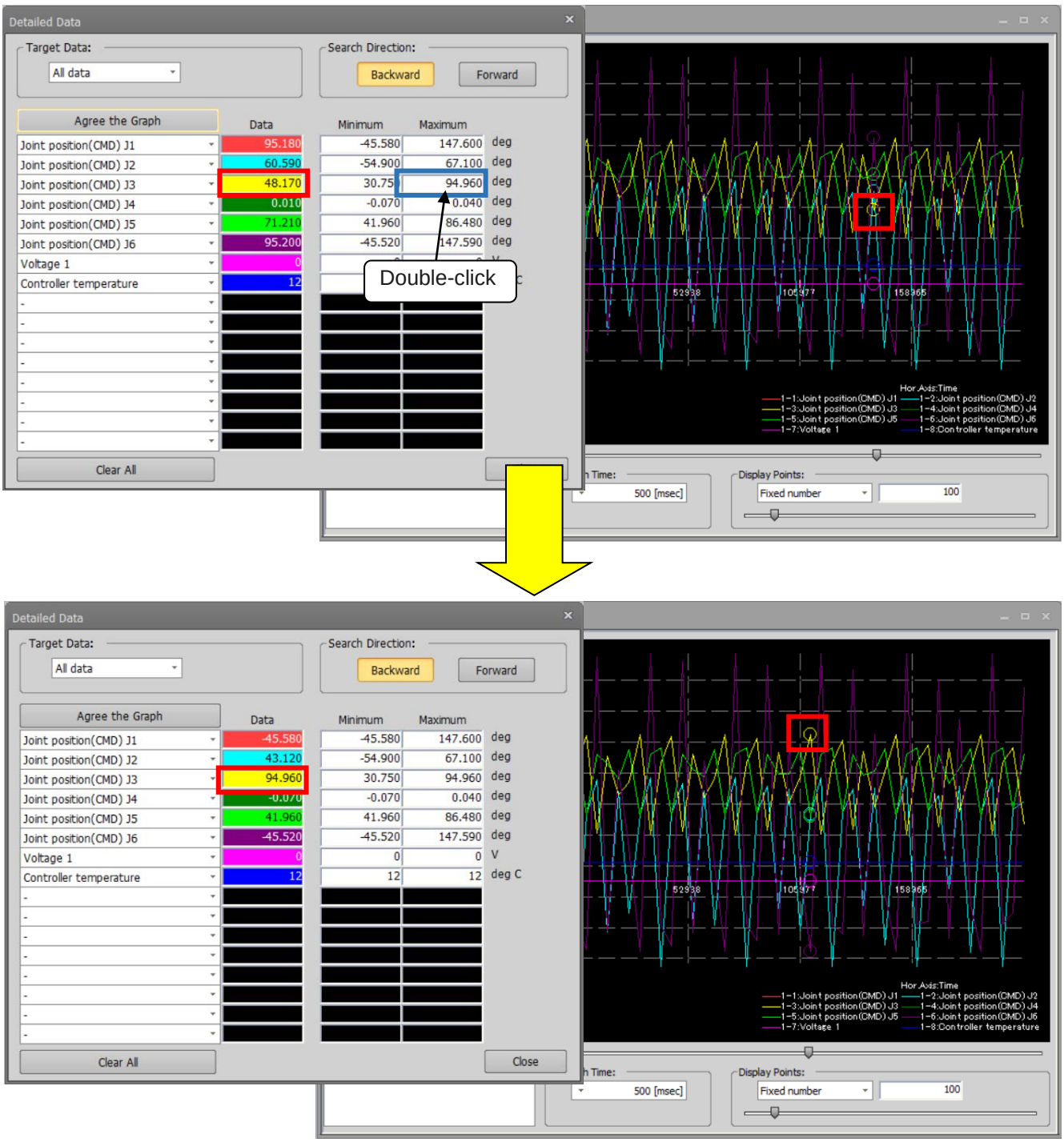


Figure 18-13 Cursor movement by double click [Maximum] (in screen)

⚠ Caution

When jumping to [Minimum] [Maximum] with the data "Time Scale" displayed for a long time, the value of [Data] may not match the value of the graph. At that time, change the number of display points to "Fixed number" and check the graph.

18.1.10. Playing back data

Clicking the following buttons in the [Oscillograph] tab -> [Playing Back Data] group on the ribbon, data can be played back along the time axis while the cursor is moved automatically.

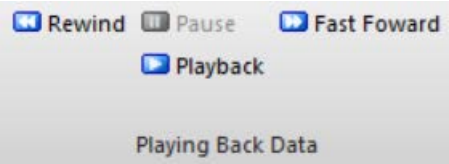
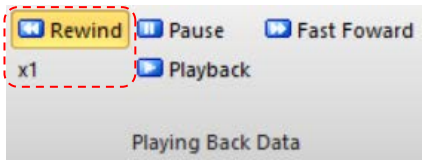
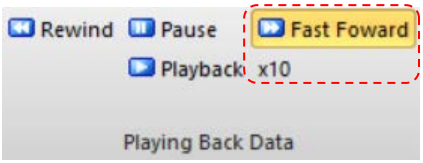


Figure 18-14 Data Playback Buttons

Clicking the [Playback] button moves the cursor along the time axis.
Clicking the [Rewind] or [Fast Forward] button moves the cursor at [x1] or [x2] speed, respectively. You can select the speed from [x1]/[x2]/[x10] by clicking the button again.
To stop playback midway, click the [Pause] button.



Rewind (x1)



Fast Forward (x10)

Figure 18-15 Data Playback States on Oscillograph

18.1.11. Save Data／Log Setting

Clicking the [**Save Data**] ( ) button in the [Oscillograph] tab -> [Data File] group on the ribbon, the data acquired up to that point in time can be saved in CSV file format.

The newest data can be written out to a log file at a set time interval. Clicking the [**Log Setting**] ( ) button in the [Oscillograph] tab -> [Data File] group on the ribbon, select the [Log the Measurement Data] check box in the operation dialog of the displayed log file. The time interval written in a log file is specified in the [Select the Interval Log] drop-down list.

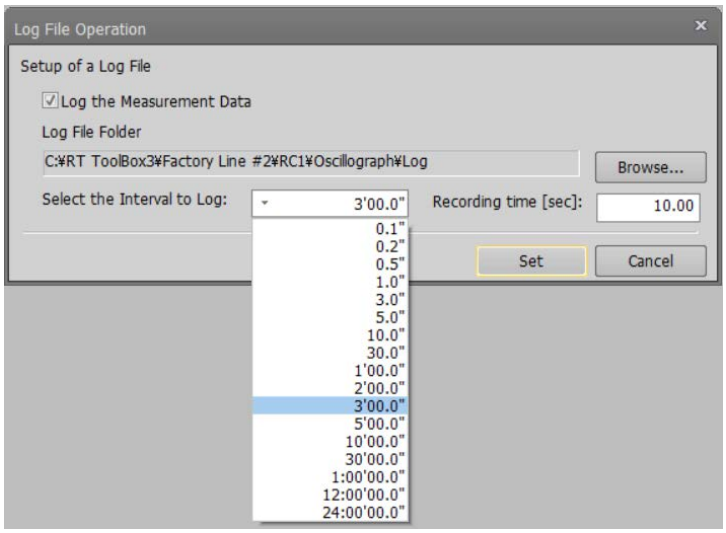


Figure 18-16 Log file operation

If you select 3 minutes or more in the log preservation interval, you can set [Recording time]. When [Recording time] is set, log data for the specified time is saved for each log preservation interval specified. [Recording time] can be set up to half the log preservation interval. However, when the log preservation interval is set to 10 minutes or more, [Recording time] is 3 minutes (180 seconds).
When [Recording time] is set to 0, the latest data is written to the log at regular time intervals as when log preservation interval is specified to 2 seconds or less.

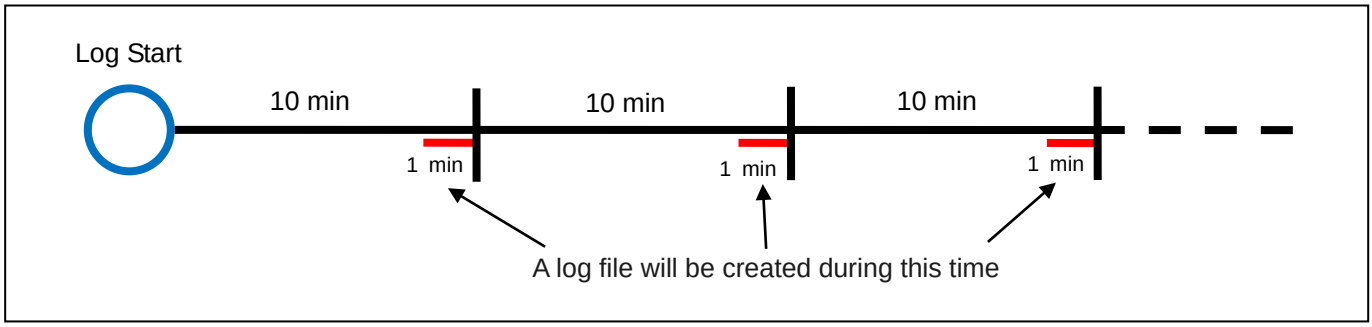


Figure 18-17 Log output image when log interval is 10 minutes and recording time is 1 minute

Click the [Set] button to complete log file setup.

The data save / log file name, and its save folder are as follows.

Table 18-6 Data saving file name / Log file name / Data saving folder

Item	Explanation
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. (Same as data save file name) (Same when [Recording time] is set) Example： Log20130911-183525.csv
Data save folder	“Workspace \ Project \ Oscillograph \ Log” The save folder of the log file can be changed.
Select the interval to log	When you select the [Real time monitor] of the [Select the interval to log] drop-down list, you can save all the data acquired in real time monitor to the log file. If the data is more than 50 million cases (about 1 hour), it will be saved to a new time stamp log file.
Recording time	Save the log for the specified time. If you select "3'00.0" or more from the [Select the Interval to log] drop-down list, the recording time can be set. It is possible to set it to half the log preservation interval (maximum 3 minutes (180 seconds)). When set with "0" (second), only one data is output as with normal log.

⚠ Caution

If you select the [Real time monitor] in [Select the interval to log]

・Cancel the power saving settings of the personal computer such as screensavers, disk stoppage, PC sleep, etc.
・File save will stop if the disk capacity is less than or equal to 500M bytes.

If you are using a low-performance PC

・It may not be possible 3.5/7.1msec interval.
・High-speed communication writing to files takes CPU power, and screen operation may not be possible. In such cases, shut off the communication with the robot by, for example disconnecting the communication cable of the robot. Screen operation will then recover.
If screen operation is not possible, select a save interval of [1.0”] or more.

18.1.12. Load Data

The data file and log file which were saved in **"18.1.11 Save Data／Log Setting"** can be displayed on the graph by clicking the [**Load Data**] ( ) button in the [Oscillograph] tab -> [Data File] group on the ribbon.

18.1.13. Save Image

Clicking the [**Save Image**] ( ) button in the [Oscillograph] tab -> [Data File] group on the ribbon, the graph currently displayed can be saved as a bitmap image
The image file name and the image save folder name are as follows.

Table 18-7 image filename & Image saving folder

Item	Explanation
Image file name	Img***<time stamp>***.bmp The <time stamp> shows the time stamp when the [Image save] button was clicked. Example： Img20130911-183525.csv
Image save folder	“Workspace \ Project \ Oscillograph \ Image”

18.1.14. Gray scale

When the gray scale checkbox is turned on, the graph is displayed in gray scale.

18.1.15. Reflect to 3D monitor

Clicking the [Reflect to 3D monitor] button () in the [Oscillograph] tab -> [Monitor] group on the ribbon, you can reflect the joint position (FB) or joint position (CMD) which you acquired from the robot on the 3D monitor.

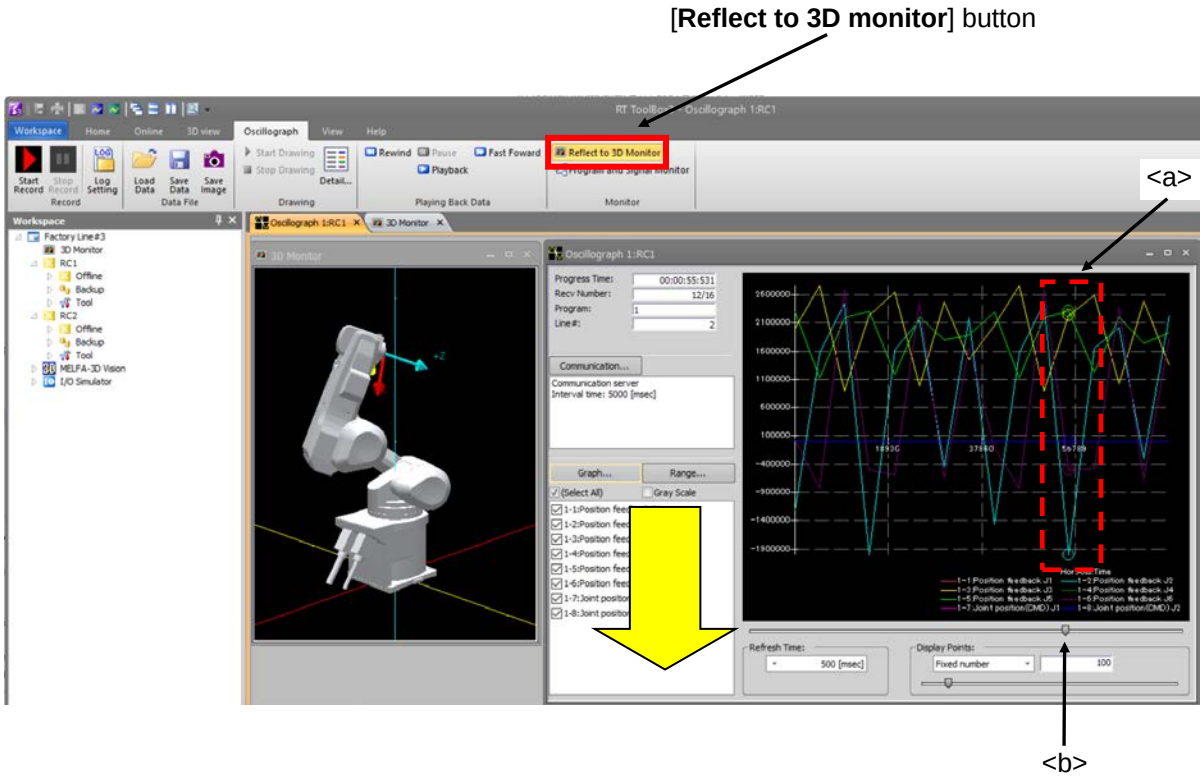


Figure 18-18 Operation of reflected to the 3D monitor

Clicking the [**Reflect to 3D monitor**] button (Reflect to 3D Monitor) and pushing down, the joint position (FB) or the joint position (CMD) selected by the cursor<b> is reflected in the 3D monitor.

By moving the cursor<b> with the slider, you can change the posture of the robot in the 3D monitor.

You cannot click the [**Reflect to 3D monitor**] button if the log data that you acquired from the robot includes neither the joint position (FB) nor the joint position (CMD).
The joint position (FB) is reflected in the 3D monitor if the log data that you acquired from the robot has both the joint position (FB) and the joint position (CMD).

You cannot click the [**Reflect to 3D monitor**] button if the robot model displaying log data in the oscillograph screen does not match the robot model set in the project. In this case, it is necessary to change the robot model in the project to match the robot model set in the log data.

Set the robot model in the project as follows.

Table 18-8 Setting the robot model in the project

Log data displayed in oscillograph screen	Robot model set in project
Log data acquired from the connected robot	Robot model of the connected robot
Log data read from the log file	Robot model set in the header row of the log file

Caution

This function can be used in offline status( ) only.

You cannot use this function in online status or simulation status ( ).

Caution

The graph display will be disturbed by operations requiring CPU power

Regardless of which software is operated, when an operation needing CPU power, or file read/write operation, is carried out, the communication with the controller will be delayed/dropped, disturbing the graph display.

Please keep in mind that graphing is mainly disturbed by the following operations.

・Data saving operation
・Image saving operation
・Graph setting operation

18.1.16. Program and Signal Monitor

Clicking the [Program and Signal Monitor] button (Program and Signal Monitor) in the [Oscillograph] tab -> [Monitor] group on the ribbon, you can check the program execution line and the signal status at the cursor position of the data displayed on the graph.
If the data contains robot information, the contents of the program are displayed and the execution line is highlighted.
The signal displayed on the signal monitor is the range of the signal acquired at the time of oscillograph recording for both input and output. Refer to "**14.3.1 General signals**" for how to see the signal.

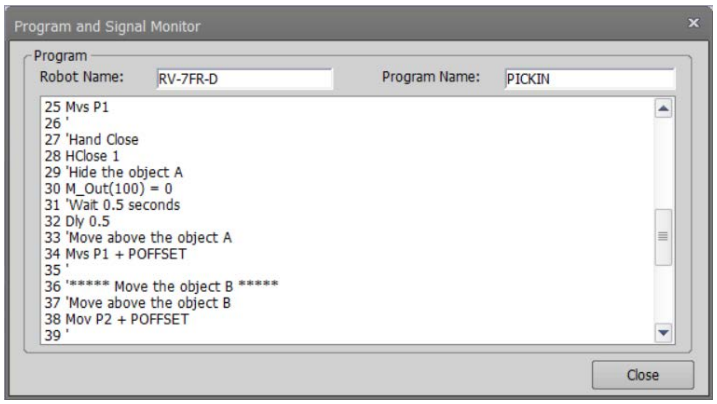


Figure 18-19 When displaying data recorded via Communication Server

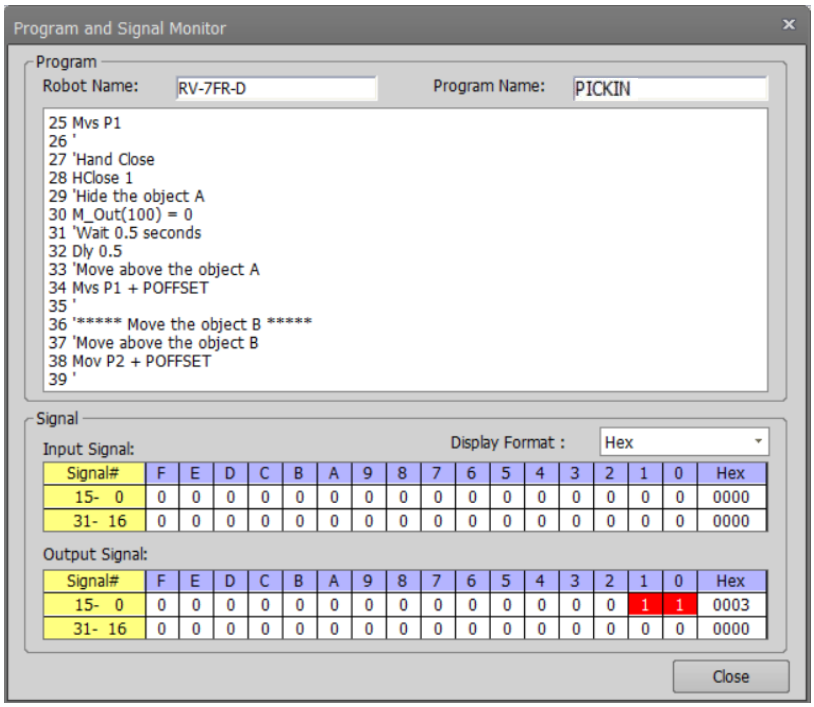


Figure 18-20 When displaying data recorded via realtime monitor

Caution

This function can be used in offline status( ) only.

You cannot use this function in online status or simulation status ( ).

Caution

- If the program executed during oscillograph recording does not exist in the offline program list, the program will not be displayed. Please copy from online to offline and read the data again.
- If the name of the program executed during oscillograph recording is 7 characters or more, or if you change the program name, the program will not be displayed.
- If you change the contents of the program executed at the time of oscillograph recording after recording, the execution line highlighted on the program monitor may not match the graph data.
- The range of the input / output signal to be displayed can not be changed.

18.2. DXF file import

Here we will explain the DXF file import function.
This function is not available in the mini edition.

18.2.1. Outline

This imports the DXF files can be converted into robot programs / spline files.
The version and entity data of the DXF files that are compatible with this function are shown below.

Table 18-9 DXF files compatible with this function

Item	Explanation
Version	To AutoCAD 2014.
Entity data	LINE ARC CIRLE POLYLINE/LWPOLYLINE SPLINE

* DXF is a CAD data format developed by Autodesk, Inc.
* Unit system is treated in millimeters (mm).

18.2.2. Starting

Select [**Tool**] – [**DXF File Import**] from the project tree and click the right mouse button. The context menu will open. Click [Open]. DXF file selection dialog is displayed.
Select a DXF file, and press the **[Open]** button. The “DXF File import” dialog appears.

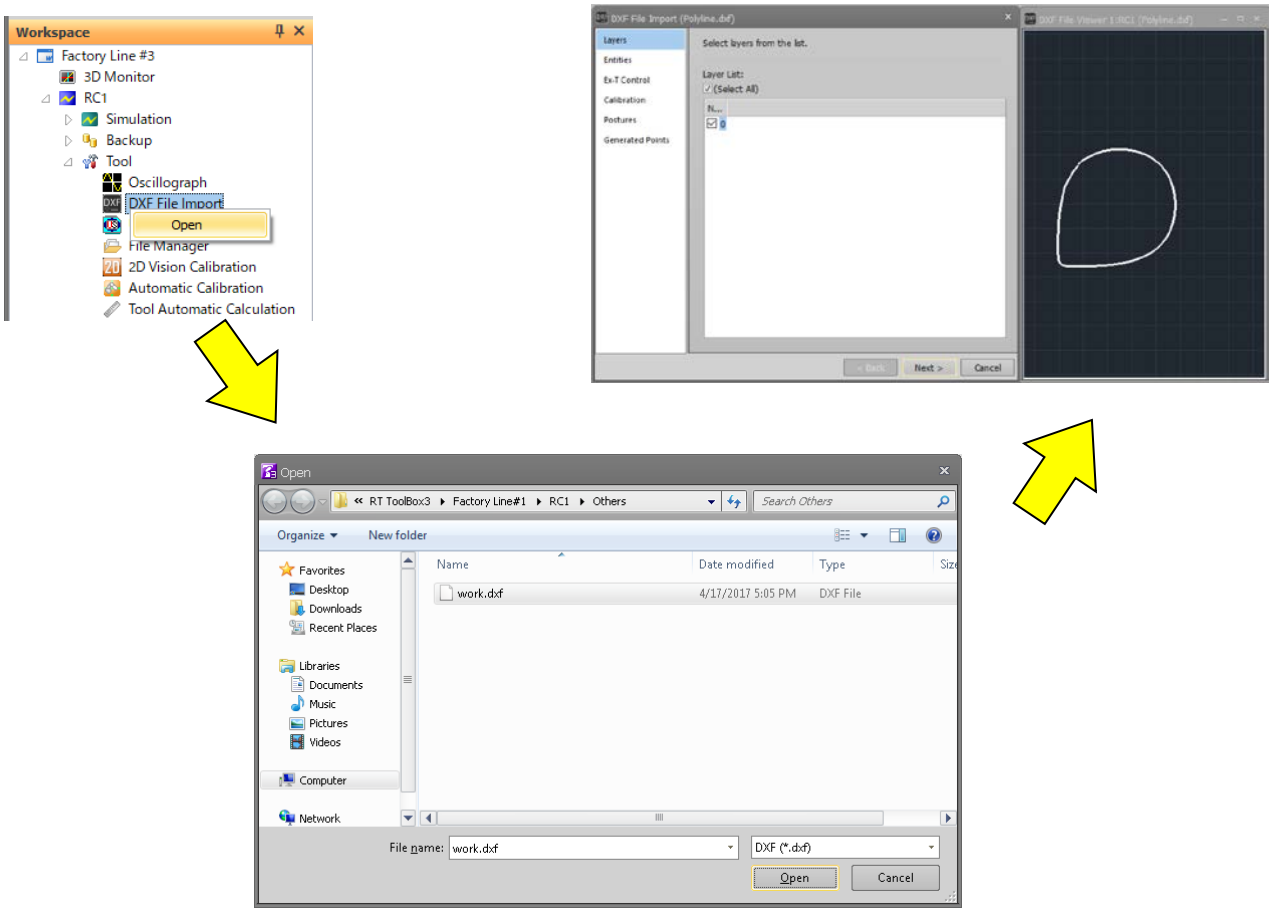


Figure 18-21 DXF File Import Startup Screen

18.2.3. Flow of operations

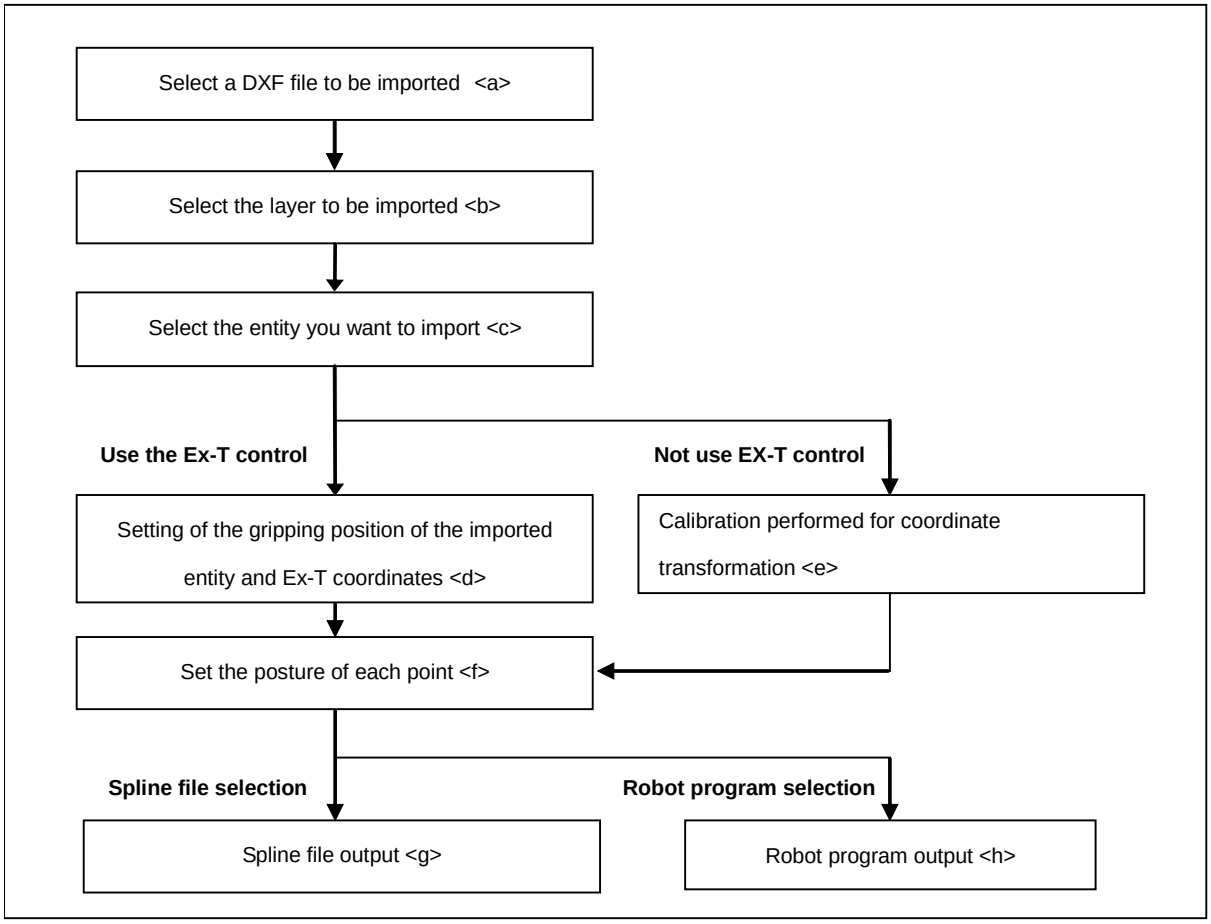


Figure 18-22 Flow of operations

For detailed operation method of <a> ~ <f>, refer to **"7.4.5 Creating a spline file (2) Creating with DXF file import function"** in the robot controller owner's manual.

<g> Output to spline file
Select the **[Spline file]** as the output format in the **[Generated Points]** page and click the **[Finish]** button. The spline file edit screen opens, and the generated point sequence data will be output. Click the **[Yes]** button in the import completion message to display the spline file save dialog. Specify the spline file number you want to save and click the **[Save]** button to save the spline.

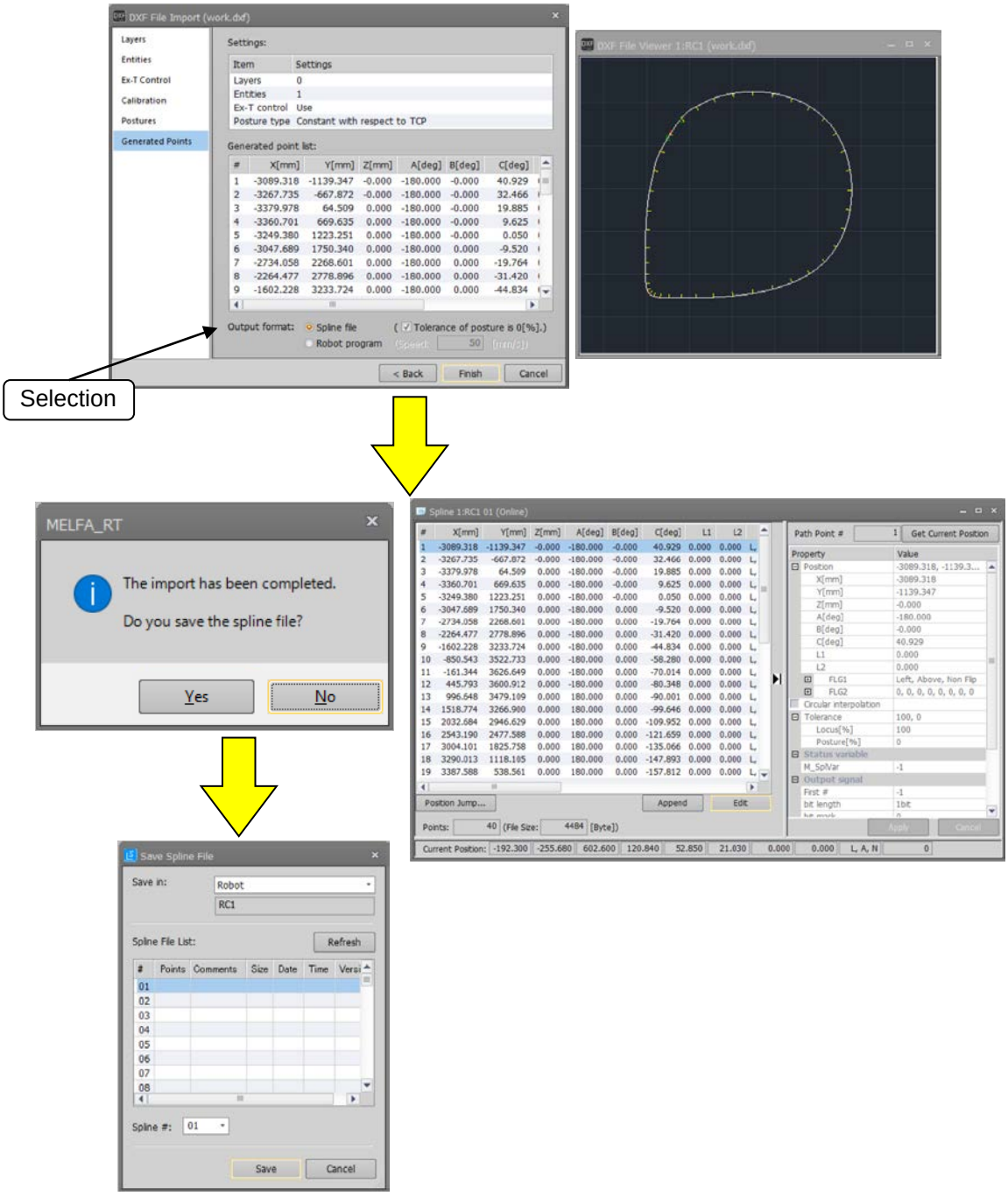


Figure 18-23 Output to spline file

<h> Output to robot program

Select **[Robot program]** as the output format in the **[Generated Points]** page and click the **[Finish]** button. A “New Robot program” dialog appears. In the "New Robot program" dialog, enter the name of the robot program you want to save, and click the **[OK]** button to display the program edit screen.

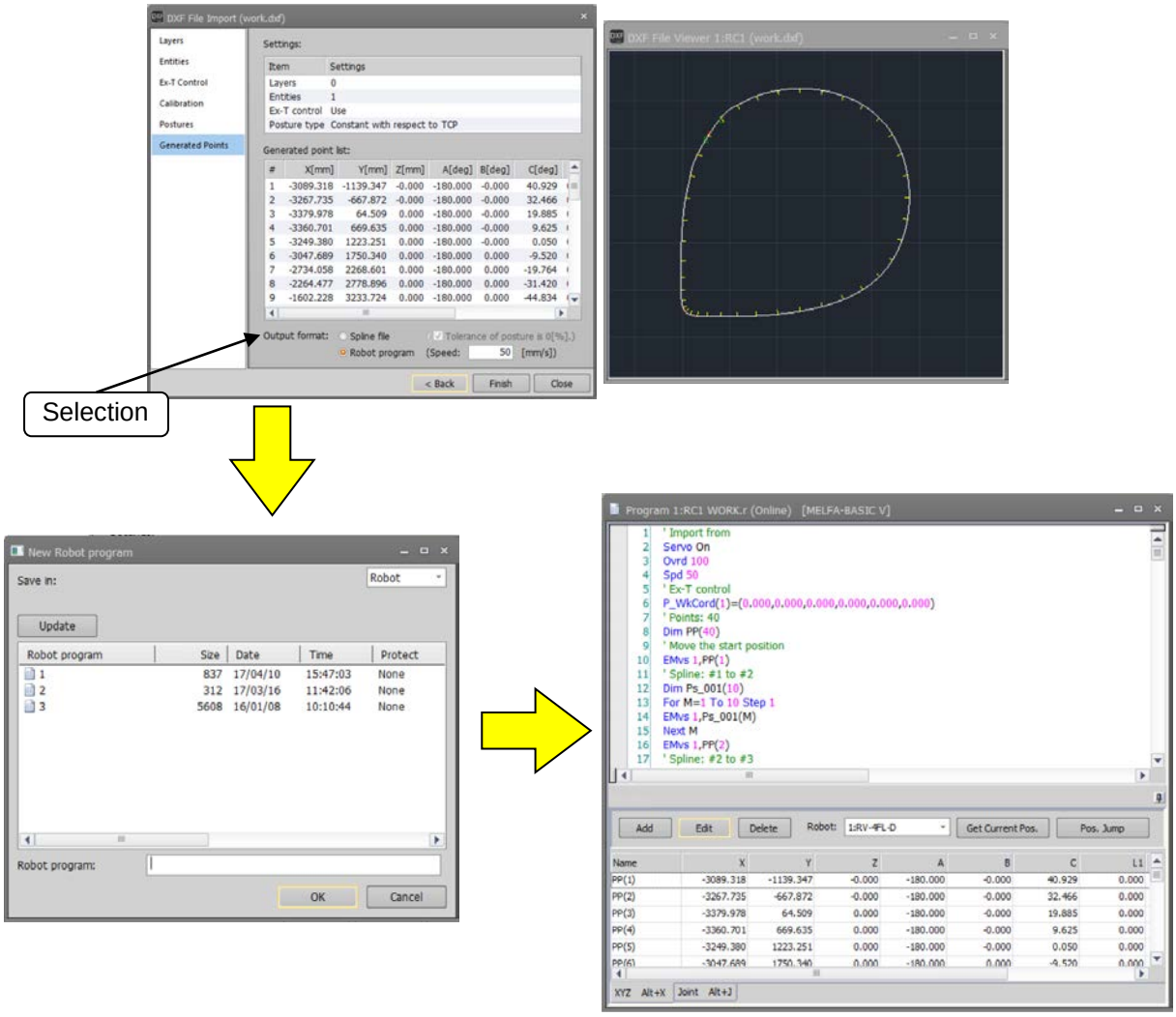
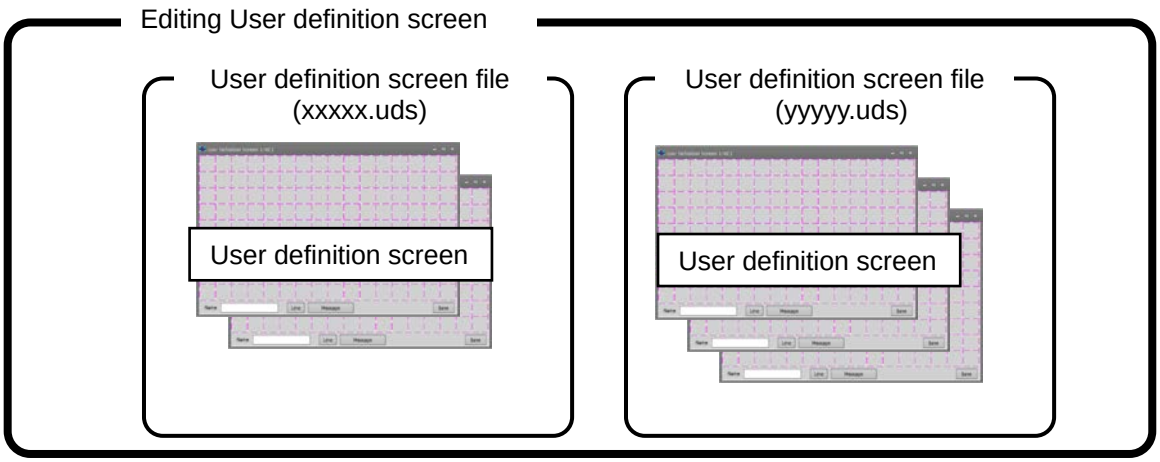


Figure 18-24 Output to Robot program

18.3. User definition screen

It is possible to edit the user definition screen which can be operated by highly efficient T/B.
You can make a customized screen by arranging parts such as buttons and lamps 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 a customized screen in the high-function T/B by arranging parts such as buttons and lamps that synchronize with the I/O signal. You can make two or more pages of definition screens.



T This screen can be used by the following applications in in high-function T/Bs.

- As an operation monitor.
- With T/B is enabled, peripheral devices such as conveyers can be made to work by the buttons on the screen.

T/Bs which can use user definition screens, and their software versions, are as follows.

Table 18-10 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

Parts that can be displayed on the user definition screen are as follows.

Table 18-11 List of parts

	Parts		Explanation
1	Buttons		A signal can be output from the robot controller by clicking the button. The signal can be output only in T/B-enabled state.
2	Lamps		Lamps can be turned on/off by the state of an I/O signal.
3	Robot information	Variable	The value of a 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 position data of the XYZ coordinate system can be displayed.
		Cur jnt	Current position data of the joint coordinate system can be displayed
4	Label		A character string can be displayed.
5	Operation Panel Button		You can display each the button that exists in the operation panel ([START] button etc.).
6	Menu Button		You can display the menu button that moves to the specified screen. But click the button and move to the corresponding window only. This software can be used after Ver.1.40S. T/B software version can be used after Ver.4.1

7	Jog Button	The jog button for manipulating the axes of the robot can be displayed. But click the button and manipulate the robot axes only T/B This software can be used after Ver.1.40S. T/B software version can be used after Ver.4.1
8	Message	You can display a message when the set conditions met (It is not always displayed on the screen).

18.3.1. Creating a new User definition screen file

In order to create a user definition screen, it is necessary to create a user definition screen file.
Select [Tool] -> [User definition screen] in the project tree and click the right mouse button and select "New" in the right button menu. Click the [OK] button after inputting a new file name. The newly-created user definition screen file is added to the bottom row of the [user definition screen].

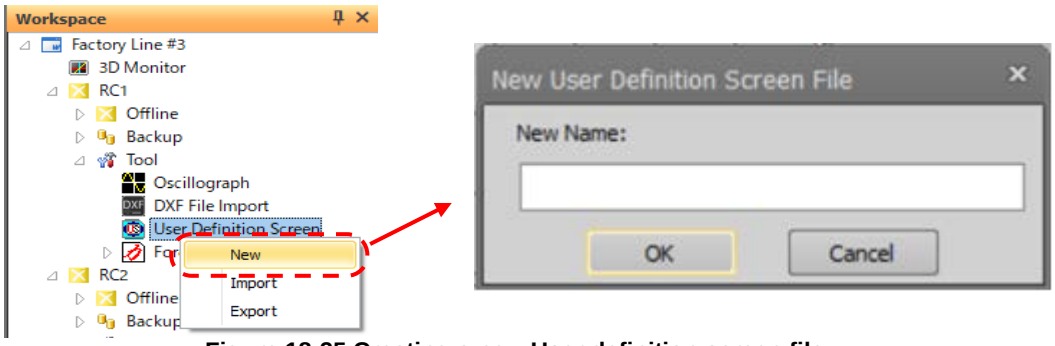


Figure 18-25 Creating a new User definition screen file

Caution

About User definition screen files

It is possible to create a user definition screen file name as desired. But user definition screen files are used as folder names in Windows, so you cannot use characters that cannot be used in Windows folders names (\ /: *? “ < > |).
An error will occur when an inputted user definition screen file already exists.

About the extension of user definition screen files

The extension of the user definition screen file is “.uds”. If the extension is omitted, or when the wrong extension is input, the .uds extension is attached automatically.

18.3.2. Editing the user definition screen page

Double-click [Tool] -> [User definition screen] -> [“User definition screen file”] -> [“Page name”] in the project tree. The edit dialog of the user definition screen is displayed.

When you create a new user definition screen, select [Tool]->[User definition screen] -> [“User definition screen file”]-in the project tree then click the right mouse button and select "New” in the right button menu. A new “User definition screen” is displayed.

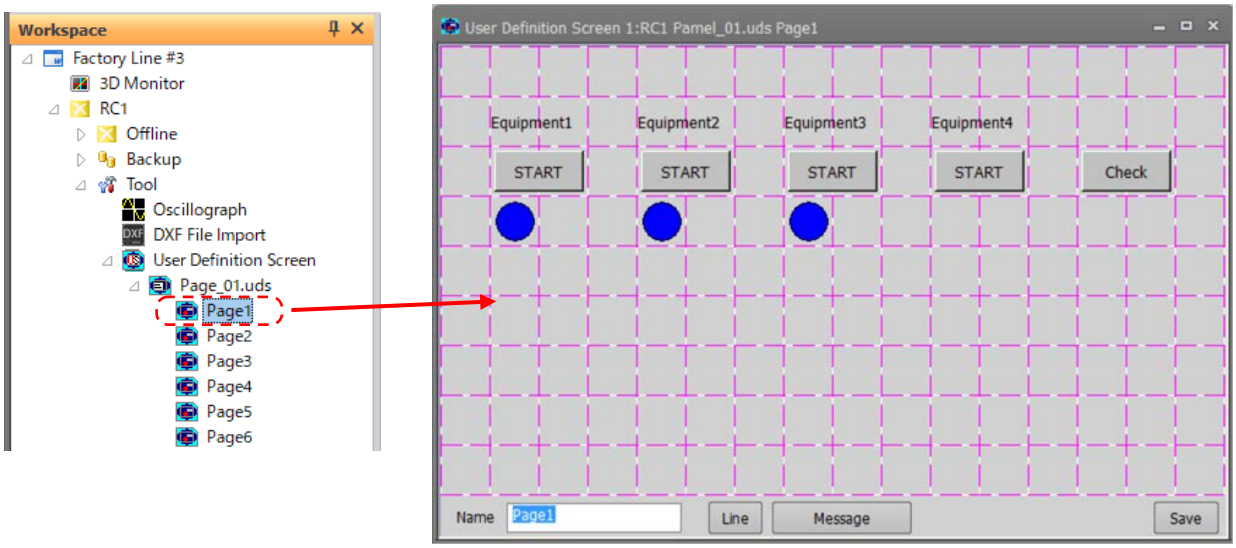


Figure 18-26 Editing the existing user definition screen

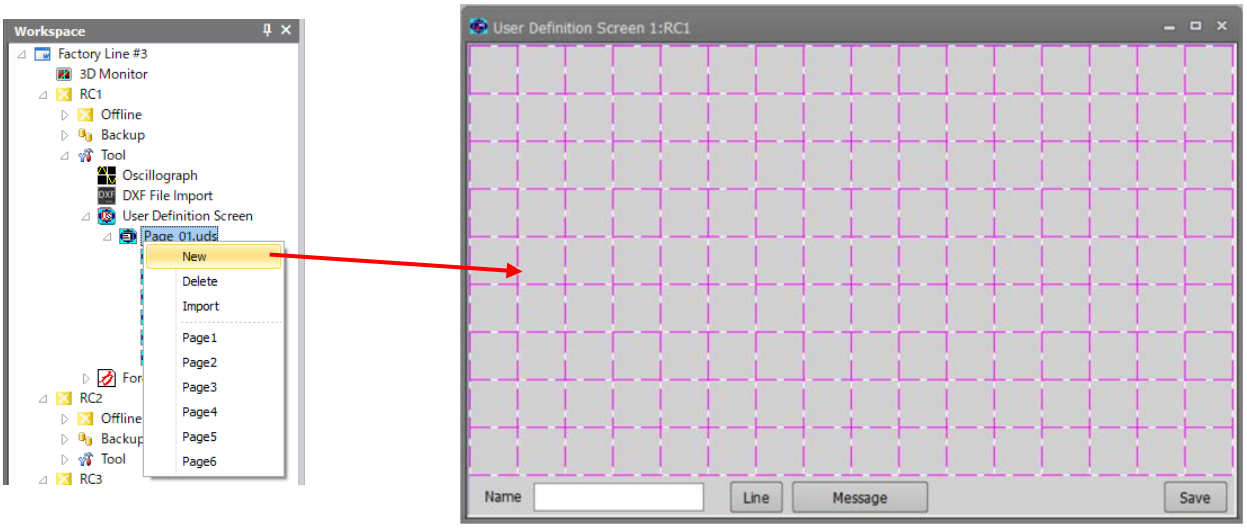


Figure 18-27 creating a new user definition screen

The grid lines (<a>) are displayed in the edit display of the user definition screen. Each part can be registered with the block units (<b>) delimited in this grid line.

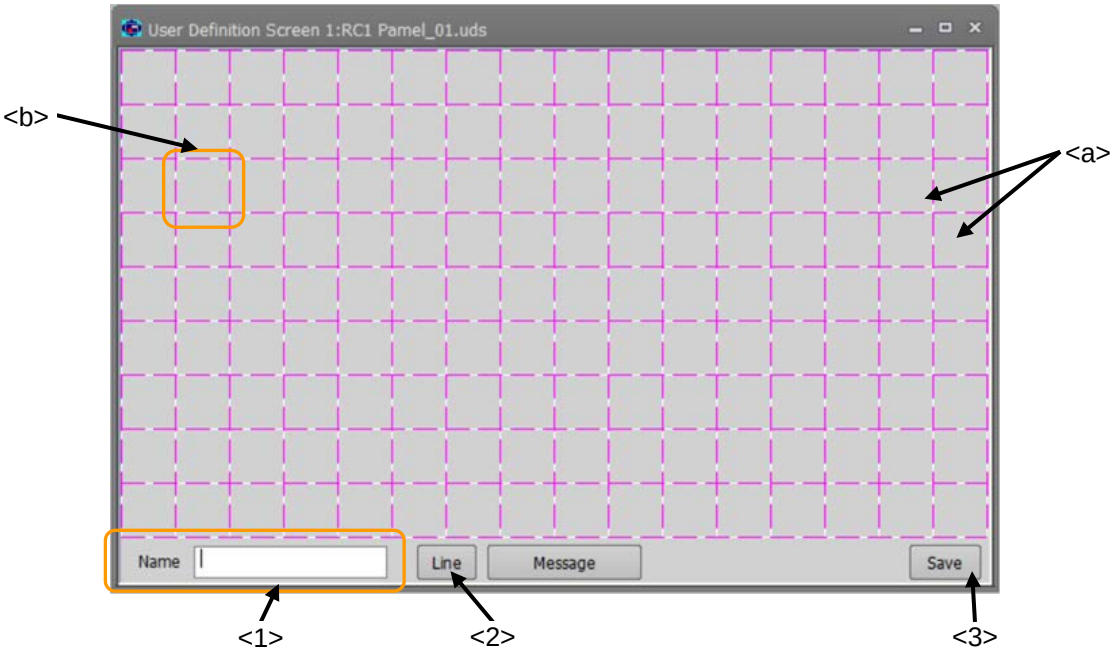


Figure 18-28 Editing the user definition screen

<1> Name	:	Set the page name. The name can be input by the [Edit] button.
<2> Line	:	The ruled lines are drawn on the "User definition screen".
<3> Save	:	Saves the edited content.
<4>message		You can edit the message (see Table 18-10).

18.3.2.1. Button

(1) Click the position (block) in which a button is made (<a>). The left side of the button is arranged in this position.
(2) After the "Select item" window is displayed, click the [Button] button (<b>).
(3) Set the button name, button size and the kind of button in the "Create button" window.
(4) The operation when the button is clicked is set by the [Set] button (<c>). The set content is displayed in "Operation setting" (<d>).
(5) After the setting is completed, click the [OK] button (<e>).

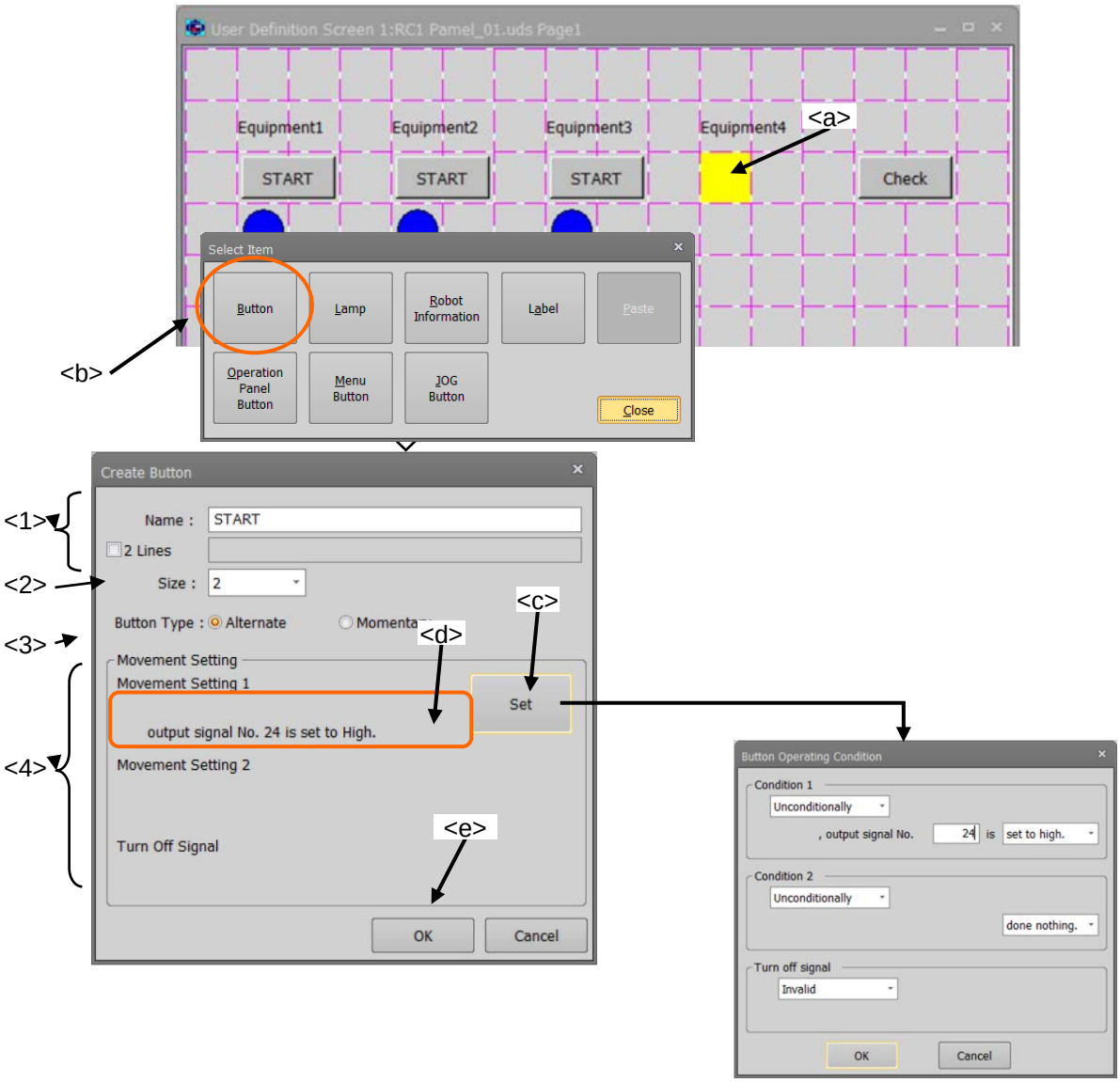
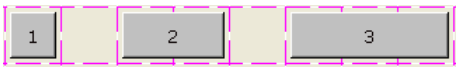


Figure 18-29 Creating a button

<1> Name : Sets the name of the button.
The button name can be input by the [Button name edit] button.
The button name can be displayed with two lines by checking "2 lines".

<2> Size : The width of the button can be set.
The settable button widths are 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 stays in an ON state while it is being pushed.

<4> Operation setting : This sets the preconditions and the signal output operation when the button ON.

The preconditions can be selected as follows. Set the signal number etc., when a signal state is the precondition. The precondition is judged when the button is ON or OFF.

- 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 this signal is output.

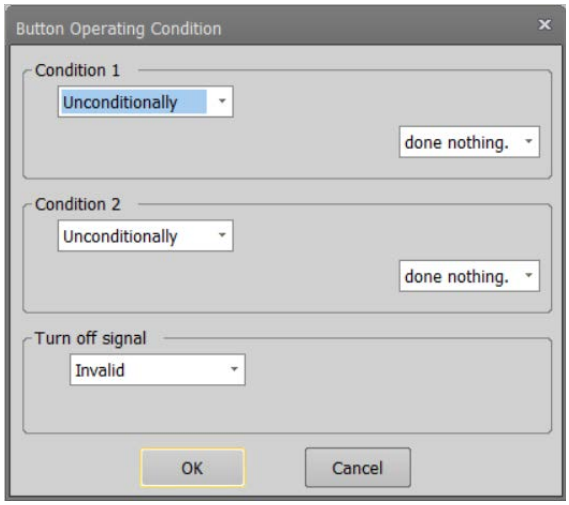
- Do nothing
- Output the specified output signal

Up to two operation settings can be registered.
Two operation settings operate individually by using their respective preconditions.
Moreover, when High and Low are set to output to the same signal number, and both conditions become true, Condition2 is given priority.
If the operation is set to signal output, when the button is OFF an inverse signal to the High/Low state will be output at ON.

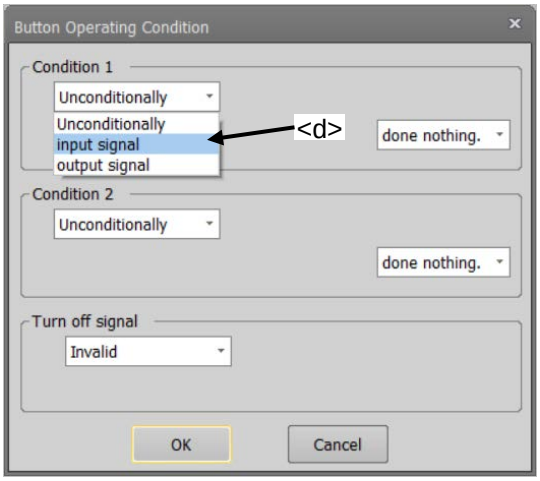
Button operation setting examples

Here we will describe an example of a button that outputs output signal number 20 at High when input signal number 20 is high.

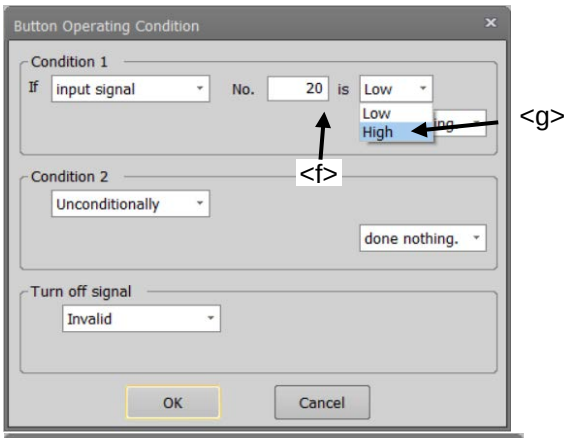
(1) A default value of the “Button operating condition” window is shown in the figure at right.



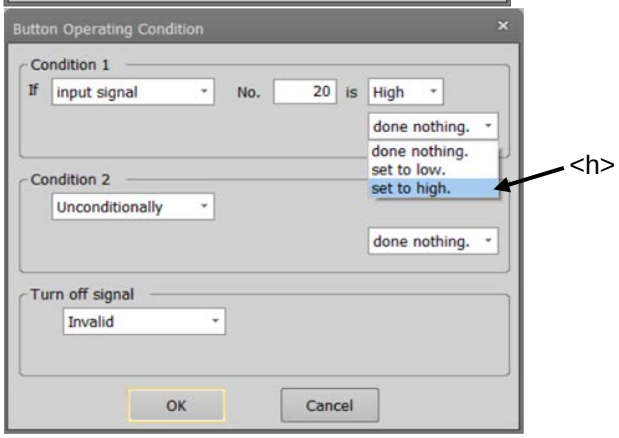
(2) Set the operation conditions.
Click <d>, and select the signal type.
If something other than "Unconditionally" is selected, the input area of the signal number and the combo box to select the status are displayed.
Now, select "input signal".



(3) Input "20" in the signal number (<f>).
Click the status of the signal (<g>), and select "High".

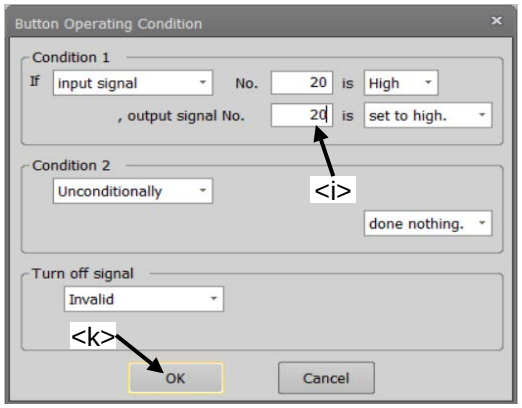


(4) Select "High" as the signal operation when clicking the button (<h>).



(5) The input area of the output signal number is displayed.
Input "20" to the signal number (<i>).

(6) After the setting is completed, click the [OK] button (<k>).



18.3.2.2. Lamp

(1) Click the position (block) in which the lamp is made (<a>). The lamp will be arranged at this position.
(2) After the “Select item” window is displayed, click the [Lamp] button (<b>).
(3) Select the lighting color of the lamp in the “Create lamp” window.
(4) Click the [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 the [OK] button (<f>). The set content is displayed (<d>) to the right of the [On/Off condition] button.
(5) After setting the lamp color and lighting condition and the turning off condition, click the [OK] button (<g>).

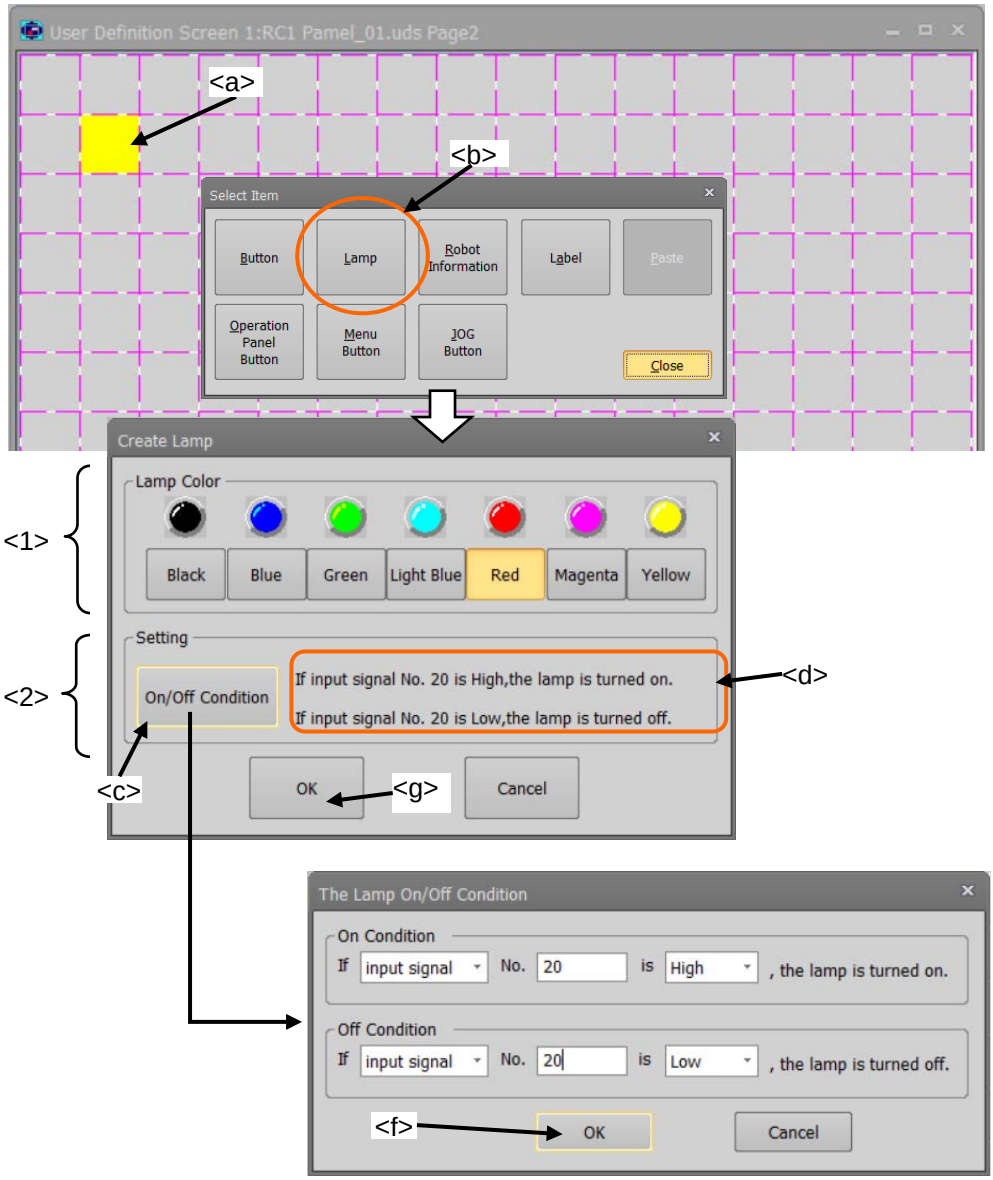


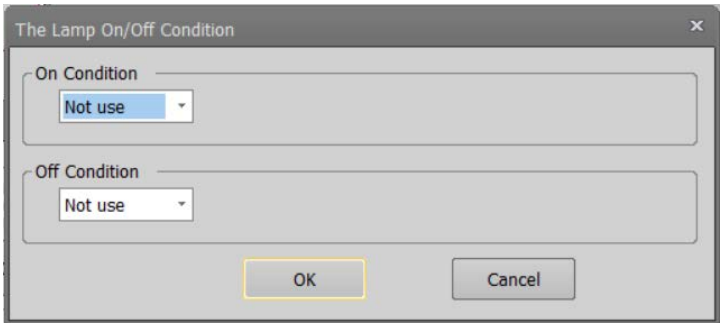
Figure 18-30 Creating a lamp

<1> Lamp color : The lighting color of the lamp can be selected.
<2> Setting : The lamp turning on / off conditions can be set.
If only one condition is set, the lamp will operate as if the other condition is set to the opposite High/Low state for the same signal number.
Moreover, when both the ON condition and the OFF condition are true, the ON condition is given priority.

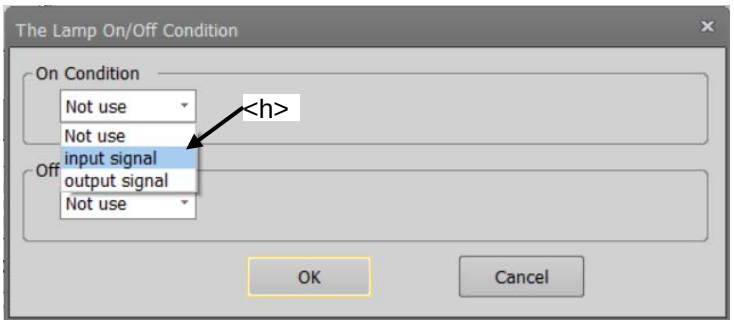
Example of setting lamp ON/OFF

Here we will describe an example where a lamp is turned on when the input signal number 20 is high, and is turned off when the input signal number 20 is Low.

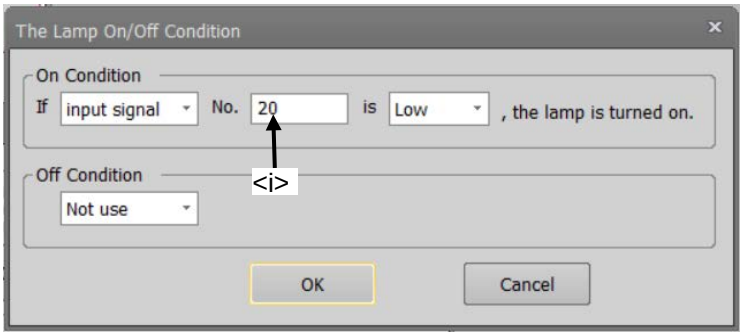
(1) The default value of “The Lamp on/off condition” window is shown in the figure at right.



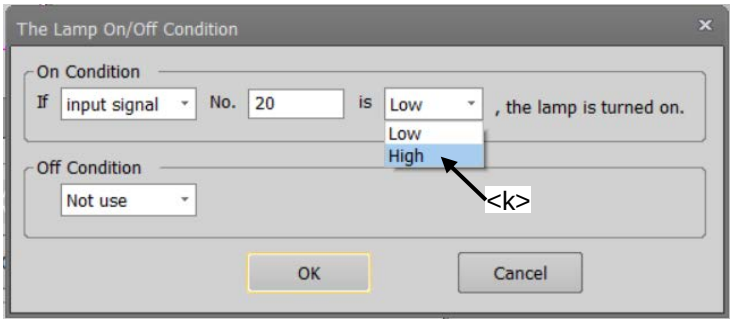
(2) Set the “On condition”.
Click <h>, and Select the signal type.
Now, select “input signal”.



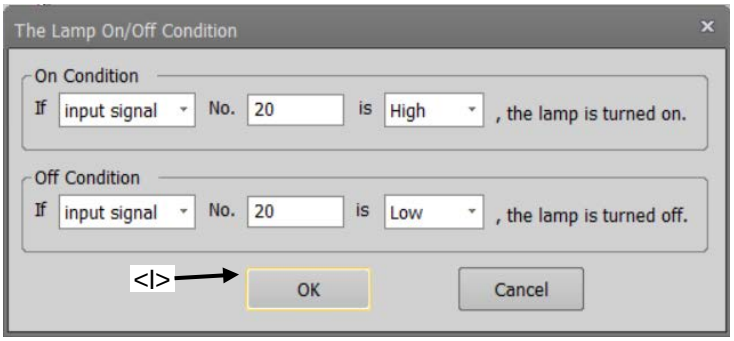
(3) Input “20” for the signal number (<i>).



(4) Select "High" (<k>), as signal state to light the lamp.



(5) Similarly, set the condition for turning off the lamp, and click the [OK] button (<l>).



18.3.2.3. 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 at this position.
(2) After the "Select item" window is displayed, click the [Robot information] button (<b>).
(3) Select "variable" (<c>) as the type in the “Create robot information” window.
(4) After setting the information of the variable, click the [OK] button (<d>).

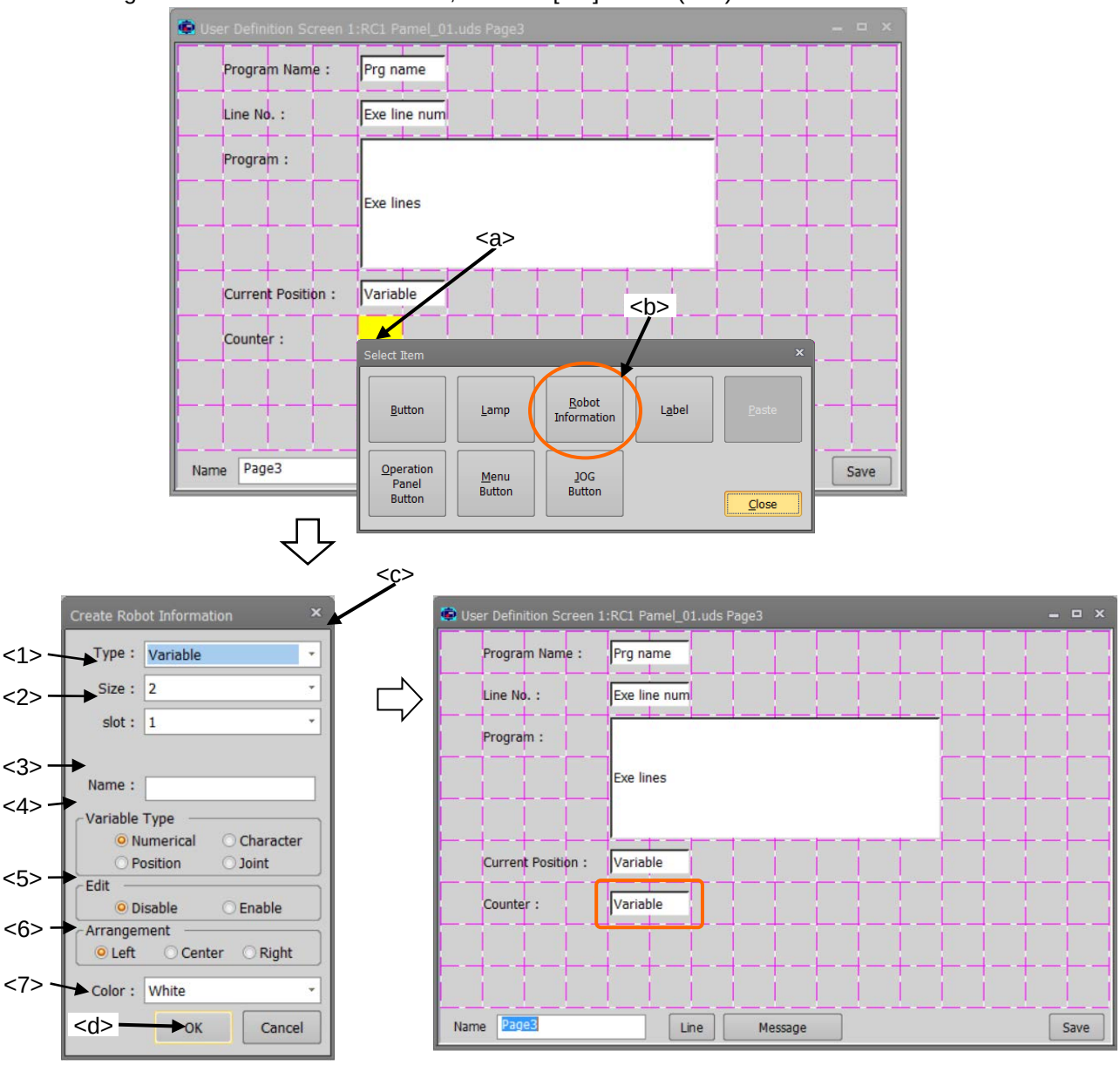


Figure 18-31 Creating a display of the variable

<1> Size	:	Set the width of box in which the variable is displayed. A value from 1 to 16 can be set.
<2> Slot	:	Select task slot number for which the variable is used. The range of slot numbers that can be set differs according to the system using it.
<3> Name	:	Set the variable name. Robot Status Variables also can be set.
<4> Variable type	:	Select the variable type.
<5> Edit	:	Select the edit permissions of the variable When set to Enable, while displaying this screen you can change the value of this variable by touching this part and displaying the input value screen. (Only when T/B state is enabled.)
<6> Arrangement	:	Select the position at which the variable is arranged.
<7> Color	:	Select the background color of the area where the variable is displayed.

18.3.2.4. Program execution content

The content of the program being executed is displayed. Up to 7 lines can be displayed.

(1) Click the position (block) in which the content of the program is displayed (<a>). The left side of the program execution content is arranged in this position.
(2) After the "Select item" window is displayed, click the [Robot information] button (<b>).
(3) Select "Exe line" (<c>) as the type on “Create robot information” window.
(4) After setting the information on the execution content, click the [OK] button (<d>).

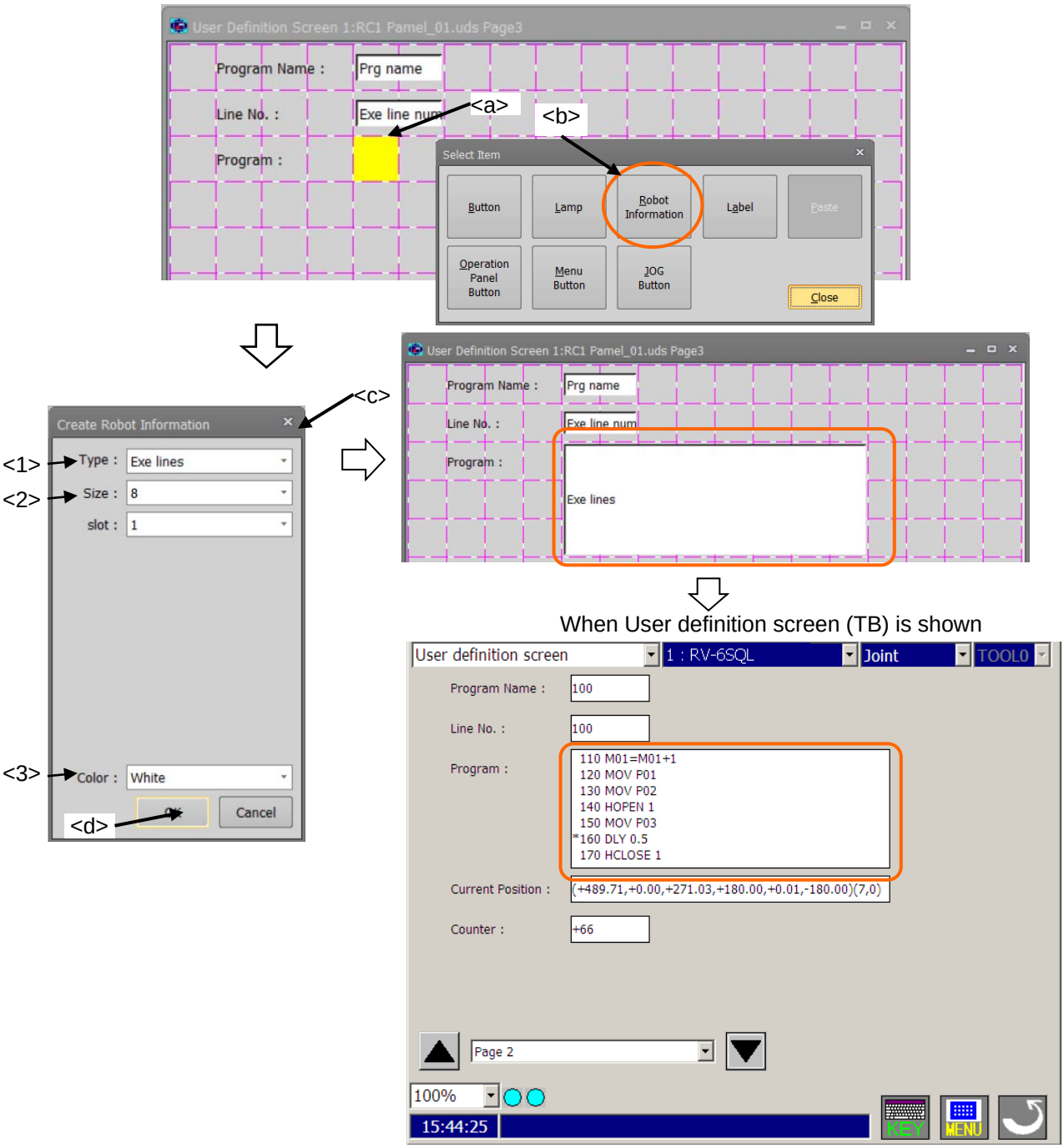


Figure 18-32 Creating a display of the program execution content

<1> Size	:	Set the width of the box in which the content of program is displayed. A value from 1 to 16 can be set.
<2> Slot	:	Select the task slot number for which the program is executed. The range of slot numbers that can be set differs according to the system using it.
<3> Color	:	Select the background color of the area where the program execution content is displayed.

18.3.2.5. Program name

The name of program being executed is displayed.

(1) Click the position (block) in which program name is displayed (<a>). The left side of the name display box is arranged in this position.
(2) After the "Select item" window is displayed, click the [Robot information] button (<b>).
(3) Select "Program name" (<c>) as the type in the “Create robot information” window.
(4) After setting the information regarding program name display, click the [OK] button (<d>).

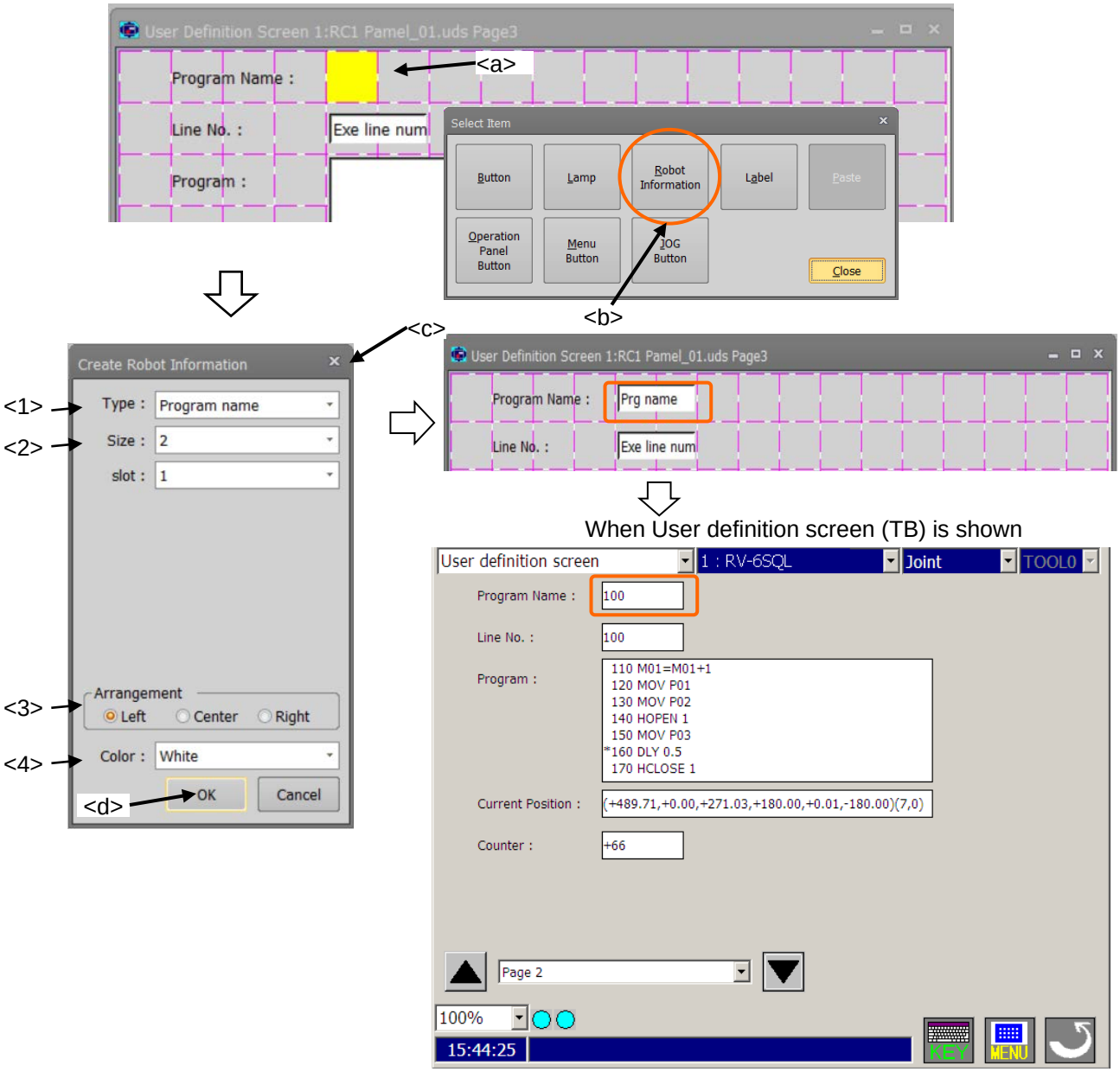


Figure 18-33 Creating a display of the program name

<1> Size	:	Set the width of box in which program name is displayed. A value from 1 to 16 can be set.
<2> Slot	:	Select task slot number displaying the program name. The range of slot numbers that can be set differs according to the system using 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.

18.3.2.6. Execution line number of program

The line number of the program being executed is displayed.

(1) Click the position (block) at which execution line number is displayed (<a>). The left side of the execution line number display is arranged in this position.
(2) After the "Select item" window is displayed, click the [Robot information] button (<b>).
(3) Select "Exe line num" (<c>) as the type in the “Create robot information” window.
(4) After setting the information on the execution line number, click the [OK] button (<d>).

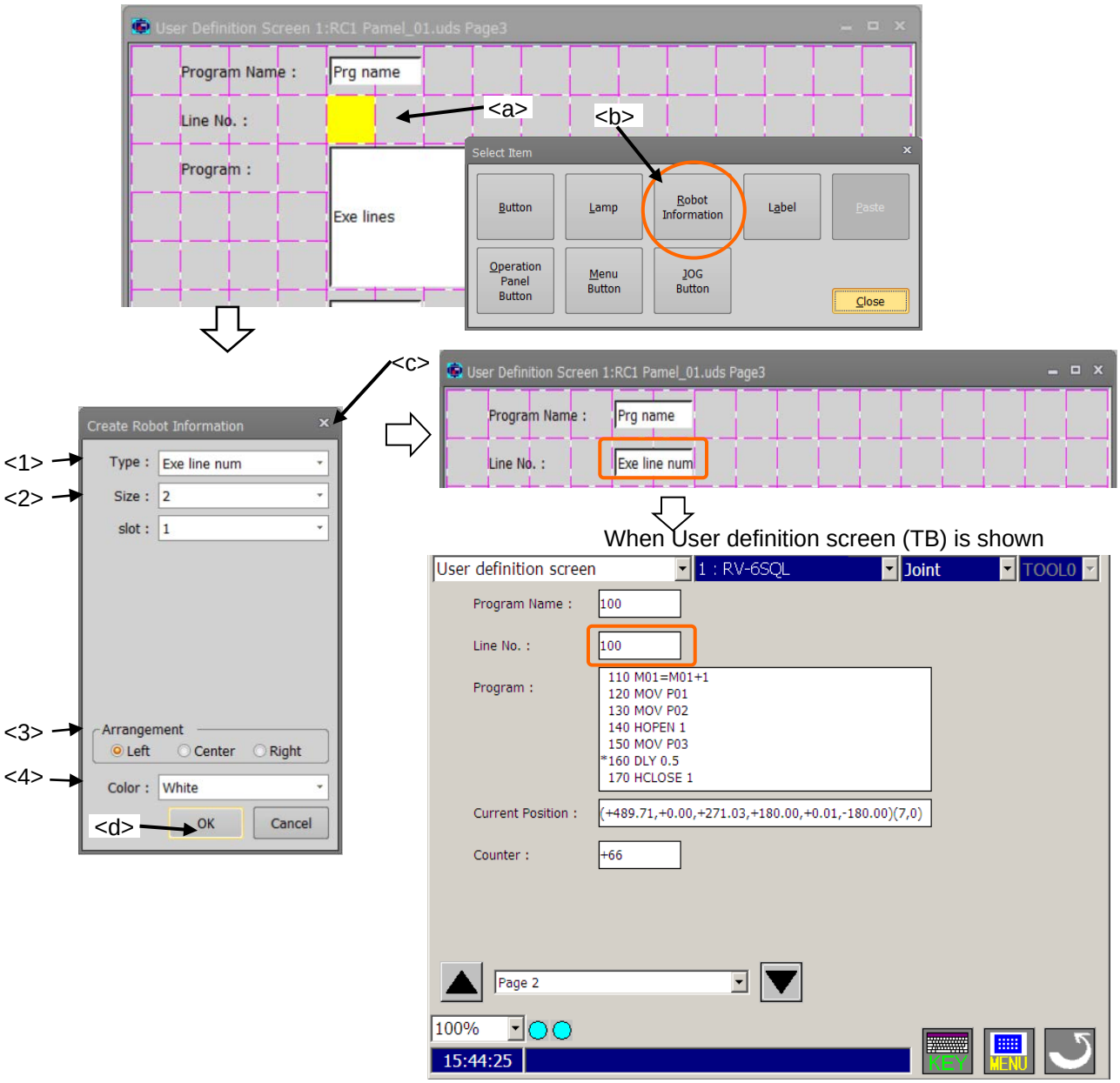


Figure 18-34 Creating a display of the execution line number of program

<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 the task slot number for which the program is executed. The range of slot numbers that can be set differs according to the system using it.
<3> Arrangement	:	Select the position at which execution line number is arranged.
<4> Color	:	Select the background color of the area where the execution line number is displayed.

18.3.2.7. Current position data (the XYZ coordinate system)

The current position data of robot is displayed for each XYZ coordinate system axis.
To display the current position data (the XYZ coordinate system) all together, use the “Variable” type and set the Robot Status Variable “P_CURR”. Refer to **“18.3.2.3 Variable"** for details.

(1) Click the position (block) at which the current position data is displayed (<a>). The left side of the display is arranged in this position.
(2) After the "Select item" window is displayed, click the [Robot information] button (<b>).
(3) Select "Cur pos" (<c>) as the type in the “Create robot information” window.
(4) After setting the information of the current position data (the XYZ coordinate system), click the [OK] button (<d>).

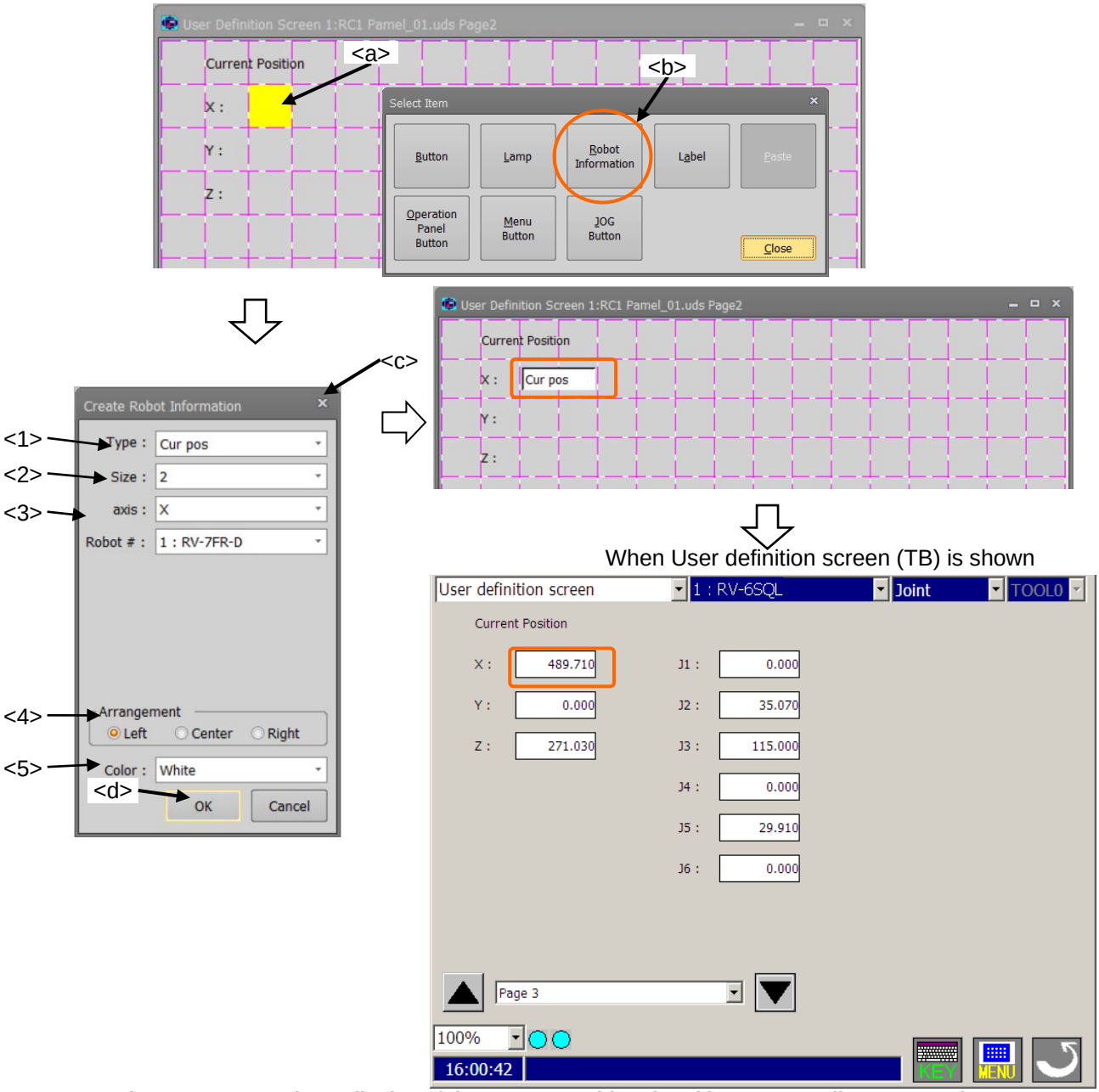


Figure 18-35 Creating a display of the current position data (the XYZ coordinate system)

<1> Size	:	Set the width of box in which the current position data (the XYZ coordinate system) is displayed. A 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 for which the current position data is displayed.
<4> Arrangement	:	Select the position at 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.

18.3.2.8. Current position data (the joint coordinate system)

The current position data of robot is displayed for each joint coordinate system axis.
To display the current position data (the joint coordinate system) all together, use the "Variable" type and set the Robot Status Variable "J_CURR". Refer to **"18.3.2.3 Variable"** for details.

(1) Click the position (block) at which the current position data is displayed (<a>). The left side of the box is arranged in this position.
(2) After the "Select item" window is displayed, click the [Robot information] button (<b>).
(3) Select "Cur jnt" (<c>) as the type in the “Create robot information” window.
(4) After setting the information on the current position data (the joint coordinate system), click the [OK] button (<d>).

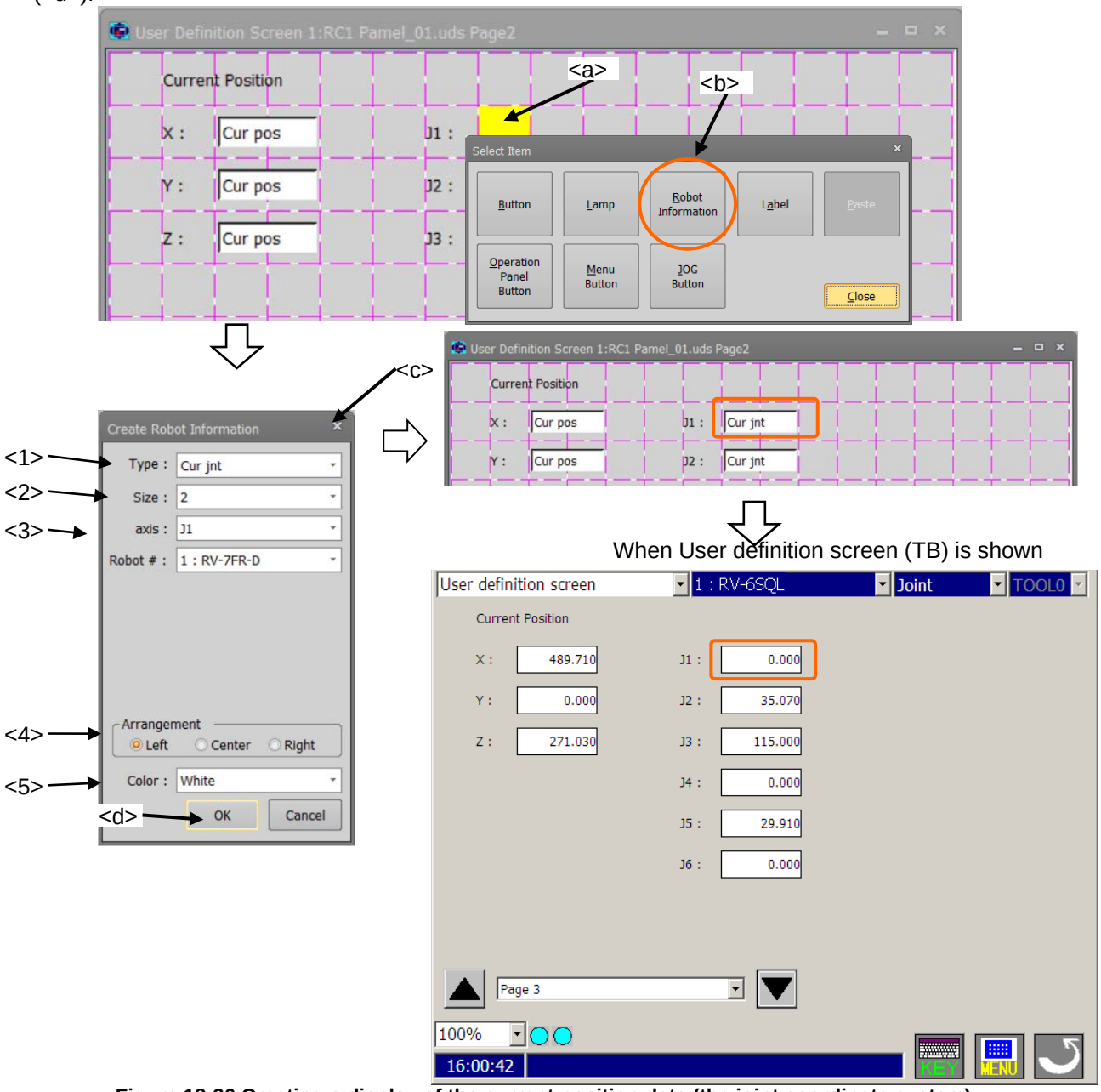


Figure 18-36 Creating a display of the current position data (the joint coordinate system)

<1> Size	:	Set the width of the box in which the current position data (the joint coordinate system) is displayed. A 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 for which the current position data is displayed.
<4> Arrangement	:	Select the position at 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.

18.3.2.9. Operation Panel Button

You can place each the button that exists in the operation panel ([START] button etc.) at the specified position. T / B can be used with Software Ver. 4.1 or later.

(1) Click the position (block) in which the operation panel button is made (<a>). The operation panel button is arranged in this position.
(2) After "Select item" window is displayed, click [Operation Panel Button] button (<b>).
(3) Select the kind of operation panel button on “Create Operation Panel Button” window (<c>).
(4) After the above selection, click [OK] button on “Create Operation Panel Button” window (<d>).

