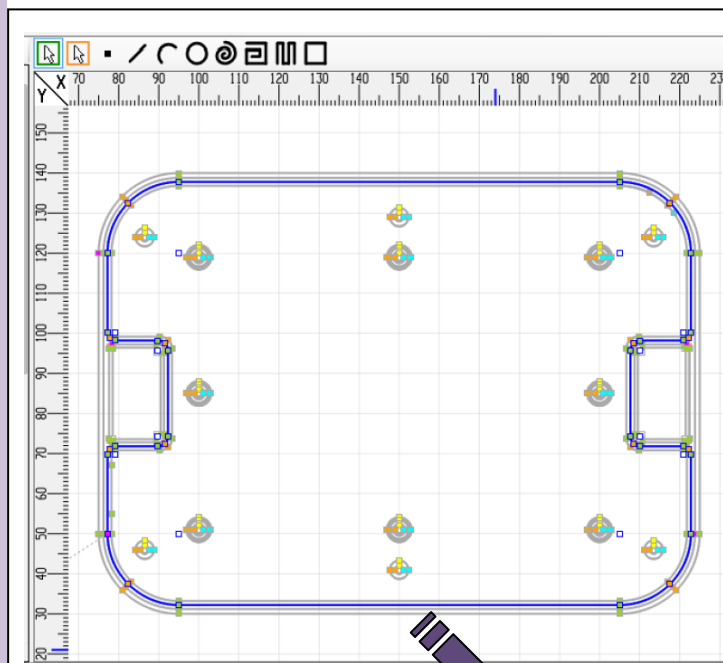


SEL Program Generator (Soldering Type)

Operation Manual Third Edition



No.	G	E	N	Command	Operand 1	Operand 2	Pst	Comment	Vel	Acc	Dcl
1				*****							
2				* This program was generated				*			
3				* by SEL program generator.				*			
4				* 2015/10/30 09:59:49				*			
5				*****							
6											
7				*****							
8				*Initialize					100	0.30	0.30
9				*****					100	0.30	0.30
10				BTOF	300				100	0.30	0.30
11				ACHZ	3			Z-axis for arch	100	0.30	0.30
12				*****					100	0.30	0.30
13				*Home return				*	100	0.30	0.30
14				*****					100	0.30	0.30
15				HOME	100				100	0.30	0.30
16				HOME	11				100	0.30	0.30
17									100	0.30	0.30
18									100	0.30	0.30
19									100	0.30	0.30

IAI Corporation



Please Read Before Use

Thank you for purchasing our product.

This manual explains how you can use this feature and necessary information to use it safely. Before the operation, read this manual carefully and fully understand it to operate this product. The enclosed DVD in this product package includes the Instruction Manual for this product.

For the operation of this product, print out the necessary sections in the Instruction Manual or display them using the personal computer.

After reading through this manual, keep this Instruction Manual at hand so that the operator of this product can read it whenever necessary.

[Important]

- This Manual is original.
- The product cannot be operated in any way unless expressly specified in this Manual. IAI shall assume no responsibility for the outcome of any operation not specified herein.
- Information contained in this Manual is subject to change without notice for the purpose of product improvement.
- If you have any question or comment regarding the content of this manual, please contact the IAI sales office near you.
- Using or copying all or part of this Manual without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.

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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	<ul style="list-style-type: none">• 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.<ol style="list-style-type: none">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.<ol style="list-style-type: none">1) Location where there is any inflammable gas, inflammable object or explosive2) Place with potential exposure to radiation3) Location with the ambient temperature or relative humidity exceeding the specification range4) Location where radiant heat is added from direct sunlight or other large heat source5) Location where condensation occurs due to abrupt temperature changes6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid)7) Location exposed to significant amount of dust, salt or iron powder8) 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<p>(1) Installation of Robot Main Body and Controller, etc.</p> <ul style="list-style-type: none"> • 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. <ol style="list-style-type: none"> 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	<p>(2) Cable Wiring</p> <ul style="list-style-type: none"> ● 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. <p>(3) Grounding</p> <ul style="list-style-type: none"> ● 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 on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm² (AWG20 or equivalent) or more 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 technical standards). ● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).

No.	Operation Description	Description
4	Installation and Start	<p>(4) Safety Measures</p> <ul style="list-style-type: none">• 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.

No.	Operation Description	Description
5	Teaching	<ul style="list-style-type: none"> • 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. <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>
6	Trial Operation	<ul style="list-style-type: none"> • 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.





No.	Operation Description	Description
7	Automatic Operation	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none"> • 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 cover or untightened 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. <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>
9	Modification and Dismantle	<ul style="list-style-type: none"> • Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	<ul style="list-style-type: none"> • 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.

No.	Operation Description	Description
11	Other	<ul style="list-style-type: none">• 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

Construction of Instruction Manual and This Manual

● Basic Specifications

• Tracking Control

(Soldering) Operation ——— ■ SEL Program Generator (this manual)_____ ME0374

★ Program

• SEL Program Language ——— ■ SEL Language Programming Manual_____ ME0224

■ Applicable Controller (including actuator integrated type)

• TTA ——— ■ TTA Instruction Manual_____ ME0320

• MSEL ——— ■ MSEL Instruction Manual_____ ME0336

■ Teaching Tool

• PC Software ——— ■ PC Software_____ ME0154

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1. Introduction

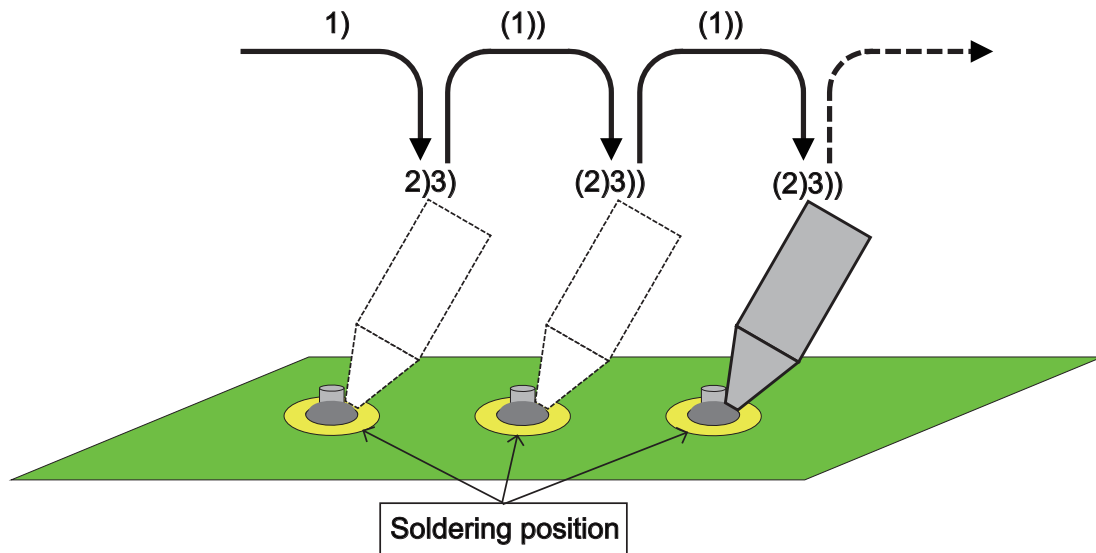
1.1 Overview of SEL Program Generator (Soldering Type)

“SEL Program Generator (Soldering Type)” is a tool that automatically generates the “SEL programs” and “position data” which are necessary in order to perform soldering work. There are three types of soldering operation that are supported.

- Point soldering
- Line soldering
- Iron tip cleaning

1.1.1 Point Soldering

The actuator moves to the “soldering position” and conducts soldering work.

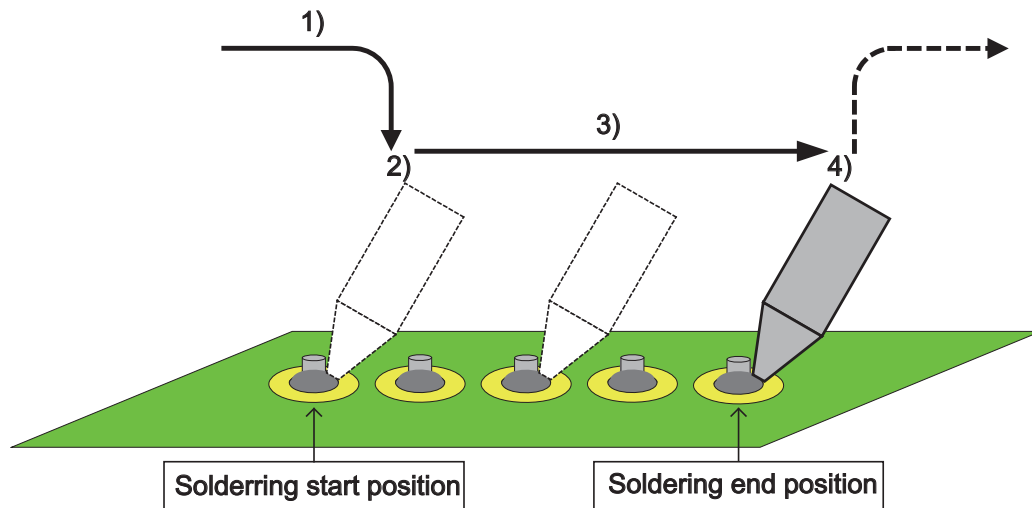


- 1) The actuator moves to the “soldering position”.
- 2) Soldering program starts to operate. (Note 1)
- 3) The actuator waits for the soldering program until it finishes.

Note 1 It is necessary that a soldering program (heating time, soldering feeding amount, etc.) is registered to a soldering controller.

1.1.2 Line Soldering

The actuator moves to the “soldering start position” and then starts to solder and goes to the “soldering end position”.



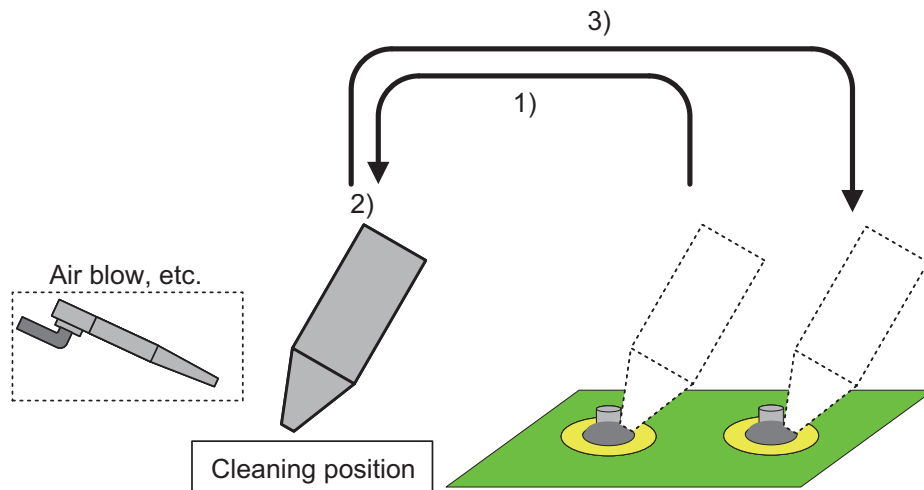
- 1) The actuator moves to the “soldering start position”.
- 2) Soldering program starts to operate. ^(Note 1)
- 3) The actuator starts to solder and goes to the “soldering end position”. ^(Note 2)
- 4) The actuator waits for the soldering program until it finishes.

Note 1 It is necessary that a soldering program (heating time, soldering feeding amount, etc.) is registered to a soldering controller.

Note 2 It is necessary to input the movement start command signal to a robot controller. After completes to move, movement complete signal should be output to the soldering controller.

1.1.3 Iron Tip Cleaning

The actuator moves to the cleaning position and conducts cleaning of the iron tip with using such as an air blow.



- 1) The actuator moves to the "cleaning position".
- 2) Cleaning of the iron tip starts.
- 3) The actuator moves to the next soldering position (soldering start position) and conducts soldering work.

1.2 Environment for Operation

In order to operate this software, it is necessary that your personal computer satisfies the following conditions.

OS	Windows 7 ^(Note 1) Windows 8 Windows 8.1 Windows 10 Note 1 It is necessary to install Microsoft .NET Framework 4.x separately.
Computer Main Unit	Personal computer capable to operate the OS above
Memory Capacity	Capacity required to operate the OS above
Open Capacity in Hard Disk	10MB or more
Display Resolution	XGA (1024×768) or more

Windows is registered trademark of Microsoft Corporation.

1.3 Applicable Robot Controllers

This software is applicable for the following robot controllers.

- Table-Top Type Robot TTA (with built-in controller)
- MSEL-PC/PG/PCF/PGF (Cartesian, Single-Axis Robot Control Type)
(It is applicable only for those with the same construction as TTA has, which is 1st axis = X-axis, 2nd axis = Y-axis, 3rd axis = Z-axis and 4th axis = R-axis)



Caution:

SEL program generator is not applicable for the work and tool coordinate system features.

When the TTA and MSEL controller to be used is applicable for the work and tool coordinate system features ^{*1}, set the of the work coordinate offset and tool coordinate offset to "0.000mm" for all the axes before executing the program.

When the work coordinate offset and tool coordinate offset are not set to "0.000mm" for all the axes, unexpected operation may occur, which could cause interference of robot, tool, workpiece, etc., and cause malfunction.

*1 Supported versions of work and tool coordinate systems

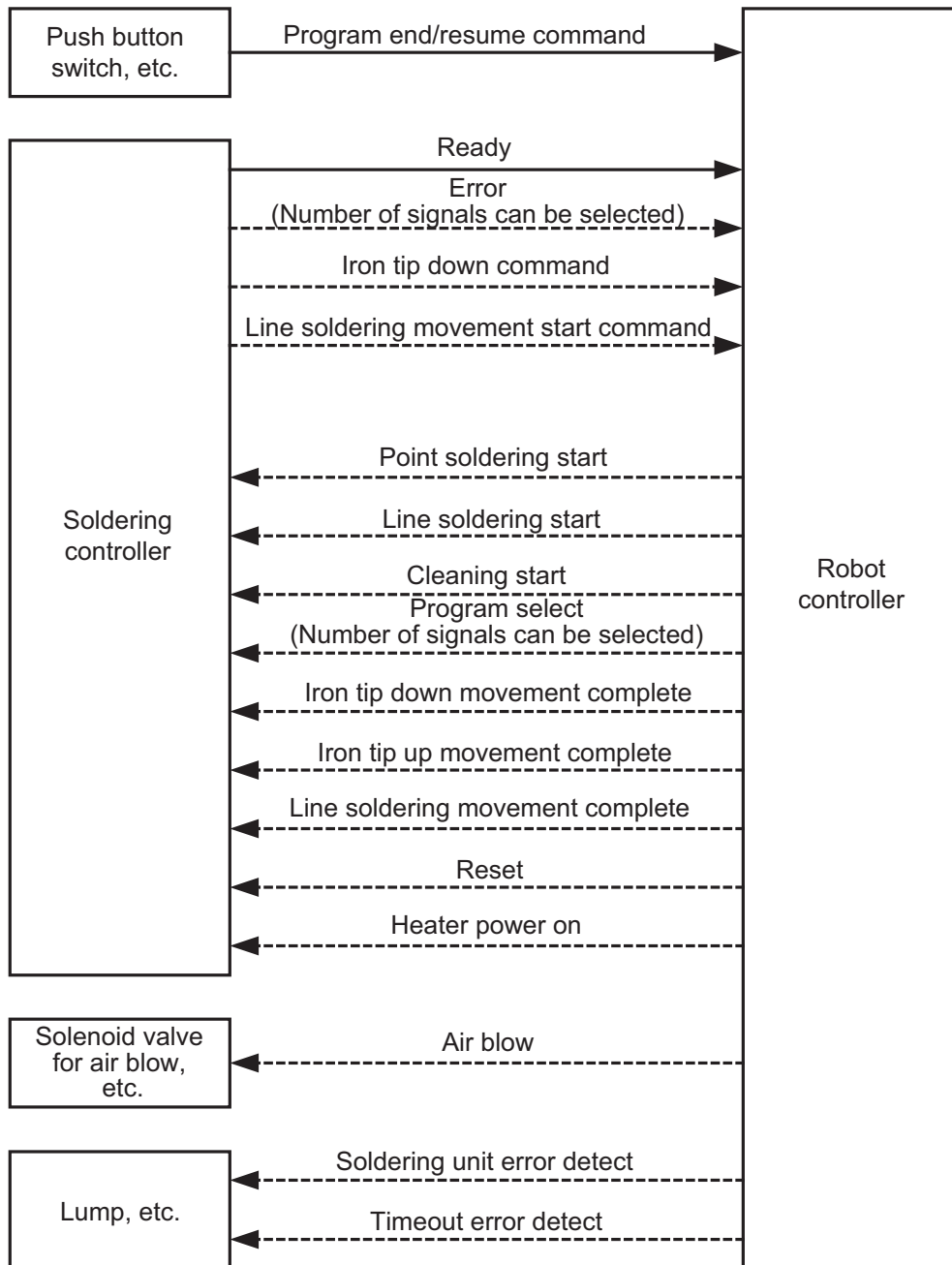
TTA : Main application part V2.00 and later

MSEL : Main application part V2.00 and later

The SEL programs, position data and simulations generated in SEL program generator should be applicable only when using the table top type robot and cartesian robot. They are not applicable when using only the single axis (including gripper, rotary, etc.) wrist unit (including cartesian robot combined) or SCARA Robot (IXP).

1.4 Input and Output Signals to be Used (PIO)

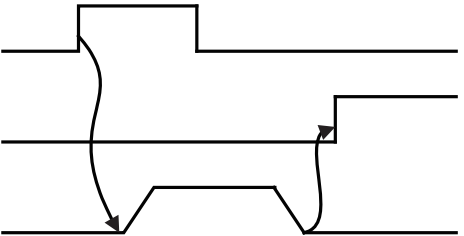
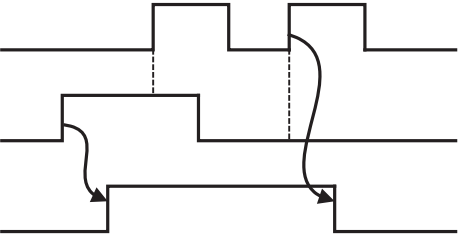
PIO signals are to be used for command/response between a robot controller and external devices (such as soldering controller).



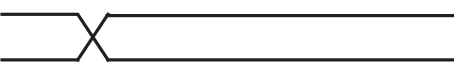
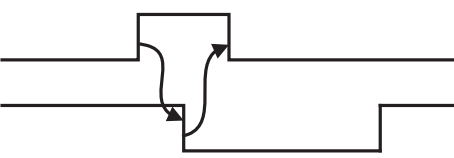
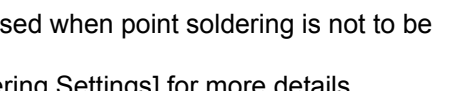
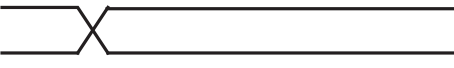
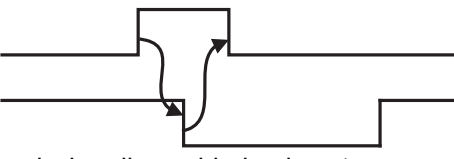
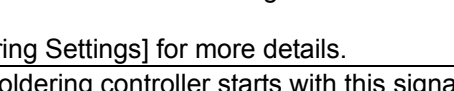
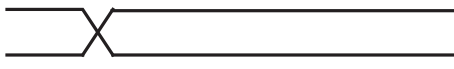
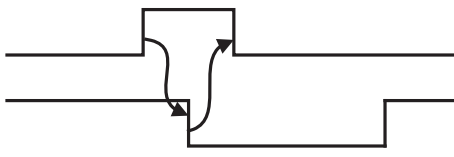
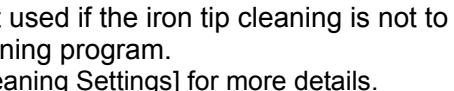
- Solid line signals are mandatory
- Dashed line signals are optional (Related functions require them)

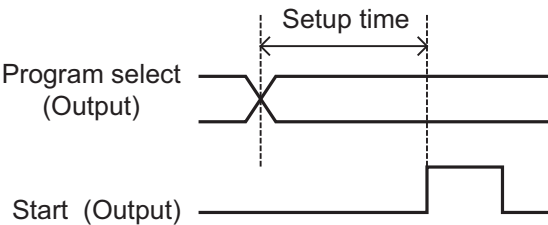
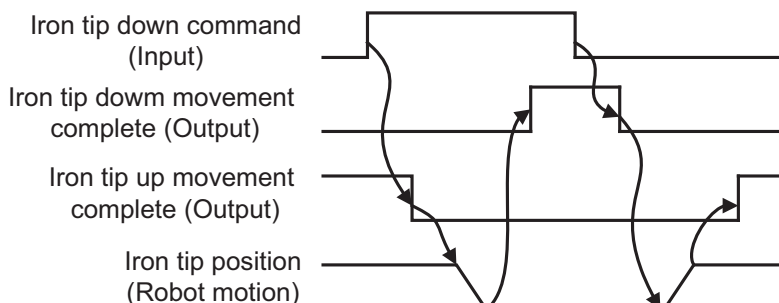
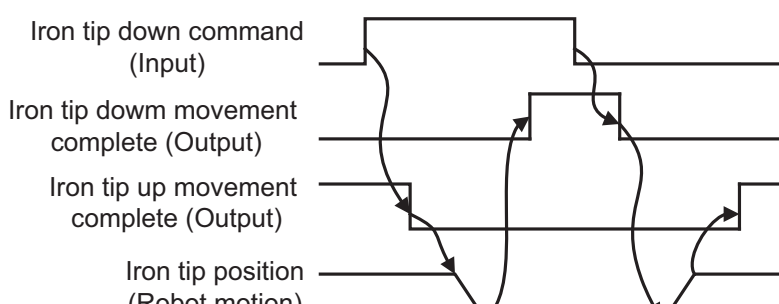
1.4.1 Input Signals (External Device ⇒ Robot Controller)

Signal Name	Functions
Ready [Mandatory]	<p>Ready signal of the soldering controller is to be input. It turns ON when the program is ready to be executed. It is OFF while the program is under execution or in an error state.</p> <p>Start (Output)</p> <p>Ready (Input)</p> <p>Program execution state</p> <p>Error state</p> <p>Refer to [7.7.1 Common Settings] for more details.</p>
Error	<p>Error signal of the soldering controller is to be input. The number of errors to be monitored and level (“Turn on when an error occurred” or “Turn off when an error occurred”) can be chosen.</p> <p>Refer to [7.7.6 Error Monitoring Settings] for more details.</p>
Iron tip down command	<p>Start command signal for the iron tip moving upward/downward by robot operation should be input. The iron tip goes downward when this signal is ON while it goes upward when OFF.</p> <p>Iron tip down command (Input)</p> <p>Iron tip down movement complete (Output)</p> <p>Iron tip up movement complete (Output)</p> <p>Iron tip position (Robot motion)</p> <p>This signal should be not used if the soldering iron unit goes downward / upward with only the slide feature (air cylinder). Refer to [7.7.2 Iron Tip Down/Up Settings] for more details.</p>

Signal Name	Functions
Line soldering movement start command	<p>The start command signal for the line soldering movement gets input. Line soldering movement of the robot starts with this signal turned ON.</p>  <p>This signal would not be used when line soldering is not to be conducted. Refer to [7.7.4 Line Soldering Settings] for more details.</p>
Program end/resume command [Mandatory]	<p>Complete/Resume command signal (signals such as pressing button switch) of the robot program that was paused due to error detection is to be input.</p>  <p>Signal level should be selected from the following. OFF level / ON level / OFF edge / ON edge Refer to [7.7.7 Operation after Error Detection Settings] for more details.</p>

1.4.2 Output Signals (Robot Controller ⇒ External Device)

Signal Name	Functions
Point soldering start	<p>Spot soldering program of the soldering controller starts with this signal turned ON. The signal turns OFF once the program starts (when the ready signal turns OFF).</p> <p>Program select (Output) </p> <p>Point soldering start (Output) </p> <p>Ready (Input) </p> <p>This signal would not be used when point soldering is not to be conducted. Refer to [7.7.3 Point Soldering Settings] for more details.</p>
Line soldering start	<p>Line soldering program of the soldering controller starts with this signal turned ON. The signal turns OFF once the program starts (when the ready signal turns OFF).</p> <p>Program select (Output) </p> <p>Line soldering start (Output) </p> <p>Ready (Input) </p> <p>This signal would not be used when line soldering is not to be conducted. Refer to [7.7.4 Line Soldering Settings] for more details.</p>
Cleaning start	<p>Cleaning program of the soldering controller starts with this signal turned ON. The signal turns OFF once the program starts (when the ready signal turns OFF).</p> <p>Program select (Output) </p> <p>Cleaning start (Output) </p> <p>Ready (Input) </p> <p>This signal should be not used if the iron tip cleaning is not to be conducted with a cleaning program. Refer to [7.7.5 Iron Tip Cleaning Settings] for more details.</p>

Signal Name	Functions
Program select	<p>The point soldering program, line soldering program and cleaning program to start should be selected.</p>  <p>Setting of the number of signals and setup time can be established in the property. Refer to [7.7.1 Common Settings] for more details.</p>
Iron tip down movement complete	<p>It turns ON when the iron tip finishes to go down and turns OFF when starts to go up.</p>  <p>This signal should be not used if the soldering iron unit goes downward / upward with only the slide feature (air cylinder). Refer to [7.7.2 Iron Tip Down/Up Settings] for more details.</p>
Iron tip up movement complete	<p>It turns ON when the iron tip finishes to go up and turns OFF when starts to go down.</p>  <p>This signal should be not used if the soldering iron unit goes downward / upward with only the slide feature (air cylinder). Refer to [7.7.2 Iron Tip Down/Up Settings] for more details.</p>

Signal Name	Functions
Line soldering movement complete	<p>It turns ON when the iron tip finishes line soldering movement and turns OFF when the line soldering program completes.</p> <p>Line soldering program execution state</p> <p>Ready (Input)</p> <p>Line soldering movement start command (Input)</p> <p>Line soldering movement complete (Output)</p> <p>Line soldering movement (Robot motion)</p> <p>This signal would not be used when line soldering is not to be conducted. Refer to [7.7.4 Line Soldering Settings] for more details.</p>
Reset	<p>It resets an error on the soldering controller.</p> <p>Error (Input)</p> <p>Reset (Output)</p> <p>Pulse width</p> <p>Setting of the pulse band width can be established in the property. Refer to [7.7.1 Common Settings] for more details.</p>
Heater power on	<p>It turns ON the heater for iron tip heating.</p> <p>Heater power on (Output)</p> <p>Heater power state</p> <p>This signal should be not used if the control of turning the heater power ON/OFF is not to be conducted with the robot program. Refer to [7.7.1 Common Settings] for more details.</p>
Air blow	<p>Control of the air blow for iron tip cleaning is to be conducted.</p> <p>Air blow (Output)</p> <p>Air blow state</p> <p>This signal should be not used if the iron tip cleaning is not to be conducted with an air blow. Refer to [7.7.5 Iron Tip Cleaning Settings] for more details.</p>

Signal Name	Functions
Soldering unit error detection signal	<p>It turns ON when an error signal of the soldering unit gets input ^(Note 1), and turns OFF when “Complete / Resume Command Signal” gets input ^(Note 2).</p> <p>Note 1 In case of having an evacuating action, it turns ON after the movement.</p> <p>Note 2 It would not turn OFF unless the error occurred on the soldering unit is cancelled.</p> <p>Refer to [7.7.7 Operation after Error Detection Settings] for more details.</p>
Timeout error detection signal	<p>It turns ON when each type of timeout error is detected ^(Note 1), and turns OFF when “Complete / Resume Command Signal” gets input.</p> <p>Note 1 In case of having an evacuating action, it turns ON after the movement.</p> <p>Refer to [7.7.7 Operation after Error Detection Settings] for more details.</p>

1.5 Data to be Used (Variables, Flags and Subroutines)

Following data should be used in SEL programs generated by this software.

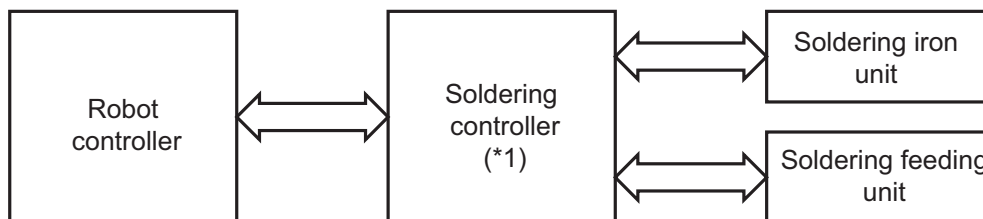
Data Type	Used Range
Local Integer Variables	1070 to 1099
Local Real Variables	1180 to 1199
Local Flags	980 to 999
Subroutines	61 to 99

⚠ Caution: There is a concern that operation would not be performed in normal condition in case any change (such as to change values, reuse for another purpose, etc.) is made to the data above.
Pay special attention in case it is required to change the generated program.

1.6 Devices Necessary for Soldering

In order to perform soldering, it is necessary to have the following devices.

- Soldering controller (*1)
- Soldering iron unit
- Soldering feeding unit

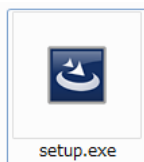


- * 1 It is necessary that the soldering controller satisfies the following conditions;
- Available for registration of soldering programs (heating time, soldering feeding amount, etc.)
 - Possesses necessary input and output signals
(Refer to [1.4 Input and Output Signals to be Used (PIO)])

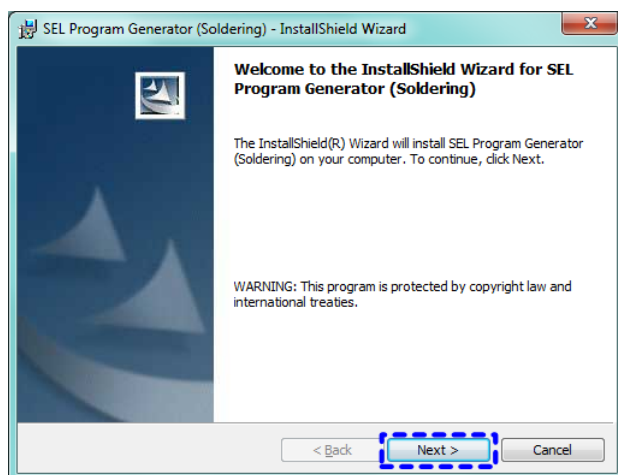
2. Installation

Install the software in the following procedure.

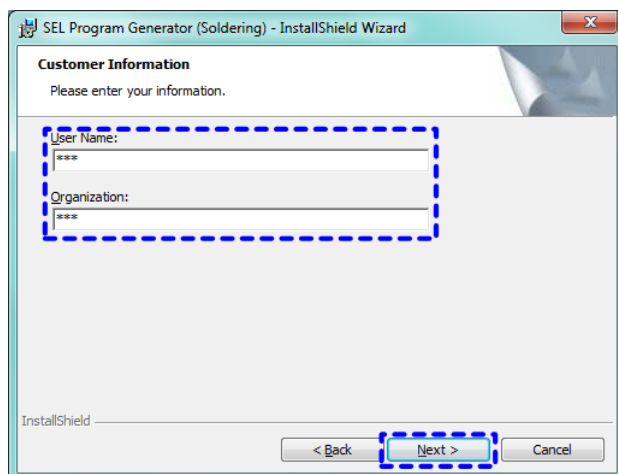
- (1) Double-click "Setup.exe".



- (2) Once the installer is ready, click on **Next** button.

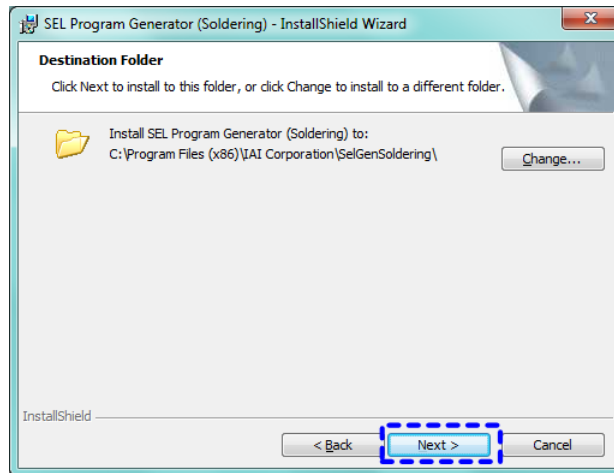


- (3) Input the information in "User Name" and "Organization", and click on **Next** button.



