Software for Laser Scanning System for Welding

SWDraw3

OPERATION MANUAL

Z09OM1206504-03

About This Documentation

Thank you for purchasing our SWDraw3 Software for Laser Scanning System for Welding.

Please read this manual carefully to ensure correct use of the product. Keep the manual handy after reading for future reference.

This documentation covers instructions for welding control using the SWDraw3 application for laser scanning system for welding. For installation, maintenance, and specifications of the laser scanning system for welding, refer to the manual for CL-E100A.

1. Note

- Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and other countries.
- Company and product names in this manual are trademarks or registered trademarks of their respective owners.
- Unauthorized reproduction of this manual in whole or part is prohibited.
- The contents of this manual are subject to change without notice.
- Every effort has been made to ensure the accuracy of this information. If you come across oversights or errors, please notify your dealer.
- Be sure to read the user's manuals for any equipment used in conjunction with the system (e.g., documentation for computer systems).
- Graphics rendering support (for importing DXF data) is CADBuilderOCX developed by Knack SoftWare Inc.
- Image processing and pattern matching supports are Matrox Imaging Library (MIL) developed by Matrox.

2. Symbols Used in this Manual

 CAUTION	Indicates instructions that must be followed to prevent hardware or software damage or operating errors.
 ATTENTION	Indicates additional information on a particular topic.

Menus, icons, buttons, windows, tabs	Enclosed in brackets. Example: Click the [OK] button.
Keyboard keys	Enclosed in angle brackets. Example: Press the <Tab> key.
References	Enclosed in quotes. Example: Refer to “Chapter 8-3.2 Changing Passwords” (page 5).

Contents

Chapter 1 SWDraw3 Overview

1. Features

By combining SWDraw3 with CL-E100A, consistent, high-quality, high-speed multi-spot welding can be achieved.

- Operation on Windows operating system

  Easy operation using the mouse. Drawings created using plotting software (such as CAD software) can be registered easily.

- Large, easy-to-read graphic screen

  The screen uses a similar layout to Windows and is large and easy-to-read for easy operation.

- Full range of plotting functions

- Auto-backup function

  The time interval or number of operations can be specified for automatically backing up data.

- Easy device setting and management

  The laser equipment and scanner can be set and monitored from the computer.

2. Installation

2.1. Installing SWDraw3, the Welding Application

The SWDraw3 application must be installed to control the laser equipment from a computer. For the corresponding operating system, refer to the manual for CL-E100A.

Images and texts used in this section are for the standard setting of a desktop personal computer. They may differ depending on the installed service pack or patch.

SWDraw3 is not intended for the touch panel operation with Windows 10 (including tablet). Operations with keyboard and mouse are explained.

CAUTION	SWDraw3 operates on Windows 10. Use Windows 10 with a build version of 1607 or later.

CAUTION	You must have Administrators rights to install and use SWDraw3. Only a user with Administrators rights can operate SWDraw3.

CAUTION	If SWDraw3 is already installed on your computer, uninstall it according to the following procedure by selecting [Control Panel] from the Start menu. Right-click [SWDraw3] from [Programs and Features], and select [Uninstall]. Do not start SWDraw3 before uninstalling after booting the computer. Additionally, back up the work folder (the folder created by selecting [Settings] -> [Preferences] -> [Folders]). When uninstalling is complete, reboot the computer and reinstall SWDraw3.

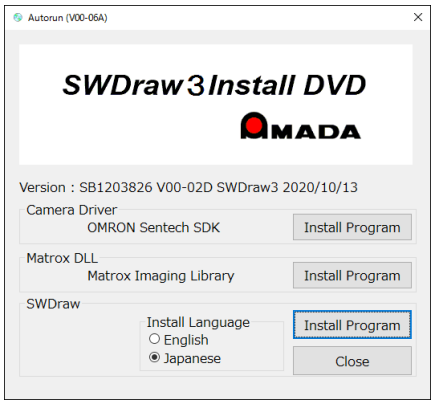
CAUTION	When starting installation, do not connect a new USB device such as a USB memory and a USB hard disk other than this equipment. The wrong driver might be installed.

Follow steps given below to install this application. The UAC (User Account Control) dialog box asking whether you want to install it may appear during installation. Select [Yes] or [Allow] to continue installations unless otherwise canceled purposely.

1 Close all applications.

2 Load the included DVD into the computer.

3 After you insert the DVD, the launcher (Autorun.exe) starts and the following screen is displayed.



If the above screen is not displayed, open the DVD drive using the Explorer and double-click the Autorun.exe.

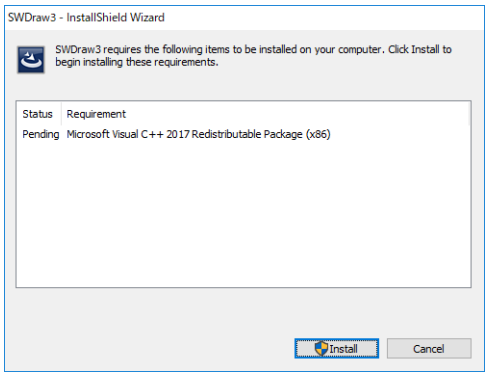
4 Click the [Install Program] button in the SWDraw field of the launcher (Autorun.exe).

CAUTION	Do not double-click the [Install Program] button. You may fail to install it if more than one installer is launched at a time.

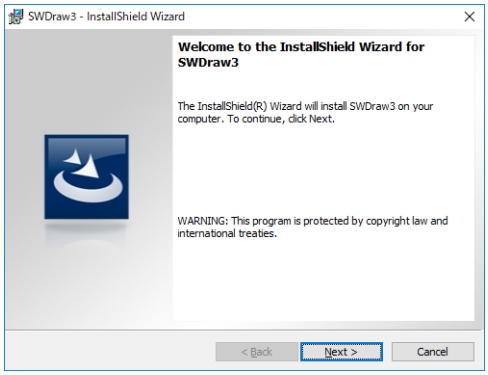
The operating system on your computer is automatically detected to install a proper installer. Also, the language (Japanese or English) is automatically selected. The language to be selected depends on that when the operating system of the computer installed on the computer is set up for the first time (installation of operating system and activation). When the language is Japanese, the Japanese version is installed. When the language is not Japanese, the English version is installed.

There are radio buttons for selecting language, and the program with the selected language is installed. If the Japanese version is installed on the English operating system and appropriate fonts are not installed on your computer, however, the characters are garbled and the application does not operate normally.

5 Immediately after starting installation, the screen which prompts you to install the Microsoft Visual C++2017 Redistributable Package(x86) is displayed. Click the [Install] button to install it.

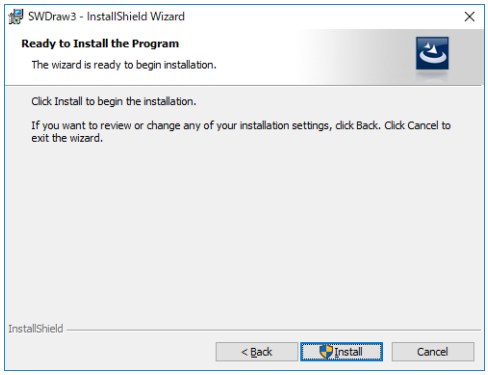


6 Click the [Next] button.



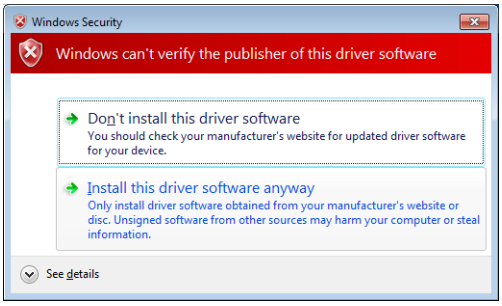
7 Read the precautions. Select [I accept the terms in the license agreement] to accept, then click the [Next] button.

8 Click the [Install] button.

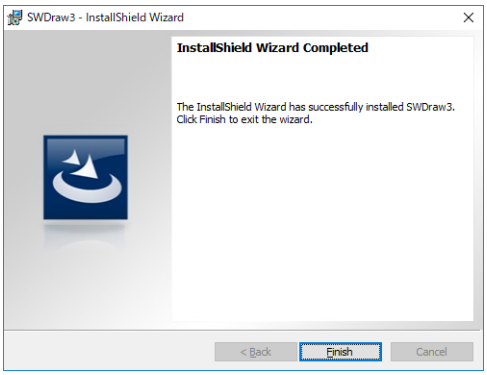


File copying will begin.

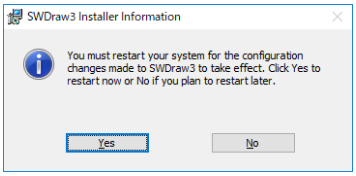
9 When the confirmation screen is displayed, click [Install this driver software anyway] to install it. (The screen display may differ.)



10 The following screen is displayed after SWDraw3 is installed. Click the [Finish] button to close the screen.



11 The screen which prompts you to reboot the computer is displayed. First, eject the DVD from the computer. Next, click the [Yes] button to reboot the computer.



SWDraw3 is now installed.

When starting SWDraw3 for the first time and there is no information on the connected model in the installation folder, a message which prompts you to reboot SWDraw3 is displayed.

2.2. Computer Network Settings

To set schedules by the SWDraw3 laser equipment application, set the same network group as the laser equipment. Follow steps given below to set the appropriate computer network.

1 From the start menu, select [Windows System] -> [Control Panel].

You will see the [Control Panel] screen.

2 Click [Network and Sharing Center] in Classic View or [View network status and tasks] in Category View.

You will see the [Network and Sharing Center] screen.

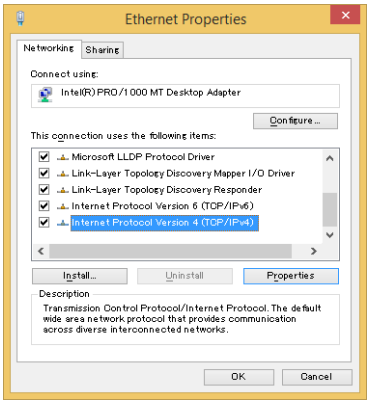
3 Choose [Change adapter settings] on the [Network and Sharing Center] screen.

You will see the [Network Connections] screen.

4 Right-click [Local Area Connection] for the adapter to use and select the Properties.

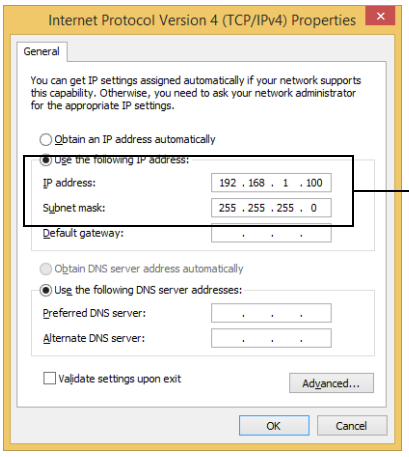
You will see the [Ethernet Properties] screen.

5 Choose [Internet Protocol Version 4 (TCP/IPv4)] and select the Properties.



You will see the [Internet Protocol Version 4 (TCP/IPv4) Properties] screen.

6 Set the IP address and the Subnet mask.



IP address: 192.168.1.100 (example)
* Anything except 70 since the laser equipment is [192.168.1.70].

Subnet mask: 255.255.255.0

7 Click the [OK] button to close the Control Panel.

You have finished setting up the computer network.

2.3. Computer Environment Settings

Before using the SWDraw3 laser equipment application, follow steps given below to set the appropriate computer environment.

1 After starting the computer, adjust the energy management settings.

1) From the start menu, select [Windows System] -> [Control Panel].

   You will see the [Control Panel] screen.

2) Choose [Power Options].

   You will see the [Power Options] screen.

3) Choose [Balanced] and click [Change plan settings].

   You will see the [Change plan settings] screen.

4) Choose [Change advanced power settings].

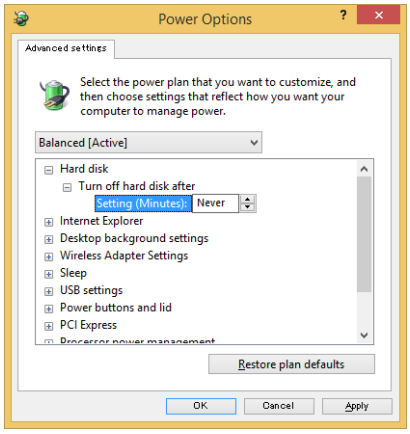
   You will see the [Power Options (Advanced)] screen.

5) Complete the settings as shown below. For items not shown, leave them as the standard settings.

   Hard disk, Turn off hard disk after: Never (or 0)

   USB settings, USB selective suspend setting: Disabled

   Display, Turn off display after: Never (or 0)



6) Click the [Apply] button and then click the [OK] button.

   You will return to the [Power Options] screen.

7) Click the [Cancel] button.

   You will return to the [Power Options] screen.

8) Click the [x] button to close the screen.

2 Adjust the display settings.

1) Press <Windows logo> key and <X> key simultaneously.

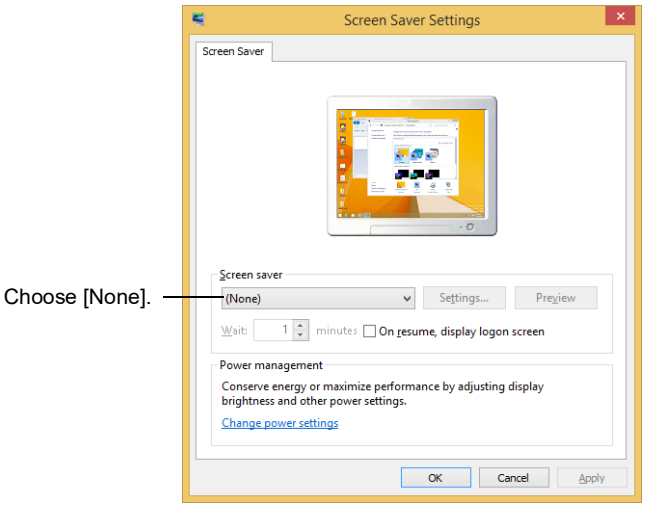
2) Click the Control panel from a pop-up shortcut menu.

   The [Control Panel] screen will be displayed.

3) Choose [Screen Saver] from [Personalization] in Classic view or [Screen Saver] from [Change the theme] in Category View.

   The [Screen Saver Settings] screen will be displayed.

4) Choose [None] from a drop-down list of Screen saver.



5) Click the [Apply] button and then click the [OK] button.

You will return to the [Personalization] screen.

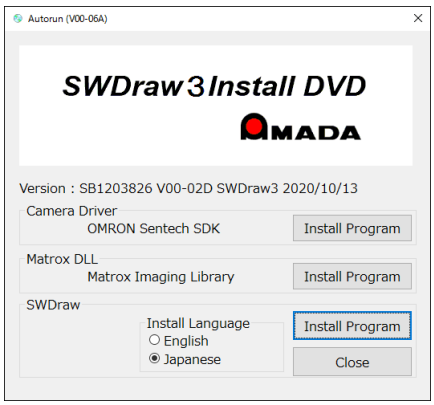
3 Click the [x] button to close the screen.

You have finished setting up the computer environment.

2.4. Installing the Camera Driver for the Gridwork

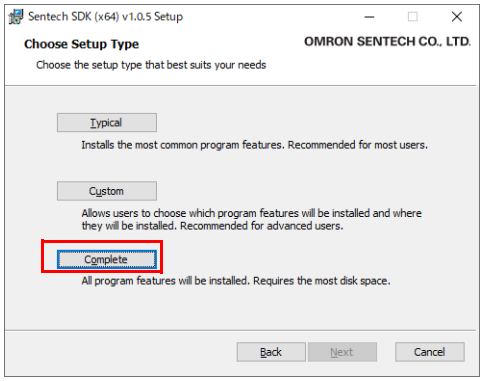
To connect the camera for the Gridwork, follow steps given below to install the camera driver.

1 Click the [Install Program] button in the Camera Driver field of the launcher (Auto-run.exe). When not starting the launcher, perform steps 1 to 3 of “2.1. Installing SWDraw3, the Welding Application.”



2 Follow the instructions on the screen to perform installation. Click the [Next] button when there is no instruction.

3 The screen for selecting the setup method is displayed in the middle of setup. Click the [Complete] button.



4 Click the [Install] button to start installation.

After a several seconds, you will see the screen confirming that the driver installation is complete.

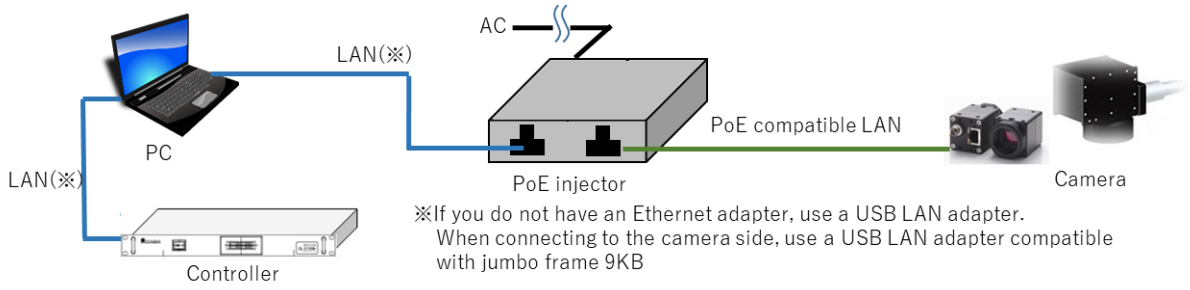
5 Click the [Finish] button.

You have finished installing the camera driver.

When using the USB camera, connect the USB cable to the USB3.0 port of the computer. When using the GigE (LAN) camera, refer to section 2.5.

2.5. LAN Connection and Camera Driver Communication Settings

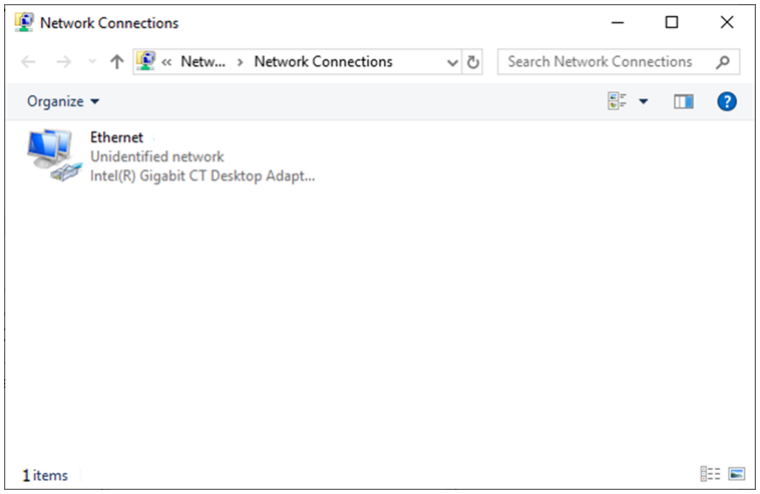
Perform the communication settings of LAN connection with a computer and the camera driver installed in section 2.4. Before setting, confirm that LAN connection is made as follows.



2.5.1. IP Address and Jumbo Frame Settings of LAN Connection

Follow steps given below to set the IP address and the jumbo frame of LAN connection.

1 From the start menu, select [Setting] -> [Network and Internet], and click [Change adapter options] in Change your network settings on the displayed screen.

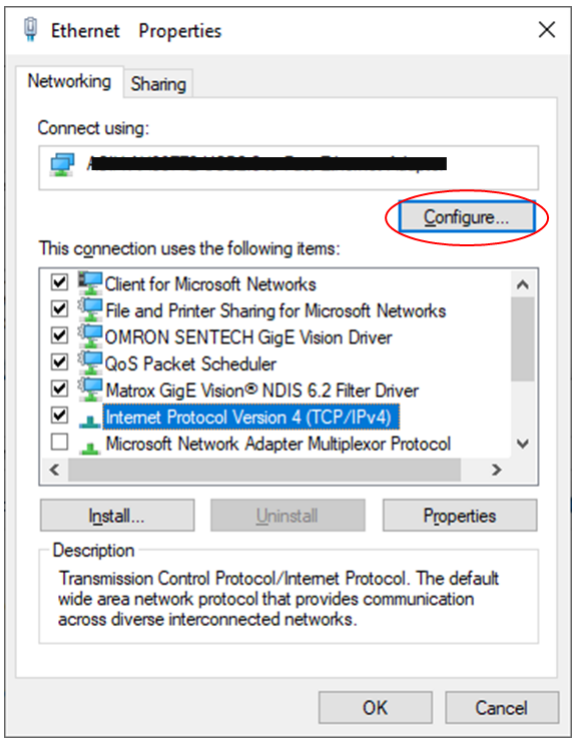


You will see the [Network Connections] screen. (Connection example)

2 Select the connected Ethernet from the [Network Connections] screen and right-click it. Select [Properties] from the pop-up menu and click it.

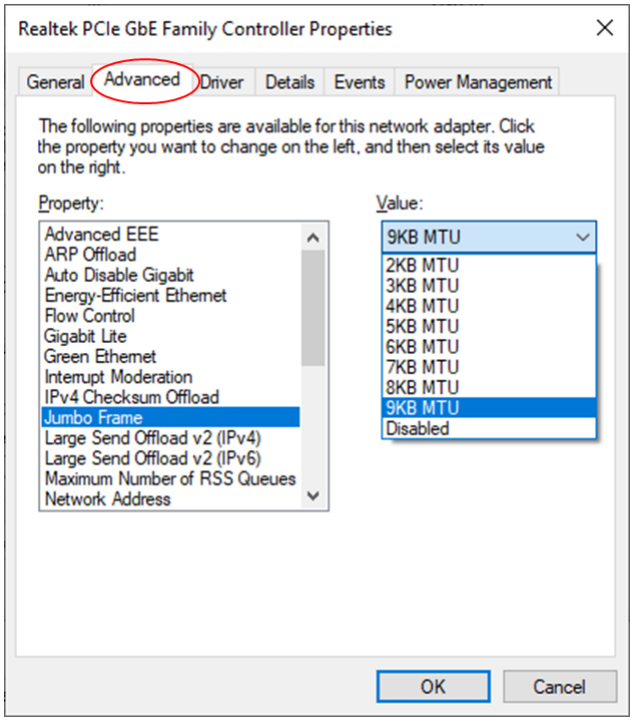
You will see the [Ethernet Properties] screen.

3 Set the jumbo frame. Click the [Configure] button on the [Ethernet Properties] screen.

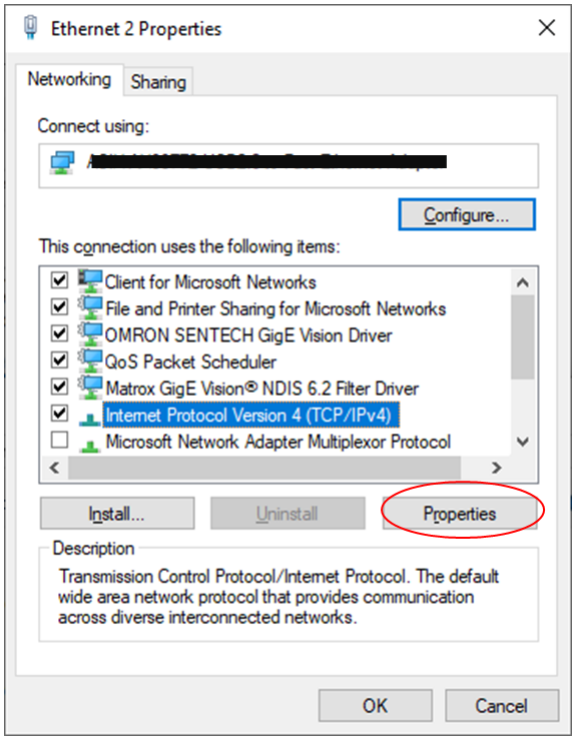


You will see the ["connected Ethernet name" Properties] screen.

4 Select the [Advanced] tab and select [Jumbo Frame (or Jumbo Packet)] from Property and [9KB MTU (or 9014 Bytes)] from a drop-down list of Value. After selection, click the [OK] button to close the screen. The jumbo frame setting is complete.

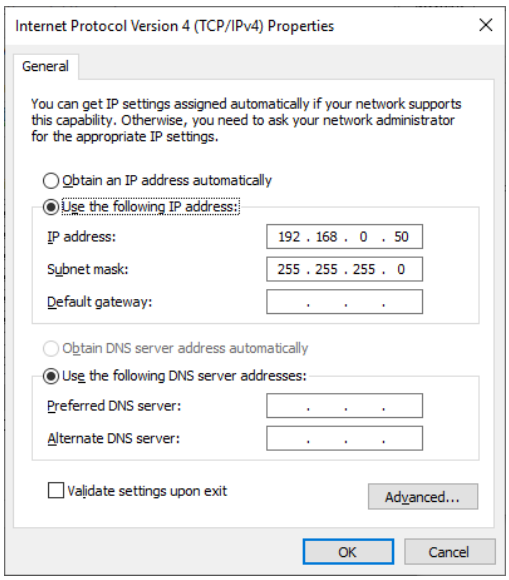


5 Set the IP address. Select [Internet Protocol Version 4 (TCP/IP)] in the [Ethernet Properties] screen and click the [Properties] button.



You will see the [Internet Protocol Version 4 (TCP/IP) Properties] screen.

6 Select [Use the following IP address] and specify “192.168.0.50” for the IP address not used for CL-E100A and “255.255.255.0” for the Subnet mask.



7 Click the [OK] button to close the screen.

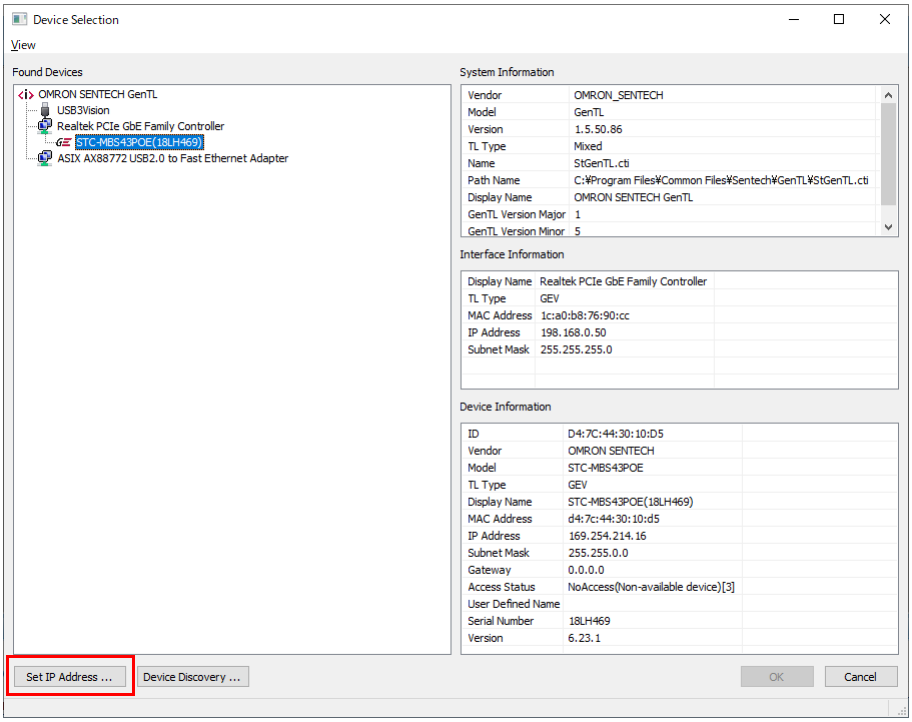
You have finished setting up the LAN adapter.

2.5.2. IP Address Setting by the Camera Driver

Set the IP address by using the application (GigECamaeraIPConfig) in the Sentech SDK installed in section 2.4.

Follow steps given below to perform settings by using GigECamaeraIPConfig.

1 Select [Sentech SDK / GigECamaeraIPConfig] in the start program to start the GigECamaeraIPConfig or start the GigECameraIPConfig_VC120_Win32.exe from the folder which the Sentech SDK has been installed (C:\Program Files\OMRON_SENTECH\Sentech SDK\Application).

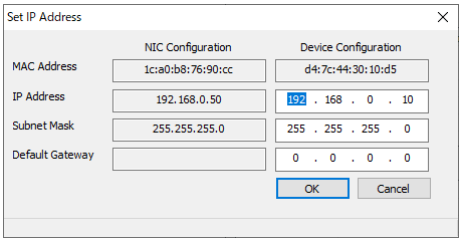


You will see the [Device Selection] screen.

2 Select the connected camera from the [Device Selection] screen and click the [Set IP Address...] button at the lower left portion.

You will see the [Set IP Address] screen.

3 Input “192.168.0.10” which is not the same as the IP address set at the time of LAN connection with CL-E100A in [IP Address], and the value set for LAN connection in [Subnet mask]. When the input values are not wrong, the [OK] button can be clicked. Click the [OK] button to close the screen.



4 After setting the IP address, click the [OK] button to close the [Device Selection] screen. The [GigE Camera IP Config] screen for recording the IP address into the camera side appears automatically. Set the same IP address in the screen.

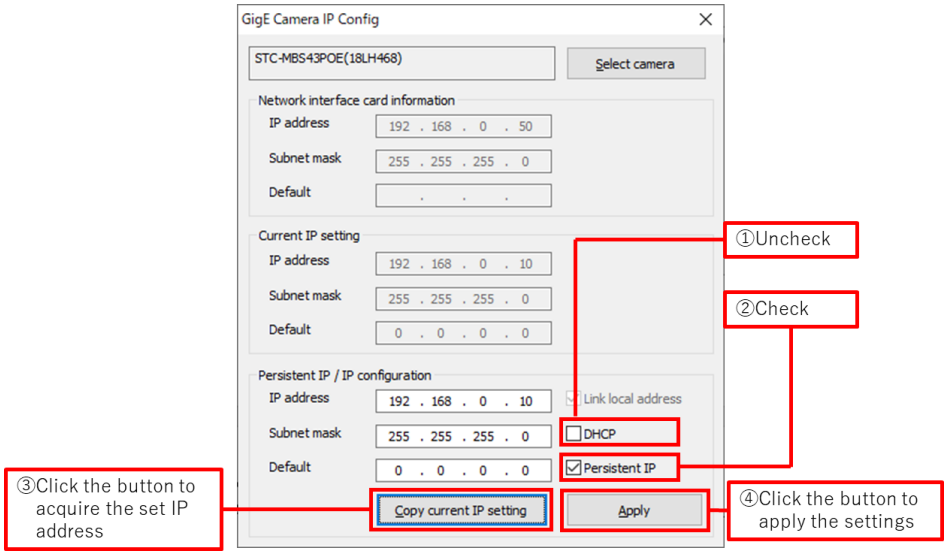
Follow steps given below to perform settings in the [GigE Camera IP Config] screen.

1) Uncheck [DHCP] if checked.

2) Check [Persistent IP].

3) Click the [Copy current IP setting] button to acquire the IP address set in step 3.

4) Click the [Apply] button to record the IP address into the camera side.



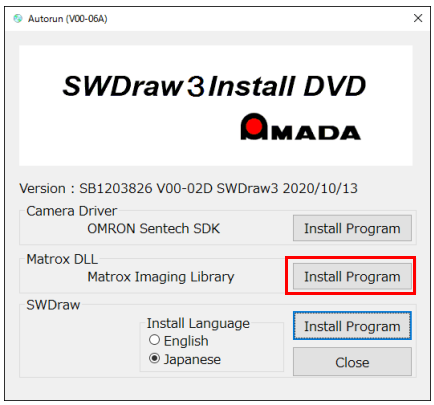
5 Click the [x] button to close the screen.

You have finished setting up the camera.

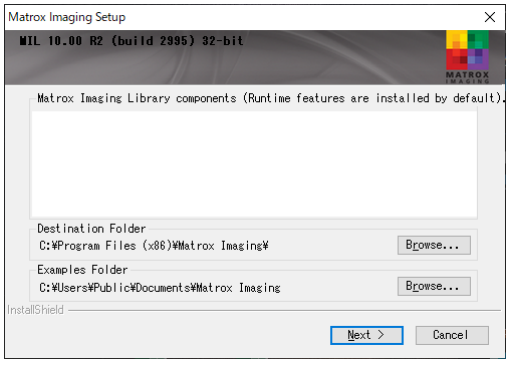
2.6. Installing the Matrox Imaging Library

To use the Auto position alignment, follow steps given below to install the Matrox Imaging Library (MIL).

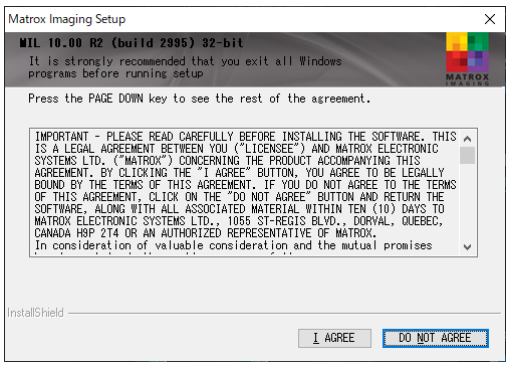
1 Click the [Install Program] button in the Matrox DLL field of the launcher (Auto-run.exe). When not starting the launcher, perform steps 1 to 3 of “2.1. Installing SWDraw3, the Welding Application.”



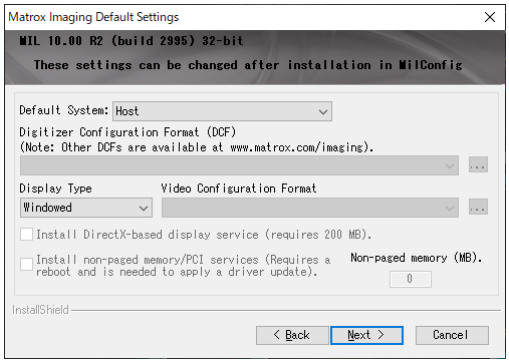
2 Select the folder where the Matrox Imaging Library is installed. Leave it unchanged and click the [Next] button if there is not special reason to change it.



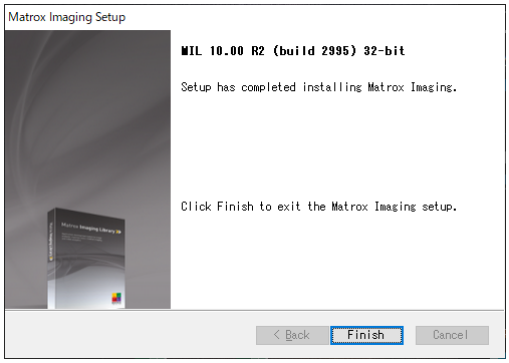
3 The license agreement screen is displayed. Click the [I AGREE] button to accept the contents. If you do not agree, click the [DO NOT AGREE] button. In that case, the Auto position alignment function cannot be used.



4 The installation setting screen for the Matrox Imaging Library (MIL) is displayed. Click the [Next] button without making any changes.



5 After installation, click the [Finish] button.



The Matrox Imaging Library (MIL) is now installed.

Chapter 2 Basic Settings of SWDraw3

1. Overview

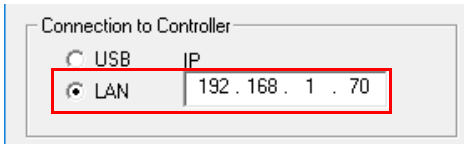
The following settings are necessary after installing SWDraw3 referring to “Chapter 1 SWDraw3 Overview.”