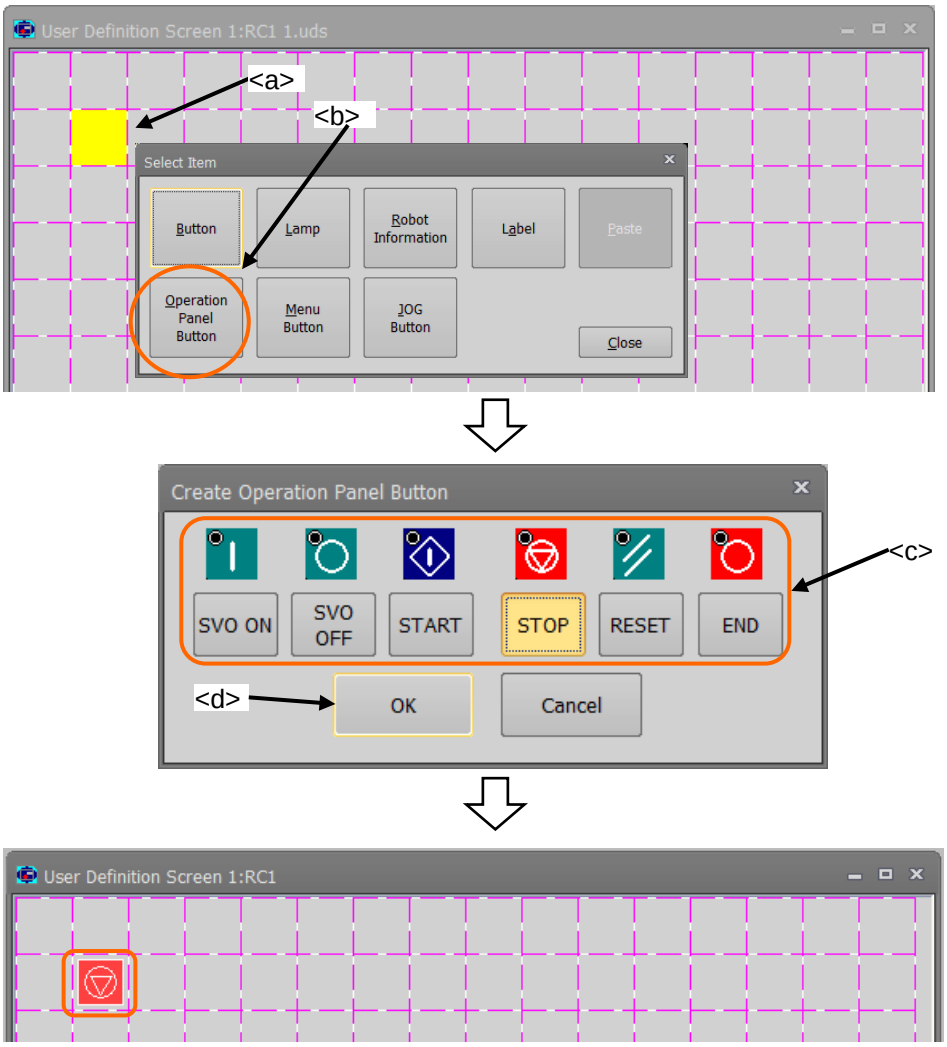


Figure 18-37 Create of a operation panel button

You can place each the button that exists in the operation panel ([START] button etc.) at the specified position.

Button image	Button name	Explanation
	SVO ON	Turn on the servo.
	SVO OFF	Turn off the servo.
	START	Start the driving.
	STOP	Stop the driving immediately.
	RESET	Reset the robot program.
	END	End the driving.

18.3.2.10. Menu

Menu buttons can be configured at the specified location.
This function can be used after the software version Ver.1.40S and T/B software version er.4.1.

(1) Click the Location <a> to make menu button. The button uses 2 areas from the left of the current position.
(2) Select [Menu Button] <b> in the [Select Item] dialog.
(3) Select the menu button <c> to be created in the [Create menu button] dialog. The menu button image at the time of execution will be displayed at the bottom left of the dialog.
(4) Click the [OK] button.

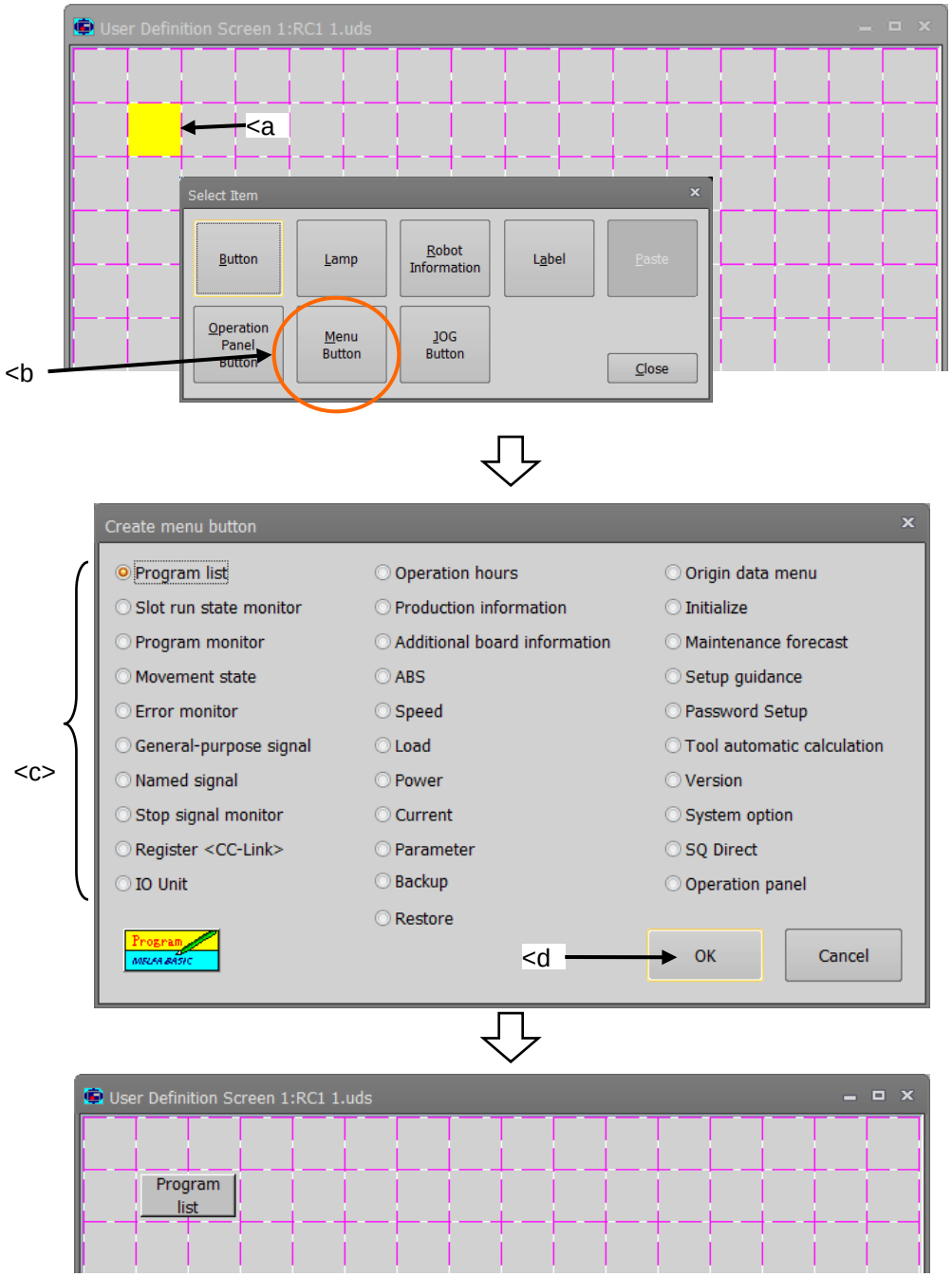


Figure 18-38 Creat menu button

The menu button type is as follows. Click and move to this screen function only corresponds to T/B.

Runtime button image	Creation button image	Description
Program MELSA BASIC	Program list	Move to program list screen.
Slot run State	Slot run state monitor	Move to slot run state monitor screen.
Program Monitor	Program monitor	Move to program monitor screen.
Movement State	Movement state	Move to movement state monitor screen.
ERROR	Error monitor	Move to error monitor screen.
IN OUT General Purpose Signal	General signal	Move to general signal monitor screen.
Named Signal	Named signal	Move to named signal monitor screen.
Stop Signal	Stop signal	Move to stop signal monitor screen.
Register CC-Link	Register <CC-Link>	Move to register<CC-Link> monitor screen.
IO Unit	IO Unit	Move to IO unit monitor screen.
Operation hours	Operation hours	Move to operation hours screen.
Production Information	Production information	Move to production information monitor screen.
Additional Board Information	Additional board	Move to additional board screen.
ABS ABS	ABS	Move to position monitor screen.
SPEED	Speed	Move to speed monitor screen.
Mol LOAD	Load	Move to load monitor screen.
POWER	Power	Move to power monitor screen.
CURRENT	Current	Move to current monitor screen.
Parameter	Parameter	Move to parameter edit screen.
	Backup	Move to backup screen.
	Restore	Move to restore screen.
OriginData	Origin data menu	Move to origin data menu screen.

	Initialize	Move to initialize screen.
	Maintenance forecast	Move to maintenance forecast screen.
	Setup guidance	Move to setup guidance screen.
	Password Setup	Move to password setup screen.
	Tool auto calculation	Move to tool auto calculation screen.
	Version	Move to version screen.
	System option	Move to system option screen.
	SQ Direct	Move to SQ direct position edit screen.
	Operation panel	Move to operation panel screen.

18.3.2.11. Jog

Jog buttons can be configured at the specified location.
This function can be used after the software version Ver.1.40S and T/B software version er.4.1

(1) Click the Location <a> to make jog button.
(2) Select [JOG Button] <b> in the [Select Item] dialog.
(3) Select the jog button <c> to be created in the [Create menu button] dialog. The jog button image at the time of execution will be displayed at the bottom left of the dialog.
(4) Select the Fixed-dimension.
(5) Click the [OK] button.

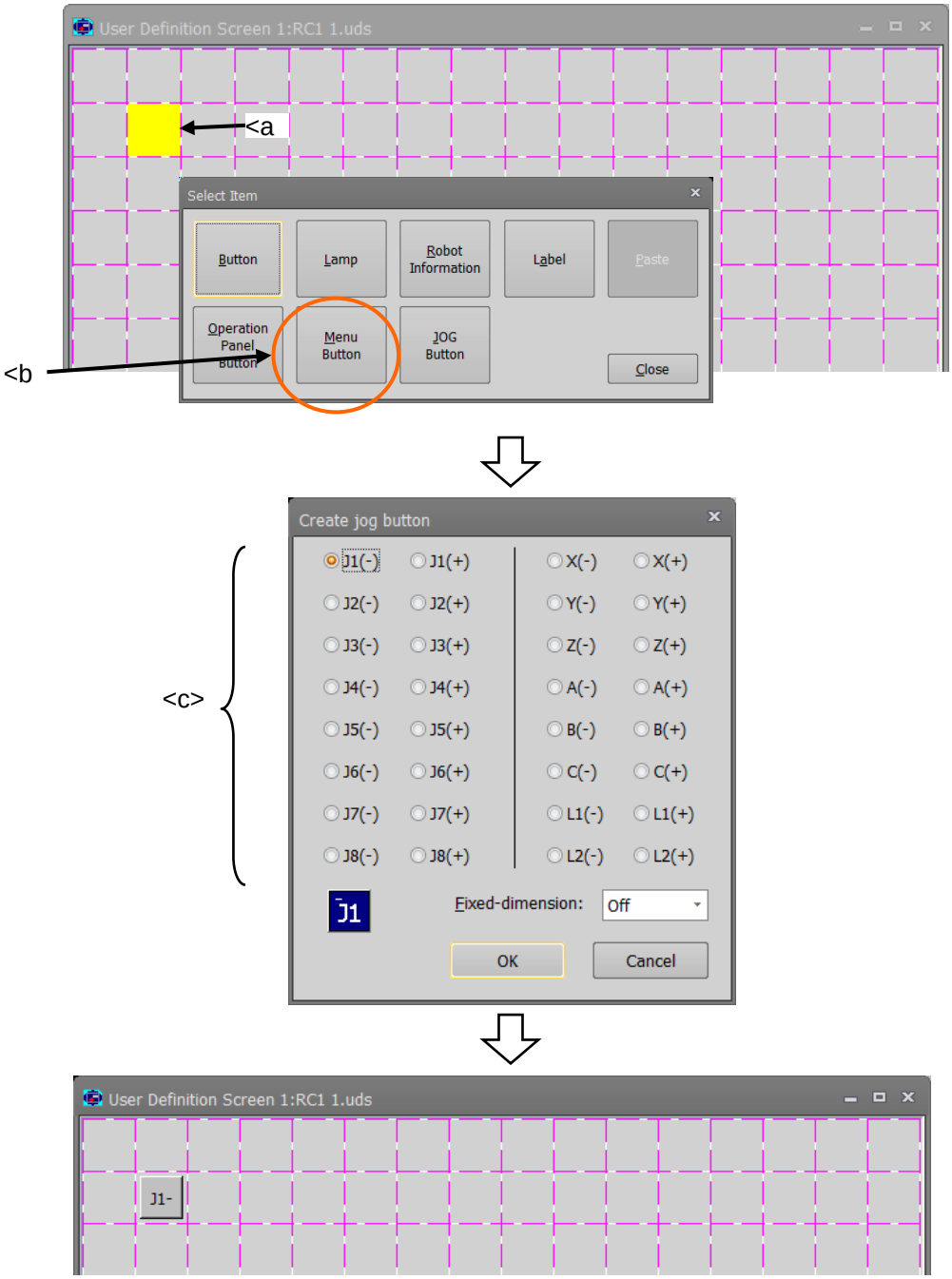


Figure 18-39 Creat jog button

Fixed-dimension	Description
Off	Press the button to move the axis.
High	The axis will move the amount specified by the JOG parameter movement amount H.
Low	The axis will move the amount specified by the JOG parameter movement amount L.

Runtime button image	Creation button image	Description
J1 J1+	J1- J1+	Move J1 axis.
J2 J2+	J2- J2+	Move J2 axis.
J3 J3+	J3- J3+	Move J3 axis.
J4 J4+	J4- J4+	Move J4axis.
J5 J5+	J5- J5+	Move J5 axis.
J6 J6+	J6- J6+	Move J6 axis.
J7 J7+	J7- J7+	Move J7 (additional axis) axis.
J8 J8+	J8- J8+	Move J8 (additional axis) axis.
X X+	X- X+	Move in X coordinate direction.
Y Y+	Y- Y+	Move in Y coordinate direction.
Z Z+	Z- Z+	Move in Z coordinate direction.
A A+	A- A+	Rotate around the X axis.
B B+	B- B+	Rotate around the Y axis.
C C+	C- C+	Rotate around the Z axis.
L1 L1+	L1- L1+	Move L1 (additional axis) axis.
L2 L2+	L2- L2+	Move L2 (additional axis) axis.

18.3.2.12. Label

A label can be displayed at the specified position.

(5) Click the position (block) at which the label is made (<a>). The label is arranged in this position.
(6) After the "Select item" window is displayed, click the [Label] button (<b>).
(7) After setting the label in the “Create label” window, click the [OK] button (<c>). T

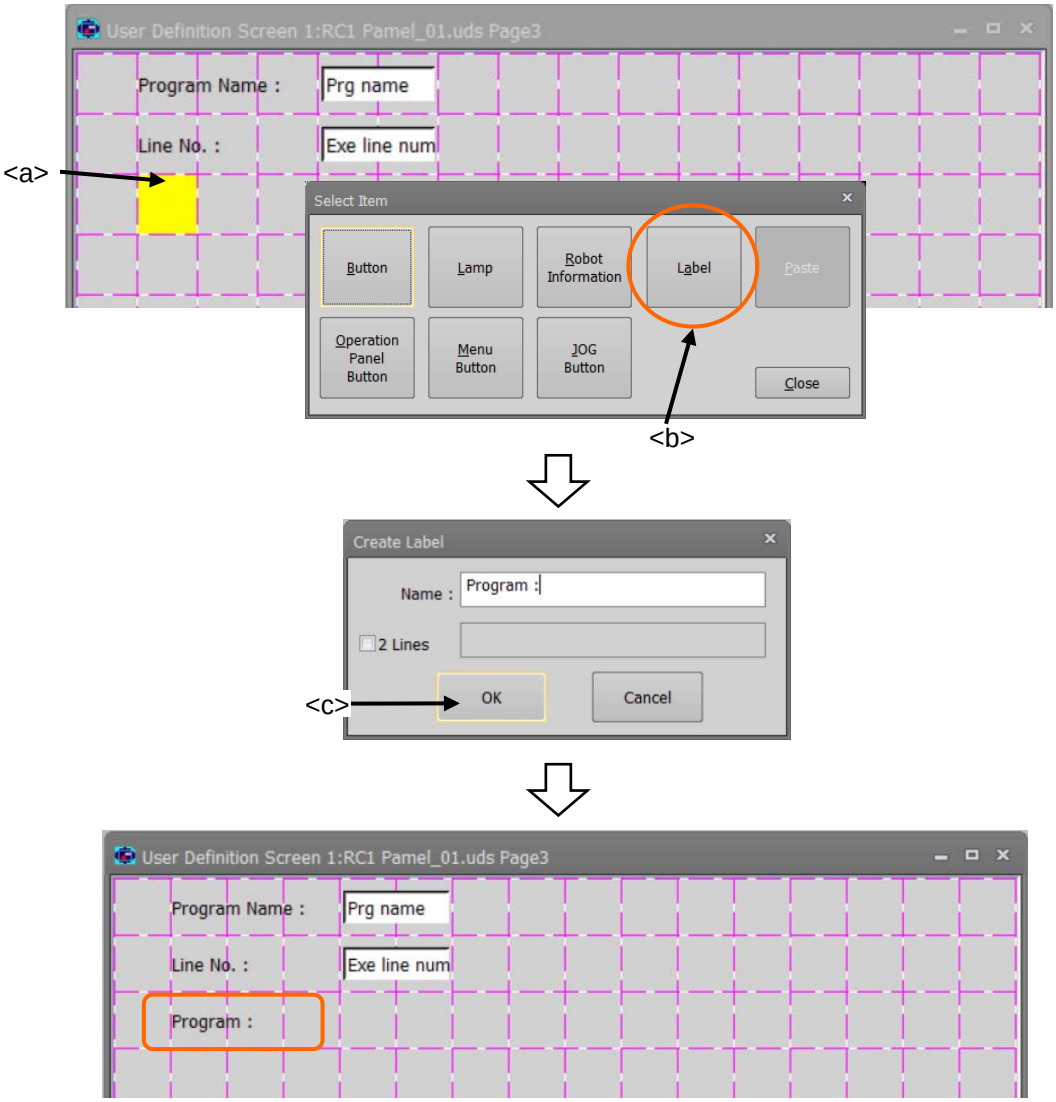


Figure 18-40 Create of a label

18.3.2.13. Message

You can display a message when the set conditions met (It is not always displayed on the screen). You can also set the behavior when clicking the button displayed on the message.

(1) Click the [Message] button (<a>), then “Message List” window will be displayed.
(2) To add a new message, click the [Add] button (<b>). To edit the existing message, select the target message and click the [Edit] button. Then “Message Editor” window will be displayed.
(3) A Set the kind of displayed icon, displayed message, etc., and click the [OK] button. Then the set contents will be displayed in the list (<c>).

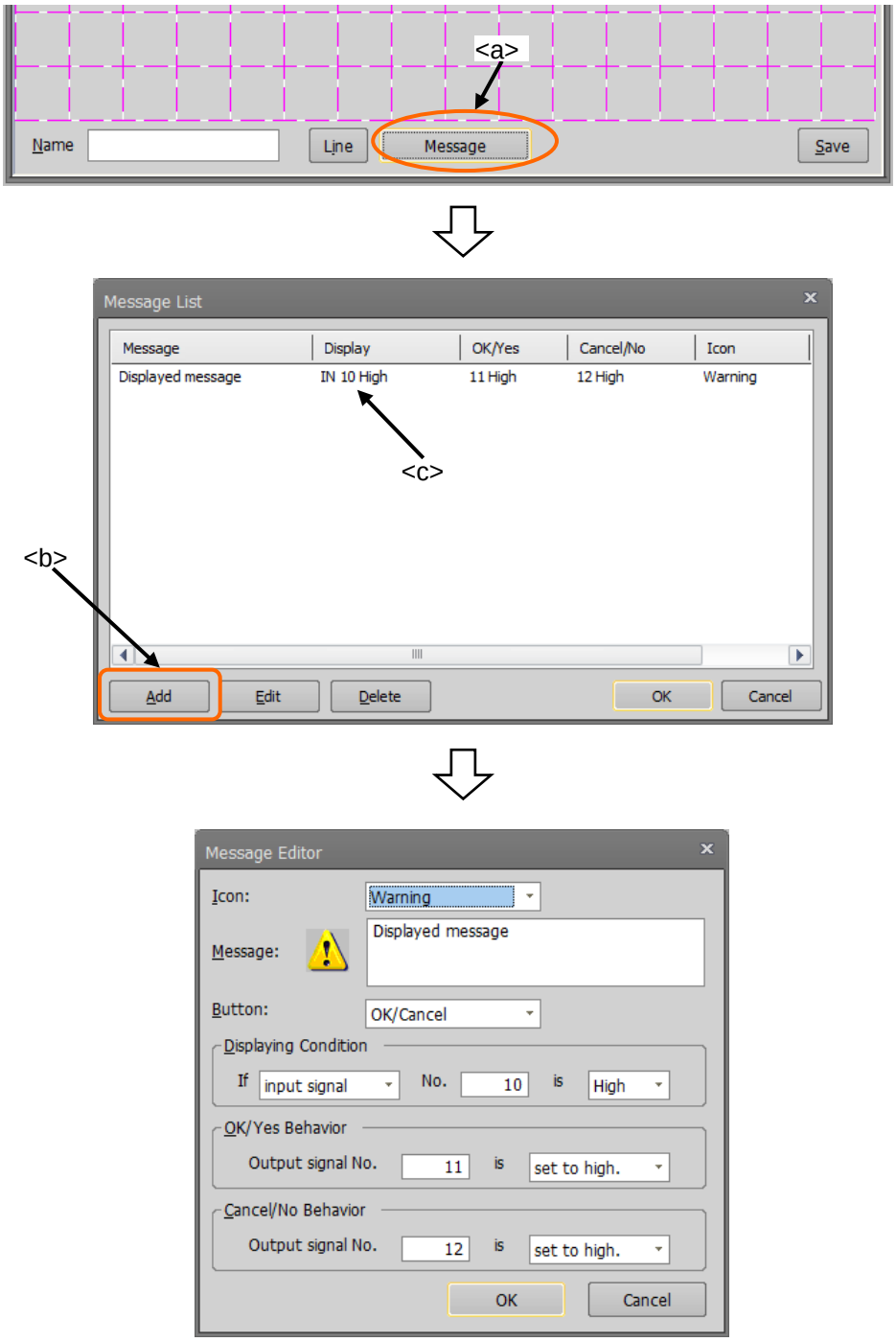


Figure 18-41 Create of a message

18.3.2.14. Save and end of editing user definition screen

After editing the user definition screen, click the [Save] button (<a>).
Click [x] (<b>) to conclude the edit.

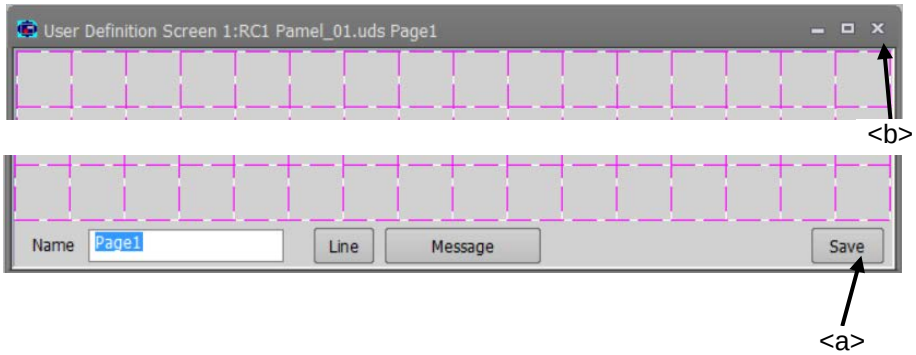


Figure 18-42 Save and end of editing user definition screen

18.3.3. Editing of existing parts

Edit already-registered parts by the following operation.

(1) Click the part to be edited (<a>).
(2) After the "Edit menu" window is displayed, click the [Edit] button (<b>).
(3) The edit screen for the selected parts is displayed. Change the setting contents and click the [OK] button (<c>).

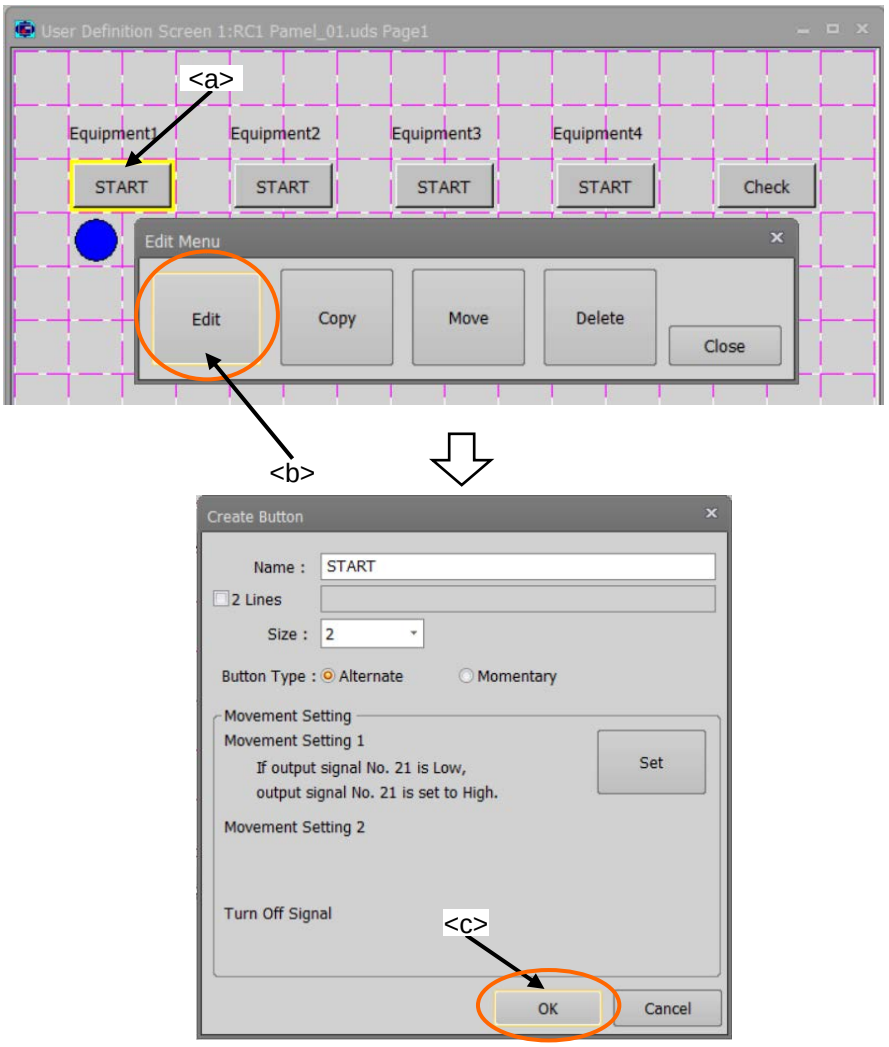


Figure 18-43 Edit of existing parts

18.3.4. Copying/Pasting of parts

Parts can be copied.

(1) Click the part to copy to select it (<a>).
(2) After the "Edit menu" window is displayed, click the [Copy] button (<b>).
(3) Click the position (block) where the part is copied onto (<c>).
(4) After the "Select item" window is displayed, click the [Paste] button (<d>).
At this time, the position (block) where the part is copied onto is green.
A copy confirmation message will be displayed. Click the [Yes] button.

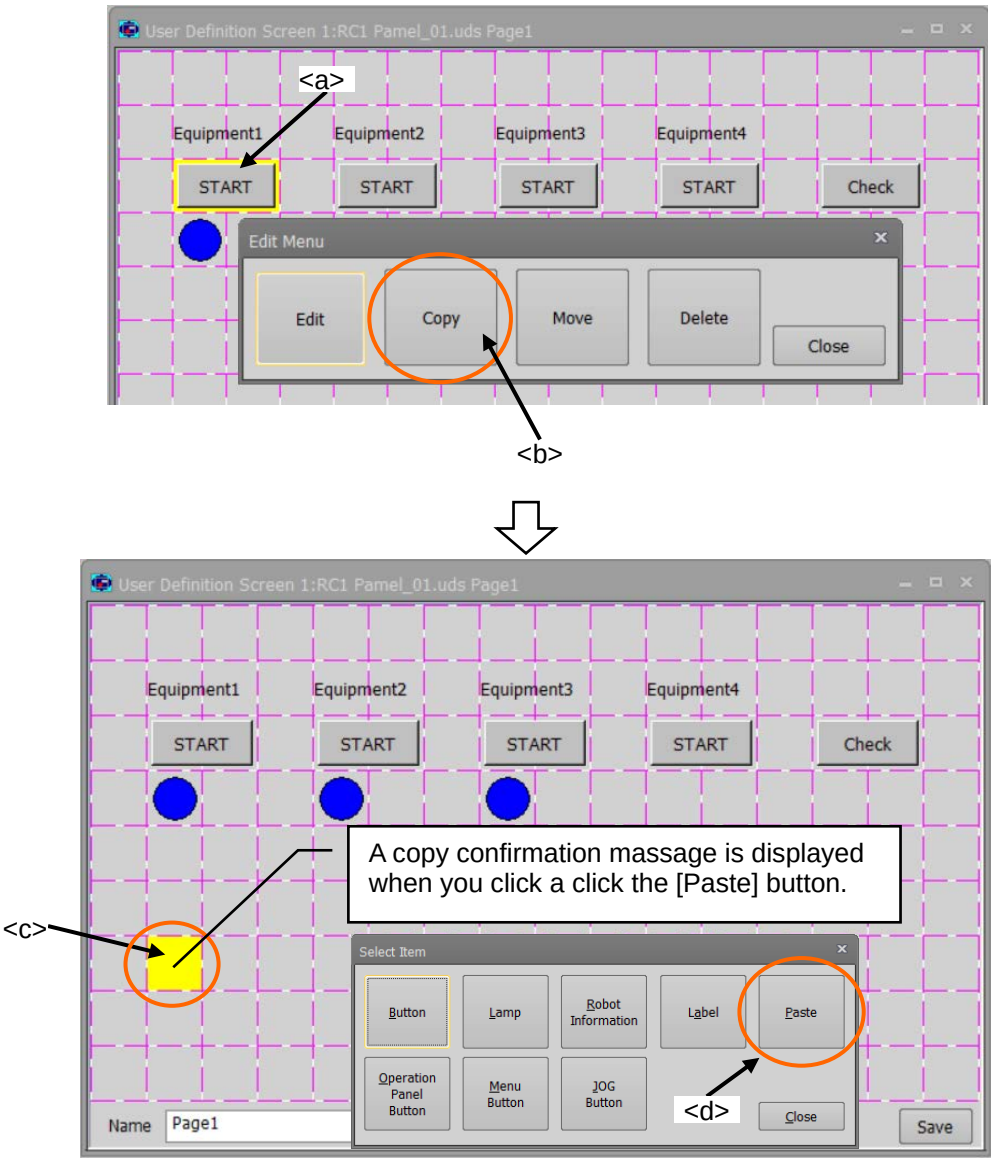


Figure 18-44 Copy/Paste of parts

18.3.5. Movement of parts

Parts can be moved.

(1) Click the part to move to select it (<a>).
(2) After the "Edit menu" window is displayed, click the [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.
A move confirmation message will be displayed. Click the [Yes] button.

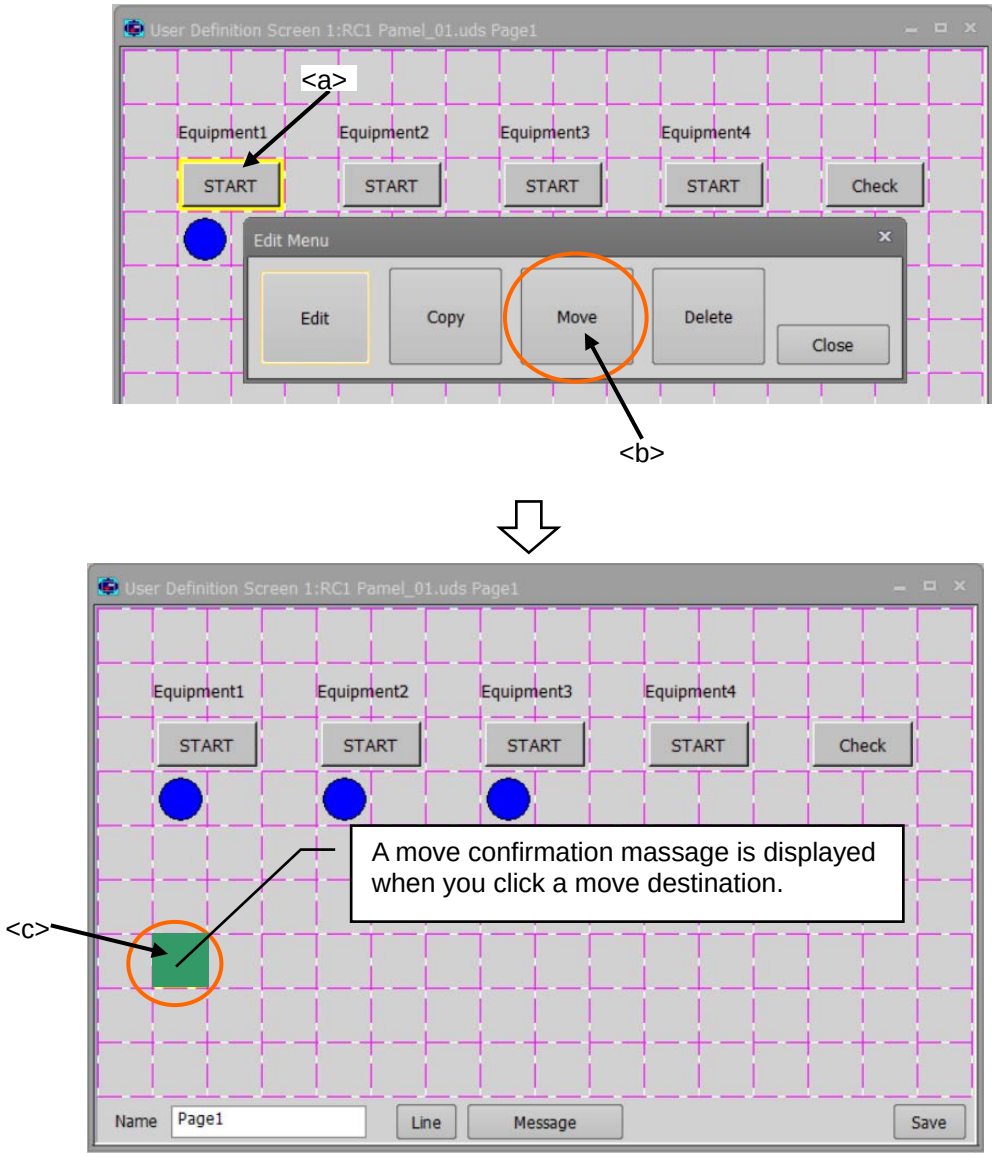


Figure 18-45 Movement of parts

18.3.6. Deletion of parts

Parts can be deleted.

(1) Click the part to delete to select it (<a>).
(2) After the "Edit menu" window is displayed, click the [Delete] button (<b>).
(3) Click the [Yes] button on the confirmation message.

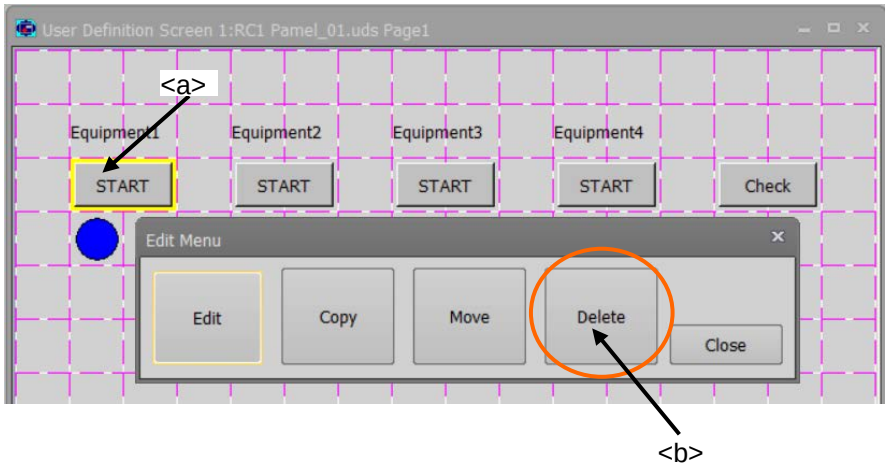


Figure 18-46 Deletion of parts

18.3.7. Changing the page name

The page name can be changed in [Name] in the lower left of the window.

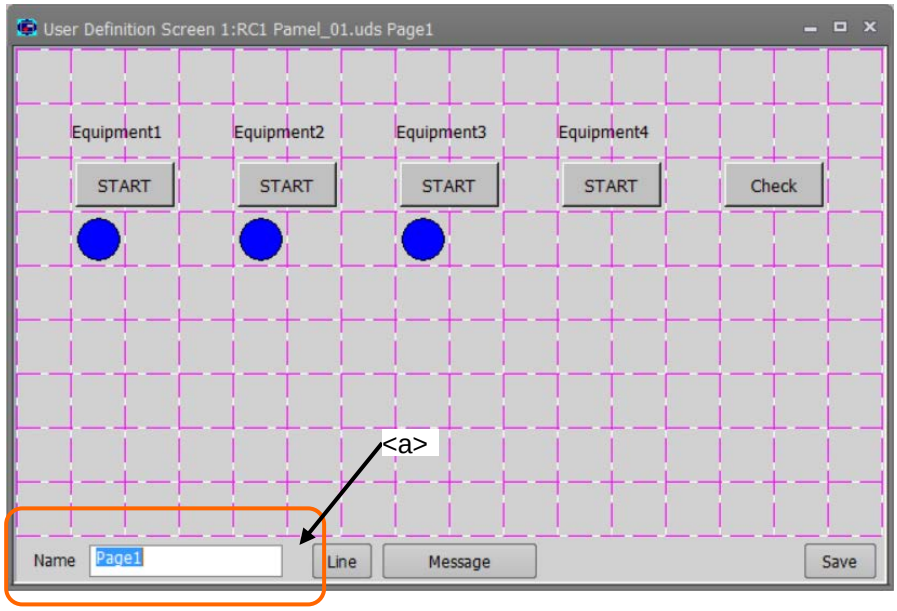


Figure 18-47 Change of page name

Caution

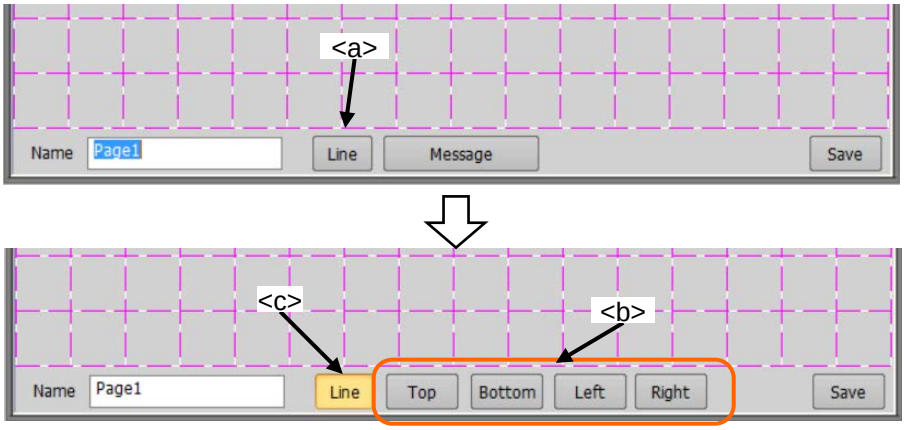
When an already-registered page name is input, an error will result.

18.3.8. Edit of ruled lines

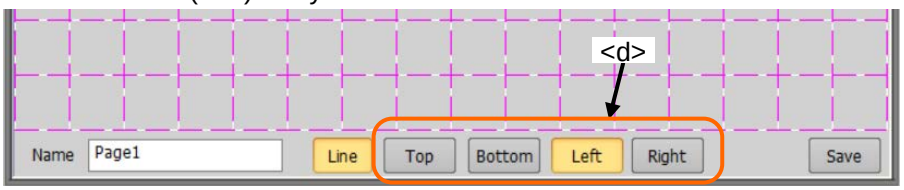
Ruled lines can be drawn on the user definition screen.

18.3.8.1. Drawing the ruled line

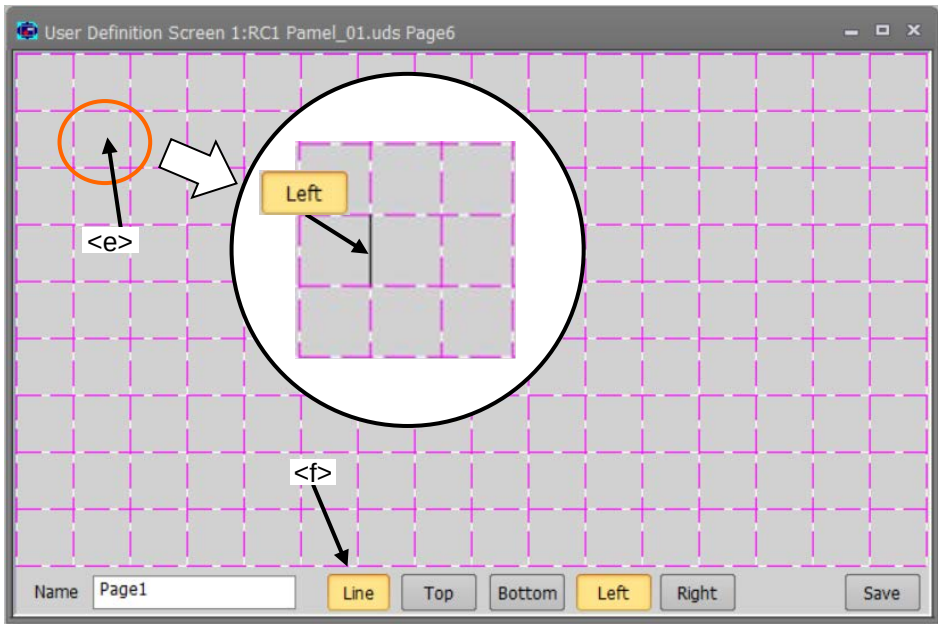
(1) Click [Line] button (<a>) on the window.
(2) The buttons ("[Top], [Bottom], [Left], [Right]") (<b>) for the ruled line are displayed at the right of [Line] button. These buttons for drawing the ruled lines disappear when [Line] button (<c>) is clicked again.



(3) Select the kind of ruled line (<d>). Only one kind of ruled line can be selected.



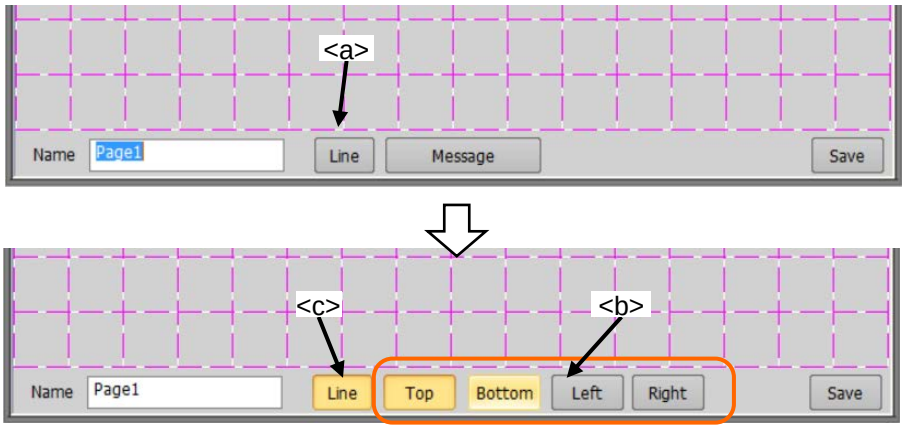
(4) Click the block (<e>) where the ruled lines are drawn. Ruled lines can be drawn at the specified position on the selected block.



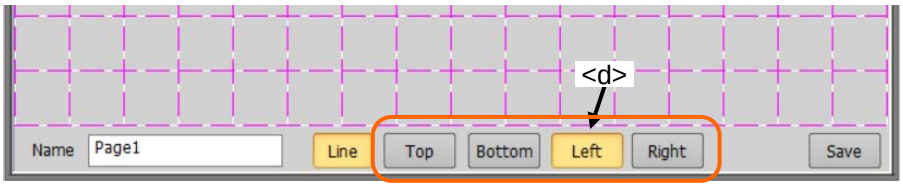
(5) After editing the ruled lines, click the [Line] button (<f>) again.

18.3.8.2. Erasing the ruled line

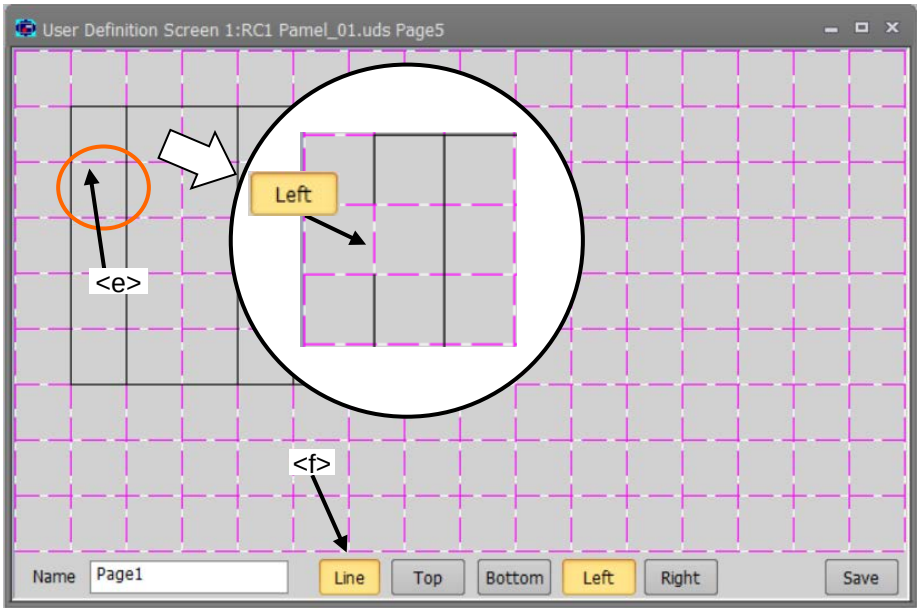
(1) Click the [Line] button (<a>) on the window.
(2) The buttons ("[Top], [Bottom], [Left], [Right]") (<b>) for the ruled lines are displayed at the right of the [Line] button. These buttons for drawing the ruled lines disappear when the [Line] button (<c>) is clicked again.



(3) Select the kind of ruled line (<d>). Only one kind of ruled line can be selected.



(4) Click the block (<e>) where the ruled lines are erased. The ruled line can be erased at the specified position on the selected block.



(5) After editing the ruled line, click the [Line] button (<f>) again.

18.3.9. Display of user definition screen

You can actually execute (display) the user definition screen you created in the editing screen when online.

(1) In the project tree, right click the screen name to be displayed and select the [view] from the displayed context menu. Then the Selected user definition screen will be displayed.
(2) In the displayed screen, the button, lamp and etc. actually work according to the state of connected robot controller.

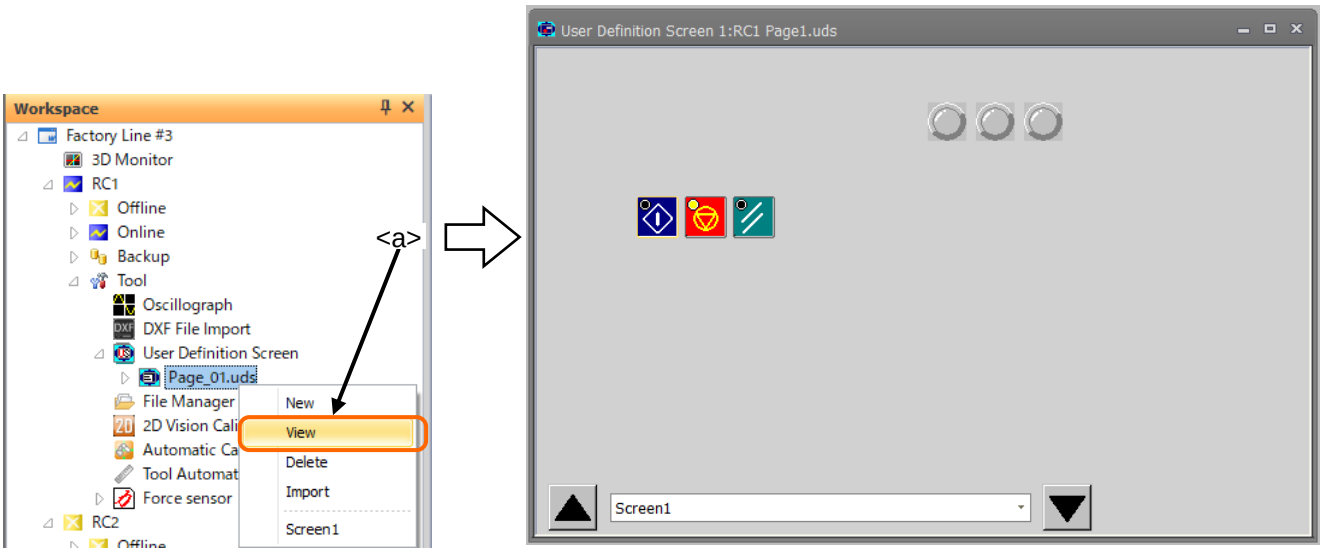


Figure 18-48 Display of user definition screen

18.3.10. Deletion of user definition screen

It is possible to delete the existing "User definition screen".
There are two methods to delete a 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) Deleting selected user definition screen from the inside of a user definition screen file.

However, the user definition screen during editing cannot be deleted.

18.3.10.1. Deletion of user definition screen file

All the user definition screens in a user definition screen file are deleted.

Select [Tool] -> [User definition screen] -> [“User definition screen file”] in the project tree, click the right mouse button and then select "Delete” in the right button menu. A confirmation message is displayed. Click the [OK] button. The entire selected user definition screen file and the user definition screens in it are deleted.

The user definition screen during editing cannot be deleted.

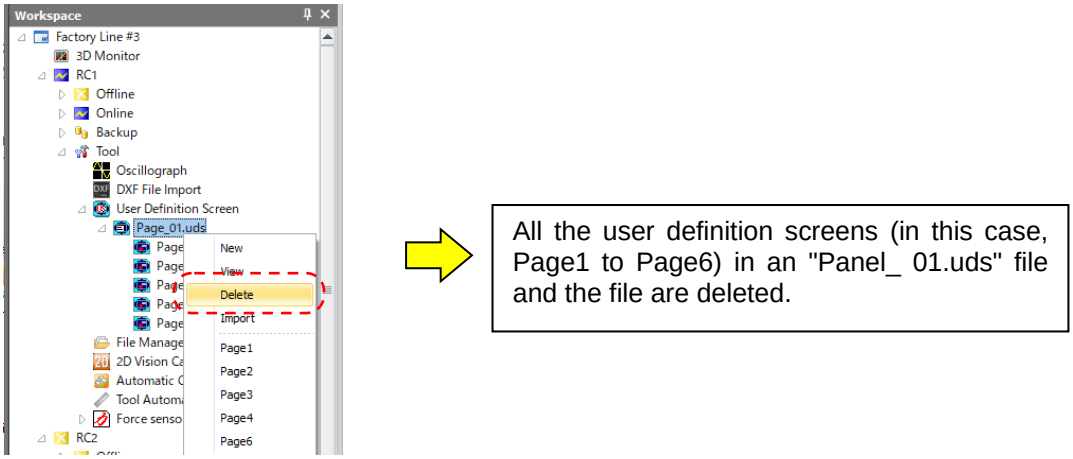


Figure 18-49 Deletion of user definition screen file

18.3.10.2. Deletion of page

The selected user definition screen pages in the user definition screen file are deleted.

Select [Tool] -> [User definition screen] -> [“User definition screen file”] -> [“User definition screen page”] in the project tree, click the right mouse button and then select “Delete” in the right button menu. A confirmation message is displayed. Click [OK] button. The selected user definition screen pages are deleted.

The user definition screens cannot be deleted during editing.

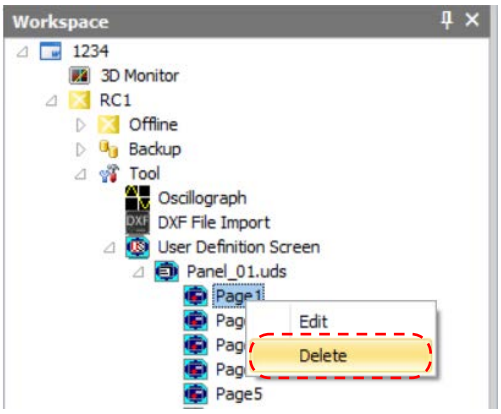


Figure 18-50 Deletion of page

18.3.11. Import of user definition screen

It is possible to import a user definition screen files created in other work spaces 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.

18.3.11.1. Importing the user definition screen files.

All the pages in the user definition screen files are imported.

Select [Tool] -> [User definition screen]-in the project tree, click the right mouse button and then select "Import" in the right button menu. The “Select import user definition screen file” screen is displayed. After selecting the import 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 a file of the same name exists in the project, an overwrite confirmation message is displayed.

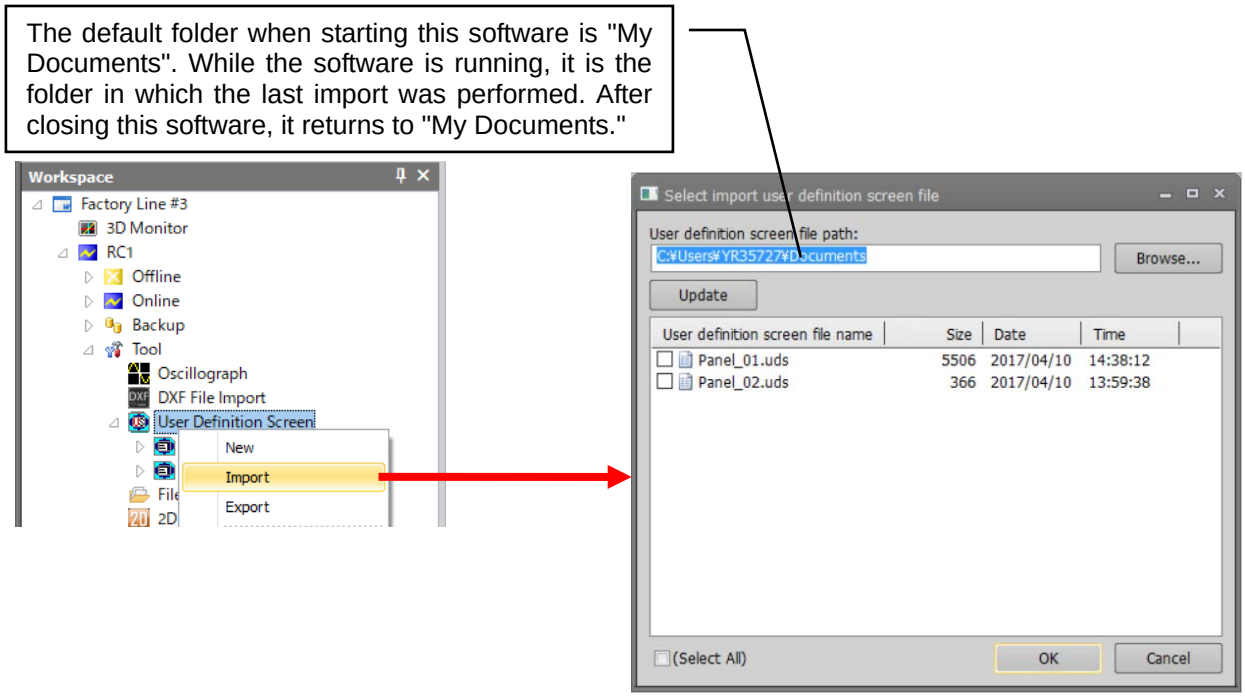


Figure 18-51 Importing the user definition screen files

18.3.11.2. Importing the page of the user definition screen

Importing the selected pages in the user definition screen file.

Select [Tool] -> [User definition screen] -> [“User definition screen file”] in the project tree, click the right mouse button and then select the "Import” in the right button menu. The “Select import user definition screen file” screen is displayed. Select the import files and click the [OK] button. The “Select import user definition screen” screen is displayed, and all the pages in the selected file are displayed. Select the import pages and click the [OK] button. The selected 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.

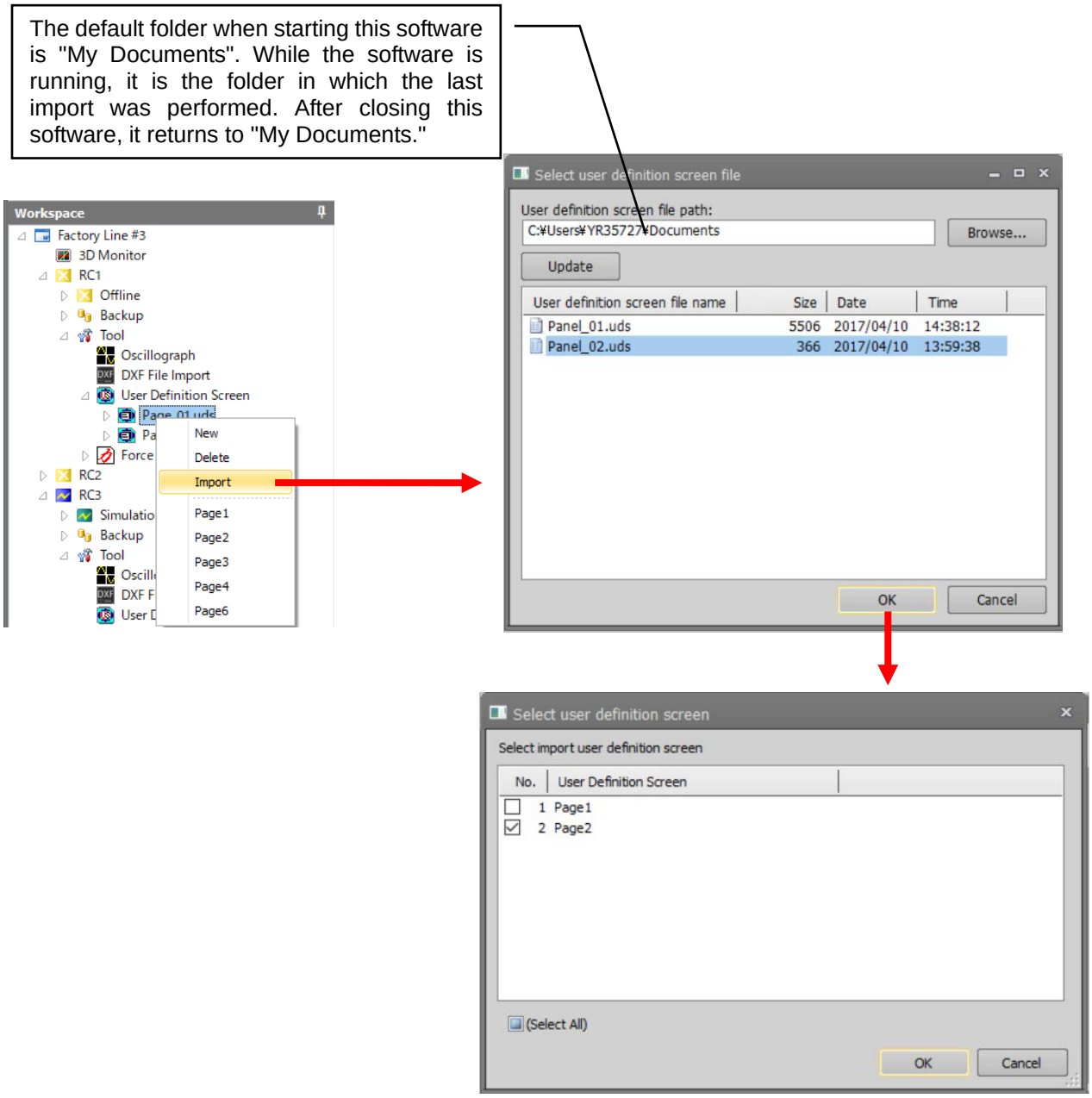


Figure 18-52 Importing the page of the user definition screen

When existing file of the same name exists in the project, the overwrite confirmation message is displayed. Clicking the “Overwrite” button will replace all the pages in the file. Import can also be performed after name change.

18.3.12. 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 projects. The user definition screen is exported in file units.

Select [Tool] -> [User definition screen] in the project tree, click the right mouse button and then select the "Export" in the right button menu. The “Select export user definition screen file” screen is displayed. Set the export path and select the export file, then click [OK] button. The selected user definition screen file is copied in the "export path" folder. Two or more pages can be exported simultaneously.

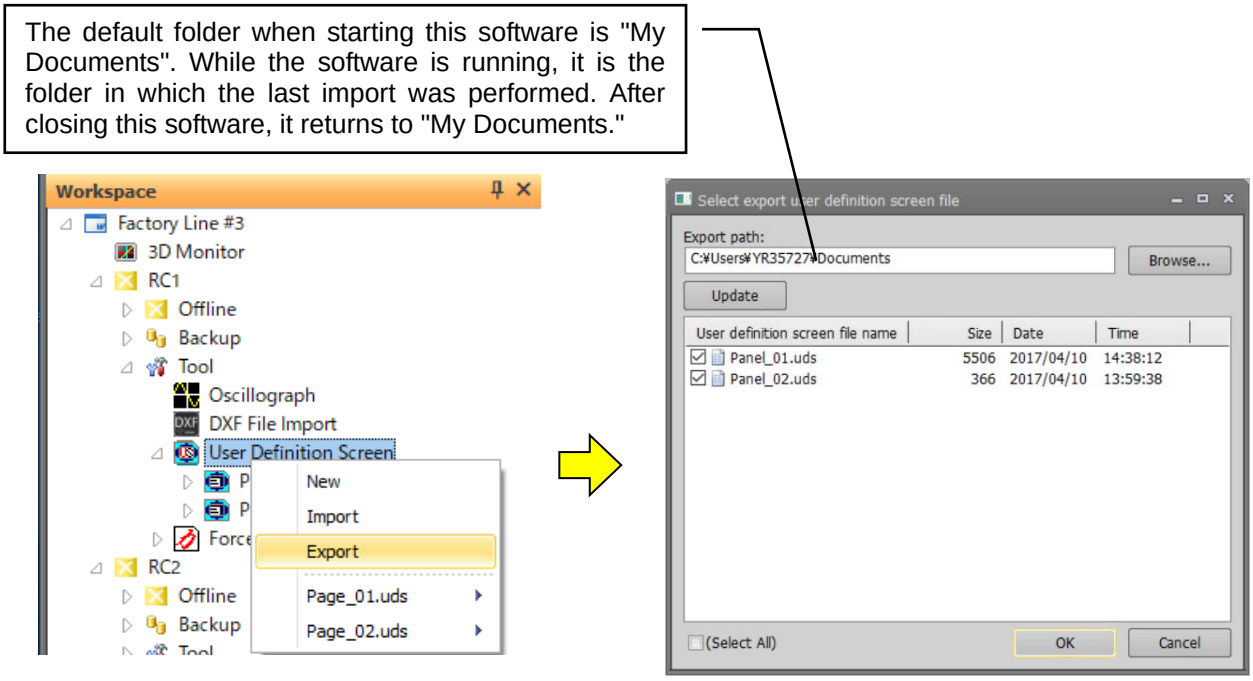


Figure 18-53 Export of the user definition screen

When a file of the same name exists in the "export path" folder, the overwrite confirmation message is displayed. Clicking the “Overwrite” button will replace all the pages in the file. Export can also be performed after name change.

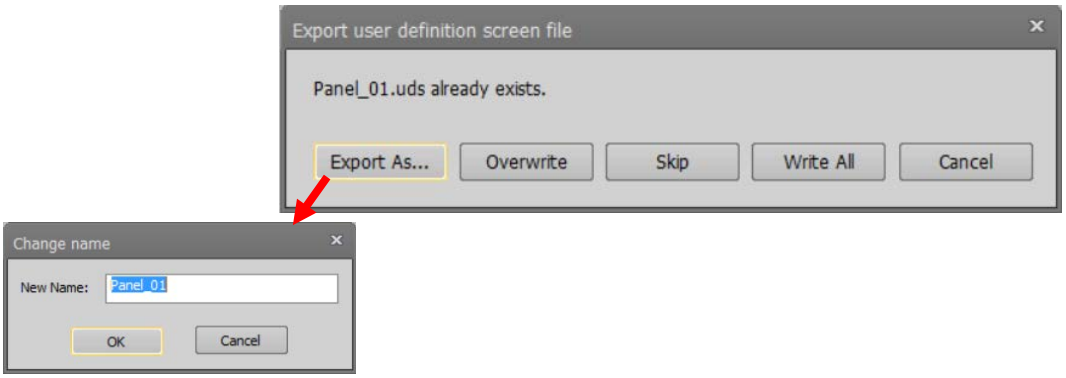


Figure 18-54 User definition screen Export- confirmation message

18.4. File Manager

You can copy, delete, and rename the files in the robot controller.
Double-click [Online] -> [Maintenance] -> [File Manager] in the project tree.

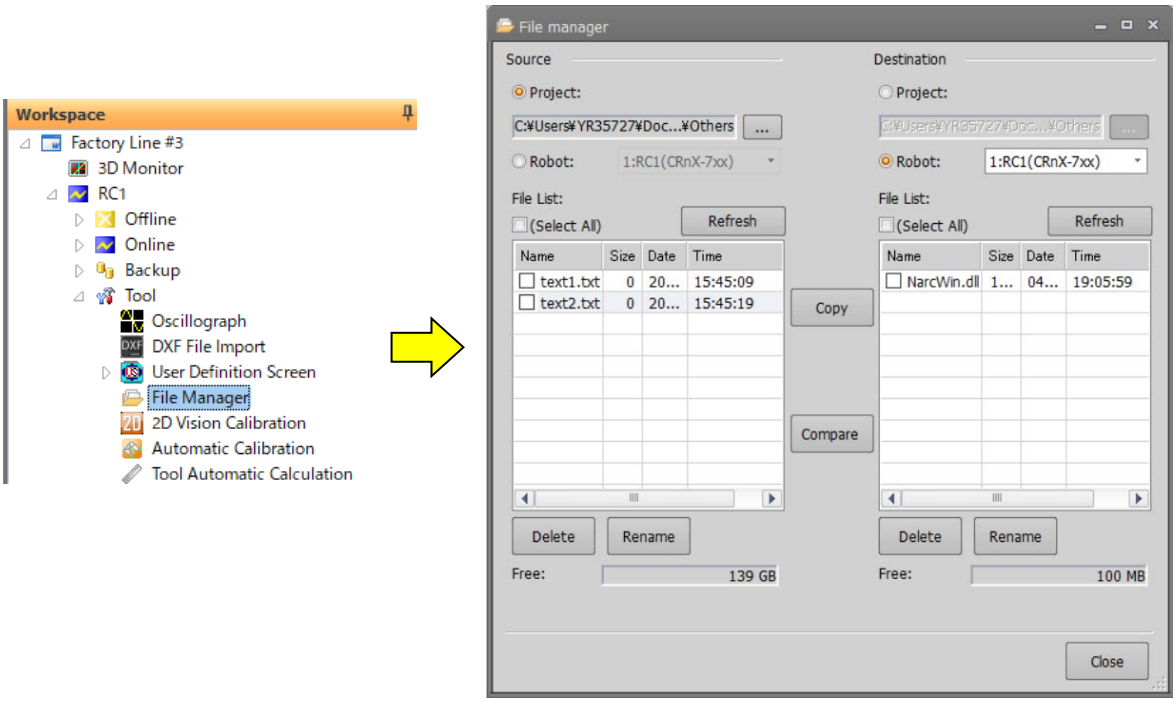


Figure 18-55 Starting File Manager

Caution

The following operations cannot be performed on CR750/700 controllers before Ver.R3e/S3e.

- ***You cannot delete or rename a file without an extension.***
- ***You cannot delete or rename the file of a name that is longer than 16 characters.***
- ***You cannot operate a file in which '0' is attached at the head of the file name.***

⚠ Caution

When a password is registered in "program" by robot controller security function, the file cannot be deleted or renamed.

When a password is registered in "program" by robot controller security function, the file cannot be deleted or renamed

○ : Enable、 × : Disable

	Item to which security function password is registered.		
	Program	Parameter	File
Delete the file Rename the file	×	○	○

Delete the password of the robot controller security function when you operate these. Refer to **"15.5.3 Delete Password"** for the method of deleting the password.

For details on setting security functions (registering passwords) and releasing security functions (deleting passwords) on robot controllers, refer to **"Table 15-12 Compliant version of this function and controller"**.

18.4.1. File list display

The left and right lists display lists of the files displayed in the robot controller and the specified folder.

(1) Transmission setup — 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.

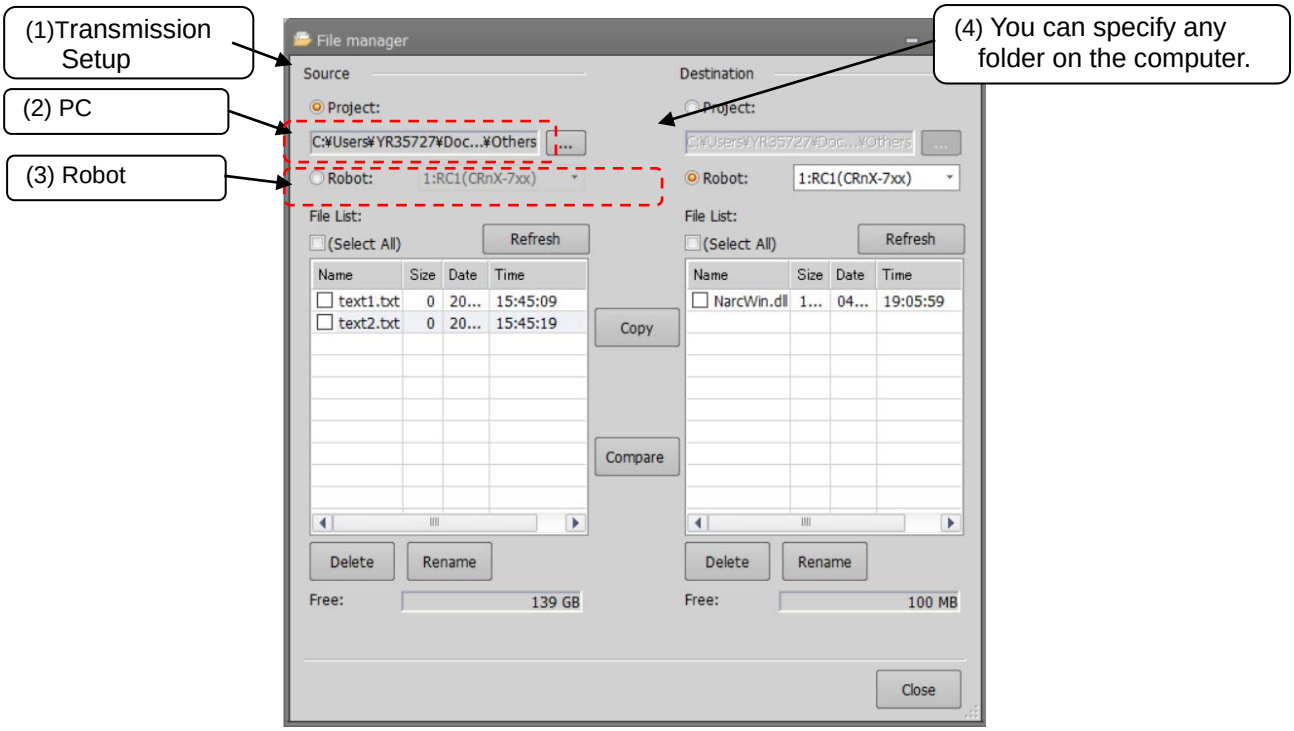


Figure 18-56 File list display

There are files which you cannot operate on this screen, such as robot programs, parameter files in the robot controller, etc. Files which cannot be operated are not displayed in the lists. Files which cannot be operated on this screen are as follows.

Table 18-12 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 power supply ON.)	.sdl/.sdb
7	Force control log file (This file is deleted at 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

18.4.2. Copy

This copies the files.
Select t the transmission source file names from the list at left, and designate the transmission destination folder on the right side. Multiple transmission source files can be selected at the same time.
Click the [Copy] button after choosing the file(s) to copy and setting up the transmission destination. The file is copied after copy confirmation message display.
When the file of the same name exists in the transmission destination, an overwrite confirmation message is displayed.

18.4.3. Delete

This deletes the files.
Select the file(s) to delete in the list. It is possible to select multiple files at the same time. All the files selected in the left and right lists are deleted. Click the [Delete] button after selecting the files in the lists. A deletion confirmation message is displayed.

18.4.4. Rename

This renames the files.
Select a file in the list. It is possible to select a file from both lists. Click the [Rename] button, and input the new file name in the “Setup for Rename” dialog.

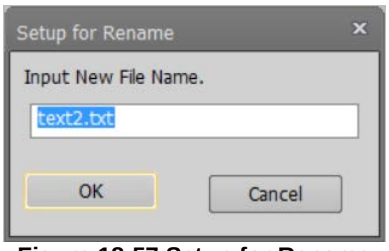


Figure 18-57 Setup for Rename

18.5. 2D vision calibration

This section explains the 2D vision calibration function.

18.5.1. Summary

(1) Summary
2D vision calibration is a function to determine the relationship between the vision sensor's coordinates and the robot's coordinates. You can have up to 8 switchable vision calibration data sets.

(2)

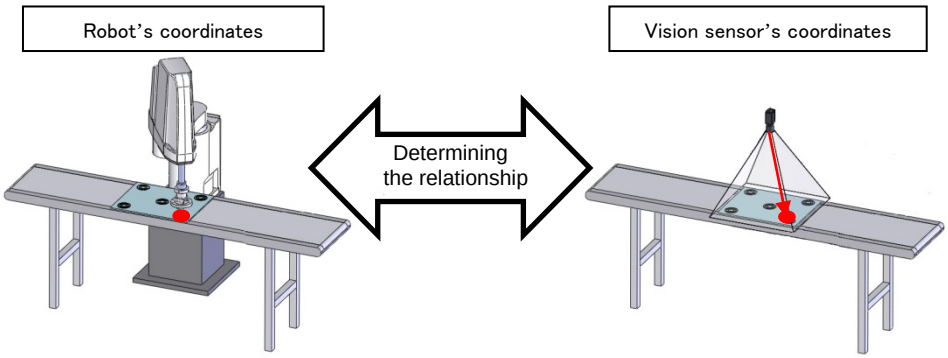


Figure 18-58 Summary of 2D vision calibration

The software version of the controller which can use this function is as follows.

Table 18-13 Supported robot controllers and model

No.	Model	CR800	CR750/700	CRn-500
1	Vertical 6-axis robot	All versions	R5/S5 or later.	Not available.
2	Vertical 5-axis robot	All versions	R5/S5 or later.	
3	Horizontal 4-axis robot	All versions	R5/S5 or later.	

(3) System components
The figure below shows the system components.
Perform the connection of the equipment before using this function Refer to the instruction manual of your vision sensor.

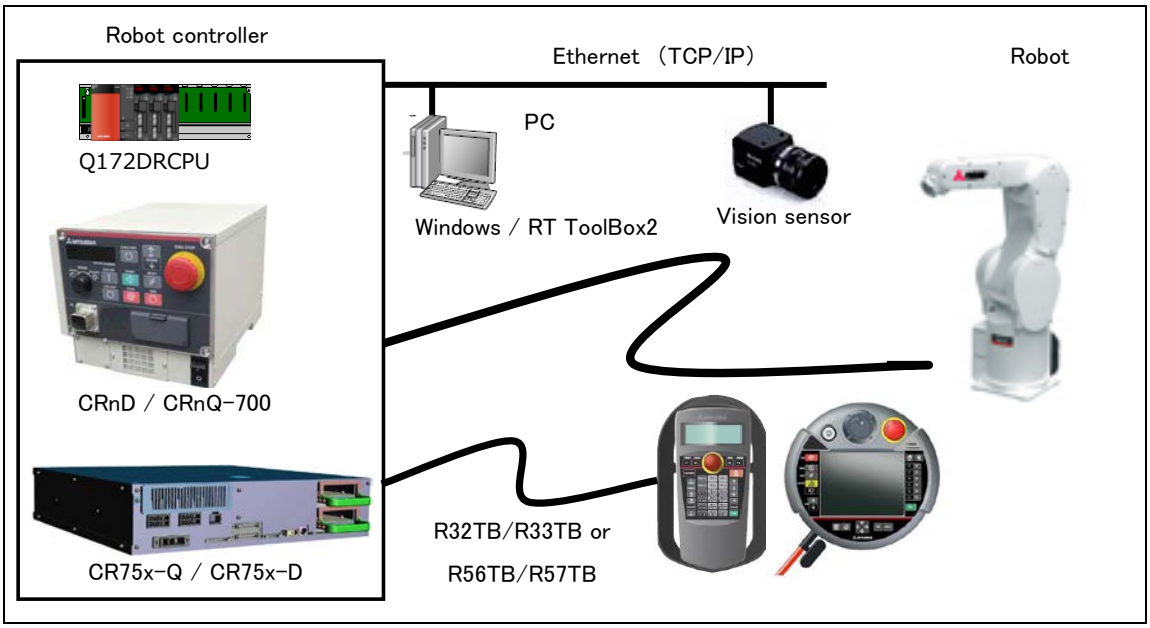


Figure 18-59 System component of 2D vision calibration

18.5.2. Operating procedure of 2D vision calibration

This section explains operating procedure of vision calibration

(1) Starting 2D vision calibration
Use this function while connected to a robot controller.
Double-click the target project [Tool] -> [2D Vision Calibration] on the project tree to start 2D vision calibration.

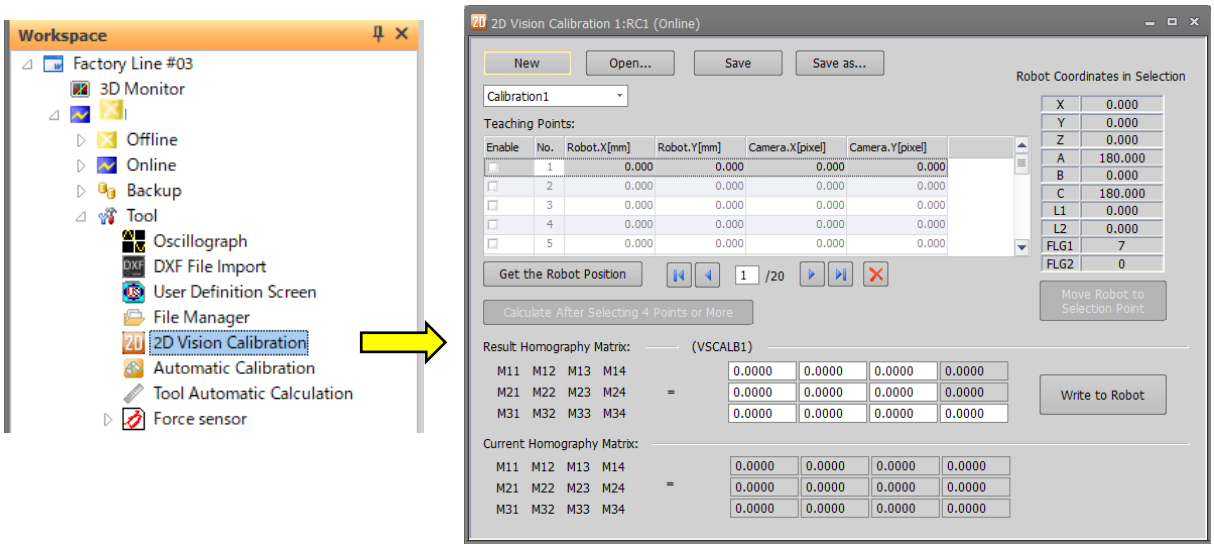


Figure 18-60 Starting 2D vision calibration

(2) Select calibration number
Select the tab of a desired number.
The maximum number of calibration settings combo box switchingly usable is 8.

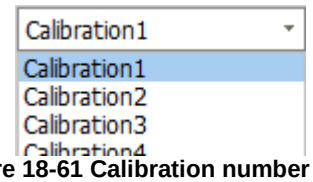


Figure 18-61 Calibration number tab

(3) Teaching points
Click the row which you want to teach a point, to move the selected line cursor.
Position the tool center point at the calibration marker.
Click the [Get the robot position] button to get the current robot position.
Robot.X and Robot.Y in the selected row are filled in and the [Enabled] checkbox is checked automatically
<u>You cannot edit teaching points before clicking the [Get the robot position] button.</u>
Measure the position of the calibration marker with the vision sensor.
Enter the X, Y pixel coordinate positions in Camera.X and Camera.Y respectively.
For the method of getting the pixel coordinates, refer to your vision sensor's manual.

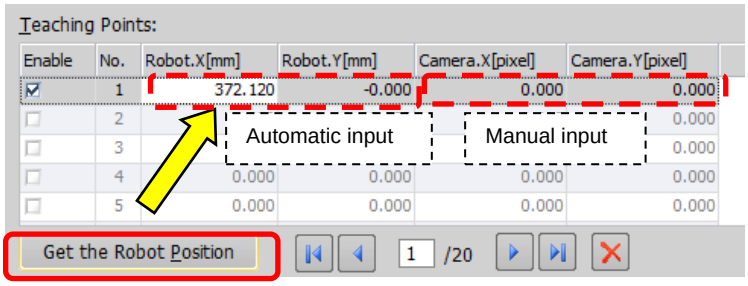


Figure 18-62 Input teaching points

If the combination of vision sensor coordinates and robot coordinates is wrong or the teaching points are closely spaced, incorrect calibration data may be calculated.
Vision calibration needs a minimum of 4 teaching points. For accurate calibration, 9 or more points arranged

separately are recommended.

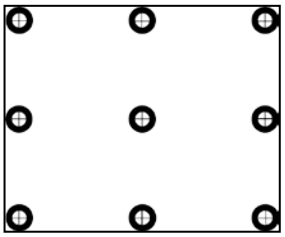


Figure 18-63 Example of 9 markers in camera vision (Image)

(4) Calculate vision calibration data

When 4 or more data on the list of [Teaching points] are enabled, the [Calculate after selecting 4 points or more] button becomes enabled. Click the button to calculate the vision calibration data and display the data in the [Result homography matrix].

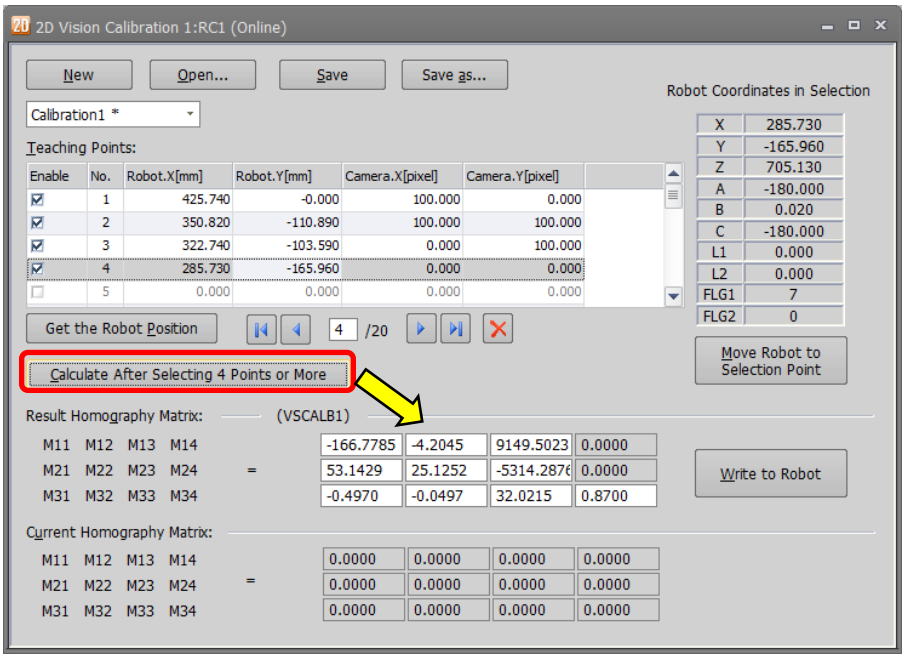


Figure 18-64 Calculating vision calibration data

(5) Write to robot

Click the [write to robot] button to write the calculated vision sensor calibration data [VSCALBn] (“n” is the calibration number) to the robot controller.

As shown in the figure below, the values of the calibration calculation results are displayed at the top, and the values currently set in the controller are displayed at the bottom for confirmation.

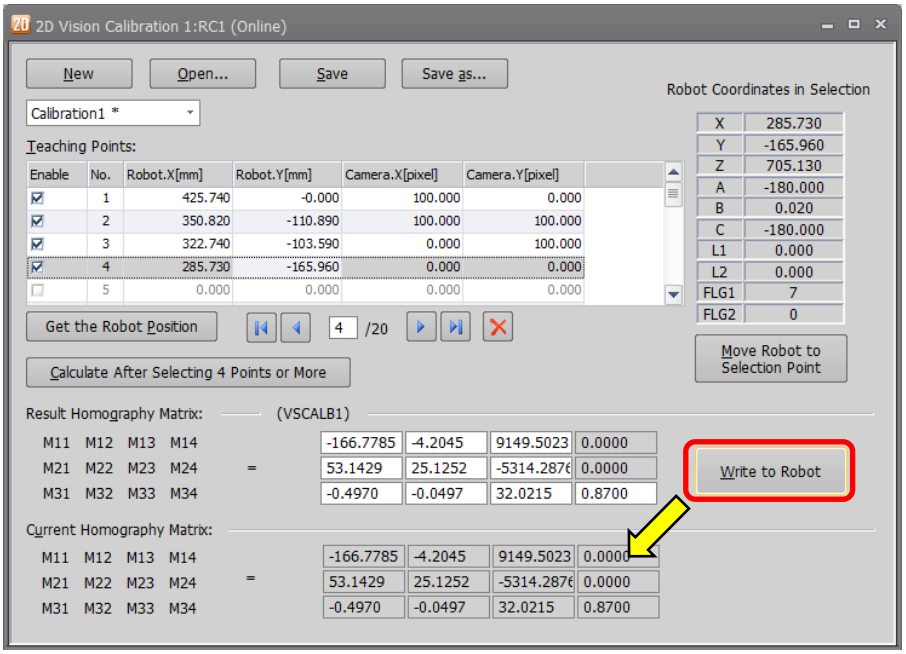


Figure 18-65 Writing to robot

(6) Saving a file

Click the [Save] button or [Save as ...] button to save the teaching points and the calculation results as a camera calibration coordinate file. The extension of the camera calibration coordinate file is “ccc”.

(7) Other function

・Move robot to selected point

Danger

The robot may operate at 100% speed. Pay attention to safety around the robot.

Also, keep a T/B at hand and use the robot in a status in which an emergency stop can be made at any time.

Click the [Move robot to selection point] button to move the robot to the position selected on the list of [Teaching points].
Indicate the trajectory in Mov (Joint interpolation movement) and MVS (Linear interpolation movement).
You can specify the offset (unit [mm]) in the tool coordinate system. For example, when a Z direction offset of "-50" is specified, the robot moves to a position shifted 50mm toward the Z direction in the tool coordinate from the teaching point.
Note that the orientation of the tool coordinate system differs between vertical robots and horizontal robots.

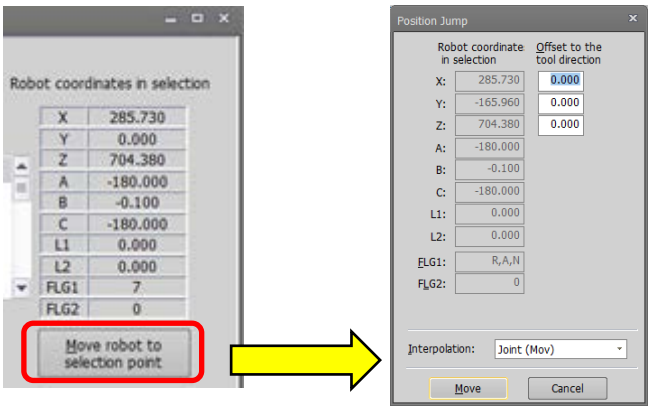


Figure 18-66 Move the robot to selected point

18.5.3. 2D vision calibration screen

This section explains each button on the 2D vision calibration screen.

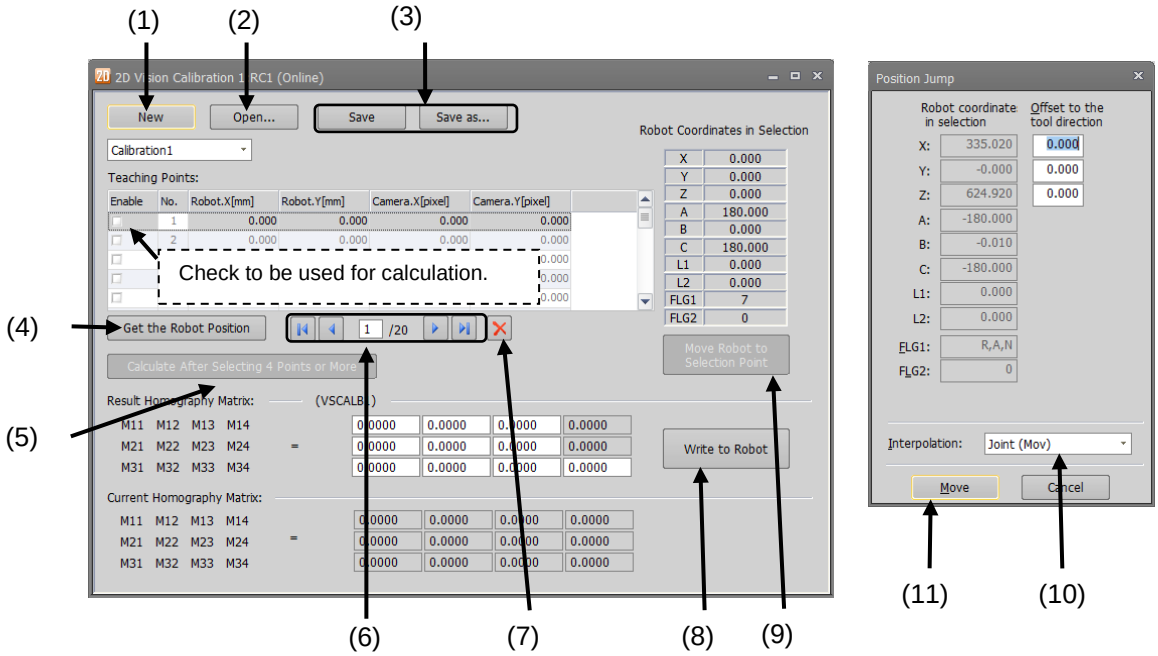


Figure 18-67 2D vision calibration screen

(1) New
Add new 2D vision calibration settings.
The current settings displayed on the screen are removed.

(2) Open…
Load a Camera calibration coordinate file saved on your PC.
The current settings displayed on the screen are removed.

(3) Save / Save as …
Save the current calibration settings as a Camera calibration coordinate file.

(4) Get the robot position
Get the current robot position (XYZ coordinate).

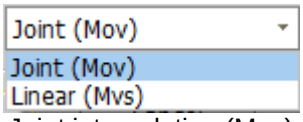
(5) Calculate after selecting 4 points or more
Calculate the calibration data using teaching points where the [Enable] checkboxes are checked.
The calculated result is displayed in [Result homography matrix].

(6)
Move the selected cursor.

(7)
Delete a row selected on the list of [Teaching points].

(8) Write to robot
Write the values of [Result homography matrix] to the robot controller.
The current values of the calibration data in the robot controller are displayed in [Current homography matrix].

(9) Move robot to selected point
Display the [Move robot to selection point] screen for a selected row on the list of [Teaching points].

(10)


Joint interpolation (Mov) or linear interpolation (Mvs) can be selected for interpolation operation.

(11) Move
Executes robot movement according to the setting in (10).

18.6. Automatic Calibration

You can set item about automatic calibration and generate the robot program.
This function can be used if the setting language is MELFA-BASIC VI and CR800 series robot controller and automatic calibration control of Melfa Smart Puls function is effective. These parameters cannot be set by the offline editing.

For more information see “**MELFA-Smart plus User's Manual**”.

You click [Tool] -> [Automatic Calibration] from the project tree.

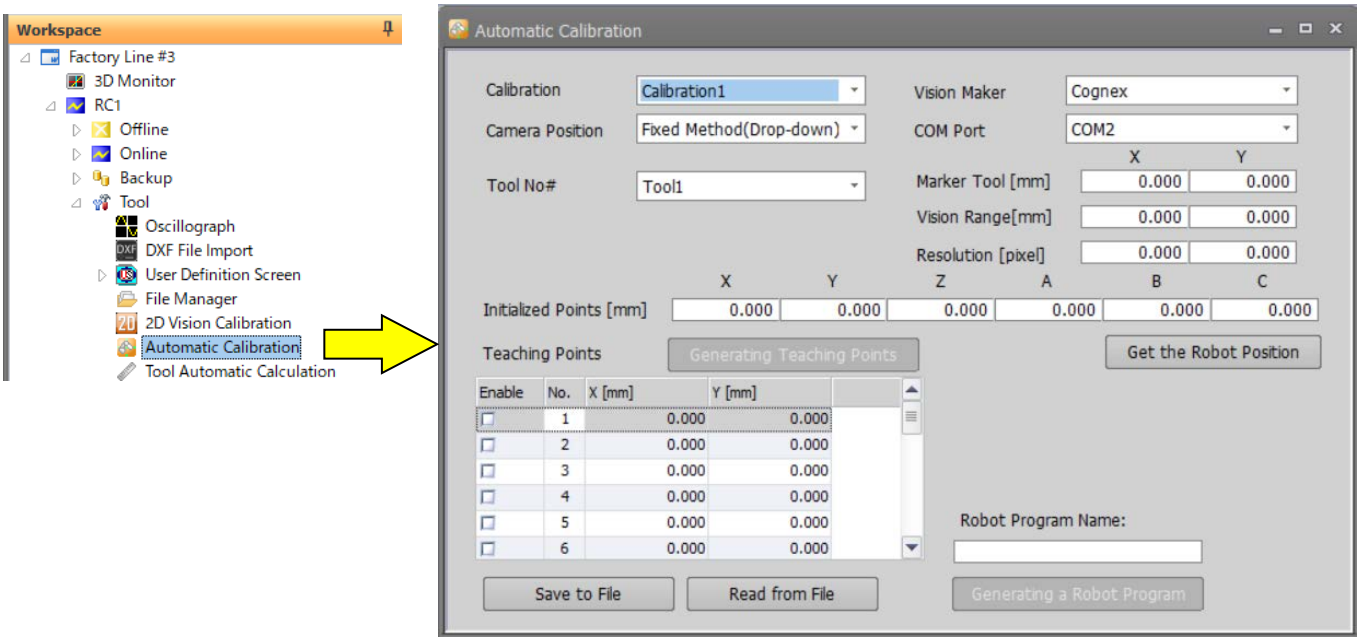


Figure 18-68 Automatic calibration screen

18.7. Force sensor calibration

18.7.1. Outline

Force sensor calibration is the function that calculates the weight and center of gravity position of the robot hand attached to a force sensor.
The data calculated by force sensor calibration (robot hand weight and center of gravity position) is needed during force offset cancellation. Execute the force sensor calibration before the execution of gravity offset cancellation.
The table below shows the robot controller versions and robot models.