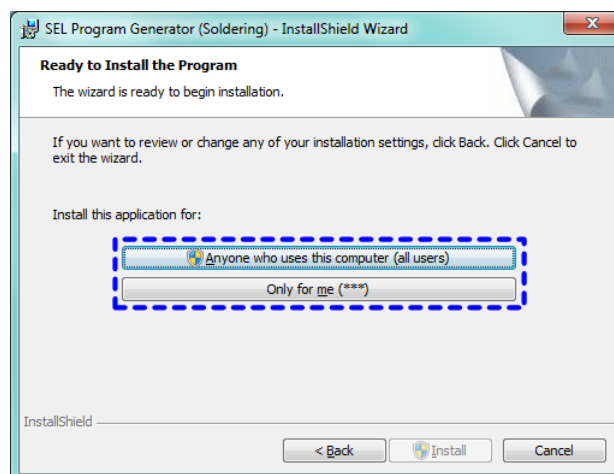
(4) Click on **Next** button.

(Note) When it is necessary to change the domain to install, click on **Change...** button and select a domain to install.

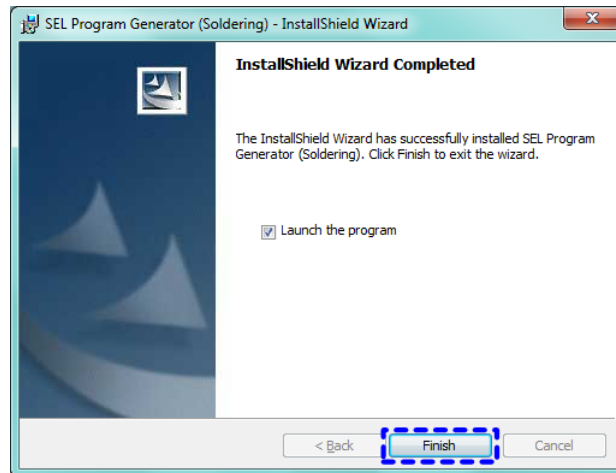


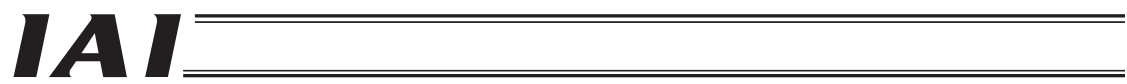
(5) Select a subject to install (click a button) and installation process will start.

(Note) If “User Account Control” dialog window appears, click on **Yes** button to continue the installation process.



(6) Click on **Finish** to finish the installation.

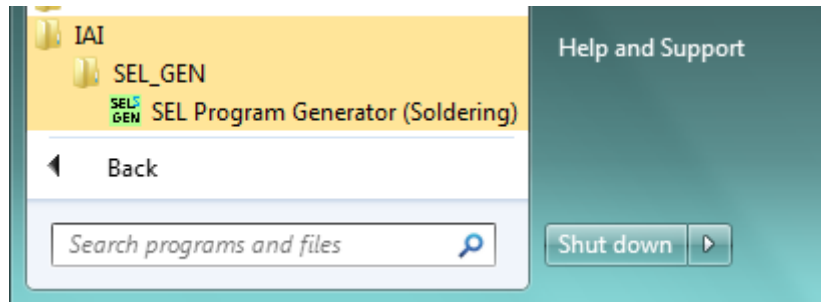




3. Startup and Finish

3.1 Startup

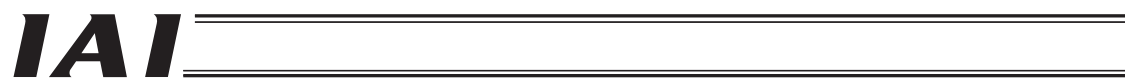
Select [All Programs] - [IAI] - [SEL_GEN] - [SEL Program Generator (Soldering)] in Start Menu of Windows.



3.2 Finish

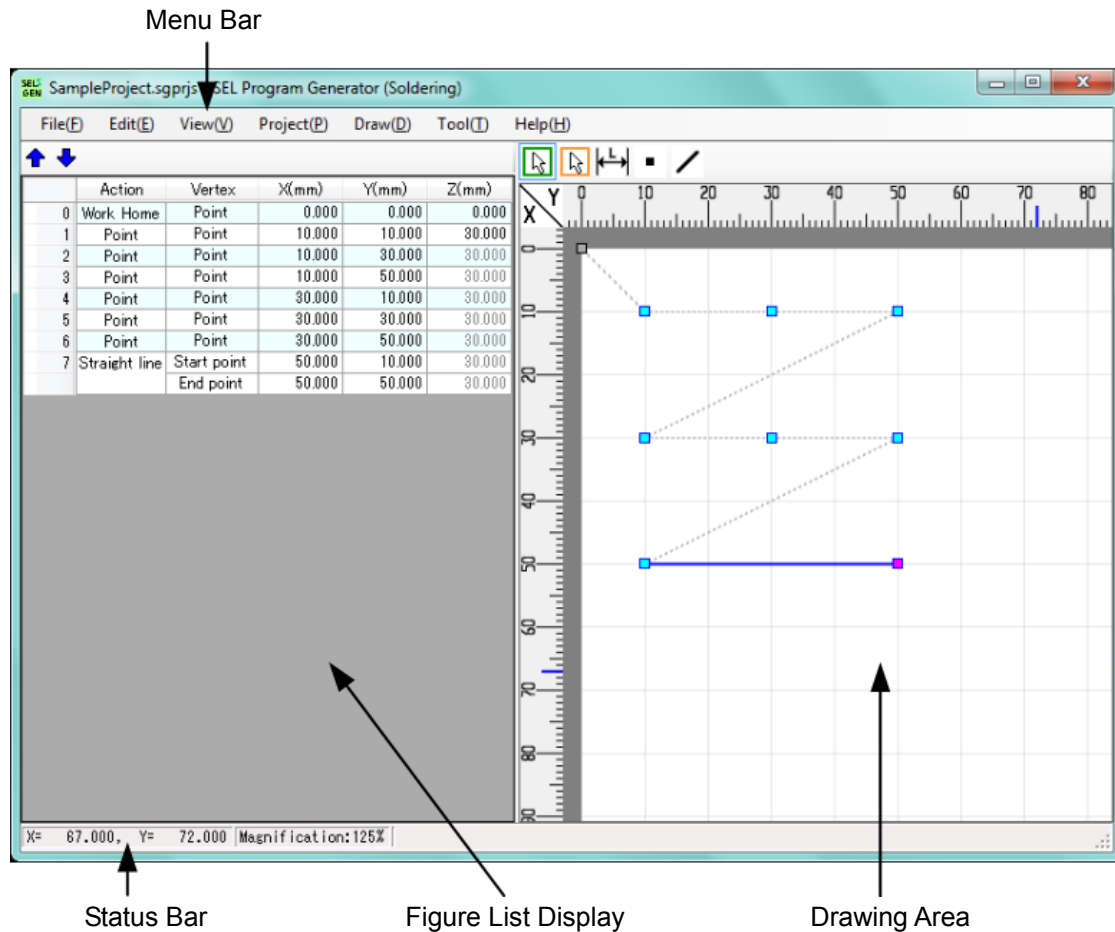
Choose either way to exit.

- Select [File (F)] - [Exit (X)] in the menu bar.
- Click on button on the top right of the main window.



4. Explanation of Windows

If you start up this software, the “Main Window” as shown below will appear.



4.1 Menu Bar

You can execute each type of operation from the pull-down menu.

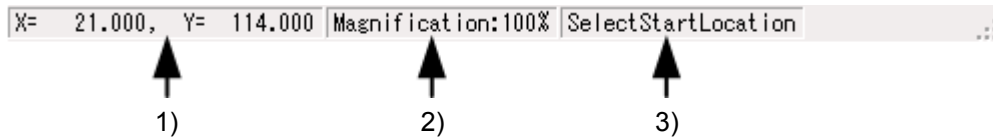
Menu	Sub Menu	Functions
File (F)	New Project (N)	A new project can be created.
	Open Project (O)	An existing project can be opened.
	Save As (A)	You can put a name to a project and save it.
	Save (S)	You can overwrite a project.
	Dxf data (D)	• Read (R) DXF figure data can be read out from a file.
		• Clear (C) The DXF figure already read in can be cleared.
	Reference data (F)	• Read (R) Figure data for reference can be read out from a file.
		• Clear (C) The figure data for reference already read in can be cleared.
	Background image (B)	• Read (R) Background image data can be read out from a file.
		• Clear (C) The image data for background already read in can be cleared.
Edit (E)	Track data (T)	• Read (R) Track data can be read out from a file.
		• Clear (C) The data for track already read in can be cleared.
	Exit (X)	This software will be finished.
	Undo (U)	The figure editing operation can be undone.
	Redo (R)	The figure editing operation can be redone.
	Cut (T)	The selected figure can be cut.
	Copy (C)	The selected figure can be copied.
	Paste (P)	The figure which was cut or copied can be pasted.
View (V)	Display lines (W)	Created figure can be selected whether to show or hide.
	Display DXF lines (X)	DXF figure can be selected whether to show or hide.
	Display reference lines (R)	Reference figure can be selected whether to show or hide.
	Display track lines (T)	Track data can be selected whether to show or hide.
	Zoom (Z)	Display magnification of a figure can be selected (from 10% to 8000%).
Project (P)	Generate (G)	SEL program and position data can be generated.
	Simulate (S)	Simulation should be performed to check the operation track and cycle time.
	Property (P)	Property setting of a project can be established.

Menu	Sub Menu	Functions
Draw (D)	Select drawing items (W)	Drawing Mode can be changed to "Select drawing items mode".
	Select dxf items (X)	Drawing Mode can be changed to "Select dxf items mode".
	Measure distance (M)	Drawing Mode can be changed to "Measure distance mode".
	Point (P)	Drawing Mode can be changed to "Point drawing mode".
	Straight line (L)	Drawing Mode can be changed to "Straight line drawing mode".
	Translation (T)	The selected figure can be moved.
	Rotation (R)	The selected figure can be rotated.
	Invert (I)	The selected figure can be inverted.
Tool (T)	Option (O)	Tool option setting can be established.
Help (H)	About (A)	The version information of this software can be shown.

4.2 Status Bar

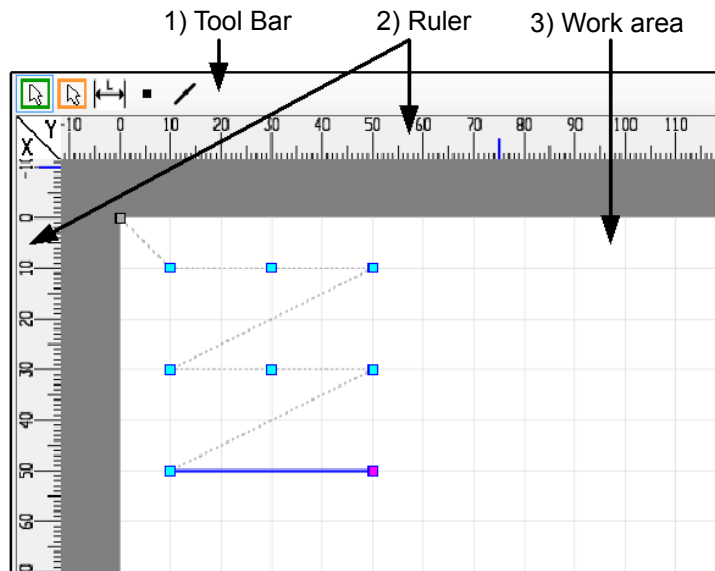
The status bar shows you the following information.

- 1) Coordinates of mouse cursor position
The coordinates (X coordinate and Y coordinate) of the mouse cursor displayed position should be shown.
- 2) Magnification
Magnification of the drawing area is shown.
- 3) Drawing Operation / Two-Point Distance
The current action of drawing operation such as "Select Start Location" and "Select End Location" is shown.
If the drawing mode is "Measure distance", the distance between the indicated two points should be displayed.








4.3 Drawing Area

Create figures such as dots and lines (motion path) in this area.
The drawing area is constructed as shown below.



- 1) **Tool Bar**
There are buttons allocated to switch the edit mode.
(Refer to “4.3.4 Edit Mode” for the edit mode.)

Button	Functions
	Mode changed "Select drawing items mode".
	Mode changed "Select dxf items mode".
	Mode changed "Measure distance mode".
	Mode changed "Point drawing mode".
	Mode changed "Straight line drawing mode".

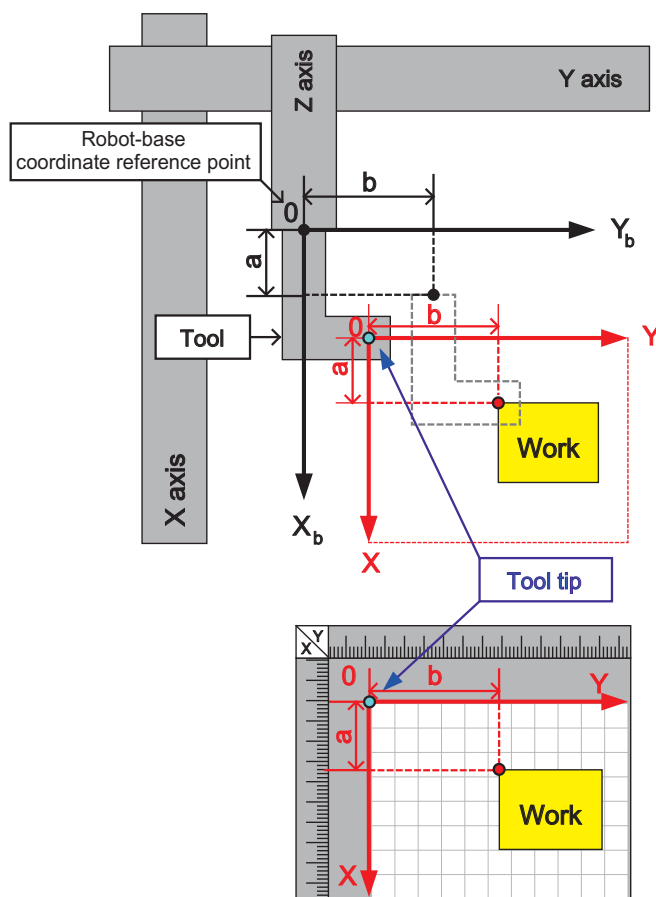
- 2) Ruler
Scales of X-axis and Y-axis are shown. (Unit: mm)
- 3) Work area
It is the work area of X-axis and Y-axis.
A figure (motion path) should be created in the range of this area.

4.3.1 Coordinate System in Work Area

Shown below is the relation between the coordinate system of the work area and that of the robot.

Shown with “a” and “b” in the figure is the relation between the position of the tool tip and that of the workpiece when X-axis and Y-axis are positioned at the robot base coordinate datum (0, 0).

Confirm “a” and “b” in advance in a device drawing and so on.



This software is not applicable for the work and tool coordinate system features. When the controller to be used is applicable for the work and tool coordinate system features^{*1}, set the work coordinate offset and tool coordinate offset to “0.000mm” for all the axes before executing the program.

When the work coordinate offset and tool coordinate offset are not set to “0.000mm” for all the axes, unexpected operation may occur, which could cause interference of robot, tool, workpiece, etc., and cause malfunction.

^{*1} Supported versions of work and tool coordinate systems

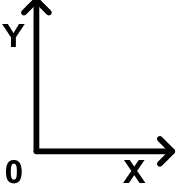
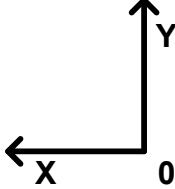
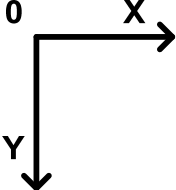
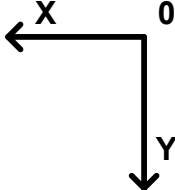
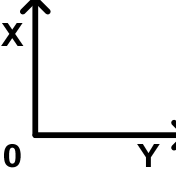
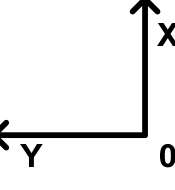
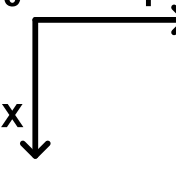
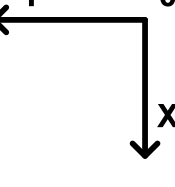
TTA : Main application part V2.00 and later

MSEL : Main application part V2.00 and later

The SEL programs, position data and simulations generated in SEL program generator should be applicable only when using the table top type robot and cartesian robot.

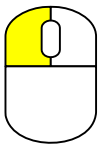
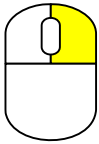
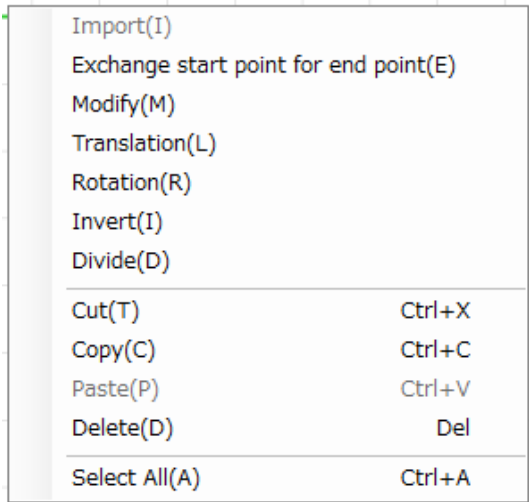
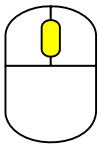
They are not applicable when using only the single axis (including gripper, rotary, etc.), wrist unit (including cartesian robot combined) or SCARA Robot (IXP).

The orientation of the coordinates display in the work area should be selected from the eight types below.

TYPE 1	TYPE 2
	
TYPE 3	TYPE 4
	
TYPE 5	TYPE 6
	
TYPE 7	TYPE 8
	















4.3.2 Basic Operation

Basic operations should be performed on a mouse and keyboard.

Button	Operation	Functions
	Click	<ul style="list-style-type: none"> In Select Drawing Items Mode / Select DXF Items Mode, A figure which the cursor is pointing on can be selected Press [Shift] key and hold it down while clicking on a figure and multiple figures can be selected at once.
		<ul style="list-style-type: none"> In Point Drawing Mode / Straight Line Drawing Mode / Measure Distance Mode, This determines the peak points (measurement start point in measure distance mode).
	Drag	<ul style="list-style-type: none"> When a figure is selected The position of the selected figure can be moved.
		<ul style="list-style-type: none"> When no figure is selected Range of a figure can be selected.
	Click	<p>Popup menu should open.</p> <div data-bbox="724 943 1251 1442">  </div>
	Rotate	<ul style="list-style-type: none"> When [Ctrl] key is held down Display can be zoomed in and out. (10% to 8000%)
		<ul style="list-style-type: none"> When [Shift] key is held down Display can be scrolled right and left.
		<ul style="list-style-type: none"> In condition other than above Display can be scrolled up and down.
	Drag	Display can be scrolled to the direction that you dragged.






4.3.3 Types of Displayed Points and Lines

The types of dots and lines displayed in the work area are as shown below.

Display	Contents
	Work Home
	Point / Starting Point of a Line / Starting Point of a Circle / Starting Point of an Arc
	End Point of a Line / End Point of an Arc
	1st Pass Point of a Circle
	2nd Pass Point of a Circle / Pass Point of an Arc
	Center Point of a Circle
	Linked Point of a Line / Circle / Arc
	Created Figure (without soldering)
	Created Figure (with soldering)
	Created Figure (selected)
	Figure read out of a DXF file
	Figure read out of a DXF file (selected)
	Figure under working
	Movement Route between Figures

4.3.4 Edit Mode

Create Drawing / Edit can be switched over by switching the edit mode in the work area.
See below for the feature of each edit mode and how to switch between them.

Mode	Functions
Select drawing items	A created figure can be selected on a mouse. [Mode Change in Menu Bar] Execute [Draw (D)] - [Select drawing items (W)] [Mode Change in Tool Button] Click on  button
Select dxf items	A figure read out of a DXF file can be selected on a mouse. [Mode Change in Menu Bar] Execute [Draw (D)] - [Select dxf items (X)] [Mode Change in Tool Button] Click on  button
Measure distance	Distance can be measured between any two points. [Mode Change in Menu Bar] Execute [Draw (D)] - [Measure distance (M)] [Mode Change in Tool Button] Click on  button
Point drawing	A dot can be drawn. [Mode Change in Menu Bar] Execute [Draw (D)] - [Point (P)] [Mode Change in Tool Button] Click on  button
Straight line drawing	A straight line can be drawn. [Mode Change in Menu Bar] Execute [Draw (D)] - [Straight line (L)] [Mode Change in Tool Button] Click on  button

4.3.5 Selecting a Figure

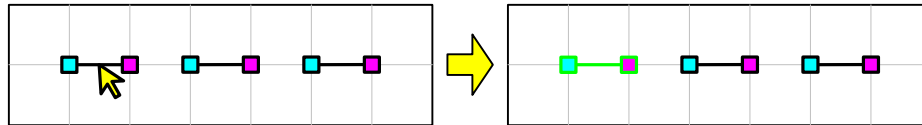
Change the edit mode to “Select drawing items” and the created figure gets available to select.

Also, choose “Select dxf items” and DXF figures get available.

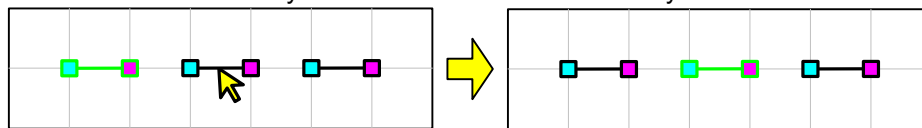
There are four types of figure select.

- Single Select

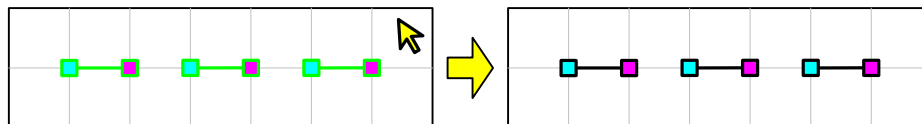
Click in a figure and this figure can be selected.



A figure that has been already selected will be cancelled if any.

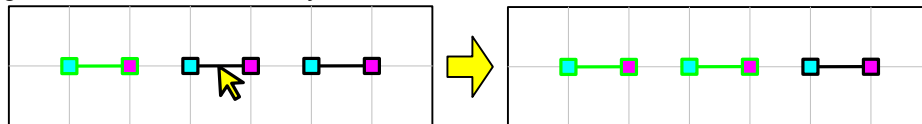


Also, if a space with no figure gets clicked, all the selection of the figures should be cancelled.

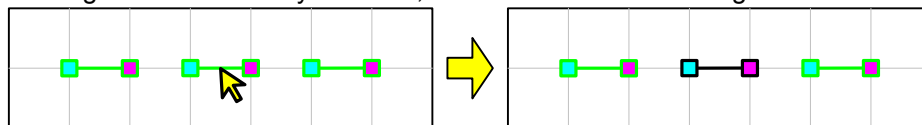


- Multiple Select

Hold down [Shift] key while selecting a figure, and the figure will be selected in addition to the figure that has been already selected.

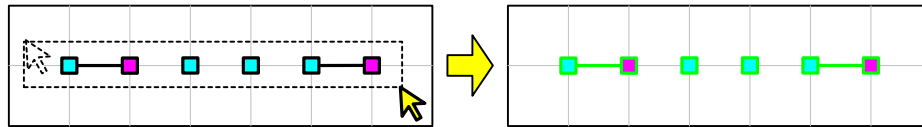


Click on a figure that is already selected, and the selection of this figure will be cancelled.

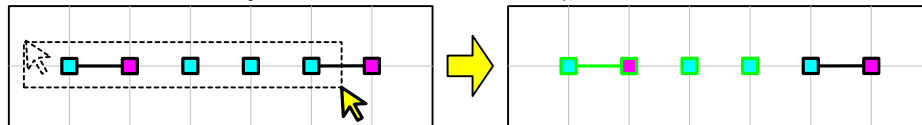


- Range Select

Drag the cursor and all the figures included in the dotted rectangle can be selected at once.



A line can be selected only when both start and end points are included.



- Select All

All the figures can be selected at once in either of the ways below.

- Execute [Edit (E)] - [Select all (A)] from the menu bar
- Execute [Select All (A)] from the popup menu

4.3.6 Show Reference Figure Data

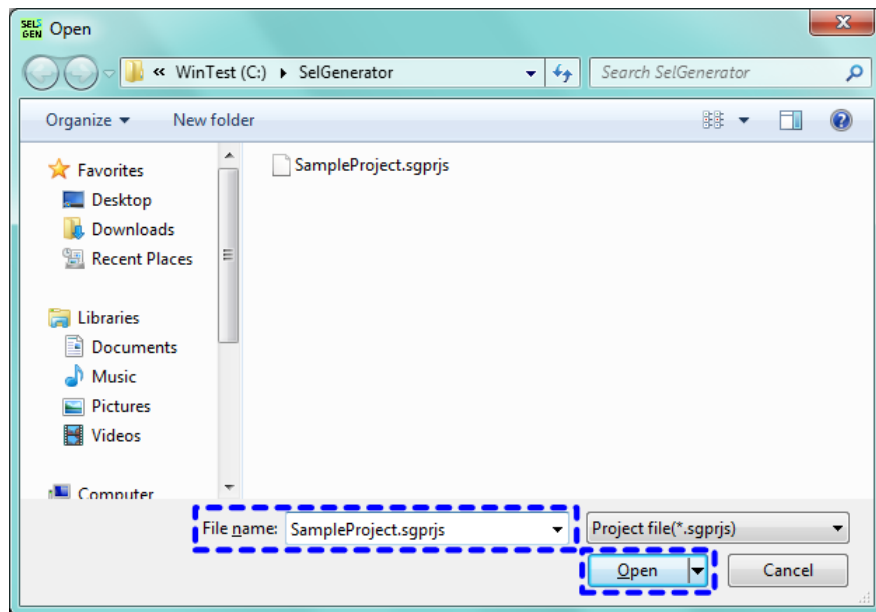
Drawing data in an existing project file can be shown ^(Note 1) as a reference drawing.

Note 1 Only the lines of the figure should be shown and peak points will not.

[1] Read

In order to read the reference figure data, follow the procedure below.

- (1) Execute [File (F)] - [Reference data (F)] - [Read (R)] from the menu bar.
- (2) Select a file name that you would like to show as a reference, and click on **Open** button.

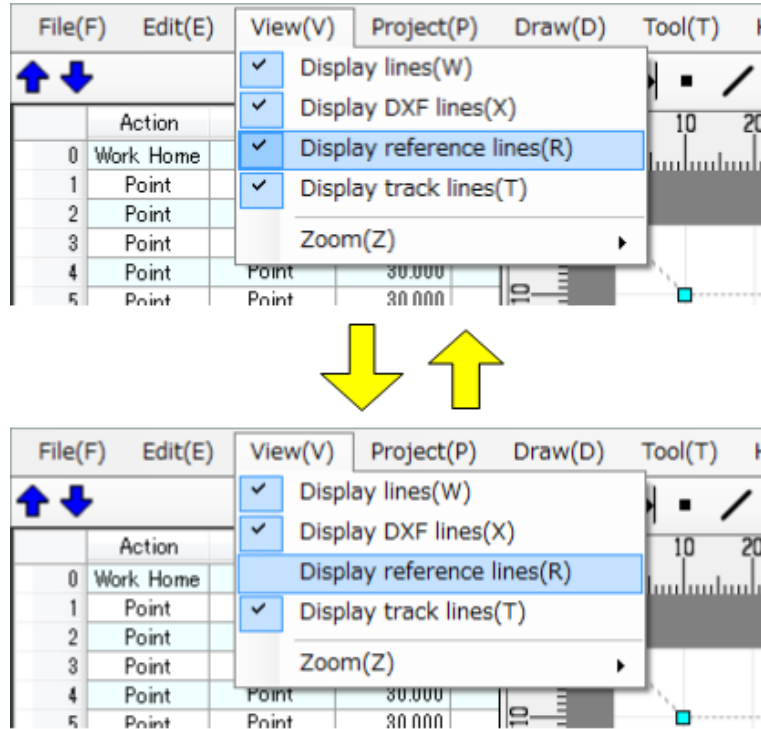


[2] Clear

Execute [File (F)] - [Reference data (F)] - [Clear (C)] in the menu bar, and the reference data being displayed can be cleared.

[3] Switchover of Show/Hide

Execute [View (V)] - [Display reference lines (R)] in the menu bar, and the reference figure can be switched between show and hide.



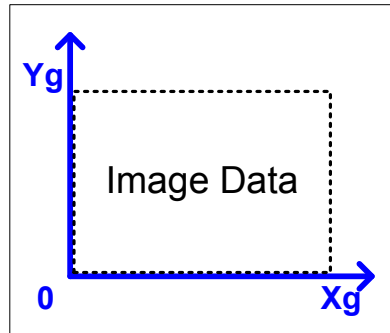
4.3.7 Show Background Image Data

An image file (jpeg format) can be read in and shown as the background of the work area.

Coordinate System for Image Data (Xg, Yg)

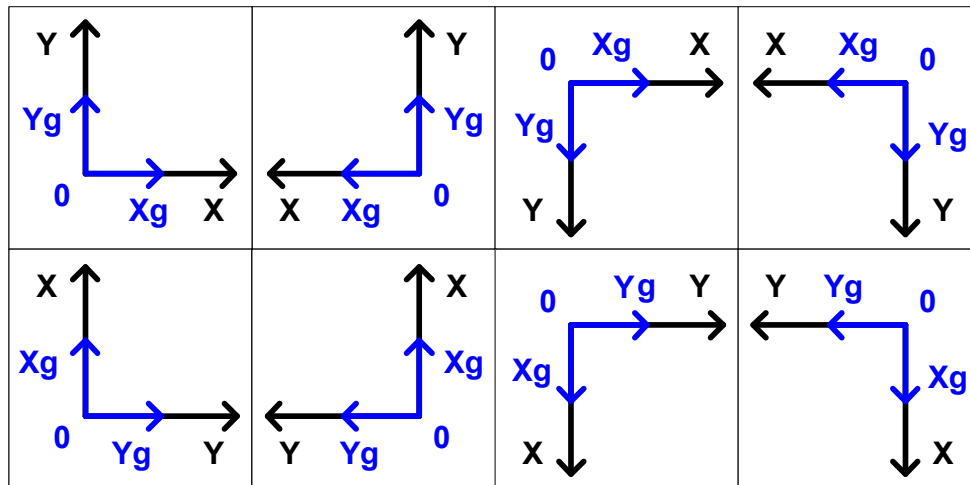
The coordinate system for image data Xg, Yg should be defined as follows.

- Positive Direction of Xg: Right Side in Horizontal
- Positive Direction of Yg: Upper Side in Vertical



Relation between Coordinate System for Image Data (Xg, Yg) and Coordinate System in Work Area (X, Y)

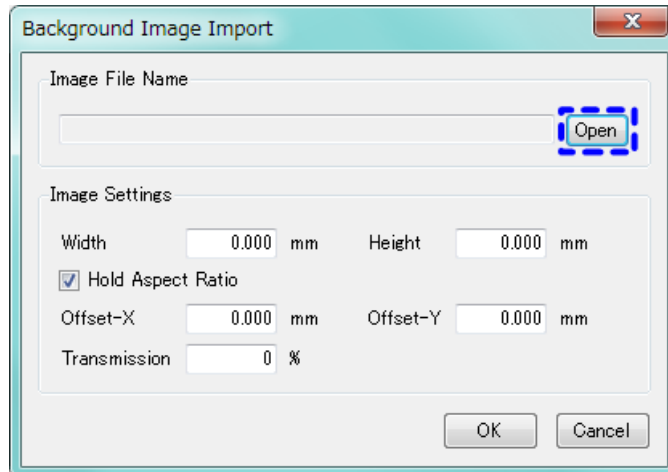
Shown below is how to read in image data and set directions of Xg and Yg in line with directions of X and Y in the work area, and set (0, 0) of the image data coordinates at (0, 0) of the work area coordinates.



