IAI
Quality and Innovation

SEL Program Assistant

Instruction Manual Third Edition *ME0396-3A*

IAI Corporation

Please Read Before Use

Thank you for purchasing our product.

This instruction manual explains the handling methods, structure and maintenance of this product, providing the information you need in order to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

Please downloaded the user's manual from our website.
You can download it free of charge. User registration is required for the first time downloading.
URL : www.iai-robot.co.jp/data_dl/CAD_MANUAL/

When using the product, print out of the necessary portions of the relevant manual, or please display it on your computer, tablet terminal, etc. so that you can check it immediately.

After reading the instruction manual, keep it in a convenient place so that whoever is handling the product can refer to it quickly when necessary.

[Important]

- This instruction manual is an original document dedicated for this product.
- This product cannot be used in ways not shown in this instruction manual. IAI shall not be liable for any result whatsoever arising from the use of the product in any other way than what is noted in the manual.
- The information contained in this instruction manual is subject to change without notice for the purpose of product improvement.
- If any issues arise regarding the information contained in this instruction manual, contact our customer center or the nearest sales office.
- Use or reproduction of this instruction manual in full or in part without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the text are registered trademarks.

Contents

Chapter 5 Parameter settings

Chapter 6 Position data

Chapter 7 Axis motion

Chapter 8 Program

Chapter 10 Monitor function

Chapter 11 Simulator

Safety Guide

“Safety Guide” has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it before the operation of this product.

Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation.

No.	Operation Description	Description
1	Model Selection	● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications. 1) Medical equipment used to maintain, control or otherwise affect human life or physical health. 2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility) 3) Important safety parts of machinery (Safety device, etc.) ● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product. ● Do not use it in any of the following environments. 1) Location where there is any inflammable gas, inflammable object or explosive 2) Place with potential exposure to radiation 3) Location with the ambient temperature or relative humidity exceeding the specification range 4) Location where radiant heat is added from direct sunlight or other large heat source 5) Location where condensation occurs due to abrupt temperature changes 6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid) 7) Location exposed to significant amount of dust, salt or iron powder 8) Location subject to direct vibration or impact ● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

No.	Operation Description	Description
2	Transportation	● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped. ● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the instruction manual for each model. ● Do not step or sit on the package. ● Do not put any heavy thing that can deform the package, on it. ● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. ● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment’s capability limit. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. ● Do not get on the load that is hung on a crane. ● Do not leave a load hung up with a crane. ● Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. ● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	(1) Installation of Robot Main Body and Controller, etc. ● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake. ● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. ● When using the product in any of the places specified below, provide a sufficient shield. 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

No.	Operation Description	Description
4	Installation and Start	(2) Cable Wiring ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. ● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. ● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire.
		(3) Grounding ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal (PE) on the AC power cable of the controller and the grounding plate in the control panel, make sure for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment standards and criteria). For detail, follow the description in [an instruction manual of each controller or controller built-in actuator]. ● Conduct functional grounding on the FG terminal for a controller supplying 24V DC or a controller built-in type actuator. In order to minimize influence to mechanical operation given by electromagnetic interference (noise) to an electrical device or insulation failure, conduct grounding on a terminal or a conductor that is electrically stable. The reference impedance should be Type D (Former Class 3, ground resistance 100Ω or less).

No.	Operation Description	Description
4	Installation and Start	(4) Safety Measures ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot’s movable range. When the robot under operation is touched, it may result in death or serious injury. ● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. ● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product. ● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input. ● When the installation or adjustment operation is to be performed, give clear warnings such as “Under Operation; Do not turn ON the power!” etc. Sudden power input may cause an electric shock or injury. ● Take the measure so that the work part is not dropped in power failure or emergency stop. ● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. ● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.
5	Teaching	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.

No.	Operation Description	Description
6	Trial Operation	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation. ● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation. ● Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc. ● Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.
7	Automatic Operation	● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication. ● Make sure to operate automatic operation start from outside of the safety protection fence. ● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.

No.	Operation Description	Description
8	Maintenance and Inspection	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● For the grease for the guide or ball screw, use appropriate grease according to the instruction manual for each model. ● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. ● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation. ● Pay attention not to lose the removed cover or screws, and make sure to put the product back to the original condition after maintenance and inspection works. Use in incomplete condition may cause damage to the product or an injury. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.
9	Modification and Dismantle	● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● When removing the actuator for disposal, pay attention to drop of components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device. ● See Overseas Specifications Compliance Manual to check whether complies if necessary. ● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure the safety.

Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the instruction manual for each model.

Level	Degree of Danger and Damage	Symbol
Danger	This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury.	 Danger
Warning	This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury.	 Warning
Caution	This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage.	 Caution
Notice	This indicates lower possibility for the injury, but should be kept to use this product properly.	 Notice

SEL Assist

Chapter 1

Introduction

1.1 Overview

The SEL Program Assistant (hereinafter described as this software) is a teaching application for program controller. It helps to perform jogging and inching, position data, creating and editing definition data of coordinate system, creating programs and performing trial run.

1.2 Operating Environment

It is recommended to have the following environment in order to use this software.
OS: Windows 10/11* (Version 21H2 or later)
Display Resolution: Full HD (1920×1080)

* Windows is a registered trademark of Microsoft Corporation in the USA.

1.3 Applicable Controllers

This software is applicable for the following controller.

- RSEL
- XSEL2-T/TX

SEL Assist

Chapter 2

Install

2.1 How to Obtain Software

This software is included with XSEL PC software Ver.14.00.00.00 or later.

2.2 How to Install Software

This software should be available to use by installing XSEL PC Software.

SEL Assist

Chapter 3

Launch and Finish

3.1 Launch

3.1.1 Launching from PC Software for XSEL

Select "Utilities" from the menu of PC software for XSEL → "SEL Program Assistant". The software gets started up in Online Mode when a controller is connected and in Offline Mode when no controller connected.
When a safety speed is enabled, the maximum speed of robotic actuator is limited to 250 mm/s.

Caution

- When a safety speed is enabled, the maximum speed of robotic actuator is limited to 250 mm/s.
  Please change from PC software for XSEL to switch between enable/disable of safety speed.
  For details, refer to [XSEL PC Software (RSEL section) 3.3 tool bar].

3.1.2 Launching from Explorer

Open “AssistSEL Program” folder of installation folder on PC software for XSEL, and double click “AssistSELProgram.exe”.

Reference: The default value of installation folder on PC software for XSEL is following. C:\Program Files (x86)\IAI\X_SEL

When the software is launched from Windows Explorer, it starts in Offline Mode.
It transfers in Online Mode when a controller is connected to a simulator.

3.2 Project setting

The following is the explanation how to create a project.
Project setting window is opened when the software is launched.

[Introduction]
Select the display method of the project.

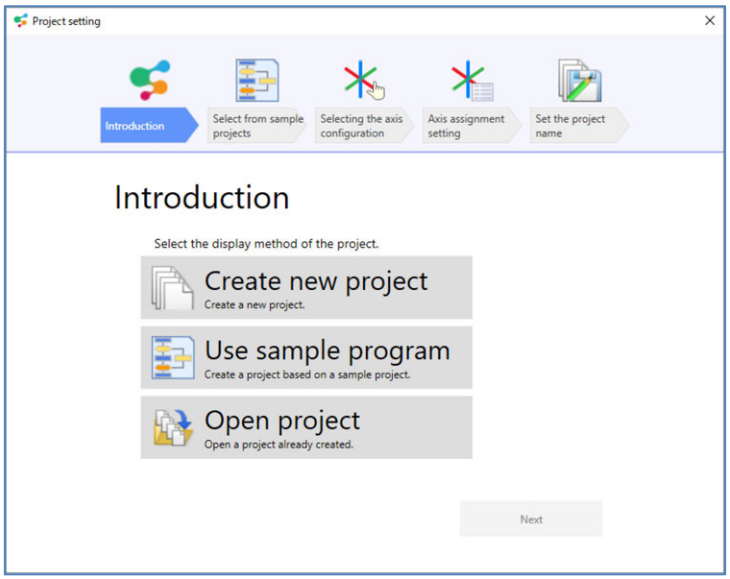


Fig. 3.2- 1 Project setting (Introduction)

Table. 3.2- 1 Project setting menu

Menu	Function
Create new project	Create a new project.
Use sample program	Create a project based on a sample project.
Open project	Open an existing project.

The Project setting window can be shown/hidden in the option.

3.2.1 Create new project

In order to create a new project, Click Create new project in the startup window or click Click Create new project in “File” tab.

“Selecting the axis configuration” is displayed in Offline Mode.
“Axis assignment setting” is displayed in Online Mode.

“Selecting the axis configuration” (Offline mode)
Select an axis configuration.

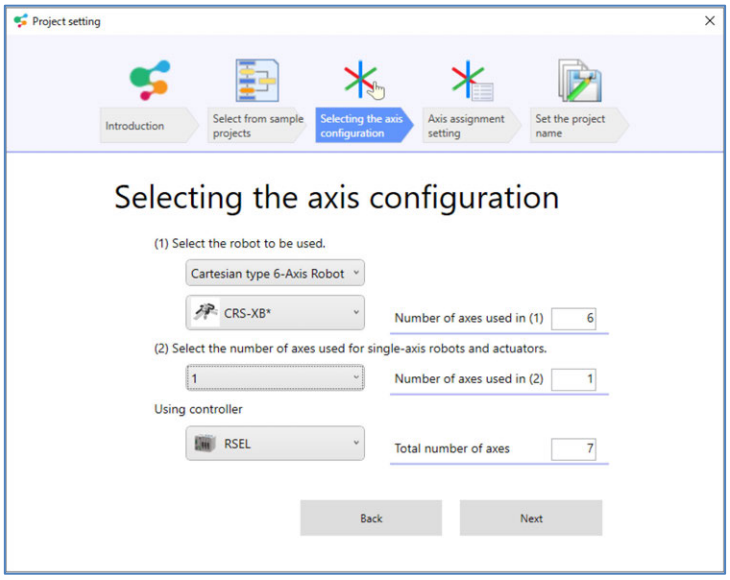


Fig. 3.2- 2 Project setting (Selecting the axis configuration)

Click Next to display the “Axis assignment setting”.

[Axis assignment setting] (Offline mode)
Edit the status of axis assignment.
Type axis name. Double click the cell of target axis in the column of "Axis name (optional)".

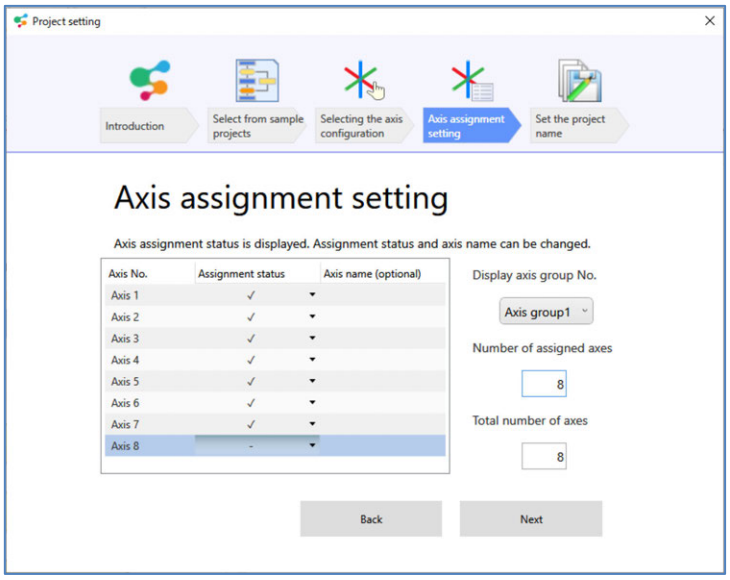


Fig. 3.2- 3 Project setting (Axis assignment setting)

Click Next to display the “Set the project name”.

[Check axis assignment] (Online mode)
Show the axis configuration that is set to the controller.
Type axis name. Double click the cell of target axis in the column of "Axis name (optional)".

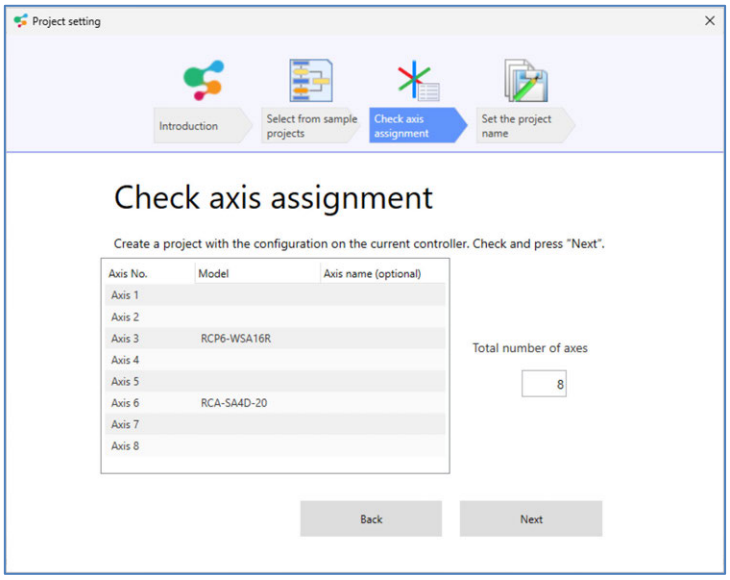


Fig. 3.2- 4 Project setting (Check axis assignment)

Click Next to display the “Set the project name”.

● [Set the project name]

Set the project name and folder path to save (a folder to save the project file).

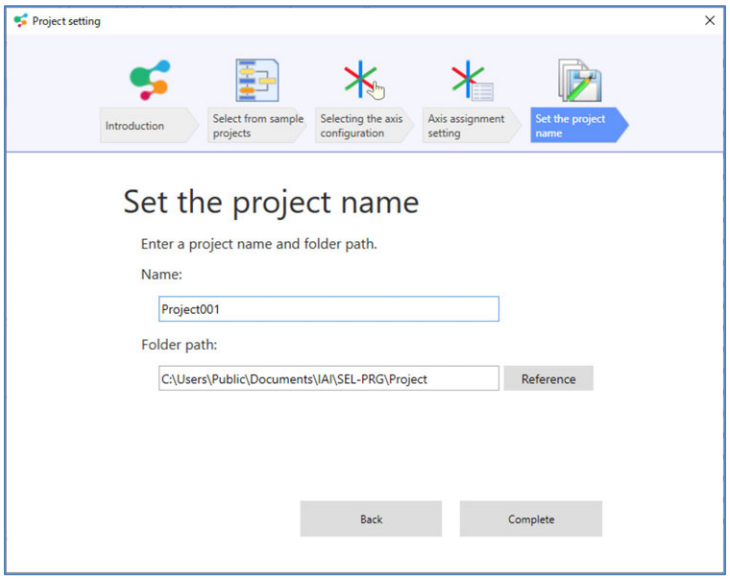


Fig. 3.2- 5 Project setting (Set the project name)

Click Complete after setting the project name and folder path.

Project file is created in the folder path.

SEL Program Assistant window is displayed.

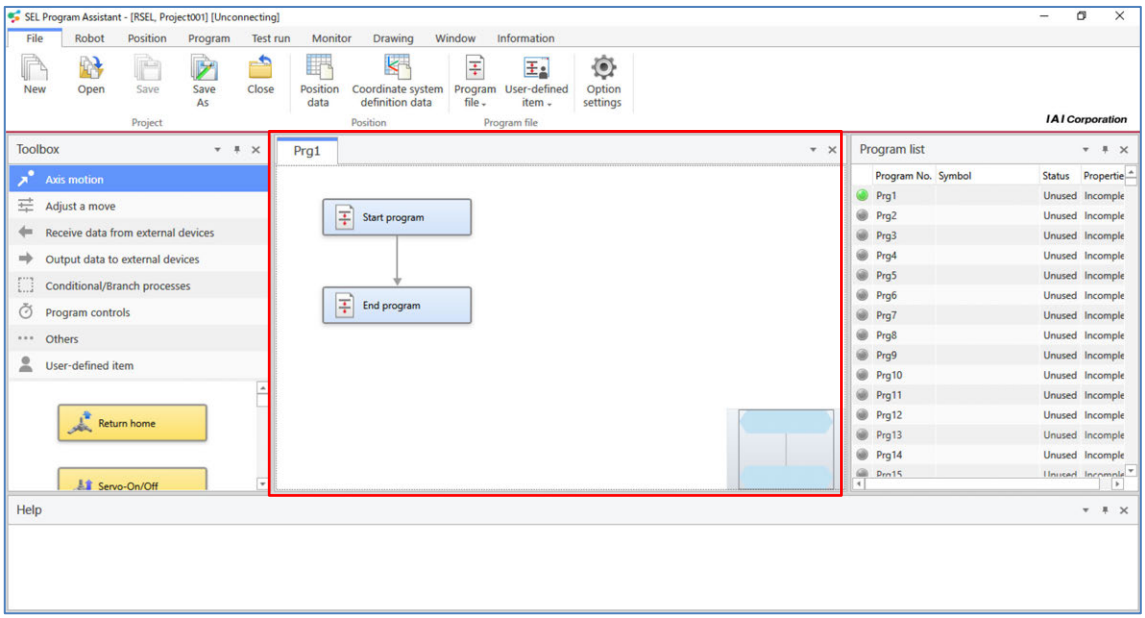


Fig. 3.2- 6 SEL program Assistant (Program Assistant window)

The following message is displayed when you select existing project file and click Complete.
Click Yes, and the file information is overwritten as a new project file.

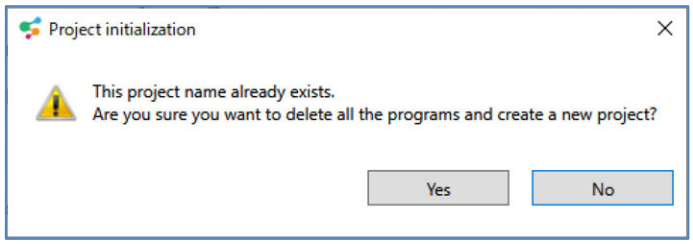


Fig. 3.2- 7 Project initialization

3.2.2 Open project

When you would like to use a project that has already been created, select “Open project” in the “Introduction” or click Open project in “File” tab.

The “Open project” dialog will be displayed.

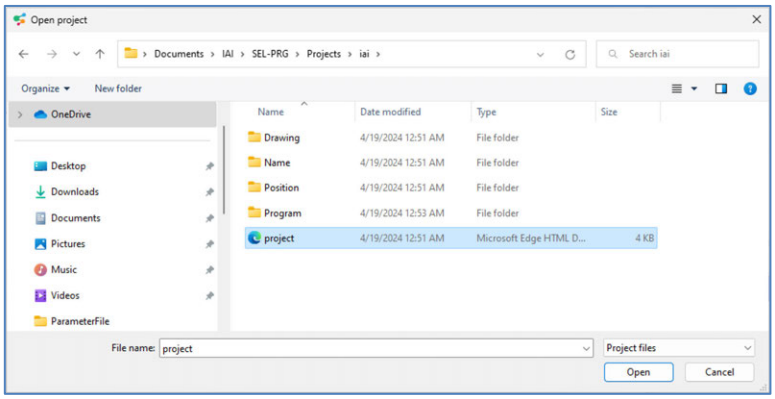


Fig. 3.2- 8 “Open project” dialog

Select the project file to use (project.xml) and click Open.
The project should open.

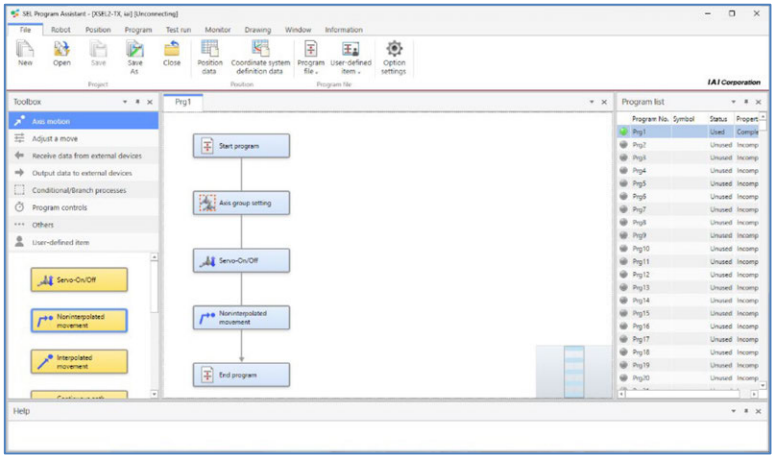


Fig. 3.2- 9 Open project

3.2.3 Use sample

Create a project based on a sample program.
“Sample project selection” is displayed when you select “Use sample program” in “Introduction” page.

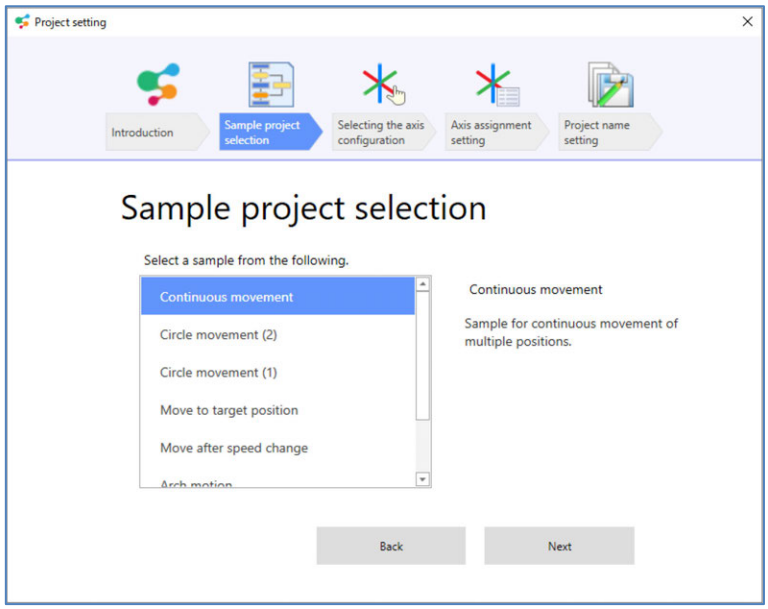


Fig. 3.2- 10 Project setting (Sample project selection)

Select a sample from the list and click Next. “Axis assignment setting” is displayed.
After this, the setting will be followed by “Create new project”.

3.3 Online mode/Offline mode

This software is worked in Online Mode and Offline Mode.
Online mode: The software is connected to a controller (including simulator)
Offline mode: The software is not connected to a controller

The following is the list of functions that are limited in Offline Mode.

Table. 3.3- 1 Functional limitation in Offline Mode.

Functions	Offline mode
Create, Save Project	○
Create Program	○
Create user-defined items	○
Transmit to controller	×
Save SEL Program File	○
Test run, Monitoring Features	×
Position data, Edit definition data of coordinate system	○ Data cannot be transferred to a controller.
Axis movement, Current position	×
Drawing function	○
Data comparison	○ Data cannot be transferred to a controller.

3.4 Finish

Click on [X] on the top right to finish this software.

A dialog is displayed when the following events are detected.

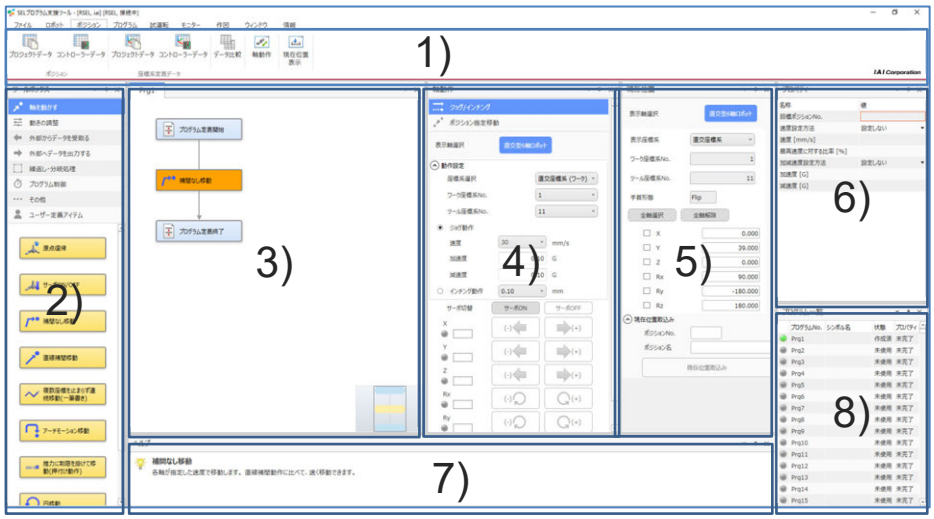
- Project is not saved
- Project is running or paused.
- Project is not seved to the flash ROM.
  When program is running or paused, it cannot be saved to the flash ROM.
- Project is connected to a simulator

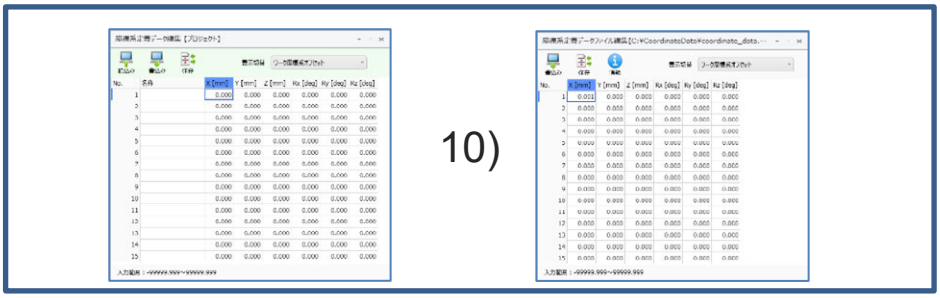
SEL Assist

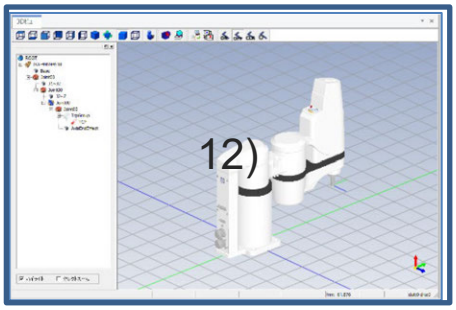
Chapter 4

Screen Configuration

The following is the screen configuration of this software.







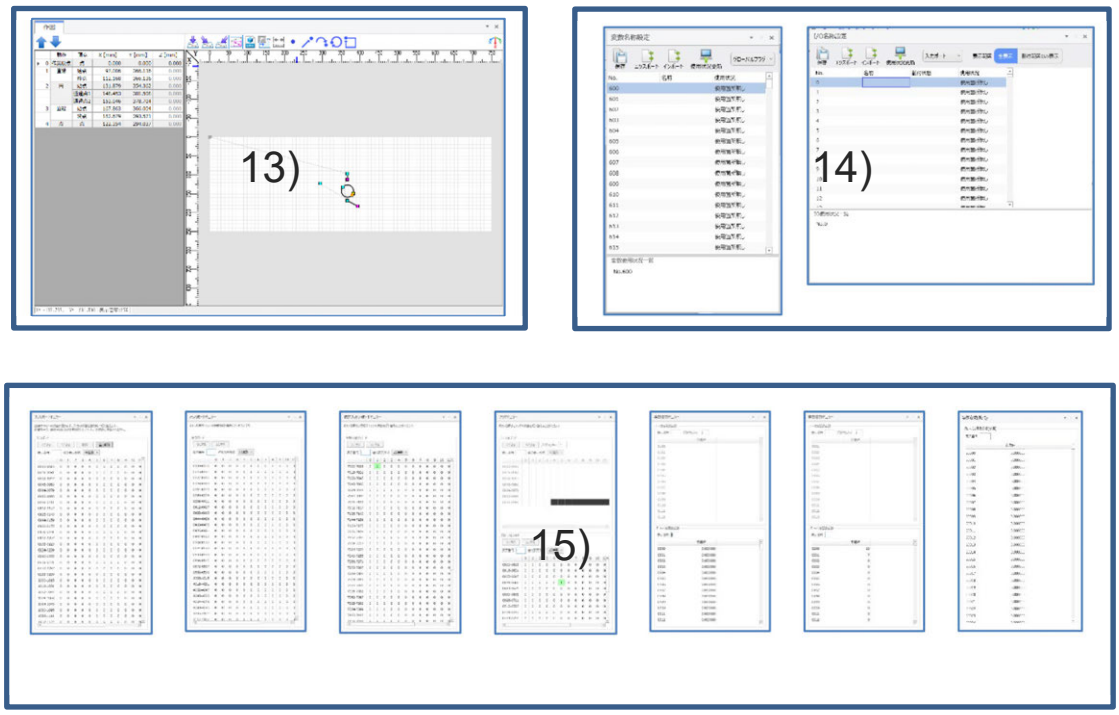


fig. 4.1- 1 SEL Programming support software screen

Table 4.1- 1 Programming support software screen configuration

No.	Name	Referred Source
1)	Ribbon Menu	4.1 Ribbon Menu
2)	Toolbox	4.2 Toolbox
3)	Programming window	4.3 Programming window 8.1 Creating a program
4)	Axis motion window	7.1 Axis motion
5)	Current position window	7.4 Current position display
6)	Properties window	4.4 Properties window 8.1.4 Property Setting
7)	Help window	4.6 Help window
8)	Program list	4.5 Program list
9)	Edit Position data window	6.1 Edit Position data
10)	Edit coordinate system definition data window	6.2 Edit coordinate system definition data
11)	Simple program window	8.3 Simple program function
12)	3D view window	11. Simulator
13)	Drawing window	9. Drawing function
14)	Name setting window	10.5 I/O name setting, 10.6Variable name setting
15)	Monitor window	10. Monitor function

4.1 Ribbon Menu

4.1.1 File tab

In “File” tab, there are buttons allocated to operate files.

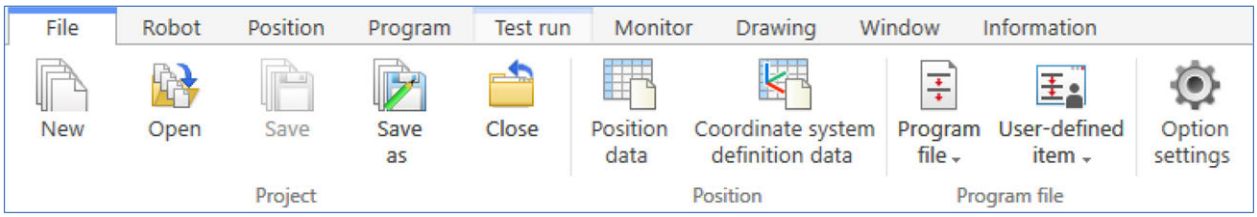


Fig. 4.1- 2 File tab

Table 4.1- 2 File tab configuration

Button name		Function
Project	New	Create a new project.
	Open	Open an existing project file.
	Save	Overwrite a project.
	Save as	Save a project with another file name.
	Close	Close a project that is open.
Position	Position data	Open the position data file.
	Coordinate system definition data	Open the coordinate system definition data file.
Program file	Program file	Export: Outputs the program to a file. Import: Imports the program files into the project.
	User-defined item	Export: Outputs a user-defined item to a file. Import: Imports a user-defined item file into the project.
Option settings		Switch show/hide the domain to save each file and explanations.

4.1.2 Robot tab

In “Robot” tab, there are buttons related to simulator and controller.

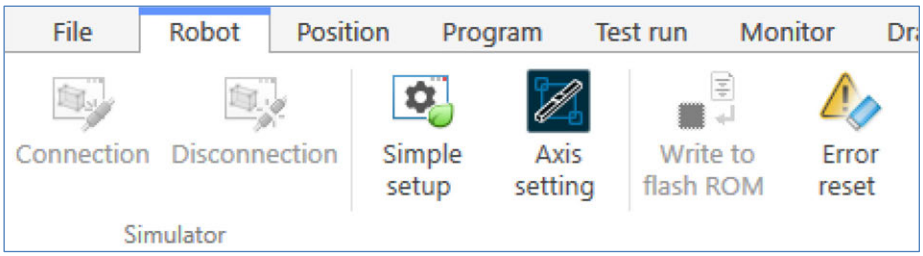


Fig. 4.1- 3 Robot tab

Table. 4.1- 3 Robot tab configuration

Button name		Function
Simulator	Connection	Runs simulator. Displays 3D view.
	Disconnection	Closes simulator. Closes 3D view.
Simple setup		Displays the simplified setup window.
Axis setting		Displays the axis settings window. Sets the axis configuration of controller.
Write to flash ROM		Saves the program that is written in a controller to the flash ROM.
Error reset		Resets the error that is occured by running program.

4.1.3 Position tab

In “Position” tab, there are buttons to edit position data, to control actuator and to perform monitoring.

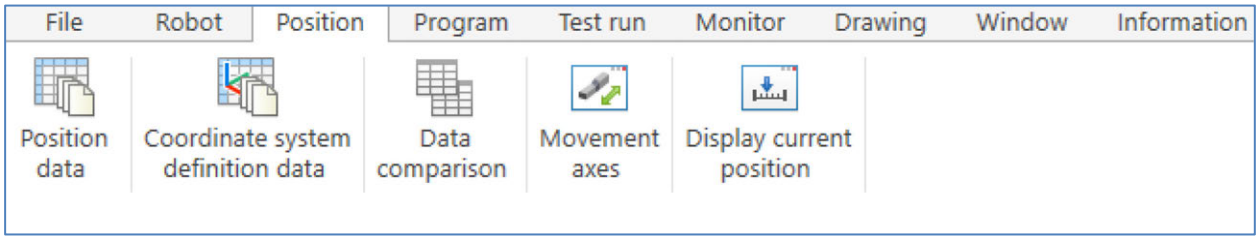


Fig 4.1- 4 Position tab

Table. 4.1- 4 Position tab configuration

Button name	Function
Position data	Display the editing position data [Project] window.
Coordinate system definition data	Display the Coordinate system definition data [Project] window.
Data comparison	Display the comparison data selection window.
Movement axes	Display the movement axes window.
Display current position	Display the current position window.

4.1.4 Program tab

In “Program” tab, there are buttons allocated to create programs.

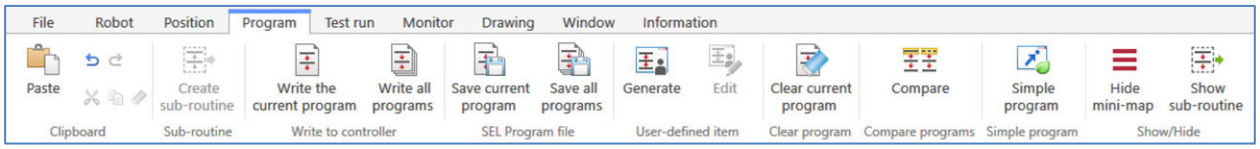


Fig. 4.1- 5 Program tab

Table 4.1- 5 Program tab configuration

Button name		Function
Clipboard	Paste	Use this button to paste an item that was copied or cut.
	Undo	Get the item allocation or property setting back to the previous condition.
	Redo	Get the item allocation or property setting conditions one step forward. Valid after “Undo” executed.
	Copy	Copy an item that is being selected.
	Cut	Copy an item that is being selected and delete it.
	Delete	Delete an item that is being selected.
Sub-routine	Create sub-routine	Reallocate an item that is being selected to a sub-routine edit.
Write to controller	Write the current program	Write the current program to a controller.
	Write all programs	Write all programs to a controller.
SEL Program file	Save current program	Save programs in display as a file in the SEL program format.
	Save all programs	Save all the programs a file in the SEL program format.
User-defined item	Generate	Create a user-defined item based on a selected item.
	Edit	Edit a user-defined item that is being selected.
Clear program	Clear current program	Delete items allocated in programs in display.
Compare program	Compare	Compare programs in display with programs in the applicable controller.
Simple program	Simple program	Display a simple program window.
Show/Hide	Show/Hide mini-map	Switch show/hide for the mini-map.
	show sub-routine	Switch show/hide for the sub-routine.

4.1.5 Test run tab

In “Test run” tab, there are buttons allocated to execute programs.

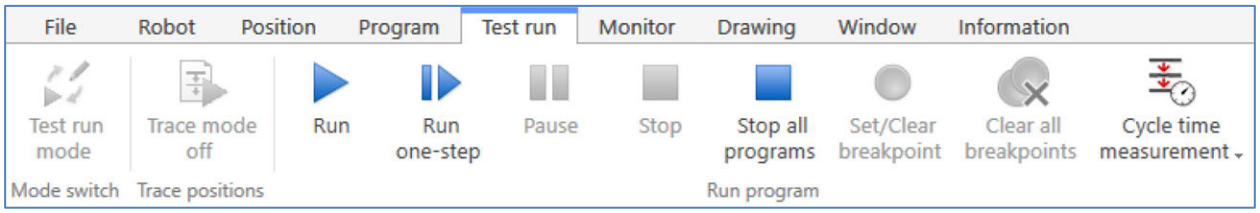


Fig. 4.1- 6 Test run tab

Table 4.1- 6 Test run tab configuration

Button name		Function	
Mode switch	Edit mode	Switch over the mode between Edit mode and Test run mode while program is running.	
	Test run mode		
Trace positions	Trace mode off	Switch over whether to display or not items being executed while program is running.	
	Trace mode on		
Run program	Run	Execute a program in display.	
	Run one-step	Execute a program in display for one item.	
	Pause	Pause the programs being executed.	
	Stop	Stop the programs being executed.	
	Stop all programs	Stop all the programs being executed.	
	Set/Clear breakpoint	Set/clear a breakpoint in an item in display.	
	Clear all breakpoints	Clear all breakpoints in the program.	
	Cycle time measurement	Set/clear cycle time starting point	Set/clear a selected item to the starting point of cycle time measurement.
		Set/clear cycle time ending point	Set/clear a selected item to the ending point of cycle time measurement.
		Display cycle time starting point	Select a set item to the starting point of cycle time measurement.
		Display cycle time ending point	Select a set item to the ending point of cycle time measurement.
		Clear all cycle time	Clear the cycle time starting/ending point of the current program.

4.1.6 Monitor tab

In “Monitor” tab, there are buttons for port, flag, variable monitor and name setting.

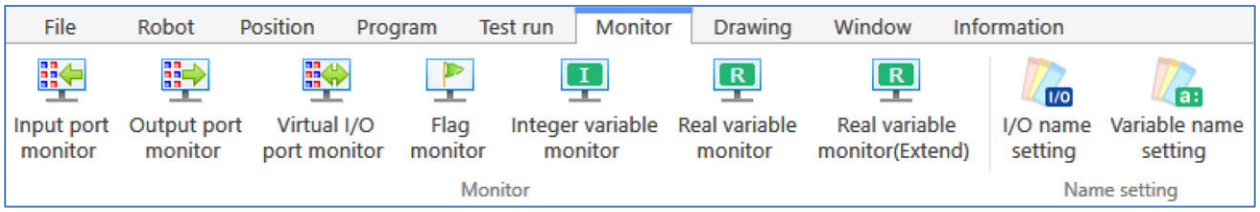


Fig. 4.1- 7 Monitor tab

Table 4.1- 7 Monitor tab configuration

Button name		Function
Monitor	Input port monitor	Display Input port monitor window.
	Output port monitor	Display Output port monitor window.
	Virtual I/O port monitor	Display Virtual I/O port monitor window.
	Flag monitor	Display Fag monitor window.
	Integer variable monitor	Display Integer variable monitor window.
	Real variable monitor	Display Real variable monitor window.
	Real variable monitor(Extend)	Display Real variable monitor (Extend) window
Name setting	I/O name setting	Display I/O name setting window.
	Variable name setting	Display Variable name setting window.

4.1.7 Drawing tab

In “Drawing” tab, there are buttons to create drawing data.

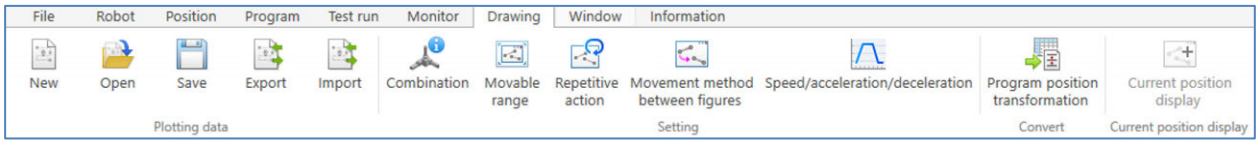


Fig. 4.1- 8 Drawing tab

Table 4.1- 8 Drawing tab configuration

Button name		Function
Plotting data	New	Create new drawing data.
	Open	Open drawing data.
	Save	Save current drawing data.
	Export	Export current drawing data in the file.
	Import	Import exported drawing data file.
Setting	Combination	Check the setting of robot that is used in the drawing data.
	Movable range	Set the movable range.
	Repetitive action	Set the repetitive frequency and repetitive starting condition.
	Movement method between figures	Set the movement method between figures.
	Speed/acceleration/deceleration	Set the speed, acceleration and deceleration.
Convent	Program position transformation	Generate the position data and program (flowchart) from drawing data.
Current position display	Current position display	Switch show/hide for the current position.

4.1.8 Window tab

In “Window” tab, there are buttons to show windows.

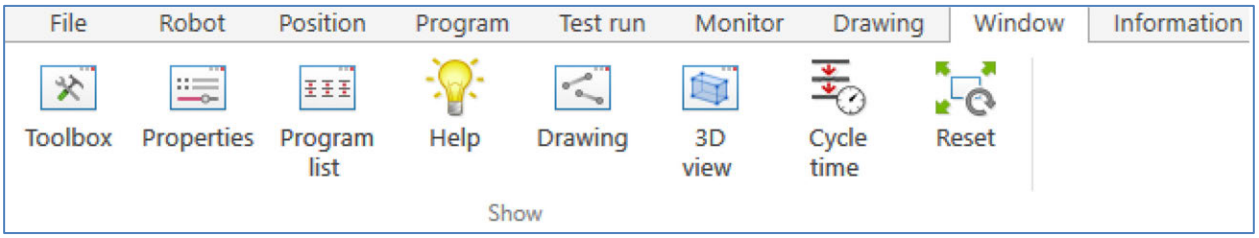


Fig. 4.1- 9 Window tab

Table 4.1- 9 Window tab configuration

Button name	Function
Toolbox	Display Tool box.
Properties	Display Properties window.
Program list	Display Program list window.
Help	Display Help window.
Drawing	Display Drawing window.
3D view	Display a 3D view of robot.
Cycle time	Display a window of cycle time measurement result.
Reset	Reset the window allocation to the default.

4.1.9 Information tab

“Information” tab are as shown below.

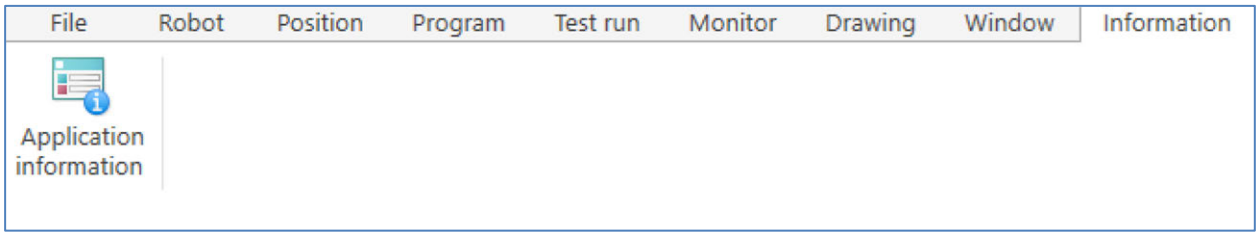


Fig. 4.1- 10 Information tab

Table 4.1- 10 Information tab configuration

Button name	Function
Application information	Displays the version information of this software.

4.2 Toolbox

Select the items that are allocated in the window to create program in the Toolbox window.

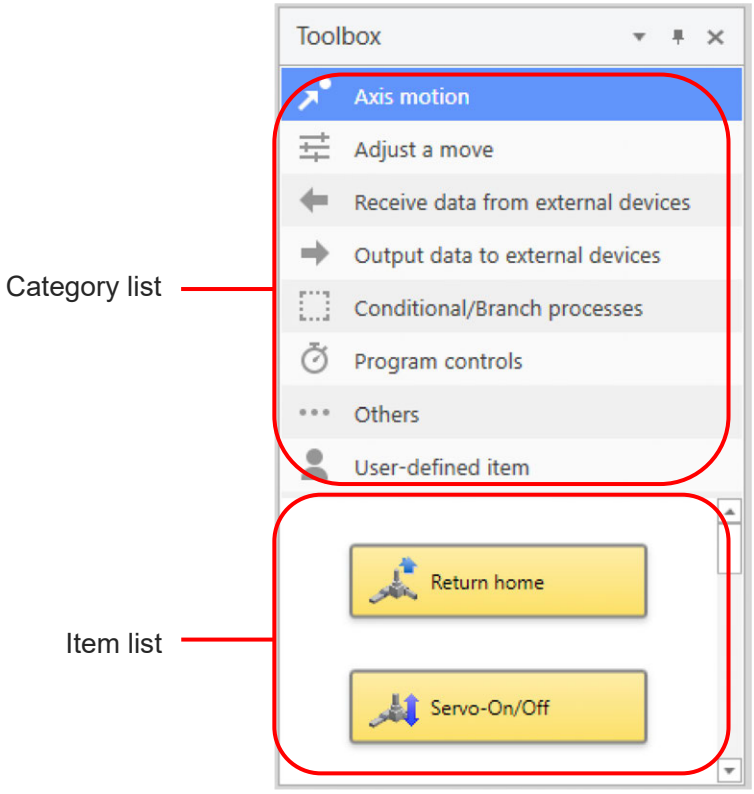


Fig. 4.2- 1 Toolbox window

Select the category from the category list, and switch the displayed item in the item list.

4.3 Programming window

Create a program in the programming window.
The programming window consists of the “Main program Edit” and “Sub-routine Edit”.

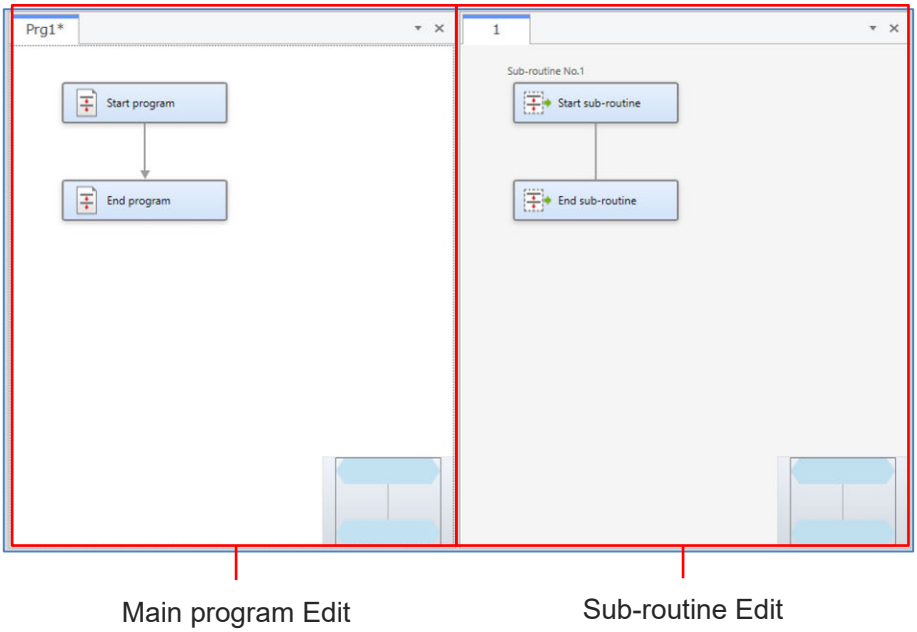


Fig. 4.3- 1 Programming window

[Main program Edit]

Create a program. In the initial setting, there are items “program definition start” and “program definition end”.

[Sub-routine Edit]

Create a sub-routine. You can create up to 16 sub-routines for each program.
In the initial setting, there are “sub-routine start” and “sub-routine end”.
Switch a display of sub-routine by clicking ▼ on the top right.
✓ at a sub-routine indicates that it is used in the program.

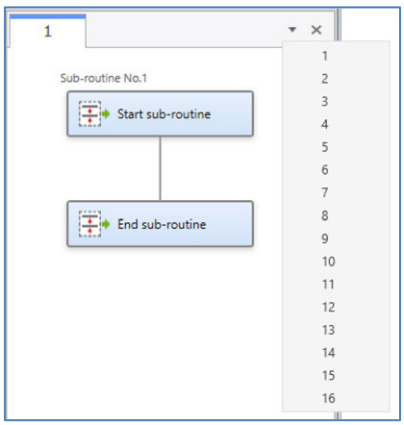


Fig. 4.3- 2 Switch the display of sub-routine

Right-click on a Programming window and the menu will appear.

Table 4.3- 1 Programming window menu

Selection	Description
Cut	Copy an item that is being selected and delete it from the programming window.
Copy	Copy an item that is being selected.
Past	Paste an item that was copied or cut.
Delete	Delete an item that is being selected.
Edit properties	Display the property of a selected item.
Edit comments	Display the comment input dialog for a selected item.
Create sub-routine	Move a selected item to a sub-routine edit window, and replace to a sub-routine executing item.
Generate user-defined item	Create a user-defined item based on a selected item.
Edit user-defined item	Edit a user-defined item that is being selected.
Save as image file	Save a program in display as an image file (PNG format).
Set/clear breakpoint	Set a breakpoint in a selected item.
Set/clear cycle time starting point	Set/clear cycle time starting point.
Set/clear cycle time starting point	Set/clear cycle time ending point.

4.3.1 Mini-map

A panel at the bottom right corner of the Main program Edit and Sub-routine Edit in the programming window is called a mini-map. Display the layout of whole program.

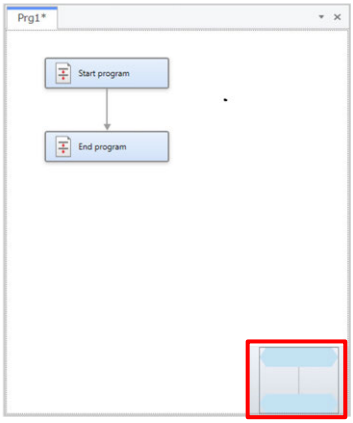


Fig. 4.3- 3 Mini-map

A mini-map enables you to move the place to show or change the display magnification. Switch show/hide with show/hide mini-map in the “program” tab.

4.4 Properties window

Display the properties window by selecting “Properties” from “Window” tab.
Display the property of selected item.
Following is an example of properties window when “Noninterpolated movement” item is selected.

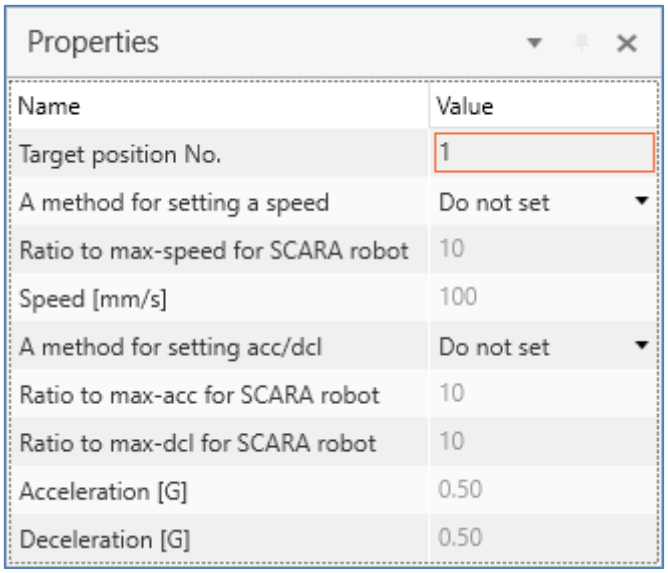


Fig. 4.4- 1 Properties window

4.5 Program list

Click Program list from “Window” tab and the menu will appear.
You can check the status of program.

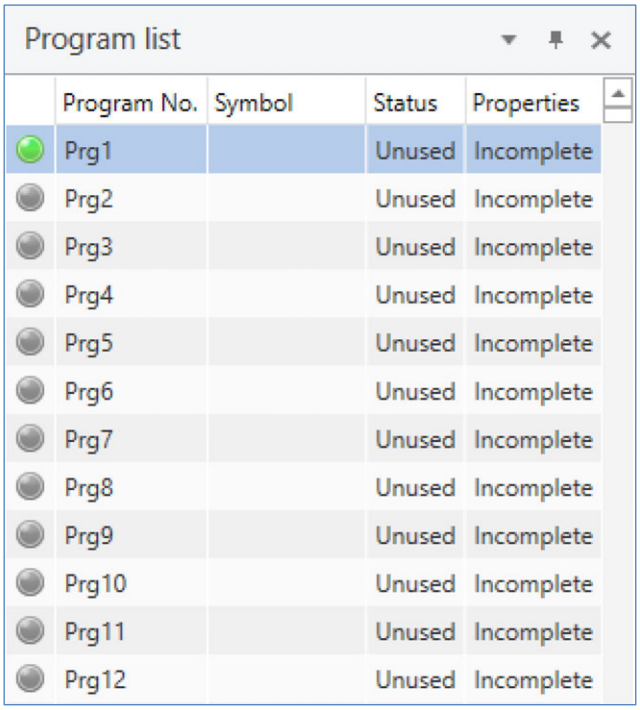


Fig. 4.5- 1 Program list

Table 4.5- 1 Column name

Column name	Description
(Lamp)	Lamp off: It indicates that the programming window is not displayed. Lamp on: It indicates that the programming window is displayed.
Program No.	A program number should be shown.
Symbol	Display a symbol (program name).
Status	Display the condition of program use and execution.
Properties	Completed: It indicates that the property settings of item are completed. Incompleted: It indicates that the property settings of item are incompleted.

Right-click on a program list window and the menu will appear.

Table 4.5- 2 Program menu description

Selection	Description
Create Program	Display a selected program edit window.
Display Program	
Edit Symbol	Symbols (Program name) can be input.

4.6 Help window

Help window is appeared by clicking Help from “Window” tab.