2. Basic Settings

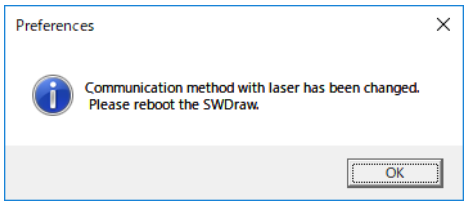
1 After starting SWDraw3, select [Setting] -> [Preferences] from the menu.

The [Preferences] screen. is displayed. For details of the [Preferences] screen, refer to "Chapter 15-1. Preferences" (page 248) .

2 Select “LAN” for [Connection to Controller] and click the [OK] button after confirming that the IP address is “192.168.1.70.”



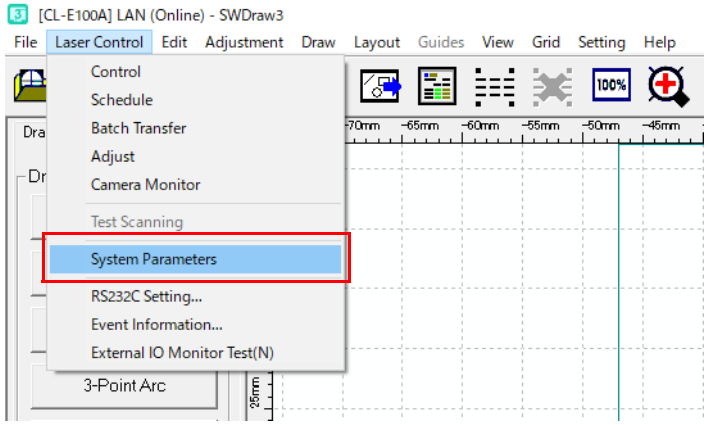
3 Perform the following procedure. After setting, a message which prompts you to reboot SWDraw3 is displayed. After being rebooted, SWDraw3 operates under the model detected online.



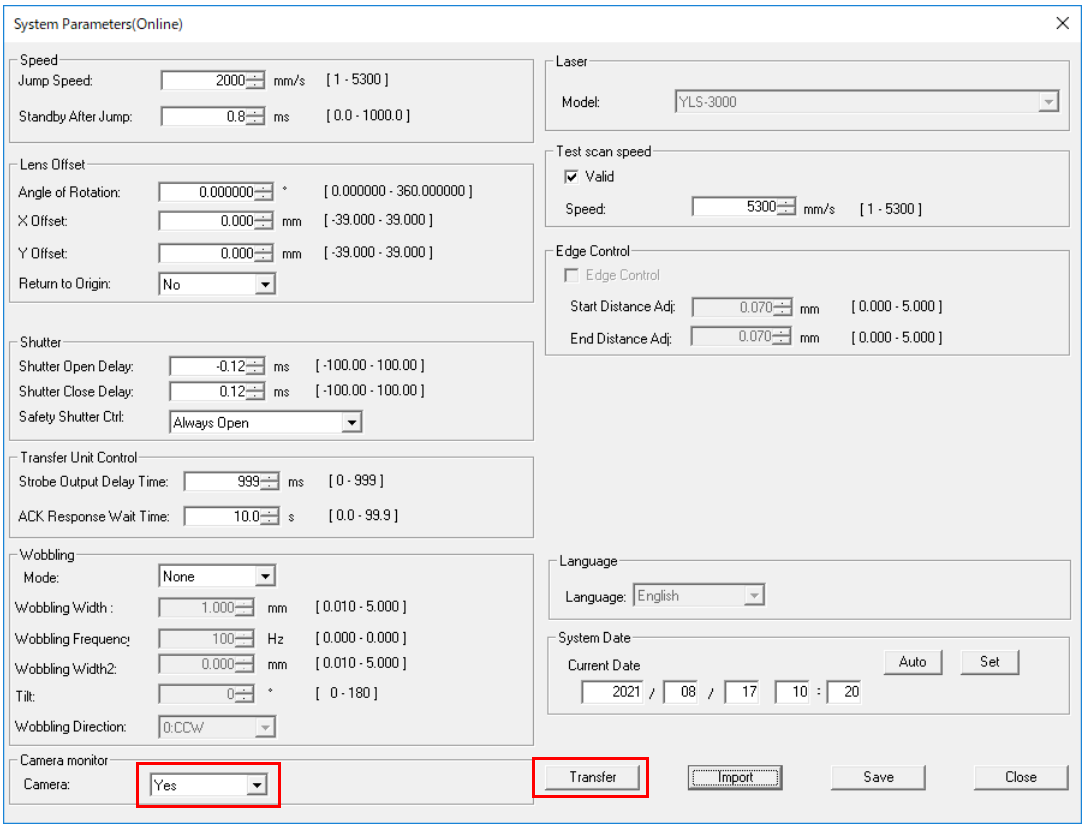
3. Camera Monitor Selection

CAUTION	• Perform this operation only when the Camera Unit (option) is connected. • Perform this operation when communicating with CL-E100A for the first time and changing the Camera Unit.

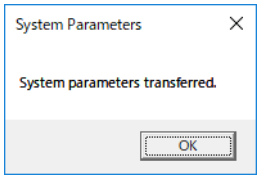
1 From the menu, select [Laser Control] -> [System Parameters].



2 Select “Yes” from [Camera] under Camera monitor.



3 Click the [Transfer] button. On success, the message “System parameters transferred” appears. Click the [OK] button to close the screen.



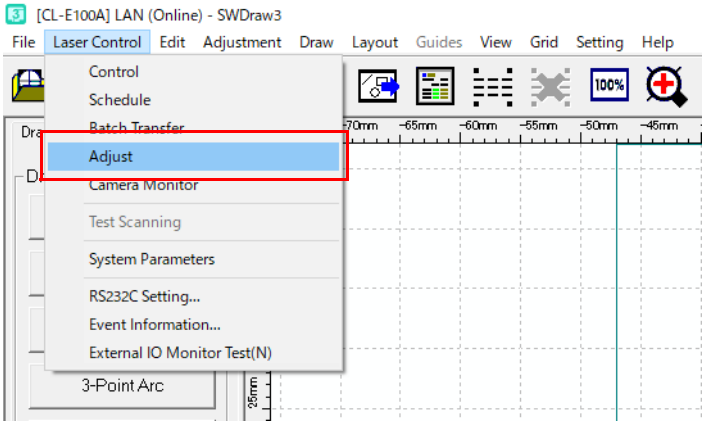
4 Click the [Close] button to close the screen.

The camera monitor is now selected.

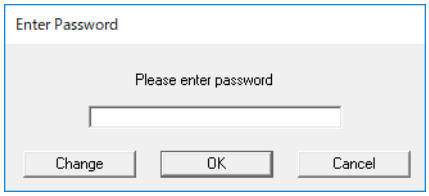
4. Scanner Setting Check

CAUTION	• Perform this operation only when the scanner head unit CL-H series is connected. • Perform this operation with online to CL-E100A. • Perform this operation when communicating with CL-E100A for the first time and changing the fθ lens.

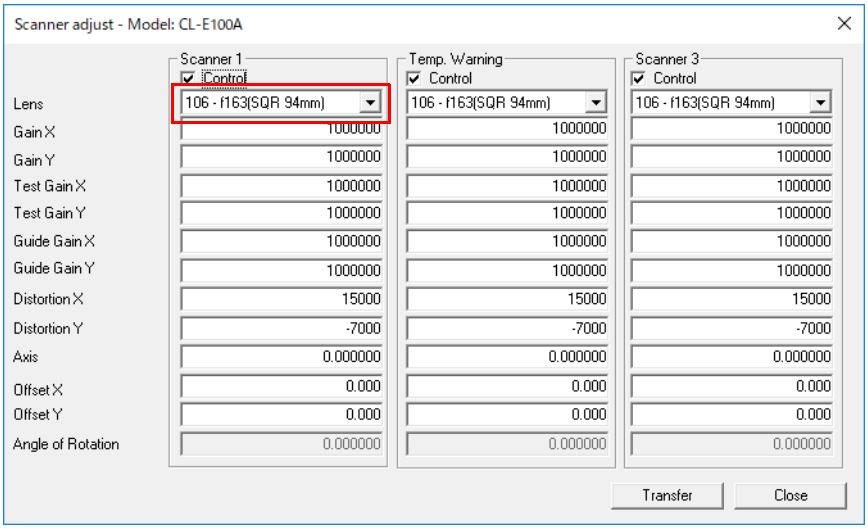
1 From the menu, select [Laser Control] -> [Adjust].



2 Input the password on the [Enter Password] screen and click the [OK] button to display the [Scanner adjust] screen. (When no password is set, leave it blank and click the [OK] button.)



3 Confirm that [Lens] of Scanner 1 is the same as the fθ lens mounted on the scanner head unit.



4 Click the [OK] button.

The scanner setting is now checked.

Chapter 3 [Quick Reference] Computer-based Welding

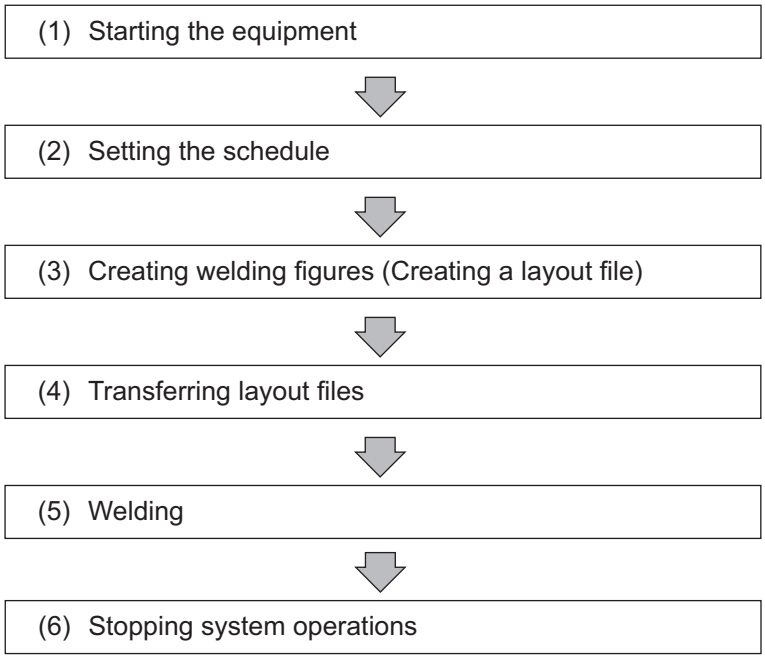
Welding Workflow

This section outlines computer-based welding using the following conditions.

Example:

- Material to be welded: SUS
- Layout filename: SAMPLE
- Figure to be welded: Rectangle

The basic welding workflow is as follows.



CAUTION	Before following these procedures, make sure the equipment has been installed and connected. If not, refer to the manual for CL-E100A for instructions on installation and connection.

(1) Starting the equipment

Before startup, confirm the following points.

- The laser equipment, laser control unit, and computer are off.
- The laser equipment, laser control unit, and computer are connected with the LAN cable.

1 Turn on the laser equipment.

2 Turn on the laser equipment Control key switch.

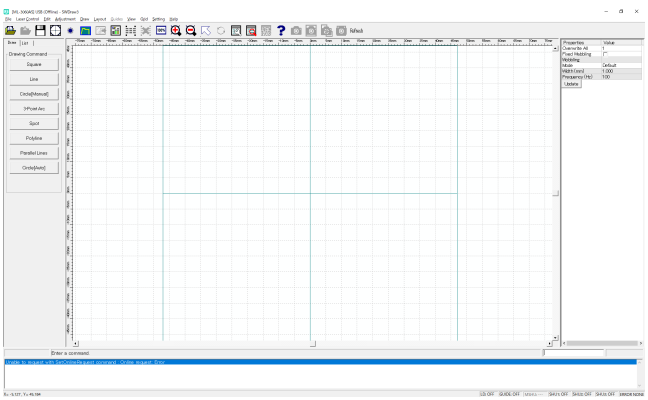
3 Turn on the laser control unit. “INITIAL” is displayed for Status on LCD and self-diagnosis begins.

CAUTION	When reversing the order of steps 2 and 3, the error No. 1030 may occur. Execute the reset operation.

4 After self-diagnosis is complete, “READY” is displayed for Status on LCD. After confirming it is displayed, go to the next step.

5 Start the computer.
After confirming that the computer is running, go to the next step.

6 Double-click the [SWDraw3] icon on the desktop to start the SWDraw3 application.
After SWDraw3 starts, the Drawing screen is displayed.



7 Confirm that the equipment is connected correctly by checking the status display field on the Drawing screen.
“Online” displayed in the title bar indicates that the laser control unit is online.

Equipment startup is now complete.

(2) Setting the schedule

Before starting welding, the waveform creation method, the laser emission time, and laser output parameters must first be set. The output parameters for this system are referred to as a schedule.

Here, the waveform is created using the FIX method. For details, refer to "Chapter 6-3. Schedule" (page 74) .

1 From the menu, select [Laser Control] -> [Schedule].

The [SCHEDULE INPUT] screen appears.

CAUTION	The [SCHEDULE INPUT] screen appears only when the laser equipment is online.

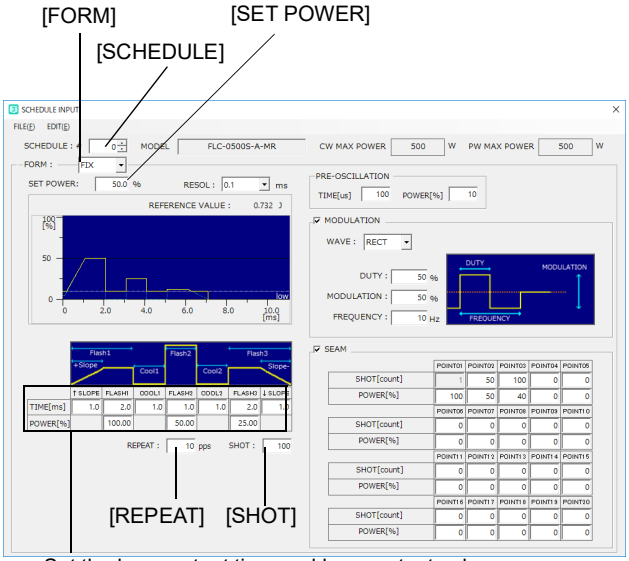
2 Set the desired schedule number in the [SCHEDULE] box (e.g. “0”), and then select “FIX” in the [FORM] box.

The FIX form screen appears.

3 Set the laser output peak value in [SET POWER], the number of laser outputs per second in [REPEAT], and the number of laser outputs in [SHOT] as shown below.

SET POWER	REPEAT	SHOT
50	10	100

4 Set the laser output time and laser output value in [↑ SLOPE] to [↓ SLOPE] as shown below. Note that [↑ SLOPE] cannot be entered after [FLASH1] has been entered.



Set the laser output time and laser output value.

	↑ SLOPE	FLASH1	COOL1	FLASH2	COOL2	FLASH3	↓ SLOPE
TIME	1.0	2.0	1.0	1.0	1.0	2.0	1.0
POWER	–	100.00	–	50.00	–	25.00	–

Schedule setting is now complete.

(3)Creating welding figures (Creating a layout file)

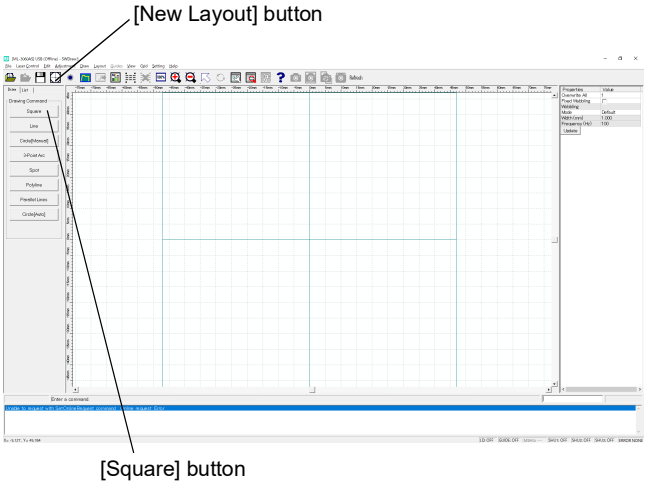
Arrange the figures to be welded and save them as a layout file.

The following example shows how to create a layout file consisting of rectangles.

1 To create a new layout, you will need a new layout file.

Click the [New Layout] button.

The Drawing screen displays a blank layout area.

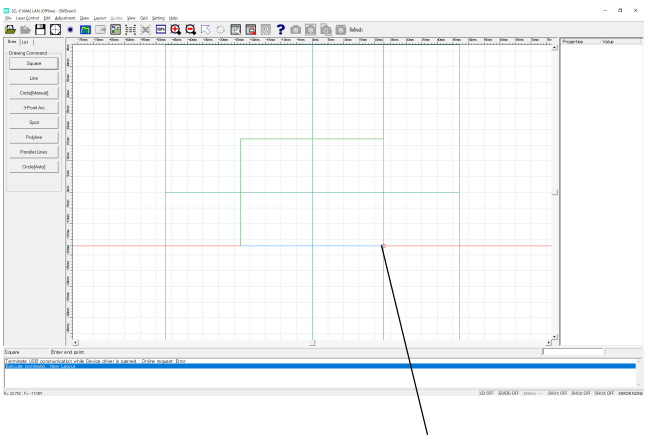


2 Click the [Square] button.

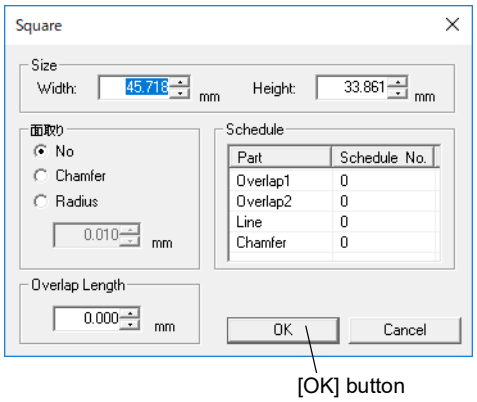
3 Position a rectangle.

Click the desired location, move the mouse to alter the size, and then click for the desired size.

The [Square] screen appears.

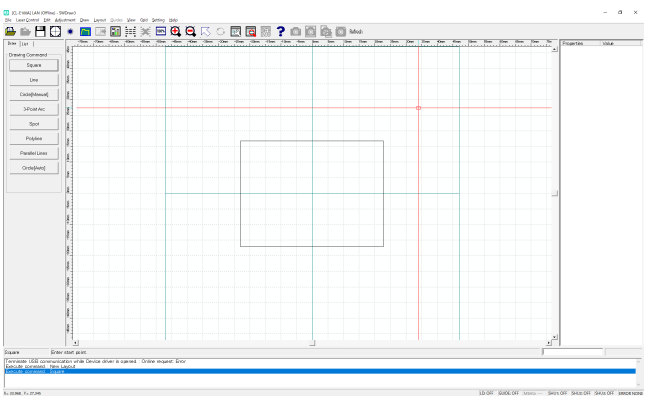


4 Enter the value, and click the [OK] button.

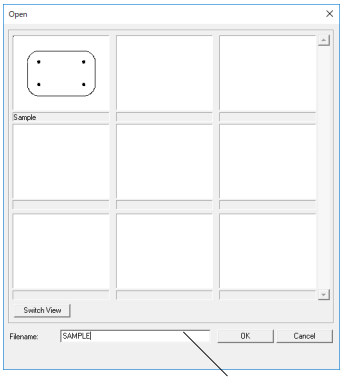


5 Save the layout file after arranging the rectangle.

From the menu, select [File] -> [Save Layout As].
The [Save Layout As] dialog is displayed.

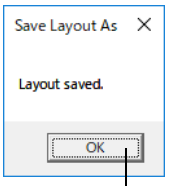


6 Enter the filename in [Filename] (e.g. SAMPLE), and click the [OK] button.



Enter the filename.

7 The confirmation message on the right is displayed after the file is saved. Click the [OK] button to close.



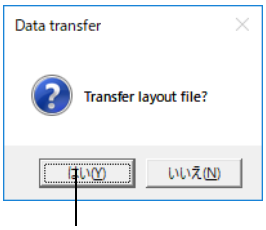
[OK] button

The layout file of the rectangle to be welded is now saved in the computer work folder.

(4) Transferring layout files

This step transfers the created layout file to the laser control unit. The laser control unit manages layout files by file numbers. You must assign a number to the file.

1 The confirmation screen appears.



[Yes] button

2 Click the [Yes] button.

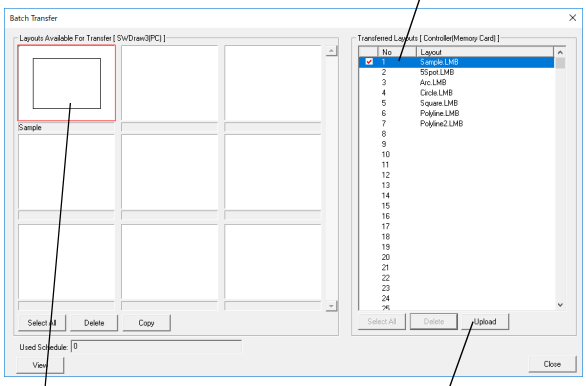
The [Batch Transfer] screen appears. The layout created in (3) is highlighted (red frame in thumbnail display or gray/blue background in list display).

You will return to the Drawing screen without transferring by clicking the [No] button.

3 In [Layouts Available For Transfer] on the left, select a layout file to be transferred (e.g. SAMPLE), and double-click on a layout number (e.g. 1) in [Transferred Layouts] on the right.

The layout filename is displayed on [Layouts Available For Transfer] and a check mark is put in [Transferred Layouts].

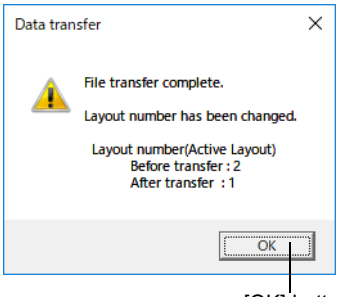
Select the layout number.



[Upload] button

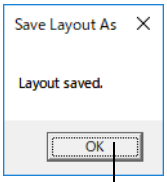
Double-click the layout file to be transferred.

4 The confirmation message on the right is displayed following file transfer. Click the [OK] button to close.



[OK] button

When the layout number is not changed, the confirmation message on the right is displayed. Click the [OK] button to close.



[OK] button

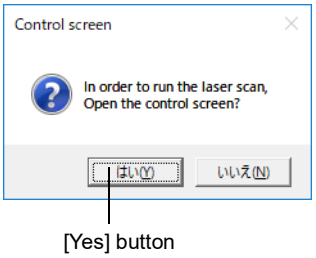
The layout file has now been transferred to the laser control unit and the layout number (active layout) is set.

(5) Welding

Commence welding.

CAUTION	Always wear protective eyewear when emitting the laser beam.

1 The confirmation screen appears.



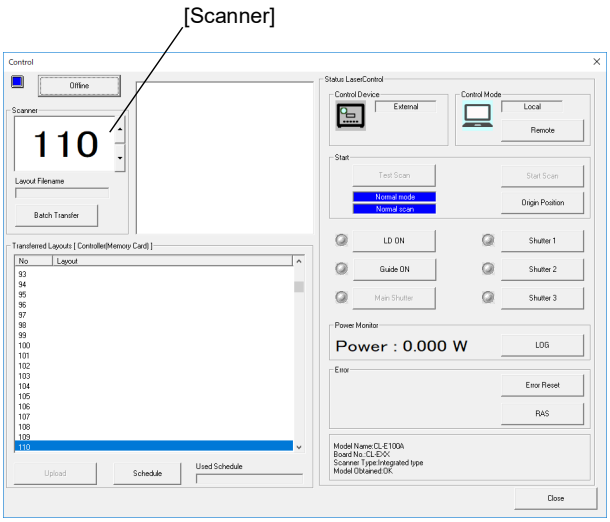
2 Click the [Yes] button to display the [Control] screen.

You will return to the Drawing screen by clicking the [No] button.

3 Mount the workpiece to be welded.

4 Confirm that the layout created in (3) is displayed in [Scanner] (e.g. “110”).

This step identifies the layout file for welding.

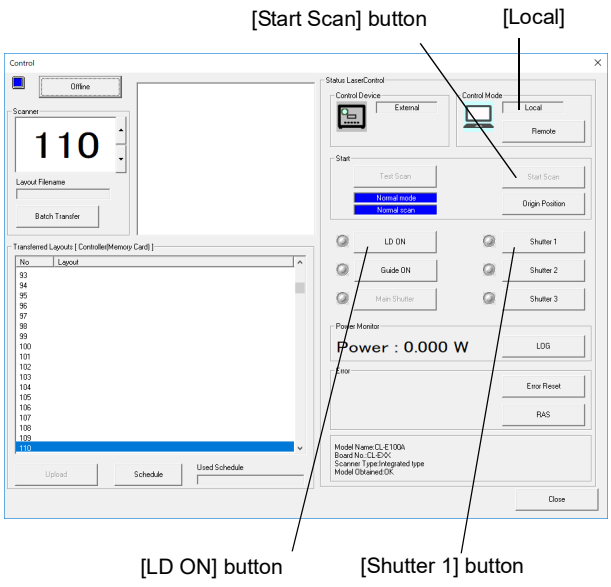


CAUTION	When the layout file cannot be transferred or the transferred layout number is not displayed, the USB communication may be offline or [Control Mode] is [Remote].

5 Confirm that the laser control unit is controlled locally. The laser control unit is controlled locally if [Control Mode] appears as [Local]. If not controlled locally, click the [Local] button for [Laser Control].

6 The laser control unit is running if [LD] appears as [ON]. If not running, click the [LD ON] button for [Laser Control].

7 Click the [Shutter Open] button of the shutter to be used to open the shutter.

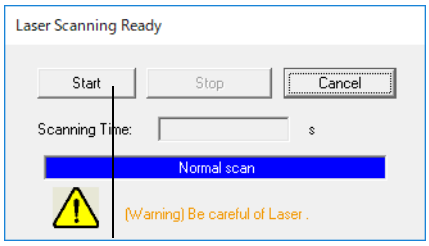


8 Click the [Start Scan] button.

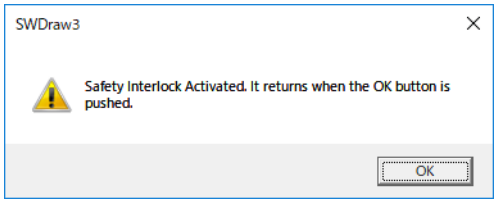
The [Laser Scanning Ready] screen appears.

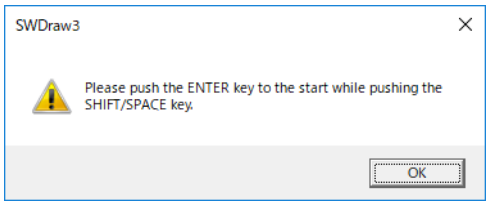
9 Click the [Start] button.

Welding starts.



[Start] button

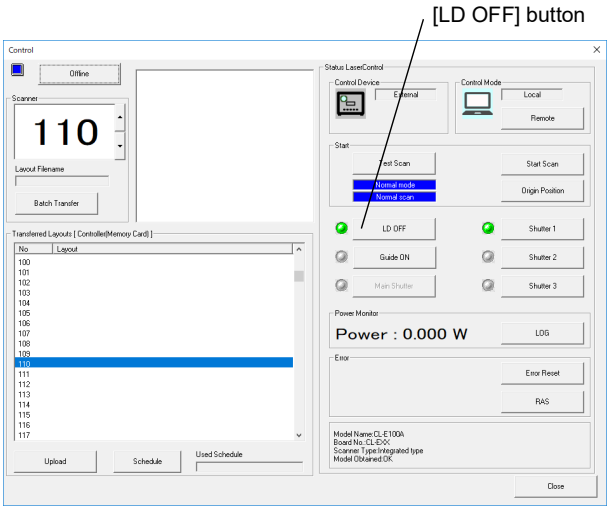
ATTENTION	When 5 seconds has passed while the mouse cursor is placed over the [Start] button on the [Laser Scanning Ready] screen or immediately after completion of laser scanning, the screen is locked for safety and the following screen appears. Click the [OK] button to return to the [Laser Scanning Ready] screen. 

ATTENTION	When the [Start Scan] button is clicked with the <Enter> key or the <Space> key on your keyboard pressed, the following screen appears. To start welding from a keyboard, press the <Enter> key or the <Space> key with pressing the <Shift> key and click the [Start Scan] button. 

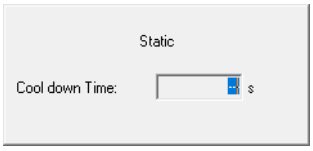
(6) Stopping system operations

1 From the menu, select [Laser Control] -> [Control].
The [Control] screen appears.

2 When the [LD] is ON, click the [LD OFF] button.



3 The "Cooling down" message is displayed on the Drawing screen while operation is stopped.



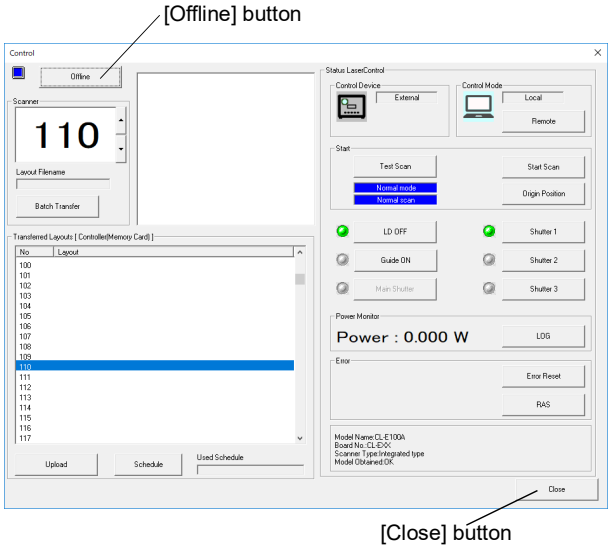
CAUTION	Do not turn off the power switch while the Drawing screen displays the “Cooling down” message. Shutting off the power switch while the system is stopped will significantly reduce the life of the laser equipment.

CAUTION	Do not shut off the power while “Online” is displayed in the title bar. Shutting off the power switch while [Online] is displayed may result in the loss of data on memory card, preventing the system from restarting.

4 The "Cooling down" message disappears on the Drawing screen after the LD has finished shutting down.

5 Click the [Offline] button on the [Control] screen.

6 Click the [Close] button to close the [Control] screen.



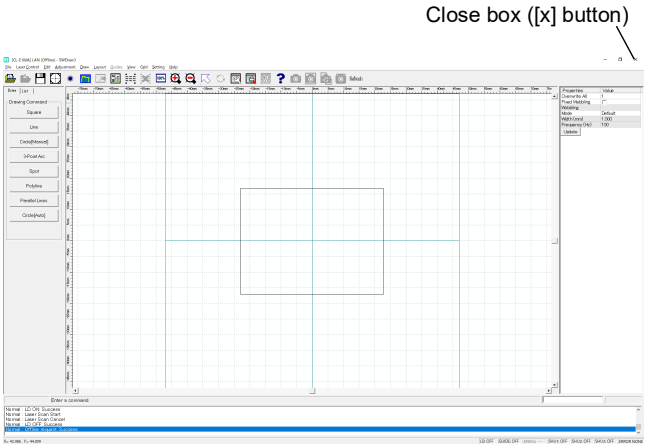
7 To exit SWDraw3, select [File] -> [Exit] from the menu or click the Close box ([x] button) in the top-right corner of the screen.

8 Turn off the power of laser control unit.

9 Turn off the laser equipment Control key switch.

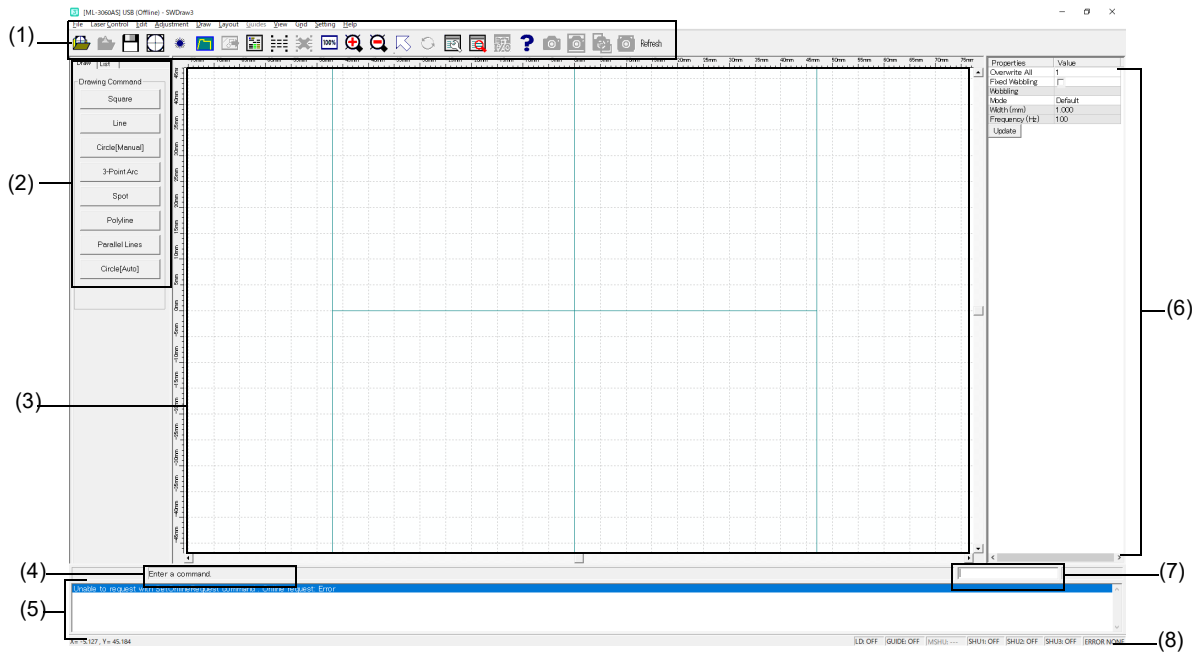
10 Turn off the laser equipment.

System shutdown is now complete.



Chapter 4 Drawing Screen

1. Drawing Screen Structure



(1) Menu bar and toolbar

The menu bar and toolbar offer functions used in preparing layout files. (Refer to "Chapter 4-2. Drawing Screen Functions" (page 42) .)

(2) Drawing commands

These buttons are used for common drawing functions. (Refer to "Chapter 4-2. Drawing Screen Functions" (page 42) .)

(3) Layout area

This area is used for drawing. The area within this circle corresponds to the actual welding area. For drawing, figure selection, and other actions, you will use the crosshair cursor (hereafter, “cursor”) or enter coordinates. The cursor can be freely moved using the mouse.

 ATTENTION	Clicking the background of the layout area will display [Overwrite All], [Fixed Wobbling] and [Wobbling] properties in the properties field. [Overwrite All] allows you to specify the number of times of repeating the overall layout (1 to 5000). [Fixed Wobbling] allows you to repeat the overall layout until the laser scanning stops. To apply the [Fixed Wobbling] function, the layout should consist of a single part and be a single closed figure. When the layout includes multiple images, the [Fixed Wobbling] function may not function. It may not work as set depending on the combination of the set values (scanning speed and specified distance). [Fixed Wobbling] cannot be used together with [Overwrite All] and overlap. To enable a function you select, click the [Update] button after inputting the number for [Overwrite All] or putting a check mark for [Fixed Wobbling]. In the [Default] setting of Mode of [Wobbling], the [Wobbling] function in the [System Parameters] screen becomes enabled. Also, when both [Wobbling] in the Drawing screen and [Wobbling] in the [System Parameters] screen are selected, the [Wobbling] setting in the Drawing screen becomes enabled. (Refer to "Chapter 6-7. System Parameters (Setting Laser Equipment Operating Conditions)" (page 101) .)