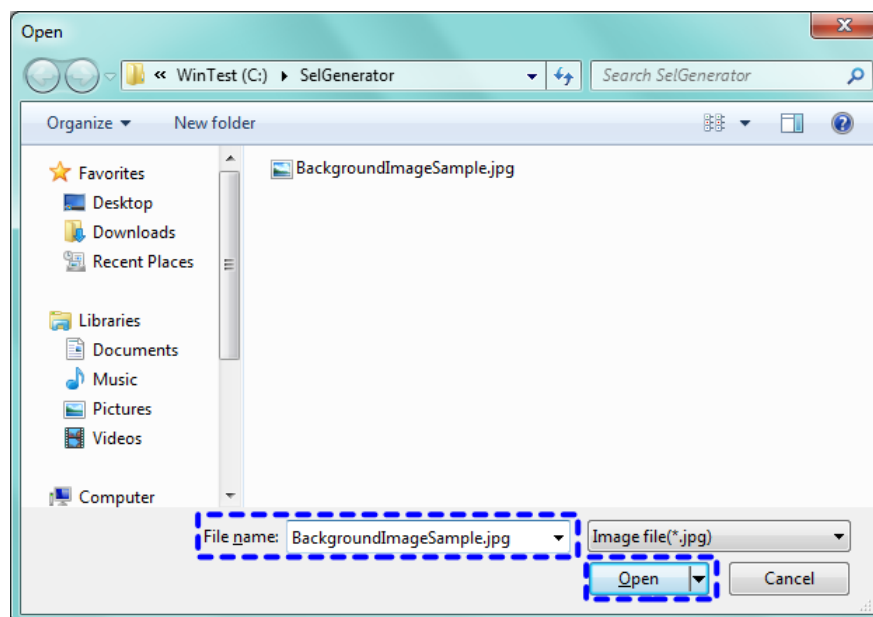
[1] Read

In order to read the background image data, follow the procedure below.

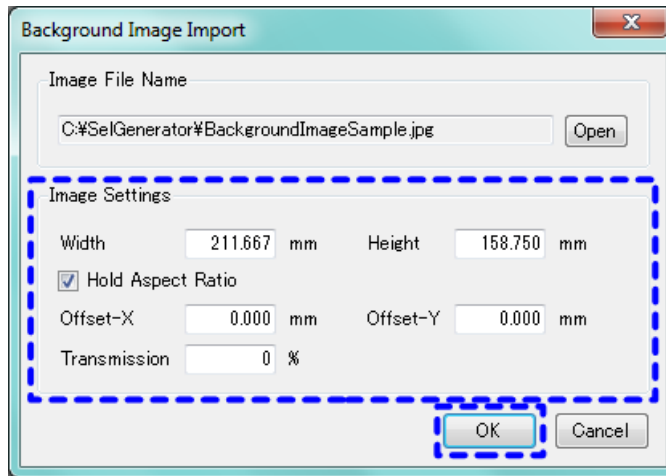
- (1) Execute [File (F)] - [Background image (B)] - [Read (R)] from the menu bar.
- (2) Click on **Open** button in “Background Image Import” window.



- (3) Select a file name of the image data that you would like to show as a background image, and click on **Open** button.



- (4) Establish the display setups for the image, and click on **OK** button.



- Width : Set the display width (X direction) of the image. (Unit: mm)
- Height : Set the display height (Y direction) of the image. (Unit: mm)
- Hold Aspect Ratio : Display height (width) should be automatically adjusted in response to the aspect ratio of the image data when the width (height) has been changed.
- Offset-X : Set the offset position in X direction. (Unit: mm)
- Offset-Y : Set the offset position in Y direction. (Unit: mm)
By having an offset, the relation between the coordinate system in the work area and the position of a workpiece should be adjusted to the actual positions.
- Transmission : Set the transmittance of background image. (Unit: %)

[2] Clear

Execute [File (F)] - [Background image (B)] - [Clear (C)] in menu bar, and the background image being displayed can be cleared.

4.3.8 Show Track Data

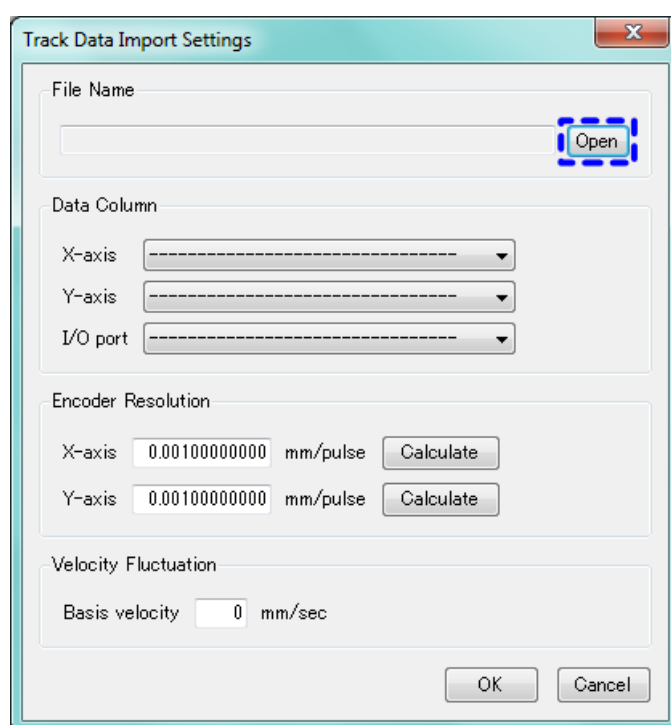
The feedback pulse at the actual operation gathered by “XSEL PC Software” is able to be shown as the actual operation tracks.

By putting the drawing data (motion path) and the actual operation tracks together to show in the same screen, it is possible to adjust the drawing data while checking dispersion.

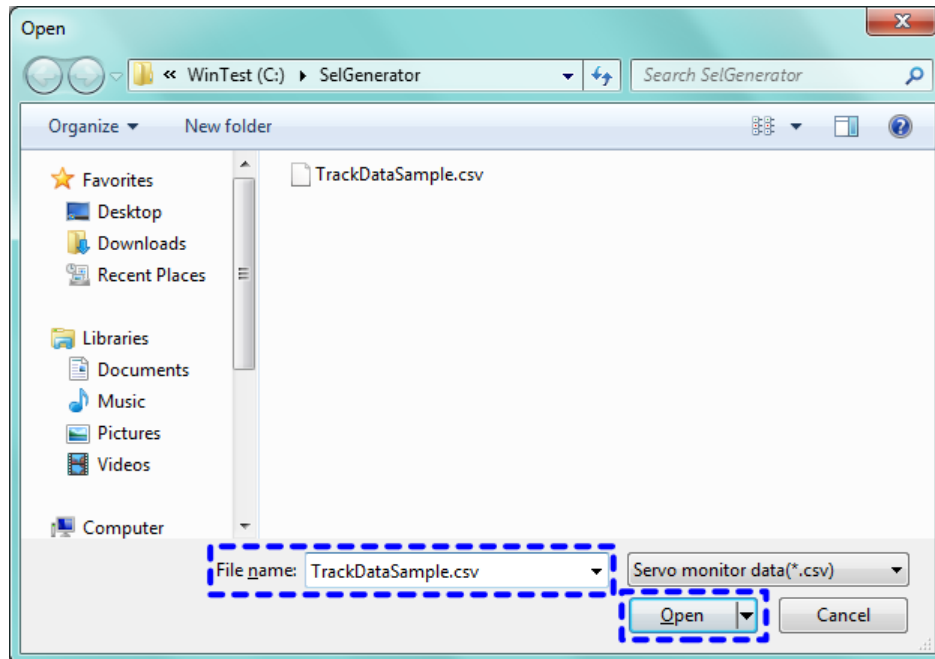
[1] Read

In order to read the track data, follow the procedure below.

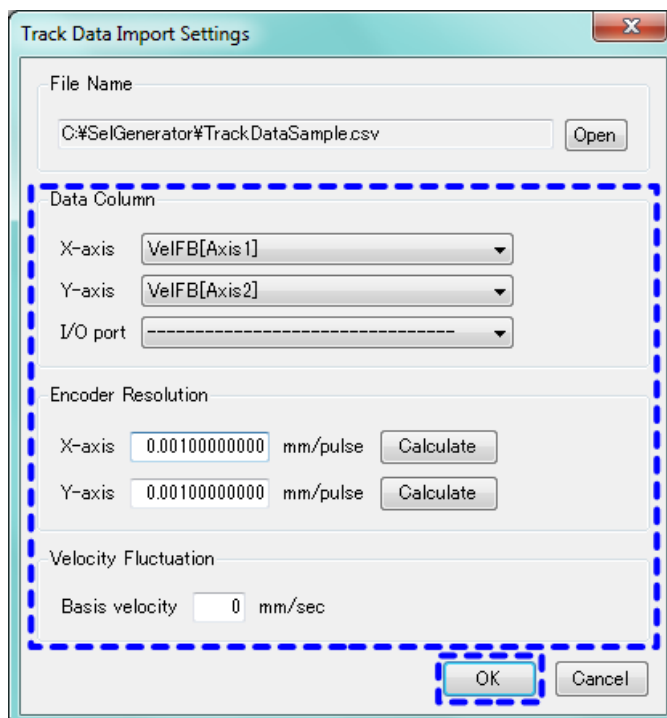
- (1) Execute [File (F)] - [Track data (T)] - [Read (R)] from the menu bar.
- (2) Click on Open button in “Track Data Import Settings” window.



- (3) Select a file name of the tracks, and click on **Open** button.



- (4) Establish the settings for “Data Column”, “Encoder Resolution” and “Velocity Fluctuation”, and click on **OK** button.

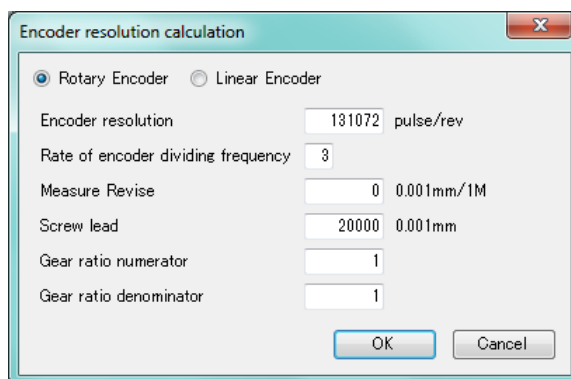


Setting of "Data Column"

- X-axis : Indicate the feedback pulse data train in X-axis.
 Y-axis : Indicate the feedback pulse data train in Y-axis.
 I/O port : Indicate the I/O monitor data train.
 Indicate this item and only the tracks while the applicable I/O port (or flag) is ON will be shown.
 If "-----" is indicated, tracks in all the sections should be displayed.

Setting of "Encoder Resolution"

- X-axis : Setup of the encoder resolution for X-axis can be established.
 (Unit: mm/pulse)
 Y-axis : Setup of the encoder resolution for Y-axis can be established.
 (Unit: mm/pulse)
 * Click on **Calculate** button, and the following window shows up.
 Establish the settings for the indicated items only and the encoder resolution can be figured out.
 For the settings of each item, look in the setting values for each applicable item in each axis parameter in "XSEL PC Software".



Setting of "Velocity Fluctuation"

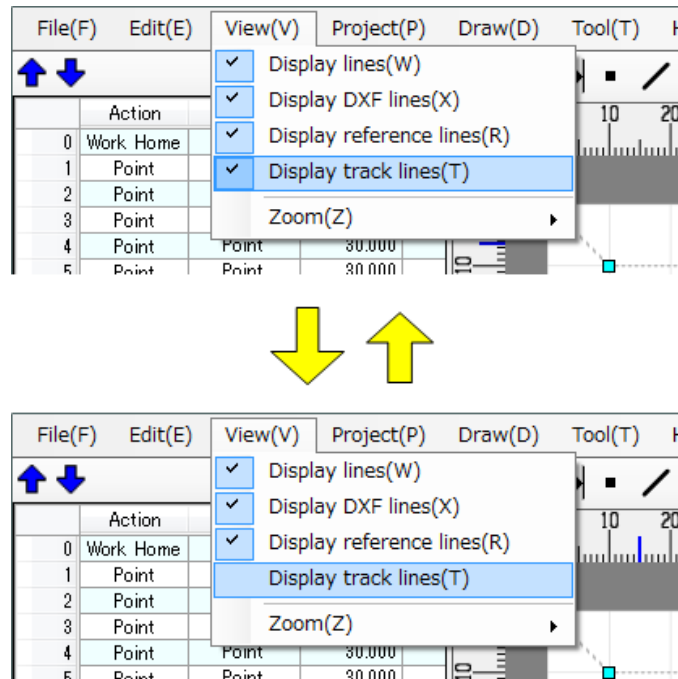
- Basis velocity : If you desire to change the width of the track lines in response to the operation speed, it is necessary to set up the standard speed (such as the indicated speed when track data was gathered). (Unit: mm/sec)
 The operation tracks in the area that is faster than the standard speed should be expressed in narrow lines while that which is slower expressed in wide lines.
 Set to "0" and the track lines will be expressed in constant width.

[2] Clear

Execute [File (F)] - [Track data (T)] - [Clear (C)] in the menu bar, and the track line data being displayed can be cleared.

[3] Switchover of Show/Hide

Execute [View (V)] - [Display track lines (T)] in the menu bar, and the track line can be switched between show and hide.



4.4 Figure List Display

The figure list display is constructed as shown below.

(2) Tool Bar (1) Figure Information List

	Action	Vertex	X(mm)	Y(mm)	Z(mm)	R(deg)
0	Work Home	Point	0.000	0.000	0.000	0.000
1	Point	Point	10.000	10.000	30.000	0.000
2	Point	Point	20.000	10.000	30.000	0.000
3	Straight line	Start point	10.000	20.000	30.000	0.000
		End point	10.000	30.000	30.000	0.000
4	Straight line	Start point	20.000	20.000	30.000	0.000
		End point	20.000	30.000	30.000	0.000

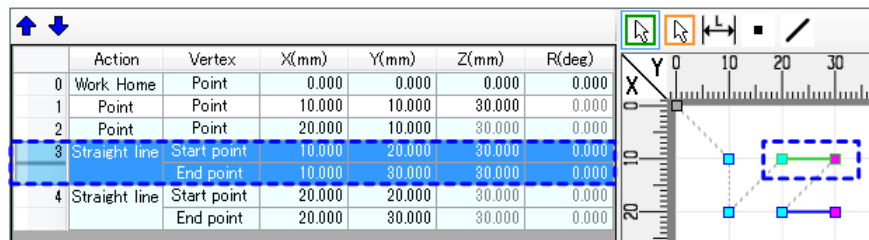
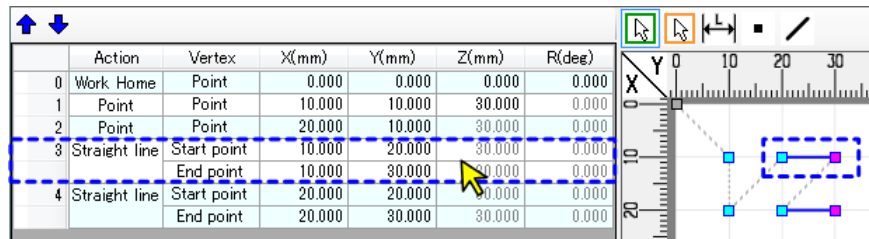
(1) Figure Information List

The information of the created figures should be shown in a list.

1)	2)	3)	4)	5)	6)	7)
0	Work Home	Point	0.000	0.000	0.000	0.000
1	Point	Point	10.000	10.000	30.000	0.000
2	Point	Point	20.000	10.000	30.000	0.000
3	Straight line	Start point	10.000	20.000	30.000	0.000
		End point	10.000	30.000	30.000	0.000
4	Straight line	Start point	20.000	20.000	30.000	0.000
		End point	20.000	30.000	30.000	0.000



No.	Contents
1)	Numbers of figures should be shown.
2)	Types of operations (figure types) should be shown.
3)	Types of peak points should be shown.
4)	Values in Coordinate X of peak points should be shown. (Unit: mm)
5)	Values in Coordinate Y of peak points should be shown. (Unit: mm)
6)	Values in Coordinate Z of peak points should be shown. (Unit: mm)
7)	Values in Coordinate R of peak points should be shown. (Unit: deg)

Click on the figure information in the mouse, and the figure can be selected.



(2) Tool Bar

There are buttons allocated to swap the order of the created figures.

Button	Functions
	Moves the order of the selected figure one step forward.
	Moves the order of the selected figure one step backward.

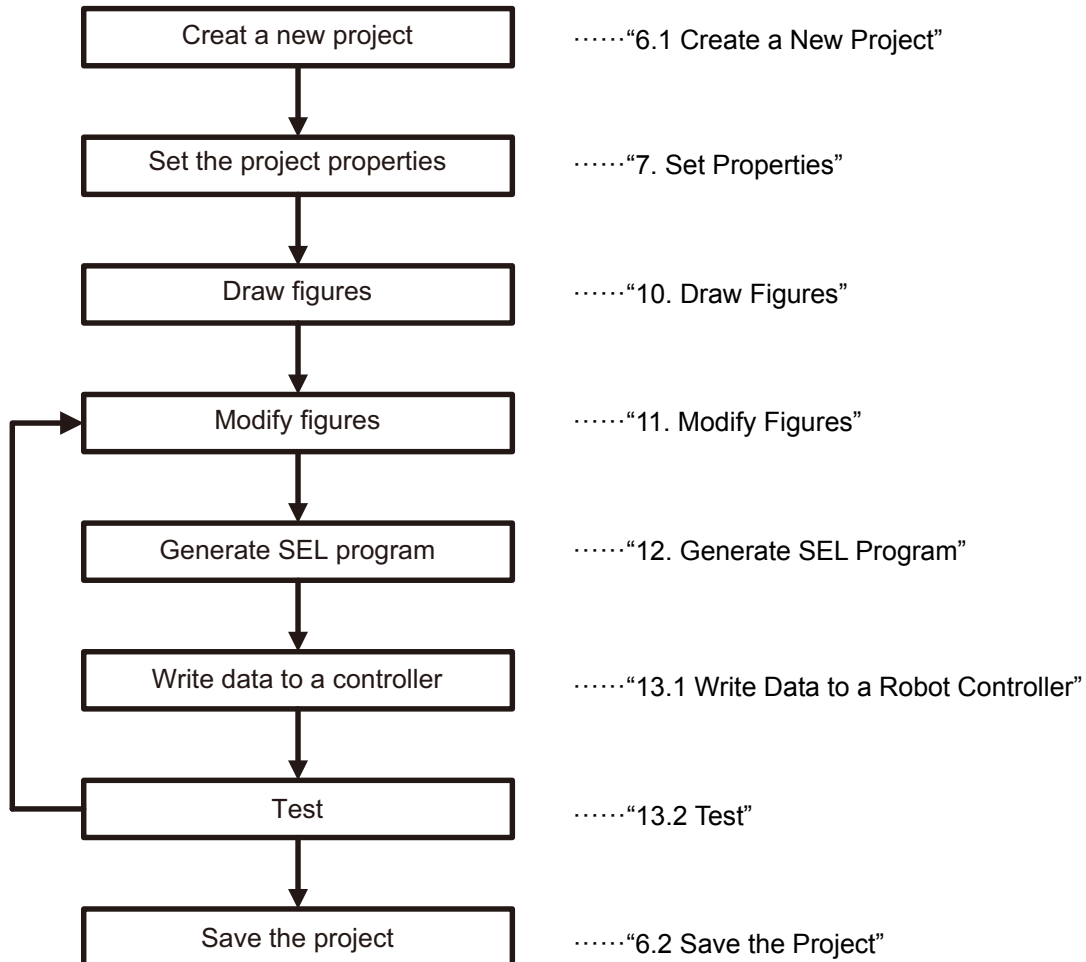
	Action	Vertex	X(mm)	Y(mm)	Z(mm)	R(deg)
0	Work Home	Point	0.000	0.000	0.000	0.000
1	Point	Point	10.000	10.000	30.000	0.000
2	Straight line	Start point	10.000	20.000	30.000	0.000
		End point	10.000	30.000	30.000	0.000
3	Point	Point	20.000	10.000	30.000	0.000
4	Straight line	Start point	20.000	20.000	30.000	0.000
		End point	20.000	30.000	30.000	0.000

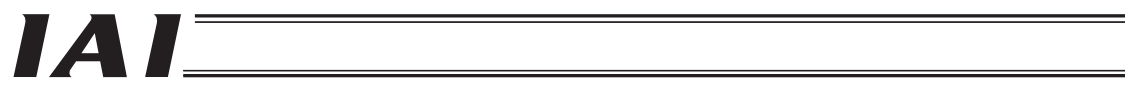


	Action	Vertex	X(mm)	Y(mm)	Z(mm)	R(deg)
0	Work Home	Point	0.000	0.000	0.000	0.000
1	Point	Point	10.000	10.000	30.000	0.000
2	Point	Point	20.000	10.000	30.000	0.000
3	Straight line	Start point	10.000	20.000	30.000	0.000
		End point	10.000	30.000	30.000	0.000
4	Straight line	Start point	20.000	20.000	30.000	0.000
		End point	20.000	30.000	30.000	0.000

5. Work Flow Chart

A SEL program should be generated in a flow as shown below.



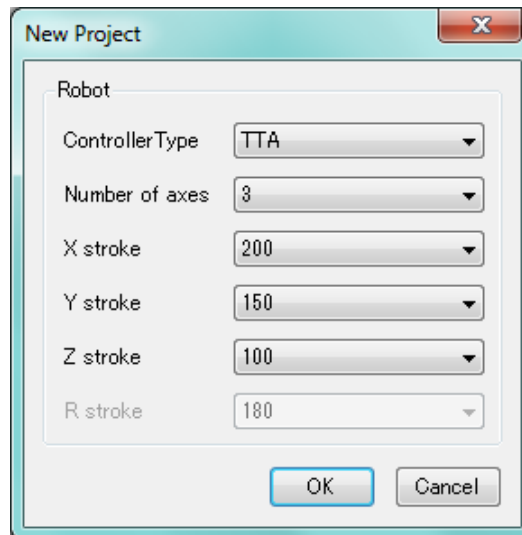


6. Creating and Saving a Project

6.1 Create a New Project

Create a project following the process below.

- (1) Execute [File (F)] - [New Project (N)] in the menu bar and open [New Project Drawing Window].



- (2) Establish the settings for the robot to be used.

Item	Contents
Controller Type	The type of the robot controller should be selected.
Number of axes	The number of axes on a robot should be selected.
X stroke	X-axis stroke should be selected.
Y stroke	Y-axis stroke should be selected.
Z stroke	Z-axis stroke should be selected.
R stroke	R-axis stroke should be selected.

6.2 Save the Project

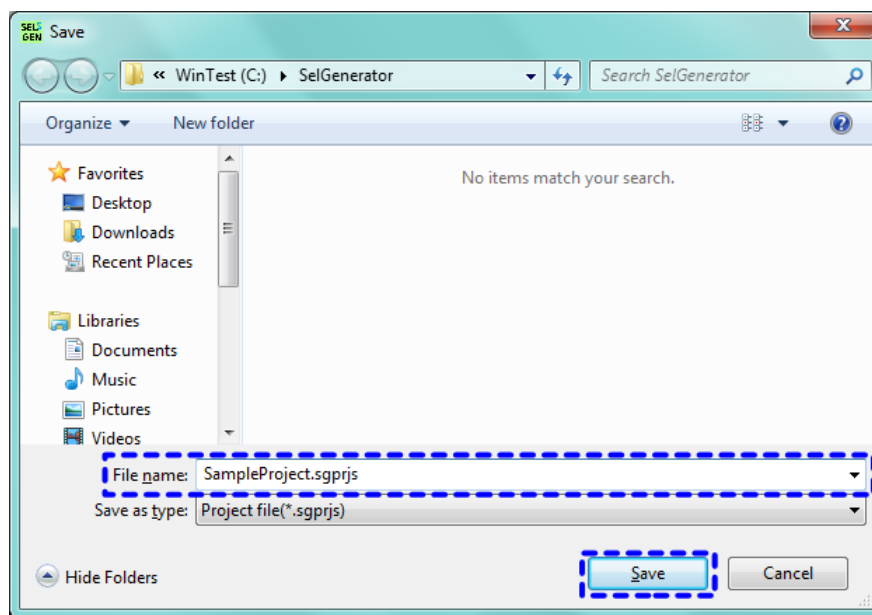
There are two ways as shown to save a project.

- Save As
- Save

6.2.1 Save As

A file should be saved as a new name.

- (1) Execute [File (F)] - [Save As (A)] from the menu bar.
- (2) Indicate a file name to save and click on **Save** button.



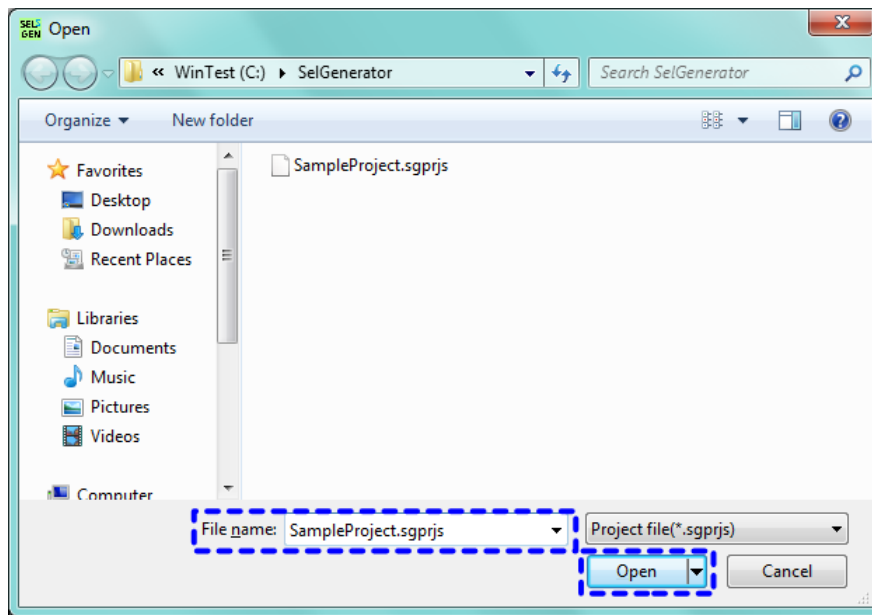
6.2.2 Save

Execute [File (F)] - [Save (S)] in the menu bar and the project file under editing should be overwritten.

6.3 Open a Project

To open an existing project in a file, follow the process described below.

- (1) Execute [File (F)] - [Open Project (O)] from the menu bar.
- (2) Select a file in a project that you would like to open, and click on **Open** button.

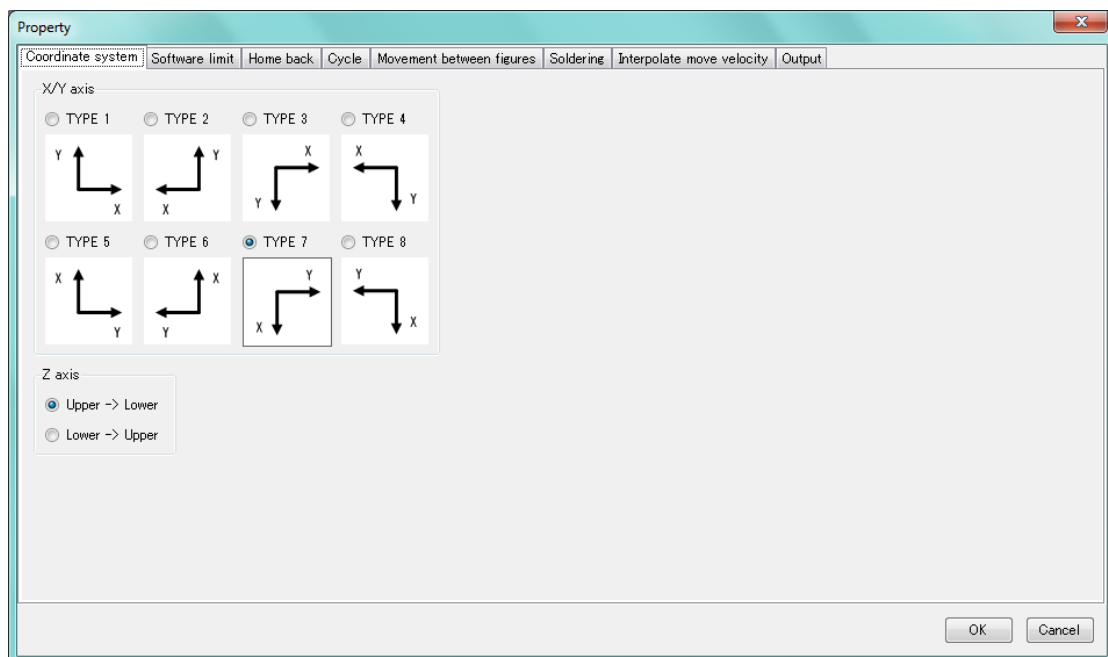




7. Set Properties

Open “Property Setting Window” and settings can be conducted on the following items.

- Coordinate System Setting
- Software Limit Setting
- Home Back Setting
- Cycle Setting
- Movement between Figures Setting
- Soldering Setting
- Interpolate Move Velocity Setting
- Output Setting
- Simulation



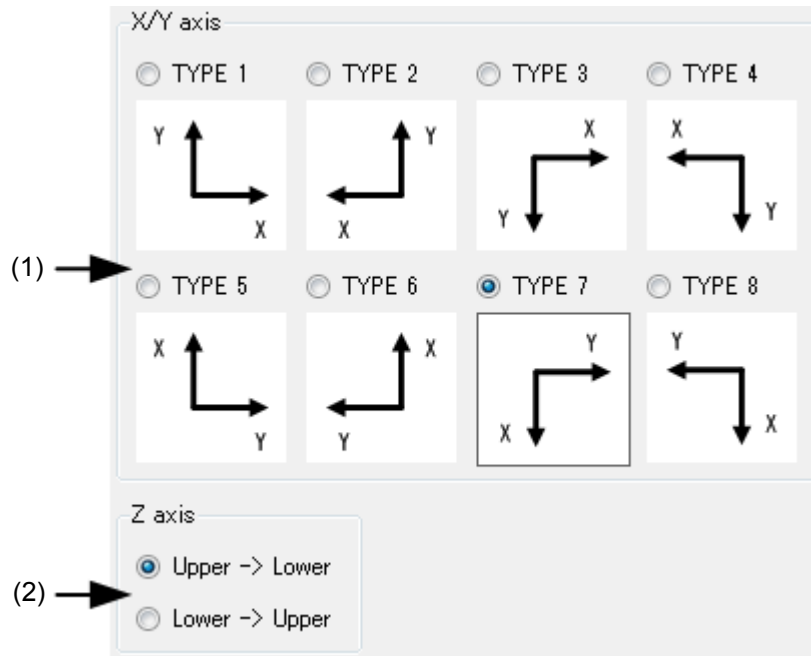
7.1 How to Show Property Setting Window

Execute [Project (P)] - [Property (P)] from the menu bar of the main window.

7.2 Coordinate System Setting

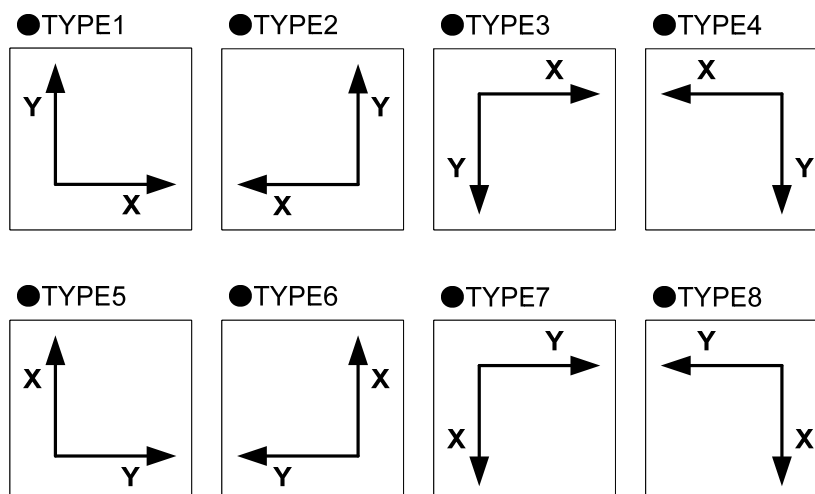
Setting of the orientation of the coordinates in the working area can be selected.

(Note) It will not change the direction of the actual robot operation.



(1) X/Y axis

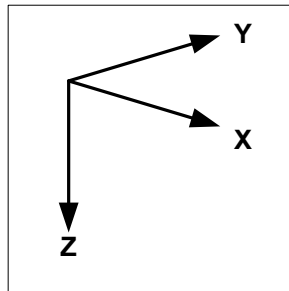
Select an orientation of the coordinates from these below for the working area (main window drawing area).