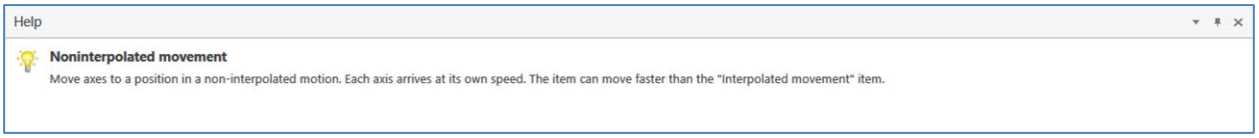


Fig. 4.6- 1 Help window

The name and the description of selected item are displayed.

4.7 Rearranging Window Allocation and Reset

[Rearranging Window Allocation]

Drag the window title with the mouse, and the dragged window can be reset.

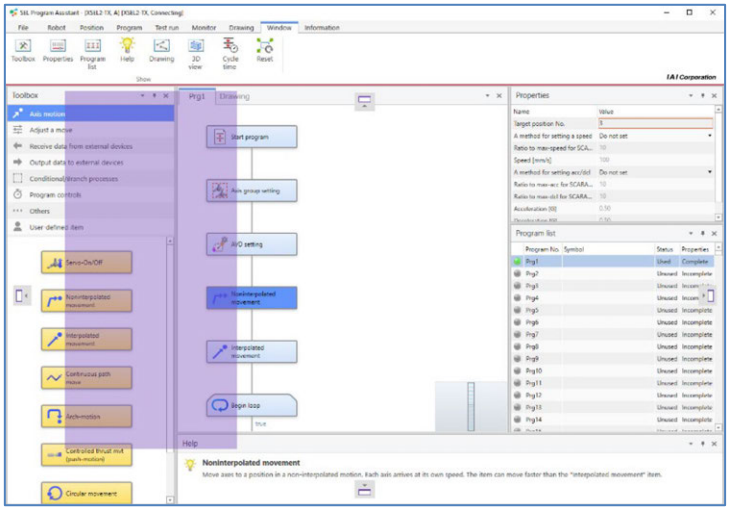


Fig. 4.7- 1 Rearranging Window Allocation (before the change)

An indicator is displayed during moving. Move the cursor to a place that you would like to allocate and drag and drop the window.

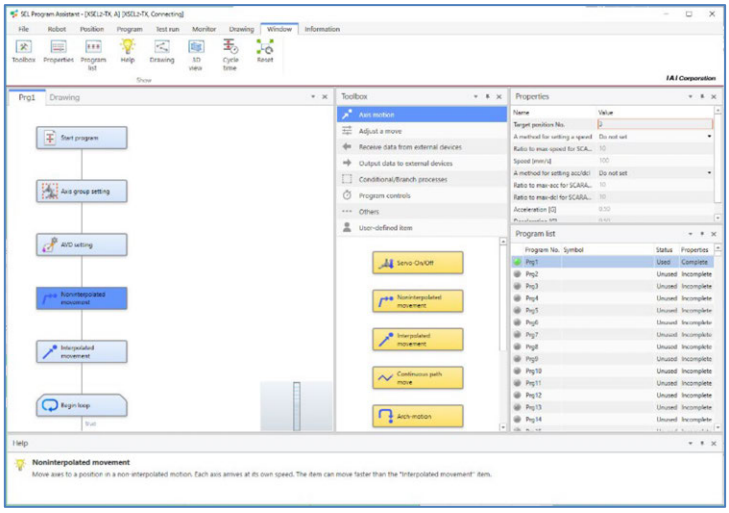


Fig. 4.7- 2 Rearranging Window Allocation (after the change)

[Rearranging Window Reset]

When you would like to reset the allocation of the windows, click Reset from “Window” tab.

There are windows that cannot be changed their allocation, such as programming window.

SEL Assist

Chapter 5

Parameter settings

5.1 Simple setup

5.1.1 Simple setup window

The following window is displayed by clicking Simple setup from “Parameter” tab.

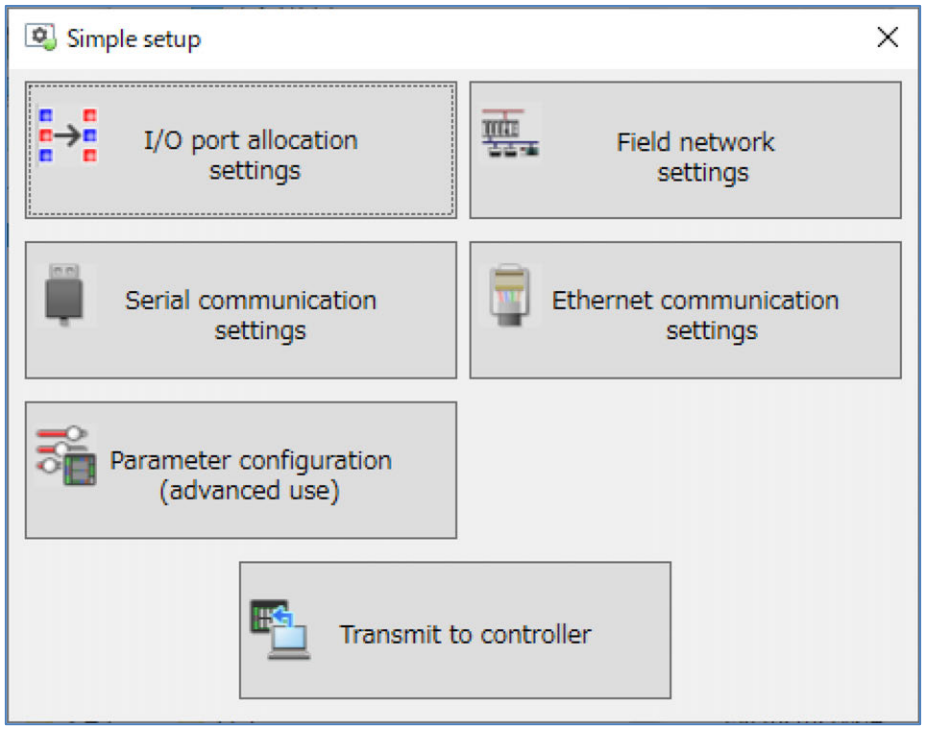


Fig. 5.1- 1 Simple setup window

Table 5.1- 1 Simple setup window configuration

Button name	Function
I/O port allocation settings	Display I/O port allocation settings window.
Field network settings	Display the Field network settings window. A dialog to select field network is displayed when the multiple field networks are connected.
Serial communication settings	Display the Serial communication settings window.
Ethernet communication settings	Display the Ethernet communication settings window.
Parameter configuration (advanced use)	Display the Parameter configuration (advanced use) window.
Transmit to controller	Write a modified parameter to a controller.

5.1.2 I/O port allocation settings

Following is an instruction of I/O port allocation settings.

[When the controller is RSEL]

Set I/O slot, Number of ports in Option units and Start port No.

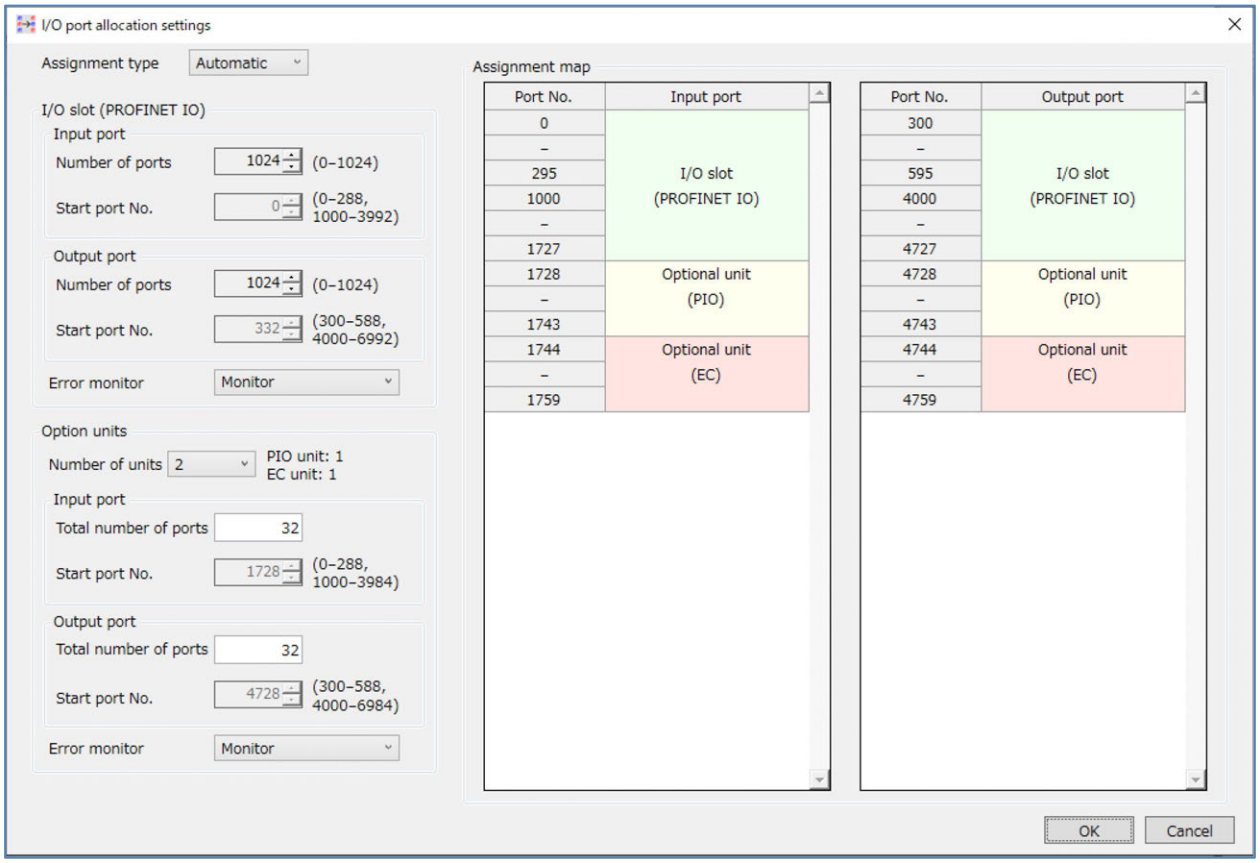


Fig. 5.1- 2 I/O port allocation settings

Table 5.1- 2 Assignment type

Item	Description
Assignment type	Select the port allocation type. The selection are as shown below. Automatic: It allocates the port automatically. Fixed: It allocates the port by Start port No..

● I/O slot

Table 5.1- 3 I/O slot

Item	Description
Input port Number of ports	Set the Number of ports of the input port.
Input port Start port No.	Set the Start port No. of the input port. It's valid when “fixed” is selected for allocation type.
Output port Number of ports	Sets the Number of ports of the output port.
Output port Start port No..	Sets the Start port No. of the output port. It's valid when “fixed” is selected for allocation type.
Error monitor	Set the error monitor for field network. The selection are as shown below. Non-monitoring, monitoring, Monitor (24V I/O Non-monitoring for the error that is related to power), Monitor (24V I/O Monitoring only for the error that is related to power), Monitor (24V I/O Make the error that is related to power message level)

● Option units

Table 5.1- 4 Option units

Item	Description
Number of units	Select number of units.
Input port Total number of ports	Display the Total number of ports on the input port.
Input port Start port No.	Display the Start port No. of input port. It's valid when “fixed” is selected for allocation type.
Output port Total number of ports	Displays the Total number of ports on the output port.
Output port Start port No.	Sets the Start port number of the output port. It's valid when “fixed” is selected for allocation type.
Error monitor	Set the error monitor for option units. The selection are as shown below. Non-monitoring, monitorting, Monitor (24V I/O Non-monitoring for the error that is related to power), Monitor (24V I/O Monitoring only for the error that is related to power), Monitor (24V I/O Make the error that is related to power message level)

[When the controller is XSEL2]

Set I/O slot1, Number of ports in I/O slot2 and Start port No.

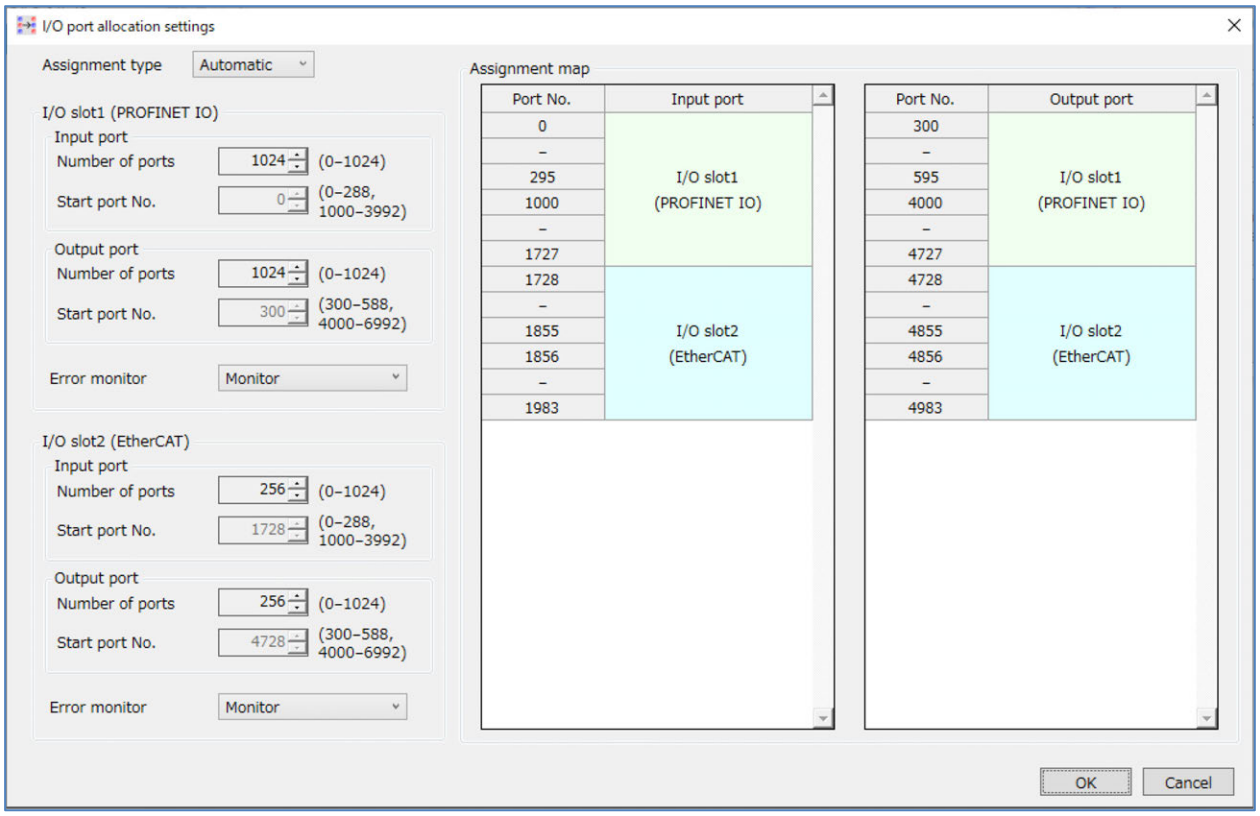


Fig. 5.1- 3 I/O port allocation settings (XSEL2)

Table 5.1- 5 Assignment type (XSEL2)

Item	Description
Assignment type	Select the port allocation type. The selection are as shown below. Automatic: It allocates the port automatically. Fixed: It allocates the port by Start port No.

● I/O slot1 / I/O slot2

Table 5.1- 6 I/O slot 1 / I/O slot 2

Item	Description
Input port Number of ports	Set the Number of ports of the input port.
Input port Start port No.	Set the start port No. of the input port. It's valid when “fixed” is selected for allocation type.
Output port Number of ports	Sets the Number of ports of the output port.
Output port Start port No..	Sets the start port No. of the output port. It's valid when “fixed” is selected for allocation type.
Error monitor	Set the error monitor for field network. The selection are as shown below. Non-monitoring, monitorting, Monitor (24V I/O Non-monitoring for the error that is related to power), Monitor (24V I/O Monitoring only for the error that is related to power), Monitor (24V I/O Make the error that is related to power message level)
Assignment map	Display allocation status of I/O port.

5.1.3 Field network settings

Field network settings dialog is displayed by clicking Field network settings while the multiple field networks are connected.

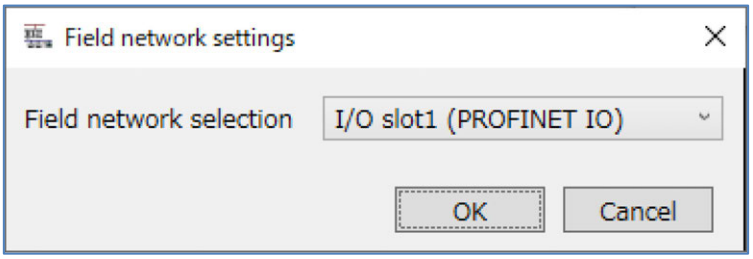


Fig. 5.1- 4 Field network settings

5.1.4 Field network settings

Field network settings window is displayed by clicking OK in the field network selection dialog or Field network settings in simple setup window.

[CC-Link]

The following is an example when the field network is CC-Link.

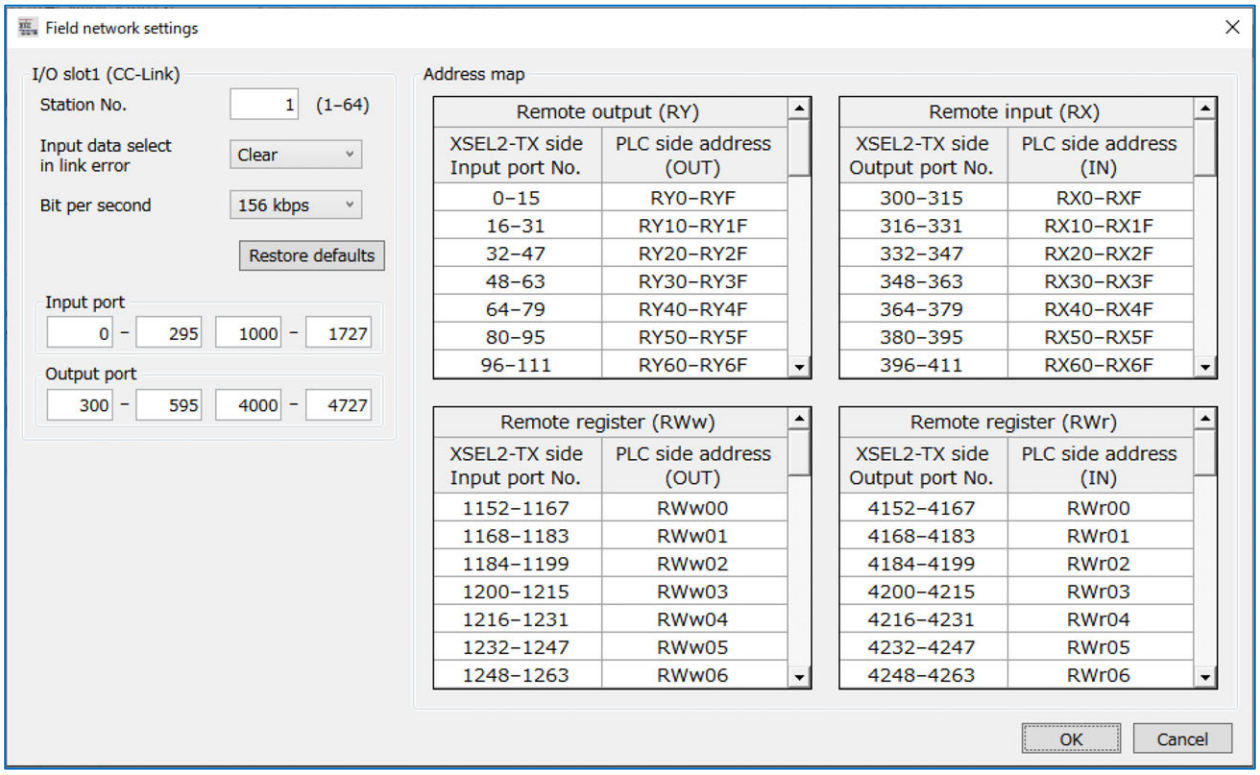


Fig 5.1- 5 Field network settings (CC-Link)

Table 5.1- 7 Field network settings item (CC-Link)

Item	Description
Station No.	Set the fieldbus node address.
Input data select in link error	Set the input data select in link error. The selection are as shown below. Clear: Clears the input port data. Hold: Holds the input port data.
Bit per second	Select the communication speed of fieldbus. The selection are as shown below. 156kbps, 625kbps, 2.5Mbps, 5Mbps, 10Mbps
Input port	Display the input port that is already allocated.
Output port	Display the output port that is already allocated.
Address map	Display the allocation status of remote I/O and remote register.

[CC-Link IE Field]

The following is an example when the field network is CC-Link IE Field.

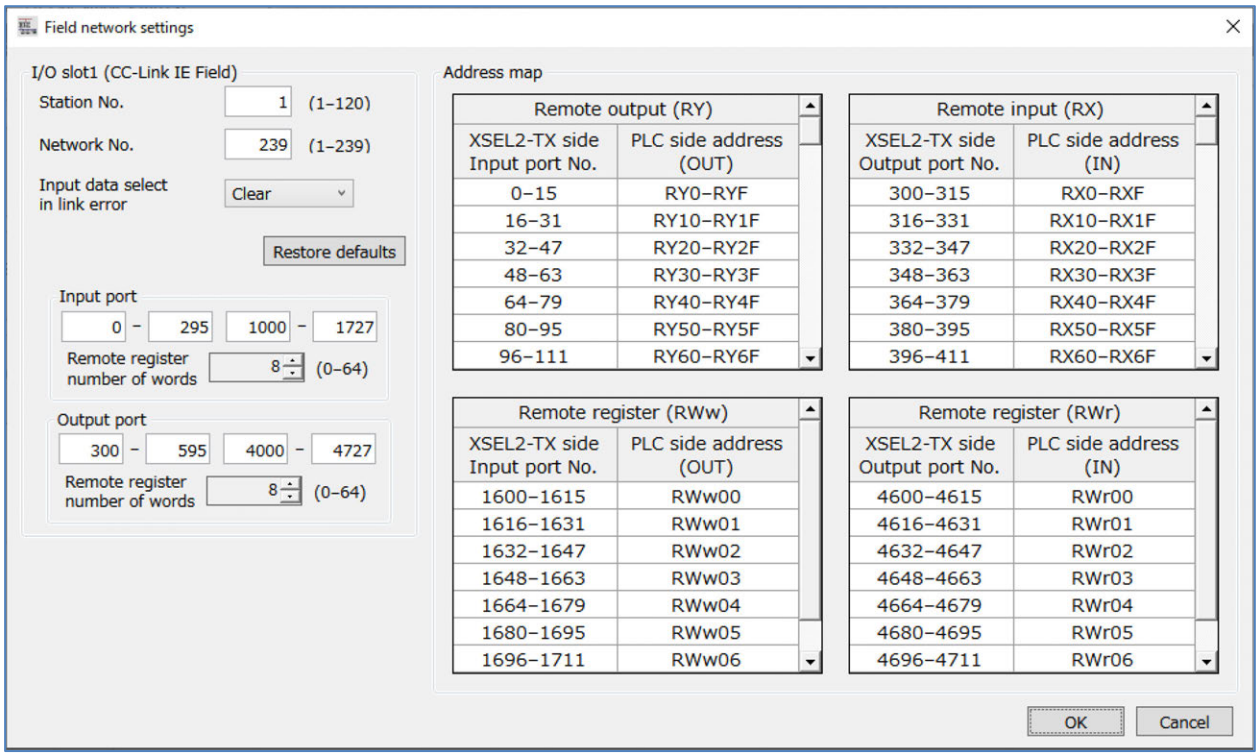


Fig. 5.1- 6 Field network settings (CC-Link IE Field)

Table 5.1- 8 Field network settings item (CC-Link IE Field)

Item	Description
Station No.	Set the fieldbus node address.
Network No.	Set the Network Number of fieldbus.
Input data select in link error	Set the input data select in link error. The selection are as shown below. Clear: Clears the input port data. Hold: Holds the input port data.
Input port	Display the input port that is already allocated.
Input port Remote register number of words	Set Remote register (RWw) number of words.
Output port	Display the output port that is already allocated.
Output port Remote register number of words	Set Remote register (RWr) number of words.
Adress map	Display the allocation status of remote I/O and remote register.

[DeviceNet]

The following is an example when the field network is DeviceNet.

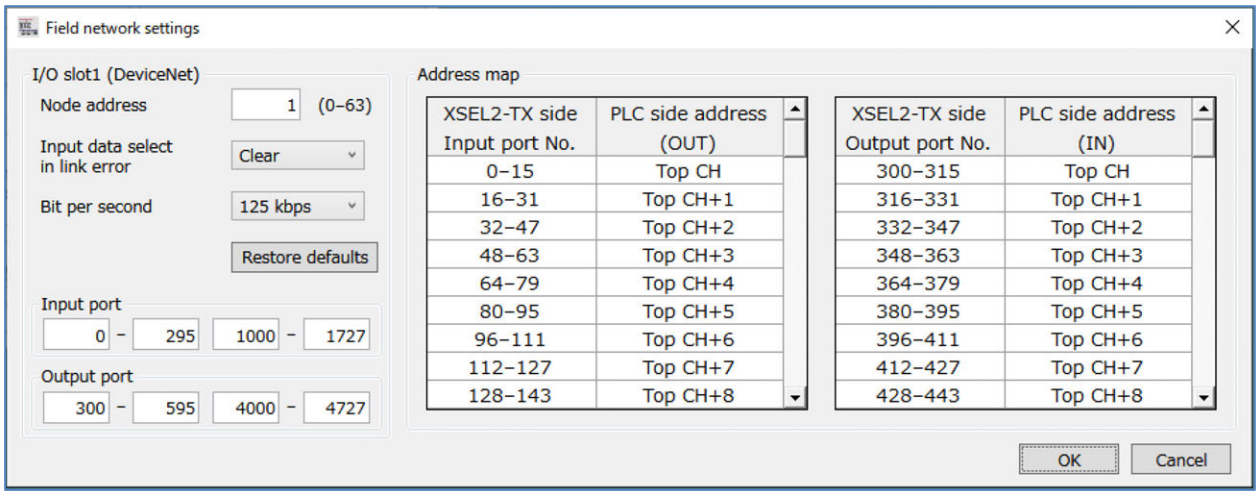


Fig. 5.1- 7 Field network settings (DeviceNet)

Table 5.1- 9 Field network settings item (DeviceNet)

Item	Description
Node address	Set the fieldbus node address.
Input data select in link error	Set the input data select in link error. The selection are as shown below. Clear: Clears the input port data. Hold: Holds the input port data.
Bit per second	Set the communication speed. The selection are as shown below. 125kbps、250kbps、500kbps
Input port	Display the input port that is already allocated.
Output port	Display the output port that is already allocated.
Address map	Display allocation status of I/O port.

[EtherCAT]

The following is an example when the field network is EtherCAT.

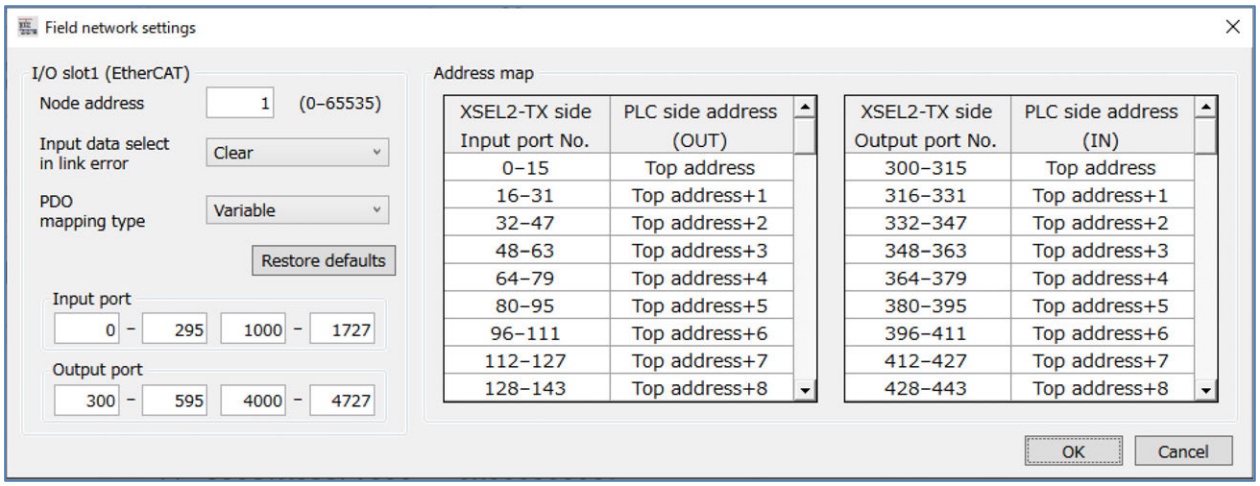


Fig. 5.1- 8 Field network settings (EtherCAT)

Table 5.1- 10 Field network settings item (EtherCAT)

Item	Description
Node address	Set the fieldbus node address.
Input data select in link error	Set the input data select in link error. The selection are as shown below. Clear: Clears the input port data. Hold: Holds the input port data.
PDO mapping type	Set the PDO mapping type. The selection are as shown below. Variable, 32 byte fixed
Input port	Display the input port that is already allocated.
Output port	Display the output port that is already allocated.
Address map	Display allocation status of I/O port.

[EtherNet/IP]

The following is an example when the field network is EtherNet/IP.

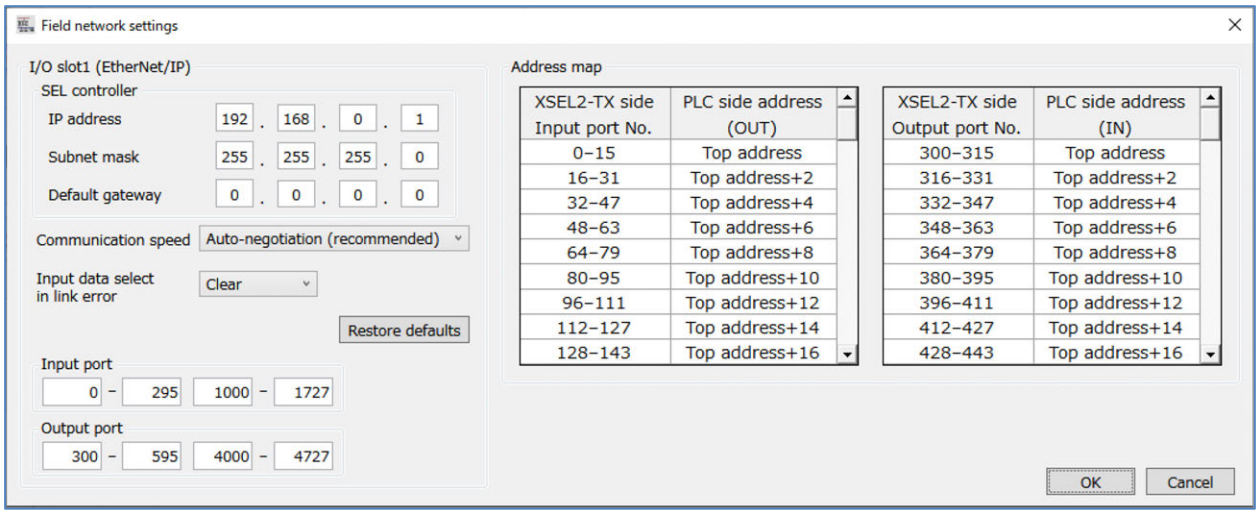


Fig. 5.1- 9 Field network settings (EtherNet/IP)

Table 5.1- 11 Field network settings item (EtherNet/IP)

Item	Description
IP address	Set IP address.
Subnet mask	Set subnet mask.
Default gateway	Set default gateway.
Communication speed	Set the communication speed. The selection are as shown below. Auto-negotiation (recommended) 10Mbps (Half duplex), 10Mbps (Full Duplex), 100Mbps (Half duplex), 100Mbps (Full Duplex)
Input data select in link error	Set the input data select in link error. The selection are as shown below. Clear: Clears the input port data. Hold: Holds the input port data.
Input port	Display the input port that is already allocated.
Output port	Display the output port that is already allocated.
Address map	Display allocation status of I/O port.

[PROFIBUS-DP]

The following is an example when the field network is PROFIBUS-DP.

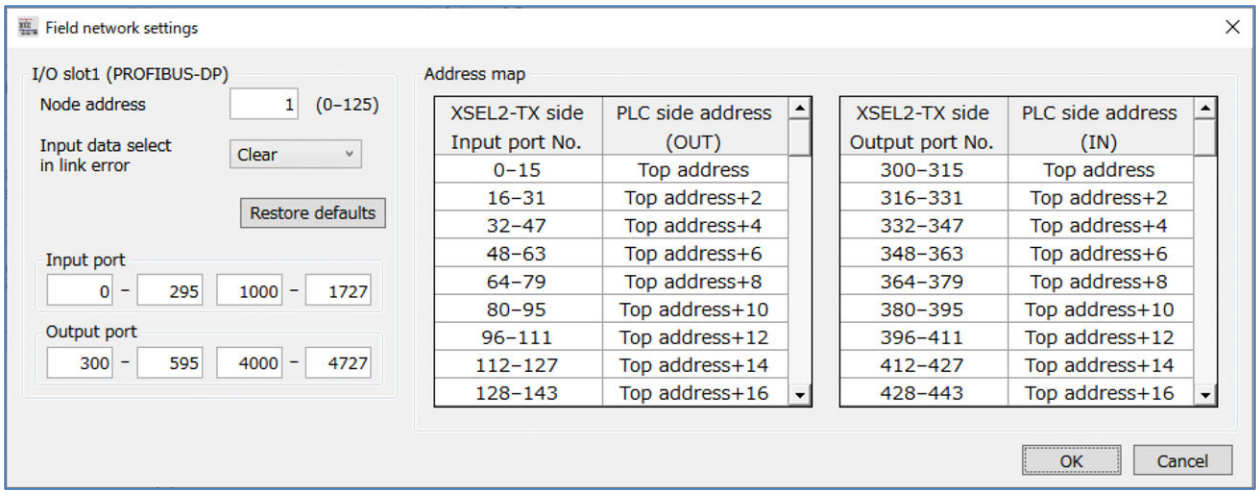


Fig. 5.1- 10 Field network settings (PROFIBUS-DP)

Table 5.1- 12 Field network settings item (PROFIBUS-DP)

Item	Description
Node address	Set the fieldbus node address.
Input data select in link error	Set the input data select in link error. The selection are as shown below. Clear: Clears the input port data. Hold: Holds the input port data.
Input port	Display the input port that is already allocated.
Output port	Display the output port that is already allocated.
Address map	Display allocation status of I/O port.

[PROFINET IO]

The following is an example when the field network is PROFINET IO.

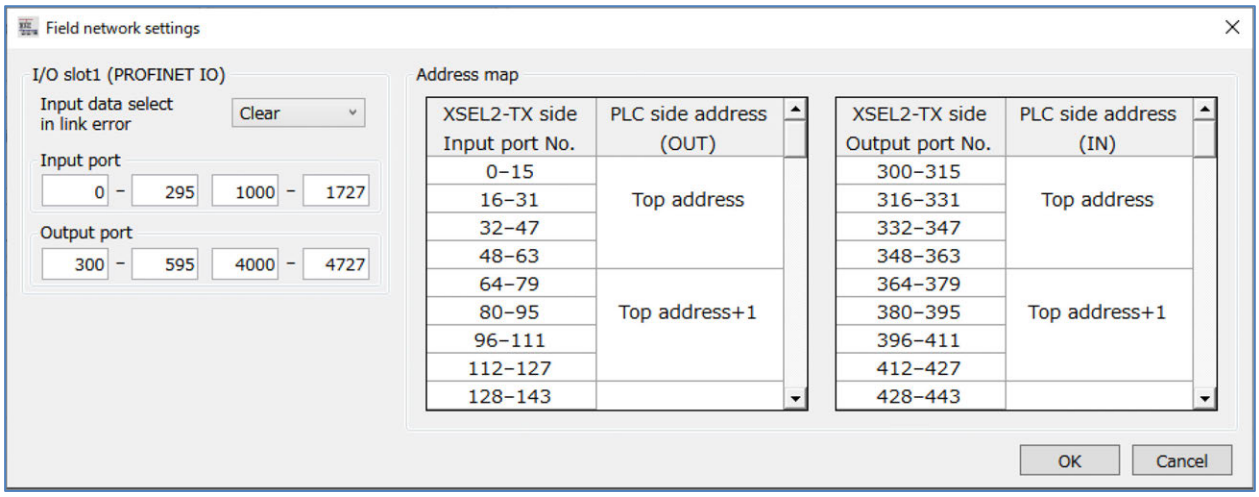


Fig. 5.1- 11 Field network settings (PROFINET IO)

Table 5.1- 13 Field network settings item (PROFINET IO)

Item	Description
Input data select in link error	Set the input data select in link error. The selection are as shown below. Clear: Clears the input port data. Hold: Holds the input port data.
Input port	Display the input port that is already allocated.
Output port	Display the output port that is already allocated.
Address map	Display allocation status of I/O port.

5.1.5 Serial communication settings

The following window is displayed when Serial communication settings is clicked on simple setup window.

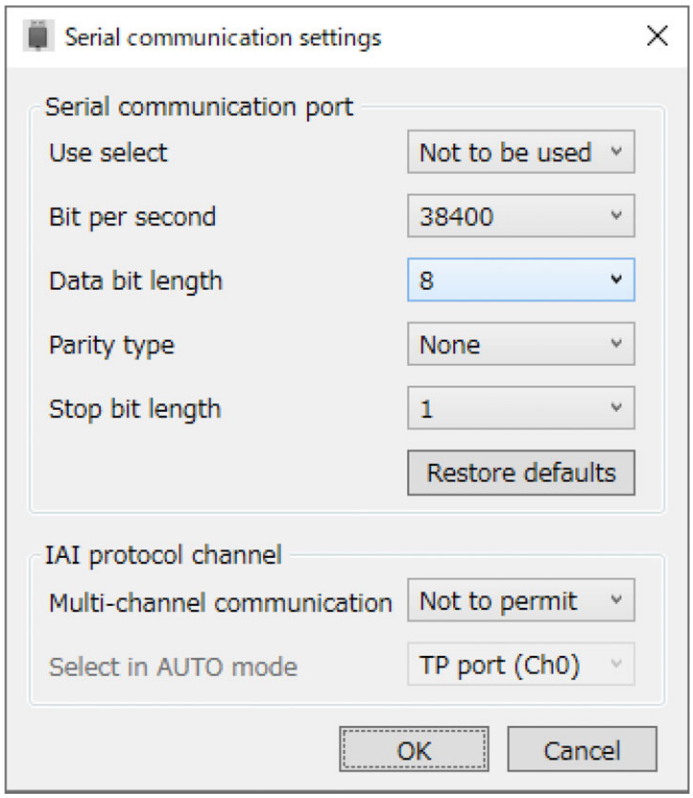


Fig. 5.1- 12 Serial communication settings

Table 5.1- 14 Serial communication settings item

Item	Description
User select	The selection are as shown below. Use: Use serial communication in the application Not to be used: Serial communication is not used
Bit per second	Set the Bit per second. The selection are as shown below. Unit [bps] 9600, 19200, 38400, 57600, 76800, 115200, 230400
Data bit length	Set the Data bit length. The selection are as shown below. 7: 7 bit data 8: 8 bit data
Parity type	Set the Parity type. The selection are as shown below. None: No parity Odd number: Odd parity Even number: Even parity
Stop bit length	Set the Stop bit length. The selection are as shown below. 1: Stop bit 1 2: Stop bit 2
Multi-channel communication	Select the permission of multi-channel communication for IAI protocol channel. The selection are as shown below. Not to permit, Permit
Select in AUTO mode	Select the channel that enable to communicate IAI protocol when a controller is in AUTO mode. The selection are as shown below. TP port (CH0), Extension SIO, USB, Ethernet

5.1.6 Ethernet communication settings

The following window is displayed by clicking Ethernet communication settings in simple setup window.

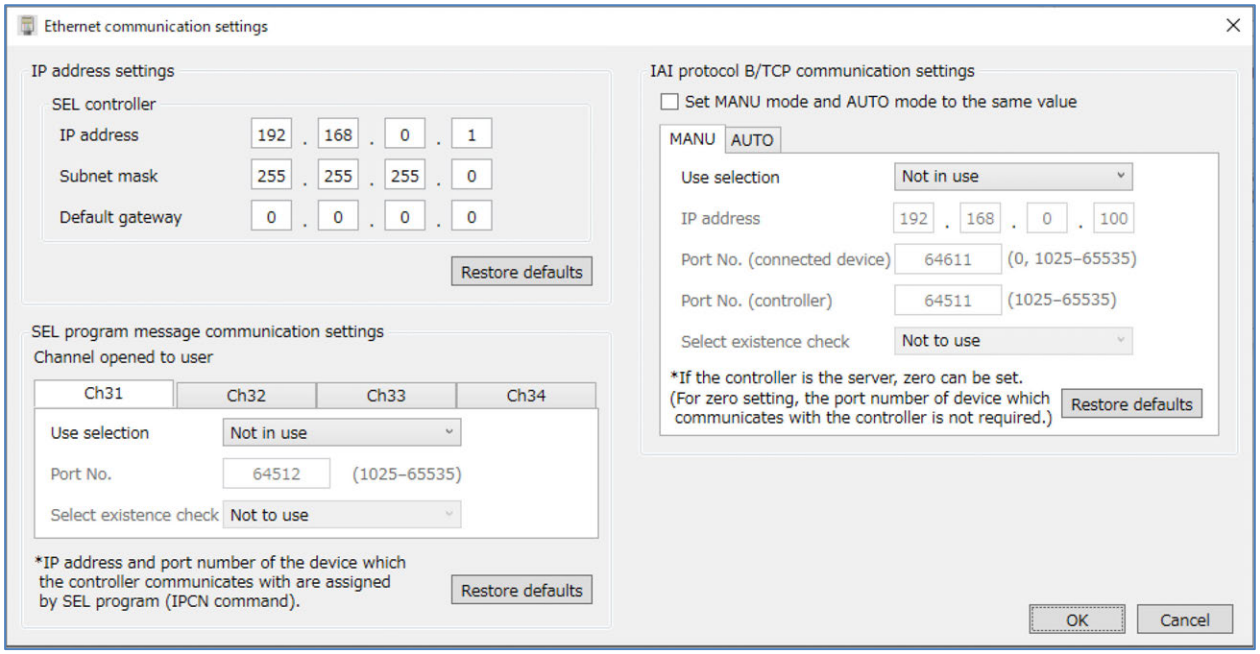


Fig. 5.1- 13 communication settings

[IP address settings]

Table 5.1- 15 IP address settings

Item	Description
IP address	Set IP address.
Subnet mask	Set subnet mask.
Default gateway	Set default gateway.

[SEL program message communication settings]

Table 5.1- 16 SEL program message communication settings

Item	Description
User selection	Set client/server. The selection are as shown below. Do not use, use (client), Use (Server)
Port No.	Set Port No. of the channel that is open to user (TCP/IP).
Select existence check	Select if you use existence check function. The selection are as shown below. Not to use: Keep alive function is not used Use: Keep alive function is in use

[IAI protocol B/TCP communication settings]

Table 5.1- 17 IAI protocol B/TCP communication settings

Item	Description
Set MANU mode and AUTO mode to the same value	Check when you would like to set MANU mode and AUTO mode to the same value.
Use selection	Set client/server. The selection are as shown below. Do not use, use (client), Use (Server)
IP address	Set IP address of connected device.
Port No. (connected device)	Set Port No. of connected device.
Port No. (controller)	Set Port No.
Select existence chack	Select if you use existence check function. The selection are as shown below. Not to use: Keep alive function is not used Use: Keep alive function is in use

5.1.7 Parameter settings (Practical version)

The following window is displayed by clicking Parameter configuration (Practical version) in simple setup window.

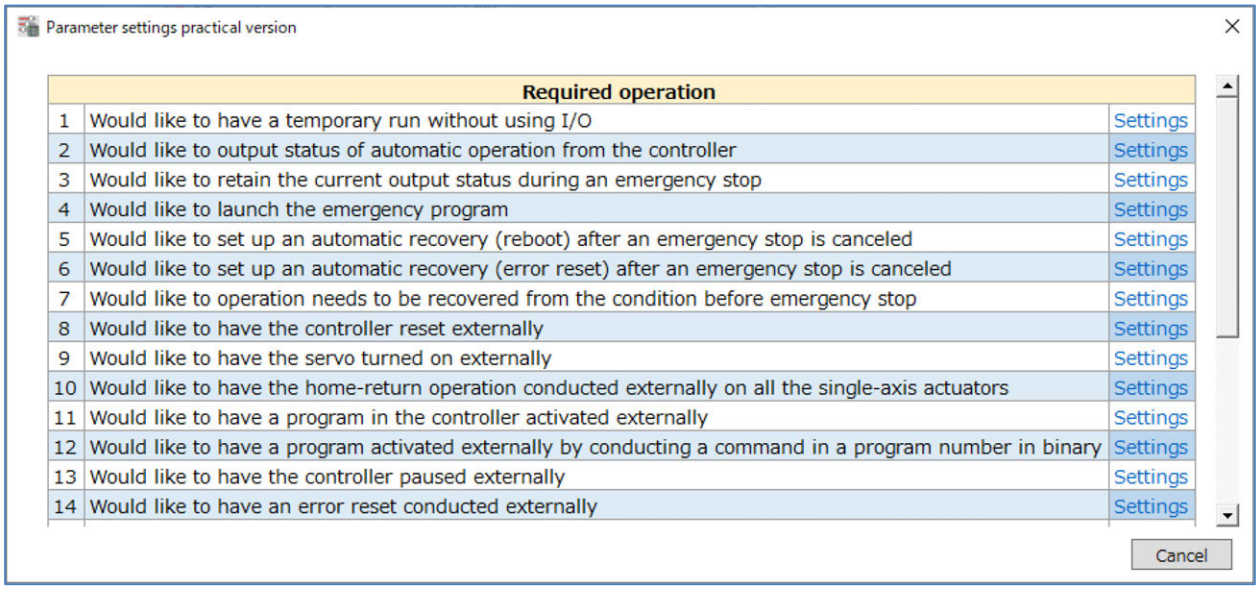


Fig. 5.1- 14 Parameter settings (Practical version)

The following is after the window is scrolled.

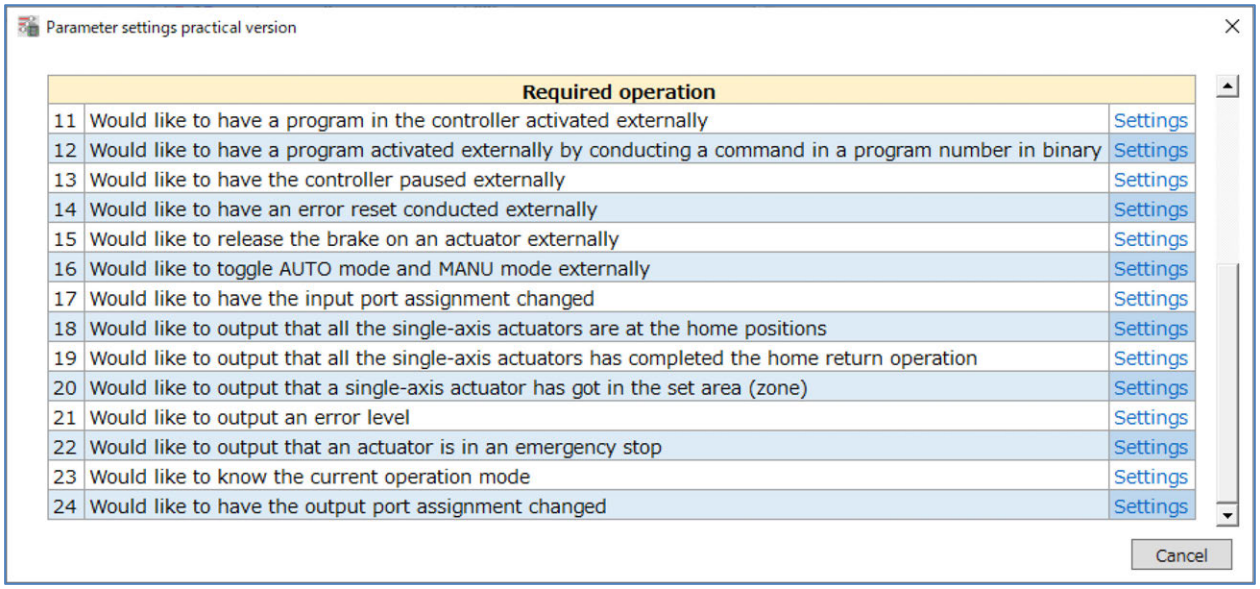


Fig. 5.1- 15 Parameter settings (Practical version) (after scrolling)

Changing the function of controller and dedicated functions for I/O port can be set by changing parameter. Click Settings in parameter list when you would like to perform “Desired action”.
Applicable parameter settings window is displayed.
For details, refer to the [Instruction manual of each controller].
RSEL Controller: Refer to [Parameter configuration (advanced use) in RSEL instruction manual].
XSEL2 Controller: Refer to [Parameter configuration (advanced use) in XSEL2-T/XSEL2-TX instruction manual].

5.2 Axis setting

For details, refer to [PC software X-SEL PC Software RSEL/XSEL2 instruction manual].

SEL Assist

Chapter 6

Position data

6.1 Edit Position data

Edit position data, write to controller and export to external file.

6.1.1 Edit Position data [Project]

Click Position data from “Position” tab

The Edit Position data [Project] window will be displayed.

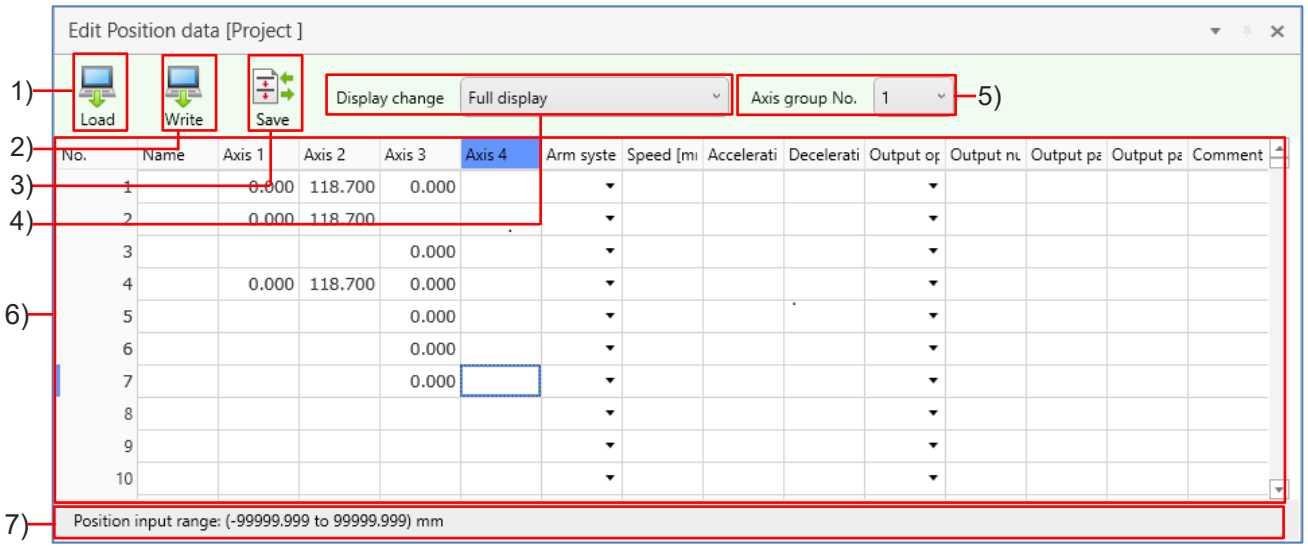


Fig. 6.1- 1 Edit Position data [Project] window

Table 6.1- 1 Edit Position data [Project] configuration

No.	Name	Description
1)	Load button	Read position data from controller, and update displayed data.
2)	Write button	Write displayed data to a controller.
3)	Save button	Export displayed data to a file.
4)	Display change	Switch data display. The selection are as shown below. Location display: Display the location information. Location + speed/addition and subtraction speed display: Display the location information + speed/addition and subtraction speed. Full display: Display all items.
5)	Axis group No.	It displays when actuator is allocated to multiple axis group. Display position data of selected axis group.

No.	Name	Description
6)	No.	Display Number of position data.
	Name	Set the name of position data, and display.
	Coordinate System	Select the coordinate system. It displays when Cartesian 6-Axis Robot is used. The selection are as shown below. (Blank): No coordinate system is selected. Joint: "Each axis coordinate system" is selected. Rect: "Cartesian coordinate system" is selected.
	Axis No.1 to Axis No.8	Set and display the location of position data. The number of column of valid axis is displayed. The selection are as shown below. -99999.999 to 99999.999
	Wrist	Select wrist joint. It displays when Cartesian 6-Axis Robot is used. It is not valid when the settings is "Joint". The selection are as shown below. (Blank): No Wrist is selected. Flip: "Flip" is selected. NonFlip: "NonFlip" is selected.
	Arm system	Select the Arm system. It displays when SCARA Robot is used. The selection are as shown below. (Blank): No Arm system is selected. Left: "Left Arm system" is selected. Right: "Right Arm system" is selected.
	Speed [mm/s]	Set Speed. The setting range is shown below. 1 to 9999
	Acceleration [G]	Set Acceleration. The setting range is shown below. 0.01 to 9.99
	Deceleration [G]	Set Deceleration. The setting range is shown below. 0.01 to 9.99
	Output operation	Select the output operation. The selection are as shown below. (Blank): No Output operation is selected. ON: After moved ON OFF: After moved OFF OND: Specified distance passed ON OFFD: Specified distance passed OFF ONR: Specified distance passed ON OFFR: Specified distance passed OFF
	Output No.	Set the Output port / Flag number. The setting range is shown below. 300 to 599, 4000 to 6999, 600 to 899, 900 to 999, 7000 to 7599
	Output parameter 1	Set output condition. The setting range is shown below. 0.01 to 9.99
	Output parameter 2	Set output time. The setting range is shown below. 0.000 to 9999.999
	Comment	Input a comment. You can input up to 16 full-width characters and 32 half-width characters
7)	Status bar	Displays the additional explanation of selected cell.