(4) Message display

Displays messages regarding operations.

(5) History display

Displays a record of operations.

(6) Properties field

Displays figure properties. You can change the properties here as needed.

(7) Command field

For entry of single-byte numbers for coordinates, angles, radii, etc.

(8) Status bar

Displays the current cursor position and ON/OFF status for the laser equipment.

Elements of the Status Bar

Item	Function
Coordinate value	Displays cursor coordinates.
LD ON/OFF	Displays ON when the laser equipment is running; OFF when stopping.
GUIDE ON/OFF	Displays ON when the guide beam of the laser equipment is turned on; OFF when turned off.
MSHU ON/OFF	Displays ON when the safety shutter 1 of the laser equipment is open; OFF when closed.
SHU1 ON/OFF	Displays ON when the branch shutter 1 of the laser equipment is open; OFF when closed.
SHU2 ON/OFF	Displays ON when the branch shutter 2 of the laser equipment is open; OFF when closed.
SHU3 ON/OFF	Displays ON when the branch shutter 3 of the laser equipment is open; OFF when closed.
Hard Error ERROR NONE	Displays the error status. Hard Error is displayed when an error occurs. ERROR NONE is displayed when no error occurs.

2. Drawing Screen Functions

The following table lists the Drawing Screen menus and the corresponding functions.

Drawing Screen Functions (1 / 6)

Menu	Submenu	Button	Function
File	New		Displays a new layout screen. (See "Chapter 5-1.1. New (Creating New Layout Files)" (page 48) .)
	Open		Opens a layout file. (See "Chapter 5-1.2. Open (Editing an Existing Layout File)" (page 49) .)
	Save		Saves the open layout file under the same name. (See "Chapter 5-1.3. Save (Saving Layout Files)" (page 50) .)
	Save As	—	Saves the open layout file under a different name. (See "Chapter 5-1.4. Save As (Saving Layout Files under a New Name)" (page 51) .)
	Save Layout PrevVer	—	Saves the open layout file in the format of the previous version to load the file in the version without hatching or repetition functions (V00-02A and earlier of SWDraw2 or SWDraw). Hatching is converted into polylines or deleted. Repetition is initialized (fixed to 1). (See "Chapter 5-1.5. Save Layout PrevVer (Saving Layout Files in the Format of the Previous Version)" (page 52) .)
	Import -> Import DXF	—	Imports a DXF file created in CAD software. (See "Chapter 5-2.1. Import DXF (Importing DXF Files)" (page 56) .)
	Import -> Import GWH	—	Imports a file created on the GWH-□□-□□. (See "Chapter 5-2.2. Import GWH (Importing GWH Files)" (page 57) .)
	Merge Layout	—	Imports a plurality of existing layout files to newly create a merged layout. (See "Chapter 5-3. Merging Layouts" (page 58) .)
	Exit	—	Quits SWDraw3. (See "Chapter 5-4. Exit" (page 60) .)
Laser Control	Control		Sends layout files performs welding, and sets control devices. (See "Chapter 6-1. Control" (page 61) .)
	Schedule		Sets the laser emission time and laser output parameters. (See "Chapter 6-3. Schedule" (page 74) .)
	Batch Transfer		Transfers layout files to the laser control unit. (See "Chapter 6-4.1. Layout File Transfer" (page 92) .)

Drawing Screen Functions (2 / 6)

Menu	Submenu	Button	Function
Laser Control (continued)	Adjust	—	Sets the scanner operating conditions. (See "Chapter 6-5. Scanner Adjust" (page 98) .)
	Camera Monitor		Operates the camera live image and the scanner. Calls the [Capture] screen. (See "Chapter 6-6. Camera Monitor" (page 100) .)
	System Parameters		Specifies basic laser equipment operating conditions. (See "Chapter 6-7. System Parameters (Setting Laser Equipment Operating Conditions)" (page 101) .)
	RS232C Setting	—	Making communication settings on the laser control unit side in RS-232C communication between the control computer and the laser control unit. (See "Chapter 6-8. RS232C Setting" (page 106) .)
	Event Information	—	Displays the contents of events. (See "Chapter 6-9. Event Information" (page 107) .)
	External I/O Monitor Test		Monitors the I/O signals connected to the external I/O connector. (See "Chapter 6-10. External I/O Monitor Test" (page 108) .)
Edit	Undo	—	Undoes the previous action. (See "Chapter 8-1. Undo (Undoing an Operation)" (page 149) .)
	Redo	—	Repeats the action that was undone. (See "Chapter 8-2. Redo (Redoing an Operation)" (page 149) .)
	Delete	—	Deletes the selected figures. (See "Chapter 8-3. Delete (Deleting a Figure)" (page 149) .)
	Copy	—	Creates a copy of the figures. (See "Chapter 8-4.1. Copy (Arranging Copied Objects)" (page 150) .)
	Copy and Rotate	—	Copies and rotates figures. (See "Chapter 8-4.2. Copy and Rotate (Arranging Rotated Copies)" (page 151) .)
	Copy and Invert	—	Copies and inverts figures. (See "Chapter 8-4.3. Copy and Invert (Arranging Inverted Copies)" (page 152) .)
	Move	—	Moves figures. (See "Chapter 8-5.1. Move (Moving Figures)" (page 153) .)
	Move and Rotate	—	Moves and rotates figures. (See "Chapter 8-5.2. Move and Rotate (Moving and Rotating Figures)" (page 154) .)
	Move and Invert	—	Moves and inverts figures. (See "Chapter 8-5.3. Move and Invert (Moving and Inverting Figures)" (page 155) .)
	Edit Comment	—	Edits the created comment. (See "Chapter 8-6. Comment (Editing a Comment)" (page 157) .)
	Resize Sketch	—	Adjusts sketch size. (See "Chapter 8-5.4. Resize Sketch" (page 156) .)

Drawing Screen Functions (3 / 6)

Menu	Submenu	Button	Function
Edit (continued)	Array -> Create		Copies the figure to create an array. (See "Chapter 8-7.1. Creating Arrays" (page 158) .)
	Array -> Cancel		Clears arrays and returns it to the original figure. (See "Chapter 8-7.2. Canceling Arrays" (page 159) .)
Adjustment	Trim	—	Removes or extends a portion of lines. (See "Chapter 9-1.1. Trim (Deleting Parts of Lines)" (page 160) .)
	Trim Junction	—	Trims unneeded lines from intersection of two lines. (See "Chapter 9-1.2. Trim Junction (Deleting Extra Lines from Junctions)" (page 161) .)
	Selection Mode		Switches to Selection Mode. (See "Chapter 9-2.1. Selection Mode (Switching to Selection Mode)" (page 162) .) Displays the properties of selected figures. (See "Chapter 9-3.1. Using Properties" (page 164) .)
	Rotation Mode		Rotates line segments in Selection Mode. (See "Chapter 9-2.2. Rotation Mode (Rotating Line Segments in Selection Mode)" (page 163) .)
	Poly Resolve	—	Splits polylines created at their construction points into line segments. (See "Chapter 9-4. Poly Resolve (Splitting Figures)" (page 175) .)
	Square Resolve	—	Splits squares into line segments or arcs. (See "Chapter 9-5. Square Resolve (Splitting Squares)" (page 176) .)
	Divide	—	Divides figures created at any point. (See "Chapter 9-6. Divide (Dividing Figures)" (page 177) .)
	Arc to Poly	—	Divides arcs into polylines in the specified number. (See "Chapter 9-7. Arc to Poly" (page 179) .)
	Unite	—	Joins two line segments or arcs into one. (See "Chapter 9-8. Unite (Joining Two Figures into One)" (page 180) .)
	Unite Poly -> Auto	—	Joins two line segments into one automatically. (See "Chapter 9-9.1. Auto (Joining Lines into One Automatically)" (page 182) .)
	Unite Poly -> Manual	—	Joins two line segments into one manually. (See "Chapter 9-9.2. Manual (Joining Lines into One Manually)" (page 183) .)
	Fillet	—	Rounds off corners created with two line segments or polyline in the specified radius. (See "Chapter 9-10. Fillet" (page 184) .)
	Add Const. Pt	—	Adds a construction point. (See "Chapter 9-11. Add Const. Pt" (page 186) .)
	Delete Const. Pt	—	Deletes a construction point. (See "Chapter 9-12. Delete Const. Pt" (page 187) .)

Drawing Screen Functions (4 / 6)

Menu	Submenu	Button	Function
Adjustment (continued)	Hatch to Poly	—	Converts hatching set in circles or squares into polylines. (See "Chapter 9-13. Hatch to Poly" (page 188) .)
	Scanning Order -> Auto	—	Automatically sets the scanning order and direction of the continuous objects in contact with the selected object. (See "Chapter 10-2. Automatic Scanning Order Function" (page 190) .)
	Scanning Order -> Reverse	—	Switches the start and end points for the selected object. (See "Chapter 10-3. Reverse Scanning Order Function" (page 195) .)
	Scanning Order -> Check	—	Indicates the continuous objects in contact with the selected object and the scanning direction. (See "Chapter 10-4. Scanning Order Confirmation Function" (page 198) .)
Draw	Line	Drawing Commands: [Line] button	Draws a line. (See "Chapter 11-1. Line (Drawing Lines)" (page 202) .)
	Polyline	Drawing Commands: [Polyline] button	Draws a polyline (polyline: a continuous line of multiple line segments; e.g., a zig-zag). (See "Chapter 11-2. Polyline (Drawing Polylines)" (page 203) .)
	Parallel Lines	Drawing Commands: [Parallel Lines] button	Draws a line parallel to the current line. (See "Chapter 11-3. Parallel Lines (Drawing Parallel Lines)" (page 217) .)
	Square	Drawing Commands: [Square] button	Draw a rectangle. (See "Chapter 11-4. Square (Drawing Rectangles)" (page 218) .)
	Circle [Manual]	Drawing Commands: [Circle [Manual]] button	Draws a circle with overlap. (See "Chapter 11-5.1. Drawing Circles with Overlap (Manual)" (page 221) .)
	Arc	—	Draws an arc of specific radius. (See "Chapter 11-6. Arc (Specifying a Radius to Draw an Arc)" (page 225) .)
	3-Point Arc	Drawing Commands: [3-Point Arc] button	Draws an arc from three specific points on a circle. (See "Chapter 11-7. 3-Point Arc (Specifying 3 Points to Draw an Arc)" (page 227) .)
	Spot	Drawing Commands: [Spot] button 	Draw a dot. (See "Chapter 11-8. Spot (Drawing Dots for Spot Welding)" (page 228) .)
	Axis Control	Drawing Commands: [Axis Control] button	Arranges the axis control command. (See "Chapter 11-9. Axis Control (Communicates with External Devices)" (page 229) .)
	Circle [Auto]	Drawing Commands: [Circle [Auto]] button	Draws a conventional circle. (See "Chapter 11-5.2. Drawing Conventional Circles (Auto)" (page 223) .)
	Comment	—	Adds a comment for layout data regardless of scanning. (See "Chapter 11-10.1. Creating a Comment" (page 232) .)
Layout	Align Left	—	Aligns figures to the left. (See "Chapter 12-1. Align Left" (page 235) .)

Drawing Screen Functions (5 / 6)

Menu	Submenu	Button	Function
Layout (continued)	Align Right	—	Aligns figures to the right.
	Align Top	—	Aligns figures to the top.
	Align Bottom	—	Aligns figures to the bottom.
	Center Horizontally	—	Centers figures horizontally.
	Center Vertically	—	Centers figures vertically.
	Justify Horizontally	—	Justifies figures horizontally.
	Justify Vertically	—	Justifies figures vertically.
View	Zoom Extents	—	Narrows view to the area containing the figures. (See "Chapter 13-1. Zoom Extents" (page 239) .)
	Zoom All		Restores the default view.
	Zoom In		Zooms in the full view.
	Zoom Selection	—	Zooms in on the selected area.
	Zoom Out		Zooms out the full view.
	Pan	—	Shifts the field of view to focus on specific coordinates.
	Show/Hide Grid	—	Shows or hides grid lines. (See "Chapter 13-7. Show/Hide Grid" (page 242) .)
	Refresh	—	Updates the screen display.
	Show/Hide Sketch	—	Shows or hides the sketch. (See "Chapter 13-9. Show/Hide Sketch" (page 242) .)
	Edit Sketch	—	Switches Sketch Edit mode on or off. (See "Chapter 13-10. Edit Sketch" (page 242) .)
	Show/Hide Overlap	—	Shows or hides the overlap portion of square object. (See "Chapter 13-11. Show/Hide Overlap" (page 242) .)
	Show/Hide Gridwork Area	—	Shows or hides the Gridwork area specified in the layout. (See "Chapter 13-12. Show/Hide Gridwork Area" (page 243) .)
	Show/Hide Landmark	—	Shows or hides the landmark in the layout. (See "Chapter 13-13. Show/Hide Landmark" (page 243) .)
Grid	Grid Spacing	—	Specifies grid spacing. (See "Chapter 14-1. Grid Spacing" (page 244) .)
	Grid Origin	—	Positions the grid. (See "Chapter 14-2. Grid Origin" (page 245) .)
	Snap Setting	—	Allows selection of elements to snap to the grid. (See "Chapter 14-3. Snap Setting" (page 246) .)

Drawing Screen Functions (6 / 6)

Menu	Submenu	Button	Function
Grid (continued)	Angle Correction	—	Activates or deactivates angle correction. (See "Chapter 14-4. Angle Correction" (page 247) .)
	Distance Measurement	—	Measures the distance between specified two points. (See "Chapter 14-5. Distance Measurement" (page 247) .)
Setting	Preferences		Used to specify operation involving basic application functions. (See "Chapter 15-1. Preferences" (page 248) .)
Help	About SWDraw3		Displays SWDraw3 version information. (See "Chapter 17-1. About SWDraw3 (Checking SWDraw3 Version Information)" (page 257) .)
	About the Controller	—	Displays the Laser Control Unit Software Version. (See "Chapter 17-2. About the Controller (Checking the Laser Control Unit Software Version)" (page 257) .)
—	—	Toolbars: [Refresh] button 	Updates the figures in the layout area.

Chapter 5 File

1. Creating, Saving and Transferring Files

1.1. New (Creating New Layout Files)

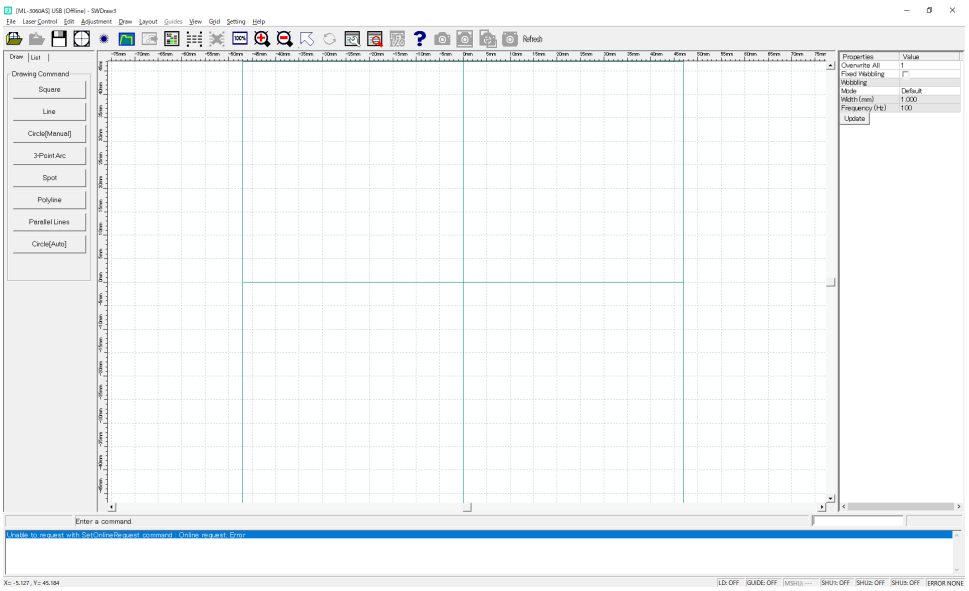
The layout and welding conditions for figure data for welding are saved in a layout file. You must prepare a new layout file to create new welding data.

Follow the steps given below to create layout files.

CAUTION	Only one layout file can be open at any time. Save and close any layout files you are in the process of creating before opening others.

1 Click the [New Layout] button from the toolbar or select [File] -> [New Layout] from the menu.

The new layout file is created with a blank layout area.



2 If you do not save the file, it will not be stored as a layout file in the work folder. You must save the file after creating the layout.
For details of how to save files, refer to "Chapter 5-1.3. Save (Saving Layout Files)" (page 50) .

1.2. Open (Editing an Existing Layout File)

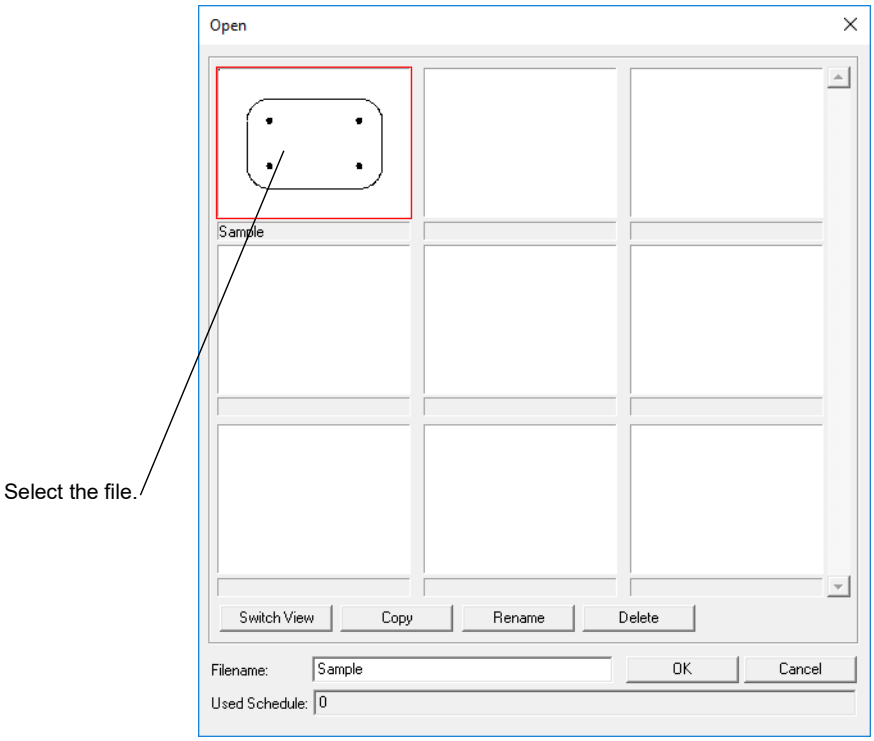
Follow the steps given below to edit existing layout files.

CAUTION	Only one layout file can be open at any time. Save and close any layout files you are in the process of creating before opening others.

1 Click the [Open Layout File] button from the toolbar or select [File] -> [Open Layout] from the menu.

This displays the [Open Layout] screen.

2 Select the file to edit.



ATTENTION	Click the [Switch View] button to view a list of filenames instead of thumbnails.

3 Click the [OK] button.

After the layout file opens, the welding data is displayed in the layout area.

1.3. Save (Saving Layout Files)

You can save layout files as shown below.

1 With the layout file open, click the [Save Layout] button from the toolbar or, from the menu, select [File] -> [Save Layout].

The layout file has now been overwritten, and you will see a message confirming that the layout has been saved. Click the [OK] button to close.

1 The message “Transfer layout file?” is displayed.
Click the [Yes] button to perform operation from layout data transfer to laser scanning. (For details, refer to "Chapter 5-1.6. Layout File Transfer" (page 53) .)
Click the [No] button to return to the Drawing screen.

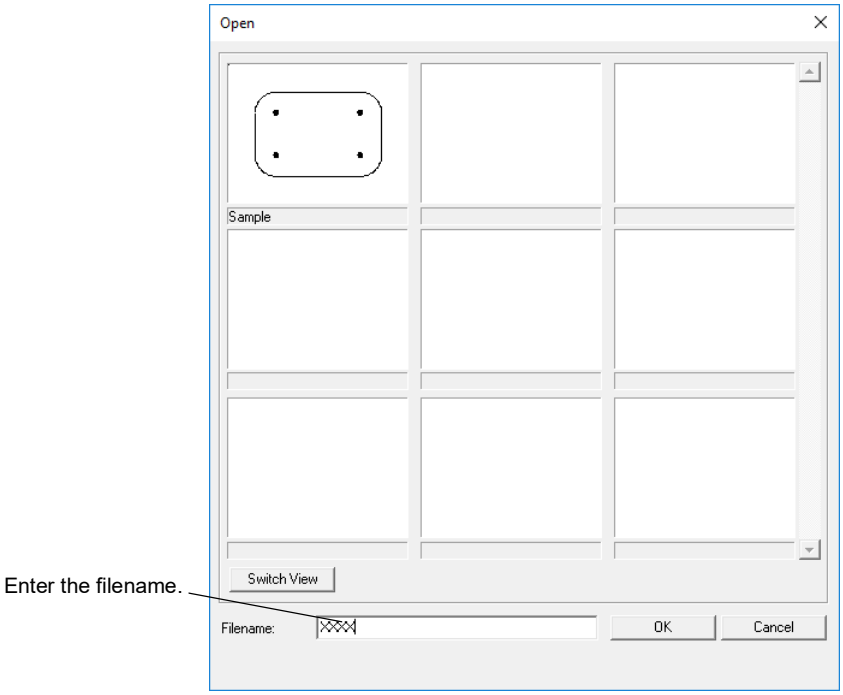
1.4. Save As (Saving Layout Files under a New Name)

Save layout files as follows.

1 From the menu, select [File] -> [Save Layout As].

The [Save Layout As] dialog is displayed.

2 Enter the filename in [Filename].

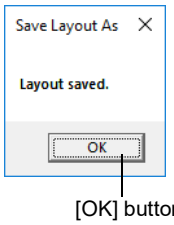


CAUTION	• Enter up to 255 single-byte characters (including drive name and path information) for the filename. • Symbols (\/:*?"<>|), one-byte space, CON, AUX, COM1 to COM9, LPT1 to LPT9, PRN, and NUL may not be used in filenames.

ATTENTION	Click the [Switch View] button to view a list of filenames instead of thumbnails. The setting remains even after restarting SWDraw3.

3 Click the [OK] button.

The layout file has now been overwritten, and you will see a message confirming that the layout has been saved. Click the [OK] button to close.



4 The message “Transfer layout file?” is displayed.
Click the [Yes] button to perform operation from layout data transfer to laser scanning. (For details, refer to "Chapter 5-1.6. Layout File Transfer" (page 53) .)
Click the [No] button to return to the Drawing screen.

1.5. Save Layout PrevVer (Saving Layout Files in the Format of the Previous Version)

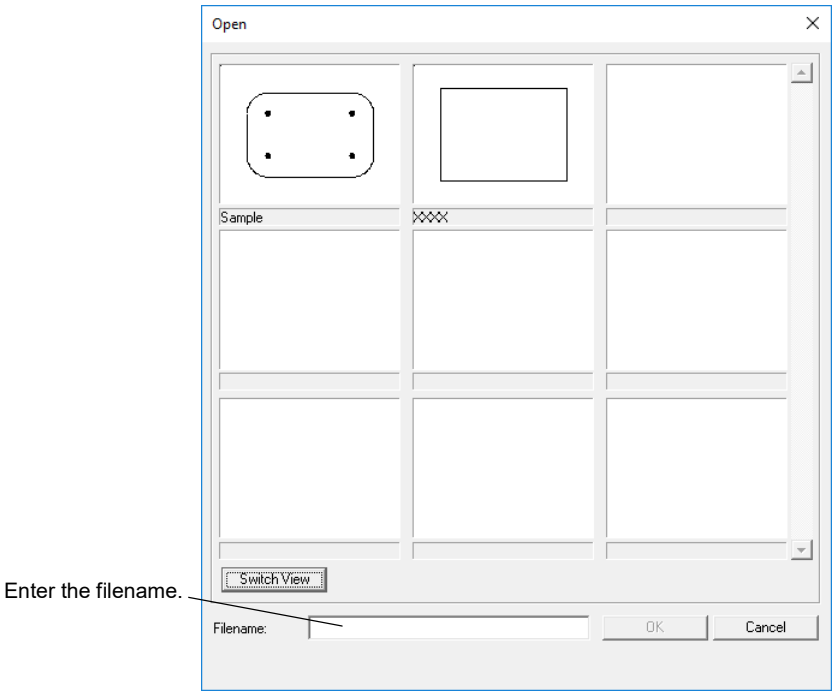
Save layout files in the format of the previous version as follows.

1 From the menu, select [File] -> [Save Layout PrevVer].

2 If hatching exists, a message is displayed.
Click the [Yes] button to convert hatching into polylines. (For details, refer to "Chapter 9-13. Hatch to Poly" (page 188) .) Click the [No] button to delete hatching.
Repetition is also initialized.

The [Save Layout PrevVer] dialog is displayed.

3 Enter the filename in [Filename].

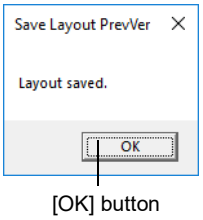


CAUTION	• Enter up to 255 single-byte characters (including drive name and path information) for the filename. • Symbols (\/:*?"<>|), one-byte space, CON, AUX, COM1 to COM9, LPT1 to LPT9, PRN, and NUL may not be used in filenames.

ATTENTION	Click the [Switch View] button to view a list of filenames instead of thumbnails. The setting remains even after restarting SWDraw3.

4 Click the [OK] button.

The layout file has now been overwritten, and you will see a message confirming that the layout has been saved. Click the [OK] button to close.



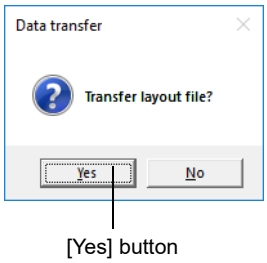
1.6. Layout File Transfer

This step transfers the created layout file to the laser control unit. The laser control unit manages layout files by file numbers. You must assign a number to the file.

The layout file can be transferred to the laser control unit as follows.

1 The message “Transfer layout file?” is displayed after file saving. Click the [Yes] button.

The following sequence differs according to the status of layout file and layout number. The sequence is explained in 1.6.1 to 1.6.4.



2 Click the [Yes] button to display the [Control] screen. In the [Control] screen, you can control the laser such as laser scan. (For details, see "Chapter 6-1. Control" (page 61) .)
You will return to the Drawing screen by clicking the [No] button.

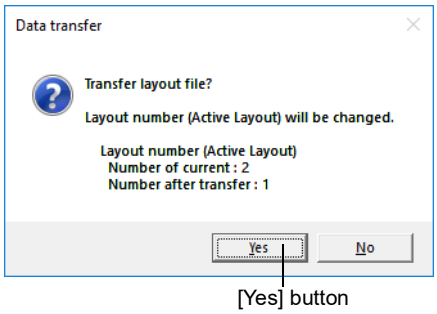
1.6.1. Layout File is Transferred and Layout Number is the Same

1 The message “File transfer complete” is displayed. Click the [OK] button.

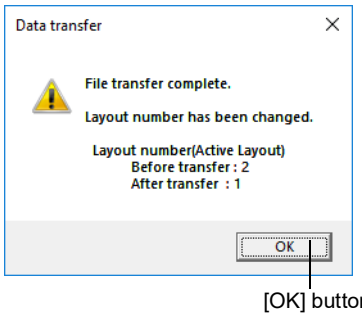
1.6.2. Layout File is Transferred and Layout Number is Different

1 To transfer the layout file, click the [Yes] button.

You will return to the Drawing screen without transferring the layout file to the laser control unit by clicking the [No] button.



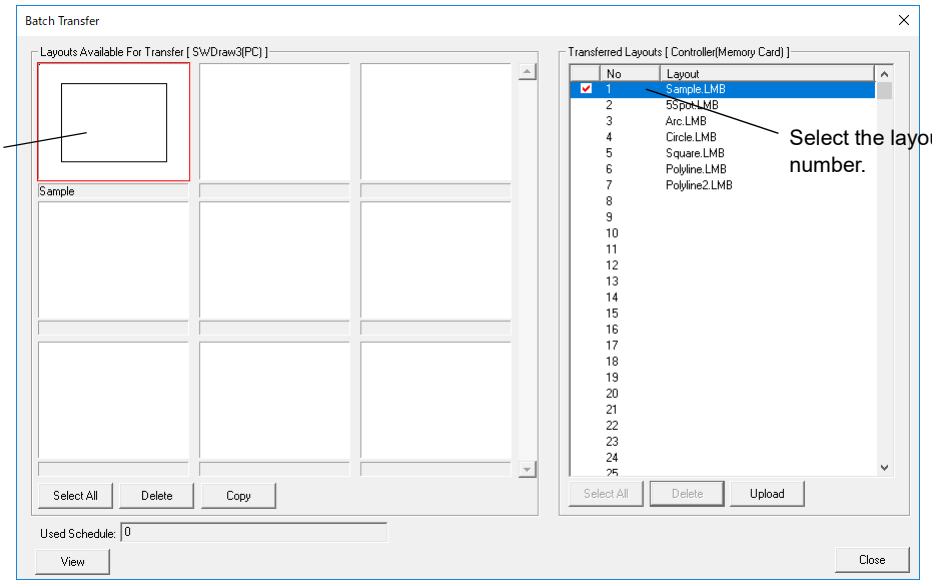
2 After transfer is complete and the message that the layout number has been changed to that of the transferred layout file, click the [OK] button.



CAUTION	When [Control Mode] is [Remote], the layout number (active layout) of the base control unit is not switched. For details, refer to "Chapter 4 Data Transfer (Transferring, Deleting, and Copying Layout Files)" (page 80).

1.6.3. Layout File is Not Transferred and Layout Number is the Same

1 The [Batch Transfer] screen is displayed.



2 Select the layout file from the thumbnail at the left, and double-click the layout number to be assigned to the layout file from the list at the right.

3 Click the [Upload] button.

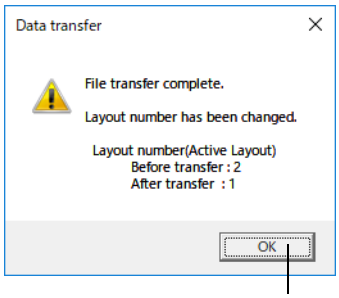
The message "File transfer complete" is dipalyed. Click the [OK] button to close.

4 Click the [Close] buton to close the [Batch Transfer] screen.

1.6.4. Layout File is Not Transferred and Layout Number is Different

Operation is the same as 1.6.3.

After transfer is complete and the message that the layout number has been changed to that of the transferred layout file, click the [OK] button.



CAUTION	When [Control Mode] is [Remote], the layout number (active layout) of the laser control unit is not switched. (For details, refer to "Chapter 6-4. Dara Transfer (Transferring, Deleting, and Copying Layout File)" (page 91) .)

2. Importing Files

2.1. Import DXF (Importing DXF Files)

DXF files created with CAD software can be imported and arranged in layout files.

CAUTION	Only DXF files created using AutoCAD are supported.

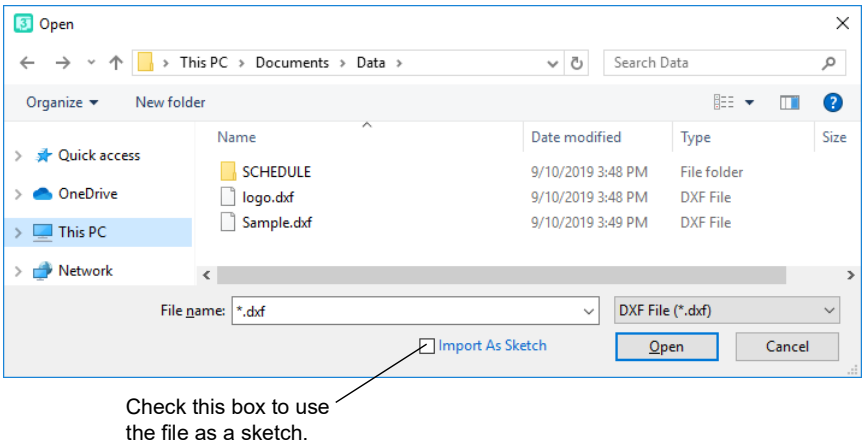
ATTENTION	• DXF data that can be imported: lines, circles, arcs, ellipses, elliptical arcs, broken lines, text, curves, blocks (parts), and dots. • When a DXF file is imported, the origin specified within the CAD program is used as the center coordinate for welding. Thus, adjust the origin accordingly within the CAD program before you import the file. • Use DXF files in ASCII format. Binary files are not supported.

Follow these steps to import a DXF file. Imported DXF files can be used as sketches.

1 From the menu, select [File] -> [Import] -> [Import DXF].

You will see the [Open] screen.

2 Select the DXF file to import.
To use the imported DXF file as a sketch, select [Import As Sketch].



3 Click the [Open] button.

The DXF file is imported and displayed in the layout area.

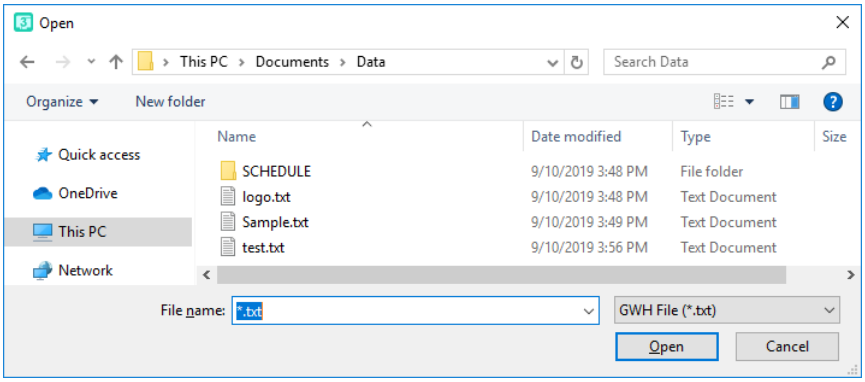
2.2. Import GWH (Importing GWH Files)

Files created with other laser equipment software can also be imported and arranged in layout files.

1 From the menu, select [File] -> [Import] -> [Import GWH].

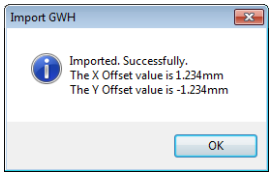
You will see the [Open] screen.

2 Select the GWH file to import.



3 Click the [Open] button.

This displays a message that confirms that you have imported. Also, the offset values set in GWH files are displayed. Record the values accordingly. Click the [OK] button to close.



The GWH file is imported and displayed in the layout area.

3. Merging Layouts

Import a plurality of existing layout files to newly create a merged layout.

3.1. Merged Elements

Elements are as follows.