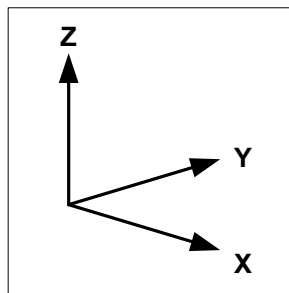
(2) Z axis

Select the direction of the Z-axis upward end in the motion path simple display (Generate SEL Program Window).

- Upper → Lower
It shows the negative side of the soft limit as the upward end.



- Lower → Upper
It shows the positive side of the soft limit as the upward end.



7.3 Software Limit Setting

Setting of the display range of the working area can be conducted.

(Note) It will not change the range of actual the robot operation.

Also, as the initial setting can be established in response to the stroke set when the project was created, it is not necessary to have this setting changed in normal use.

	Minus side	Plus side
X-axis	0.000	200.000
Y-axis	0.000	150.000
Z-axis	0.000	100.000
R-axis	-180.000	180.000

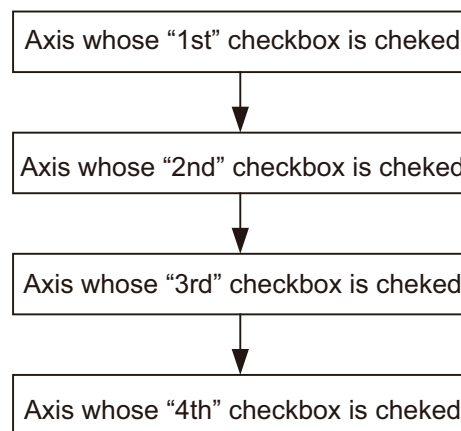
Item		Contents
X-axis	Minus side	Soft limit value in negative side on X-axis should be set. (Unit: mm)
	Plus side	Soft limit value in positive side on X-axis should be set. (Unit: mm)
Y-axis	Minus side	Soft limit value in negative side on Y-axis should be set. (Unit: mm)
	Plus side	Soft limit value in positive side on Y-axis should be set. (Unit: mm)
Z-axis	Minus side	Soft limit value in negative side on Z-axis should be set. (Unit: mm)
	Plus side	Soft limit value in positive side on Z-axis should be set. (Unit: mm)
R-axis	Minus side	Soft limit value in negative side on R-axis should be set. (Unit: deg)
	Plus side	Soft limit value in positive side on R-axis should be set. (Unit: deg)

7.4 Home Back Setting

Set the order to perform home back operation.

1st	<input type="checkbox"/> X	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> Z	<input type="checkbox"/> R
2nd	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> Z	<input checked="" type="checkbox"/> R
3rd	<input type="checkbox"/> X	<input type="checkbox"/> Y	<input type="checkbox"/> Z	<input type="checkbox"/> R
4th	<input type="checkbox"/> X	<input type="checkbox"/> Y	<input type="checkbox"/> Z	<input type="checkbox"/> R

Home-return operation should be conducted in the following procedures.



Remove all the check marks from "1st" to "4th" in case it is not necessary to have the home-return operation performed.

7.5 Cycle Setting

Setting of the way to have a cycle operation should be established.

(1) Count

Item	Contents
Not specify	A cycle should be repeated infinitely.
Specify	A cycle should be executed for the indicated number of times and the program finishes.
Cycle count	Set the number of cycles to be executed.

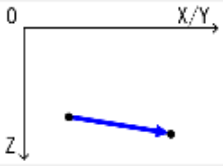
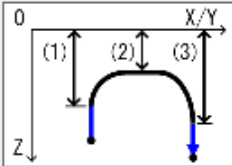
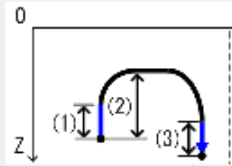
(2) Trigger

Item	Contents
Not specify	A cycle starts as soon as moved to the working home position.
Specify	Waits for the start trigger signal getting input before starting a cycle after moved to the home position.
Port/Flag	Setting of a port / flag number and the signal level used as the start trigger signal should be established. Signal level should be selected from the followings. <ul style="list-style-type: none"> • OFF (Level) • ON (Level) • OFF (Edge) • ON (Edge)

7.6 Movement between Figures Setting

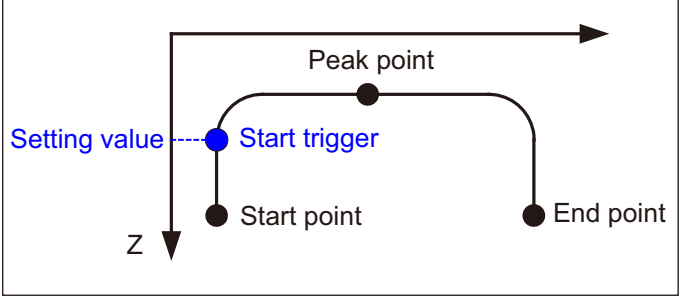
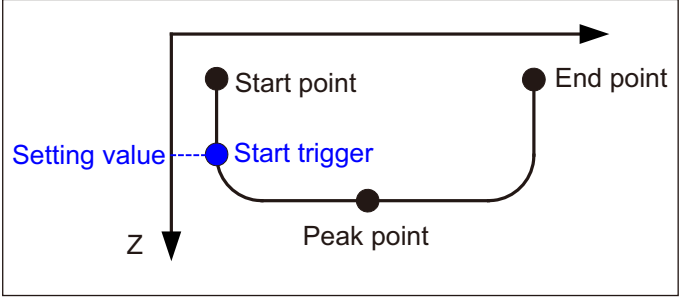
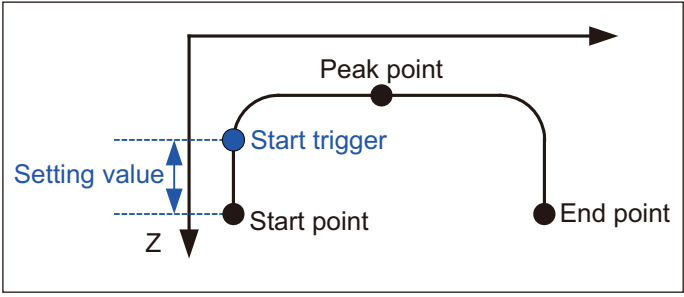
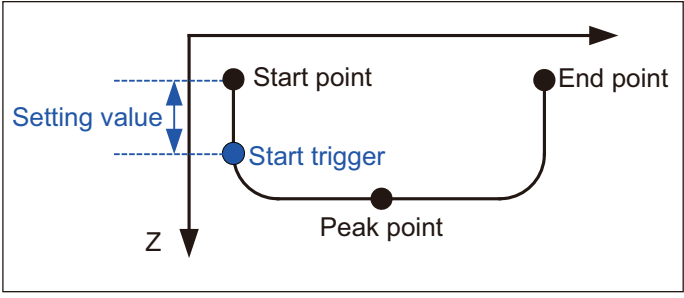
The setting of how to move between figures (from the end point of the previous figure to the start point of the next figure) should be established.

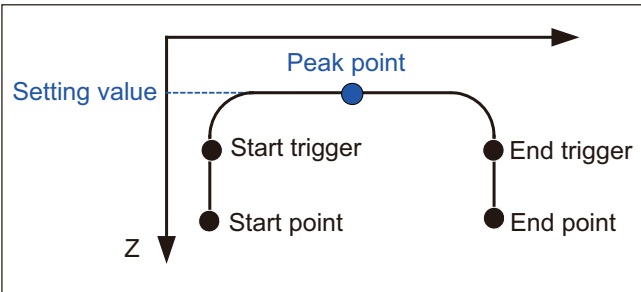
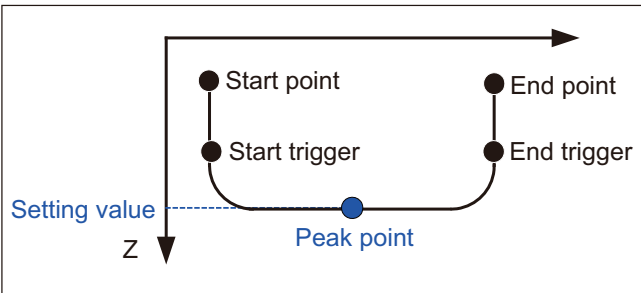
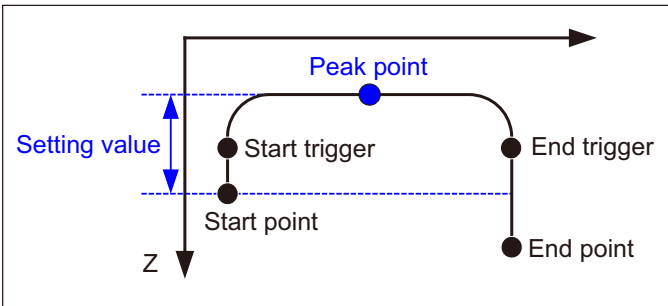
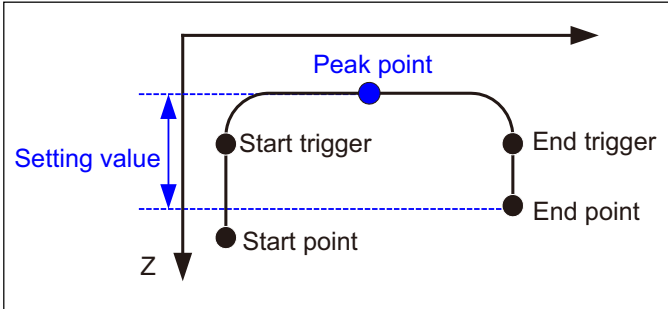
☐ InterpolateMove
 ☒ Absolute coordinates(Arch)
 ☐ Relative coordinates(Arch)

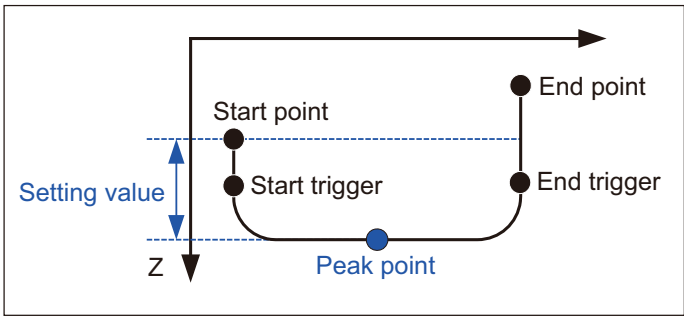
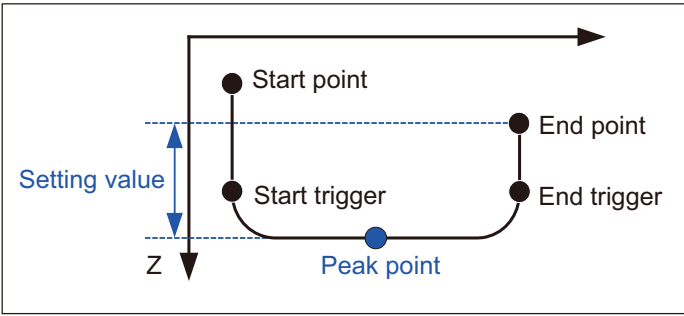
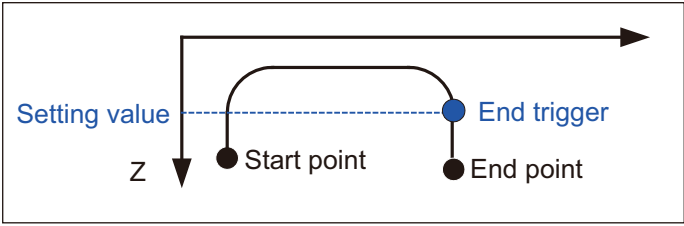
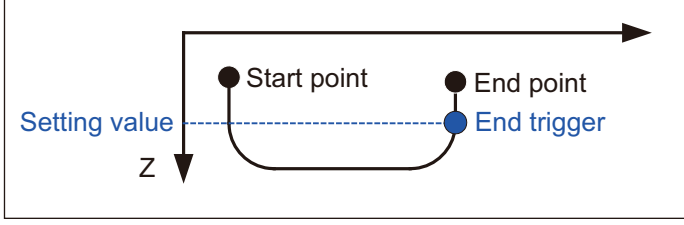




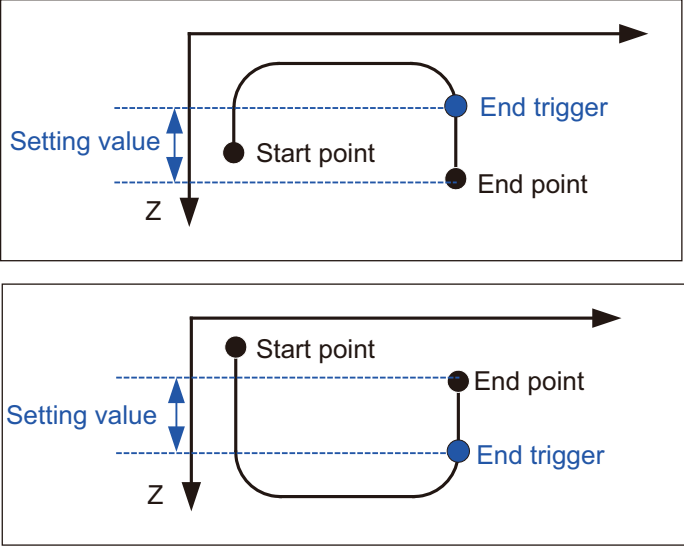
Start trigger z-position mm --- (1)
 Top z-position mm --- (2)
 End trigger z-position mm --- (3)
 Velocity mm/sec
 Acceleration G
 Deceleration G

Item	Contents
Operation Method	Select from those below for how to move. <ul style="list-style-type: none"> Interpolate Move Movement should be made with a linear interpolation motion. Absolute coordinates (Arch) Movement should be made with an arch motion. The start point trigger Z-coordinate, peak point Z-coordinate and end point trigger Z-coordinate should be indicated in the absolute coordinate values. Relative coordinates (Arch) Movement should be made with an arch motion. The start point trigger Z-coordinate, peak point Z-coordinate and end point trigger Z-coordinate should be indicated in the relative coordinate values to the start point and the end point.

Item	Contents
Start trigger z-position	<p>Set the start point trigger Z-coordinate for an arch motion.</p>   <p>For the relative-coordinate indicated arch motion, the result of this setting added to the start point coordinate value should be the start position trigger Z-coordinate.</p> <p>(Note) The relation of the start point and end point trigger positions will be determined by the sign (positive / negative) of the value set in this.</p>  

Item	Contents
Top z-position	<p>Set the peak point Z-coordinate for an arch motion.</p>   <p>For the relative-coordinate indicated arch motion, the result of this setting added to the start point or end point Z-coordinate value should be the peak position Z-coordinate.</p> <p>The coordinate subject to addition will be determined by the relation of positions for the start point and the start point trigger.</p> <ul style="list-style-type: none"> When Start Point Trigger Z-Coordinate < Start Point Z-coordinate; <u>Addition should be conducted to the smaller</u> of Start Point Z-Coordinate and End Point Z-Coordinate  

Item	Contents
Top z-position	<ul style="list-style-type: none"> When Start Point Trigger Z-Coordinate > Start Point Z-coordinate; <u>Addition should be conducted to the larger</u> of Start Point Z-Coordinate and End Point Z-Coordinate  
End trigger z-position	<p>Set the end point trigger Z-coordinate for an arch motion.</p>  

Item	Contents
End trigger z-position	<p>For the relative-coordinate indicated arch motion, the result of this setting added to the end point coordinate value should be the end position trigger Z-coordinate.</p> <p>(Note) The relation of the start point and end point trigger positions will be determined by the sign (positive / negative) of the value set in this.</p> 
Velocity	Set the speed. (Unit: mm/sec)
Acceleration	Set the acceleration. (Unit: G)
Deceleration	Set the deceleration. (Unit: G)

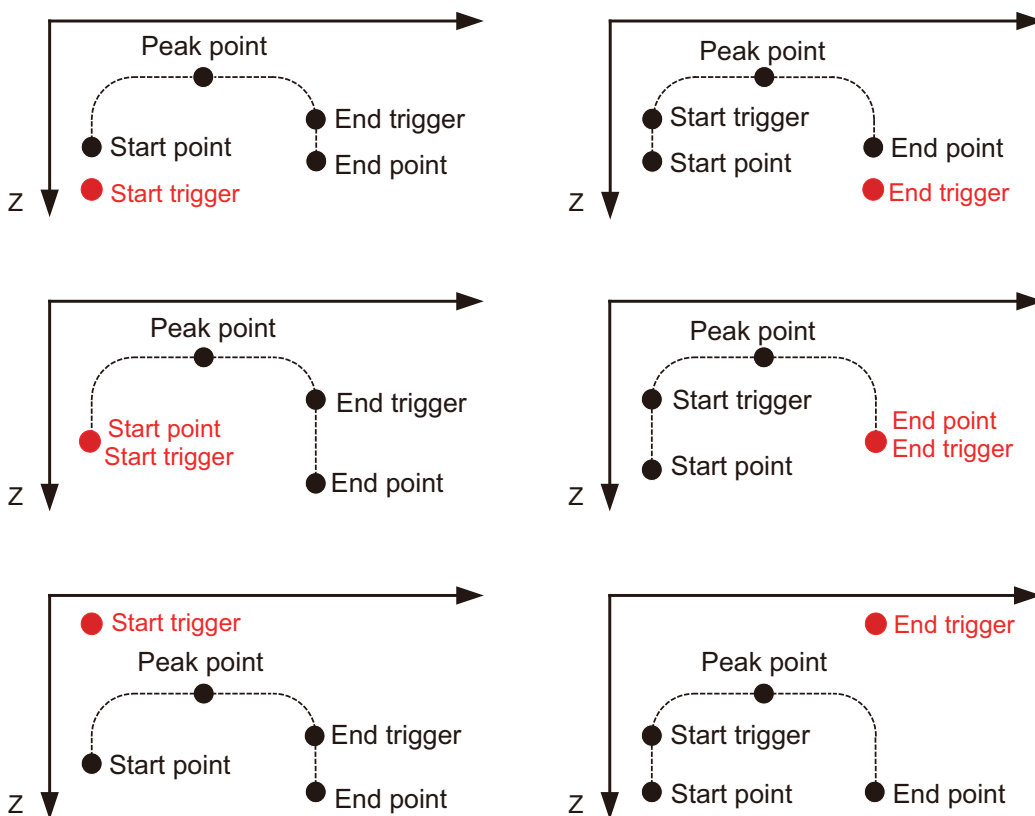


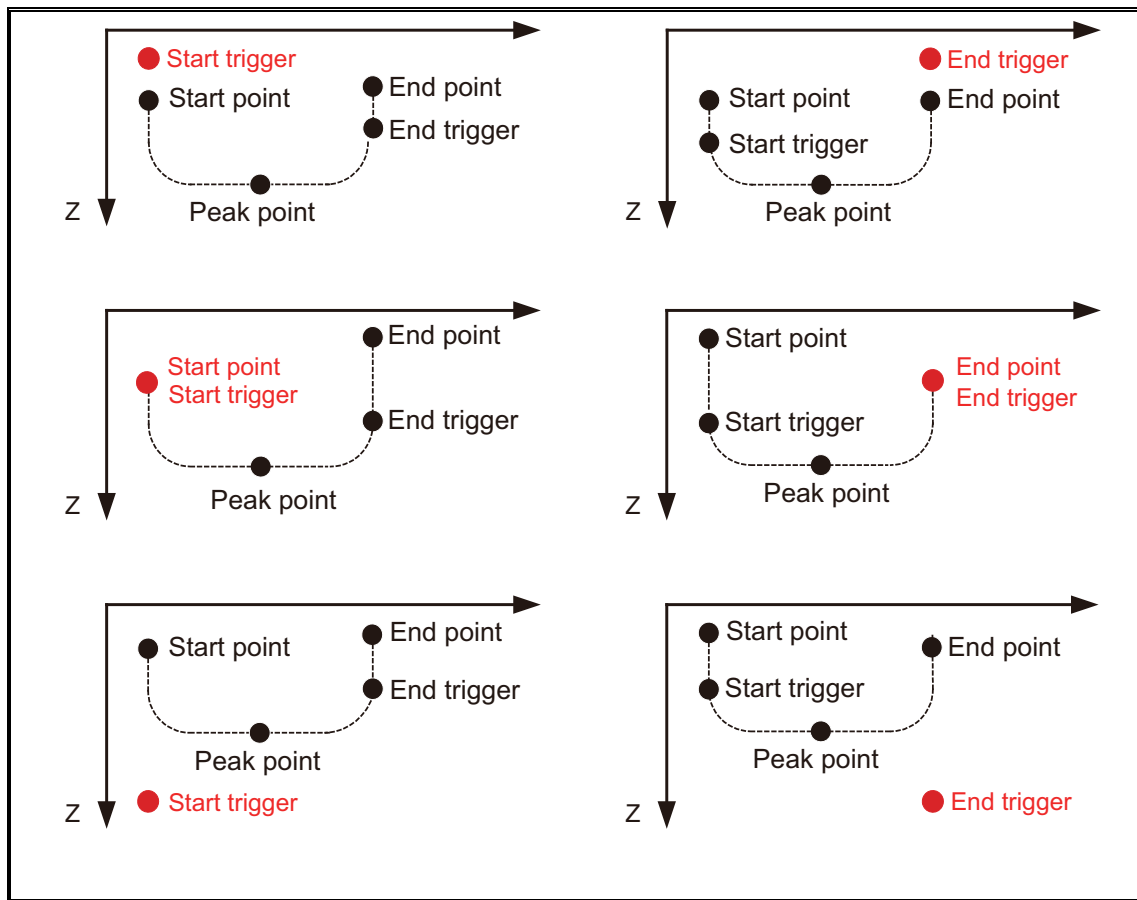
Caution:

Make sure that the following conditions are satisfied for the relation of the positions for “Start point”, “Start trigger” and “Peak point” and for the relation of the positions for “End point”, “End trigger” and “Peak point”.

- For arch motion to coordinate negative direction;
Start point Z-Coordinate < Start trigger Z-Coordinate ≤ Peak point Z-Coordinate
End point Z-Coordinate < End trigger Z-Coordinate ≤ Peak point Z-Coordinate
- For arch motion to coordinate positive direction;
Start point Z-Coordinate > Start trigger Z-Coordinate ≥ Peak point Z-Coordinate
End point Z-Coordinate > End trigger Z-Coordinate ≥ Peak point Z-Coordinate

In case these conditions are not satisfied, an error could occur at execution or an unexpected operation could occur.





7.7 Soldering Setting

Establish the settings related to soldering operation.

- Common Settings
- Iron tip down/up Settings
- Point soldering Settings
- Line soldering Settings
- Iron tip cleaning Settings
- Error monitoring Settings
- Operation after error detection Settings

The screenshot shows the 'Property' dialog box with the 'Soldering' tab selected. The dialog has a title bar with a close button. Below the title bar is a tabbed interface with the following tabs: 'Coordinate system', 'Software limit', 'Home back', 'Cycle', 'Movement between figures', 'Soldering' (selected), 'Interpolate move velocity', and 'Output'. Below the tabs is a sub-tabbed interface with the following sub-tabs: 'Common', 'Iron tip down/up', 'Point soldering', 'Line soldering' (selected), 'Iron tip cleaning', 'Error monitoring', and 'Operation after error detection'. The 'Line soldering' sub-tab contains the following settings:

- Program selection signal:**
 - Output port count: 16
 - Setup time: 0.10 sec
- Port number table:**

Port number	Port number
B0	310
B1	311
B2	312
B3	313
B4	314
B5	315
B6	316
B7	317
B8	318
B9	319
B10	320
B11	321
B12	322
B13	323
B14	324
B15	325
- Ready signal:**
 - Input port number: 0
- Heater power on signal:**
 - ☒ Output
 - Output port number: 326
 - ☐ Turn off after robot program termination

At the bottom right of the dialog are 'OK' and 'Cancel' buttons.

7.7.1 Common Settings

Setting should be established for the input and output signals between a robot controller and a soldering controller.

Program selection signal

Output port count: 16

Setup time: 0.10 sec

Port number	Port number
B0	310
B1	311
B2	312
B3	313
B4	314
B5	315
B6	316
B7	317
B8	318
B9	319
B10	320
B11	321
B12	322
B13	323
B14	324
B15	325

Ready signal

Input port number: 0

Heater power on signal

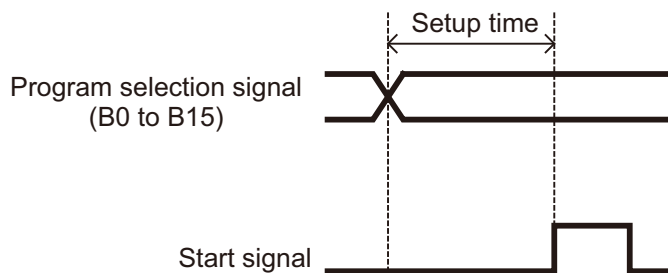
☒ Output

Output port number: 326

☐ Turn off after robot program termination

(1) Program selection signal

Item	Contents
Output port count	Set the number of output ports used as "Program selection signal".
Setup time	Set the duration before outputting the start signal after "Program selection signal" gets output. (Unit: sec)
Port number	Set the output port number for "Program selection signal".



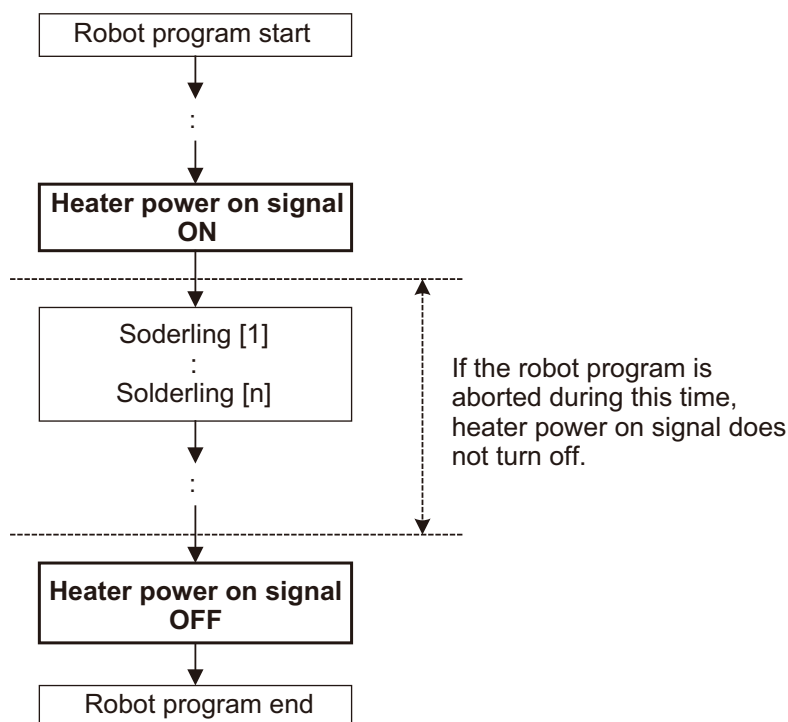
(2) Ready signal

Item	Contents
Input port number	Set the input port number for "Ready signal".

(3) Heater power on signal

Item	Contents
Output	Set if "Heater power on signal" should be controlled in the robot program. If it is set to "Output", the actuator moves to the working home position after the robot program gets started, and turns ON "Heat power on signal".
Output port number	Set the output port number for "Heater power on signal".
Turn off after robot program termination	Set if "Heater power on signal" should be turned OFF when the robot program finishes. ^(Note 1)

Note 1 It could be kept ON in case the robot program gets shut down on the way.



7.7.2 Iron Tip Down/Up Settings

Setting for the iron tip operation to move downwards / upwards by the robot operation should be established.

(1) → ☒ Iron tip is driven in Z motion by robot motion (point-soldering).

(2) → ☒ Iron tip is driven in Z motion by robot motion (line-soldering).

(3) →

Down start / up end position (point-soldering)		
Relative X-position	0.000	mm
Relative Y-position	0.000	mm
Relative Z-position	0.000	mm
Relative R-position	0.000	deg
Velocity	30	mm/sec
Acceleration	0.30	G
Deceleration	0.30	G

(4) →

Down start / up end position (line-soldering)		
Relative X-position	0.000	mm
Relative Y-position	0.000	mm
Relative Z-position	0.000	mm
Relative R-position	0.000	deg
Velocity	30	mm/sec
Acceleration	0.30	G
Deceleration	0.30	G

Down command signal

Input port number: 0

Before down movement wait time: 0.00 sec

Before up movement wait time: 0.00 sec

Down movement completion signal

☒ Output

Output port number: 310

Up movement completion signal

☒ Output

Output port number: 311

- (1) Iron tip is driven in Z motion by robot motion (point-soldering).

Establish the setting whether to have the iron tip go downwards / upwards or not when having a spot soldering conducted.

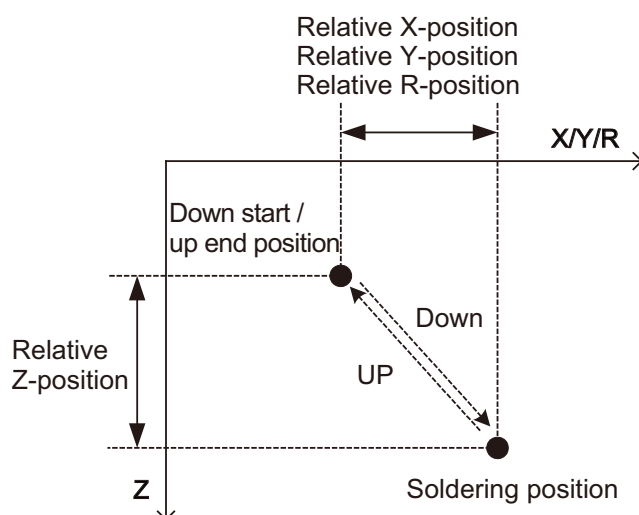
- (2) Iron tip is driven in Z motion by robot motion (line-soldering).

Establish the setting whether to have the iron tip go downwards / upwards or not when having a line soldering conducted.