6.1.2 Loading Position data

Click Load from the menu of the Edit Position Data [Project] window.

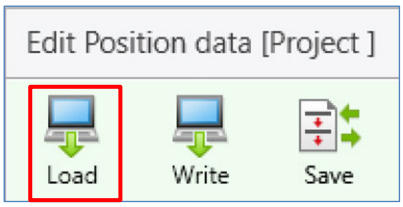


Fig. 6.1- 2 Loading Position data

The Position editing range selection dialog will be displayed.

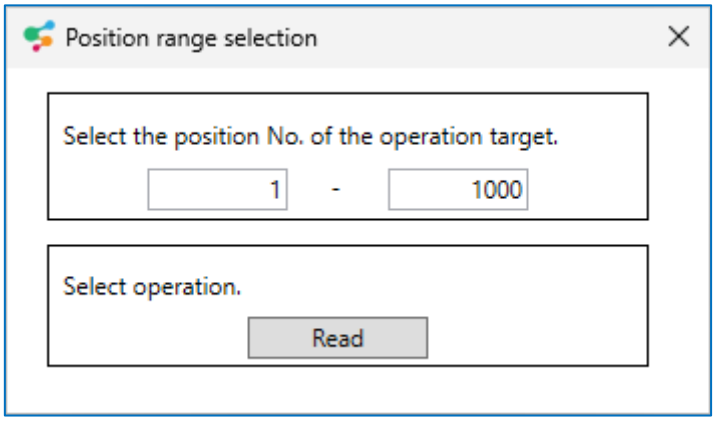


Fig. 6.1- 3 Position editing range selection dialog (Load)

Input starting position number and ending number, and click Read.
It gets the latest position data from controller, and update displayed data.

6.1.3 Writing Position data

Write the data from Edit Position data window to controller.
Click Write in the menu.

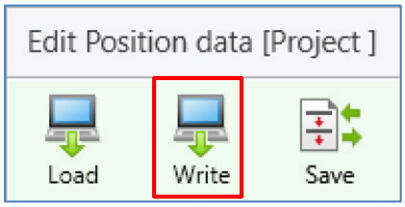


Fig. 6.1- 4 Writing Position data

The Position editing range selection dialog will be displayed.

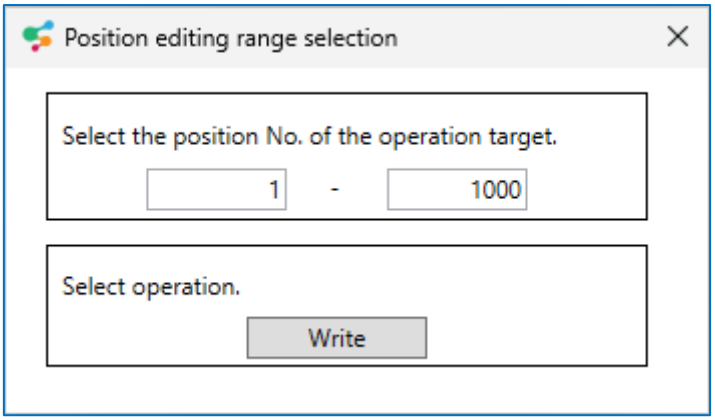


Fig. 6.1- 5 Position editing range selection dialog (Write)

Input starting position number and ending number, and click Write.

6.1.4 Edit Position data file

Click Position data in “File” tab.

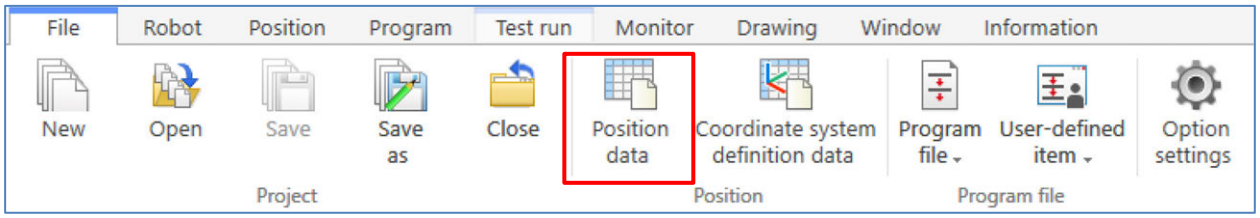


Fig. 6.1- 6 Position data

The “Open the file” dialog will be displayed.

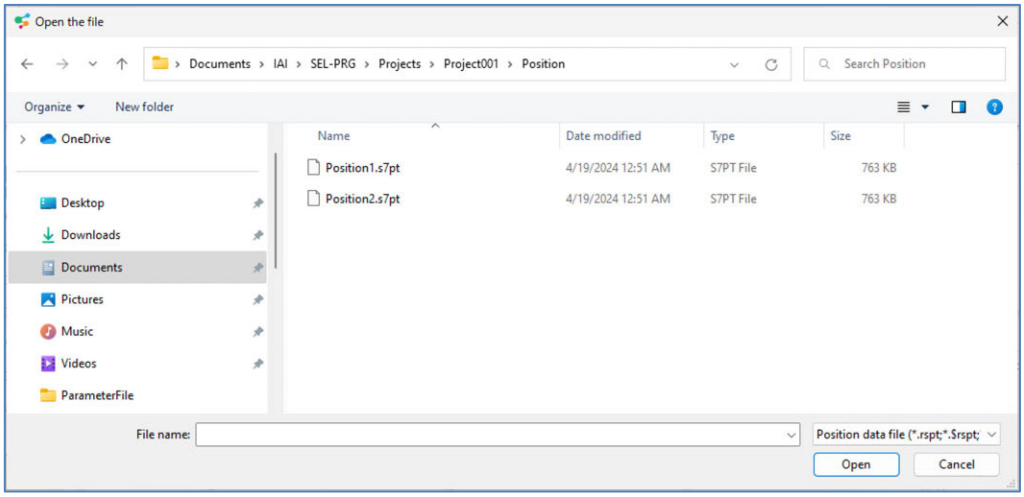


Fig. 6.1- 7 “Open the file” dialog

Select the position data file, and click Open.

The Edit position data file window will be displayed.

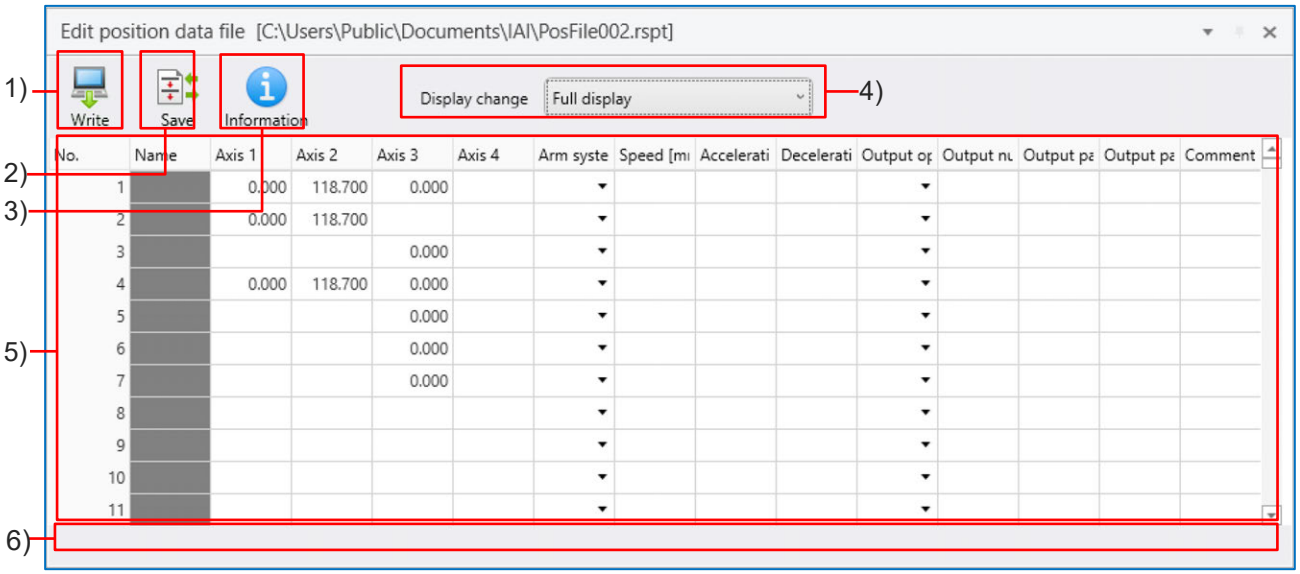


Fig. 6.1- 8 Edit position data file window

Table 6.1- 2 Edit position data file configuration

No.	Name	Description
1)	Write button	Write displayed data to a controller.
2)	Save button	Export displayed data to a file.
3)	Information button	Displays information about the open position data file.
4)	Display change	Switch data display. The selection are as shown below. Location display: Display the location information. Location + speed/addition and subtraction speed display: Display the location information + speed/addition and subtraction speed. Full display: Display all items.
5)	No.	Display Number of position data.
	Name	Not editable
	Coordinate System	Select the coordinate system. It displays when Cartesian 6-Axis Robot is used. The selection are as shown below. (Blank): No coordinate system is selected. Joint: "Each axis coordinate system" is selected. Rect: "Cartesian coordinate system" is selected.
	Axis No.1 to Axis No.8	Set and display the location of position data. The number of column of valid axis is displayed. The selection are as shown below. -99999.999 to 99999.999
	Wrist	Select wrist joint. It displays when Cartesian 6-Axis Robot is used. It is not valid when the settings is "Joint". The selection are as shown below. (Blank): No Wrist is selected. Flip: "Flip" is selected. NonFlip: "NonFlip" is selected.
	Arm system	Select the Arm system. It displays when SCARA Robot is used. The selection are as shown below. (Blank): No Arm system is selected. Left: "Left Arm system" is selected. Right: "Right Arm system" is selected.
	Speed [mm/s]	Set Speed. The setting range is shown below. 1 to 9999
	Acceleration [G]	Set Acceleration. The setting range is shown below. 0.01 to 9.99
	Deceleration [G]	Set Deceleration. The setting range is shown below. 0.01 to 9.99
	Output operation	Select the output operation. The selection are as shown below. (Blank): No Output operation is selected. ON: After moved ON OFF: After moved OFF OND: Specified distance passed ON OFFD: Specified distance passed OFF ONR: Specified distance passed ON OFFR: Specified distance passed OFF
	Output No.	Set the Output port / Flag number. The setting range is shown below. 300 to 599, 4000 to 6999, 600 to 899, 900 to 999, 7000 to 7599
	Output parameter1	Set output condition. The setting range is shown below. 0.01 to 9.99
	Output parameter 2	Set output time. The setting range is shown below. 0.000 to 9999.999
	Comment	Input a comment. You can input up to 16 full-width characters and 32 half-width characters
6)	Status bar	Displays the additional explanation of selected cell.

6.1.5 Export position data to external file

Click Save in the menu.

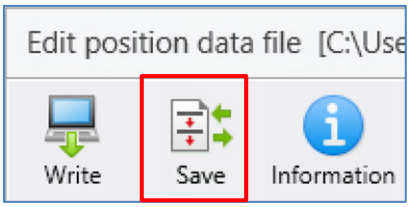


Fig. 6.1- 9 Export position data to external file

The “Export” dialog will be displayed.

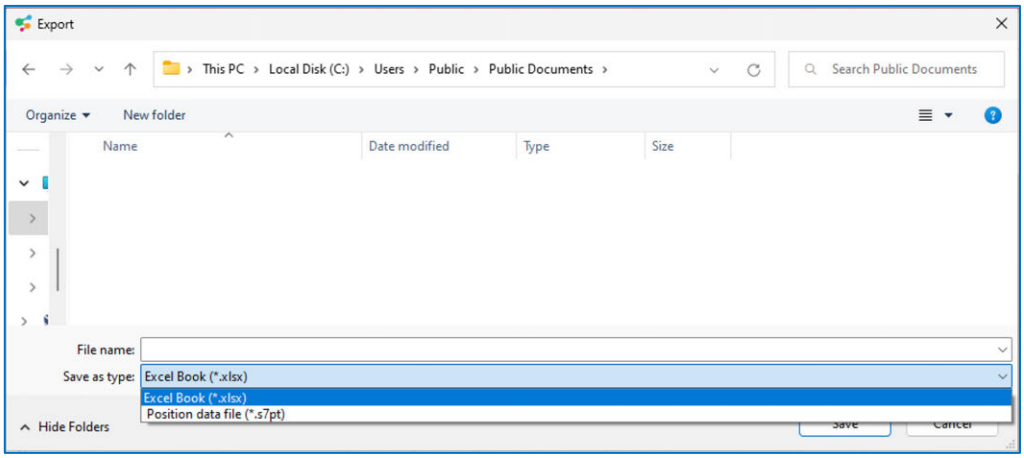


Fig. 6.1- 10 “Export” dialog

Input file name, and click Save. Export the data from Edit Position data window to the external file using excel (*.xlsx) or position data file (*.**pt).

6.1.6 Display information of position data file

Click Information from the menu of the Edit Position Data file window.

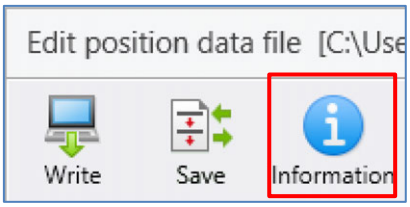


Fig. 6.1- 11 Display information of position data file

Information dialog is displayed. You can check the information of position data file.

6.2 Edit coordinate system definition data

Edit coordinate system definition data, write to controller and export to external file.

6.2.1 Edit coordinate system definition data [Project]

Click Edit coordinate system definition data from “Position” tab.
The Edit coordinate system definition data [Project] window will be displayed.

- When the display change is “Work coordinate system offset”

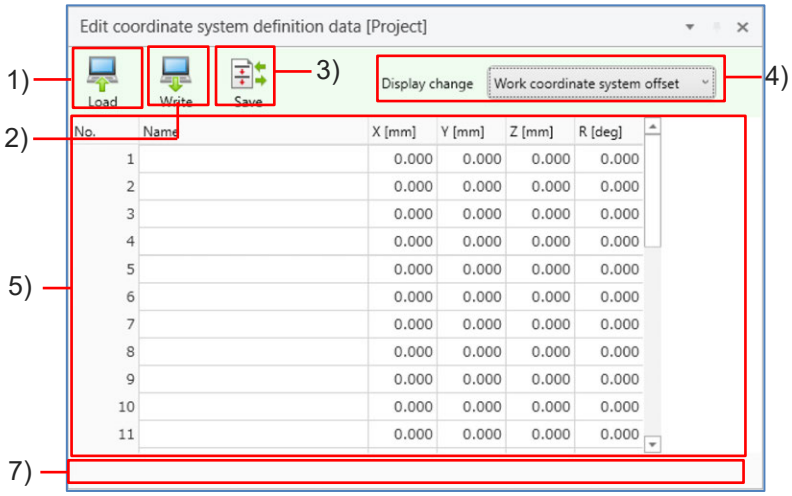


Fig. 6.2- 1 Edit coordinate system definition data [Project] (Work coordinate system offset)

- When the display change is “Tool coordinate system offset”

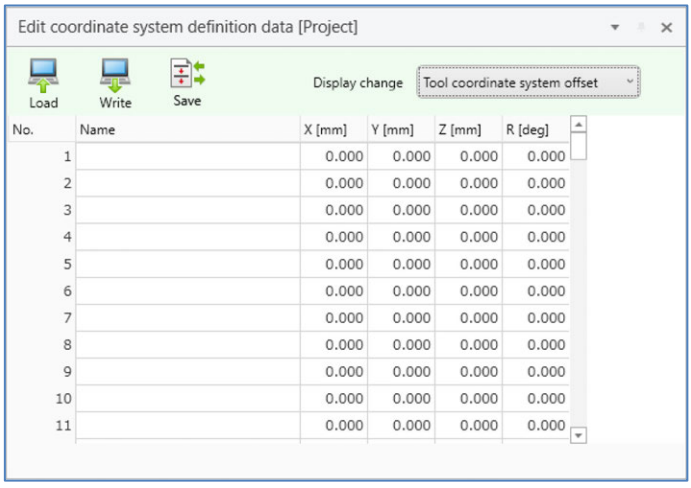


Fig. 6.2- 2 Edit coordinate system definition data [Project] (Tool coordinate system offset)

● When the display change is “Simple interference check zone”

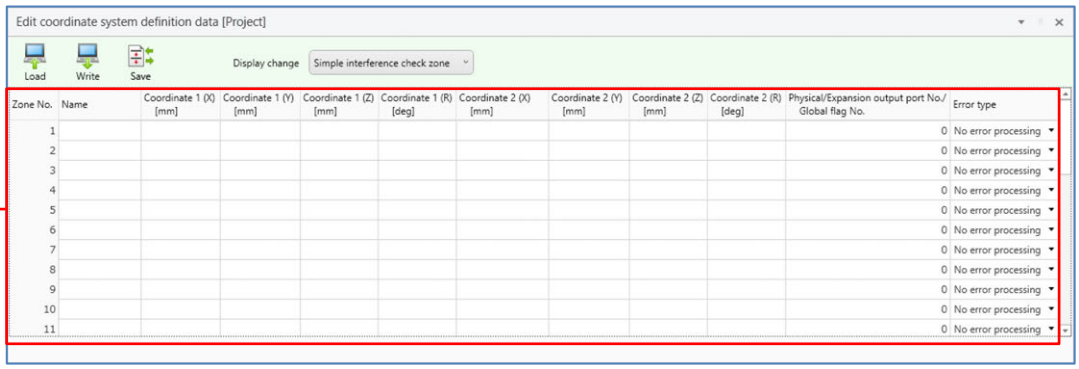


Fig. 6.2- 3 Edit coordinate system definition data [Project] (Simple interference zone)

Table 6.2- 1 Edit coordinate system definition data [Project] configuration

No.	Name	Description
1)	Load button	Read coordinate system definition data from controller, and update the displayed data.
2)	Write button	Write coordinate system definition data to controller.
3)	Save button	Export coordinate system definition data to file.
4)	Display change	Switch data display. The selection are as shown below. “Work coordinate system offset”, “Tool coordinate system offset”, “Simple interference check zone”
5)	No.	Displays the number of the Work coordinate system/Tool coordinate system definition data.
	Name	Set the name of Work coordinate system/Tool coordinate system definition data, and display.
	X [mm] to R [mm]	It is displayed when it is SCARA robot. Displays coordinate offset value of Work coordinate system/Tool coordinate system definition data, and set them. The setting range is shown below. -99999.999 to 99999.999
	X [mm] to Rz [mm]	It is displayed in the case of Cartesian 6-Axis Robot. Displays coordinate offset value of Work coordinate system/Tool coordinate system definition data, and set them. The setting range is shown below. -99999.999 to 99999.999
6)	Zone No.	Displays the number of simple interference zone.
	Name	Displays the name of the simple interference check zone.
	Coordinate 1X [mm] to 1R [mm], Coordinate 2X [mm] to 2R [mm]	Displays the name of simple interference zone. The setting range is shown below. -99999.999 to 99999.999
	Physical/Expansion output port No./Global flag No.	Displays the physical and expansion output port number/global flag number that are used in simple interference zone, and set them. The setting range is shown below. 300 to 599, 4000 to 6999, 600 to 899
	Error type	Select the error type when it is in simple interference zone. The selection are as shown below. “No error processing”, “Error processing for message level”, “Error processing for action cancel lebel”
7)	Status bar	Displays the additional explanation of selected cell.

6.2.2 Loading coordinate system definition data

Click Load from the menu of the Edit coordinate system definition data [Project] window.
Get latest coordinate system definition data from controller, and update the displayed data.

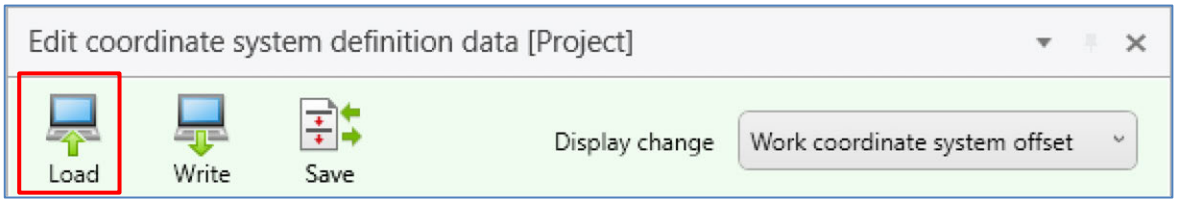


Fig. 6.2- 4 Loading coordinate system definition data

6.2.3 Writing coordinate system definition data

Write the data of edit coordinate system definition window to controller.
Click Write in the menu.

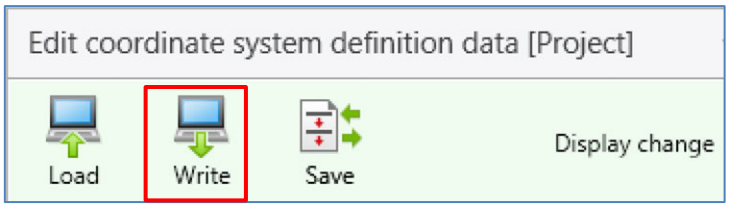


Fig. 6.2- 5 Writing coordinate system definition data

6.2.4 Edit Coordinate system definition data file

Click Coordinate system definition data in “file” tab

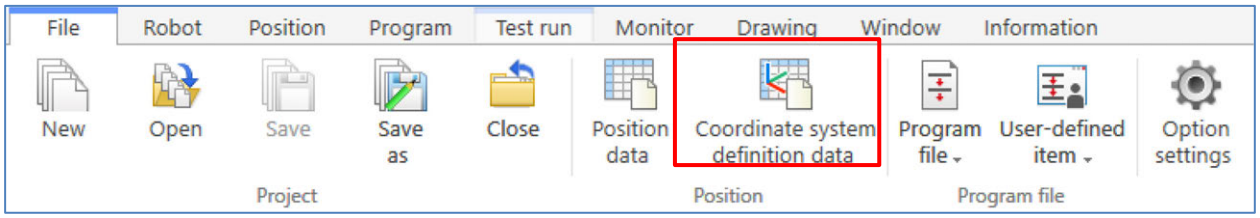


Fig. 6.2- 6 Edit Coordinate system definition data file

The “Open the file” dialog will be displayed.

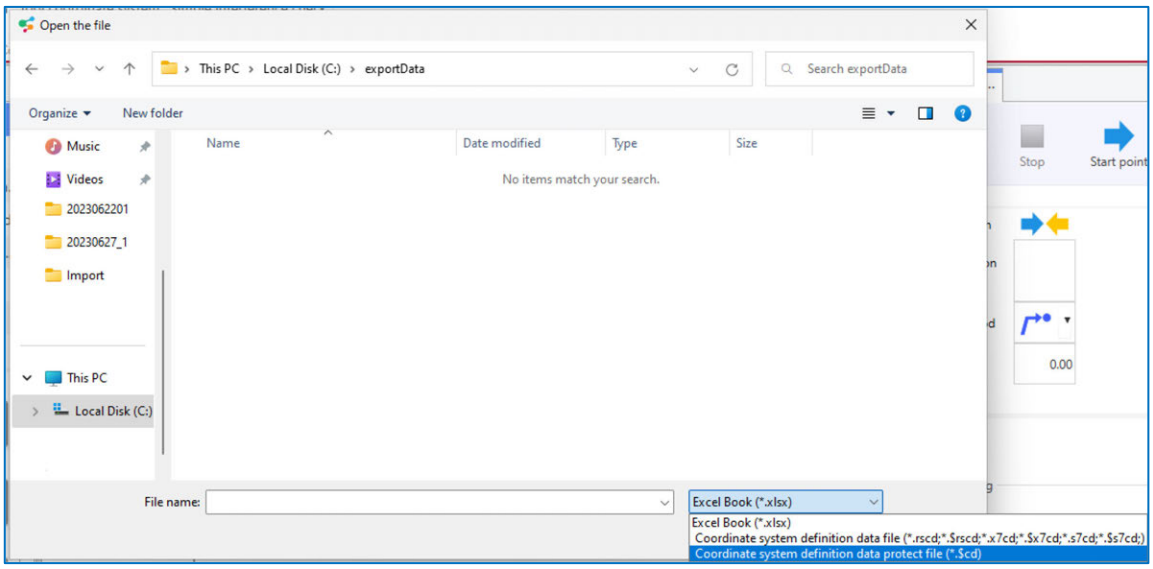


Fig. 6.2- 7 “Open the file” dialog

Specify the coordinate system definition data file and click Open.

The Edit Coordinate system definition data file window will be displayed.

● When the display change is “Work coordinate system offset”

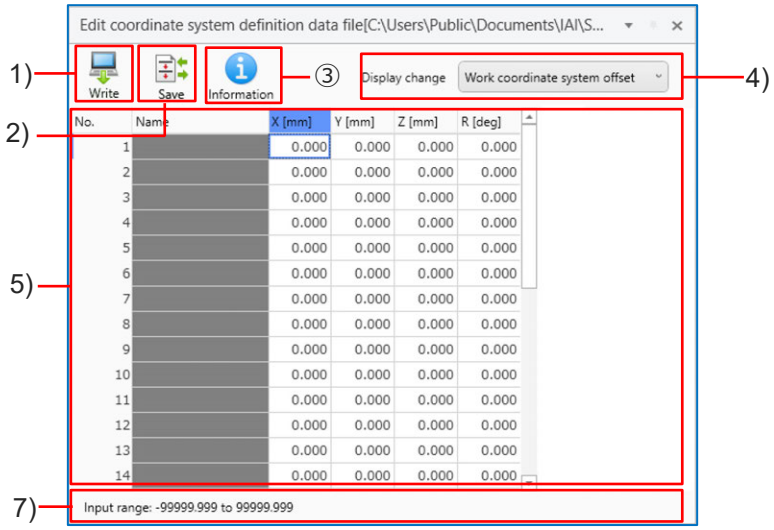


Fig. 6.2- 8 Edit Coordinate system definition data file (Work coordinate system offset)

● When the display change is “Tool coordinate system offset”

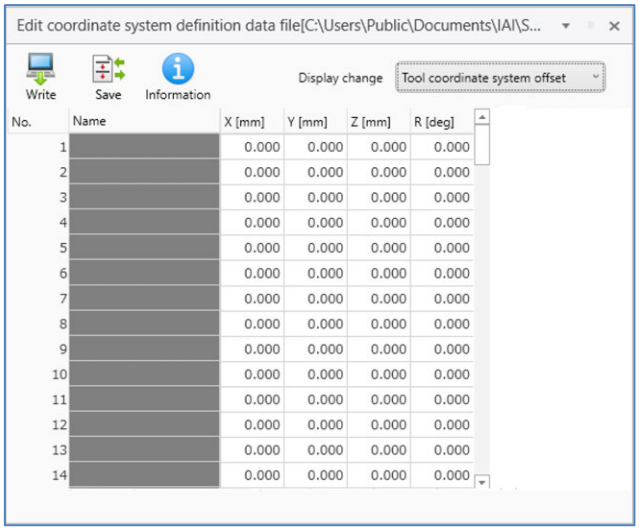


Fig. 6.2- 9 Edit Coordinate system definition data file (Tool coordinate system offset)

● When the display change is “Simple interference check zone”

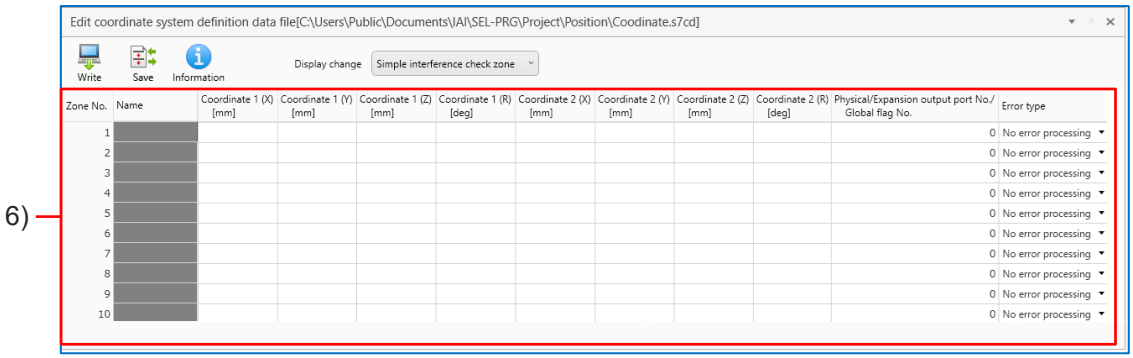


Fig. 6.2- 10 Edit Coordinate system definition data file (Simple interference zone)

Table 6.2- 2 Edit Coordinate system definition data file configuration

No.	Name	Description
1)	Write button	Write coordinate system definition data to controller.
2)	Save button	Export coordinate system definition data to file.
3)	Information button	Displays the information of opened coordinate system definition data file.
4)	Display change	Switch data display. The selection are as shown below. "Work coordinate system offset", "Tool coordinate system offset", "Simple interference check zone"
5)	No.	Displays the number of the Work coordinate system/Tool coordinate system definition data.
	Name	Not editable
	X [mm] to R [mm]	It is displayed when it is SCARA robot. Displays coordinate offset value of Work coordinate system/Tool coordinate system definition data, and set them. The setting range is shown below. -99999.999 to 99999.999
	X [mm] to Rz [mm]	It is displayed in the case of Cartesian 6-Axis Robot. Displays coordinate offset value of Work coordinate system/Tool coordinate system definition data, and set them. The setting range is shown below. -99999.999 to 99999.999
6)	Zone No.	Displays the number of simple interference zone.
	Coordinate 1X [mm] to 1R [mm], Coordinate 2X [mm] to 2R [mm]	Displays the name of simple interference zone. The setting range is shown below. -99999.999 to 99999.999
	Physical/Expansion output port No./Global flag No.	Displays the physical and expansion output port number/global flag number that are used in simple interference zone, and set them. The setting range is shown below. 300 to 599, 4000 to 6999, 600 to 899
	Error type	Select the error type when it is in simple interference zone. The selection are as shown below. "No error processing", "Error processing for message level", "Error processing for action cancel lebel"
7)	Status bar	Displays the additional explanation of selected cell.

6.2.5 Export external file of coordinate system definition data.

Click Save in the menu.

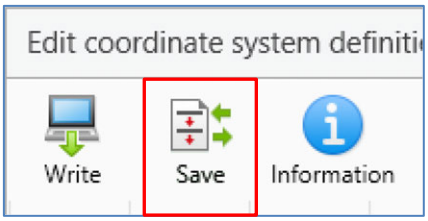


Fig. 6.2- 11 Export external file of coordinate system definition data.

The “Save” dialog will be displayed.

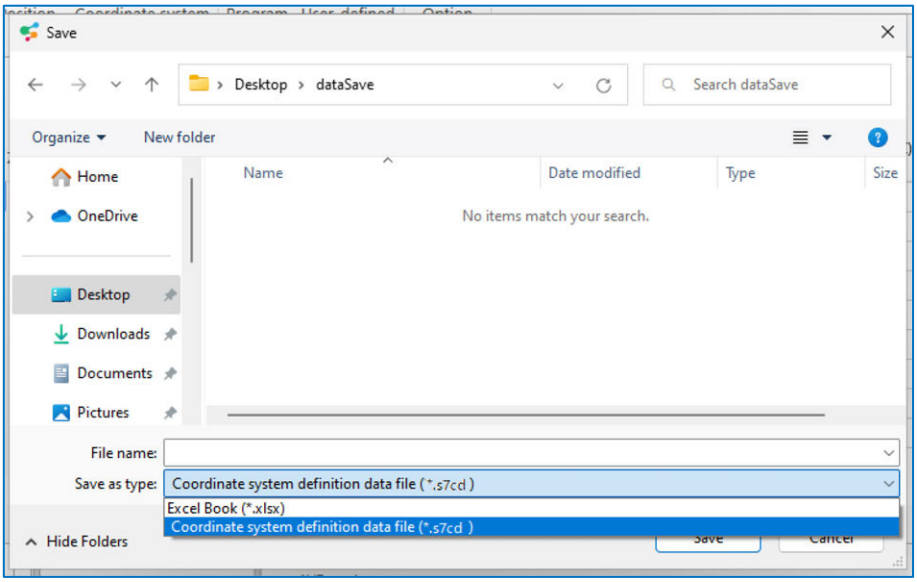


Fig. 6.2- 12 “Save” dialog

Input file name, and click Save. Export the coordinate system definition data to the external file using excel (*.xlsx) or coordinate system definition data file (*.**cd).

6.2.6 Display information of Coordinate system definition data file

Click Information from the menu of the Coordinate system definition data file window.

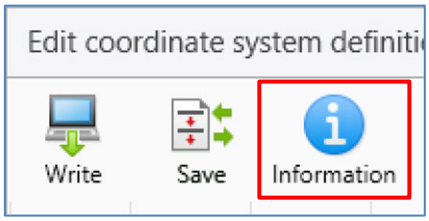


図 6.2- 13 Display information of Coordinate system definition data file

Information dialog is displayed. You can check the information of Coordinate system definition data file.

6.3 Data comparison function

Compare the data of position data and coordinate system definition data.

6.3.1 How to launch

Display comparison data selection window by clicking Data comparison on “Position” tab.

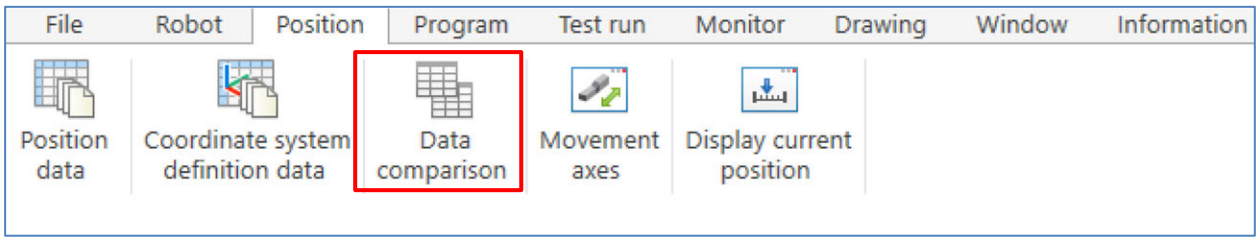


Fig. 6.3- 1 Data comparison function

6.3.2 Comparison target data selection

The following is the description of comparison target data selection window.

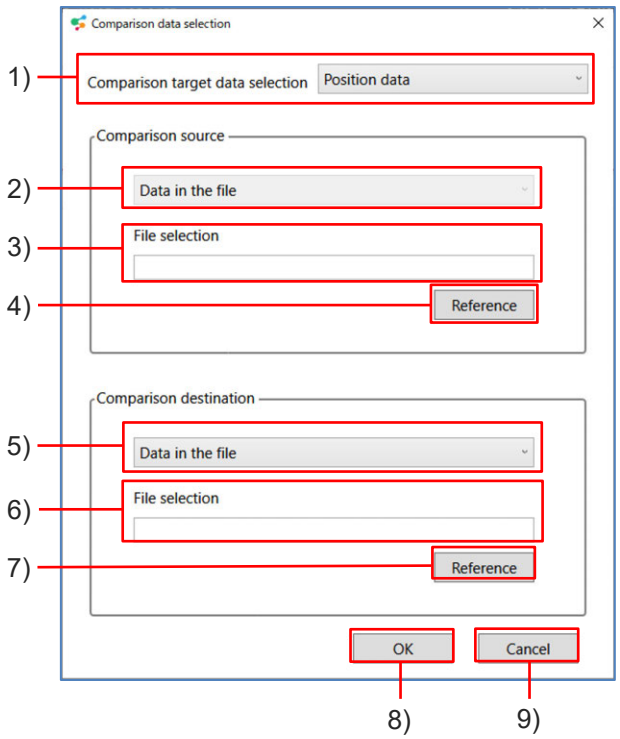


Fig. 6.3- 2 Comparison target data selection window

Table 6.3- 1 Comparison target data selection window configuration

No.	Name	Description
1)	Comparison target data selection	Select the data type that is compared. The selection are as shown below. “Position data”, “Work coordinate system offset data” “Tool coordinate system offset data”, “Simple interference check zone data”
2)	Comparison source selection	Comparison source is fixed to “Data in the file”.
3)	File selection for comparison source	Display the file path of comparison source.
4)	File refer button for comparison source	Displays “Open file” dialog. It is valid when “Data in the file” is selected in comparison source selection.
5)	Comparison destination data selection	Select the destination of comparison destination data. The selection are as shown below. “Data in the file”, “Data in the project” (It is displayed when the project is opened)
6)	Comparison destination data file selection	Display the file path of comparison destination data. It is valid when “Data in the file” is selected in comparison destination data selection.
7)	File refer button for comparison destination data	Displays “Open file” dialog. It is valid when “Data in the file” is selected in comparison source selection.
8)	OK button	Execute data comparison processing.
9)	Cancel button	Cancel data comparison processing.

6.3.3 Deta comparison

Check the result of data comparison in data comparison window.

- Data comparison for position data

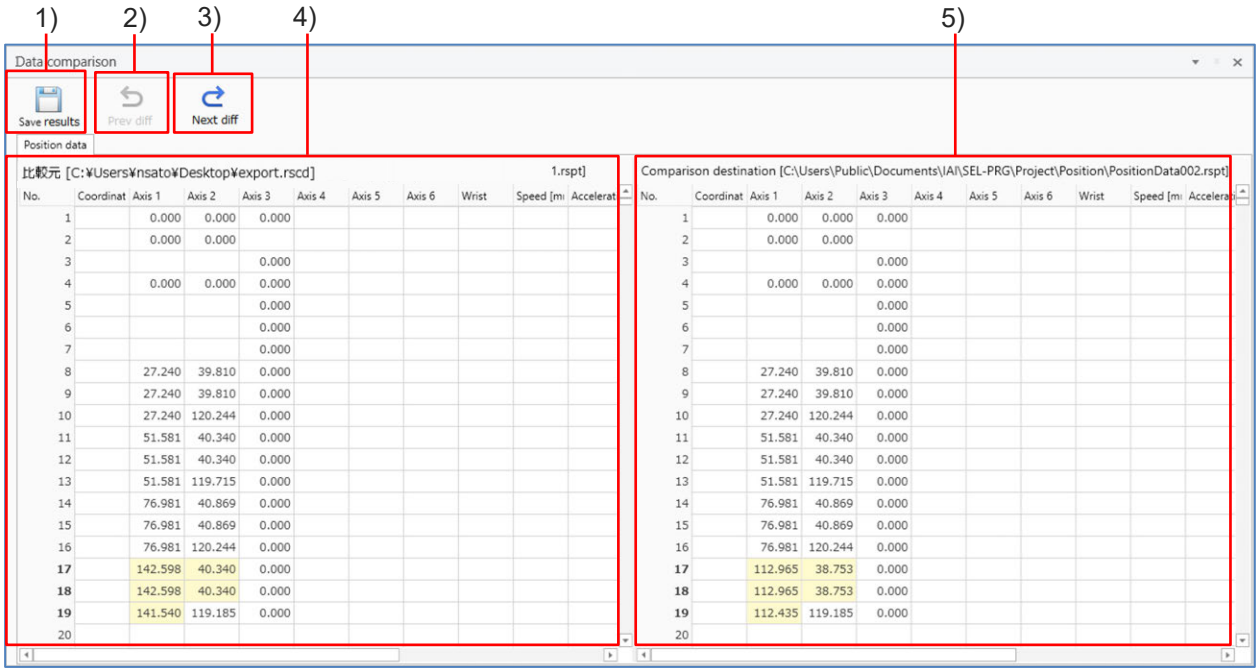


Fig. 6.3- 3 Deta comparison window

- Data comparison for coordinate system definition data

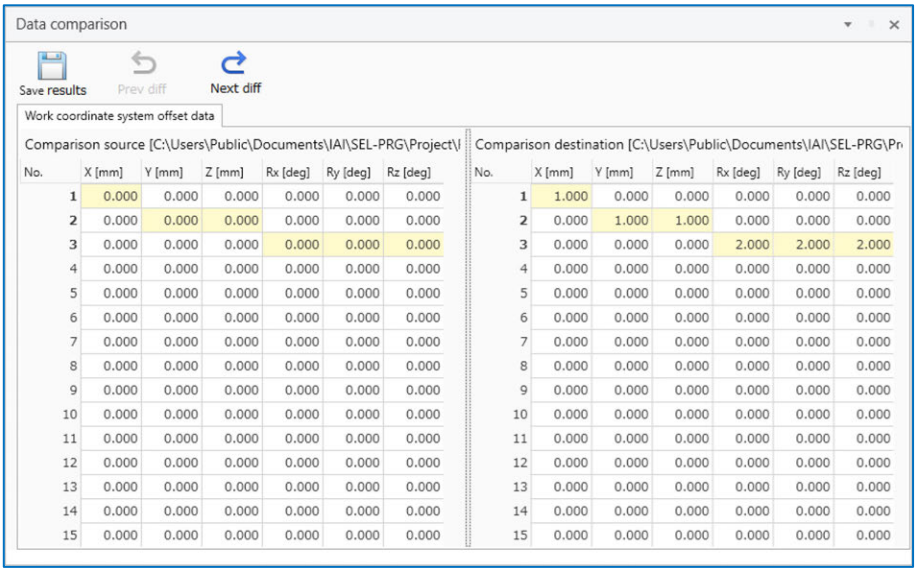


Fig. 6.3- 4 Data comparison for coordinate system definition data

Table 6.3- 2 Deta comparison window configuration

No.	Name	Description
1)	Save results button	Export data comparison result to Excel file.
2)	Prev diff button	Move focus to difference position before focus position.
3)	Next diff button	Move focus to data difference after focus position.
4)	Comparison source data	Displays Comparison source data. Data difference is shown in yellow background.
5)	Comparison destination data	Displays Comparison destination data. Data difference is shown in yellow background.

6.3.4 Export external file of Comparison results.

Click Save the result in the menu. “Save comparison result data” dialog will be displayed. Input file name, and click Save.

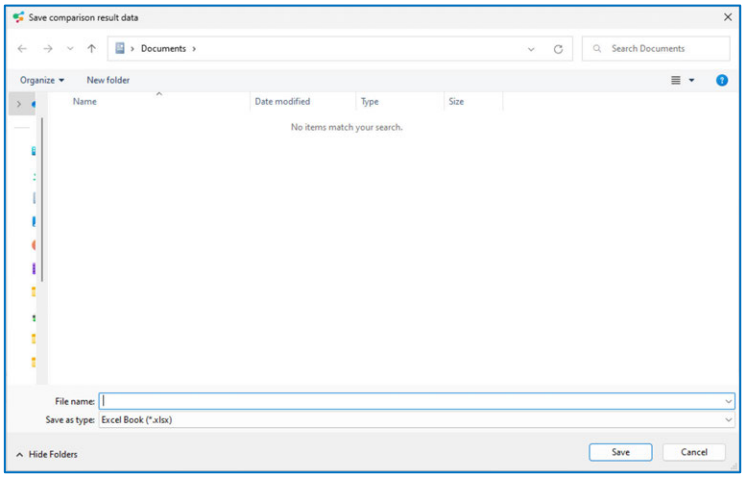


Fig. 6.3- 5 “Save comparison result data” dialog

Save the data of comparison result using excel (*.xlsx).

Work coordinate system offset data comparison result

Part with difference
No data (not subject to comparison)
Data that cannot be read (not subject to comparison)

Comparison source [C:¥Users¥Documents¥Projects¥Project001¥Position¥Coor

No.	X [mm]	Y [mm]	Z [mm]	Rx [deg]	Ry [deg]	Rz [deg]
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

Comparison destination [C:¥Users¥Documents¥Projects¥Project001¥Position¥C

No.	X [mm]	Y [mm]	Z [mm]	Rx [deg]	Ry [deg]	Rz [deg]
1	1	0	0	0	0	0
2	0	1	1	0	0	0
3	0	0	0	2	2	2
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

Fig. 6.3- 6 Comparison result data (Excel)

6.3.5 Move focus to data difference cell in comparison result.

Move focus to the position that is detected the difference of comparison source data and comparison destination data.

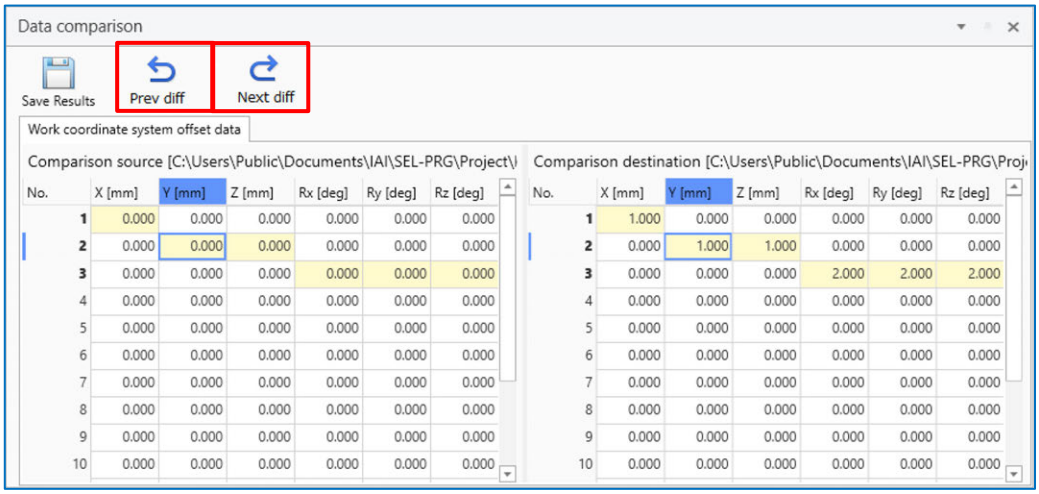


Fig. 6.3- 7 Comparison Data Focus Move

Focus is moved to the cell of data difference that is one before by clicking Prev diff.
Prev diff button is not valid when the focus is first data difference.

Focus is moved to the cell of data difference that is one after by clicking Next diff.
Next diff button is not valid when the focus is last data difference.

SEL Assist

Chapter 7

Axis motion

7.1 Axis motion

Click Axis motion in “Position” tab to display the Movement axes window.

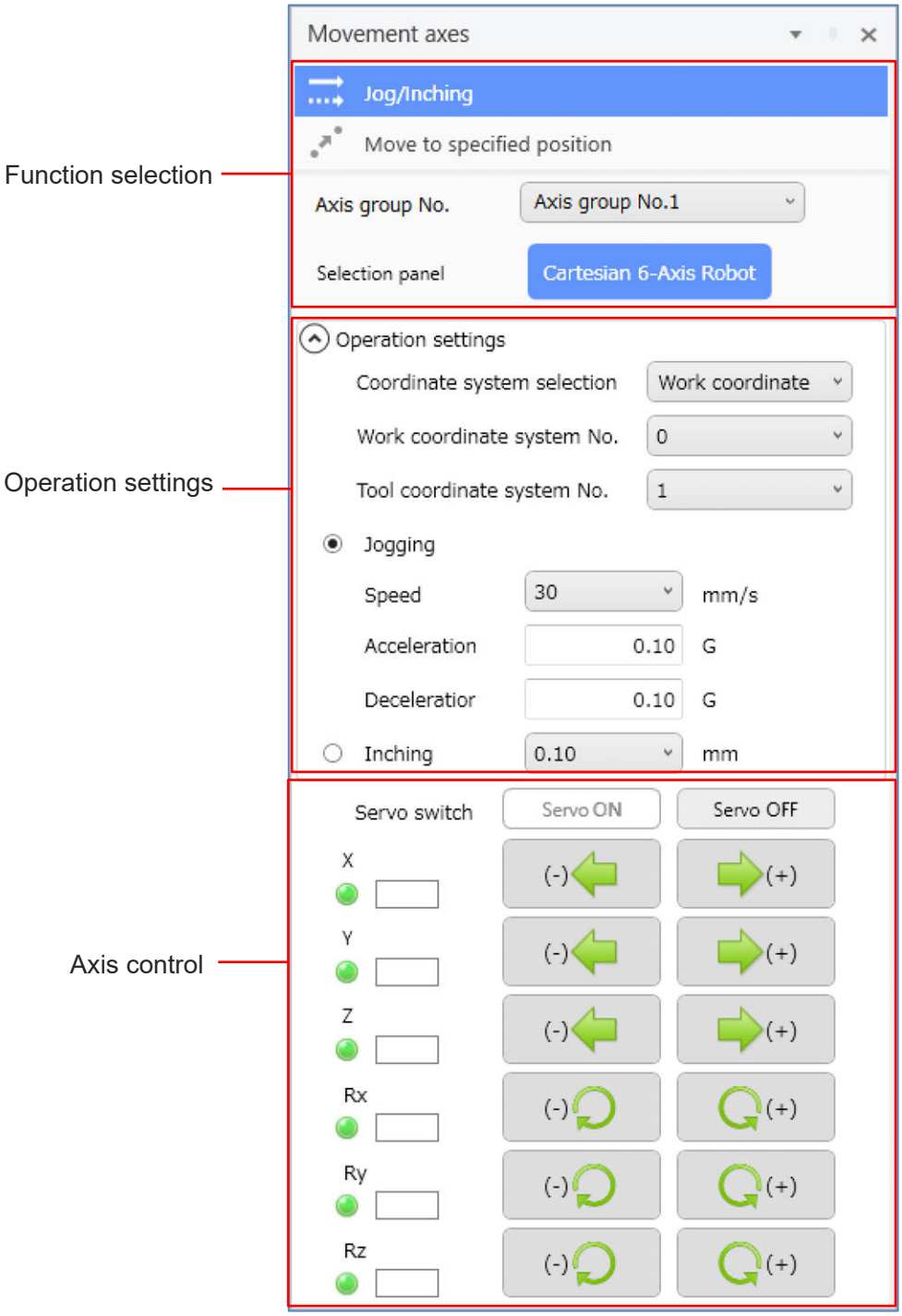


Fig. 7.1- 1 Axis motion window

7.1.1 Function selection

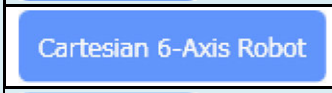
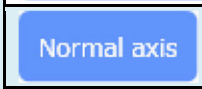
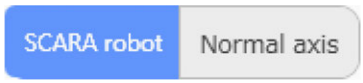
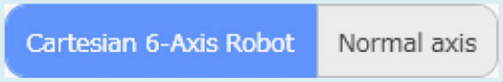
Switch Jog/Inching, Move to specified position.

Table 7.1- 1 Function selection

Item	Description
Jog/Inching	Switch to Jog/Inching function by clicking.
Move to specified position	Switch to Move to specified position function by clicking.

Axis group can be switched when axis group is plural. Robot and normal axis can be switched when the displayed axis is plural.

Table 7.1- 2 Axis group switch

Item		Description
Axis group No.		Select the Axis group No. Axis group No. of current location window is updated in conjunction. It is not displayed when axis group is singular.
Selection panel		Control SCARA robot.
		Control Cartesian 6-Axis Robot.
		Control Normal axis
		Switch SCARA robot and normal axis. Displayed axis selection of current location window is updated in conjunction.
		Switch Cartesian 6-Axis Robot and normal axis. Displayed axis selection of current location window is updated in conjunction.

7.2 Jog/Inching

7.2.1 Function

Jog and Inching are functions that move actuator.

Table 7.2- 1 Jog/Inching function

Function	Description
Jog	It moves actuator while axis control button is selected with selected speed and addition and subtraction speed.
Inching	It moves by selecting axis control button for selected speed or angle.

7.2.2 Operation settings

Set the Movement axes of Jog/Inching function.

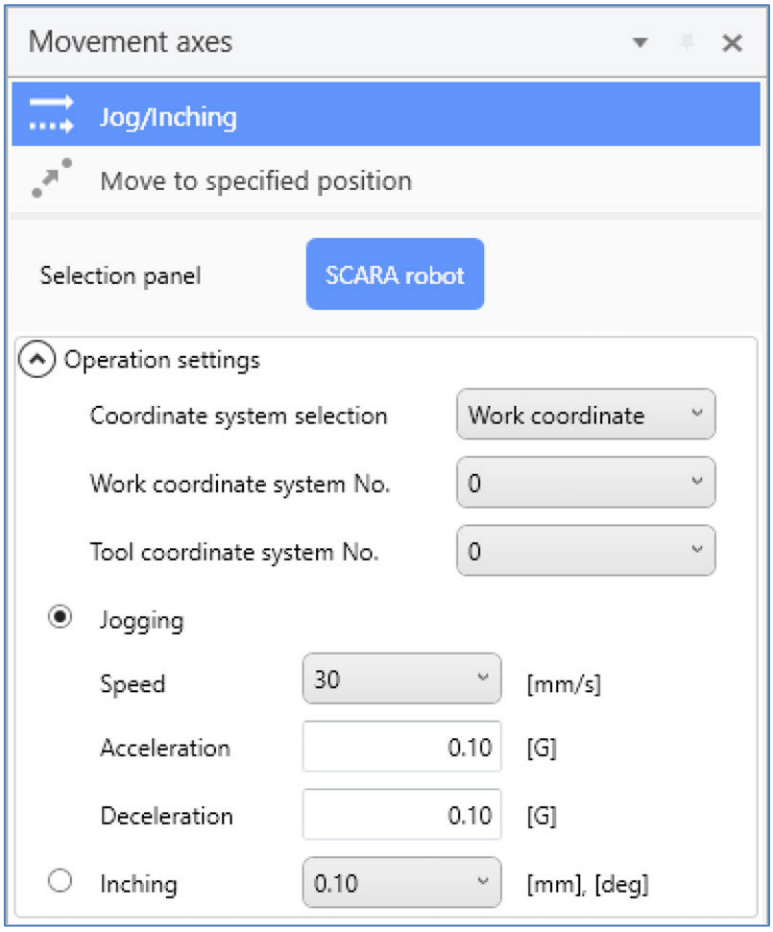


Fig. 7.2- 1 Operation settings (Jog/Inching function)

Table 7.2- 2 Operation settings configuration (Jog/Inching function)

Item	Description
Coordinate system selection	It is displayed when displayed axis selection is “SCARA robot” or “Cartesian 6-Axis Robot”. Select coordinate system. The selection are as shown below. Work coordinate system, Tool coordinate system, Each axis coordinate system
Work Coordinate system No.	It is displayed when displayed axis selection is “SCARA robot” or “Cartesian 6-Axis Robot”. Select Work coordinate system No..
Tool coordinate system No.	It is displayed when displayed axis selection is “SCARA robot” or “Cartesian 6-Axis Robot”. Select Tool coordinate system No..
Jogging Inching	Select Jogging or Inching.
Speed	Set the moving speed of Jogging. The selection are as shown below. Unit [mm/s] 10, 30, 100
	Set the ratio regarding maximum speed when displayed axis selection is “SCARA robot” and coordinate system selection is “Each axis coordinate system”. The setting range is shown below. Unit [%] 1 to 100
Acceleration	Set the acceleration when Jogging starts moving. The setting range is shown below. Unit [G] 0.01 to 9.99
	Set the ratio regarding maximum acceleration when displayed axis selection is “SCARA robot” and coordinate system selection is “Each axis coordinate system”. The setting range is shown below. Unit [%] 1 to 100
Deceleration	Set the deceleration when Jogging stops moving. The setting range is shown below. Unit [G] 0.01 to 9.99
	Set the ratio regarding maximum deceleration when displayed axis selection is “SCARA robot” and coordinate system selection is “Each axis coordinate system”. The setting range is shown below. Unit [%] 1 to 100
Inching	Select moving distance for Inching. The selection are as shown below. Unit [mm], [deg] 0.01, 0.05, 0.10, 0.50, 1.00

7.2.3 Axis control

The following is the description of how to control Jog/Inching.
It explains using SCARA robot as example when displayed axis selection is “SCARA robot” or “Cartesian 6-Axis Robot”.
“Arm system” is displayed when displayed axis selection is “SCARA robo”].