Type	Availability	Remarks
Line	○	
Circle	○	Including hatching
Arc	○	
Square	○	Including hatching
Polyline	○	
Spot	○	
Axis Control	○	
Comment	○	
Sketch	×	

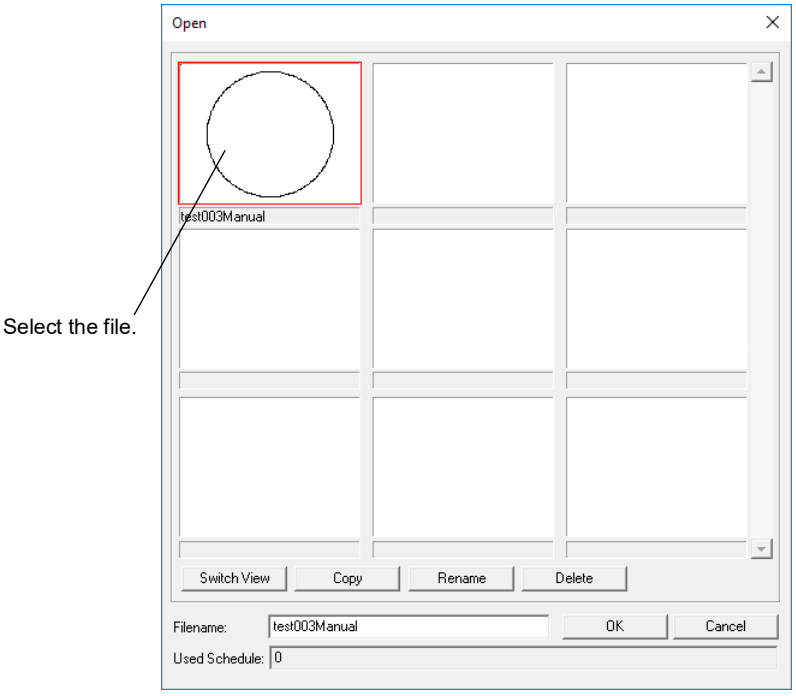
○ : Available ×: Unavailable

3.2. Merge Layout (Merging Existing Layout Files)

1 Select [File] -> [Merge Layout] from the menu.

This displays the [Merge Layout] screen.

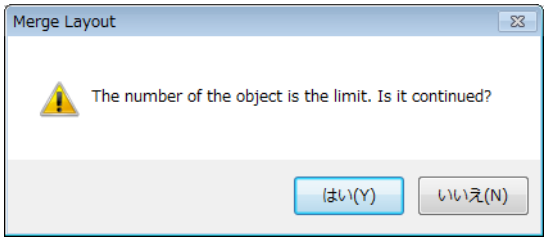
2 Select the file to merge.



ATTENTION	Click the [Switch View] button to view a list of filenames instead of thumbnails.

3 Click the [OK] button.

When the number of use elements is less than 1000 including the file to merge, the selected welding data is displayed in the layout area. When it is 1000 or more, the message “The number of the object is the limit. Is it continued?” is displayed.



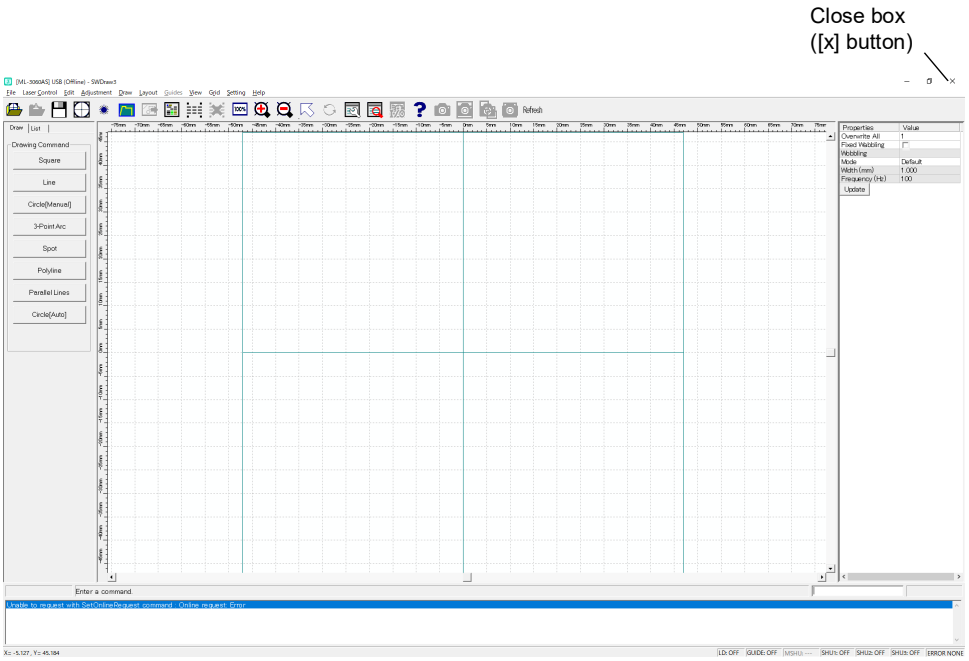
Click the [Yes] button to merge up to 1000 objects. Click the [No] button to close the screen without merging layouts.

The scanning order of the merged elements is added after the last object currently created.

4 Save the created merged layout file as new file accordingly.

4. Exit

1 To exit SWDraw3, select [File] -> [Exit] from the menu or click the Close box ([x] button) in the top-right corner of the screen.

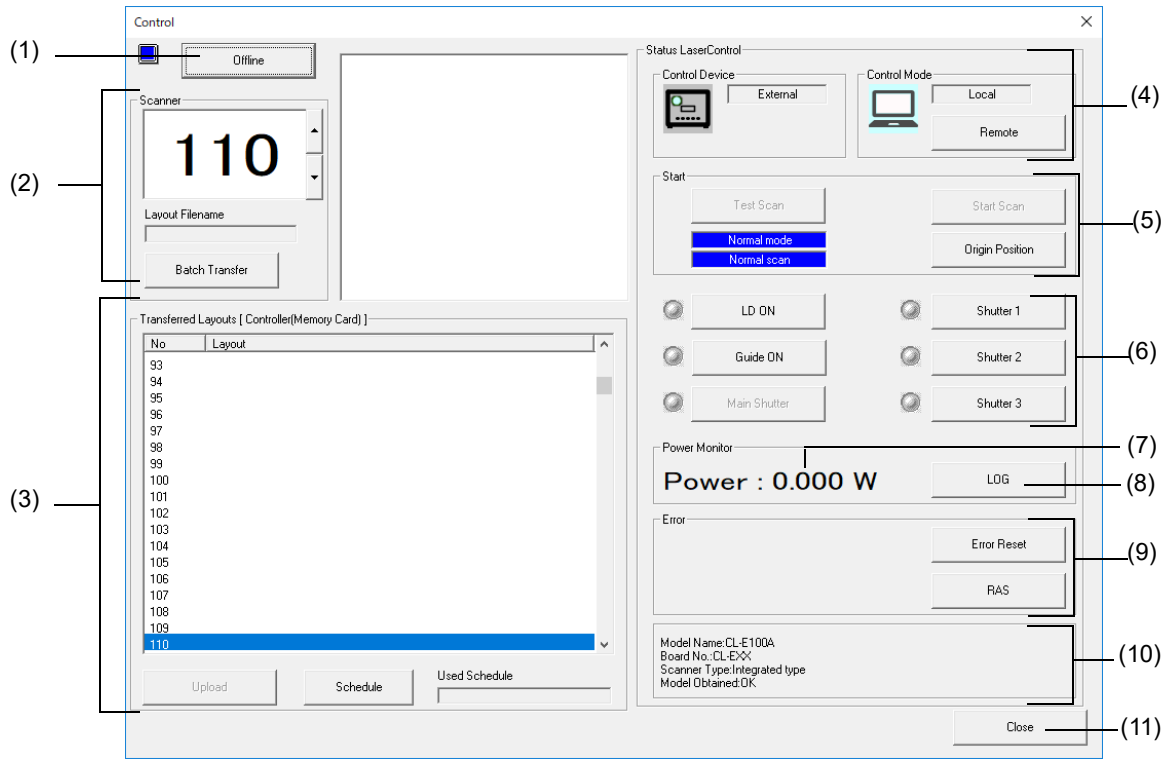


For system shutdown, refer to "Chapter 3- (6) Stopping system operations" (page 38) .

Chapter 6 Laser Control

1. Control

The [Control] screen allows layout files to be sent, welding to be performed, and control devices to be set. This section provides an overview of the [Control] screen.



(1) [Online]/[Offline] Button

Click the [Online] button to enable LAN communication.
Click the [Offline] button to disable LAN communication.

CAUTION	Reboot SWDraw3 if the model set when SWDraw3 is offline is different from the model connected when it is online.

(2) Scanner

Confirms the scanner status and sets the scanner.

- Scanner
  Selects the layout number for welding.
- Thumbnail
  Displays the thumbnail for the selected layout number.
- Layout Filename
  Displays the filename for the selected layout number.
- [Batch Transfer] button
  This button is used to transfer layout files to the laser control unit and perform file maintenance such as deleting and copying of the layout file on the laser control unit. Click this button to display the [Batch Transfer] screen. (For details, refer to "Chapter 6-4. Dara Transfer (Transferring, Deleting, and Copying Layout File)" (page 91) .)

(3) Transferred Layouts [Controller(Memory Card)]

Displays the layout information transferred to the memory card on the controller.

- [Upload] button
  Click this button to upload the selected layout to the PC software.
- [Schedule] button
  Click this button to call the [SCHEDULE INPUT] screen. (For details, refer to "Chapter 6-3. Schedule" (page 74) .)

(4) Status Laser Control

Displays the system status as detected through the network.

Status indications

Item	Indication	Meaning
Control Device	Panel	The laser equipment is controlled independently.
	External	The laser equipment is controlled by the laser control unit.
Control Mode	Local	The laser control unit is controlled locally.
	Remote	The laser control unit is controlled remotely.

- [Local]/[Remote] button
  When the [Local] button is clicked in the remote control, the laser control unit becomes controlled locally.
  When the [Remote] button is clicked in the local control, the laser control unit becomes controlled remotely.

(5) Start

Performs scanning. Click the [Start Scan] button to output the laser or the [Test Scan] button not to output the laser.

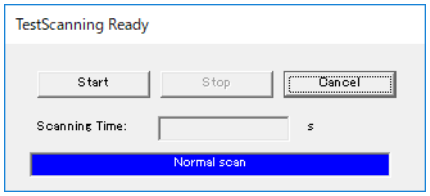
The [Start Scan] button is enabled only when the LD is on. The [Test Scan] button is enabled even when the LD is off.

To check the scan locus with the guide beam, execute the [Test Scan] button with the LD turned off for safety.

The above contents are enabled with the controller version V00-02F or later. With the earlier version, scanning fails even when test scanning is performed unless the LD is turned on.

CAUTION	External signals and the schedule-switching signal of the laser equipment are output whether laser is output or not. In the operation status, “A.P.A. manual mode” is displayed when the A.P.A. manual is performed and “Normal mode” is displayed at normal times. In the scan status, “A.P.A. offset scan” is displayed when the A.P.A. result is valid and “Normal scan” is displayed at normal times.

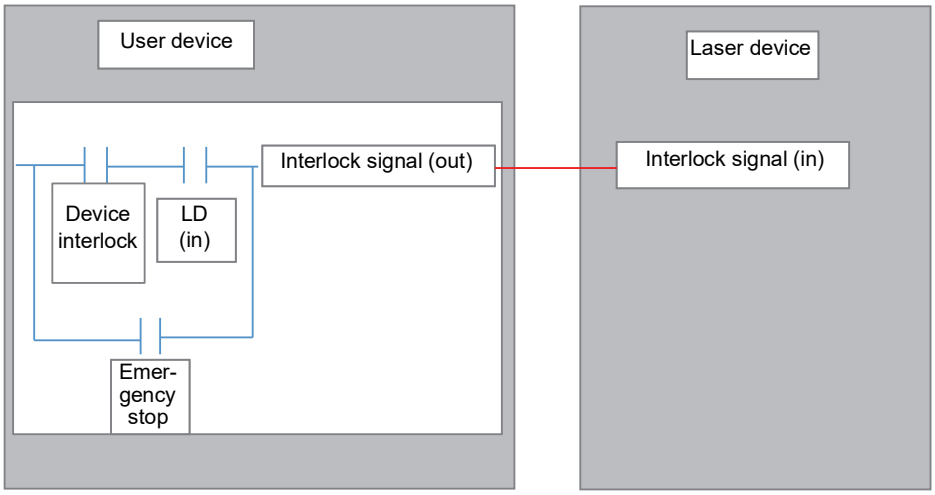
- [Test Scan] button
  Click this button to display the [Test Scanning Ready] screen.



Click the [Start] button to start test welding. Laser is not output. Once test welding starts, the button cannot be used until welding ends. Welding stops automatically when there are no more figures to scan. However, when the guide beam is turned on, the scanning operation is repeated until the [STOP] button is clicked.

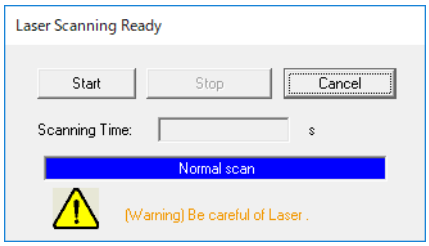
The [Test Scan] button is enabled even if the LD is off, but disabled when the controller is in an error state.

The following sequence is recommended to output the interlock signal to the laser device.

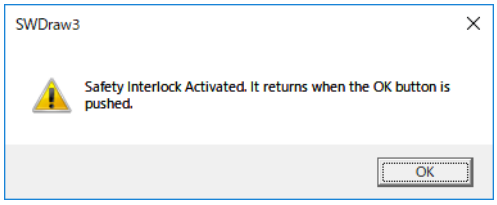


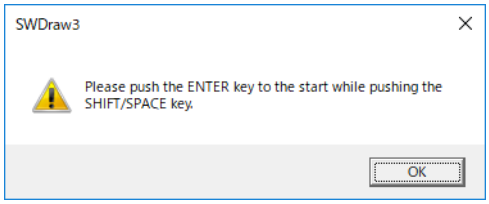
To perform test scanning remotely, use TSR/TSW of the RS-232C commands. For details, refer to the operation manual for the laser control unit CL-E100A.

- [Start Scan] button
  Click this button with the guide beam turned off to display the [Laser Scanning Ready] screen.



Click the [Start] button to start welding. Once welding starts, the button cannot be used until welding ends. Welding stops automatically when there are no more figures to scan.

ATTENTION	When 5 seconds has passed while the mouse cursor is placed over the [Start] button on the [Laser Scanning Ready] screen or immediately after completion of laser scanning, the screen is locked for safety and the following screen appears. Click the [OK] button to return to the [Laser Scanning Ready] screen. 

ATTENTION	When the [Start Scan] button is clicked with the <Enter> key or the <Space> key on your keyboard pressed, the following screen appears. To start welding from a keyboard, press the <Enter> key or the <Space> key with pressing the <Shift> key and click the [Start Scan] button. 

- [Origin Position] button
  Click this button to return the scanner to the origin.

(6) Status Display Palette

Displays the system status as detected through the network in the left. The laser equipment can be controlled using the buttons in the right.

- [LD ON]/[LD OFF] button
  Click the [LD ON] button to turn on the laser equipment. A message is displayed while the system is starting up.
  Click the [LD OFF] button to stop the laser equipment. A message is displayed while the system is stopped.

CAUTION	Do not shut off the power while a message is displayed. Otherwise, the life of the laser equipment may be significantly reduced.

- [Guide ON]/[Guide OFF] button
  Click the [Guide ON] button to turn on the guide beam. The guide beam will be emitted when scanning. The laser beam is not emitted with a state where the [Guide ON] button is clicked.
  Click the [Guide OFF] button to turn off the guide beam. The guide beam will not be emitted when scanning.

ATTENTION	Depending on a workpiece or the lens configuration, the position of the guide beam may be difficult to see. In such a case, move the guide beam to the origin once and check the position with a white paper.

- [Main Shutter] button
  Click the [Main Shutter] button to open the safety shutter built in the laser equipment.
  Click the [Main Shutter] button to close the safety shutter built in the laser equipment.
- [Shutter 1 to 3] button
  Click the [Shutter 1 to 3] button to open the branch shutter built in the laser equipment.
  Click the [Shutter 1 to 3] button to close the branch shutter built in the laser equipment.

(7) Power Monitor

Displays the average of the power monitor value from the scan start to the scan end of a single layout.

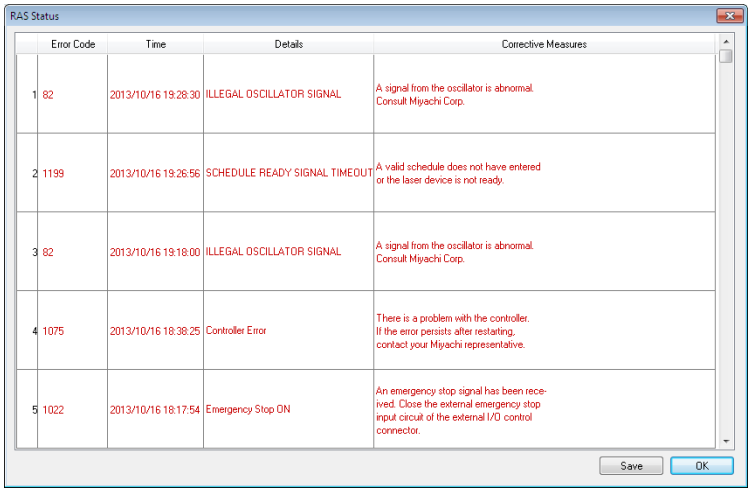
CAUTION	• The power monitor value is calculated based on the power monitor signal from the laser equipment. • Depending on quality of the power monitor signal output from the laser equipment, the value may be different from that of a measuring instrument such as power meter. • Due to the difference in the method of calculating the power monitor from the laser equipment, the value may be different. • To measure more accurate output, we recommend to install a power meter or use our MM-L300A together.

(8) [LOG] Button

Click this button to display the power monitor screen. (For details, refer to "Chapter 6-2. Power Monitor" (page 67) .)

(9) Error

- [Hard Error] lamp
  Lights if an error occurs in the laser control unit or laser equipment.
- [Error Reset] button
  Click this button to reset errors. You cannot resume welding unless you clear the error status using this button.
- [RAS] button
  Clicking this button displays the [RAS Status] screen to check the error details.



Click the [Save] button on the [RAS Status] screen to save the error details as CSV data. Click the [OK] button to close.

CAUTION	Limitations on filenames when saving data • Enter up to 255 single-byte characters (including drive name and path information) for the filename. • Symbols (\/:*?"<>|), one-byte space, CON, AUX, COM1 to COM9, LPT1 to LPT9, PRN, and NUL may not be used in filenames.

(10) Hardware Information

Displays the information of the connected equipment.

(11) [Close] Button

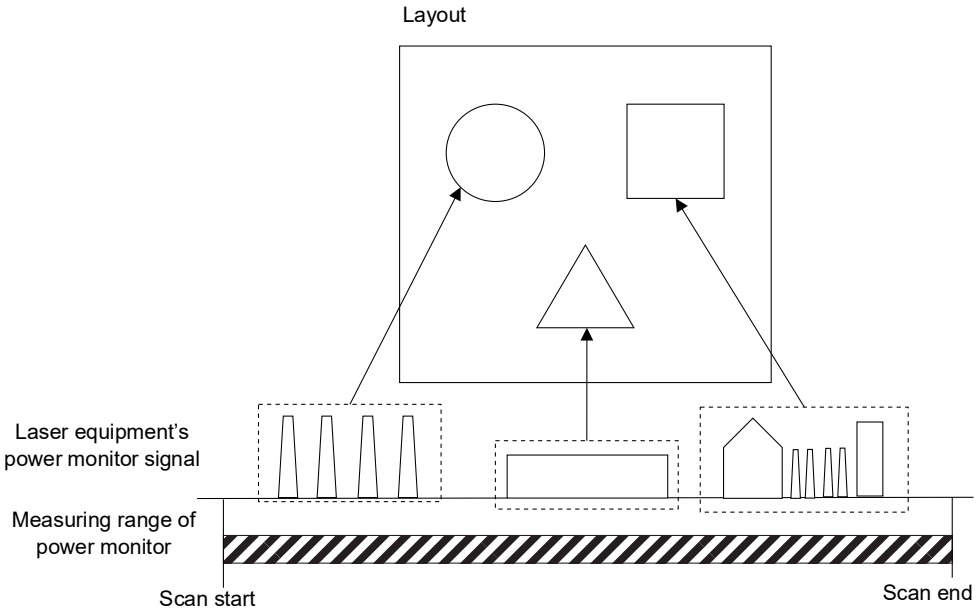
Click this button to close the [Control] screen.

2. Power Monitor

Click the [LOG] button to display the power monitor screen. Two major functions are as follows.

- Graphically displaying the power monitor value after being displayed on a screen
- Turing OFF the LD of the laser equipment when the power monitor value exceeds an arbitrarily value set by a customer

The displayed power monitor value is displayed based on the laser equipment's power monitor signal from the scan start to the scan end of a layout. Therefore, it may be different from the power monitor value of the laser equipment or the measured value of the power meter.



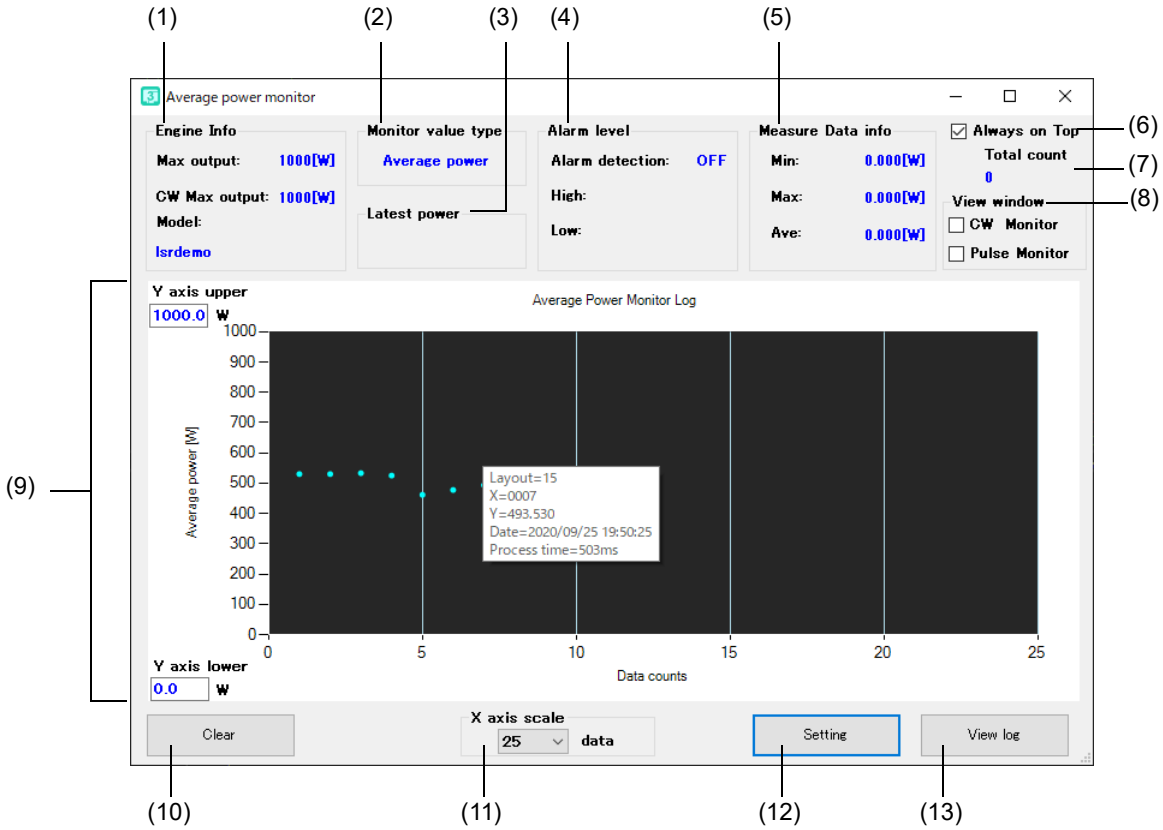
Please consider use in combination with a power meter to measure more accurate output or our MM-L300A to acquire the state of the processing end or envelope.

CAUTION	This function cannot be used when the laser equipment does not have the power monitor signal.

The following three types of graphs can be displayed.

- Average power: average output of an overall layout
- CW Peak power: output peak value of waveform set in CW or CW2 included in a layout
- Pulse Peak power: output peak value of waveform set in FIX or FLEX included in a layout

The error output detection function using the power monitor value is also enabled or disabled on this screen.



(1) Engine Info

Information on the engine.

Item	Function
Max output	Possible maximum output
CW Max output	Maximum value which can be output as CW waveform
Model	Model name of the selected engine.

(2) Monitor value type

Type of the power monitor value used for a graph. There are the following two types.

Item	Function
Average power	Average output of an overall layout
Peak hold	Peak output of a layout

(3) Latest power

The latest measured value.

(4) Alarm level

The state of the error output detection function using the power monitor value.

Item	Function
Alarm detection	Displays ON or OFF of the error output detection function.
High	Upper limit to judge as abnormal
Low	Lower limit to judge as abnormal

(5) Measure Data Info

Minimum / maximum / average data plotted after a graphically display starts or the [Clear] button is clicked.

(6) Always on Top

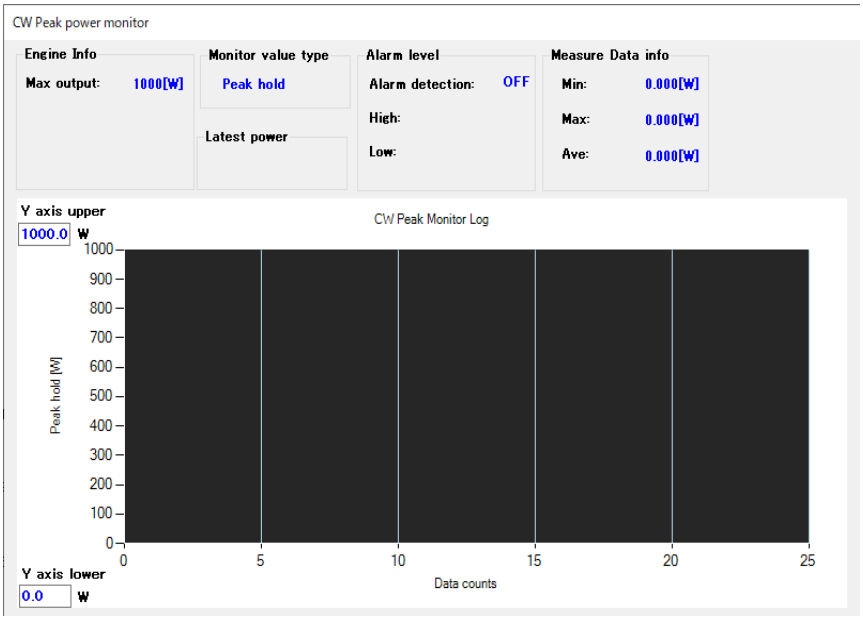
When this is enabled, this screen is always displayed on top of other windows.

(7) Total count

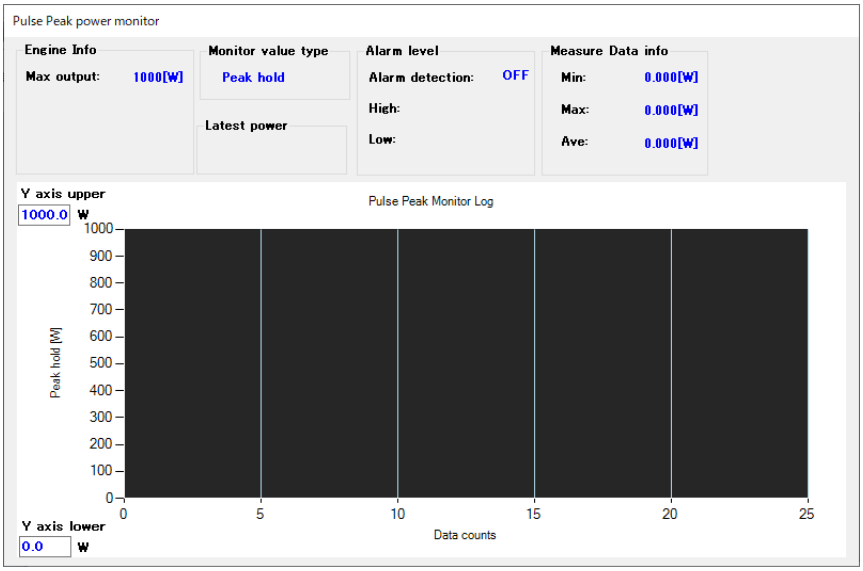
The number of scans performed after this screen is displayed. This is reset by clicking the [Clear] button or closing this screen.

(8) View window

- CW Monitor
  When this is enabled, a graph for the CW Peak power is displayed. The peak power of the CW waveform (CW, CW2) in the layout is displayed. To close the graph screen, disable this.



- Pulse Monitor
  When this is enabled, a graph for the Pulse Peak power is displayed. The peak power of the pulse waveform (FIX, FLEX) in the layout is displayed. To close the graph screen, disable this.

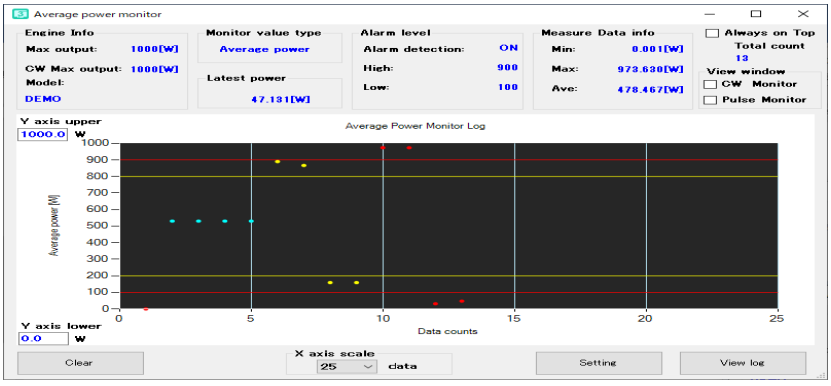


(9) Graph Area

The graph screen of the power monitor. The power monitor value is plotted in light blue on the graph. When pointing a mouse cursor to the plotted power monitor value, the detailed information of the power monitor value is displayed.

- Y axis upper
  Sets the maximum value of the vertical axis of a graph. The setting range is 0 to twice of the maximum output.
- Y axis lower
  Sets the minimum value of the vertical axis of a graph. The setting range is 0 to twice of the maximum output.

When the error detection function is enabled, the alarm border (red) and the warning border (yellow) are displayed in the graph. When the value exceeds the warning border, the plot is displayed in yellow. When the power monitor value exceeds the alarm border, the plot is displayed in red.



(10) [Clear] Button

Deletes the data displayed in the graph.

(11) X axis scale

Sets the maximum number of points displayed on the horizontal axis (up to 1000).

(12) [Setting] Button

Click this button to display the [Setting] screen to enable or disable the error detection function using the power monitor value.

When the error detection function is enabled, following values can be set.

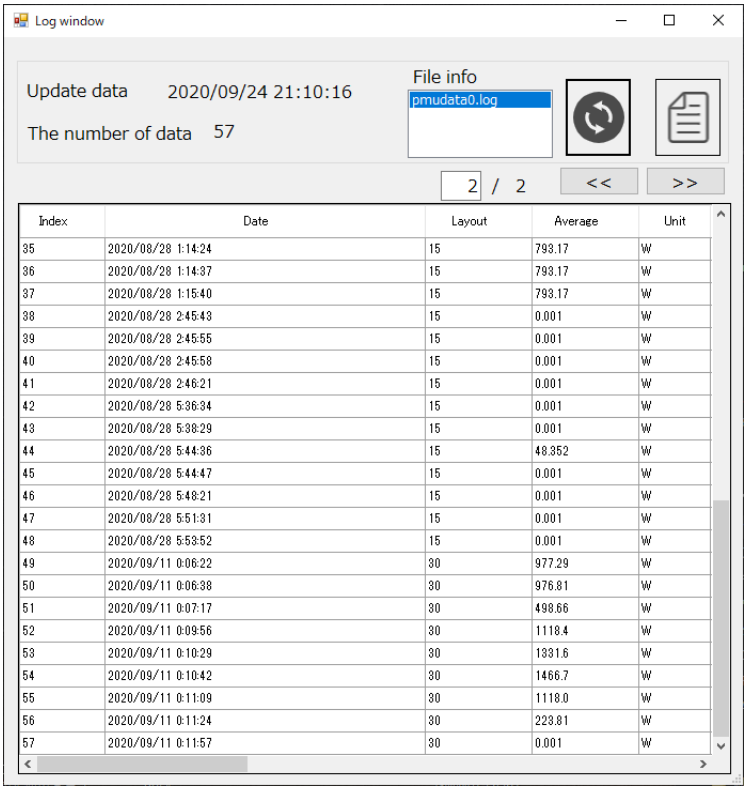
Item	Function	Range
Upper alarm limit	Arbitrarily value set by a customer for alarm border to judge it as abnormal. When this value is exceeded, it is judged as abnormal.	Average, Pulse Peak: Upper warning limit <= Input value <= Twice of Max output CW Peak: Upper warning limit <= Input value<= Twice of CW Max power
Upper warning limit	Arbitrarily value set by a customer for warning border to judge it as a warning state. When this value is exceeded, the plot is displayed in yel-low.	Lower warning limit < Input value <= Upper alarm limit
Lower warning limit		Lower arlarm limit <= Input value < Upper warning limit
Lower alarm limit	Arbitrarily value set by a customer for alarm border to judge it as abnormal. When this value is exceeded, it is judged as abnormal.	0 <= Input value <= Lower warning limit
[Save] button	Transfers the set value to the controller.	—
[Cancel] button	Returns to the previous screen.	—

CAUTION	Values set in Upper warning limit and Lower warning limit are for a graph display. This is different from Pin 43 “Warning” on the User I/O (output signal) of the controller.

When each alarm limit is exceeded, the controller turns off the LD and records the error contents of the power monitor value error and the laser equipment error. The details of error can be checked by clicking the [RAS] button. Perform an error resetting for recovery.

(13) [View log] Button

Click this button to display the history of the power monitor values saved in the controller.



CAUTION	When displaying or operating this screen during welding, the timing of the welding start may change.

- Update data
  The time when the power monitor log information is aquired from the controller.
- The number of data
  The amount of data recorded in the currently selected log file.
- File info
  The list of the power monitor log files saved in the controller. Files are saved as shown below. The maximum number of log files is 10.

pmudata0.log (the latest data)
:
pmudata9.log (the oldest data)

- [Update] button

For updating the history information of the power monitor. The latest log data is acquired.

- [Save] button

For saving the power monitor log. The log file selected in File info is saved. Click this button, select a location to save files, and click the [Save] button.

- Power monitor history
The contents of the log file selected in File info. Up to 10000 pieces of data are saved in the log file.
Up to 50 pieces are displayed at once in the history field. To display other data, change the page number with the [<<]/[>>] buttons.