Table 18-14 Supported robot controllers and model

No.	Robot model	CR800	CR750/700	CRn-500
1	Vertical 6-axis robot	All versions (RV-FR series models)	Version R6h/S6h or later (RV-F series models)	not used
2	Vertical 5-axis robot	not used	not used	
3	Horizontal 4-axis robot	not used	not used	

18.7.2. Starting

From the project tree, double-click [Tool] -> [Force sensor] -> [Force sensor calibration]

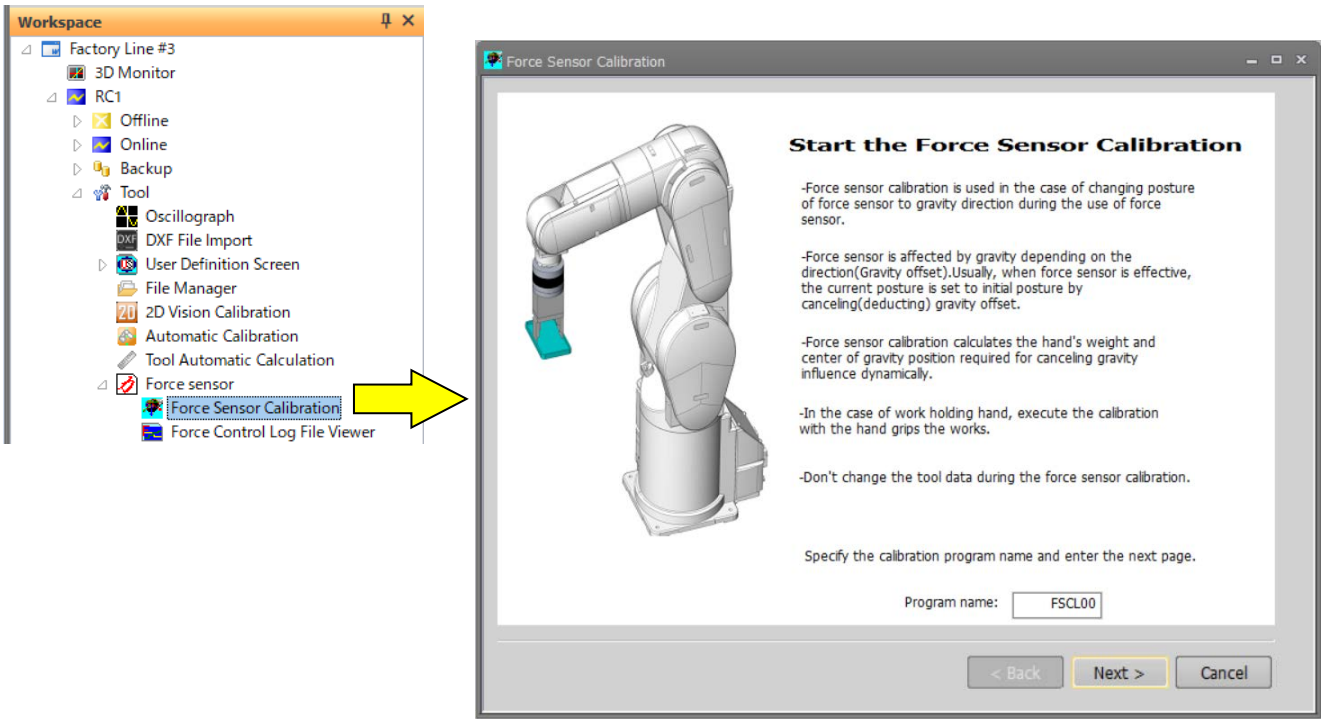


Figure 18-69 Startup screen of force sensor calibration

This function can be used when connected with a machine supporting force sensor function. For details on the setup method, refer to the user's manual of the force sensor function (BFP-A8940).

18.8. Force control log file viewer

The Force control log file viewer is a function to display a graph of force control log data in the PC and robot controllers.
From the project tree, double-click the target project [Tool] -> [Force sensor] -> [Force control log file viewer].

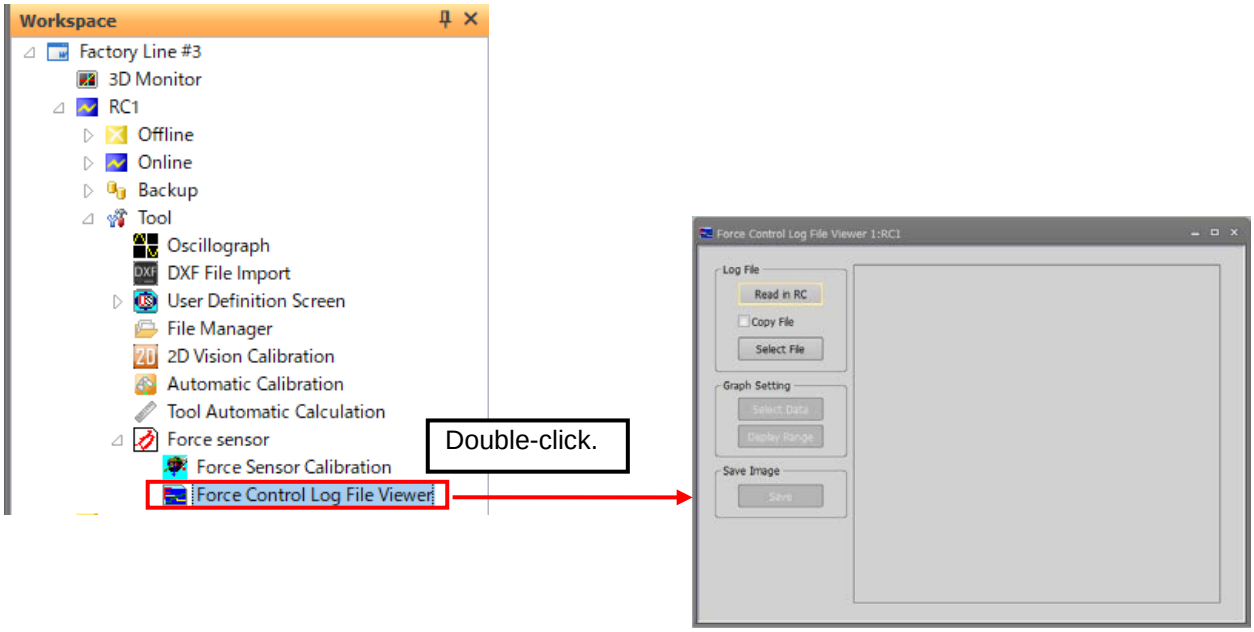


Figure 18-70 Force control log file viewer

This screen can be used when connected with a machine supporting the force control function.
For details, refer to the user's manual which contains a complete description of the force control function.

18.9. Tool automatic calculation

With “Tool automatic calculation”, the tool length is calculated automatically by teaching a same position by 3 to 8 points to the robot with an actual tool mounted, setting up the value of a tool parameter (MEXTL).

For details on supported models and robot controllers, refer to **"Table 18-15 Supported Robot Controllers and Models"**.

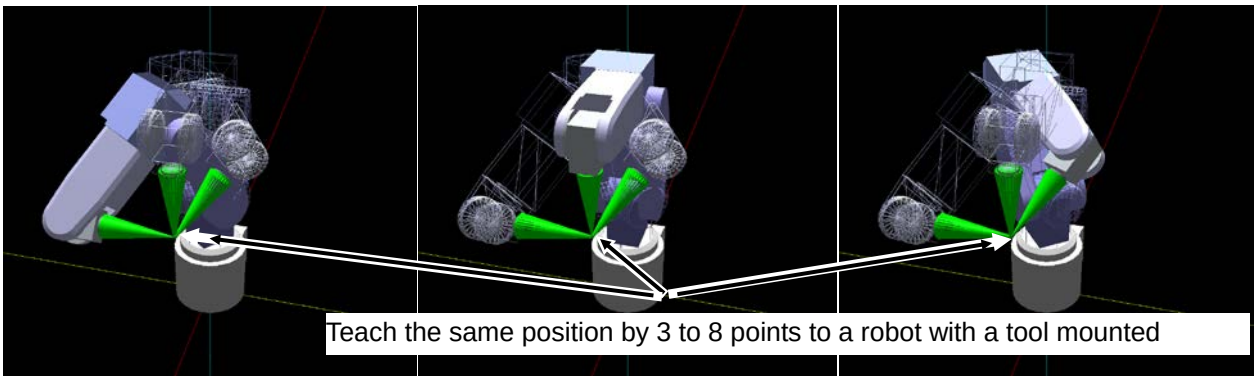


Figure 18-71 Summary the “Tool automatic calculation”

18.9.1. Specifications

The robot models and robot controller versions with which the “Tool automatic calculation” can be used are as follows.

Table 18-15 Supported Robot Controllers and Models

No.	Robot model	CR800 series Robot Controller	CR750/700 series Robot Controller	CRn-500 series Robot Controller
1	Vertical 6-axis robot	All versions	Version R3e/S3e or later	Not used
2	Vertical 5-axis robot	not use	not use	
3	Horizontal 4-axis robot	All versions	Version R3e/S3e or later	

18.9.2. Starting

The “Tool automatic calculation” is used in a state with the robot controller connected.

When the robot model and robot controller to which it is connected support this function, [Tool automatic calculation] is displayed under [Tool] in the project tree. Double-click [Online] -> [Tool] -> [Tool automatic calculation] in the project tree.

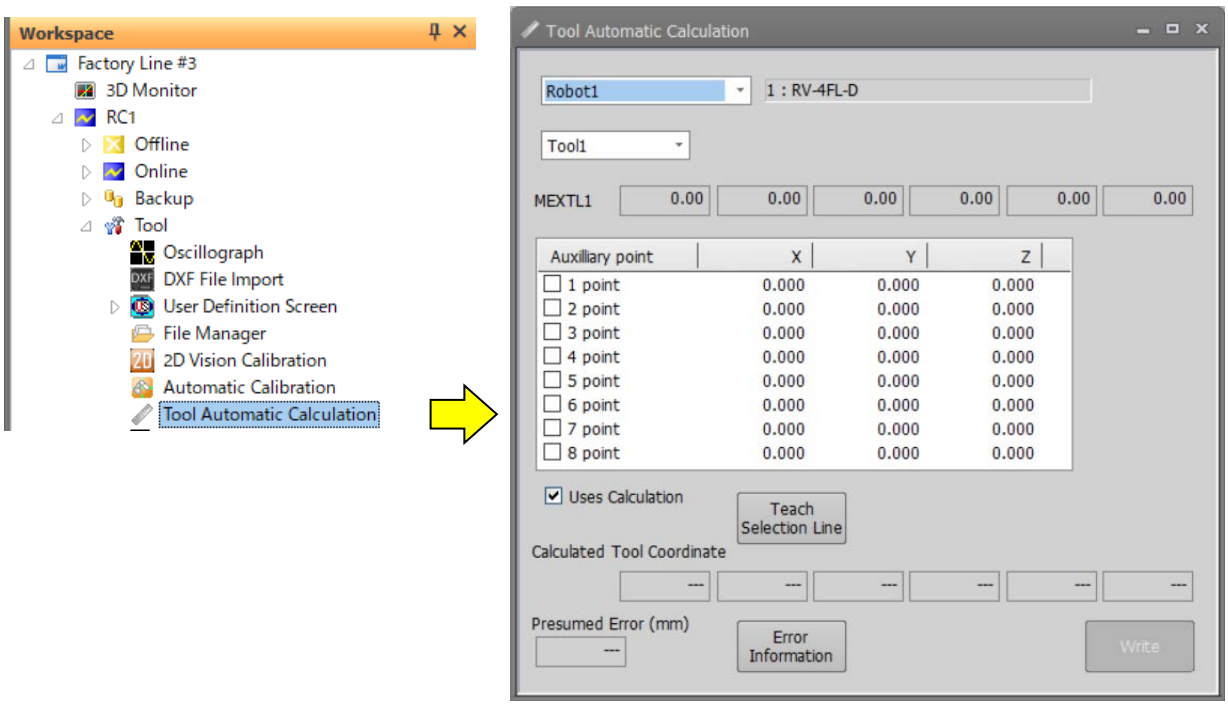


Figure 18-72 Starting the “Tool automatic calculation”

18.9.3. Flow of operations

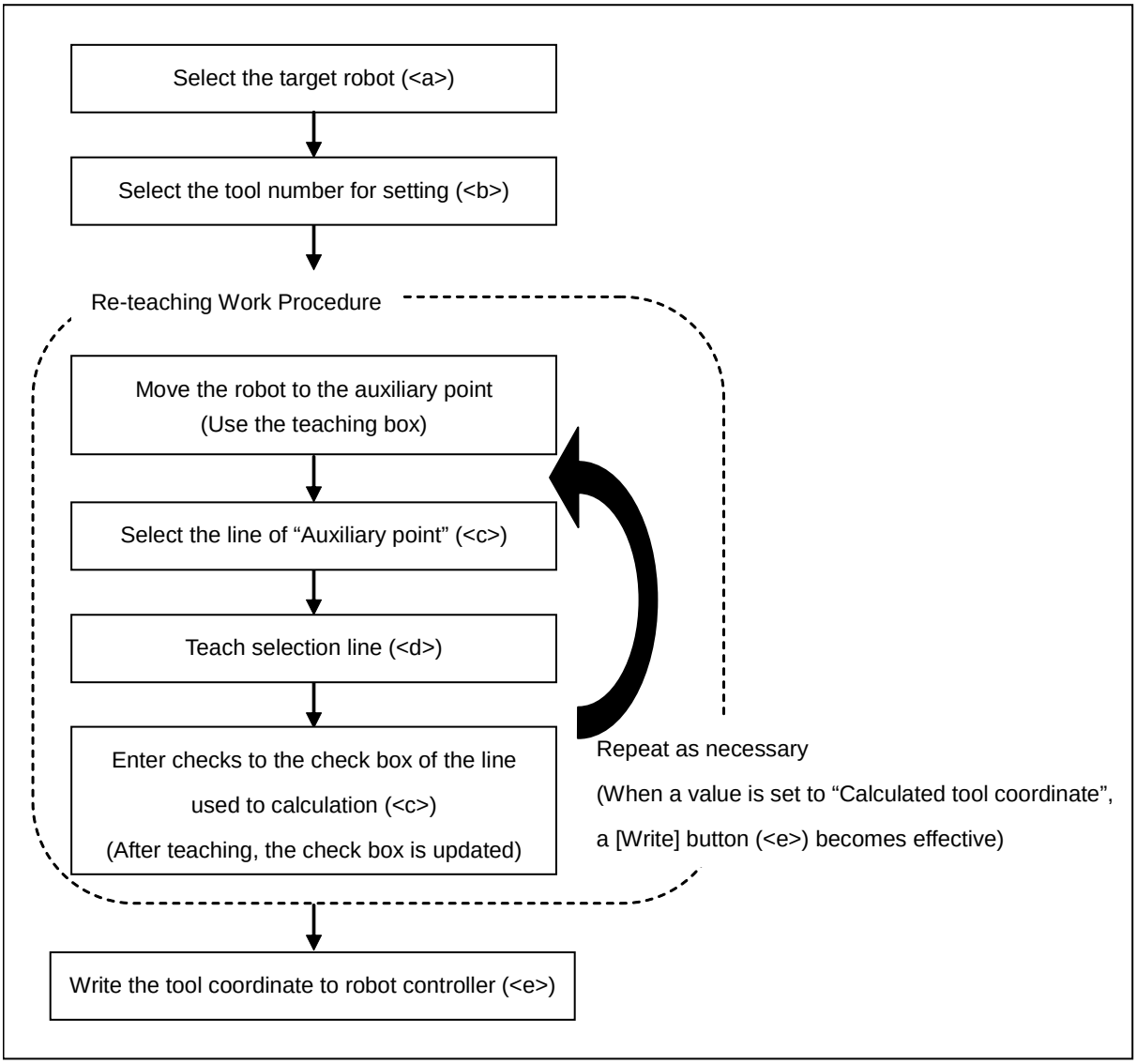


Figure 18-73 Operation Flow

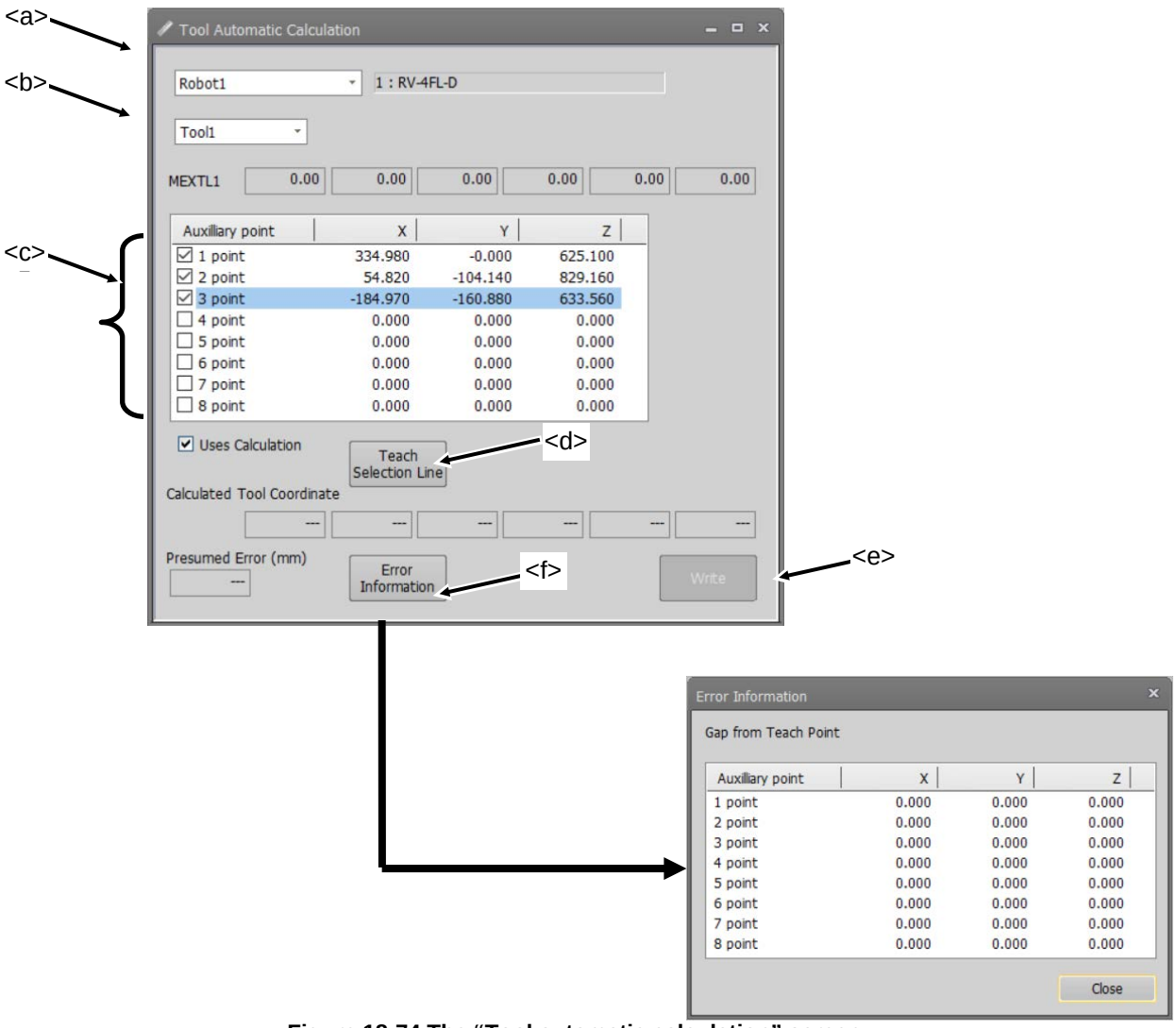


Figure 18-74 The "Tool automatic calculation" screen

Select the robot (<a>) and the tool number (<b>).

Move the robot with a tool mounted. Select a line of the "Auxiliary point" list (<c>) and click the [Teach selection line] button (<d>). It will teach the same position at 3 to 8 points with different postures.

When a value is set in "Calculated tool coordinate", the [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 the [Error information] button (<f>) is clicked, it is possible to check the deviation from a teaching point.

⚠ Caution

Teach the position by greatly varying the posture of the robot.

The tool coordinates might be not computable if the postures are similar. (e.g. when only A axis is different)

19. Operating the Robot

To operate the robot from RT ToolBox3, you use the operation panel.

19.1. About the Operation Panel

Danger

With program running and debugging, the robot might operate at 100% speed. So, pay attention to safety around the robot. Also, prepare a T/B nearby at hand, and use the robot in a state in which an emergency stop can be made at any time.

19.1.1. Starting the operation panel

In RT ToolBox3, you can start up the operation panel for operating the robot. The operation panel can be started up by clicking [Online] -> [Operation panel] from the project tree when the PC is connected online with the controller or the PC is in the simulation mode.

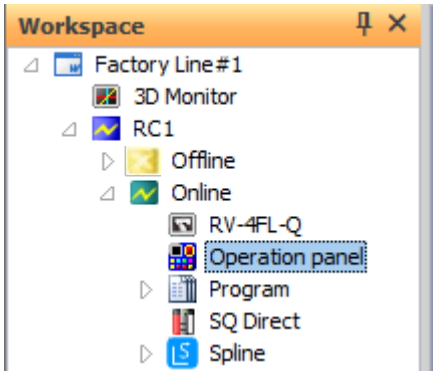


Figure 19-1 Displaying the Operation Panel

On the operation panel, you can execute robot programs, operate the hand and execute jog operation.
Although hand operation and jog operation are possible on an actual robot controller, operate with sufficient attention paid to the robot's surroundings.
The operation panel remembers the display position and is displayed at the same position the next time it is started up. To return the display position to the initial position, after changing to the offline mode, close all the displayed screens and click the [Reset] button on the [View] tab of the ribbon -> [View] group Please give me.

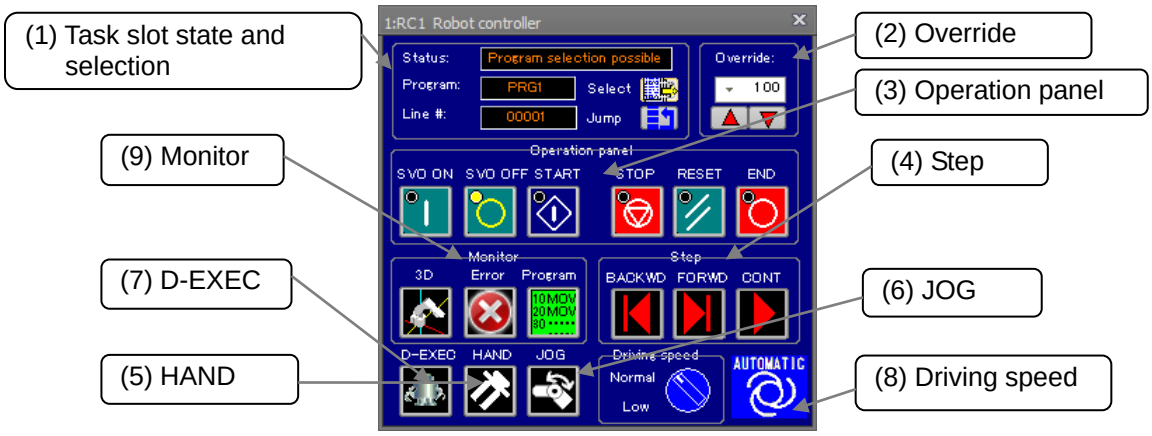


Figure 19-2 Operation Panel Screen

(1) Task slot state and selection

This shows the task slot state, currently selected program and currently executing line No.

- You can select the program to execute by clicking the [Select] button.
- You can select the line for which the program is executed by clicking the [Jump] button.

(2) Override

This displays and sets the robot speed override.

You can also set this by operating the drop-down list. 5%, 2%, and 1% also can be selected by this operation.

(3) Operation panel

This is used for controlling the robot. You can start, stop, reset and exit program operation, and turn servos ON and OFF.

(4) Step

This controls the program in the debug mode.

- [FORWD] and [BACKWD] execute the current executing line of the robot program, and move the executing line to the previous or next line.
- [CONT] executes a program that has stopped by a breakpoint or by the stop command continuously from the stopped line.

(5) HAND

This operates the robot hand. Clicking this button displays the hand operating screen.

You can open and close each of the hands, and align and move hands to the home position.

You can also operate an actual robot controller.

(6) JOG

This performs jog operation on the robot. Clicking this button displays the jog operating screen.

You can also operate an actual robot controller.

(7) D-EXEC

This is for performing direct execution, that is, execute any command directly on the robot regardless of the robot program.

(8) Driving speed

You can select the robot driving speed between normal and low.

When "Low" is selected, the robot moves at the maximum jog operation speed.

This function is available in all software versions of CR800 series controllers and in software version S6h/R6h or later on CR750/700 series controllers.

(9) Monitor

This displays the 3D monitor of the robot. Clicking the [Error] and [Program] buttons displays the "Error Monitor" and "Program Monitor" screens, respectively.

When program execution is started or D-EXEC is used, the following caution screen is displayed. Clicking the [OK] button starts robot operation. For this reason, make sure to check the safety around the robot and prepare a T/B before executing robot operation.

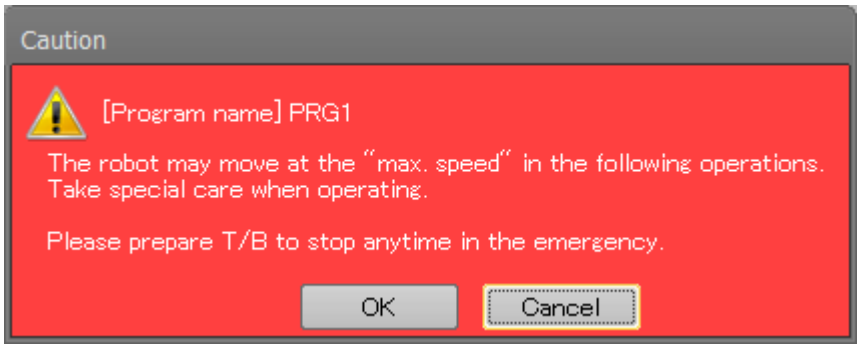


Figure 19-3 "Caution" Screen Displayed at Start of Operation.

⚠ Caution

If JOG operation can not be performed smoothly, please try the following.

- Close the open monitor screen.
- Connect by Ethernet.

19.1.2. Operation panel commands on the ribbon

The same operations as the operation panel can be performed by using the [Online] tab -> [Operation panel]/ [Step execution] group commands on the ribbon.

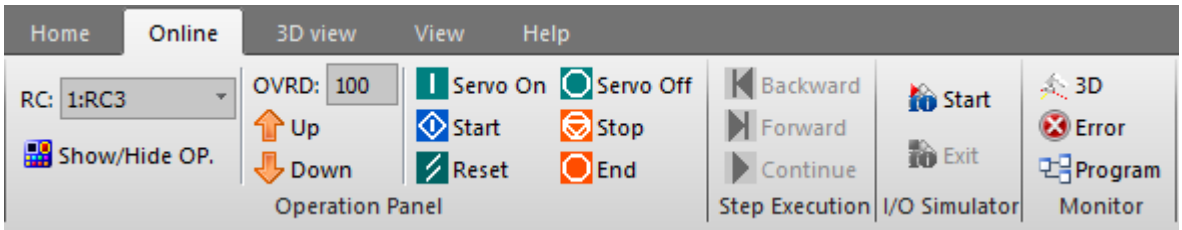


Figure 19-4 Ribbon Commands for Operation Panel Operations

The following operations can be performed on any robot or simulator.

Table 19-1 Explanation of Operation Panel Operation Commands

Group name	Command name	Description
Operation Panel	RC	Selects the robot or simulator to be operated. When "0: All robots" is selected, operations can be performed simultaneously on all currently connected robots and simulators.
	Show/Hide OP.	Displays and hides the operation panel.
	OVRD:	The current override is displayed.
	Up	Increases the override.
	Down	Decreases the override.
	Servo on	Turns the servo ON.
	Servo off	Turns the servo OFF.
	Start	Starts operation.
	Stop	Immediately stops operation.
	Rest	Resets the program.
	End	Ends operation.
Step Execution	Backward	Executes the current executing line of the program and moves the executing line to the previous line.
	Forward	Executes the current executing line of the program and moves the executing line to the next line.
	Continue	Executes the program continuously from the stopped line.
I/O Simulator	Start	Start the I/O simulator. For details, refer to "**23.4Starting I/O Simulator**".
	Exit	Exit the I/O simulator. For details, refer to "**23.6 Stopping I/O simulator**".
Monitor	3D	Display the 3D monitor screen.
	Error	Display the error monitor screen.
	Program	Display the program monitor screen.

Danger

When "0: All robots" is selected and "Start" is executed, all robots will start to operate at the same time.

So, pay attention to safety around each of the robots.

Also, prepare a T/B nearby at hand, and use the robot in a state in which an emergency stop can be made at any time.

19.2. Functions of Operation Panel

The following describes the functions of the operation panel.

19.2.1. Jog operation

You can perform the jog operations displayed in the robot view in the online or simulation mode. Click the [JOG] button in the operation panel screen. The screen for jog operation is displayed under the operation panel operation screen.
WORK JOG operation is not available when work coordinate parameters are not set or on CRn-500 series controllers.
To perform jog operation online, the PC must be set to acquire operation rights. When the MODE key on the robot controller is set to "Automatic" and external I/O signals are used, set input of operation rights from external I/O to OFF. If an attempt is made to perform jog operation when operation rights cannot be acquired, the "The operation is disabled (602000000)" error dialog is displayed.

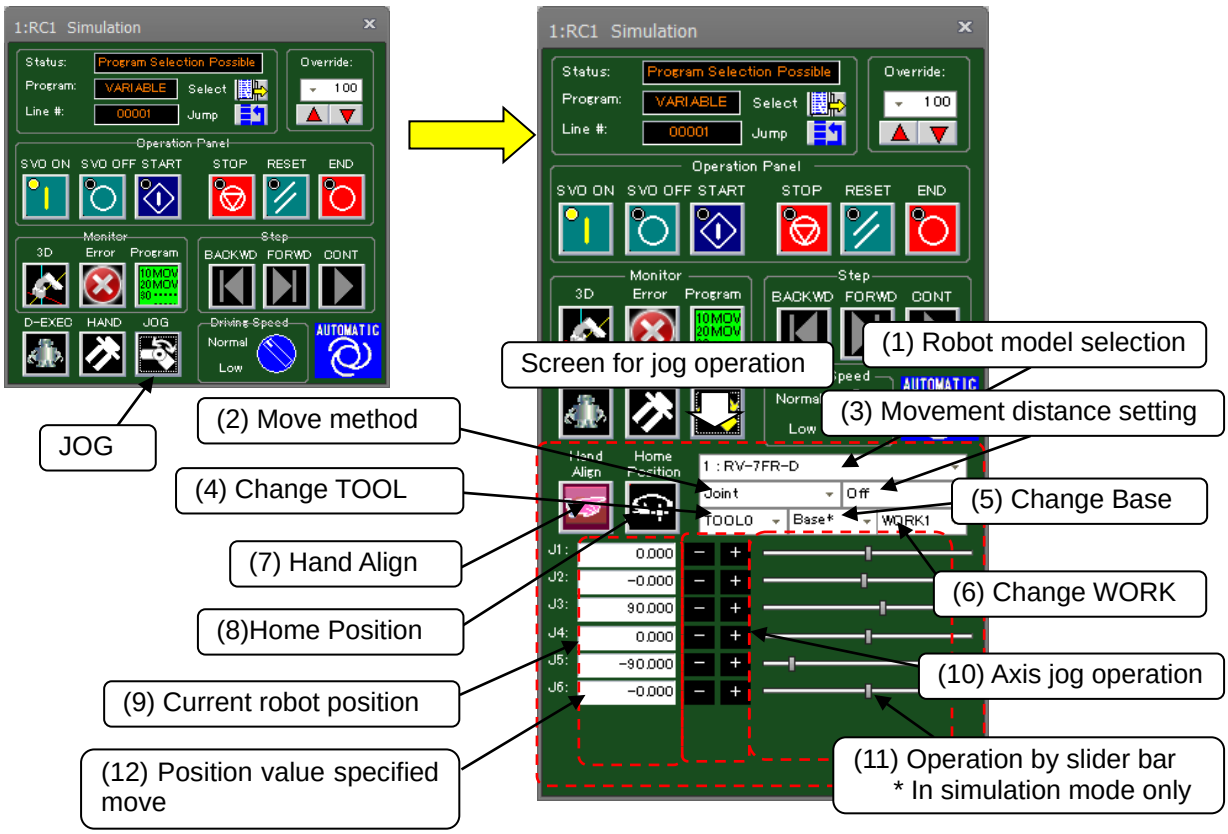


Figure 19-5 Starting Jog Operation

(1) Robot model selection
When multiple robots are set as connected, select the robot model to operate.

(2) Move method

Select the robot move method. The move methods shown below can be selected.
For details on each jog operation, refer to **"Detailed Explanations of Functions and Operations"** in the robot controller instruction manual.

Move method
Joint
XYZ
TOOL
3-axis XYZ
Cylinder
WORK

The display of the robot current position and the jog operation button for each axis varies according to the move method selected here. Also, these displays vary according to the axis configuration of the connected robot. Operation by slider bar is enabled only in the simulation mode. On actual robot controllers, the slider bar is not displayed.

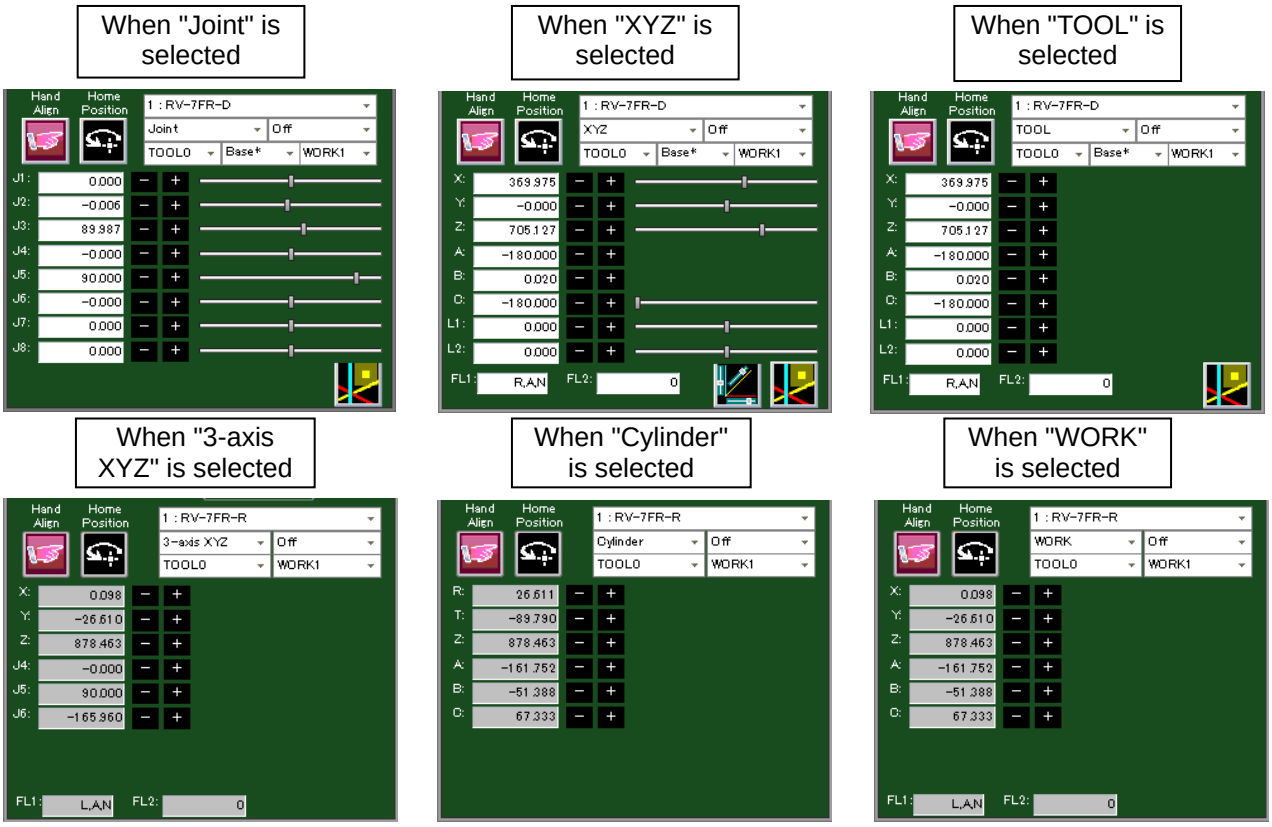


Figure 19-6 Changes in Screen for Jog Operation According to Move Method Selection

(3) Movement distance setting

This selects the robot move distance. Selectable move distances are "off", "High", and "Low".
For details on move distances, refer to **"Detailed Explanations of Functions and Operations"** in the robot controller instruction manual.

(4) Change TOOL

Select the TOOL of robot. The tools that can be selected differ according to the specifications of the connected robot.

(5) Change Base

Select the base coordinate number of the robot. It can be selected are “Base 0” to “Base 8”.
"Base *" will be displayed if base is switched by not using base coordinate number.
It cannot be used on a controller that does not have the base coordinate number parameter (MEXBSNO).

(6) Change WORK

This selects the workpiece when moving the robot by "WORK JOG". The workpieces that can be selected are "WORK1" to "WORK8".

WORK JOG operation is not available when work coordinate parameters are not set or on CRn-500 series controllers.

(7) Hand Align

You can align the posture of the hand installed on the robot in 90 degree units.
This function moves the robot to a multiple value of 90 degrees that is closest to the A, B and C components of the current position.

(8) Home Position

You can move the robot to the position set to the evacuation point position parameter (JSAFE).

(9) Current robot position

This displays the current robot position.

(10) Axis jog operation

This performs jog operation 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.

(11) Operation by slider bar

When Joint or XYZ jog is selected, the corresponding coordinate axis can be moved by dragging the slider bar to the left and right. Operation by slider bar is enabled only in the simulation mode. On actual robot controllers, the slider bar is not displayed.
The following might occur regarding the operation range of the X, Y or Z axis in XYZ job depending on your environment.

The movement area of the robot is outside the operation range of the slider bar.
The operation range of the slider bar is too wide, making it difficult to operate the robot.
In such cases, change the operation range of the slider bar for each axis in the "XYZ Slider range" screen that is displayed by clicking the button at the lower right corner of the XZY jog screen.

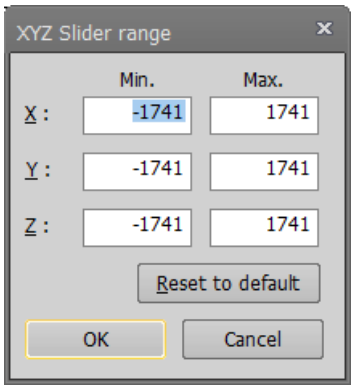


Figure 19-7 XYZ Slider Bar Range Screen

In XYZ job on a vertical 6-axis robot, you can use the slider bar on axes other than the A- and B-axes.

(12) Position value specified move

You can move the robot by specifying the joint or XYZ coordinates directly.
When you double-click the coordinate value display part on the joint or XYZ jog screen or click the [P.Jump] button, the "Position Jump" screen corresponding to the jog mode will be displayed. When you enter the coordinate value in this screen, the robot will move to that position.
Coordinate value specification model and robot controller version are available below.
In the case of simulation, this function can be used regardless of the following model or robot controller.

Table 19-2 Supported robot controllers and model

No.	Model	CR800	CR750/700	CRn-500
1	Vertical 6-axis robot	All versions	R3e/S3e or later	Unavailable
2	Vertical 5-axis robot	Unavailable	Unavailable	
3	Horizontal 4-axis robot	All versions	R3e/S3e or later	

If the entered position is outside the movement area of the robot, the robot will not move.
This operation is invalid while the robot is running.
If you are using a vertical 5-axis robot, the 6th axis in FLG2 cannot be used.

You can specify "offset" to specify relative movement amount. When you click the [Offset] button, the input value of the offset returns to 0.
As the "Interpolation" can choose Joint (Mov) ,Linear (Mvs) ,Arch(Mva) and Direct.
Direct can only be selected during simulation.

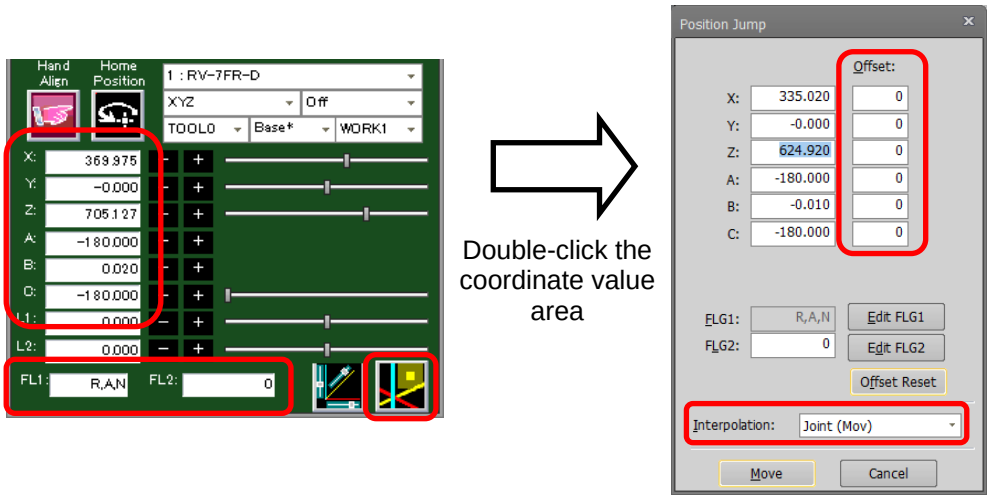


Figure 19-8 Operation of Position Value Specified Move

Arch interpolation can choose to specify the Arch number for Arch movement.

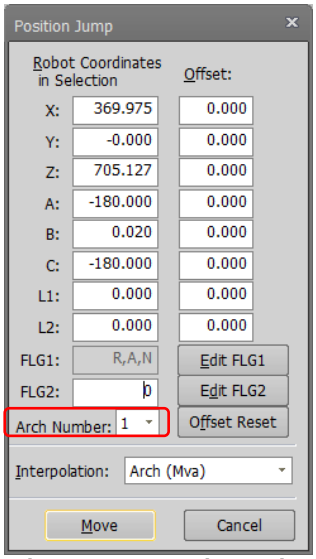


Figure 19-9 Arch Number

Direct can be selected only during simulation. Arch cannot be selected when it is MOVEMASTER command or Joint or multi-mech.

19.2.2. Program execution

You can execute a program selected on the operation panel or a program that has been opened in the debug mode.
For details on how to make programs, refer to **"11 Writing Programs"**.

Table 19-3 Differences Between Program Execution and Debugging

	Program Execution	Program Debugging
Program selection	Use [Select] button on operation panel	Open program in debug mode
Program operation	Use buttons on [Operation panel]	Use buttons on [Step]
Program starting conditions	Starting conditions specified in slot table	Finished in one cycle (*1)

(*1) Note that programs that are repeated infinitely do not end automatically.

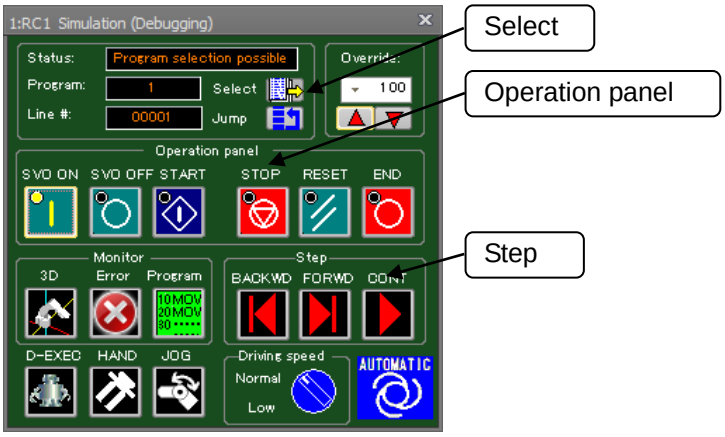


Figure 19-10 Program Execution

To forcibly stop a program that is executing, click the [STOP] button.

19.2.3. Specifying the starting line for program execution

You can freely specify the line in the program from which to start execution. Click the [Jump] button in the operation screen. The "Jump" screen is displayed. In this screen, enter the step number to start execution from. The current execution line moves to the specified step number.

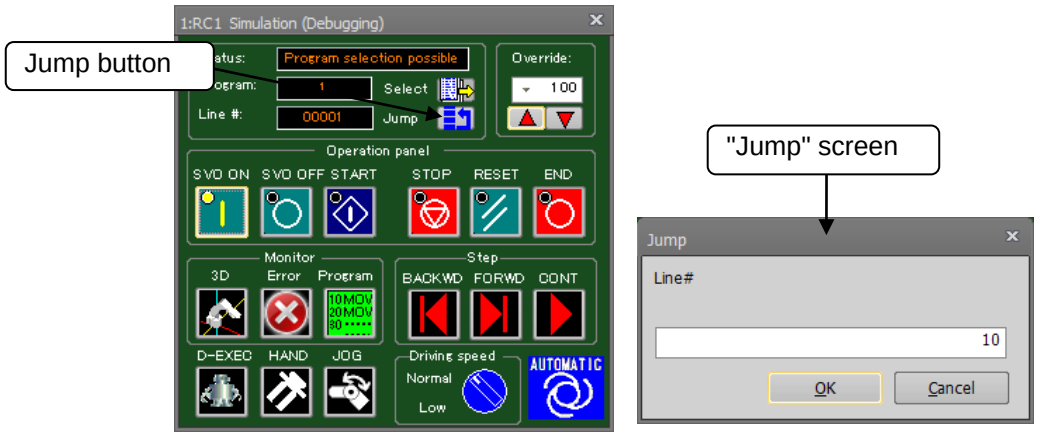


Figure 19-11 Specifying the Line for Program Execution

19.2.4. Step operation

You can execute a program that has been opened in the debug mode one step at a time.
In the online or simulation mode, open the program in the debug mode. The step function on the operation panel is enabled.

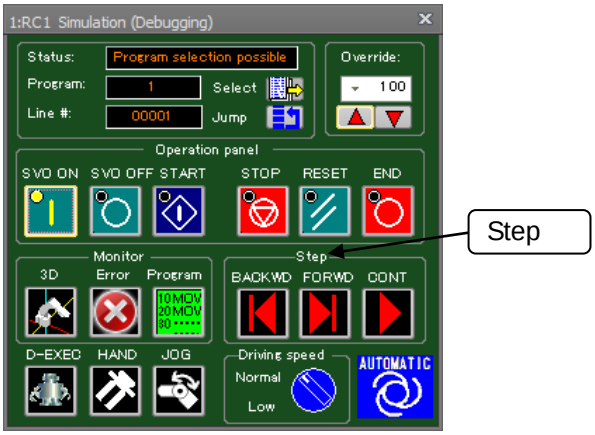


Figure 19-12 Step Operation in Operation Panel Screen

Operate with the [FORWD] or [BACKWD] button in the "Step" group on the operation panel.
Clicking the [FORWD] button executes the command on the current execution line and advances the current execution line by one line. Clicking the [BACKWD] button executes the command on the current execution line and returns the current execution line by one line. Backward execution by one line can be executed only for interpolation commands. The maximum number of lines that can be returned to by backward execution is four lines.

19.2.5. Direct execution

You can enter command statements to operate the robot directly.
Click the [D-EXEC] button on the operation screen.

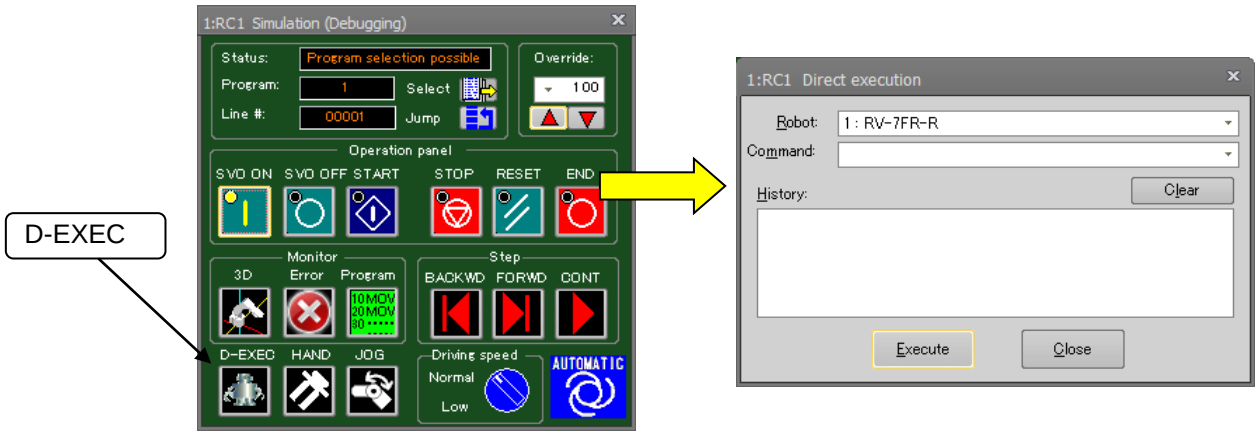


Figure 19-13 Starting Direct Execution

Enter the command to execute in the "Command" box, and either press the [Enter] key on the keyboard or click the [Execute] button. The entered command is executed. At this time, if a position variable is specified by a move command, for example, the position variables defined in the currently open program are used. A position variable not defined in the program cannot be used.
A command that has once been entered to the "Command" box is added to the history, and can be selected from the command box drop-down list. Note, however, that when the simulation is ended, the history and drop-down list commands are cleared.

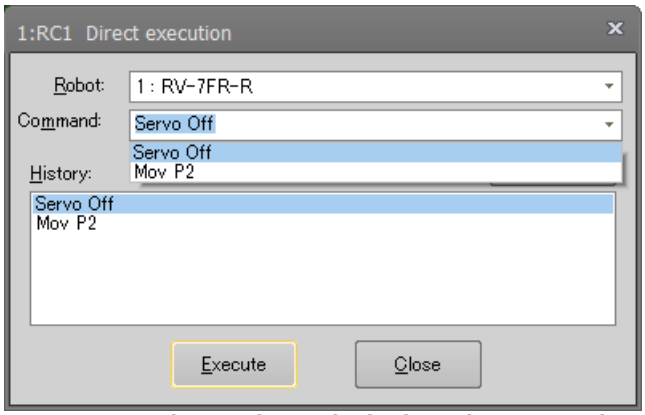


Figure 19-14 Command Drop-down List in the "Direct execution" Screen

This operation cannot be performed during automatic operation by the [CONT] button.

⚠ Caution

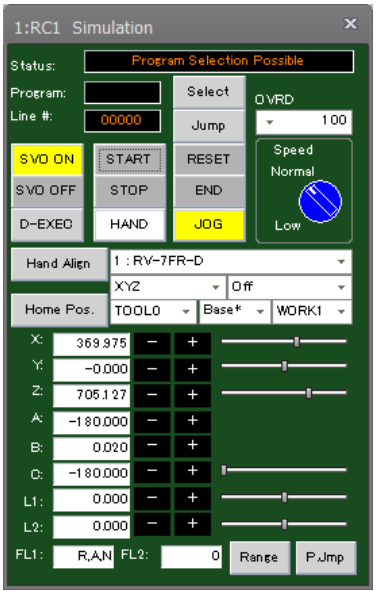
When executing directly, select the program to execute.

Direct execution cannot be performed unless a program is selected.

19.3. Change to the small operation panel

You can change the display of operation panel to the type of small size.

Small size type



Standard type

Figure 19-15 Comparison of the display types of operation panel

19.3.1. How to change the display type

You can change the display type of operation panel from the option screen. To display the option screen, you will select the [Option] in [Workspace] tab from the ribbon.
By the [Small Size] in [Operation Panel] is checked, the operation panel will be displayed in type of small size when RT ToolBox3 is executed next time or later.
If you want to return the operation panel to the standard type, please uncheck the [Small Size].

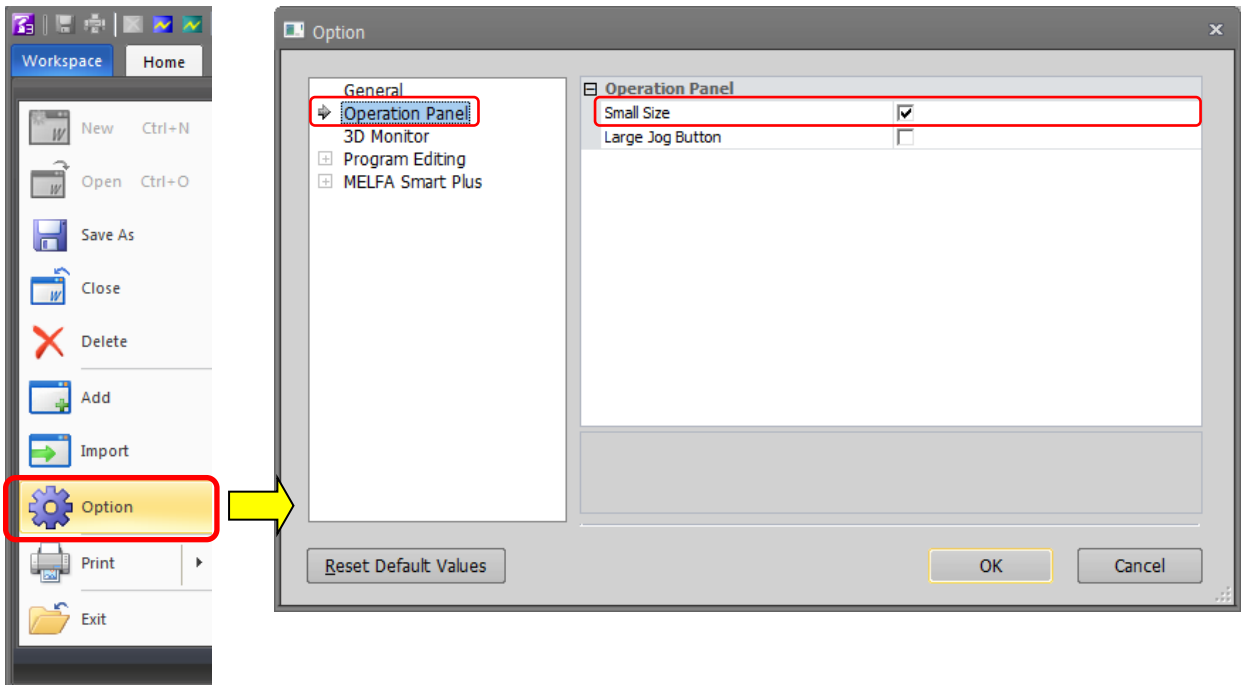


Figure 19-16 Comparison of the display types of operation panel

19.3.2. How to operate

On the small type operation panel, there are the buttons with the same name as one for the case where the operation panel is the standard size. By operating the corresponding button, you can use the same function as the operation panel of standard type.

However, [Monitor] group and [Step] group are not on the operation panel of small size type. If you want to use these functions, please use the commands in the [Online] tab from the ribbon.

19.4. Display the operation panel in the docking window

You can display the same type as the small type of the operation panel in the docking window.
When connecting to multiple projects, switch the project to be operated with "RC" dropdown.

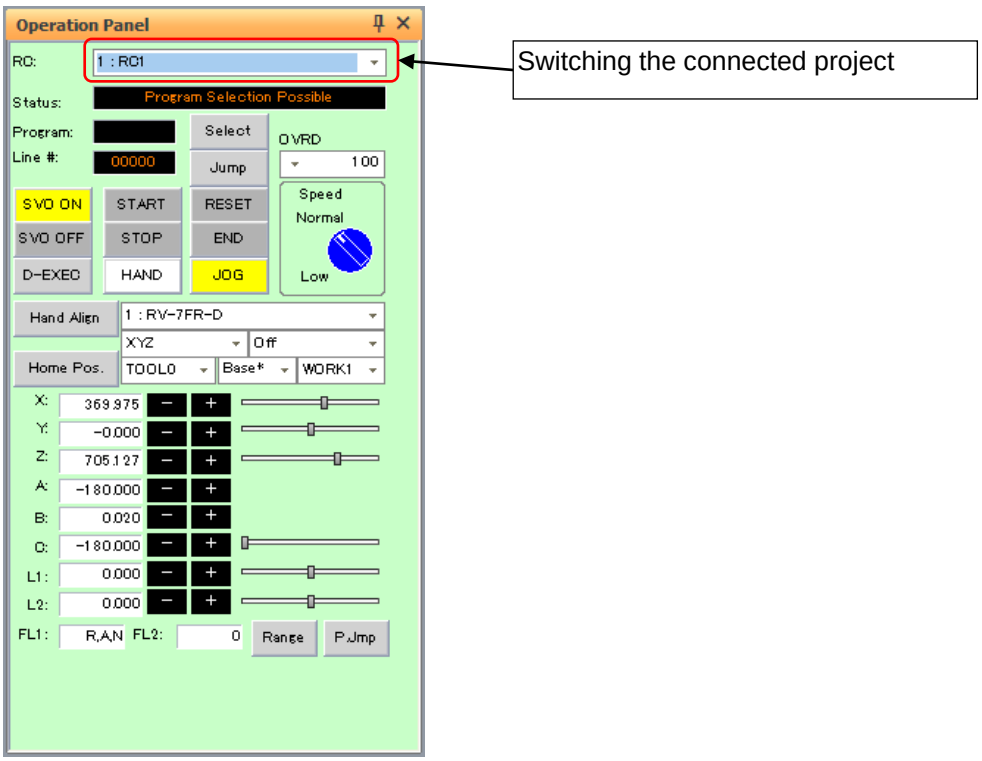


Figure 19-17 Operation panel of docking window

19.4.1. Display method

Check the [Display] tab → [Operation panel] of the ribbon to display it. Please remove the check if you want to hide it.

Caution

It can not be displayed unless the operation panel has been activated at least once.

After the project is connected, the operation panel check box on the ribbon will not be valid unless the operation panel has been activated at least once.
Projects that have never been launched on the Operations Panel will not be added to the RC dropdown.

19.4.2. Change the display type

The operation panel of the docking window can be displayed with the large jog button.

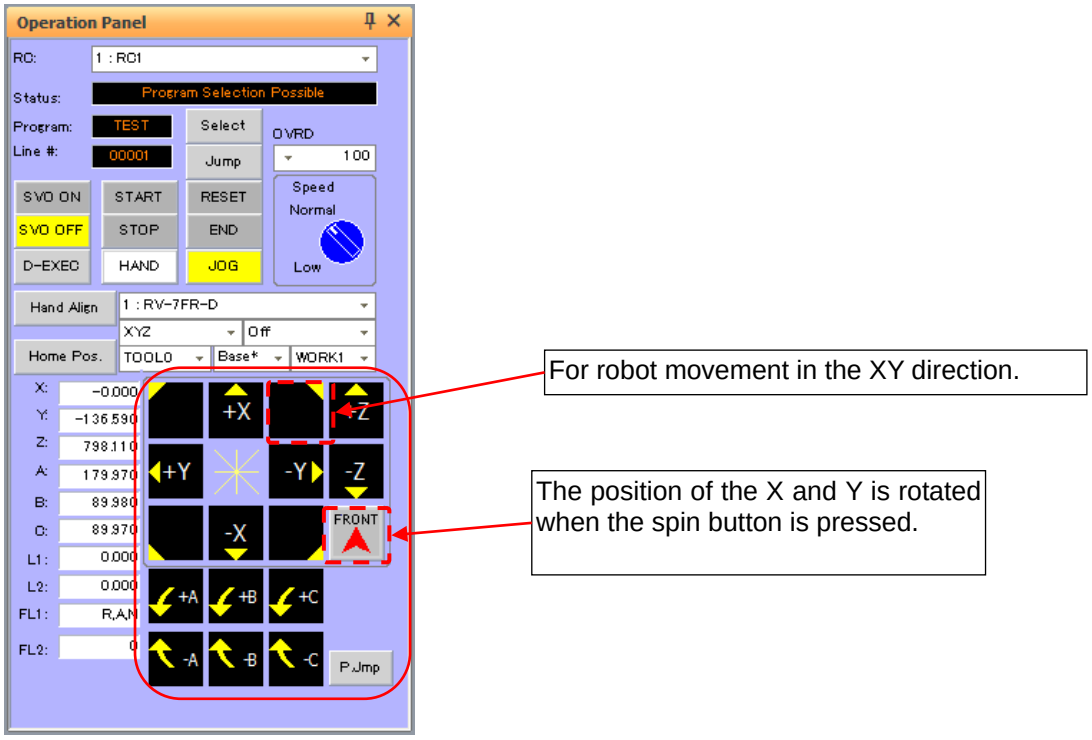


Figure 19-18 Display the large jog button

Select the [Workspace] -> [Option] on the ribbon. When [Large JOG Button] of [Operation Panel] is selected, the operation panel of large jog button style will be displayed, it will be valid from next start.

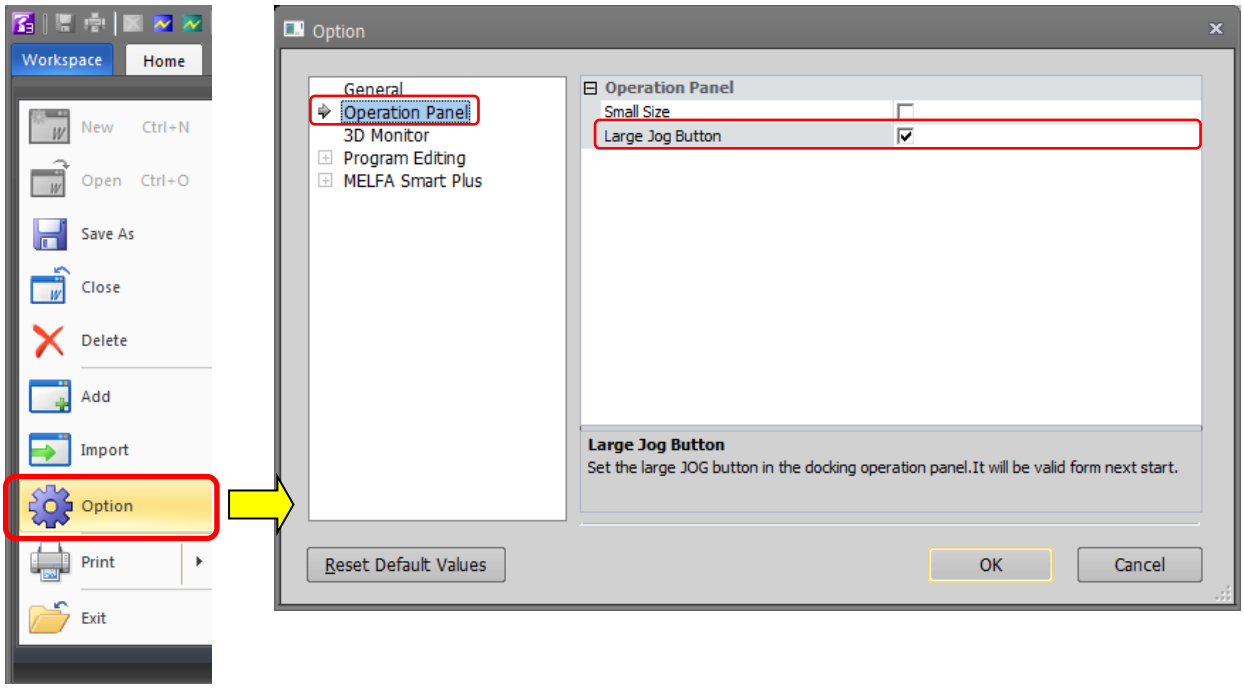


Figure 19-19 Docking window operation panel display style change

19.5. Direct Teaching

To teach the position of the robot, you can easily push and move the arm by direct teaching.
The direct teaching function can be used only with the following robot.

	Model
Robot model that supports direct teaching.	MELFA ASSISTA

⚠ Caution

. Jog operation and hand operation cannot be performed while direct teaching is ON.

. If the servo OFF, stop operation, or an error occurs, direct teaching is automatically turned OFF.

. Direct teaching is automatically turned off when the jog operation panel, hand operation panel, or operation panel is closed.

. Before using direct teaching, confirm that the mass, center of gravity, and size of the robot hand are set correctly. If the set value is incorrect, the robot arm may move up or down when starting direct teaching.

. In direct teaching, the robot may move by inertia, so do not let go of the robot arm until it stops.

. Work settings are not reflected in direct teaching. The robot may descend depending on the weight of the work. Do not let go until the robot stops securely.

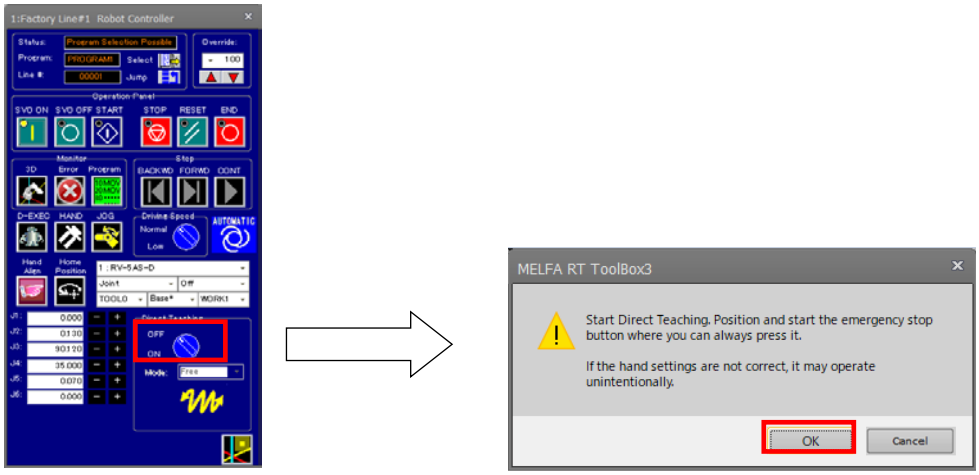
. If you are using HNDDAT1 to HNDDAT8, it will be set to HNDDAT0 when the controller power is turned on again, so the robot arm may move up or down when starting direct teaching.

19.5.1. Teach procedure by direct teaching

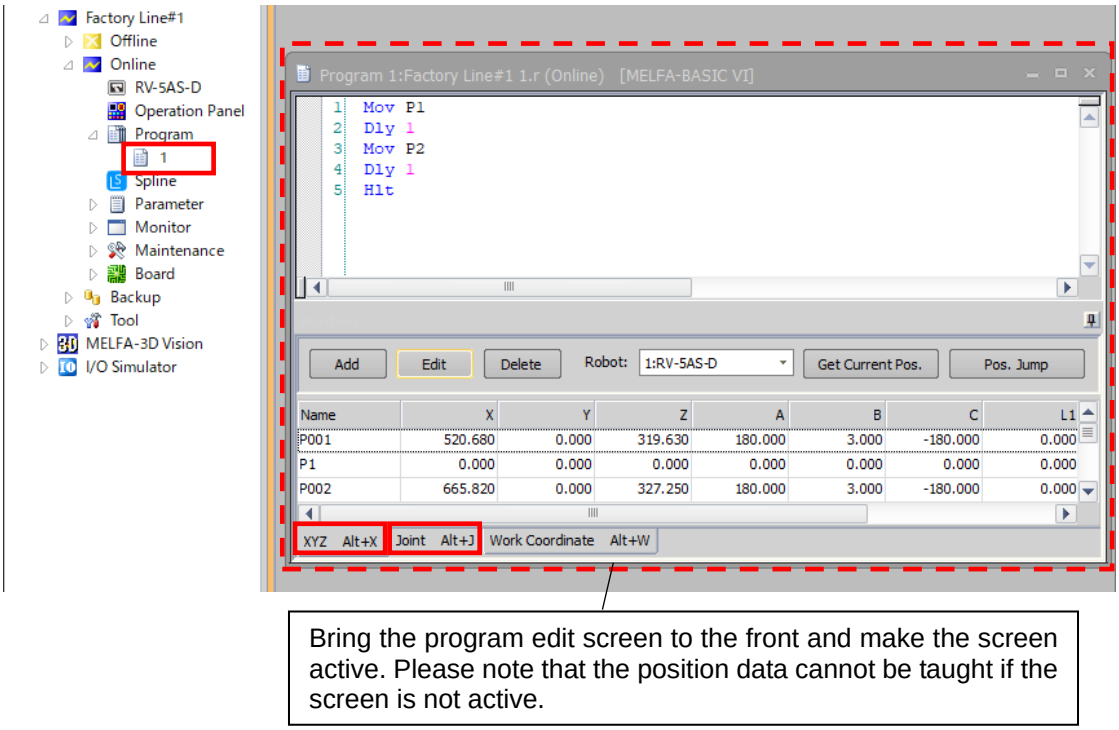
Teaching position to the robot program by direct teaching is possible by the following procedure.

① Check that the mode selector switch input on the robot controller is set to "Automatic" and operation mode is set to collaborative(standard or low speed).

② Open operation panel and click direct teaching switch.
Click the [OK] button on the confirmation screen to turn on the direct teaching.

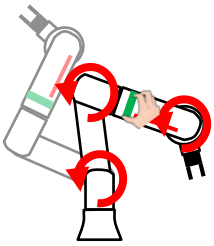


③ Open the robot program to which teaches position data and select the XYZ or joint tab.
(Work coordinate position data cannot be taught by direct teaching.)

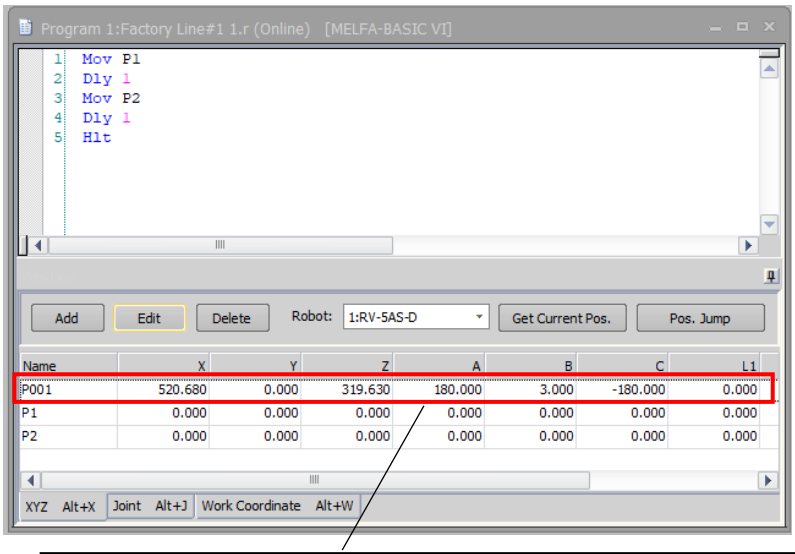


Bring the program edit screen to the front and make the screen active. Please note that the position data cannot be taught if the screen is not active.

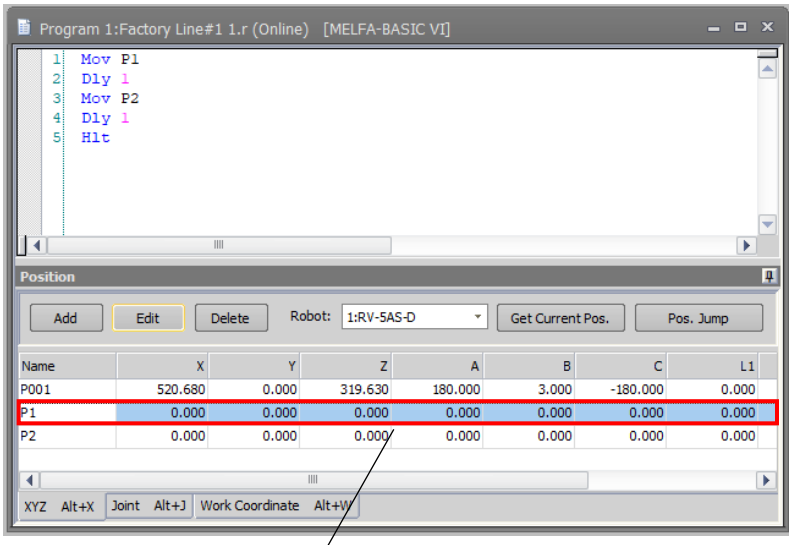
④ Hold the robot arm directly with your hand and move it to the destination position / posture, and then press the [TEACH] button on the robot arm.



⑤ If no position data is selected on the program edit screen, new position data is added, and if selected, the value of the selected position data is updated.



If no position data is selected, new position data will be added.



If the position data is selected, the selected position data will be updated.

19.5.2. Direct teaching mode switching

You can switch the direct teaching mode by mode selection combo box. When "Pan" is selected, the operation direction is limited to the translation direction.

Figure 19-20 Direct teaching mode switching

Table 19-4 Direct teaching mode

Mode	Option
Free	Operates with each joint of the robot free.
Pan	The robot moves along the direction of the coordinate axes.

You can also use the operation button [DIRECT TEACHING] on the robot arm to start direct teaching and switch the direct teaching mode.

Table 19-5 Direct teaching startup and mode switching

Operation	Direct teaching status	Motion
Long push (2 seconds or more)	OFF	Direct teaching turns on.
	ON	Direct teaching turns off.
Push	OFF	-
	ON	The operation system switches in the following order. Free → Pan If it is pressed during Pan, it will return to free.

20. 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 ToolBox3" 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 [Home] tab → [Mode] group → [Online] button to change to online mode.

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.

Operation that depends on external input can not be simulated.

It is not possible to simulate actions dependent on external input such as force sensors.

In simulation mode of MELFA ASSISTA, “Wait” command is disabled.

If “Wait” command is executed in simulation mode of MELFA ASSISTA, next command is executed without waiting.

20.1. Starting a Simulation

Click the [Home] tab -> [Mode] group -> [Simulator] on the ribbon. If there are two or more projects in the workspace at this time, the screen for selecting the screen to conduct the simulation is displayed.
You can simulate eight projects or less.

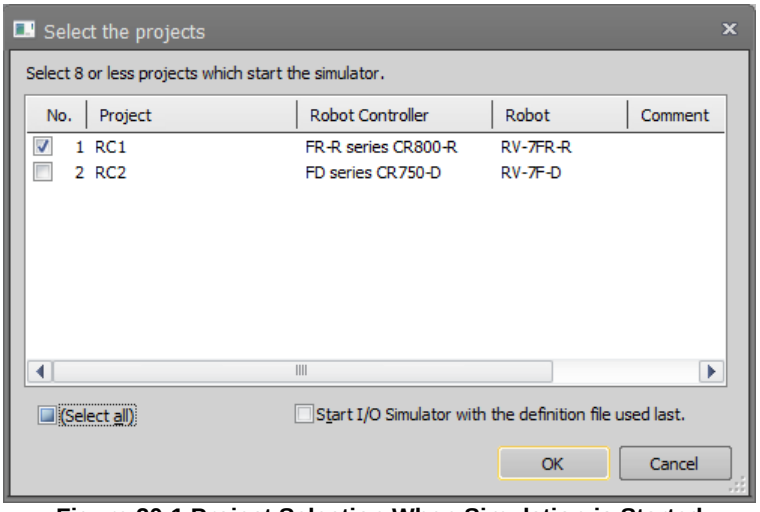


Figure 20-1 Project Selection When Simulation is Started

[(Select all)]	Selects and deselects all projects.
[Start I/O Simulator with the definition file used last.]	When the I/O Simulator was started up beforehand, the I/O Simulator is started up using the same definition file as last time.

Select the project to start the simulation, and then click the [OK] button.

Caution

Simulation may not start in cases of multiple projects.

Be aware that it may not be possible to start multiple simulations due to PC performance.

You can also start simulations from the title bar.

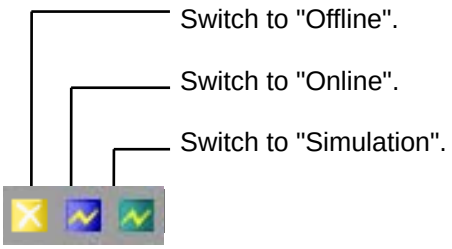


Figure 20-2 Explanation of Title Bar

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 20-3)

Figure 20-3 Virtual Controller stored in task tray

The simulation is run by this virtual controller. The virtual controller closes automatically when the simulation ends. Do not close the virtual controller manually.
3D monitor is automatically started when the simulation starts. The explanation of 3D monitor, see **"21 3D Monitor"**.

20.1.1. About the warning at first-time startup simulation

After installing RT ToolBox3, when you first start the simulation, the following warning screen may be shown. If the screen is displayed, confirm that checkbox corresponding to the environment is set to ON, and click [Allow access]. You need to select the [Allow access] button to use all the functions of the simulation.

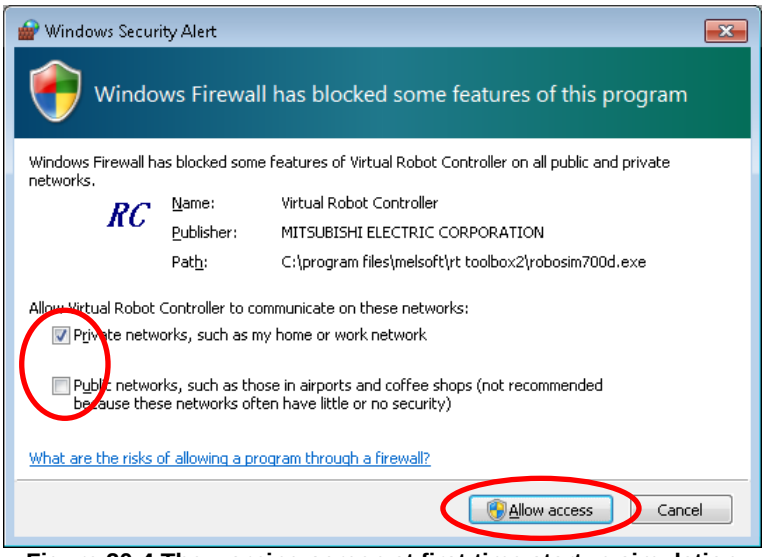


Figure 20-4 The warning screen at first-time startup simulation

20.2. Explanation of the Simulation Operation Screen

Use the [Operating panel] screen to operate simulations.
Refer to **"19.1 About the Operation Panel"** to understand how to operate the “Operation panel”.

20.3. Tact Time Calculation

You can calculate the tact time and axis load level of the operation command section of programs created by using the simulation function.
RV-F and RH-F series robots can calculate the axis load level.

Caution

Tact time calculation

The calculated tact time varies with the performance and load status of the computer used and will 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 **"20.3.3 Causes of tact time deviation".**

Caution

Axis load level calculation

The axis load level numerically expresses the motor load.

The robot will generate an overload error and stops protecting the motor when the axis load level exceeds 100%.The calculated axis load level assumes multiple iterations of the same operation. **However, be aware that stop will not occur in simulation even if the load level exceeds 100%.**

There is a possibility that continuous operation will not be possible in an actual robot when the calculated axis load level is high. You should lower the operation frequency with the Dly command, and lower operation speed and the acceleration with the Accel and the Ovrd commands, etc. Changing the operation point may lower the operation point.

Complete agreement with the calculated axis load level cannot be guaranteed because the axis load level of an actual robot is influenced in robot individual differences, the ambient temperature, the condition of the robot, etc. Use this function as a rough yardstick for studying robot movement.

Caution

Be aware that tact time may not be calculated correctly when measuring tact time with the XYZ position variables, layout parts, or Robot information displayed in the 3D monitor.

20.3.1. Conditions for tact time calculation

Note that the following restrictions are applied to calculation of the tact time.

⚠ Caution

Do not start multiple simulations.

Correct measurement may not result due to the PC load.

Do not set the [Tool] and [Collision area] displays ON

Correct measurement may not result due to the PC load.

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 for which you want to calculate the tact time for and then perform calculations.

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 in 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 the program contains a position array variable or joint array variable, include the Dim declaration in the tact time calculation range.

If the program whose tact time is to be calculated contains a position array variable or joint array variable, also include the Dim declaration in the tact time calculation range.

Set hand data correctly.

Please set the actually used hand and work conditions (mass, center of gravity, and shape) correctly. If the setting is different from the actual robot, the tact time and axis load factor cannot be correctly calculated. The setting of the hand and work condition is set by parameter HNDDAT*, WRKDAT *. The hand and work conditions are specified by the Loadset command.