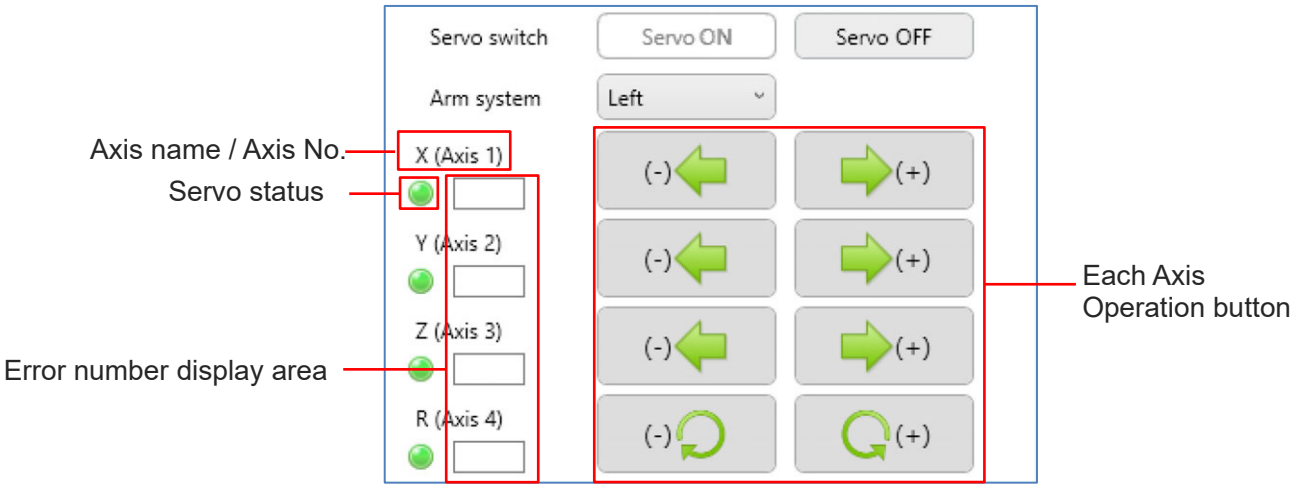


Fig. 7.2- 2 Axis control (SCARA robot /Cartesian 6-Axis Robot)

Table 7.2- 3 Axis control configuration (SCARA robot /Cartesian 6-Axis Robot)

Item	Description
Servo switch	Servo ON button: Set servo of all axis to ON at one click. Servo OFF button: Set servo of all axis to OFF at one click.
Arm system	Set the arm system for SCARA robot. The selection are as shown below. Left Arm system, Right Arm system
Axis name / Axis No.	Displays axis name when coordinate system selection is “Work coordinate system” or “Tool coordinate system”. Displays Axis No. when coordinate system selection is “Each axis coordinate system”.
Servo status	Lamp ON: Servo status is ON. Lamp OFF: Servo status is OFF.
Error number display area	Displays the error number when the error is detected.
Each Axis Operation button	Jog: Actuator starts moving by clicking button. It stops by removing button. Inching: It moves actuator for selected distance by clicking button.

The following is the example when displayed axis selection is “Normal Axis”.

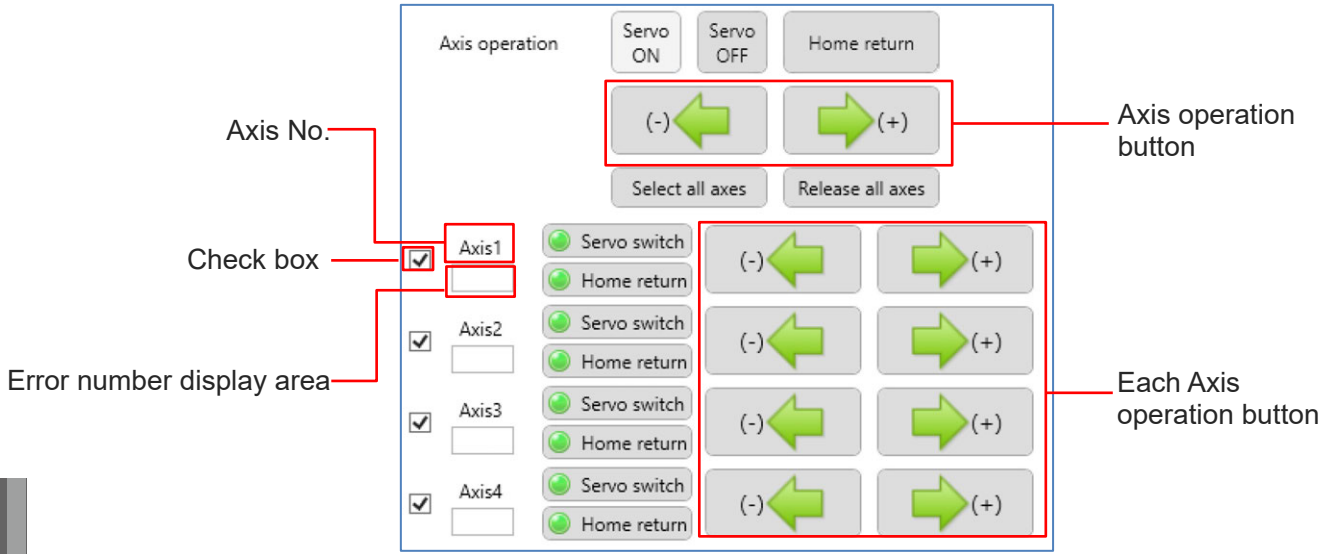


Fig. 7.2- 3 Axis control (Normal Axis)

Table 7.2- 4 Axis control configuration (Normal Axis)

Item		Description
Axis operation	Servo ON button	Set servo status of selected axis to ON at one click.
	Servo OFF button	Set servo status of selected axis to OFF at one click.
	Home return button	It moves actuator of selected axis to the initial position.
	Axis operation button	Jog: Actuator starts moving by clicking button. It stops by removing button. Inching: It moves actuator of selected axis for selected distance by clicking button.
	Select all axes button	Select all checkboxes for all axes.
	Release all axes button	Release all checkboxes for all axes.
Check box		Checked axis is subject to selected axis movement.
Axis No.		Displays the Axis No.
Error number display area		Displays the error number when the error is detected.
Servo switch button		Switch servo status. Lamp ON: Servo status is ON. Lamp OFF: Servo status is OFF.
Home return button		It moves actuator to the initial position. Lamp ON: Home return is completed. Lamp ON: Home return is completed.
Each Axis operation button		Jog: Actuator starts moving by clicking button.It stops by removing button. Inching: It moves actuator for selected distance by clicking button.

7.3 Move to specified position

7.3.1 Function

This function is to move actuator to selected position number.
Select the position number in position data edit [Project] window, and it moves by clicking “Move” button.

7.3.2 Movement settings

Set movement settings of function to move selected position.

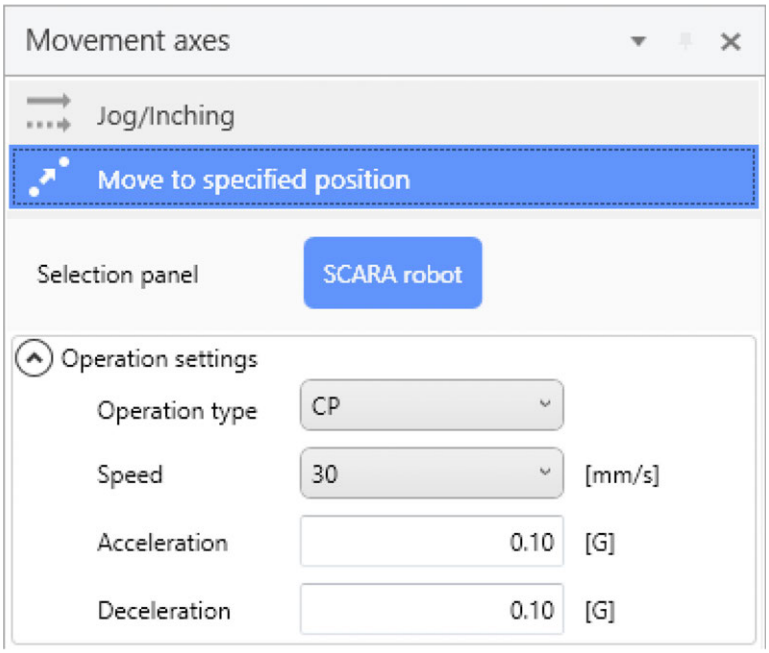


図 7.3- 1 Movement settings (Move to specified position)

Table 7.3- 1 Movement settings configuration (Move to specified position)

Item	Description
Operation type	Set operation type. The selection are as shown below. Linear interpolation movement (CP), No interpolation movement (PTP)
Speed	Set the moving speed. The selection are as shown below. Unit [mm/s] 10, 30, 100
	Set the ratio regarding maximum speed when displayed axis selection is “SCARA robot” and operation type is “(PTP)”. The setting range is shown below. Unit [%] 1 to 100
Acceleration	Set the acceleration when it starts moving. The setting range is shown below. Unit [G] 0.01 to 9.99
	Set the ratio regarding maximum acceleration when displayed axis selection is “SCARA robot” and operation type is “(PTP)”. The setting range is shown below. Unit [%] 1 to 100
Deceleration	Set the deceleration when it stops moving. The setting range is shown below. Unit [G] 0.01 to 9.99
	Set the ratio regarding maximum deceleration when displayed axis selection is “SCARA robot” and operation type is “(PTP)”. The setting range is shown below. Unit [%] 1 to 100

7.3.3 Axis control

The following is the axis control when displayed axis selection is “SCARA robot” or “Cartesian 6-Axis Robot”.

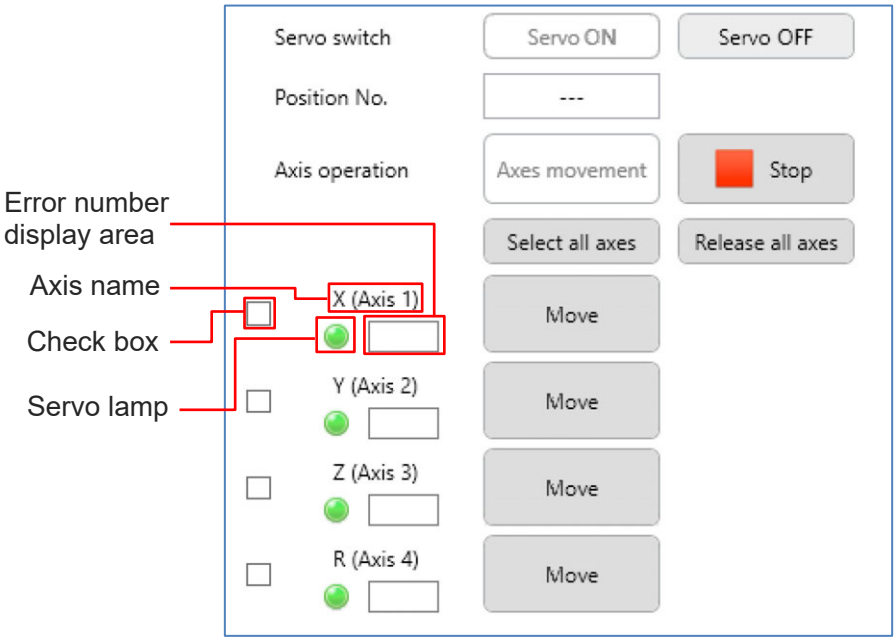


Fig. 7.3- 2 Axis control (SCARA robot /Cartesian 6-Axis Robot)

Table 7.3- 2 Axis control configuration (SCARA robot /Cartesian 6-Axis Robot)

Item		Description
Servo switch	Servo ON button	Set servo status of all axis to ON at one click.
	Servo OFF button	Set servo status of all axis to OFF at one click.
Position No.		Display position number that is selected in position data edit [Project].
Axis operation	Axes movement button	Move actuator of selected axis to selected position number.
	Stop button	Stop actuator movement.
	Select all axes button	Select all checkboxes for all axes.
	Release all axes button	Release all checkboxes for all axes.
Check box		Checked axis is subject to selected axis movement.
Axis name		Displays the Axis No.
Servo lump		Lamp ON: Servo status is ON. Lamp OFF: Servo status is OFF.
Error number display area		Displays the error number when the error is detected.
Move button		Move actuator of applicable axis to applicable axis coordinate of selected position number.

The following is the Axis control unit when displayed axis selection is “Normal Axis”.

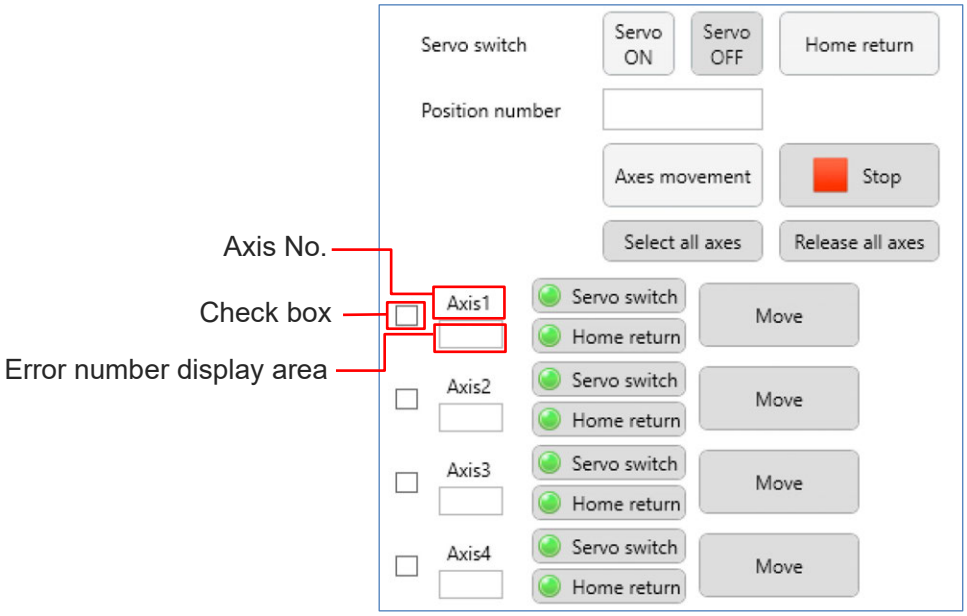


Fig. 7.3- 3 Axis control (Normal Axis)

Table 7.3- 3 Axis control configuration (Normal Axis)

Item		Description
Servo switch	Servo ON button	Set servo of all axis to ON at one click.
	Servo OFF button	Set servo of all axis to OFF at one click.
	Home return button	It moves actuator of selected axis to the initial position.
Position number		Display position number that is selected in position data edit [Project].
Axes movement	Axes movement button	Move actuator of selected axis to selected position number.
	Stop button	Stop actuator movement.
	Select all axes	Select all checkboxes for all axes.
	Release all axes	Release all checkboxes for all axes.
Check box		Checked axis is subject to selected axis movement.
Axis No.		Displays the Axis No.
Error number display area		Displays the error number when the error is detected.
Servo switch button		Switches the servo status of the corresponding axis. Lamp ON: Servo status is ON. Lamp OFF: Servo status is OFF.
Home return button		It moves actuator to the initial position of the corresponding axis. Lamp ON: Home return is completed. Lamp OFF: Home return is incompleted.
Move button		Move actuator of applicable axis to applicable axis coordinate of selected position number.

7.4 Current position display

Display current position window by clicking Current position display in “Position” tab.
The following is current position window when displayed axis selection is “SCARA robot”.

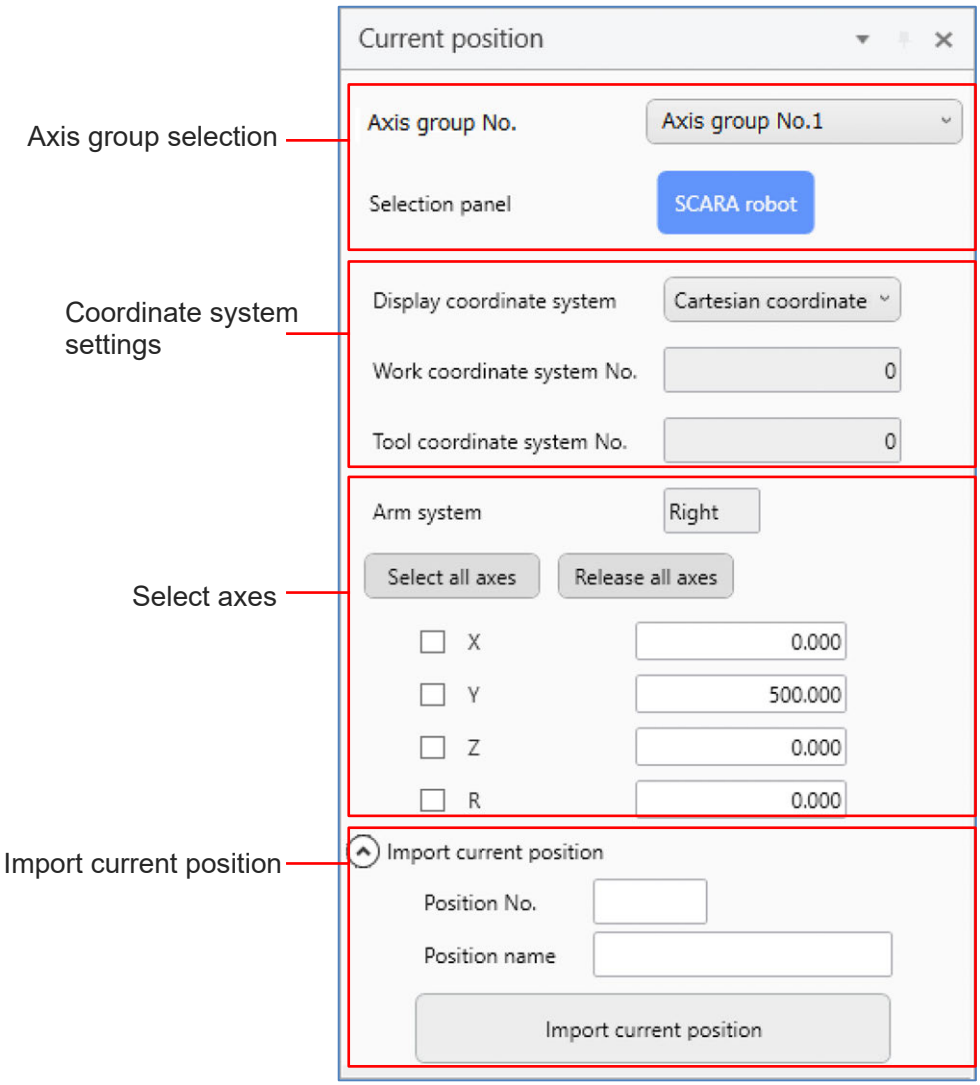


Fig. 7.4- 1 Current position window

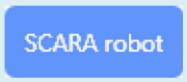
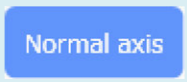
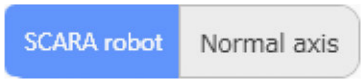
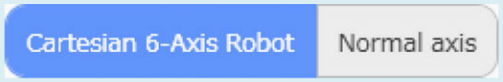
7.4.1 Function

Display current position coordinate of actuator. It takes in the current position as position data.

7.4.2 Axis group selection

Axis group can be switched when axis group is plural.
Robot and normal axis can be switched when the displayed axis is plural.

Table 7.4- 1 Axis group selection

Item		Description
Axis group No.		Select the Axis group No. It interlocks to the change of Axis group No. of axis movement window. It is not displayed when axis group is singular.
Selection panel		Control SCARA robot.
		Control Cartesian 6-Axis Robot.
		Control Normal axis
		Switch SCARA robot and normal axis. It interlocks to the change of displayed axis selection of axis movement window.
		Switch Cartesian 6-Axis Robot and normal axis. It interlocks to the change of displayed axis selection of axis movement window.

7.4.3 Coordinate system settings

The following is coordinate system settings. It is displayed when displayed axis selection is “SCARA robot” or “Cartesian 6-Axis Robot”.

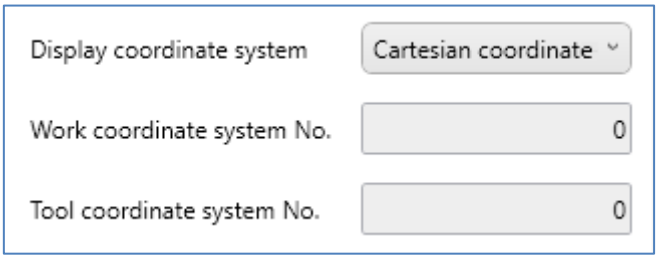


Fig. 7.4- 2 Coordinate system settings

Table 7.4- 2 Coordinate system settings configuration

Item	Description
Display coordinate system	Switch coordinate system that displays current position. The selection are as shown below. Cartesian coordinate system, Each axis coordinate system
Work coordinate system No.	Set the Work coordinate system No.. It is valid when displayed coordinate system is “Cartesian coordinate system”.
Tool coordinate system No.	Set the Tool coordinate system No.. It is valid when displayed coordinate system is “Cartesian coordinate system”.

7.4.4 Select axis

The following is Select axis when displayed axis selection is “SCARA robot”.

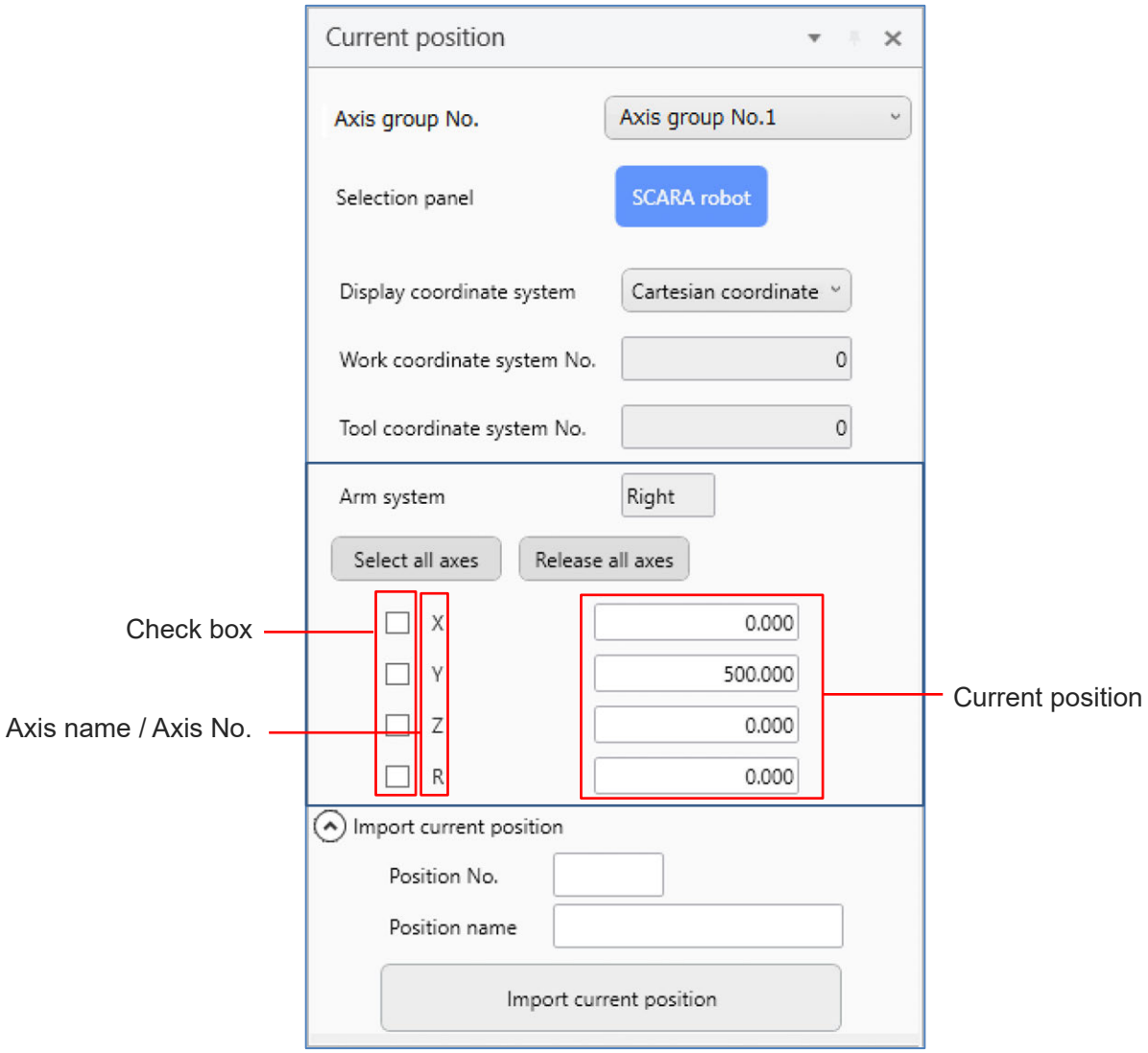


Fig. 7.4- 3 Select axis (SCARA robot)

Table 7.4- 3 Select axis configuration (SCARA robot)

Item	Description
Arm system	Display the Arm system.
Select all axes button	Select all checkboxes for all axes.
Release all axes button	Release all checkboxes for all axes.
Check box	Checked axis is subject to the Import current position.
Axis name / Axis No.	Axis name is displayed when displayed coordinate system is “Cartesian coordinate system”. Axis No. is displayed when displayed coordinate system is “Each axis coordinate system”.
Current position	Display the current position of each axis.

The following is Select axis when displayed axis selection is “Cartesian 6-Axis Robot”.

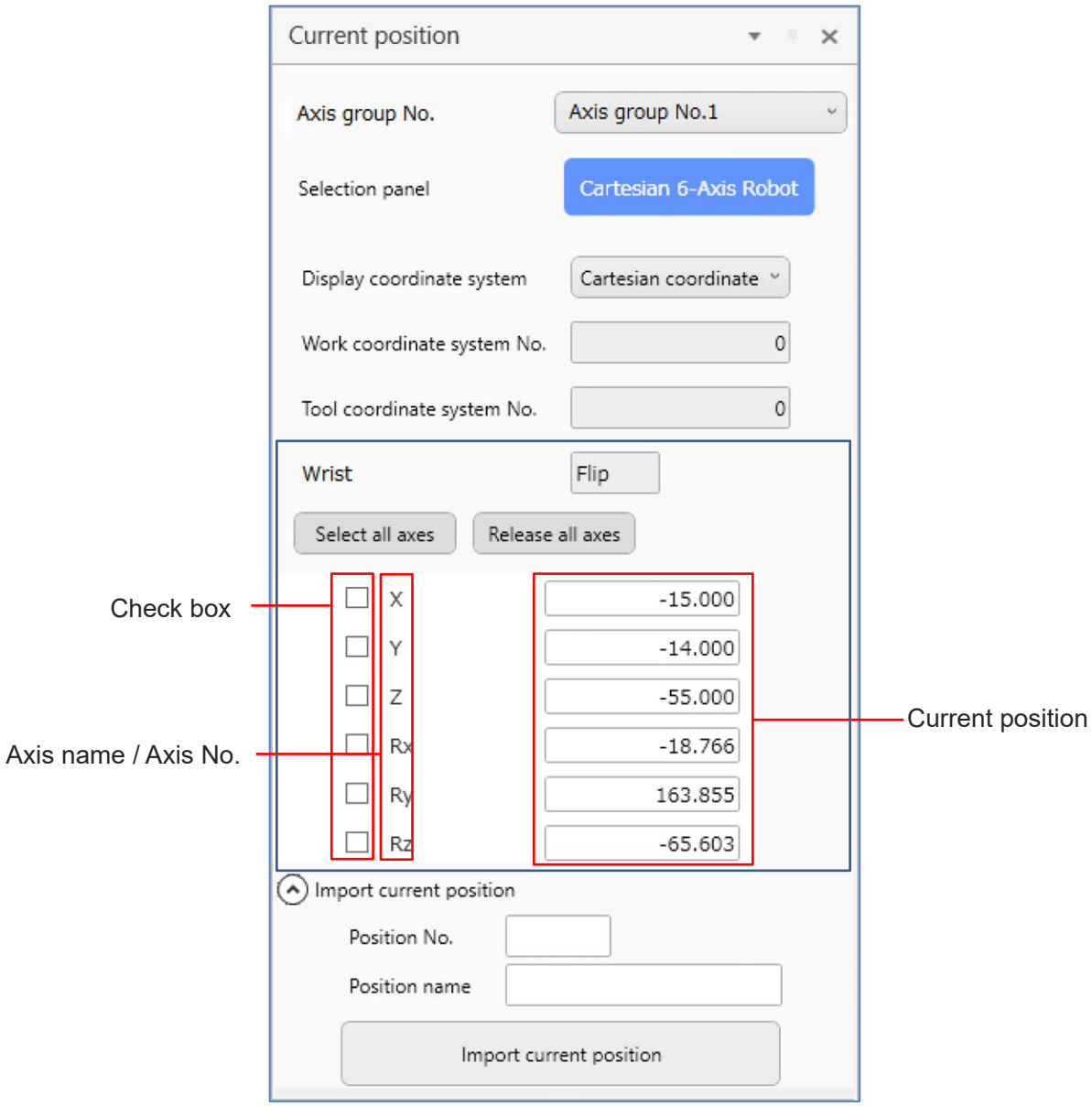


Fig. 7.4- 4 Select axis (Cartesian 6-Axis Robot)

Table 7.4- 4 Select axis configuration (Cartesian 6-Axis Robot)

Item	Description
Wrist	Display the Wrist
Select all axes button	Select all checkboxes for all axes.
Release all axes button	Release all checkboxes for all axes.
Check box	Checked axis is subject to the Import current position.
Axis name / Axis No.	Axis name is displayed when displayed coordinate system is “Cartesian coordinate system”. Axis No. is displayed when displayed coordinate system is “Each axis coordinate system”.
Current position	Display the current position of each axis.

The following is Select axis when displayed axis selection is “Normal axis”.

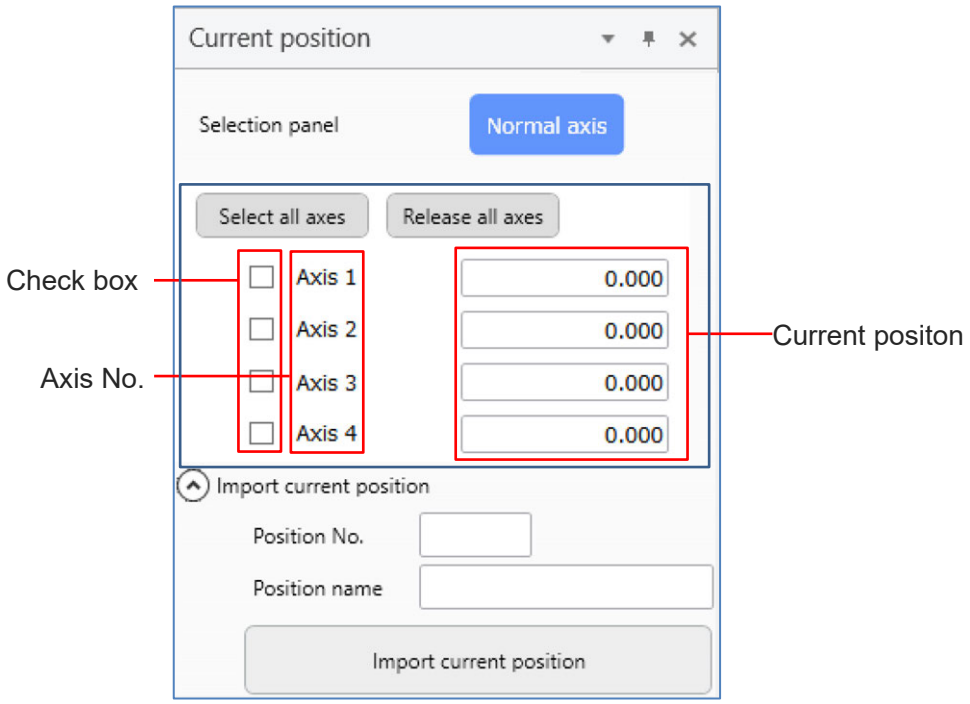


Fig. 7.4- 5 Select axis (Normal axis)

Table 7.4- 5 Select axis configuration (Normal axis)

Item	Description
Select all axes button	Select all checkboxes for all axes.
Release all axes button	Release all checkboxes for all axes.
Check box	Checked axis is subject to the Import current position.
Axis No.	Displays the Axis No.
Current position	Display the current position of each axis.

7.4.5 Import current position

The following is the Import current position.

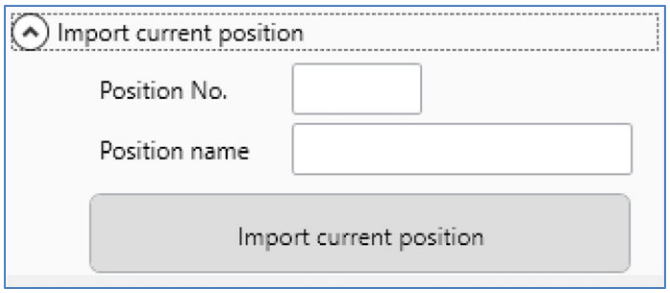


Fig. 7.4- 6 Import current position

Table 7.4- 6 Import current position configuration

Item	Description
Position No.	Displays the selected Position No. when the list in position data edit [Project] window is selected.
Position name	Displays the Position name.
Import current position button	It is valid when position data edit [Project] window is opened. Import checked axis current position to position data edit [Project] window as position data.

SEL Assist

Chapter 8

Program

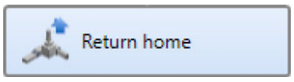
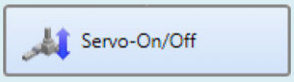
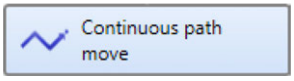
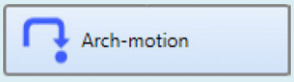
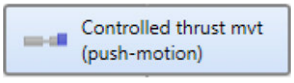
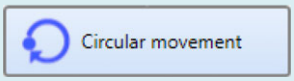
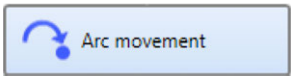
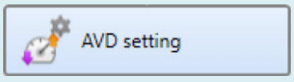
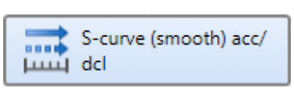
8.1 Creating a program

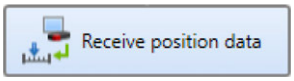
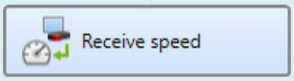
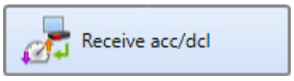
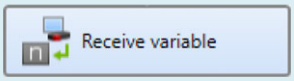
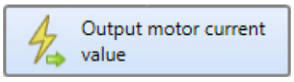
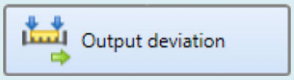
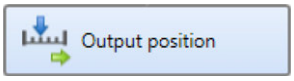
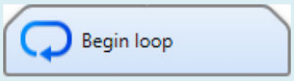
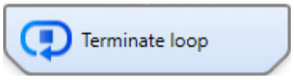
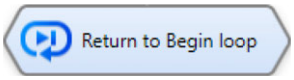
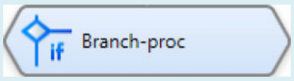
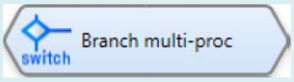
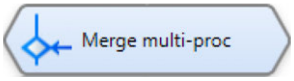
In this chapter, explains how to create a program.

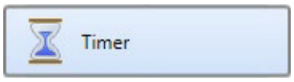
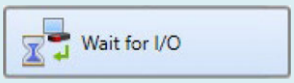
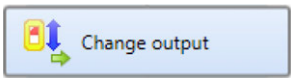
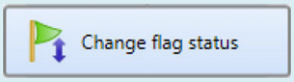
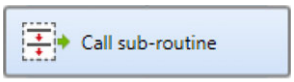
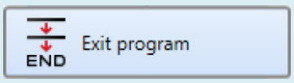
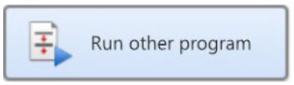
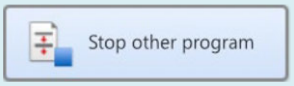
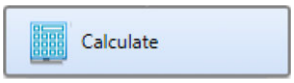
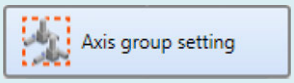
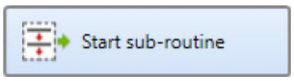
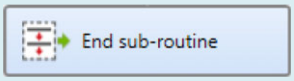
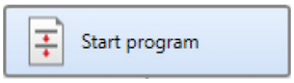
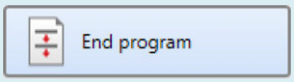
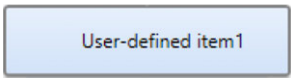
8.1.1 Item

An item indicates a component that is allocated in a program. The list of items is shown below.

Table 8.1- 1 Item list

Category	Item	Description
Axis motion		Return actuator to the initial point. Returning home does not need to be performed for actuator that is equipped with absolute encoder.
		Switch ON/OFF for servo of selected axis.
		Each axis moves with selected speed. It moves faster compared to interpolated movement.
		Axis tip moves with selected speed. Each axis moves with straight trajectory by adjusting speed.
		It moves multiple position from initial position to last position without stopping.
		Shorten moving time by arch motion. It is used for pick and place movement of work.
		Move certain section by controlling thrust.
		Move with circular trajectory in orthogonal multiple axis.
		Move with arc trajectory in orthogonal multiple axis.
Adjust a move		Set the speed when actuator is operated and addition and subtraction speed.
		Operate S-curve for addition and subtraction speed. Add speed and subtract speed to axis gently compared to linear addition and subtraction speed.
		Regard setting positioning as completed towards the position that should be set before selected distance.

Category	Item	Description
Receive data from external devices		Receive position data from external devices.
		Receive axis moving speed data from external devices.
		Receive axis addition speed and subtraction speed data from external devices.
		Receive value for variable from external devices.
Output data to external devices		Output motor current value (ratio against rated current value) to external devices.
		Output deviation (per encoder pulse) to external devices.
		Export axis current position to external devices. Set current position to position data.
Conditional/Branch processes		Perform item process repeatedly that is allocated between this item and end loop item with selected requirement.
		Return to terminate loop item.
		Leave loop with selected requirement.
		Return to begin loop with selected requirement.
		Branch processes depending on selected requirement.
		End branch processes.
		Branch processes depending on selected requirement. Requirements can be set up to 7.
		End multiple processes selection.

Category	Item	Description
Program controls		Pause performing program during set time.
		Pause program until the flag that is used in I/O signal from external devices or controller is selected.
		Change output signal status in external devices.
		Change flag status that is used inside controller.
		Call selected sub-routine.
		Exit from current program.
		An indicated program should get executed. Condition setting with input ports / global flags is available.
		An indicated program should be stopped. Condition setting with input ports / global flags is available.
Others		Save created calculate result to variable. It can be set in property dialog.
		Set the axis group setting.
Initial Placement Item		This is the start item of sub-routine.
		This is the end item of sub-routine.
		This is the start item of program.
		This is the end item of program.
User-defined item		This is the User-defined item.

8.1.2 Selecting Program

When a new project is created, a window for Program No. 1 should appear on the programming window.

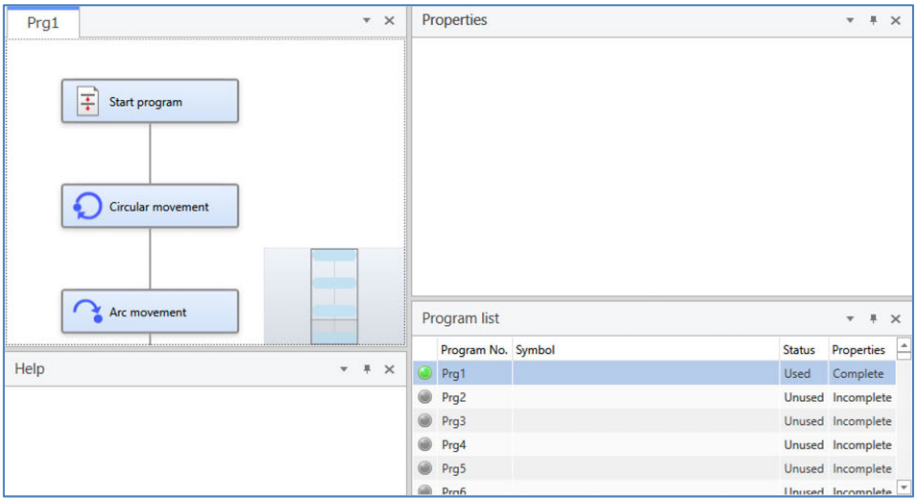


Fig. 8.1- 1 Programming window

A window of selected program number is displayed by double clicking the cell that is in the column of program number in program list. The following is the example when “Prg4” is selected.

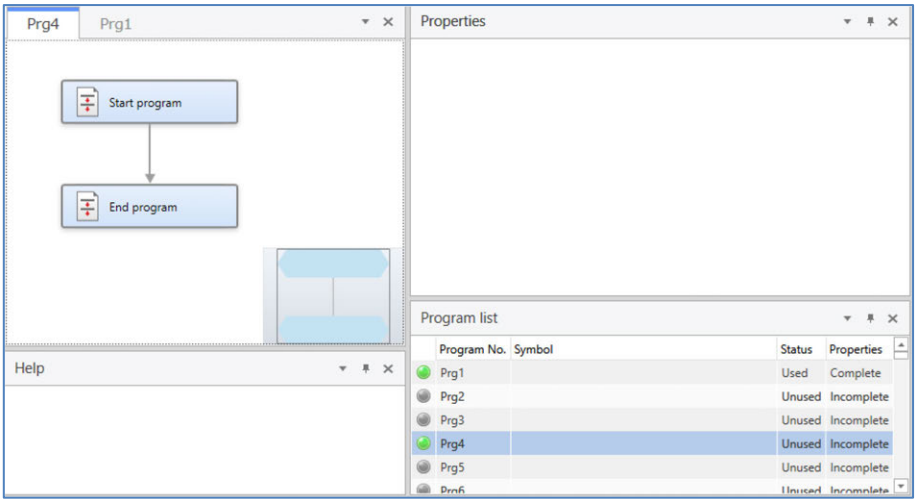


Fig. 8.1- 2 Selected program number

8.1.3 Allocation of Items

Click an item from Toolbox, and drag it to the creating a program window.

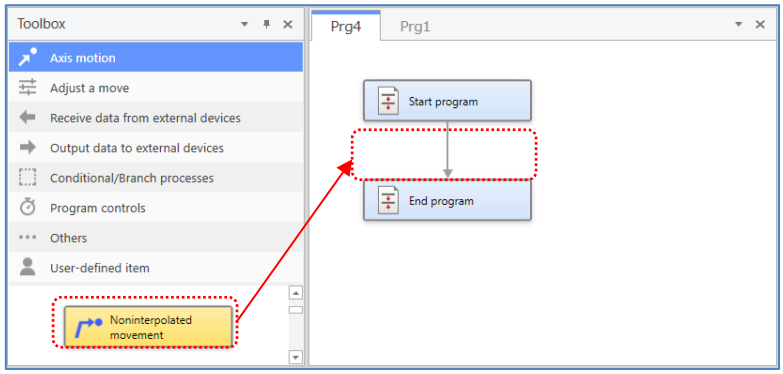


Fig. 8.1- 3 Allocation of Items

Allocation position is displayed as navigation when the item gets close to where allocation is available.

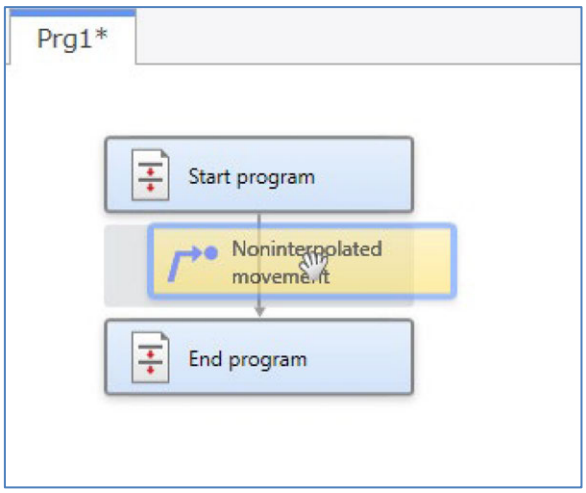


Fig. 8.1- 4 Allocation of Items (Navigation display)

The item is inserted and the property dialog is displayed when the item is dropped.

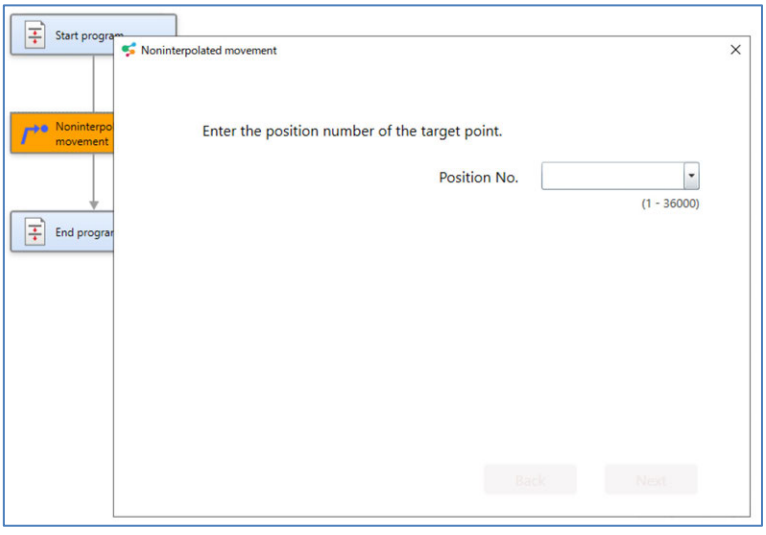


Fig. 8.1- 5 Allocation of Items (Property dialog)

[1] Items with Limitations to Allocation

The following is the description of the items with limitations to allocation.

Table 8.1- 2 Items with Limitations to Allocation

Item name	Description
Branch-proc	Allocate begin/terminate loop processes item and combined nesting up to 15 steps.
Merge-proc	
Begin loop	Allocate begin/terminate branch item and combined nesting up to 15 steps.
Terminate loop	
Leave loop items	Allocate the item to the position that is enclosed with begin loop processes item and end loop processes item.
Return to Begin loop items	
Multi Branch Items	Allocate nesting up to 15 steps for multi branch items.
Call sub-routine Items	It cannot be allocated to sub-routine edit. Allocate main program edit and combined nesting up to 15 steps for call sub-routine items, multi branch items of user-defined items or loop processes items.
User-defined Items	

[2] Reallocation items

Items allocated in the program edit window can be reallocated.

Select an item to be reallocated and drag & drop it.

[3] Multiple Item Select

Selecting multiple items. Drag the mouse to surround items with dotted frame.

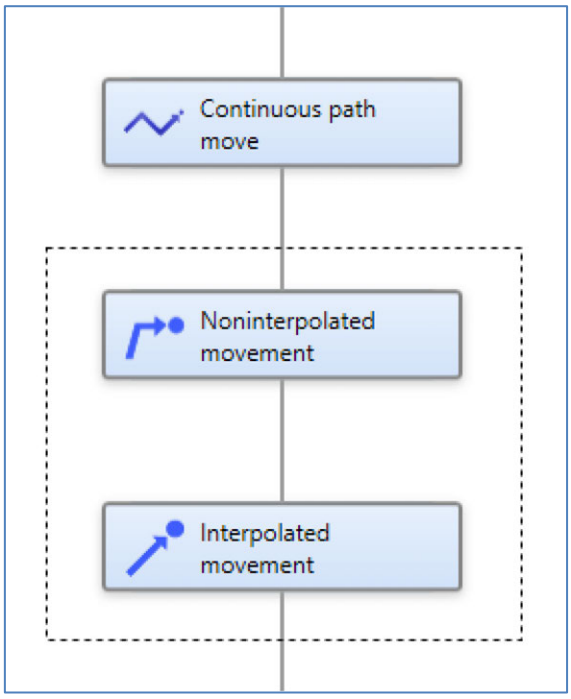


Fig. 8.1- 6 Multiple Item Select

Items in dotted from get selected.

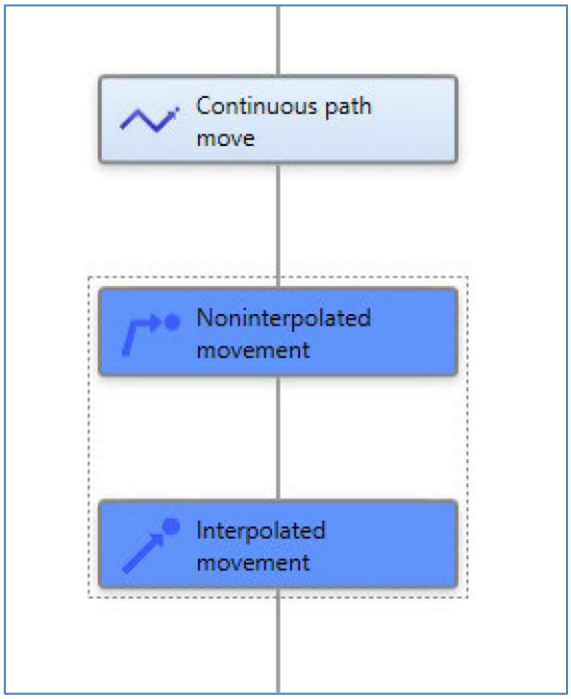


Fig. 8.1- 7 Multiple Item Select (Selection status)

8.1.4 Property Setting

Set the item property. The following is how to set the property.

- Set from the property dialog
- Set from property window

If the property setting of item is incomplete, the background color is orange.
If the property setting of item is completed, the background color is blue.

[1] Setting from Property Dialog

Set a property item in the wizard format in the property dialog.

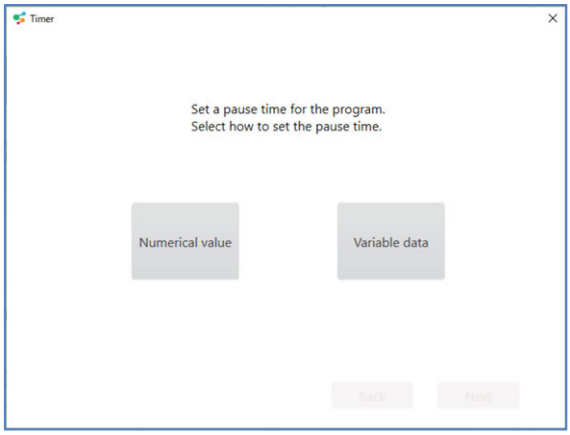


Fig. 8.1- 8 Property setting of an item

Property dialog is automatically displayed when items are allocated.
The setting of automated display of property dialog can be changed in option setting.

Set value of property window is updated when property setting is completed.

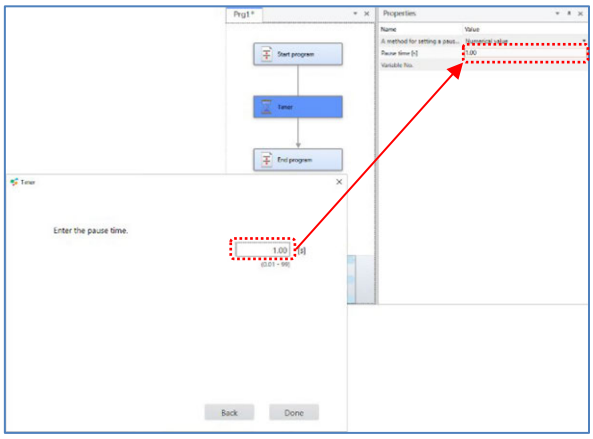


Fig. 8.1- 9 Set value of property window is updated

When you require to open the property dialog again, whether to double-click on the item or right-click to show the menu and select "Edit properties".

[2] Setting from Property Window

Property window is consisted of name column and value column. The following is the input format of value column.

Text box: Input numbers and letters
Combo box: Choose from choices
Check box: Switch valid/invalid

There is a property that switches valid/invalid depending on the selection of combo box. The following is an example of property of “Timer” item.

“Pause time” is valid when “A method for setting a pause time” is “Numerical value”.

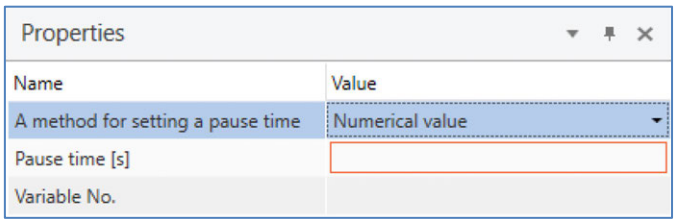


Fig. 8.1- 10 “Timer” item property (Numerical value)

“Variable No.” is valid when “A method for setting a pause time” is “Variable data”.