Power monitor history indications

Indication	Meaning
Index	The higher the number, the more recent data.
Date	Date and time when the log is recorded. This time information is converted from the local time of the computer which is SWDraw3 is installed based on the time set in the controller.
Layout	Layout number which is used.
Average	Average of the average output of the overall layout.
Unit	Unit of Average.
CW Peak	Peak output of the CW or CW2 waveform in the layout. "-------" is displayed when the CW or CW2 waveform is not set in the layout.
Unit	Unit of CW Peak
Pulse Peak	Peak output of the FIX or FLEX waveform in the layout. "-------" is displayed when the FIX or FLEX waveform is not set in the layout.
Unit	Unit of Pulse Peak.
Processing time	Weld time.
Unit	Unit of the weld time.
Cancel	1 is recorded when welding has not been is completely processed by being canceled by user, etc.

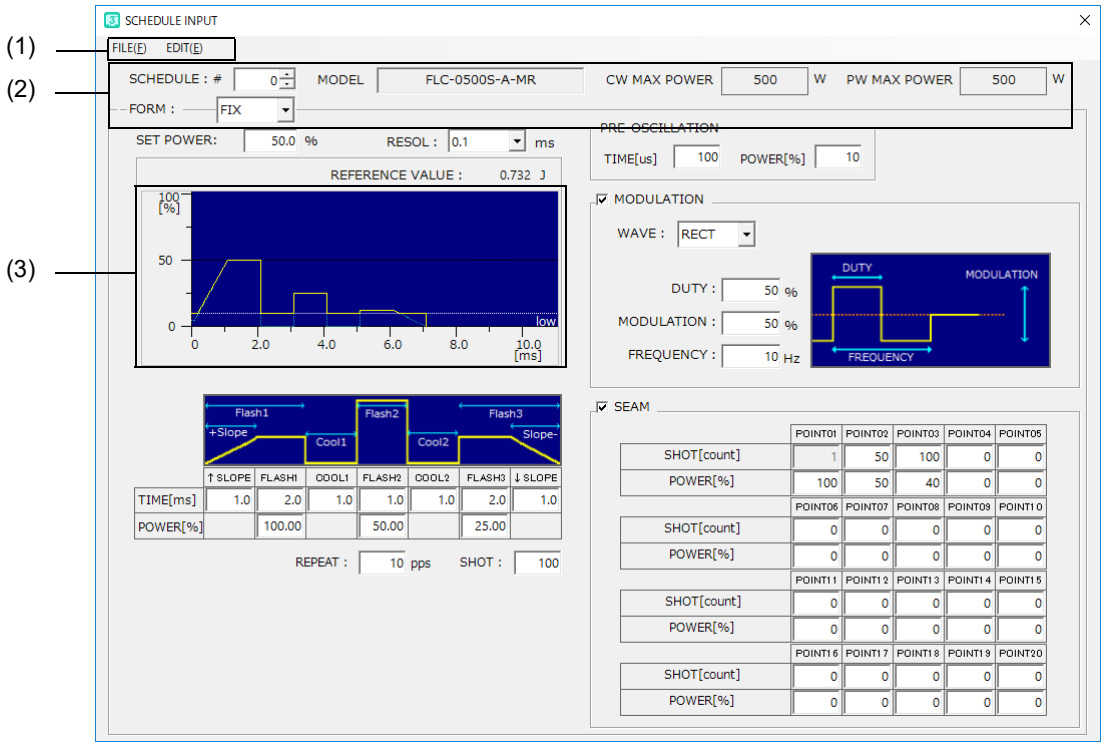
3. Schedule

Before starting welding, the waveform creation method, the laser emission time, and laser output parameters must first be set.

The laser output parameters for this system are referred to as a schedule. The schedule is displayed on the [SCHEDULE INPUT] screen.

For the setting ranges of schedules, refer to the operation manual for the laser equipment.

3.1. [SCHEDULE INPUT] Screen Arrangement



CAUTION	・ The [SCHEDULE INPUT] screen appears only when the laser equipment is online. ・ When changing the settings, the schedule settings on the laser equipment immediately change.

(1) Menu

Item		Setting Details
FILE	Import	Displays the dialog to select a JSON file to import. Reads the selected schedule data and transmits it as schedule data. After transmission, reaquires the schedule data to display it.
	Export	Displays the dialog to select a file to export. After entering the file-name, schedule data in JSON format and waveform image (bitmap) are created. Values of acquired schedule data are output in JSON for-mat.

Item		Setting Details
EDIT	Copy *1	Copies the schedule data of the specified number and form to the clipboard.
	Paste *1	Acquires the schedule data stored in the clipboard and transmits it as schedule data. After transmission, reaquires the schedule data to display it.
	Reset	Resets the schedule data of all forms of the specified number. After reset, reaquires the schedule data to display it.

*1 Copy and Paste functions can be used only in SWDraw3. For data interaction with other applications, use Import and Export functions.

(2) Output conditions

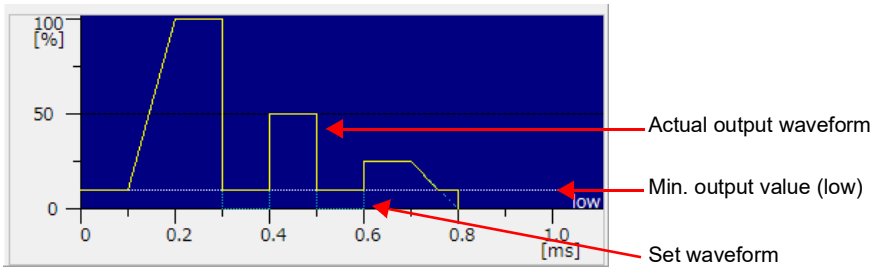
Item	Setting Details
SCHEDULE	Selects the schedule number (0 to 255) to display or edit.
MODEL	The model name of the selected engine is displayed.
CW MAX POWER	The possible maximum output value (output when set to 100%) in CW/CW2 is displayed.
PW MAX POWER	The possible maximum output value (output when set to 100%) in FIX/FLEX is displayed.
FORM	Specifies the welding method (FIX / FLEX / CW / CW2).

(3) Graph display

In the FIX/FLEX/CW forms, the set waveform is displayed as a graph.

In a graph, the set waveform (input waveform) is displayed by a blue dash line, the actual output waveform is displayed by a yellow solid line, and the minimum output value (low) is displayed by a white dashed line.

In the FIX/FLEX/CW forms, when the set output falls below the minimum output value, the minimum output value is output. The minimum output value differs depending on MODEL.



3.2. Setting Schedule using FIX Form

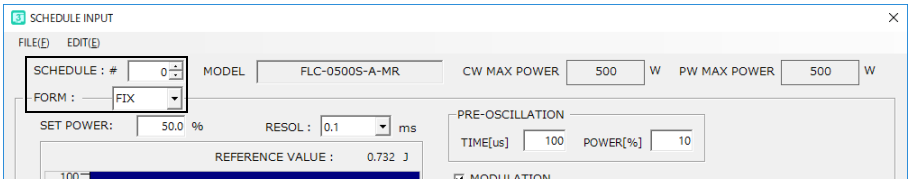
The FIX form is a welding method that generates the waveform using pulse laser excitation and setting the three particular combinations of laser output time and peak output. Gradients can be added for the waveform start-up and drop-off sections.

The schedule can be set as follows.

1 From the menu, select [Laser Control] -> [Schedule].

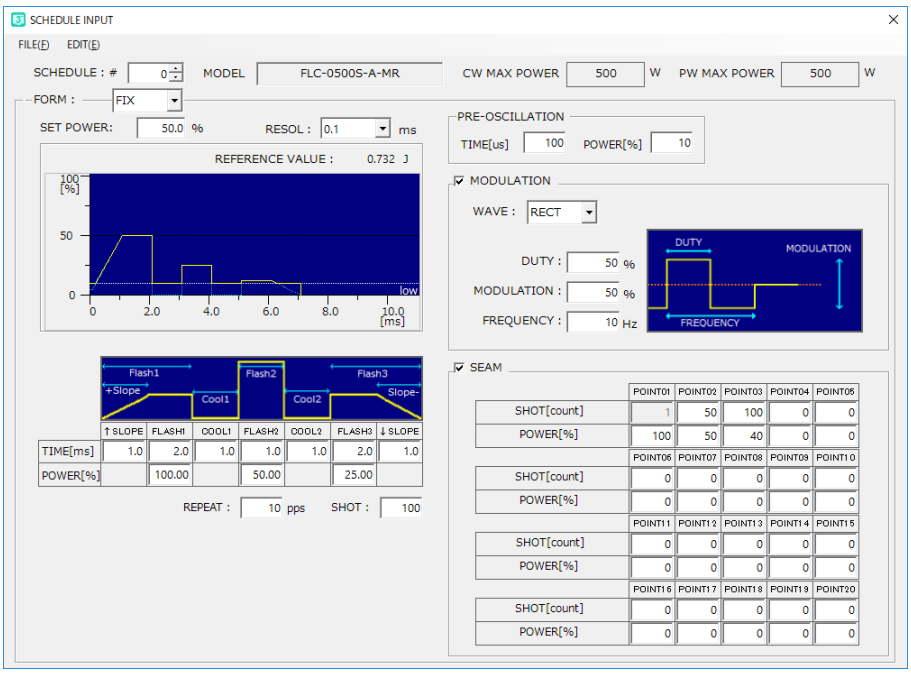
The [SCHEDULE INPUT] screen appears.

2 Set the desired schedule number in the [SCHEDULE] box, and then select "FIX" in the [FORM] box.



The FIX form screen appears.

3 Enter the laser output time and output values referring to the table below. The graph is automatically updated to show the values set here.



FIX Form Settings (1 / 2)

Item	Setting Details	Range
SET POWER	Set the reference value for the laser output peak value. The actual laser output is set as a percentage of this value.	Depends on laser equipment.
RESOL	Set the resolution (0.1 ms / 0.01 ms). The laser output time is displayed with the specified resolution.	—
REFERENCE VALUE	Displays the reference value of the laser output energy for the displayed graph.	—

FIX Form Settings (2 / 2)

Item	Setting Details	Range
↑ SLOPE	Set the time for the increase (laser output increases gradually) to the output value set in FLASH1. This increase is included in the FLASH1 time. Set so that ↑ SLOPE <= FLASH1. Set FLASH1 before setting ↑ SLOPE.	Depends on laser equipment.
FLASH1 to 3	Set the laser output time (TIME) and output values (POWER). POWER is set as percentage of SET POWER.	Depends on laser equipment.
COOL1 to 2	Set the time (TIME) for which the laser is not output.	Depends on laser equipment.
↓ SLOPE	Set the time for the decrease (laser output decreases gradually) from the output value set in the last FLASH. The decrease is included in the last FLASH time. Set so that ↓ SLOPE <= last FLASH.	Depends on laser equipment.
REPEAT*1	Set the number of laser output cycles per second.	Depends on laser equipment.
SHOT*1	Set the number of laser output cycles. Set SHOT to "1" for single output.	Depends on laser equipment.
PRE-OSCILLATION	Outputs the laser with the set time (TIME) and output values (POWER) before the FLASH output. POWER is set as percentage of SET POWER. The resolution of TIME in this setting does not change according to the RESOL setting. Also, the modulation setting does not work for this output.	Depends on laser equipment.
MODULATION	When the checkbox is checked, the screen is displayed to make the modulation setting.	—
SEAM	When the checkbox is checked, the screen is displayed to make the seam setting.	—

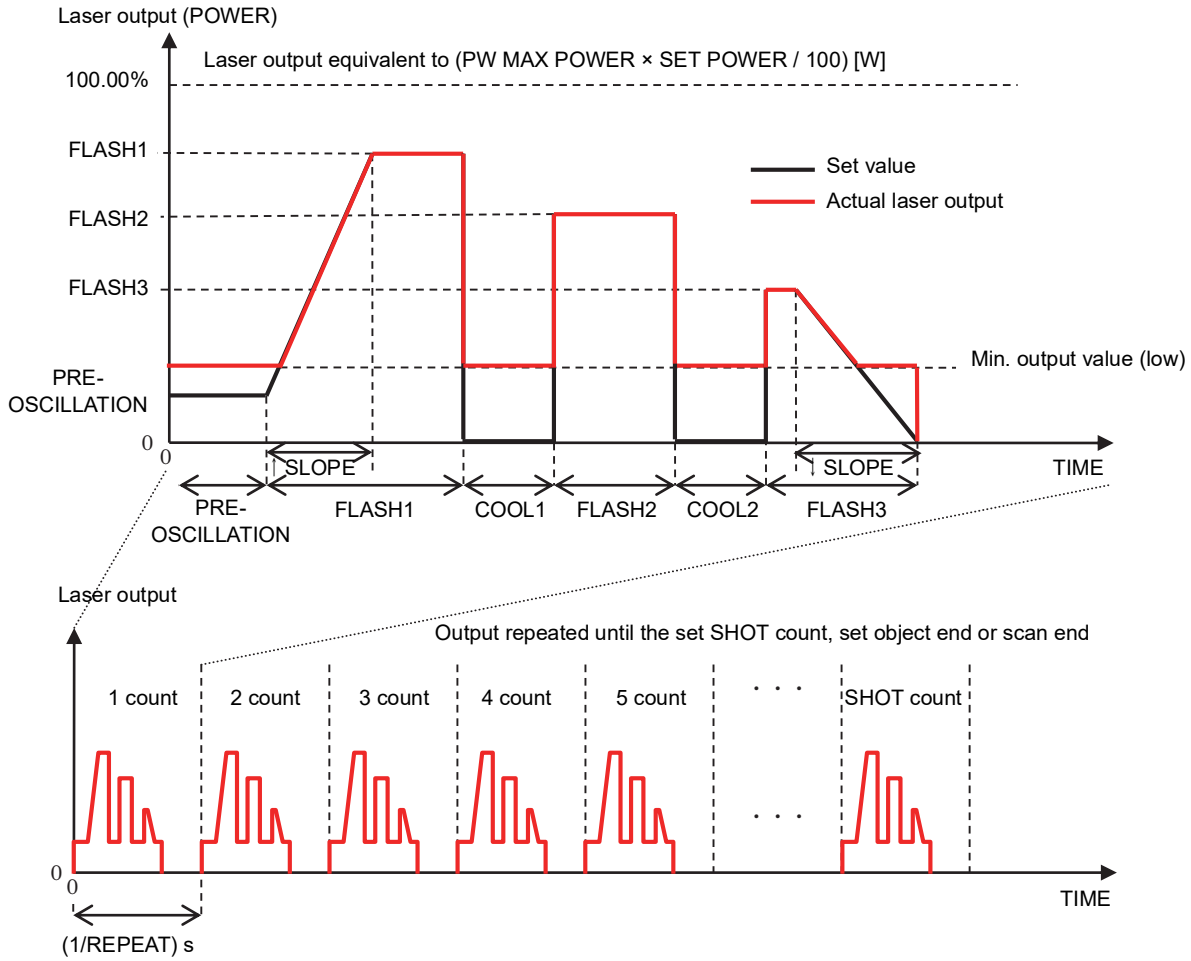
*1 The difference between single-shot and repeated output
The difference between single-shot and repeated output is described below.

Single-shot output	The system stops after a single laser shot output.
Repeated output	Laser output is repeated. The system stops once the number of cycles reaches the value set in SHOT. For details, refer to the operation manual for the laser equipment.

Schedule setting is now complete.

In the FIX form, the laser beam is output as shown below.

When the set value falls below the minimum output value (low), the actual laser output value becomes the minimum output value as indicated by a red line in the following figure.


Laser output (POWER)
Laser output equivalent to (PW MAX POWER × SET POWER / 100) [W]
100.00%
FLASH1
FLASH2
FLASH3
PRE-
OSCILLATION
0
0
Set value
Actual laser output
Min. output value (low)
SLOPE
SLOPE
TIME
PRE-
OSCILLATION
FLASH1
COOL1
FLASH2
COOL2
FLASH3
Laser output
Output repeated until the set SHOT count, set object end or scan end
1 count
2 count
3 count
4 count
5 count
SHOT count
0
0
TIME
(1/REPEAT) s

3.3. Setting Schedule using FLEX Form

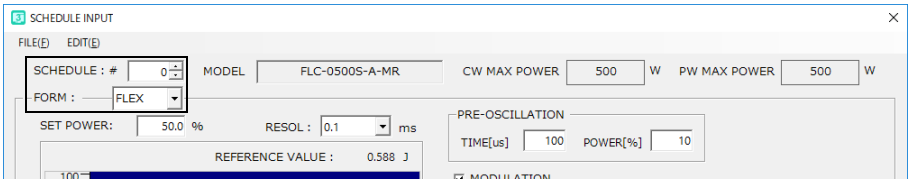
The FLEX form is a welding method that generates the waveform using pulse laser excitation and setting the peak output values for each laser output time. Up to 20 different output times can be set.

The schedule can be set as follows.

1 From the menu, select [Laser Control] -> [Schedule].

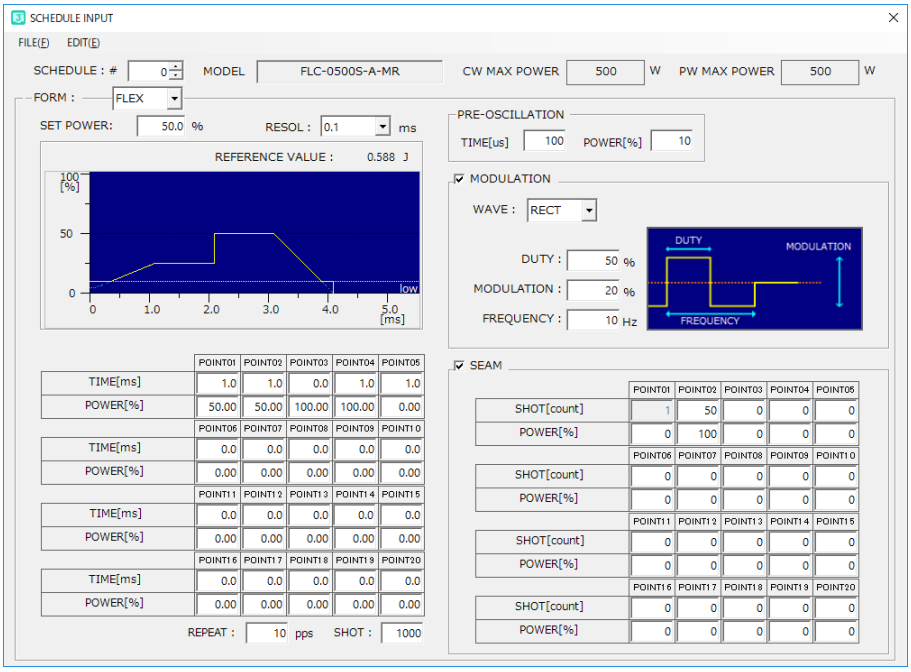
The [SCHEDULE INPUT] screen appears.

2 Set the desired schedule number in the [SCHEDULE] box, and then select "FLEX" in the [FORM] box.



The FLEX form screen appears.

3 Enter the laser output time and output values referring to the table below. The laser output time is set from the previous POINT. The graph is automatically updated to show the values set here.



FLEX Form Settings

Item	Setting Details	Setting Range
SET POWER	Set the reference value for the laser output peak value. The actual laser output is set as a percentage of this value.	Depends on laser equipment.
RESOL	Set the resolution (0.1 ms / 0.01 ms). The laser output time is displayed with the specified resolution.	—
REFERENCE VALUE	Displays the reference value of the laser output energy for the displayed graph.	—

FLEX Form Settings

Item	Setting Details	Setting Range
POINT01 to 20	Set the laser output time (TIME) and laser output peak values for each corresponding output time (POWER). POWER is set as percentage of SET POWER.	• TIME: Depends on laser equipment. • POWER: Depends on laser equipment.
REPEAT*1	Set the number of laser output cycles per second.	Depends on laser equipment.
SHOT*1	Set the number of laser output cycles. Set SHOT to "1" for single output.	Depends on laser equipment.
PRE-OSCILLATION	Outputs the laser with the set time (TIME) and output values (POWER) before the POINT output. POWER is set as percentage of SET POWER. The resolution of TIME in this setting does not change according to the RESOL setting. Also, the modulation setting does not work for this output.	Depends on laser equipment.
MODULATION	When the checkbox is checked, the screen is displayed to make the modulation setting.	—
SEAM	When the checkbox is checked, the screen is displayed to make the seam setting.	—

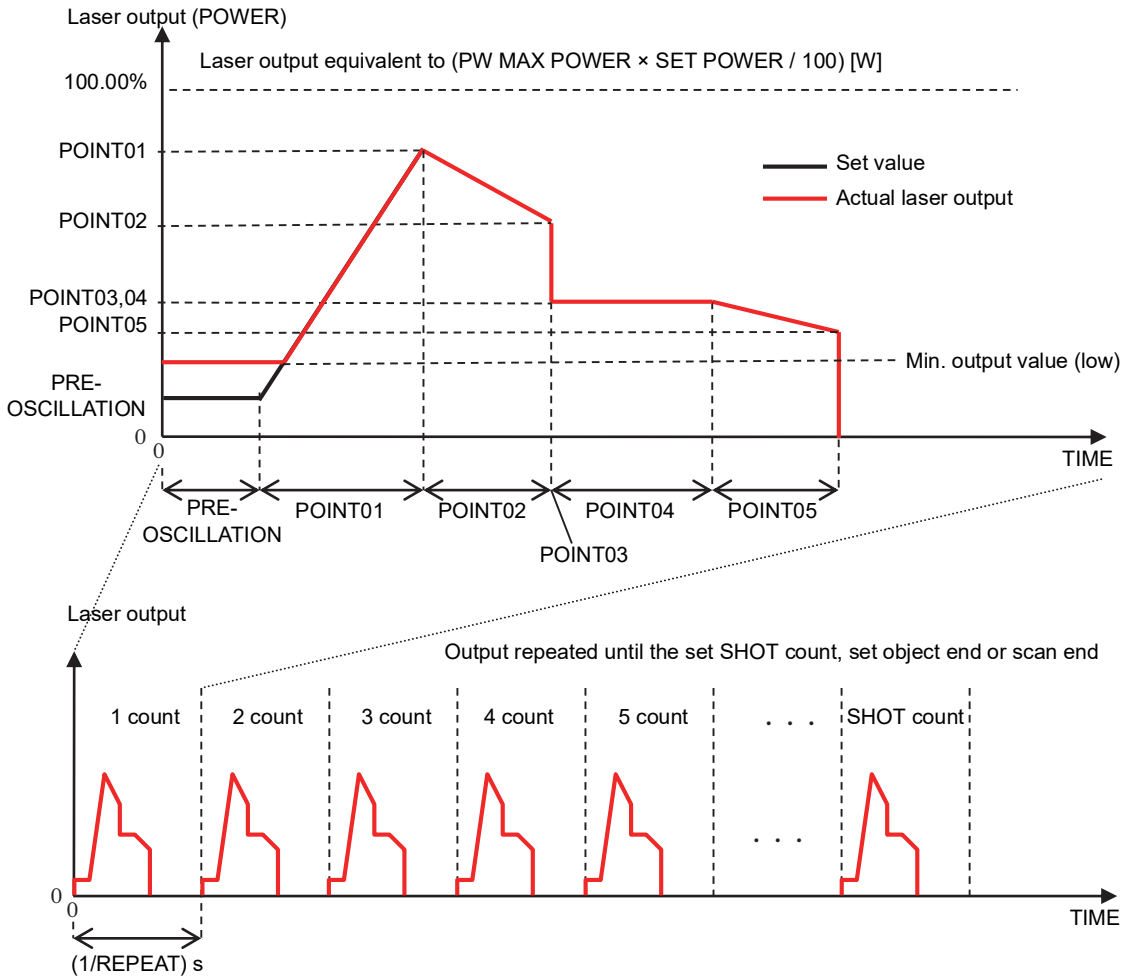
*1 The difference between single-shot and repeated output
The difference between single-shot and repeated output is described below.

Single-shot output	The system stops after a single laser shot output.
Repeated output	Laser output is repeated. The system stops once the number of cycles reaches the value set in SHOT. For details, refer to the operation manual for the laser equipment.

Schedule setting is now complete.

In the FLEX form, the laser beam is output as shown below. (In the example below, POWER and TIME settings of POINT06 and after are 0.)

When the set value falls below the minimum output value (low), the actual laser output value becomes the minimum output value as indicated by a red line in the following figure.


Laser output (POWER)
Laser output equivalent to (PW MAX POWER × SET POWER / 100) [W]
100.00%
POINT01
POINT02
POINT03,04
POINT05
PRE-
OSCILLATION
0
0
Set value
Actual laser output
Min. output value (low)
TIME
PRE-
OSCILLATION
POINT01
POINT02
POINT04
POINT05
POINT03
Laser output
Output repeated until the set SHOT count, set object end or scan end
1 count
2 count
3 count
4 count
5 count
. . .
SHOT count
. . .
0
0
TIME
(1/REPEAT) s

3.4. Setting Schedule using CW Form

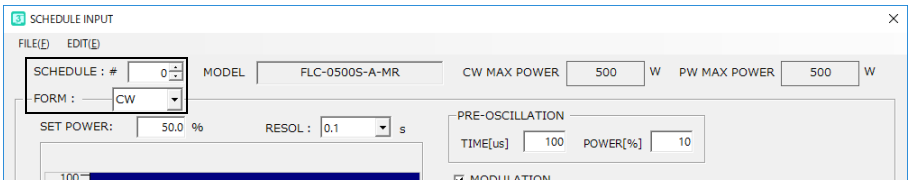
The CW form is a welding method that generates the waveform using continuous laser excitation and setting the peak output values for each laser output time. Up to 20 different output times can be set. Unlike the FIX and FLEX forms, SEAM settings and repeated/single output cannot be set, reducing output time, but a clean weld is achieved since welding is performed continuously.

The schedule can be set as follows.

1 From the menu, select [Laser Control] -> [Schedule].

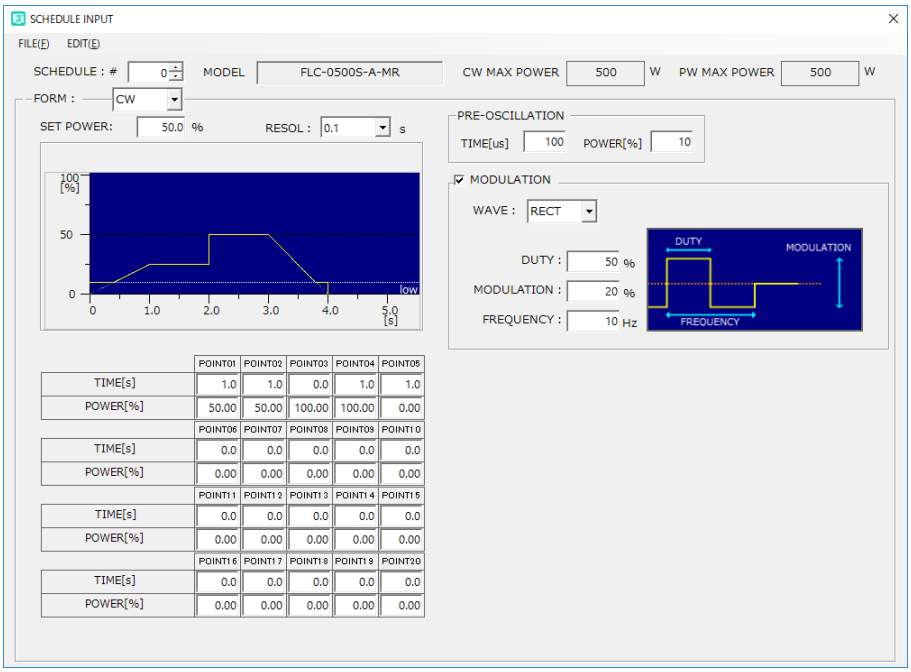
The [SCHEDULE INPUT] screen appears.

2 Set the desired schedule number in the [SCHEDULE] box, and then select "CW" in the [FORM] box.



The CW form screen appears.

3 Enter the laser output time and output values referring to the table below. The graph is automatically updated to show the values set here.



	POINT01	POINT02	POINT03	POINT04	POINT05
TIME[s]	1.0	1.0	0.0	1.0	1.0
POWER[%]	50.00	50.00	100.00	100.00	0.00

	POINT06	POINT07	POINT08	POINT09	POINT10
TIME[s]	0.0	0.0	0.0	0.0	0.0
POWER[%]	0.00	0.00	0.00	0.00	0.00

	POINT11	POINT12	POINT13	POINT14	POINT15
TIME[s]	0.0	0.0	0.0	0.0	0.0
POWER[%]	0.00	0.00	0.00	0.00	0.00

	POINT16	POINT17	POINT18	POINT19	POINT20
TIME[s]	0.0	0.0	0.0	0.0	0.0
POWER[%]	0.00	0.00	0.00	0.00	0.00

CW Form Settings

Item	Setting Details	Setting Range
SET POWER	Set the reference value for the laser output peak value. The actual laser output is set as a percentage of this value.	Depends on laser equipment.
RESOL	Set the resolution (1 s / 0.1 s / 0.01 s / 0.001 s). The laser output time is displayed with the specified resolution.	–

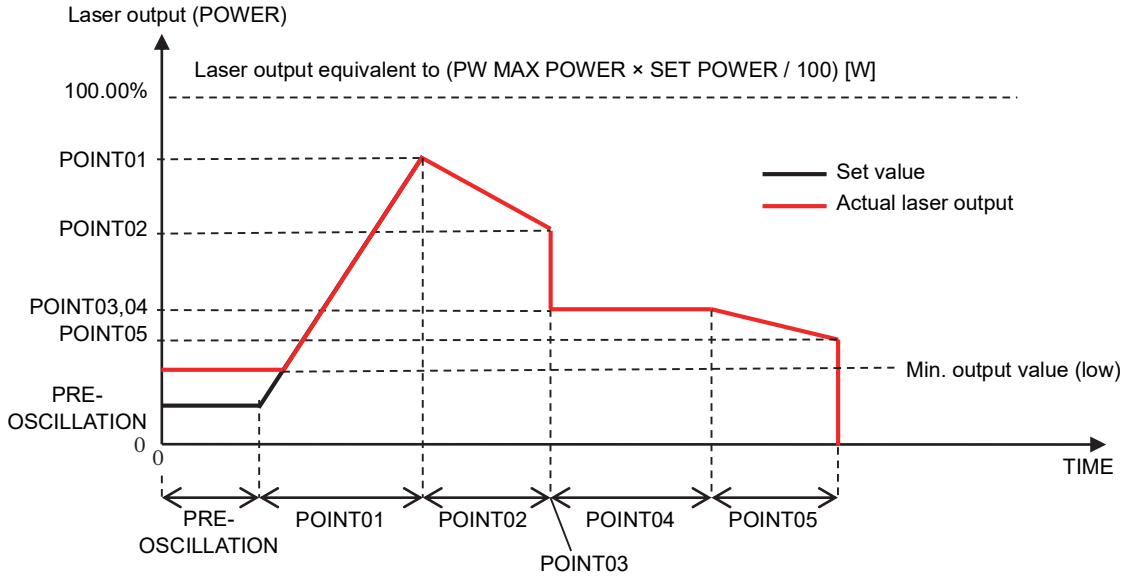
CW Form Settings

Item	Setting Details	Setting Range
POINT01 to 20	Set the laser output time (TIME) and laser output peak values for each output time (POWER). POWER is set as percentage of SET POWER.	• TIME: Depends on laser equipment. • POWER: Depends on laser equipment.
PRE-OSCILLATION	Outputs the laser with the set time (TIME) and output values (POWER) before the POINT output. POWER is set as percentage of SET POWER. The resolution of TIME in this setting does not change according to the RESOL setting. Also, the modulation setting does not work for this output.	Depends on laser equipment.
MODULATION	When the checkbox is checked, the screen is displayed to make the modulation setting.	–

Schedule setting is now complete.

In the CW form, the laser beam is output as shown below. (In the example below, POWER and TIME settings of POINT06 and after are 0.)

When the set value falls below the minimum output value (low), the actual laser output value becomes the minimum output value as indicated by a red line in the following figure.



3.5. Setting Schedule using CW2 Form

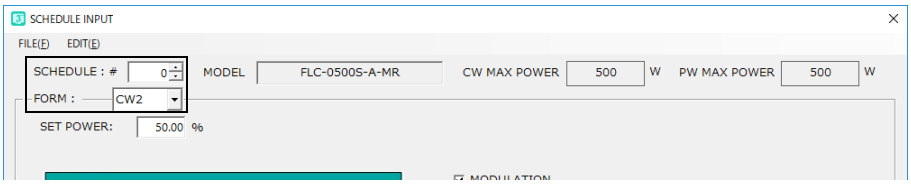
In the CW2 form, upslope and downslope of laser output can be set according to the line length of layout.

The schedule can be set as follows.

1 From the menu, select [Laser Control] -> [Schedule].

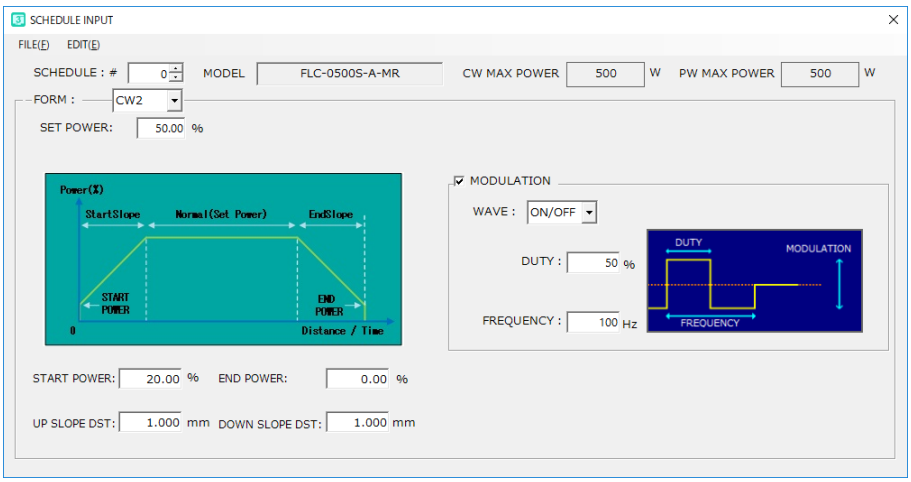
The [SCHEDULE INPUT] screen appears.

2 Set the desired schedule number in the [SCHEDULE] box, and then select "CW2" in the [FORM] box.



The CW2 form screen appears.