⚠ Caution

Include the GoTo or GoSub jump destinations 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
```

Commands other than move commands cannot be calculated.

Tact time cannot be correctly calculated for programs that doesn't accompany the movement of robots, such as calculation processing, branch processing, etc.

20.3.2. Tact time measurement

This explains tact time measurement.

1. Start simulation.

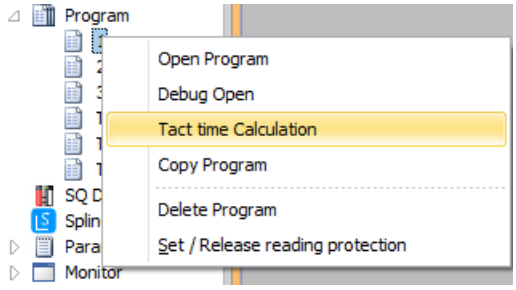
Start the simulation. For details, see **"20.1 Starting a Simulation"**.

2. Open the program, and start tact time calculation.

There are two ways of starting tact time calculation, by starting from the project tree or by starting from the program edit screen.

(1) Starting tact time calculation from the project screen

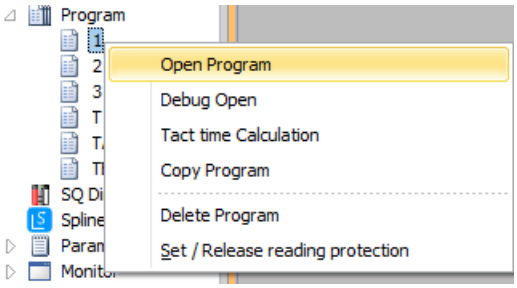
Select the program whose tact time is to be calculated from the project tree and click "Tact time Calculation" from the context menu.



(2) Starting tact time calculation from the program edit screen

1) Open the program.

Open the program whose tact time is to be calculated. You can calculate the tact time for both “offline” and “online” programs. Note, however, that the tact time of programs opened in the debug mode cannot be calculated. Always open programs by “Open Program”.



For details on the operations for opening a program, see **“11.2 Opening an Existing Program”**.

2) Specify the range in which the tact time of the program is to be calculated.

Drag the section of the program to calculate the tact time to select the range.

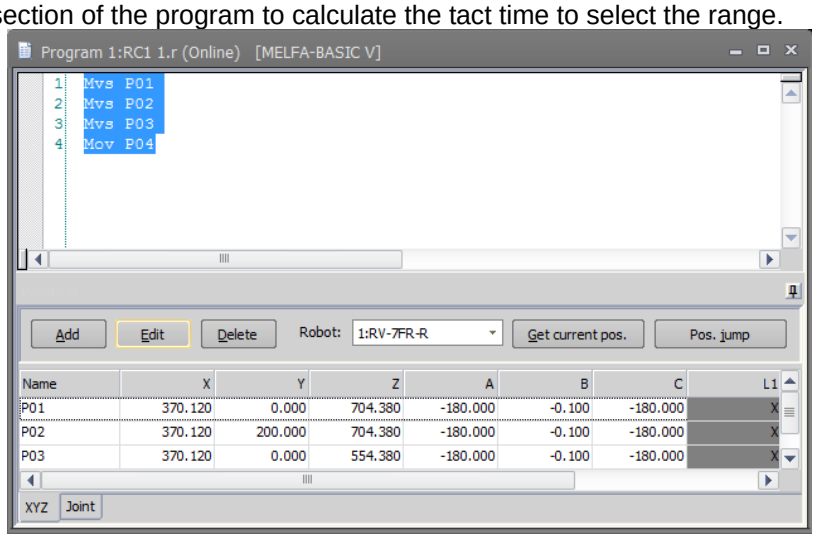


Figure 20-5 Selecting the Tact Time Calculation Range

3) **Click the [Tool] tab -> [Tact time Calculation] group - [Run calculation] button on the ribbon.**

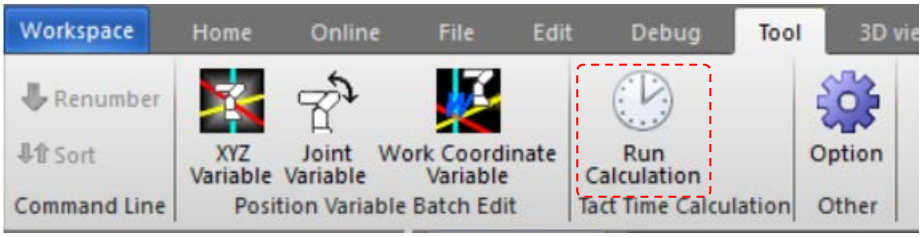


Figure 20-6 Toolbar "Tool" Menu

3. Check the range in which the tact time is to be calculated.

The "Tact calculation" screen for checking the tact time calculation range is displayed. Check the contents of this range, and click the [OK] button.

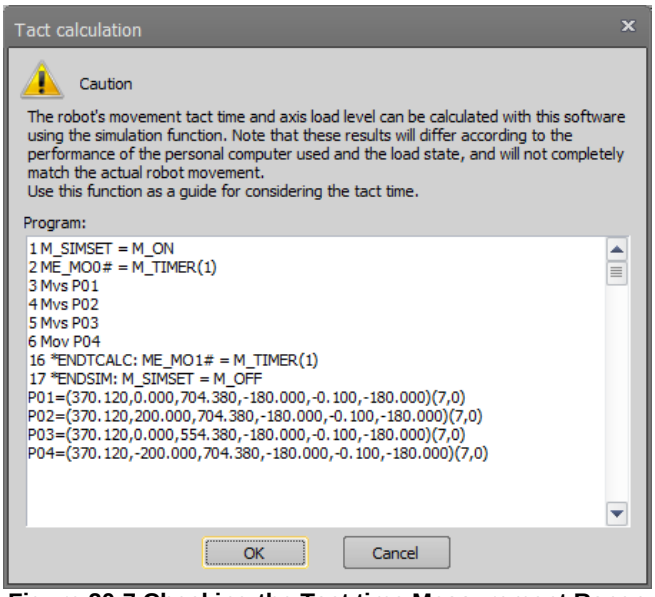


Figure 20-7 Checking the Tact time Measurement Range

The tact time calculation is started. During tact time calculation, "Tact time Calculation" is displayed at "Status" in the simulation operation screen. Do not perform any other operations until this display ends.

Figure 20-8 Simulation Operation Screen During Tact Time Calculation

4. The tact time calculation results are displayed.

When the tact time calculation is completed, the "Tact time calculation results" screen is displayed. The tact time calculation results are displayed in milliseconds. The tact time calculation results are also displayed in the output window.

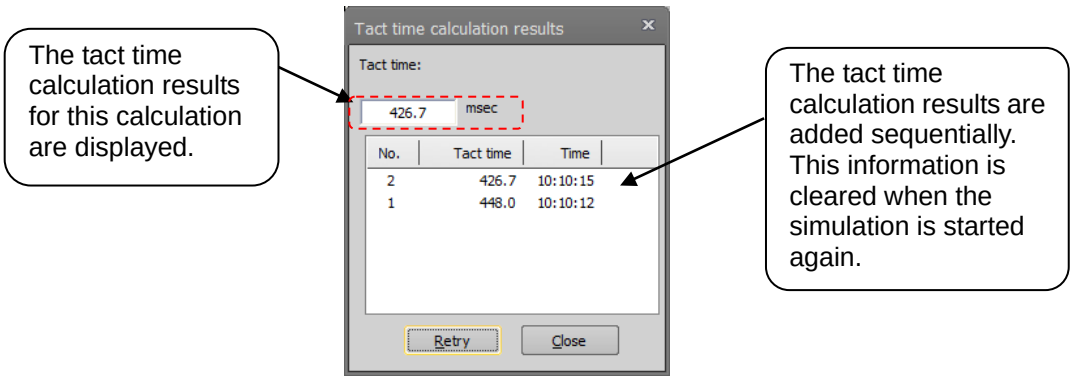


Figure 20-9 Tact Time Calculation Results (Calculation of Axis Load Level Impossible)

The axis load level (J1-J6 each axis) and the tact time are displayed for robots that can measure the axis load level.
The calculation result for axis load level is displayed as %.

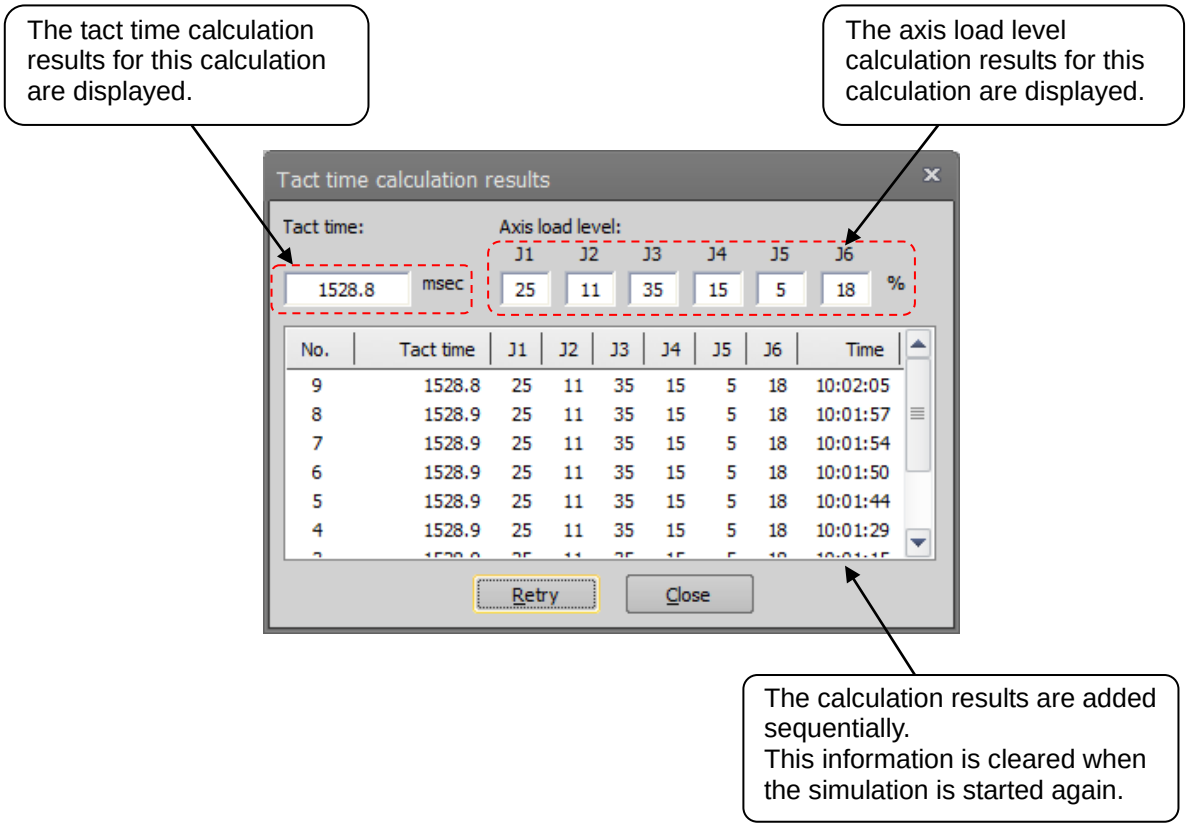


Figure 20-10 Tact Time Calculation Results (Calculation of Axis Load Level Possible)

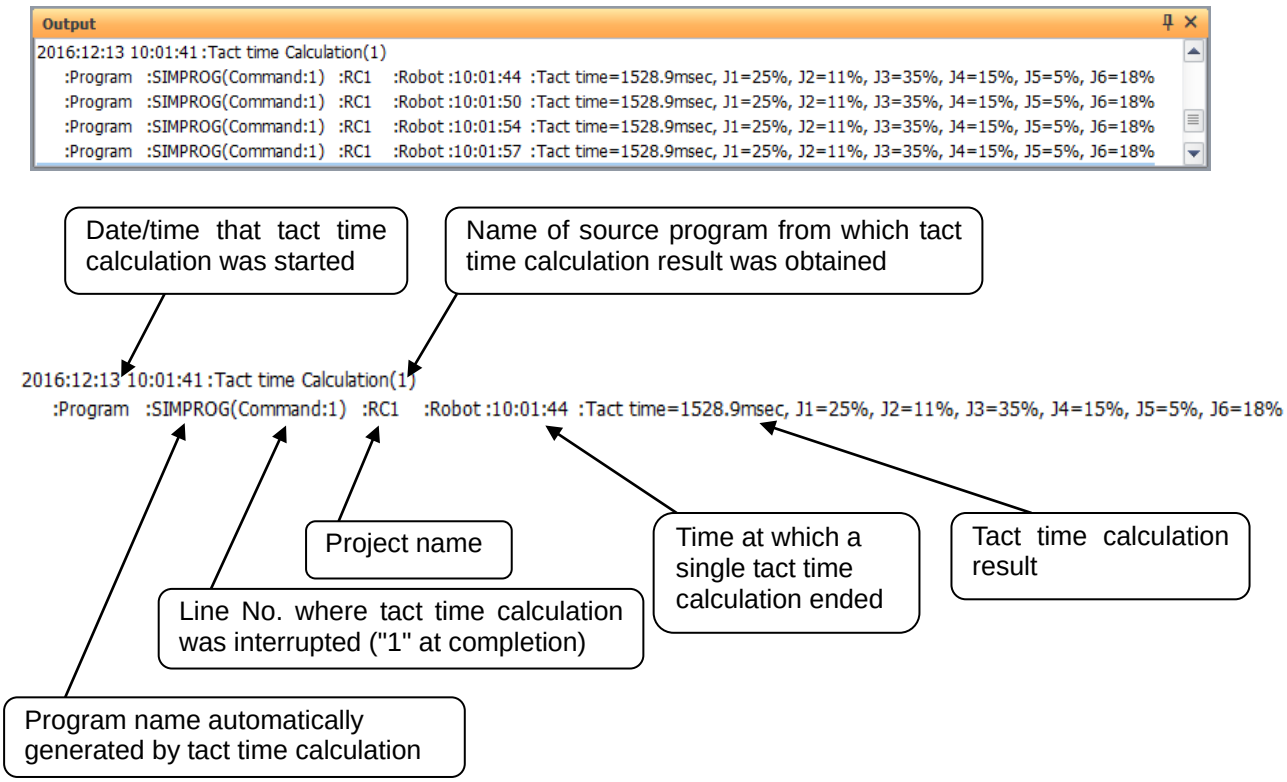


Figure 20-11 Tact time calculation result (Output window)

Caution

J7, J8 axis are the outer.

20.3.3. 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 performance and load status of the computer used, and will 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 of 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, the background processing for this software will take more time and sometimes the correct tact time will not be calculated. The tact time will increase.)
When calculating the tact time with this software, first close other applications.
Also, in this software itself, first close all the screens except "Program edit".

(2) Using 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 by communicating with such equipment are executed as if ideal information were sent from that equipment. Therefore, the calculated cycle time will be 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	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

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). To calculate the tact time precisely, write the program using only move commands and none of the previously mentioned 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) Using 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, in the 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 cannot be calculated. Therefore, if you use the following high-load functions, 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.

20.4. Cooperative control simulation

Cooperative control by multiple robots can be simulated. Cooperative control is available only when CR800-R/CR800-Q/CR750-Q/CRnQ-700 controller is selected.

The correspondence between the robot number used for coordinated control and the slot number of the robot CPU installed in the PLC base unit is as shown below. The robot CPU must be installed in order from the first slot.

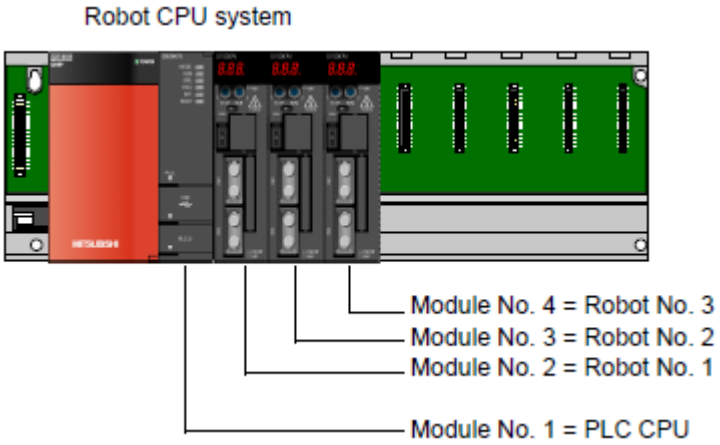


Figure 20-12 Correspondence between robot number and mounting position of robot CPU

The correspondence between the project in the workspace and the robot number is as follows.
From the first project, it is assigned as Module No. 2 (Robot No. 1) -> Module No. 3 (Robot No. 2) -> Module No. 4 (Robot No. 3). This function can not be used if there are projects other than CR800-R/CR800-Q/CR750-Q/CRnQ-700 on the way.

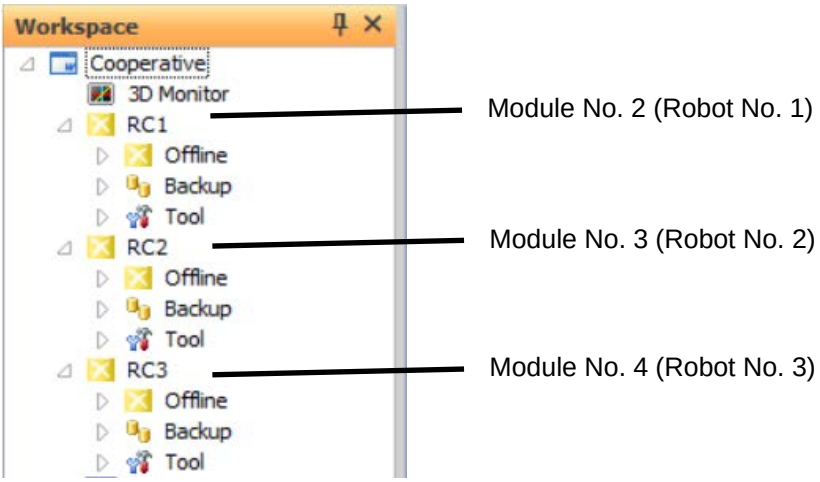


Figure 20-13 Correspondence between robot number and mounting position of robot CPU

With cooperative control simulation support, the following state variables can now be used in simulation.
For details, refer to the instruction manual “Detailed explanations of functions and operations 4.14 Detailed explanation of Robot Status Variable”.

Variable name	Explanation
M_UDevW	Reads/Writes the signals per word directly with two or more robot CPUs.
M_UDevD	Reads/Writes the signals per double word directly with two or more robot CPUs.

20.4.1. Cooperative operation

It is possible to simulate the operation of conveying one work in cooperation with up to three robots.
For details, refer to the instruction manual “Detailed explanations of functions and operations 7.5 Cooperative operation function”.

Cooperative operation simulation setting

When using cooperative action on actual machine, it is necessary to absorb installation error and manufacturing error. However, there is no error in the virtual space of the simulation, so you can use the following simple method.

1. Preparation

Set up two CR800-R/CR800-Q/CR750-Q/CRnQ-700 Series robots and start the simulation. After that, open the 3D monitor, display the "Robot arrangement list" screen from the "3D View" menu, and place the robot. In this example, the robot 1 and the robot 2 are arranged to face each other.

*Robot 1 (-50,-300, 0, 0, 0, 90), Robot 2 (50, 300, 0, 0, 0,-90)

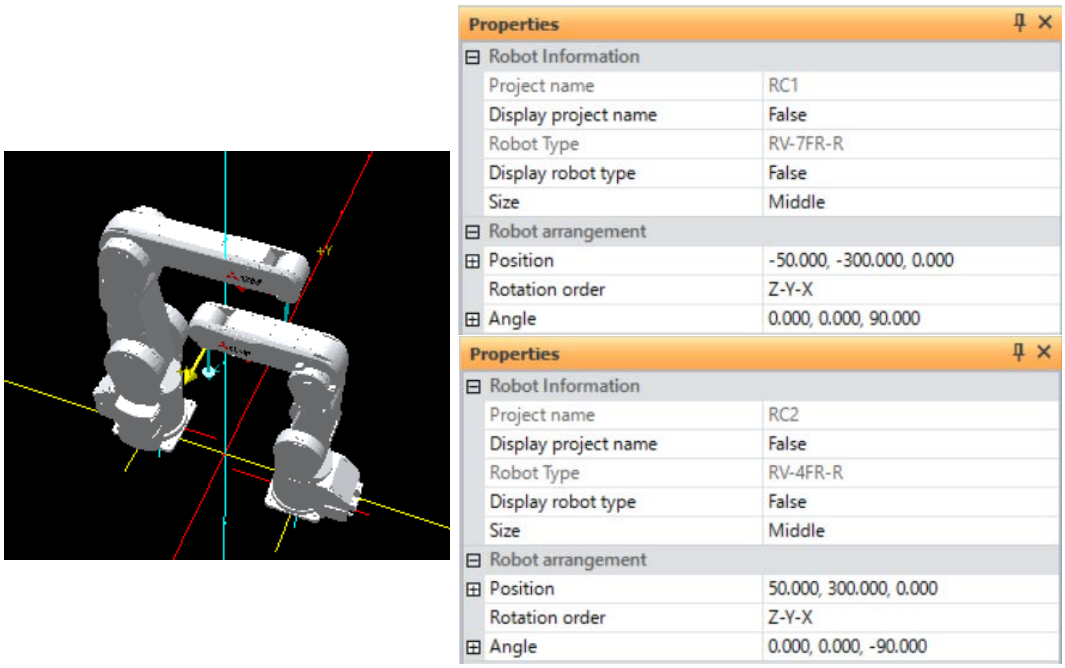


Figure 20-14 Robot arrangement example

2. Base setting

In cooperative operation, one is the master and the other robot is the slave that follows the master. In this example, since the robot 1 is the master, set "the position of the robot 2 seen from the robot 1" on the base of the robot 2.

In this example, it becomes (600, -100, 0, 0, 0, 180).

3. Tool setting

Set the tool of two robots. When controlling the center of the work grasped by two robots, set both the robot 1 and robot 2 tools to the work center. In this example, it is the tool coordinates (0, 375, 100, 0, 0, 0) of robot 1 and the tool coordinates (0, 375, 100, 0, 0, 180) of robot 2.

*The tool Z elements is set to 100 mm from the mechanical interface.

*The tool C elements of the robot 2 is rotated 180 degrees to match the tool direction of robot 1.

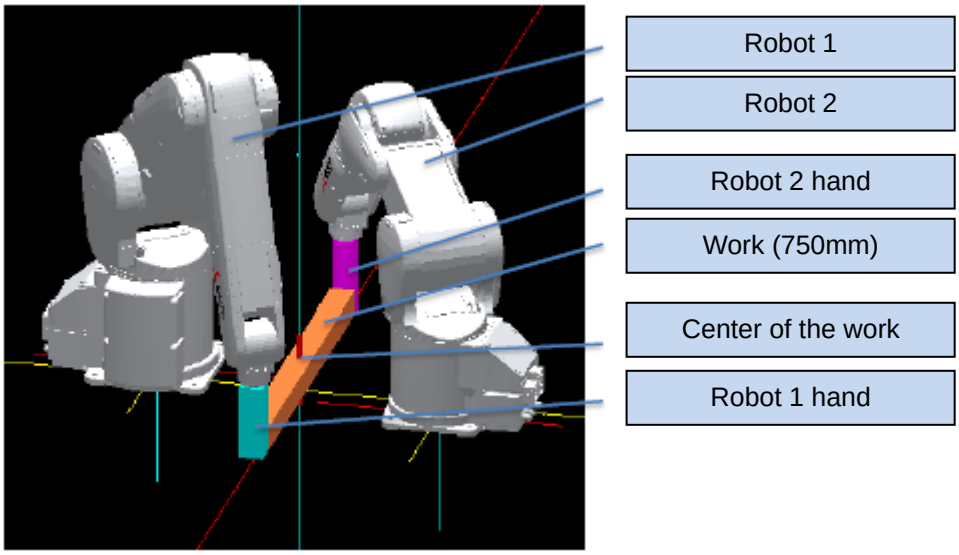


Figure 20-15 Example of controlling the center of the work

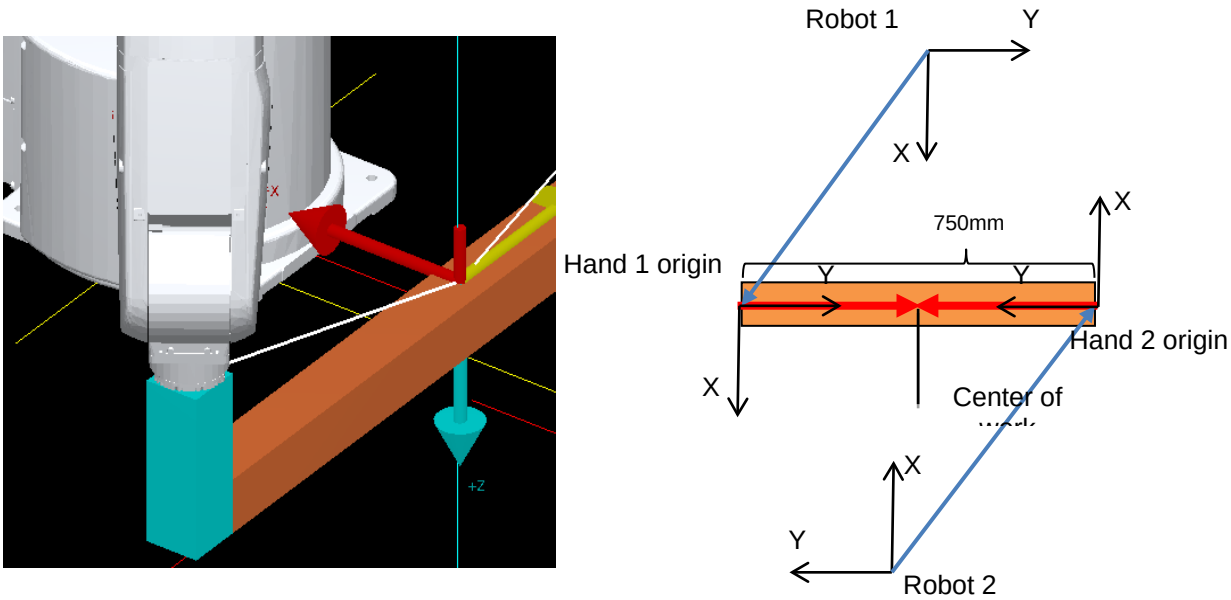


Figure 20-16 Example of controlling the center of the work (Detail image)

The control point need not be the center of the workpiece. When moving a long work with two robots, it may be easier to teach if there is a control point at the tip of the work. For example, in the above example, the control points of robots 1 and 2 are (0, **375 -> 750**, 100, 0, 0, 0), (0, **375 -> 0**, 100, 0, 0, 180) respectively.

4. Confirmation of collaborative operation

To move robot 2 (slave) according to the movement of robot 1 (master), specify the shared memory of robot 1 and execute the Mxt command.

In the next sample program, Mxt instruction is executed after confirming preparation completion. The robot 2 reads the posture of the robot 1 and moves to the grasping posture of the work. The robot 1 pauses with the Hlt command, but since the robot 2 continues cooperative operation, if JOG operation is performed on the robot 1, the robot 2 will follow up.

*To execute the program, start up in order of robot 2 -> robot 1.

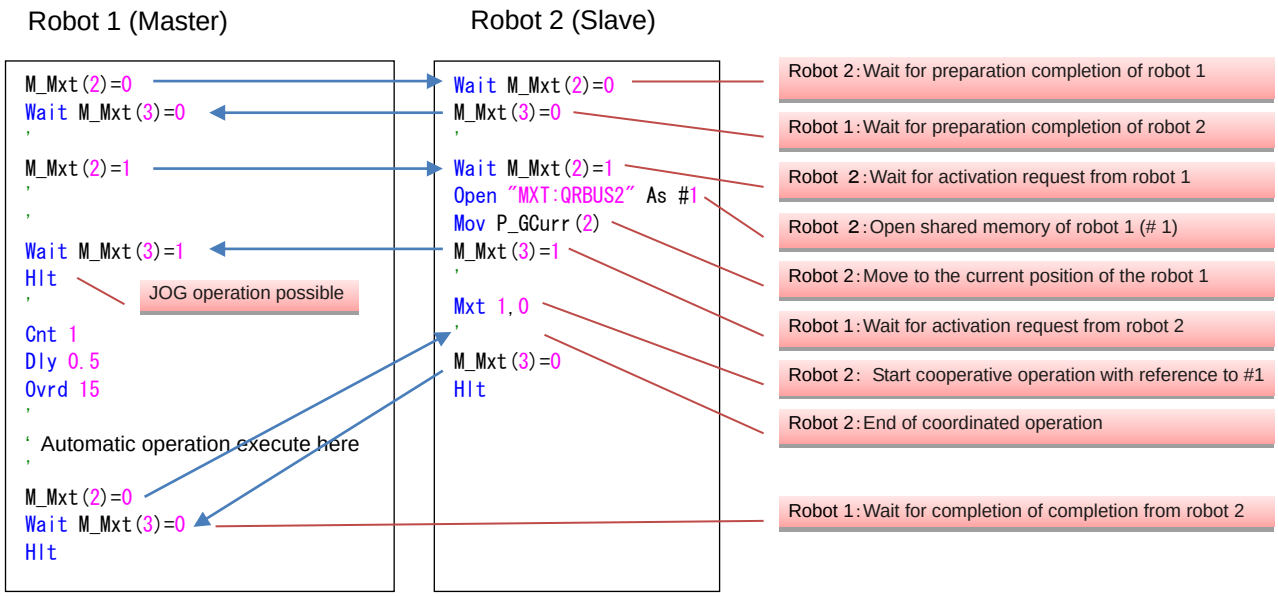


Figure 20-17 Sample program

M_Mxt (CPU number) is a special variable that can communicate state between CPUs. Take the timing of starting and ending cooperative operation using this variable.

When coordinated operation is controlled from a robot program, the robot 1 executes a movement command while the robot 2 is executing the Mxt command. If the slave side cannot keep up with over speed or outside the operating range, it generates an error and stops.

20.4.2. Interference avoidance

It is possible to operate the robot while checking interference with other robots.
For details, refer to the instruction manual “Detailed explanations of functions and operations 5.24 Interference avoidance function”.
Also, refer to "**13.3.15 Collision avoidance parameters**" for how to set the interference avoidance parameters with this software.

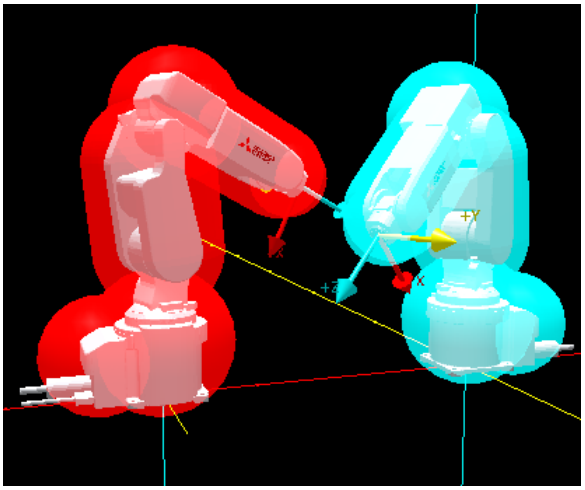


Figure 20-18 Image of interference check with two robots

20.5. Ending Simulation

To end the simulation, close the robot program in debugging status. Then click the [Home] tab -> [Mode] group -> [Offline] button or [Online] button on the ribbon, or click "Offline" or "Online" on the application tab.

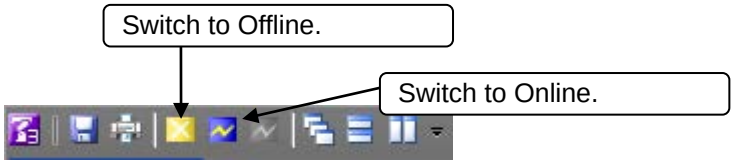


Figure 20-19 Switching Between "Offline" and "Online" on the Application Tab

When the simulation ends, the virtual robot controller, robot view, and simulation operation screen close and the controller goes back offline.

21. 3D Monitor

You can display the robots and their movements in multiple projects in 3D to check them.

Caution

When using the 3D monitor, we recommend using a high-performance PC. Jog operation may not be performed properly if low-performance PC is used.

21.1. Starting Up 3D Monitor

Either double-click [3D Monitor] or [Online]/ [Offline]/ [Simulation] -> [<Robot model name>] from the project tree or select [3D Monitor] from the context menu. The 3D display for the selected robot is displayed in the "3D Monitor" screen. If the "Travel base setting for display" is set to the project, the travel base also is displayed.
In the offline mode, the robot is basically displayed at its fixed posture.

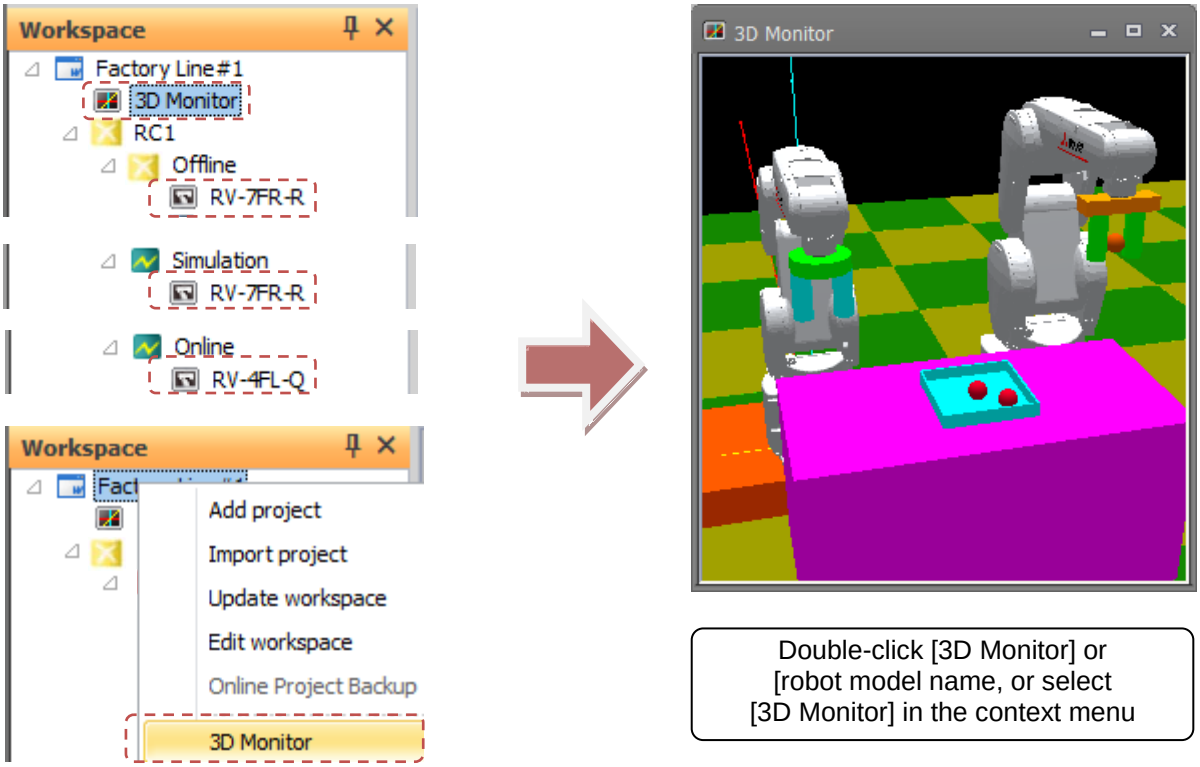


Figure 21-1 Starting Up 3D Monitor

21.2. Change 3D Monitor Display Method

You can change the display method of the 3D monitor on the option screen.
Select the [Workspace] tab -> [Options] menu on the ribbon.
By checking [Always display in front] in [3D Monitor], it will always be displayed on the front from the time the next 3D monitor is started up and you can move outside the screen of RT ToolBox 3.
If you want to display the 3D monitor on the display tab and display it in line with other windows, please uncheck the [Always display in front] check box.

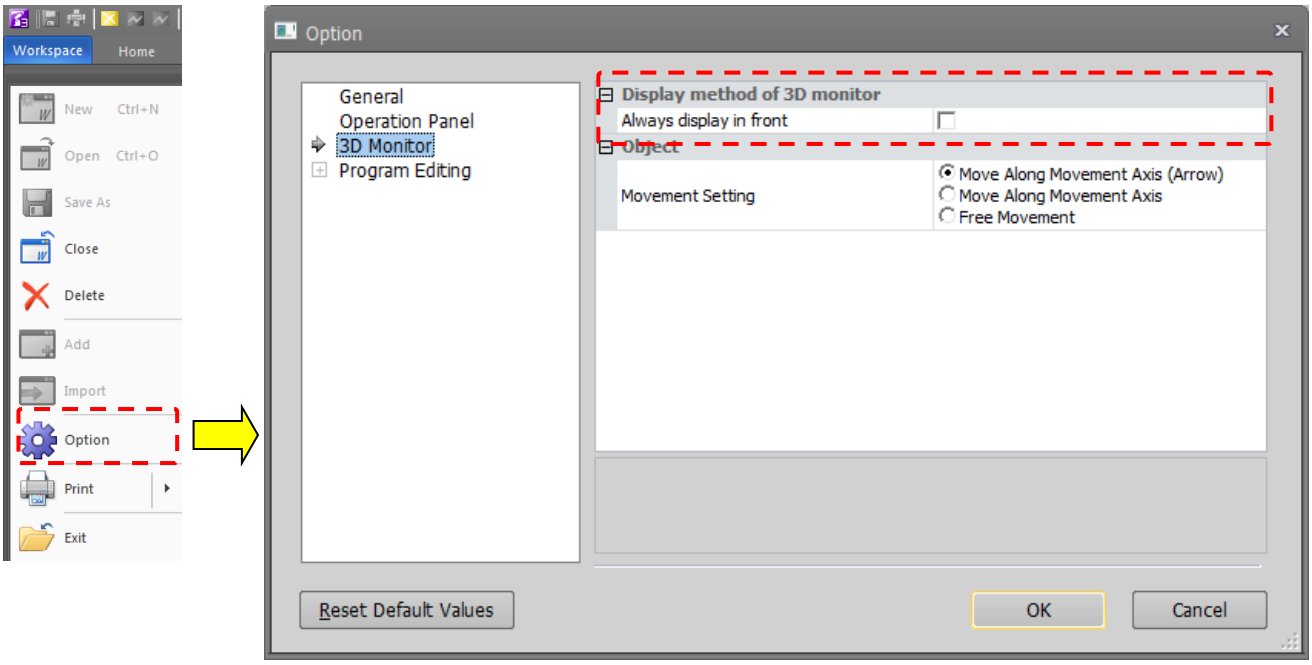


Figure 21-2 Change display method of 3D monitor

21.3. 3D Monitor Operations

On the 3D monitor, you can rotate the display, move it in parallel or enlarge and reduce it.
Also, all 3D monitor operations can be executed basically by operating the mouse on the 3D monitor.

21.3.1. List of operations

The following table lists operations in the 3D monitor.

Table 21-1 List of 3D Monitor Operations

Operation	Motion	Details
[Shift] key + drag up/down Mouse wheel operations	Enlarge/reduce	**21.3.2 Zoom operation**
Drag (mouse left button + move mouse)	View rotation (around X- and Z-axes)	**21.3.3 Rotating the view**
Drag both buttons (both mouse left/right buttons + move mouse)	View rotation (around Y-axis)	**21.3.3 Rotating the view**
Drag right (mouse right button + move mouse)	Parallel movement of view	**21.3.4 Parallel movement of view**
[Ctrl] key + [Shift] key + click	Selecting robot/object	**21.3.5 Selecting objects**
[Ctrl] key + [Shift] key + drag (only arrow of reference position)	Moving the position of robot/object	**21.3.6.1 Moving objects by the**
[Ctrl] key + click	Moving the robot by clicking (only in simulations)	**21.15 Moving the Robot by Clicking**
[Space] key + click	Measuring distance (only when distance measurement screen is displayed)	**21.17 Distance measurement**
[Ctrl] key + [Z] key	Returning the editing state of robot and object one time ago	**21.4.2.16**Restore

21.3.2. Zoom operation

In the 3D monitor, the display can be enlarged or reduced by mouse wheel operation.
Rotating the mouse wheel upwards enlarges a display, while rotating the mouse wheel downwards reduces a display.

Also, the center of enlargement/reduction also can be changed by selecting the zoom type.
The zoom type can be selected by [3D view] tab -> [Zoom type] group on the ribbon.

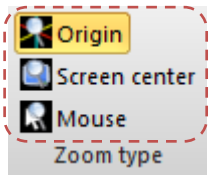


Figure 21-3 Zoom Type Select Button

The following table summarizes the relationship between zoom type and center of enlargement/reduction.

Table 21-2 Zoom Type and Center of Enlargement/reduction

Zoom Type	Center of Enlargement/reduction
Zoom toward origin	Origin of 3D monitor
Zoom toward screen	Center of screen
Zoom toward mouse	Mouse cursor point

Besides this, the display can also be enlarged and reduced while holding down the [Shift] key and the mouse left button. Moving the mouse upwards in this state enlarges the display, and moving the mouse downwards reduces the display. Note, however, that enlargement/reduction is performed around the center of the screen when this operation is performed with "Mouse" selected at "Zoom type".

Changes made to the zoom type setting are also reflected in operations in the following screen:

- Collision avoidance area screen
- Hand edit
- Robot parts edit
- User mech. edit

21.3.3. Rotating the view

On the 3D monitor, the view can be rotated by moving the mouse with the mouse left button or the mouse left and right buttons held down. The rotation angle is reflected in the following order: around the Z-axis -> around the Y-axis -> around the X-axis.
The following table summarizes the correspondence between operation and rotation.

Table 21-3 View Rotation Operations

Operation	Rotation
Move mouse left or right with mouse left button held down	Rotation around Z-axis
Move mouse up or down with mouse left button held down	Rotation around X-axis
Move mouse left or right with mouse left and right buttons held down	Rotation around Y-axis

In addition to mouse operations, the view can be rotated by using numerical values, that is, by changing the values of [3D view] tab -> [View angle] group -> [X]/[Y]/[Z] on the ribbon.

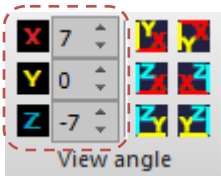


Figure 21-4 View Angle Setting

Also, in view rotation operations using the mouse, the view center of rotation can be changed to match the zoom type.
With zoom toward screen and zoom toward mouse operations, the center of rotation can be changed according to the center of the screen and presence of an object at the mouse position when the mouse left button is clicked on the 3D monitor.

Table 21-4 Changing the View Center of Rotation in 3D Monitor

Selected Zoom Type	Monitor When Left Button Is Clicked	View Center of Rotation
Zoom toward origin	Always	Origin
Zoom toward screen	Opaque object exists in center of screen	Center of screen
	Opaque object does not exist in center of screen	Origin
Zoom toward mouse	Opaque object exists at mouse position	Click point on object
	Opaque object does not exist at mouse position	Origin

If you are rotating the view around a point other than the origin, small coordinate axes as shown below are displayed at the center of rotation point.

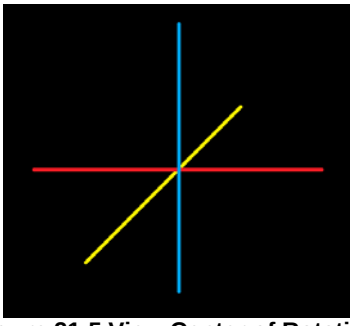


Figure 21-5 View Center of Rotation

The view can also be changed to a position visible on a plane, such as the X-Y plane or X-Z plane, by clicking the following buttons in the [3D view] tab -> [View angle] group on the ribbon.

Figure 21-6 Buttons for Setting a Plane View

21.3.4. Parallel movement of view

In the 3D monitor, the view can be moved by moving the mouse with the mouse right button held down.
If parallel movement is performed repeatedly, the origin of the 3D monitor is sometimes lost. However, if this happens, exit the 3D monitor and then restart it. The origin will return to its initial view position.

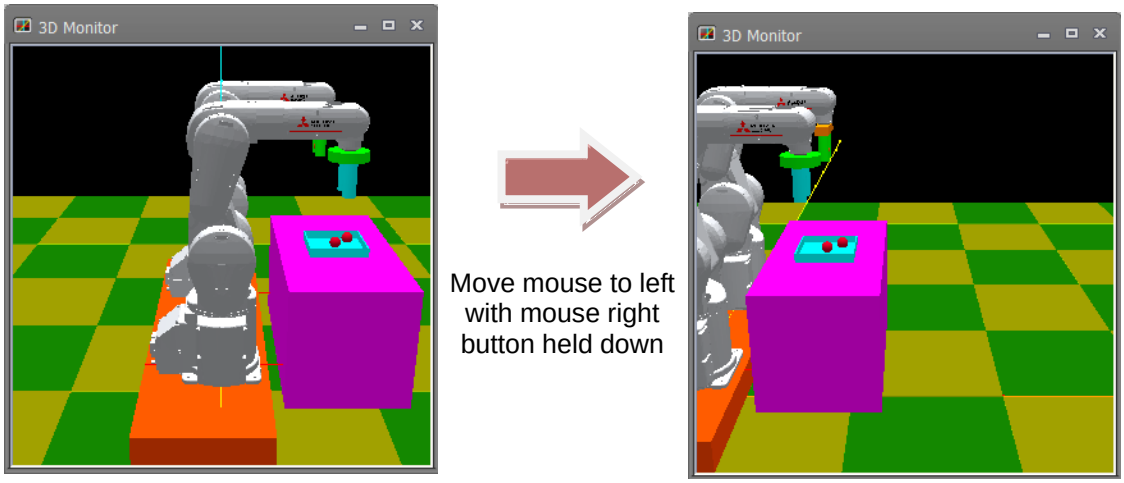


Figure 21-7 Parallel Movement of View

21.3.5. Selecting objects

In the 3D monitor, a corresponding item on the layout tree is selected and its display information is displayed at "Properties" if a robot or layout object is clicked with the [Ctrl] and [Shift] keys held down. When display data held by the robot, such as hand or free plane limit, is clicked with the [Ctrl] and [Shift] keys held down, the robot will be selected.
Alternatively, if a location where no 3D monitor information is displayed is clicked with the [Ctrl] and [Shift] keys held down, the layout tree will become deselected.
When a robot or layout is selected in the layout tree, arrows such as shown below are displayed at the reference positions of the corresponding object in the 3D monitor.

This method allows you to check correspondence between object display in the 3D monitor and items in the layout tree.

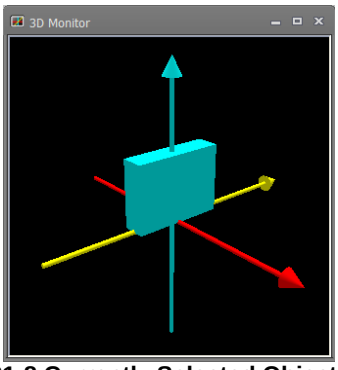


Figure 21-8 Currently Selected Object Display

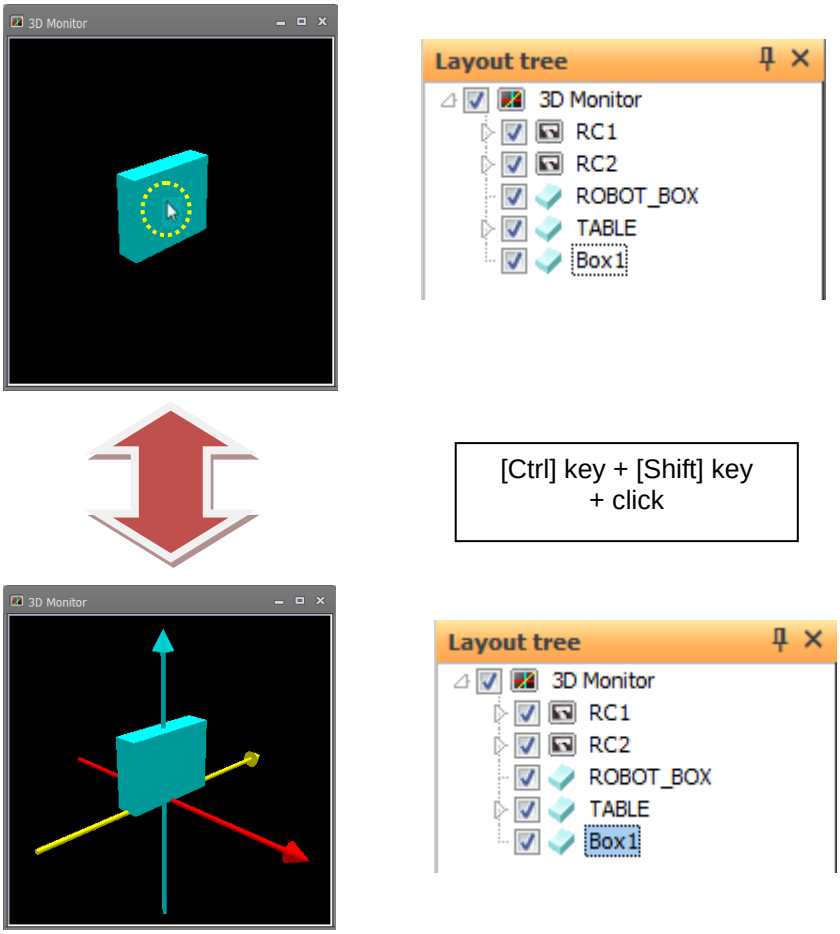


Figure 21-9 Selecting an Object by the Mouse

Caution

When you select an object on the 3D monitor, the wire frame object is sometimes selected if there is a wire frame object at the front even if its surface is not displayed.

21.3.6. Moving Objects Mouse

You can move the object by mouse operation on the 3D monitor.
The movement method can be changed on the option screen, and it can be selected from [Move Along Movement Axis] and [Free Movement].
To display the options screen, select the [Workspace] tab -> [Option] menu on the ribbon.

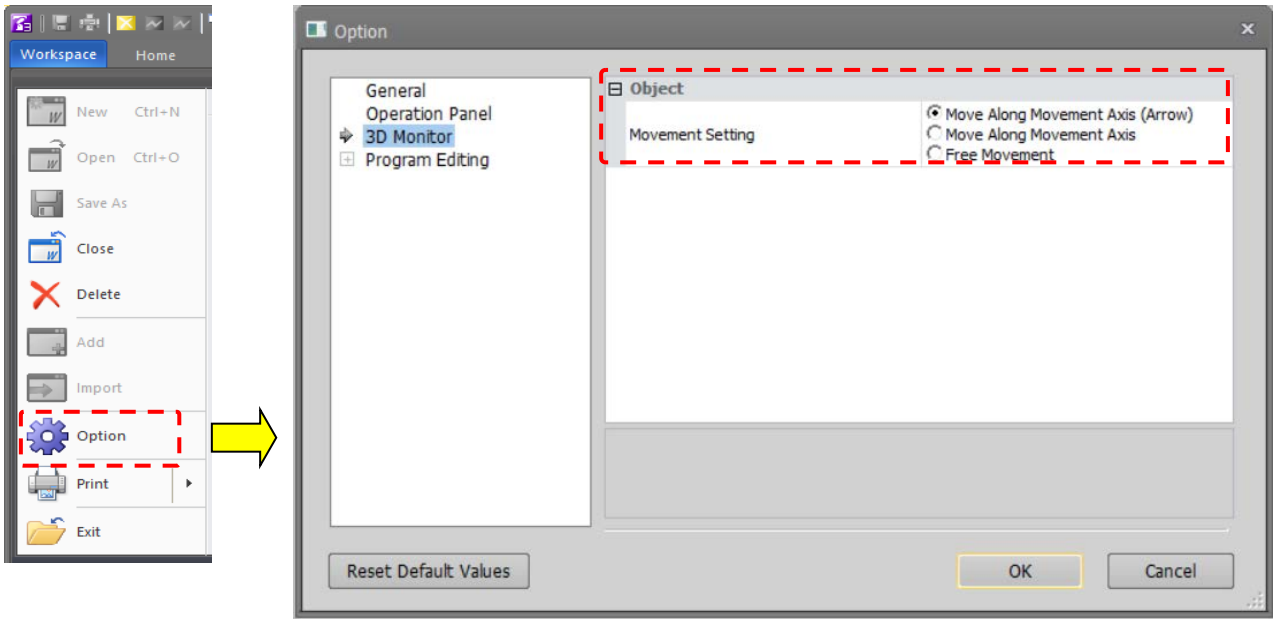


Figure 21-10 Mouse move method of object changes

21.3.6.1. Moving objects by the Axis

By selecting [Move along Movement Axis (Arrow)] and [Move along Movement Axis] on the option screen, you can move the selected object along the movement axis with the mouse operation on the 3D monitor.

The currently selected object can be moved by mouse operation on the 3D monitor.
For details on selecting objects, refer to **"21.3.5 Selecting objects"**.

When a currently displayed object is selected, arrows are displayed at its reference positions.
If an arrow is dragged on the 3D monitor with the [Ctrl] and [Shift] keys held down, the object moves along the arrow that is being dragged.

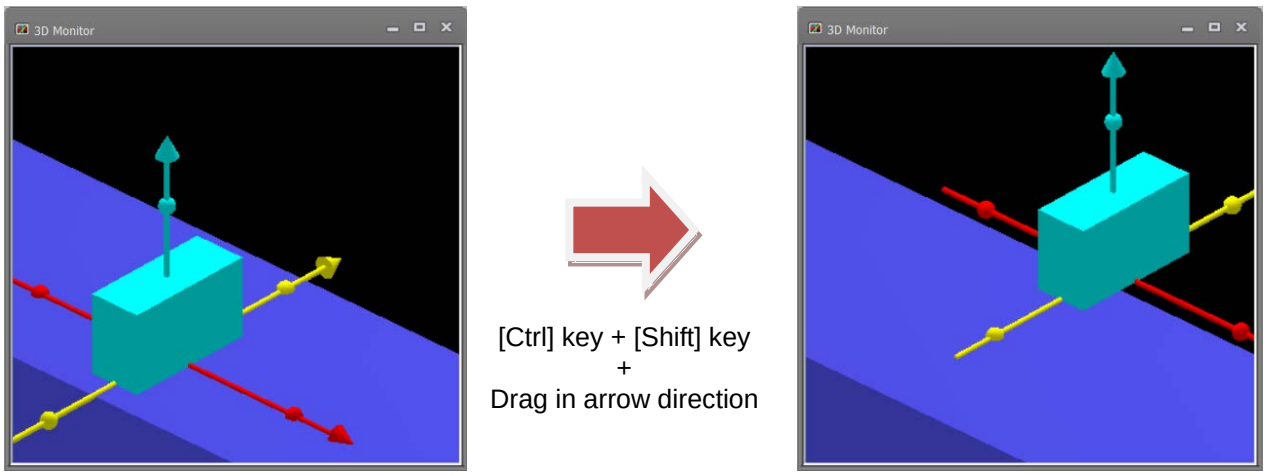


Figure 21-11 Moving Objects by the Mouse

After pressing the [Ctrl] key + [Shift] key, drag the sphere on the axis and the part will rotate along the axis.

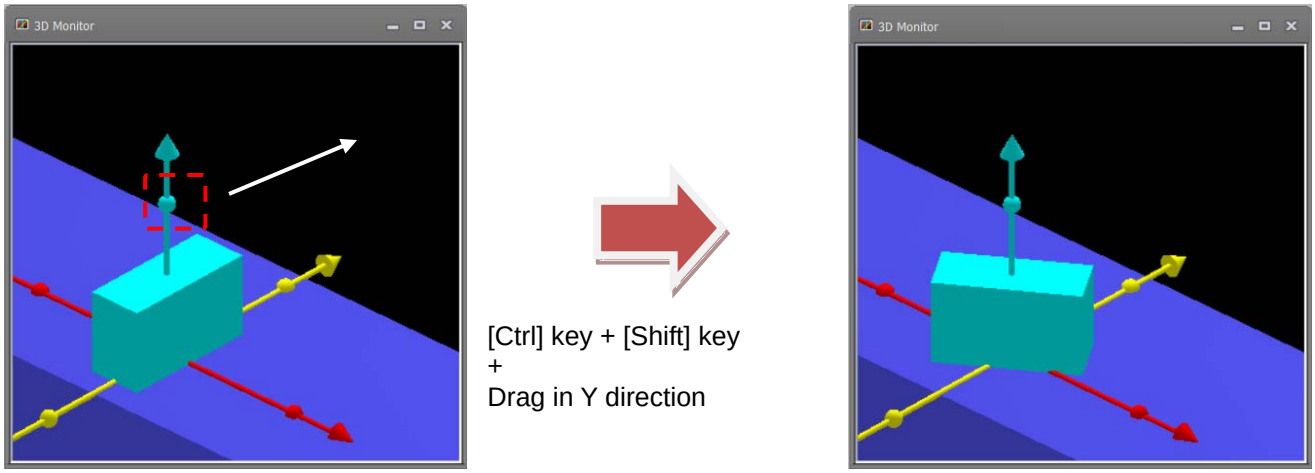


Figure 21-12 The object rotates along the axis of rotation

Caution

When you drag an arrow, a wire frame object will be selected if there is a wire frame object at the front even if its surface is not displayed.

When projection type is perspective, the object sometimes moves in the direction opposite to the move direction of the mouse when the mouse is dragged to move the object in the arrow direction.

21.3.6.2. Free Movement

If you select [Free Movement] on the option screen, you can move the object freely by operating the mouse on the 3D monitor.
While holding down [Ctrl] + [Shift], dragging an object on the 3D monitor moves the object in the direction you drag.

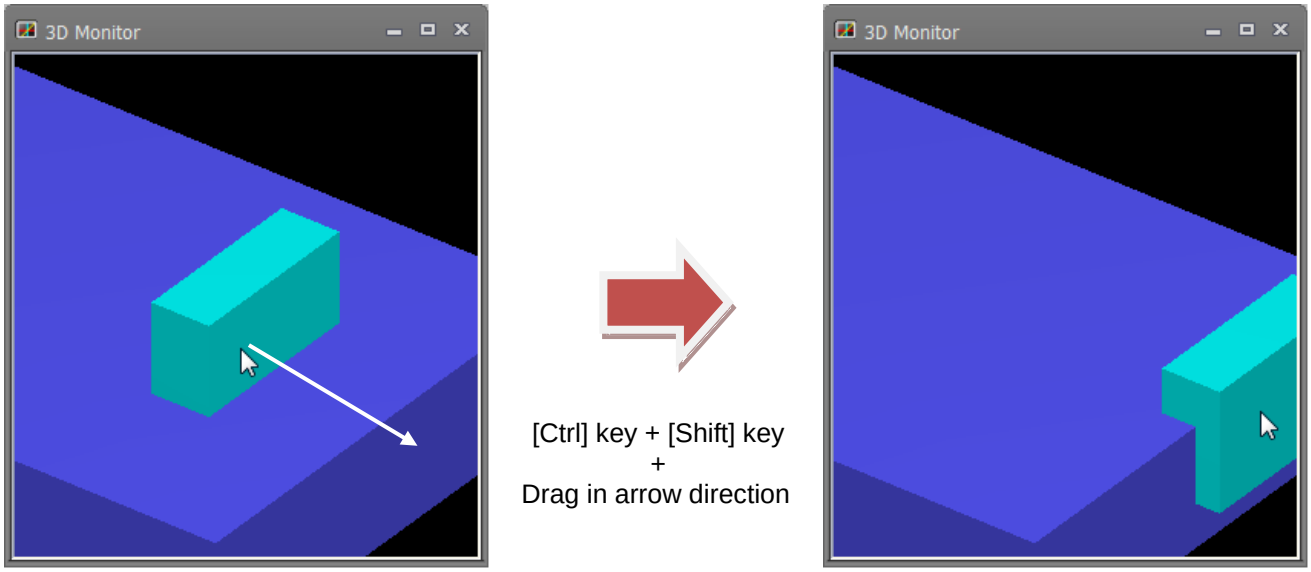


Figure 21-13 Free movement of objects

To move the object on the XY plane or the XZ plane, click the [3D display] tab -> [view change] group -> [XY plane] button on the ribbon, move the viewpoint to a position visible on the plane and then move the object.

Figure 21-14 Free movement on object plane

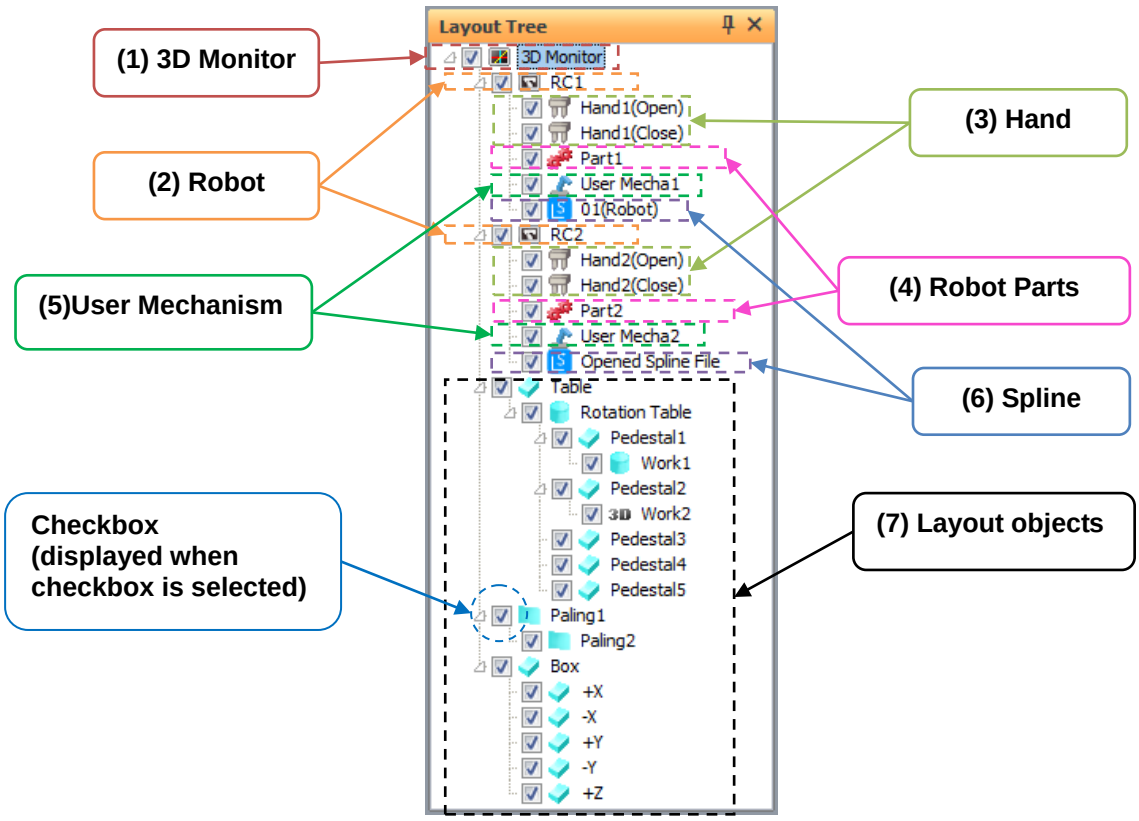
Caution

When dragging an object, if there is an object of wireframe in front, the object of the wireframe is selected even if the face is not displayed.

21.4. Layout Tree

Data that is displayed on the 3D monitor can be selected in the layout tree.
Also, display information relating to items selected in the layout tree is displayed at "Properties", and respective display information can be edited.

21.4.1. Content of layout tree



(1) 3D Monitor
When this is selected, the display information relating to the entire 3D monitor is displayed at "Properties" and can be changed.
Checkboxes cannot be changed.

(2) Robot
When these are selected, the display information relating to the robot is displayed at "Properties" and can be changed.
In modes other than offline, only currently connected robots are displayed in the layout tree.

(3) Hand
When these are selected, the display information relating to the hand is displayed at "Properties" and can be changed.
The hand file name is displayed as the name of the hand.

(4) Robot Parts
When these are selected, the display information relating to the robot parts is displayed at "Properties" and can be changed.
The robot parts file name is displayed as the name of the robot parts.

(5) User Mechanism
When selected, the display information on the user mech. is displayed in the property and can be changed.
“User Mech. Name” display the selected user mech. name.

(6) Spline
When these are selected, the display information relating to the spline curve is displayed at "Properties" and

can be changed.
The name is changed according to the display information, and "Opened spline file" or "01(PC)", for example, indicating the specified spline file is displayed.

(7) Layout objects
When these are selected, the display information relating to layout objects is displayed at "Properties" and can be changed.
The [Name] set in the display information is displayed as the name.

21.4.2. Operations in layout tree

21.4.2.1. Add hand

To add a hand to the layout tree, right-click the robot to add the hand to, and select [Add hand] from the context menu. A hand item will be newly added at the bottom of the list of hands. Or, a hand can be added immediately under a specific hand by right-clicking that hand and selecting [Add hand].
Next, set the display information, for example, by selecting [Hand Name] at "Properties".

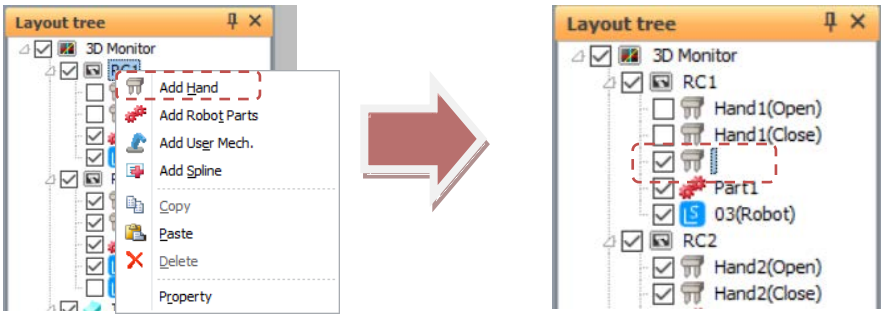


Figure 21-15 Add a Hand Item

21.4.2.2. Add robot parts

To add a robot part to the layout tree, right-click the robot to add the robot parts to, and select [Add Robot Parts] from the context menu. A robot part item will be newly added at the bottom of the list of robot parts. Or, a robot part can be added immediately under a specific robot parts by right-clicking that robot parts and selecting [Add robot parts].
Next, set the display information, for example, by selecting [Robot Parts Name] at "Properties".

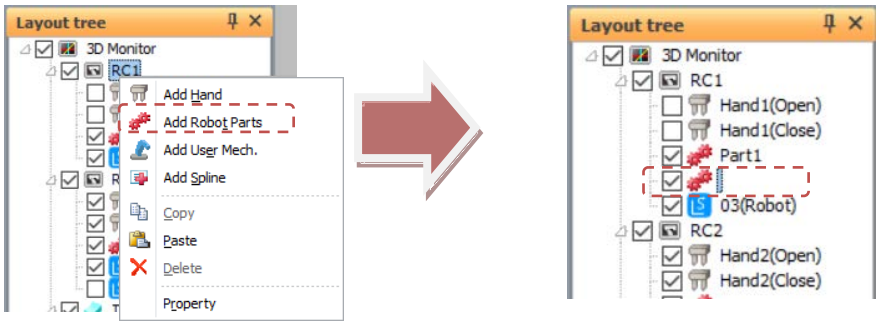


Figure 21-16 Add a Robot Parts Item

21.4.2.3. Add user mechanism

To add a user mech. to the layout tree,right-click the robot to add the user mech. ,and select [Add User Mech.] from the context menu.The user mech. item will be newly added at the bottom of the list of robot parts.Or, a user mech. can be added immediately under a specific user mech. by right-clicking that user mech. and selecting [Add User Mech.].
Next,set the display information ,for example,by selecting [User Mech. Name] at “Properties”.

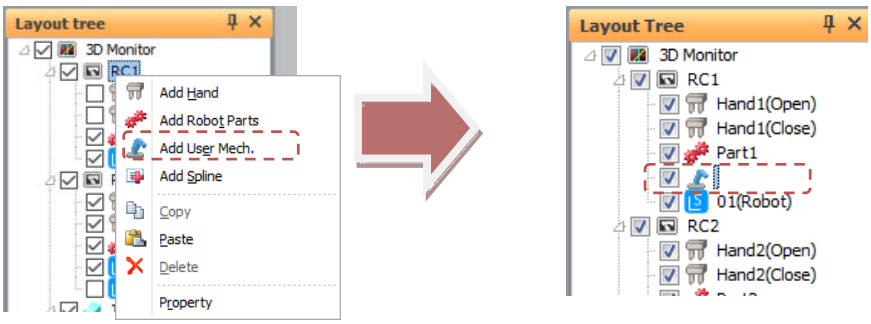


Figure 21-17 Add a user mech. Item

Caution

Up to 3 user mechanisms can be displayed on 3D monitor

You can add more than four user mech., but display up to three user mech. on the 3D monitor.
When adding the fourth user mech. on the 3D monitor (checked in the layout tree), the first user mech. will be hidden. (the layout tree is not checked) .

21.4.2.4. Add spline

To add a spline to the layout tree, right-click the robot to add the spline to, and select [Add spline] from the context menu. A spline item will be newly added at the bottom of the list of splines. Or, a spline can be added immediately under a specific spline by right-clicking that spline and selecting [Add spline].
Next, set the display information, for example, by selecting [Display curve] at "Properties".

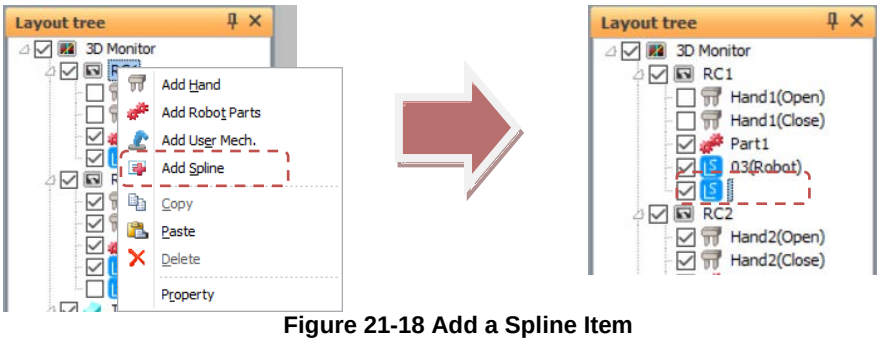


Figure 21-18 Add a Spline Item

21.4.2.5. Copying a hand / robot parts / user mechanism

Follow the procedure below to copy a hand / robot parts / user mech. in the layout tree.
(1) Select the hand / robot parts / user mech. to copy, and select [Copy] from the context menu.
(2) Right-click again on the copy destination robot, and select [Paste] from the context menu.
(3) The selected hand / robot parts / user mech. is copied to the right-clicked robot.

Or, a hand / robot parts / user mech. can be copied immediately under a specific hand by right-clicking that hand / robot parts / user mech. and selecting [Paste].

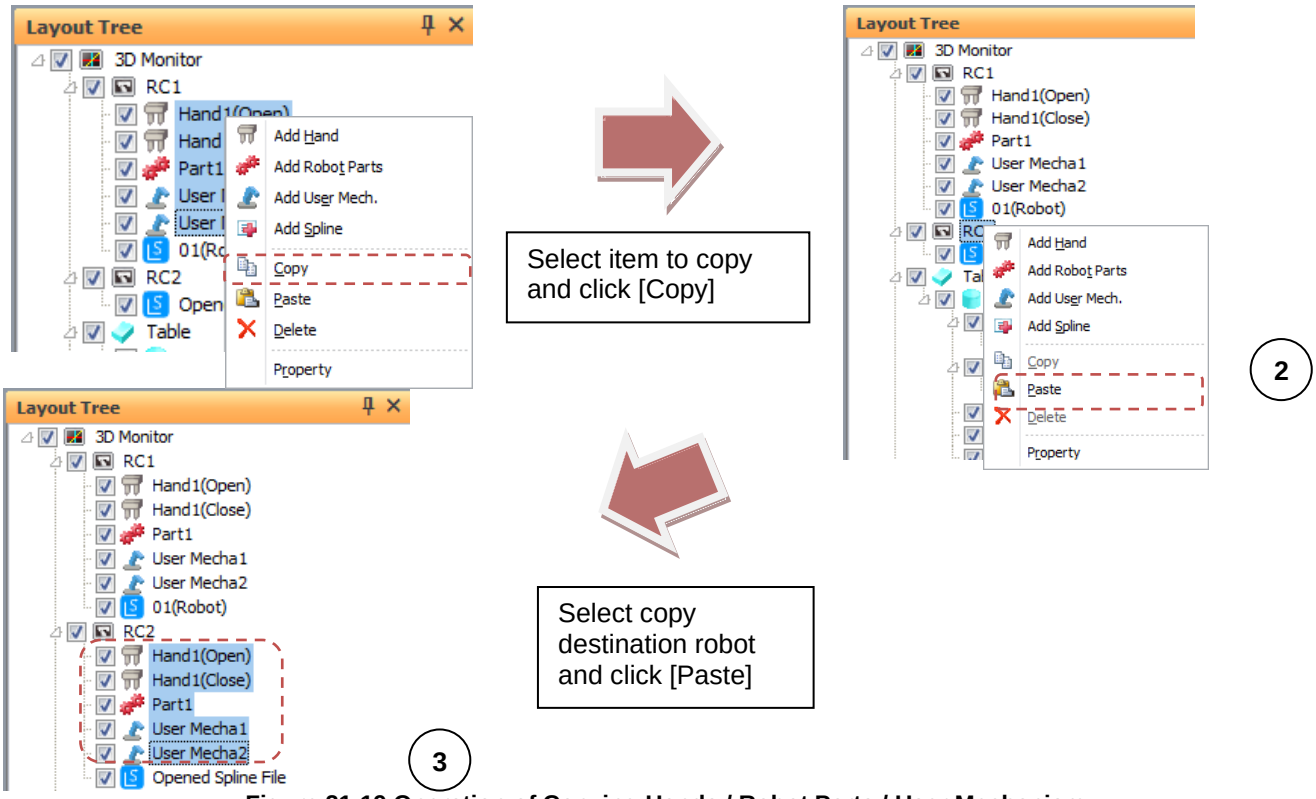


Figure 21-19 Operation of Copying Hands / Robot Parts / User Mechanism

21.4.2.6. Deleting hands / robot parts / splines / user mechanism

Follow the procedure below to delete hands / robot parts / user mech. / splines in the layout tree.

(1) Select the hands / robot parts / user mech. / splines to delete, and select [Delete] from the context menu.
(2) A confirmation message is displayed. Check the message and select [Yes].
(3) The selected hands / robot parts / user mech. / splines is deleted.

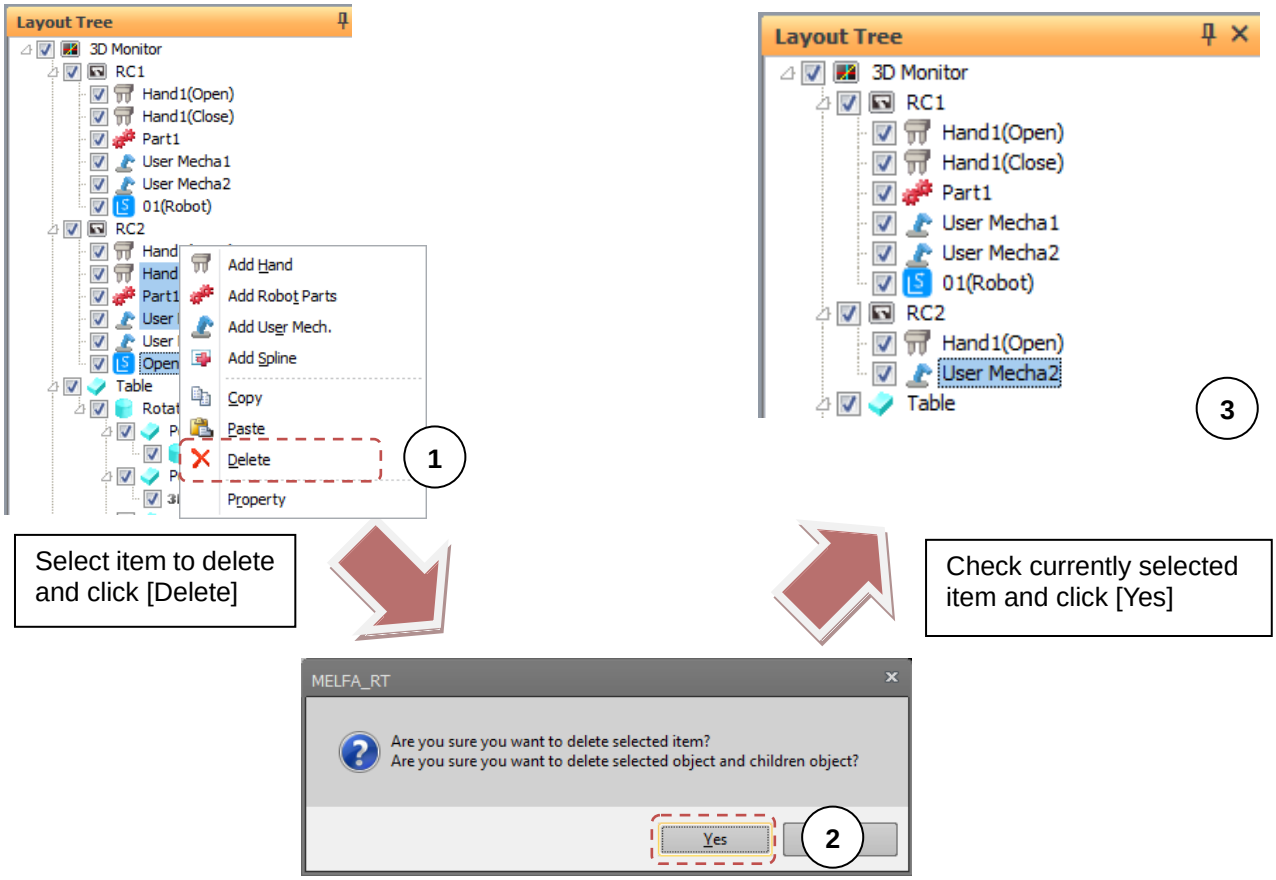


Figure 21-20 Operation of Deleting Hands / Robot Parts / User Mech. / Splines

21.4.2.7. Adding layout objects

To add a layout object to the layout tree, right-click the 3D monitor, layout object or a place where nothing is set on the layout tree, and select [Add object] from the context menu. The layout object is added.
Right-click the layout object, and select [Add object] from the menu that is displayed. A layout object is added as a child object under the right-clicked layout object.

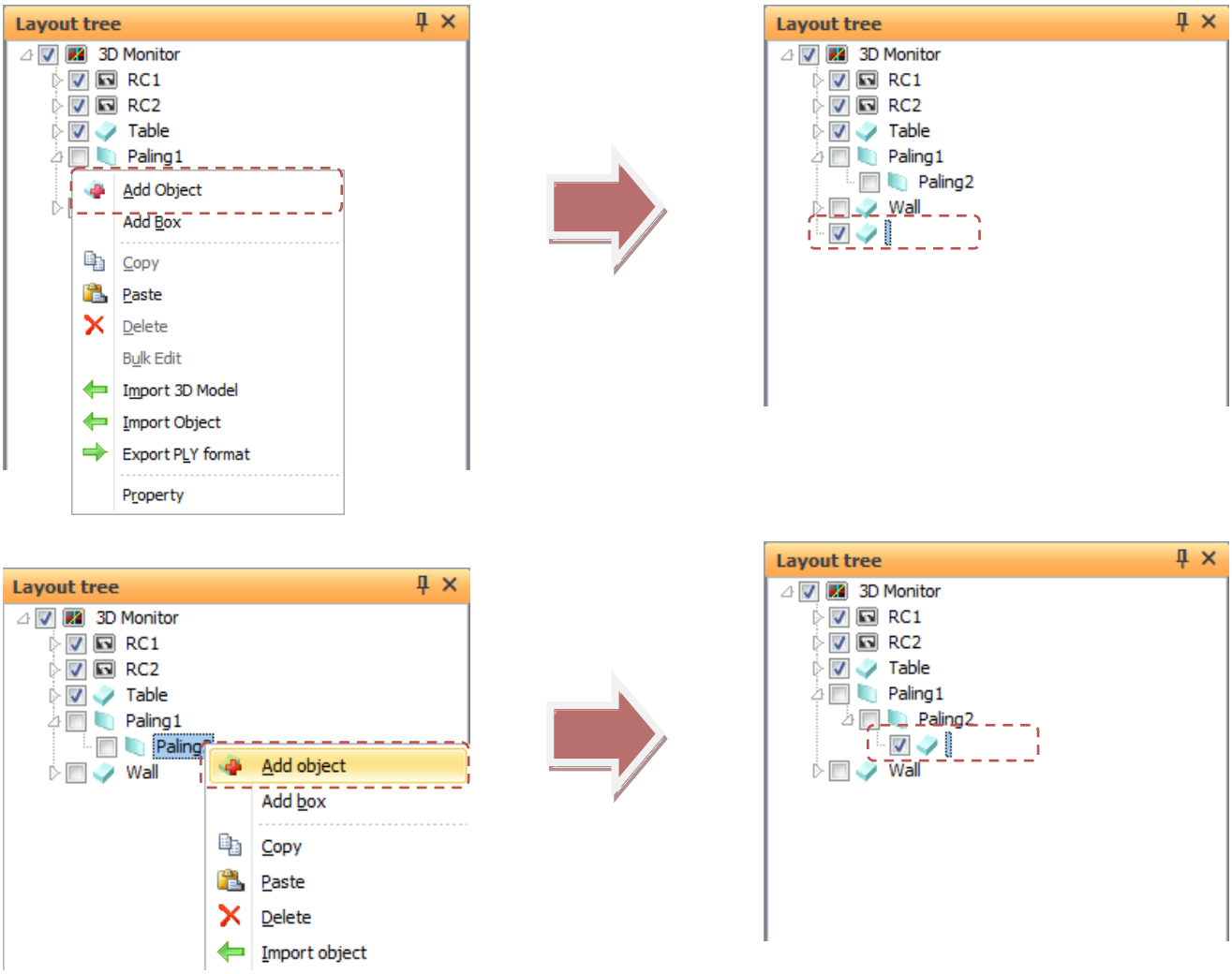


Figure 21-21 Adding Layout Objects

Also, multiple hexahedrons arranged in a box type can be batch-added. Follow the procedure below to add multiple hexahedrons.

(1) Right-click the 3D monitor, layout object or a place where nothing is set on the layout tree, and select [Add box] from the context menu.
(2) In the Edit box screen that is displayed, set the sizes of the box and click the [OK] button.
(3) Multiple hexahedrons arranged like a box are added in a single operation.

The base hexahedron is displayed using the name set in the Edit box screen, and other box parts are child objects of the base hexahedron. For this reason, when moving the entire box, move the base hexahedron.

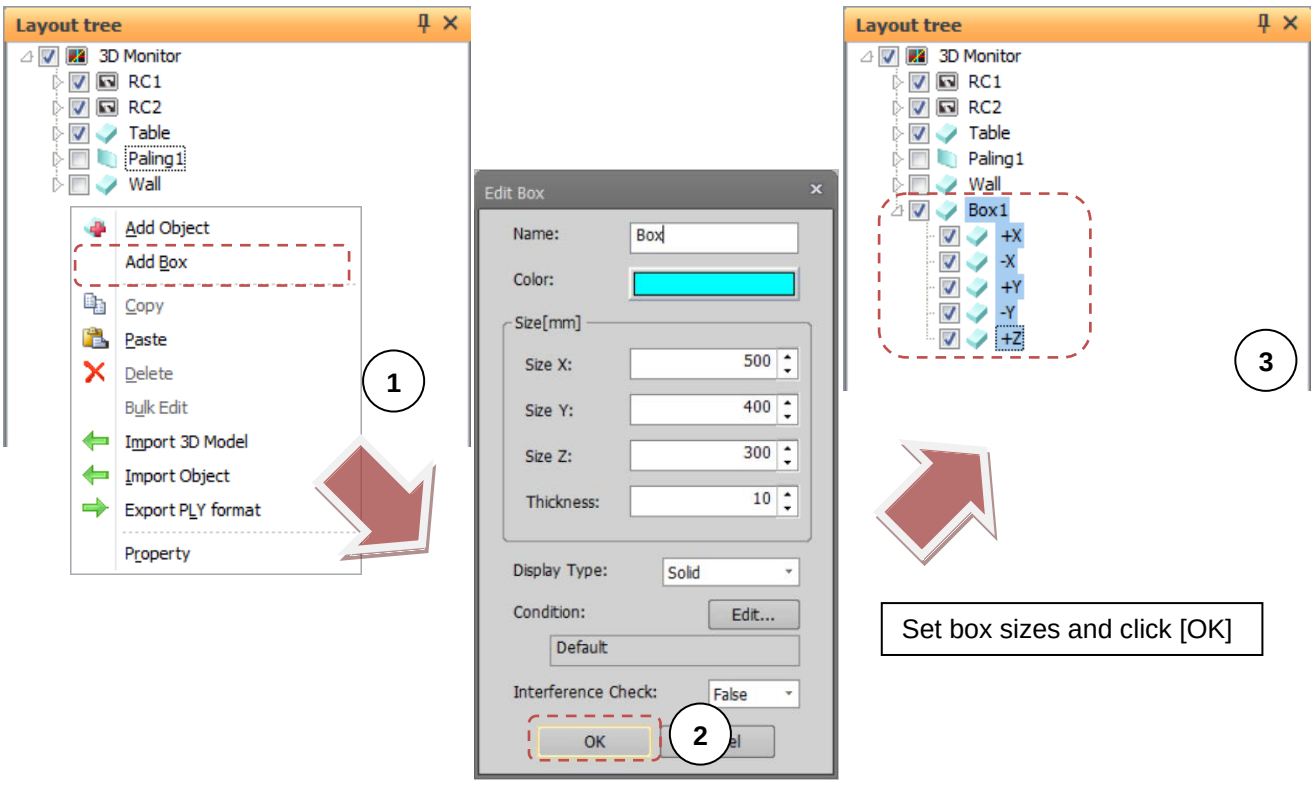


Figure 21-22 Operation of Adding a Box

When setting sizes, refer to the following.

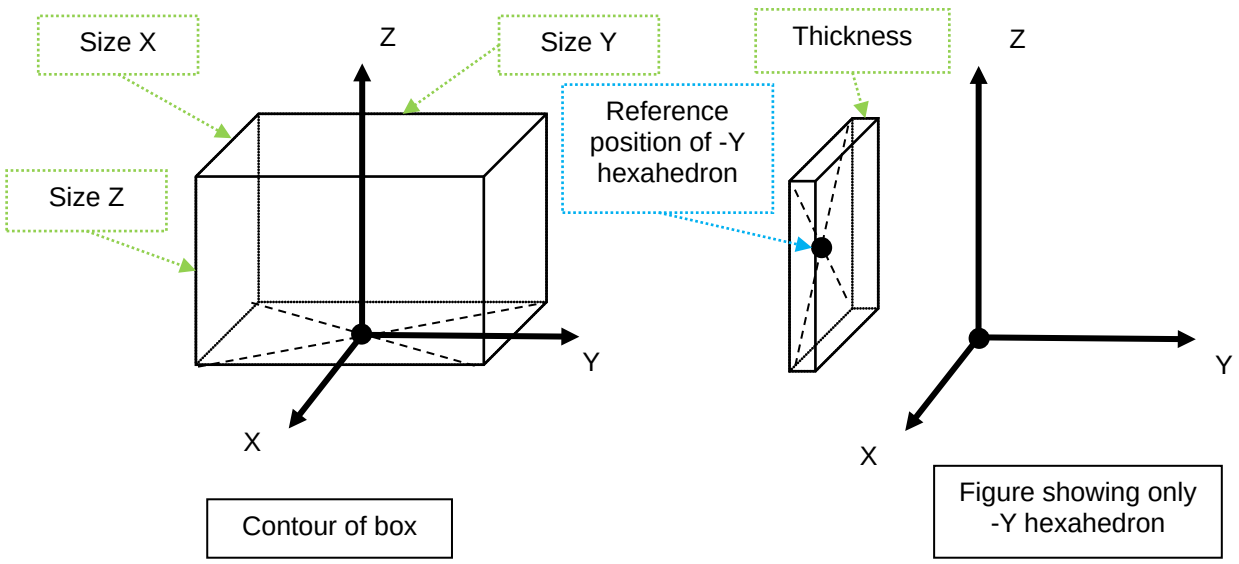


Figure 21-23 Explanation of Box Sizes

21.4.2.8. Copying layout objects

Follow the procedure below to copy a layout object in the layout tree.

(1) Select the layout object to copy, and select [Copy] from the context menu.

(2) Right-click the copy destination layout object, 3D monitor or a place where nothing is set on the layout tree, and select [Paste] from the context menu.

(3) The layout object is copied. Any child layout objects included with the layout object also are copied together.

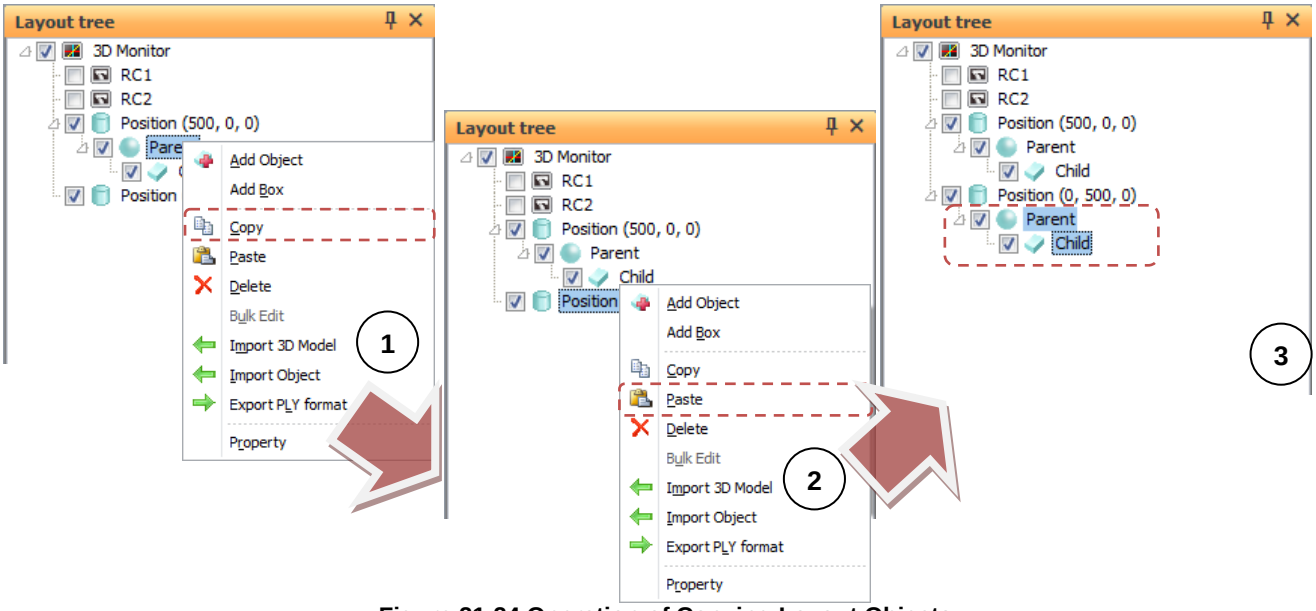


Figure 21-24 Operation of Copying Layout Objects

When the parent object of a copied layout object is changed, its display position in the 3D monitor will not be changed, and it will be displayed overlaid on the copy source layout object. The [Position] value at "Properties" is changed to the relative position from the copy source layout object or origin.

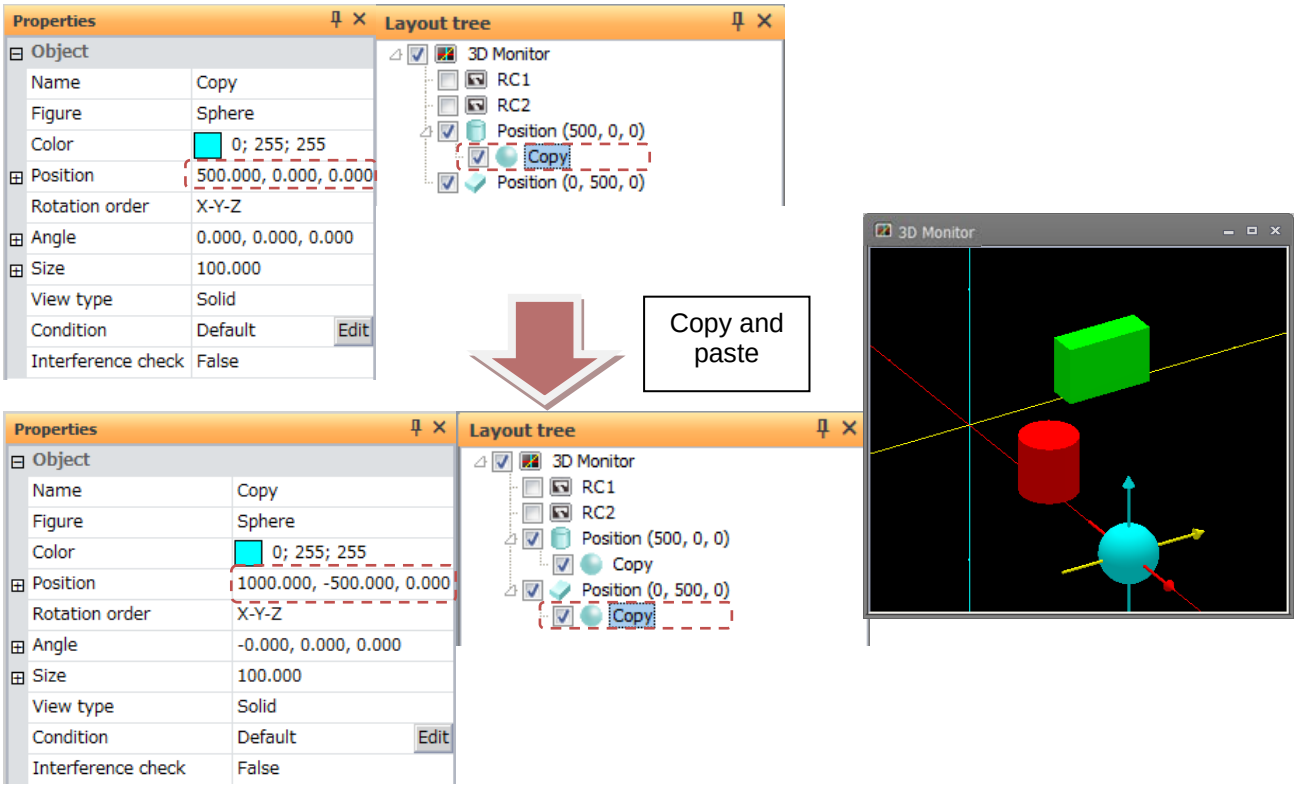


Figure 21-25 Changing the Position Value by Copy

21.4.2.9. Deleting layout objects

Follow the procedure below to delete a layout object in the layout tree.

(1) Select the layout object to delete, and select [Delete] from the context menu.
(2) A confirmation message is displayed. Check the message and select [Yes].
(3) The selected layout object is deleted. Any child layout objects included with the layout object also are deleted together.

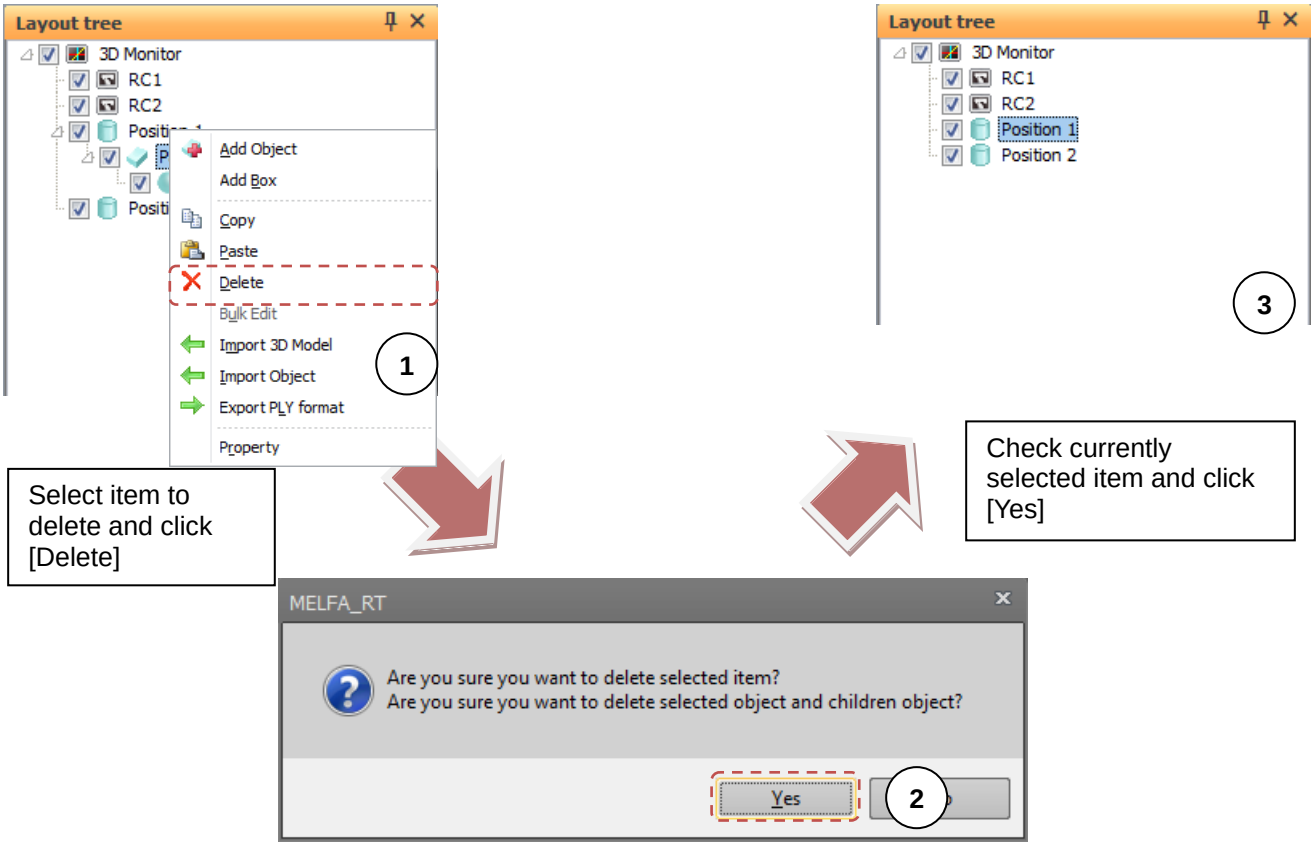


Figure 21-26 Deleting Layout Objects

21.4.2.10. Bulk editing layout objects

In some of the layout objects settings, you can edit some layout objects in bulk. When you edit in bulk, you follow the steps below.

(1) You select some layout objects that you want to edit and [Bulk edit] on context menu.
(2) When bulk edit screen appears, you change only the check boxes for the items you want to edit in bulk on, set your edits and select [OK] button.
(3) The settings of the selected layout objects as (1) changes items ticked in the bulk edit screen.

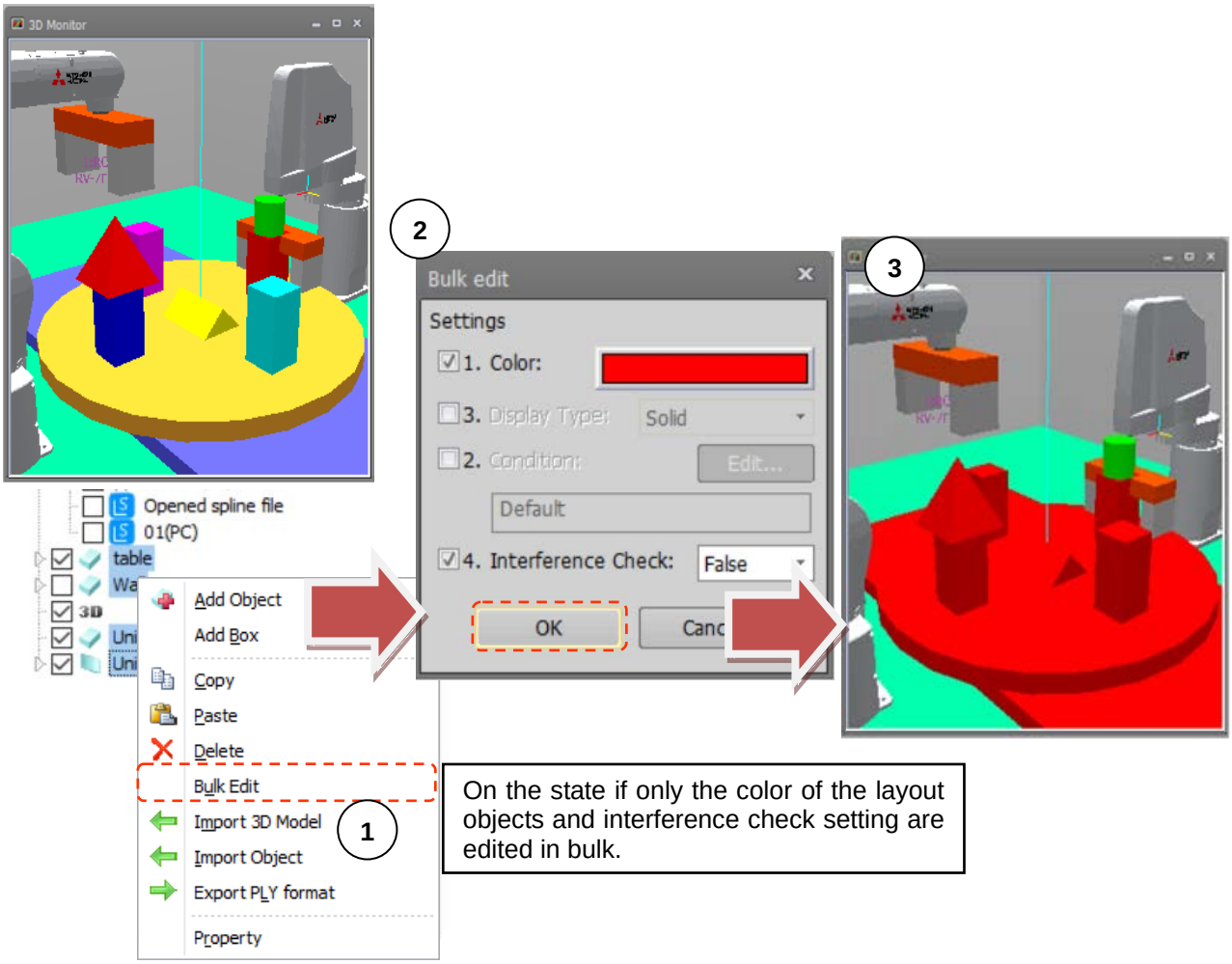


Figure 21-27 Bulk Editing Layout Objects

Caution

"Display Type" and "Interference Check" can not be set if "String" is included in the selected object.

21.4.2.11. Bulk edit of box

You can set the color, display type, etc. of the box (child of hexahedron on the bottom) created by [Add Box] in the context menu. Please follow the procedure below.

(1) Select the object (hexahedron) at the bottom of the box you want to edit, and select [Bulk edit] on the context menu.
(2) [Edit Box] screen will be displayed, set the items you want to edit and select the [OK] button.
(3) The setting contents of the child hexahedron are changed collectively.

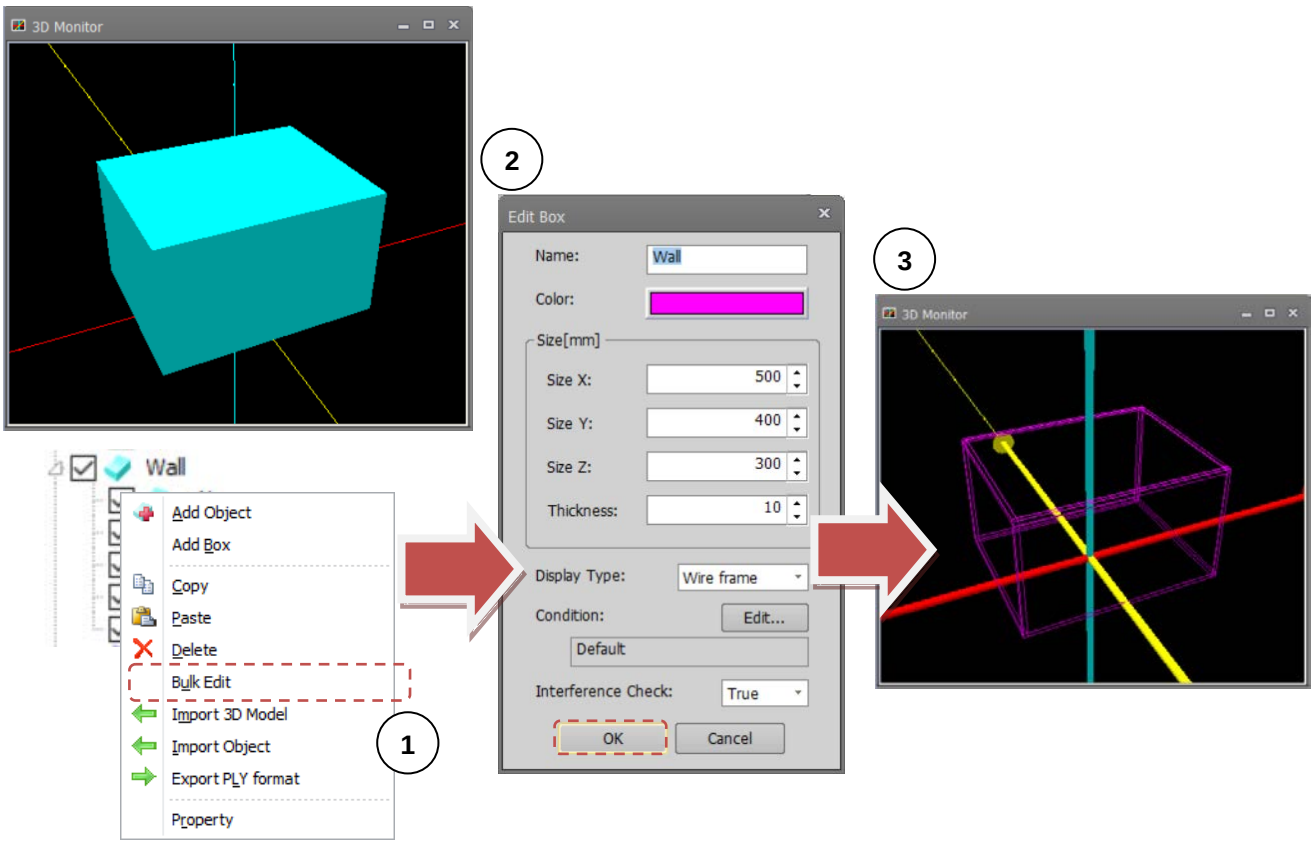


Figure 21-28 Bulk Edit of Box

⚠ Caution

After adding the box, if you do the following operation on the child (the child of hexahedron on the bottom), you can not edit the box at once.

- *Change Figure*
- *Move to another object*