(3) Down start / up end position (point-soldering)

Item	Contents
Relative X-position	The setting of the relative coordinate to the X-coordinate of the soldering position should be established. (Unit: mm)
Relative Y-position	The setting of the relative coordinate to the Y-coordinate of the soldering position should be established. (Unit: mm)
Relative Z-position	The setting of the relative coordinate to the Z-coordinate of the soldering position should be established. (Unit: mm)
Relative R-position	The setting of the relative coordinate to the R-coordinate of the soldering position should be established. (Unit: deg)
Velocity	The setting of velocity for iron tip to go downwards / upwards. (Unit: mm/sec)
Acceleration	The setting of acceleration for iron tip to go downwards / upwards. (Unit: G)
Deceleration	The setting of deceleration for iron tip to go downwards / upwards. (Unit: G)

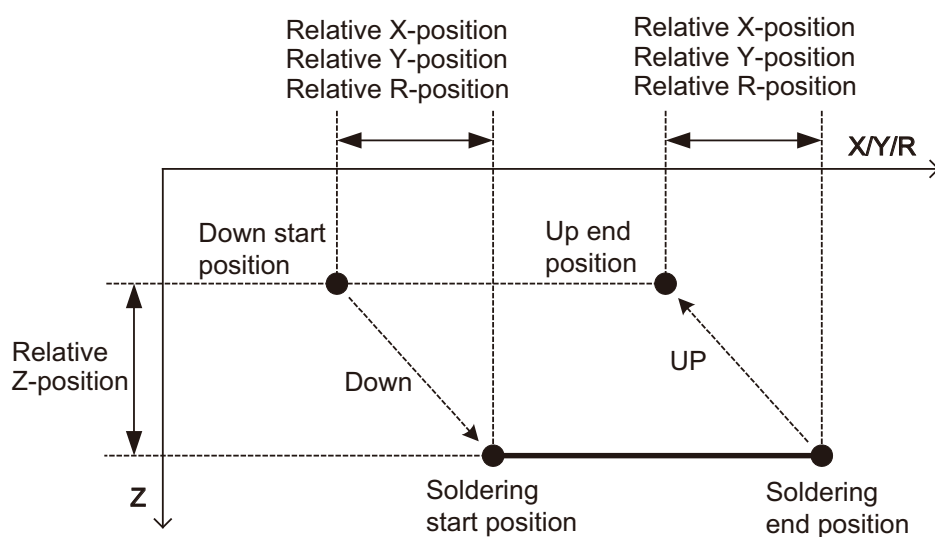
Position for Start to Go Downward / Finish to Go Upward in Spot Soldering



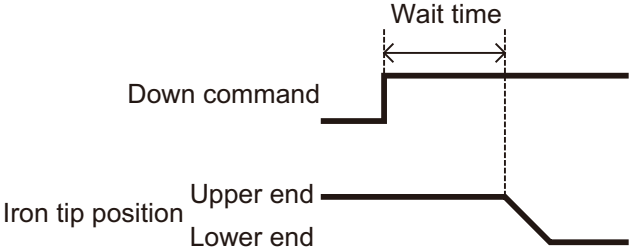
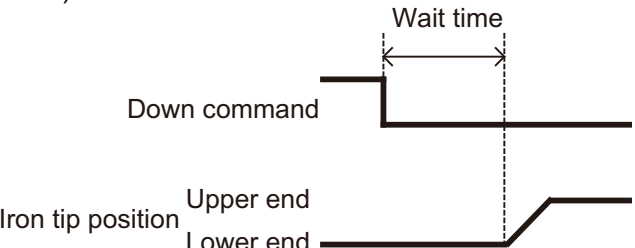
(4) Down start / up end position (line-soldering)

Item	Contents
Relative X-position	The setting of the relative coordinate to the X-coordinate of the start position / finish position of soldering work should be established. (Unit: mm)
Relative Y-position	The setting of the relative coordinate to the Y-coordinate of the start position / finish position of soldering work should be established. (Unit: mm)
Relative Z-position	The setting of the relative coordinate to the Z-coordinate of the start position / finish position of soldering work should be established. (Unit: mm)
Relative R-position	The setting of the relative coordinate to the R-coordinate of the start position / finish position of soldering work should be established. (Unit: deg)
Velocity	The setting of velocity for iron tip to go downwards / upwards. (Unit: mm/sec)
Acceleration	The setting of acceleration for iron tip to go downwards / upwards. (Unit: G)
Deceleration	The setting of deceleration for iron tip to go downwards / upwards. (Unit: G)

Position for Start to Go Downward / Finish to Go Upward in line Soldering



(5) Down command signal

Item	Contents
Input port number	Set the input port number for "Down command signal".
Before down movement wait time	<p>The standby time setting before starting to go downward after "Down command signal" turns ON should be established. (Unit: sec)</p> 
Before up movement wait time	<p>The standby time setting before starting to go upward after "Down command signal" turns OFF should be established. (Unit: sec)</p> 

(6) Down movement completion signal

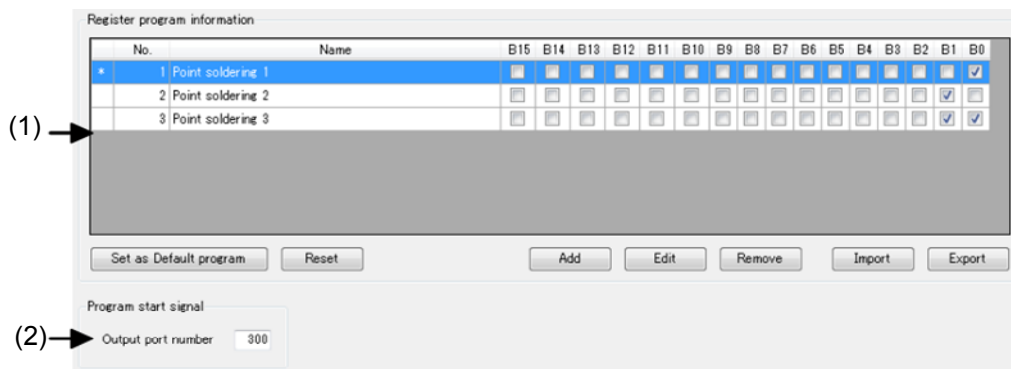
Item	Contents
Output	Setting should be established to determine if "Down movement completion signal" gets output when the movement of the iron tip downwards is finished.
Output port number	Set the output port number for "Down movement completion signal".

(7) Up movement completion signal

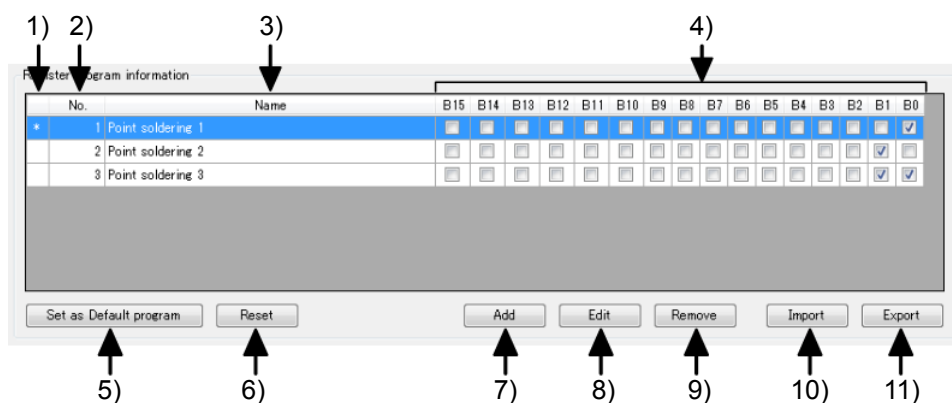
Item	Contents
Output	Setting should be established to determine if "Up movement completion signal" gets output when the movement of the iron tip upwards is finished.
Output port number	Set the output port number for "Up movement completion signal".

7.7.3 Point Soldering Settings

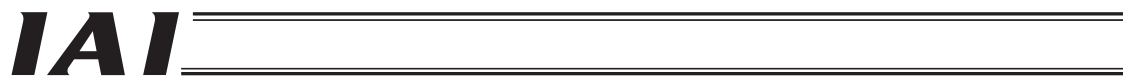
Settings should be established for the spot soldering program select signal and the start signal.



(1) Register program information



No.	Contents
1)	“*” should be displayed when it is set as the initial value in drawing.
2)	Program number should be displayed.
3)	Program name should be displayed.
4)	The output setting ON/OFF of “Program Select Signal” (B0 to B15) should be displayed.
5)	The program in the line pointed with the cursor should be set as the initial setting for the new drawing.
6)	Initial setting for the new drawing should be cancelled.
7)	Program information should be registered additionally. For how to register, refer to [8. Soldering Program Information Setting].
8)	The program information in the line pointed with the cursor should be edited. For how to edit, refer to [8. Soldering Program Information Setting].
9)	The program information in the line pointed with the cursor should be deleted.
10)	The program information should be read in from a file.
11)	The program information should be output to a file.

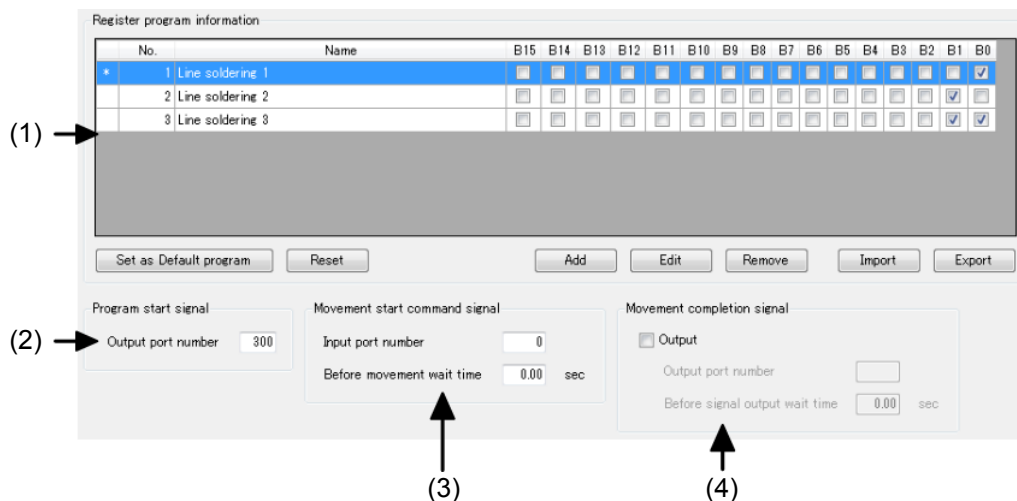


(2) Program start signal

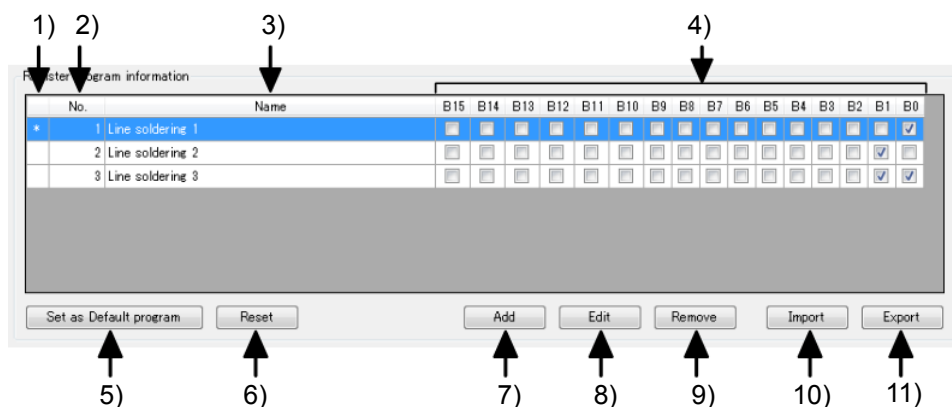
Item	Contents
Output port number	Set the output port number for “Program start signal”.

7.7.4 Line Soldering Settings

Settings should be established for the line soldering program select signal and the start signal.



(1) Register program information



No.	Contents
1)	"*" should be displayed when it is set as the initial value in drawing.
2)	Program number should be displayed.
3)	Program name should be displayed.
4)	The output setting ON/OFF of "Program Select Signal" (B0 to B15) should be displayed.
5)	The program in the line pointed with the cursor should be set as the initial setting for the new drawing.
6)	Initial setting for the new drawing should be cancelled.
7)	Program information should be registered additionally. For how to register, refer to [8. Soldering Program Information Setting].
8)	The program information in the line pointed with the cursor should be edited. For how to edit, refer to [8. Soldering Program Information Setting].
9)	The program information in the line pointed with the cursor should be deleted.
10)	The program information should be read in from a file.
11)	The program information should be output to a file.

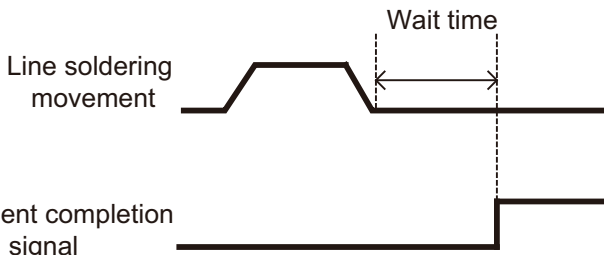
(2) Program start signal

Item	Contents
Output port number	Set the output port number for the program start signal.

(3) Movement start command signal

Item	Contents
Input port number	Set the input port number for the movement start command signal.
Before movement wait time	The standby time setting before starting to move after the movement start command signal turns ON should be established. (Unit: sec)

(4) Movement completion signal

Item	Contents
Output	Setting should be established to determine if the movement complete signal gets output when the movement is finished.
Output port number	Set the output port number for the movement complete signal.
Before signal output wait time	<p>The standby time setting before outputting (turning ON) the movement complete signal after the movement start is finished should be established. (Unit: sec)</p>  <p>The diagram illustrates the timing relationship between a movement pulse and the resulting completion signal. The top trace, labeled 'Line soldering movement', shows a pulse that rises, stays high for a duration, and then falls. The bottom trace, labeled 'Movement completion signal', shows a step function that transitions from low to high. A horizontal double-headed arrow labeled 'Wait time' indicates the interval between the falling edge of the movement pulse and the rising edge of the completion signal.</p>

7.7.5 Iron Tip Cleaning Settings

Iron tip cleaning operation setting should be edited.

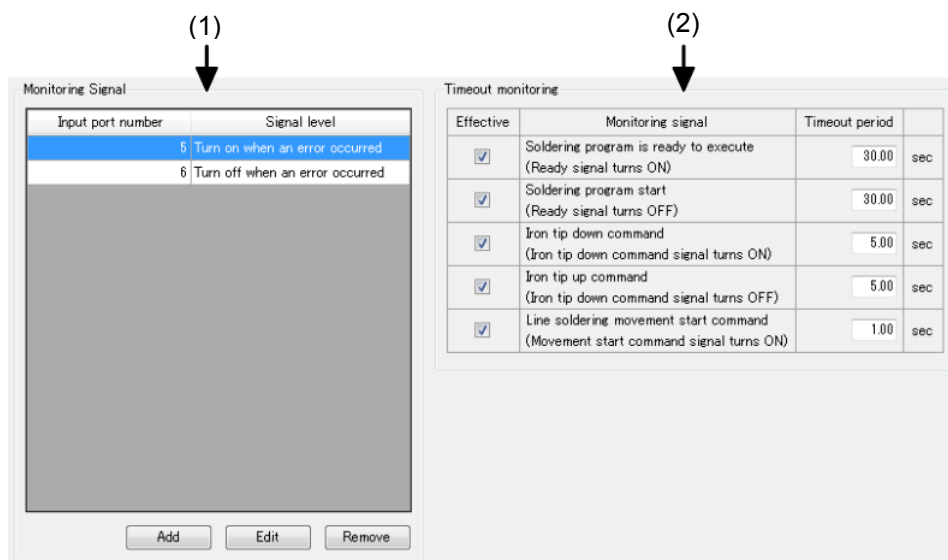
	Name
Cleaning 1	Cleaning 1
Cleaning 2	Cleaning 2
Cleaning 3	Cleaning 3
Cleaning 4	(Undefined)
Cleaning 5	(Undefined)
Cleaning 6	(Undefined)
Cleaning 7	(Undefined)
Cleaning 8	(Undefined)
Cleaning 9	(Undefined)
Cleaning 10	(Undefined)
Cleaning 11	(Undefined)
Cleaning 12	(Undefined)
Cleaning 13	(Undefined)
Cleaning 14	(Undefined)
Cleaning 15	(Undefined)
Cleaning 16	Cleaning 16

Buttons: Edit, Clear

No.	Contents
1)	Cleaning number should be displayed.
2)	Cleaning name should be displayed.
3)	The cleaning operation in the line pointed with the cursor can be edited. For how to edit, refer to [9. Iron Tip Cleaning Operation Setting].
4)	The cleaning operation in the line pointed with the cursor can be cleared.

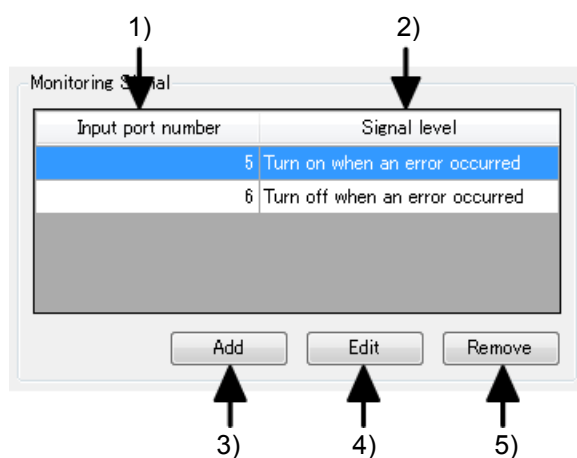
7.7.6 Error Monitoring Settings

Setting for errors to be monitored should be established.



(1) Monitoring Signal

Register the error signals to be monitored.



No.	Contents
1)	The input port number of the error signal gets displayed.
2)	Signal level of the error signal gets displayed.
3)	Error signal to be monitored can be added.
4)	The error signal in the line pointed with the cursor can be edited.
5)	The error signal in the line pointed with the cursor can be deleted.

(2) Timeout monitoring

Put a check mark on an item to monitor the timeout, and set the timeout period (0.01 to 99.00sec).

7.7.7 Operation after Error Detection Settings

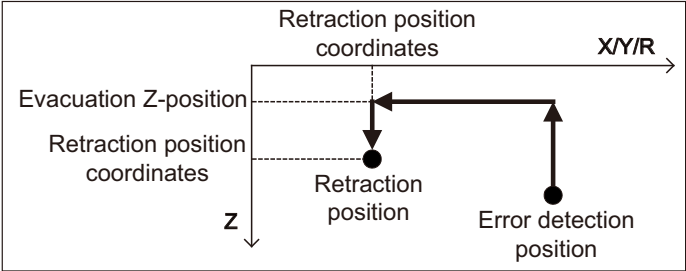
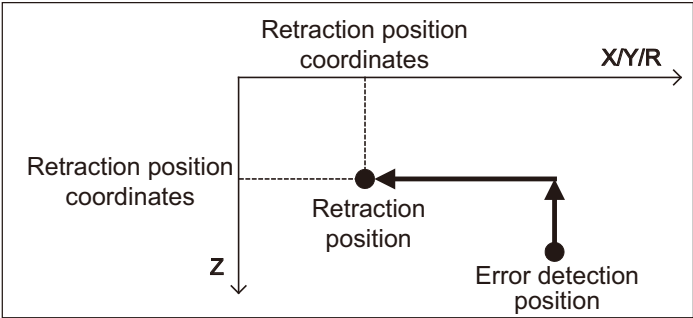
Setting should be established for when an error is detected.

The screenshot shows the following settings:

- (1) Retraction position:**
 - ☒ Move to the retraction position
 - X-position: 0.000 mm
 - Y-position: 0.000 mm
 - Z-position: 10.000 mm
 - R-position: 0.000 deg
 - Velocity: 30 mm/sec
 - Acceleration: 0.30 G
 - Deceleration: 0.30 G
 - Evacuation z-position: 0.000 mm
- (2) Error detection signal:**
 - ☒ Output soldering unit error detection signal
 - Output port number: 310
 - ☒ Output timeout error detection signal
 - Output port number: 311
- (3) Program end/resume setting after soldering unit error detection:**
 - ☒ Program end
 - ☐ Resume next
- (4) Program end/resume trigger signal:**
 - Input port number: 10
 - On edge
- (5) Reset signal:**
 - ☒ Output
 - Output port number: 312
 - Pulse width: 0.10 sec

(1) Retraction position

Item	Contents
Move to the retraction position	Setting should be established to determine if to move to the evacuation point and wait.
X-position	Set the X-coordinate of the evacuation point. (Unit: mm) If it is not set (left blank), evacuation motion in X-axis will not be conducted.
Y-position	Set the Y-coordinate of the evacuation point. (Unit: mm) If it is not set (left blank), evacuation motion in Y-axis will not be conducted.
Z-position	Set the Z-coordinate of the evacuation point. (Unit: mm) It is mandatory to set this up when Z-axis is activated and it is necessary to have a movement to the evacuation point.
R-position	Set the R-coordinate of the evacuation point. (Unit: deg) If it is not set (left blank), evacuation motion in R-axis will not be conducted.
Velocity	Setting of the evacuation motion velocity should be established. (Unit: mm/sec)
Acceleration	Setting of the evacuation motion acceleration should be established. (Unit: G)
Deceleration	Setting of the evacuation motion deceleration should be established. (Unit: G)

Item	Contents
Evacuation z-position	<p>Set up the Z-coordinate at evacuation motion. (Unit: mm)</p> <p>If the setting the evacuation motion Z-coordinate is established, the Z-axis moves in the evacuation motion Z-coordinate first and then X-axis/Y-axis/R-axis move to the evacuation points. After that, Z-axis moves to the evacuation point.</p> <p>This item should be invalid (not available for setting) in case no evacuation motion is required for the axes other than the Z-axis (X-axis/Y-axis/R-axis).</p> <p>[Evacuation Motion When Setting Evacuation Motion Z-Coordinate]</p>  <p>[Evacuation Motion When Not Setting Evacuation Motion Z-Coordinate]</p> 

(2) Error detection signal

Item	Contents
Output soldering unit error detection signal	<p>Select if an external notification signal gets output when a soldering unit error was detected.</p> <p>It should be output after movement is finished if evaluation motion is set activated.</p>
Output port number	<p>Set the output port number for the soldering unit error detection signal.</p>
Output timeout error detection signal	<p>Select if an external notification signal gets output when a timeout error was detected.</p> <p>It should be output after movement is finished if evaluation motion is set activated.</p>
Output port number	<p>Set the output port number for the timeout error detection signal.</p>

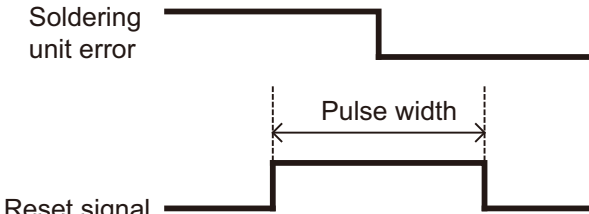
(3) Program end/resume setting after soldering unit error detection

Item	Contents
Program end	The actuator moves back to the working home position and the robot program completes.
Resume next	<p>Operation should be resumed from the next figure. However, in case of an error detection in which the movement was made to the evacuation point, it will move ^(Note 2) to the end position of a figure that the error was detected ^(Note 1), and then makes an operation to the next figure.</p> <p>Note 1 If the movement of the iron tip to go downward / upward is to be conducted with the robot operation, it will move to the upward complete position.</p> <p>Note 2 Movement will be made with the same velocity / acceleration / deceleration as those in the evacuation motion.</p>

(4) Program end/resume trigger signal

Item	Contents
Input port number	<p>Set the input port number and signal level of the finish / resume trigger signal.</p> <p>Signal level should be selected from the following.</p> <ul style="list-style-type: none"> • Off level • On level • Off edge • On edge

(5) Reset signal

Item	Contents
Output	Set if the reset signal (ON-pulse) gets output in order to reset an error on the soldering unit.
Output port number	Set the output port number for the reset signal.
Pulse width	<p>Set the pulse band width (ON-time) of the reset signal. (Unit: sec)</p>  <p>The diagram illustrates the timing of the reset signal. It shows two horizontal timelines. The top timeline, labeled 'Soldering unit error', starts at a high level and transitions to a low level. The bottom timeline, labeled 'Reset signal', starts at a low level and transitions to a high level. A horizontal double-headed arrow labeled 'Pulse width' indicates the duration of the high pulse on the reset signal timeline, which is aligned with the duration of the error on the soldering unit error timeline.</p>

7.8 Interpolate Move Velocity Setting

The setting of the velocity / acceleration / deceleration for the interpolation motion (movement between start point and end point on a line) should be established.

Velocity	<input type="text" value="100"/>	mm/sec
Acceleration	<input type="text" value="0.30"/>	G
Deceleration	<input type="text" value="0.30"/>	G

Item	Contents
Velocity	Set the velocity for the interpolation motion. (Unit: mm/sec)
Acceleration	Set the acceleration for the interpolation motion. (Unit: G)
Deceleration	Set the deceleration for the interpolation motion. (Unit: G)

7.9 Output Setting

Settings related to the output data when SEL program / position data get generated should be established.

Position No.	<input type="text" value="1"/>
--------------	--------------------------------

Item	Contents
Position No.	Set the top position number.

7.10 Simulation

Settings should be established regarding simulation.

(1) Parameter

Controller parameters in simulation should be set up. It is available establish the setting by reading in values from another project file or controller parameter file by using the import button.

- * In case the parameter setting values differ from the actual device, dispersion in simulation for the cycle time and operation track may get large.

Property

Coordinate system | Software limit | Home back | Cycle | Movement between figures | Soldering | Interpolate move velocity | Output | **Simulation**

Parameter | Track data

Common to All Axes Parameters

No.	Name	Value	Unit
22	Acceleration max	999	0.01G
23	Deceleration max	999	0.01G

Axis-Specific Parameters

No.	Name	X-axis	Y-axis	Z-axis	R-axis	Unit
6	Select act direction	1	1	1	1	
28	Max speed axis	3000	3000	3000	3000	mm/sec, deg/sec
42	Encoder resolution	131072	131072	131072	131072	pulse/rev
43	Rate of encoder dividing frequency	3	3	3	3	
44	Measure revise	0	0	0	0	0.001mm/1M
47	Screw lead	16000	16000	6000	360000	0.001mm
50	Gear ratio numerator	1	1	20	16	
51	Gear ratio denominator	1	1	24	96	
60	Position gain	30	30	30	30	/s
66	Rotation move axis mode select	0	0	0	0	
67	Rotation move axis short-cut select	0	0	0	0	

Import

OK Cancel

[Details of Common to All Axes Parameters Contents]

No.	Parameter Name	Input Range	Unit	Remarks
22	Acceleration max	1 to 999	0.01G	
23	Deceleration max	1 to 999	0.01G	

[Details of Axis-Specific Parameters Contents]

No.	Parameter Name	Input Range	Unit	Remarks
6	Select act direction	0 to 1		Do not attempt to change the initial values or the values in the parameter file.
28	Max speed axis	1 to 3000	mm/s	
42	Encoder resolution	800, 131072	pulse/rev	Set it to 800 in incremental and to 131072 in battery-less absolute.
43	Rate of encoder dividing frequency	0, 2 to 5		Set it to 0 in incremental, to 4 in battery-less absolute and pulse motor at the same time and to 3 in battery-less absolute and AC servomotor at the same time.
44	Measure revise	-99999999 to 99999999	0.001mm/1M	It changes coordinates in proportion. Valid only for linear drive axes
47	Screw lead	1 to 99999999	0.001mm	Make sure to establish the setting to satisfy "Lead Described in Catalog or Instruction Manual" = "Screw Lead" × "Numerator of Gear Ratio" / "Denominator of Gear Ratio" for X, Y and Z-axes. *
50	Gear ratio numerator	1 to 99999999		Do not attempt to change the initial value or the values in the parameter file for R-axis.
51	Gear ratio denominator	1 to 99999999		
60	Position gain	1 to 9999	/s	Set it to 50 for pulse motor type TTA and to 30 for servomotor type TTA.
66	Rotation move axis mode select	0 to 5		0: Normal Mode, 1: Index Mode
67	Rotation move axis short-cur select	0 to 5		0: Not Selected, 1: Selected (Valid only in index mode and INC encoder at the same time)

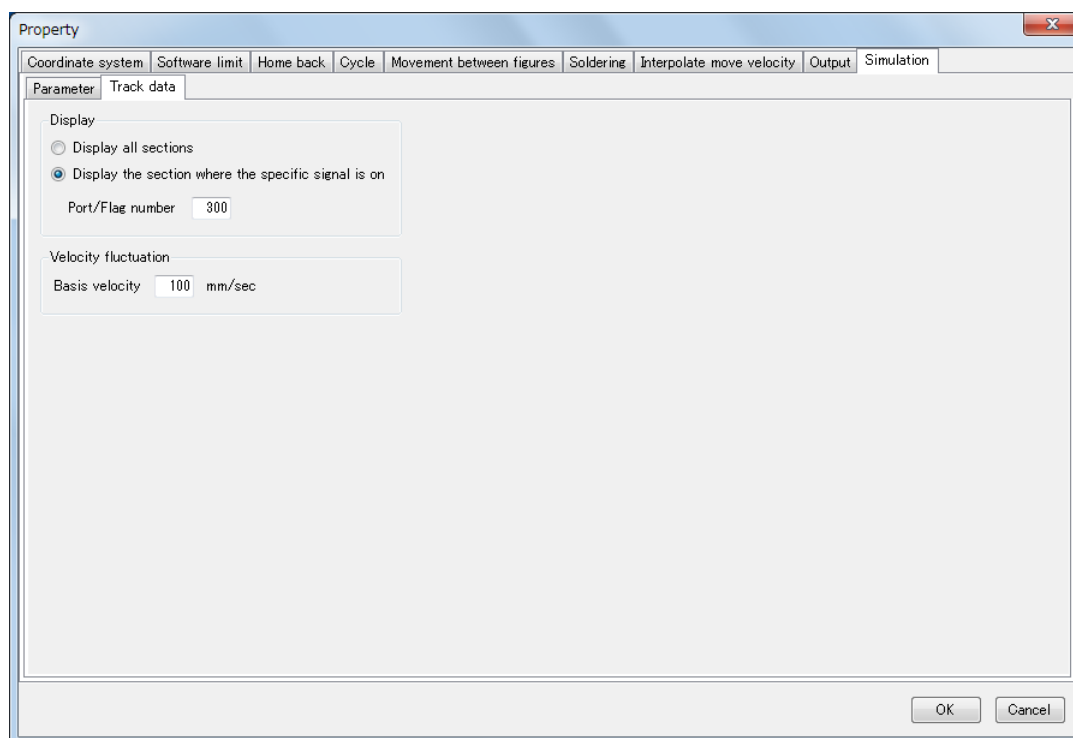
* Example of Setting for Axis-Specific Parameters 47, 50 and 51

Lead [mm]	Axis-Specific Parameter Setting Value		
	47	50	51
24 or equivalent	16000	36	24
16	16000	1	1
3	3000	1	1

(2) Track data

Display settings for the operation track in simulation should be established.

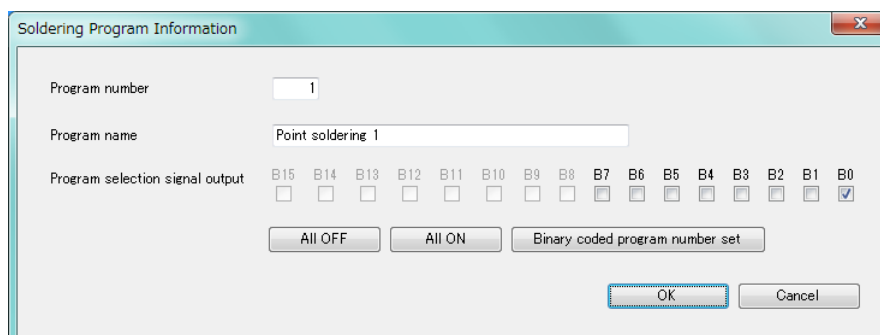
- Display
Select either “Display all sections” or “Display the section where the specific signal is on”. It is required to set a signal to be specified in the Port/Flag number box when “Display the section where the specific signal is on” is selected.
- Velocity fluctuation
It is necessary to establish the standard velocity when you would like to change the track line thickness in response to the operation velocity. (Unit: mm/sec)
The operation track should be shown thin in the area faster than the standard while the track shown thick in the area slower than the standard.
The track line should be shown in constant width when the parameter is set to “0”.



* The settings above should be reflected only to the simulation track display (not to the track display in the actual device servo monitor data).

8. Soldering Program Information Setting

Set up the soldering program information in “Soldering Program Information Setting Window”.



(1) Program number

Set the program number registered in the soldering controller.
(Settable Range: 0 to 65535)

(2) Program name

Set a name to the program. (Settable Range: Character string with size from 0 to 32 bytes)
The program name should be displayed in the soldering program number select list in “Drawing Information Edit Window”.
(Refer to [11.13.4 Soldering Setting] for more details.)

(3) Program selection signal output

Set the program selection signal (B0 to B15) output required at program setup.
(OFF: Remove check mark, ON: Put check mark)

All OFF Button

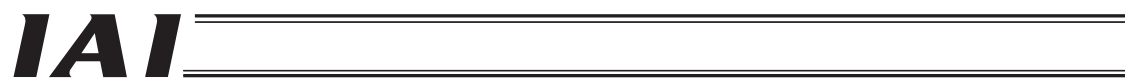
It turns OFF from B0 to B15.

All ON Button

It turns ON from B0 to B15.

Binary coded program number set Button

It outputs a program number in binary numbers to the signals from B0 to B15.



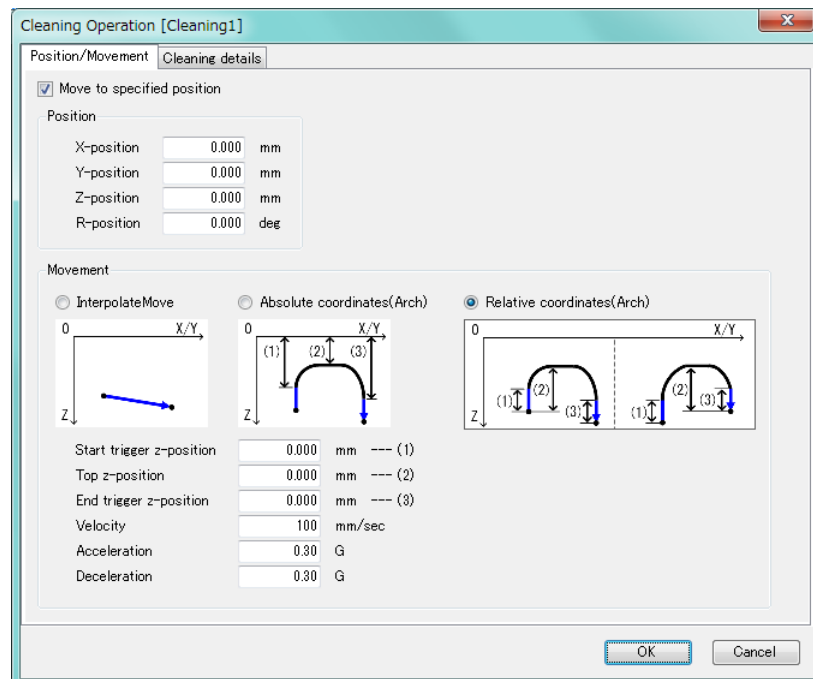
9. Iron Tip Cleaning Operation Setting

Set the followings related to iron tip cleaning actions in “Iron Tip Cleaning Operation Setting Window”.