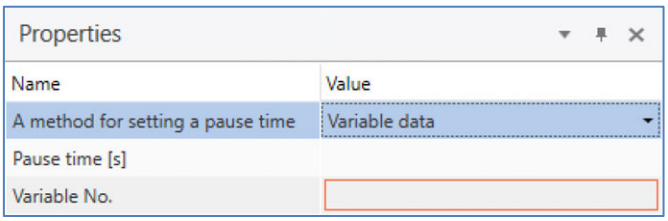


Fig. 8.1- 11 “Timer” item property (Variable data)

When the value in a textbox exceeds the input available limit, error dialog is displayed.

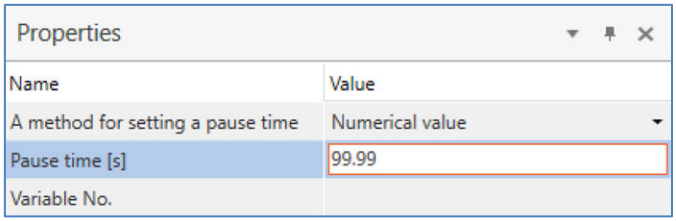


Fig. 8.1- 12 “Timer” item property (When it exceeds the input available limit)

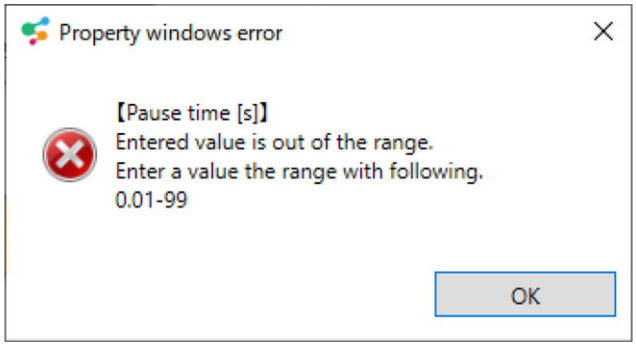


Fig. 8.1- 13 Property widows error

8.1.5 Comment input

Input comments in the items. Right-click the item to display the menu.

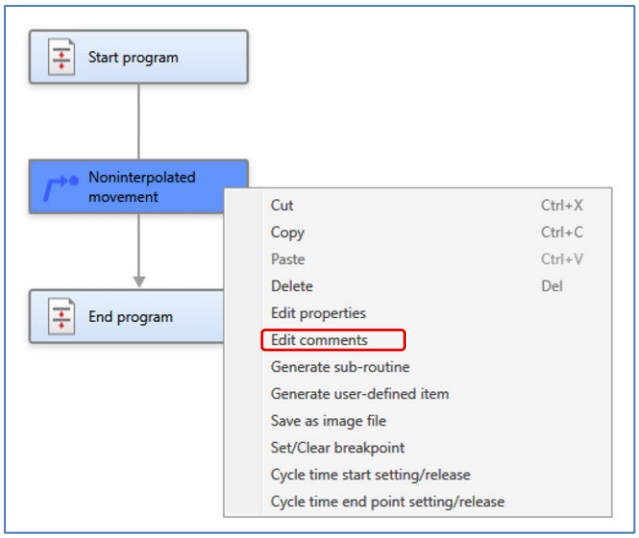


Fig. 8.1- 14 Comment input (Menu display)

Select “Edit comments”. Edit comments dialog will be displayed.

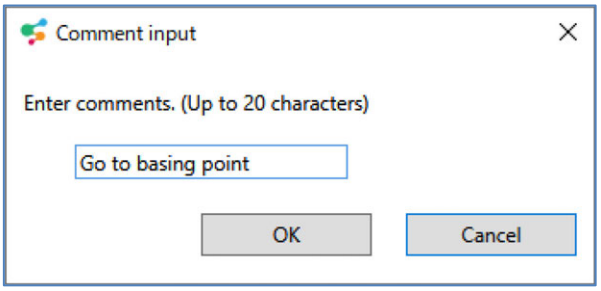


Fig. 8.1- 15 Comment input dialog

A comment is available for input with 10 full-width characters or 20 half-size characters.

Input a comment and click OK.

The comment will be displayed below the item name.

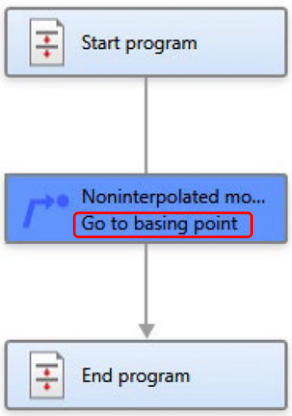


Fig. 8.1- 16 Comment input (Comment display)

8.1.6 Sub-Routine Features

The sub-routine is a feature that the specific function and the processes are gathered in one place to get an easy access from other program.

The following is how to create an item of “Call sub-routine”.

- Drag the item that you would like to make it as sub-routine.

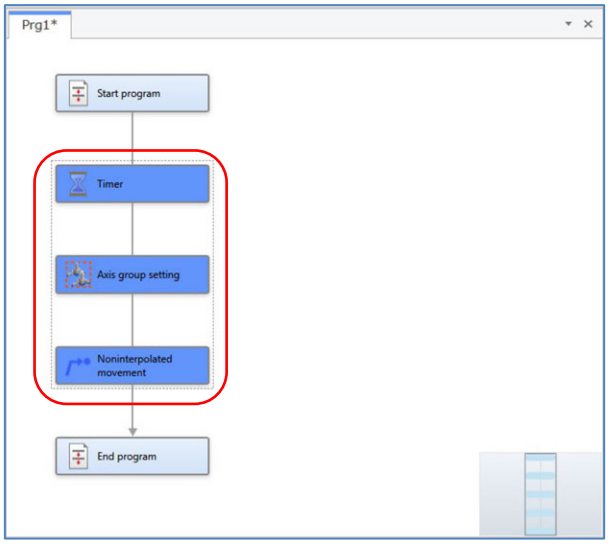


Fig. 8.1- 17 Sub-Routine Features (Item selection)

- Click “Sub-routine” button from “Program” tab, or select “Sub-routine” from menu of right-click.
- Selected item is converted to “Call sub-routine” item.
- Items that are made to sub-routine is added to sub-routine edit.

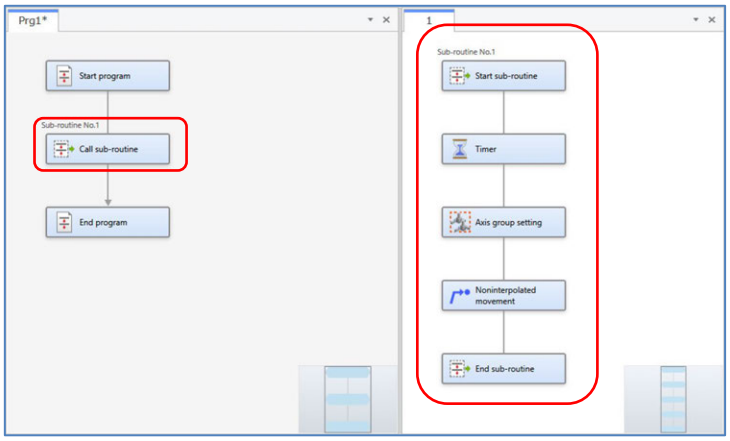


Fig. 8.1- 18 Sub-Routine Features (Generate sub-routine)

The following is a process to call sub-routine.

- Allocate “Call sub-routine” item in main program.
- Set the sub-routine number in property edit.

8.1.7 Write to program

Write a program to a controller.
Use the following buttons in “Program” tab.

Table 8.1- 3 Button to use to write program

Button name	Function
Current program	Write current program.
All programs	Write all programs.

An error dialog is displayed when the following events are detected.

- When the items that property setting is incomplete are included in program.
- When program is performed.
- When the protection is set to program in controller.

8.1.8 Write to flash ROM

Write position data and program to flash ROM in controller with “Write to flash ROM” button in “Robot” tab.
Position data and program are deleted when controller is turned off without writing flash ROM or software is reset.
Write to flash ROM if the data is retained in controller.

8.1.9 Save SEL Program File

Program is saved as a program file that can be used in a teaching pendant or PC software.
Use following buttons in “Program” tab.

Table 8.1- 4 Button to use to save program file

Button name	Function
Save current program	Save a program displayed
Save all programs	Save all programs.

An error dialog is displayed when the following events are detected.

- When the items that property setting is incompleted are included in saved program.

8.1.10 Clear

The program clear is a feature to delete displayed program and all items that are allocated in sub-routine.
Click Clear current program in the “Program” tab.

8.1.11 Compare programs

The program comparing is a feature to compare displayed programs and programs that are saved in the controller.
Click Compare programs in the “Program” tab.
The result is displayed when the program comparing is complete.

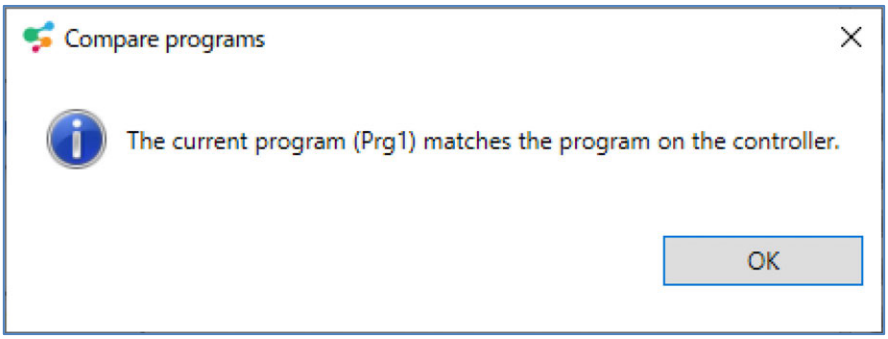


Fig. 8.1- 19 Compare programs

8.1.12 Screenshot Feature

The screenshot feature is a feature to save screenshots of the programming window and sub-routine as an image file.
Right-click on the programming window and select "Save as image file" in the menu.
Select a domain to save and click OK.

8.1.13 Setting Name (Symbol) to Program

It is available to put a name (symbol) to a program.
Double-click or right-click a cell in “Symbol” column in the program list window, and select “Edit symbol” in the menu.

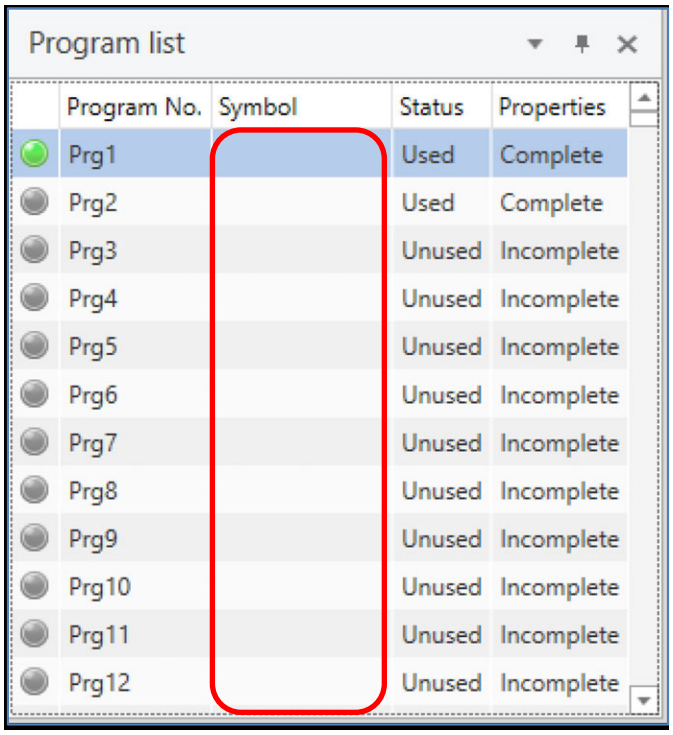


Fig. 8.1- 20 Setting Name (Symbol) to Program

Synchronize symbols window is displayed when the following actions are performed after setting name.

- Click Current program in “Program” tab.
- Click All programs in “Program” tab.
- Click Save current program in “Program” tab.
- Click Save all programs in “Program” tab.
- Click Open project in “Program” tab.

The Synchronize symbols window are as shown below.

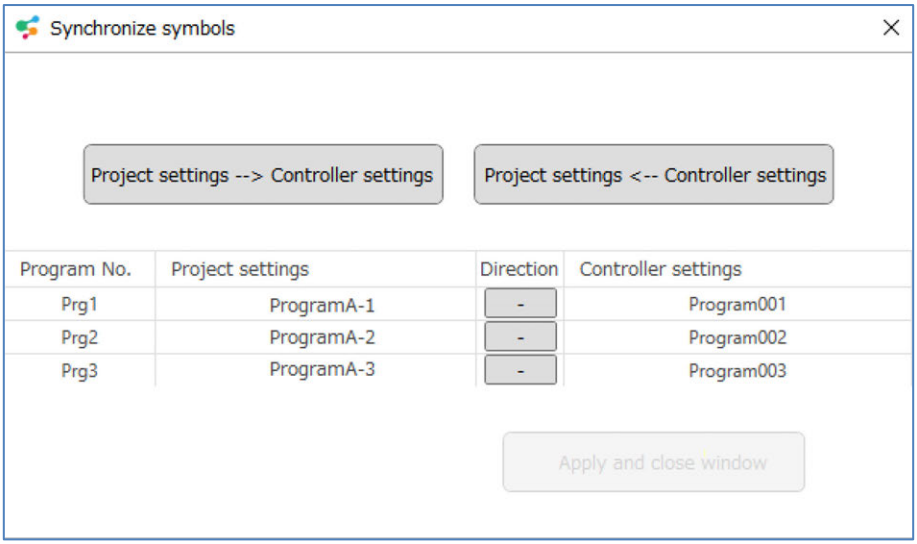


Fig. 8.1- 21 Synchronize symbols window

Set the symbol that is retained by project and controller.
Click [-] in “Direction” column and [>>] and [<<] should be shown in turns.
[>>]: Project symbol is applied.
[<<]: Controller symbol is applied.
“Apply and close window” button is valid by setting symbols to all programs. Window is closed and symbols are updated by clicking.

8.1.14 Program file Export/Import

Created program can be shared with other project.
Export and import program files.

[Export]

Export the program to a file.
Display the menu from “Program file” in “File” tab, and select “Export”.
The “Export program file” window will be displayed.

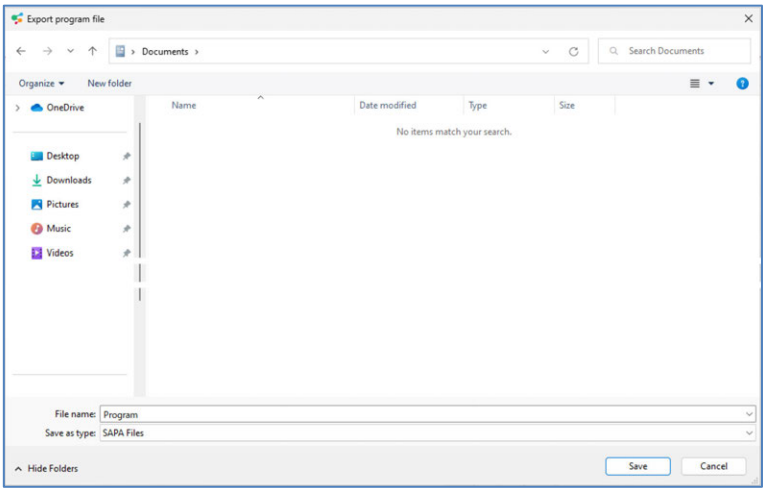


Fig. 8.1- 22 Export program file

Select a domain to save and click Save.

[Import]

Load the program file.
Display the menu from “Program file” in “File” tab, and select “Import”. The “Import program file” window will be displayed.

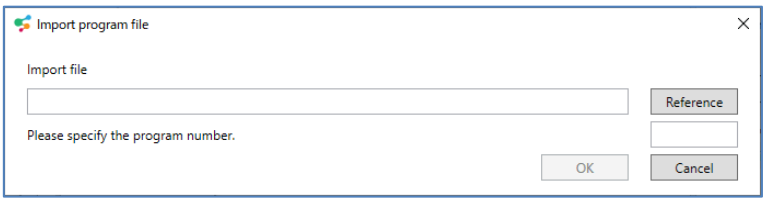


Fig. 8.1- 23 Import program file

Select a program number and an import file and click OK.
User-defined item file is also imported when the program file containing user-defined item is imported.

8.1.15 User-defined item

A user-defined item is an item that registers several items as one item and can be used in multiple programs in common.

[1] Create user-defined item

Select the item to make user-defined item.

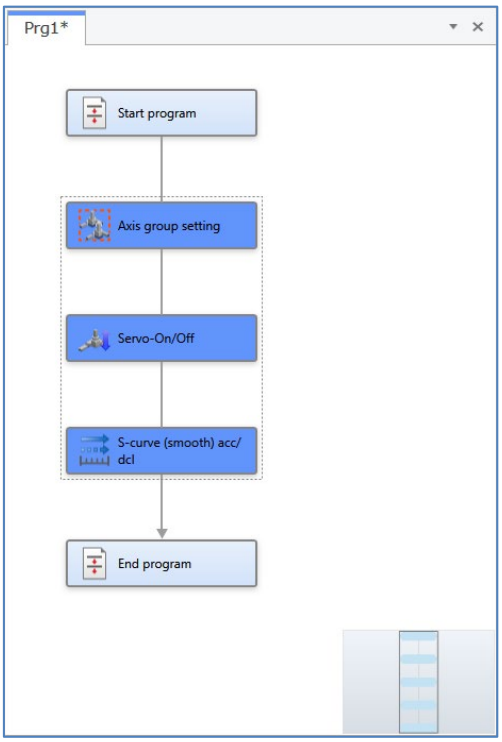


Fig. 8.1- 24 User-defined item (item selection)

Click Generate in “Program” tab or right-click selected item, and select “Generate user-defined item” from menu.

The User-defined item name and description settings window will be displayed.

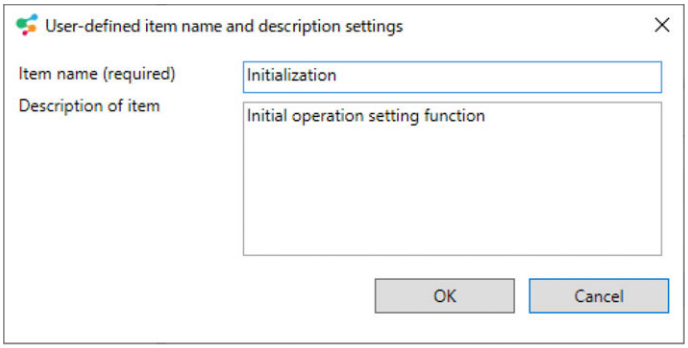


Fig. 8.1- 25 User-defined item name and description settings window

Input item name and explanation, and click OK.

The User-defined item window will be displayed.
In the user-defined item edit window, you can add item, edit the name and explanation of user-defined item and edit item property.

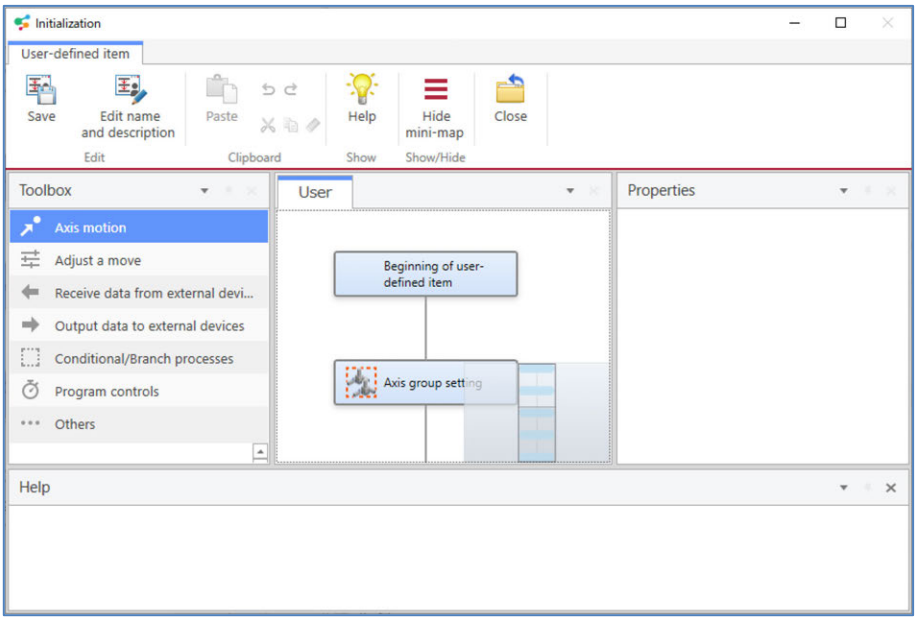


Fig. 8.1- 26 Edit User-defined item window

The following is the menu functions.

Table 8.1- 5 Edit User-defined item window function

Button name		Function
Edit	Save	Save edited contents.
	Edit name and description	Edit the name and explanation of user-defined item.
Clipboard	Past	Paste the copied or cut item.
	Undo	Get the item allocation or property setting back to the previous condition.
	Redo	Get the item allocation or property setting conditions one step forward. Valid after “Undo” executed
	Cut	Copies and deletes the selected item.
	Copy	Copy the selected item.
	Delete	Deletes the selected item.
Show	Help	Display Help window.
Show/Hide	Show/Hide mini-map	Switch show/hide for mini-map.
Close		Close the Edit User-defined item window

[2] Edit User-defined item

[Edit User-defined item in Toolbox]

Right-click on a user-defined item in Toolbox and select “Edit User-defined item”.
The Edit User-defined item window will be displayed.

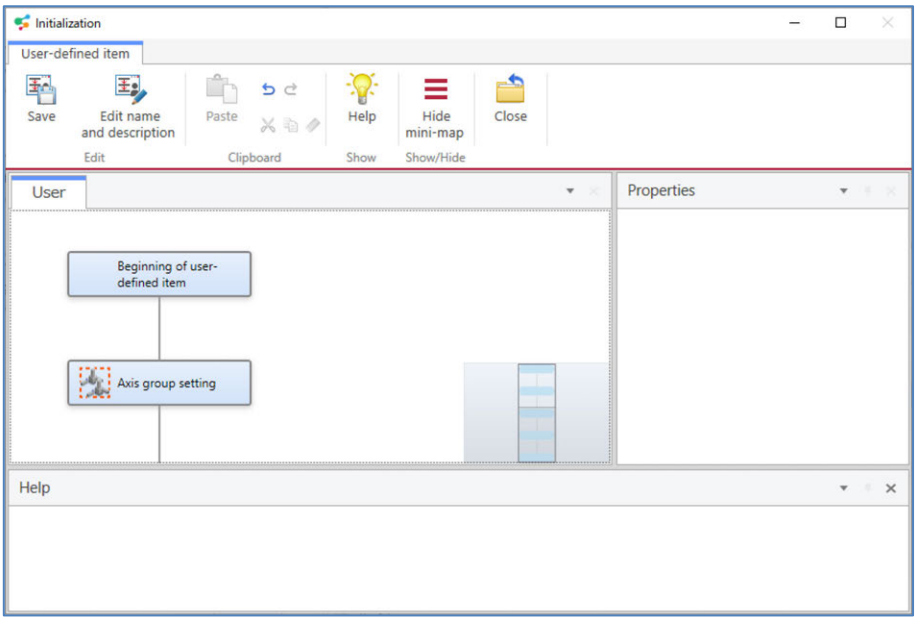


Fig. 8.1- 27 Edit User-defined item

You can change the name and explanation of user-defined item and edit item property.

[Editing Already Allocated User-Defined Item]

Right-click the user-defined item that is allocated to program, and select “Edit user-defined” from the menu. The User-defined item window will be displayed.

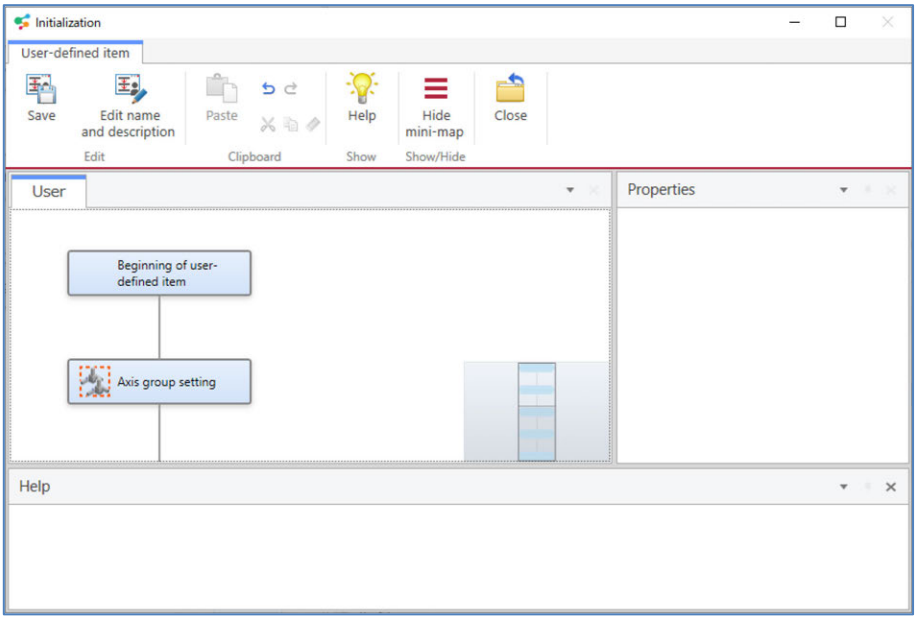


Fig. 8.1- 28 Editing Already Allocated User-Defined Item

[3] User-defined item Export/Import

User-defined items can be shared to other projects.

Export and import user-defined item.

[Export]

Export a user-defined item to file.

Display the menu from “User-defined item” in “File” tab, and select “Export”.

The “Export user-defined item” dialog will be displayed.

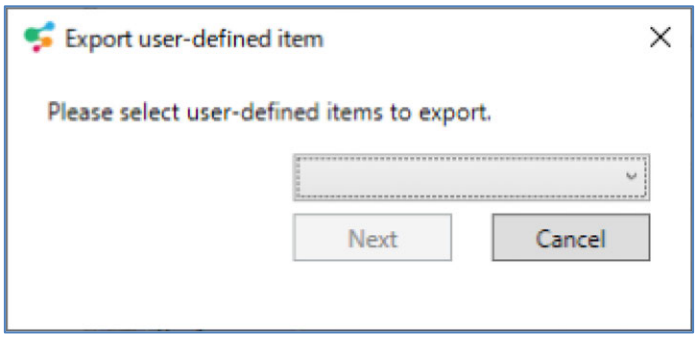


Fig. 8.1- 29 Export user-defined item

Select the user-defined item to export, and click Next.

Select a domain to save and click Save.

[Import]

Import user-defined item file.

Display the menu from “User-defined item” in “File” tab, and select “Import”.

The “Import user-defined item” window will be displayed.

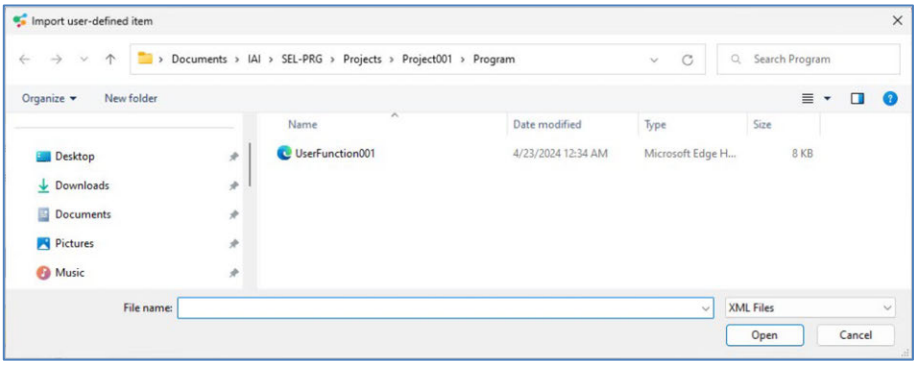


Fig. 8.1- 30 Import user-defined item

Select the user-defined item file to import, and click Open.

8.1.16 Delete user-defined item

The menu is displayed by right-clicking user-defined item in Toolbox.

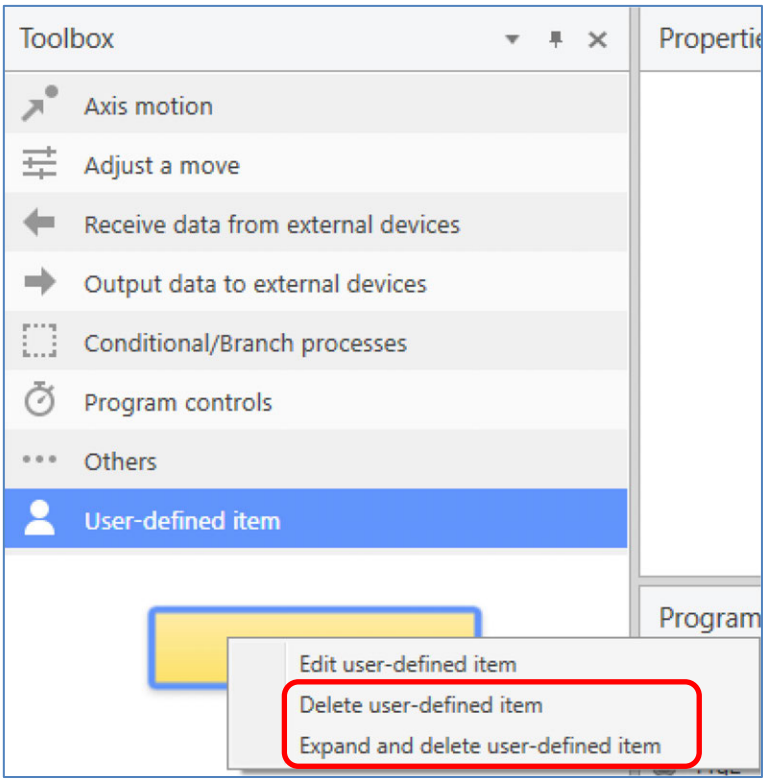


Fig. 8.1- 31 Display Toolbox menu

[Delete user-defined item]

Deletes the selected user-defined item.

Delete the user-defined item that is already allocated to program.

[Expand and delete user-defined item]

Deletes the selected user-defined item.

Allocated user-defined item is replaced with the program that the user-defined item is expanded.

8.2 Test run

Test run program. Test run can be used in online mode.

8.2.1 Execution of Program

Move to test run mode and program is executed by clicking Run or Run 1step. The background color of an item under execution is green and one in pause displays in purple.

Caution

- An actuator may start moving. Check that the safety circuit is connected before operation.

8.2.2 Trace positions

Switch ON/OFF of trace that is under program execution by selecting “Trace positions” in “Test Run” tab. When the trace is ON, window is scrolled to display executed item all the time.

8.2.3 Program Pause & Resume

Displayed program can be paused in the conditions below;

- When Run 1step is clicked
- When reached an item that the breakpoint is set after “Run is executed”.
- When you click Pause after “Run is executed”.

When you resume the program, click either Run program or Run 1step.

8.2.4 Program Finish

When you finish executed program, click Stop in “Test run” tab.
When you finish executed all programs, click Stop all programs.

8.2.5 Set/Clear breakpoint

By setting the breakpoint for specific item, executed program can be paused.ブレークポイントは、

Breakpoint can be set/clear when program is not executed.

[Setting Breakpoints]
The following is how to set breakpoint.
Select item, and click Set/Clear breakpoint in “Test run” tab.
Or right-click item, and select “Set/Clear breakpoint” from menu.

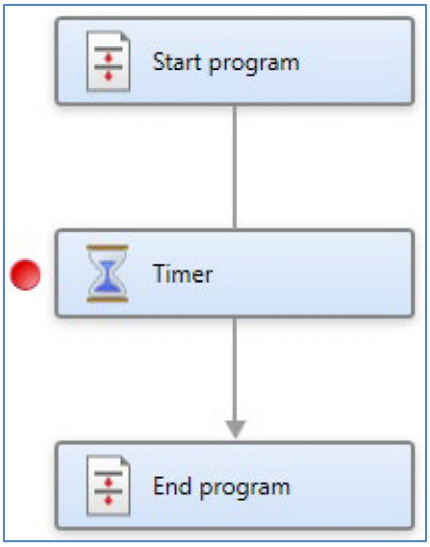


Fig. 8.2- 1 Setting Breakpoints

Setting mark of breakpoint is displayed on the left of an item.

[Break Point Release]
Breakpoint can be cleared when setting action for breakpoint is done again.

8.2.6 Cycle time measurement

The following is the description of process of cycle time measurement.

[1] Set/clear cycle time starting/ending point

Set cycle time starting point and cycle time ending point.

[Set cycle time starting point]

Left-click on the item to select it. Select “Cycle time measurement” button in “Test run” tub, and display the menu. Click Set/clear cycle time starting point.

An icon is displayed on the left of the item.

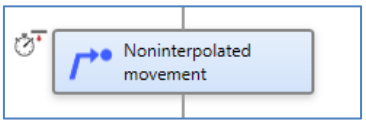


Fig. 8.2- 2 Set cycle time starting point

[Set cycle time starting point]

Click Set/clear cycle time starting point again. An icon is disappeared on the left of the item.

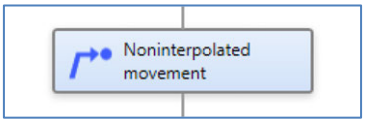


Fig. 8.2- 3 Set cycle time starting point

[Change cycle time starting point]

Select an item that is not set to cycle time starting point. Display a menu by selecting “Cycle time measurement” button in “Test run” tab, and click Set/clear cycle time starting point. Cycle time starting point moves to selected item.

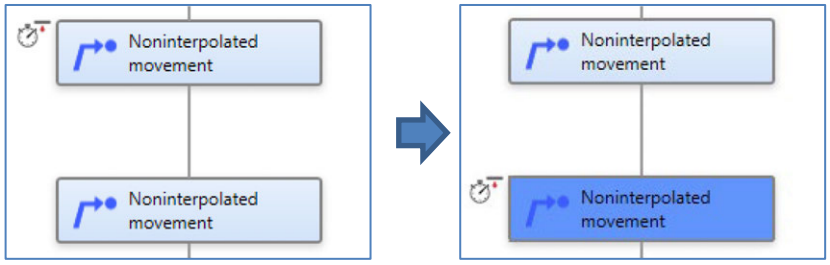


Fig. 8.2- 4 [Change cycle time starting point]

[Set cycle time ending point]

When you would like to set cycle time ending point as well, select an item, display a menu by selecting “cycle time measurement” button in “Test run” tab,

and click Set cycle time ending point.

[2] Display of setting position

Display a menu by selecting “Cycle time measurement” button in “Test run” tab.

Display an item that is set to cycle time starting point when “Display cycle time starting point” is selected.

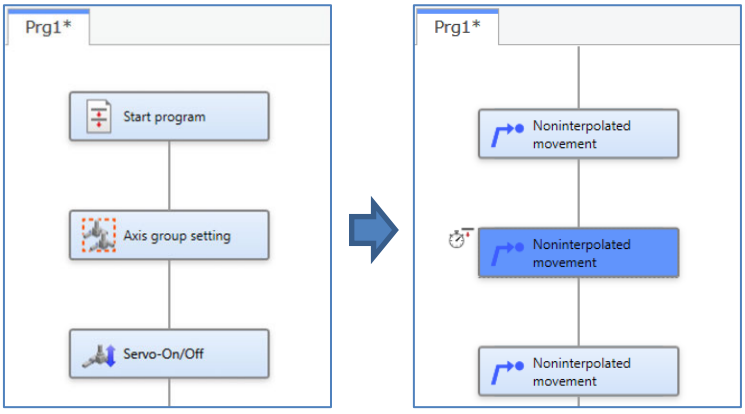


Fig. 8.2- 5 Display of setting position

Display an item that is set to cycle time ending point when Display cycle time ending point is clicked.

[3] Display measurement result

The result of cycle time measurement can be checked in cycle time window.

Click Cycle time in “Window” tub. Cycle time window will be displayed.

Select program number of target measurement.

1st measurement is displayed as [----_----] after the program is executed. Measurement time is displayed when the measurement is completed.

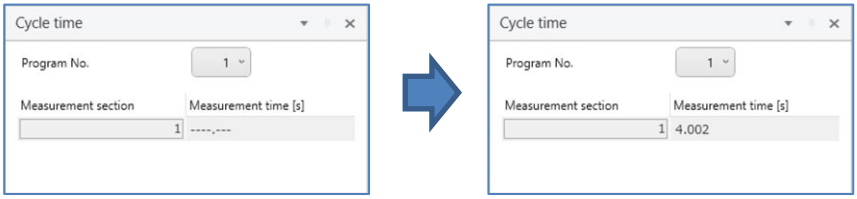


Fig. 8.1- 6 Measurement result (1st time)

From 2nd time, previous measurement time is displayed until the measurement is completed.

The display is updated when the measurement is completed.

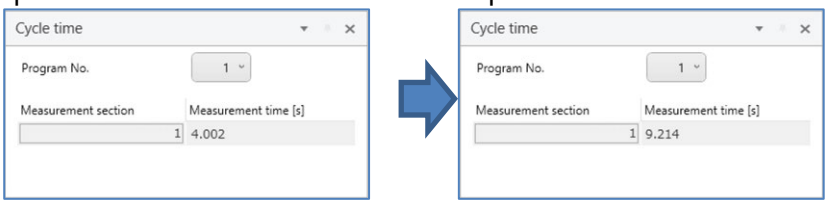


図 8.2- 7 Measurement result (from 2nd time)

8.2.7 Checking Program Execution Condition

The status of program execution can be checked in the program list window.

8.2.8 Program Execution Error

While a program is under execution, when the error occurs due to the program, the items in error is highlighted in red frame and error dialog is displayed.
The display of target item turns back when error dialog is closed.

8.2.9 Test Run Mode / Edit Mode

Test Run Mode and Edit Mode can be switched when program is executed or paused.
The mode is switched to Test Run Mode by clicking Run program or Run 1step.

The following is the functions that can be used in Edit Mode/Test Run Mode.

Table 8.2- 1 Functions that can be used in Edit Mode/Test Run Mode.

Function	Edit Mode	Test RUN Mode
Create project	○	×
Transmit to controller	○	×
Save SEL Program File	○	×
Executed Item Display	×	○
Setting Breakpoint	○	×
Setting Cycle time	○	×
Monitor	○	○

8.3 Simple program functions

Create a program by adding/editing position number and operating method.

8.3.1 Simple program window

The following is the description of simple program window.

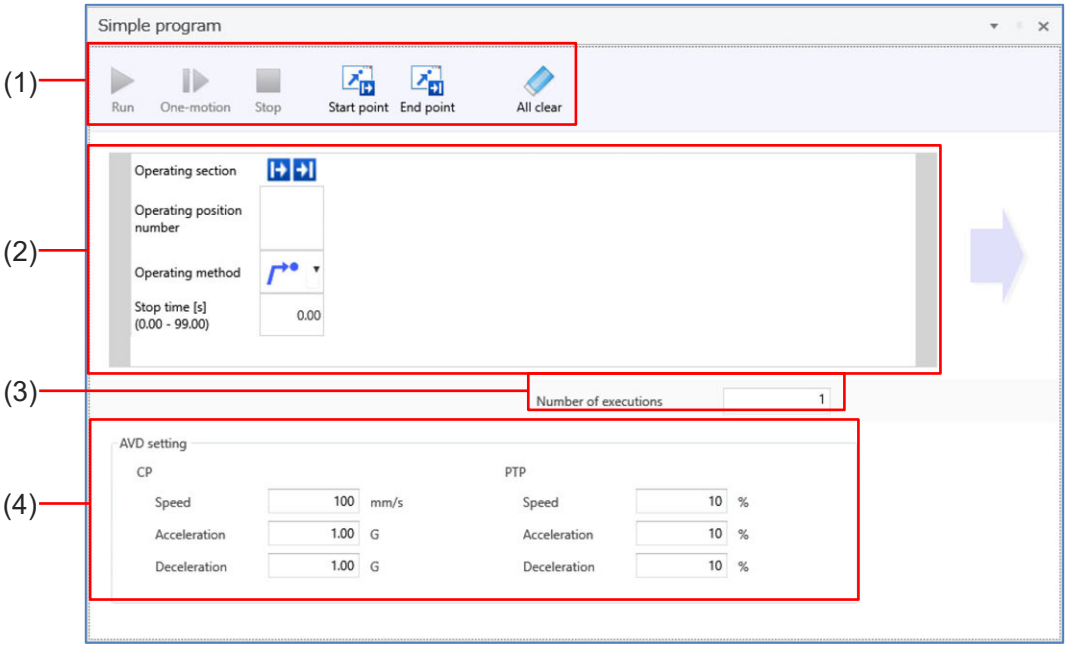


Fig. 8.3- 1 Simple program window

The following is the description of each number.

Table 8.3- 1 Simple program window configuration

No.	Name	Description
(1)	Simple program menu	Buttons to operate program are allocated.
(2)	Area to edit program	Area to create program.
(3)	Number of executions	Set the number of executions of program. It displays the rest of the number of executions while program is executed.
(4)	Speed/acceleration/deceleration setting	Set the speed, acceleration and deceleration while program is executed.

8.3.2 Aimple program menu

The following is the description of functions of the simple program menu.

Table 8.3- 2 Functions of the simple program Menu

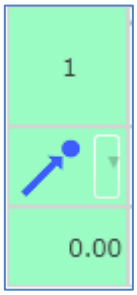
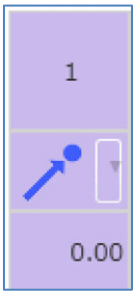
Menu	Functional Overview
Run	Run the program.
On-motion	Run the program for one motion.
Stop	Stop the programs being executed.
Start point	Set the start point when program is executed.
Stop point	Set the end point when program is executed.
All clear	Clear the program.

[1] Run

Simple program is executed by clicking Run from simple program menu.

It runs after the position that is set in program is written to controller. The following is the background color during running.

Table 8.3- 3 The background color during running

Running	Paused	Error
		

Caution

- It might draw unexpected trajectory because the start point when the program is started to execute is current position.

[2] On-motion Execution

Execute program for one motion by clicking On-motion in simple program menu. Execute the position that is selected in the program after it is written to controller.

[3] Stop

Executed program can be stopped by clicking Stop in simple program menu.

[4] Start point / Stop point

Select start point and stop point when the program is executed.

[Select start point]

Select the column that is the start point of operating section, and click Start point.

[Select stop point]

Select the column that is the stop point of operating section, and click Stop point.

[5] All clear

The following dialog is displayed by clicking All clear in simple program menu.

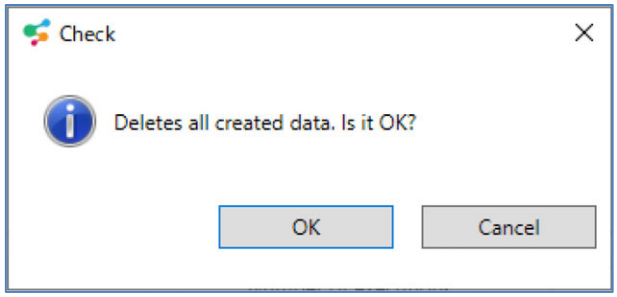


Fig 8.3- 2 “All clear” Check dialog

Click OK to clear the program.

8.3.3 Program Editing

The following menu is displayed by right-clicking in program editing.

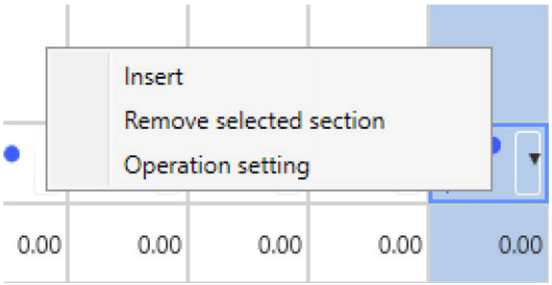


Fig. 8.3- 3 Program Editing

Table 8.3- 4 Program Editing Selection

Selection	Function
Insert	Insert operating column before selected section.
Remove selected section	Remove selected section.
Operation setting	Display dialog to input position number.

[1] Insert

[Insert operating column]

Select “Insert” by right-clicking in program editing.

Operating column is inserted.

[Select and edit operating column]

Select operating column, and edit setting information.

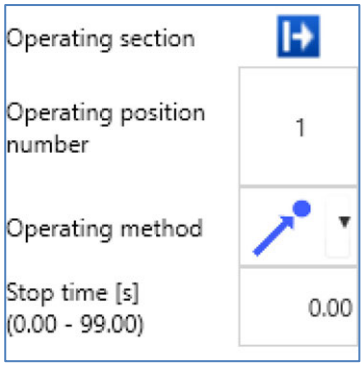


Fig. 8.3- 4 Setting information edit

The following is about setting information.

Table 8.3- 5 Setting information

Setting information	Description
Operating section	Selected section during test run is displayed. Set start point and stop point of program.
Operating position number	Set the position number.
Operating method	Select the operating method.
Stop time	Set stop time after the operation is stopped. Unit [s]

[2] Remove selected section

Right-click in program editing, and select “Remove selected section”. The following dialog is displayed

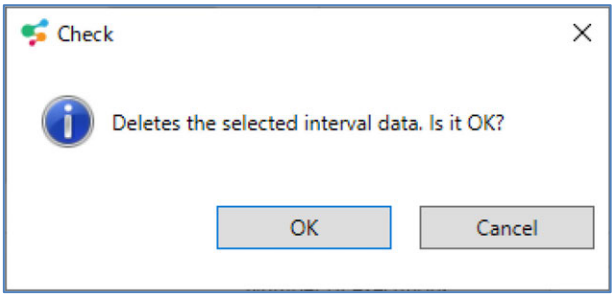


Fig. 8.3- 5 “Remove selected section” Check dialog

Remove selected section by clicking OK.

[3] Operating method

Set position number of operating column.

Select operation method, display menu by right-clicking and select “Operation setting”.

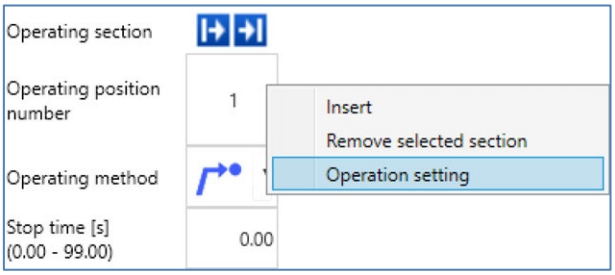


Fig. 8.3- 6 Selecting Operation setting

A dialog will be displayed.

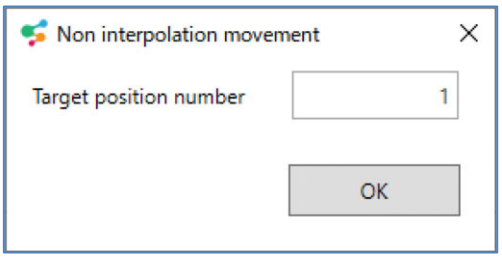


Fig. 8.3- 7 Non interpolation movement dialog

Input the position number and click OK.

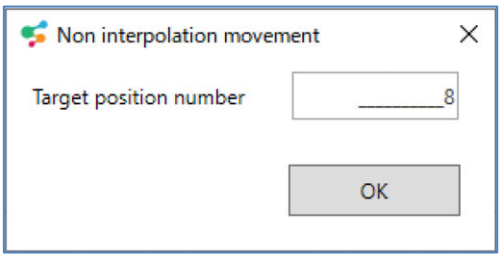


Fig. 8.3- 8 Non interpolation movement dialog (Position number input)

The Operation position number is updated.

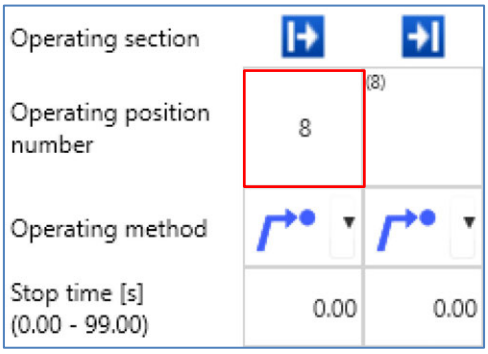


Fig. 8.3- 9 Update operating position number

The following is about the position number to set every operation method.

Table 8.3- 6 Position number to set every operation method

Operation method	Position number (1)	Position number (2)
Non interpolation movement	Target Position Number	None
Linear interpolation movement	Target Position Number	None
Path movement	Start position number to pass	Target Position Number
Arc interpolation movement	Position number to pass	End position number
Circle interpolation movement	Position number to pass	Position number to pass

[Import from position data edit window]

Select position data to use in simple program in position data edit window. Display menu by right-clicking, and select “Expand to simple program”.

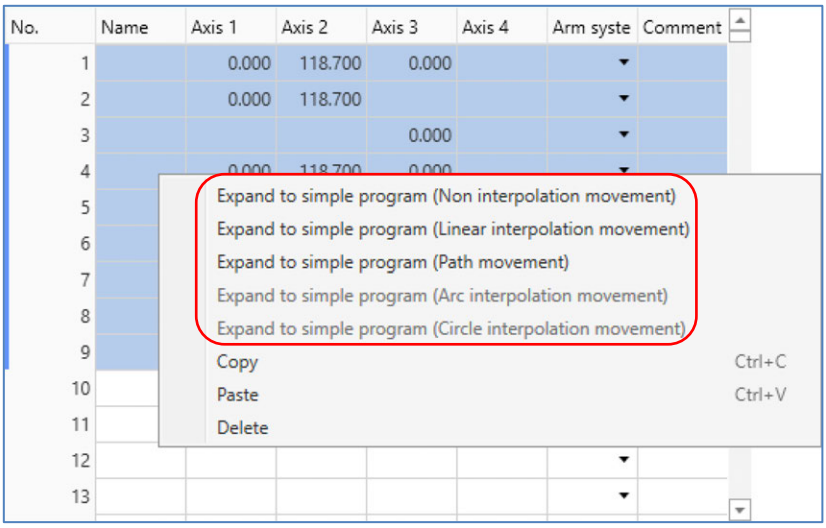


Fig. 8.3- 10 Import from position data edit window

The Simple Programs window is updated.

Fig. 8.3- 11 Update simple program window

8.3.4 Number of executions

Set the number of program executions.

Fig. 8.3- 12 Number of Program Executions

The number of executions is displayed in red while the program is running.
The number of executions decreases when the program returns back to the start.

Fig. 8.3- 13 Number of Program Executions (execution)

8.3.5 AVD setting

Set operation speed, acceleration and deceleration when program is running.

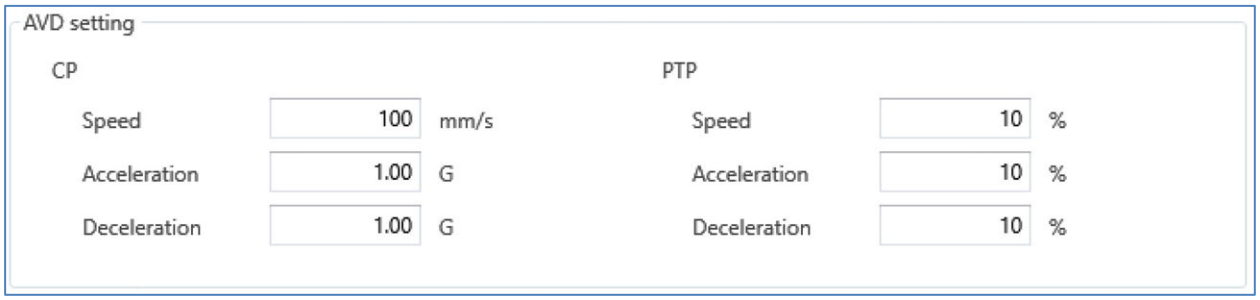


Fig. 8.3- 14 AVD setting

The setting range is shown below.

Table 8.3- 7 Speed and acceleration/deceleration Setting range

Setting information		Setting range
CP	Speed	1 to 9999
	Acceleration	0.01 to 9.99
	Deceleration	0.01 to 9.99
PT	Speed	1 to 100
	Acceleration	1 to 100
	Deceleration	1 to 100

SEL Assist

Chapter 9

Drawing function

9.1 Drawing window

The drawing window is shown below.