- *Delete item*

⚠ Caution

This function can only be used for boxes added with RT ToolBox 3 Ver.1.10L or later.

21.4.2.12. Importing layout objects

Follow the procedure below to import layout objects in other layout files.

(1) Right-click the 3D monitor, layout object or a place where nothing is set on the layout tree, and select [Import object] from the context menu.
(2) The select file screen is displayed. In this screen, select the file to import.
(3) If the selected file is a normal layout file, the layout objects in the selected layout file are imported to the layout tree.

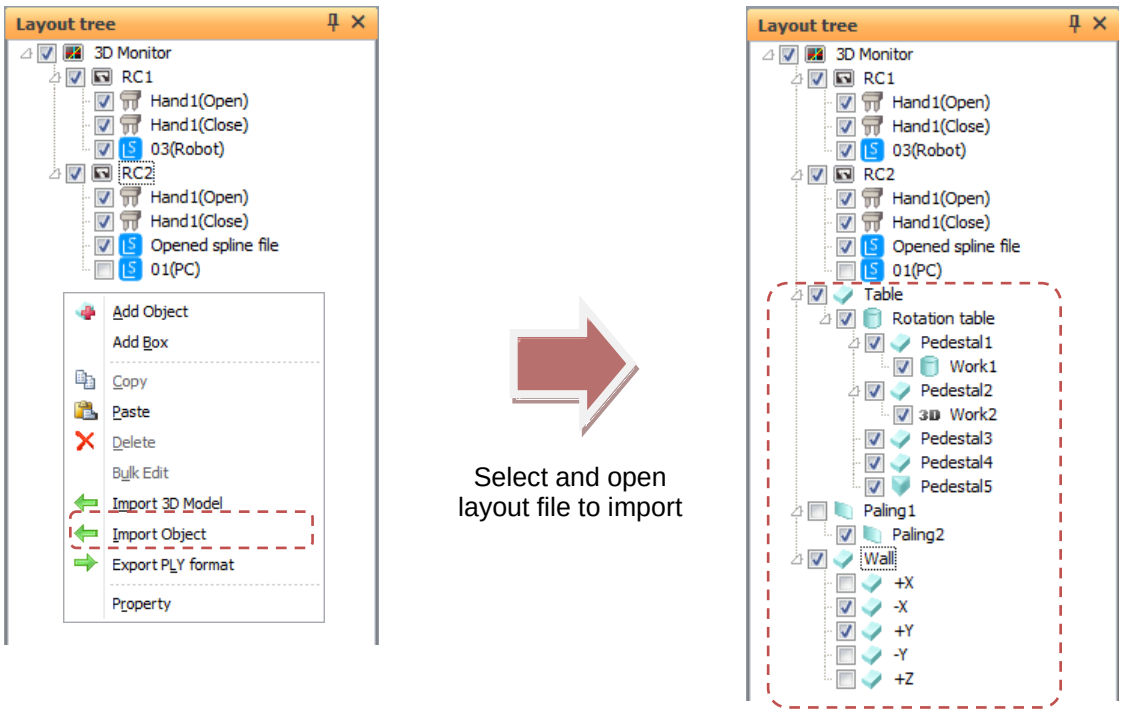


Figure 21-29 Importing Layout Objects

Also, layout objects can be imported from RT ToolBox2 layout files by similar operation.

21.4.2.13. Importing 3D model files

There are the following three ways to import a 3D model.

(1) In the properties of the layout object, you change the [3D model] to [Figure]. When [File] is displayed on properties, you click the button displaying. When [3D model file select] is displayed, you choose 3D model file that you want to import.

(2) In the layout tree, you right-click 3D monitor/layout objects/where does not show anything and select [Import 3D model] on context menu. When [3D model file select] is displayed, you choose 3D model file that you want to import.

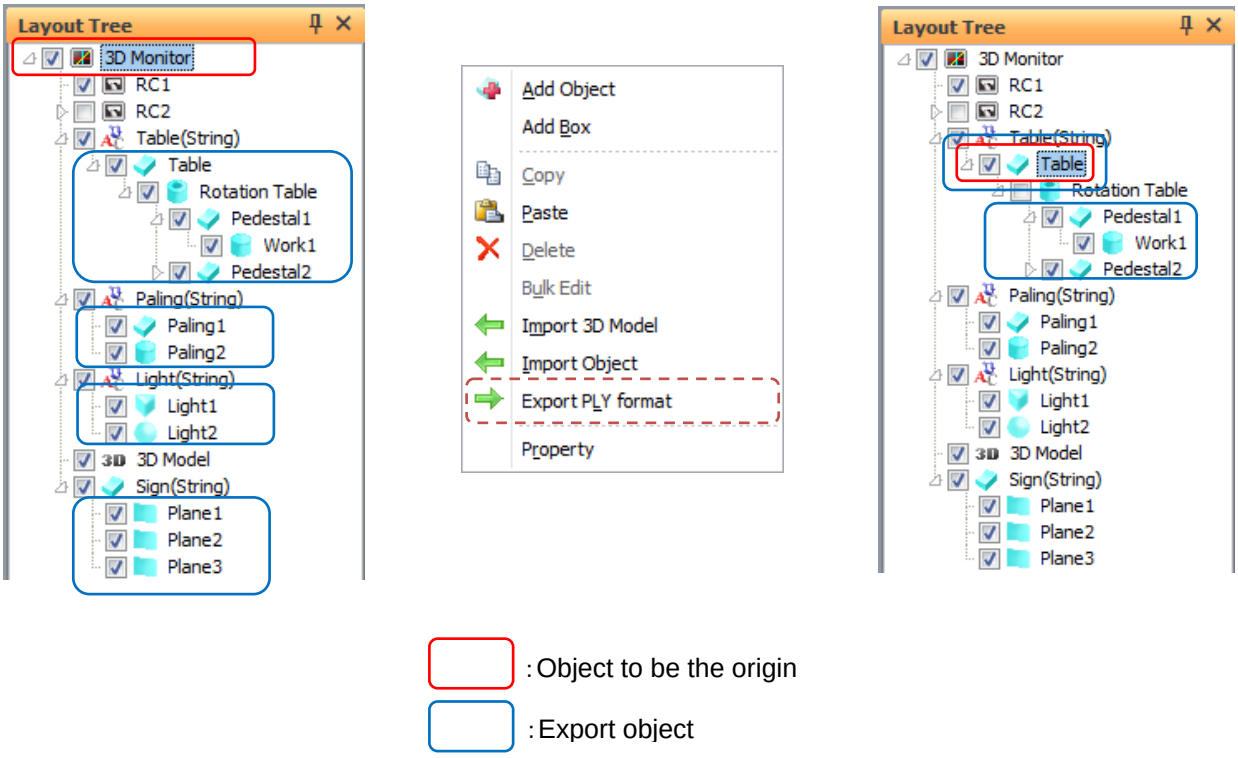
(3) Please you drag the 3D model files from Windows Explorer onto the tree. If it is supporting 3D model, you can import it as an object.

21.4.2.14. Export PLY format

You can export the displayed layout objects (Hexahedron, Column, Sphere, Triangle Prism, Tube, Plane) in PLY format.
Coordinates of child items are calculated with the object as the origin (0, 0, 0) and export.

Export procedure of layout object

(1) Check the objects you want to export in the layout tree.(It can also be output from the hand edit tree and the user mech. edit tree)
(2) Select the object as the origin and right click.
(3) Click "**Export PLY format**"on the context menu.
(4) Click the "**Save**"button on the "Save As"screen.



: Object to be the origin

: Export object

Figure 21-30 Export PLY fomart

The export PLY file can be read as a 3D model.Please refer to **21.4.2.13Importing 3D model files**.

Caution

3D Model, String can not export

If one of the 3D model, or character string is included, a confirmation message will be displayed stating that these can not be export.
Objects that are not displayed (not checked in the layout tree) are not output.

Caution

PLY can not be export from the robot parts edit tree

You can export PLY from layout tree, hand edit tree, user mech. edit tree, but PLY can not be done from robot part edit tree.

21.4.2.15. Dragging and dropping

Hands / robot parts / user mech. in the layout tree can be moved to other robots by dragging and dropping.
Layout objects can be made into child objects of other layout objects by dragging and dropping.
Even if multiple items are selected, only one item is targeted in drag and drop operations.
Also, items can be copied by pressing the [Ctrl] key when releasing the mouse button in drag and drop operations.

- **Hand / robot parts / user mech. drag and drop**
  If the drop destination is a hand / robot parts / user mech., the dragged item is added immediately under the item at the drop destination.

- **Layout object drag and drop**
  If the drop destination is another layout object, the dragged item is added as a child of the layout object at the drop destination.
  Just like in copying layout objects, even if the parent object of the layout object is changed, its display position in the 3D monitor will not be changed. (Refer to **21.4.2.8 Copying layout objects**.)

21.4.2.16. Restore

If you are editing a layout, press Ctrl + Z to return to the previous editing state.
You can restore the setting contents of the layout object and the robot arrangement (position / rotation) to the previous editing state up to 10 times.
You can also return to the previous edit state for the following operations.

(1) Operations that can be restored
Add objects in the layout (import / copy paste)
Delete objects in the layout
Drop and drag the layout object
Object size / movement / rotation (including movement / rotation in 3D monitor)
Movement / rotation of robot arrangement (including movement / rotation by 3D monitor)

(2) Operations that cannot be undone
When saving the layout
When changing the operation mode (robot arrangement position (position / rotation))

Caution

Spin button operation is not recorded

21.5. 3D Monitor Display Settings

Display the 3D monitor and select 3D monitor in the layout tree.
The 3D monitor display settings will be displayed at "Properties", and 3D monitor related display settings can be changed at respective items.

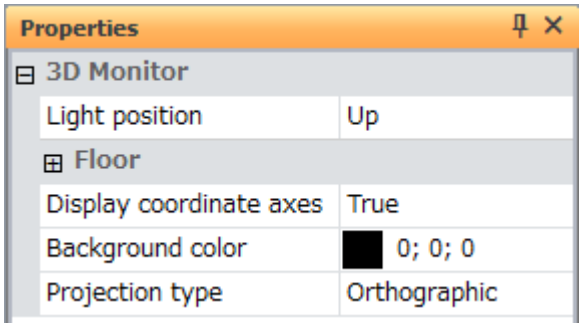
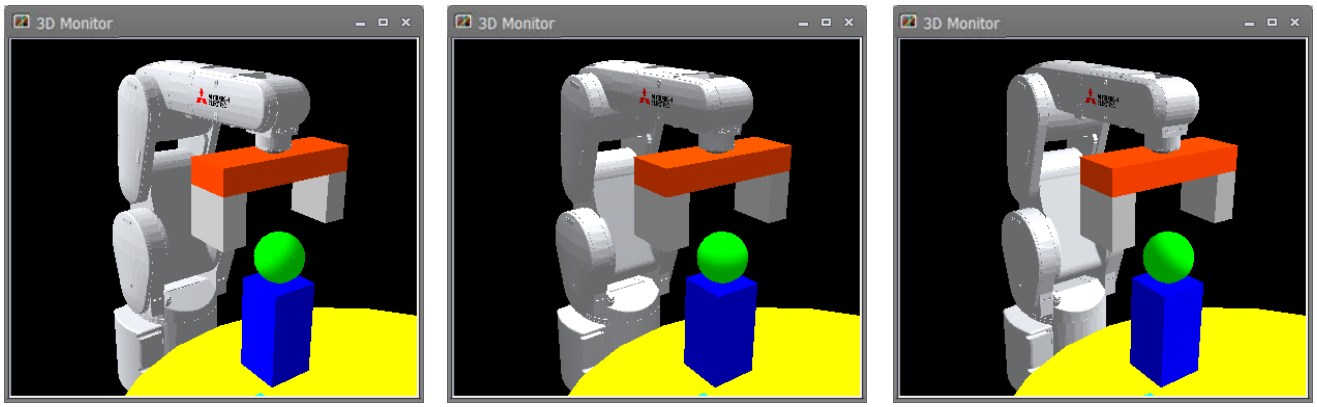


Figure 21-31 3D Monitor Display Settings

21.5.1. Light source position

The position of the light source of the 3D monitor can be set.
You can select from three light positions [Up], [Upper left], and [Upper right].
These positions are positions from the viewpoint.



Left up **Up** **Right up**

Figure 21-32 Light Source Position

21.5.2. Floor

You can set the floor to be displayed in the 3D monitor.

21.5.2.1. Floor display

When [Display] is set to [True], the floor is displayed in the 3D monitor.
The floor display can also be changed by clicking the [3D view] tab -> [3D View] group -> [Floor] button on the ribbon.

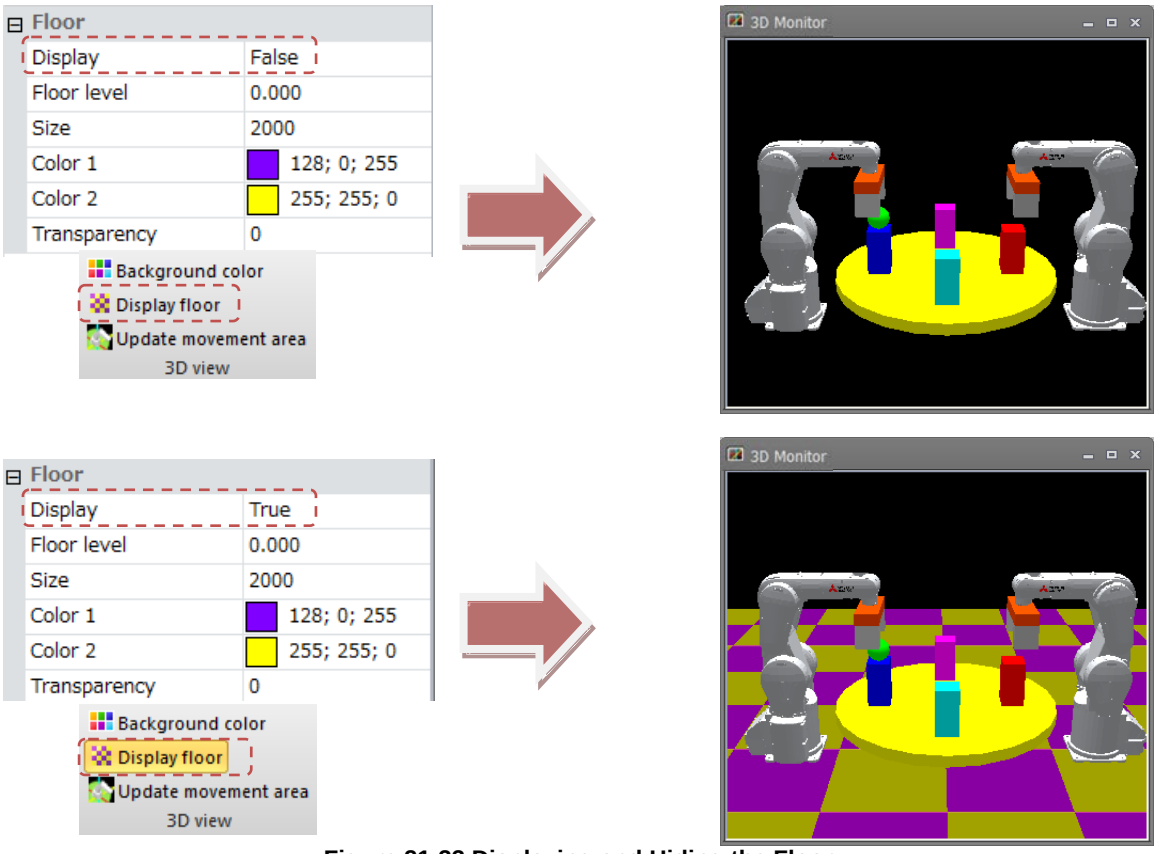


Figure 21-33 Displaying and Hiding the Floor

21.5.2.2. Floor level

When [Floor level] is changed, the height of the floor that is displayed on the 3D monitor can be changed.
With "0" set as the origin, increasing the value changes the position of the floor in the + direction of the Z-axis, and decreasing the value changes the position of the floor in the - direction of the Z-axis.

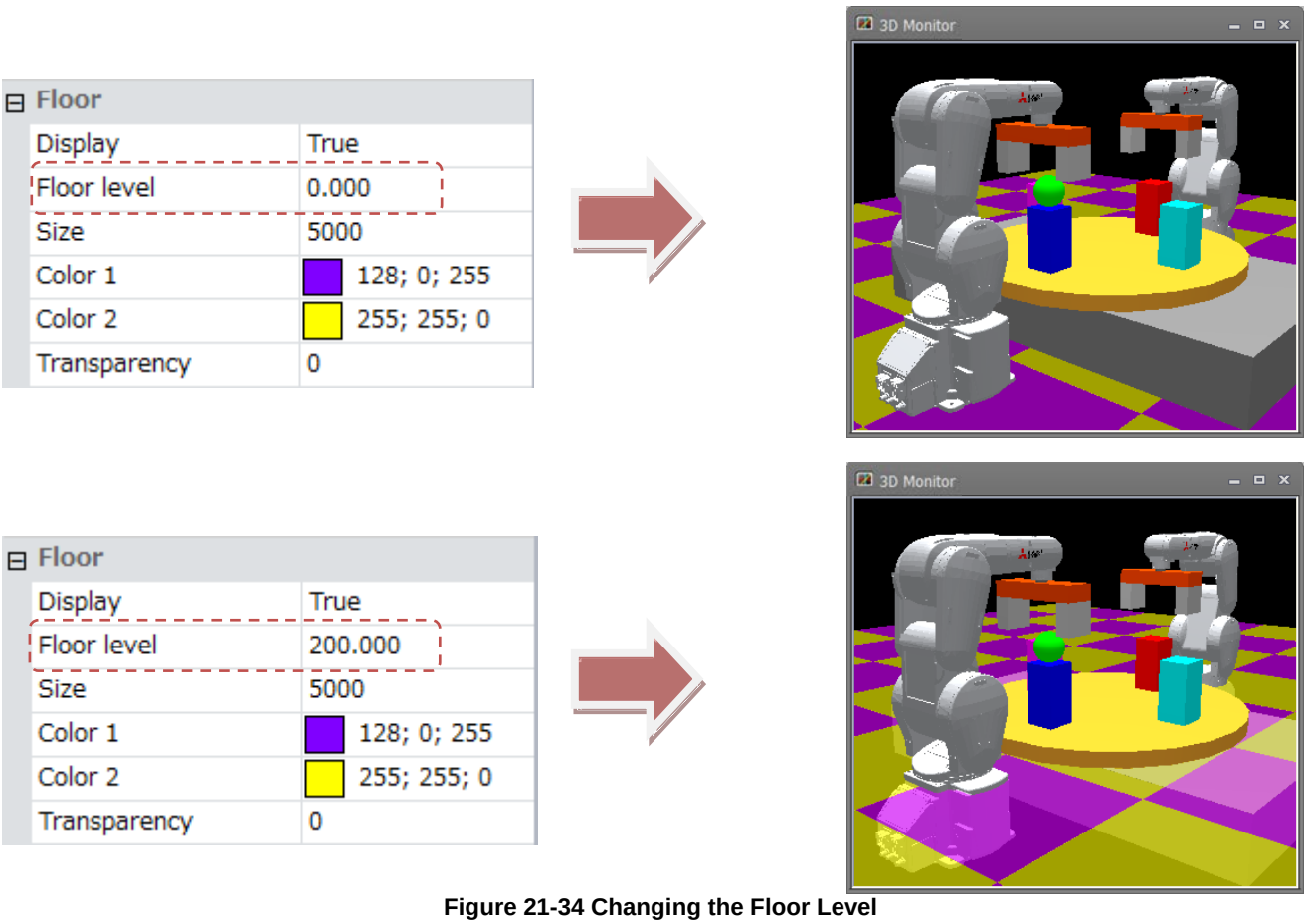


Figure 21-34 Changing the Floor Level

21.5.2.3. Size

At [Size], you can set the length of one side of the floor.

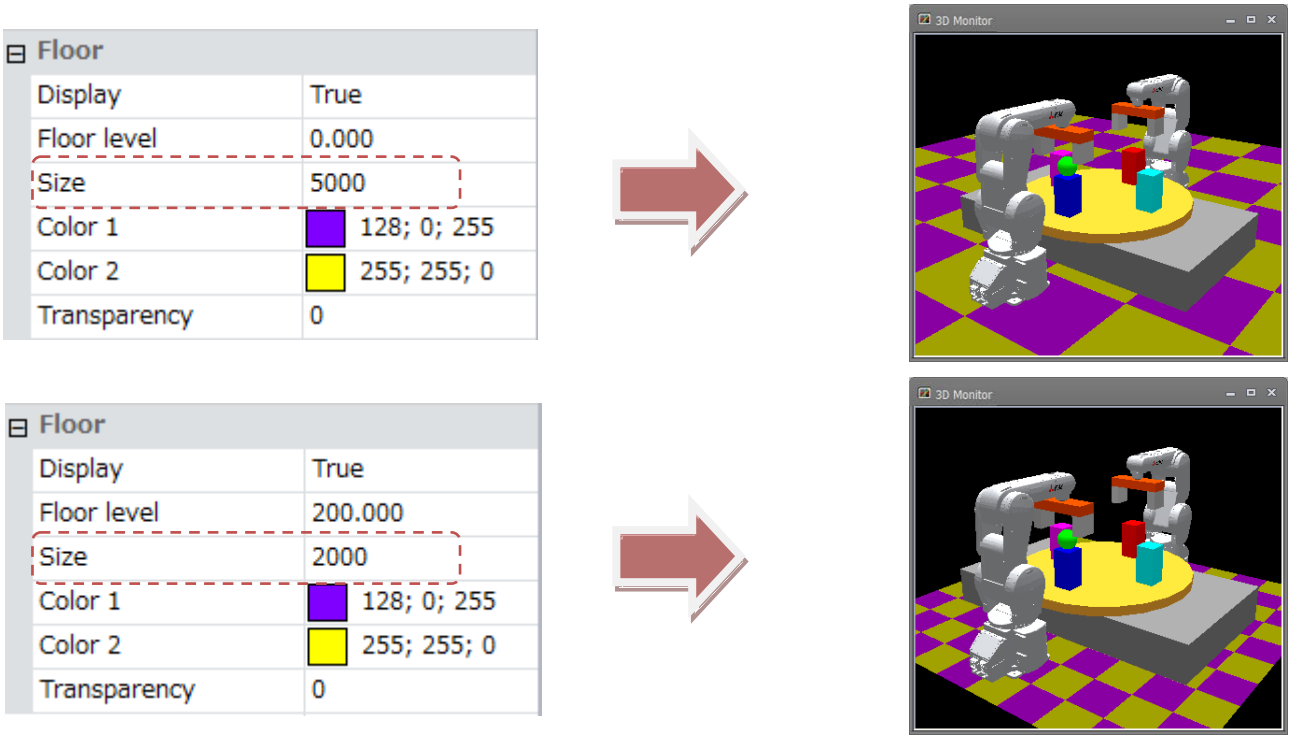


Figure 21-35 Change the size of the floor

21.5.2.4. Color

At [Color 1] and [Color 2], you can set the color of the floor. At "Floor", the [Color 1] and [Color 2] color panels are displayed alternately.

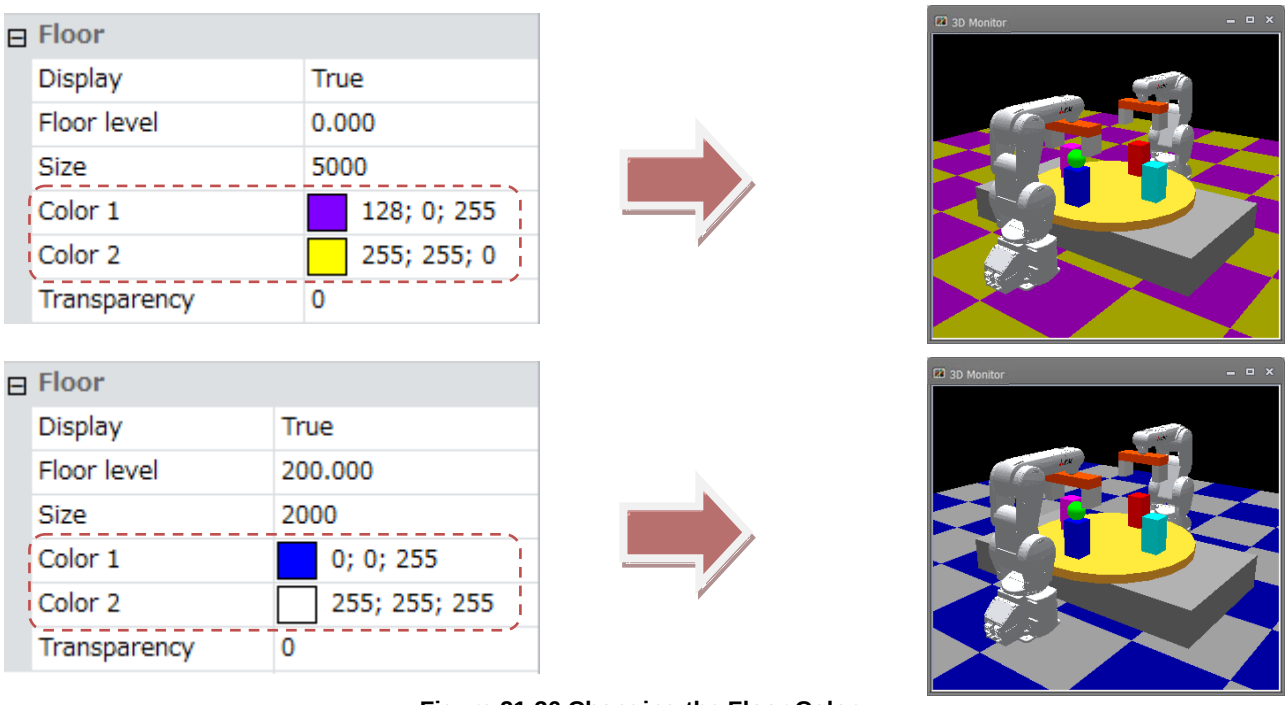


Figure 21-36 Changing the Floor Color

21.5.2.5. Transparency

The transparency of the floor can be changed by changing [Transparency].
The closer a value to 99 (maximum value) is set, the closer to transparent the floor is displayed. At the minimum value of 0, the floor is opaque.

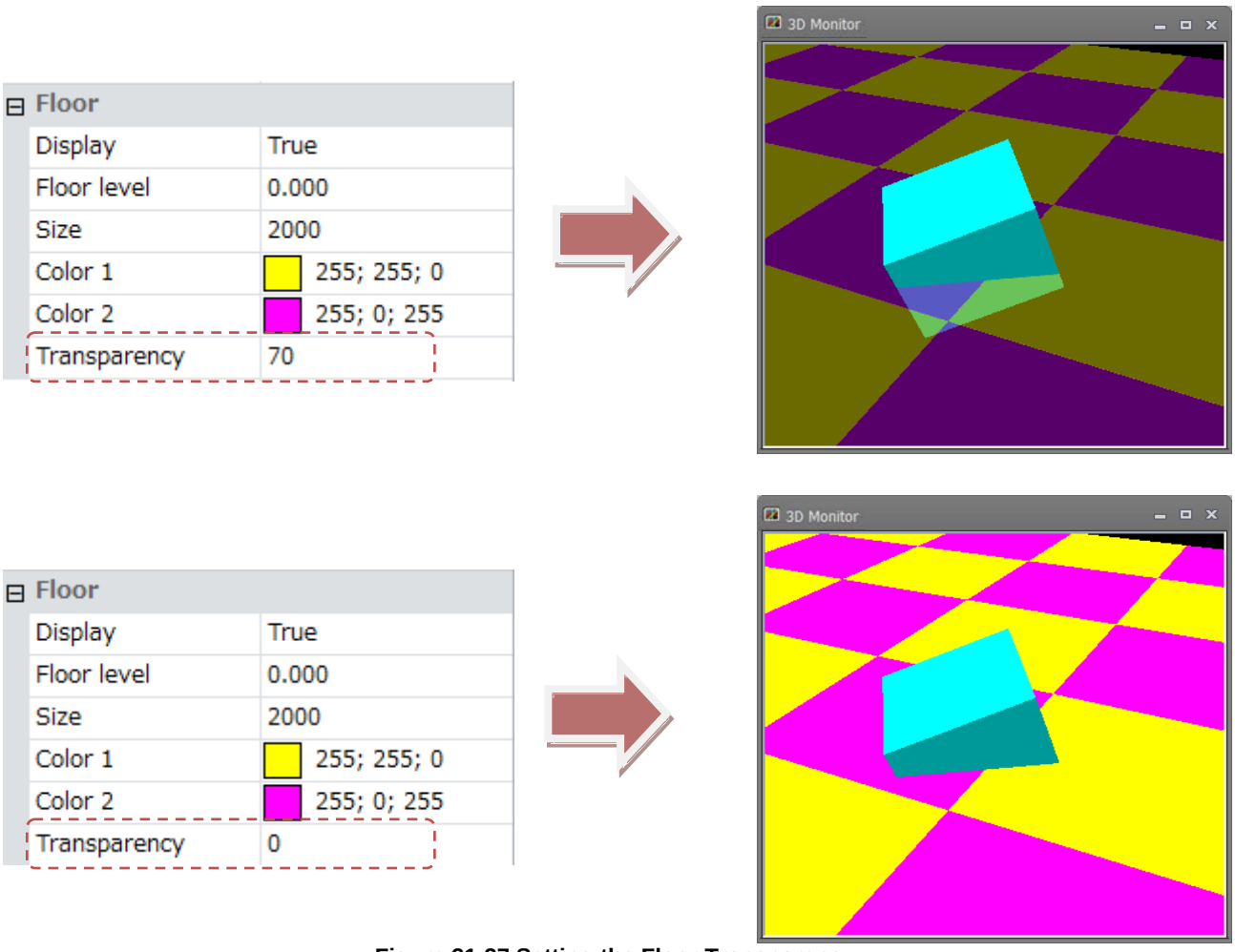
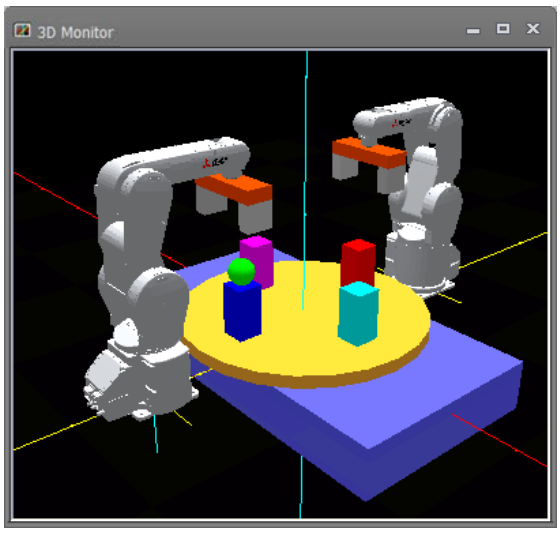


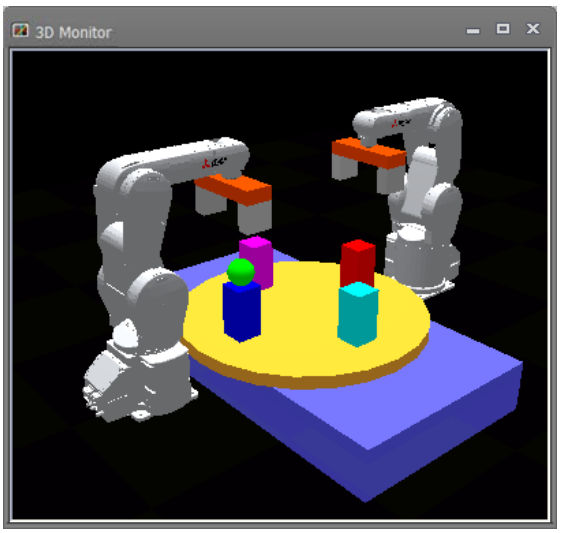
Figure 21-37 Setting the Floor Transparency

21.5.3. Displaying coordinate axes

When [Display coordinate axes] is set to [False], the coordinate axes displayed at the origin in the 3D monitor and the small coordinate axes displayed at the reference position of the robot model are hidden.



Coordinate axes displayed

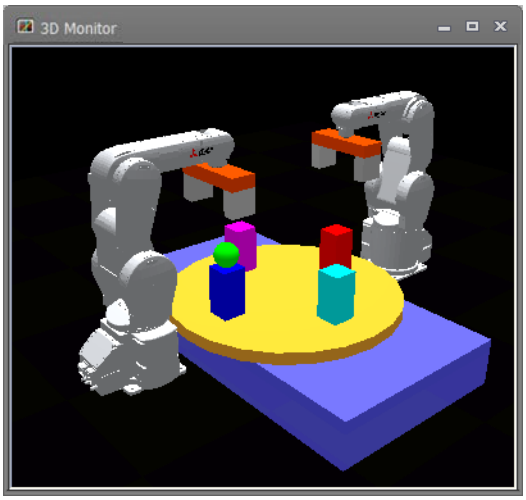


Coordinate axes hidden

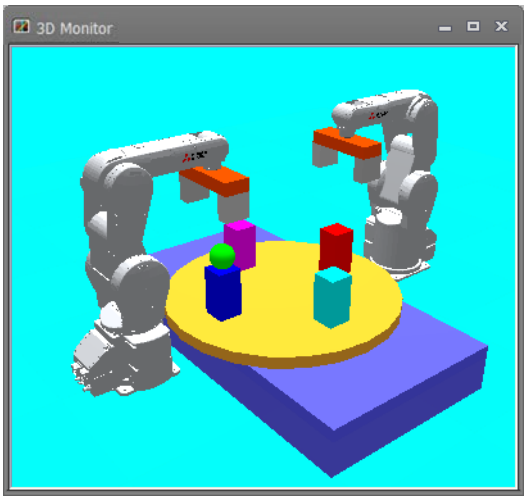
Figure 21-38 Displaying and Hiding the Coordinate Axes

21.5.4. Background color

When [Background color] is changed, the background color in the 3D monitor is changed to the new color. Click the [...] button at [Color]. The Set Color screen is displayed. Set the new color in this screen.
The Set Color screen is also displayed just like clicking the [...] button at [Color] by clicking the [3D view] tab -> [3D View] group -> [Background color] button on the ribbon.



Background color (0; 0; 0)



Background color (0; 255; 255)

Figure 21-39 Changing the Background Color

21.5.5. Projection type

At [Projection type], the projection type of the 3D monitor can be changed to [Perspective] or [Orthographic]. The [Perspective] and [Orthographic] setting can also be switched in the [3D view] tab -> [Projection type] group on the ribbon.

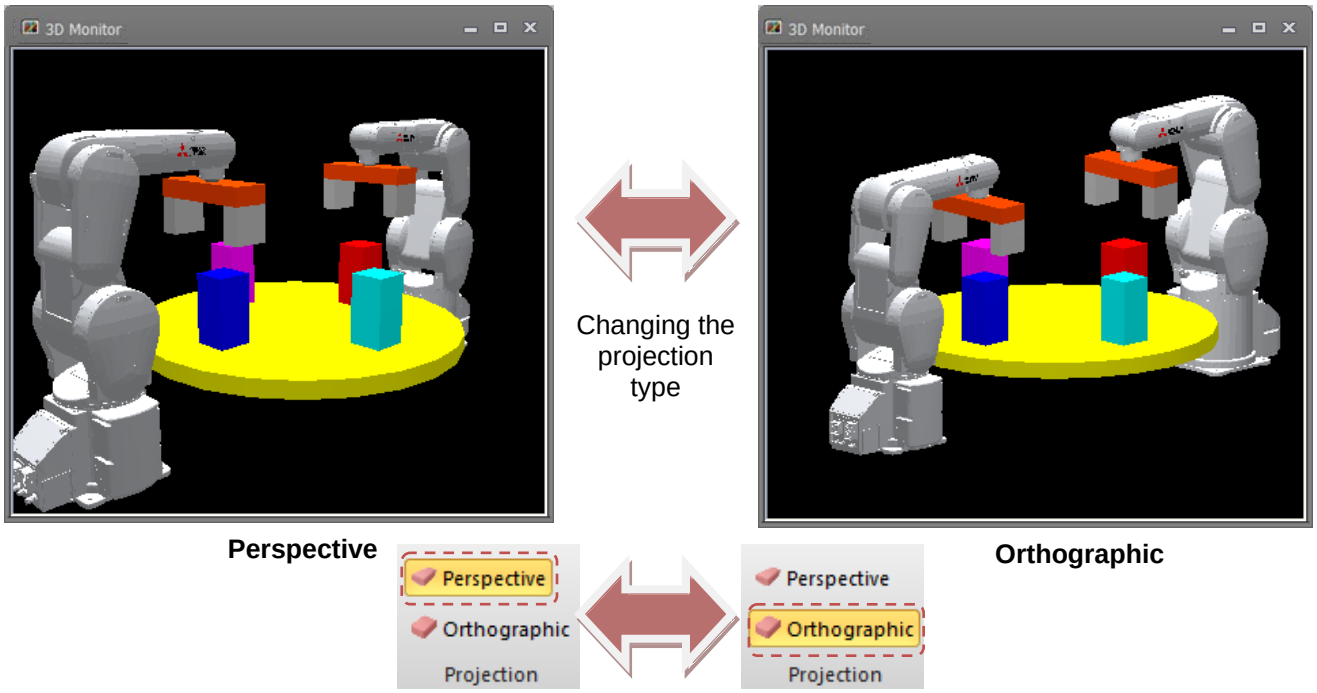


Figure 21-40 Projection Type

21.6. Robot Display Settings

Display the 3D monitor and select the robot whose display settings are to be changed in the layout tree.
The display settings of that robot will be displayed at "Properties", and robot related display settings can be changed at respective items.

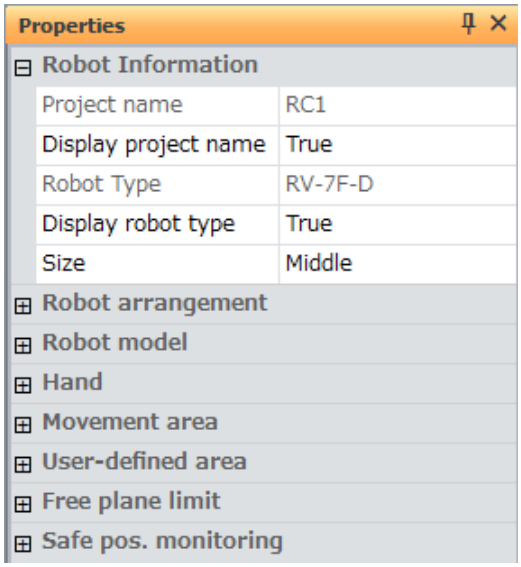


Figure 21-41 Robot Display Settings

21.6.1. Robot information

When [Display project name]/ [Display robot type] is set to "True", each of the project name and hardware name (model name of robot) are displayed near the mechanical interface position of the robot on the 3D monitor.
When both the project name and robot type are displayed, the project name is displayed at the upper level and the robot type is displayed at the lower level.
The text size of the robot information displayed on the 3D monitor can be changed by selecting from [Large]/ [Middle]/ [Small] at [Size].

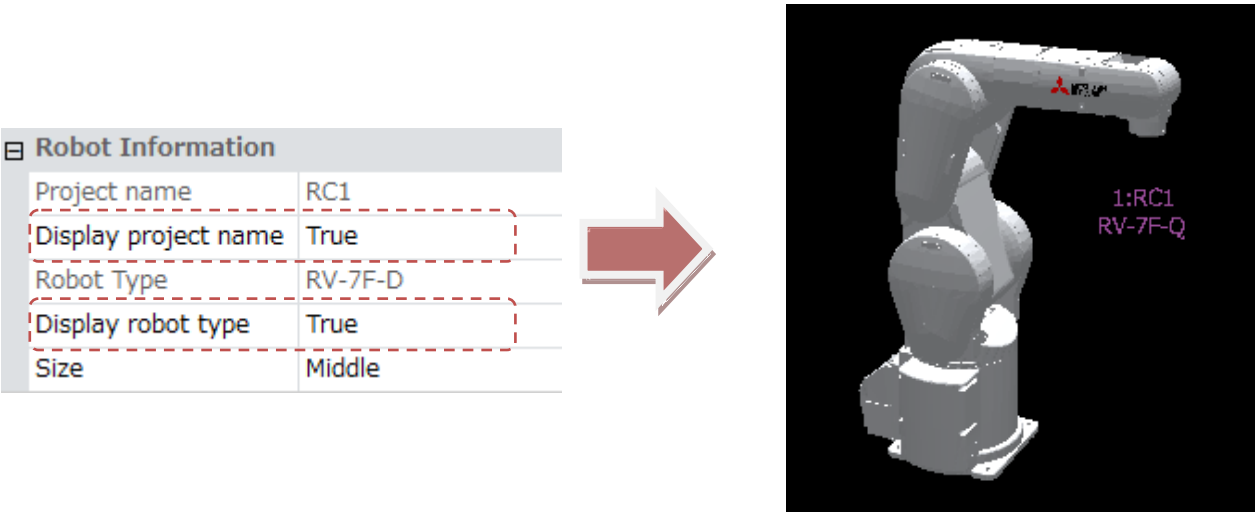


Figure 21-42 Displaying Robot Information

21.6.2. Robot arrangement

You can set the arrangement of the robot model displayed on the 3D monitor.

Robot arrangement	
Position	0.000, -700.000, 0.000
X[mm]	0.000
Y[mm]	-700.000
Z[mm]	0.000
Rotation order	Z-Y-X
Angle	0.000, 0.000, 90.000
X[deg]	0.000
Y[deg]	0.000
Z[deg]	90.000

Figure 21-43 Robot Arrangement Settings

You can set the arrangement position of the robot model by editing [Position].

You can rotate the robot model by editing [Angle].

At [Rotation order], you can select from [Z-Y-X] or [X-Y-Z]. The rotation setting is reflected in the order around Z-axis -> around Y-axis -> around X-axis and around X-axis -> around Y-axis -> around Z-axis, respectively. Standard CAD programs rotate in the same order as [X-Y-Z], and robots rotate in the same order as [Z-Y-X].

Robot arrangement	
Position	300.000, -100.000, 200.000
X[mm]	300.000
Y[mm]	-100.000
Z[mm]	200.000
Rotation order	Z-Y-X
Angle	0.000, -15.000, 135.000
X[deg]	0.000
Y[deg]	-15.000
Z[deg]	135.000

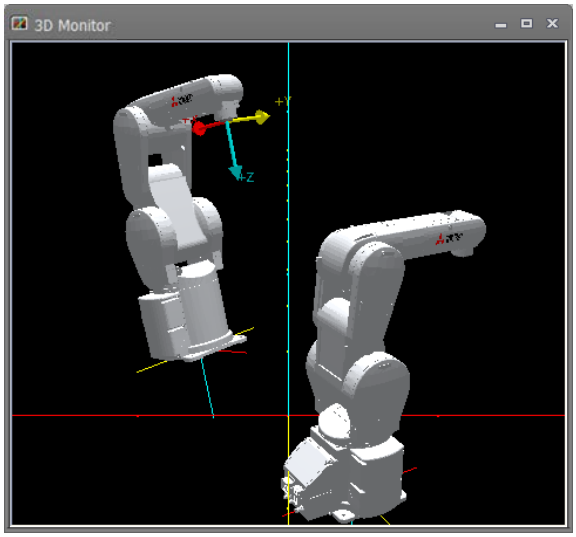


Figure 21-44 Robot Arrangement

21.6.3. Robot model

You can change display settings related to the robot model displayed on the 3D monitor.

Robot model	
Display robot model	True
View type	Solid
Display solenoid valve	False
Interference check	False
Display tool coordinate system	False
Display tool position	False
Robot path	
Display	False
Thickness[point]	1
Delete	Delete

Figure 21-45 Robot Model Settings

21.6.3.1. Displaying the robot model

When [Display robot model] is set to [False], the robot model is hidden.

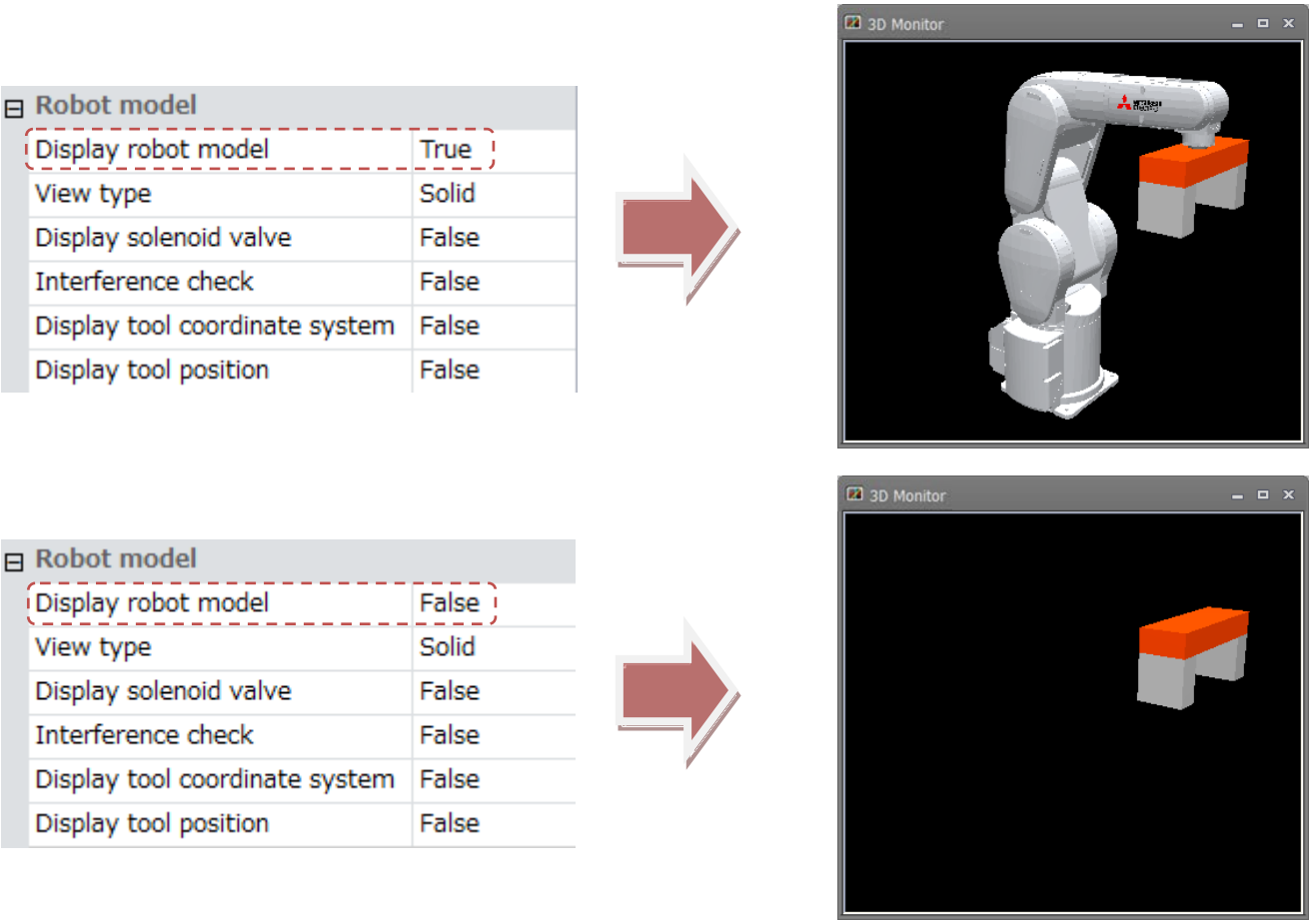


Figure 21-46 Displaying and Hiding the Robot Model

21.6.3.2. View type

You can select [View type] from [Solid]/ [Wire frame].
The respective display of the robot model is switched to the selected view type by changing this setting.

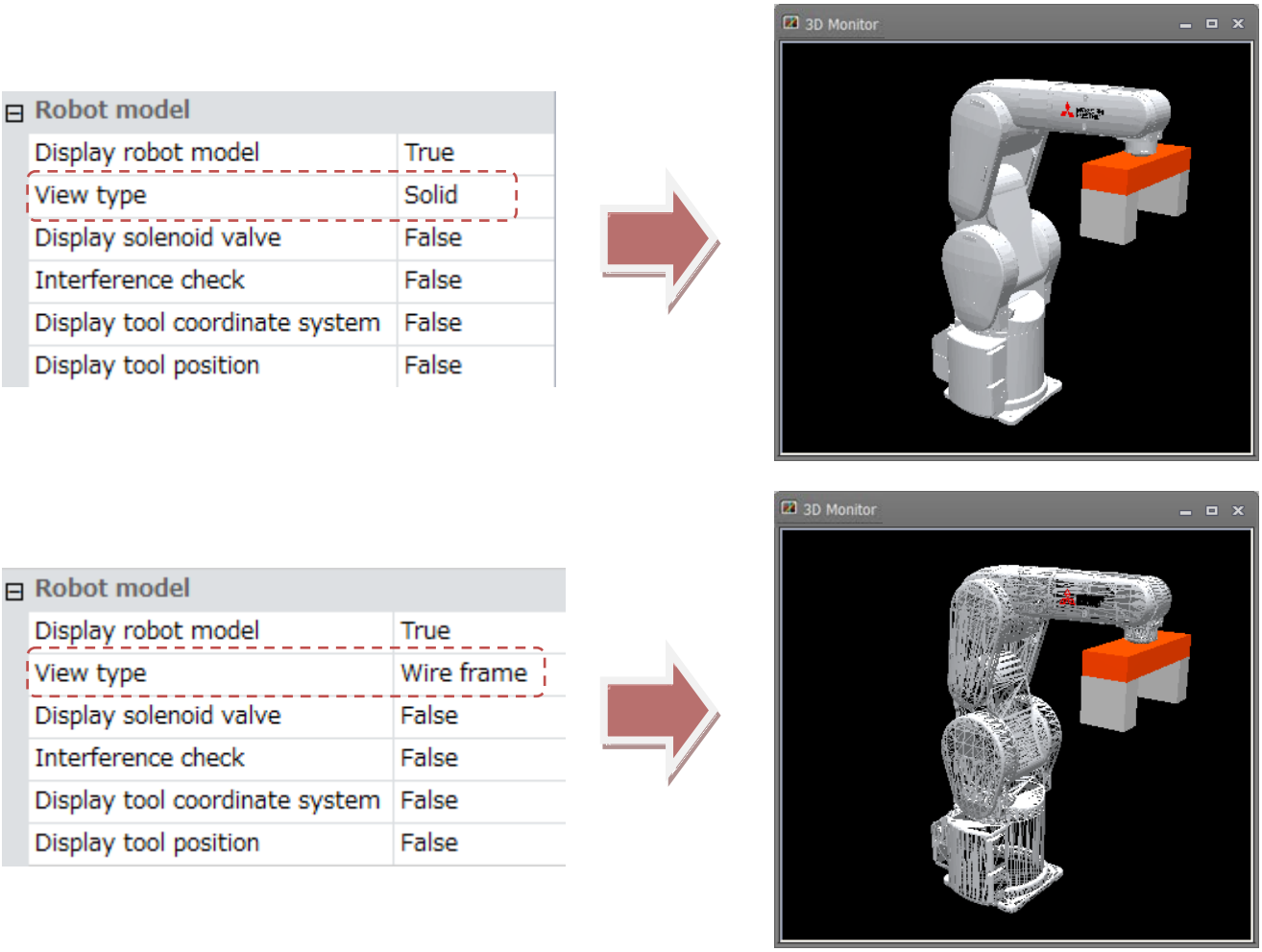


Figure 21-47 Changing the View Type of the Robot Model

21.6.3.3. Displaying solenoid valves

When [Display solenoid valve] is set to [True], the solenoid valves corresponding to the robot are displayed on the 3D Monitor screen.
In the simulation mode, interference with peripheral devices can be checked.
This function is available on robots mounted with the following solenoid valves, and solenoid valves with four valves are displayed.

Solenoid valve	1F-VD0□(E)-02 1F-VD0□(E)-03 (□ shows the number of solenoid valves)
Robots which can display solenoid valves	RV-4FR series RV-7FR series RV-13FR series RV-20FR series RV-4F series RV-7F series RV-13F series RV-20F series

This function is available when the robot model to display on the 3D monitor is a "Detailed model".

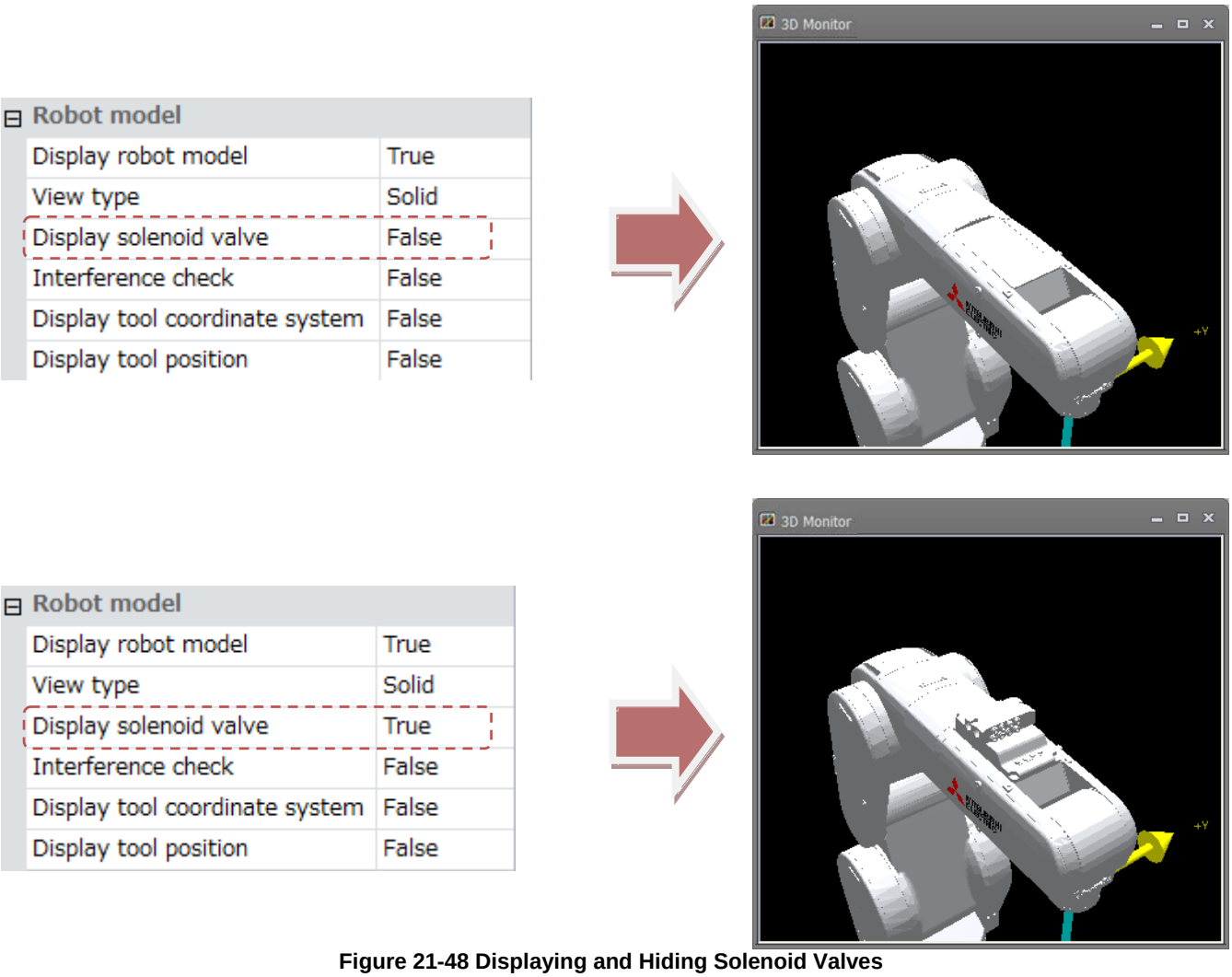


Figure 21-48 Displaying and Hiding Solenoid Valves

21.6.3.4. Interference check

When [Interference check] is set to [True] and an interference check is executed, the interference check is performed on that robot model.
When the robot model is hidden, the interference check is not performed. For this reason, to execute this check, display the robot model.

For details on the interference check, refer to **"21.14 Interference Check"**.

21.6.3.5. Displaying the tool coordinate system

When [Display tool coordinate system] is set to [False], arrows that show the mechanical interface position or the tool coordinate system at the tool coordinates are hidden.

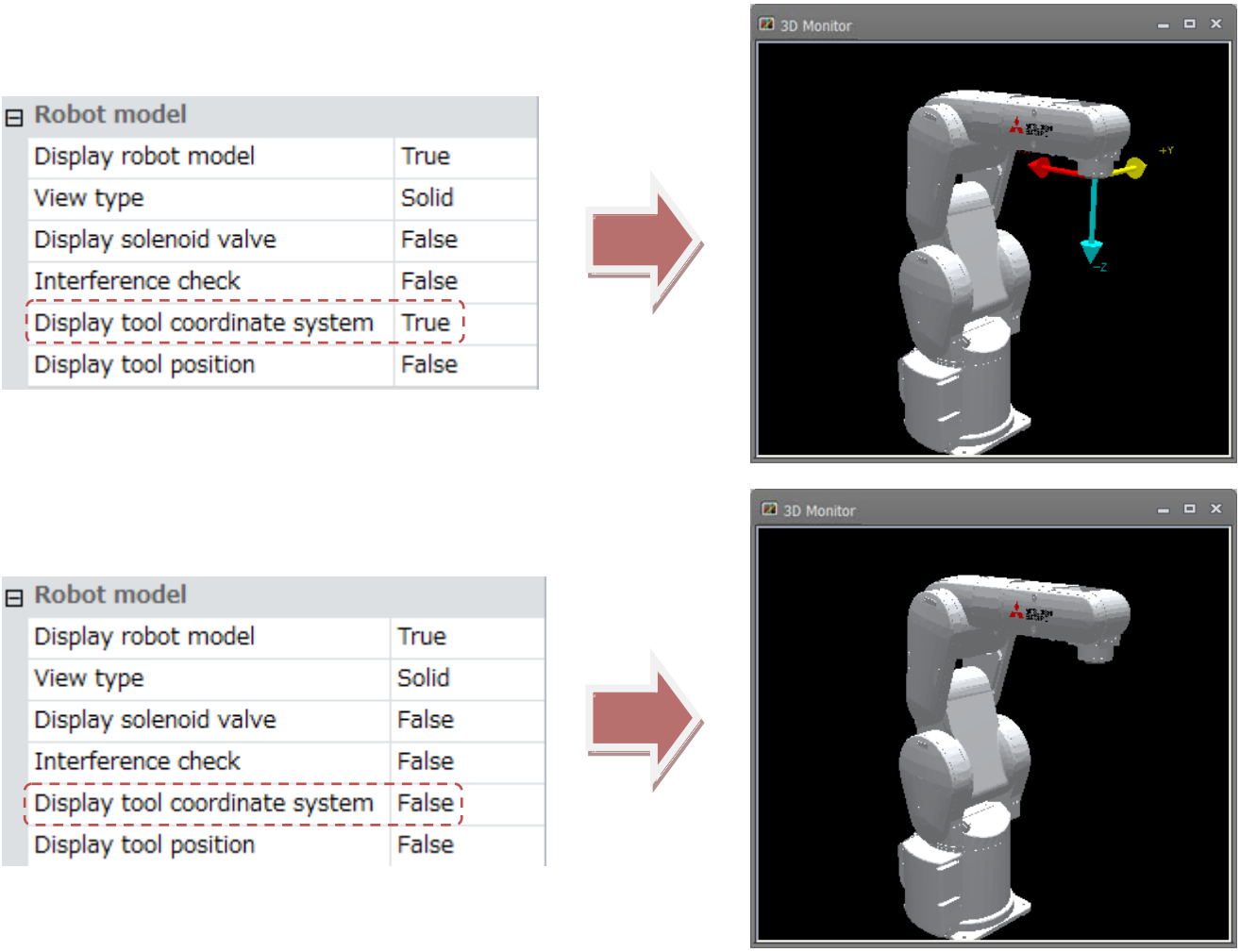


Figure 21-49 Displaying and Hiding the Tool Coordinate System

21.6.3.6. Displaying the tool position

When [Display tool position] is set to [True], the tool currently selected by the controller is displayed on the 3D monitor.

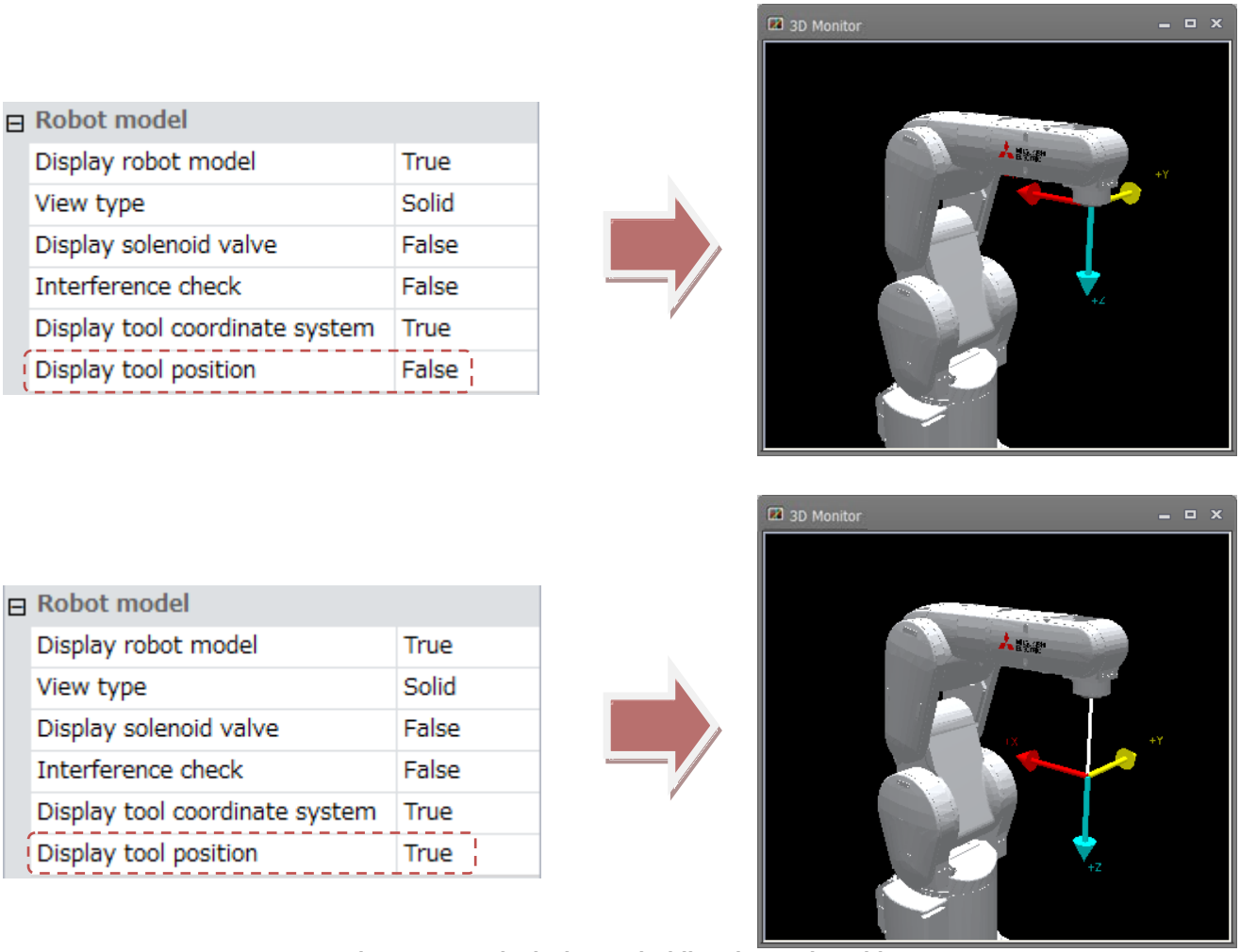


Figure 21-50 Displaying and Hiding the Tool Position

21.6.3.7. Display of work coordinate

Expand [Display work coodinate] and set the number of each work coordinate to [True], "(Robot ID): Work (work number)" will be displayed at the position set in the work coordinate of **"13.3.5 Tool parameter"**.

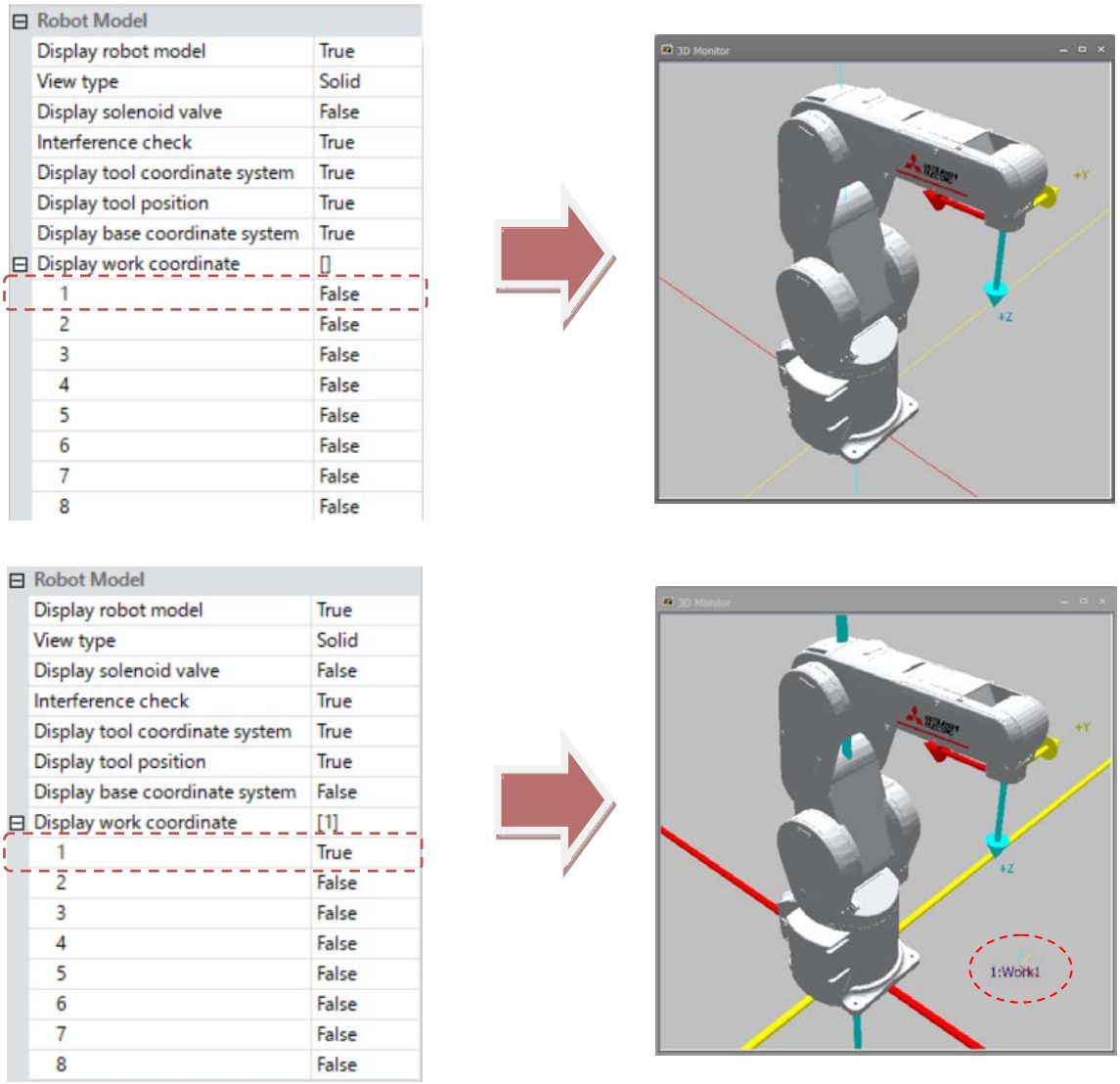


Figure 21-51 Displaying and Hiding the Work Coodinate

21.6.3.8. Robot path

By [Robot path], display of the robot path can be set.

When [Display] is set to [True], the path of robot movement is displayed on the 3D monitor.
This function is available in modes other than offline.
The robot path is displayed in green. Certain movements are displayed as the robot path, and are erased sequentially from the oldest data.

The thickness of the path can be selected at [Thickness[point]] within the range 1 to 5 points.
When the thickness is changed, the thickness of the line displayed to indicate the robot path is changed.

When the [Delete] button is clicked, all currently displayed paths are deleted.

The display of the robot path is restricted according to the robot model that is displayed.
Models whose path is not displayed are as follows.

	Robot model type
Robot models whose path is not displayed	RH-G, RC-G, RH-U

When a robot model whose path is not displayed is selected, [Robot path] is not displayed.

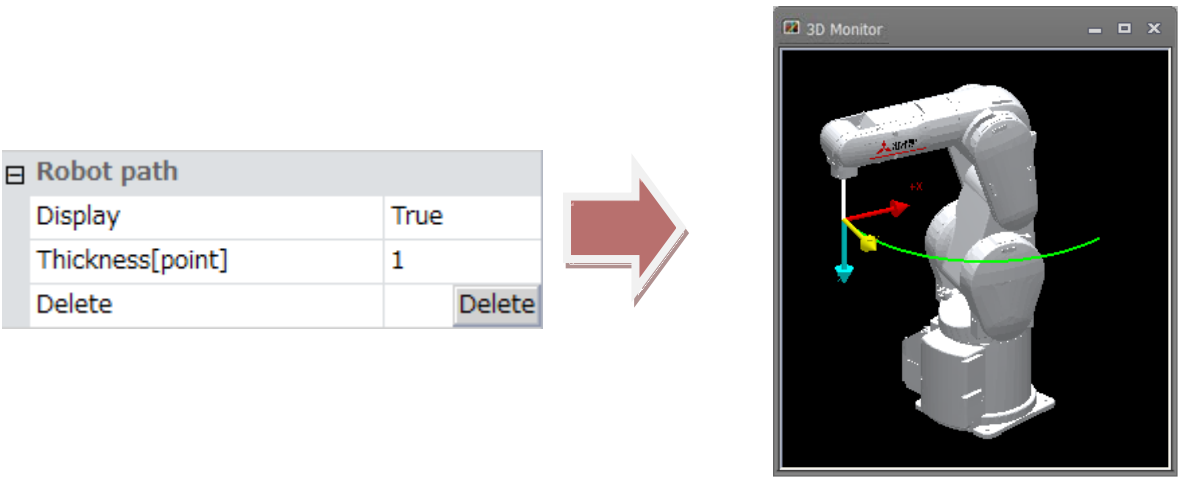


Figure 21-52 Displaying the Robot Path

⚠ Caution

Under the following circumstances, the plot interval of the robot path might become longer.

When the operation speed of the robot is fast

When the performance of the PC used is low

When multiple simulators are started up

When complex CAD models are displayed on the 3D monitor

When another application is running, and others

21.6.4. Hand

You can change the display settings of hands provided with the robot.
Note, however, that to display a hand, a hand file must first be created from the hand file manager. Then, the hand item must be added to the robot in the layout tree, and the hand file to display must be selected.

When [Display] is set to [False], the hand is hidden regardless of the state in the layout tree or display conditions.

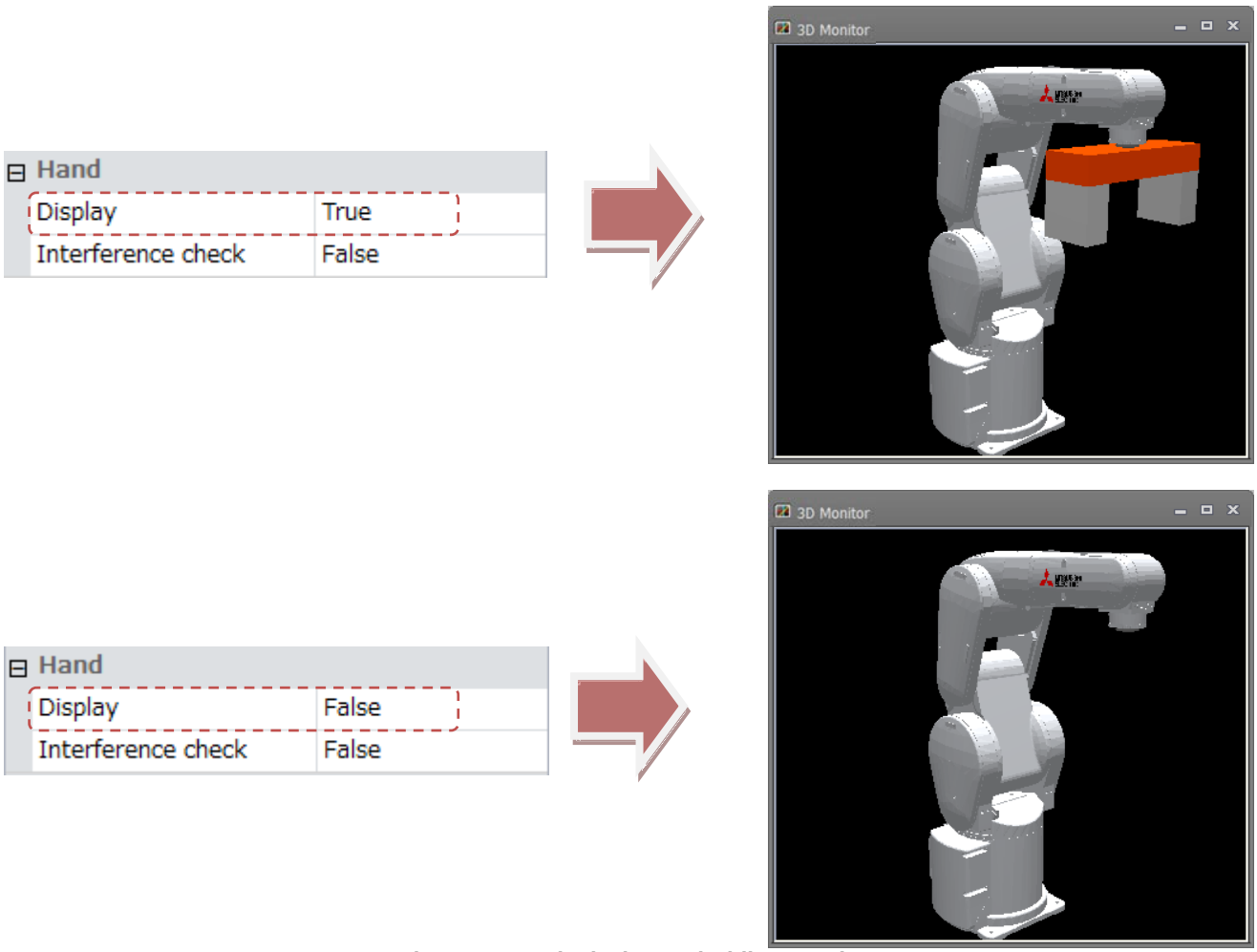


Figure 21-53 Displaying and Hiding Hands

When [Interference check] is set to [True] and an interference check is executed, the interference check is performed by the hand on that robot.
When the hand is hidden, the interference check is not performed. For this reason, to execute this check, display the hand.

For details on the interference check, refer to **"21.14 Interference Check"**.

21.6.5. Robot Parts

You can change the display settings of robot parts provided with the robot.
Note, however, that to display robot parts, robot parts file must first be created from the robot parts file manager. Then, the robot parts item must be added to the robot in the layout tree, and the robot parts file to display must be selected.

When [Display] is set to [False], the robot parts are hidden regardless of the state in the layout tree or display conditions.

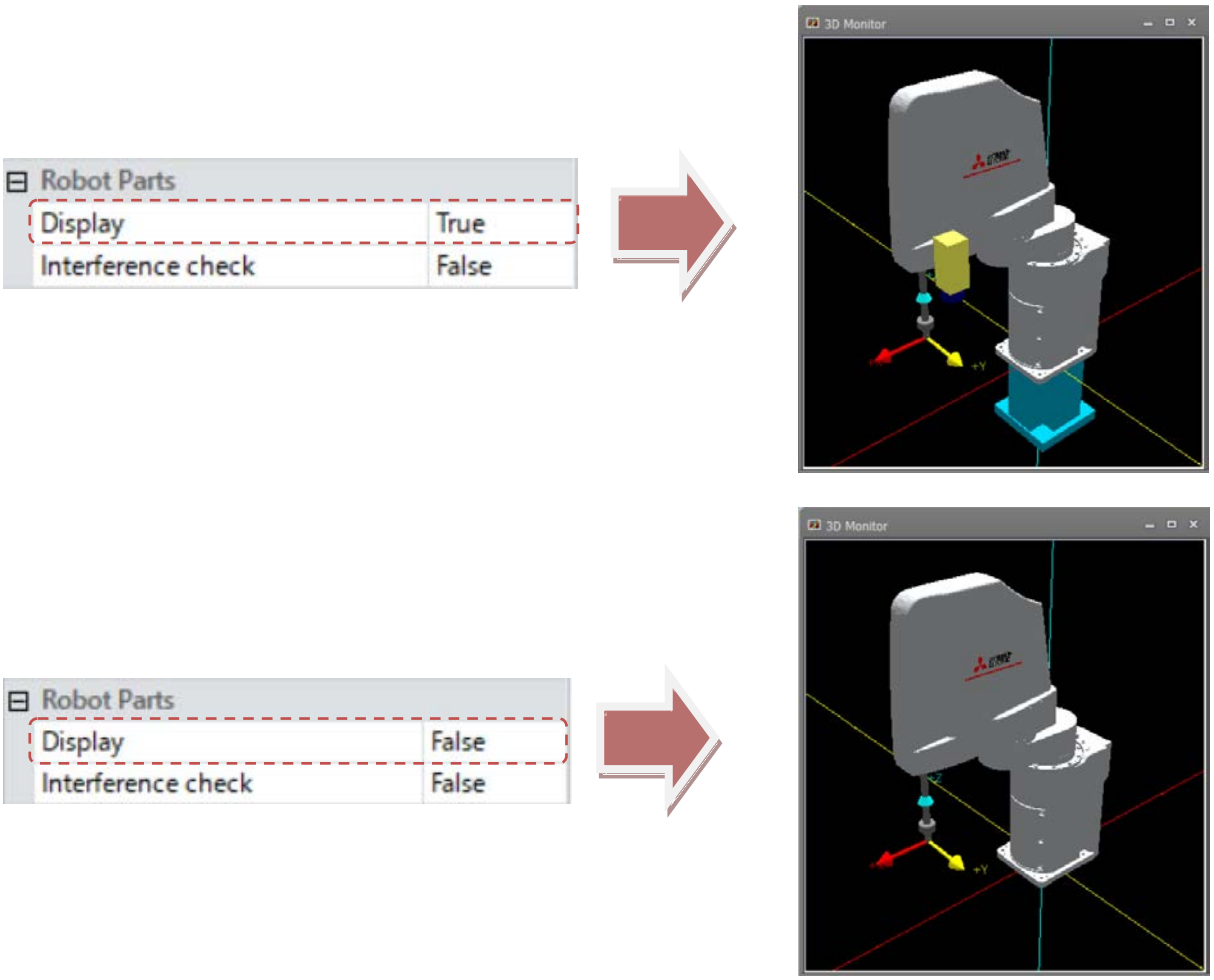


Figure 21-54 Displaying and Hiding Robot Parts

When [Interference check] is set to [True] and an interference check is executed, the interference check is performed by the robot parts on that robot.
When the robot parts are hidden, the interference check is not performed. For this reason, to execute this check, display the robot parts.

For details on the interference check, refer to **"21.14 Interference Check"**.

21.6.6. User Mechanism

You can change the display settings of the user mech. attached to the robot.
Create a user mech. file from the [**User Mech. File Manager**] and add the user mech. item to the robot in the layout tree and select the user mech. file to be displayed.

If [**Display**] is set to "**False**", the user mech. will be hidden.

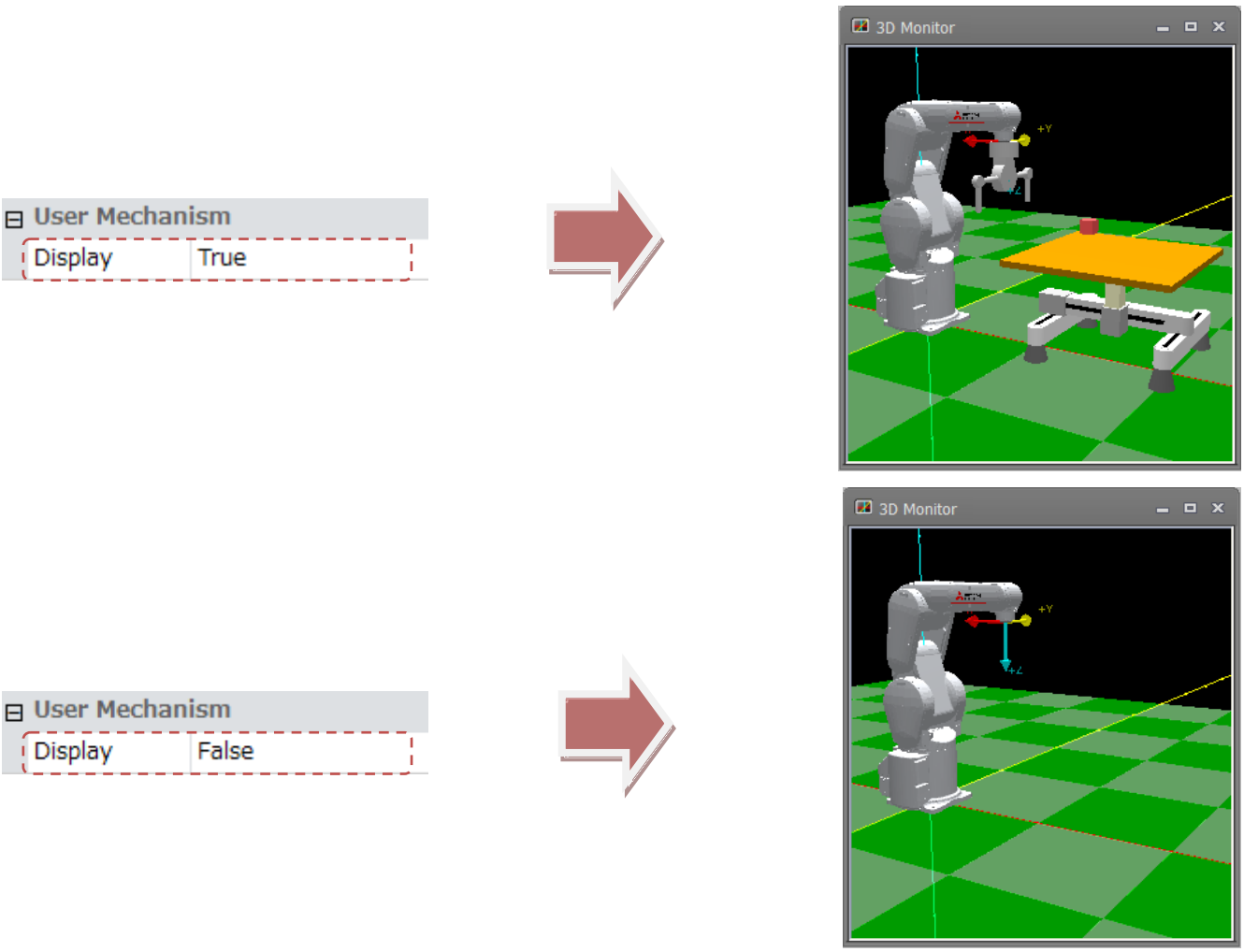


Figure 21-55 Hide display of user mechanism

21.6.7. Collision area

You can check the collision area on the 3D monitor.
[Collision area] is not displayed for robots that are in the offline mode or do not support the collision avoidance function.

When [Display] is set to [True], the collision area of the robot and the collision area selected at [Hand] and [Work] are displayed on the 3D monitor.
When [Color] is changed, the color of the collision area displayed on the 3D monitor is changed to the new color.
Click the [Color] button. The Set Color screen is displayed. The color can be set visually in this screen.

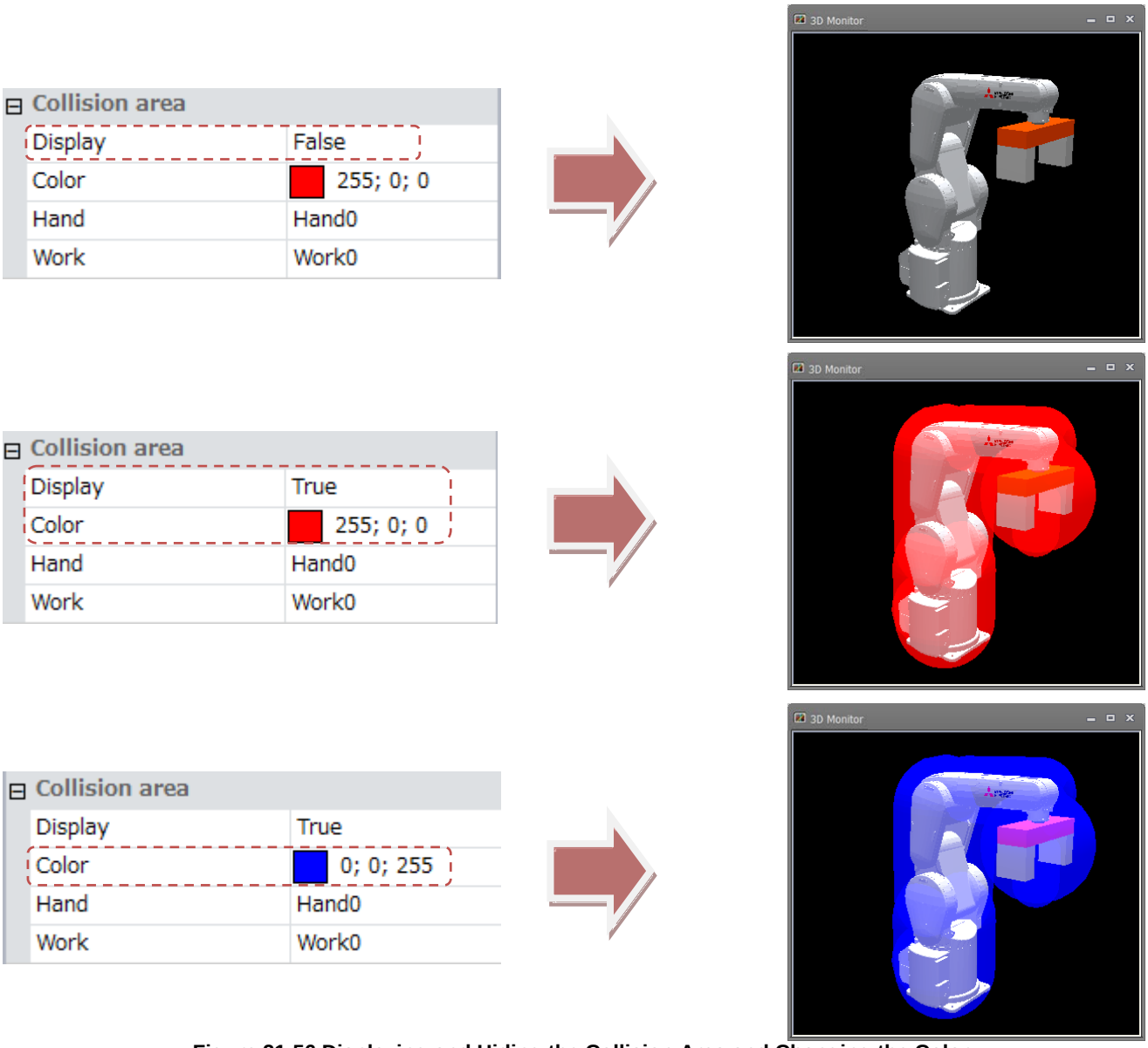


Figure 21-56 Displaying and Hiding the Collision Area and Changing the Color

21.6.8. Movement area

You can check the movement area in the robot's current posture in the 3D monitor.
In the offline mode, [Movement area] is not displayed.
When the posture is changed, click the [3D view] tab -> [3D View] group -> [Update Movement Area] button on the ribbon to refresh the movement area display. Updating takes several seconds depending on the performance of the PC.

When [Display] is set to [True], positions that the robot can move in the posture at the tool control point at that time are displayed on the 3D monitor as the movement area.
When [Color] is changed, the color of the movement area displayed on the 3D monitor is changed to the new color. Click the [...] button at [Color]. The Set Color screen is displayed. The color can be set visually in this screen.

The display of the movement area is restricted according to the robot model that is displayed.
The following table shows the models that do not support display of movement area.

	Robot model type
Models that do not support display of movement area.	RH-G, RC-G, RH-U

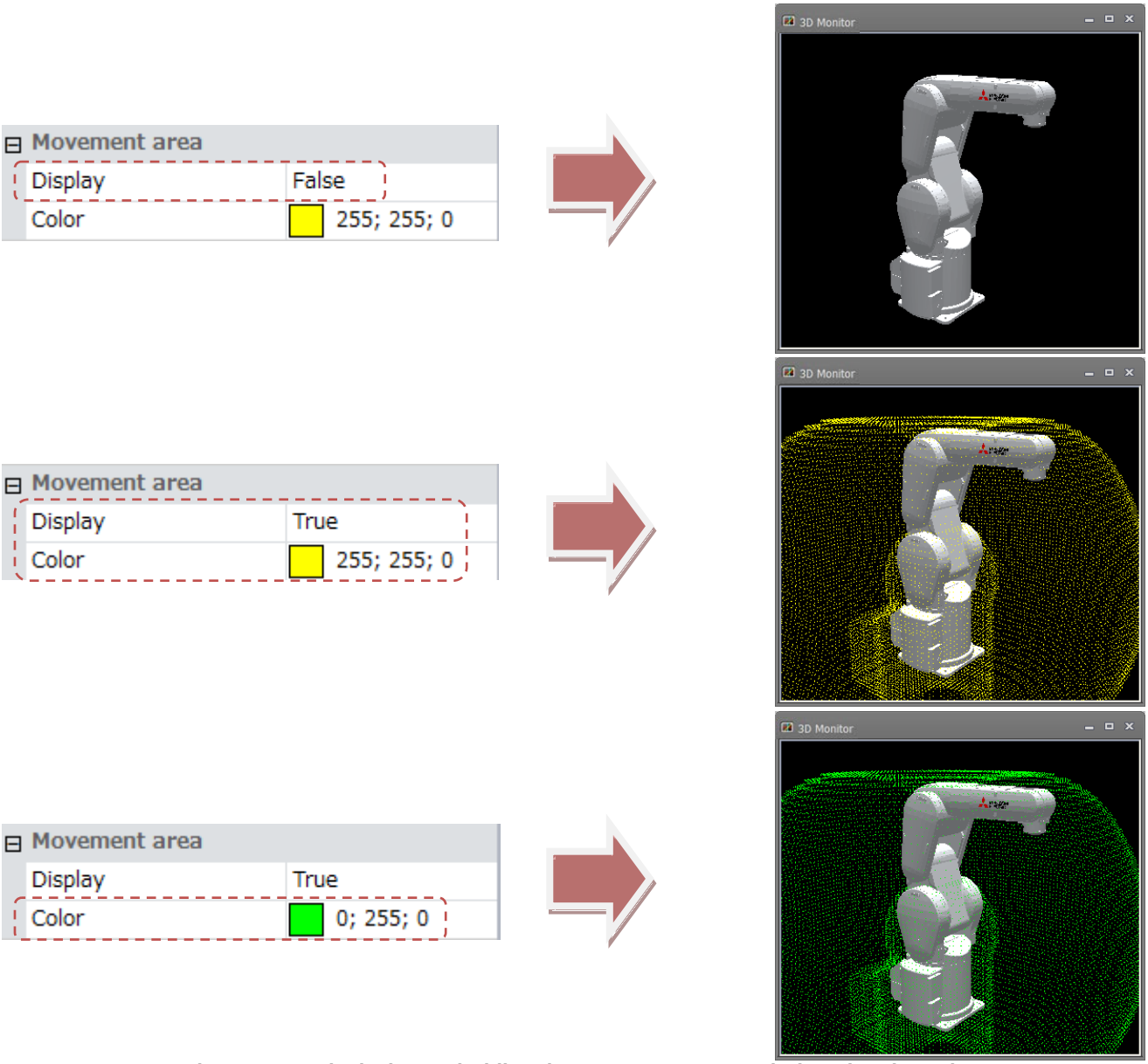


Figure 21-57 Displaying and Hiding the Movement Area and Changing the Color

21.6.9. User-defined area

You can check the user-defined area in the 3D monitor.
Only numbers set with the user-defined area parameter are displayed at "Properties".
In the offline mode, [User-defined area] is not displayed.

When a number item is set to [True], the respective user-defined area is displayed.
Also, multiple user-defined areas can be displayed together by entering only the numbers of specific user-defined areas to display in the format "[1; 2]" in [Display].

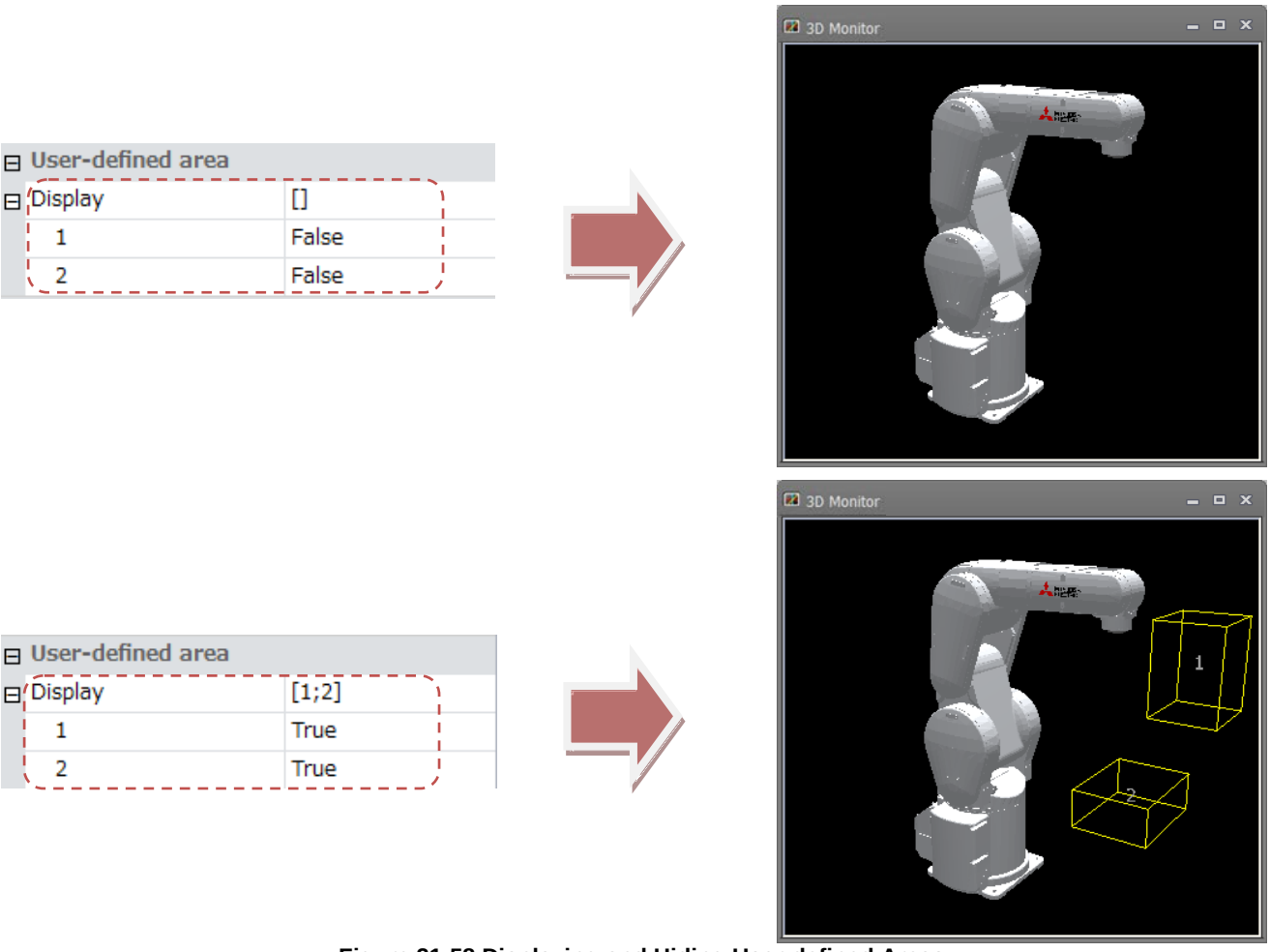


Figure 21-58 Displaying and Hiding User-defined Areas

21.6.10. Free plane limit

You can check the free plane limit on the 3D monitor.
Only numbers set with the free plane limit parameter are displayed at "Properties".
In the offline mode, [Free plane limit] is not displayed.

When a number item is set to [True], the respective free plane limit is displayed.
Also, multiple free plane limits can be displayed together by entering only the numbers of specific free plane limits to display in the format "[1; 2]" in [Display].

The length of one side of a free plane limit can be changed at [Length]. Note, however, that locations that are not displayed cannot be moved simply by their display on the 3D monitor being changed.

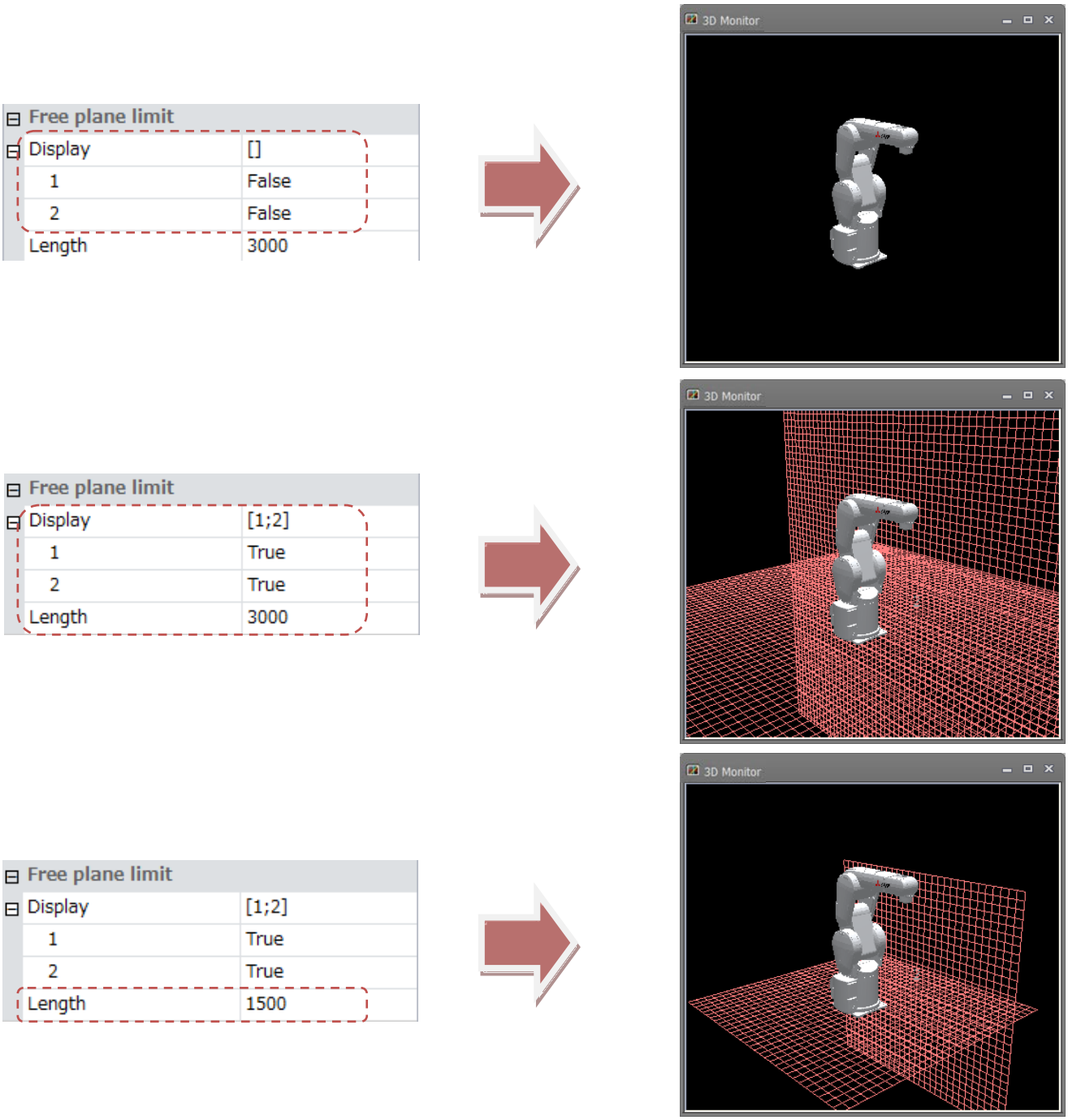


Figure 21-59 Displaying and Hiding Free Plane Limits and Changing Length

21.6.11. Safe monitoring

You can check the monitoring plane and monitoring position set in the safety parameters in the 3D monitor.
[Safe monitoring] is not displayed in the offline mode or on models that do not support safety parameters.
The contents displayed are different between CR800 series and CR750 / CR700 series.

21.6.11.1. Safe monitoring of CR 750 / CR 700 series

At [Display monitoring plane], only item numbers of planes set with position monitoring (plane setting) in the safety parameters are displayed, and operation is not possible if no items are set.
When a number item is set to [True], the respective plane is displayed on the 3D monitor.

When a number item at [Display monitoring position] is set to [True], the respective position set at position monitoring (position setting) in the safety parameters is displayed in the 3D monitor.

The plane in position monitoring (plane setting) is separate from the plane in the free plane limit. Also, the position in position monitoring (position setting) is separate from the collision area.
This function is available in controller software Ver.R6, S6 (robot safety option is required) or later.
For details on the robot safety option, refer to the **"Robot Safety Option Instruction Manual"** (BFP-A3371).

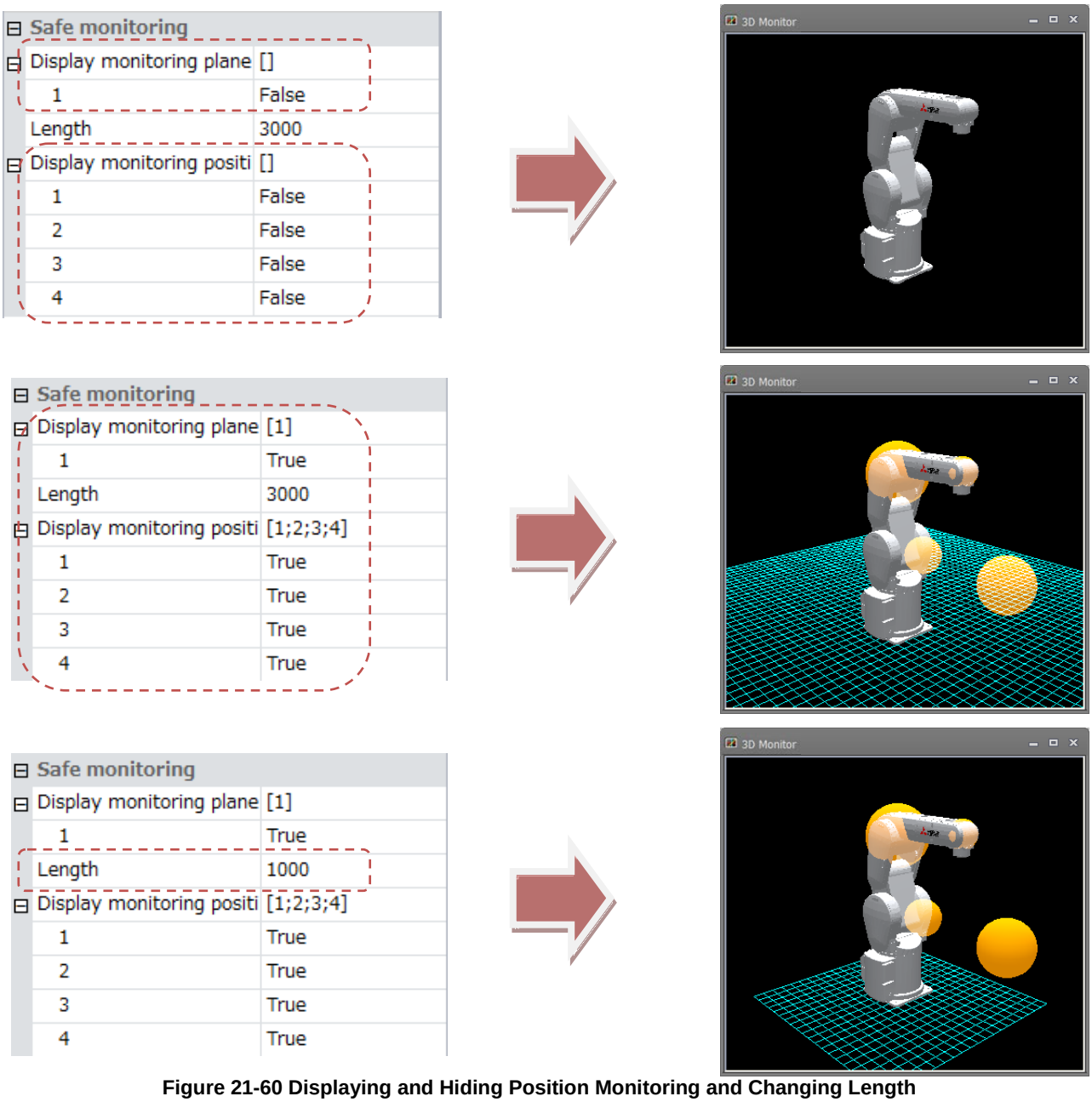


Figure 21-60 Displaying and Hiding Position Monitoring and Changing Length

21.6.11.2. Safe monitoring of CR 800 series

If you set the item of [Display monitoring planes] to [True], the plane set on the safety parameter SLP monitoring plane setting screen is displayed on the 3D monitor. If it is an invalid setting, the face is not displayed.

If you set the item of [Display monitoring area] to [True], the area set on the safety parameter SLP monitoring area setting screen is displayed on the 3D monitor. If it is an invalid setting, the area is not displayed.

If you set the item of [Display AREA Input to [True], the area set on the safety parameter AREA input area setting screen is displayed on the 3D monitor. If it is an invalid setting, the area is not displayed.

If you set the [Display] item of [Arm model] to [True], the arm monitoring model will be displayed on the 3D monitor. When you change the item of [Color], the color of the robot arm monitoring position displayed on the 3D monitor is changed to that color.

If you set the item of [Display tool model] to [True], the user specified monitoring position set on the safety parameter robot model screen is displayed on the 3D monitor.

The plane in SLP position monitoring is separate from the plane in the free plane limit. Also, the robot arm monitoring position and the position of the user specified monitoring position are different from the interference area. The areas of SLP monitoring area and AREA input area are also different from those of user defined area.
This function requires robot safety option.
For details on the robot safety option, refer to the **"Robot Safety Option Instruction Manual"** (BFP-A3371).

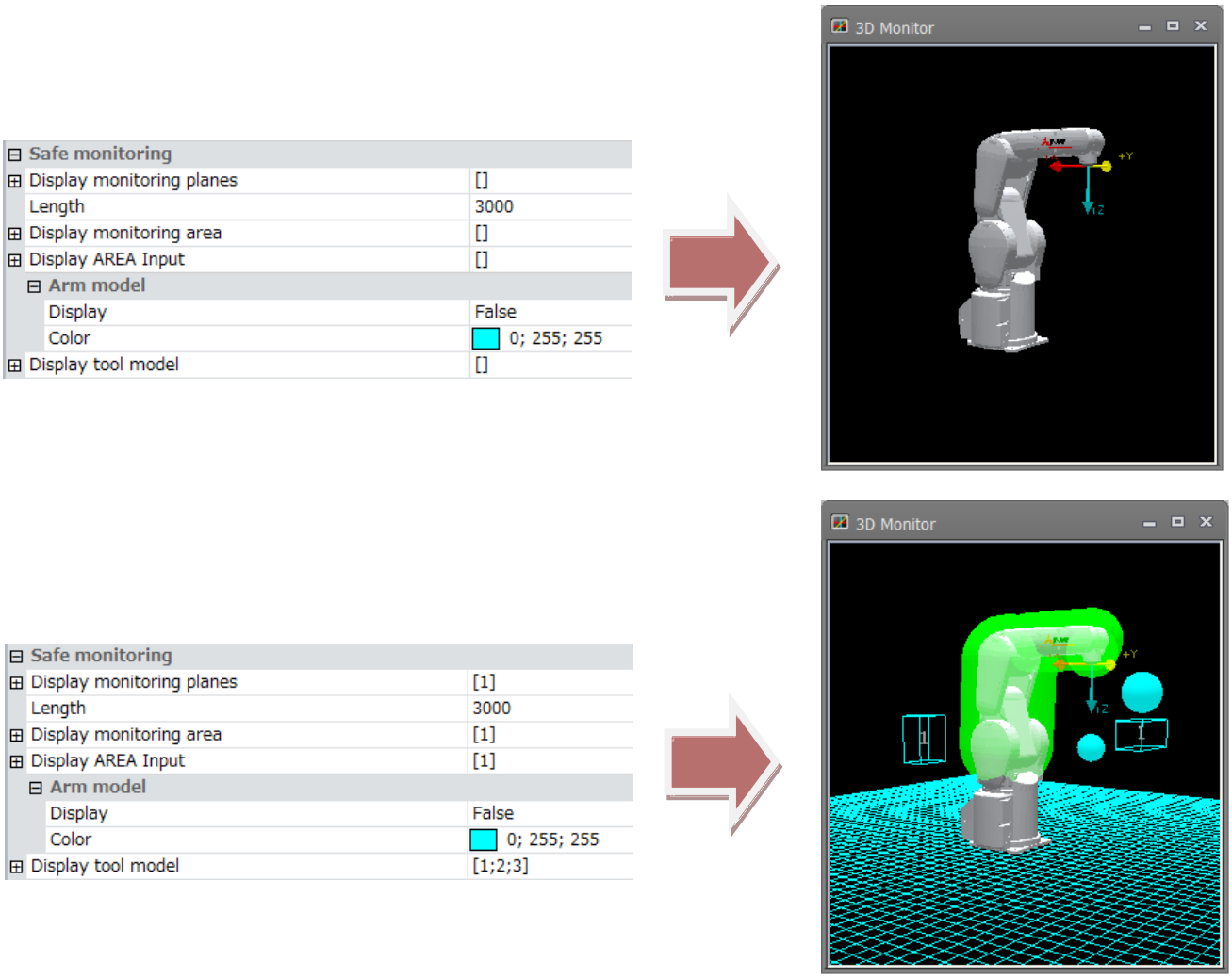


Figure 21-61 Displaying and Hiding Position Monitoring

21.7. Hand Display Settings

Display the 3D monitor and select the hand whose display settings are to be changed in the layout tree.
The display settings of that hand will be displayed at "Properties", and hand related display settings can be changed at respective items.
For details on how to add hands in the layout tree, see **"21.4.2.1 Add hand"**.

Also, to display hands in the 3D monitor, hands must be registered separately to the workspace. For details on how to register hands, see **"21.19 Hand Design"**.

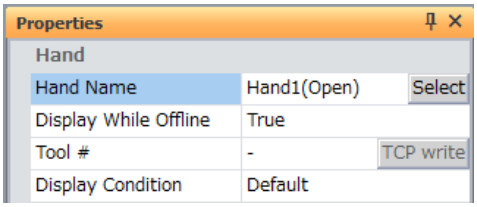


Figure 21-62 Hand Display Settings

21.7.1. Hand display content

At [Hand name], the hand file name is displayed as the name of the item.
Also, the Select hand file screen is displayed by selecting [Hand name] and clicking the [Select] button or double-clicking a hand whose file is not set on the layout tree.

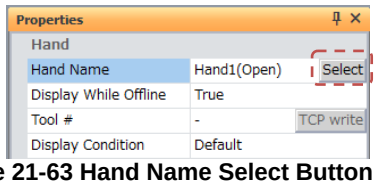


Figure 21-63 Hand Name Select Button

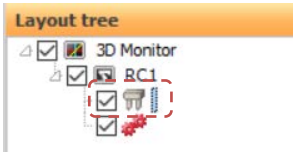


Figure 21-64 Undefined Hand

In the Select hand file screen, the list of hand files currently registered to the workspace are displayed. Select the hand file to display in the list, check content in the 3D monitor and select the [OK] button. The selected hand file is set to the display content.

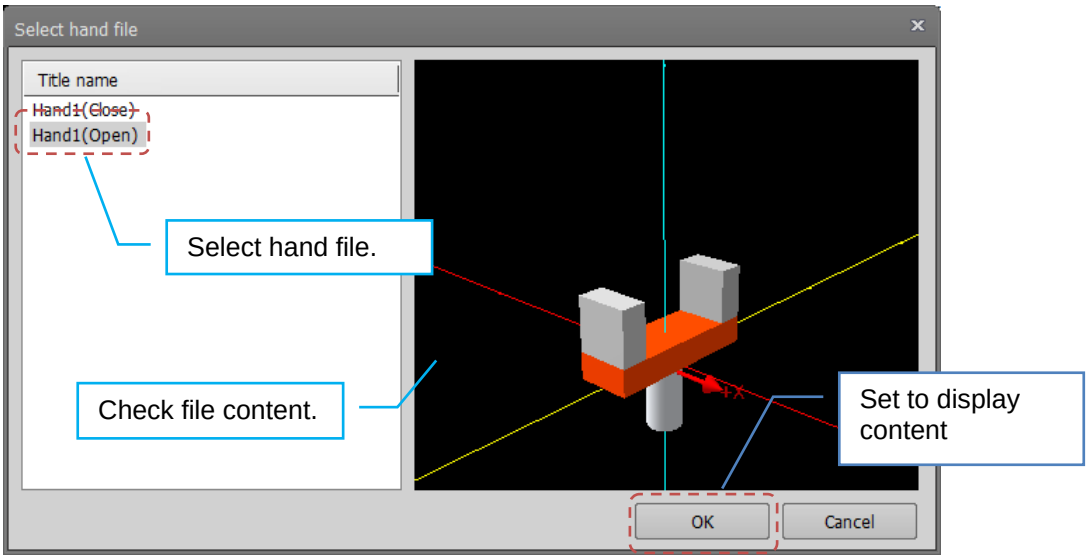


Figure 21-65 Select Hand File Screen

21.7.2. Display conditions

By setting display conditions, the target hand file can be displayed only in specified I/O states or when a tool is selected.

- Display in offline mode

In the offline mode, hands for which [True] is selected are displayed.
This setting is possible only on one hand per robot. When [Display while offline] is changed to [True], all other hands are changed to [False].

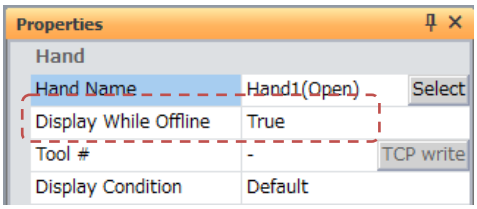


Figure 21-66 Display in Offline Mode

- Tool #

Specify the tool No. for displaying the target hand file. This condition is valid in both the simulation mode and when connected to an actual controller.
Options are [-], [0], [1] and so forth. When [-] is selected, all tool Nos. are displayed regardless of the tool selection state. Note, however, that if there is a hand file that is specified with the same No. as the current tool No., that hand file will be displayed.

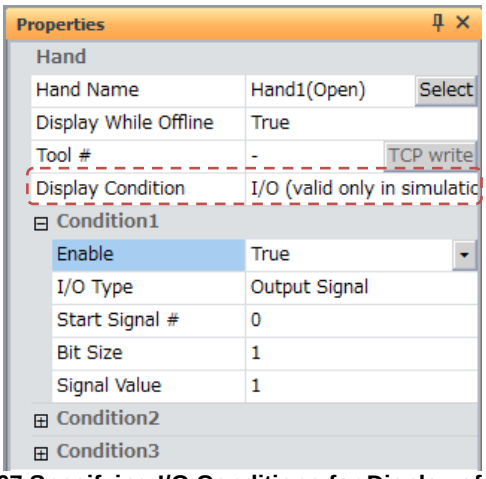


Figure 21-67 Specifying I/O Conditions for Display of Hand Files

- Display conditions

Specify the I/O conditions for displaying the target hand file. This condition is valid only in the simulation mode. To disable I/O conditions, select [Default], and to enable I/O conditions, select [I/O (valid only in simulation)]. When [I/O (valid only in simulation)] is selected, items [Condition1] to [Condition3] are displayed, and up to three I/O conditions can be specified. The hand file is displayed when all respective conditions are satisfied.

(1) Enable:	Set [True] for only the number of I/O conditions to set. When [True] is set, the following items are displayed.
(2) I/O type:	Specify the I/O type. You can select from [input signal], [output signal], [Register (CC-Link) input] and [Register (CC-Link) output].
(3) Start signal #:	Specify the I/O start No. No. 0 onwards can be specified for I/O signals. No. 6000 onwards can be specified for register (CC-Link) I/O signals.
(4) Bit size:	Specify the number of bits (or number of registers) from the I/O start No. 1 to 32 can be specified for I/O signals. 1 and 2 can be specified for register (CC-Link) I/O.
(5) Signal value:	Specify the numerical value for comparing with the I/O state. For I/O signals, specify a value expressed in binary for the bit size using an unsigned decimal. For register (CC-Link) I/O, specify a value expressed in binary for one I/O (16-bit width) or 2 I/O (32-bit width) using a signed decimal.

21.7.3. Write TCP (hand tip)

If you select the hand setting and the tool number other than [-], the [TCP Write] button will be enabled.
Click the [TCP Write] button to write the TCP coordinate value set by the hand to
the tool parameter. (MEXTL/MEXTLn, n = tool #1-)

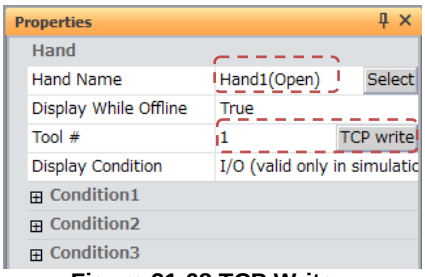


Figure 21-68 TCP Write

21.8. Robot Parts Display Settings

Display the 3D monitor and select the robot parts whose display settings are to be changed in the layout tree.
The display settings of that robot parts will be displayed at "Properties", and robot parts related display settings can be changed at respective items.
For details on how to add robot parts in the layout tree, see **"21.4.2.2 Add robot parts"**.

Also, to display robot parts in the 3D monitor, robot parts must be registered separately to the workspace. For details on how to register robot parts, see **"21.20 Robot Parts Design"**.

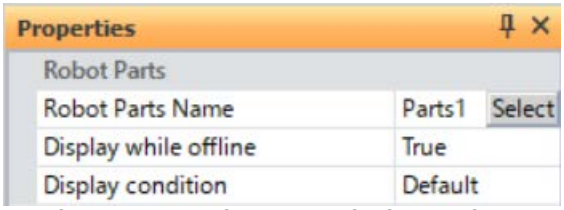


Figure 21-69 Robot Parts Display Settings

21.8.1. Robot parts display content

At [Robot Parts Name], the robot parts file name is displayed as the name of the item.
Also, the Select robot parts file screen is displayed by selecting [Robot Parts Name] and clicking the [Select] button or double-clicking a robot part whose file is not set on the layout tree..

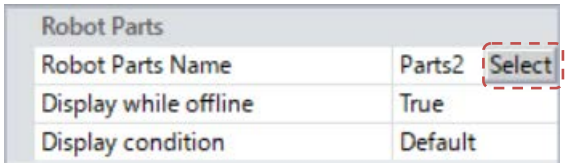


Figure 21-70 Robot Parts Name Select Button

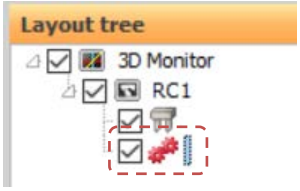


Figure 21-71 Undefined Robot Parts

In the Select robot parts file screen, the list of robot parts files currently registered to the workspace are displayed.
Select the robot parts file to display in the list, check content in the 3D monitor and select the [OK] button. The

selected robot parts file is set to the display content.

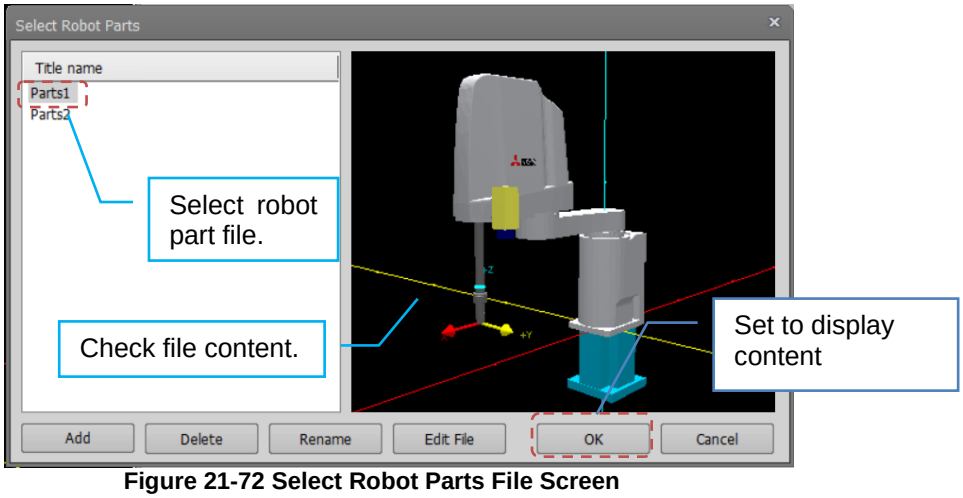


Figure 21-72 Select Robot Parts File Screen

21.8.2. Display conditions

By setting display conditions, the target robot parts file can be displayed only in specified I/O states or when a tool is selected.

- Display in offline mode

In the offline mode, robot parts for which [True] is selected are displayed.
This setting is possible only on one robot part per robot. When [Display while offline] is changed to [True], all other robot parts are changed to [False].

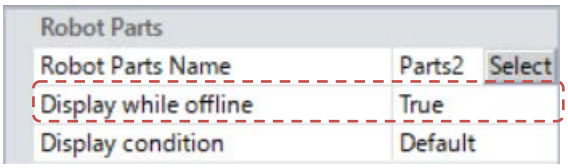


Figure 21-73 Display in Offline Mode

- Display conditions

Specify the I/O conditions for displaying the target hand file. This condition is valid only in the simulation mode. To disable I/O conditions, select [Default], and to enable I/O conditions, select [I/O (valid only in simulation)]. When [I/O (valid only in simulation)] is selected, items [Condition1] to [Condition3] are displayed, and up to three I/O conditions can be specified. The hand file is displayed when all respective conditions are satisfied.

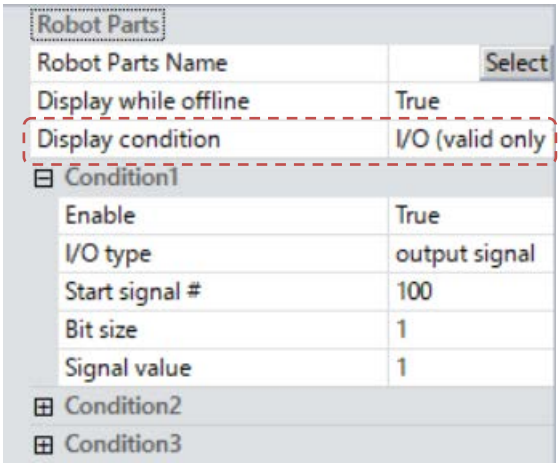


Figure 21-74 Specifying I/O Conditions for Display of Robot Parts Files

(1) Enable: Set [True] for only the number of I/O conditions to set.

When [True] is set, the following items are displayed.

(2) I/O type: Specify the I/O type.

You can select from [input signal], [output signal], [Register (CC-Link) input] and [Register (CC-Link) output].

(3) Start signal #: Specify the I/O start No.
No. 0 onwards can be specified for I/O signals.
No. 6000 onwards can be specified for register (CC-Link) I/O signals.

(4) Bit size: Specify the number of bits (or number of registers) from the I/O start No.
1 to 32 can be specified for I/O signals. 1 and 2 can be specified for register (CC-Link) I/O.

(5) Signal value: Specify the numerical value for comparing with the I/O state.
For I/O signals, specify a value expressed in binary for the bit size using an unsigned decimal.