- Position/Movement
- Cleaning details

9.1 Position/Movement

Set the position to conduct cleaning and set the moving way.



(1) Move to specified position

Set whether to indicate the cleaning position.

- Put check mark
The iron tip moves to the indicated position and conducts cleaning.
- Remove check mark
Cleaning should be conducted at the spot (current position).

(2) Position

Set the position to conduct cleaning.

- 1) X-position
Set the X-axis. (Unit: mm)
- 2) Y-position
Set the Y-axis. (Unit: mm)
- 3) Z-position (when three or more axes)
Set the Z-axis. (Unit: mm)
- 4) R-position (when four or more axes)
Set the R-axis. (Unit: deg)

(3) Movement

Set the way to move to the cleaning position.

The contents of settings are the same as those in the movement setting between figures in the project property.

Refer to [7.6 Movement between Figures Setting] for more details.

9.2 Cleaning Details

Set the cleaning method / standby time before and after cleaning / name.

(1) Method

Select a cleaning method from those below.

(A) Execute cleaning program

Cleaning should be conducted with the cleaning program registered in the soldering controller.

1) Start signal

Set the output port number for the start signal.

2) Program selection signal

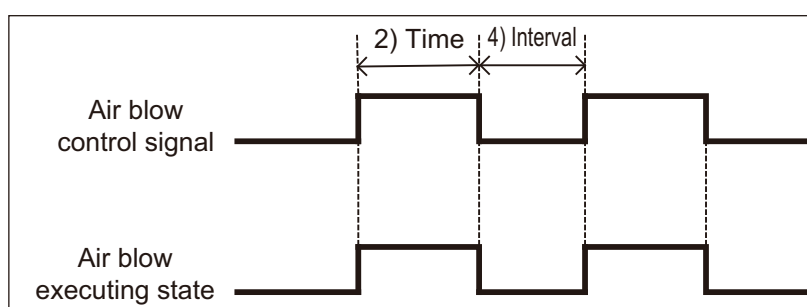
When it is necessary to output the program selection signal, put a check mark at "Output program selection signal" and establish the settings in B0 to B15.

(B) Air blow

Air blow should be controlled with the output of the robot controller.

Turn the output ON and the air blow starts while OFF to finish the air blow.

- 1) Control signal output port number
Set the output port number to control the air blow.
- 2) Time
Set the period of time to conduct air blow.
(Unit: sec, Settable Range: 0.01 to 99.00sec)
- 3) Repeat
Set the number of times to conduct air blow.
(Unit: times, Settable Range: 1 to 99,999,999times)
- 4) Interval
Set the interval time in case air blow is to be conducted two times or more.
(Unit: sec, Settable Range: 0.01 to 99.00sec)



(C) Other

Select a content to execute from those below.

- 1) Do nothing
- 2) Turn the output port OFF
- 3) Turn the output port ON
- 4) Wait till the input port turns OFF
- 5) Wait till the input port turns ON

Select an option other than 1), and the setting of the applicable output port number / input port number should be established.

(2) Wait time

Set the standby time before and after cleaning.

- 1) Before cleaning wait time
Set the standby time before cleaning.
(Unit: sec, Settable Range: 0.00 to 99.00sec)
- 2) After cleaning wait time
Set the standby time after cleaning.
(Unit: sec, Settable Range: 0.00 to 99.00sec)

(3) Name

Set a name. (Settable Range: Character string with size from 0 to 32 bytes)

10. Draw Figures

Create drawing in one of the ways below.

- Reading figures in from CAD data
- Creating figures with mouse operation

10.1 Reading Figures in from CAD Data

Figures (points / lines) necessary for work can be read in from the CAD data in work.

10.1.1 CAD Data Format Available for Reading

The CAD data format available to read in is as shown below.

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

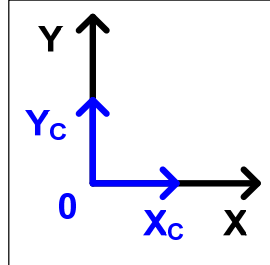
10.1.2 Types of Figures Available for Reading

The figure available to read in is as shown below.

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

10.1.3 Relation of CAD Drawing Coordinates and Working Area Coordinates

The relation of the CAD drawing coordinates X_c , Y_c and the working area coordinates X , Y are as shown below.



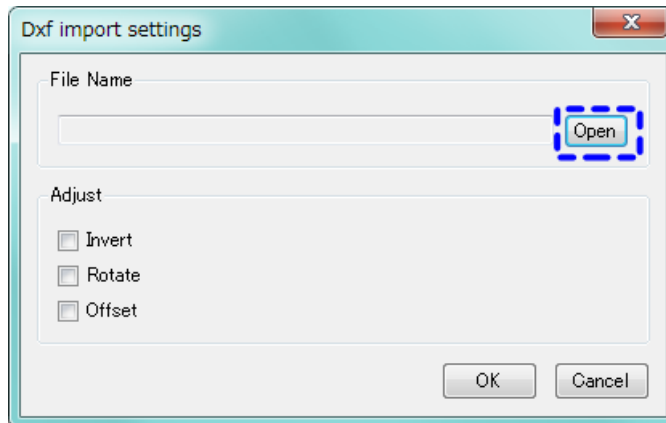
The orientation of the CAD drawing should change in relation to the coordinate orientation of the working area.

Coordinate Operation of Working Area: TYPE 1	Coordinate Operation of Working Area: TYPE 2
Coordinate Operation of Working Area: TYPE 3	Coordinate Operation of Working Area: TYPE 4
Coordinate Operation of Working Area: TYPE 5	Coordinate Operation of Working Area: TYPE 6
Coordinate Operation of Working Area: TYPE 7	Coordinate Operation of Working Area: TYPE 8

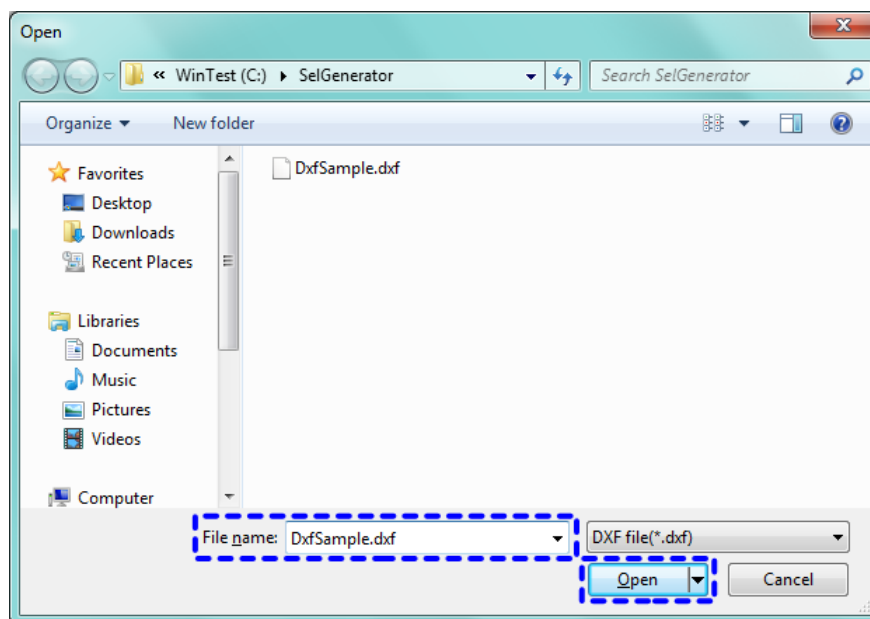
10.1.4 Read the DXF Data

In order to read the DXF data, follow the procedure below.

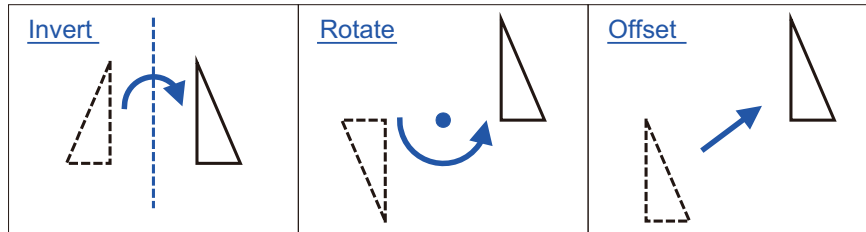
- (1) Prepare a DXF data for work drawing.
- (2) Execute [File (F)] - [Dxf data (D)] - [Read (R)] from the menu bar.
- (3) Click on **Open** button in “Dxf import settings” window.



- (4) Select a file name of the DXF data, and click on **Open** button.

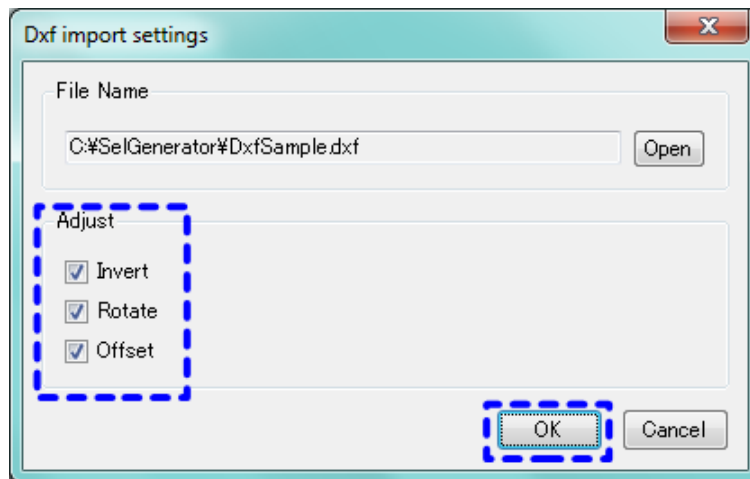


- (5) In order to adjust the relation between the coordinates (0, 0) (= tool tip position) of the working area and the work position, operate the figures that was read in to “Invert”, “Rotate” and “Offset”.



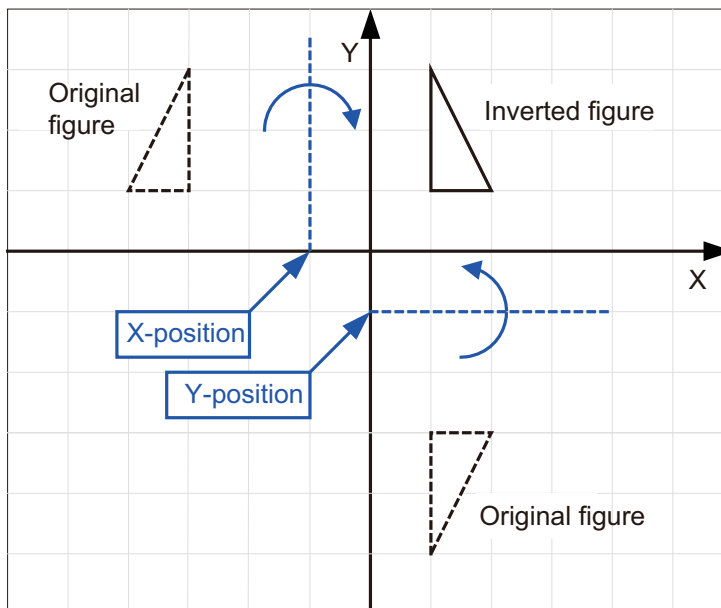
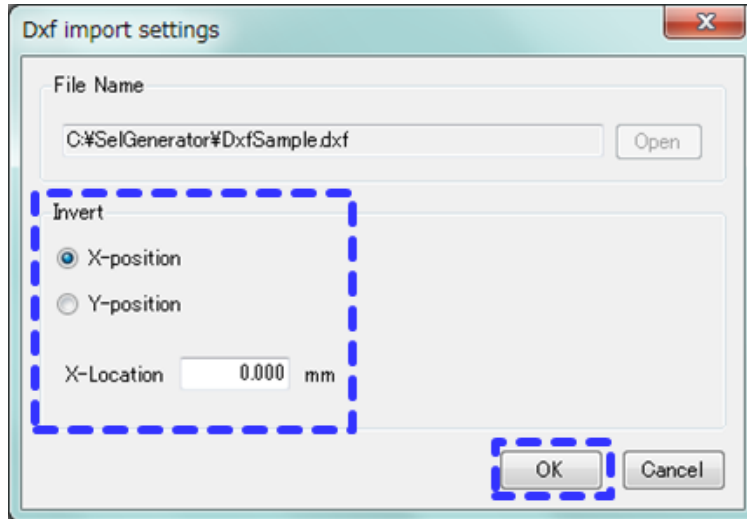
Select an item to execute, and click on **OK** button.

(Note) If multiple items are selected, the coordinates should be converted in the order of “Invert” ⇒ “Rotate” ⇒ “Offset”.



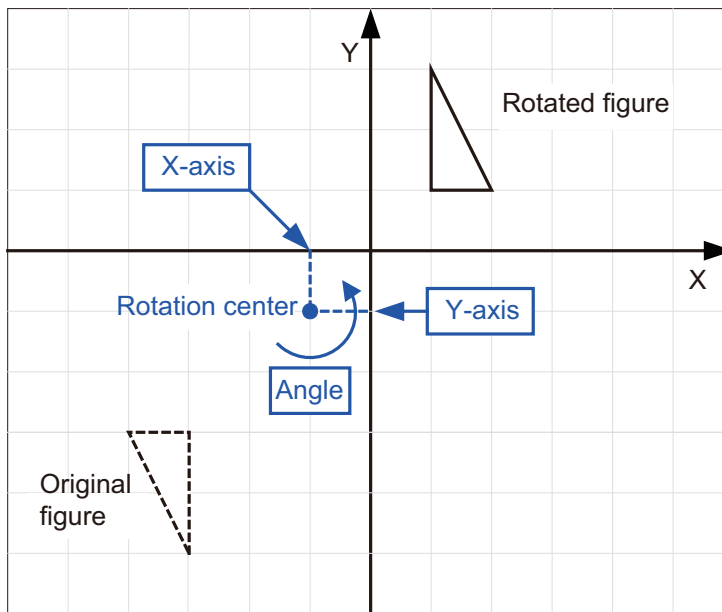
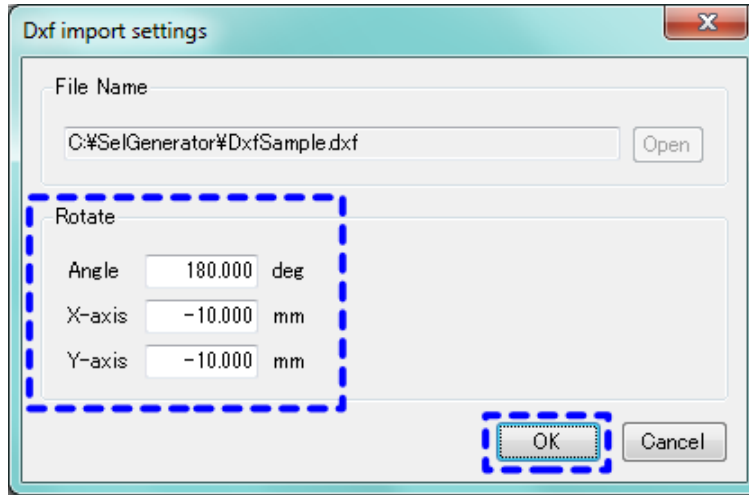
- (6) Set the datum coordinate for inversion and click on **OK** button.

[If “Invert” is selected in (5)]



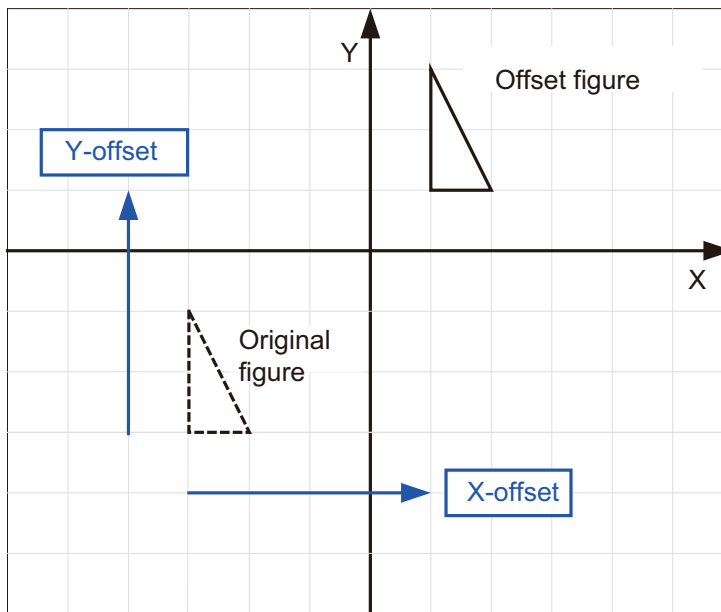
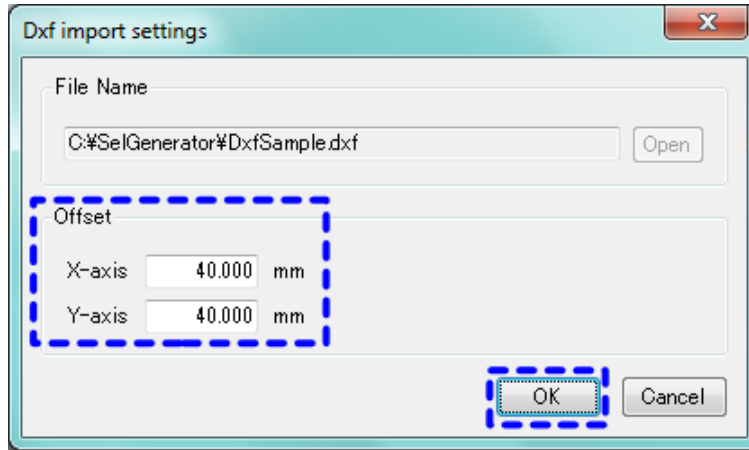
- (7) Set the rotation angle and the center coordinate and click on **OK** button.

[If “Rotate” is selected in (5)]



(8) Set the offset values and click on button.


[If “Offset” is selected in (5)]



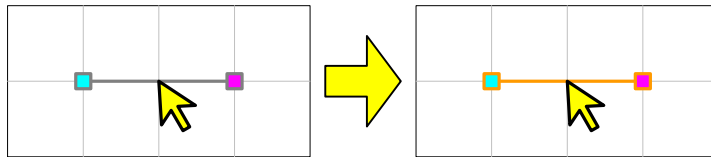
10.1.5 Import the Figure

In order to import the DXF figure, follow the procedure below.

(1) Change the edit mode to “Select dxf items” in one of the ways below.

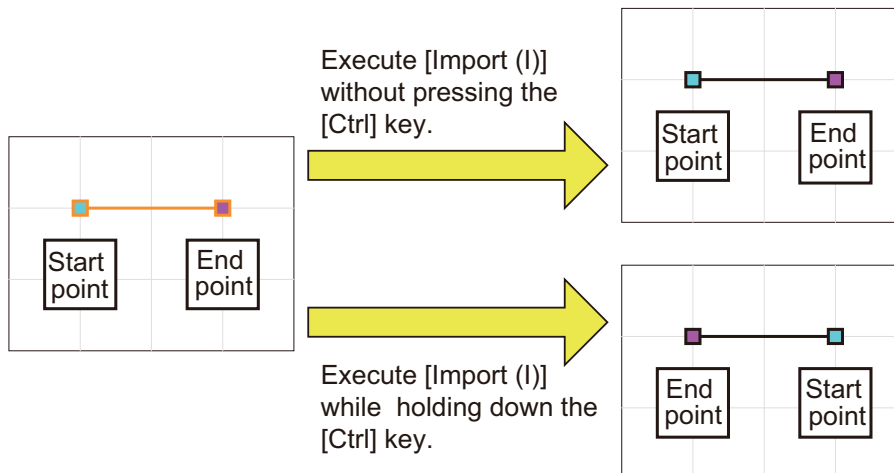
- Click on  (Select dxf items) button in the tool bar
- Execute [Draw (D)] - [Select dxf items (X)] from the menu bar

(2) Click the mouse on the figure you would like to read in to select it.



(3) Right-click the mouse to open the popup menu and execute [Import (I)].

By executing [Import (I)] with holding down [Ctrl] key, the start point and the end point of a line can be swapped to each other to be read in.

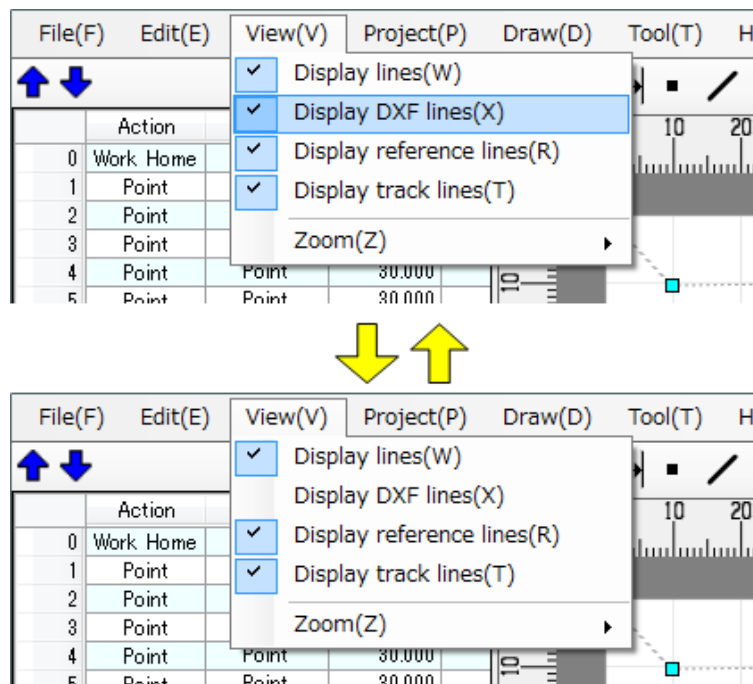


10.1.6 Clear the Figure

Execute [File (F)] - [Dxf data (D)] - [Clear (C)] in the menu bar, and the DXF figure being displayed can be cleared.

10.1.7 Show / Hide a Figure

Execute [View (V)] - [Display DXF lines (X)] in the menu bar, and the DXF figure can be switched between show and hide.




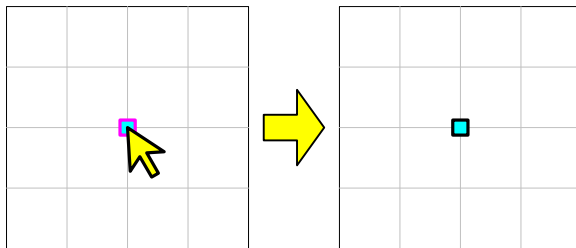
10.2 Creating a Figure with Mouse Operation

There are two types of figures (motion path) “Point” and “Straight Line” available to create.

10.2.1 To Create a Point

Follow the procedures below to create a point.


- (1) Change the edit mode to “Point drawing” in one of the ways below.
 - Click on  (Point) button in the tool bar
 - Execute [Draw (D)] - [Point (P)] from the menu bar
- (2) Move the mouse cursor to the position that you would like to place a point and click there.



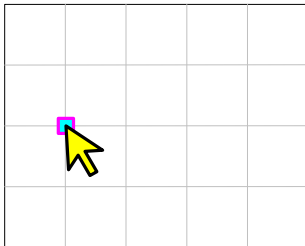
10.2.2 To Create a Straight Line

Follow the procedures below to create a straight line.

(1) Change the edit mode to “Straight line drawing” in one of the ways below.

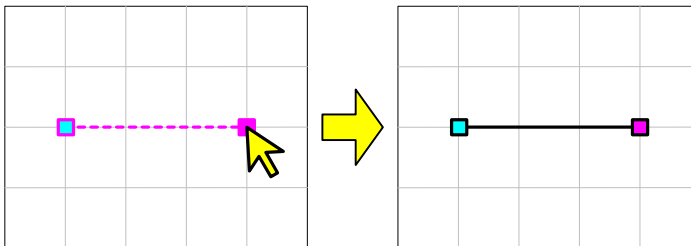
- Click on  (Straight line) button in the tool bar
- Execute [Draw (D)] - [Straight line (L)] from the menu bar

(2) Move the mouse cursor to the position that you would like to place a start point and click there.



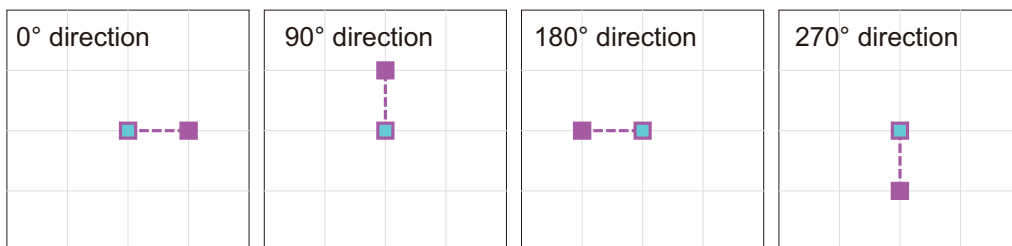
(3) Move the mouse cursor to the position that you would like to place an end point and click there.

(Press [Esc] key and the status returns to that in (2))



Fixing End Point Direction

Move the mouse cursor while pressing and holding down [Ctrl] key when selecting the end position of a line, and the end point position can be fixed to 0deg, 90deg 180deg and 270deg.



11. Modify Figures

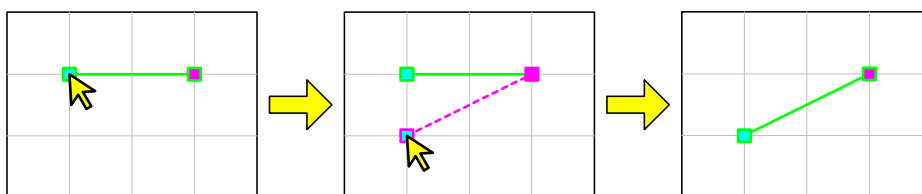
11.1 Moving Peak Point / Figure by Mouse Drag

Drag a created figure with the mouse and the peak point or figure can change its position. (It is limited only to when the edit mode is set to "Select drawing items".)

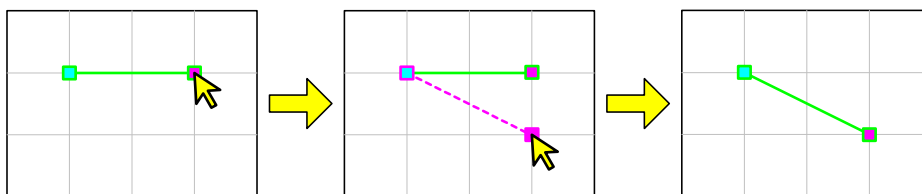
[1] Moving a Peak Point

Drag a peak point of a figure, and the position of the peak point can be moved.

- Move the start point of a line by dragging

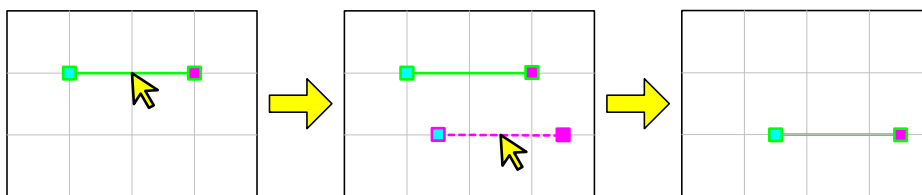


- Move the end point of a line by dragging



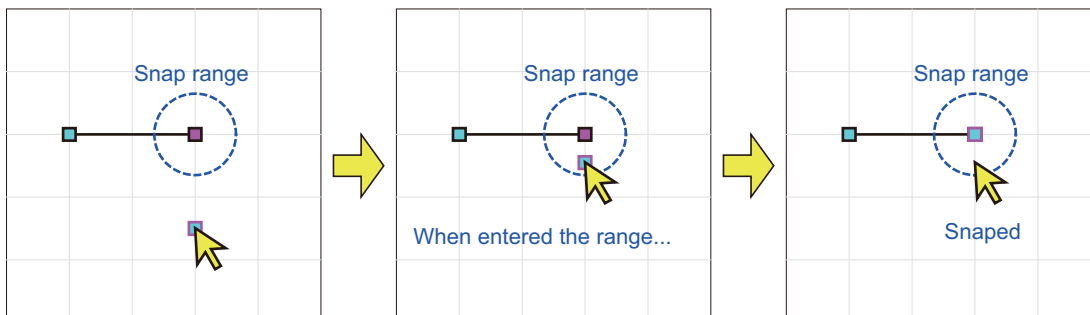
[2] Moving a Figure

Drag a line of a figure, and the figure will be moved in parallel orientation.

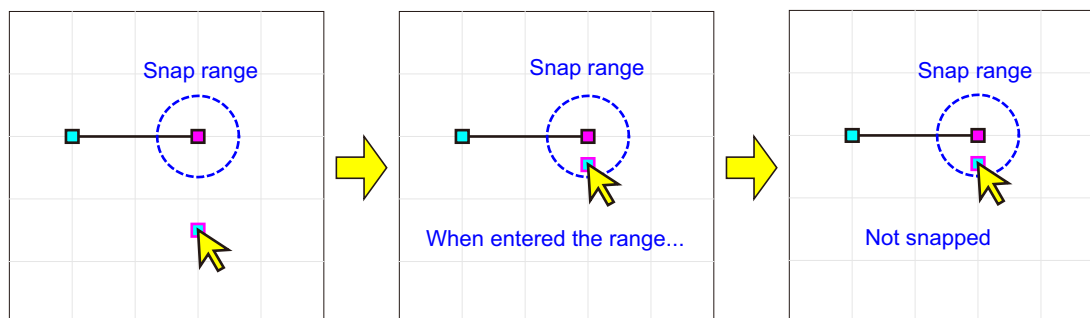


11.2 Peak Snap

When selecting a peak point, get the mouse cursor close to a peak point of another figure, and the dragged point will get snapped to that peak point.



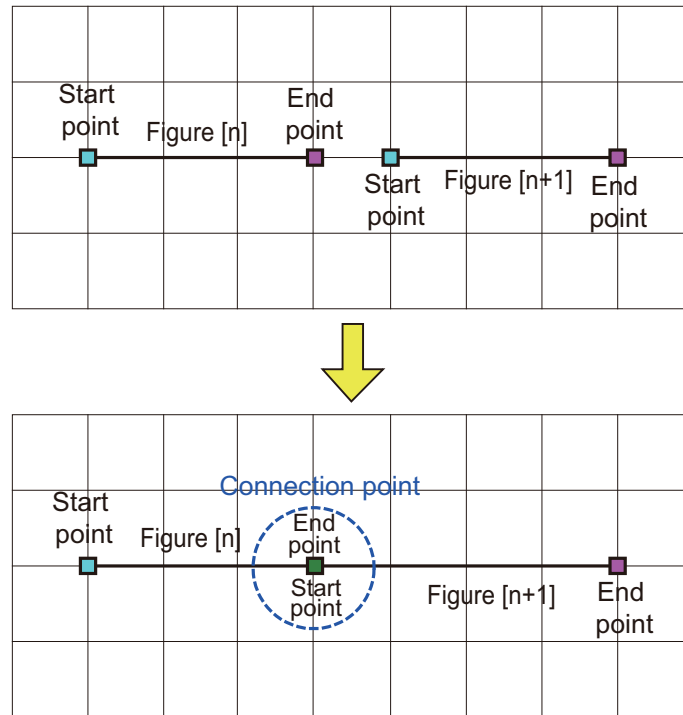
When you desire not to have the cursor snapped, hold down [Ctrl] key and [Shift] key while you move the mouse cursor.



The snap range can be changed in the tool option ([14.3 Drawing Setting]).

11.3 Link up Figures

If two figures get joined at the start point and the end point (make the points placed on the same coordinates) with such an action as peak point snap, these figures will get linked.