3 Enter the laser output time and output values referring to the table below.



CW2 Form Settings

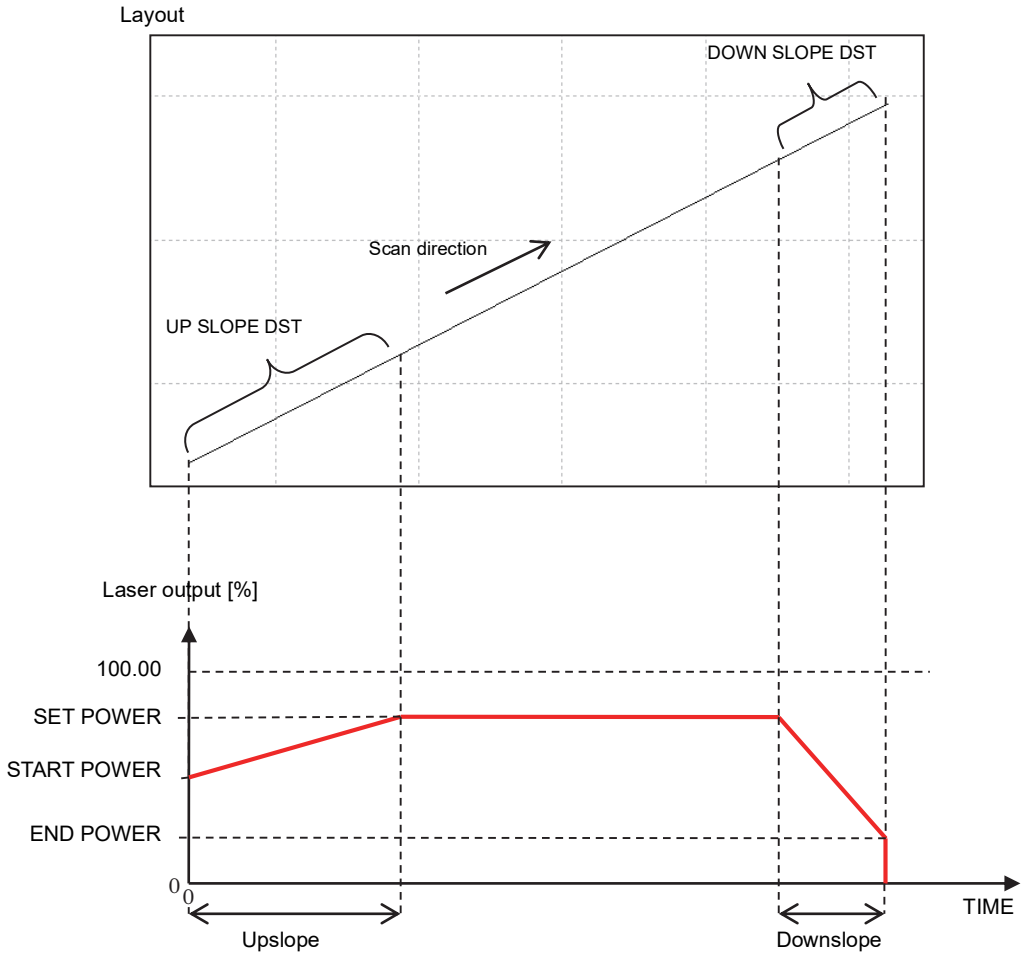
Item	Setting Details	Setting Range
SET POWER	Sets the power (in %) of a single object of the layout at the normal scan. This is set as percentage of the CW maximum output.	Depends on laser equipment.
START POWER	Sets the power (in %) of a single object of the layout at the scan start. This is set as percentage of the CW maximum output.	Depends on laser equipment.
END POWER	Sets the power (in %) of a single object of the layout at the scan end. This is set as percentage of the CW maximum output.	Depends on laser equipment.
UP SLOPE DST	Sets the distance (in mm) applying upslope for the normal (line) layout.	Depends on laser equipment.
DOWN SLOPE DST	Sets the distance (in mm) applying downslope for the normal (line) layout.	Depends on laser equipment.
MODULATION	When the checkbox is checked, the screen is displayed to make the modulation setting.	—

Schedule setting is now complete.

In the CW2 form, the laser beam is output as shown below.

Upslope and downslope are output according to the length of the object in the layout. Even if the schedule settings are the same, output times of upslope, downslope and set power differs depending on the length of the object.

CAUTION	・ When the total length of upslope and downslope exceeds that of the object during scanning, an error occurs and scanning stops. ・ When the CW2 schedule is set for a spot object, the output of SET POWER becomes steady.

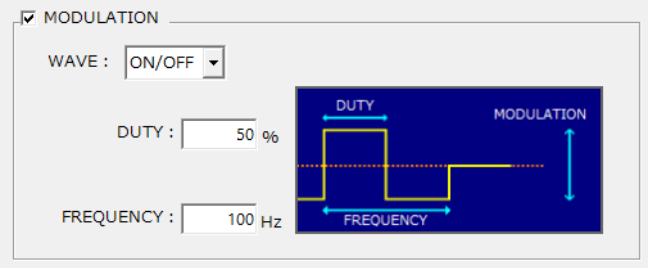


3.6. Setting Modulation Form in Schedule

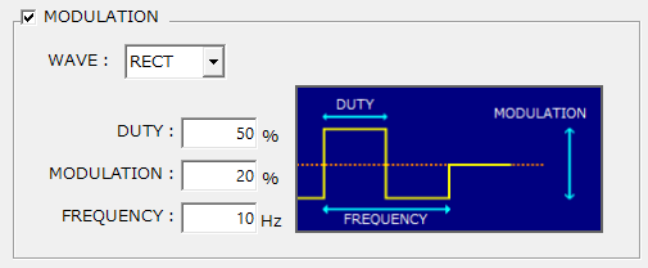
The modulation form is a welding method that modulates the pulse width by setting a constant modulation width and frequency and realizes various processes.
Set the modulation degree and modulation cycle among the ON/OFF, the rectangular wave (RECT), the triangular wave (TRI), and the sinusoidal wave (SINE) to generate a waveform.

In the FIX/FLEX/CW forms, RECT, TRI or SINE can be set. ON/OFF cannot be set. In the CW2 form, options other than ON/OFF cannot be set.

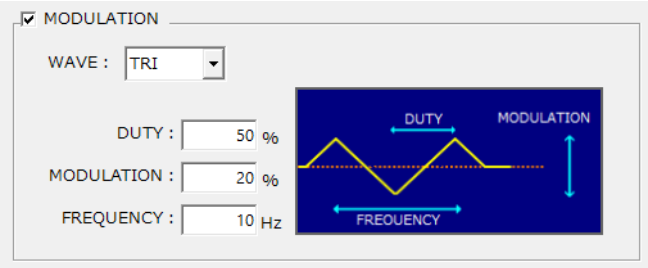
- ON/OFF



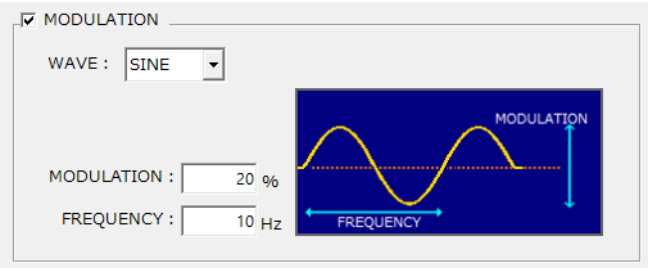
- Rectangular wave (RECT)



- Triangular wave (TRI)



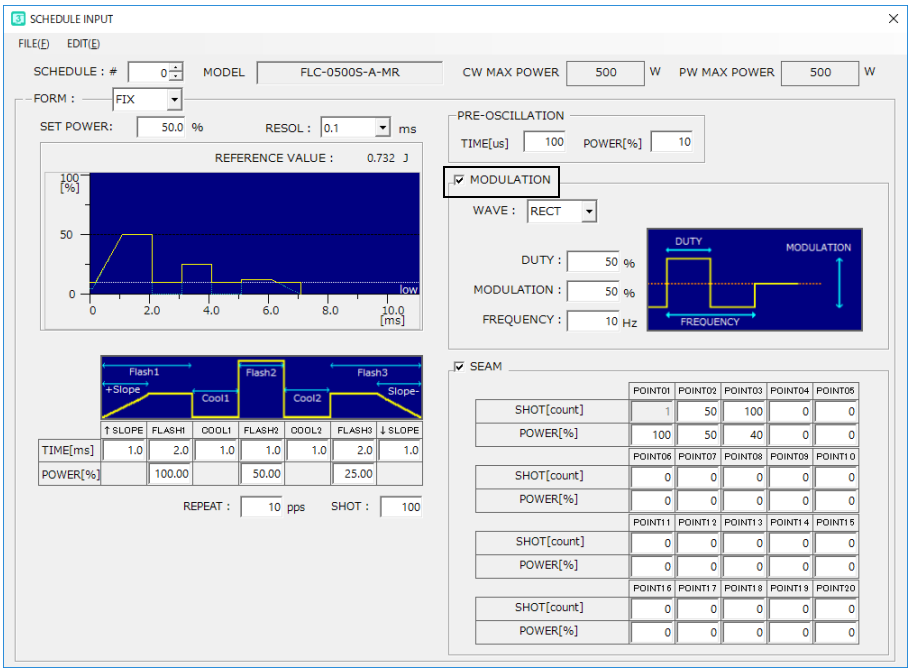
- Sinusoidal wave (SINE)



The modulation form can be set as follows.

1 Check the checkbox for the [MODULATION].

2 Enter the modulation width and the frequency referring to the table below.

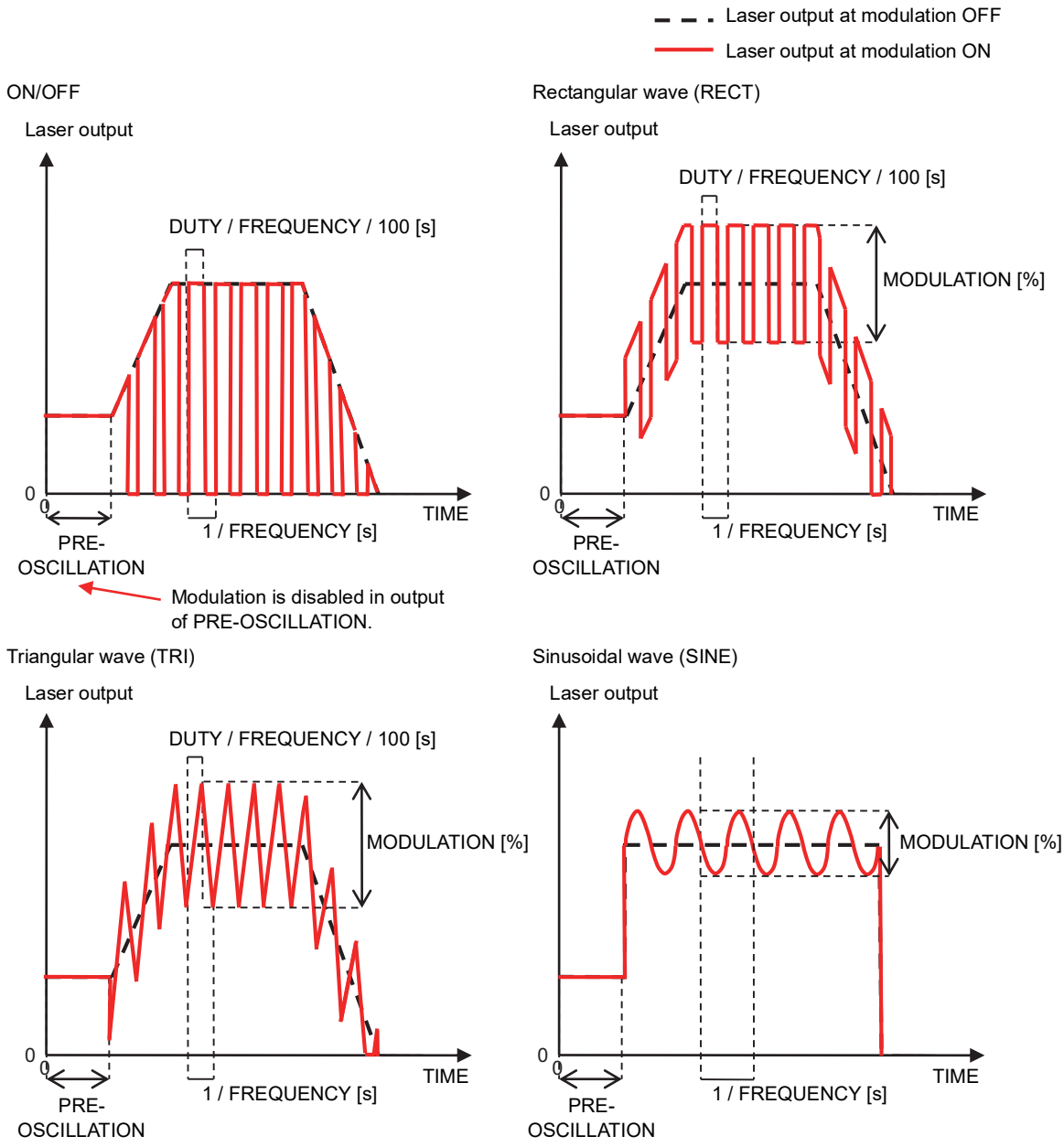


Modulation Form Settings

Item	Setting Details	Setting Range
WAVE	Set the type of modulation waveform from ON/OFF, rectangular wave (RECT), triangular wave (TRI), or sinusoidal wave (SINE).	—
DUTY	Set the duty ratio.	Depends on laser equipment.
MODULATION	Set the modulation width.	Depends on laser equipment.
FREQUENCY	Set the frequency.	Depends on laser equipment.

Modulation form setting is now complete.

When modulation is enabled, the laser beam is output as shown below.


Laser output at modulation OFF
Laser output at modulation ON
ON/OFF
Laser output
DUTY / FREQUENCY / 100 [s]
0
TIME
PRE-
OSCILLATION
1 / FREQUENCY [s]
Modulation is disabled in output
of PRE-OSCILLATION.
Rectangular wave (RECT)
Laser output
DUTY / FREQUENCY / 100 [s]
MODULATION [%]
0
TIME
PRE-
OSCILLATION
1 / FREQUENCY [s]
Triangular wave (TRI)
Laser output
DUTY / FREQUENCY / 100 [s]
MODULATION [%]
0
TIME
PRE-
OSCILLATION
1 / FREQUENCY [s]
Sinusoidal wave (SINE)
Laser output
MODULATION [%]
0
TIME
PRE-
OSCILLATION
1 / FREQUENCY [s]

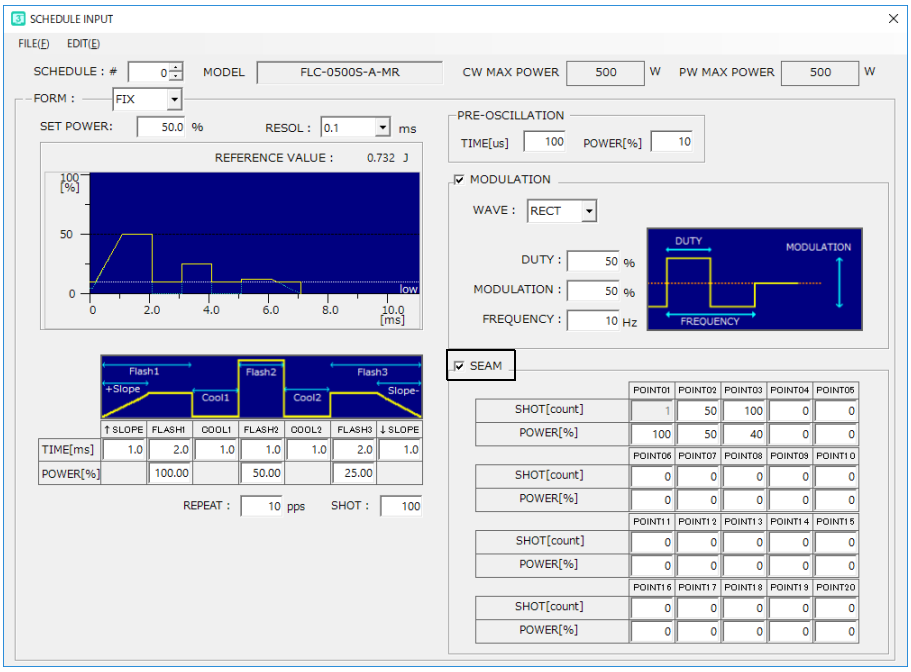
3.7. Setting Seam Function in Schedule

The fade function increases or decreases the laser energy in a gently-sloping form to obtain a continuous waveform suitable for seam welding. As a result, the finished status of seam welding is made beautiful.

The seam function can be set as follows.

1 When "FIX" or "FLEX" is selected in the [FORM] box, check the checkbox for the [SEAM].

2 Enter the laser output count and a percentage for [SET POWER] referring to the table below.



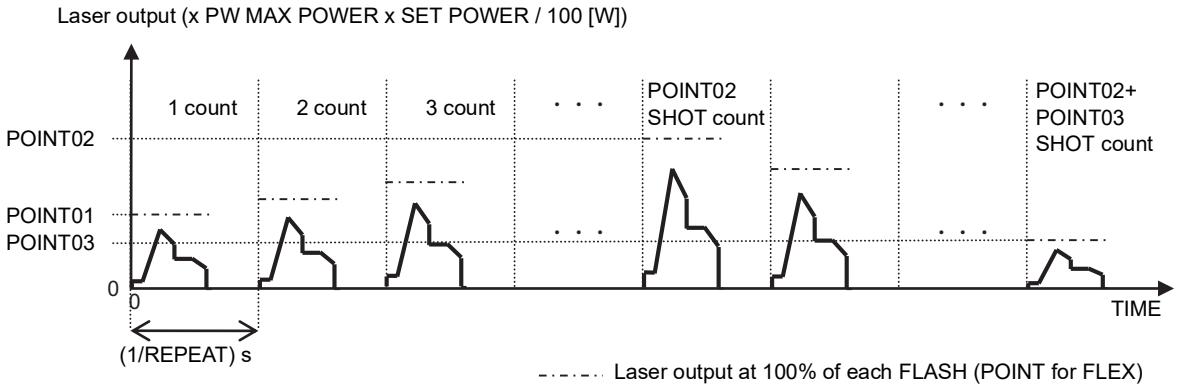
Seam Function Settings

Item	Setting Details	Setting Range
POINT01 to 20	Set the laser output count (SHOT) and a percentage of laser output (POWER).	• SHOT: 2 to 9999 counts*1 • POWER: 0 to 150%

*1 SHOT for POINT01 is fixed to 1. The value larger than the previous POINT can be input, for example POINT02 < POINT03.

Seam function setting is now complete.

When the seam function is enabled, the laser beam is output as shown below.


Laser output (x PW MAX POWER x SET POWER / 100 [W])
1 count
2 count
3 count
POINT02
SHOT count
POINT02+
POINT03
SHOT count
POINT02
POINT01
POINT03
0
0
TIME
(1/REPEAT) s
Laser output at 100% of each FLASH (POINT for FLEX)

4. Dara Transfer (Transferring, Deleting, and Copying Layout File)

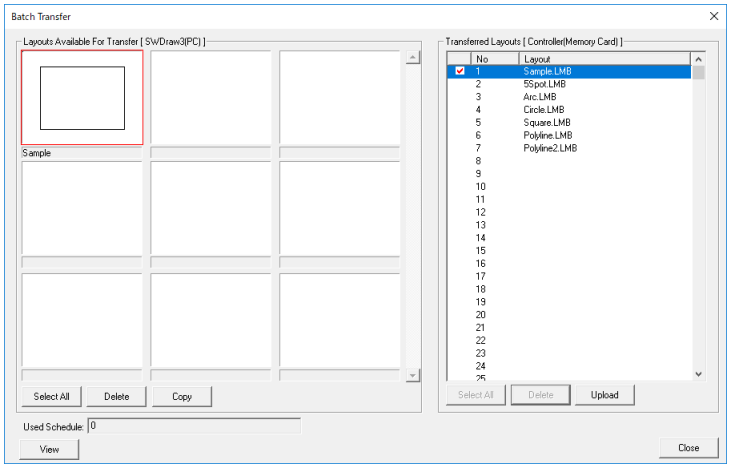
This step transfers the created layout file to the laser control unit. The laser control unit manages layout files by file numbers. You must assign a number to the file.

The layout file can be transferred to the laser control unit as follows.

Open the [Batch Transfer] screen with any of the following methods.

- Click the [Batch Transfer] button on the toolbar.
- From the menu, select [Laser Control] -> [Batch Transfer].
- From the right-click menu, select [Laser Control] -> [Batch Transfer].
- Click the [Batch Transfer] button on the [Control] screen.

The [Batch Transfer] screen is displayed.



[Batch Transfer] Screen Function List

Button	Function
Select All	Selects all files.
Delete	Deletes the selected files. Multiple files can be selected.
Copy	Copies the selected layout figure to a file. (Save As)
Upload	Transfers the file.
Used Schedule	Displays the used schedule number.
View	Switches the file display between thumbnail display and filename list display.
Close	Closes the [Batch Transfer] screen.

ATTENTION	Click the [Switch View] button to view a list of filenames instead of thumbnails. The setting remains even after restarting SWDraw3.

The procedure to transfer the layout file and each operation is as follows.

4.1. Layout File Transfer

This step transfers the created layout file to the laser control unit. The laser control unit manages layout files by file numbers. You must assign a number to the file.

1 Select a layout file from the [Layouts Available For Transfer] on the left, and a layout number to be assigned to a layout file from the [Transferred Layouts] on the right. To select them, there are two ways:

- Click and double-click
  Single-click the desired layout file in [Layouts Available For Transfer] on the left, and then double-click the desired number in [Transferred Layouts] on the right.
- Drag and drop
  Select a file from [Layouts Available For Transfer] on the left (shown with a red frame in thumbnail display) and drag it. After successful file dragging, the mouse cursor changes. (The layout file is displayed around the mouse cursor.) Then, a red frame is displayed when the mouse is placed over the desired number in [Transferred Layouts] on the right. Drag it there.

2 Repeat step 2 to assign layout numbers to all files to be transferred.

Files to be transferred are identified by a check mark next to the filename in the list on the right.

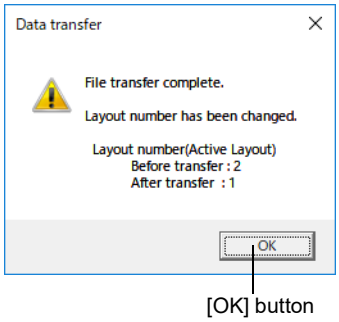
Uncheck the file names if you decide not to transfer particular files. For clearing, refer to "Chapter 6-4.2. Clearing Transfer of Layout File and Changing the Transfer Reservation Number" (page 94) .

ATTENTION	To transfer the transferred file again, double-click the desired number in [Transferred Layouts] on the right with selecting nothing in [Layouts Available For Transfer] on the left. When transfer is reserved, a check mark is placed. The file to be transferred again should be displayed on [Layouts Available For Transfer]. If not, you cannot transfer it again. (A check mark is not placed.)

CAUTION	The transferred file cannot be transferred to the other number. For example, when “A.LMB” has been transferred to No. 1, “A.LMB” cannot be transferred to the number other than No. 1.

3 Click the [Upload] button.

When the layout number does not change, a confirmation message is displayed after successful file transfer. When the layout number changes, the message which shows layout numbers of [Before transfer] and [After transfer] for the layout number (active layout), and the layout number which is ready for laser scanning via the [Control] screen or the external I/O is newly set for [Scanner] on the [Control] screen as a layout number of [After transfer]. Click the [OK] button to close the dialog.



CAUTION	When two or more layout files are transferred, the layout file with the biggest number is set as the layout number (active layout).

CAUTION	When [Control Mode] is [Remote], the layout number (active layout) is not switched since the control by the external I/O has priority. When the layout number of the transferred layout file and the current layout number set for the laser control unit are different, a message that the layout number does not change is displayed.

4 Click the [Close] button to close the [Batch Transfer] screen.

5 A message that asks whether or not to perform laser scanning is displayed.
When the [Yes] button is clicked, the [Control] button is displayed. (For details, refer to "Chapter 6-1. Control" (page 61) .)
You will return to the Drawing screen by clicking the [No] button.

All selected layout files have now been transferred to the laser control unit.

The transferred layout file is saved in the ZIP folder in the memory card of the laser equipment as a compressed file (ZIP format). The layout data with extensions INF, LID, LMB, and LOS are compressed. Also, the current SWDraw3 version is copied in the version information of INF file. The filename of compressed file is the same as that of transferred layout file.

If the ZIP folder does not exist, it is automatically created.

When a layout file transferred to the laser control unit is deleted, the ZIP file is also deleted. However, the created ZIP folder is not deleted even if all transferred layout files are deleted.

4.2. Clearing Transfer of Layout File and Changing the Transfer Reservation Number

4.2.1. Clearing Selection of [Layouts Available For Transfer]

The selected layout file in [Layouts Available For Transfer] on the left can be cleared as follows.

Thumbnail display:

- Click the selected file again.
- Click a blank thumbnail.

List display:

- Click the selected file again.

4.2.2. Clearing Transfer Reservation of [Transferred Layouts]

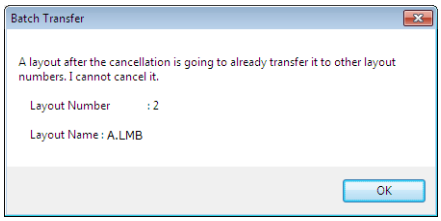
To clear transfer reservation of "reserved" layout file which has a check mark in [Transferred Layouts] on the right, double-click the desired file. At this time, operation differs according to whether the file selected in [Layouts Available For Transfer] on the left is the same or different.

When nothing is selected in [Layouts Available For Transfer] on the left or the file [Layouts Available For Transfer] on the left and the filename selected in [Transferred Layouts] on the right is the same, transfer reservation is cleared by double-clicking the desired layout file in [Transferred Layouts] and a check mark is taken off.

But, the files selected in [Layouts Available For Transfer] on the left and [Transferred Layouts] on the right are different and the file selected in [Layouts Available For Transfer] on the left has not been transferred, transferring the file selected in [Layouts Available For Transfer] on the left is reserved by double-clicking. (A new layout file transfer is reserved.)

For example, when "A.LMB" is selected in [Layouts Available For Transfer] on the left and "B.LMB" is selected in [Transferred Layouts] on the right, "A.LMB" transfer is reserved by double-clicking "B.LMB." Since the files in [Layouts Available For Transfer] on the left and [Transferred Layouts] on the right are the same, transfer reservation is cleared by double-clicking "A.LMB" again with this state.

Also, transfer reservation can be cleared with dragging and dropping. Drag the reserved layout file and drop it outside the frame of [Transferred Layouts] on the right. A confirmation message appears. Click the [Yes] button to clear transfer reservation or click the [No] button to cancel.

CAUTION	Reservation cannot be cleared depending on sequence of transfer reservation. Transfer reservation cannot be cleared under the condition that a layout file with the same name is transferred to two numbers. Example) “A.LMB” and “B.LMB” are displayed in [Layouts Available For Transfer], and “A.LMB” has been reserved at No. 1. 1. Reserve “B.LMB” transfer at No. 1. (“A.LMB” overwrites “B.LMB.”) 2. Reserve “A.LMB” transfer at No. 2. 3. Clear transfer reservation of No. 1. After the above procedures, the following message appears and transfer reservation in step 3 cannot be cleared. This is because “A.LMB” is restored at No. 1 by clearing transfer reservation of No. 1 and the contradiction of transferring “A.LMB” to both No. 1 and No. 2 is generated.  In this case, you can also clear No. 1 by clearing “A.LMB” at No. 2 in first.

4.2.3. Changing Transfer Reservation Number of [Transferred Layouts]

The transfer reservation number can be changed with dragging and dropping.

When the layout file is displayed in [Layouts Available For Transfer] on the left and reserved (checked) but not yet transferred to the laser control unit, its transfer reservation number can be changed with dragging and dropping it to the other number.

For example, “A.LMB” transfer is reserved at No. 10. To change it to No. 15, drag “A.LMB” at No. 10 and drop it at No. 15. It can also be dropped to the transferred layout file. (It is overwritten.)

However, the transfer number of the layout file already transferred to the laser control unit cannot be changed in this way. You need to transfer the file to a new number again after deleting it.

4.3. Layout File Delete

This step deletes the layout file.

4.3.1. Layouts Available For Transfer

1 Select a layout file to be deleted from the [Layouts Available For Transfer] and click the [Delete] button.

The layout file saved on the computer is deleted.

In thumbnail display, only a file can be selected at a time. The selected layout file is displayed with a red frame.

In list display, click the file to be deleted. Two or more files can be selected by clicking them with pressing the <Ctrl> or <Shift> key. The selected layout file is displayed in blue background.

CAUTION	The layout file reserved in [Transferred Layouts] cannot be deleted. Two or more layout files can be deleted when all of them are not reserved.

4.3.2. Transferred Layouts

1 Select the layout file to be deleted from the [Transferred Layouts] and click the [Delete] button.

The layout file which has been transferred to the laser control unit is deleted. The layout file saved in CF (compact flash) in a compressed way is also deleted.

Click the file to be deleted. Two or more files can be selected by clicking them with pressing the <Ctrl> or <Shift> key. The selected layout file is displayed in blue background.

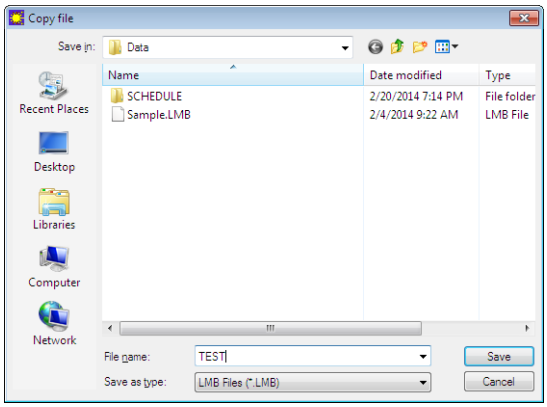
CAUTION	If a reserved file exists, the file cannot be deleted. (The [Delete] button is disabled.) To delete it, you need to clear all transfer reservations.

4.4. Layout File Copy

This step copies the layout file.

1 Select the layout file to be copied from the [Layouts Available For Transfer] and click the [Copy] button.

The [Copy file] screen is displayed.



2 Specify where to save it and filename and click the [Save] button.

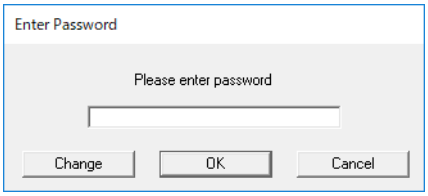
The layout file saved on the computer is copied.

CAUTION	・ If the location where the file is saved is changed, if becomes unreadable from SWDraw3. Do not change it unless you need to. Also, do not change the file extension. If an extension other than INF, LID, LMB, and LOS is set, you will fail to copy it. ・ Files with same name cannot be copied. For example, “A.LMB” cannot be copied as “A.LMB.” ・ If two or more files are selected in list display, the files cannot be copied.

5. Scanner Adjust

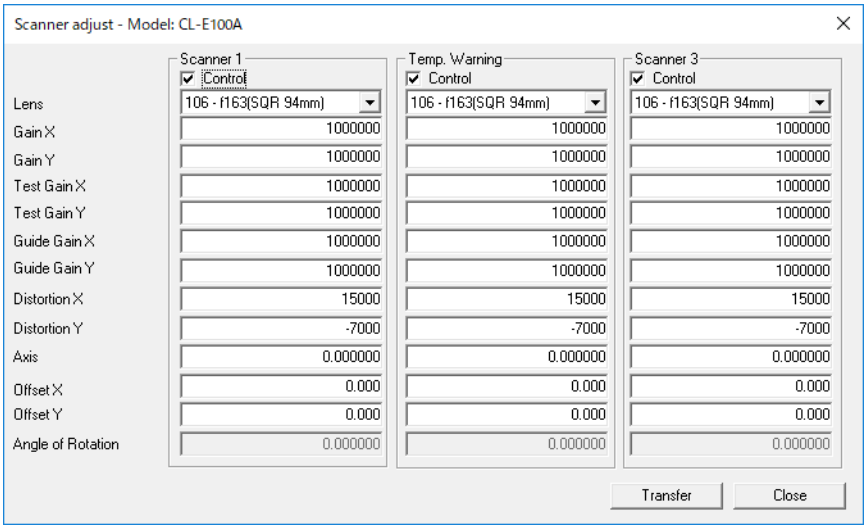
Select [Laser Control] -> [Adjust] on the menu to set the scanner operating conditions.

First, the [Enter Password] screen is displayed.



No password is set by default, and so clicking the [OK] button opens the [Scanner adjust] screen.

The following items can be set on the [Scanner adjust] screen.



Scanner Adjust Settings

Item		Setting Details	Setting Range
Scanner 1 to 3 *1	Control	Sets whether or not to use the corresponding number scanner. Check the checkbox for the scanner number to be used to set the scanner operating parameters.	—
	Lens	Sets the lens type.	—
	Gain X	Sets the scaling factor for the X-coordinate output values.	0 to 10000000
	Gain Y	Sets the scaling factor for the Y-coordinate output values.	0 to 10000000
	Test Gain X	Sets the scaling factor for the X-coordinate output values in a test start.	0 to 10000000
	Test Gain Y	Sets the scaling factor for the Y-coordinate output values in a test start.	0 to 10000000
	Guide Gain X	Sets the scaling factor for the X-coordinate output values when the guide beam function is on.	0 to 10000000

Scanner Adjust Settings

Item		Setting Details	Setting Range
Scanner 1 to 3 *1 (continued)	Guide Gain Y	Sets the scaling factor for the Y-coordinate output values when the guide beam function is on.	0 to 10000000
	Distortion X	Sets the X-coordinate lens distortion correction coefficient.	-32767 to 32767
	Distortion Y	Sets the Y-coordinate lens distortion correction coefficient.	-32767 to 32767
	Axis	Sets the scanner X/Y-axis intersection angle correction value.	-45° to 45°
	Offset X*2	Sets the distance moved in the X-axis.	-280.00 to 280.00
	Offset Y*2	Sets the distance moved in the Y-axis.	-280.00 to 280.00

*1 The setting is effective for the connected scanner (controller) only.

*2 Input the value in view of the value set in the [System Parameters] screen.

Note: To set (or change) the password, click the [Change] button on the [Enter Password] screen, and set the new password on the [Change Password] screen.

6. Camera Monitor

CAUTION	This function can be used only when CL-E100A is connected to a computer and the Camera Unit (option) is connected.

When the camera monitor is used, the [Capture] screen for operating the camera live images and scanner is called. The Gridwork can be performed from the [Capture] screen. For details, refer to “Chapter 7. Gridwork and Auto Position Alignment.”

7. System Parameters (Setting Laser Equipment Operating Conditions)

Follow these steps to specify basic laser equipment operating conditions.

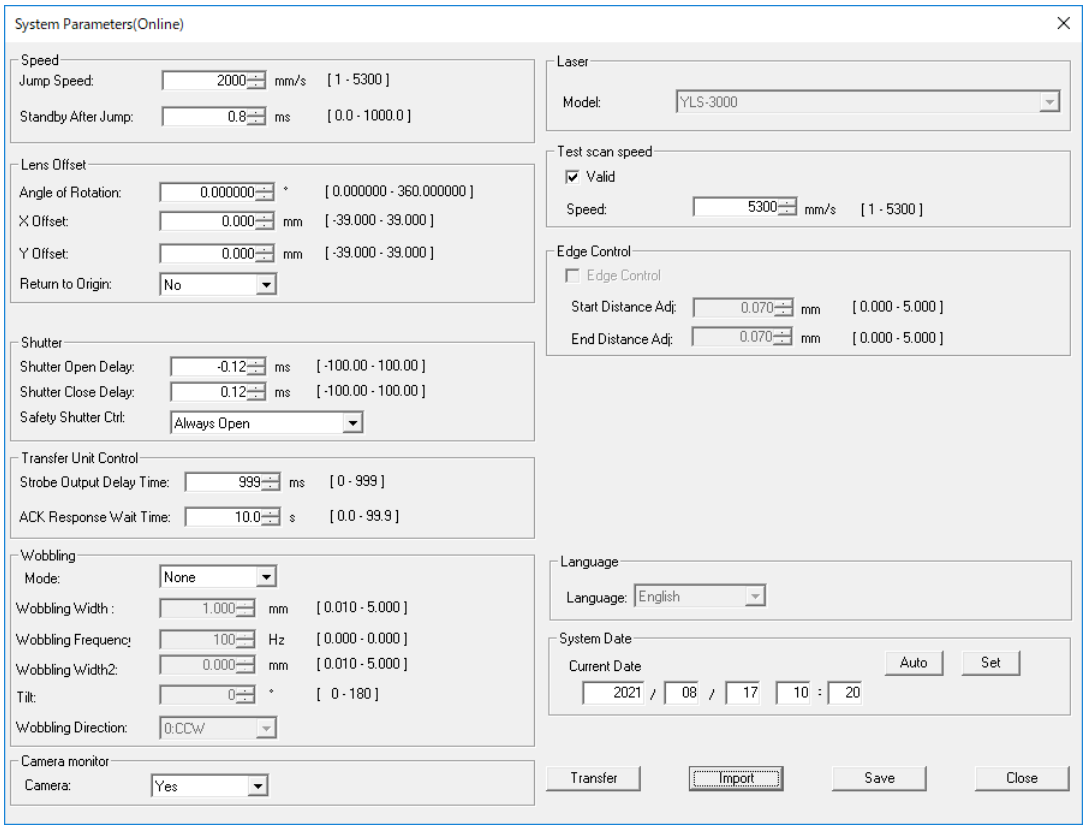
1 From the menu, select [Laser Control] -> [System Parameters].