For register (CC-Link) I/O, specify a value expressed in binary for one I/O (16-bit width) or 2 I/O (32-bit width) using a signed decimal.

21.9. User Mech. Display Settings

Display the 3D monitor and select the user mech. whose display settings are to be changed in the layout tree.
The display settings of that user mech. will be displayed at “Properties”, and user mech. related display settings can be changed at respective items.
For details on how to add a user mech. , refer to “**21.4.2.3 Add user mechanism**”.

Also, in order to display the user mech. on the 3D monitor, you need to register the user mech. in the workspace separately, refer to “**21.21 Design of User Mechanism**”.

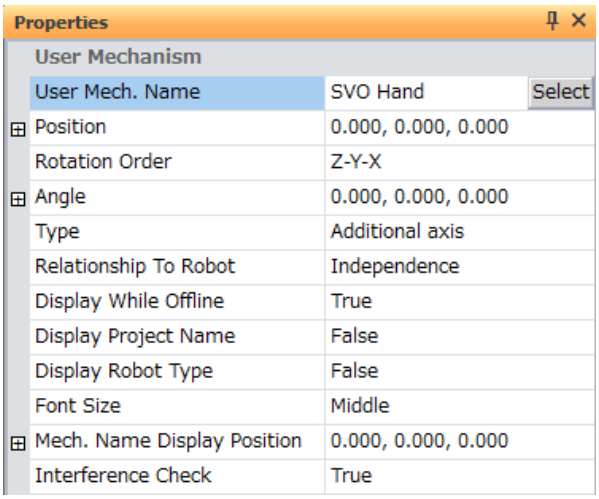


Figure 21-75 User Mech. Display Settings

21.9.1. Display contents of user mechanism

Clicking the [Select] button, or double-clicking on the user mech. for which no file is set in the layout tree, the user mech. file selection screen will be displayed.

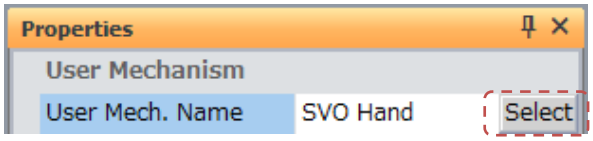


Figure 21-76 User mech. name selection button

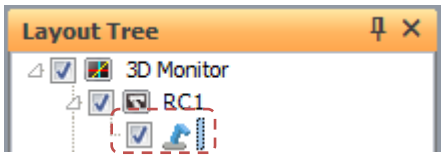


Figure 21-77 Unconfigured user mechanism

On the [select user mech. file]screen, a list of user mech. files registered in the current workspace is displayed.
Select the user mech. file, check the contents in the 3D display, and select the [OK] button.
The selected user mech. file is set to display contents.

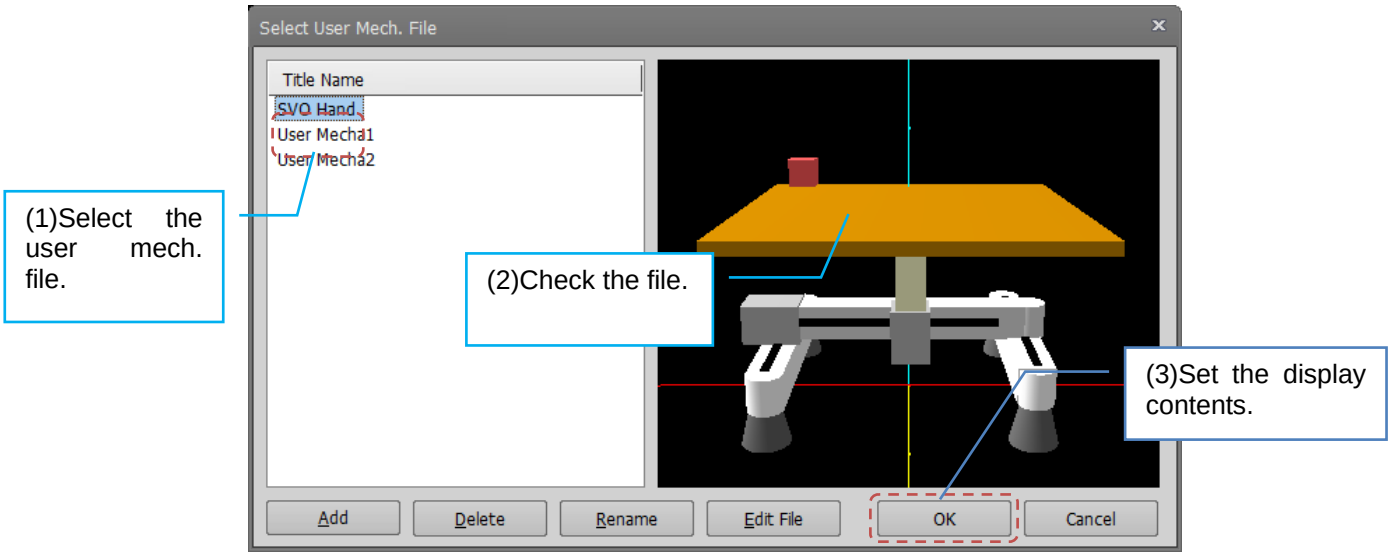


Figure 21-78 Select user mech. file

Position
It is displayed at the position specified by the user.
If there is a parent item, it is relative to the position and angle of the parent item. The setting unit is [mm].

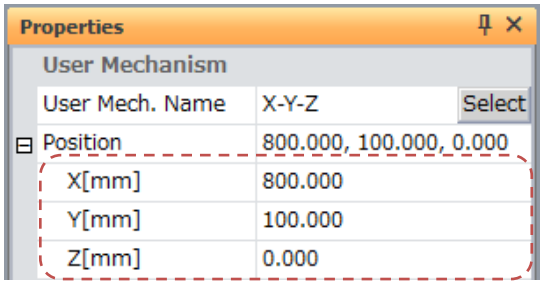


Figure 21-79 User mech. position

Rotation order and Angle
Display the rotation order and rotation angle by the user mechanism.

If there is a parent item, it is the relative rotation angle from the position and angle of the parent item. The setting unit is [deg].

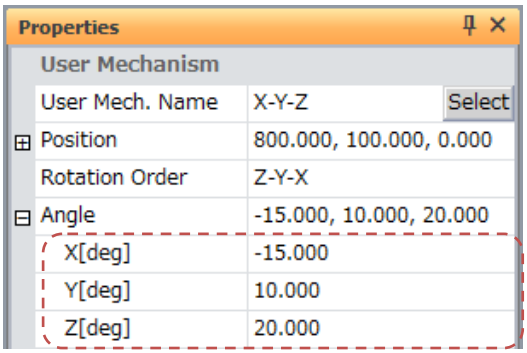


Figure 21-80 User mech. position

Displayed while offline
When [True] is selected, user mech. can be displayed even while offline.

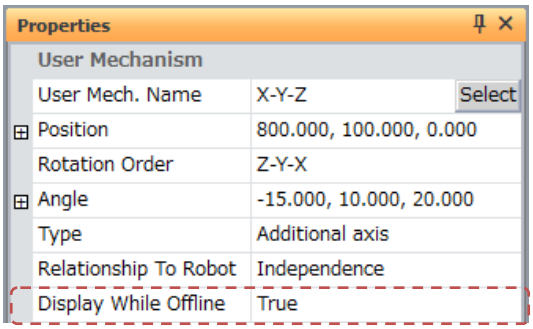


Figure 21-81 When while offline

Display the project name / mech. name
When [True] is selected, the project name / mech. name is displayed at the specified position from the origin of the user mech. with the specified character size (Large / Medium / Small).

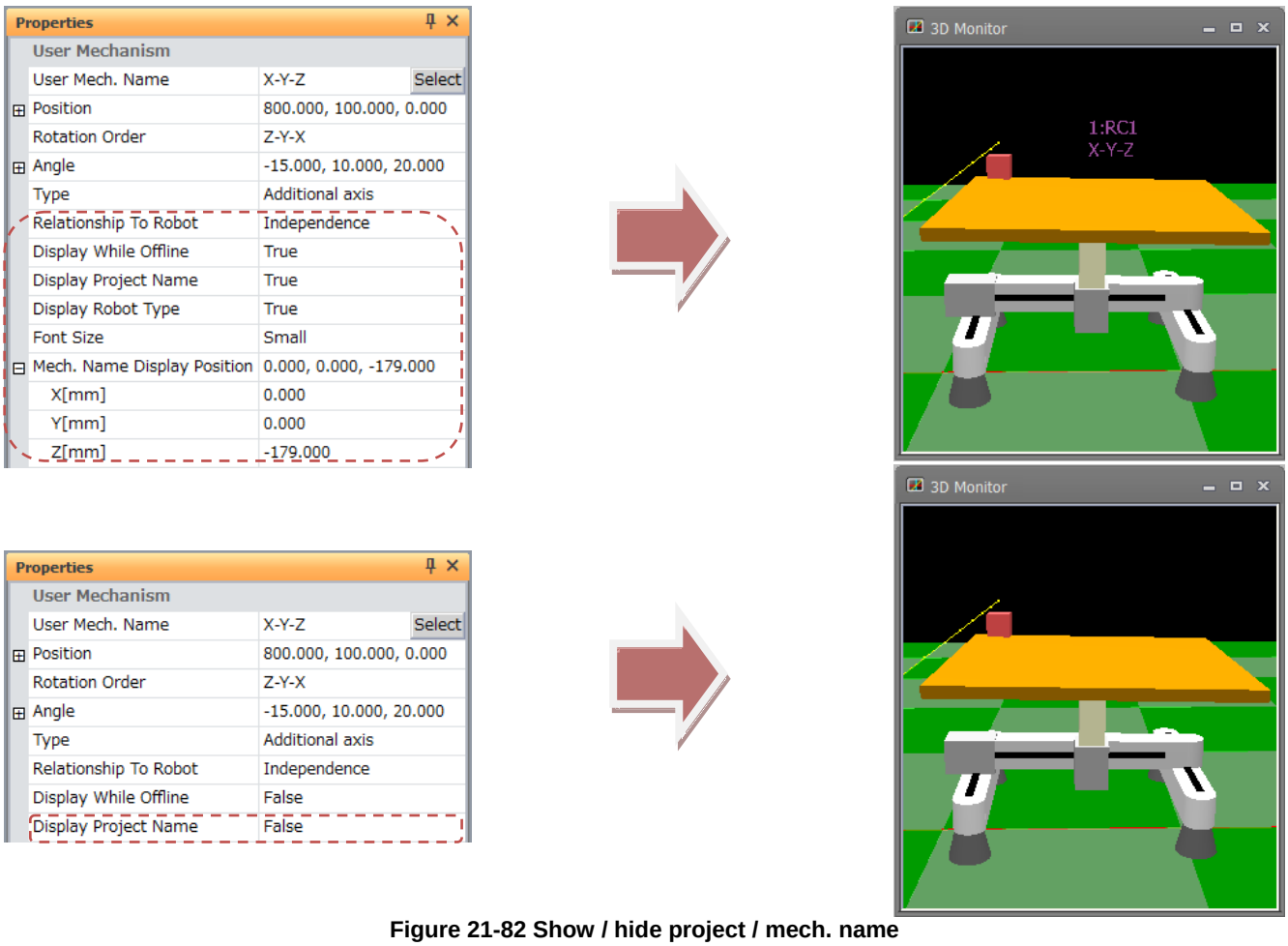


Figure 21-82 Show / hide project / mech. name

21.9.2. User mech. type and relationship to robot

User mech. type

Set mech. to assign the joint axis value of the user mechanism.

Additional axis	:	Mech. with mech. number 1 (robot)
User mech.-1	:	Mech. with mech. number 2
User mech.-2）	:	Mech. with mech. number 3

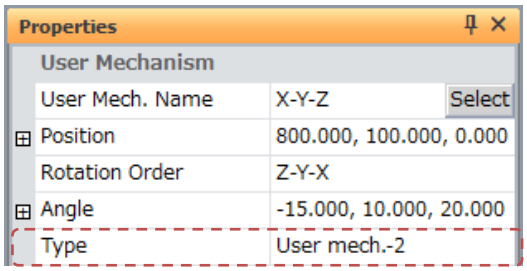


Figure 21-83 User mech. type

For details on setting of multi-mech. and additional axis, please refer to "**13.3.9Robot additional axis parameter**".

Relationship to robot

Set the relationship between the user mech. and the robot.

Independence	:	Make it a mechanism separate from the robot at a position distant from the robot (Coordinates are relative to the robot coordinates)
Attach to the robot's mechanical interface	:	Attach to the mechanical interface of robot and make it part of robot (The coordinates are relative coordinates from the mechanical interface)

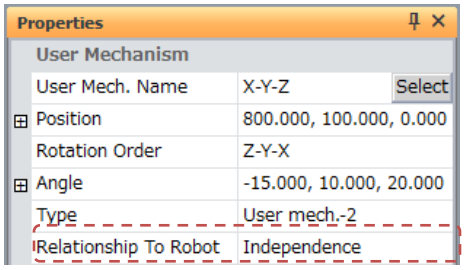


Figure 21-84 User mech. relationship to robot

21.9.3. User mech. Interference check

When [True] is selected, By clicking the [3D view] -> [interference check] button, interference check between the user mech. and other objects etc. can be done.

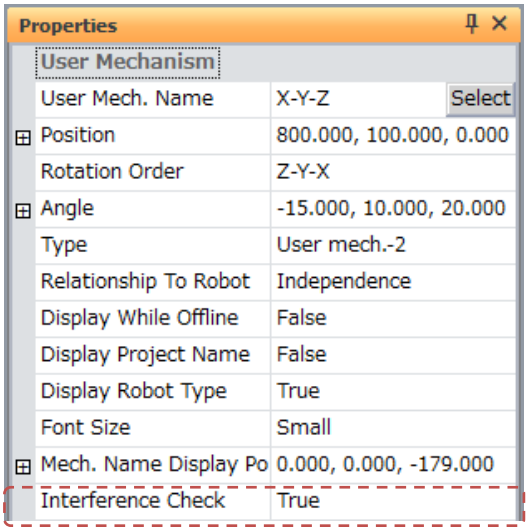


Figure 21-85 User mech. Interference check

Please refer to "**21.14Interference Check**".

21.10. Spline Display Settings

Display the 3D monitor and select the spline whose display settings are to be changed in the layout tree.
The display settings of that spline will be displayed at "Properties", and spline related display settings can be changed at respective items.
For details on how to add a spline, refer to **"Adding a spline"**.

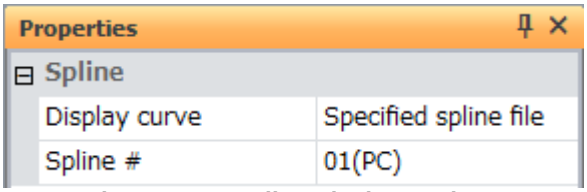


Figure 21-86 Spline Display Settings

At [Display curve], you can select [Opened spline file], [Specified spline file] and [MXT file].

21.10.1. Opened spline file

If the Spline screen for the target robot is opened, the data displayed in that screen can be displayed as the spline curve.

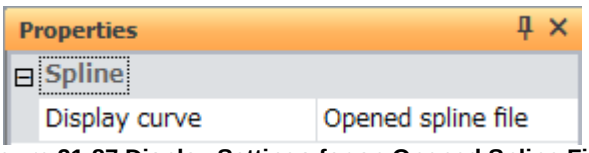


Figure 21-87 Display Settings for an Opened Spline File

When there is an [Opened spline file], the position data of the curve (blue) of the spline file currently open in the 3D Monitor screen and the currently selected path points are displayed.

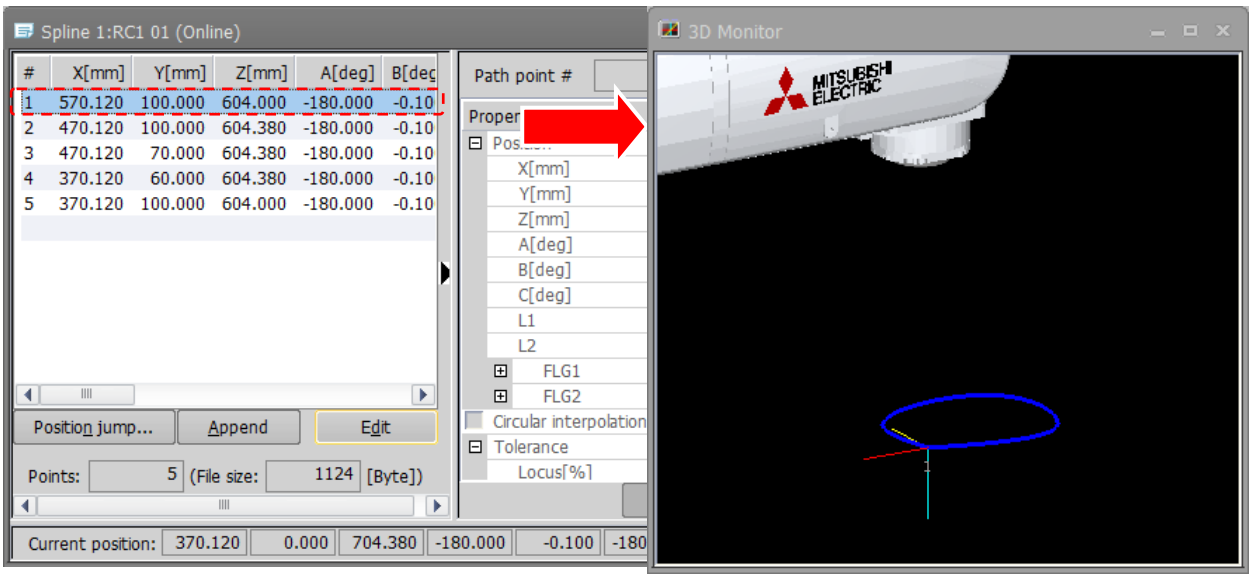


Figure 21-88 Display of Spline Curve (Opened File)

When a spline file corresponding to an EX-T spline is opened, the spline curve is displayed at the start position along the Ex-T coordinates. In addition to the position data of the currently selected path points, the position data (En, n: path point No.) corresponding to those points, and the gripping position (G) and Ex-T coordinate origin (EO) are displayed.

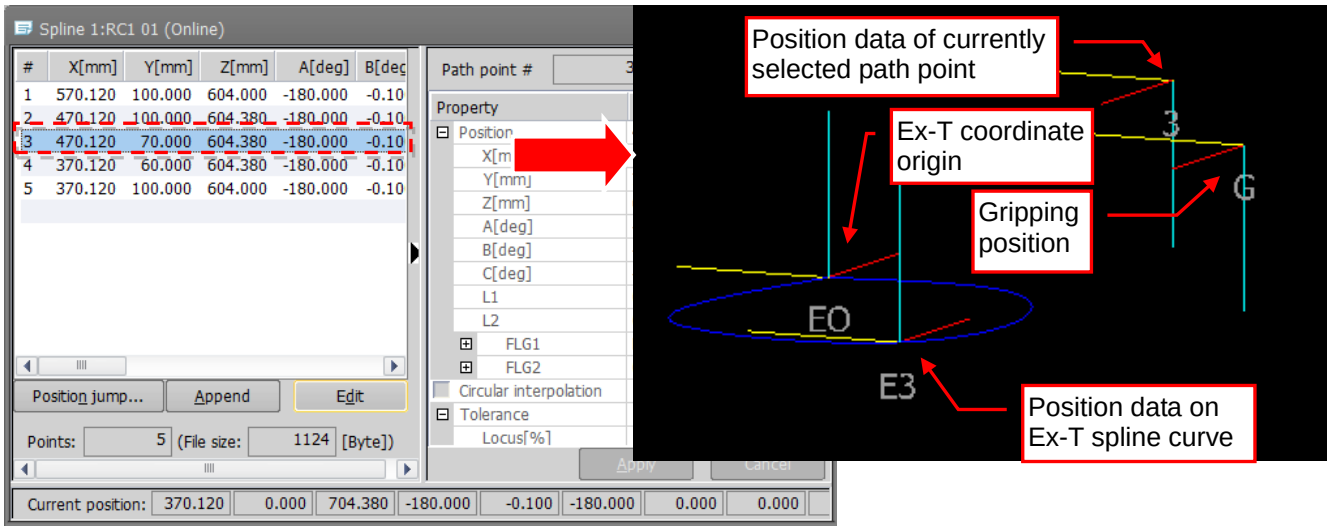


Figure 21-89 Display of Curve Corresponding to Ex-T Spline (Opened File)

21.10.2. Specified spline file

The spline file on the PC or robot can be specified, and its spline curves can be displayed.
To specify a spline file to display, select [Spline #] and click the [Select] button. The Select spline file screen is displayed. In this screen, select the spline file to display.

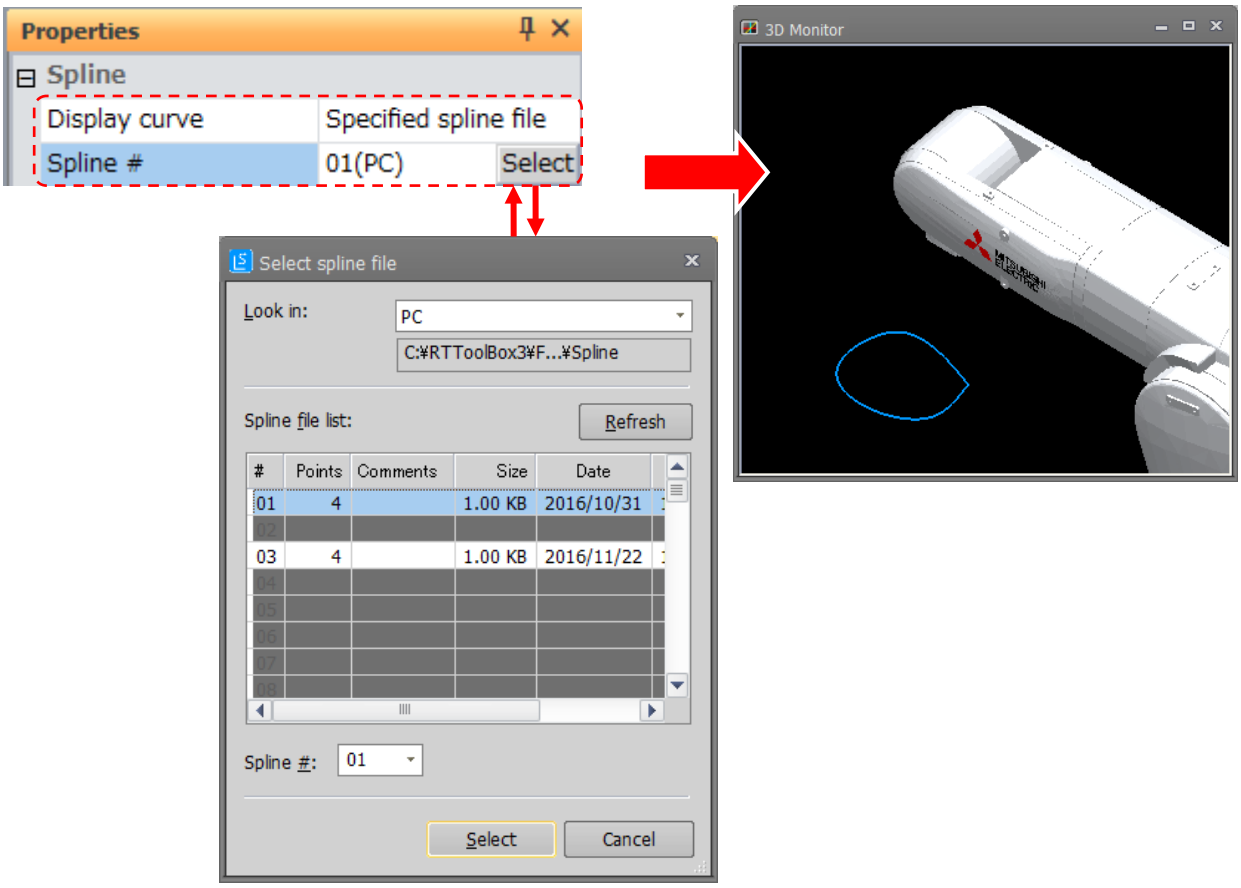


Figure 21-90 Display of Spline Curve (Specified File)

When a spline file corresponding to an Ex-T spline is selected, the spline curve is displayed at the position where the robot's tool is aligned with the gripping position.
Also, the Ex-T coordinate original (EO) is displayed.

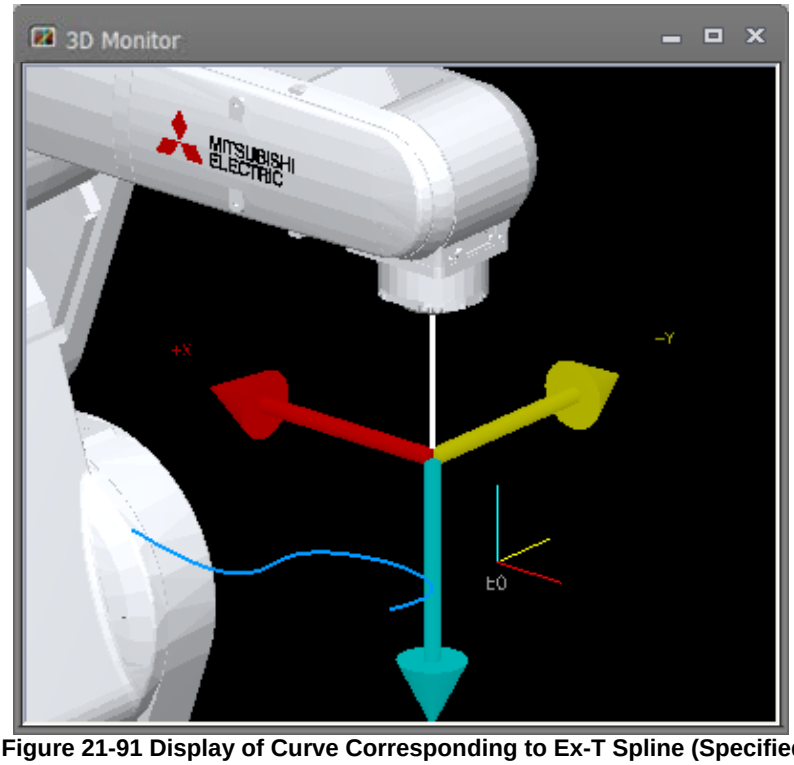


Figure 21-91 Display of Curve Corresponding to Ex-T Spline (Specified File)

21.10.3. MXT file

You can display a specified MXT file approximated to the spline curve.
To select an MXT file to display, select [File] and click the [...] button. The select read file screen is displayed. In this screen, select the MXT file to display.
Then, set the tolerance for calculating the control points of the spline curve from the MXT file by changing the [Tolerance] setting. The smaller the set value, the more detailed points are calculated.

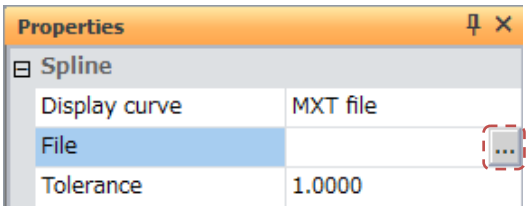


Figure 21-92 MXT File Display Settings

21.11. Layout Object Display Settings

Display the 3D monitor and select the layout object whose display settings are to be changed in the layout tree. The display settings of that layout object will be displayed at "Properties", and layout object related display settings can be changed at respective items.

21.11.1. Layout object display content settings

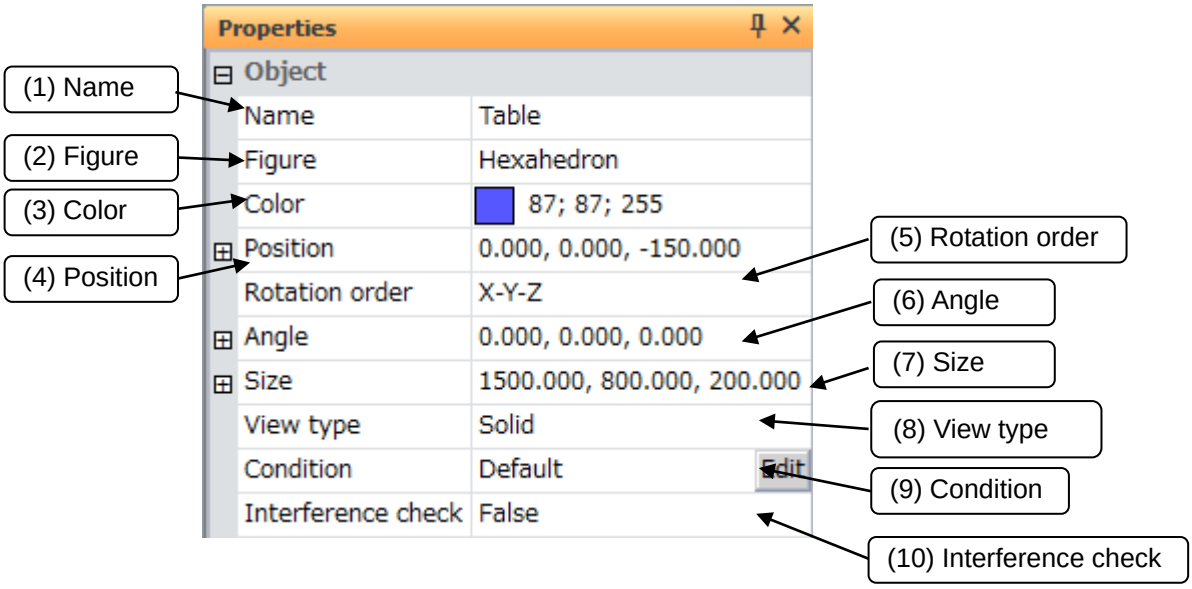


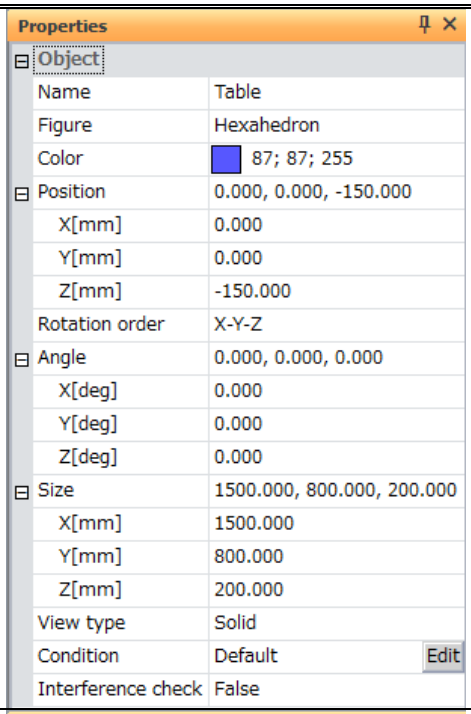
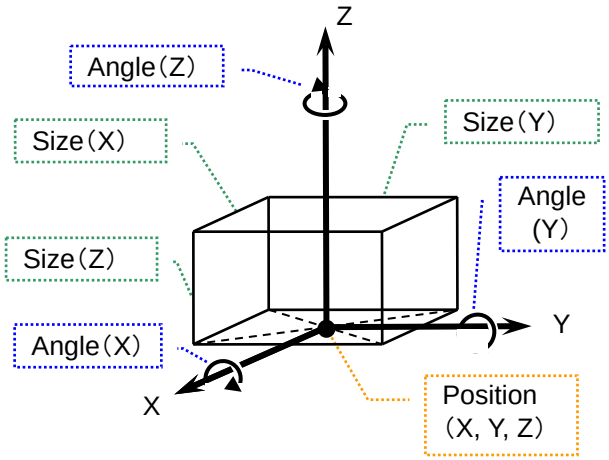
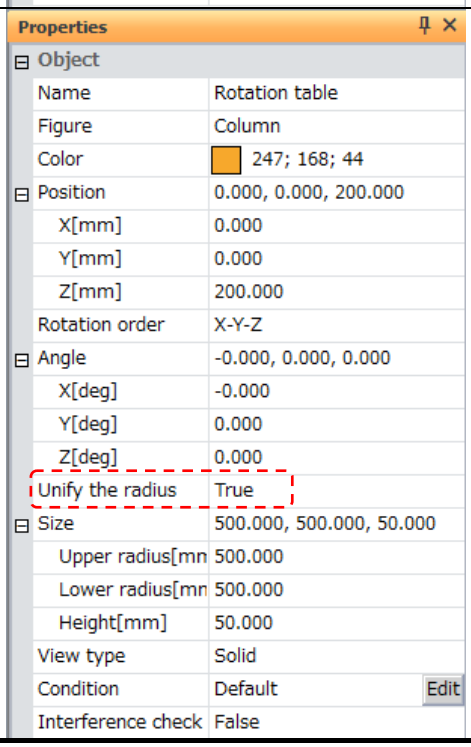
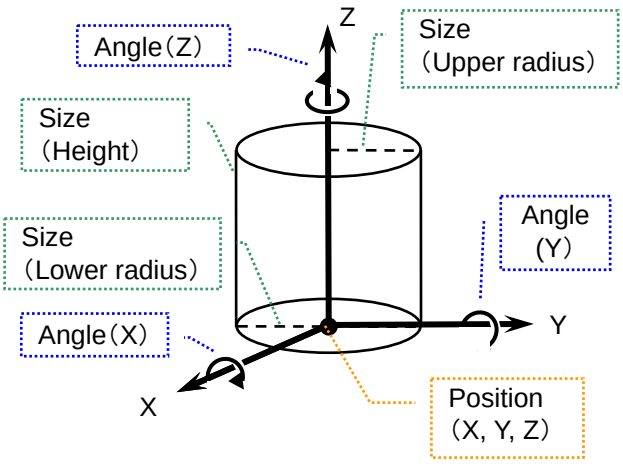
Figure 21-93 Layout Object Display Settings

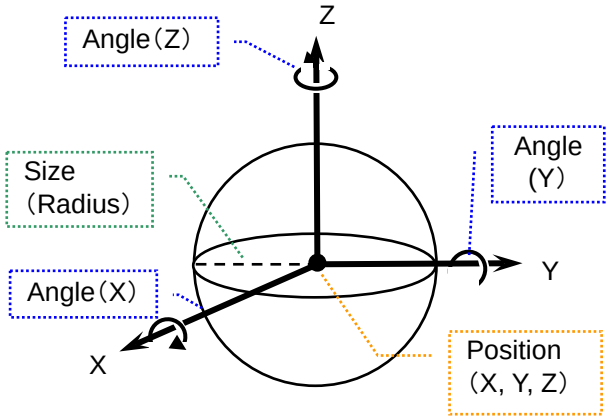
Table 21-5 Explanation of Layout Object Display Settings

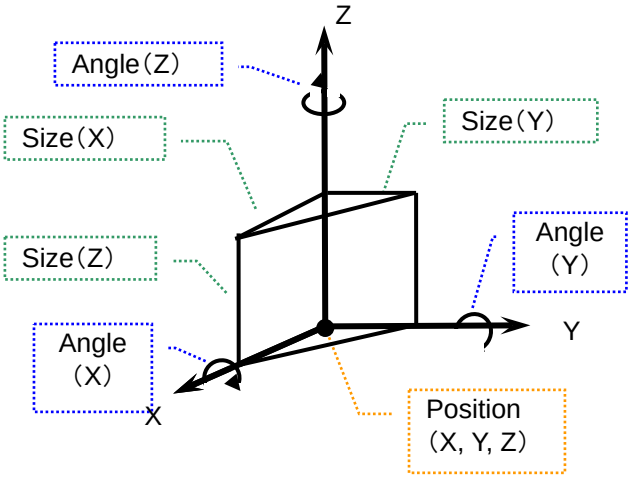
	Name	Description
(1)	Name	This item names layout objects. Names entered here are displayed in the layout tree.
(2)	Figure	This specifies the shape of the layout objects. You can specify from hexahedron, column (cone), sphere, triangle prism, plane, tube, 3D model and string. When 3D model is specified, data created by CAD can be read.
(3)	Color	This specifies the color of the layout objects. Select this item and click the [...] button. The Set Color screen is displayed. The color can be set visually in this screen.
(4)	Position	This sets the position where layout objects are to be placed. When there is a parent layout object in the layout tree, the position is the relative position from the parent layout object.
(5)	Rotation order	This sets the order in which the rotation angle of the layout object is reflected. You can select from "X->Y->Z" or "Z->Y->X".
(6)	Angle	This sets the posture in which layout objects are to be placed. When there is a parent layout object in the layout tree, the angle is the relative angle from the parent layout object.
(7)	Size	This specifies the size of the layout objects.
(8)	View type	This sets the view type of the layout objects. You can select from [Solid] or [Wire frame].
(9)	Condition	This sets the conditions for displaying and hiding layout objects. For details, refer to **"21.11.3 Layout condition edit"**.
(10)	Interference check	This sets whether or not to perform an interference check on the selected layout object when the interference check is executed. By the interference check, the interference with the robot model, hand / robot parts / user mech. is checked.

The following explains each of the layout objects.

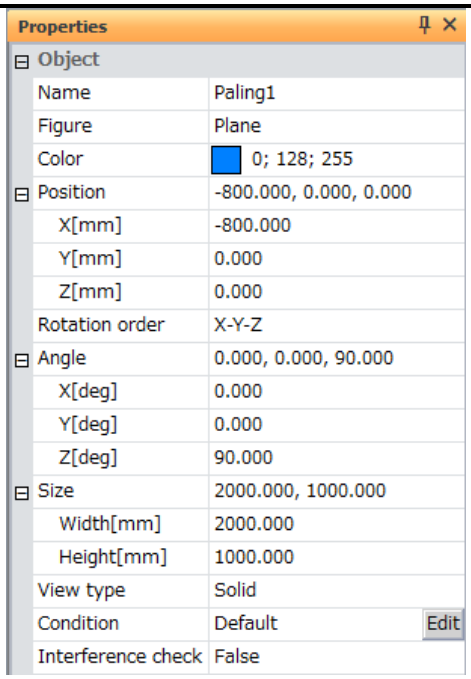
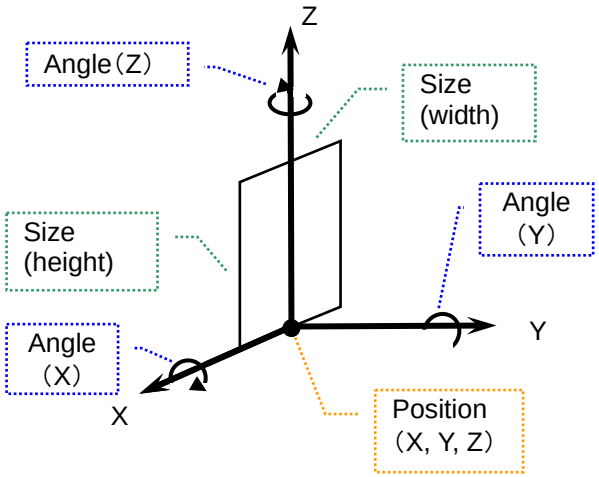
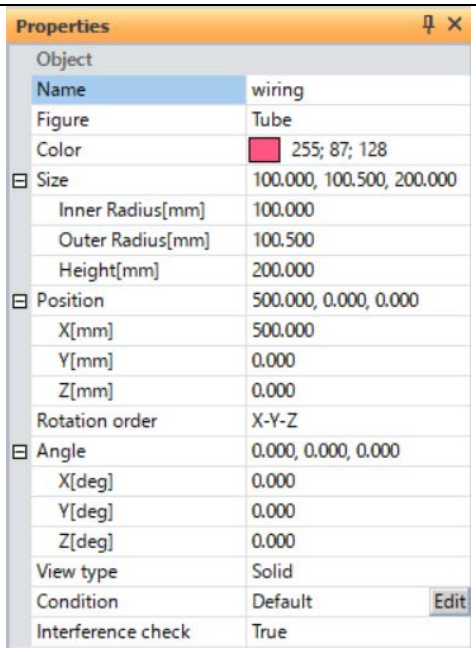
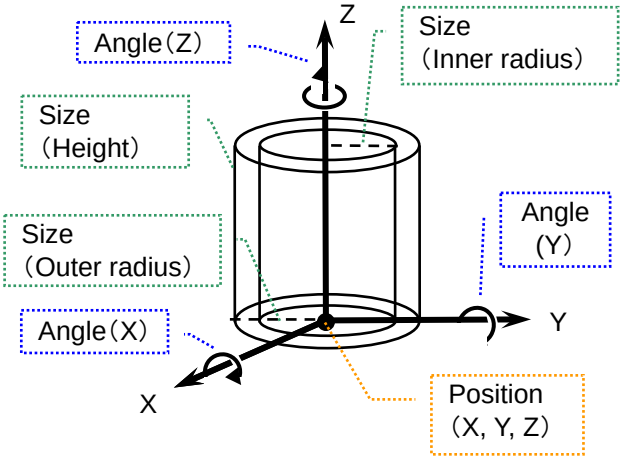
Table 21-6 Explanation of Layout Objects

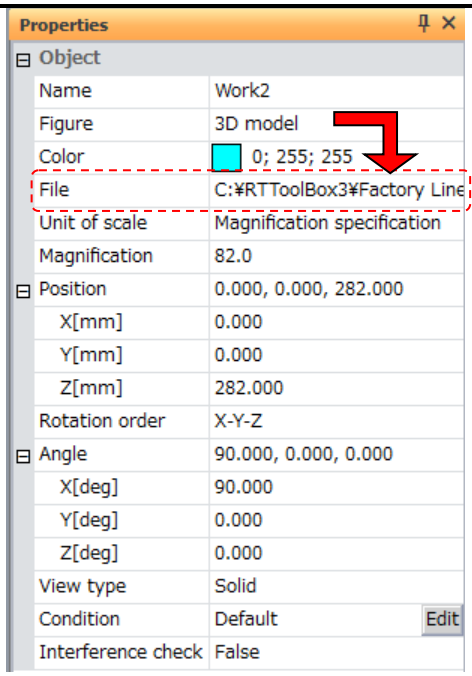
	Window	Explanation
Hexahedron (rectangular parallelepiped)	 Properties Object Name: Table Figure: Hexahedron Color: 87; 87; 255 Position: 0.000, 0.000, -150.000 X[mm]: 0.000 Y[mm]: 0.000 Z[mm]: -150.000 Rotation order: X-Y-Z Angle: 0.000, 0.000, 0.000 X[deg]: 0.000 Y[deg]: 0.000 Z[deg]: 0.000 Size: 1500.000, 800.000, 200.000 X[mm]: 1500.000 Y[mm]: 800.000 Z[mm]: 200.000 View type: Solid Condition: Default (Edit) Interference check: False	
Column (Cone)	 Properties Object Name: Rotation table Figure: Column Color: 247; 168; 44 Position: 0.000, 0.000, 200.000 X[mm]: 0.000 Y[mm]: 0.000 Z[mm]: 200.000 Rotation order: X-Y-Z Angle: -0.000, 0.000, 0.000 X[deg]: -0.000 Y[deg]: 0.000 Z[deg]: 0.000 Unify the radius: True Size: 500.000, 500.000, 50.000 Upper radius[mn: 500.000 Lower radius[mn: 500.000 Height[mm]: 50.000 View type: Solid Condition: Default (Edit) Interference check: False	 * If a different value is set to an upper radius and a lower radius, it becomes a conic type. When [Unify the radius] is set to [True], the size of the upper radius and lower radius are always matched.

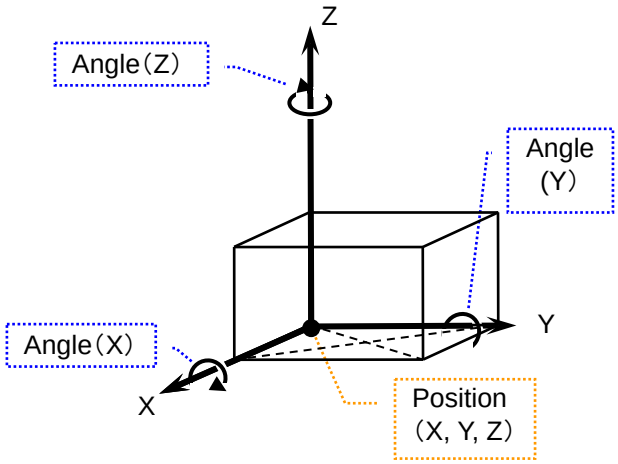
<table>
<tr><th></th><th>Window</th><th>Explanation</th></tr>
<tr><td>Sphere</td><td>
<table>
<tr><td colspan="2">Properties</td></tr>
<tr><td colspan="2">Object</td></tr>
<tr><td>Name</td><td>Work1</td></tr>
<tr><td>Figure</td><td>Sphere</td></tr>
<tr><td>Color</td><td>0; 255; 0</td></tr>
<tr><td>Position</td><td>0.000, 0.000, 250.000</td></tr>
<tr><td>X[mm]</td><td>0.000</td></tr>
<tr><td>Y[mm]</td><td>0.000</td></tr>
<tr><td>Z[mm]</td><td>250.000</td></tr>
<tr><td>Rotation order</td><td>X-Y-Z</td></tr>
<tr><td>Angle</td><td>0.000, 0.000, 0.000</td></tr>
<tr><td>X[deg]</td><td>0.000</td></tr>
<tr><td>Y[deg]</td><td>0.000</td></tr>
<tr><td>Z[deg]</td><td>0.000</td></tr>
<tr><td>Size</td><td>50.000</td></tr>
<tr><td>Radius[mm]</td><td>50.000</td></tr>
<tr><td>View type</td><td>Solid</td></tr>
<tr><td>Condition</td><td>Default Edit</td></tr>
<tr><td>Interference check</td><td>False</td></tr>
</table>
</td><td>


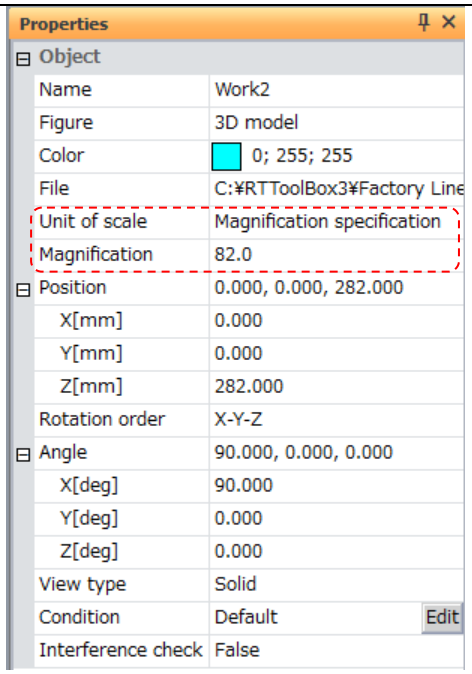
* With [Sphere], when there is a child layout object in the layout tree, the setting of this item affects the position posture of the child layout object.
</td></tr>
<tr><td>Triangle prism</td><td>
<table>
<tr><td colspan="2">Properties</td></tr>
<tr><td colspan="2">Object</td></tr>
<tr><td>Name</td><td>Pedestal5</td></tr>
<tr><td>Figure</td><td>Triangle prism</td></tr>
<tr><td>Color</td><td>255; 255; 0</td></tr>
<tr><td>Position</td><td>102.226, 0.000, 123.000</td></tr>
<tr><td>X[mm]</td><td>102.226</td></tr>
<tr><td>Y[mm]</td><td>0.000</td></tr>
<tr><td>Z[mm]</td><td>123.000</td></tr>
<tr><td>Rotation order</td><td>X-Y-Z</td></tr>
<tr><td>Angle</td><td>0.000, -90.000, 135.000</td></tr>
<tr><td>X[deg]</td><td>0.000</td></tr>
<tr><td>Y[deg]</td><td>-90.000</td></tr>
<tr><td>Z[deg]</td><td>135.000</td></tr>
<tr><td>Size</td><td>100.000, 100.000, 200.000</td></tr>
<tr><td>X[mm]</td><td>100.000</td></tr>
<tr><td>Y[mm]</td><td>100.000</td></tr>
<tr><td>Height[mm]</td><td>200.000</td></tr>
<tr><td>View type</td><td>Solid</td></tr>
<tr><td>Condition</td><td>Default Edit</td></tr>
<tr><td>Interference check</td><td>False</td></tr>
</table>
</td><td>


</td></tr>
</table>

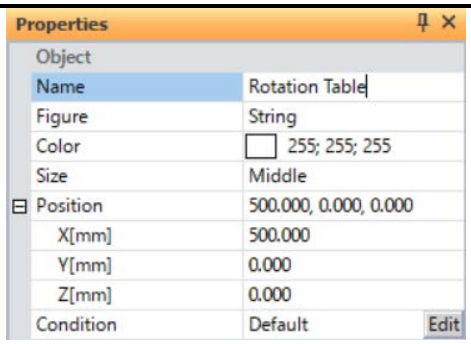
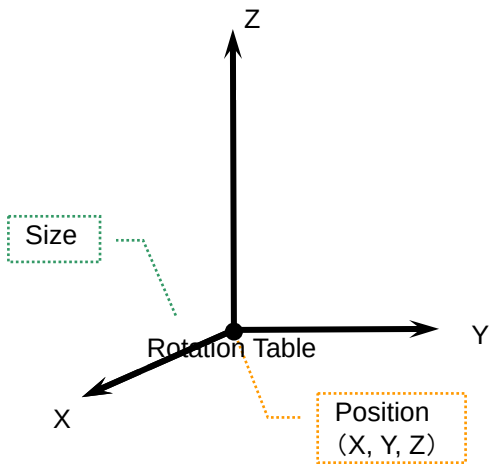
	Window	Explanation
Plane	 Properties Object Name: Paling1 Figure: Plane Color: 0; 128; 255 Position: -800.000, 0.000, 0.000 X[mm]: -800.000 Y[mm]: 0.000 Z[mm]: 0.000 Rotation order: X-Y-Z Angle: 0.000, 0.000, 90.000 X[deg]: 0.000 Y[deg]: 0.000 Z[deg]: 90.000 Size: 2000.000, 1000.000 Width[mm]: 2000.000 Height[mm]: 1000.000 View type: Solid Condition: Default Edit Interference check: False	
Tube	 Properties Object Name: wiring Figure: Tube Color: 255; 87; 128 Size: 100.000, 100.500, 200.000 Inner Radius[mm]: 100.000 Outer Radius[mm]: 100.500 Height[mm]: 200.000 Position: 500.000, 0.000, 0.000 X[mm]: 500.000 Y[mm]: 0.000 Z[mm]: 0.000 Rotation order: X-Y-Z Angle: 0.000, 0.000, 0.000 X[deg]: 0.000 Y[deg]: 0.000 Z[deg]: 0.000 View type: Solid Condition: Default Edit Interference check: True	 * The minimum thickness ([Outer radius [mm]] - [Inner radius [mm]]) is 0.5 mm.

<table>
<tr><th></th><th>Window</th><th>Explanation</th></tr>
<tr>
<td>3D model</td>
<td>


</td>
<td>


The position and a rotational reference position of 3D model are reference positions at the time of CAD data creation.
When 3D model is selected, the CAD file to read can be specified. The CAD file which can be read is as follows.
<table>
<tr><th>file</th><th>extension</th></tr>
<tr><td>STL (Stereolithography) file</td><td>.stl</td></tr>
<tr><td>OBJ (Wavefront format) file</td><td>.obj</td></tr>
<tr><td>3DS (3D Studio) file</td><td>.3ds</td></tr>
<tr><td>PLY (Stanford Triangle Format) file</td><td>.ply</td></tr>
<tr><td>VRML 2.0 (Virtual Reality Modeling Language) file</td><td>.wrl</td></tr>
</table>
When the file of OBJ form is read, the information on a texture is not reflected.
</td>
</tr>
<tr>
<td>3D model (Continuation)</td>
<td>


</td>
<td>
The unit of scale that display in 3D monitor can be specified.
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.)
</td>
</tr>
</table>

	Window	Explanation
String		 * The maximum number of characters that can be displayed is 32 characters. * Multibyte characters are displayed only in the same language as the OS. (Different languages may display garbled characters.) * If you create many character strings, screen rendering processing becomes heavy.

⚠ Caution

- If 3D model of big size is read, screen drawing processing will become heavy.

- Abnormal operation may result due to size. Therefore make data size as small as possible during CAD tool conversion.

- Because not all VRML formats are supported, these may not display normally.

21.11.2. Moving and rotating layout objects

To move or rotate layout objects that have been created, change the "Position" and "Angle" values in the respective "Properties". Layout objects can also be moved by mouse operation on the 3D monitor. For details, refer to **"21.3.6.1 Moving objects by the "**.
Note, however, that the property values (position and posture) of child layout objects that are in a parent-child relationship on the layout tree become the relative position and posture from the reference position of the parent layout object. For this reason, take this into consideration when setting the position and posture.

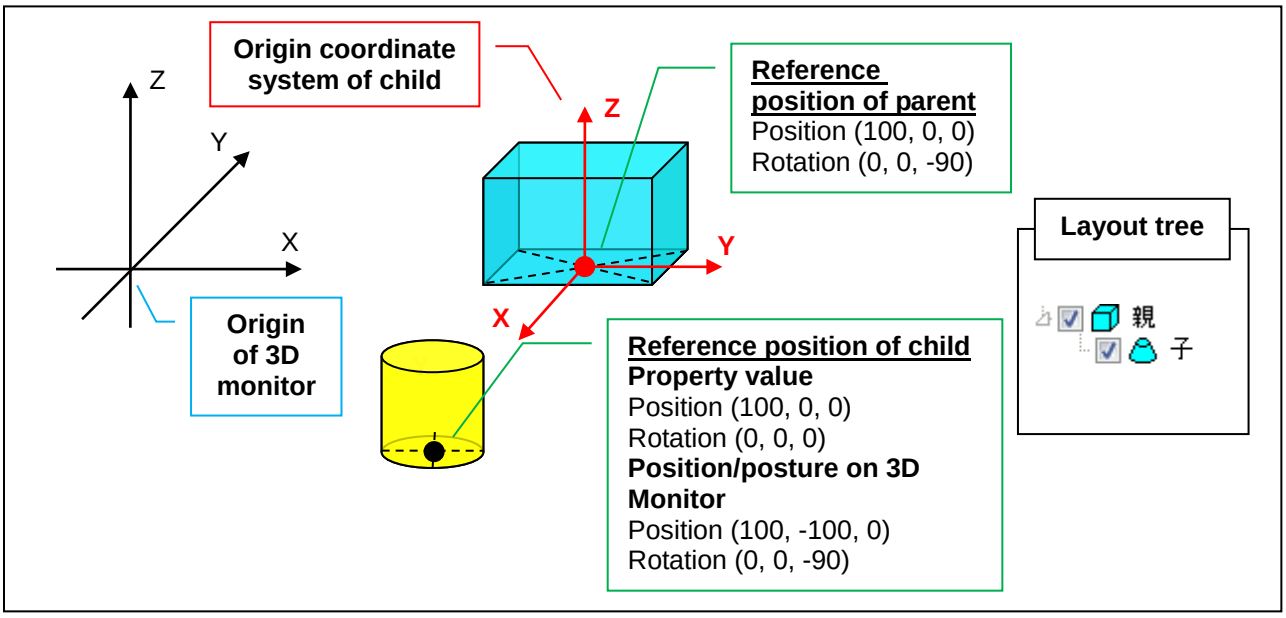


Figure 21-94 Position and Posture of Layout Objects in Parent-child Relationship

Also, the position and posture of the child layout object are relative coordinates from the parent layout object. So, child layout objects can also be moved and rotated together with movement and rotation of the parent layout object.

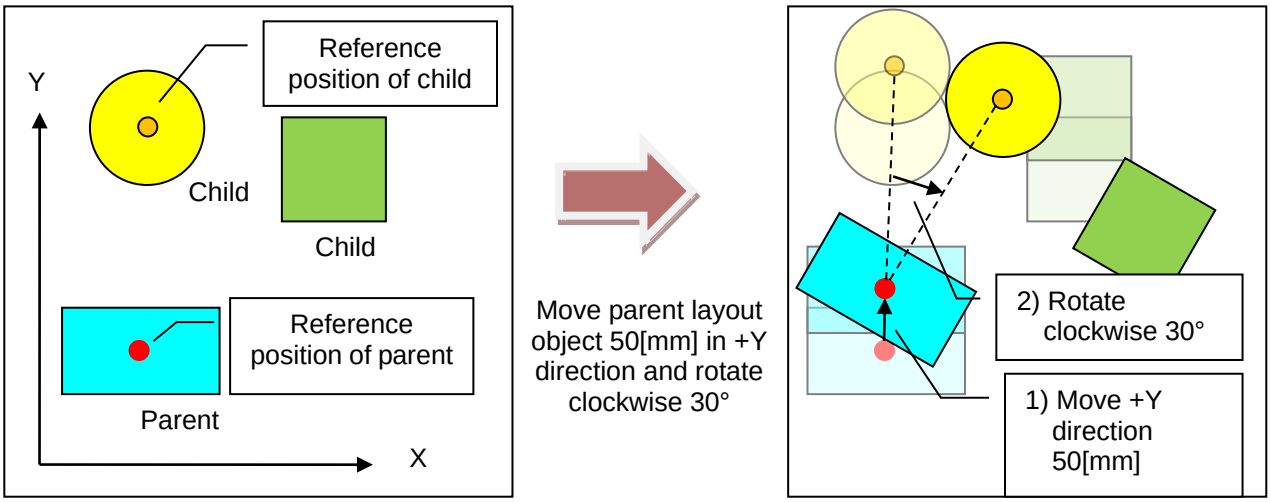


Figure 21-95 Moving and Rotating Parent Layout Objects

To move and rotate a parent layout object only, either drag and drop or copy and paste the parent layout object on the layout tree, then cancel the parent-child relationship, edit the objects and then re-create the parent-child relationship.

21.11.3. Layout condition edit

Click the [Edit] button at [Condition] at "Properties". The "Layout object condition edit" screen is displayed.

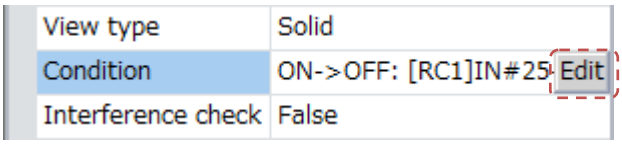


Figure 21-96 Layout condition editing

You can display or hide layout objects by specifying I/O conditions for corresponding layout objects. This function can be used in simulation.

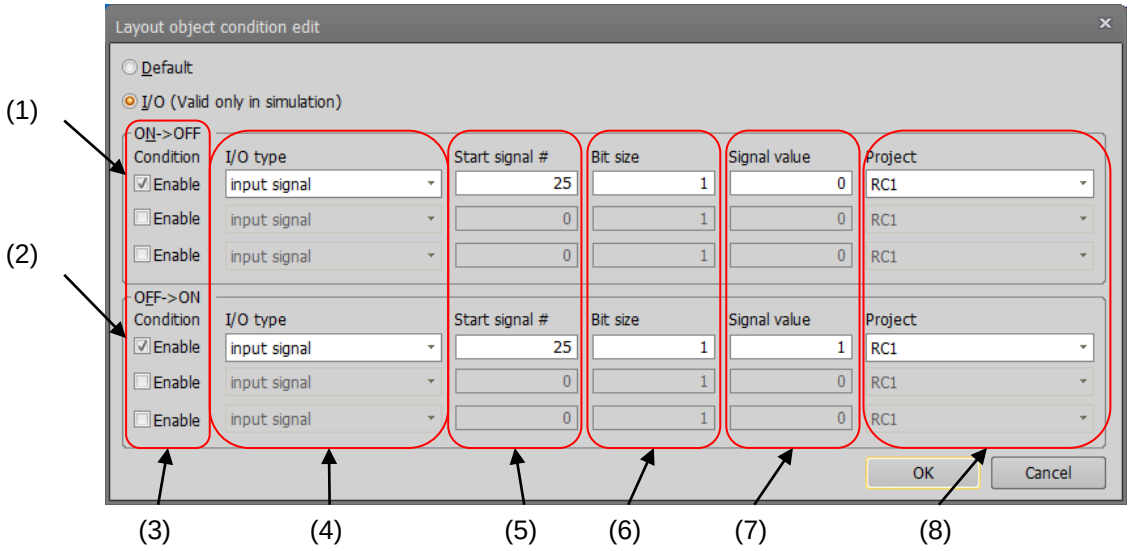


Figure 21-97 Layout condition edit

If you set no condition, select [Default]. If you set some conditions, select [I/O (Valid only in simulation)].

(1) ON->OFF : This sets the conditions for changing target layout objects from a displayed to a hidden state. Up to three conditions can be specified. When all conditions are satisfied, the layout object is hidden.

(2) OFF->ON : This sets the conditions for changing target layout objects from a hidden to a displayed state. Up to three conditions can be specified. When all conditions are satisfied, the layout object is displayed.

(3) Condition : If you checked [Enable], you can set the condition.
Check same number to set conditions.

(4) I/O type : Select [input signal], [output signal], [Register (CC-Link) Input], [Register (CC-Link) Output].

(5) Start signal # : Set 0 or larger when you select [input signal] or [output signal].
Set 6000 or larger when you select [Register (CC-Link) Input] or [Register (CC-Link) Output].

(6) Bit size : Set 1 - 32 when you select [input signal] or [output signal].
Set 1 - 2 when you select [Register (CC-Link) Input] or [Register (CC-Link) Output].

(7) Signal value : Set the value which is compared with I/O state.
Set the unsigned decimal value which is expressed in binary value with bit size specified (6) when you select [input signal] or [output signal].
Set the signed decimal value which is expressed in binary value with 1 register (16 bit) or 2 register (32 bit) specified (6) when you select [Register (CC-Link) Input] or [Register (CC-Link) Output].

(8) Project : Specifies the target project (robot) to check I/O conditions.

21.12. Layout Files

You can save the display settings of 3D monitor, robots, hands, robot parts, user mech., splines, and layout objects to layout files. Also, you can load the display settings of 3D monitor, robots, hands, robot parts, user mech., splines, and layout objects saved to layout files.
The display settings of 3D monitor, robots, hands, robot parts, user mech., splines, and layout objects can be easily switched to and used in a separate workspace by saving these settings to a layout file.

21.12.1. Saving layout information

To save settings to a layout file, click the [3D view] tab -> [Layout file] group -> [Save]/ [Save as] button on the ribbon.
The layout file is overwritten with the current layout information by clicking the [Save] button.
When the [Save as] button is clicked, the "Input new name" screen is displayed. In this screen, enter the layout file name, and click the [OK] button. The current layout information is saved as a layout file using the name you entered, and is registered to the workspace.

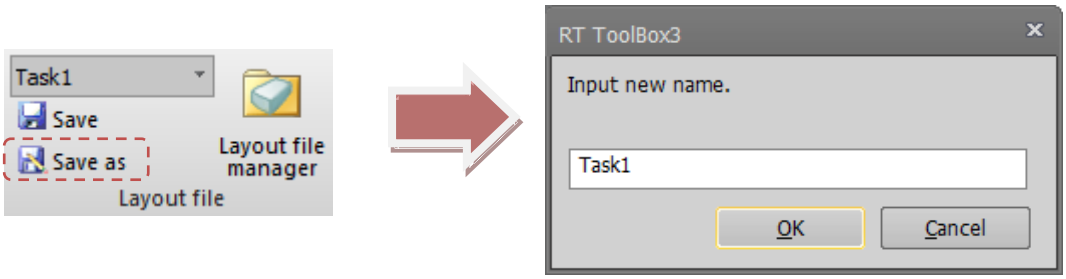


Figure 21-98 Operation of Saving Layout Files by "Save As"

Caution

Cautions when saving layout information that uses a 3D model or an MXT file

When a 3D model or MXT file is used in a layout, the file in use when the layout information is saved is copied to the same folder as the layout file, and from then on the copied file is referenced. To edit a 3D model or MXT file, either edit a copied file or select the file again after editing it.

21.12.2. Loading layout information

If layout information is changed even once after it is loaded from a layout file, the following confirmation screen will be displayed when the layout file is loaded.

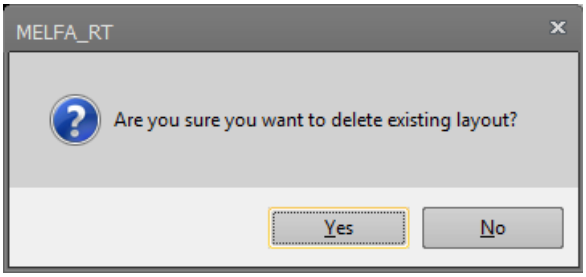
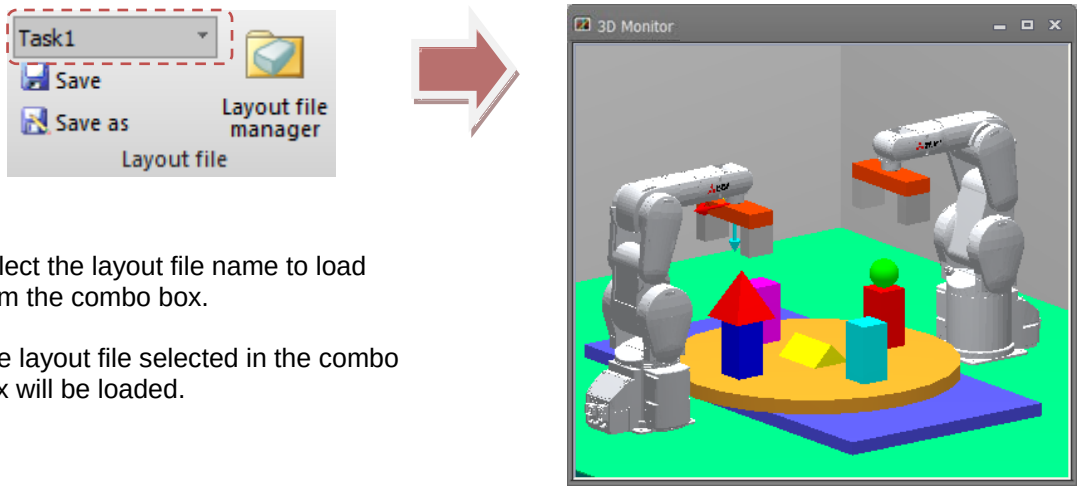


Figure 21-99 Layout File Load Confirmation Screen

Note that if you select [Yes] in this screen to load the layout file, all currently displayed layout information will be deleted.

There are two ways of loading layout information saved to layout file.

Select the layout file to load by the [3D view] tab -> [Layout file] group -> [Select Layout File to be Load] combo box on the ribbon.
The layout information of the layout file selected in the combo box will be loaded.
This method is recommended when performing tasks while switching between multiple layout files, for example, when creating layout files for individual tasks, since layout information can be easily switched.

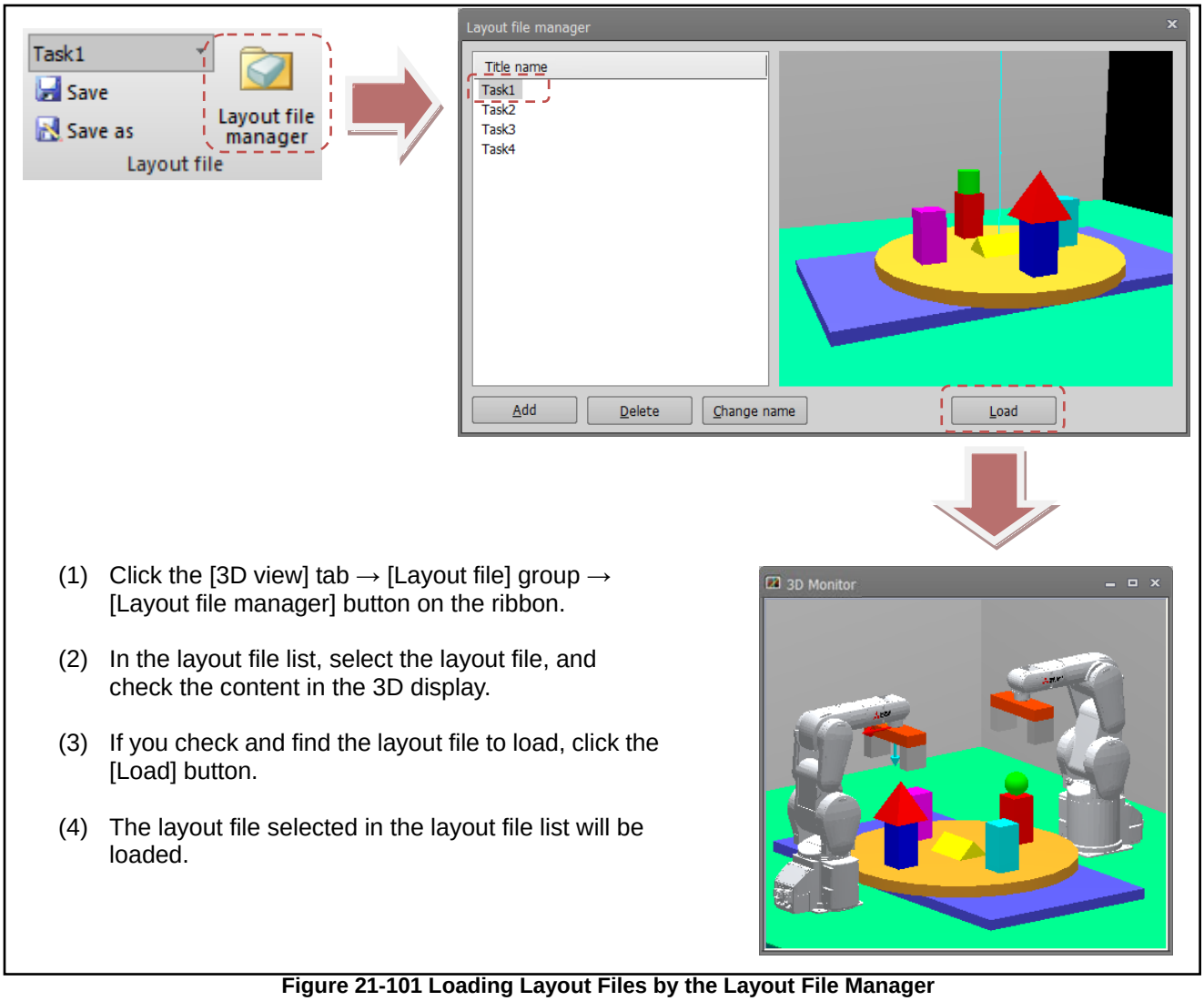


(1) Select the layout file name to load from the combo box.

(2) The layout file selected in the combo box will be loaded.

Figure 21-100 Loading Layout Files on the Ribbon

Click the [3D view] tab -> [Layout file] group -> [Layout file manager] button on the ribbon. The "Layout file manager" screen is displayed.
In the layout file list in this screen, select the layout file, and check the content of the layout information in the 3D display. When you have finished checking, click the [Load] button.
The layout file selected in the layout file list will be loaded.
This method is recommended when files cannot be distinguished purely by file name since both the file name and the content of the layout information can be checked in the 3D display.



(1) Click the [3D view] tab → [Layout file] group → [Layout file manager] button on the ribbon.

(2) In the layout file list, select the layout file, and check the content in the 3D display.

(3) If you check and find the layout file to load, click the [Load] button.

(4) The layout file selected in the layout file list will be loaded.

Figure 21-101 Loading Layout Files by the Layout File Manager

21.12.3. Layout file manager

The "Layout file manager" screen opens by clicking the [3D view] tab -> [Layout file] group -> [Layout file manager] button on the ribbon.
In the "Layout file manager" screen, you can add, delete, rename and perform other operations on layout files.

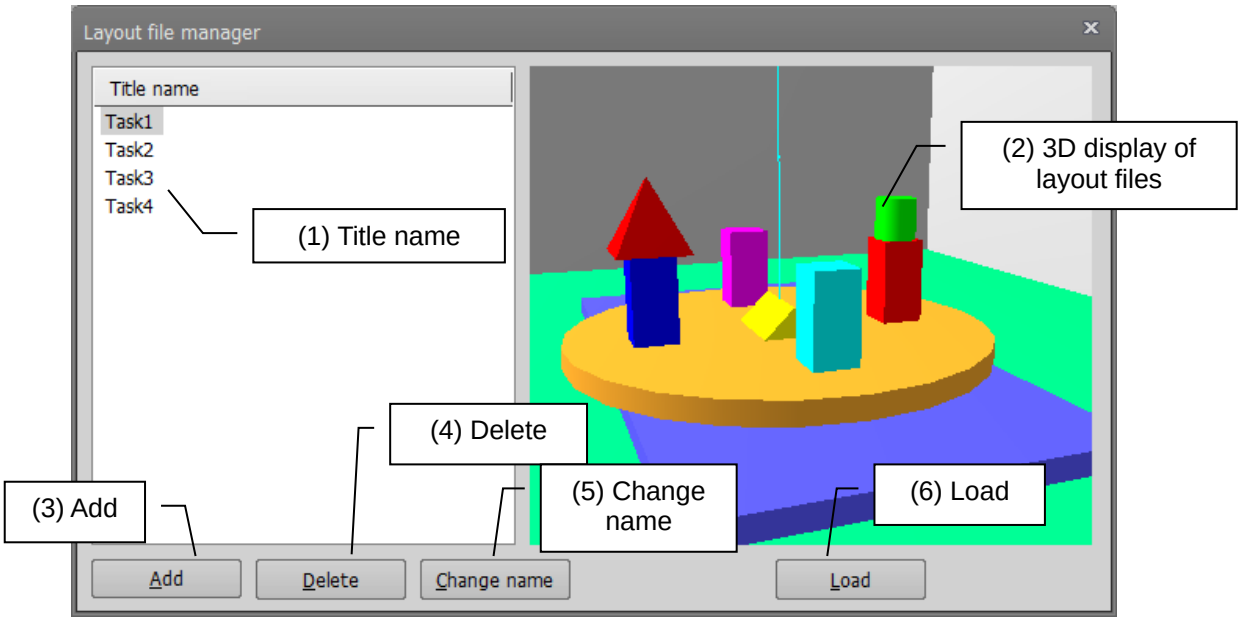


Figure 21-102 Layout File Manager Screen

No.	Item	Description
(1)	Title name	This displays all of the layout file names registered to the current workspace.
(2)	3D display of layout files	This displays the layout objects of the files currently selected in the layout file list so that you can check the file content.
(3)	Add	This adds a new or existing layout file to the current workspace. Clicking the [Add] button displays the screen for selecting [New] or [Existing]. By [New], you can create a layout file with a new name. By [Existing], you can select an existing layout file, such as a layout file in another workspace, and add this to the current workspace.
(4)	Delete	This deletes the layout file selected in the layout file list. Since the entire folder is deleted when a layout file is deleted, 3D models and MXT files also will be deleted if they are in the same folder.
(5)	Change name	This renames the layout file selected in the layout file list.
(6)	Load	This loads the layout file selected in the layout file list in the 3D monitor. Note that the current layout information will be deleted.

- **Adding a layout file**
  To add a new layout file, click the [Add] button. The following screen will be displayed.

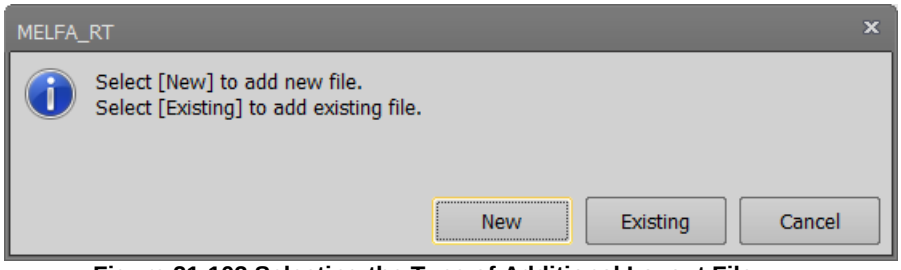
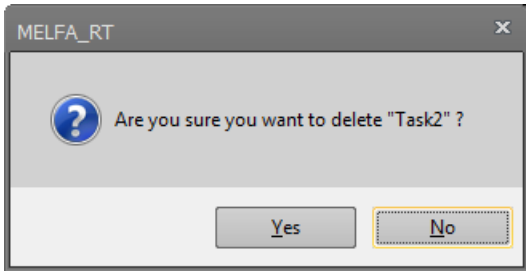


Figure 21-103 Selecting the Type of Additional Layout File

When [New] is clicked, the name input screen is displayed. In this screen, enter the name of the new layout file to add, and click the [OK] button. The new layout file is added to the layout file list with the name you entered.

When [Existing] is clicked, the select file screen is displayed. In this screen, select the layout file to add. After selecting the file, the name input screen is displayed. In this screen, enter the name of the new layout file to add, and click the [OK] button. The selected layout file is added to the layout file list with the name you entered.

- **Deleting a layout file**
  To delete an existing layout file, select the layout file to delete in the list, and click the [Delete] button. The following screen is displayed. In this screen, check that the file is the layout file to delete, and click the [Yes] button. The selected layout file is deleted from the layout file list.
  Since the entire target layout file folder is deleted when a layout file is deleted, 3D models and MXT files also will be deleted at the same time if they are in the same folder.



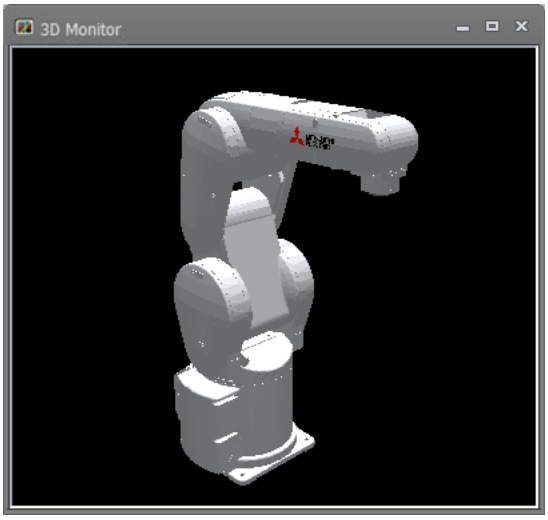
- **Renaming a layout file**
  To rename a layout file, select the layout file to rename in the list, and click the [Change name] button.The name input screen containing the current file name is displayed. In this screen, enter the new name, and click the [OK] button.

- **Loading a layout file**
  To load a layout file to the 3D monitor, select the layout file to load in the list, and click the [Load] button. The layout file list will be loaded to the 3D monitor. For details on cautions when loading layout files and other ways to load layout files, refer to **"21.12.2 Loading layout information"**.

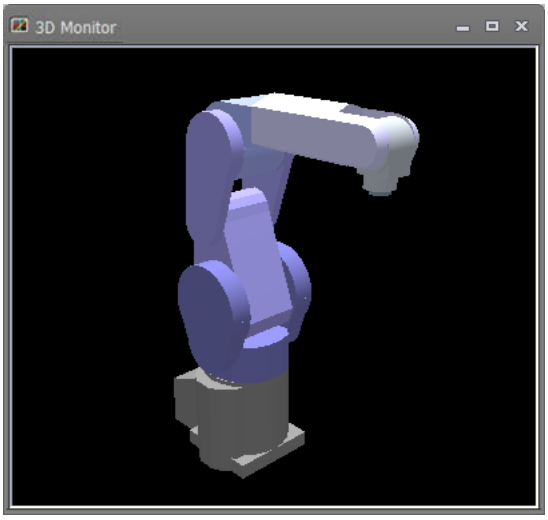
21.13. Types of Robot Model

You can select the robot model to be displayed on the 3D monitor from "detailed model" and "simple model". Note, however, that the "detailed model" sometimes is not displayed depending on the model.

As the default setting, "detailed model" is displayed.
To change the type of robot model, select the type of robot model to displayed in the [3D view] tab -> [Robot model] group on the ribbon.
Also, the type of robot model becomes "simple model" with the "The robot of 3D monitor is displayed in simple model." checkbox selected in the New Workspace screen.



Detailed model



Simple model

Figure 21-104 Types of Robot Model

The recommended environment for displaying a "detailed model" is as follows.

Item	Recommended environment
CPU	Dual core including Core2 Duo or Core i3 3 GHz or faster processor
Main memory	2GB or more

⚠ Caution

The 3D monitor sometimes cannot display detailed models normally and functions such as the operation panel are obstructed if they are displayed on a PC that does not satisfy this recommended environment. In this case, change the model type to simple model.

21.14. Interference Check

The interference check can be performed in the 3D monitor.
The following table summarizes combinations in which the interference check can be performed.

Table 21-7 Combinations in Which Interference Check Can Be Performed

	Robot model (detailed model)	Robot model (simple model)	Hand	Robot Parts	User Mechanism	Layout object
Robot model (detailed model)	○	×	○	○	○	○
Robot model (simple model)	×	×	○	○	○	○
Hand	○	○	○	○	○	○
Robot Parts	○	○	○	○	○	○
User Mechanism	○	○	○	○	○	○
Layout object	○	○	○	○	○	×

Note, however, that attention must be paid when setting both the robot model and the hand as targeted in the interference check since the hand also checks interference with the robot model other than the parts provided on the robot on which the hand is provided.

Before starting the interference check, set the robot model and layout objects to be targeted by the interference check in their respective properties.

Setting for not targeting in the interference check

Setting for targeting in the interference check

Figure 21-105 Robot Model and Layout Object Interference Check Settings

Set the interference check of the hand by the following items in the properties of the robot that is provided on.

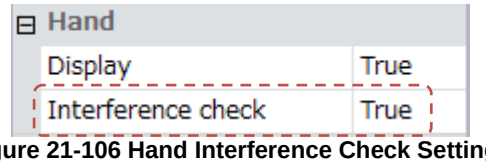


Figure 21-106 Hand Interference Check Settings

Set the interference check of the robot parts by the following items in the properties of the robot that is provided on.

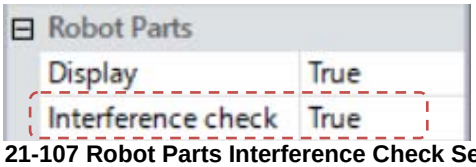


Figure 21-107 Robot Parts Interference Check Settings

After setting the parts to be targeted in the interference check, click the [3D view] tab -> [Interference check] group -> [Setting] button on the ribbon to start the interference check. Also, the interference check can be ended by clicking the [Setting] button again during the interference check.

Please set the interference check of the user mech. with the following item of the user mech. property.

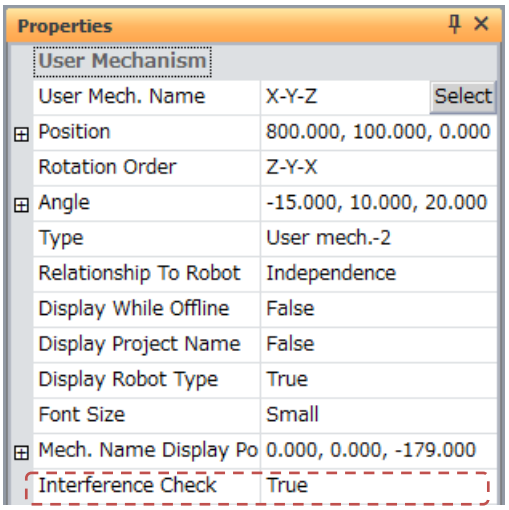
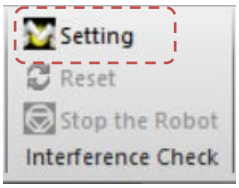
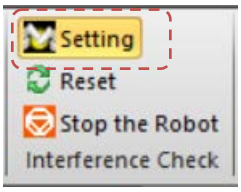


Figure 21-108 Interference Check Setting



Before interference check



During interference check

Figure 21-109 Interference Check Start/End Buttons

When you click [Setting] button and [Stop the Robot] button, you can stop the robot interfering.

Effective [Stop the Robot] button

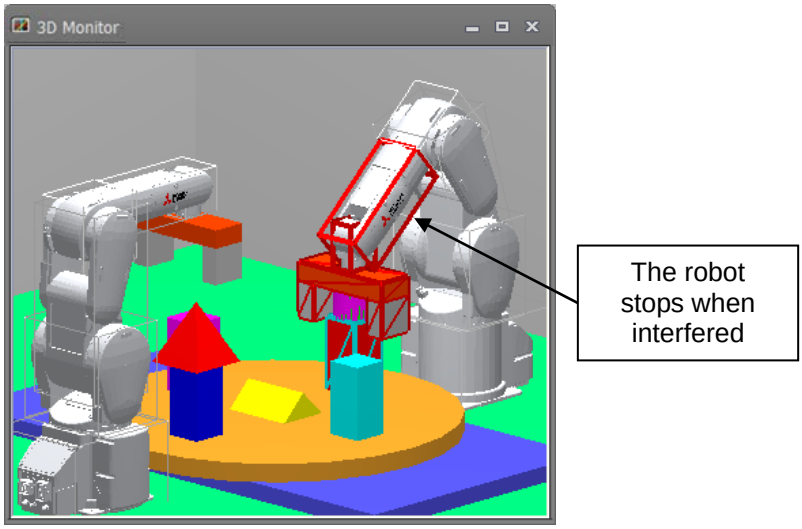


Figure 21-110 Stop the Robot Button

⚠ Caution

You stop the robot in the low-speed. You do not necessarily stop the robot in the high-speed.

During the interference check, end the interference check by either switching the mode by [Offline mode] or [Online mode] or by ending the 3D monitor.

The interference check on the 3D model of the detailed models and simple models of the robot model is performed not on the currently displayed model but on its bounding box. The bounding box is displayed as a wire frame during the interference check, so refer to this.

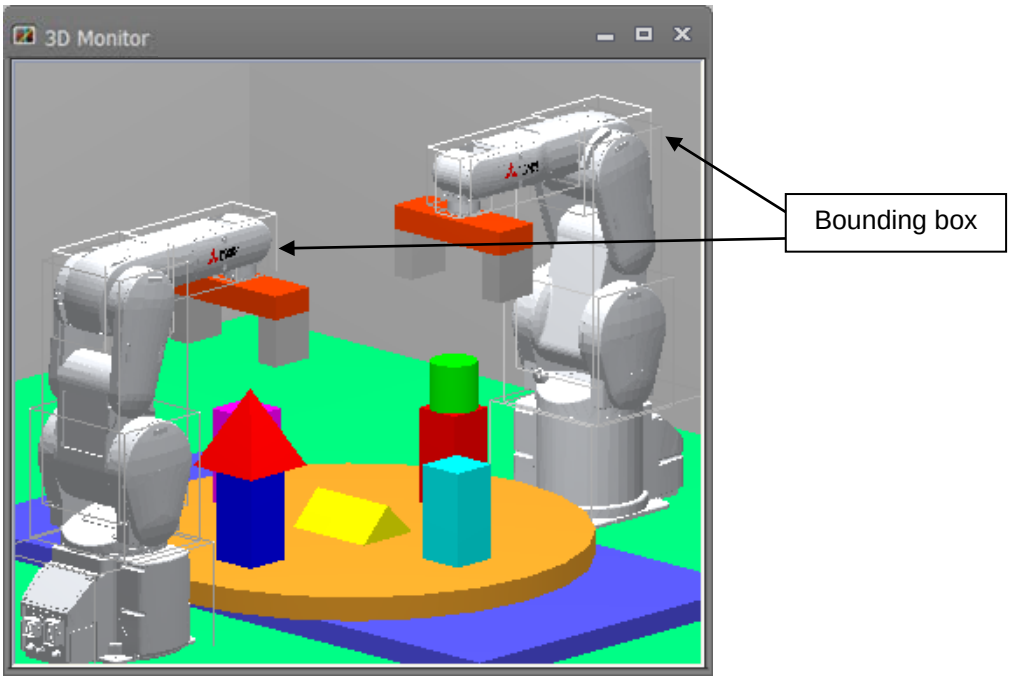


Figure 21-111 Bounding Box of Robot Model

When two parts targeted in the interference check interfere with each other during the interference check, the 3D monitor display is changed and the combinations of interfering parts are displayed at [Output].

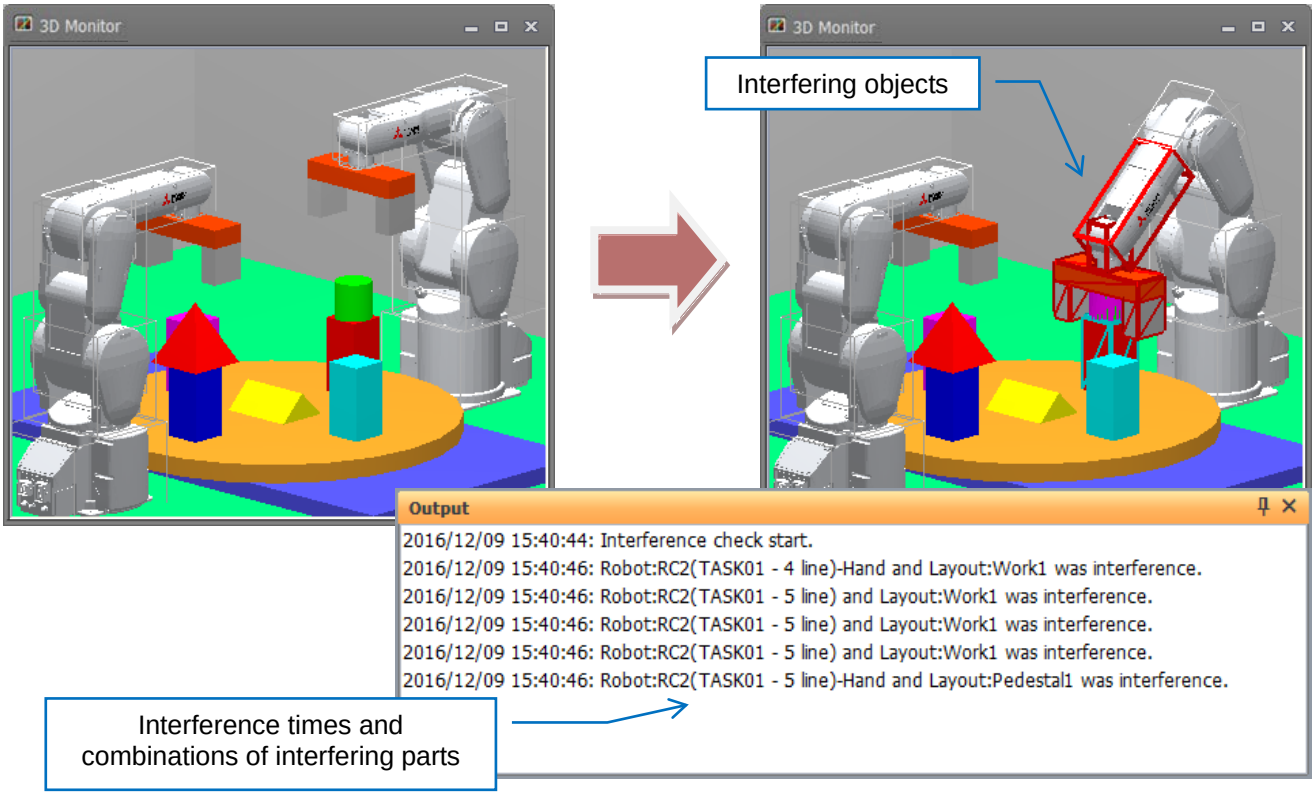


Figure 21-112 Changes in Interference Times

- **Changes in 3D monitor**

When two parts targeted in the interference check interfere with each other during the interference check, the display of the interfering objects on the 3D monitor is changed.

Table 21-8 Changes in Display at Interference

No.	Type	Display at Interference
1	Robot model (detailed model) Layout object (3D model)	The currently displayed bounding box changes color from white to red.
2	Robot model (simple model) Hand Robot parts User mechanism	A red wire frame is displayed overlapping the robot.