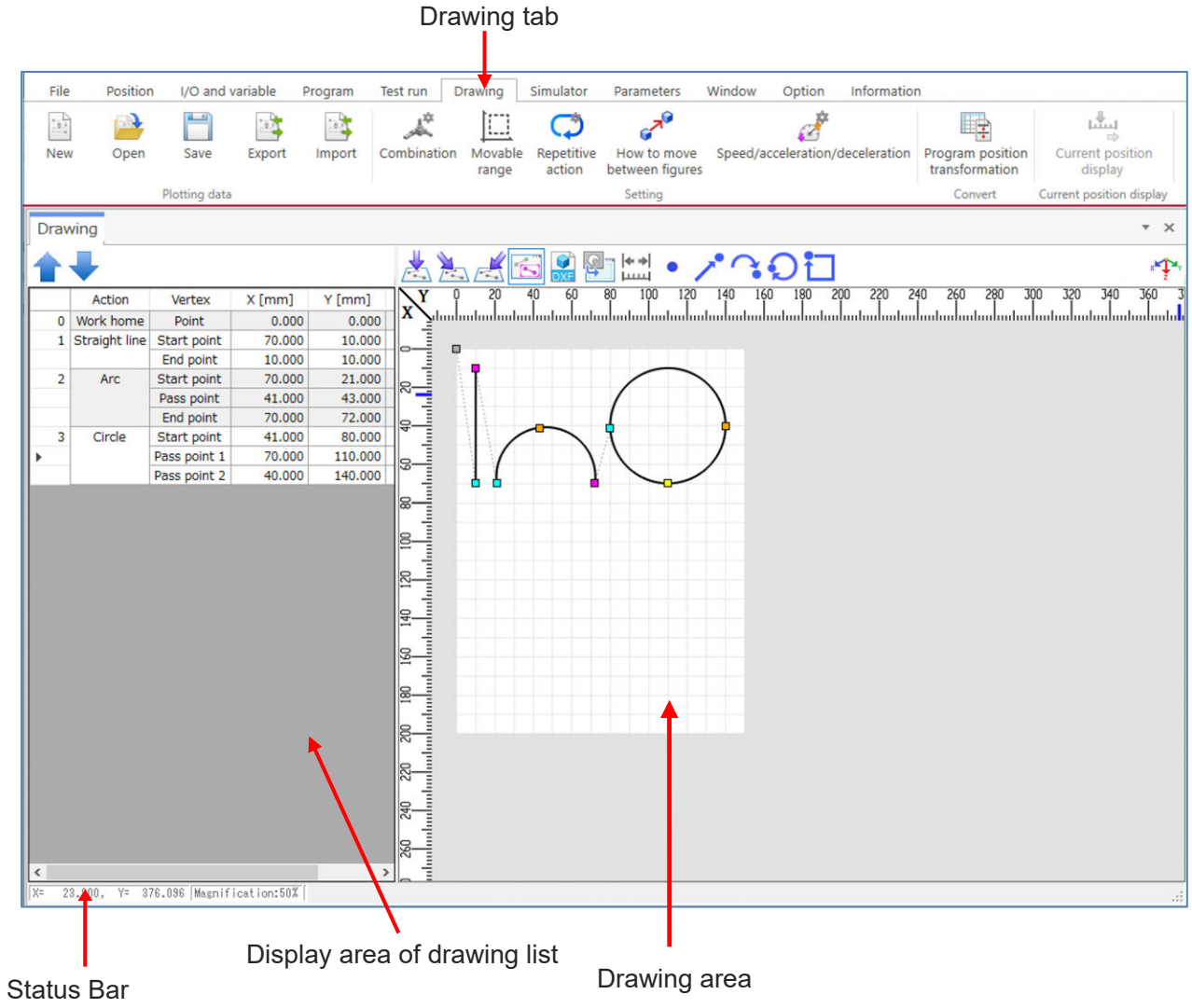


Fig. 9.1- 1 Drawing window

9.1.1 Drawing tab

For details on the drawing tab, refer to [4.1.7 Drawing tab].

9.1.2 Display area of drawing list

- Drawing list

  Click Drawing from Toolbar. Display list of created drawing in drawing area.

  Selected drawing is switched with the previous data by  clicking

  Selected drawing is switched with the next data by  clicking

- DXF import panel

  Display “DXF import” panel by clicking DXF import from Toolbar.

  For details, refer to [9.6.2 Import DXF data].

- Background image import panel

  Display “Background image import” panel by clicking Background image import from Toolbar.

  For details, refer to [9.1.4 [5] Display background image data].

9.1.3 Status Bar

The following information is displayed in Status Bar.

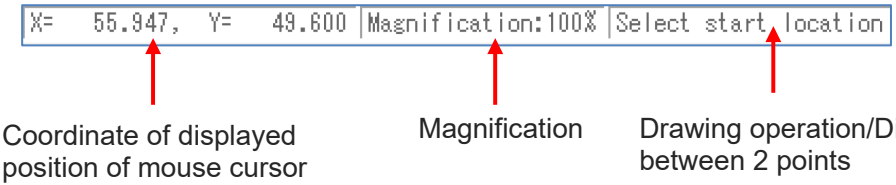


Fig. 9.1- 2 Status Bar

Table 9.1- 1 Status Bar Function Description

Name	Function Description
Coordinate of displayed position of mouse cursor	Display coordinate (X, Y) of displayed position of mouse cursor.
Magnification	Display magnification of drawing.
Drawing operation/Distance between 2 points	Display the current drawing operation such as “start selection” and “end selection”. Display the distance between selected 2 points while “distance measurement” is executed.

9.1.4 Drawing area

Create the drawing (operation route) such as dot and line. The following is the structure of drawing area.

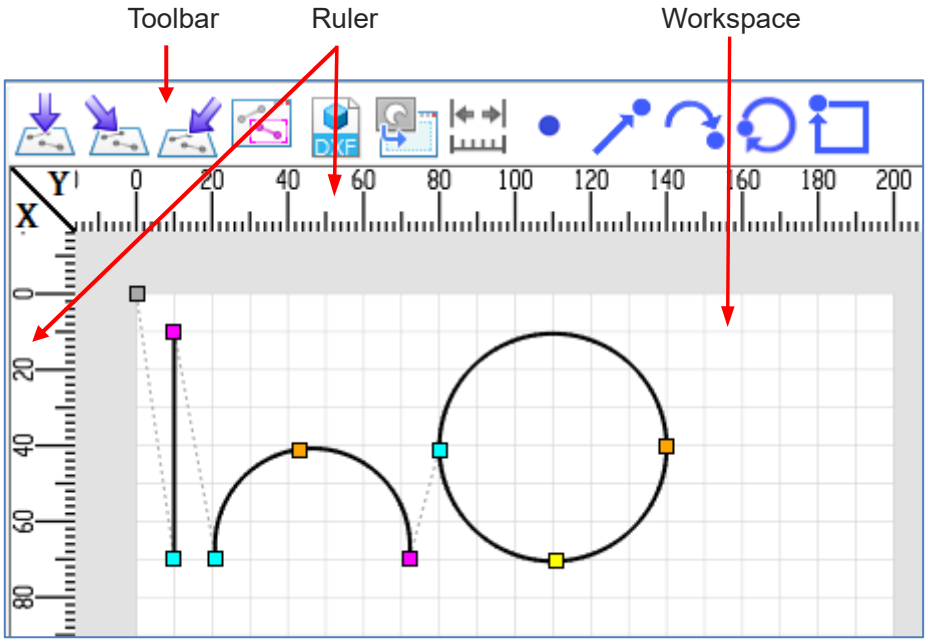


Fig. 9.1- 3 Drawing area

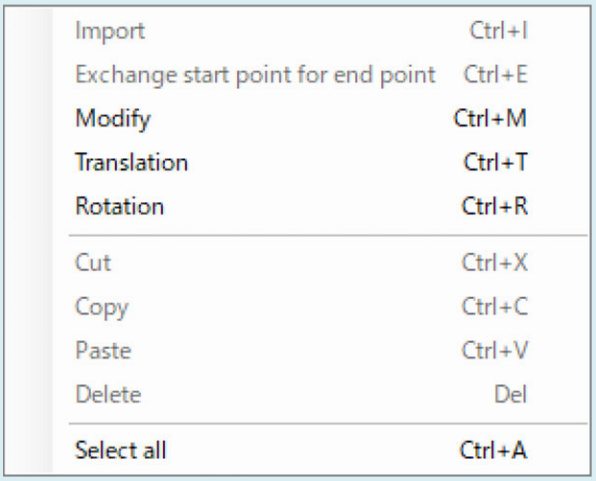
Table 9.1- 2 Structure of drawing area

Name	Function Description
Toolbar	Buttons to edit drawing and create drawing are allocated.
Ruler	Display scale of X and Y. (Unit: mm)
Workspace	Area to create drawing. Create drawing (operation route) inside this area.

[1] Basic operation

Perform basic operation using mouse and keyboard.

Table 9.1- 3 Basic operation

Mouse	Operation	Function
Left Button	Click	Select the drawing that is located in where the cursor is by importing drawing selection and DXF. Select multiple drawing by pressing and clicking “Shift” key. Decide apex location when the created drawing and distance are measured. Decide measurement start point while the distance is measured.
	Drag	Move the location of selected drawing when the drawing is selected. Range selection for drawing is done when the drawing is not selected.
Right button	Click	Open the pop-up menu. 
Wheel	Rotation	Zoom in/out the display. (10% to 8000%)
	Drag	Scroll to dragged direction.

[2] Dot and line

The following is the dots and lines that are displayed in create drawing area.

Table 9.1- 4 Dot and line

Display	Description
	Work home
	Dot/Start point of straight line/Start point of circle/Start point of arc
	End point of straight line/End point of arc
	Passing point 1 of circle
	Passing point 2 of circle / Passing point of arc
	Center point of circle
	Straight line/Circle/Connection point of arc
	Created drawing
	Created drawing (Selected)
	Drawing that is read from DXF file
	Drawing that is read from DXF file (Selected)
	Drawing during creating
	Moving route between drawings

[3] Toolbar

The following is the buttons and functions of Toolbar.

Table 9.1- 5 Toolbar Buttons and Functions

Button	Name	Function
	Above	Display the created drawing that is looked from above.
	Above upper left	Display the created drawing that is looked from above upper left.
	Above upper right	Display the created drawing that is looked from above upper right.
	Drawing selection	Select this when you would like to edit the created drawing data.
	Import DXF	Display “DXF import” panel.
	Import background image	Display “Import background image” panel.
	Distance measurement	Select this when you would like to measure distance between optional 2 points.
	Point	Select this when you would like to create drawing with points.
	Straight line	Select this when you would like to create drawing with lines.
	Arc	Select this when you would like to create drawing with arc.
	Circle	Select this when you would like to create drawing with circle.
	Square/Rectangle	Select this when you would like to create drawing with square/rectangle.

[4] Select figure

Select created drawing by clicking Drawing selection.

Select DXF drawing by clicking Import DXF.

The following is how to select the drawing.

- Single selection

The drawing is selected when it's clicked.

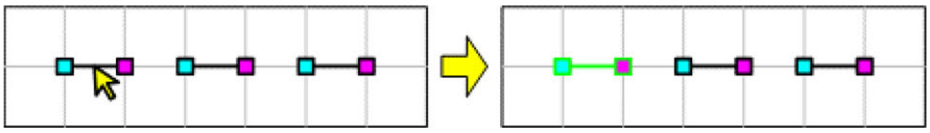


Fig. 9.1- 4 Single selection (Selected)

The selected drawing is unselected.

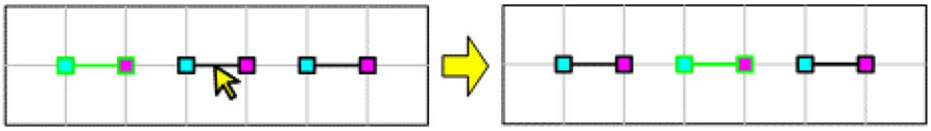


Fig. 9.1- 5 Single selection (Unselected)

All selected drawings are unselected when the area outside of drawing is clicked.

- Multiple selection

Select multiple drawing by pressing “Shift” key and clicking drawing.

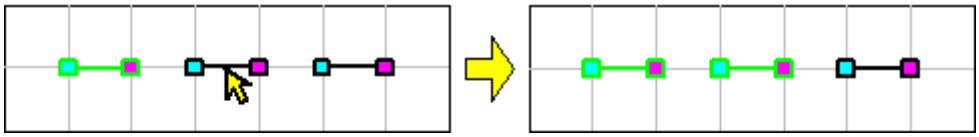


Fig. 9.1- 6 Multiple selection (Selected)

The drawings are unselected by clicking selected drawing.

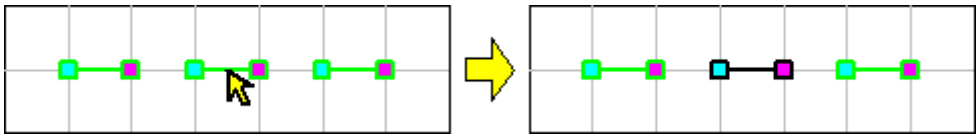


Fig. 9.1- 7 Multiple selection (Unselected)

● Range selection

Select drawing that is inside dotted rectangle by dragging.

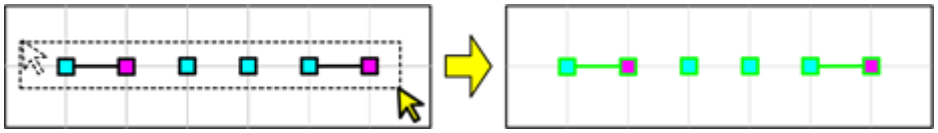


Fig. 9.1- 8 Range selection

Select straight line when start point and stop point are included in the dotted rectangle.

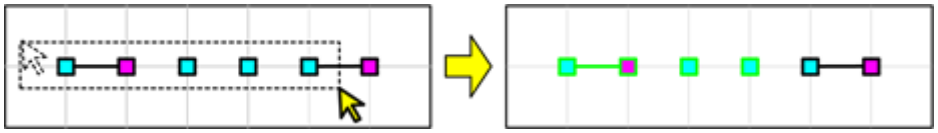


Fig. 9.1- 9 Range selection (Straight line selection)

Select arc when start point, passing point and stop point are included in the dotted rectangle, and select circle when start point, passing point 1 and passing point 2 are included in the dotted rectangle.

● All selection

Select all drawings by selecting “Select All” from pop-up menu.

[5] Display background image data

Display read image file (jpg/png) in the background of workspace.

- Reading

  Click Background image editing in the Toolbar. Display background image import panel in the area to display drawing list.

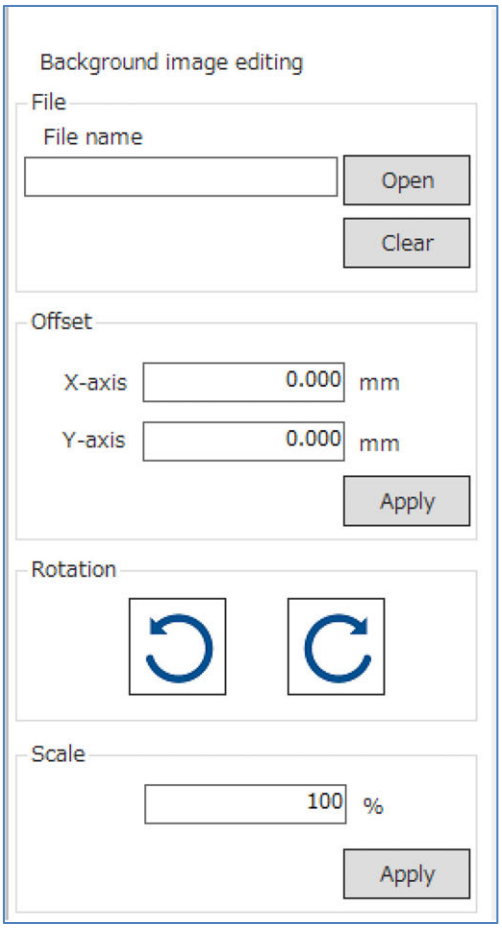


Fig. 9.1- 10 Background image editing Panel

Click Open. The “Open” window will be displayed.

Select image data file to display as background image, and click Open.

The image is displayed in the created drawing area.

- Clear
  The image is deleted by clicking Clear.

- Offset
  Set offset for X-axis and Y-axis. Move image by clicking Apply.

- Rotation
  By selecting rotation buttons for clockwise and counterclockwise, the image rotates based on the center of image by 90 degrees.

- Scale
  Input ratio for image size. Set between 10% to 8000%.
  Change image scale by clicking Apply.

9.2 Create and save drawing data

9.2.1 New

Select “New” from the “Drawing” tab. The New dialog will be displayed.

[In the case of SCARA robot]

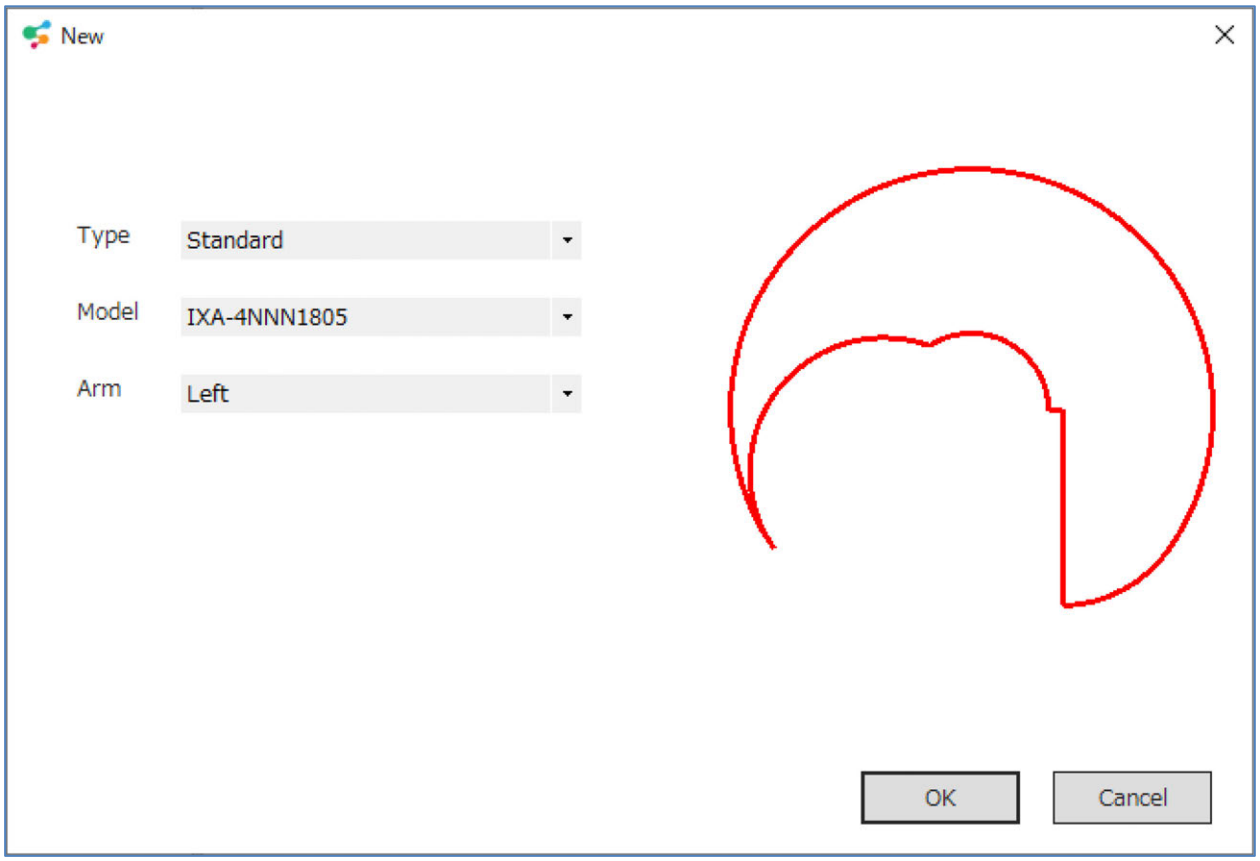


Fig. 9.2- 1 New dialog (SCARA robot)

Table 9.2- 1 New selection items (SCARA robot)

Item	Description
Type	Set the type. The following is the choices. The selection are as shown below. “Standard”, “High speed”, “High transportable”, “Clean room”, “Wall hanging”, “Ceiling hanging”
Model	Select SCARA robot model that is correspond to type.
Arm	Select from “Left Arm System” and “Right Arm System”.

[In the case of Cartesian 6-Axis Robot)]

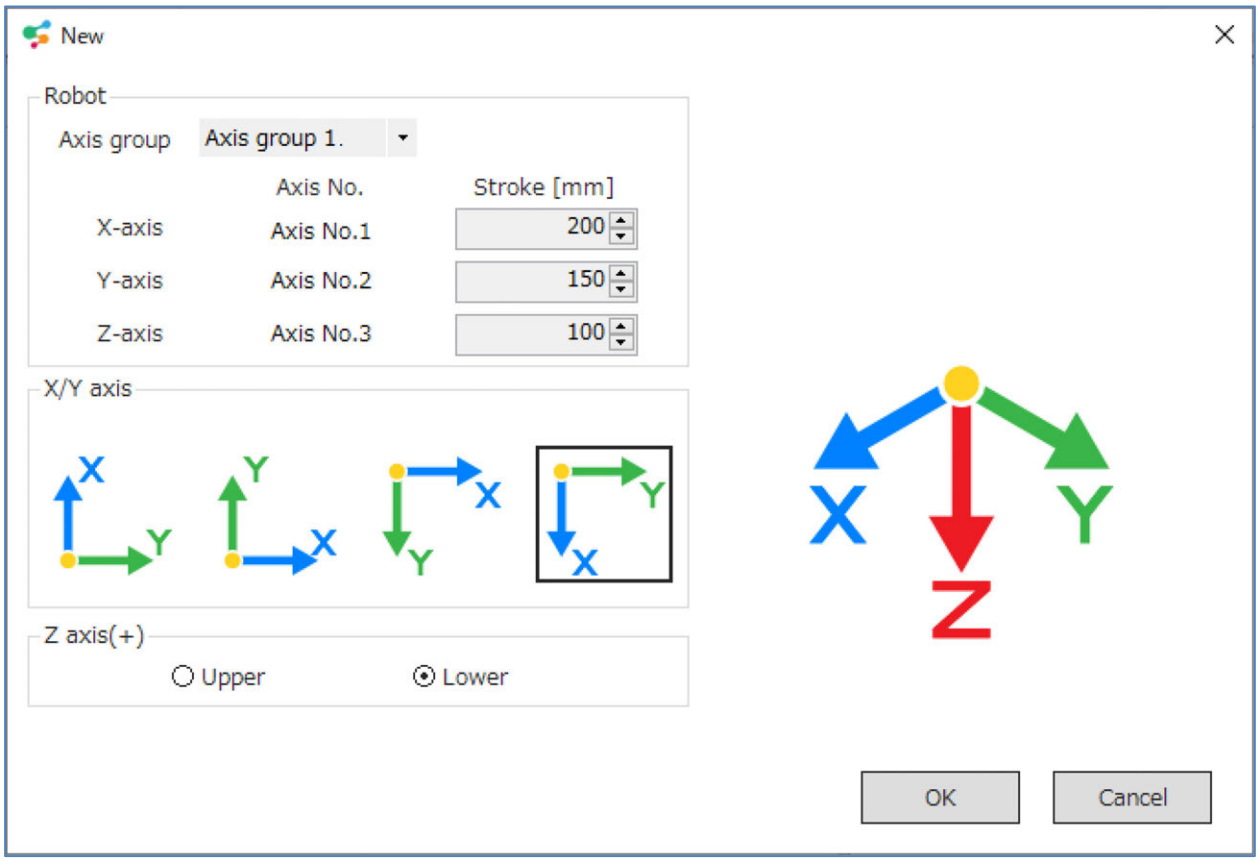


Fig. 9.2- 2 New dialog (Cartesian 6-Axis Robot)

Table 9.2- 2 New selection items (Cartesian 6-Axis Robot)

Item	Description
Axis No.	Display assigned axis number in project setting.
Stroke	Display the stroke. Change stroke when controller is not connected.
X/Y axis	Select X-axis and Y-axis in drawing area.
Z axis (+)	Select plus direction of Z-axis.

[Single axis combination]

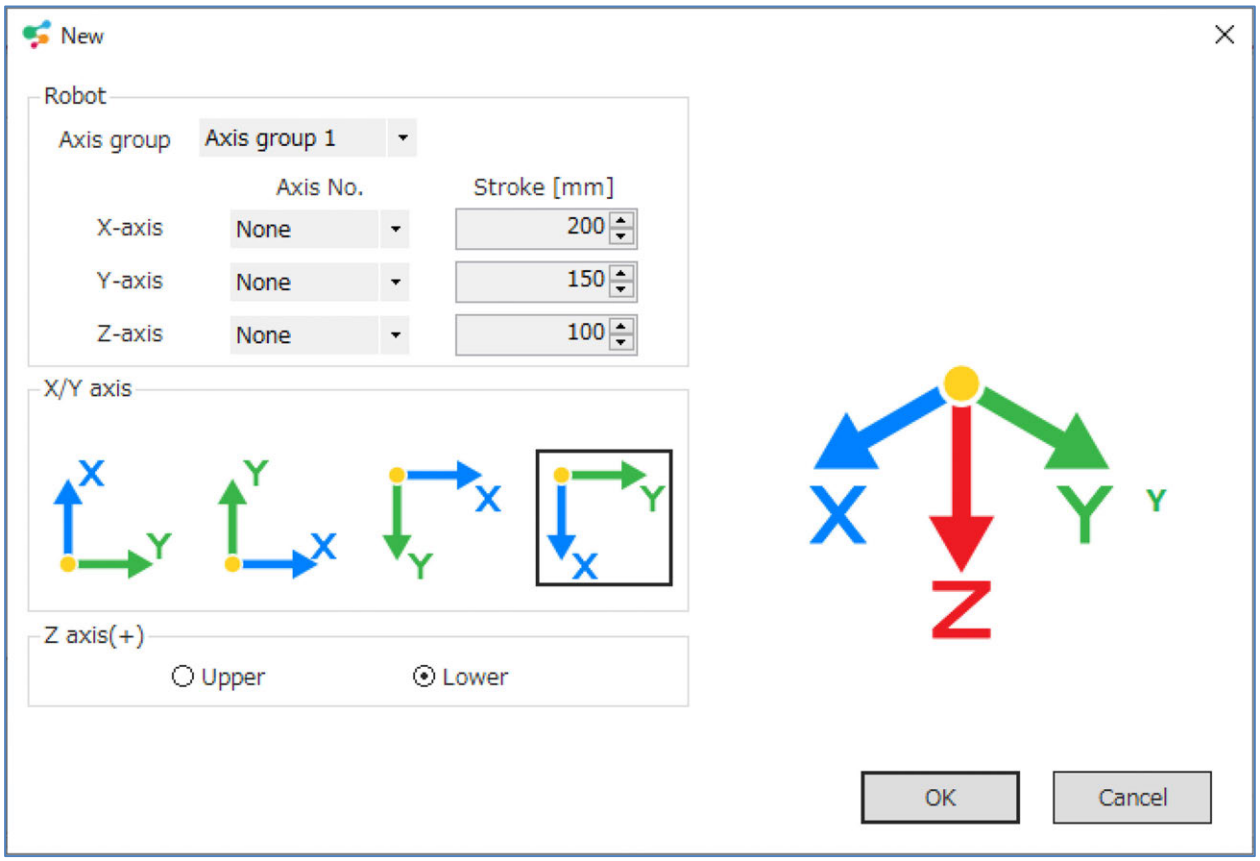


Fig. 9.2- 3 New dialog (Single axis combination)

Table 9.2- 3 New selection items (Single axis combination)

Item	Description
Axis No.	Select the Axis number.
Stroke	Display the stroke. Change stroke when controller is not connected.
X/Y axis	Select X-axis and Y-axis in drawing area.
Z axis (+)	Select plus direction of Z-axis.

9.2.2 Open and save drawing file

[Open]

Select Open from the “Drawing” tab. Display the drawing data of project.

[Save]

Select Save from the “Drawing” tab. Save to drawing data file of project.

9.2.3 Drawing File Export and Import

[Export]

Export drawing data to optional file.

Click Export in the “Drawing” tab. The Export window will be displayed.

Select the domain to save and input the file name, and click Save.

[Import]

Import drawing data file, and display it in drawing area.

Click Import in the “Drawing” tab. The Import window will be displayed.

Select drawing data file, and click Open.

9.3 Setting

9.3.1 Movable range setting

Click Movable range in the “drawing” tab.

Set the movable range of drawing area. The setting is not displayed for SCARA robot.

You can't change the setting when it is not connected to controller or simulator.

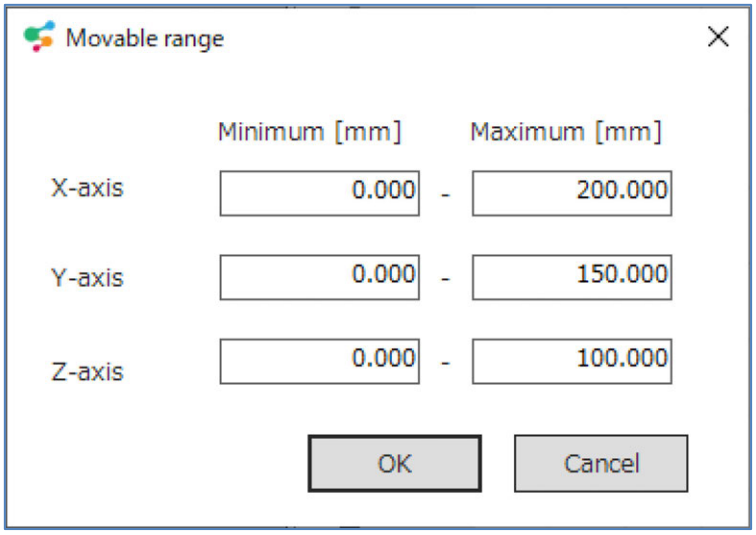


Fig. 9.3- 1 Movable range

Table 9.3- 1 Movable rang settings

Item	Description
X-axis Minimum	Set the minimum of X-axis. (Unit: mm)
X-axis Maximum	Set the maximum of X-axis. (Unit: mm)
Y-axis Minimum	Set the minimum of Y-axis. (Unit: mm)
Y-axis Maximum	Set the maximum of Y-axis. (Unit: mm)
Z-axis Minimum	Set the minimum of Z-axis. (Unit: mm)
Z-axis Maximum	Set the maximum of Z-axis. (Unit: mm)

9.3.2 Repetitive action setting

Click Repetitive action in the “drawing” tab. Set how to do repetitive action.

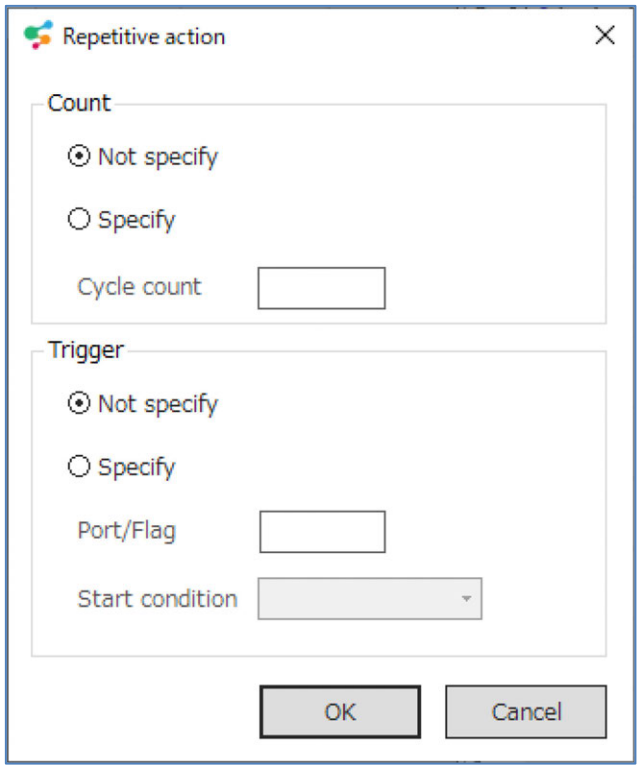


Fig. 9.3- 2 Repetitive action

[Count]

Table 9.3- 2 Count

Item	Description
Not specify	Repeat infinitely.
Specify	Finish program after repeated number of executions.
Cycle count	Set number of repetition.

[Trigger]

Table 9.3- 3 Trigger

Item	Description
Not specify	Start repetition as soon as it starts.
Specify	Start repetition after waiting the input of start trigger signal.
Port/Flag	Set I/O port or flag that is used as start trigger signal.
Start condition	Set signal level of start trigger signal. The selection are as shown below. “OFF Level”, “ON Level”, “OFF Edge”, “ON Edge”

9.3.3 How to move between figures setting

Click How to move between figures in the “Drawing” tab.

Set how to move between figures (from end point of previous figure to start point of next figure).

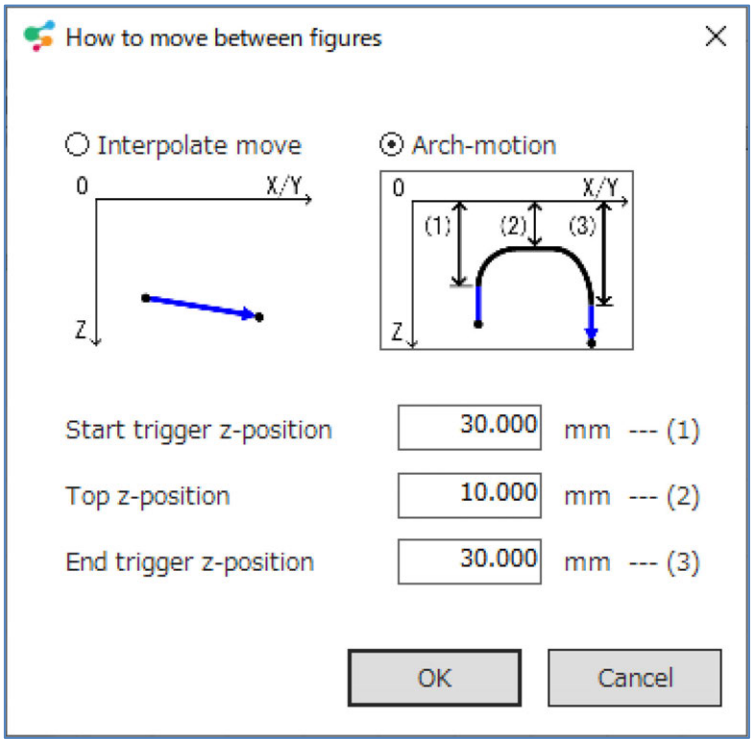


Fig. 9.3- 3 How to move between figures

Select how to move from the following items.

Table 9.3- 4 How to move between figures items

Item	Description
Interpolate move	Move the Interpolate move
Arch-motion	Move the Arch-motion. Set start position of arch area, top position and end position of arch area with absolute coordinate.

9.3.4 Speed Acceleration Deceleration setting

Click Speed Acceleration Deceleration in the “Drawing” tab.
Set speed, acceleration and deceleration of interpolated moving (from start point to end point of line figure).

[In the case of SCARA robot]

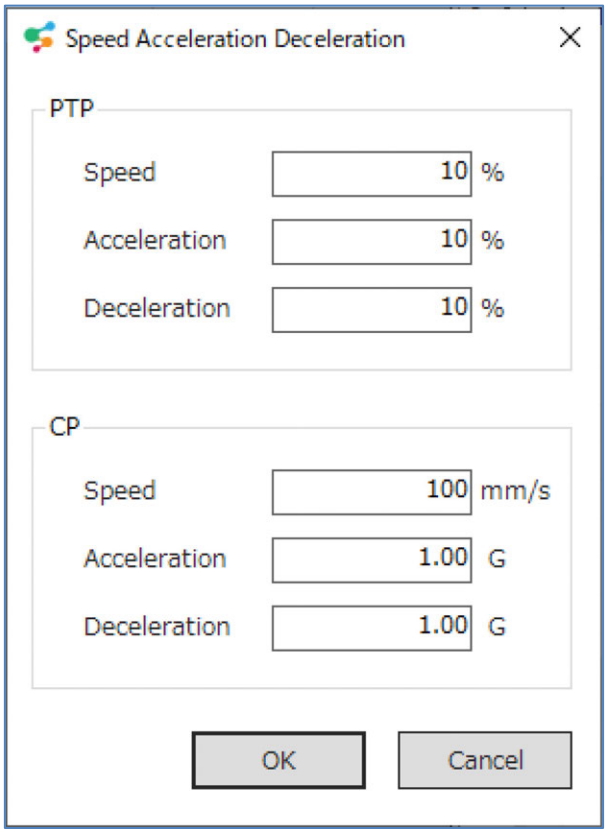


Fig. 9.3- 4 Speed Acceleration Deceleration (SCARA robot)

PTP Speed

Table 9.3- 5 PTP Speed Setting Items

Item	Description
Speed	Set speed with ratio for maximum speed. (Unit: %)
Acceleration	Set acceleration with ratio for maximum acceleration. (Unit: %)
Deceleration	Set deceleration with ratio for maximum deceleration. (Unit: %)

CP Speed

Table 9.3- 6 CP Speed Setting Items

Item	Description
Speed	Set Speed (Unit: mm/s)
Acceleration	Set Acceleration (Unit: G)
Deceleration	Set Deceleration (Unit: G)

[Cartesian 6-Axis Robot, Single axis combination]

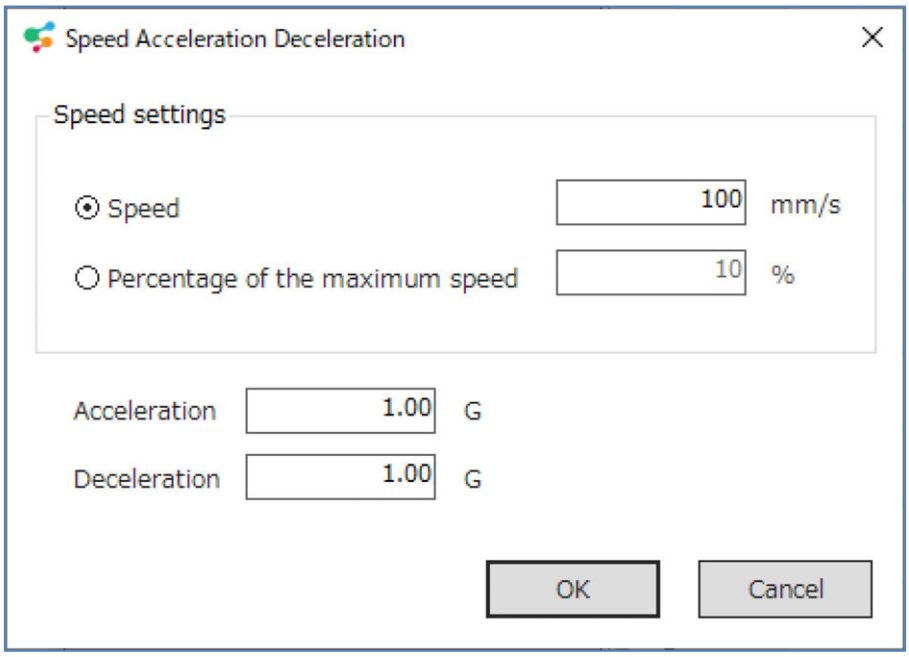


Fig. 9.3- 5 Speed Acceleration Deceleration (Cartesian 6-Axis Robot, Single axis combination)

Table 9.3- 7 Speed Acceleration Deceleration Setting Items

Item	Description
Speed	Set the speed of interpolated moving. (Unit: mm/s)
Percentage of the maximum speed	Set the speed of interpolated moving with ratio for maximum speed. (Unit: %)
Acceleration	Set the Acceleration of interpolated moving. (Unit: G)
Deceleration	Set the Deceleration of interpolated moving. (Unit: G)

9.4 Program position transformation

Click Program position transformation in the “Drawing” tab.

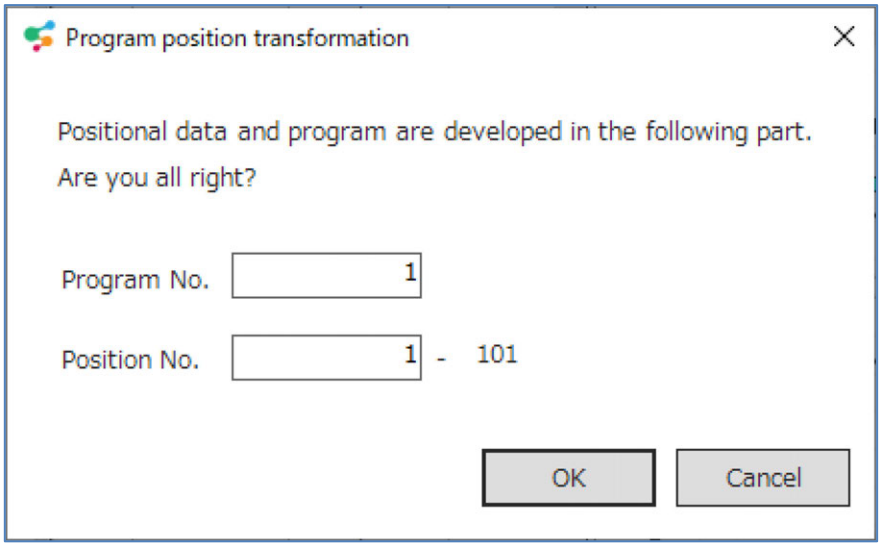


Fig. 9.4- 1 Program position transformation

Set the range of program number of the domain to open and position number to use in program. Generate program in the program number that is selected by clicking OK. In addition, generate position data from selected position number. Position data can be checked in position edit [project] window.

9.5 Current position display

Switch show/hide of current position with Current position display button in “Drawing” tab. Display current position with plus mark in drawing area when it is connected to controller or simulator.

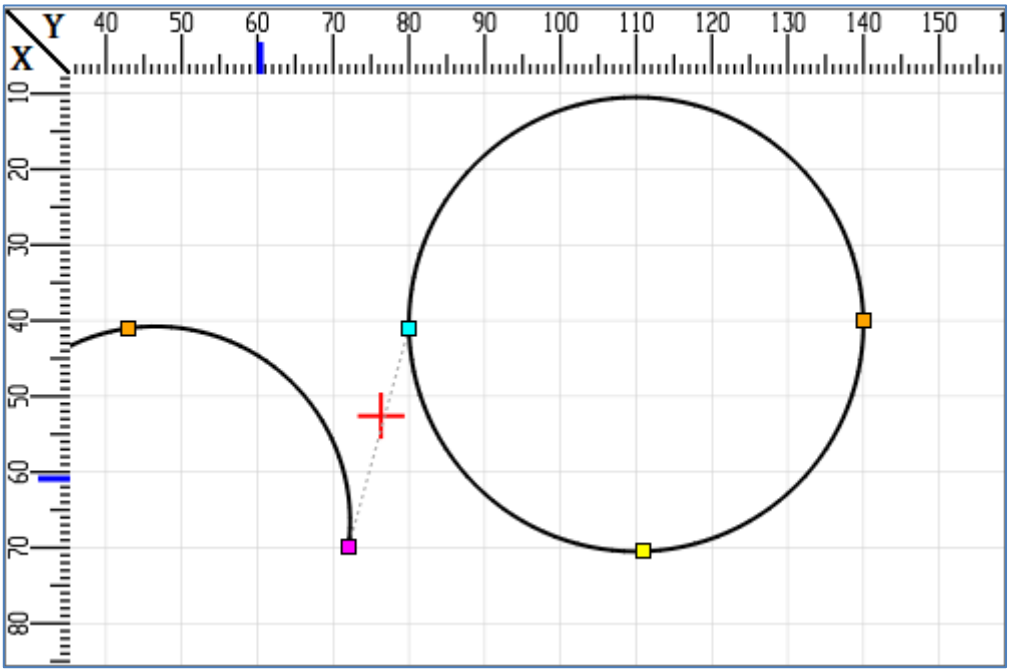


Fig. 9.5- 1 Current position display

9.6 Figure Creation

Create figure in any of the following way.

- Import figure from CAD data
- Create figure with mouse

9.6.1 Import figure from CAD data

Import figure (point, straight line, arc, circle) from work CAD data.

The following is the format of CAD data that can be imported.

- Format: DXF (ASCII format)
- Version: AutoCAD Release14

The following is the figures that can be imported.

- POINT
- LINE
- CIRCLE
- ARC
- POLYLINE
- LWPOLYLINE
- SPLINE
- ELLIPSE
- TRACE
- SOLID

9.6.2 Import DXF data

The following is how to import DXF data.

Prepare DXF data of work drawing.
Click DXF graphic editing in the toolbar. Switch drawing list area to “DXF import” panel.

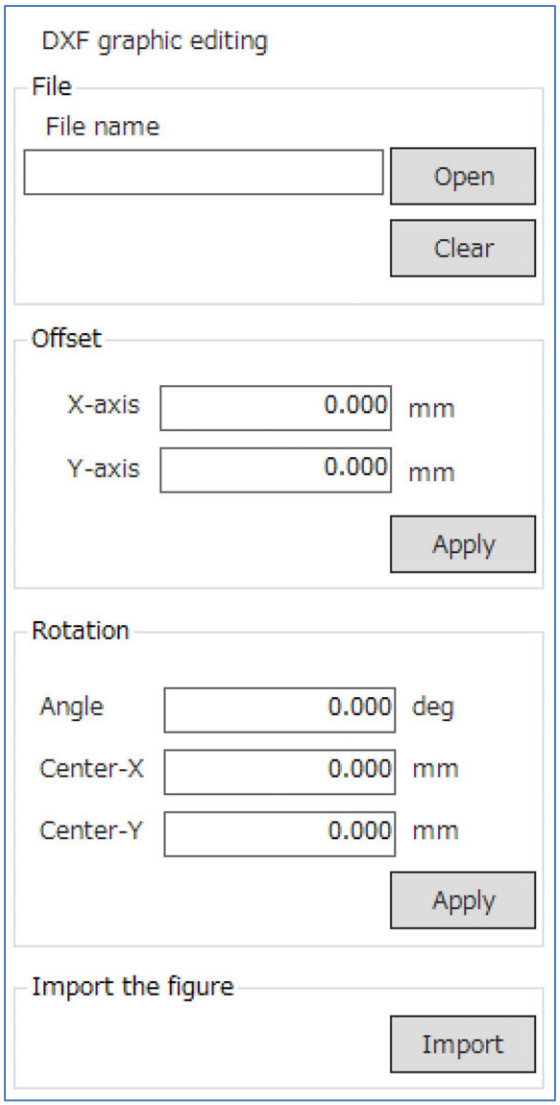


Fig. 9.6- 1 Import DXF data

Click Open.
Select the file name of DXF data, and click Open.
Display the DXF figure in drawing area.

9.6.3 Import DXF figure

The following is how to import DXF data to drawing data.

Click DXF graphic editing in the toolbar.
Select the DXF figure to import with left-click.

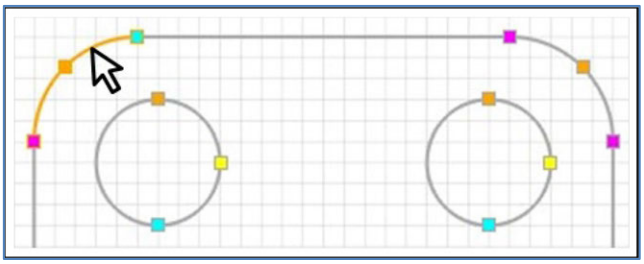


Fig. 9.6- 2 Import DXF figure

Select “Import” from the pop-up menu that is displayed with right-click.

9.6.4 Delete DXF figure

Delete the DXF figure by clicking Clear.

9.6.5 Point drawing

Click Point in the Toolbar.
Click the position of point drawing.
Finish the drawing by typing ESC key.

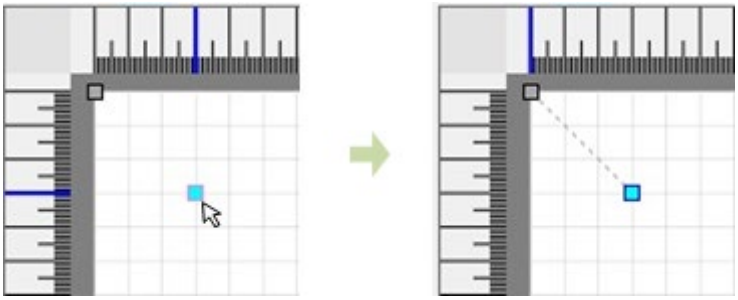


Fig. 9.6- 3 Point drawing

9.6.6 Straight Line Drawing

Click Straight line in the Toolbar.
Click start point of straight line.
Finish the drawing by typing ESC key.

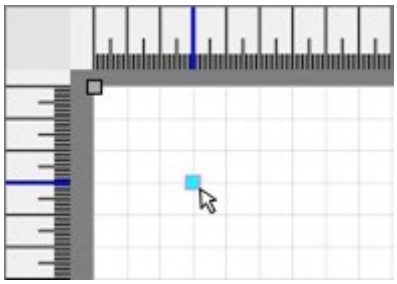


Fig. 9.6- 4 Straight Line Drawing (Start point)

Click end point of straight line.
Return back to the start point selection by typing ESC key.

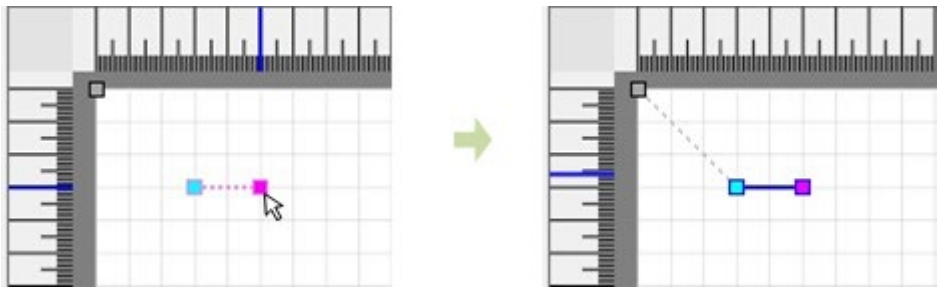


Fig. 9.6- 5 Straight Line Drawing (End point)

Fix the direction of end point to 0, 90, 180 and 270 degrees by moving cursor while typing Ctrl key.

Fig. 9.6- 6 Straight Line Drawing (Fix the direction of end point)

9.6.7 Arc Drawing

Click Arc in the Toolbar.
Click the start point of the arc.
Finish the drawing by typing ESC key.

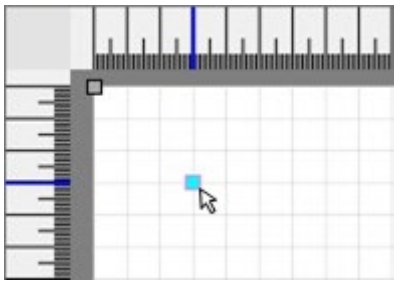


Fig. 9.6- 7 Arc Drawing（始点位置）

Click the end point of the arc.
Return back to the start point selection by typing ESC key.

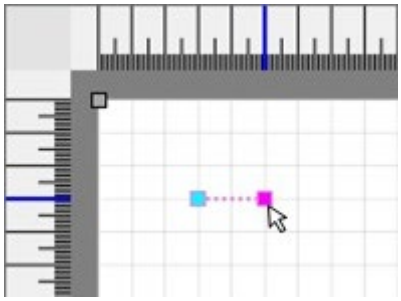


Fig. 9.6- 8 Arc Drawing（終点位置）

Fix the direction of end point to 0, 90, 180 and 270 degrees by moving cursor while typing Ctrl key.

Fig. 9.6- 9 Arc Drawing (Fix the direction of end point)

Click passing point of the arc.
Return back to the end point selection by typing ESC key.

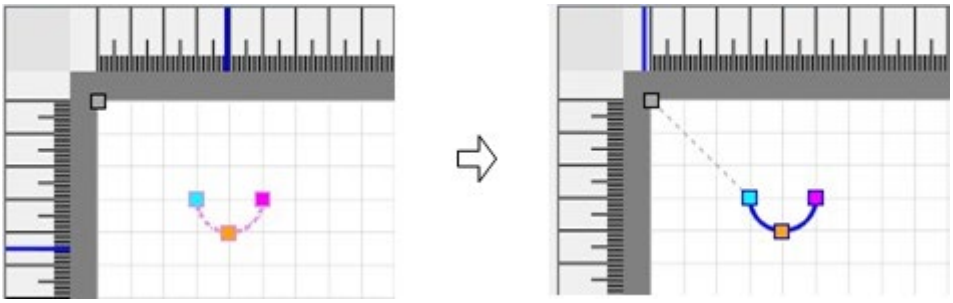


Fig. 9.6- 10 Arc Drawing (passing point)

Fix the center angle of arc to 180 degrees by moving cursor while typing Ctrl key.

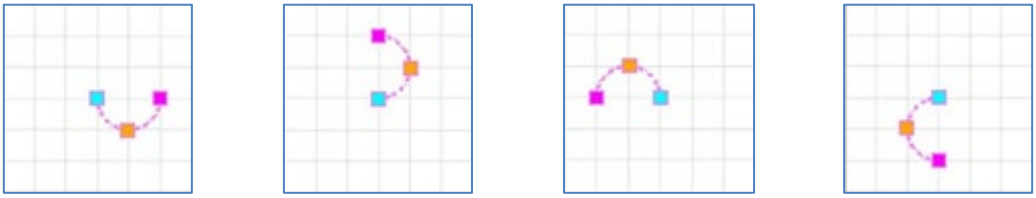


Fig. 9.6- 11 Arc Drawing (Fix the center angle to 180 degrees)

9.6.8 Circle Drawing

Click Circle in the Toolbar.
Click the start point of the circle.
Finish the drawing by typing ESC key.

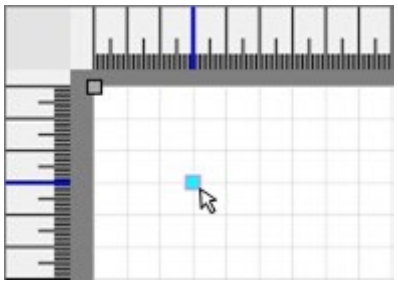


Fig. 9.6- 12 Circle Drawing (Start point)

Click the 2nd passing point of circle.
Return back to the start point selection by typing ESC key.

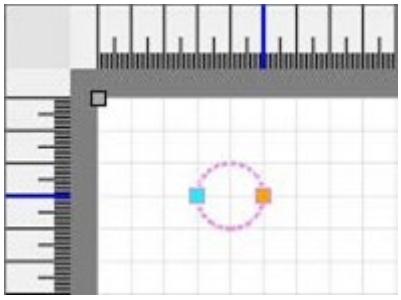


Fig. 9.6- 13 Circle Drawing (2nd passing point)

Fix the direction of end point to 0, 90, 180 and 270 degrees by moving cursor while typing Ctrl key.

Fig. 9.6- 14 Circle Drawing (Fix the direction of 2nd passing point)

Click the 1st passing point of circle.
Return back to the 2nd passing point selection by typing ESC key.

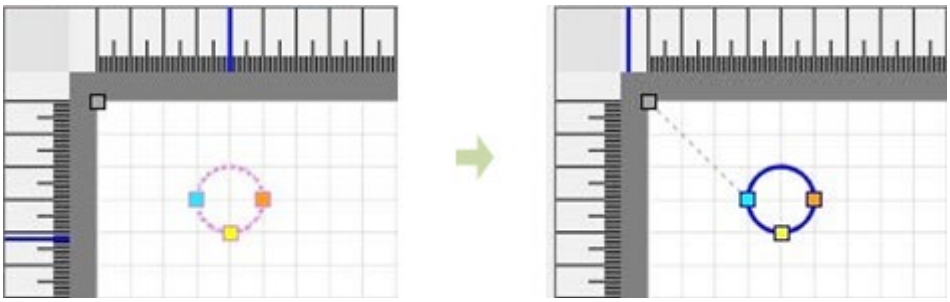


Fig. 9.6- 15 Circle Drawing (Return back to the 2nd passing point selection)

9.6.9 Square/Rectangle Drawing

Click Square/Rectangle in the Toolbar.
Click the drawing start point.
Finish the drawing by typing ESC key.