However, linkup will not be established in such cases as stated below;

- The orders of figures are not in a row
- One of the two figures or both is/are a point
- Two figures possess different Z-coordinate or R-coordinate
- Setting of soldering activated / inactivated is different
(One figure is set to activate soldering while the other inactivated)

11.4 Cut

The created figure can be cut in the procedures below.

- (1) Select a created figure that you would like to cut.
(For how to select a figure, refer to [4.3.5 Selecting a Figure].)
- (2) Execute an operation from those below.
 - Execute [Edit (E)] - [Cut (T)] from the menu bar
 - Right-click in a working area to open the popup menu, and execute [Cut (T)]

11.5 Copy

The created figure can be copied in the procedures below.

- (1) Select a created figure that you would like to copy.
(For how to select a figure, refer to [4.3.5 Selecting a Figure].)
- (2) Execute an operation from those below.
 - Execute [Edit (E)] - [Copy (C)] from the menu bar
 - Right-click in a working area to open the popup menu, and execute [Copy (C)]

11.6 Paste

A figure that has been cut / copied can be pasted by any operation of those below.

- Execute [Edit (E)] - [Paste (P)] from the menu bar
- Right-click in a working area to open the popup menu, and execute [Paste (P)]

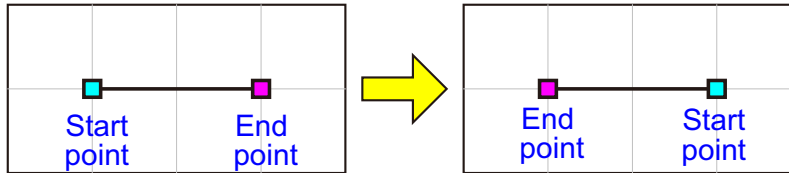
11.7 Delete

The created figure can be deleted in the procedures below.

- (1) Select a created figure that you would like to delete.
(For how to select a figure, refer to [4.3.5 Selecting a Figure].)
- (2) Execute an operation from those below.
 - Execute [Edit (E)] - [Delete (D)] from the menu bar
 - Right-click in a working area to open the popup menu, and execute [Delete (D)]

11.8 Swapping Start Point and End Point

The start point and the end point of a created line figure can be swapped.

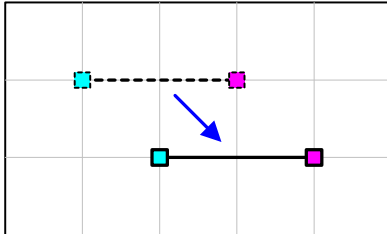


The procedures are as follows.

- (1) Select a created figure.
(For how to select a figure, refer to [4.3.5 Selecting a Figure].)
- (2) Right-click in a working area to open the popup menu, and execute [Exchange start point for end point (E)].

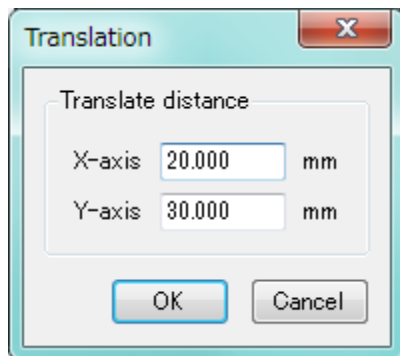
11.9 Translation

A created figure can be moved in parallel orientation.



The procedures are as follows.

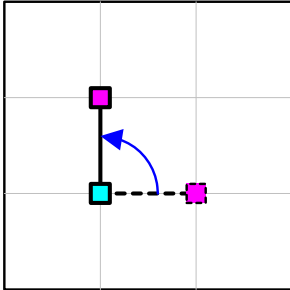
- (1) Select a created figure.
(For how to select a figure, refer to [4.3.5 Selecting a Figure].)
- (2) Execute an operation from those below.
 - Execute [Draw (D)] - [Translation (T)] from the menu bar
 - Right-click in a working area to open the popup menu, and execute [Translation (L)]
- (3) Set the amount to move for X-axis and Y-axis, and click on button.



Item	Contents
X-axis	Set the movement amount for X-axis. (Unit: mm)
Y-axis	Set the movement amount for Y-axis. (Unit: mm)

11.10 Rotation

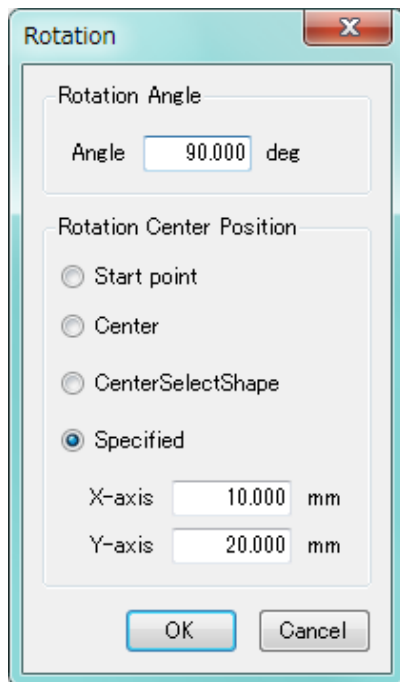
A created figure can be rotated.

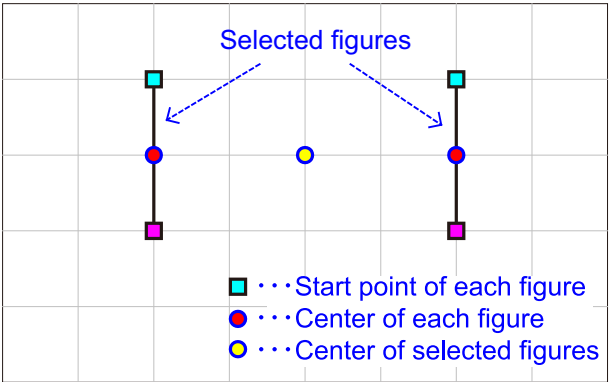
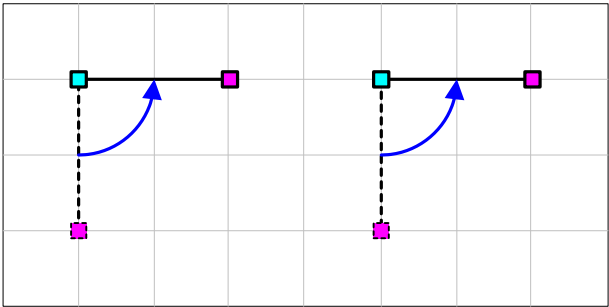


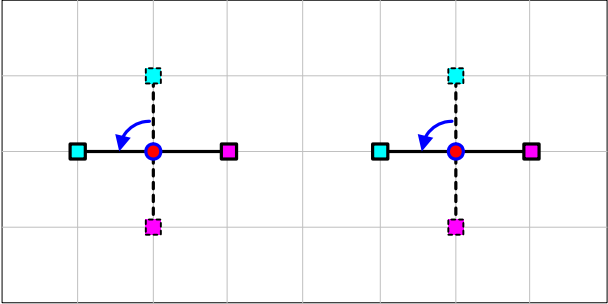
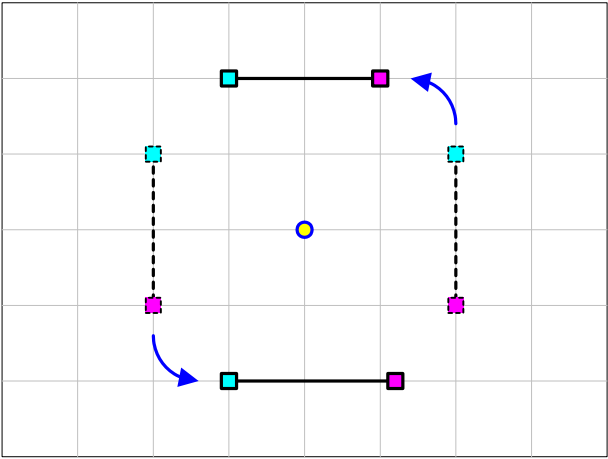
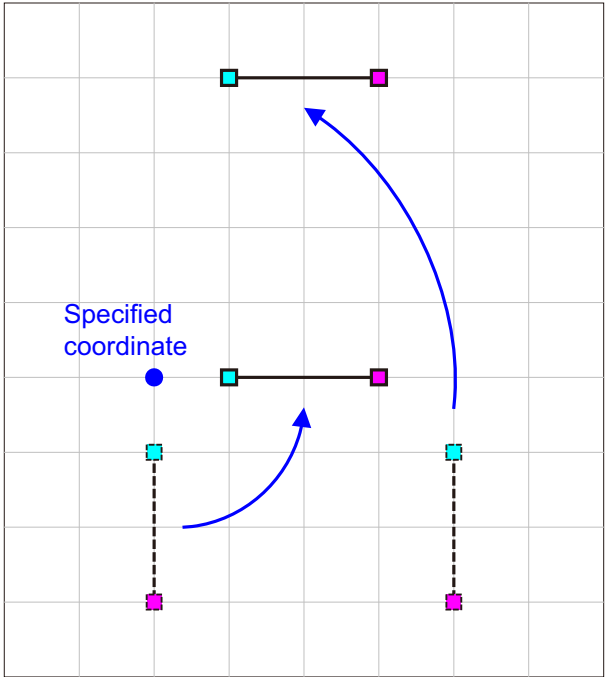
The procedures are as follows.

- (1) Select a created figure.
(For how to select a figure, refer to [4.3.5 Selecting a Figure].)
- (2) Execute an operation from those below.
 - Execute [Draw (D)] - [Rotation (R)] from the menu bar
 - Right-click in a working area to open the popup menu, and execute [Rotation (R)]

(3) Set the rotation angle and the rotation center coordinate, and click on **OK** button.

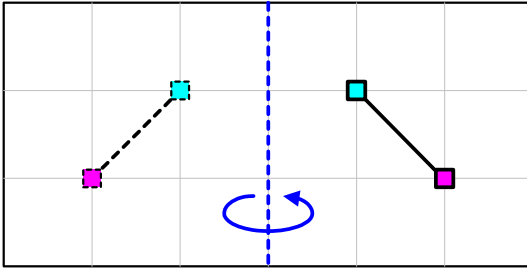


Item	Contents
Rotation Angle	Set the rotation angle. (Unit: deg)
Rotation Center Position	<p>Select / specify the coordinates that should be the center for rotation.</p>  <ul style="list-style-type: none"> Start point 

Item	Contents
Rotation Center Position	<ul style="list-style-type: none"> • Center  <p>The diagram shows a 7x7 grid with a central red dot. A horizontal line segment connects a cyan square at (3,4) to a magenta square at (5,4). A vertical dashed line segment connects a cyan square at (4,3) to a magenta square at (4,5). Blue curved arrows indicate a 90-degree clockwise rotation around the central red dot.</p> • Center Select Shape  <p>The diagram shows a 7x7 grid with a blue dot at the center (4,4). A horizontal line segment connects a cyan square at (3,6) to a magenta square at (5,6). A vertical dashed line segment connects a cyan square at (3,3) to a magenta square at (3,5). Blue curved arrows indicate a 90-degree clockwise rotation around the central blue dot.</p> • Specified  <p>The diagram shows a 7x7 grid with a blue dot at (3,3) labeled "Specified coordinate". A horizontal line segment connects a cyan square at (3,4) to a magenta square at (5,4). A vertical dashed line segment connects a cyan square at (3,3) to a magenta square at (3,5). Blue curved arrows indicate a 90-degree clockwise rotation around the specified coordinate.</p>

11.11 Invert

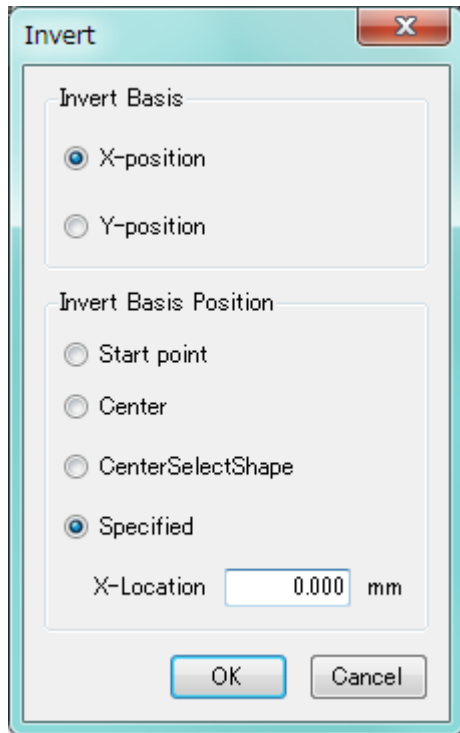
A created figure can be inverted.



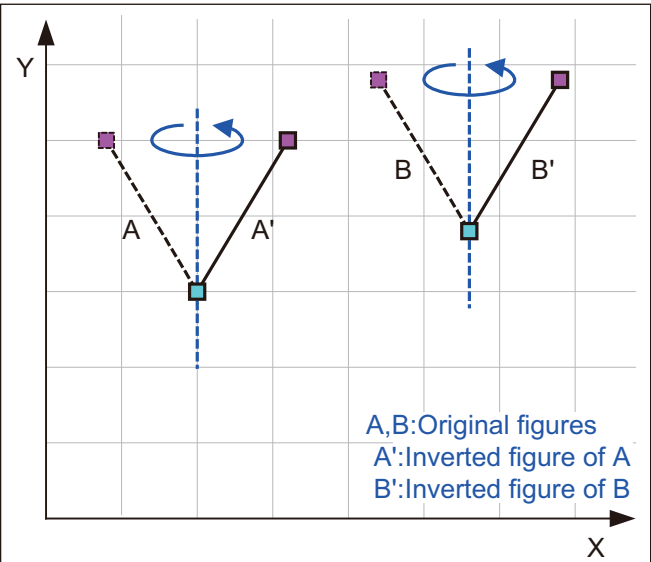
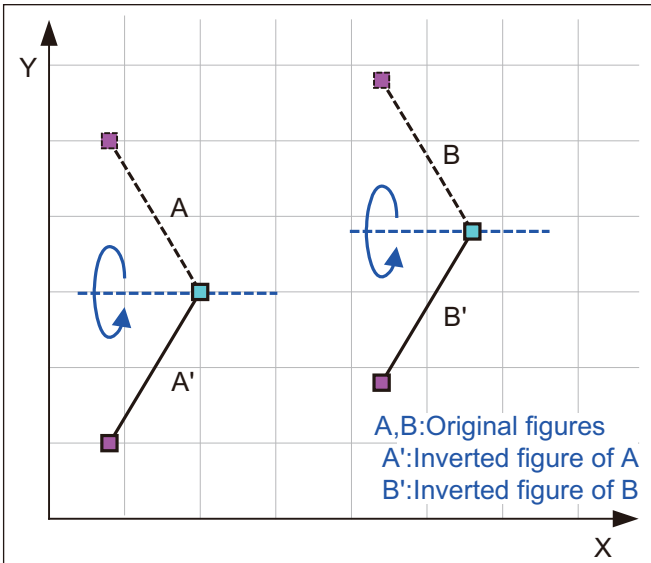
The procedures are as follows.

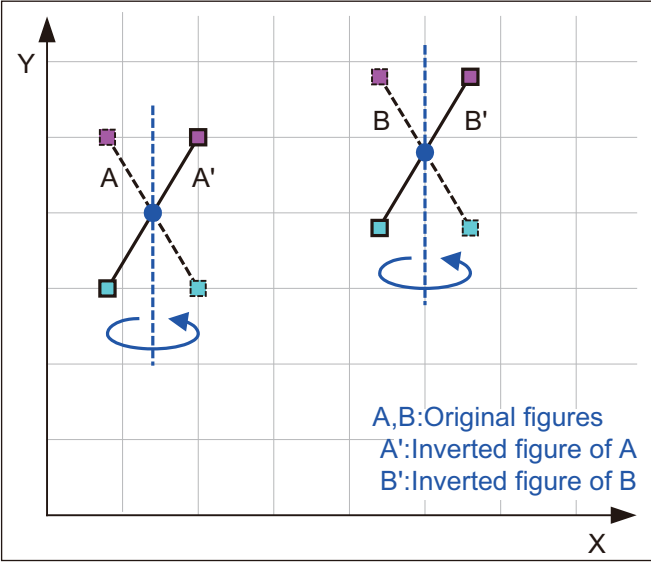
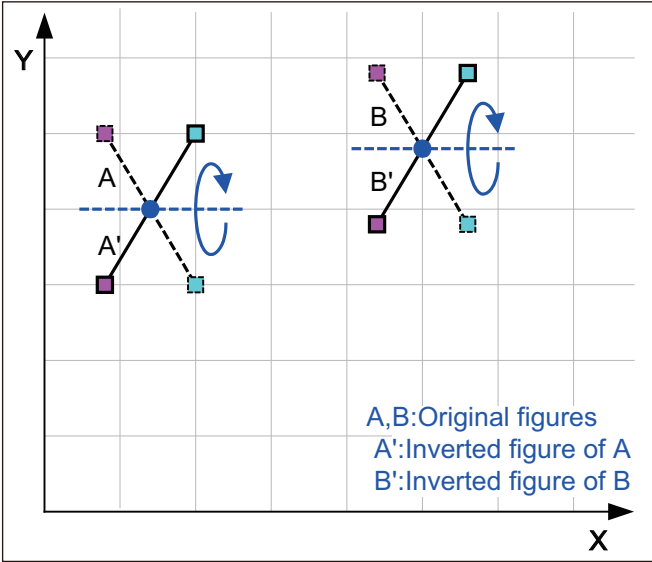
- (1) Select a created figure.
(For how to select a figure, refer to [4.3.5 Selecting a Figure].)
- (2) Execute an operation from those below.
 - Execute [Draw (D)] - [Invert (I)] from the menu bar
 - Right-click in a working area to open the popup menu, and execute [Invert (I)]

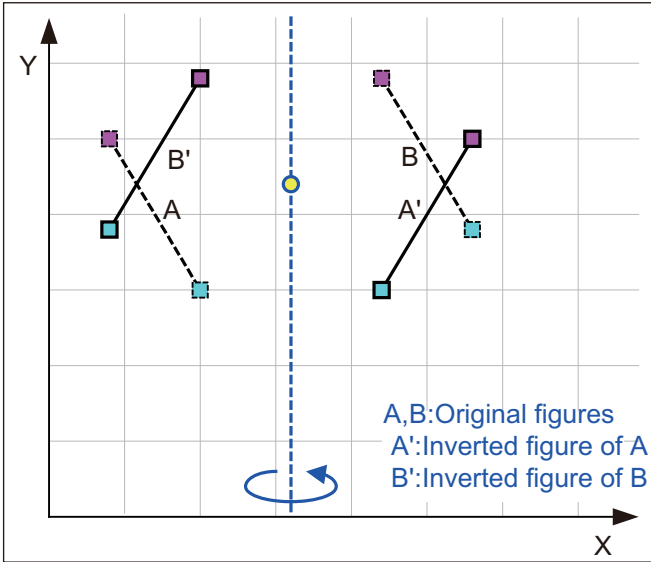
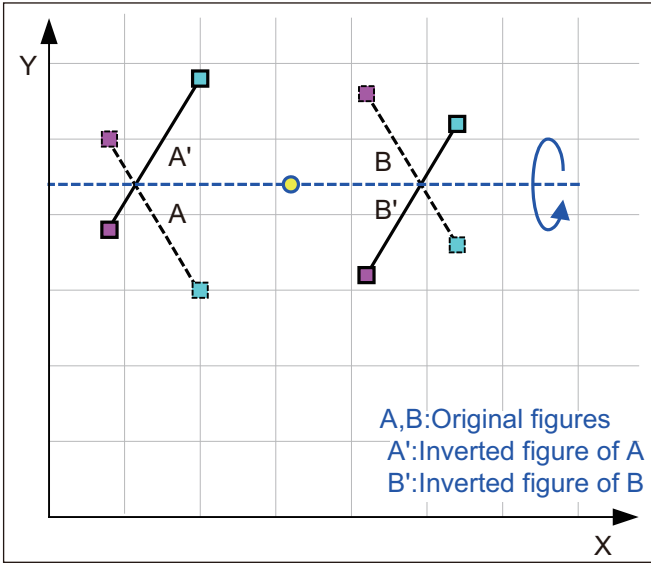
- (3) Set the inversion datum and the inversion datum coordinate, and click on **OK** button.

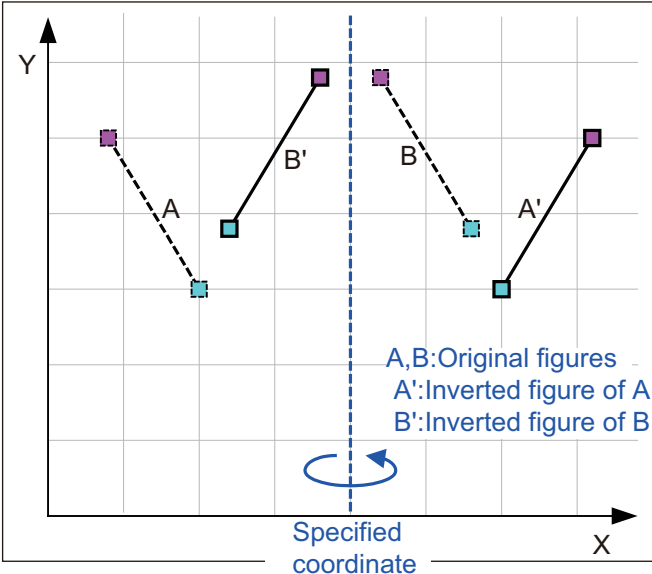
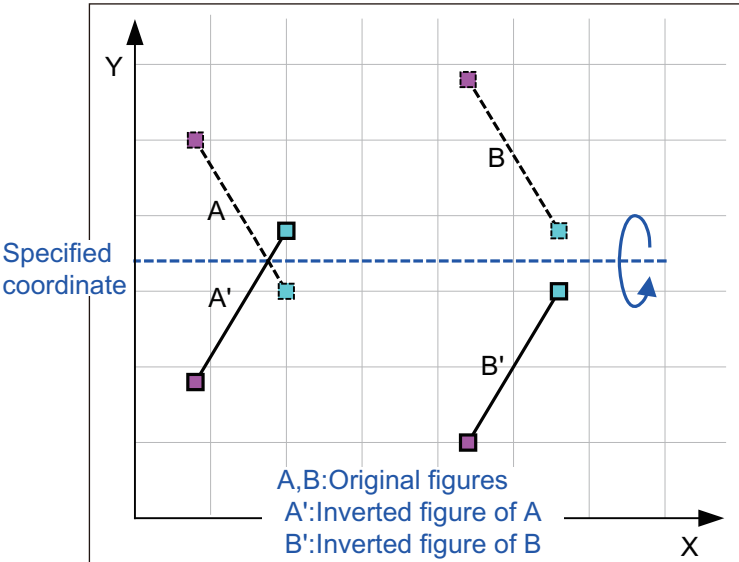


Item	Contents
Invert Basis	Select a coordinate (X-coordinate or Y-coordinate) that should be the datum for inversion.
Invert Basis Position	Select / specify the inversion datum coordinate. <div data-bbox="612 1263 1267 1823"> <p>Selected figures</p> <p>Y</p> <p>X</p> <p>Start point of each figure</p> <p>Center of each figure</p> <p>Center of selected figures</p> </div>

Item	Contents
Invert Basis Position	<ul style="list-style-type: none"> Start point (X-position)  <p>A,B:Original figures A':Inverted figure of A B':Inverted figure of B</p> <ul style="list-style-type: none"> Start point (Y-position)  <p>A,B:Original figures A':Inverted figure of A B':Inverted figure of B</p>

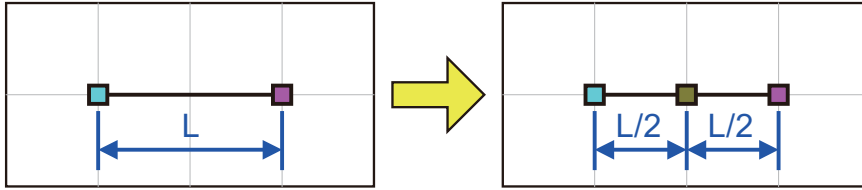
Item	Contents
Invert Basis Position	<ul style="list-style-type: none"> Center (X-position)  <p>A,B:Original figures A':Inverted figure of A B':Inverted figure of B</p> <ul style="list-style-type: none"> Center (Y-position)  <p>A,B:Original figures A':Inverted figure of A B':Inverted figure of B</p>

Item	Contents
Invert Basis Position	<ul style="list-style-type: none"> Center Select Shape (X-position)  <p>A,B:Original figures A':Inverted figure of A B':Inverted figure of B</p> <ul style="list-style-type: none"> Center Select Shape (Y-position)  <p>A,B:Original figures A':Inverted figure of A B':Inverted figure of B</p>

Item	Contents
Invert Basis Position	<ul style="list-style-type: none"> Specified (X-Location)  <p>A,B:Original figures A':Inverted figure of A B':Inverted figure of B</p> <p>Specified coordinate</p> <ul style="list-style-type: none"> Specified (Y-Location)  <p>A,B:Original figures A':Inverted figure of A B':Inverted figure of B</p> <p>Specified coordinate</p>

11.12 Divide

A created line can be divided (in half).



The procedures are as follows.

- (1) Select a created figure.
(For how to select a figure, refer to [4.3.5 Selecting a Figure].)
- (2) Right-click in a working area to open the popup menu, and execute [Divide (D)].

11.13 Editing Information of a Figure

Information of a created figure can be edited.
The figure information available to edit is as shown below.

- Vertex Setting
- Movement between Figures Setting
- Soldering Setting
- Iron Tip Cleaning Setting

Straight line

Vertex Movement between figures Soldering Iron tip cleaning

Start point

X-position 10.000 mm

Y-position 20.000 mm

Z-position mm

R-position deg

End point

X-position 10.000 mm

Y-position 40.000 mm

Z-position mm

R-position deg

CP Velocity

Velocity mm/sec

Acceleration G

Deceleration G

OK Cancel

11.13.1 How to Display Edit Window

Show “Figure Information Edit Window” in the procedures stated below.

- (1) Select a created figure that you would like to edit.
(For how to select a figure, refer to [4.3.5 Selecting a Figure].)
- (2) Right-click in the working area or on the drawing data list to open the popup menu, and execute [Modify (M)].

11.13.2 Vertex Setting

Establish the settings such as coordinates for a peak point of each figure.

[1] Work home

Point

X-position	<input type="text" value="0.000"/>	mm
Y-position	<input type="text" value="0.000"/>	mm
Z-position	<input type="text" value="0.000"/>	mm
R-position	<input type="text" value="0.000"/>	deg

Item	Contents
X-position	Set the X-coordinate. (Unit: mm)
Y-position	Set the Y-coordinate. (Unit: mm)
Z-position	Set the Z-coordinate. (Unit: mm)
R-position	Set the R-coordinate. (Unit: deg)

[2] Point

Point

X-position	<input type="text" value="10.000"/>	mm
Y-position	<input type="text" value="10.000"/>	mm
Z-position	<input type="text"/>	mm
R-position	<input type="text"/>	deg

Item	Contents
X-position	Set the X-coordinate. (Unit: mm)
Y-position	Set the Y-coordinate. (Unit: mm)
Z-position	Set the Z-coordinate. (Unit: mm) If no setting is conducted (blank), the Z-coordinate of the end point for the figure before it should be applied.
R-position	Set the R-coordinate. (Unit: deg) If no setting is conducted (blank), the R-coordinate of the end point for the figure before it should be applied.

[3] Straight line

Start point		End point	
X-position	<input type="text" value="10.000"/> mm	X-position	<input type="text" value="10.000"/> mm
Y-position	<input type="text" value="20.000"/> mm	Y-position	<input type="text" value="40.000"/> mm
Z-position	<input type="text"/> mm	Z-position	<input type="text"/> mm
R-position	<input type="text"/> deg	R-position	<input type="text"/> deg
CP Velocity			
Velocity	<input type="text"/> mm/sec		
Acceleration	<input type="text"/> G		
Deceleration	<input type="text"/> G		

(1) Start point

Set the coordinates of the start point.

Item	Contents
X-position	Set the X-coordinate. (Unit: mm)
Y-position	Set the Y-coordinate. (Unit: mm)
Z-position	Set the Z-coordinate. (Unit: mm) If no setting is conducted (blank), the Z-coordinate of the end point for the figure before it should be applied.
R-position	Set the R-coordinate. (Unit: deg) If no setting is conducted (blank), the R-coordinate of the end point for the figure before it should be applied.

(2) End point

Set the coordinates of the end point.

Item	Contents
X-position	Set the X-coordinate. (Unit: mm)
Y-position	Set the Y-coordinate. (Unit: mm)
Z-position	Set the Z-coordinate. (Unit: mm) If no setting is conducted (blank), the Z-coordinate of the start point should be applied.
R-position	Set the R-coordinate. (Unit: deg) If no setting is conducted (blank), the R-coordinate of the start point should be applied.

(3) CP Velocity

Set the interpolation speed between the start and end points.

Item	Contents
Velocity	Set the velocity. (Unit: mm/sec) If no setting is conducted (blank), the interpolation speed set in the project property should be applied.
Acceleration	Set the acceleration. (Unit: G) If no setting is conducted (blank), the interpolation acceleration set in the project property should be applied.
Deceleration	Set the deceleration. (Unit: G) If no setting is conducted (blank), the interpolation deceleration set in the project property should be applied.

11.13.3 Movement between Figures Setting

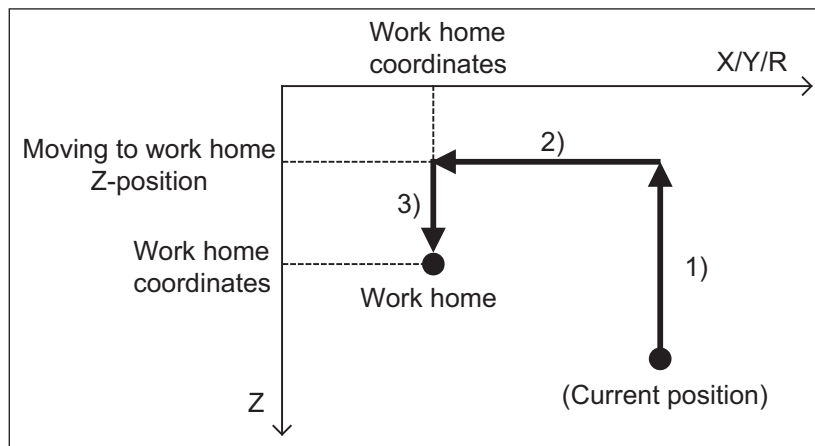
Set the way to move from the end point of the previous figure to the start point of the applicable figure.

[1] Work home

Set the Z-axis of when moving to the work home point. (Unit: mm)

Z-position when moving to work starting point	<input type="text" value="0.000"/> mm
---	---------------------------------------

The movement to the work home point should be performed in the order from 1) to 3) as shown in the figure below.

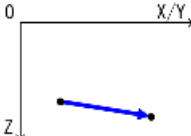
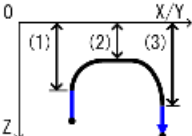
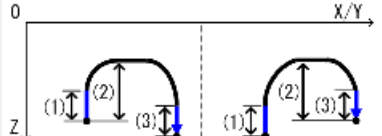


[2] Figures other than work home point

Set the way to move from the end point of the previous figure to the start point of the applicable figure.

☒ Individual setting

☐ InterpolateMove
 ☒ Absolute coordinates(Arch)
 ☐ Relative coordinates(Arch)

Start trigger z-position mm --- (1)
 Top z-position mm --- (2)
 End trigger z-position mm --- (3)
 Velocity mm/sec
 Acceleration G
 Deceleration G

(1) Individual setting

Select whether to set the way to move to the start point of the applicable figure.
If no setting is conducted, the movement setting between figures set in the project property should be applied.

(2) Individual setting for movement between figures

The contents of settings are the same as those in the movement setting between figures in the project property.
Refer to [7.6 Movement between Figures Setting] for more details.

11.13.4 Soldering Setting

Settings related to soldering actions performed in the applicable figure (except for work home position) should be established.