3	Layout object (other than 3D model)	A wire frame of the opposite color is displayed overlapping the robot.

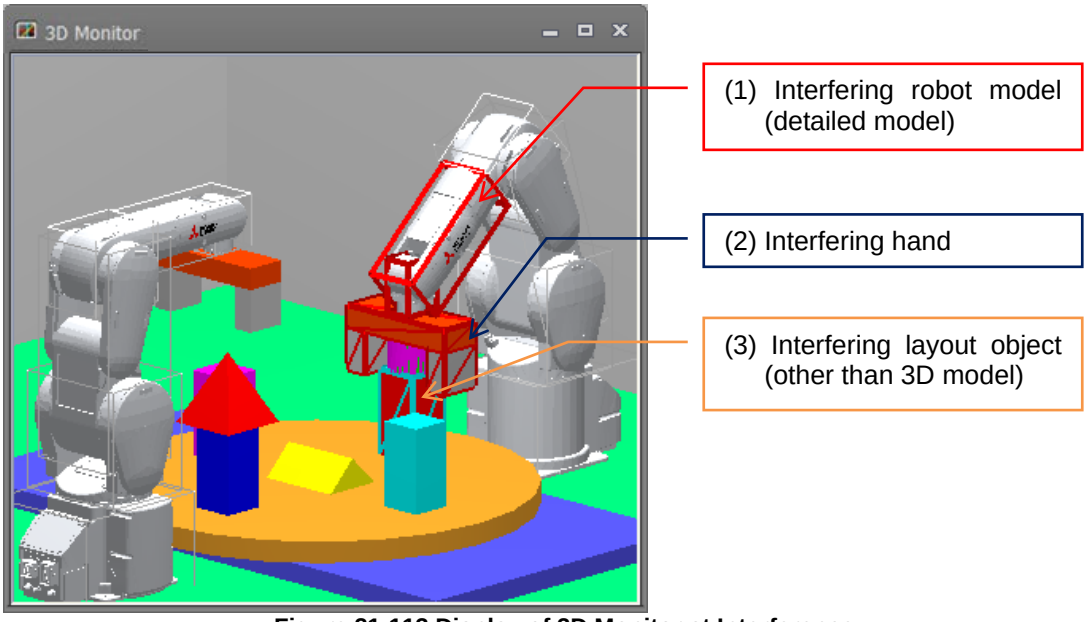


Figure 21-113 Display of 3D Monitor at Interference

- **Changes in [Output]**

When two parts targeted in the interference check interfere with each other during the interference check, the combinations of interfering parts are displayed at [Output] together with their times.

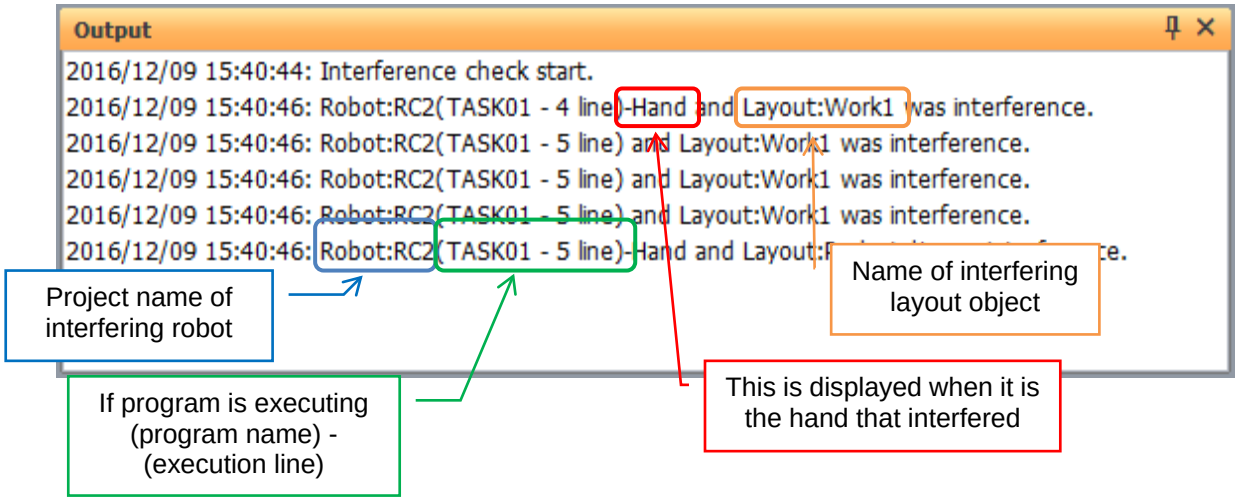


Figure 21-114 Output Information at Interference

Caution

The program execution line in the output information at interference sometimes shifts from the line that was actually executing. Use this as a rough guide that interference occurred somewhere neat that line.

By this function, only combinations of interfering parts that include objects that have not interfered even once since the interference check is started are checked. For this reason, with objects that have interfered even once, even in a combination that has never interfered with another object, when both objects have interfered with another object, that combination is not checked. To check those combinations, reset the interference history by clicking the [3D view] tab -> [Interference check] group -> [Reset] button on the ribbon.

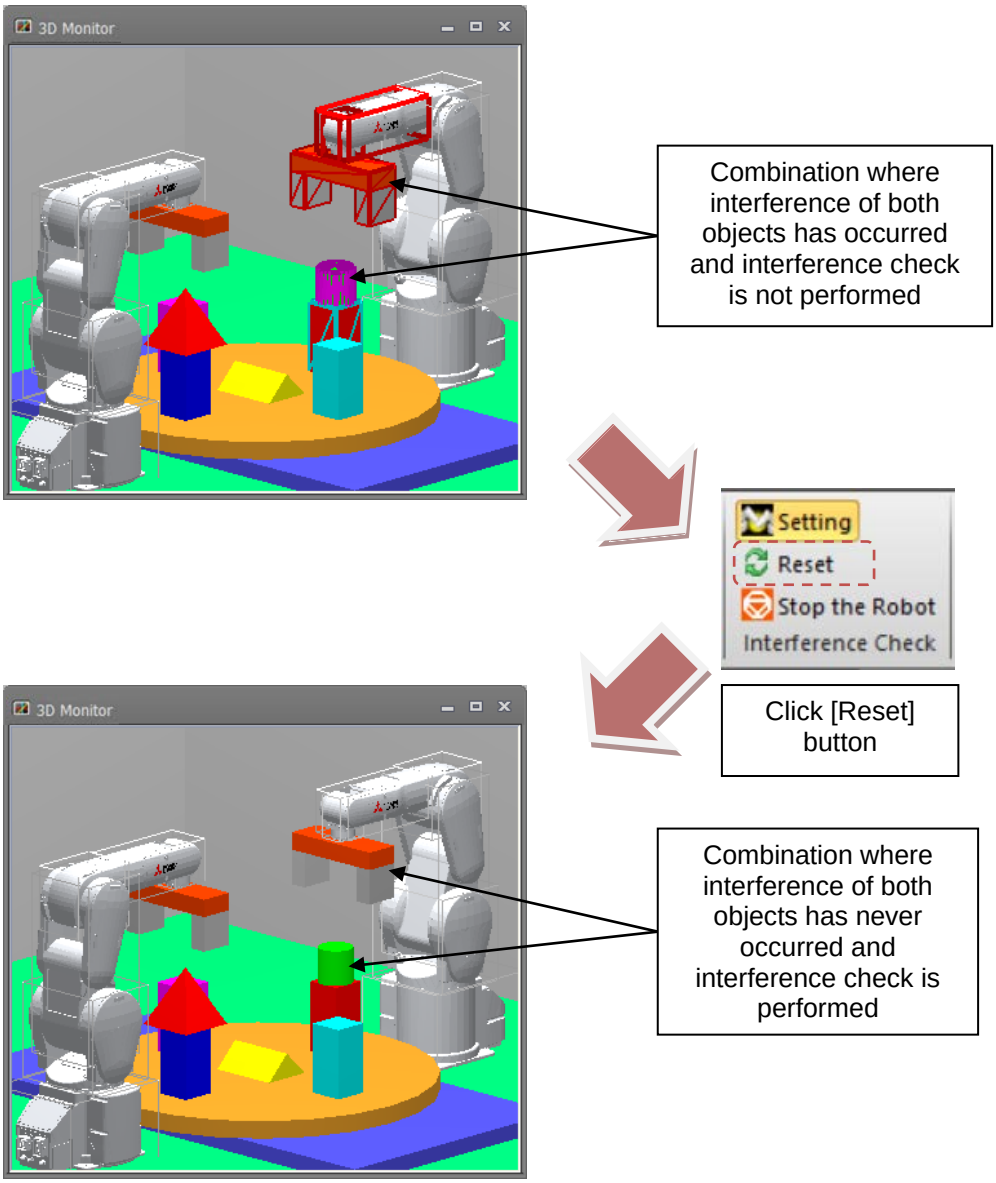


Figure 21-115 Resetting the Interference History

Caution

Perform the interference check with the 3D monitor displayed. The interference check will not be executed if the 3D monitor display is minimized.
During the interference check, robot movement on the 3D monitor sometimes slows down. If this happens, either reduce the number of objects set as targeted in the interference check or decrease the override.
On low-performance PCs, the interference check sometimes is not performed normally.

Also, models hose parts are displayed in 3D monitor as shown below, but does not check for hose part interference, please note.

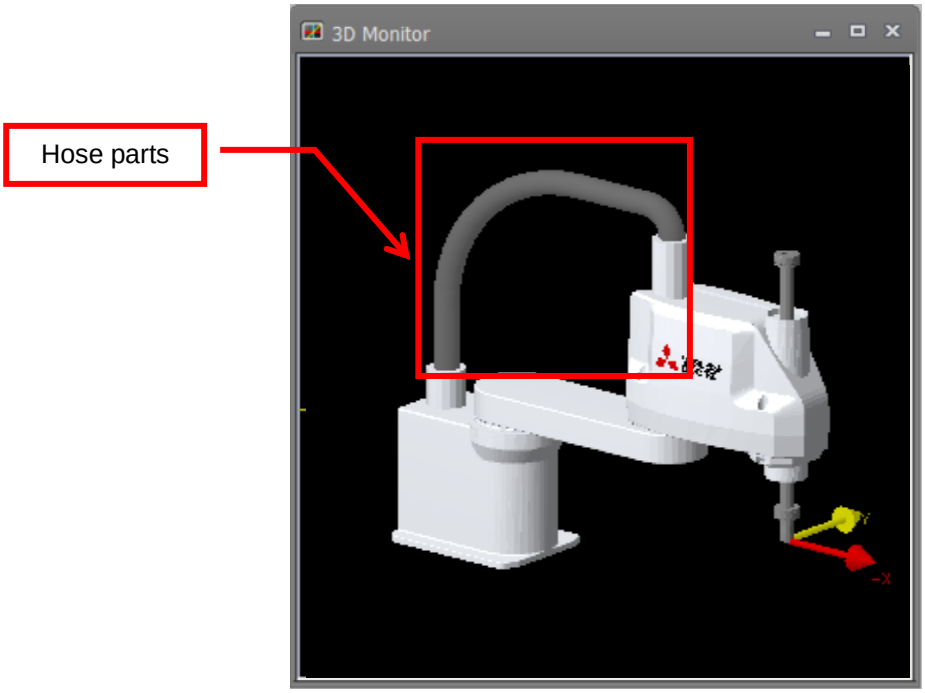


Figure 21-116 Models does not check for hose part interference

21.15. Moving the Robot by Clicking

With the simulation started up, click an object on the 3D monitor with the [Ctrl] key held down. The control point of the robot moves to the clicked position.

This function is not available on the following models.

	Robot model type
Models that do not support the click move function	RH-G, RC-G, RH-U

The robot targeted for moving by clicking can be selected in the [3D view] tab -> [Click move] group -> [Robot] combo box on the ribbon.
When the [3D view] tab -> [Click move] group -> [Change posture of the robot] checkbox on the ribbon is not selected, the robot will not move depending on its posture because it moves with its posture held intact.

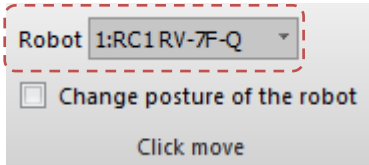


Figure 21-117 Setting the Robot Targeted for Moving by Clicking

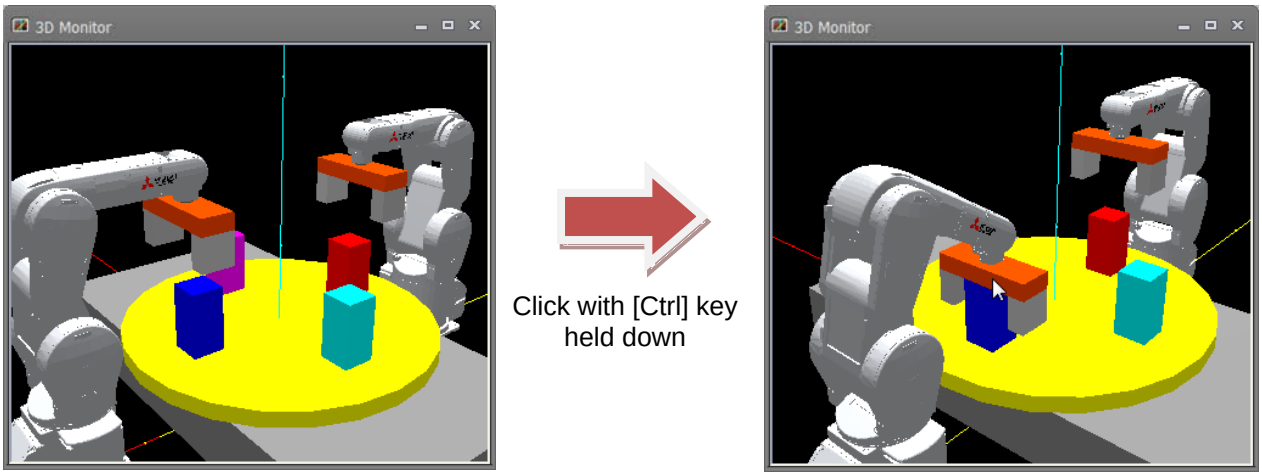


Figure 21-100 Click Move Operation

Caution

If there is no object at the clicked position or it is outside the robot operation range, the robot will not move.
Since the robot moves with the multi-rotation state of the joints held intact, the robot will not move depending on the multi-rotation state of the joints.
This operation is invalid while the robot is running.

Also, if you click an object on the 3D monitor with the [Ctrl] key held down with the [3D view] tab -> [Click move] group -> [Change posture of the robot] on the ribbon selected, the control point of the robot will move to the clicked position, and the posture will be changed to one where the normal direction of the click surface matches the Z-axis direction of the tool coordinate system.

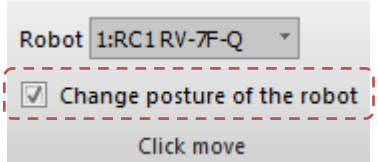


Figure 21-118 Setting to Match the Posture with the Normal Direction of the Click Surface

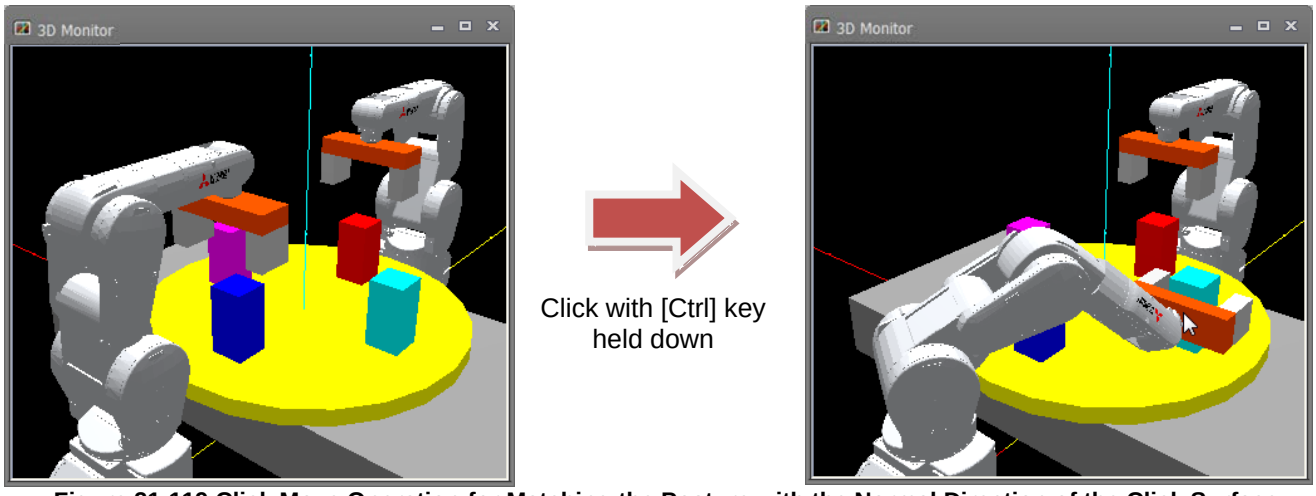


Figure 21-119 Click Move Operation for Matching the Posture with the Normal Direction of the Click Surface

Caution

- ***This function is available only on vertical 6-axis robots.***
  On other models, the robot moves to the clicked position with its current posture held intact.
- ***The target posture is sometimes not attained depending on the current posture before click move operation.***
  In this case, bring the current posture close to the target posture, and then perform click move.

21.16. Move the robot by grasping the tool

When displaying the robot tool coordinate system, while pressing [Ctrl] + [Shift], click and slide in the XYZ direction, and the robot's control point will move in the direction of the grasped axis.

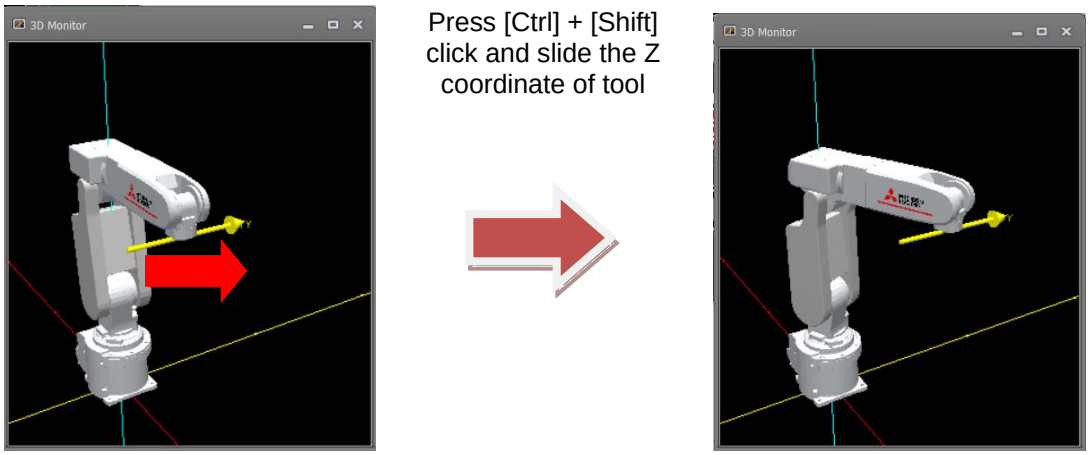


Figure 21-120 Move the robot by grasping the tool

Hold down [Ctrl] + [Shift] and slide one of the spheres on X, Y, Z coordinates in the tool with left clicking, the control point of the robot will be rotate along the rotation axis.

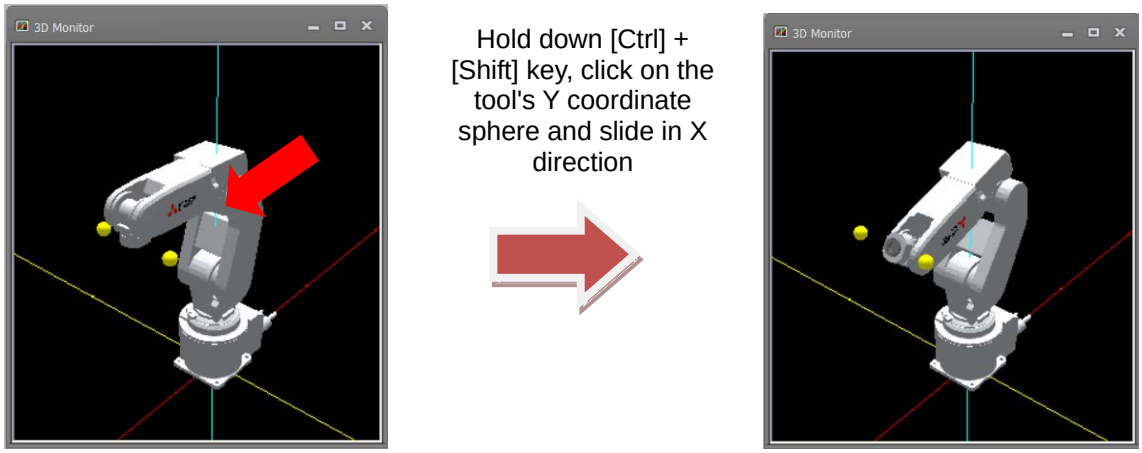


Figure 21-121 Operation to grab the tool and rotate the robot

When the robot is selected, the tool coordinate is expanded as shown below and a ball for rotation is displayed.

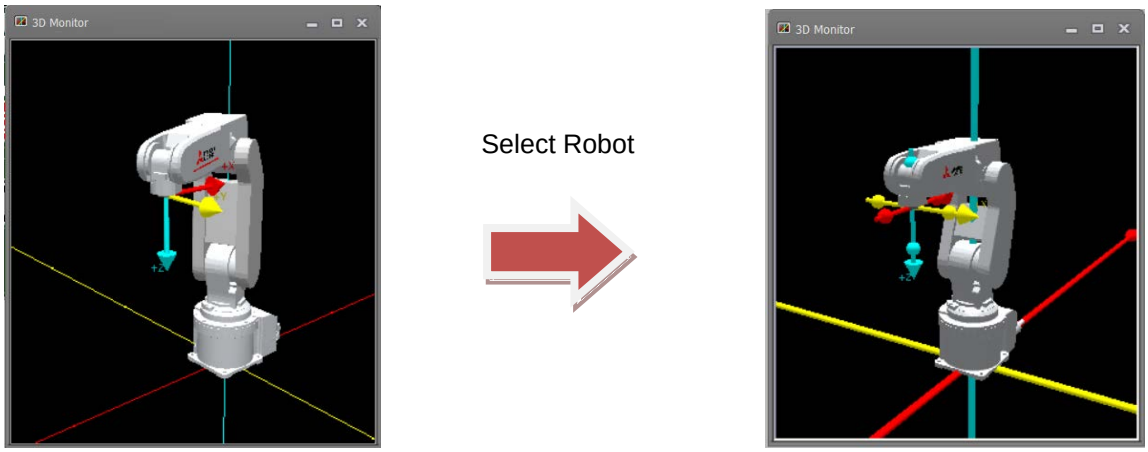


Figure 21-122 Display change of tool coordinate system

	Robot
Tool mobile robot	Vertical 6 axis, Horizontal 4 axis, Ceiling horizontal 4 axis, Micro, Palletizing Caser, RH-L Series

Caution

. The robot cannot move when the moving position exceeds the operating range of the robot.
. This operation is invalid when the robot is running.

21.17. Distance measurement

You can measure the distance between any two points on objects (robots, layouts etc.) displayed in 3D monitor. To use this function, click the [3D view] tab -> [Tool] group -> [Distance measurement] button on the ribbon. The "Distance measurement" screen is displayed. Then when you click **while entering the space key** two points on objects to be measured, the line and distance (mm) as follows are displayed.

This function can also be used with hand / robot parts / user mech. .

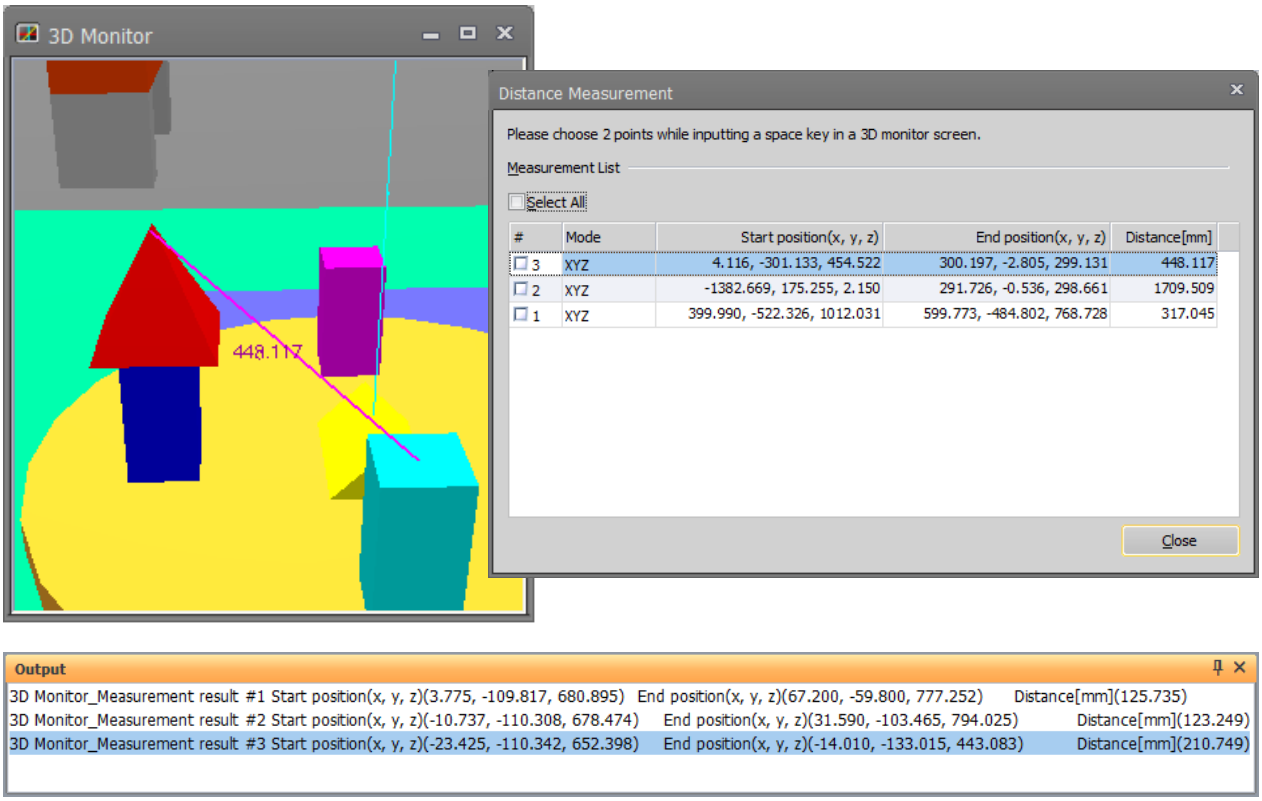
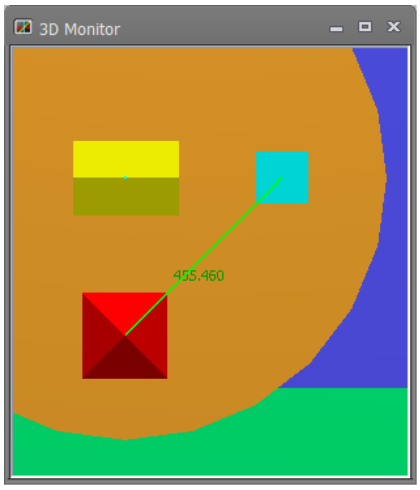


Figure 21-123 Distance measurement between two points

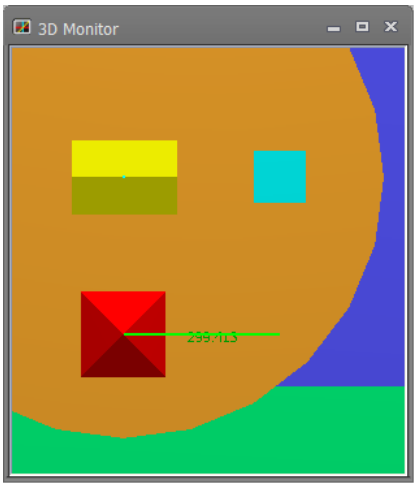
The distance measurement screen displays the history of positions and distances of each measurement. If you turn ON / OFF a checkbox of each line, you can show / hide the line and the distance of the measurement. The history keeps during the 3D monitor is opened.

In addition, the measurement result is also displayed in the [Output] window as shown above.

[XYZ] / [X] / [Y] / [Z] can be selected in the mode field of each measurement result. By changing to the mode of [X] / [Y] / [Z], the line that extracted only the distance on the designated axis between the two points is displayed on the 3D monitor. The distance column is changed to the distance on that coordinate axis.



#	Mode	Start position(x, y, z)	End position(x, y, z)	Distance[mm]
☑ 4	XYZ	0.869, -300.917, 463.242	300.282, 0.990, 300.000	455.460
☐ 3	XYZ	4.116, -301.133, 454.522	300.197, -2.805, 299.131	448.117
☐ 2	Y	-1382.669, 175.255, 2.150	291.726, -0.536, 298.661	175.791
☐ 1	X	399.990, -522.326, 1012...	599.773, -484.802, 768.728	199.783



#	Mode	Start position(x, y, z)	End position(x, y, z)	Distance[mm]
☑ 4	X	0.869, -300.917, 463.242	300.282, 0.990, 300.000	299.413
☐ 3	XYZ	4.116, -301.133, 454.522	300.197, -2.805, 299.131	448.117
☐ 2	Y	-1382.669, 175.255, 2.150	291.726, -0.536, 298.661	175.791
☐ 1	X	399.990, -522.326, 1012...	599.773, -484.802, 768.728	199.783

Figure 21-124 Distance measurement on the coordinate axis between two points

21.18. XYZ position variables

It is possible to display the XYZ position variable on 3D monitor.
Correspondence of color and coordinate axis are as follows.

Table 21-9 Correspondence table of colors and coordinate axes

Color	Coordinate axes
Red	X axes
Yellow	Y axes
Light Blue	Z axes

When some XYZ position variables in a robot program are selected, these all of positions are displayed on 3D monitor.
It is possible to display the XYZ position variables on some 3D monitors. When selection of the XYZ position variables is released, the positions on 3D monitor are vanished.

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.

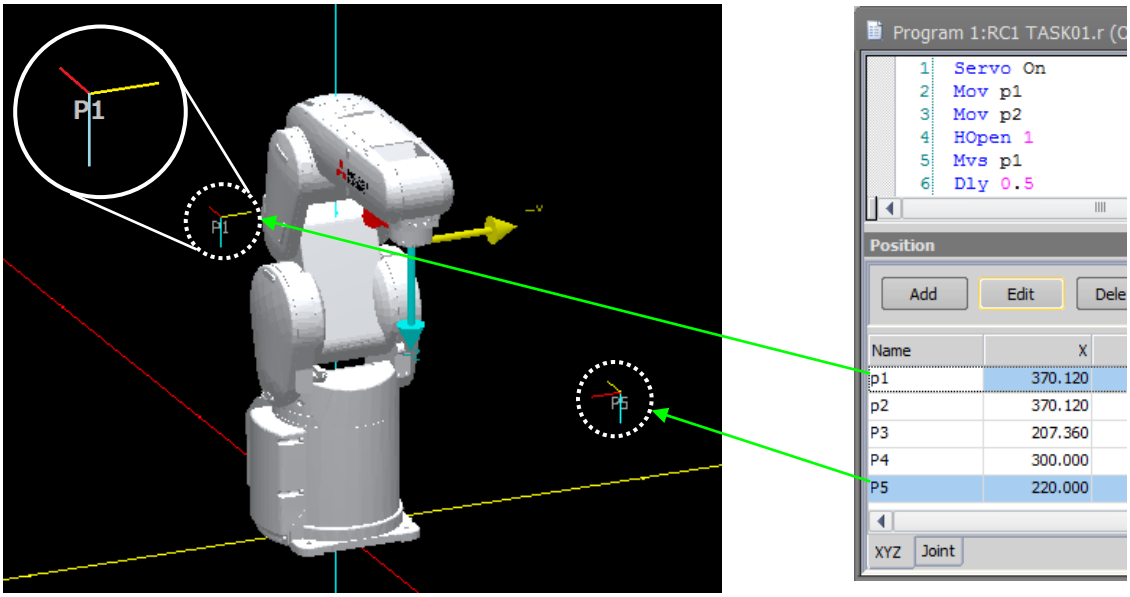


Figure 21-125 XYZ position

The position data which can be displayed is as follows.

Table 21-10 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	
	MELFA-BASIC VI	
	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	
	MELFA-BASIC VI	
	SQ Direct	
	Backup programs	

21.19. Hand Design

Hands can be displayed at the mechanical interface position of the robot on the 3D monitor, and the hand to display can be switched according to signal state, for example.
Hands that you design are registered to the workspace. For this reason, hands must be designed before hand display settings are made on the layout tree. Create the hand file to be used and then make the display settings on the layout tree.

21.19.1. Hand file manager

Click the [3D view] tab -> [Hand file] group -> [Hand file manager] button on the ribbon. The "Hand file manager" screen is displayed.

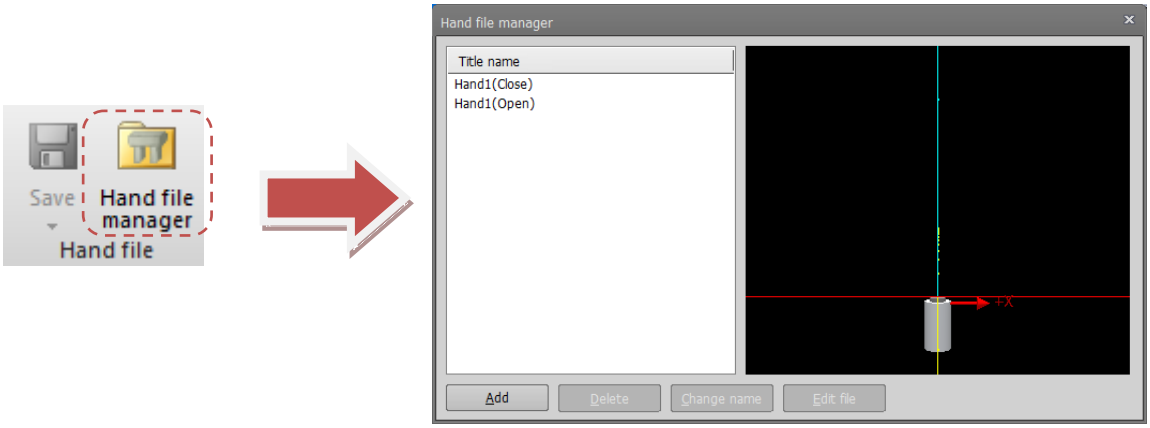


Figure 21-126 Display of the "Hand file manager" Screen

Except for the [Edit file] button, the layout files are changed to hand files. However, operations are the same as in **"21.12.3 Layout file manager"**. So, refer to this section for details on operation in the hand file manager.

- Editing hand files

Double-click the selected edit file in the hand list, or click the [Edit] button to open the hand editing dialog and display the edit tree. You can also open the hand editing screen by double-clicking the already set hand in the layout tree.

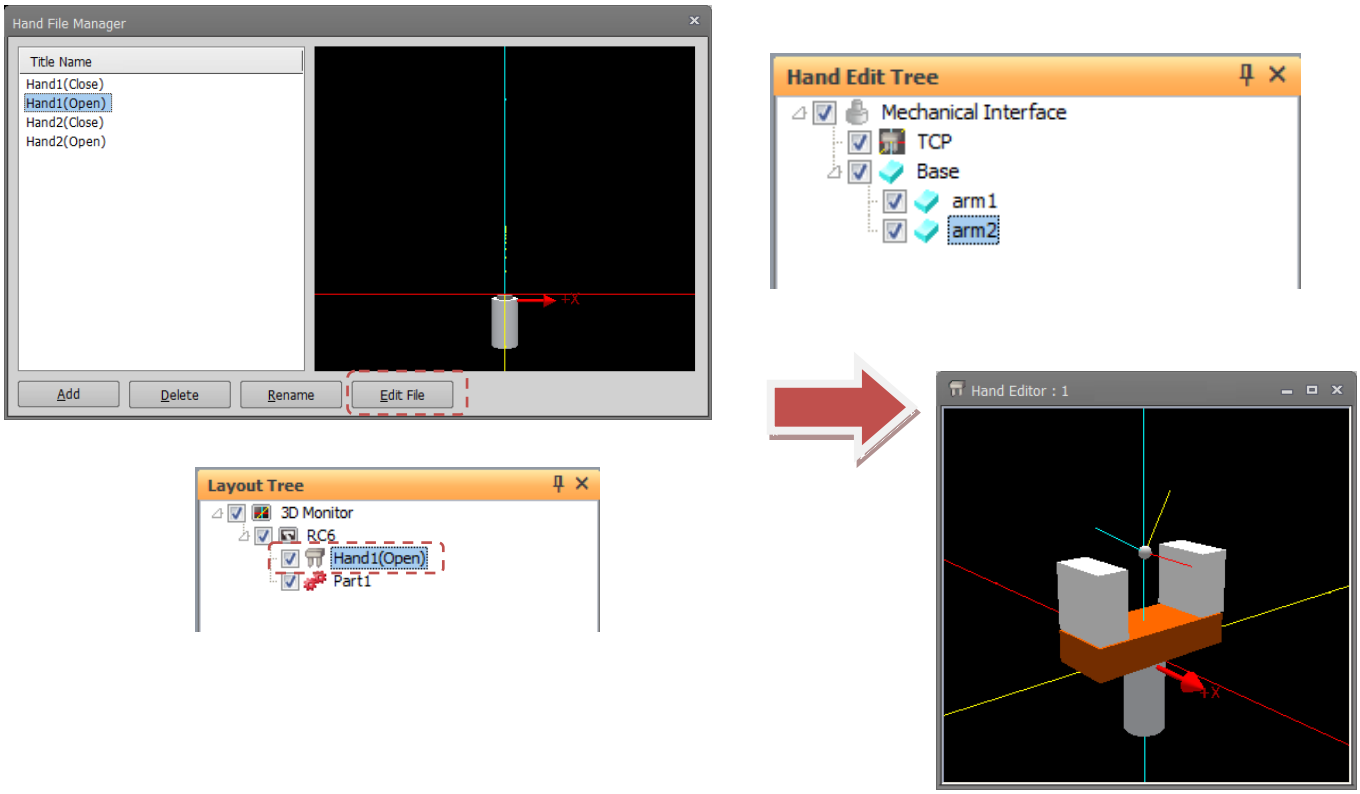


Figure 21-127 Editing Hands

21.19.2. Hand editing operations

Operation methods are basically the same as in the 3D monitor. So, refer to **"21.3 3D Monitor Operations"** for details.
Note, however, that view center rotation differs from operation in the 3D monitor in that this can be operated by the mouse only.
To save hand files, click the [3D view] tab -> [Hand file] group -> [Save]/ [Save as] button on the ribbon.

Figure 21-128 Saving Hand Files

21.19.3. Hand edit tree

The display content and operation methods on the hand edit tree are basically the same as in the layout tree. So, refer to **"21.4 Layout Tree"** for details.
Note, however, that display and operations related to the robot, hands, robot parts, user mech. and splines cannot be executed. Display conditions cannot be set to objects for hand parts.
Also, [3D Monitor] in the layout tree is changed to [Mechanical interface] on the hand edit tree. The properties of this item will not be displayed even if this item is selected. However, the mechanical interface in the "Hand editor" screen can be switched between displayed and hidden by selecting the [Mechanical interface] checkbox.

A TCP item is added to the child item of the mechanical interface. TCP is displayed as a gray ball and a rotated coordinate system in the hand deitor screen. Select the TCP item and press [Ctrl], click on a part from hand editor screen, the TCP will move to the clicked position. In addition, the coordinates of the TCP (hand tip) can be written to the TOOL parameter (MEXTL/MEXLn). Please refer to **"21.7.3Write TCP (hand tip)"** for details.

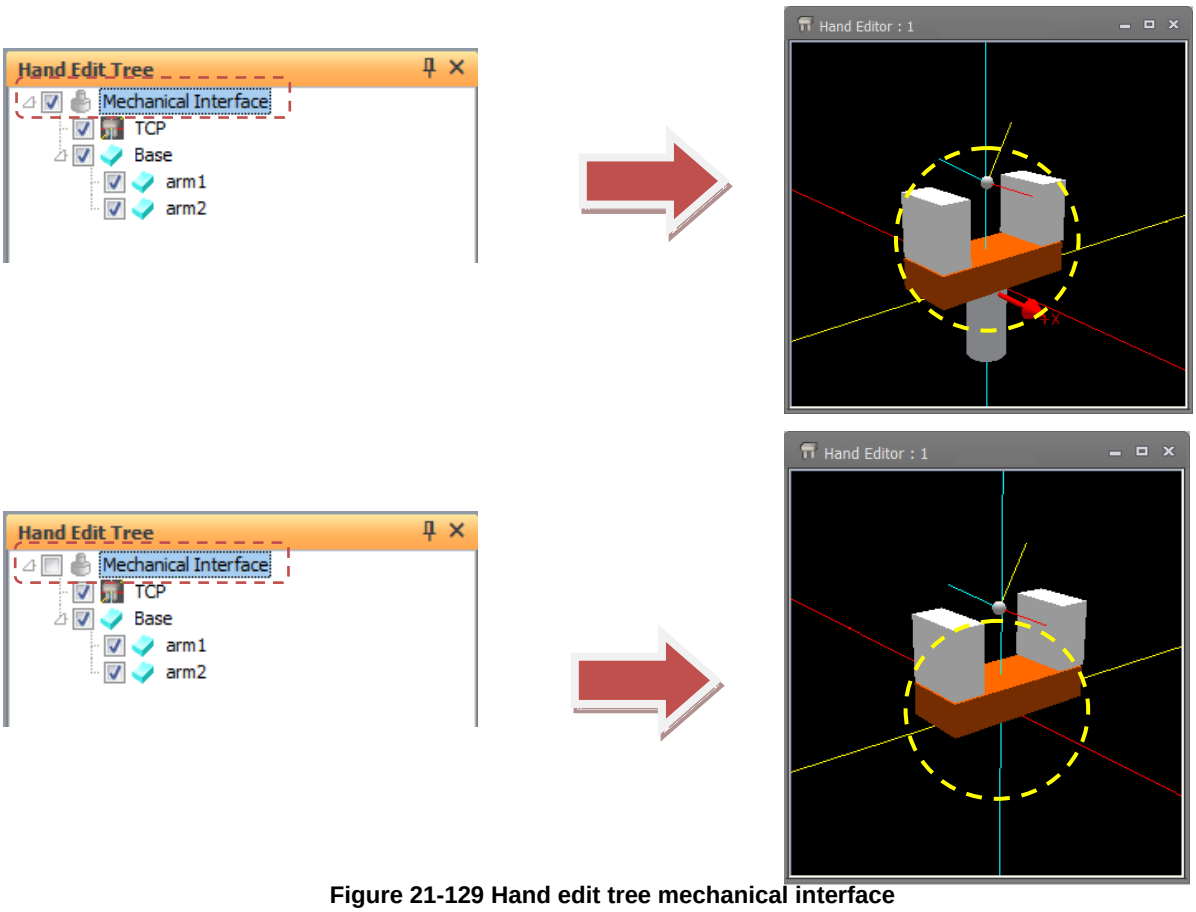


Figure 21-129 Hand edit tree mechanical interface

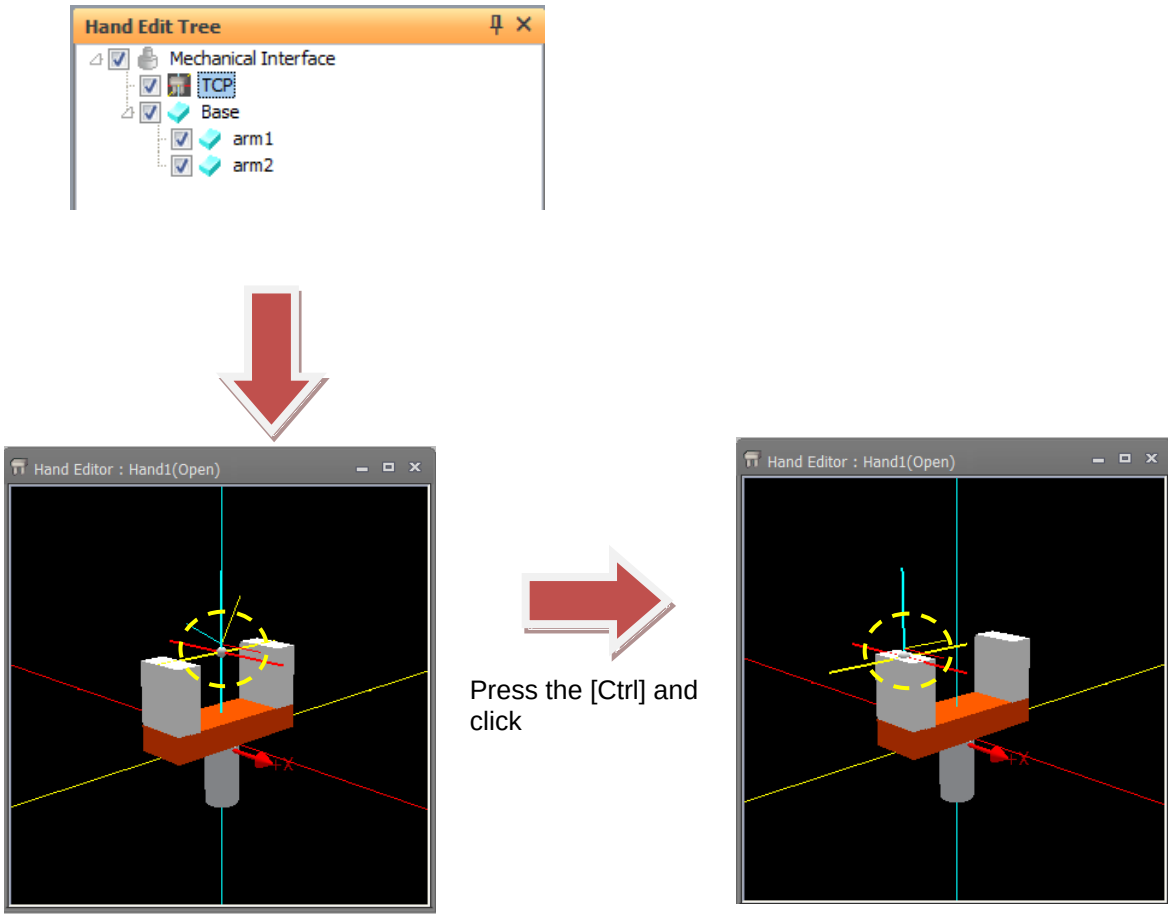


Figure 21-130 Click movement of TCP (hand selection)

21.19.4. Distance Measurement

Please refer to "**21.17Distance measurement**".

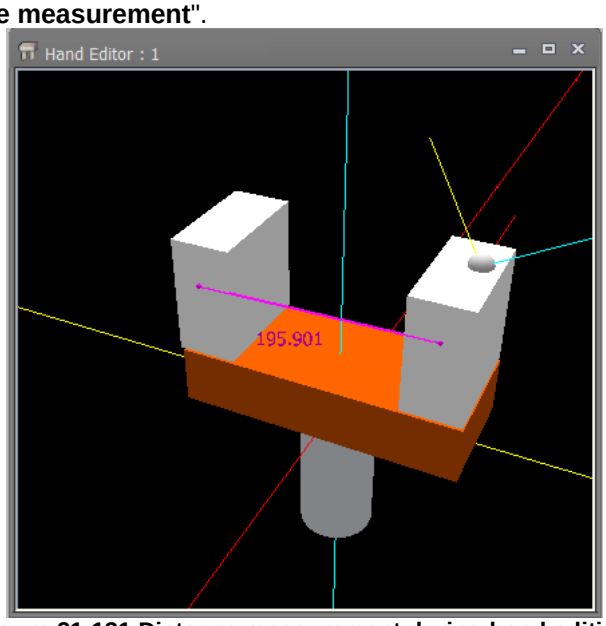


Figure 21-131 Distance measurement during hand editing

21.20. Robot Parts Design

Robot parts are displayed on each axis of the robot on the 3D monitor and the robot parts to display can be switched according to signal state, for example.
Robot parts that you design are registered to the workspace. For this reason, robot parts must be designed before robot parts display settings are made on the layout tree. Create the robot parts file to be used and then make the display settings on the layout tree.

21.20.1. Robot parts file manager

Click the [3D view] tab -> [Robot Parts File] group -> [Robot Parts File Manager] button on the ribbon. The "Robot Parts File Manager" screen is displayed.

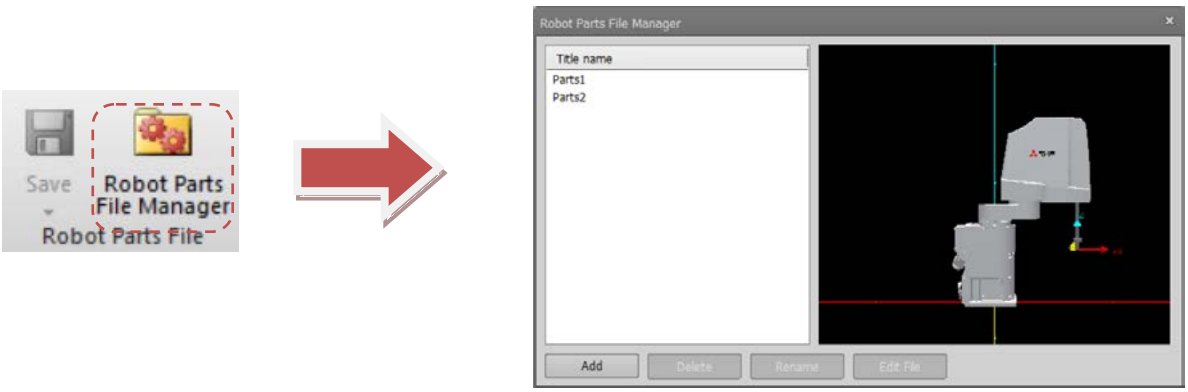


Figure 21-132 Display of the "Robot Parts File Manager" Screen

Except for the [Edit file] button, the layout files are changed to robot parts files. However, operations are the same as in **"21.12.3 Layout file manager"**. So, refer to this section for details on operation in the robot parts file manager.

- Editing robot parts files

Double-click the selected edit file in the parts list, or click the [Edit] button to open the parts editing dialog and display the edit tree. You can also open the parts editing screen by double-clicking the already set parts in the layout tree.

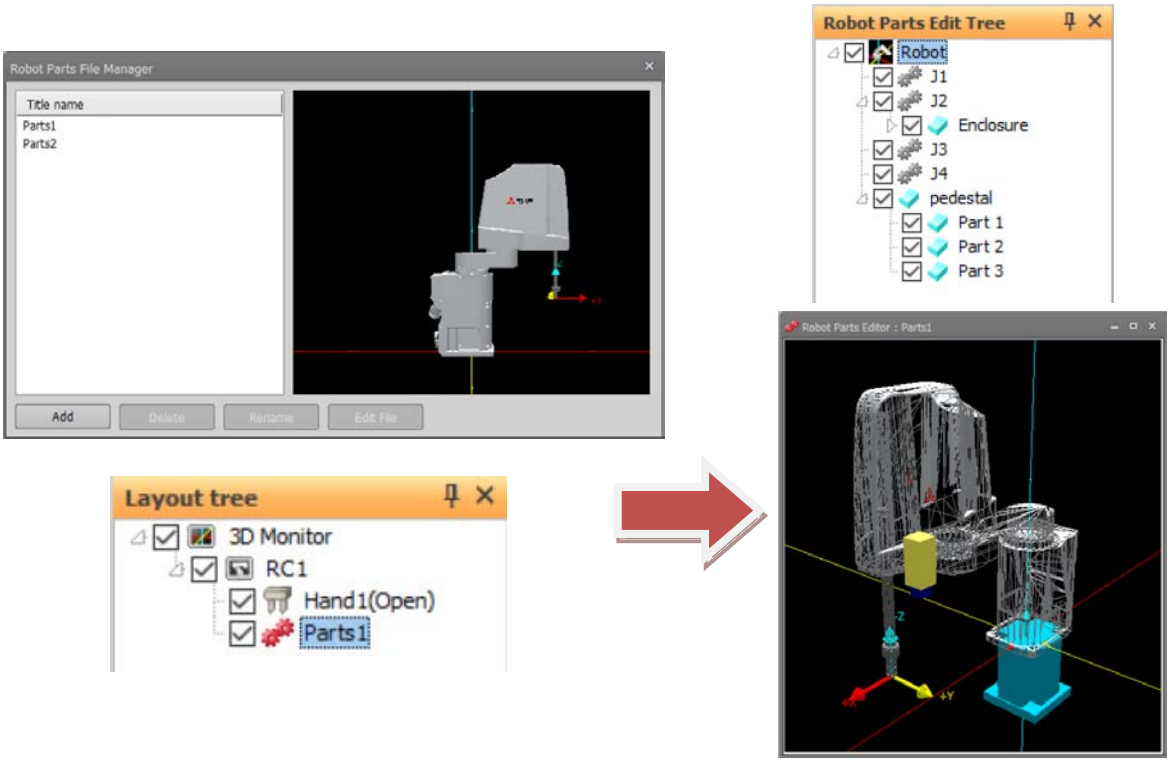


Figure 21-133 Editing Robot Parts

21.20.2. Robot parts editing operations

Operation methods are basically the same as in the 3D monitor. So, refer to **"21.3 3D Monitor Operations"** for details.
Note, however, that view center rotation differs from operation in the 3D monitor in that this can be operated by the mouse only.
To save robot parts files, click the [3D view] tab -> [Robot Parts File] group -> [Save]/ [Save As] button on the ribbon.

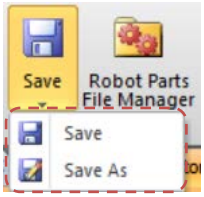


Figure 21-134 Saving Robot Parts Files

21.20.3. Robot parts edit tree

[3D Monitor] in the layout tree is changed to [Robot] on the robot parts edit tree and the axis are displayed in the child item. The number of axes displayed is the same axis number as the displayed robot.
When you select an axis to which you want to attach a robot part and add an object, the object is displayed on the corresponding axis of the robot. When you select [Robot] and add an object, the object is displayed on the base part of the robot.
When you select [Robot], properties are displayed, you can select the display robot and change the display type.
The display content and operation methods on the robot parts edit tree are basically the same as in the layout tree. So, refer to **"21.4 Layout Tree"** for details.
Robots, hand, robot parts, user mech., spline and related display and operations can not be executed. Objects of robot parts an not set display conditions.

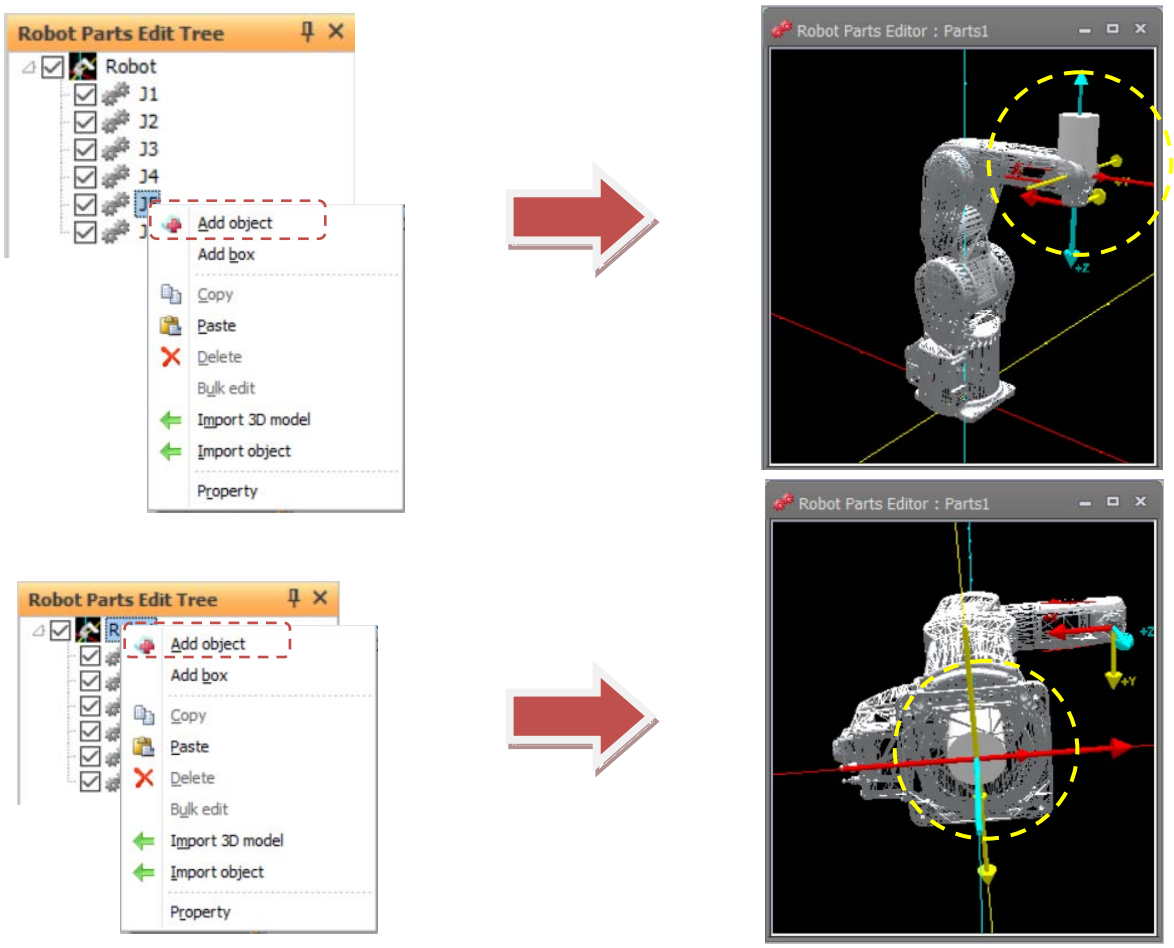


Figure 21-135 Add Objects in Robot Parts Editing Tree

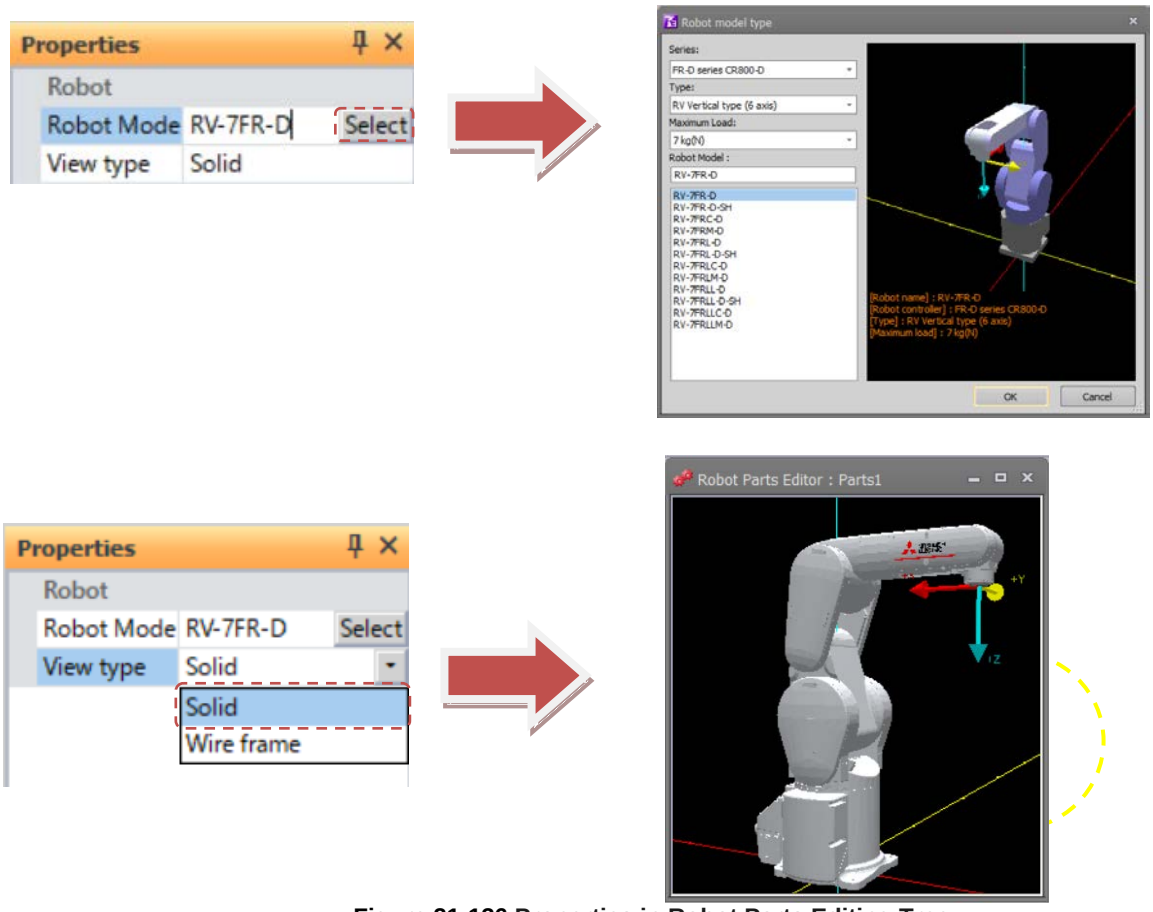


Figure 21-136 Properties in Robot Parts Editing Tree

21.20.4. Distance Measurement

Please refer to "**21.17Distance measurement**".

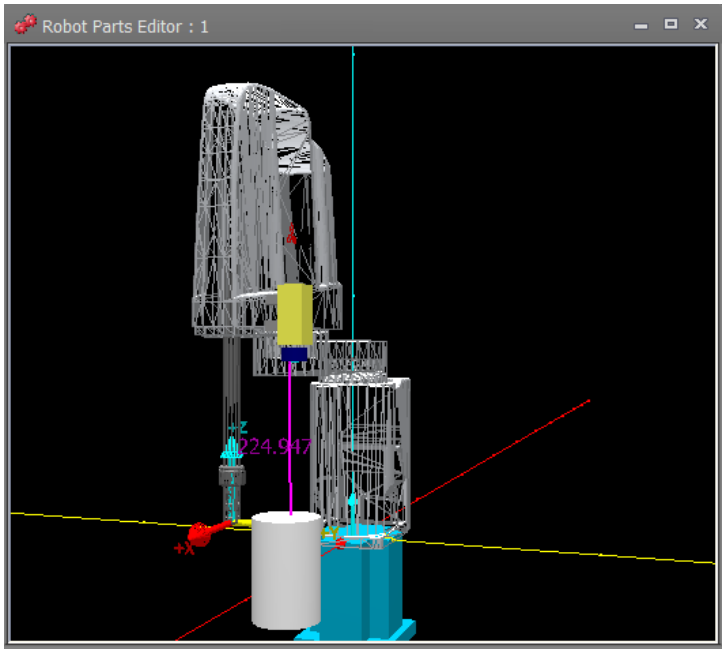


Figure 21-137 Distance measurement during parts editing

21.21. Design of User Mechanism

Displays the user mech. at a position away from the mechanical interface on the 3D monitor or the robot.
The designed user mech. is registered in the workspace. Before setting the display of the user mech. in the layout tree, it is necessary to design the user mechanism.
Please create the user mech. file to be used beforehand and make the display setting in the layout tree.

21.21.1. User mech. file manager

Click the [3D Display] tab of the ribbon -> [User Mech. File] group -> [User Mech. File Manager] button to display the user mech. file manager screen.

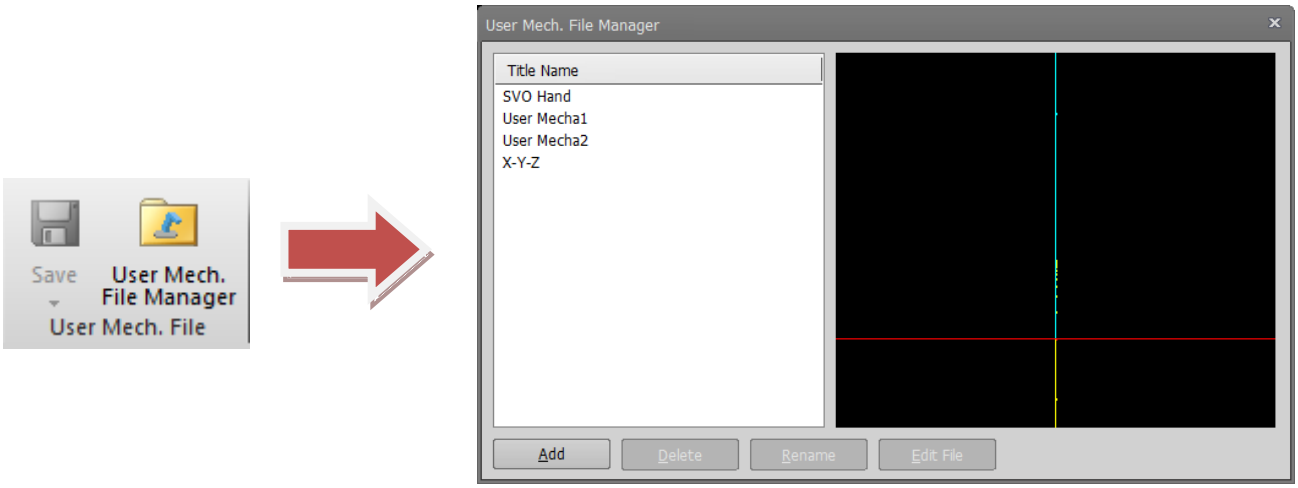


Figure 21-138 Display User Mech. File Manager

Except for the [**File Edit**] button, the rest of the operation is the same as the layout file,Please refet to "**21.12.3Layout file manager**".

Edit user mech. file
Double-click the selected edit file in the user mech. list, or click the [Edit] button to open the user mech. editing dialog and display the edit tree. You can also open the user mech. editing screen by double-clicking the already set user mech. in the layout tree.

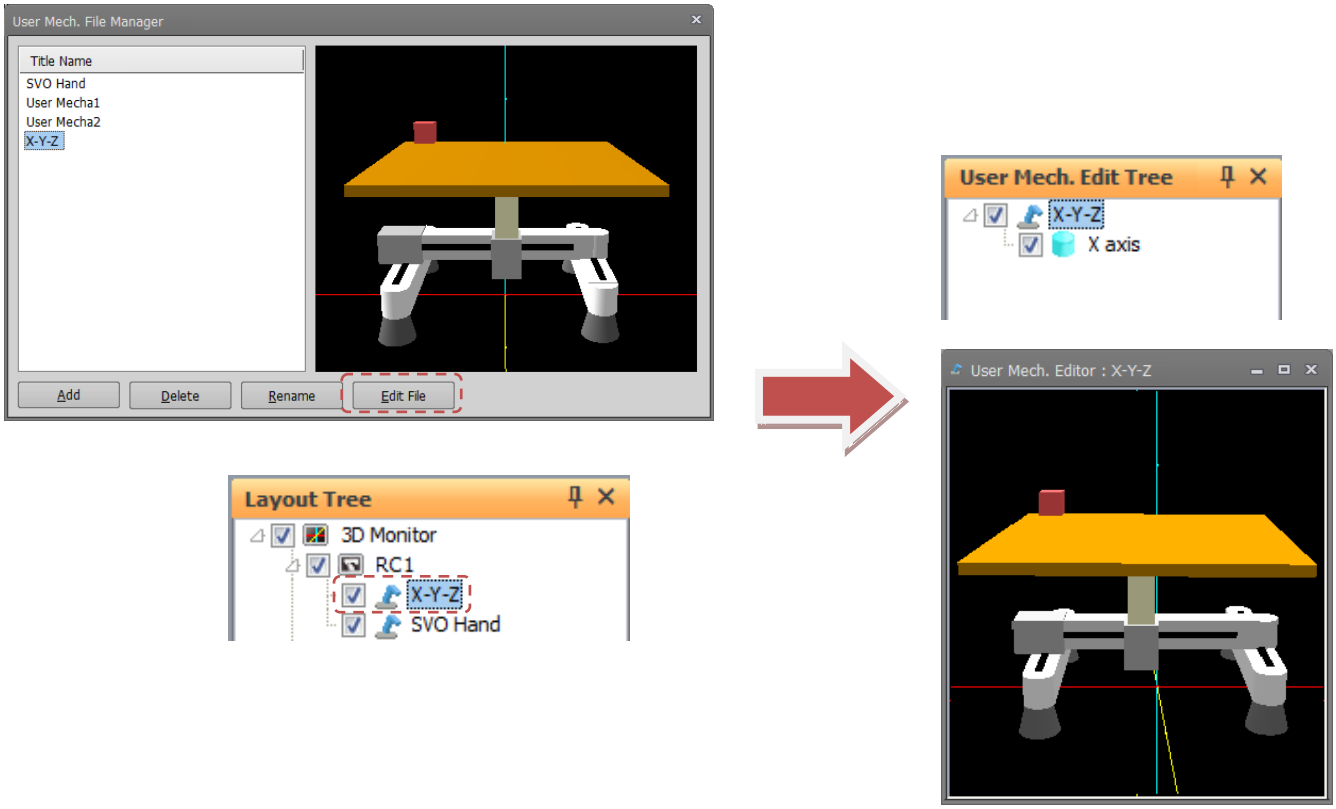


Figure 21-139 Display Edit user mechanism

21.21.2. Operation of editing user mechanism

The operation method is basically the same as the 3D monitor, refer to "**21 3D Monitor**".
However, rotation of the viewpoint is possible only with the mouse operation unlike the 3D monitor.
Use the [3D view] tab of the ribbon -> [User Mech. File] group -> [**Save**] / [**Save As**] button to save the user mech. name file.

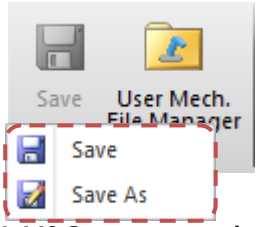


Figure 21-140 Save user mech. file

21.21.3. User mech. edit tree

[**3D monitor**] in the layout tree is changed to the user mech. name that you set in the user mech. edit tree.
Add objects and create user mechanism.
Joint is used for the part to be used as the axis of the mech. set in the [Type] of the property.
You can add joint by clicking [Add Joint] in the context menu.
When you add a joint, a red ball appears on the user mech. edit screen with the mark [ ] in the user mech. edit tree.
For other display contents and operation method, refer to "**21.4Layout Tree**"
However, display and operation related to robot, hand, robot parts, user mech., spline can not be executed.

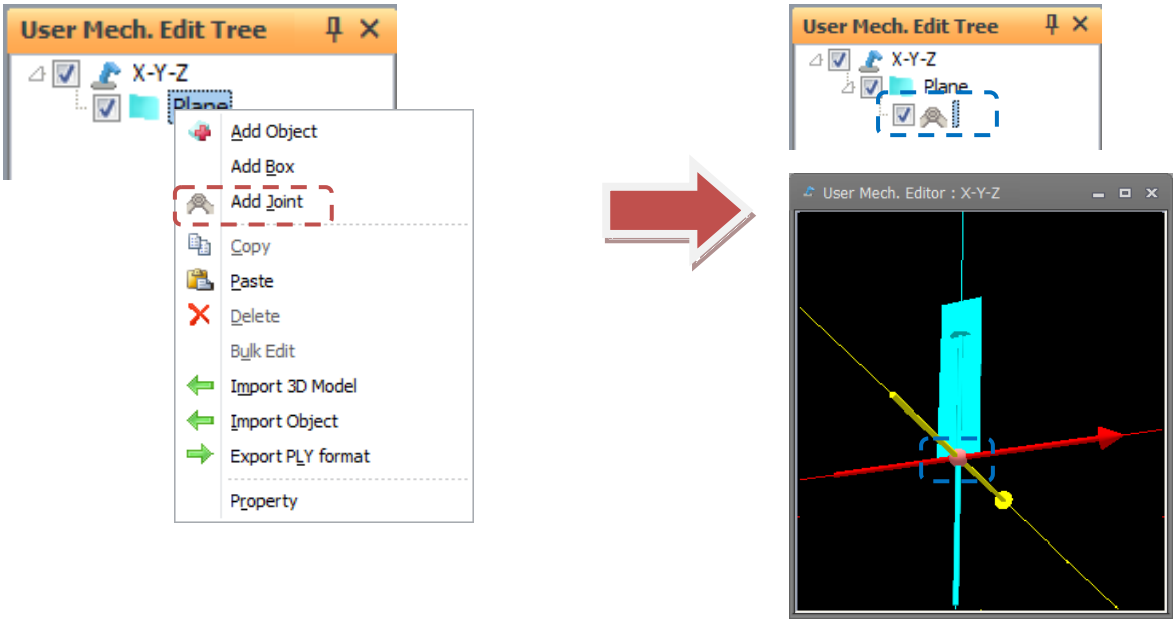


Figure 21-141 Add joint in user mech. edit tree

21.21.3.1. Object properties

The property item of the user mech. object is the same as the layout object (except for the interference check item).
Objects added to the user mech. have display conditions individually, and you can display or hide certain objects by specifying I / O conditions. Please refer to "**21.11.3 Layout condition edit**".

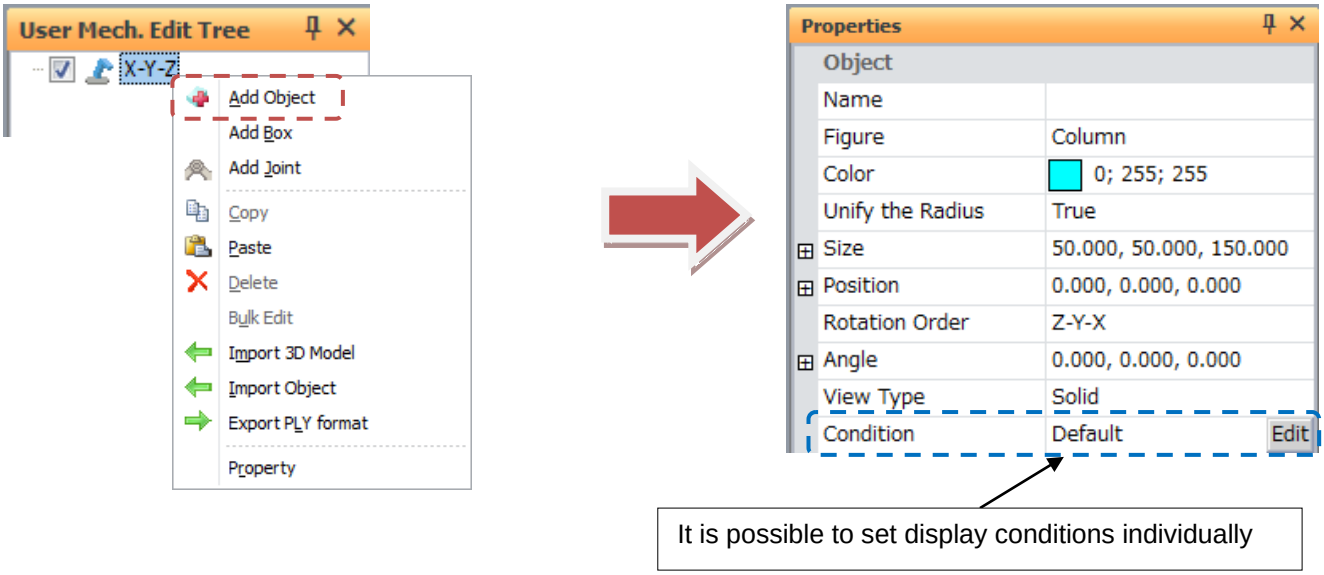


Figure 21-142 Add joint in user mech. edit tree

21.21.3.2. Joint properties

Joint name
Set the joint name.

Position
The joint is displayed at the specified position. The position is relative to the position of the parent item. The setting unit is [mm].

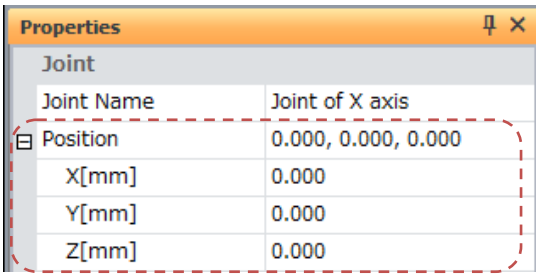


Figure 21-143 Display position of joint

Rotation order and Angle

The rotation order and angle specified by the joint are displayed. It becomes relative rotation angle from the position and angle of the parent item. The setting unit is [deg].

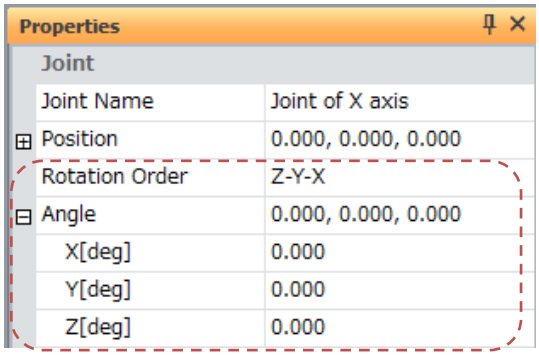


Figure 21-144 Rotation order and Angle of the joint

Axis type

Set up the movement method of the joint.

Axis rotation : Rotation about the Z axis
Axis linear : Move in X axis direction

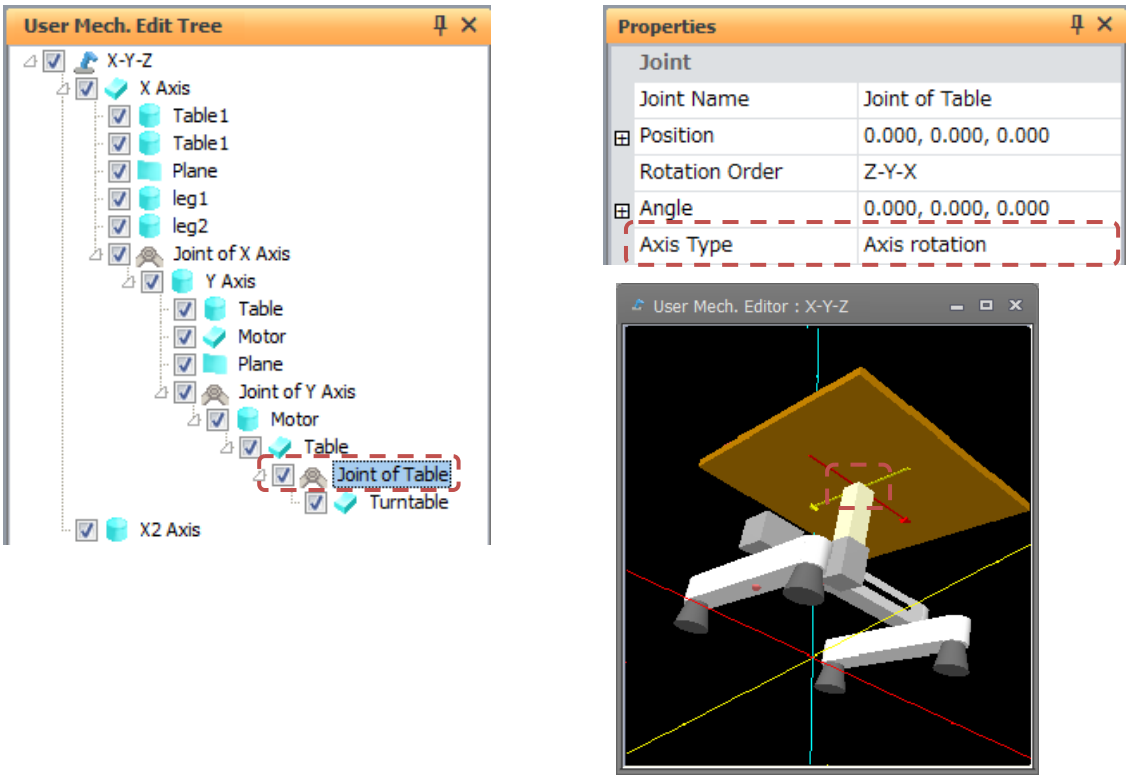


Figure 21-145 Joint type of joint(Axis rotation)

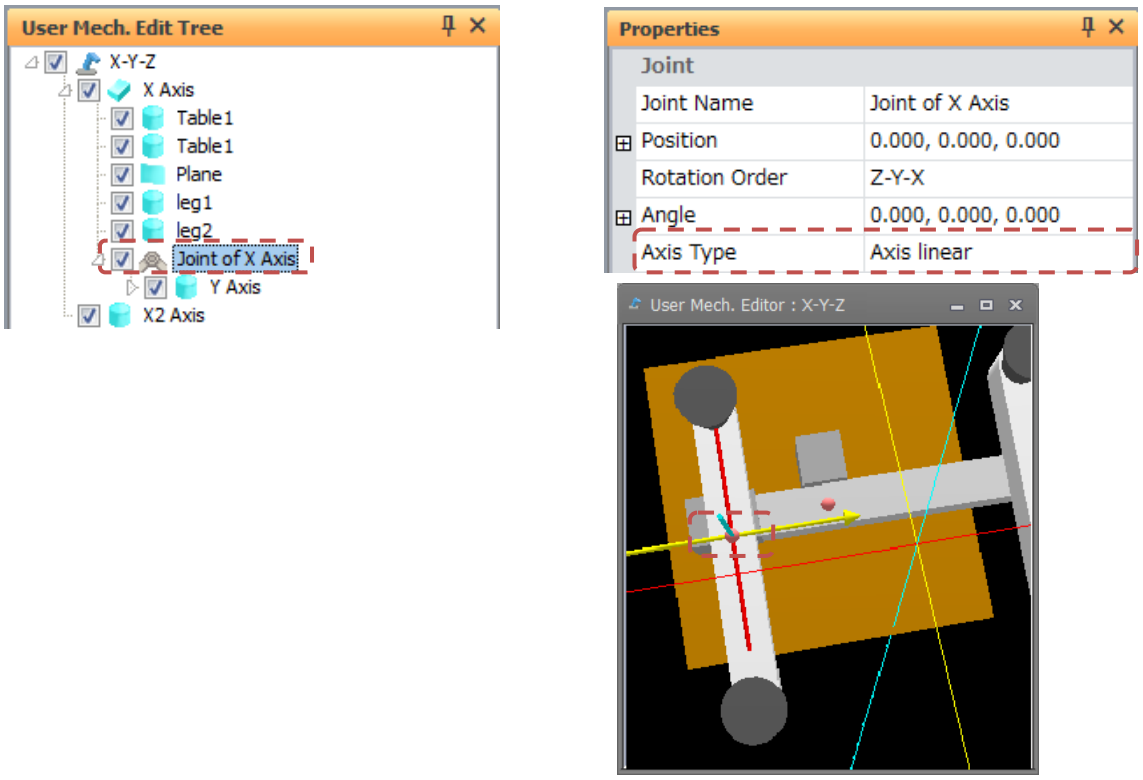


Figure 21-146 Joint type of joint(Axis linear)

Reversed

Sets whether or not to reverse the movement of child items. When set to [Reversed], the direction of rotation or the direction of movement is reversed.

By creating joints of [Not Reversed] and [Reversed] and assigning them to the same axis, it becomes possible to make symmetrical movement.

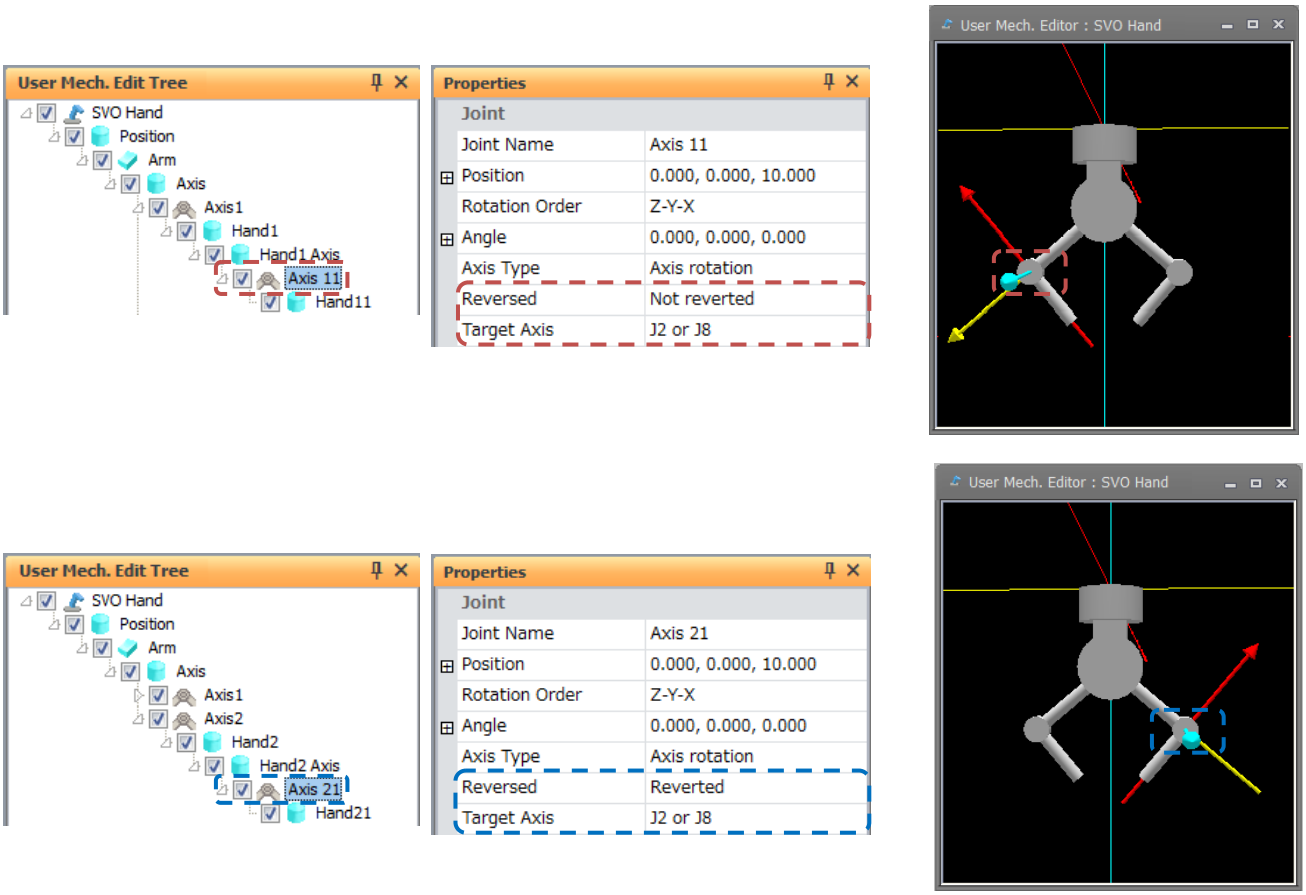


Figure 21-147 Reversed of Joint

Axis of symmetry

Assign the joint to the axis of the mechanism specified by the [Type] of the property of the user mechanism.Please refer to "**21.9.2User mech. type and relationship to** robot".

J1 or J7 : Assign to J7 of Mech. # 1 (Robot)
Assign to J1 of Mech. number 2 or Mech. number 3

J2 or J8 : Assign to J8 of Mech. # 1 (Robot)
Assign to J2 of Mech. number 2 or Mech. number 3

J3 : Assign to J3 of Mech. number 2 or Mech. number 3

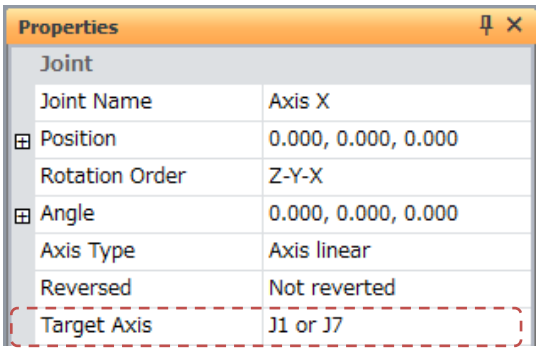


Figure 21-148 Target Axis of Joint

Caution

J3 can not be assigned to the mech. number 1 (robot).

Axis value

When entering a value or moving the knob of the slider bar, you can check the movement of the user mechanism.

Axis rotation : It can be set within the range of -180 to 180. The unit is [deg].
Axis linear : It can be set in the range of -1000 to 1000. The unit is [mm].

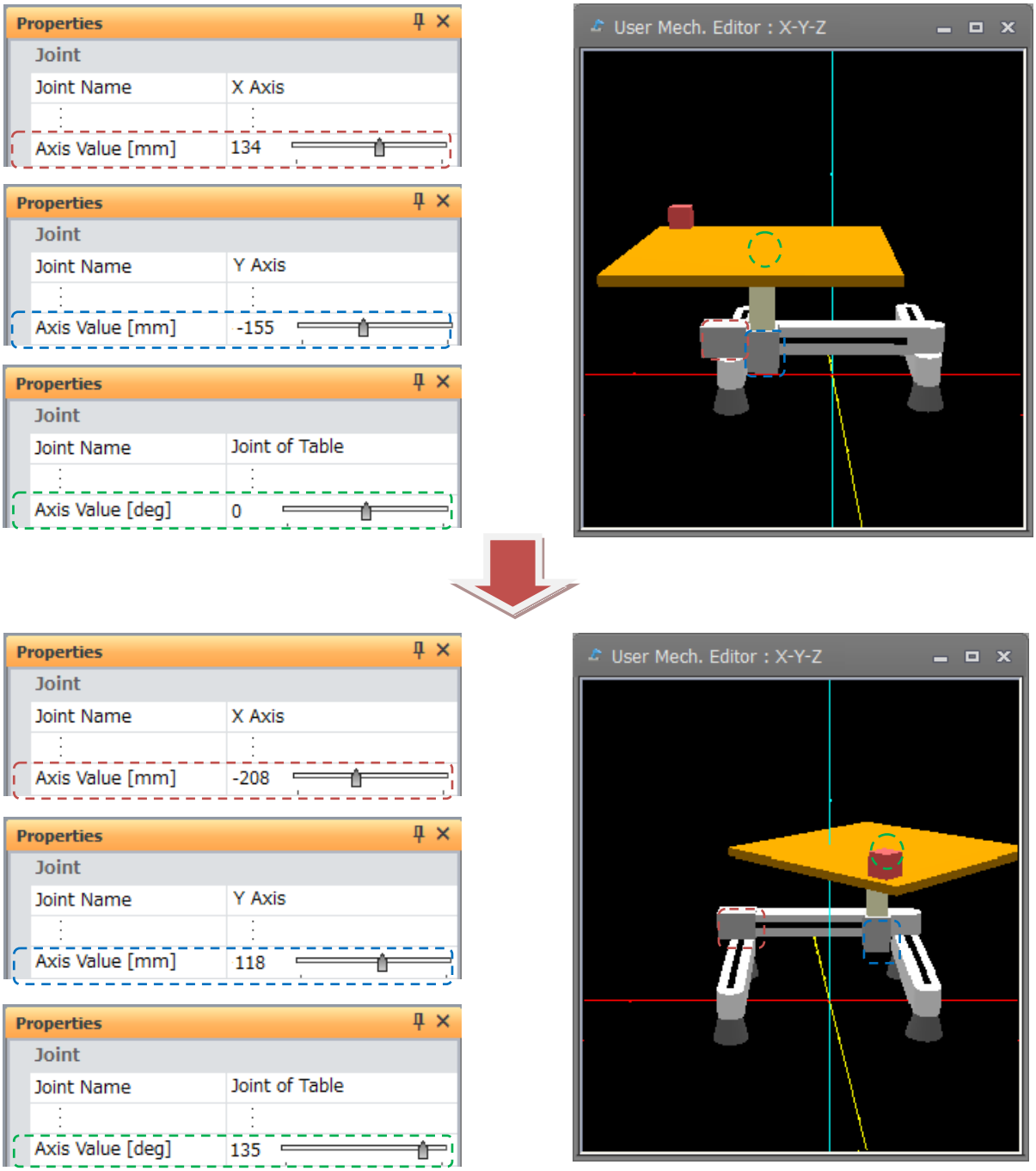


Figure 21-149 Axis Value of Joint

Caution

Please confirm with jog operation of simulator on 3D monitor

The movement can be confirmed by entering the axis value only on the user mech. edit screen.

To move the user mech. on the 3D monitor, specify the mechanism on the simulation operation panel and operate the jog.

21.21.4. Distance Measurement

Please refer to "**21.17Distance measurement**".

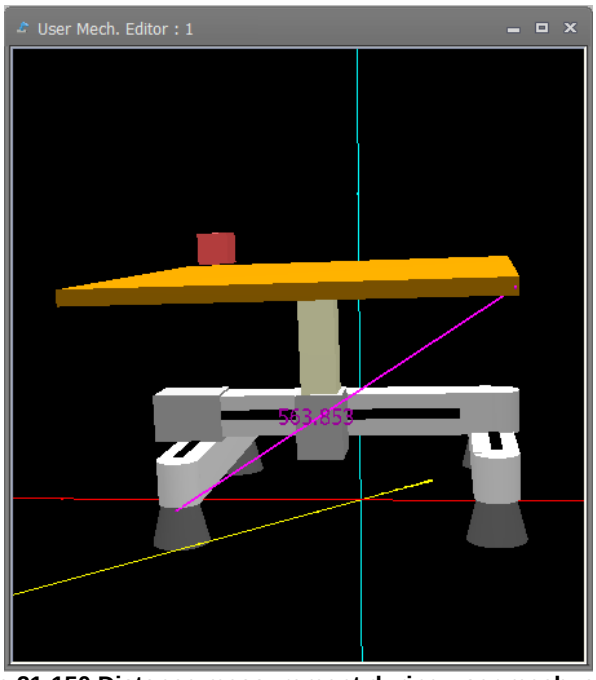


Figure 21-150 Distance measurement during user mech. editing

21.22. Recording

Content displayed on the 3D monitor screen can be recorded and saved to an AVI file.

Click the [3D view] tab -> [Rec.] group -> [Start] button on the ribbon. The recording is started.

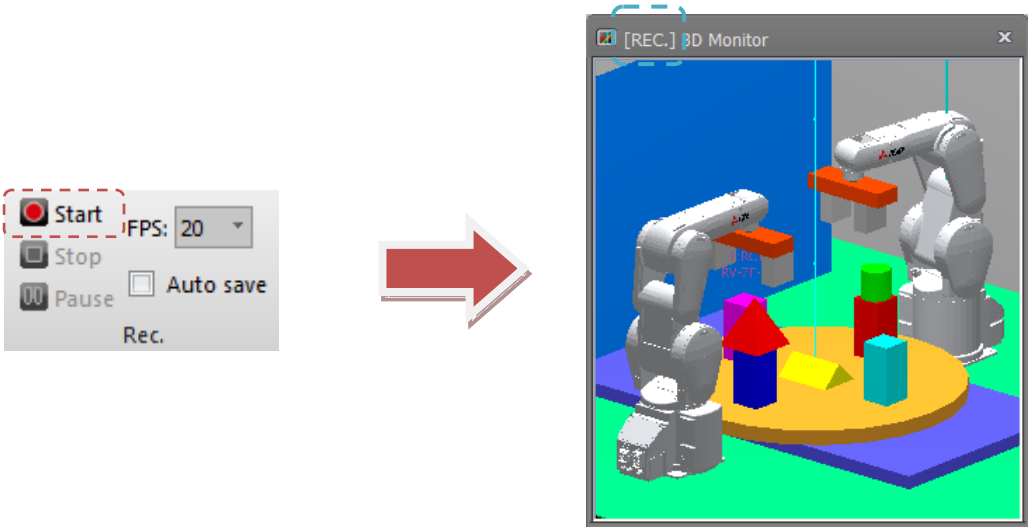


Figure 21-151 3D Monitor: Recording in Progress

To pause recording, click the [3D view] tab -> [Rec.] group -> [Pause] button on the ribbon.

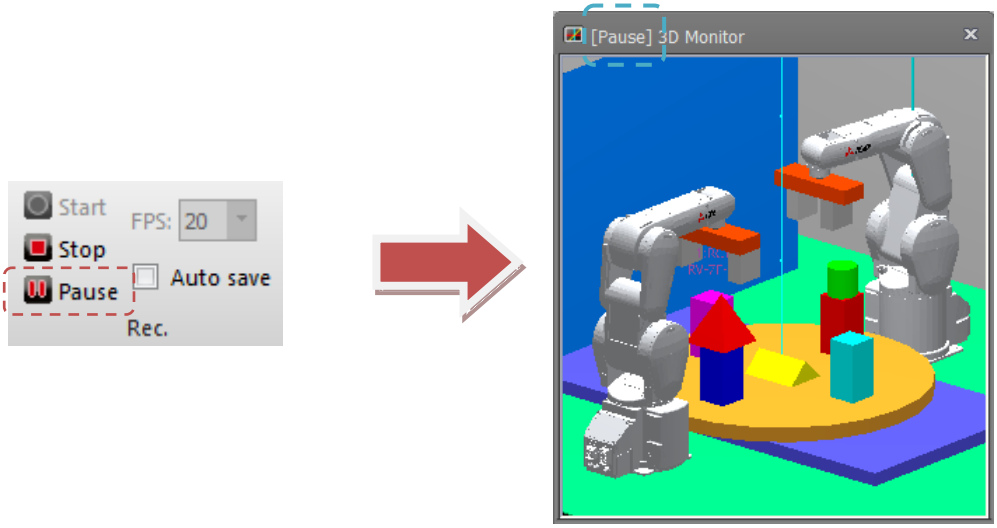


Figure 21-152 3D Monitor: When Recording Is Paused

If the [3D view] tab -> [Rec.] group -> [Stop] button on the ribbon is clicked during recording or when recording is paused, recording is stopped and the "Save As" dialog for saving the AVI file opens.

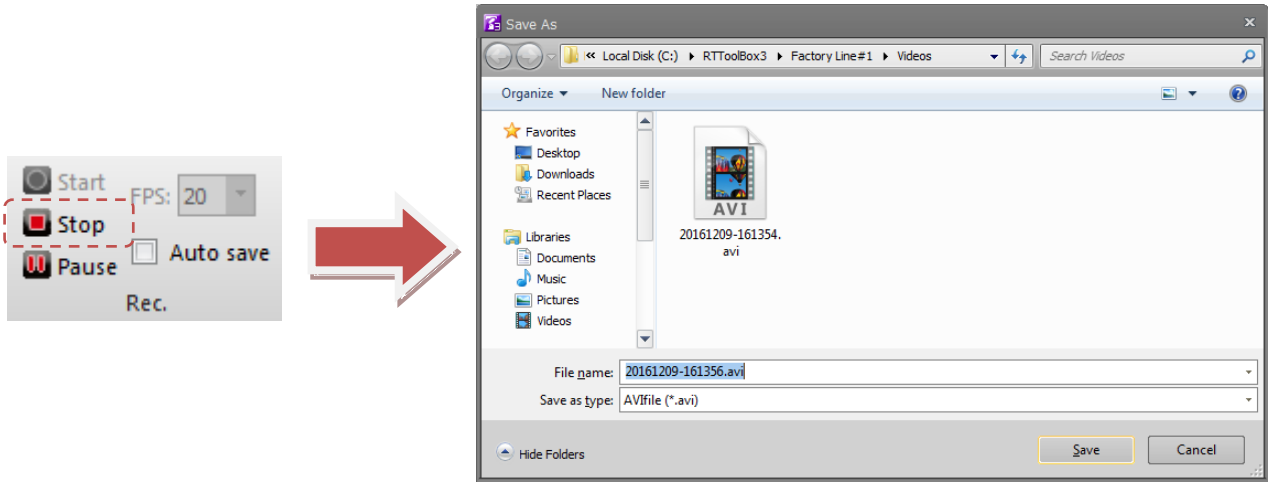


Figure 21-153 "Save As" Dialog

Also, recording functions can be set before recording by the [3D view] tab -> [Rec.] group -> [FPS] combo box/[Auto save] checkbox on the ribbon. These items cannot be operated during recording. So, set them beforehand.

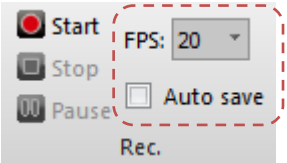


Figure 21-154 3D Monitor: Recording Options

Frame rate (FPS)

You can change the frame rate of the video data to save the avi file.

Setting range: 30/20/10[FPS]

* By raising the frame rate the video will be smoothed, but on the other hand, the file size will be large(recording time is short).

Auto save

When the [Auto save] checkbox is selected, the AVI file is automatically saved to the "Videos" folder in the workspace folder when recording is stopped.

⚠ Caution

About the recording time

The recording time is affected by the screen size of the 3D monitor and the frame rate.
To extend the recording time, reduce the screen size or the frame rate. If the initial screen size and frame rate is 30, it can be recorded for about 2GB. (30 minutes).

About codec

The recorded video is saved and compressed with codec [Microsoft Video 1]. If you can not see the recorded video, please play on a computer environment that corresponds to the codec [Microsoft Video 1].

About 3D monitor display position

Please be sure to record with 3D monitor display (you can use some). If the 3D monitor is completely hidden behind other windows (project tree or property window), correct video data can not be recorded.

⚠ Caution

When a black movie is created instead of the contents of the 3D monitor screen

If a black screen was created when recording on Windows Vista, change the window design to the following and restart the 3D monitor.

・Windows Vista: Please select "Windows Vista Basic" on the "Design Setting" screen of personal setting.

22. MELFA-3D Vision

This sets the control unit of MELFA-3D Vision.

To add a control unit for use in the workspace, double-click the [MELFA-3D Vision] – [Setup/Add] in the project tree.

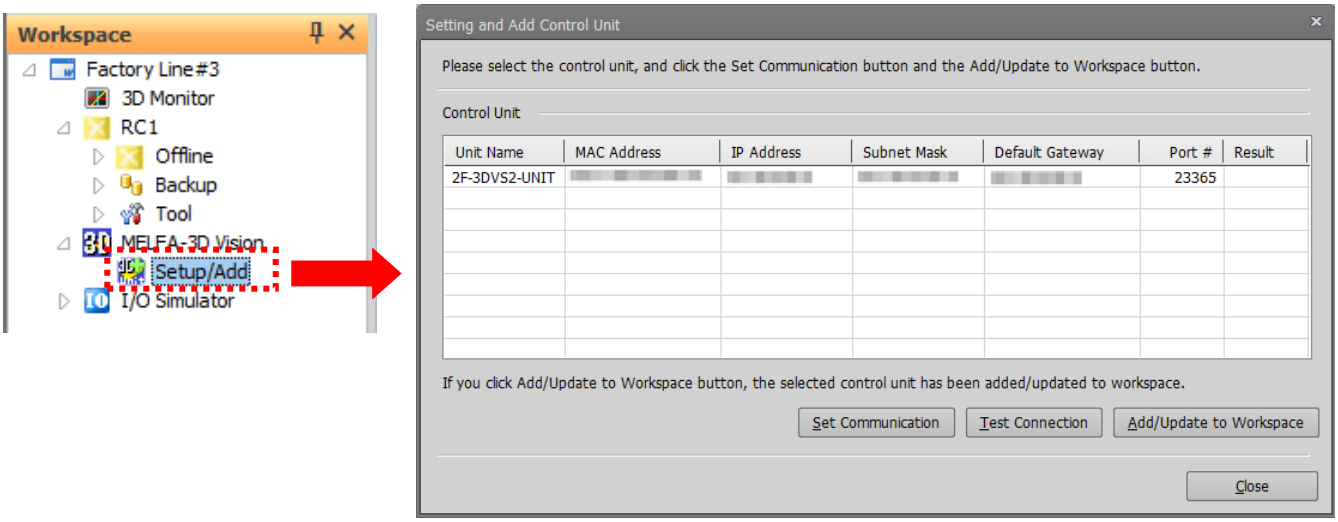


Figure 22-1 "Setting and Add Control Unit" window

When the control unit is double-clicked, the MELFA-3D Vision window is displayed.

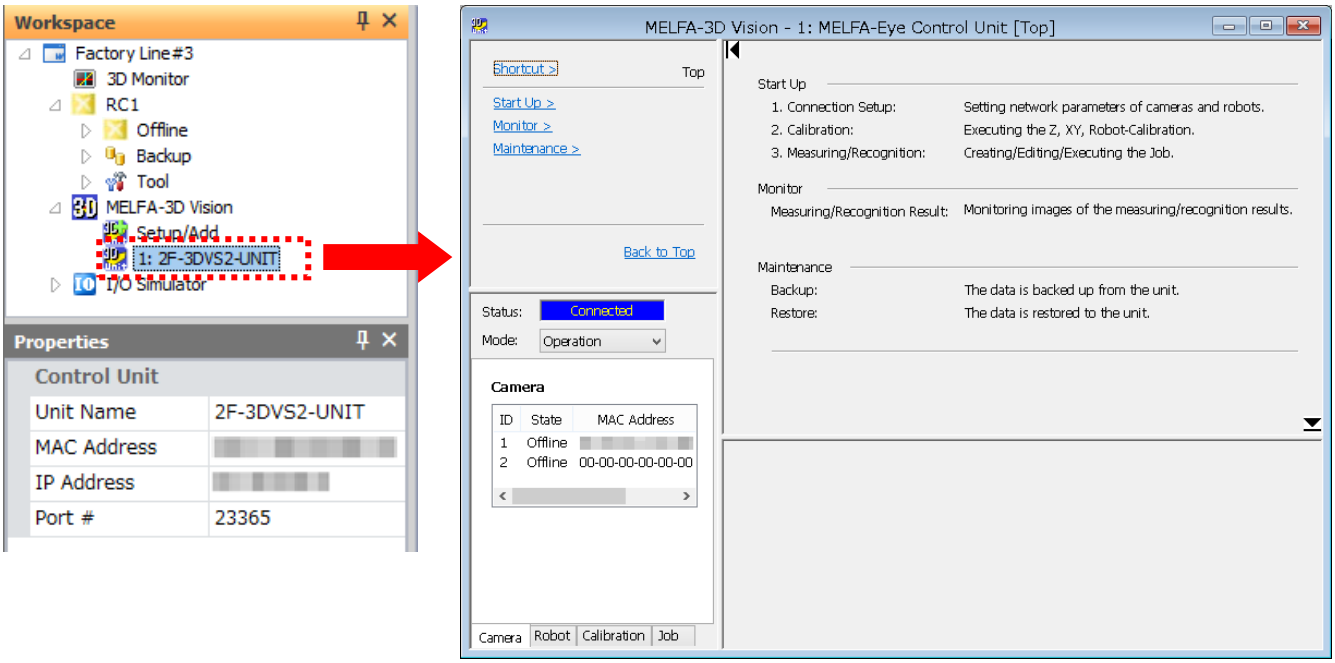


Figure 22-2 MELFA-3D Vision window

For details, refer to the user's manual containing a complete description of the MELFA-3D Vision.

23. I/O Simulator

23.1. Summary

The I/O simulator simulates the signal communication between robots. This function can also interact with GX Simulator2, 3 devices. (For details of GX Simulator2, 3, refer to GX WORKS2, 3's manual.)

Caution

This Software supports only GX Simulator2, 3.

23.2. Simulator settings

Before starting the I/O simulator, create an I/O simulator definition file.
Double-click [I/O Simulator] -> [Simulator Setting] on the project tree to display the [Simulator Setting] screen.
Checking [Enable] checkbox applies the signal connection to the I/O simulator.

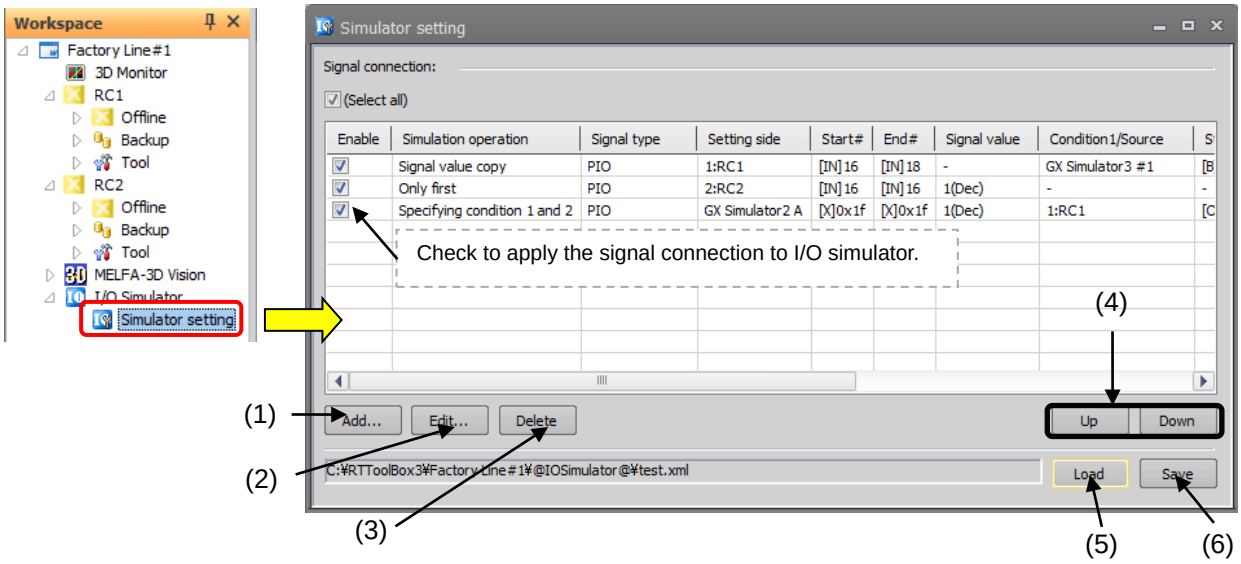


Figure 23-1 Simulator setting screen

Right-click on the list of signal connection to display the right button menu.

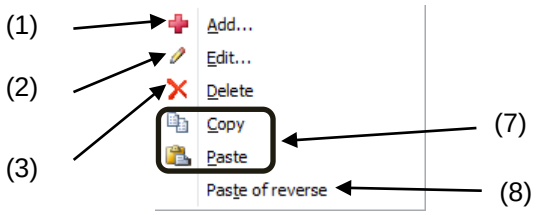


Figure 23-2 Right button menu.

(1) Add
Add a new signal connection.
Select a row and click the [Add] button to add a new signal connection.

(2) Edit
Edits the selected signal connection row.
For editing signal connections, refer to **"23.3 Signal connection edit screen".**

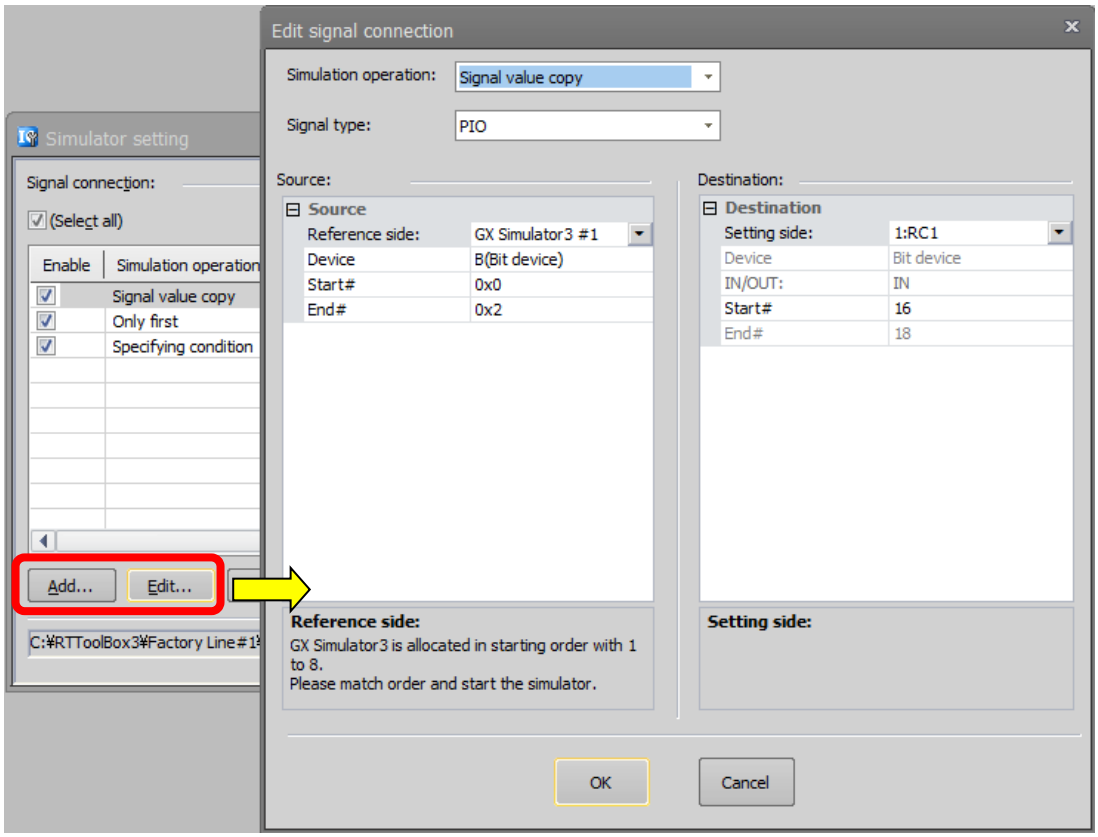


Figure 23-3 Add/Edit signal connection.

(3) Delete

Deletes the selected signal connection row.
You can also delete multiple rows at the same time.

(4) Up / Down

Moves the selected signal connection row up/down.
You can also move multiple rows at the same time.
Signal connections are applied in descending order.

(5) Load

Loads signal definitions saved in an I/O simulator definition file.
Be aware that the signal selection settings shown in the signal connections list will be cleared.

(6) Save

Saves the current signal connection settings into an I/O simulator definition file.
During the I/O simulator operating, you can choose whether to apply the save setting to the I/O simulator.

(7) Copy / Paste

Copies / Pastes signal connections.
You can copy / paste multiple rows at the same time.

(8) Paste in reverse

When both the source and destination are robots, you can swap source for destination by pasting.

23.3. Signal connection edit screen

On the simulator setting screen, Click the [Add] button or [Edit] button to display the signal connection edit screen.

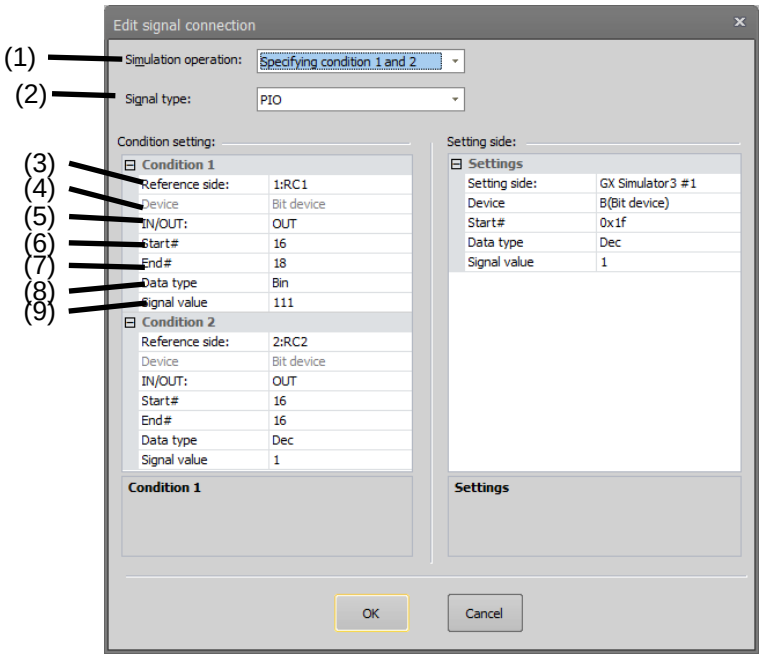


Figure 23-4 Signal connection edit screen

(1) Simulation operation

Select a desired signal simulation behavior.
Select from [Signal value copy] (default), [Only first], [Unconditional], [Specifying condition1], [Specifying condition 1 and 2].

Each behavior is as follows.

- Signal value copy

Copies the signal value to another device.

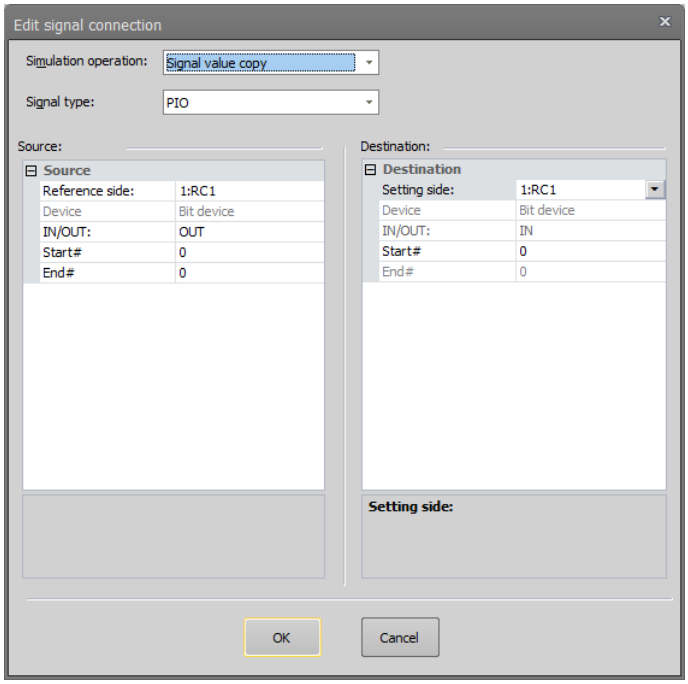


Figure 23-5 Signal value copy

- Only first

Specify an initial signal value condition.

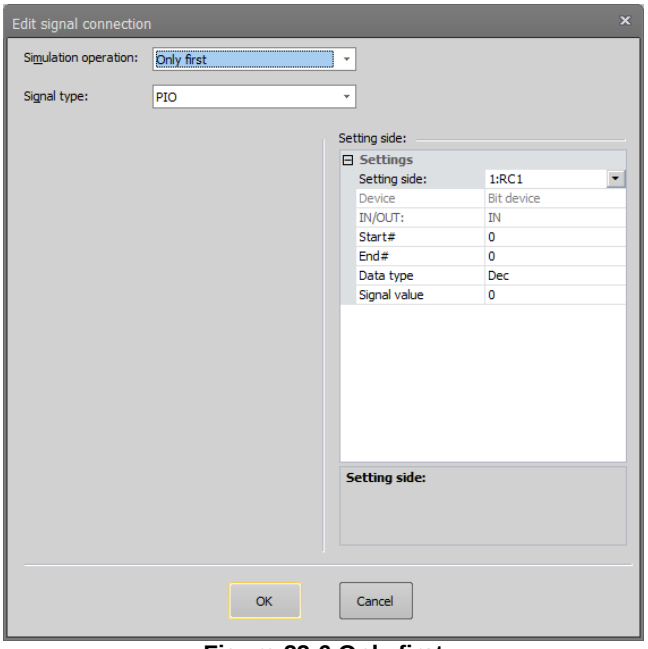


Figure 23-6 Only first

- Unconditional

Specifies the signal state during simulation.

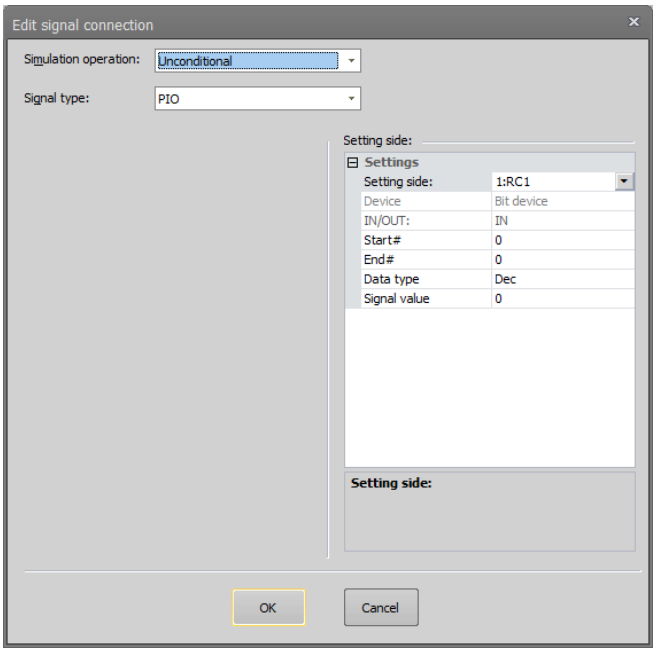


Figure 23-7 Unconditional

- Specifying condition1 / Specifying condition 1 and 2

Specifies 1 or 2 conditions and a signal value. The set value is applied when the set conditions are satisfied.

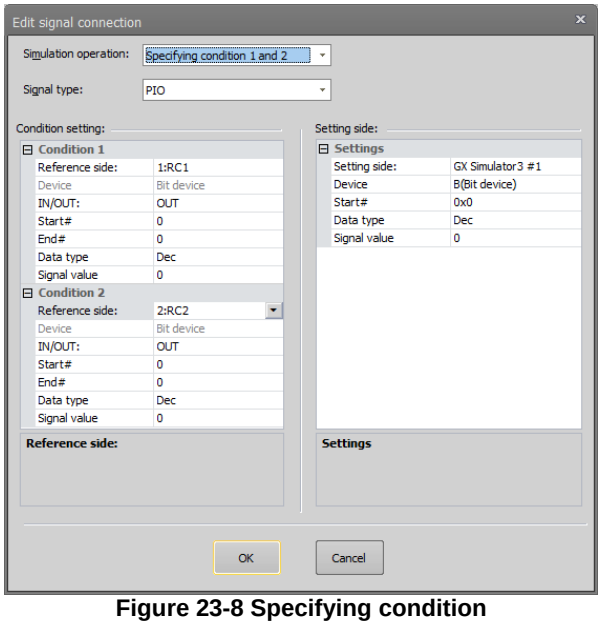


Figure 23-8 Specifying condition

(2) Signal type

Specify a Signal type.
Select from [PIO] (default), [CC-Link (Link Relay)] and [CC-Link (Link Register)].

The following items differ according to [Simulation operation] and [Signal type].

(3) Source / Destination / Reference side / Setting side

Select the signal copy source from robot, GX Simulator2 and GX Simulator3 devices.
You can select from [Project ID: name of project] (Only the number of projects is displayed), [GX Simulator2 A to D], and [GX Simulator3 #1 to 8].
GX Simulator2 is assigned to A to D in the order that it is started up. Startup GX Simulator2 so that the order is matched.
GX Simulator3 is assigned to 1 to 8 in the order that it is started up. Startup GX Simulator3 so that the order is matched.

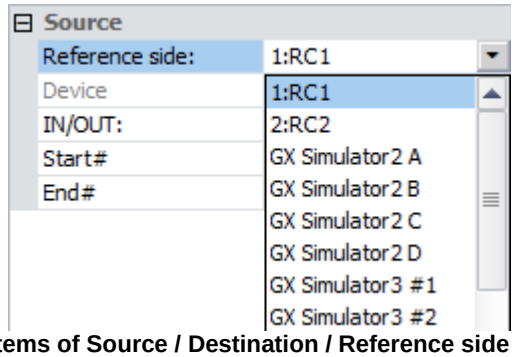


Figure 23-9 Items of Source / Destination / Reference side / Setting side

(4) Device

When [Source] / [Destination] / [Reference side] / [Setting side] is GX Simulator2, 3, select the device used in the simulation. When it is robot, the device setting is fixed.

Table 23-1 Selectable Devices

[Signal Type]	[Source]/[Destination]/[Reference side]/[Setting side]	
	Robot	GX Simulator2, 3
[PIO] [CC-Link(Link relay)]	[Bit device]	B (bit device) SB (bit device) L (bit device) M (bit device)
[CC-Link(Link register)]	[Word device]	

		SM (bit device) X (bit device) Y (bit device) D (word device) SD (word device) R (word device) ZR (word device) W (word device) SW (word device) U3En(0 to 3)\G (word device) (*1) U3En(0 to 3)\HG (word device) (*2)

(*1) This can be selected only when GX Simulator2 is selected.
(*2) This can be selected only when GX Simulator3 is selected. (GX Works3 version can be used after 1.040S)

(5) IN / OUT

Select input / output of signal.
When [Source] / [Reference side] is a robot, select [IN] or [OUT]. When [Source] / [Setting side] is a robot, fixed by the [IN].
When it is GX Simulator2, 3, this item is not visible.

(6) Start #

Specifies the start numbers of the signals / devices.
For input range of this item, refer to Table 23-2 Input range of [Start #]/ [End #].

(7) End #

Specifies the end number of the signal / devices. Please set the start and ending numbers to within 32 points.
When [Simulation operation] is [Signal value copy], the destination [End #] is filled in automatically according to [Start #] and [End #] of source.
For input range of this item, refer to Table 23-2 Input range of [Start #]/ [End #].

Table 23-2 Input range of [Start #]/ [End #]

[Signal type]	[Source]/[Destination]/[Reference side]/[Setting side]	
	Robot	GX Simulator2, 3
[PIO]	0～40960	0～65535（0xFFFF）
[CC-Link(Link relay)]	6000～8047	
[CC-Link(Link register)]	6000～6255	

(8) Data type

Specifies the Data type of [Signal value].
Select from [Bin], [Dec] and [Hex].

(9) Signal value

Specify the output signal value. The set value is treated in the specified [Data type].

23.4. Starting I/O Simulator

Before starting the I/O simulator, create an I/O simulator definition file.
For an explanation of creating an I/O simulator definition file, refer to **“23.2 Simulator settings”.**

To start up the I/O simulator, click the [Online] tab -> [I/O Simulator] group [Start] button on the ribbon in the simulation mode.

Figure 23-10 Starting I/O simulator

Click the [Start I/O simulator] button to display the following [I/O simulator start] screen.

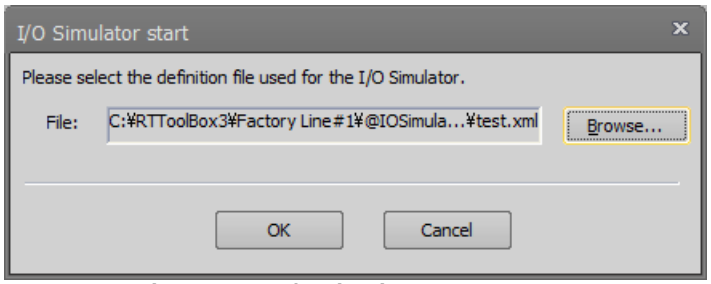


Figure 23-11 I/O simulator start screen

Click the [Browse] button to select an I/O simulator definition file. The file used in the simulation can be checked on the [Simulator setting] screen.
I/O simulator start, and the character “I/O Simulator” is displayed on the status bar. The letters [GX Simulator] also are displayed when the controller is connected to either GX Simulator2 or GX Simulator3.

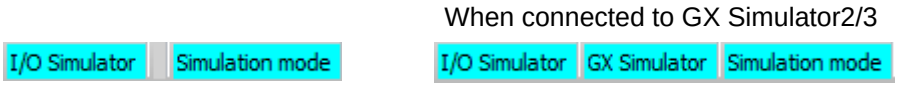


Figure 23-12 Status bar during I/O simulator operating

While the I/O simulator is operating, the I/O simulator icon is displayed in the task tray.

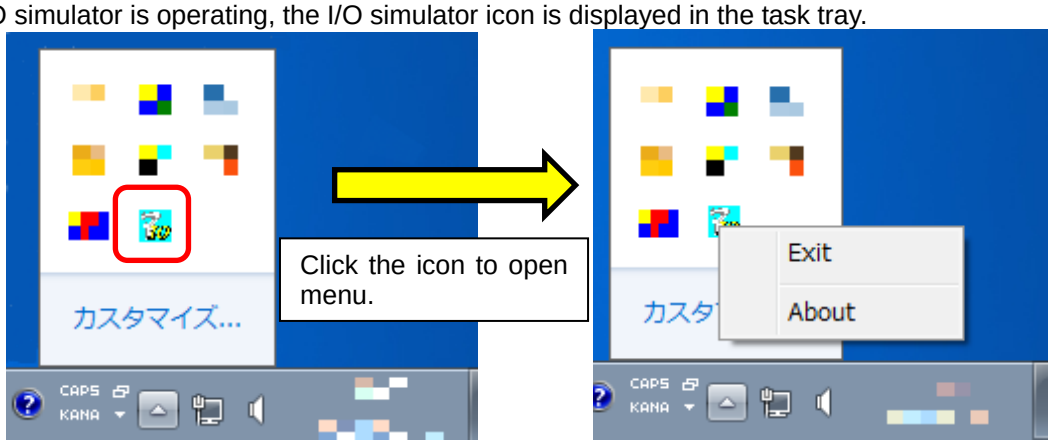


Figure 23-13 Icon of I/O simulator