The [System Parameters] screen is displayed. In online mode, the current laser equipment parameters will appear.

2 To load system parameters saved in the computer, click the [Import] button.

System parameters saved on the computer are loaded.

3 Specify basic laser equipment operating conditions, referring to the following table.



System Parameters Settings (1 / 3)

Item		Setting Details	Range (Default)	Pitch
Speed	Jump Speed	Specifies the transfer speed after welding one line until reaching the starting point of the next.	Lens dependant	1 mm/s
	Standby After Jump	Specifies the time for the welding to restart after one line is drawn and the laser is repositioned at the starting point for the next line.	0.0 to 1000.0 ms (10 ms)	0.1 ms

System Parameters Settings (2 / 3)

Item			Setting Details	Range (Default)	Pitch
Lens Offset*2	Angle of Rotation		Rotates the layout file by the specified amount before welding.	0 to 360° (0°)	0.000001°
	X Offset*1		Moves the X axis of the layout file by the specified amount before welding.	Lens dependant (0 mm)	0.001 mm
	Y Offset*1		Moves the Y axis of the layout file by the specified amount before welding.	Lens dependant (0 mm)	0.001 mm
	Return to Origin	Yes	Returns the scanner to the origin after each welding session.	—	—
		No	The scanner remains in place after welding, without returning to the origin. (Default setting)	—	—
Shutter	Shutter Open Delay *3*4		Adjusts the timing for laser emission.	-100.00 to 100.00 ms (0 ms)	0.01 ms
	Shutter Close Delay *3*4		Adjusts the timing when laser emission stops.	-100.00 to 100.00 ms (0 ms)	0.01 ms
	Safety Shutter Ctrl*5	Always Open	The shutter is always open when LD is ON.	—	—
		Scanning Interlock	Open during welding, closed otherwise.	—	—
Transfer Unit Control	Strobe Output Delay Time		Specify the timing for strobe signal output to the transfer unit.	0 to 999 ms (999 ms)	1 ms
	ACK Response Wait Time		Specify the wait time for the timer regarding transfer unit error monitoring. When 0 is set, no timeout is set.	0 to 99.9 s (10.0 s)	0.1 s
Wobbling*6	Mode	None	The wobbling does not function.	—	—
		Spiral	Performs scanning spirally.	—	—
		Sine curve	Performs scanning sinusoidally.	—	—
		Eight	Performs scanning in the shape of a figure eight.	—	—
		Triangle curve	Performs scanning triangularly.	—	—
	Wobbling Width		Specify the width (line width) of the wobbling. When Eight is selected for Mode, specify the width of the upper circle of a figure eight.	0.01 to 5 mm (1.000 mm)	0.001 mm
	Wobbling Freq.		Specify the frequency for the wobbling operation.	1 to 1000 Hz (100 Hz)	1 Hz
	Wobbling Width 2		When Eight is selected for Mode, specify the width of the lower circle of a figure eight.	0.01 to 5 mm (1.000 mm)	0.001 mm
	Tilt		Scans the start point when Spiral is selected for Mode or the figure eight when Eight is selected for Mode by inclining it by the set angle.	0 to 180° (0°)	1°
	Wobbling Direction		When Spiral or Eight is selected for Mode, specify the wobbling direction.	CW or CCW (Drawing data dependant)	—

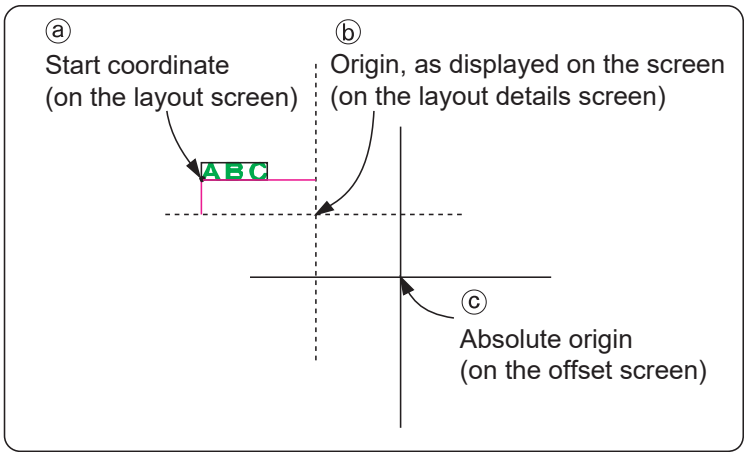
System Parameters Settings (3 / 3)

Item			Setting Details	Range (Default)	Pitch
Camera monitor	Camera	No	The camera is disabled.	—	—
		Yes	The camera is enabled. Set when using the Gridwork function.	—	—
Laser	Model		Displays the laser equipment connected to the controller. This can be operated by our service person.	—	—
Test scan speed	Valid		Select whether to perform test scan speed control.	—	—
	Speed		Specify the test scan speed (in mm/s).	Lens dependant (500 mm/s)	1 mm/s
Edge Control	Edge Control		Select whether to perform edge control.	No, yes	—
	Start Distance Adj		Specify the adjustment distance (lead distance, in mm) before marking.	Lens dependant (0.070 mm)	0.001 mm
	End Distance Adj		Specify the adjustment distance (lead distance, in mm) after marking.	Lens dependant (0.070 mm)	0.001 mm
Language	Language	OS Language	Sets the language for SWDraw to process to the OS language.	—	—
		English	Sets the language for SWDraw to process to English.	—	—
System Date	Current Date		Inputs the system date.	—	—
	Auto		Automatically adjusts [Current Date] to date and time of the computer.	—	—
	Set		Changes the date into that set in [Current Date].	—	—

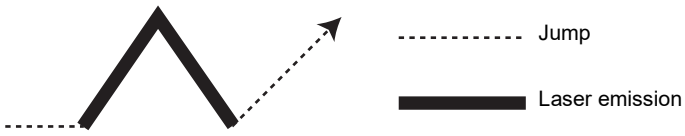
*1 Input the value in view of the value set in the [Scanner adjust] screen.

*2 Lens Offset

Before welding, the absolute origin C is repositioned along the X-axis by the distance specified in [X Offset]. Before welding, the absolute origin C is repositioned along the Y-axis by the distance specified in [Y Offset]. The layout for welding is rotated counterclockwise around the absolute origin C by the angle specified in [Angle of Rotation].



*3 The shutter open delay and shutter close delay are parameters for setting the timing of laser output for scanner operation. When the interface unit is connected, set the following recommended values. The timing of laser output needs to be changed depending on the actually used conditions (schedule waveform of laser equipment, etc.). Specify conditions according to welding status.



Shutter Open Delay (positive value)

Outputs the laser and then waits for a set time.
(No change in appearance. Takt simply extends by a set time.)

Shutter Close Delay (positive value)

Waits for a set time and then stops the laser.
(A line changes in the direction of extension.)

Shutter Open Delay (negative value)

Waits for a set time and then outputs the laser.
(A line changes in the direction of shrink.)

Shutter Close Delay (negative value)

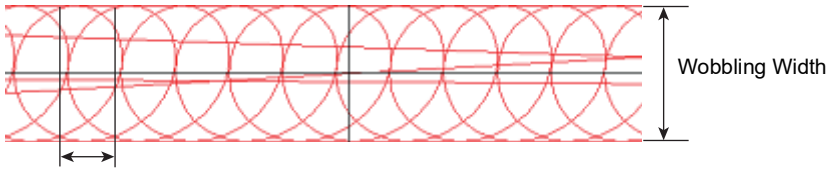
Stops the laser and then waits for a set time.
(No change in appearance. Takt simply extends by a set time.)

*4 [Shutter Open Delay] and [Shutter Close Delay] are invalid for SPOT layouts.

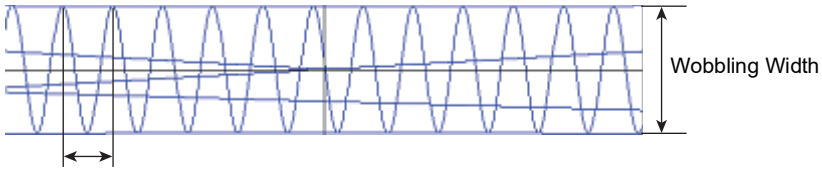
*5 Not used normally.

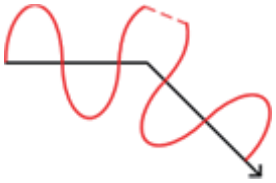
*6 Wobbling
Scanning is performed as shown below by setting [Wobbling Width] and [Wobbling Frequency].

- Spiral mode



- Sine curve mode



CAUTION	・ The wobbling may not work as being set depending on the combination of set values. ・ The wobbling does not function for the spot object. ・ In the sine curve mode, the laser is interrupted at the point where the angle of the trajectory changes. 

4 Click the [Save] button to save the settings.

The settings values for system parameters are saved on the computer.

5 You must now transfer the settings details to the system. Click the [Transfer] button.

* The [Transfer] button can be used only when the system is online.

6 Click the [Close] button when you have finished setting.

CAUTION	If you have not saved the settings details described in step 4, the changes you have made will not be applied.

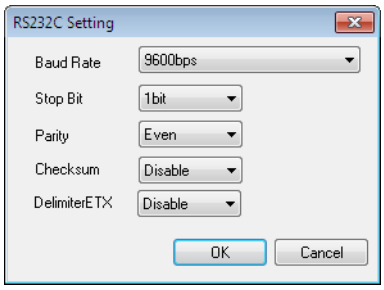
8. RS232C Setting

Follow these steps to making the RS-232C communication settings.

1 When online and the welding is not done (the [Start Scan] button cannot be used), select [Laser Control] -> [RS232C Setting] from the menu.

The [RS232C Setting] screen is displayed.

2 Make RS-232C communication settings, referring to the following table.



RS232C Settings

Item	Setting Range
Baud Rate	4800bps, 9600bps, 19200bps, 38400bps, 57600bps, 115200bps
Stop Bit	1bit, 2bit
Parity	None, Even, Odd
Checksum	Disable, Enable
DelimiterETX	Disable, Enable

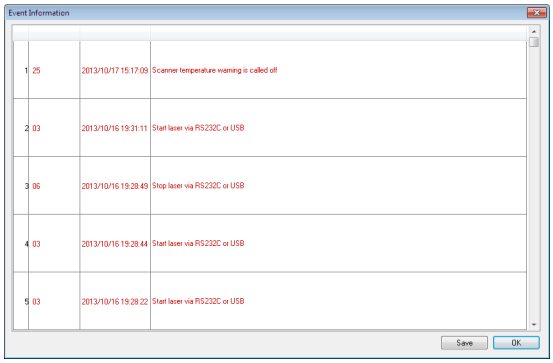
3 Click the [OK] button to save the settings.

9. Event Information

Follow these steps to check the contents of events.

1 When online, select [Laser Control] -> [Event Information] from the menu.

The [Event Information] screen is displayed.



2 Click the [Save] button to save the event details as CSV data. Click the [OK] button to close.

CAUTION	Limitations on filenames when saving data • Enter up to 255 single-byte characters (including drive name and path information) for the filename. • Symbols (\/:*?"<>|), one-byte space, CON, AUX, COM1 to COM9, LPT1 to LPT9, PRN, and NUL may not be used in filenames.

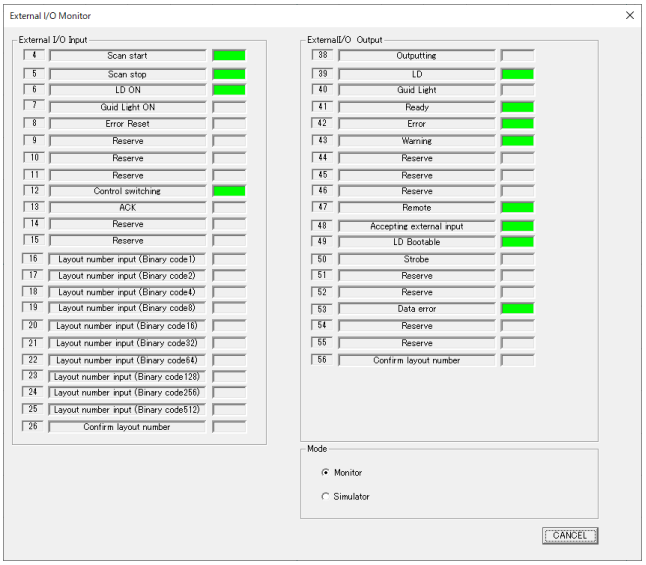
10. External I/O Monitor Test

With the external I/O monitor test tool, you can monitor the input/output status of I/O signals connected to the external input/output connector and the extended external input/output connector.

Also, you can use the simulate mode that can manually change the status of output signals to check the connection with external devices such as sequencer.

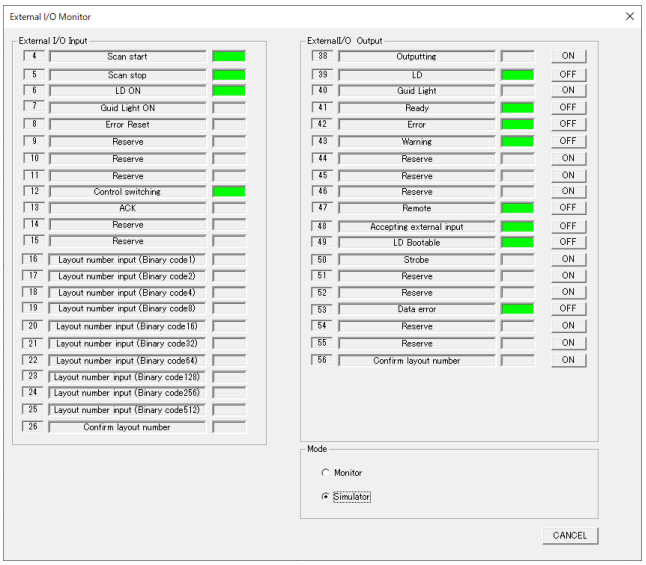
1 When online, select [Laser Control] -> [External I/O Monitor Test] from the menu.

A dialog box is displayed for the external I/O monitor test. The external I/O monitor test dialog box shows ON/OFF status of I/O signals on the external input/output connector and the extended external input/output connector.



2 Click [Simulator] to switch to the mode to the simulate mode. In the simulate mode, you can turn ON/OFF the I/O output with button operation. The external I/O can be monitored even during the simulate mode.

To exit the simulate mode, click [Monitor].



3 Click the [CANCEL] button during the monitor mode to finish the external I/O monitor test.

Chapter 7 Gridwork and Auto Position Alignment

1. Gridwork

The Gridwork is the function to image the whole of scanning area by the specified division number (horizontally and vertically), combine them, save it as a single picture, and use it as a sketch of SWDraw3. To perform the Gridwork, call the [Capture] screen.

CAUTION	The [Capture] screen can be used only when CL-E100A is connected to the computer and the Camera Unit (option) is connected.

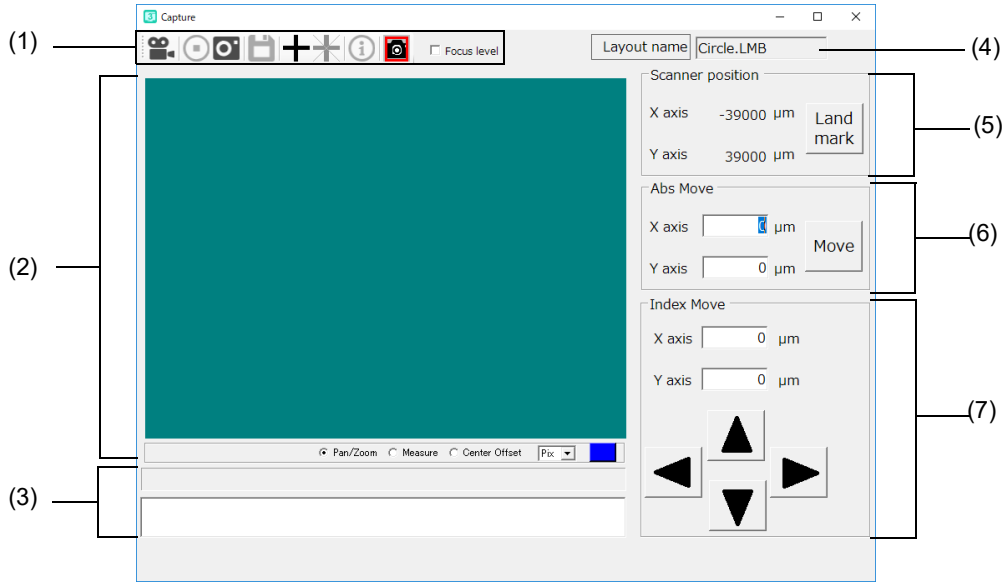
To perform the Gridwork, use the following buttons on the toolbar in the Drawing screen.

Toolbars in the Drawing Screen Functions

Button name	Button	Function
Camera monitor		Displays the [Capture] screen. Used for live display and parameter settings.
Perform Gridwork		Images and combines the whole of the lens area to display it as a sketch.
Perform Gridwork Specified Area		Images and combines the specified area to display it as a sketch.
Specify Gridwork Area		Edits and saves the specified area on the CAD software. Up to thirty-six areas can be specified and areas can be overlapped.
Live display start		Displays live images of camera. Since this is for seeing images during process, the display position cannot be operated.
Live display stop		Stops displaying live images of camera.

1.1. [Capture] Screen Arrangement

Select [Laser Control] -> [Camera Monitor] from the menu or click the [Camera Monitor] button on the toolbar.



(1) Toolbar

For camera operation. The following functions can be used.

Toolbar Indications

Item	Function	Operation possibility during live display
Live display start	Displays the live image from a camera.	—
Live display stop	Stops the live image from a camera.	○
One shot	Captures a still image and displays it.	×
Save displayed image	Saves the displayed image in the specified folder with the specified filename.	×
View crossed line	Displays the crossed line.	○
Hide crossed line	Hides the crossed line.	○
Parameter setting	Calls the parameter setting screen. This can be operated by our service person.	×
Gridwork start	Performs the Gridwork. After performing, a message asking whether the image is saved as a sketch or not is displayed. When saved, the Image folder is created and the Gridwork images are saved in the Image folder. The saved images are displayed as a sketch in the Drawing area of SWDraw3.	×
Focus level *1	Used for the focus adjustment.	○

*1 Keep the highest value when adjusting the focus.

(2) Camera image display

Displays the image from the camera.

Scanner Position Indications

Item	Function	Operation possibility during live display
Pan/Zoom	Select [Pan/Zoom] and move the mouse to the display window. The image can be zoomed in or out by scrolling the mouse wheel up and down and moved by moving by holding down the left mouse button and dragging it. Double-click the right mouse button to bring the image back to the initial size and position.	○
Measure	Select [Measure] and click two arbitrary points on the display window with the mouse to display the distance between them. It is displayed in the unit of pixel when [Pix] is selected or in the unit of μm when [μm] is selected. Also, the display color can be changed by the color button. The display is deleted by clicking the right mouse button and measured again with the above operations.	○
Center Offset	Select [Center Offset] and click an arbitrary point on the display with the mouse to display the distance from the camera center. It is displayed in the unit of pixel when [Pix] is selected or in the unit of μm when [μm] is selected. Also, the display color can be changed by the color button. The display is deleted by clicking the right mouse button and measured again with the above operations.	○

(3) Operation log display

Displays the operation log on the screen.

(4) Layout name

Displays the filename of the layout number selected in [Scanner] on the [Control] screen.

(5) Scanner position

Displays the scanner mirror position.

Scanner Position Indications

Item	Function	Operation possibilityduring live display
X axis	Displays the X-axis position of the scanner mirror.	—
Y axis	Displays the Y-axis position of the scanner mirror.	—

Scanner Position Indications

Item	Function	Operation possibilityduring live display
[Landmark] button	Adds a landmark with making the current scanner coordinate value as a sketch of SWDraw3. The snap functions can be used. (Refer to "Chapter 14-3. Snap Setting" (page 246) .) The position of the set landmark can be changed on the Drawing screen of SWDraw3. After selecting the landmark on the Drawing screen, change [X Coordinate] and [Y Coordinate] in the properties on the right and click the [Update] button. This is can be input in the unit of 0.001. The input range is within the range of the set lens.	○

(6) Abs Move possibility

Moves the scanner mirror position at the specified position. The moving range is within the effective range of the specified lens.

Abs Move Indications

Item	Function	Operation possibilityduring live display
X axis	Specifies the X-axis position of the scanner mirror.	○
Y axis	Specifies the Y-axis position of the scanner mirror.	○
[Move] button	Moves the scanner mirror position to the set value of [X axis] and [Y axis].	○

(7) Index Move

Moves the scanner mirror position at a constant pitch. The moving range is within the effective range of the specified lens.

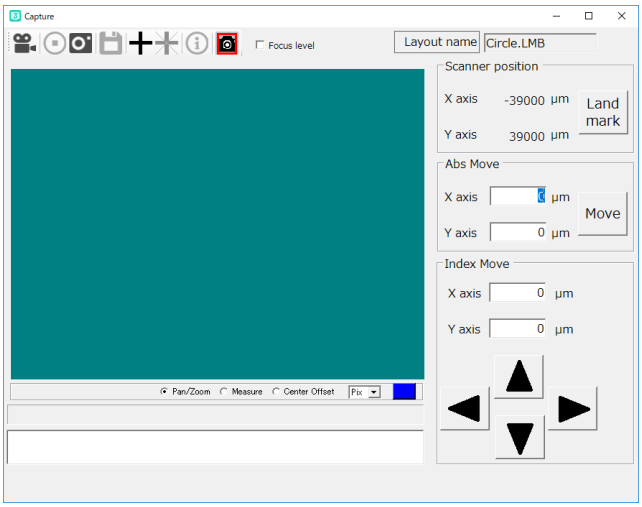
Index Move Indications

Item	Function	Operation possibilityduring live display
X axis	Specifies the X-axis moving distance.	○
Y axis	Specifies the Y-axis moving distance.	○
Cursor buttons	Moves the scanner mirror position by the set value of [X axis] and [Y axis] in the direction of the button.	○

1.2. Using All Ranges as Sketch

Follow these steps to perform the Gridwork.

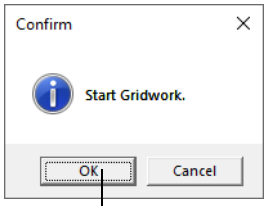
1 Select [Laser Control] -> [Camera Monitor] from the menu or click the [Camera Monitor] button on the toolbar.



The [Capture] screen appears.

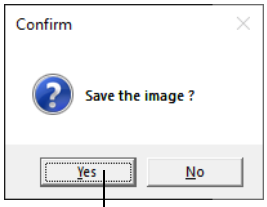
2 Click the [Start Gridwork] button on the toolbar.

3 A message confirming that the Gridwork is performed is displayed. Click the [OK] button.



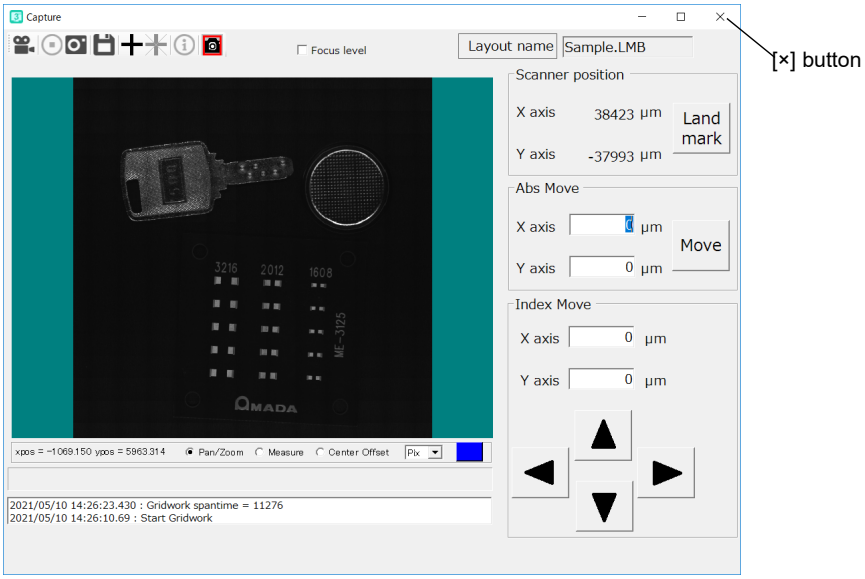
[OK] button

4 Start the Gridwork. After performing, a message asking whether the image is saved as a sketch or not is displayed. Click the [Yes] button.

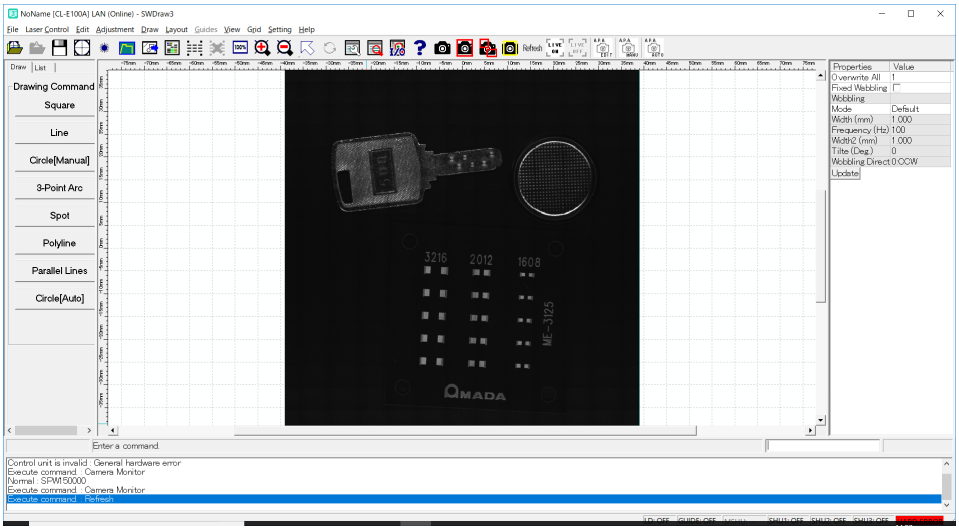


[Yes] button

5 When the [Capture] screen is open, click the [x] button to close the screen.



6 The sketch is displayed in the Drawing screen.



The sketch is also saved when the layout saved.

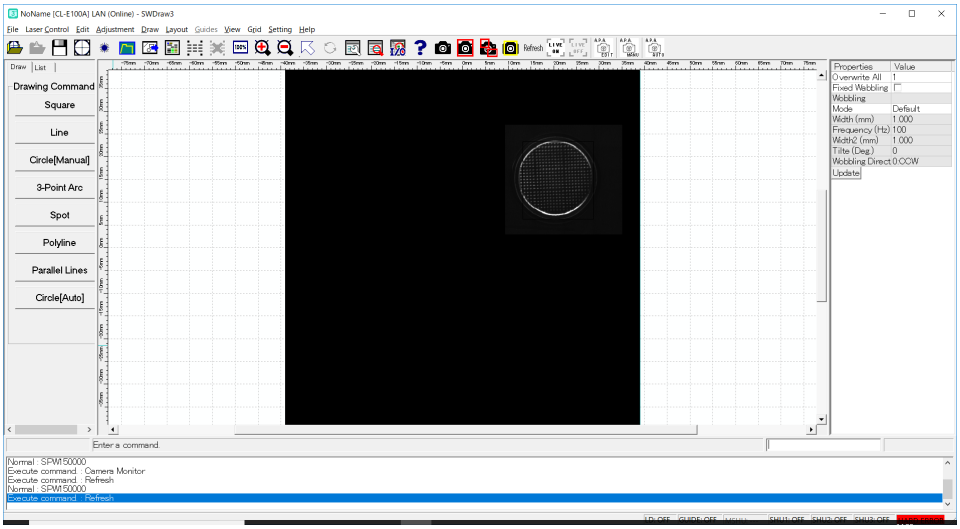
1.3. Using Partial Range as Sketch

The vicinity of the specified area (square) can be imaged and combined to display it as a sketch. When utilizing this function effectively, the processing time of Gridwork can be shortened.

To perform the Gridwork specified area, it is necessary to add a specified area to the layout.

Follow these steps to add, delete and edit the specified area and perform the Gridwork specified area.

CAUTION	The specified area can be set up to thirty-six areas in a single layout.



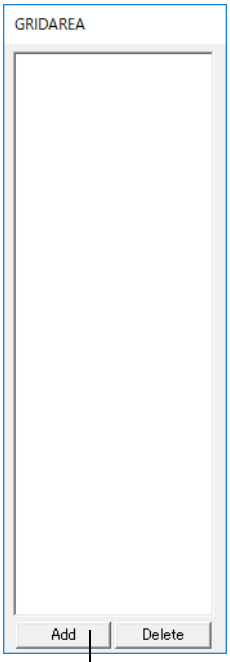
1.3.1. Adding the Specified Area

1 Click the [Specify Gridwork Area] button on the toolbar.

[Specify Gridwork Area] button

The [GRIDAREA] screen appears.

2 Click the [Add] button.

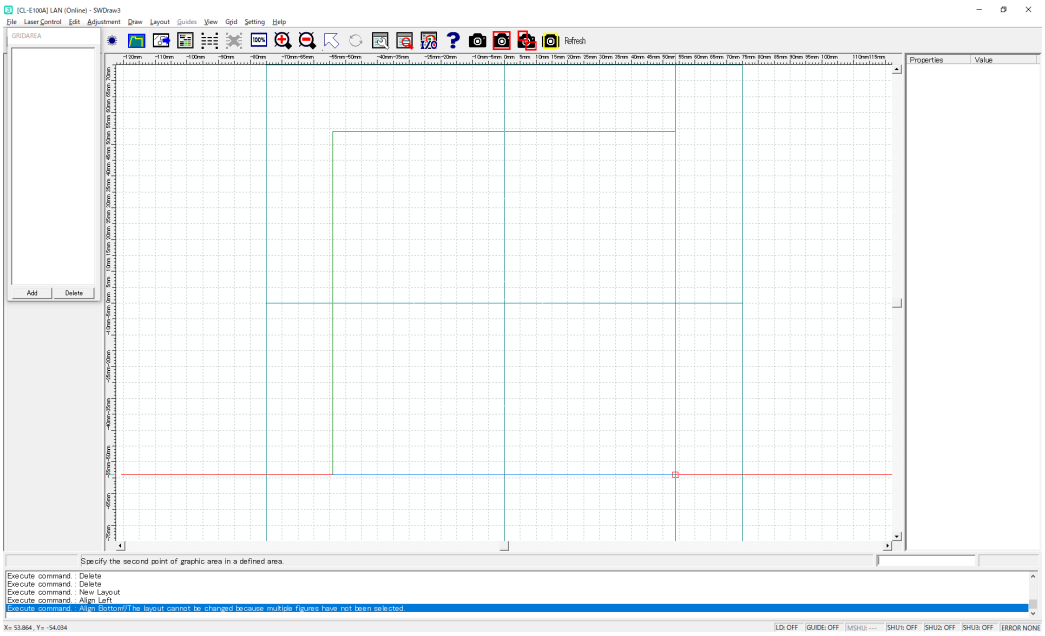


[Add] button

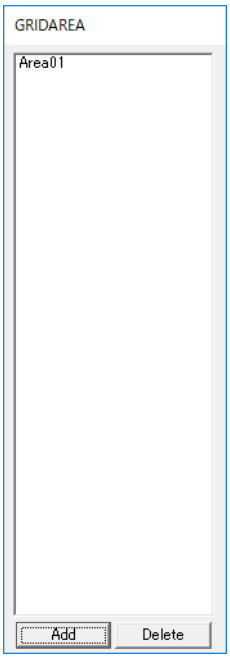
3 Specify the end point of the area.

4 Specify the size of the area.

When the mouse moves, the square size changes. When it becomes an appropriate size, click the left mouse button at the point.



5 The specified area is displayed and an item is added to the [GRIDAREA] screen.



6 Click the title bar of SWDraw3 and then press the <Esc> key to close the [GRIDAREA] screen.

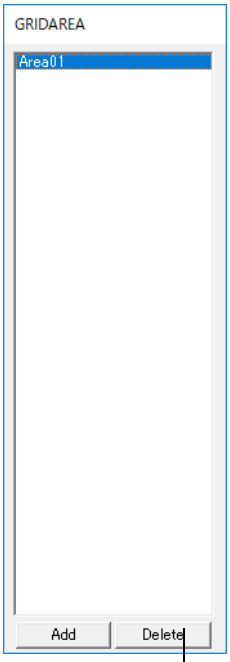
1.3.2. Deleting the Specified Area

1 Click the [Specify Gridwork Area] button on the toolbar.

[Specify Gridwork Area] button

The [GRIDAREA] screen appears.

2 Select the item from the list and click the [Delete] button.



[Delete] button

3 After the specified area is deleted, click the title bar of SWDraw3 and then press the <Esc> key to close the [GRIDAREA] screen.

1.3.3. Editing the Specified Area

Like figures, the specified area can be selected ("Chapter 9-2. Selecting Figures" (page 162)) and changed the properties ("Chapter 9-3. Changing Figure Properties" (page 164)).

The properties of the specified area are as follows.

Properties Settings

Type	Item	Setting specifics	Range	Pitch
Specified area	Object type	Displays the type of the specified area (object).	GRIDAREA	—
	Left-Top X	Specifies the X coordinate of the start point where the Gridwork is performed, which is the X coordinate at the upper left of the Gridwork range.	Lens dependant	0.001 mm
	Left-Top Y	Specifies the Y coordinate of the start point where the Gridwork is performed, which is the Y coordinate at the upper left of the Gridwork range.	Lens dependant	0.001 mm
	Width	Specifies the horizontal length from the Gridwork origin when performing the Gridwork.	0.001 to Lens dependant	0.001 mm
	Height	Specifies the vertical length from the Gridwork origin when performing the Gridwork.	0.001 to Lens dependant	0.001 mm
	Boundary color	Specifies the color of the boundary of the specified area.	0 to 15	1
	ID	Displays the number assigned to the specified area.	001 to 036	—

1.3.4. Performing the Gridwork Specified Area

Click the [Specify Gridwork Area] button on the toolbar.

The Gridwork area is specified by performing step 3 and later of “1.2. Using All Ranges as Sketch.”

The Gridwork is performed at the part where the specified area is included in the imaging range.