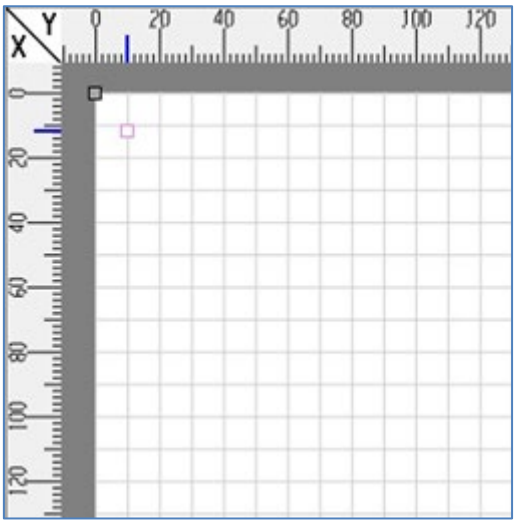


Fig. 9.6- 16 Square/Rectangle Drawing (drawing start point)

Click the diagonal point of drawing start point.
Return back to the start point selection by typing ESC key.

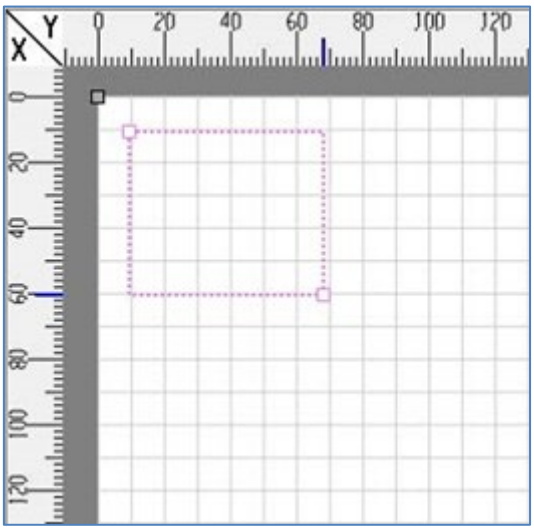


Fig. 9.6- 17 Square/Rectangle Drawing (Click the diagonal point)

Click the the 1st passing point.
Return back to the diagonal point selection by typing ESC key.

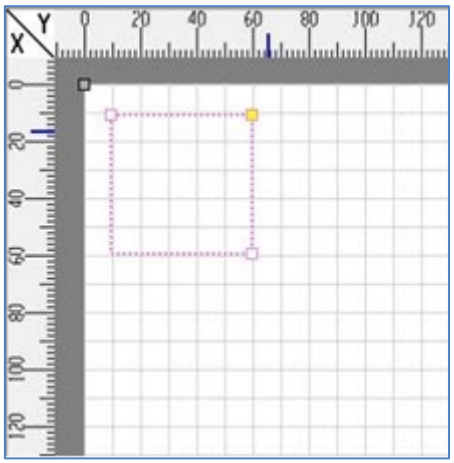


Fig. 9.6- 18 Square/Rectangle Drawing (Return back to the diagonal point selection)

9.7 Figure Edit

9.7.1 Moving top point/figure by dragging

Move top point or figure by dragging them.
Cancel the movement by typing ESC key before leaving the button.

[Move top point]

Move top point location by dragging the top point of figure.

- Move the start point of straight line by dragging

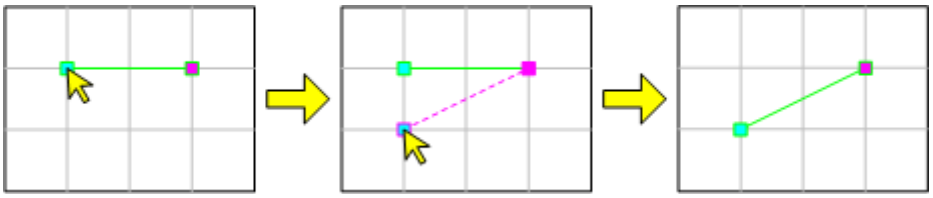


Fig. 9.7- 1 Move top point (Move the start point by dragging)

- Move the end point of straight line by dragging

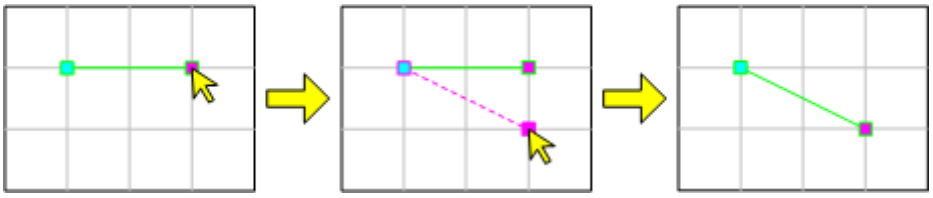


Fig. 9.7- 2 Move top point (Move the end point by dragging)

[Move figure]

Move parallel figure location by dragging figure line.

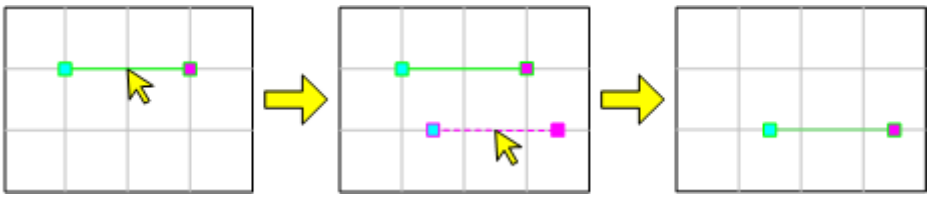


Fig. 9.7- 3 Move figure

9.7.2 Top point snap

Snap top point by making the cursor closer to other drawing top point when selecting top point location.

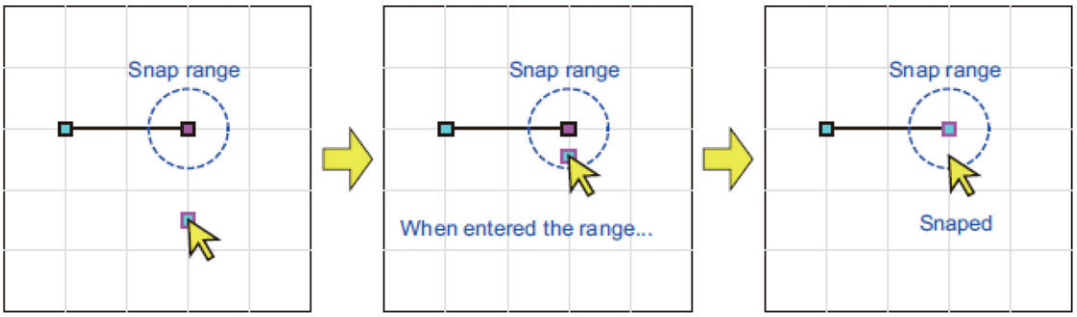


Fig. 9.7- 4 Top point snap

Move cursor while typing Ctrl key and Shift key when you would like to stop the snap action.

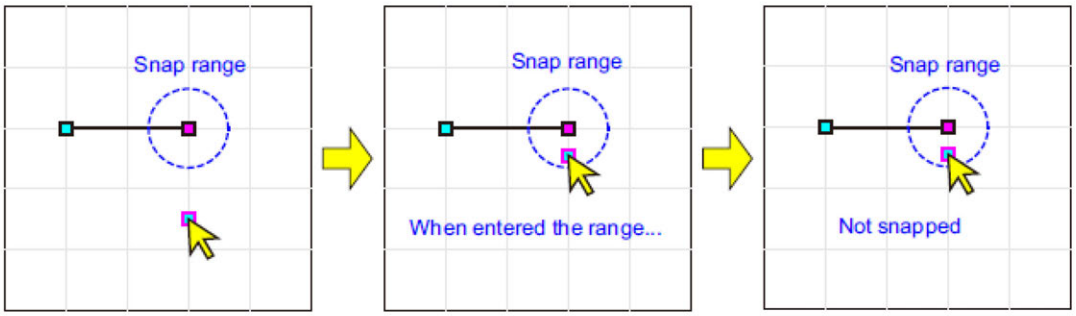


Fig. 9.7- 5 Top point snap (Stop snap action)

9.7.3 Connecting Figures

These figures are linked when the end point and start point of 2 concecutive figures are the same coordinate by top point snap.

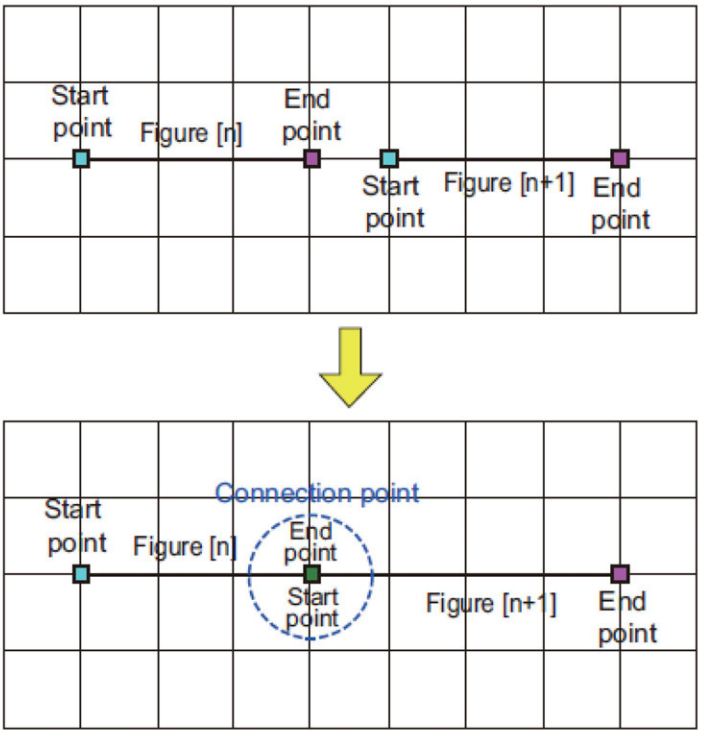


Fig. 9.7- 6 Connecting Figures

They cannot be linked in the following situation.

- The order of figure is not consecutive.
- One or both are point figure.
- Z-axis are different.

9.7.4 Cut

Cut figure in the following process.

- Select a figure.
- Open pop-up menu by right-clicking drawing area, and select “Cut”.

9.7.5 Copy

Copy figure in the following process.

- Select a figure.
- Open pop-up menu by right-clicking drawing area, and select “Copy”.

9.7.6 Past

Paste cut/copied figure in the following process.

- Perform cut/copy action.
- Open pop-up menu by right-clicking drawing area, and select “Past”.

9.7.7 Delete

Delete figure in the following process.

- Select a figure.
- Open pop-up menu by right-clicking drawing area, and select “Delete”.

9.7.8 Replace start point and end point

Replace start point and end point of figure (1st passing point and 2nd passing point if it is circle).

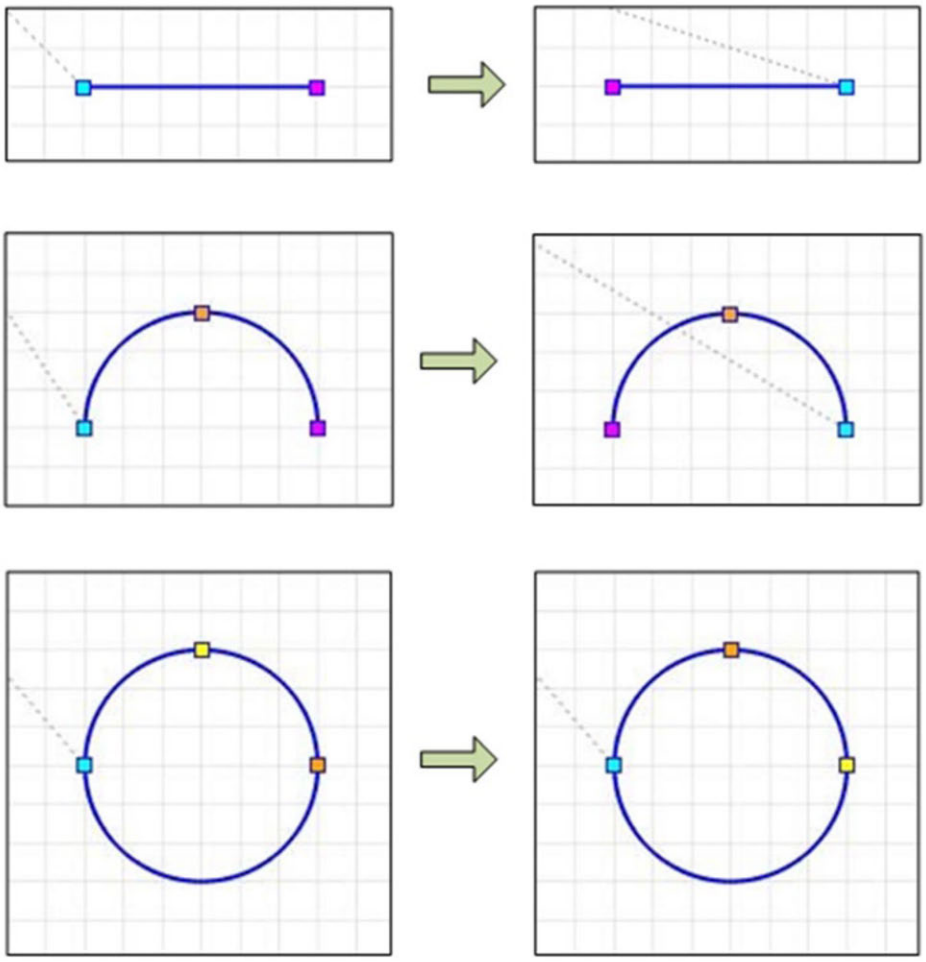


Fig. 9.7- 7 Replace start point and end point

The following is the process.

- Select a figure.
- Open pop-up menu by right-clicking drawing area, and select “Replace start point and end point”.

9.7.9 Translation

Translation parallel figure.

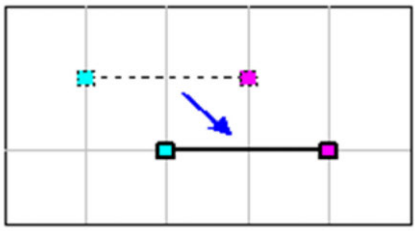


Fig. 9.7- 8 Translation

The following is the process.

- Select a figure.
- Open pop-up menu by right-clicking drawing area, and select “Translation”.

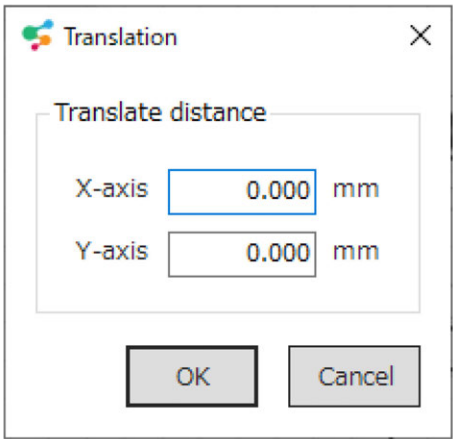


Fig. 9.7- 9 Translation (Set translation distance for X-axis and Y-axis)

- Set translation distance for X-axis and Y-axis, and click OK.

9.7.10 Rotation

Rotate figure.

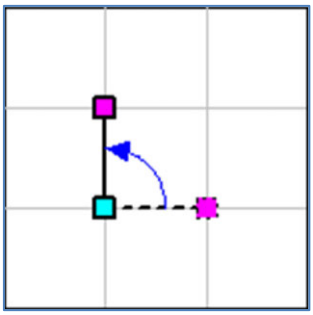


Fig. 9.7- 10 Rotation

The following is the process.

- Select a figure.
- Open pop-up menu by right-clicking drawing area, and select “Rotation”. The following dialog will be displayed

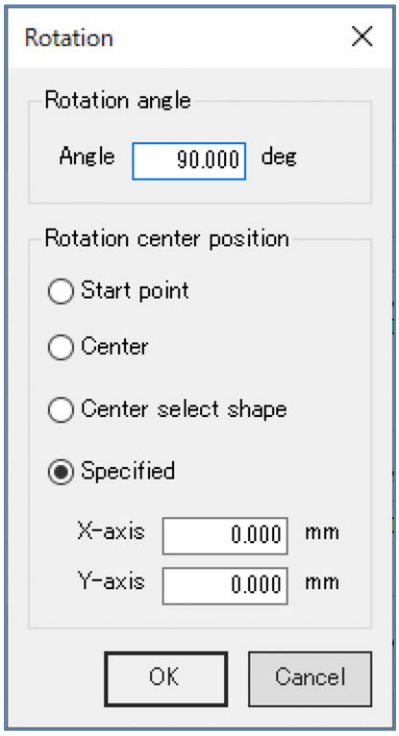


Fig. 9.7- 11 Rotation dialog

Table 9.7- 1 Rotation items

Item	Description
Rotation angle	Set the rotation angle. (Unit: deg)
Rotation center position	Select/Set coordinate that is center of rotation.

9.8 Edit figure information

Edit figure information.

The following is the editable figure information.

●Top point setting

●Set movement between figures.

Display edit figure information window in the following process.

● Click Select figure in the Toolbar.

● Select figure or figure list to edit.

● Open menu by right-clicking drawing area or drawing data list, and select “Edit”.

9.8.1 Top point setting

The following is the description of top point setting for each figures.

[Work home]

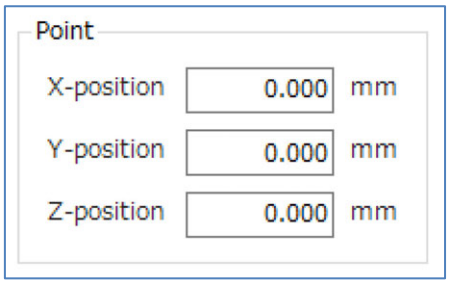


Fig. 9.8- 1 Top point setting (Work home)

Table 9.8- 1 Top point setting items (Work home)

Item	Description
X-position	Sets the X-position.
Y-position	Sets the Y-position.
Z-position	Sets the Z-position.

[Point]

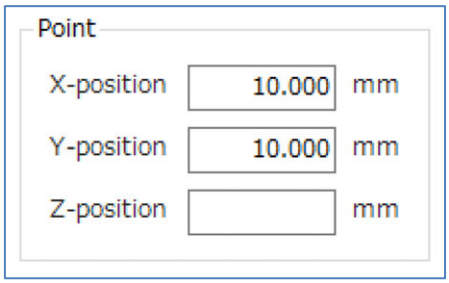


Fig. 9.8- 2 Top point setting (Point)

Table 9.8- 2 Top point setting items (Point)

Item	Description
X-position	Sets the X-position.
Y-position	Sets the Y-position.
Z-position	Sets the Z-position. The Z-position of end point of previous figure is applied when it is empty.

[Straight line]

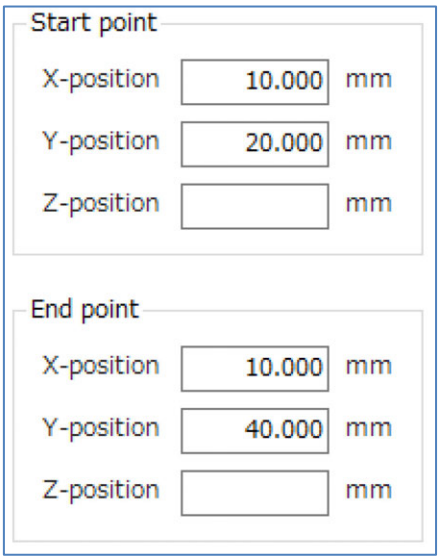


Fig. 9.8- 3 Top point setting (Straight line)

● Start point

Set the position of start point.

Table 9.8- 3 Top point setting items (Start point)

Item	Description
X-position	Sets the X-position.
Y-position	Sets the Y-position.
Z-position	Sets the Z-position. The Z-position of end point of previous figure is applied when it is empty.

● End point

Set the position of end point.

Table 9.8- 4 Top point setting items (End point)

Item	Description
X-position	Sets the X-position.
Y-position	Sets the Y-position.
Z-position	Sets the Z-position. The Z-position of end point of previous figure is applied when it is empty.

[Arc]

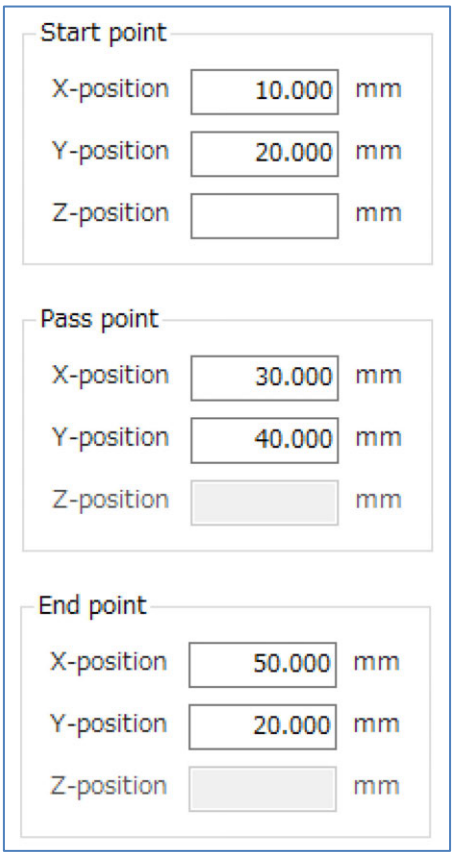


Fig. 9.8- 4 Top point setting (Arc)

● Start point

Set the position of start point.

Table 9.8- 5 Top point setting items (Start point)

Item	Description
X-position	Sets the X-position.
Y-position	Sets the Y-position.
Z-position	Sets the Z-position. The Z-position of end point of previous figure is applied when it is empty.

● Pass point

Set the position of pass point.

Table 9.8- 6 Top point setting items (Pass point)

Item	Description
X-position	Sets the X-position.
Y-position	Sets the Y-position.
Z-position	Sets the Z-position. Z-position of start point is applied. This cannot be changed.

● End point

Set the position of end point.

Table 9.8- 7 Top point setting items (End point)

Item	Description
X-position	Sets the X-position.
Y-position	Sets the Y-position.
Z-position	Sets the Z-position. Z-position of start point is applied. This cannot be changed.

[Circle]

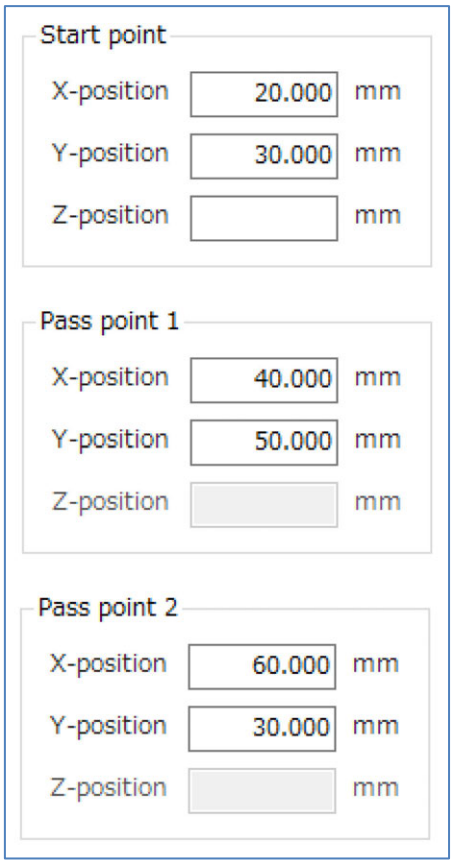


Fig. 9.8- 5 Top point setting (Circle)

● Start point

Set the position of start point.

Table 9.8- 8 Top point setting items (Start point)

Item	Description
X-position	Sets the X-position.
Y-position	Sets the Y-position.
Z-position	Sets the Z-position. The Z-position of end point of previous figure is applied when it is empty.

● Pass point 1

Set the position of pass point 1.

Table 9.8- 9 Top point setting items (Pass point 1)

Item	Description
X-position	Sets the X-position.
Y-position	Sets the Y-position.
Z-position	Sets the Z-position. Z-position of start point is applied. This cannot be changed.

● Pass point 2

Set the position of pass point 2.

Table 9.8- 10 Top point setting items (Pass point 2)

Item	Description
X-position	Sets the X-position.
Y-position	Sets the Y-position.
Z-position	Sets the Z-position. Z-position of start point is applied. This cannot be changed.

9.8.2 Individual setting

Set how to move from the end point of previous figure to the start point of this figure.

[Work starting point]

Set Z-position when moving to work starting point.

Fig. 9.8- 6 Individual setting (Work starting point)

[Figure other than work starting point]

Set how to move from the end point of previous figure to the start point of this figure.

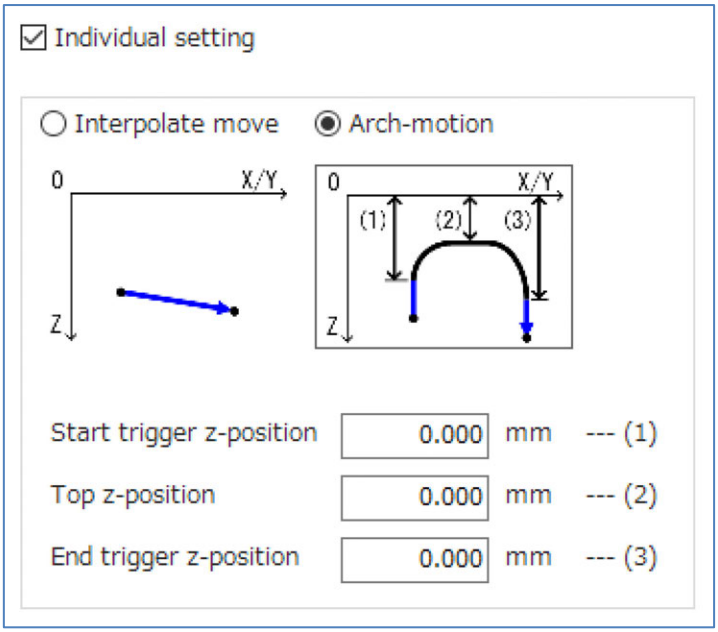


Fig. 9.8- 7 Individual setting (Figure other than work starting point)

● Set the movement between figures individually.

Check when how to move to the start point of this figure is set individually.

The setting value of “movement setting between figures” in “Setting” tab is applied when it is not set.

● Individual movement setting between figures

Set how to move between figures (from the end point of previous figure to the start point of next figure).

For details, refer to [9.3.3 How to move between figures setting]

SEL Assist

Chapter 10

Monitor function

10.1 Monitor function

Monitor port, flag data and variable that are retained by controller. Use in Online Mode.

10.2 Input port monitor

Click Input port from the “Monitor” tab. The input port monitor window will be displayed.

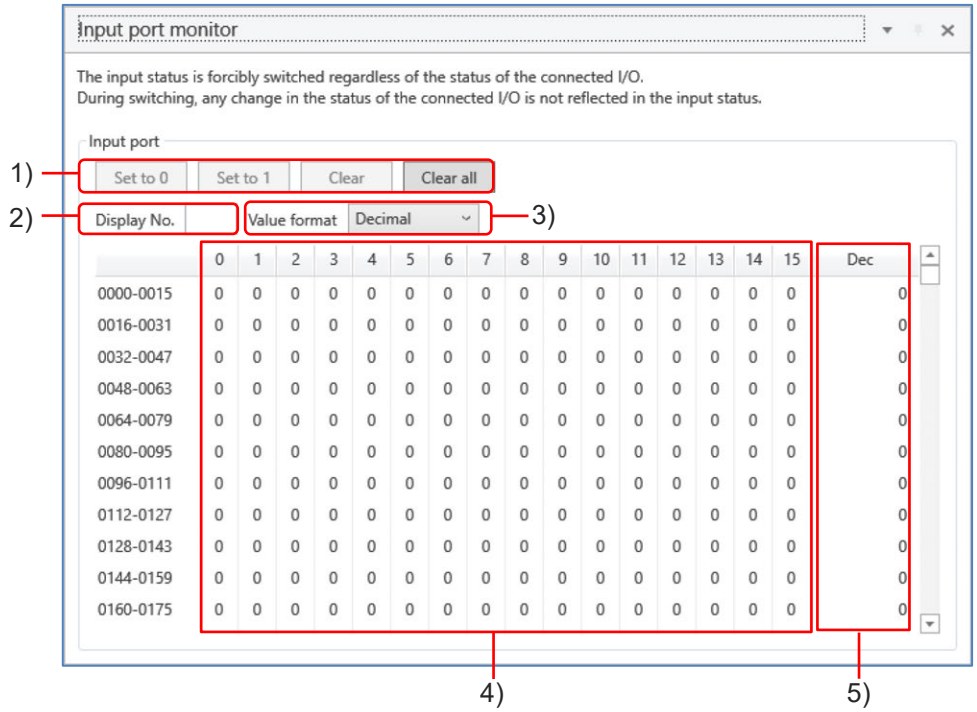


Fig. 10.2- 1 Input port monitor

Table 10.2- 1 Input port monitor configuration

No.	Name	Description
1)	Set to 0 button	The value in a selected cell can be set to “0” spuriously.
	Set to 1 button	The value in a selected cell can be set to “1” spuriously.
	Clear button	Set the value of selected cell to back.
	Clear all button	The values changed spuriously can all set back.
2)	Display No.	The focus moves to a cell with an input number.
3)	Value format	Switch the display type of Column Dec. Decimal: Displays in decimal numbers. Hexadecimal: Displays in hexadecimal numbers.
4)	Column 0 to 15	Input port values should be displayed. 0: Shows OFF. 1: Shows ON Values that are set spuriously is displayed in red.
5)	Column Dec/Hex	Display column 0 to 15 as the number of 16 bit.Column 15 is the most significant bit. Input data by double-clicking. Set the value spuriously.

Display selected number when the cursor is hovered to selected multiple cells.

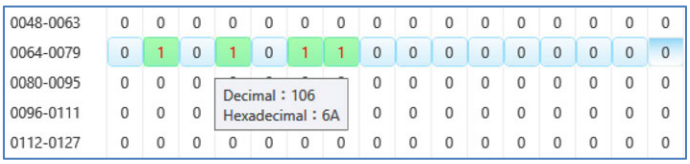


Fig. 10.2- 2 Input port monitor (Multiple Selection)

10.3 Output Port / Flag / Virtual Input and Output Port Monitor

The Output Port Monitor, virtual input and output port monitor, and Flag Monitor are described using the Global flag Monitor window as an example. The monitor of local flags is available during program execution.

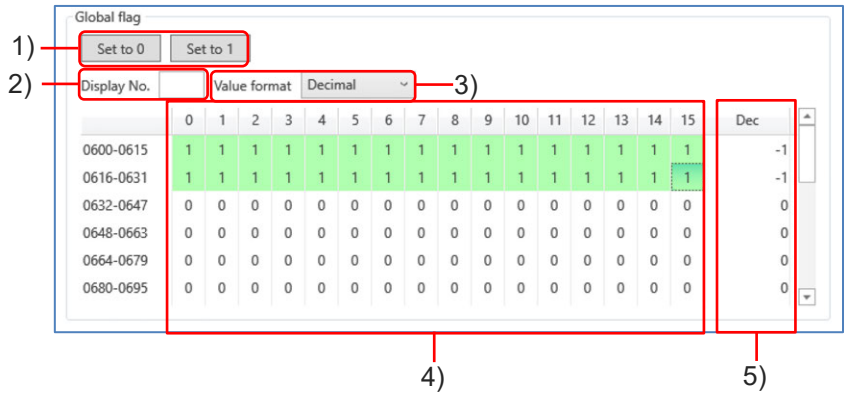


Fig. 10.3- 1 Global flag Monitor window

Table 10.3- 1 Global flag Monitor window configuration

No.	Name	Description
1)	Set to 0 button	The value in a selected number can be set to “0”.
	Set to 1 button	The value in a selected number can be set to “1”.
2)	Display No.	The focus moves to a cell with an input number.
3)	Value format	Switch the display type of Column Dec/Hex. Decimal: Displays in decimal numbers. Hexadecimal: Displays in hexadecimal numbers.
4)	Column 0 to 15	Output Port / Flag / Virtual Input and Output Port values should be displayed. 0: Shows OFF. 1: Shows ON
5)	Column Dec/Hex	Display column 0 to 15 as the number of 16 bit.Column 15 is the most significant bit. Input data by double-clicking.

Display the value that is converted to number when the cursor is hovered to selected multiple cells.

10.4 Integer Variables / Real Variables Monitor

Below explains the integer variables and real variables monitor with the Global integer variable monitor as an example.
The local integer variables and real variables can be used on a program under execution.

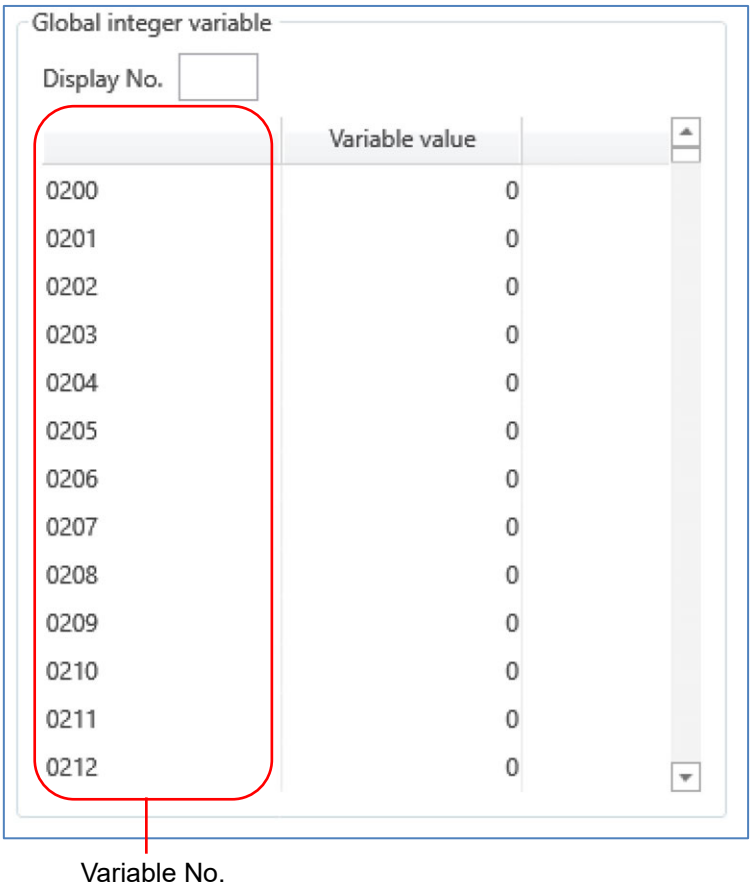


Fig. 10.4- 1 Global integer variable monitor

Table 10.4- 1 Global integer variable monitor items

Name	Description
Display No.	The values of input variable numbers will be displayed
Variable No.	The variable numbers will be displayed.
Variable value	The current variable values will be displayed. Double-click on it and a value can be changed.

10.5 I/O name setting

Click I/O name setting from the “Monitor” tab. The I/O name setting window will be displayed.

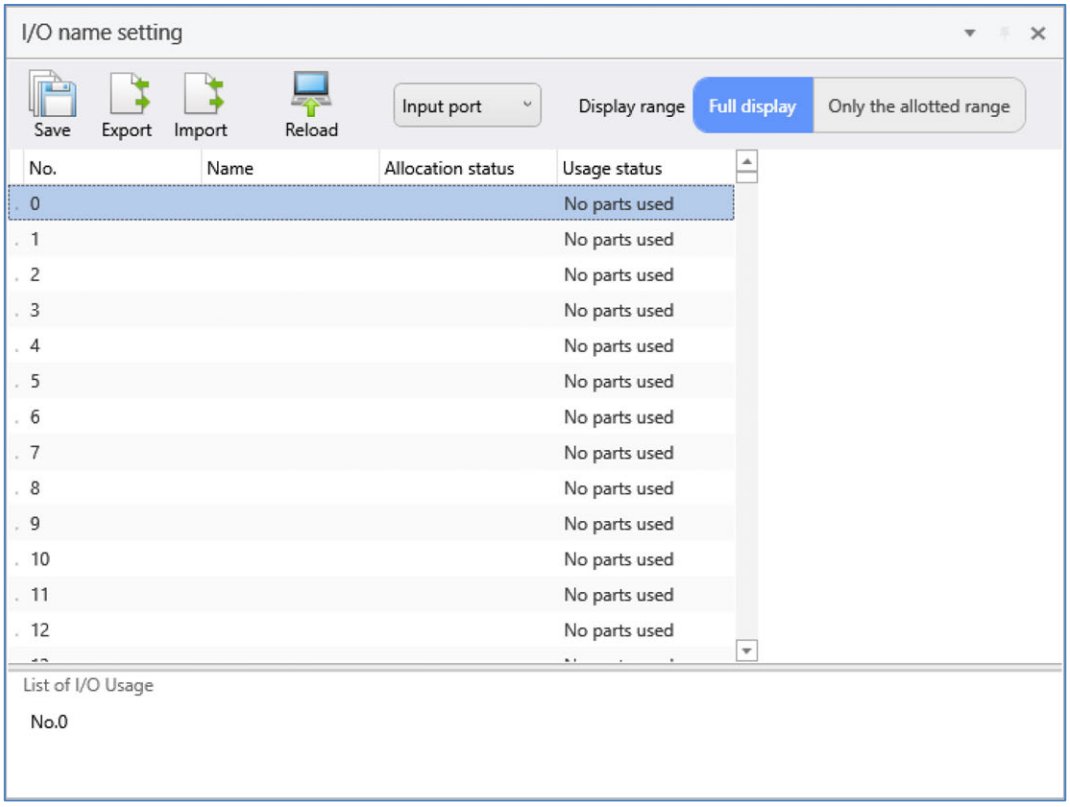


Fig. 10.5- 1 I/O name setting

Describes the functions of the menu.

Table 10.5- 1 I/O name setting function

Menu	Description
Save button	Save edited I/O name.
Export button	Save edited I/O name to xml file.
Import button	Import I/O name data file of xml file.
Reload button	Update the information of output port that is used in program.
I/O Port Switching	Switch list display. Input port: Display input port list. Output port: Display output port list.
Display range	Switch display range of list display. Full display: Display all ports. Display only allocated range: Display port in allocated range.

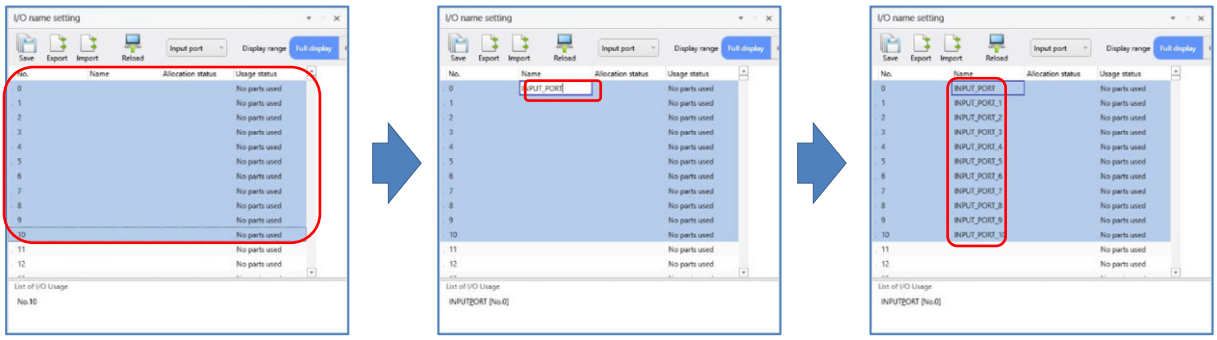
Describes the items in the list.

Table 10.5- 2 I/O name setting list items

Item	Description
No.	The I/O port number should be displayed.
Name	The name of the I/O port should be displayed. Display input form by clicking the cell in “Name” column.
Allocation status	Display fieldbus name that is allocated. It shows empty when fieldbus is not allocated.
Usage status	Display usage status of output port that is used in program. No parts used: Display the output port that is not set in the item. Used in one place: Display the output port that is set in one item. Used in multiple place: Display the output port that is set in multiple items.

10.5.1 I/O Name setting at once

If you select multiple rows of display data, click the “Name” column, and enter an I/O name, the I/O name will be automatically entered in the cells after the selected number.



Select multiple rows.

Input I/O name.

The I/O name of the selected range is automatically entered.
Serial number is added at the end of the name.

Fig. 10.5- 2 I/O Name setting at once

10.5.2 List of I/O Usage

Display the usage status of output port that is selected in I/O name setting window in the usage status list.

The following is the example when No.371 is selected.

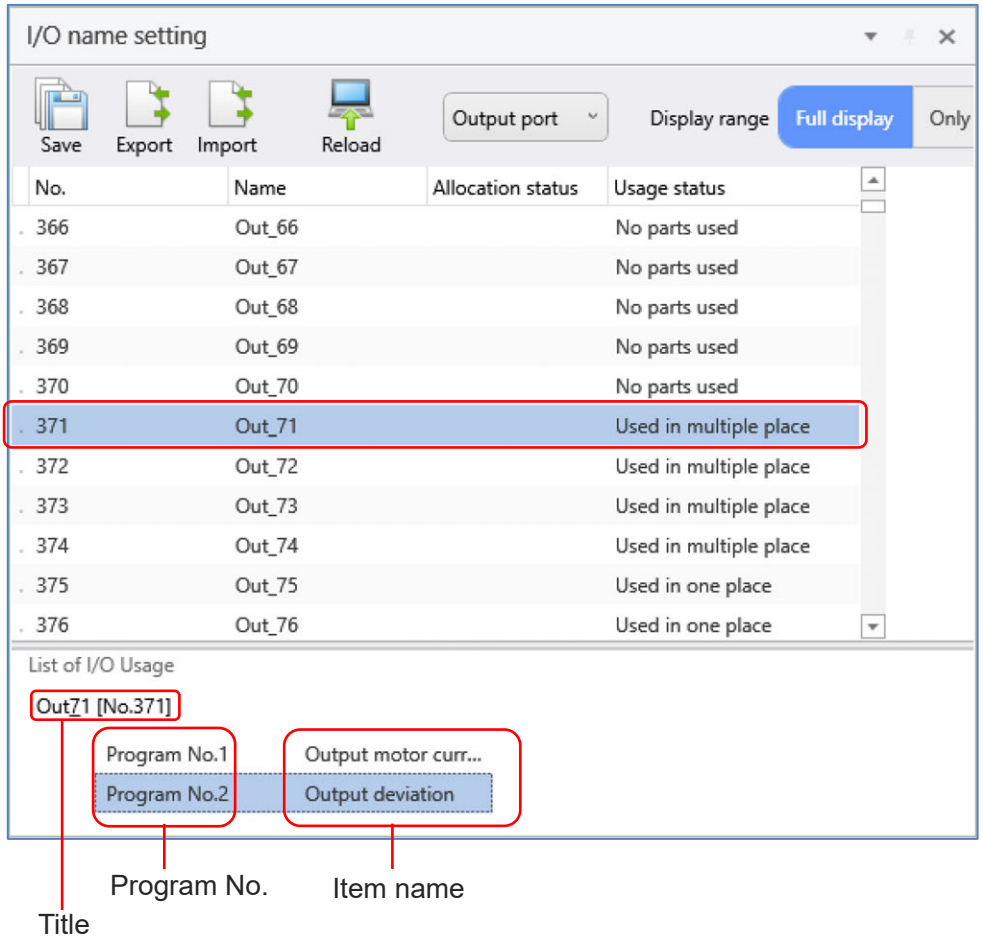


Fig. 10.5- 3 List of I/O Usage

The following is the information that is displayed in I/O usage status list.

- Title

  Output port No. [Output port name]

- Lists

Table 10.5- 3 List of I/O Usage

Item	Description
Program No.	Display the program number that uses output port.
Item name	Display the item name that uses output port.

10.6 Variable name setting

Click Variable name setting from the “Monitor” tab. The Variable name setting window will be displayed.

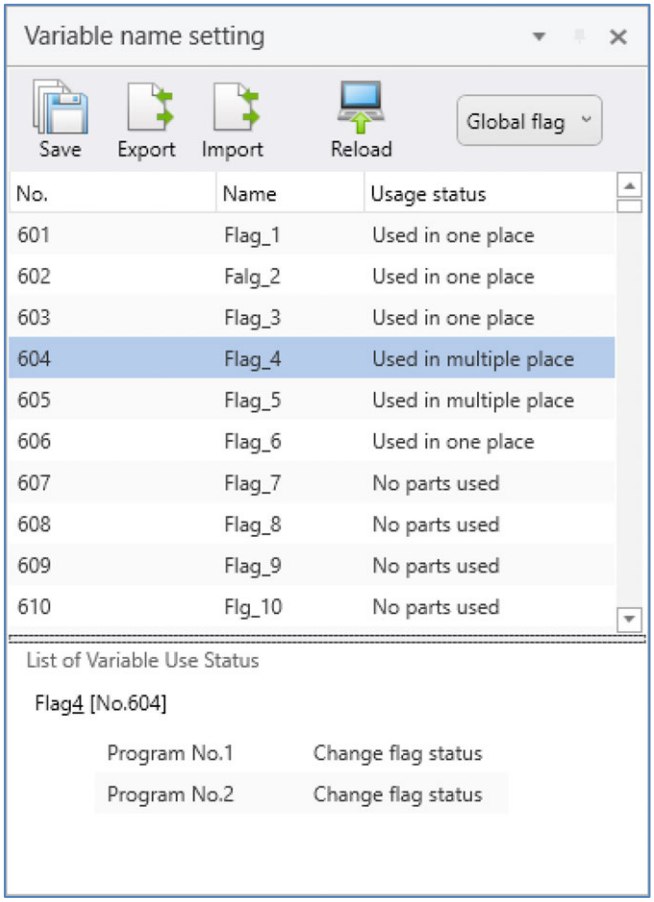


Fig. 10.6- 1 Variable name setting

Describes the functions of the menu.

Table 10.6- 1 Variable name setting menu functions

Menu	Description
Save button	Save edited name.
Export button	Save edited name to xml file.
Import button	Import name data file of xml file.
Reload button	Update variable and flag information that are used in program.
Switch displayed data	Switch display by selecting variable and flag. The selection are as shown below. Global flag, Global integer variable, Global real number variable
Display No.	Display the row of input variable and flag number.

Describes the items in the list.

Table 10.6- 2 Variable name setting list items

Column name	Description
No.	The Variable / Flag No. should be displayed.
Name	The Variable name should be displayed. Display input form by clicking the cell in “Name” column.
Usage status	Display variable and flag information that are used in program. No parts used: It is not set in the item. Used in one place: It is set in one item. Used in multiple place: It is set in multiple items.

10.6.1 List of Variable Use Status

Describes the List of Variable Use Status.

Display the usage status of variable that is selected in variable name setting window in the variable usage status list.

The following is the example when No.605 is selected.

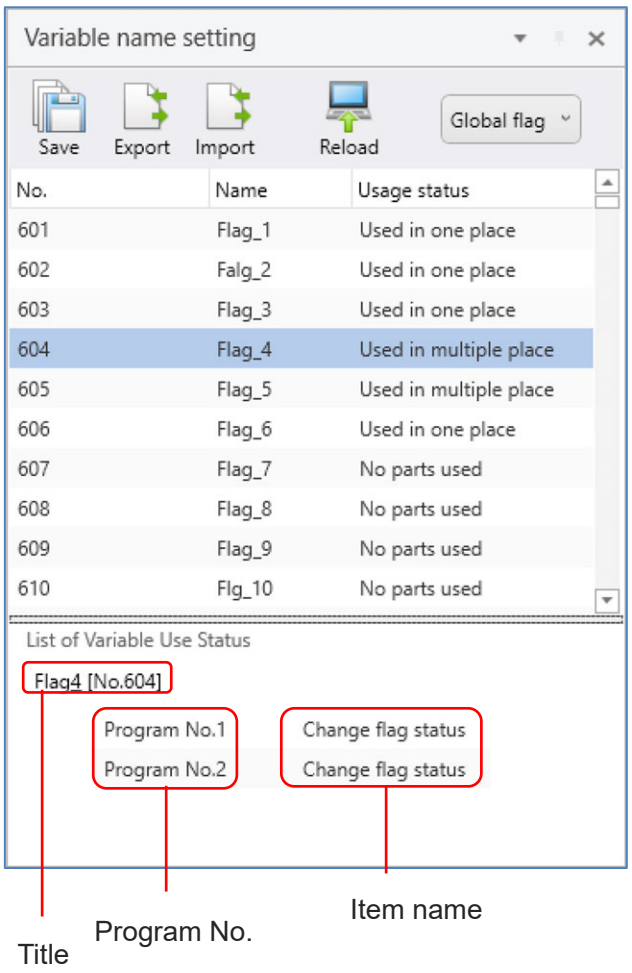


Fig. 10.6- 2 List of Variable Use Status

The following is the information that is displayed in variable usage status list.

- Title

  Variable / Flag No. [Variable name]

- Lists

Table 10.6- 3 List of Variable Use Status

Item	Description
Program No.	Display the program number that uses variable.
Item name	Display the item name that uses variable.

SEL Assist

Chapter 11

Simulator

11.1 Screen configuration

The Simulator Screen configuration is shown below.

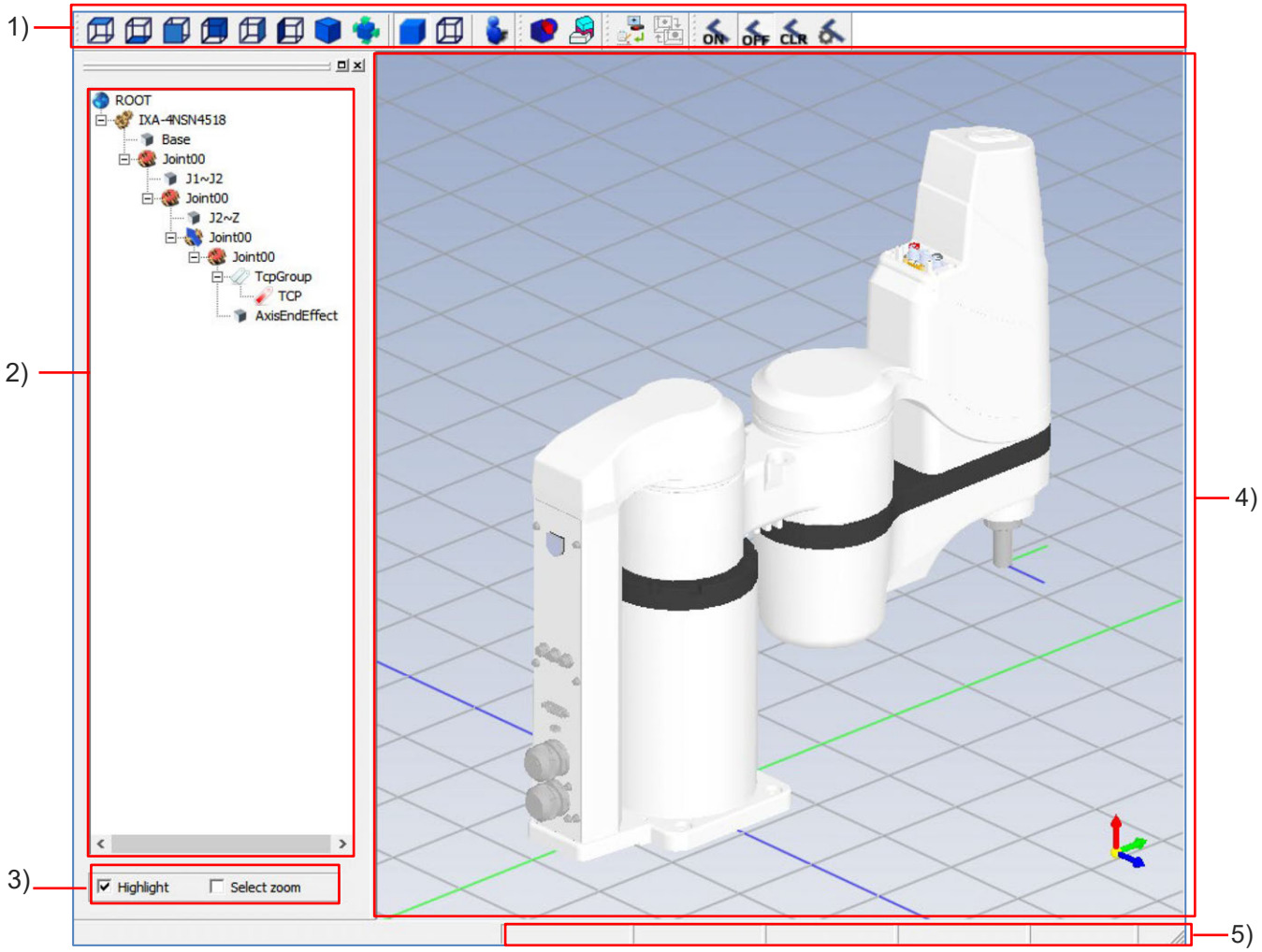


Fig. 11.1- 1 Simulator Screen

Table 11.1- 1 Simulator Screen configuration

No.	Name	Description
1)	Menu	Set 3D view viewpoint switching, interference check, position output, calibration and trajectory display.
2)	Tree	Display the robot allocation.
3)	Highlight	Display where 3D view that is applied to Joint that is selected in the Tree is in highlighted.
	Select zoom	Display the area that is selected either in the Tree or in the 3D view in Zoom in.
4)	3D View	Display the robot in 3D view. Viewpoint switching can be done from menu.
5)	Status bar	Displays the status.

11.1.1 Menu

3D view viewpoint switching, interference check, position output, calibration and trajectory display setting button are allocated in the menu.