When a previously-used I/O simulator definition file exists, it is possible to start the robot simulator and I/O simulator simultaneously. Check the checkbox [Start I/O Simulator with the definition file used last] on the [Select the project] screen which is displayed before starting the simulation.

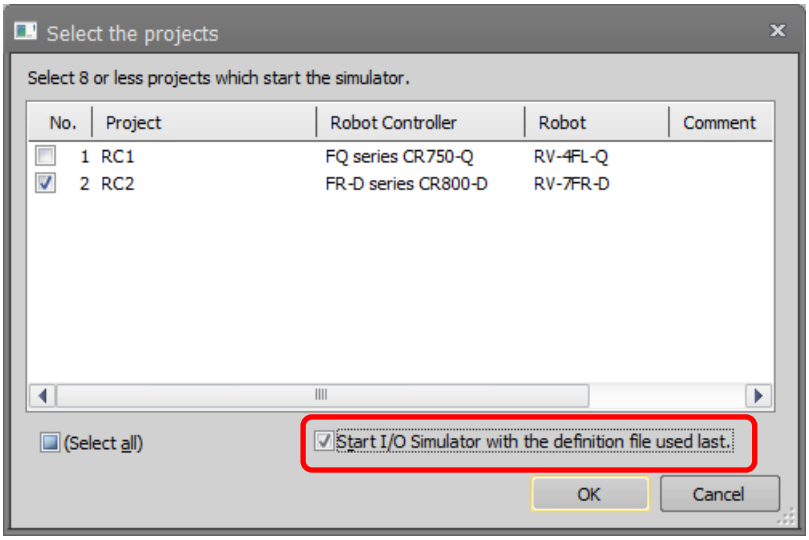


Figure 23-14 Start robot simulator and I/O simulator simultaneously

During the simulation, the signal values of the robots can be checked on the signal monitors. For details, refer to **"14.3.1 General signal"** and **"14.3.4 Register (CC-Link/**EtherCAT)**"**. To check the signal value of GX Simulator2, 3 devices, use GX Works2, 3.

23.5. I/O Simulator Connection Status

When the "Simulator setting" screen is opened when the I/O simulator is started up, the connection status to the robot simulator and GX Simulator2/3 that are to be connected to the I/O simulator can be checked.

When each of the [Setting side], [Condition1/Source] and [Condition2] cells in the signal connection list are displayed in red, this means that the simulator displayed in those cells is not yet connected.
When there are simulators that are not yet connected, check the following:

Is the simulator to be connected started up?
In the case of GX Simulator2/3, is the startup order correct?

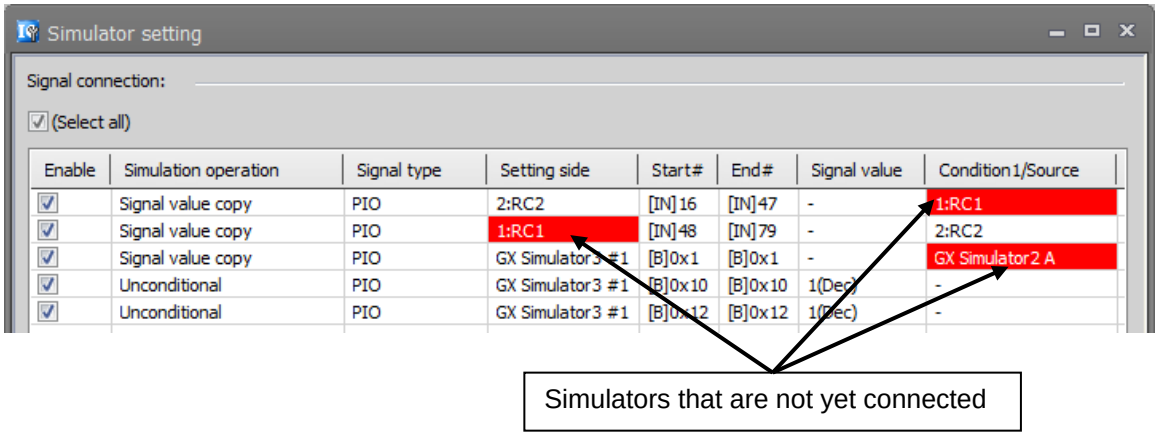


Figure 23-15 I/O Simulator Connection Status

23.6. Stopping I/O simulator

To exit the I/O simulator, click the [Online] tab -> [I/O Simulator] group [Exit] button on the ribbon. Or, click the I/O simulator icon on the task tray, and select [Exit] in the menu that is displayed.

Figure 23-16 Stopping I/O simulator

When the simulation stops and the connection status is offline, I/O simulator stops simultaneously.

24. Document out

You can create and save to the HTML document of information of the connected robot controller and the offline settings.

24.1. Start-up of the document creation screen

There are two methods of starting document out screen.

[Method (1)] Starting from the project tree

Select the Offline, Online or Simulation of the targeted project in the project tree and click the right mouse button. The context menu will open, so click [Document Out]. Document Out dialog is displayed.

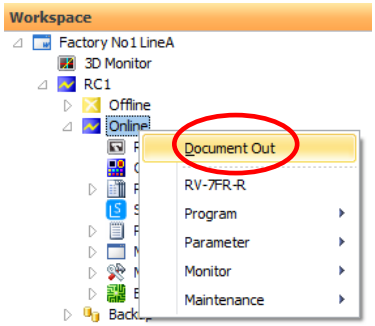


Figure 24-1 Starting Document Out Screen from the project tree

[Method (2)] Starting from the ribbon

Select the item in the Offline, Online or Simulation of the targeted project from the project tree. Click the [Document Out] button in [Home] tab -> [Document] group from the ribbon, then Document Out dialog is displayed.

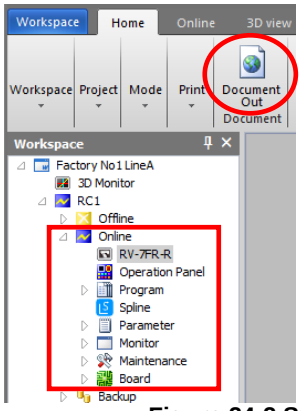


Figure 24-2 Starting Document Out Screen from the ribbon

Caution

During editing the parameter or the robot program

During displaying the parameter list screen or the program edit screen in the project, you can not use this function.

After closing the parameter list screen and the program edit screen, please use this function.

About the displayed position of 3D monitor

When you output the image of the 3D monitor to the document, please move the 3D monitor to the position to see (Even the part is possible). If the 3D monitor is completely hidden by other windows (project tree, properties window or others), correct image can not be output.

24.2. Selection of content to be output to document

By checking each checkboxes in the document out screen, you can select contents to be output to the document.

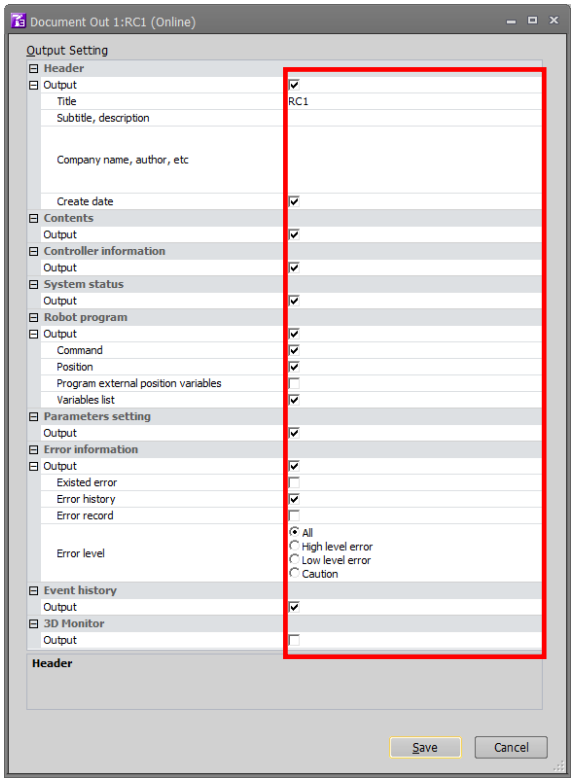


Figure 24-3 Select contents to be output to the documen

Table 24-1 Content of output to document

Item	Content of output to document	Reference of output content
Header	Output the entered title, subtitle, company name etc. as header page on the document.	
Contents	Output links to each page of "Controller information" to "3D Monitor" as contents page on the document.	
Controller information	· Output the model information (model name, robot controller software version and etc.) of connected robot controller and robots on the document. · When offline, Output information of the project inside the PC to the document.	3.2
System status	· Output the each status of connected robot controller and robots to the document. · When offline, cannot output.	14
Robot program	· Output all programs in the connected robot controller to the document. · When offline, Output all programs in the project inside the PC to the document.	11.2 11.13.1
Parameters setting	Output the list of changed parameters to the document.	13.1.3
Error information	· Output the currently occurring errors or the histories/records of error that have occurred so far to the document. · When offline, cannot output.	14.2.6
Event history	· Output the list of events that have occurred so far in the connected robot controller to the document. · When offline, cannot output.	14.2.5
3D Monitor	Output the images in which the viewpoint of the 3D monitor is switched to X-Y plane, X-Z plane and others to the document.	21.3.3

RC1

XXXX Project

XXXX Corp.

XXXXXXXX

2017/03/21

Contents

1.Controller information
2.System status
3.Robot program
4.Parameters setting
5.Error information
6.Event history
7.3D Monitor

1.Controller information

Attribute	Data
Controller Type	CR8xx-R
Controller Version	Ver.A0V
Serial number	AR0703001
Robot #1	RV-7FR-R
Serial number	
Program count	4
Empty volume	104857600

2.System status

Robot controller

Item	Value
Power ON time	0 hours
Operation time	0 hours
Temperature[deg C]	12.35
Override	100

Slot run state

No.	Status	Program	Robot	Conditions	Mode	Priority
1	Waiting	1		START	REP	1
2	Program selection possible			START	REP	1

========== Omit ==========

Robot No: 1:RV-7FR-R

Item	Value
Servo ON time	0 hours
Tool No	0

XYZ

Coordinate axis	Current	Destination
X	-347.640	-347.640
Y	-126.530	-126.530
Z	705.130	705.130
A	180.000	180.000
B	0.020	0.020
C	20.000	20.000
FLG1	R,A,N	R,A,N
FLG2	1	1

Joint

Axis	Current	Destination
J1	200.000	200.000

========== Omit ==========

3.Robot program

Name	Controller Version	Serial number	Robot #1	Serial number	Program count	Empty volume
3DVS	Ver.A0V	AR0703001	RV-7FR-R		4	104857600
CL3D	Ver.A0V	AR0703001	RV-7FR-R		4	104857600
JB3D	Ver.A0V	AR0703001	RV-7FR-R		4	104857600

3DVS

Line	Command
1	MX00SW=1
2	MX02WK=1
3	Tool PG_Tool

========== Omit ==========

480	S99Recv
481	MY99Recv%=1
482	Return 0

Position data(XYZ)

Name	X	Y	Z	A	B	C	L1	L2	FLG1	FLG2
P01Pick	428.740	111.760	48.430	-179.980	0.000	-15.000	0.000	0.000	R,A,N	0
P01Tmp	428.970	114.550	339.430	0.000	0.000	-105.000	0.000	0.000	R,A,N	0

========== Omit ==========

PG_RECG(4)	390.370	-74.330	447.640	180.000	-0.030	-180.000	A	A	R,A,N	0

Variable list

Name	Type	Comment
PG_CLB(8)	Dim	
PG_RECG(4)	Dim	

CL3D

Line	Command
1	
2	[4D-3DVS1-PKG]

========== Omit ==========

4.Parameters setting

Robot No: 0:Common

Parameter	Explanation	Pos.	Data
LNG	Language(JPN:Japanese,ENG:English)	[1]	ENG
SLT1	Program name,Mode,Condition,Priority	[1]	1
		[2]	REP
		[3]	START
		[4]	1

5.Error information

========== Omit ==========

Existed error

Date	Time	No.	Error message	Cause	Recovery	Level	Program	Line	Robot#	Detail
17-03-21	08:47:54	2602	DSTN pos. exceeds the limit	Destination position data exceeds the limit	Change the position data	Low level error	1	2	1	260200100

Error history

Error level: All

Tabulation information(Start date and time): 17-02-28 18:33:38

Count of registered items: 7

Date	Time	No.	Error message	Cause	Recovery	Level	Program	Line	Robot#	Detail
17-03-21	08:47:54	2602	DSTN pos. exceeds the limit	Destination position data exceeds the limit	Change the position data	Low level error	1	2	1	260200100
17-03-21	08:47:46	2000	The servo is OFF	The servo is OFF so the robot will not operate	Turn the servo ON and then restart	Low level error	1	1	0	200000000

========== Omit ==========

Error record

Error level: All

Tabulation information(Start date and time): 17-02-28 18:33:38

Count of registered items: 2

No.	Error message	Level	Detail	Frequency	Last date
2000	The servo is OFF	Low level error	200000000	5	17-03-21 08:47:46
2602	DSTN pos. exceeds the limit	Low level error	260200100	1	17-03-21 08:43:44

Error #: 200000000

Date	Program	Line	Robot#
17-03-21 08:47:46	1	1	0
17-03-21 08:43:20	1	1	0
17-03-16 18:22:40	TESTPRG	1	0
17-03-15 16:57:36	TESTPRG	1	0
17-03-07 14:23:28	sysalgn	10	0

Error #: 260200100

Date	Program	Line	Robot#
17-03-21 08:43:44	1	2	1

6.Event history

Items: 35

Date	Event	Note	Device
17-03-21 09:01:56	Program open	JB3D	PC(LAN)
17-03-21 09:01:56	Program open	CL3D	PC(LAN)
17-03-21 09:01:56	Program open	3DVS	PC(LAN)
17-03-21 09:01:54	Program open	1	PC(LAN)
17-03-21 09:01:54	Operation disable		PC(LAN)

========== Omit ==========

7.3D Monitor

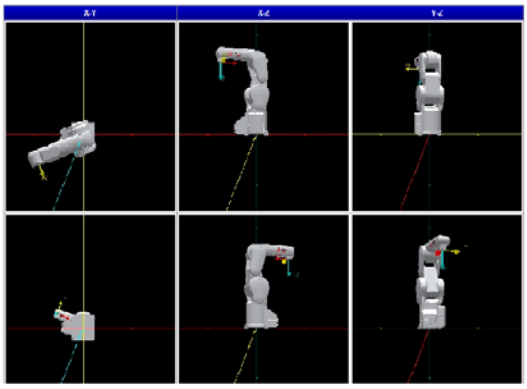


Figure 24-4 Document output example

24.3. Save document

By click the [Save] button in the document out screen, “Folder of the document to create” dialog. In this dialog, enter or select the folder name for create the document, and click the [Save] button, then the document creation will start to the selected folder.
When the creation of the document is completed, the created HTML document is displayed in Windows default web browser.

25. MELFA-Works

You can be used the function of 3D robot simulator “MELFA-Works”.
This function can only be used with the Pro edition.

When "RT ToolBox 3" Pro version is started and set to simulation mode, the item of "MELFA - Works" is displayed in the project tree. Clicking [MELFA - Works] -> [Start] in the project tree starts the MELFA - Works function as an add - in for Solid Works.

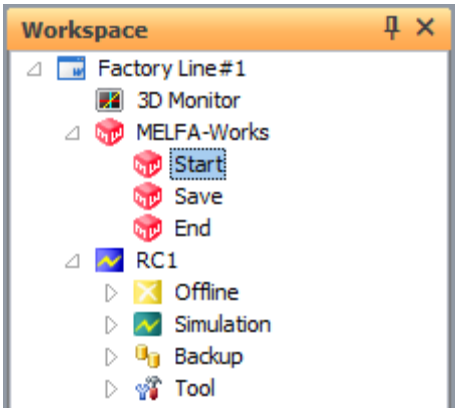


Figure 25-1 Start of MELFA-Works function

For details, refer to the **“MELFA-Works Instruction Manual".**

26. MelfaRXM.ocx Communications Middleware Setup

26.1. Summary

MelfaRXM.ocx is an ActiveX controller that communicates with CR800/750/700/500 series robot controllers. MELFARXM.ocx can only be used if you have purchased the standard edition of RT ToolBox3. (Customers who have purchased the mini edition cannot install MELFARXM.ocx.)
When using only the RT ToolBox3 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 ToolBox3 standard edition DVD-ROM.
> The means for communicating with CR800/750/700 series robot controllers are RS-232(CRnD-700), Ethernet and USB(CR800-D/CR750-D/CRnD-700).
> To communicate with CRnQ_R and GOT, the RT ToolBox3 must be installed.

26.2. DVD-ROM Contents

The contents of the "RT ToolBox3" (standard edition) DVD-ROM are as follows.

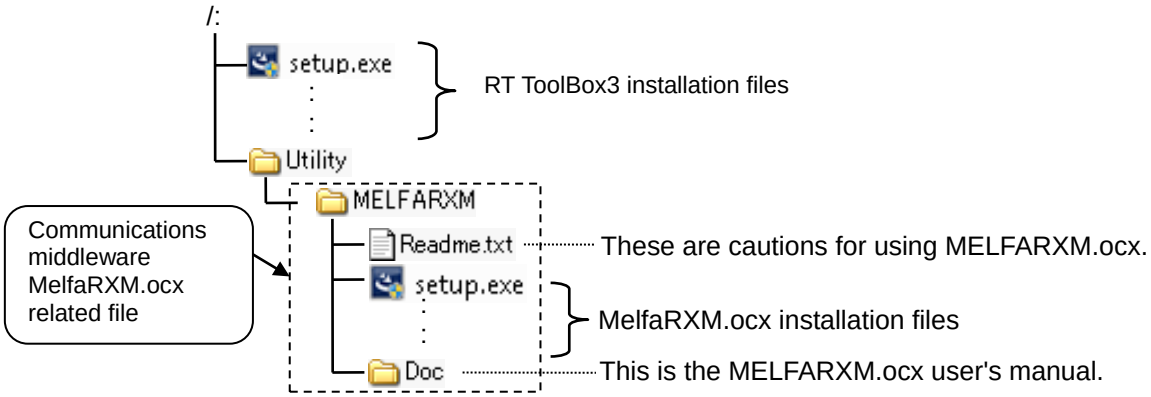


Figure 26-1 DVD-ROM Contents

For details on MelfaRXM.ocx usage methods, refer to the user's manual on the DVD-ROM.

26.3. User's Manual Reading Guide

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

D:/Utility/MELFARXM/Doc/MelfaRXME.pdf

* Example for when the DVD-ROM drive is "D:"

(1) Preparation for viewing

1) Prepare computer

Prepare a computer that has a DVD-ROM drive.

2) Preparation of viewing software

Adobe Reader is required to read the User's Manual.

If neither Acrobat Reader (nor Adobe Reader) is installed, download it from the Adobe Systems web site. (As of November 2019)

URL: http://www.adobe.com

(2) Viewing methods

1) Starting from Windows Explorer

Start Windows Explorer, then select the file. Acrobat Reader (or Adobe Reader) will start and the user's manual displayed.

2) Starting directly from Acrobat Reader (or Adobe Reader)

Start Acrobat Reader (or Adobe Reader), then select the file to display the user's manual.

26.4. Installation

Perform installation according to the following procedure

(1) Insert the program DVD-ROM into the DVD-ROM drive of your personal computer. Setup of “RT ToolBox3” will start automatically. Click “cancel”.

(2) Select [Run] from the [Start] button.

Windows Vista Previously used:

From [Start] button, select [Specify file name].

Figure 26-2 Selecting [Run]

When using Windows 7 or later:

Press + R on the keyboard.

(3) Check the drive name of the DVD-ROM drive. Enter the following and click the [OK] button.

"Drive name":/Utility/MelfaRXM/Setup.exe

(If the DVD-ROM drive is "D", enter "D:/Utility/MelfaRXM/Setup.exe")

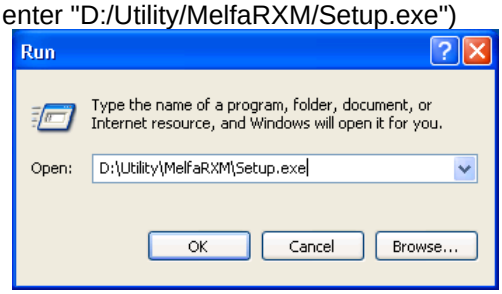


Figure 26-3 [Run] Screen

(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 ToolBox3". "MelfaRXM.ocx" can be installed with the Product ID of the standard version, but cannot be installed with the Mini version.

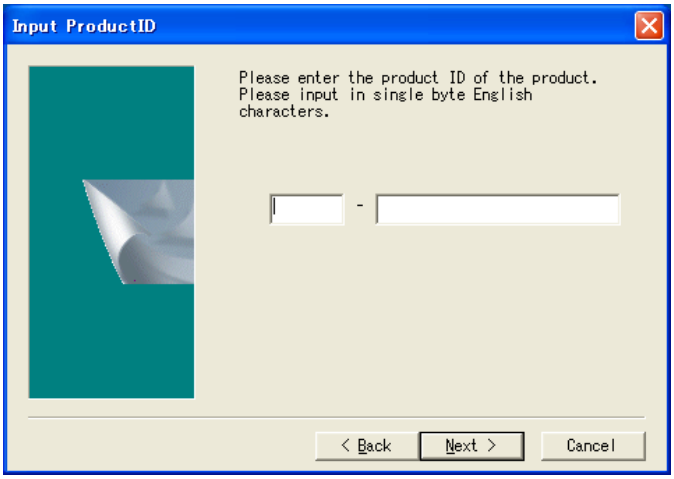


Figure 26-4 Input Product ID

The product is installed as in **"Table 26-1 Files to be Installed".**

Table 26-1 Files to be Installed

No.	Description	Install destination
1	MelfaRXM.ocx	These files are installed under the system folder. For example: 32bitOS : \Windows\System32 64bitOS : \Windows\SysWOW64
2	communication DLLs	
3	RoboCom.exe (communication server2)	A folder specified during install operation (Normally, C:/ is used.) [MelfaRXM_Dev] ├─ ReadMe.txt …… text file which indicates notes ├─ [RoboCom] …… folder of communication server ├─ [Doc] …… folder of Instruction Manual ├─ [Sample] …… folder of sample programs │ ├─[BCB] …… Borland C++ Builder (5.0) │ ├─[CS] …… Visual C# (Visual Studio 2010) │ ├─[VB] …… Visual Basic (6.0) │ └─[VC++] …… Visual C++ (6.0) │ [VB.NET] …… Visual Basic .NET 2003 │ (Operation confirmed only in the Japanese version.) ├─ [Redist] │ └─[Installer] …… folder of system files Installer (for redistribution)
4	Instruction Manual (this document)	
5	Sample programs	
6	Redistribution files	
7	Information files for USB driver (for CR800-D/CR750-D/CRnD-700)	

27. Appendix

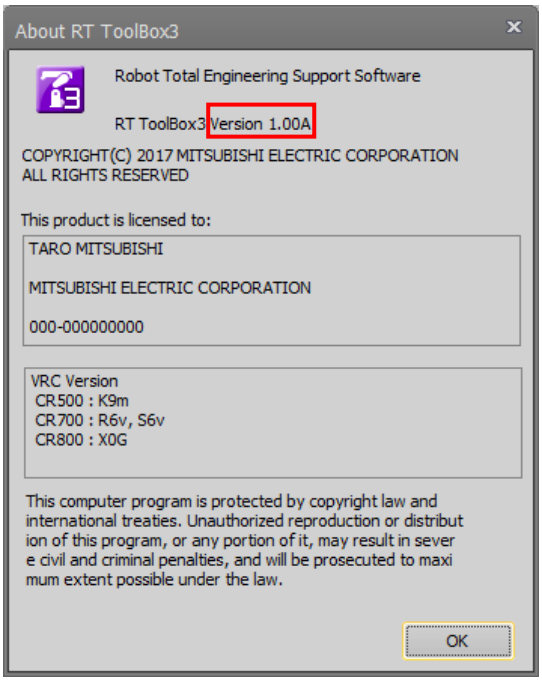
27.1. Q&A

This explains frequently asked questions in a Q&A format.

1. Version

(1) Where is the software version information?

It is printed on the surface of your DVD-ROM for this software.
You can also check the version information on the screen displayed by clicking the [Help] tab -> [Version Information] button on the ribbon of this software.



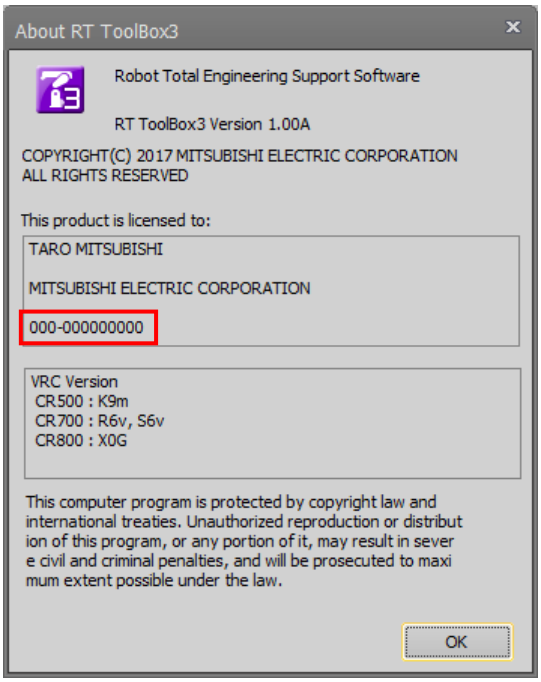
(2) Where is the robot controller software version information displayed?

When this software is connected, you can check in the [Online] properties in the project tree.
The version information is also displayed on the title screen for the optional teaching box.

2. 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.
After installing this software, you can check the product ID on the screen displayed by clicking the [Help] tab -> [Version Information] button on the ribbon.



(2) I checked the version information but the product ID is not displayed.

Is "No Product ID!" displayed?
If "No Product ID!" is displayed in the version information, the software installation may have failed. Unfortunately, you need to install the software again.

3. Communications (general)

(1) What are the means for communication with the robot controller?

With a CR800/750/700 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 **"9.1 Robots Connected and Types of Communication"**.

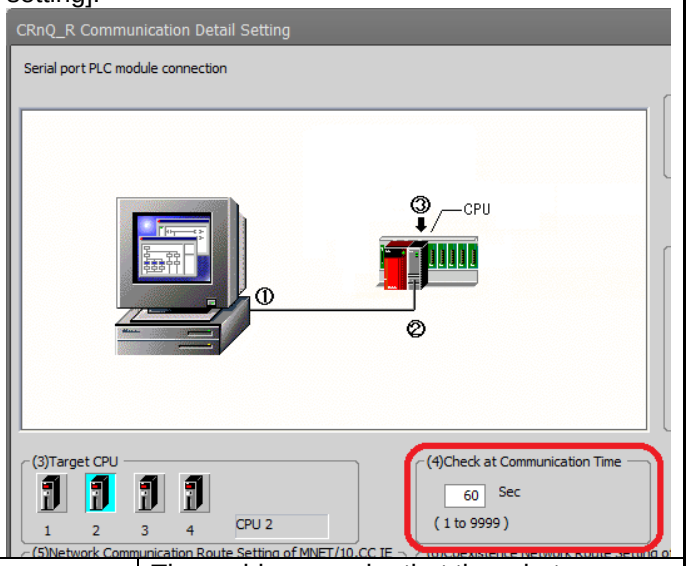
(2) Where are the communications settings made?

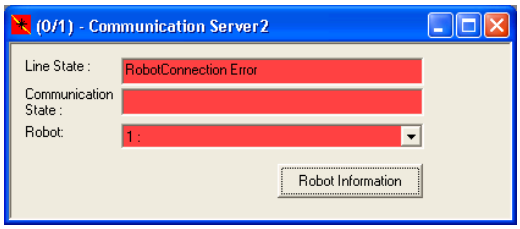
They are made on the project edit screen. For details, see **"9.2 Connection Settings"**.
For the robot controller side, change the communications parameters with the optional teaching box. For details, see **"Detailed explanations of functions and operations"** in the robot controller's user's manual.
[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 cannot communicate with the robot controller.

If you cannot communicate with the robot controller, check the following.
Also see **"4 Communications (RS-232)"**, **"5 Communication (Ethernet)"**, and **"6 Communication (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 **"8.18 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 Communication Server 2 running? Communication Server 2 is started automatically when this software is started. Communication Server 2 is started as an icon.	If you closed Communication Server 2 by mistake, close this software, then restart it.
Are you connected to a robot controller other than the CR800/750/700/500 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 by the 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 **"9.2 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
Is there a error occurred in the PLC CPU?	Extend the time of [(4)Check at Communication Time] on the [Detail setting] screen of [CRnQ_R communication setting]. 

What color is Communication Server 2? Return Communication 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 Communication 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 Communication Server 2 is green (overall)"**.
	Yellow	Check the items in **"(6) When Communication Server 2 is yellow (overall)"**.
	Light blue	Check the items in **"(7) When Communication Server 2 is in light blue or blue (overall)".**
	Blue	

(4) When Communication Server 2 is red (overall)

When Communication Server 2 is displayed in 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 by CRnQ_R communication, is the target CPU set correctly?	Set the target CPU correctly. For details, see **"9.2.5 CRnQ_R Communication Settings"**.

(5) When Communication Server 2 is green (overall)

When Communication Server 2 is displayed in 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 **"9.2 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 user's manual.

(6) When Communication Server 2 is yellow (overall)

When Communication Server 2 is displayed in yellow, check the following.

Check item or cause	Solution
Is this software in the "Online" status?	This software initially starts in the "Offline" status. When you put it into "Online" status, it communicates with the robot controller. For details, see **"8.18 Offline/Online/Simulation"**.

(7) When Communication Server 2 is in 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 screensaver running on the computer?	Close the computer's screensaver.
Is the computer's hard disk is power save mode?	Close computer hard disk power save mode setting.

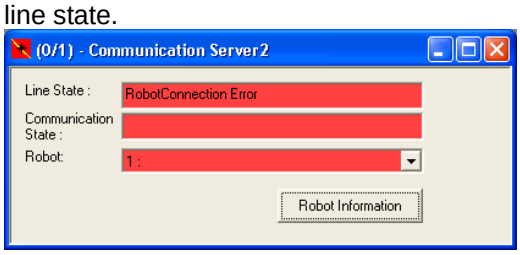
(8) Communication with the robot controller is cut off mid-way through.

If you cannot 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 communication? Or is any permanent resident software running that uses communication?	A computer communication port cannot be opened for two applications, so either close the other application or change the port that this software uses.

4. Communications (RS-232)

If you cannot communicate with the robot controller using RS-232, check the following.
Also, see **"Communication (general)"**.

Check item or cause	Solution	
What color is Communication Server 2? Return Communication 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 Communication 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 Communication Server 2 is green (RS-232)"**.
	Yellow	See **"3Communications (general)"**.
	Light blue	Check the items in **"(3) When Communication Server 2 is light blue or blue. (RS-232)"**.
	Blue	

(1) When Communication Server 2 is red (RS-232)

If Communication Server 2 is displayed in red with communication with the robot controller set to RS-232, check the following.

Check item or cause	Solution
Is Communication Server 2 set for the correct communication 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 communication settings to that port.
Is some other product running that uses the communication port? Or is any permanent resident software running that uses the communication port?	A computer communication port cannot 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 communication method set to TCP/IP or USB?	Change the communication method to RS-232.

(2) When Communication 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 communication settings in this software and on the robot controller match? In particular, check that the protocol settings match.	The communication 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 Communication Server 2 is light blue or blue. (RS-232)

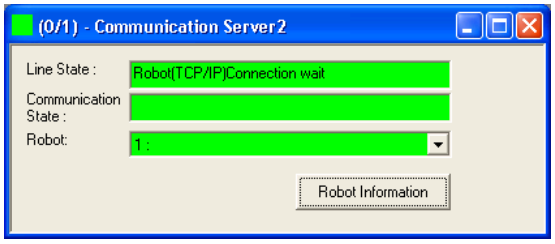
If Communication Server 2 is displayed in light blue with communication with the robot controller set to RS-232, check the following.

Check item or cause	Solution
Is anti-virus software running virus checks on RS-232 communication?	Switch off virus checking for RS-232.
When a computer starts up, sometimes this generates noise. This noise can cause a communication error in the robot controller.	Either start the computer before connecting the cable or start the computer before starting the robot controller.

5. Communication (Ethernet)

[Note] When using Ethernet with a CRn-500 series robot controller, the robot controller must have the optional Ethernet card.

If you cannot communicate with the robot controller using Ethernet, check the following.
Also, see **"3. Communications (general)"**.

Check item or cause	Solution	
What color is Communication Server 2? Return Communication 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 Communication Server 2 is red (Ethernet)"**.
	Green	The problem may be that the robot controller and the computer have different communication settings. See the items in **"(2) When Communication Server 2 is green (Ethernet)"**.
	Yellow	See **"3 Communications (general)"**.
	Light blue Blue	See **"3 Communications (general)"**.

(1) When Communication Server 2 is red (Ethernet)

If Communication Server 2 is displayed red with communication with the robot controller set to Ethernet, check the following.

Check item or cause	Solution
In the communication settings for this software, is the communication method set to USB or RS-232?	Change the communication method to TCP/IP.

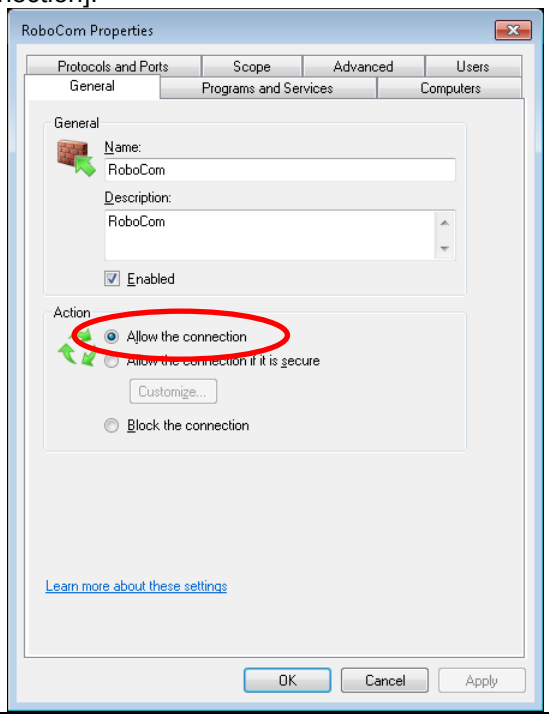
(2) When Communication Server 2 is green (Ethernet)

If Communication Server 2 is displayed green with communication 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 communication settings?	Correctly set the IP address of the robot controller connected to.

(3) The communication time is long when using a backup etc.

In the Windows Firewall settings, if inbound communication of Communication Server 2 (RoboCom.exe) is blocked, change to allow the connection.

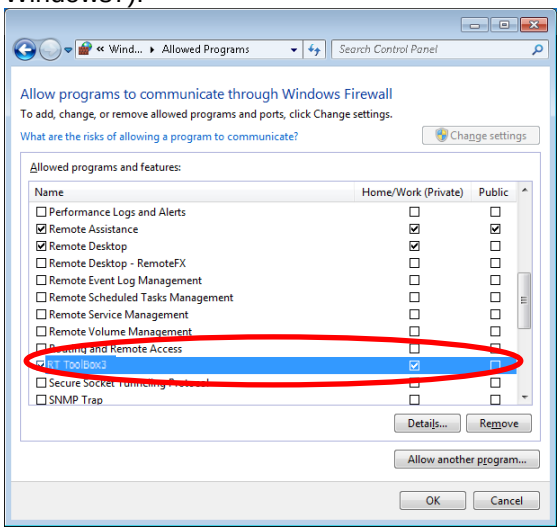
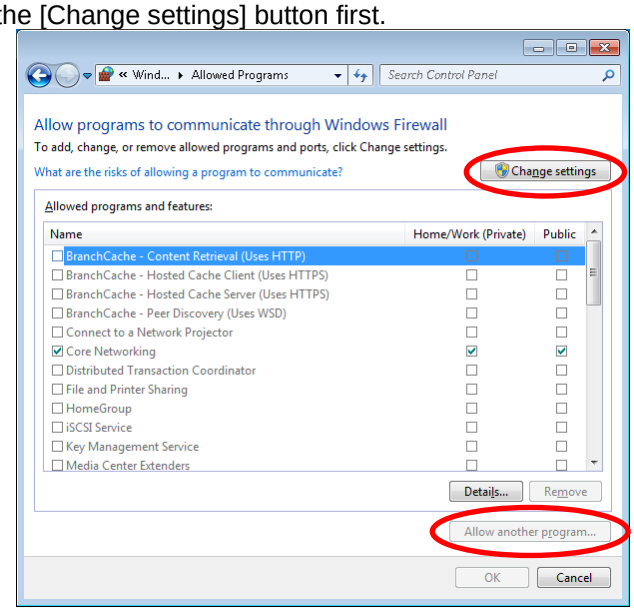
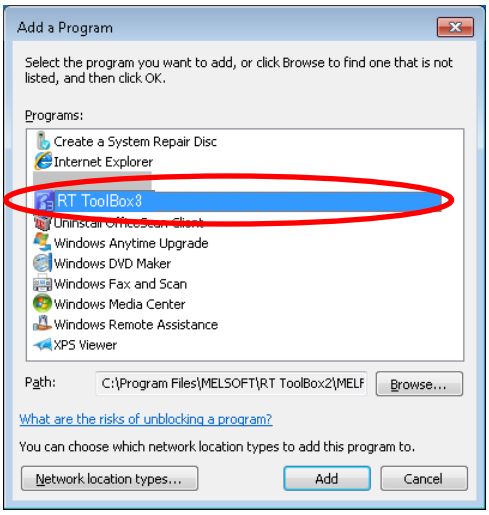
Check item or cause	Solution
If there are one or more “RoboCom” lines in the [Inbound Rules] of the [Windows Firewall] - [Advanced settings] screen, is [Allow the connection] selected for all these lines?	If there are “RoboCom” lines with [Block the connection] selected, change them to [Allow the connection]. 

(4) Spline files cannot be saved.

See **"(3) The communication time is long when using a backup etc.“.**

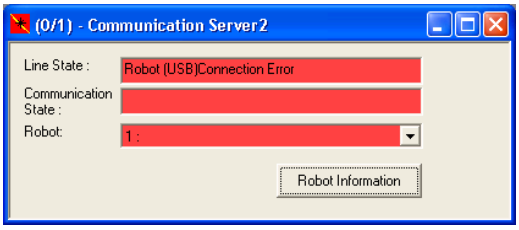
(5) The Oscillograph cannot be used when the communication method is set to High speed.

If you see the message "It can not communicate with the controller." after clicking the [Start Record] button, please change so that that RT ToolBox3 (MELFA_RT.exe) is allowed to receive in the Windows Firewall settings.

Check item or cause	Solution
Show the following screen by selecting [Control panel] -> [System and Security] -> [Windows Firewall] -> [Allow a program or feature through Windows Firewall] (for Windows7).  Is [RT ToolBox3] in the [Allowed programs and features] list is the communication range of the use environment allowed?	If [RT ToolBox3] is not in the [Allowed programs and features] list, click the [Allow another program] button. If the [Allow another program] button is disabled, click the [Change settings] button first.  Select and add [RT ToolBox3] on the [Add a program] screen.  Set the check boxes ON according to the use environment of [Home/Work (Private)] and [Public].

6. Communication (USB)

If you cannot communicate with the robot controller using USB, check the following.
Also, see "Communications (general)".

Check item or cause	Solution	
What color is Communication Server 2? Return Communication 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 Communication Server 2 is red (RS-232)"**.
	Green	The problem may be that the robot controller and the computer have different communications settings. See **"3 Communications (general)"**.
	Yellow	See **"3 Communications (general)"**.
	Light blue	Check the items in **"(2) When Communication Server 2 is light blue or blue (USB)".**
	Blue	

(1) When Communication Server 2 is red (USB)

If Communication Server 2 is displayed in red with communication with the robot controller set to USB, check the following.

Check item or cause	Solution
In the communication settings for this software, is the communications method set to TCP/IP or RS-232	Change the communication 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 (CR800-D/CR750-D/CRnD-700 series robot controller)** installation**"**, **"1.5.4 CRnQ_R communication USB driver installation"** and **"1.5.5 CRnQ_R Communication USB driver for GOT transparent function / GOT communication installation".**

(2) When Communication Server 2 is light blue or blue (USB)

With communications with the robot set to USB, if Communication Server 2 is displayed in light blue or blue, but communication is still not possible, check the following.

Check item or cause	Solution
Is the robot controller power supply Off?	When connected by USB in CRnQ communication, if the robot controller power goes Off after a normal connection was established, the display remains light blue. Switch to Offline in this software, switch the robot controller power On, and then go back online.
Is the communications cable connected correctly?	When connected by USB in CRnQ communications, if the communications cable is disconnected after a normal connection was established, the display remains light blue. Switch to Offline in this software, connect the communications cable, and then go back online.

7. Robot program

(1) Did you write the program with Movemaster commands?

The robots that can use Movemaster commands are restricted. Check your robot's standard specifications to see whether it supports Movemaster commands. If your robot supports Movemaster commands, change the language used with **"10 Robot Programming Language Setting"** in this document

(2) Is it possible to use programs as is that have been used with an E/EN series robot controller?

Position data prepared with MELFA-BASIC III (for E/EN series) cannot be used as is. Convert the position data with the "Program conversion" function. For details, see **"11.14 Program Conversion"**.
Also, some commands have changed. For details, see **"Detailed explanations of functions and operations"** in the robot controller 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 cannot be used as is. Write new programs.

8. 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/V/VI 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 **"10 Robot Programming Language Setting"**.
Does the version of this software support your robot controller? For some robot functions, new commands have been added.	Purchase a version that supports your robot controller. (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?

This is done on the project editing screen. For details, see **"10 Robot Programming 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 by 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 by the connected robot controller. The robot program language set in the project is enabled when you edit a program offline.

(4) Is it possible to edit or copy a program while it is running?

You can neither edit nor copy a program while it 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 **"11.6.10Changing the font"** in this document.

(7) Is it possible to edit backed up program data with the program editor?

Program data backed up by this software can be opened in editing of programs. Please refer to **"11.2.4 Editing a program in the backup data"** in this manual for details.

(8) "User-defined external variable cannot be used (481000000)" is displayed and the program cannot 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 user's manual.

(9) Is it possible to copy position data to another program?

Yes.
For details, see **"11.7.4.4 Copying position variables"** and **"11.7.4.5 Pasting Position Variables"** in this document.

(10) 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.

9. 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 **"14.2.2 Program monitoring"** in this document.

10. Option card

(1) How should one check what option cards are mounted in a robot controller?

Check from the project tree.
For details, see **"16 Option Card"** in this document.

11. Parameter editing

(1) No parameter list is displayed in the parameter editing tool.

Download the parameter list from the robot controller.
For details, see **"13.1.4 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.

12. Backup/restore

(1) Is it possible to edit backed up program data with the program editor?

Program data backed up by this software can be opened in editing of programs. Please refer to **"11.2.4 Editing a program in the backup data"** in this manual for details.

13. 3D Monitor

(1) It takes time to update the screen display.

It might take time to update the screen display when a lot of data is displayed in the 3D monitor. The time to update the screen display shortens when the displayed data is reduced.
Moreover, depending on the performance of the computer, it may not be possible to display other screens during 3D monitor display.
If you selected the "Detailed model" of the robot, change to "Simple model". The robot model can be changed to detailed model or simple model in the [3D view] tab -> [Robot model] group on the ribbon.

14. 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 the screen settings in Windows XP, click [Control Panel] -> [Display]. Now, from the "Display Properties" window's "Appearance" tab, set the font size with [Font Size].

(2) A program does not print correctly.

In some printer types, tab characters in a program may not print correctly.
Replace them with a space character in program editing, or change the printer settings to use a TrueType font.

(3) RT ToolBox 3 is forcibly terminated when opening the graphic screen of the robot such as project edit / 3D monitor.

Is the Aero function of Windows 7 enabled?
If the Aero function is disabled in Windows 7, please enable the Aero function by the following procedure.
1) Right-click on the desktop and open "Personalize".
2) Select an arbitrary theme from the list of Aero themes.

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27.2.1. Open Source Computer Vision Library

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27.2.2. Diff Template Library

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