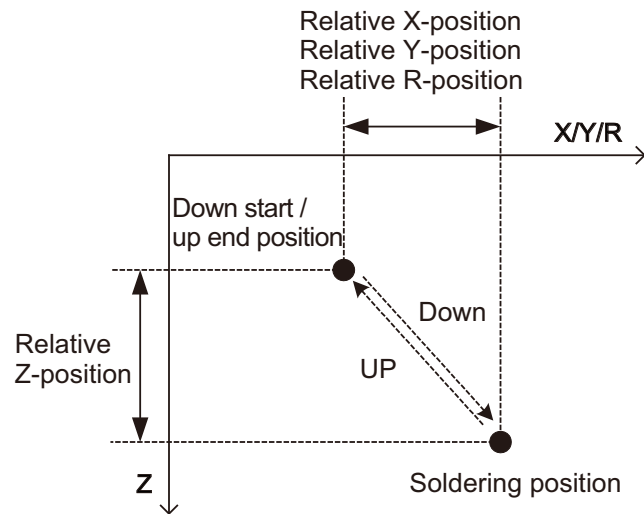
Soldering program number 1 [Line soldering 1]

☒ Individual setting of the iron tip down start / up end position

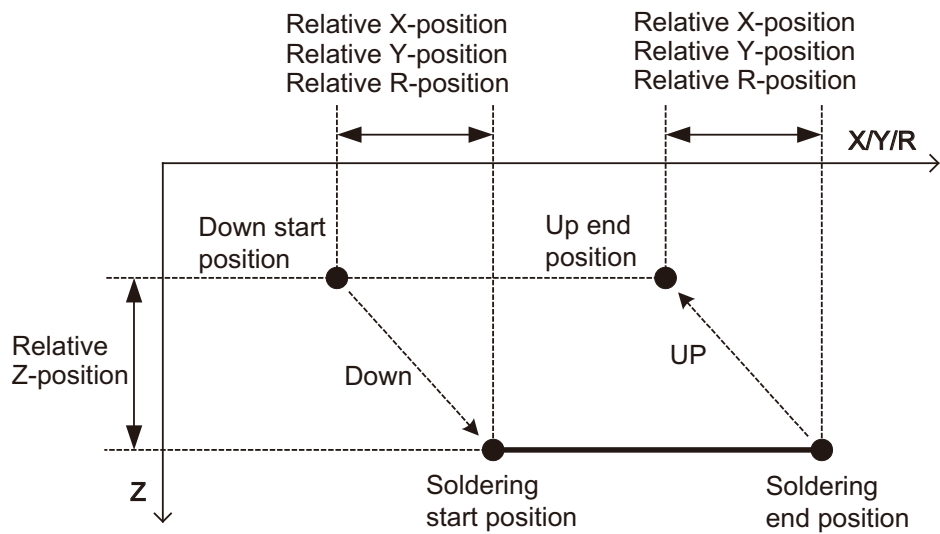
Relative X-position	<input type="text" value="0.000"/>	mm
Relative Y-position	<input type="text" value="0.000"/>	mm
Relative Z-position	<input type="text" value="-10.000"/>	mm
Relative R-position	<input type="text" value="0.000"/>	deg
Velocity	<input type="text" value="30"/>	mm/sec
Acceleration	<input type="text" value="0.30"/>	G
Deceleration	<input type="text" value="0.30"/>	G

Item	Contents
Soldering program number	Select a soldering program number to be executed.
Individual setting of the iron tip down start / up end position	Set the position to start iron tip going down / up, and set whether to apply to the applicable figure. If no setting is conducted, the setting of the iron tip going down / up set in the project property should be applied.
Relative X-position	Set the position to start iron tip going down / up for the X-axis in the relative coordinates.
Relative Y-position	Set the position to start iron tip going down / up for the Y-axis in the relative coordinates.
Relative Z-position	Set the position to start iron tip going down / up for the Z-axis in the relative coordinates.
Relative R-position	Set the position to start iron tip going down / up for the R-axis in the relative coordinates.
Velocity	Set the velocity of the iron tip to go down / up. (Unit: mm/sec)
Acceleration	Set the acceleration of the iron tip to go down / up. (Unit: G)
Deceleration	Set the deceleration of the iron tip to go down / up. (Unit: G)

- Position for Start to Go Downward / Finish to Go Upward in Spot Soldering



- Position for Start to Go Downward / Finish to Go Upward in Line Soldering



11.13.5 Iron Tip Cleaning Setting

16 types ^(Note 3) of iron tip cleaning actions ^(Note 2) executed in the applicable figure ^(Note 1) can be assigned at maximum.

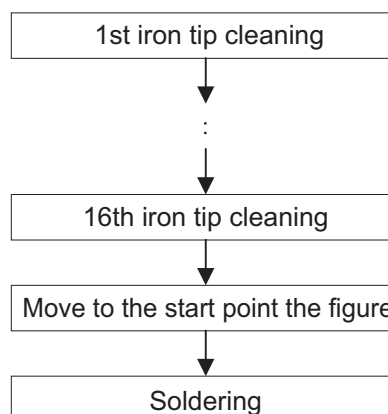
Note 1 The work home position should be excluded.

Note 2 It is necessary that the actions are registered in the project property in advance. (Refer to [7.7.5 Iron Tip Cleaning Settings].)

Note 3 It is available to assign the same iron tip cleaning action for several times.

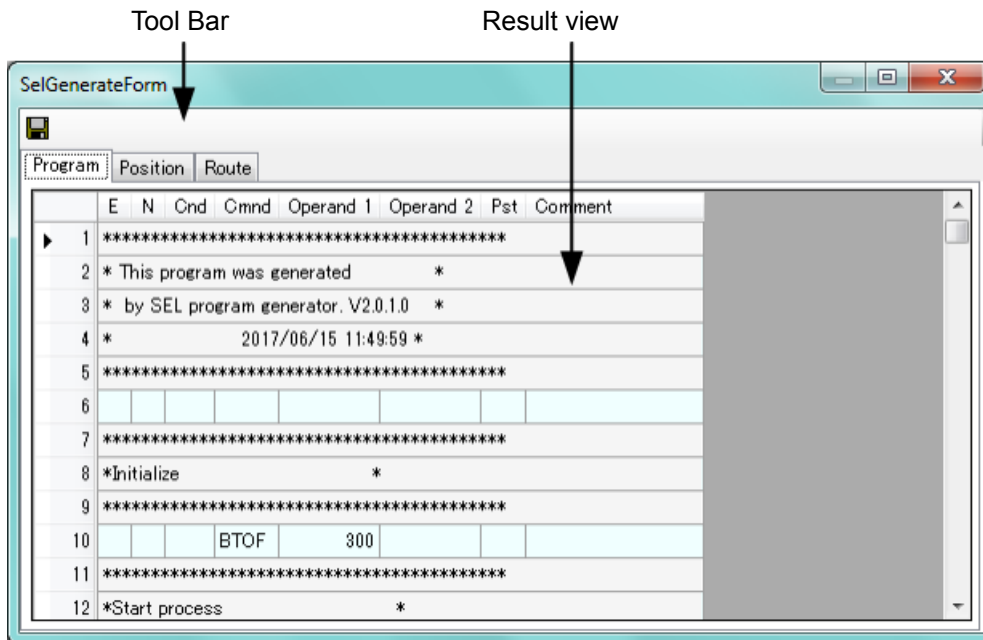
1st	Cleaning1 [Cleaning 1]
2nd	Cleaning2 [Cleaning 2]
3rd	Cleaning3 [Cleaning 3]
4th	Cleaning1 [Cleaning 1]
5th	Cleaning2 [Cleaning 2]
6th	Cleaning3 [Cleaning 3]
7th	Cleaning16 [Cleaning 16]
8th	<Not clean>
9th	<Not clean>
10th	<Not clean>
11th	<Not clean>
12th	<Not clean>
13th	<Not clean>
14th	<Not clean>
15th	<Not clean>
16th	<Not clean>

All the iron tip cleaning actions are conducted, and then the iron tip moves to the start point of the applicable figure and start soldering work.



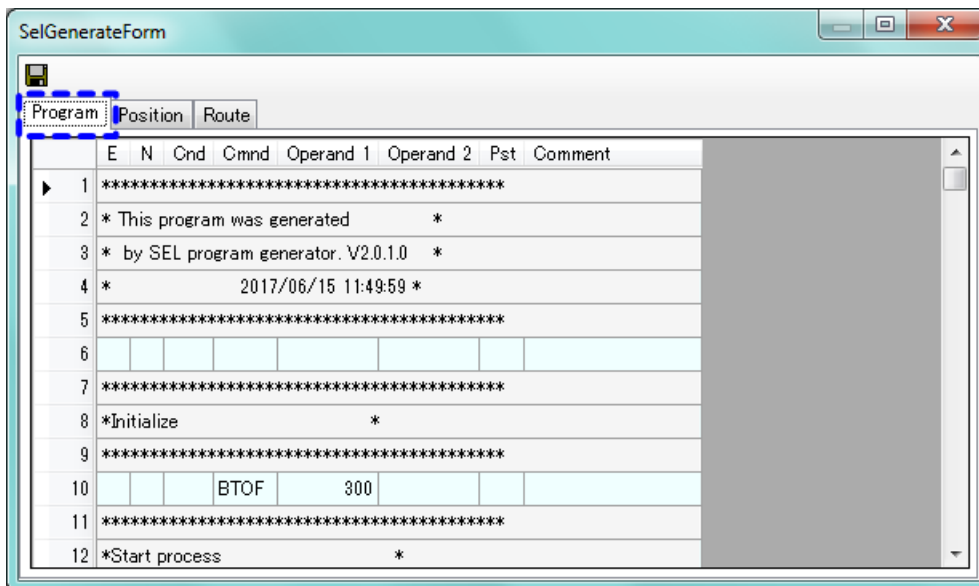
12. Generate SEL Program

Execute [Project (P)] - [Generate (G)] in the menu bar to generate a SEL program. Once it is finished to be generated, “Sel Generate Form Window” shows up.



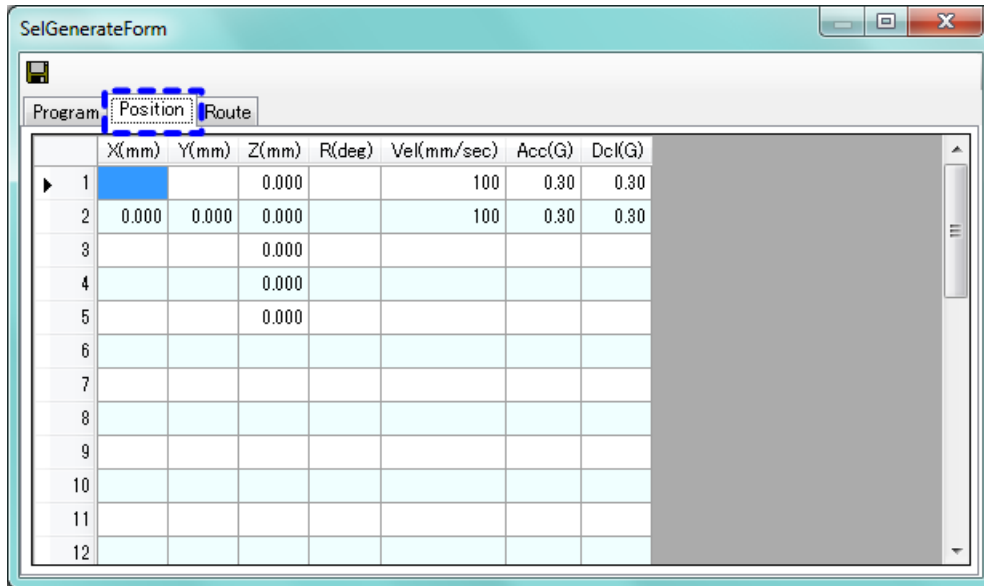
12.1 SEL Program Display

Select “Program” Tab in the Generation Result Display Area, and the generated SEL program should be displayed.



12.2 Position Data Display

Select "Position" Tab in the Generation Result Display Area, and the generated position data should be displayed.



SelGenerateForm

Program Position Route

	X(mm)	Y(mm)	Z(mm)	R(deg)	Vel(mm/sec)	Acc(G)	Dcl(G)
1			0.000		100	0.30	0.30
2	0.000	0.000	0.000		100	0.30	0.30
3			0.000				
4			0.000				
5			0.000				
6							
7							
8							
9							
10							
11							
12							

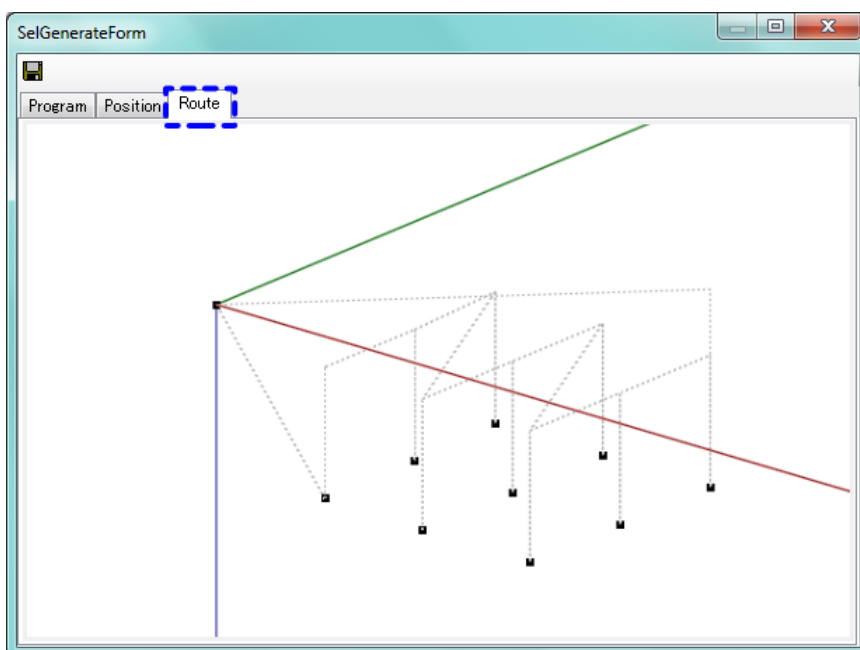
12.3 Simple Motion Path Display

Select "Route" Tab in the Generation Result Display Area, and the generated motion path should be displayed in a simple form.



Caution:


- The route of evacuation / return operation at home return operation or error detection should not be displayed.
- This display would not guarantee the actual motion path and its accuracy.

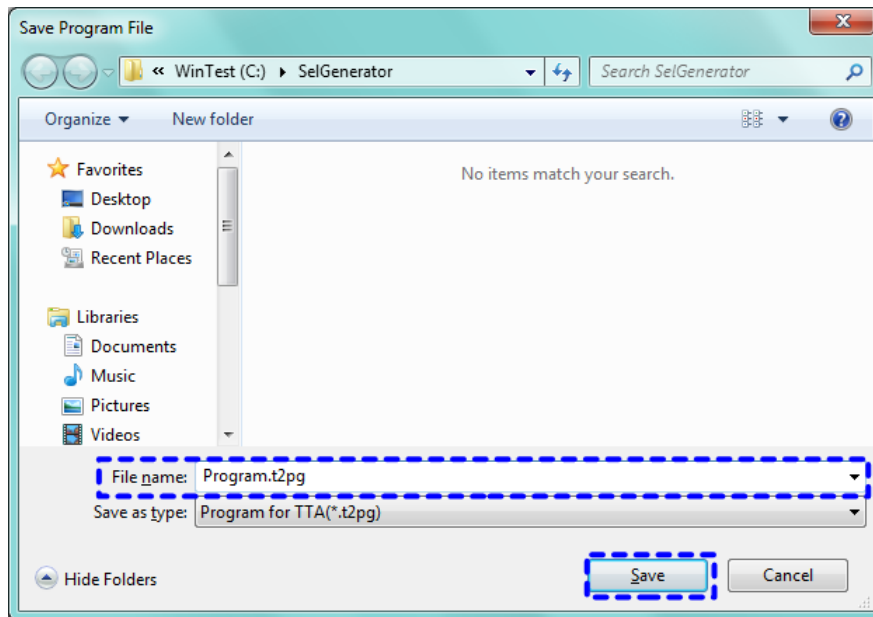


Button	Operation	Functions
	Drag	The display rotates in the dragged direction.
	Rotate	• When [Ctrl] key is held down Display can be zoomed in and out.
		• When [Shift] key is held down Display can be scrolled right and left.
		• In condition other than above Display can be scrolled up and down.
	Drag	Display can be scrolled to the direction that you dragged.

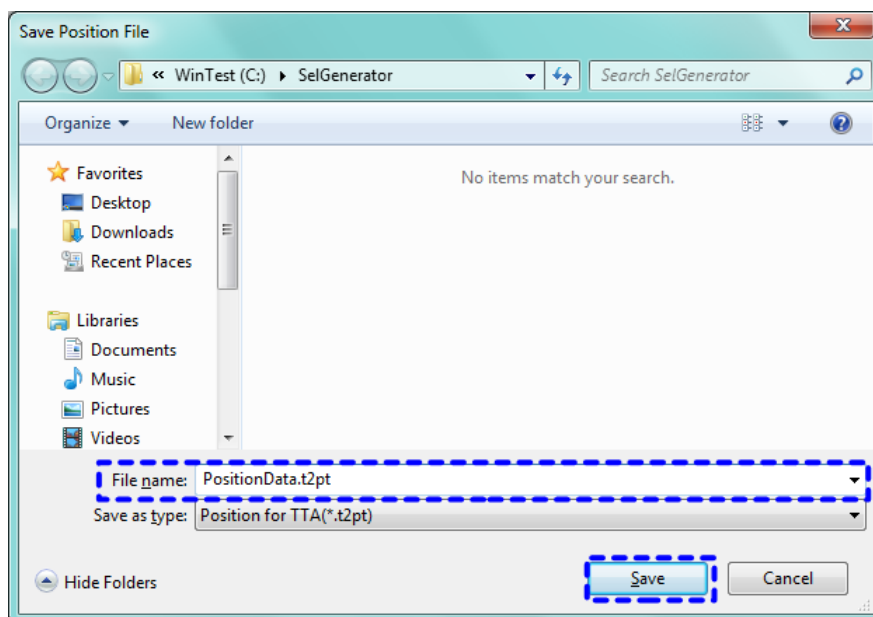
12.4 How to Save the SEL Program/Position Data

The generated SEL program and position data should be able to be saved to a file with a format capable to be read in "XSEL PC Software".

- (1) Click on  (Save As) button in the tool bar.
- (2) Indicate a file name of a SEL program to be saved, and click on **Save** button.



- (3) Indicate a file name of a position data to be saved, and click on **Save** button.

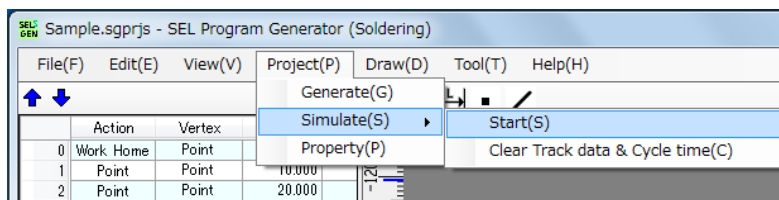


12.5 Simulation

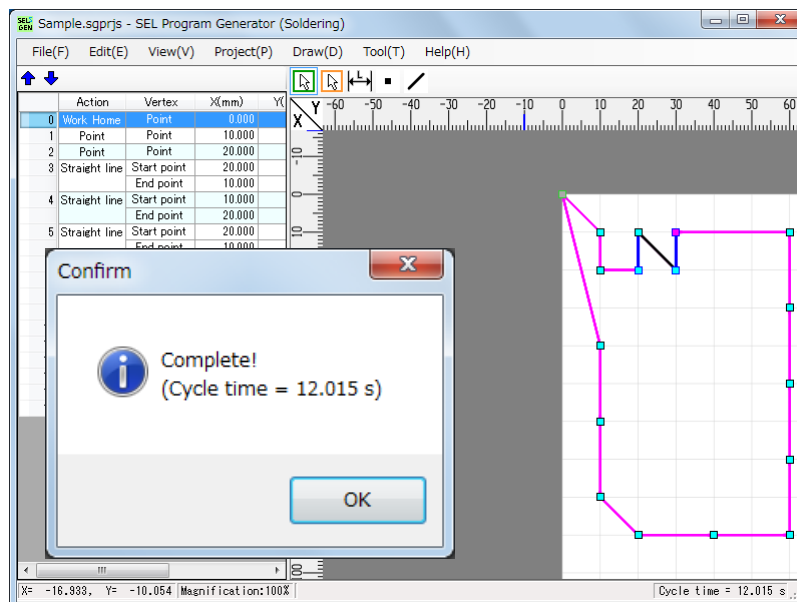
The generated program can be simulated so you can get to know the operation track and cycle time as a reference.

- ⚠ Note that the operation track is a movement command to a controller, and it does not include the dispersion (caused by load, finishing, etc.) which can be assumed in the actual use of the device.
- The cycle time display may change depending on the performance or load of your computer, and it does not include the dispersion (caused by load, finishing, etc.) which can be assumed in the actual use of the device. Close all the softwares other than this software as much as possible when running a simulation and use it as a reference.
- The cycle time should be calculated assuming that the external input standby operation gets cancelled immediately.
- The cycle time should be calculated assuming that the home-return operation gets completed immediately.

1) Execute [Project (P)] - [Simulate (S)] - [Start (S)] from the menu bar.



2) Operation track and cycle time should be displayed after the simulation is complete.



[Cycle Time]

It is the sum total of the operation time in one cycle of “work home position → drawn figure → work home position” and time required for related processes. It shows the process time required to perform “Cycle top (DWLT Command in figure) → “Cycle end (EDDO Command in figure)” in the generated program.

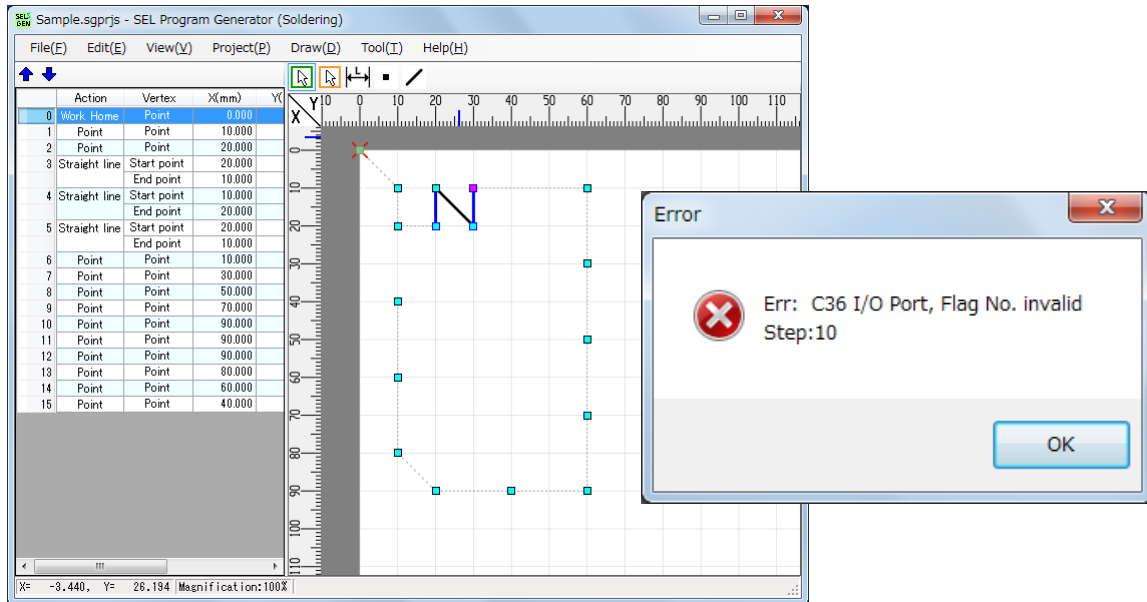
* The program shown in the figure on the right is an example.

	E	N	Cnd	Cmd	Operand 1	Operand 2	Pst	Comment
1								*****
2								* This program was generated *
3								* by SEL program generator. V3.0.0.1 *
4								* 2017/05/17 20:31:55 *
5								*****
6								
7								*****
8								*Initialize *
9								*****
10				BTOF	300			
11				ACHZ	3			Z-axis for arch
12								*****
13								*Home return *
14								*****
15				HOME	100			
16				HOME	11			
17								*****
18								*[0000] *
19								*****
20				EXSR	99			Execute subroutine
21								*****
22								*Cycle top *
23								*****
24				DWLT	1099	100		
25								*****
26								*[0001]-[0003] *
27								*****
28				MOVL	6			
29				BTON	300			
30				PATH	7	9		[0001]-[0003]
31				BTOF	300			
32								*****
33								*[0000] *
34								*****
35				EXSR	99			Execute subroutine
36								*****
37								*Cycle end *
38								*****
39				ADD	1099	1		Counter increment
40				EDDO				Jump to cycle top
41								*****
42								*Program end *
43								*****
44				EXIT				Program end
45								

A set of process
subject to cycle
time calculation

[Error Display]

If an error gets detected in the simulation, content as shown below should be displayed in the error window, and a cross (x) mark should be shown on the figure or track that the error was detected. Correct the figure or track referring to the information.



[Contents Displayed in Error Window (display to be shown only for contents with information)]

- Err : Error Number and Error Name
 - Step : Error Detection Program Step *
 - Axis : Error Detected Axis Number
 - Pos : Error Detected Position Number *
- * Applicable for SEL Program Generation Window Display displayed by selecting [Project (P)] - [Generate (G)]

13. Operation Check of Generated SEL Program

The generated SEL program should be written in the robot controller and checked the operation in the actual device.

13.1 Write Data to a Robot Controller

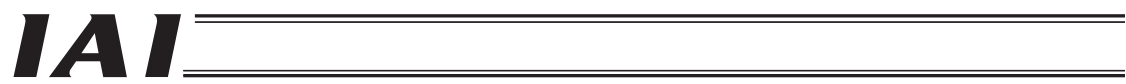
Write the SEL program and position data saved in a file in the robot controller with using "XSEL PC Software".

For the procedures how to write in, refer to the instruction manual for "XSEL PC Software".

13.2 Test

Execute the written SEL program to check the operation.

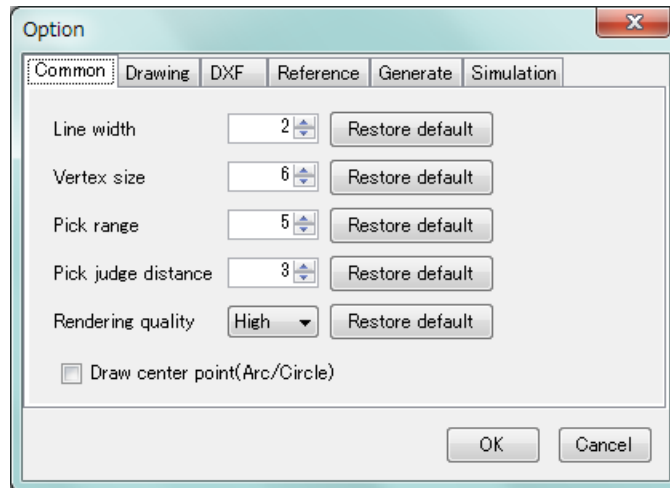
For how to execute a program, refer to the instruction manual for "XSEL PC Software".



14. Tool Option Setting

Setting should be established for each option in this software.

- Common Setting
- Drawing Setting
- DXF Setting
- Reference Setting
- Generate Setting
- Simulation



14.1 How to Display Setting Window




Execute [Tool (T)] - [Option (O)] from the menu bar.

14.2 Common Setting

Line width	<input type="text" value="2"/>	<input type="button" value="Restore default"/>
Vertex size	<input type="text" value="6"/>	<input type="button" value="Restore default"/>
Pick range	<input type="text" value="5"/>	<input type="button" value="Restore default"/>
Pick judge distance	<input type="text" value="3"/>	<input type="button" value="Restore default"/>
Rendering quality	<input type="button" value="High"/>	<input type="button" value="Restore default"/>
<input type="checkbox"/> Draw center point(Arc/Circle)		




Item	Contents
Line width	Set the line width of a line figure. Unit: Pixel Settable Range: 1 to 10 (Default: 2)
Vertex size	Set the size of a peak point. Unit: Pixel Settable Range: 0 to 10 (Default: 6)
Pick range	Set the picking range of the mouse cursor when clicking a figure with a mouse. Unit: Pixel Settable Range: 1 to 10 (Default: 5)
Pick judge distance	A figure starts moving after the figure gets picked (selected) and dragged for the distance set in this setting or more. Unit: Pixel Settable Range: 0 to 10 (Default: 3)
Rendering quality	Set the drawing quality of a figure. Set it to "Low" and the load of drawing process should be reduced. Settable Range: Low or High (Default: High)
Draw center point (Arc/Circle)	Set if a center of a circle / arc should be shown.

14.3 Drawing Setting

Normal line color		Restore default
Soldering line color		Restore default
Selected line color		Restore default
Decimal places	<input type="text" value="3"/>	Restore default
Snap range	<input type="text" value="10"/>	Restore default

Item	Contents
Normal line color	Set the color to display normal figures (figures not selected and no soldering conducted).
Soldering line color	Set the color to display figures with soldering conducted.
Selected line color	Set the color to display selected figures.
Decimal places	Set the number of digits under decimal point for the coordinate values at the position where the mouse cursor points at. Unit: Digit Settable Range: 0 to 3 (Default: 3)
Snap range	Set the snap range of a peak point. Set it to "0" and the snap function will be inactivated. Unit: Pixel Settable Range: 0 to 100 (Default: 10)

14.4 DXF Setting

Normal line color		Restore default
Selected line color		Restore default
Spline 1st division distance	<input type="text" value="1.0"/> 	Restore default
<input type="checkbox"/> Import Z-coordinate		
<input type="checkbox"/> Remove imported figures		

Item	Contents
Normal line color	Set the color to display figures not selected.
Selected line color	Set the color to display selected figures.
Spline 1st division distance	Set the distance to divide a spline figure into straight lines. Settable Range: 0.1 to 100.0 (Default: 1.0)
Import Z-coordinate	Set if the Z-axis should be read in when a dxf drawing is read in.
Remove imported figures	Set if the read dxf drawing should be deleted.

14.5 Reference Setting

Line color		Restore default
------------	---	-----------------

Item	Contents
Line color	Set the color to display reference figures.

14.6 Generate Setting

☐ Suppress coordinate so that it falls within software limit

☐ Simple arch motion conversion when arch motion is not established

Item	Contents
Suppress coordinate so that it falls within software limit	Set if adjustment should be conducted to get in the soft limit range when a figure falls out of the soft limit range. A warning message will appear if no adjustment is conducted.
Simple arch motion conversion when arch motion is not established	Set whether to switch to the simple arch motion (go up in Z-axis → move horizontally → go down in Z-axis) when “Relative Coordinate Indicated Arch Motion” should not satisfy the arch motion conditions.

14.7 Simulation

Adjust cycle time

fast

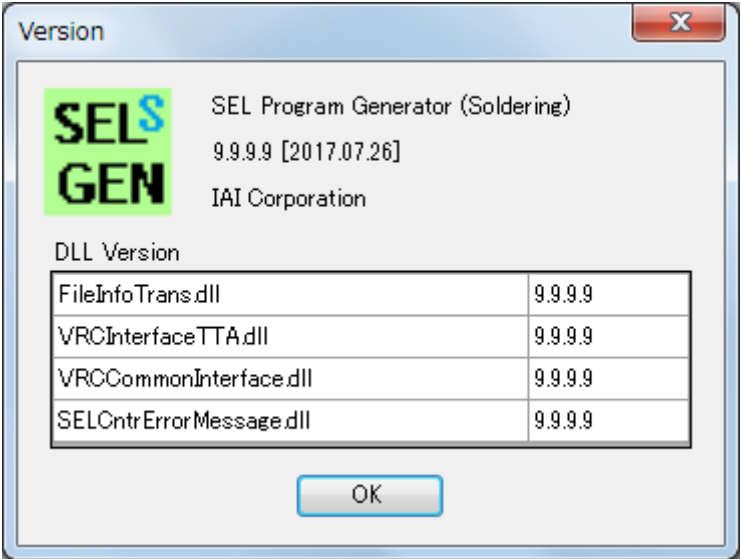
0

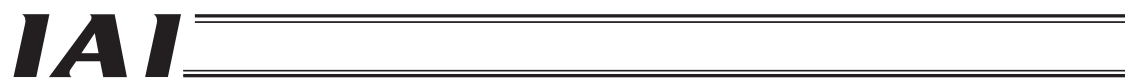
slow

Item	Contents
Adjust cycle time	It is for adjustment at the manufacturer. Keep it set at 0.

15. Version Information

Execute [Help (H)] - [About (A)] from the menu bar, display the “Version Information Window”





Change History

Revision Date	Revision Description
2017.07	First Edition
2017.09	Second Edition <ul style="list-style-type: none"> • “MSEL” added in applicable controllers • Simulation feature added
2019.06	Third Edition Descriptions revised in general



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