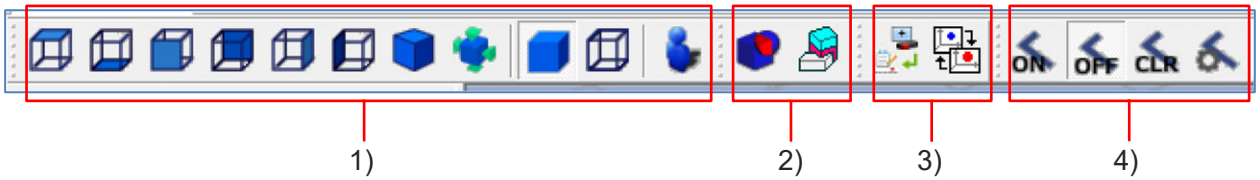


Fig. 11.1- 2 Menu bar

Table 11.1- 2 Menu bar configuration

No.	Button name		Function
1)		Top	It is a viewpoint that is faced directly to YX flat.
		Bottom	It is a viewpoint that is faced directly to YX flat (back).
		Front	It is a viewpoint that is faced directly to ZX flat.
		Rear	It is a viewpoint that is faced directly to ZX flat (back).
		Right side	It is a viewpoint that is faced directly to ZY flat.
		Left side	It is a viewpoint that is faced directly to ZY flat (back).
		Isometric view	It is a viewpoint from diagonally above (isometric view).
		Entire display	It is a viewpoint to display all elements without changing viewpoint.
		Solid	It is a solid display.
		Wireframe	It is a wireframe display.
		Walk through	Switch to walk through mode.
2)		Interference Check	The icon is stayed in pushed when the mode is interference check mode. The interfered model is highlighted when the mode is interference check mode.
		Interference check setting	Create the object list that is a key when the interference check is performed and the object list that is exempt.
3)		Position output	Export the data that is set in offline teaching.
		Calibration	Create location correction data.

No.	Button name		Function
4)		Enable trajectory display	Draw the trajectory of vertical axis based on robot animation display.
		Disable trajectory display	Stop the trajectory drawing.
		Clear trajectory display	Delete the displayed trajectory.
		Set trajectory display	Set trajectory color, line thickness and robot show/hide.

11.1.2 Tree

Display structure of the robot that is drawn in 3D view and 3D object.

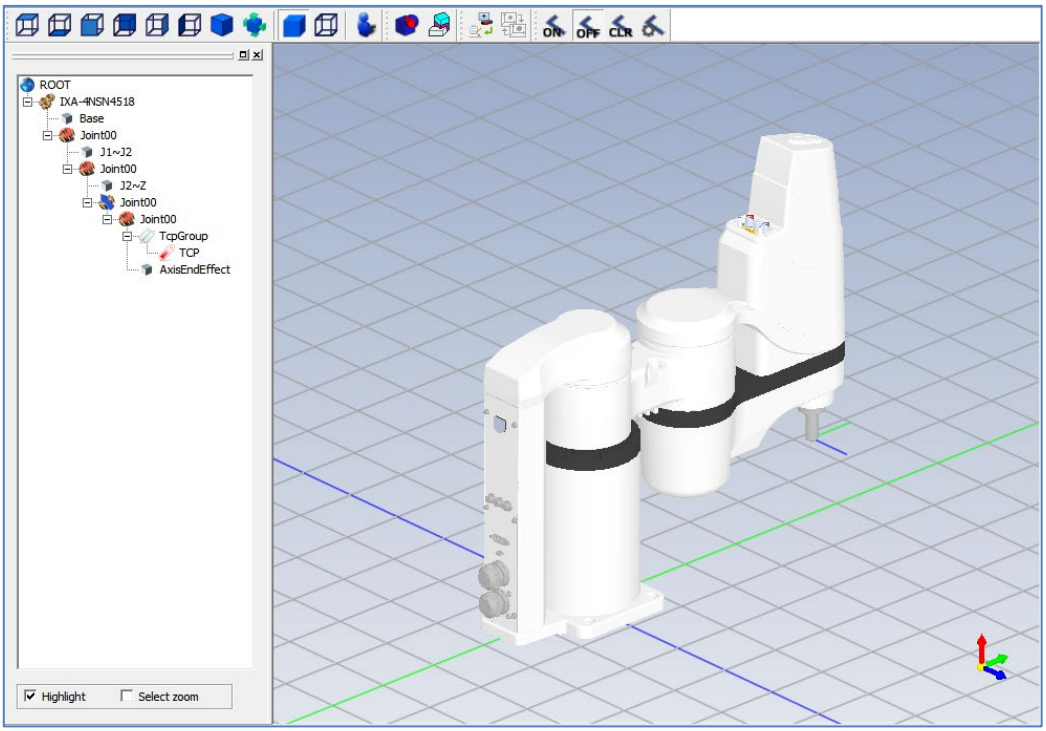
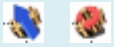


Fig. 11.1- 3 3D View

[1] Node type

The nodes in the 3D view are shown below.

Table 11.1- 3 3D View Nodes

Node name		Description
	ROOT	It is world node. All nodes are created under ROOT.
	Structure	It is node for robot definition.
	Model	It is model node (including Shape). Display switching for 3D object, color setting and allocation change can be done.
	Joint	It is joint node.
	TcpGroup	It is TCP (Tool Center Point) group. Manage TCP.
	Tcp	It is TCP. It means tool apex.

[2] Context menu

The context menu for the node is shown below.

Table 11.1- 4 Context menu

Context menu	Description
Import 3D model	Read the model file for STL type and DirectX type, and add model.
Add 3D object	Add 3D object. The selection are as shown below. “Box”, “Sphere”, “Cylinder”
Add tool	Read the tool file for STL type, and add tool.
Display	Switch show/hide.
Display in half transparent.	Switch display in half transparent/normal.
Color setting	Change display color.
Offline teaching	Offline teaching window will be displayed.
Change node name	Change node name.
Allocation change	Change allocation for node.
Delete	Delete the node.
Add TCP	Not available
Switch tool	Switch tool.
Edit	Change coordinate.

[3] Import 3D model

The following is the description of the process to add model.

Right-click ROOT to display the menu. Select “Import 3D model”.

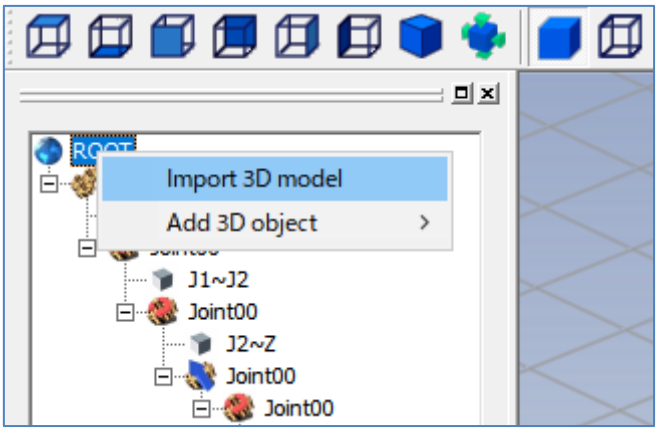


Fig. 11.1- 4 Import 3D model

The “Open” window will be displayed. Select the model file.

Draw model in 3D view.

Caution

- Only binary type is readable for STL file.

[4] Add 3D object

The following is the description of the process to add 3D object.

Right-click ROOT to display the menu. Display the menu from “Add 3D object”.

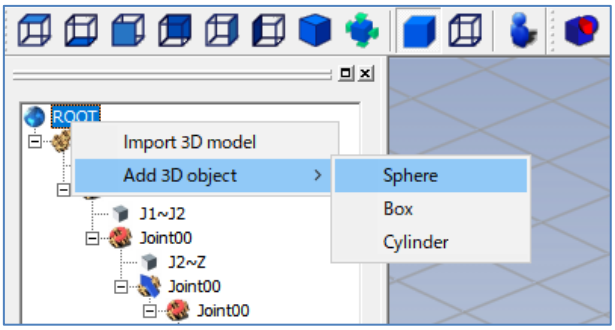


Fig. 11.1- 5 3D object

[Sphere creation]

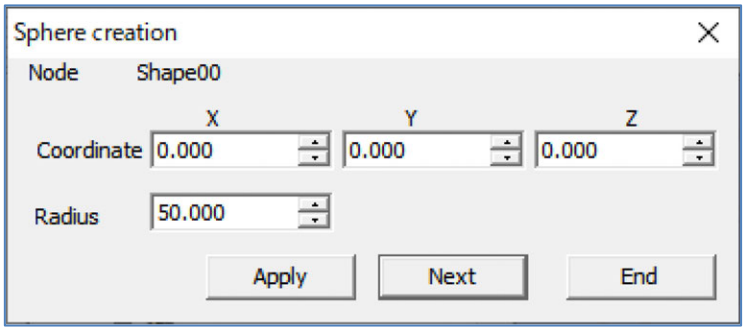


Fig. 11.1- 6 Sphere creation

Set the allocation position for Sphere and radius, and click Apply.

Click Next when you would like to add Sphere.

[Box creation]

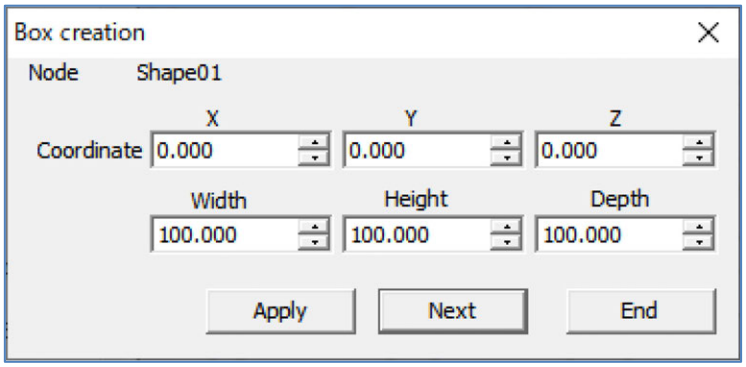


Fig. 11.1- 7 Box creation

Set the allocation position for Box and size, and click Apply.

Click Next when you would like to add Box.

[Cylinder creation]

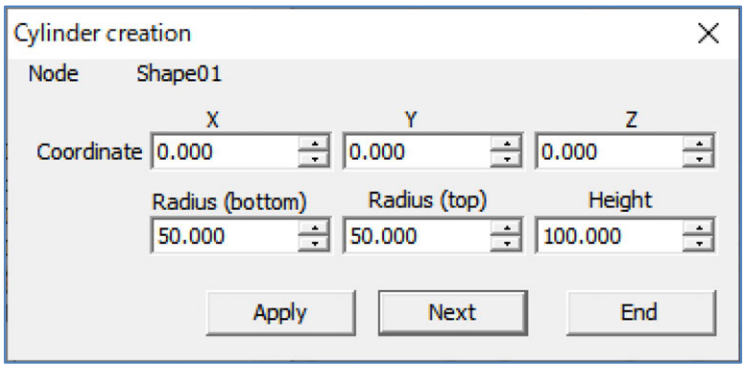


Fig. 11.1- 8 Cylinder creation

Set the allocation position for cylinder and size, and click Apply.
Click Next when you would like to add Sphere.

[5] Change the layout

The following is the description of the process to change allocation for model in 3D view and 3D object.
Display menu by right-clicking model or 3D object.
Select “Change the layout”.

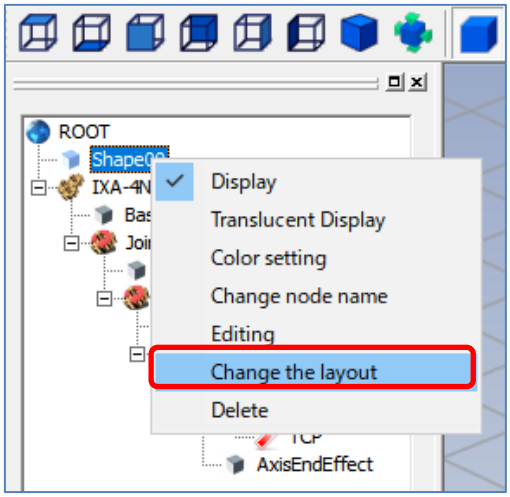


Fig. 11.1- 9 Change the layout

Space handle and coordinate setting window will be displayed.

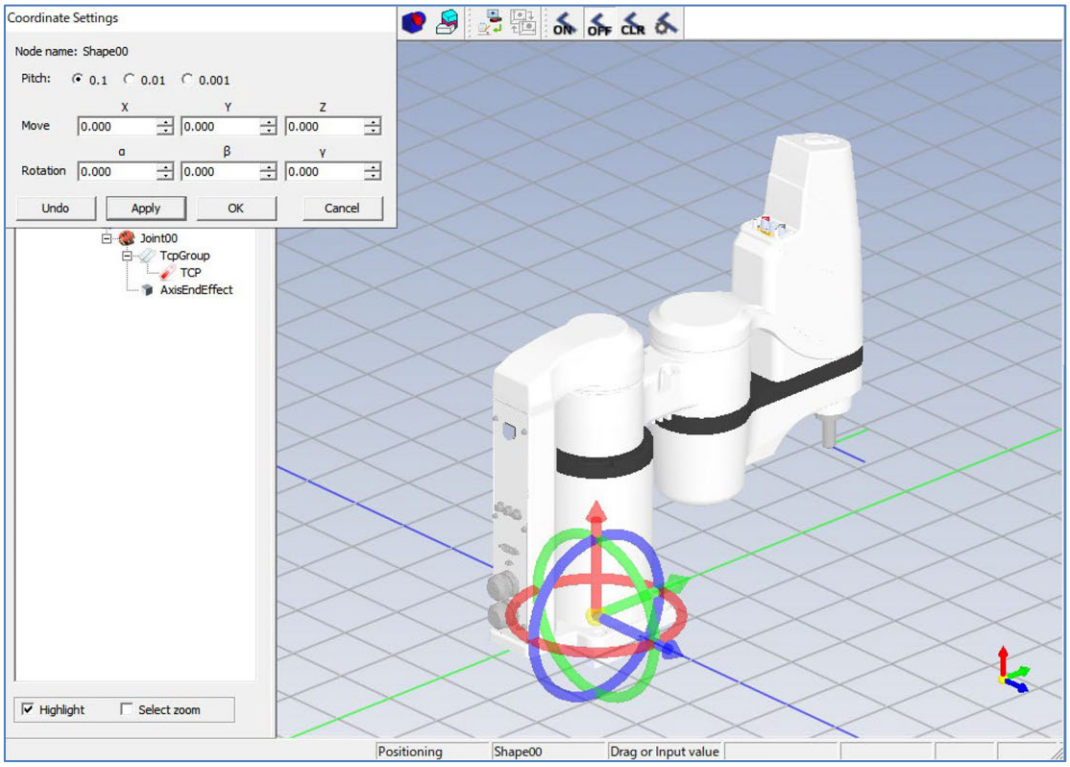


Fig. 11.1- 10 Space handle and coordinate setting window

Allocation can be changed in space handle and coordinate setting window.

[Allocation change by space handle]

Following shape is called space handle.

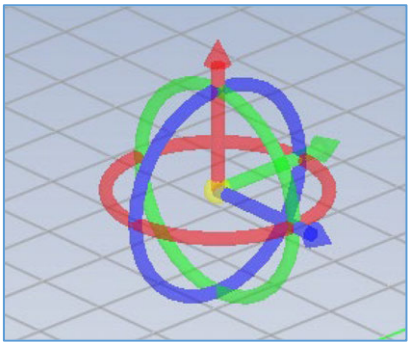


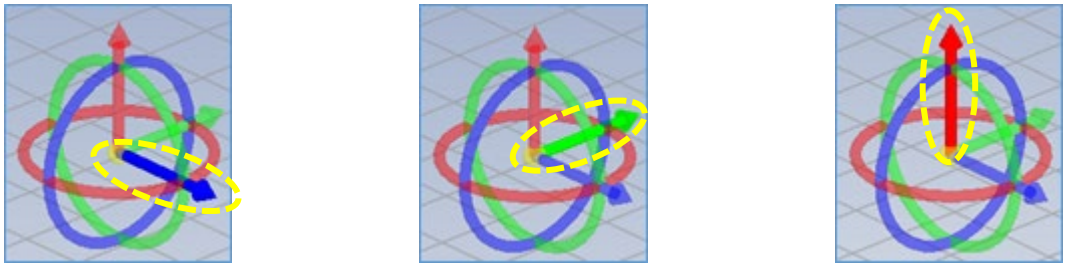
Fig. 11.1- 11 Space handle

Space handle can be moved by dragging or inputting coordinate in coordinate setting window.

- Movement using space handle

  Drag the arrow of space handle.

  Applicable arrow is emphasized, and space handle moves to selected axis direction.



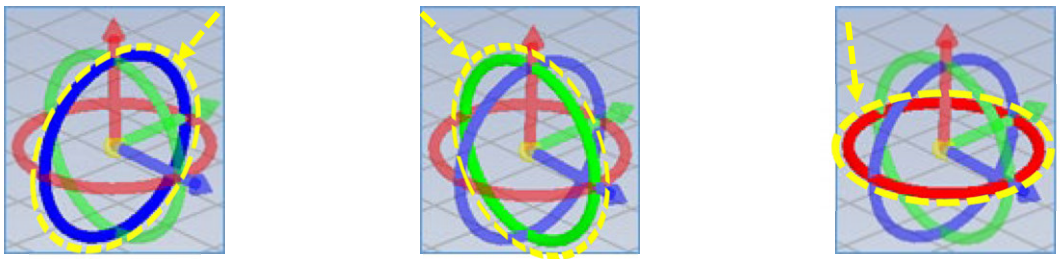
X-axis movement　　Y-axis movement　　Z-axis movement

Fig. 11.1- 12 Movement using space handle

● Rotation using space handle

Drag the torus (circle) of space handle.

Applicable torus is emphasized, and space handle rotates.



X-axis rotation　　Y-axis rotation　　Z-axis rotation

Fig. 11.1- 13 Rotation using space handle

[Allocation change by coordinate setting]

Input coordinate and rotation degree, and model and 3D object can be moved and rotated.

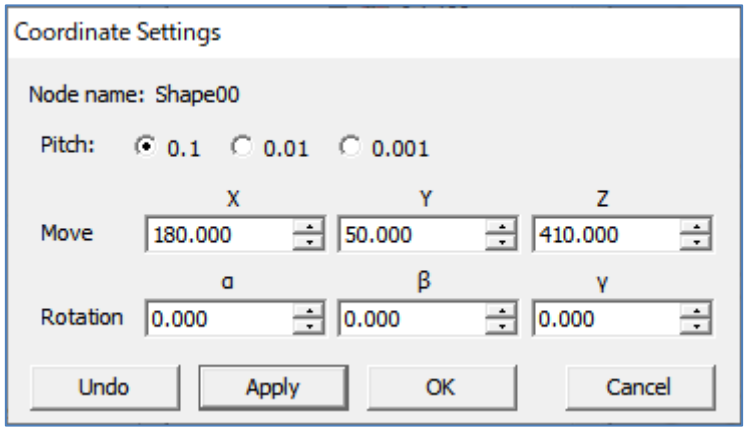


Fig. 11.1- 14 Allocation change by coordinate setting

11.1.3 Expansion and Reduction

Expansion and reduction display is available by operating mouse wheel.

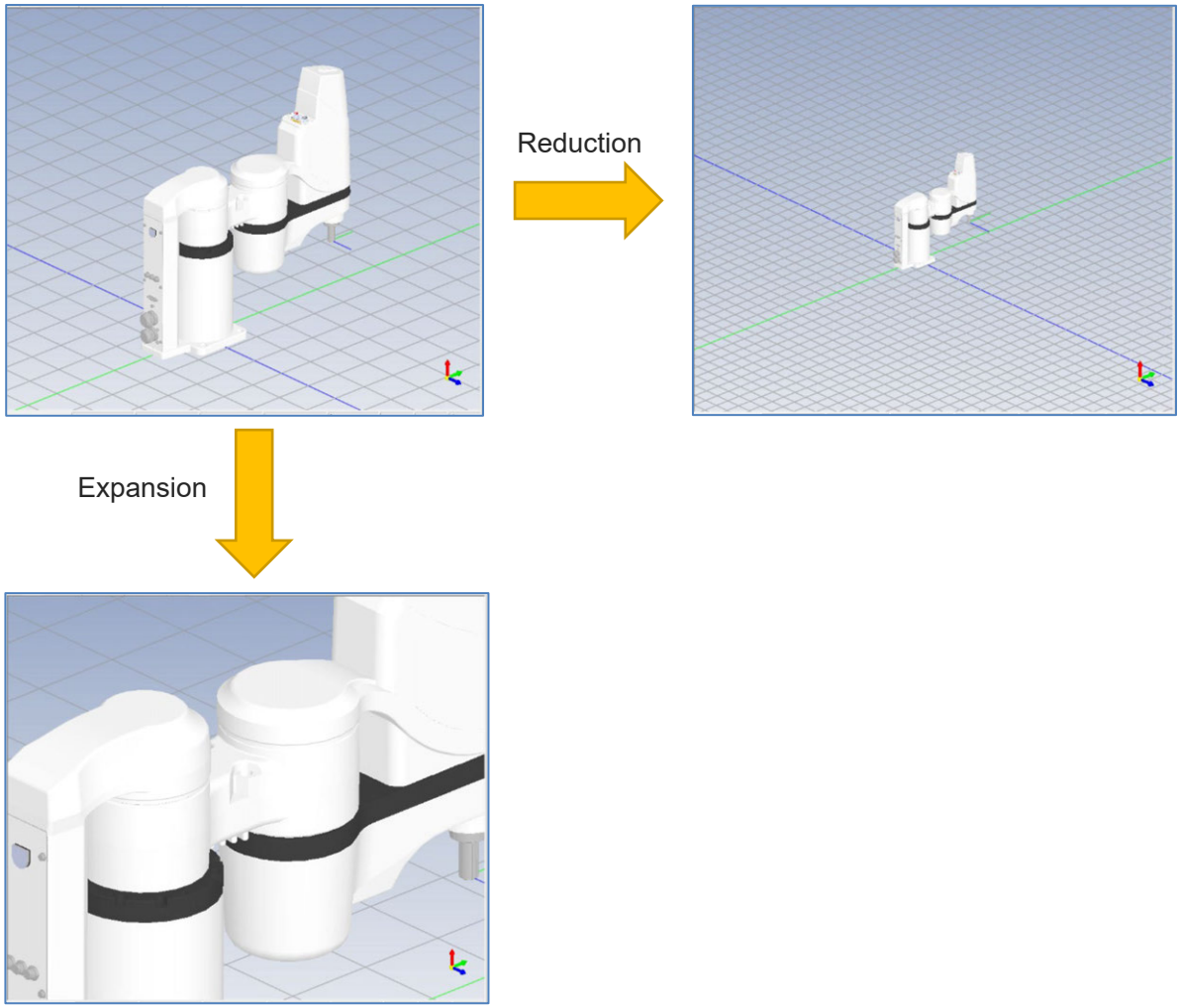


Fig.11.1- 15 Expansion and Reduction

11.2 Calibration

Calibration is a function to create position correction data (calibration data).
Get 3 teaching points (the point to configure triangle) on an actual machine and create calibration data when teaching point data and position data on an actual machine are different.

Caution

- Created position correction data is only parallel movement component.
  Rotation movement component is not included.

The following is the description of how to create calibration data.

Click Calibration from the 3D view menu.

Fig. 11.2- 1 “Calibration” button

The Calibration window will be displayed.

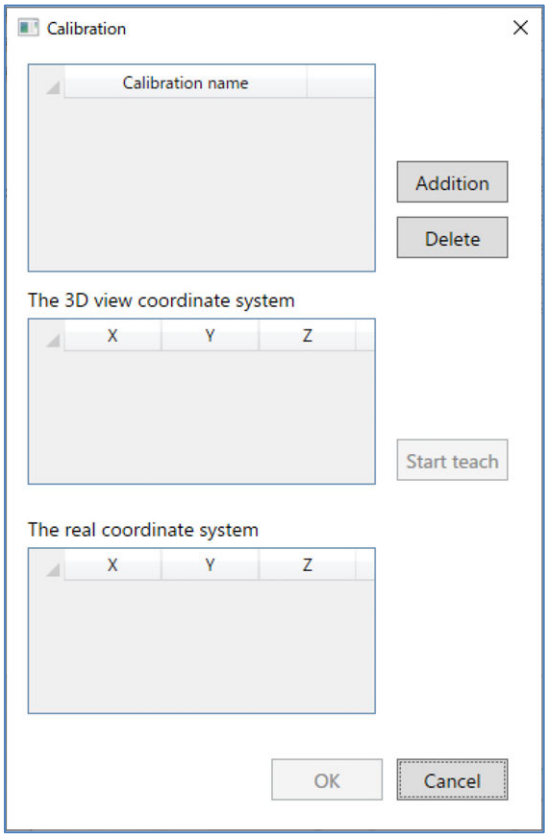


Fig. 11.2- 2 Calibration window

Click Addition. List is added to calibration name.

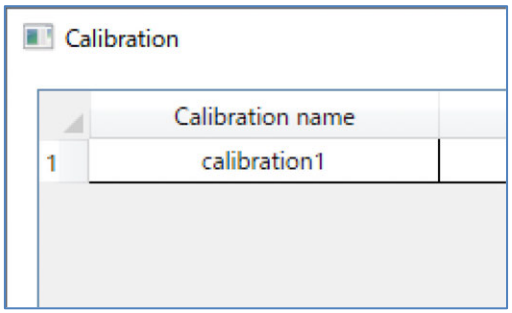


Fig. 11.2- 3 List added

Click the cell. Change calibration name.

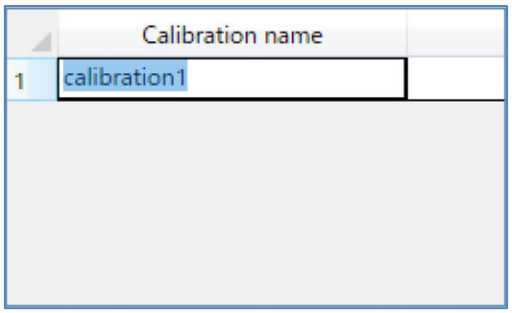


Fig. 11.2- 4 Calibration name changed

Select a list. Display list in “Coordinate on 3D view” and “Coordinate on an actual machine”.

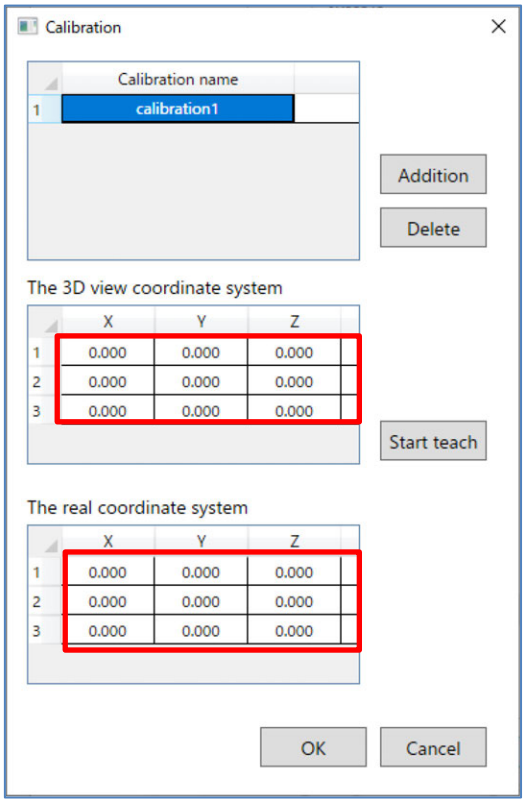


Fig. 11.2- 5 Calibration (List display)

[Setting The 3D view coordinate system]

Allocate 3D object to 3D view based on the measurement position of an actual machine.

Click Start teach. Click 3 points on 3D object.

Coordinate is displayed on “Coordinate on 3D view”. Coordinate can be input manually.

[Setting The real coordinate system]

Input coordinate of actual machine that is corresponded to 3 points on 3D view manually.

Click OK. Creating calibration data is completed.

It is added to the choices in “Calibration name” column in offline teaching window.

11.3 Offline Teaching

Offline teaching is a function to convert teaching point of robot into data on offline without connecting to robot.

11.3.1 Screen Description

Right-click “Robot name” from the 3D view tree, and display menu.

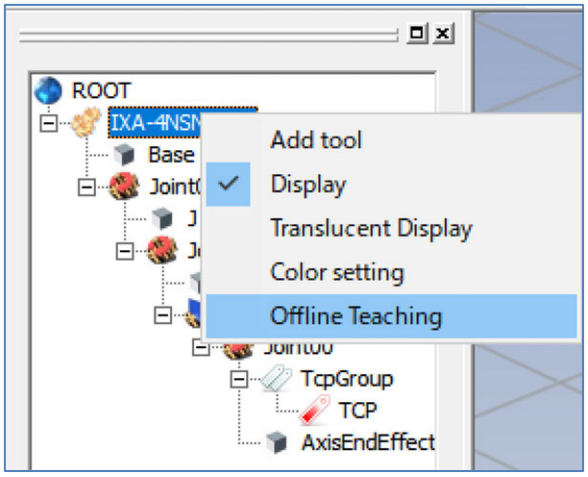


Fig. 11.3- 1 Offline Teaching

Select “Offline Teaching”. The Offline Teaching window will be displayed.

[In the case of SCARA robot]

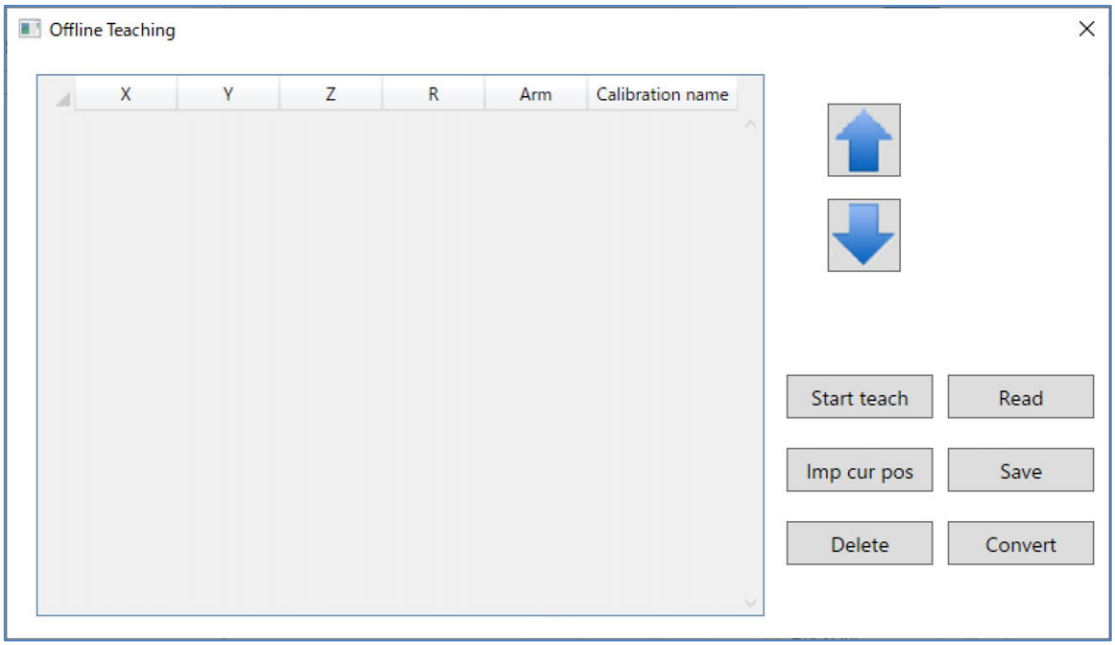


Fig. 11.3- 2 Offline Teaching window (SCARA robot)

[In the case of Cartesian 6-Axis Robot]

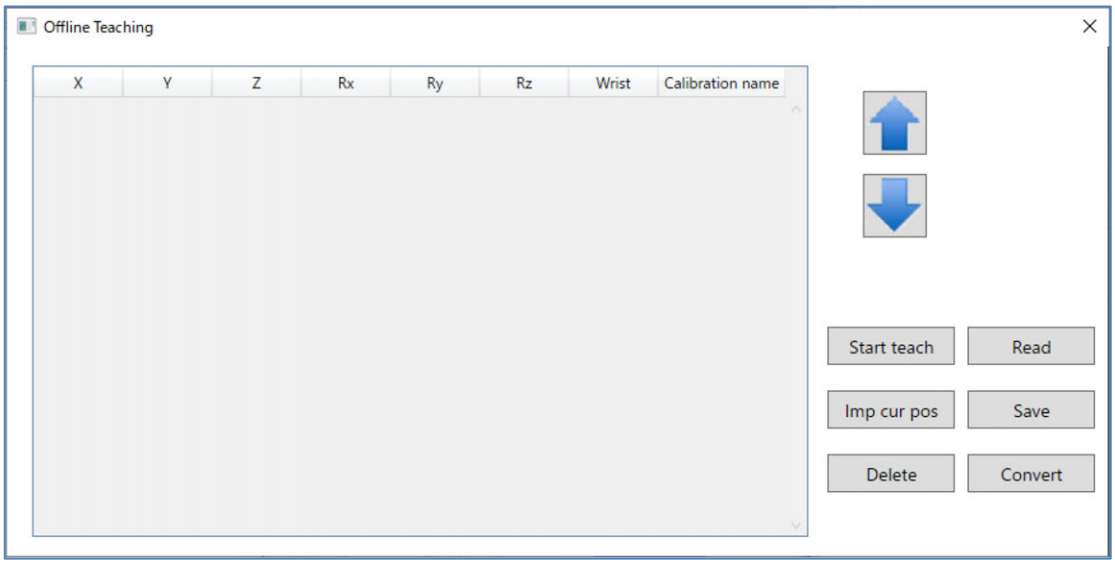


Fig. 11.3- 3 Offline Teaching window (Cartesian 6-Axis Robot)

The list items are described below.

Table 11.3- 1 Offline Teaching window list items

Item	Description
X, Y, Z	Display the position of each coordinate. Value can be changed. Unit [mm]
R, Rx, Ry, Rz	Display the coordinate of rotation axis. Value can be changed. Unit [deg]
Arm system	Display when SCARA robot. The setting values is shown below. “Left”, “Right”
Wrist	Display when Cartesian 6-Axis Robot. The setting values is shown below. “Flip”, “NonFlip”
Calibration name	Calibration can be selected.

The functions of the buttons are described below.

Table 11.3- 2 Offline Teaching window button function

Button name	Description
Arrow to top	Switch selected row with the above row.
Arrow to bottom	Switch selected row with the bottom row.
Start teach	Start teaching.
Imp cut pos	Current position coordinate of TCP is added in the list.
Delete	Delete selected row.
Read	Read teaching point data file, and display list. Refer to [11.3.3 Teaching point data file] about teaching point data file.
Save	Save list data to teaching point data file.
Convert	Calibration is applied when calibration name is set. Check converted position data in position edit [project].

11.3.2 Add teaching point data

The following is how to add teaching point data.

[Imp cur pos]

Click Imp cur pos. Coordinate of 3D view actuator is added in the list.

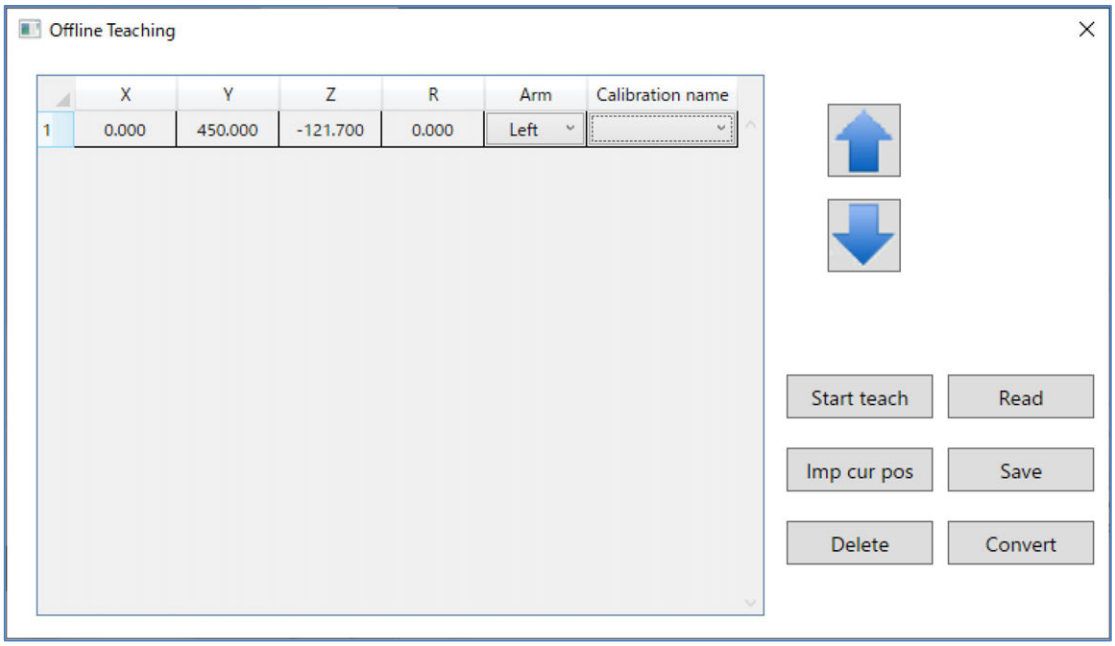


Fig. 11.3- 4 Imp cur pos

[Coordinate input]

Select cell, and input value.

[Teaching]

Start teaching by clicking Start teaching. Click 3D object of 3D view and surface of machines. Coordinate is added in the list. Stop teaching with button and list selection.

11.3.3 Teaching Point Data Files

The following is the domain to save folder and file name of teaching point data.

Folder: “project folder name” \Simulator\Position\
File name: Robot ID + “_” + Date (YYYYMMDD) + “_” +_Time (HHMMSS)+ “.csv”
Example file name: 0_20220101_010101.csv

11.3.4 Convert position

Click Convert. The Convert position dialog will be displayed.

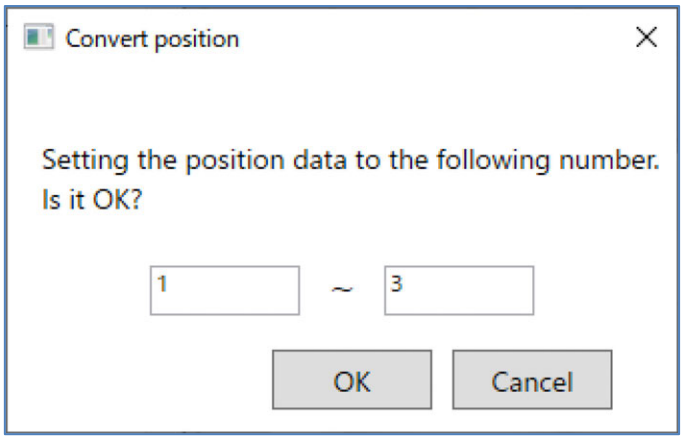


Fig. 11.3- 5 Convert position dialog

Generate position data after calibration is applied when the calibration name is set.
Check position data in position edit [project].

11.4 Interference Check

Check interference between registered parts in 2 groups with round-robin per mesh.
Check interference status by changing initial position of robot, jog and simulation.
Output log when interference is detected during simulation.
Even though it depends on the computer performance, check time gets longer when registered parts are more and the number of mesh is more.

11.4.1 Interference check key setting

The following is the description of setting for interference check key and launching interference check.

(1) Interference check key setting

Click Interference check setting in the menu.

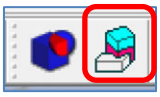


Fig. 11.4- 1“Interference check setting” button

A list of interference check keys will be displayed.

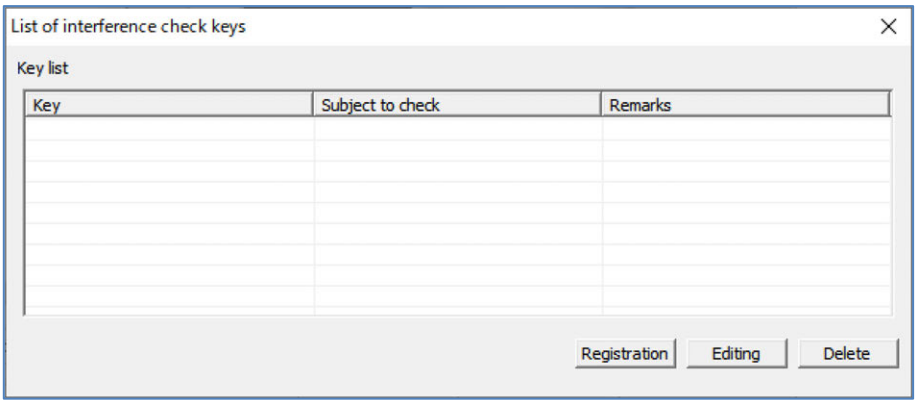


Fig. 11.4- 2 List of interference check keys

(2) Interference check key registration

Click Registration. The interference key settings will be displayed.

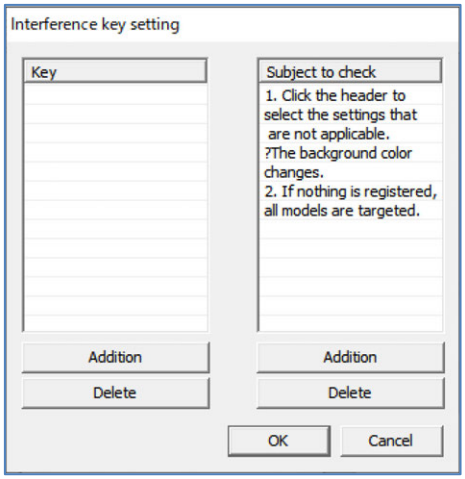


Fig. 11.4- 3 Interference key setting (interference check key registration)

Model is highlighted when the model in 3D view is hovered.
Select model by clicking.

Click Addition in interference key settings or Addition in subject to check list.
The list is added.

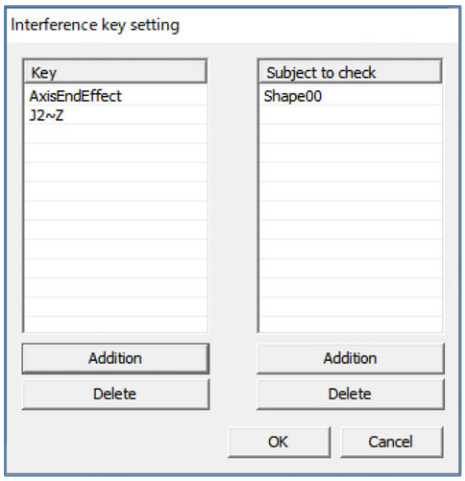


Fig. 11.4- 4 Interference Key Settings (Add List)

Select list and click Delete, and delete the list.
Key and subject to check can be selected multiple.

Interference key settings is closed by clicking OK.
Key is added in the list of interference check keys.

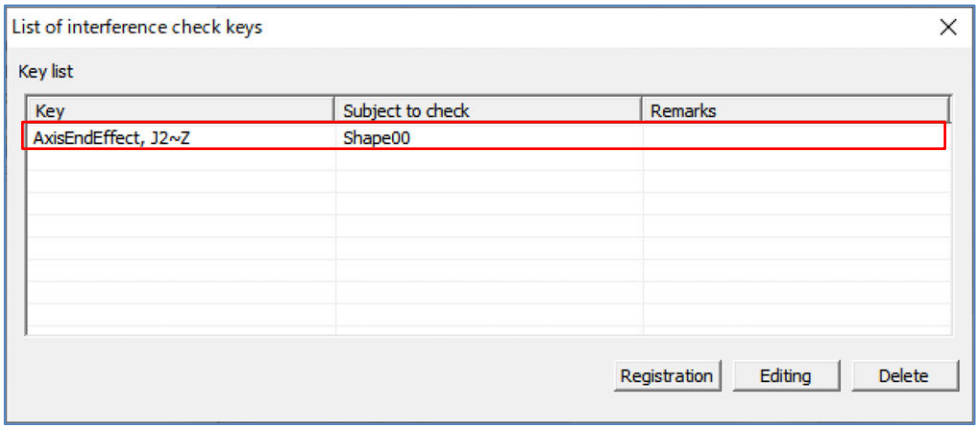


Fig. 11.4- 5 List of Interference check keys (Add Key)

(3) Interference exclusion setting

Create object list that becomes key when interference check is performed and object list that is excluded.

[Operation point]

In the excluded setting, interference check is performed towards the object that is not registered in key list and subject to check. Reduce the items in subject to check by using excluded setting when excluded object is less than the objects to check.

Click the header of subject to check list. List background color turns to light blue.
Add excluded object.
Click OK when the setting is complete.

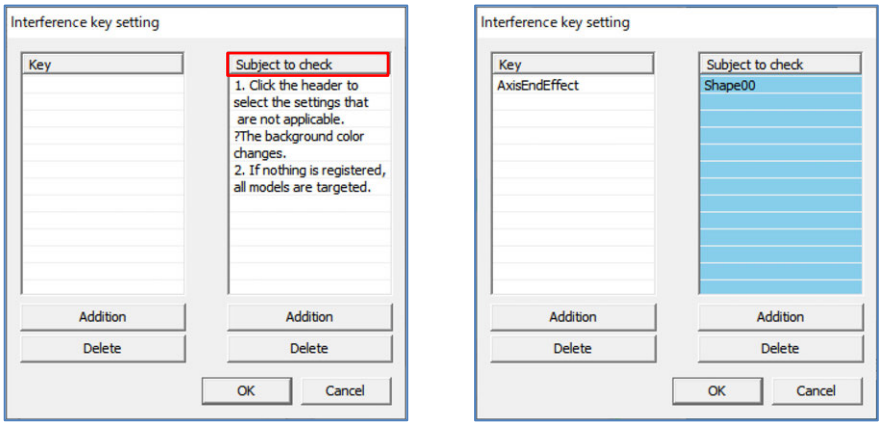


Fig. 11.4- 6 Interference key setting (Interference exclusion setting)

"Excluded." is displayed in the Remarks in List of interference check keys.

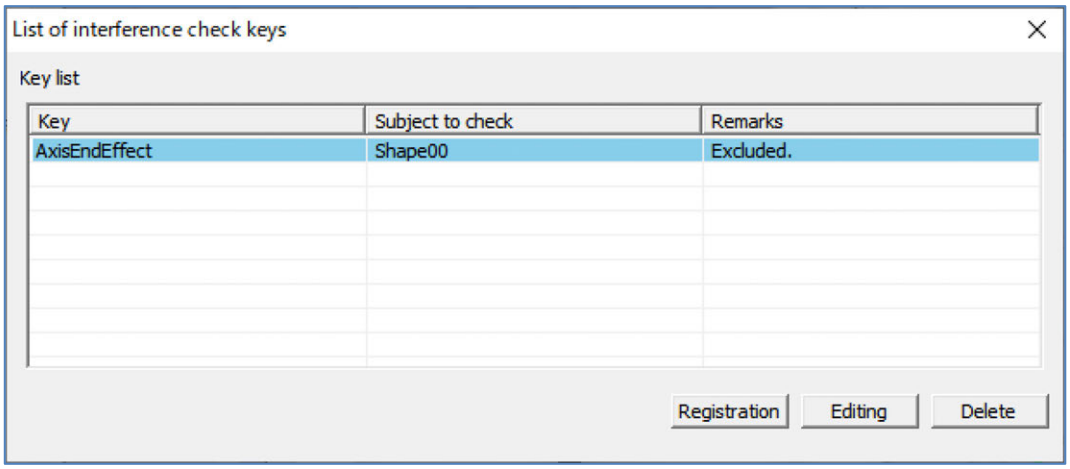


Fig. 11.4- 7 List of Interference check keys (Interference exclusion setting)

(4) Edit interference check keys.

Select a key to edit, click Edit and edit in interference key setting.

Click OK when the setting is complete.

(5) Delete interference check keys.

Select a key to delete and click Delete.

11.4.2 Interference check setting

- Interference Check ON/OFF Switching

  Click interference check icon in 3D view toolbar.

  The following is the status of interference check icons.

Interference check OFF status	Interference check ON status
	

Fig. 11.4- 8 Interference Check ON/OFF Switching

Caution

- Interference may not be detected or the position of detected interference may be shifted depending on load status in interference check in simulation.
- Interference may not be detected in interference check in jog because robot operation has priority.

11.4.3 Display interference position

Change the model color of the position that the interference is detected.
A message stating “Interference occurred.” should be shown and a program / axis operation should pause when an interference is occurred.

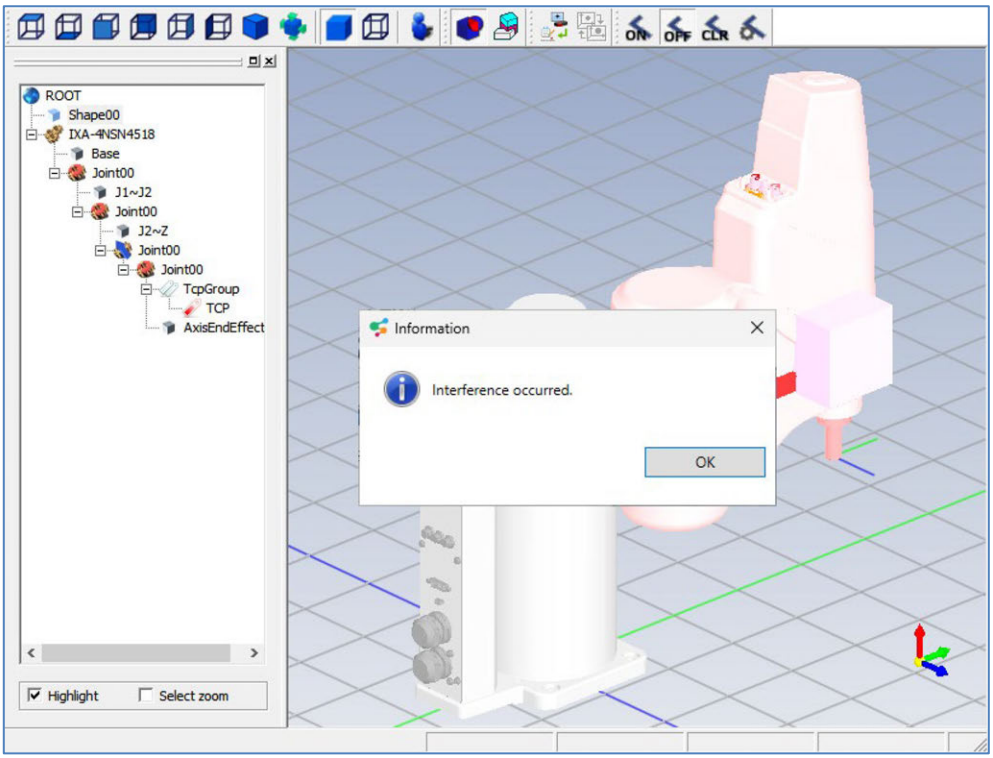


Fig. 11.4- 9 Display interference position

Export the coordinate that the interference is detected into file. The following is the domain to save folder and file name.
Folder: “Project Folder Name” \Simulator\ColLog\
File name: ColLog_ + Date (YYYYMMDD) + “_” +_Time (HHMMSS) + “.log”
Example file name: Callog_20220101_010101.log

The following is about the format of interference log.

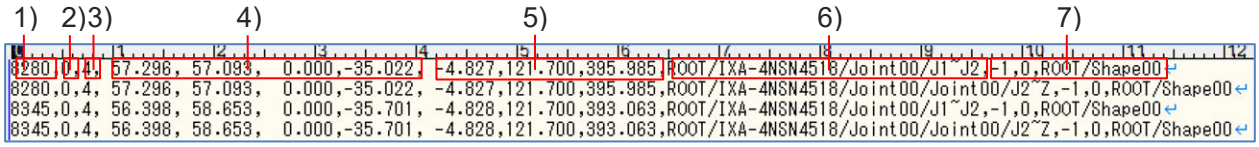


Fig. 11.4- 10 Interference Log Format

Table 11.4- 1 Interference Log Format Configuration

No.	Description
1)	Time that interference is detected Passing time since animation is started [ms]
2)	Robot ID
3)	Number of axes
4)	Axis value
5)	Position of active TCP Coordinate value of TCP from the Structure initial point of applicable robot
6)	Node path
7)	Node information under robot

Revision History

Revision date	Revised content
2020.02	First Edition
2020.03	Second Edition • Directory Name change of "SEL programming support software" • 4-1, 4-5, 4-7-4-10, 4-12, 4-13, 5-2, 5-3, 6-1-6-9, 6-11, 6-12, 7-1, 7-5, 8-2, 10-1, 11-1 screen change • Correction made
2024.09	Third Edition • Full-Scale Revision Complied with XSEL2

Manual No.: ME0396-3A (September 2024)

IAI
Quality and Innovation

IAI Corporation

Head Office: 1210 Ihara Shimizu-KU Shizuoka City Shizuoka 424-0114, Japan
TEL +81-54-364-5105 FAX +81-54-364-2589
website: www.iai-robot.co.jp/

IAI America, Inc.

Head Office: 2690 W. 237th Street, Torrance, CA 90505
TEL +1-310-891-6015 FAX +1-310-891-0815
Chicago Office: 110 East State Parkway, Schaumburg, IL 60173
TEL +1-847-908-1400 FAX +1-847-908-1399
Atlanta Office: 1220 Kennestone Circle, Suite 108, Marietta, GA 30066
TEL +1-678-354-9470 FAX +1-678-354-9471
website: www.intelligentactuator.com

Technical Support available in Europe

IAI Industrieroboter GmbH

Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany
TEL +49(0)6196-88950 FAX +49(0)6196-889524
website:www.iai-automation.com

Technical Support available in Great Britain

LC Automation
control & safety

Duttons Way, Shadsworth Business Park, Blackburn, Lancashire, BB1 2QR, United Kingdom
TEL +44(0)1254-685900
website: www.lcautomation.com

IAI (Shanghai) Co., Ltd.

SHANGHAI JIAHUA BUSINESS CENTER A8-303, 808, Hongqiao Rd. Shanghai 200030, China
TEL+86-21-6448-4753 FAX +86-21-6448-3992
website: www.iai-robot.com

IAI Robot (Thailand) Co., Ltd.

825 PhairojKijja Tower 7th Floor, Debaratana RD., Bangna-Nuea, Bangna, Bangkok 10260, Thailand
TEL +66-2-361-4458 FAX +66-2-361-4456
website:www.iai-robot.co.th

24.09.000