2. Auto Position Alignment (Option)

The Auto position alignment is the function to perform pattern matching the composite image aquired by the Gridwork function and a template (image, circle or line serving as a mark) and automatically move the processing point set as the reference layout data associated with a template.

For the moving distance, a difference information (X-coordinate moving distance, Y-coordinate moving distance and rotation angle) between the reference position information set when a template is registered and the position detected at pattern matching is used. To perform the Auto position alignment, call the [A.P.A. Editor] screen or the [Auto position alignment manual (A.P.A Manual)] button or the [Auto position alignment automatic (A.P.A. Auto)] button in the toolbar.

This function is available when the following conditions are satisfied.

- CL-E100A and a computer are connected.
- [Camera Monitor] is set to "Yes" on the [System Parameters] screen.
- The license dongle of Matrox Imaging Library (option) is connected to a computer.

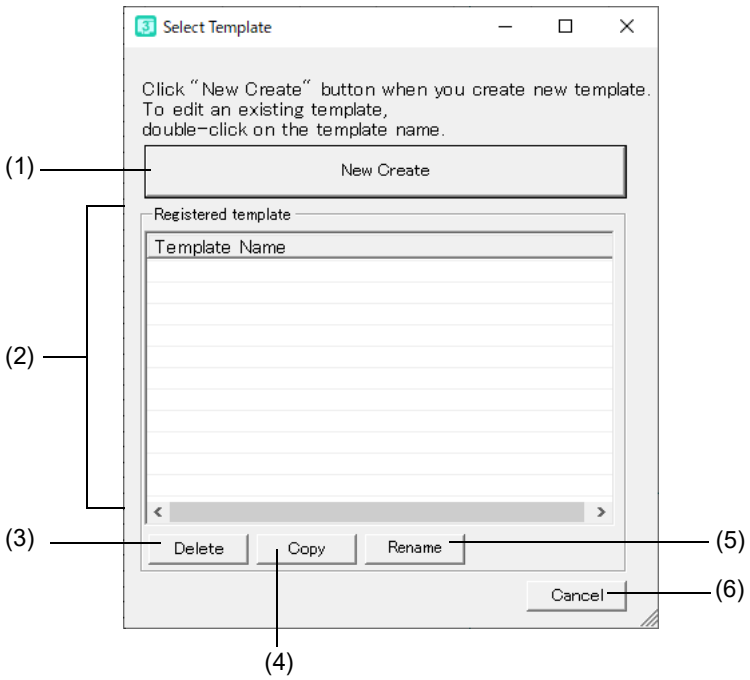
To perform the Auto position alignment, following buttons on the toolbar in the Drawing screen are used.

Toolbars in the Drawing Screen Functions

Button name	Button	Function
Auto position alignment edit (A.P.A. Edit)		Resisters patterns and sets the search area to perform the Auto position alignment.
Auto position alignment manual (A.P.A. Manual)		Used when the laser output of the Auto position alignment is performed from the computer.
Auto position alignment automatic (A.P.A. Auto)		Used when the laser output of the Auto position alignment is performed from the external control device such as PLC.

2.1. [Select Template] Screen Arrangement

Click the [Auto position alignment edit (A.P.A. Edit)] button on the toolbar.



(1) [New Create] button

Creates a template for performing the Auto position alignment. Click this button to display a dialog for entering the template name.

(2) Template Name

Displays the created templates in a list. Double-click the displayed template name to open the created template.

(3) [Delete] button

Deletes the selected template from the template name display. When clicking the [Delete] button with selecting the template name to delete, a confirmation dialog is displayed. Click the [Yes] button to delete the template.

(4) [Copy] button

Copies the selected template from the template name display. When clicking the [Copy] button with selecting the template name to copy, a screen for entering the name after copying is displayed. After entering a name, click the [Execute] button.

(5) [Rename] button

Renames the selected template from the template name display. When clicking the [Rename] button with selecting the template name to rename, a screen for entering the name after renaming is displayed. After entering a name, click the [Execute] button.

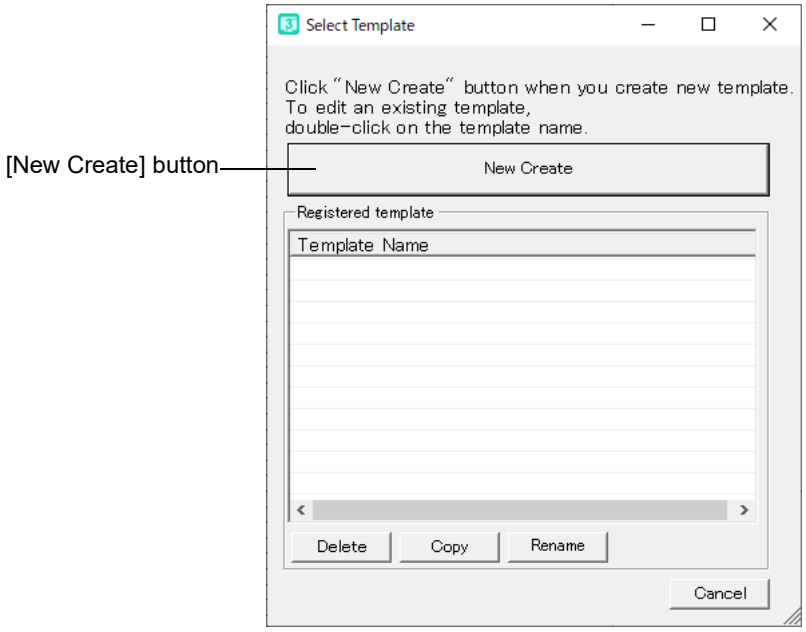
(6) [Cancel] button

Closes the [Select Template] screen.

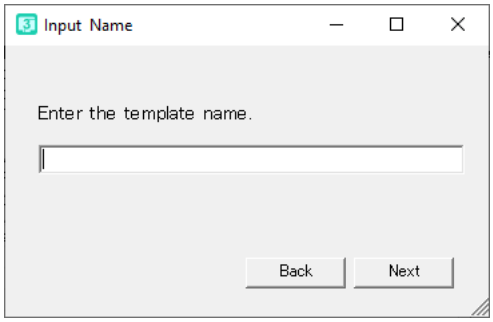
2.2. Creating a New Template

Follow these steps to create a new template.

1 Click the [New Create] button on the [Select Template] screen.



2 Enter the template name for performing the Auto position alignment. The number of characters that can be entered is up to 32767 single-byte characters or 16383 double-byte characters.

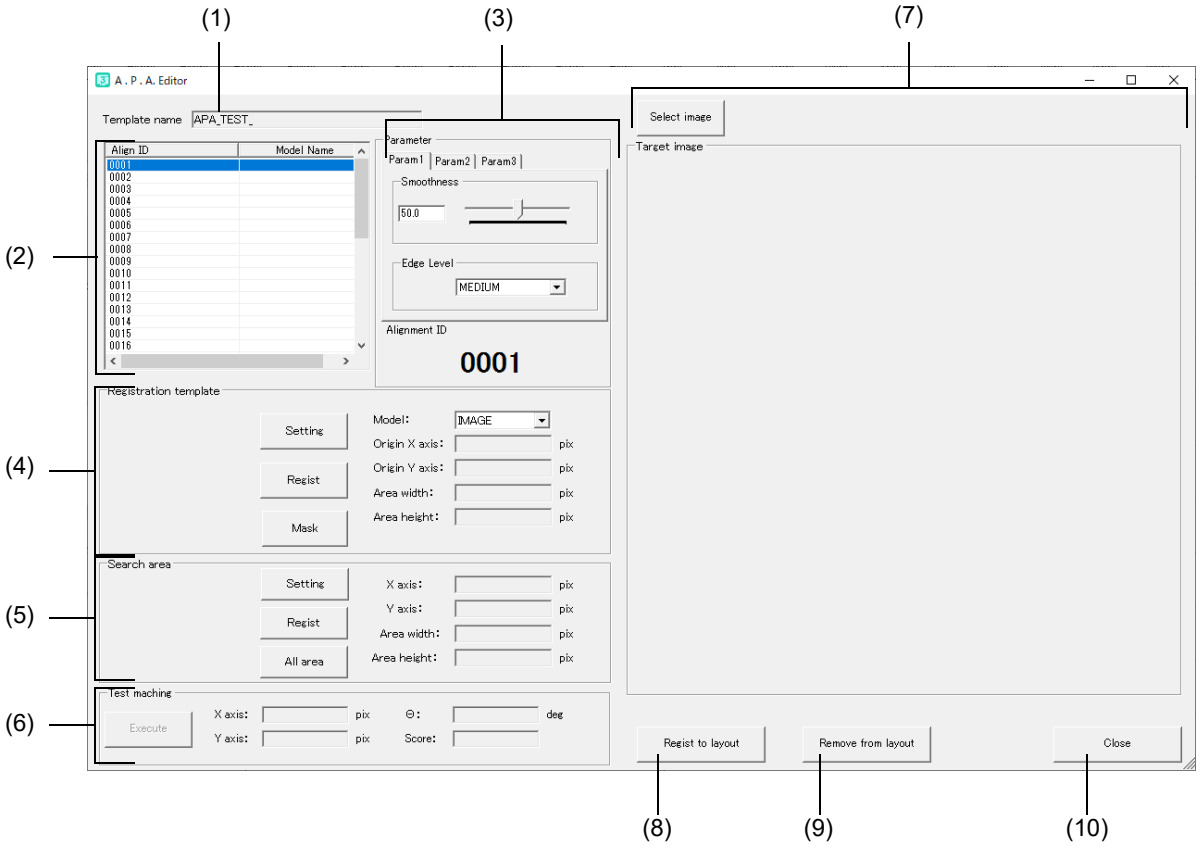


The entered template name is displayed on the [A.P.A. Editor] screen described later.

CAUTION	Symbols (\/:*?"<>|) may not be used in template names.

3 Click the [Next] button to display the [A.P.A. Editor] screen. To display the screen, a template name should be entered.
To cancel, click the [Back] button.

2.3. [A.P.A. Editor] Screen Arrangement



(1) Template name

Displays the template name entered when the template has been created.

(2) Align ID and Model Name

To perform the Auto position alignment, it is necessary to set the alignment ID associated with the model (type of search method). Up to thirty-six Align IDs can be set per template.

There are three types of models, and each feature is as follows.

Model Type	Functions
IMAGE	Compares a shape matched with the registered image and performs pattern matching. Used for correcting the layout data position and tilt with reference to the characteristic figure (logo mark or parts, etc.).
CIRCLE	Searches the circle matched to the set radius of the circle. Used for correcting the layout data position with reference to the position of the specific circle.
LINE	Searches the line edge (boundary). Used for correcting the layout data position and tilt with reference to the line existing at the specific position.

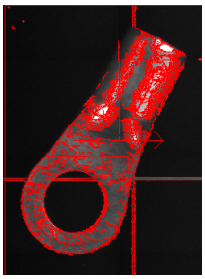
(3) Parameter

Sets parameters of the model. The following table lists the items that can be set in Parameter.

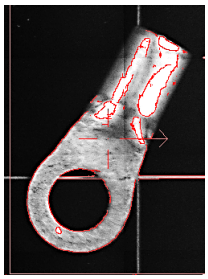
Parameter Settings

Type	Item	Setting Details	Range (Default)
Parameter	Param1		
	Smoothness*1	Reduces noises at the time of search. Values closer to 0 do not reduce noises and values closer to 100 reduce noises.	0.0 to 100.0 (50.0)
	Edge Level*2	Sets the accuracy of the image edge extraction. The accuracy becomes higher in the order of MEDIUM, HIGH and VERY HIGH, and more information about the image edge can be acquired. This is effective when acquiring more feature points for workpiece having less edge information. This cannot be set when LINE is selected for Model.	MEDIUM, HIGH, VERY HIGH (MEDIUM)
	Alignment ID	ID (alignment ID) to perform the currently selected Auto poisition alignment. Set it for objects in a layout on the layout drawing screen of SWDraw3.	— (0001)
	Param2		
	Rotation*3	Sets the angle during template matching. Used when changing the template angle or limiting the allowable angle. This cannot be set when CIRCLE or LINE is selected for Model.	0.0 to 180.0° (Angle: 0.0°, Delta Pos: 180.0°, Delta Neg: 180.0°)
	Scaling*4	Sets the scaling factor during template matching. Used when scaling the template or limiting the allowable scaling factor at the time of search. This cannot be set when LINE is selected for Model.	0.500 to 2.000 (Scale: 1.000, Max: 2.000, Min: 0.500)
	Time out	Sets the upper limit of the search time during template matching. Used when limiting the time during template matching or taking longer time for template matching. This cannot be set when LINE is selected for Model.	1 to 10000 ms (2000 ms)
	Param3		
	Score*5	Determines the matching state when the matching degree acquired as a result of the conditions used for search and the actual pattern matching is higher than the set value. When the value is closer to 100, a matching condition becomes severe. This cannot be set when LINE is selected for Model.	1 to 100 (60)
	Speed	Sets the search speed during template matching algorithm. The search speed becomes faster in the order of LOW, MEDIUM, HIGH, and VERY HIGH, and template matching can be performed at high speed. However, the higher the search speed, the less the search accuracy. Be careful when performing high-precision template matching. This cannot be set when CIRCLE or LINE is selected for Model.	LOW, MEDIUM, HIGH, VERY HIGH (MEDIUM)
	Accuracy	Sets the search accuracy during template matching. The search accuracy becomes higher in the order of LOW, MEDIUM and HIGH, and template matching can be performed in subpixel accuracy. However, the more the search accuracy, the lower the search speed. Be careful when performing high-speed template matching. This cannot be set when CIRCLE or LINE is selected for Model.	LOW, MEDIUM, HIGH (MEDIUM)

*1 When Smoothness is changed to 70 for the left image (Smoothness 50), feature points are emphasized by reducing noises shown in the right image (Smoothness 70). However, when the value is set too high, feature points to search for may be also smoothed. Adjust it using test matching so that extra feature points are not detected.

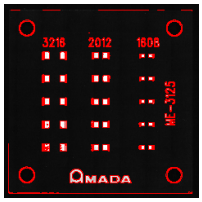


Smoothness 50

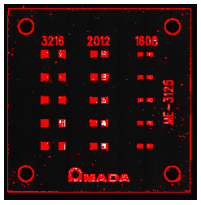


Smoothness 70

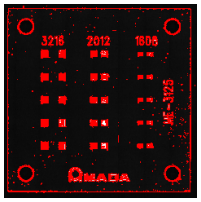
*2 In the Edge Level setting, the edge information (green line) acquired from image changes as shown below. The edge information (red line) can be used as feature points of image. However, the edge information may contain noise. When setting Edge Level high, be careful not to extract extra edges.



EDGE LEVEL
MEDIUM

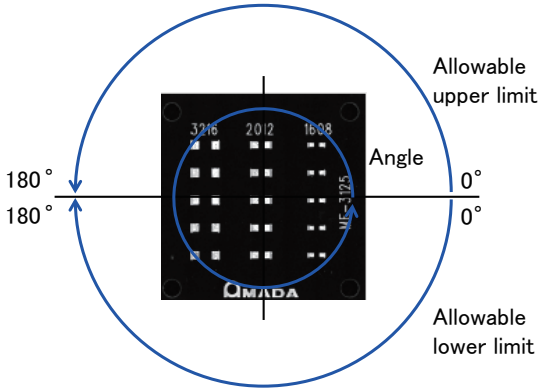


EDGE LEVEL
HIGH

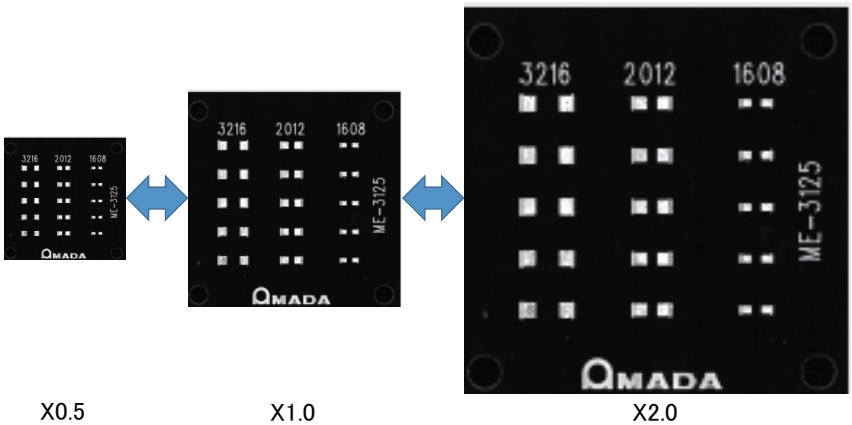


EDGE LEVEL
VERY HIGH

*3 The angle setting during template matching and upper/lower limits of the allowable angle are as shown below. The angle can be set in the unit of 0.1°.



*4 Settings of the scaling factor during template matching and maximum/minimum scaling factor at the time of search are as shown below. The scaling factor can be set in the range of 0.500 to 2.000 and in the unit of 0.001.



X0.5 X1.0 X2.0

*5 A threshold for judging as a matching state corresponding to the result of pattern matching can be set in Score. By setting Score to a lower value, they are determined to be matched even if a part of Target image is different from the registered template due to the influence such as a reflected light by illumination and dirt. However, when the value is too low, a possibility of erroneous recognition becomes high. Also, because Score is not the matching rate (%), it does not become 100 even if the same image is used.

Model image

Target image

(4) Registration template

Sets and displays the template information. The following table lists the set and displayed items. Items displayed in gray rows cannot be input directly.

Registration Template Settings

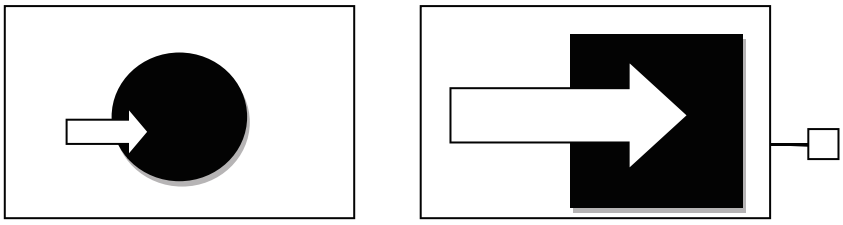
Type	Item		Setting Details	Range[*1]
Registration template	Model	IMAGE	Registers the model featuring the model image information. When the model is registered by IMAGE, the model image information is displayed.	16×16 to 4096×4096 pixel
		CIRCLE	Registers the model featuring the radius value of the circle. When the model is registered by CIRCLE, a geometric shape of the circle created with the specified radius value is displayed.	16×16 to 4096×4096 pixel
		LINE	Registers the model featuring the line edge information. When the model is registered by LINE, the image indicating that it is registered by LINE is displayed.	—
	Origin X axis		Displays the center position (X coordinate) of the setting range in subpixels.	Lens dependant
	Origin Y axis		Displays the center position (Y coordinate) of the setting range in subpixels.	Lens dependant
	Area width		Displays the width of the setting range in subpixels.	Lens dependant
	Area height		Displays the height of the setting range in subpixels.	Lens dependant
	Edge polarity[*2]	White to Black	Sets when the color from the outside to the inside in the search direction changes from white to black (bright to dark).	—
		Black to White	Set when the color from the outside to the inside in the search direction changes from black to white (dark to bright).	—
	[Setting] button		Sets the items required for search of each model.	—
	[Regist] button		Saves the reference position information and the parameter setting of each model as a template.	—

Registration Template Settings

Type	Item	Setting Details	Range[*1]
Registration template (continued)	[Mask] button[*3]	Performs template matching with setting correlation with the specific part of the model image information. By performing mask processing, matching can be performed even with image that contains partially different information.	—

*1 Indicates an area or a search range which can be registered as template. (Refer to "Chapter 7-2.6. Setting the Auto Position Alignment" (page 134) .)

*2 Performs searching toward the center from the outer circumference of a search range when Model is CIRCLE or toward the rotation handle from the opposite side of a search area when Model is LINE.



Search direction of CIRCLE　　Search direction of LINE

*3 Mask processing can be set only when Model is IMAGE.

(5) Search area

Displays the information of area where a model is searched. The following table lists the displayed items. Effective only when Model is IMAGE. Items displayed in gray rows cannot be input directly.

Search Area Settings

Type	Item	Setting Details	Range
Search area	X axis	Displays the X coordinate at the center position of the area set in Target image in pixels.	Lens dependant
	Y axis	Displays the Y coordinate at the center position of the area set in Target image in pixels.	Lens dependant
	Area width	Displays the width of the area set in Target image in pixels.	Lens dependant
	Area height	Displays the height of the area set in Target image in pixels.	Lens dependant
	[Setting] button	Specifies the range of the search area.	—
	[Regist] button	Registers the specified search area.	—
	[Full area] button	Specifies the search area to the whole area.	—

(6) Test matching

Performs matching with the target image to check if the set template operates correctly and displays the result. The following table lists the displayed items.

Test Matching Settings

Type	Item	Setting Details	Range
Test matching	X axis	Displays the X coordinate at the matching center position in Target image when the matching is successful.	Lens dependant
	Y axis	Displays the Y coordinate at the matching center position in Target image when the matching is successful.	Lens dependant
	θ	Displays the matching angle in Target image when the matching is successful.	0 to 360.0°
	Score	Displays the matching degree in Target image when the matching is successful.	1 to 100.0
	[Execute] button	Performs matching with the target image with the set template.	—

(7) Target image

Selects the target image and displays it. Click the [Select image] button and select the target image to display the selected image in the Target image area. Also, the coordinate point of image indicated by a mouse cursor is displayed at the lower left of the area. (The upper left is X=0 and Y=0.)

(8) [Regist to layout] button

Displays the [Select Layout] screen to associate the created template with the layout number. After setting the Auto position alignment, specify the align ID for the figure in layout data. (Align ID can be set in advance.)

(9) [Remove from layout] button

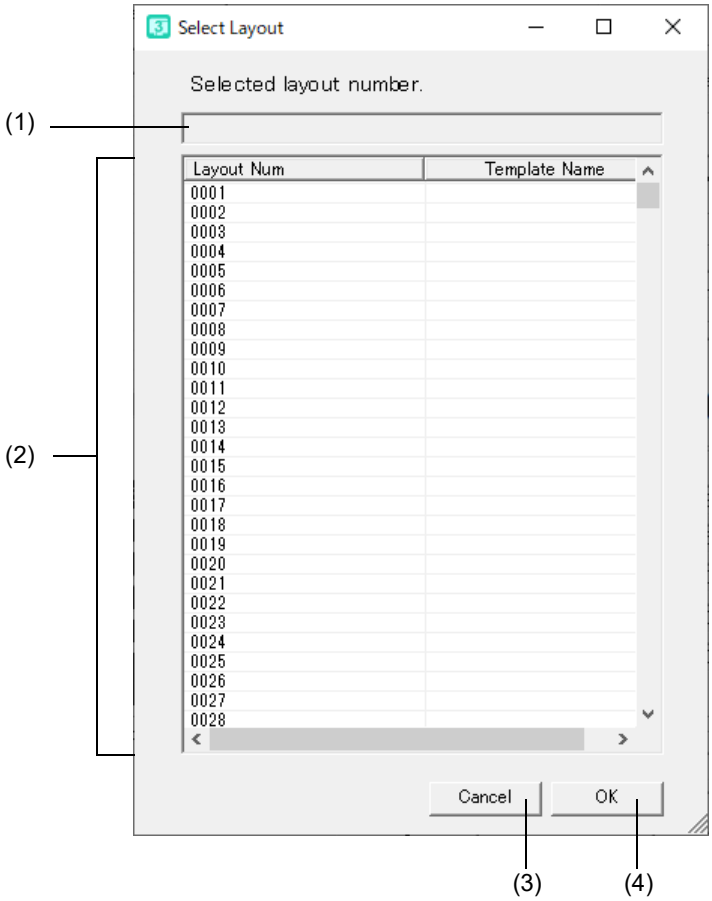
Displays the [Select Layout] screen to delete the combination of template and layout data (number) associated in the past. Template is not deleted.

(10) [Close] button

Ends the Auto position alignment setting. Click the [Close] button to close the [A.P.A. Editor] screen and return to the screen of SWDraw3.

2.4. [Select Layout] Screen Arrangement

Click the [Regist to layout] button or the [Remove from layout] button on the [A.P.A. Editor] screen to register or delete a template to/from the layout.



(1) Selected layout number

Displays the number selected from the layout number list. Two or more layout numbers can be selected.

(2) Layout number list

Displays the template name associated with the layout data. Layout numbers 0001 to 1023 can be registered.

(3) [Cancel] button

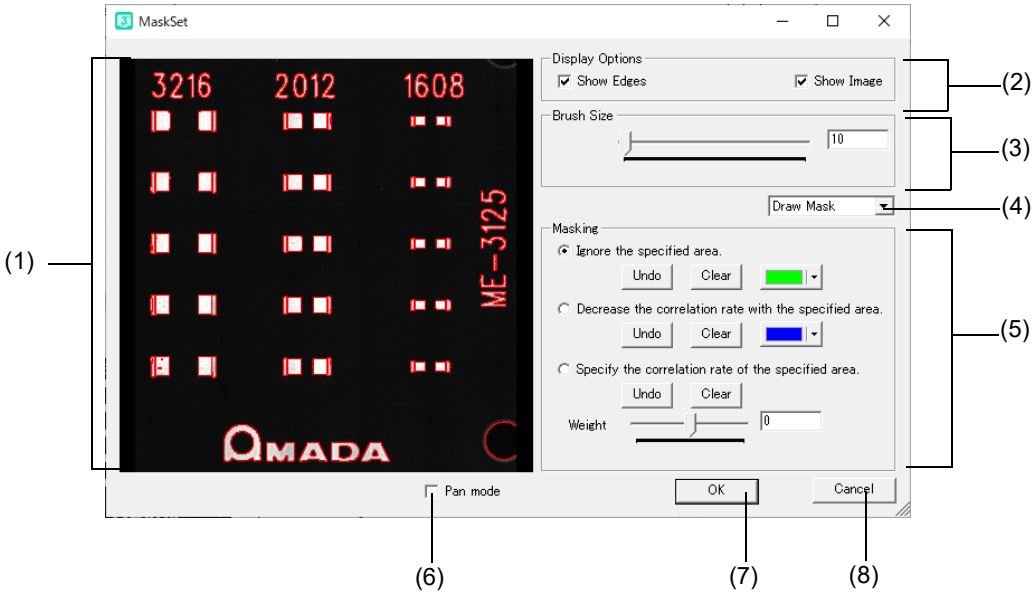
Closes the [Select Layout] screen.

(4) [OK] button

Registers a template set on the [A.P.A. Editor] screen to the selected layout number when the [Register to layout] button is clicked on the [A.P.A. Editor] screen. When registration is complete, the template name is displayed for the selected layout number.
Deletes a template name displayed for the selected layout number when the [Remove from layout] button is clicked on the [A.P.A. Editor] screen. When deletion is complete, the template name of the selected layout number is deleted and the association with the layout number is released.

2.5. [MaskSet] Screen Arrangement

Click the [Mask] button on the [A.P.A. Editor] screen to add mask processing to the IMAGE model.



(1) Template image

Displays the registered template image. The area of mask processing can be specified by dragging the displayed image with the left mouse button. The image is scaled by scrolling the mouse wheel up and down. To fit the frame, press the mouse wheel. Also, when Pan mode is checked, the image can be moved by dragging the mouse.

(2) Display Options

Sets the display contents of the template image. By putting a check in Show Edges, the edge information of the image can be displayed in a red line. Also, by putting a check in Show Image, the image information of the template images displayed.

(3) Brush Size

Specifies the line width of mask to draw. Specifies the line width with 1 to 1000 pixel by a slide bar or text box.

(4) Draw Mask / Draw Clear

Selects whether drawing or canceling mask. When Draw Mask is selected, draw mask processing by dragging the template image. When Draw Clear is selected, the drawn mask processing part is canceled by dragging the template image.

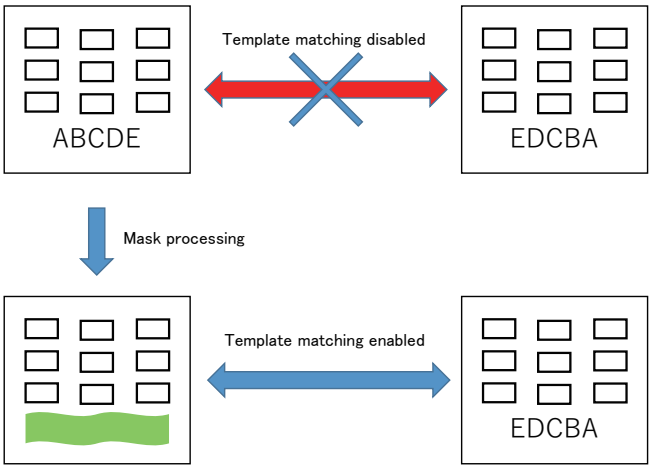
(5) Mask

Selects a mask processing to draw in the template image. There are the following three options. In each option, there are the [Undo] button and the [Clear] button. Click the [Undo] button to reverse the last action. Click the [Clear] button to cancel all processes drawn on the template image.

- Ignore the specified area.

  Skips the part where mask processing is drawn on the template image during template matching. This function allows matching with similar image.

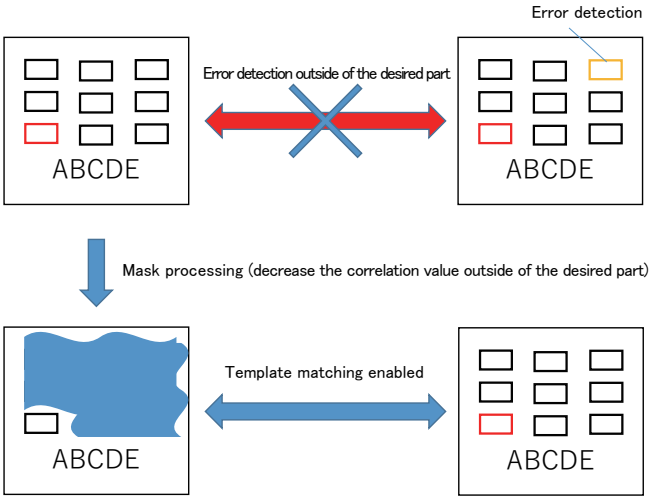
  The draw color can be changed. The default color is green.



- Decreases the correlation rate with the specified area.

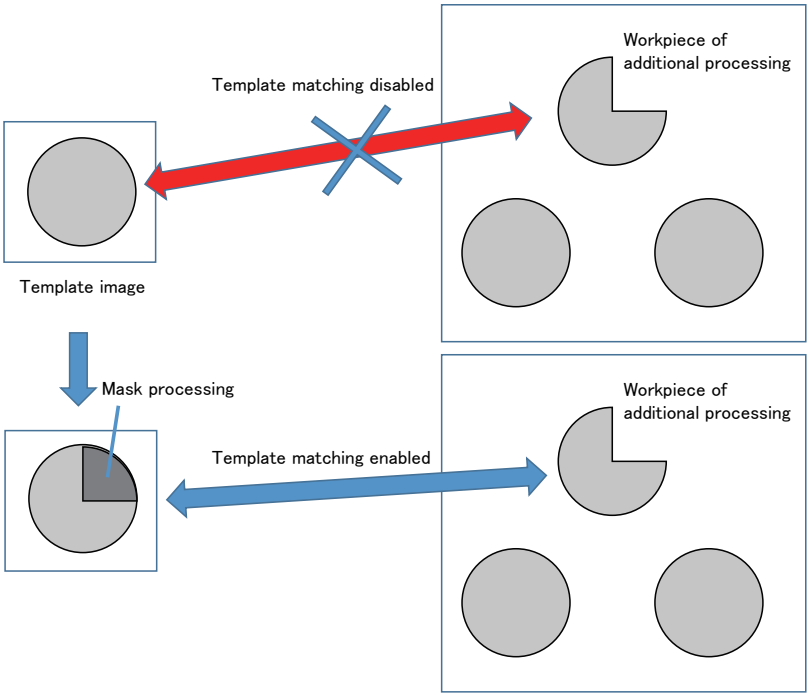
  Decreases correlation with the part where mask processing is drawn on the template image. This function reduces the probability of error detection.

  The draw color can be changed. The default color is blue.



- Specify the correlation rate of the specified area.

  Sets correlation with the part where mask processing is drawn on the template image. This function allows template matching with additionally processed parts. In this function, a black-to-white 255 of gradations (-127 to 127) can be set by a slide bar (or text box). The lower the value, the higher the effect to lower correlation.



(6) Pan mode

Sets to allow or to not allow the displayed image move. When checked, the image moves by dragging the left mouse button without specifying the area for mask processing.

(7) [OK] button

Adds mask processing to the registered template image.

(8) [Cancel] button

Closes the [MaskSet] screen.

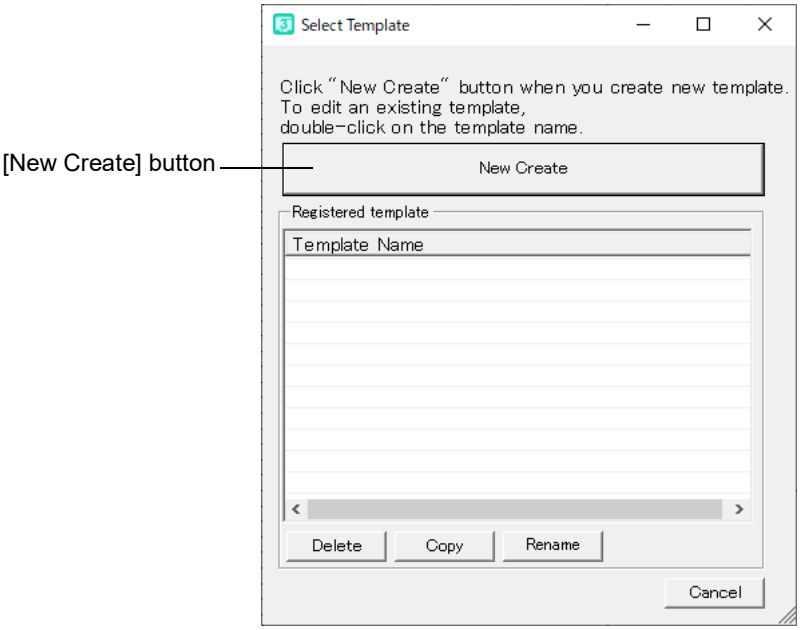
2.6. Setting the Auto Position Alignment

Follow these steps to set the Auto position alignment.

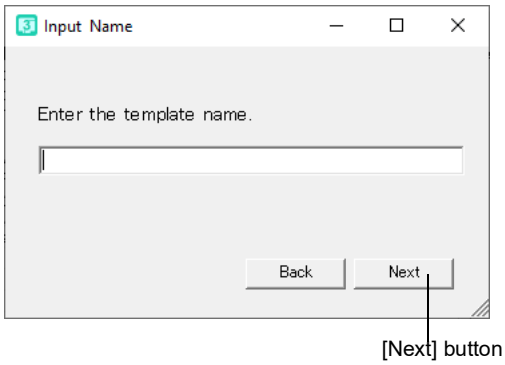
In the Auto position alignment, images aquired by the Gridwork are used. If they have not been aquired, see "Chapter 7-1.2. Using All Ranges as Sketch" (page 114) or "Chapter 7-1.3. Using Partial Range as Sketch" (page 116) to aquire images.

1 Click the [Auto position alignment edit (A.P.A. Edit)] button on the toolbar.

2 A dialog for creating a template is displayed. Click the [New Create] button.

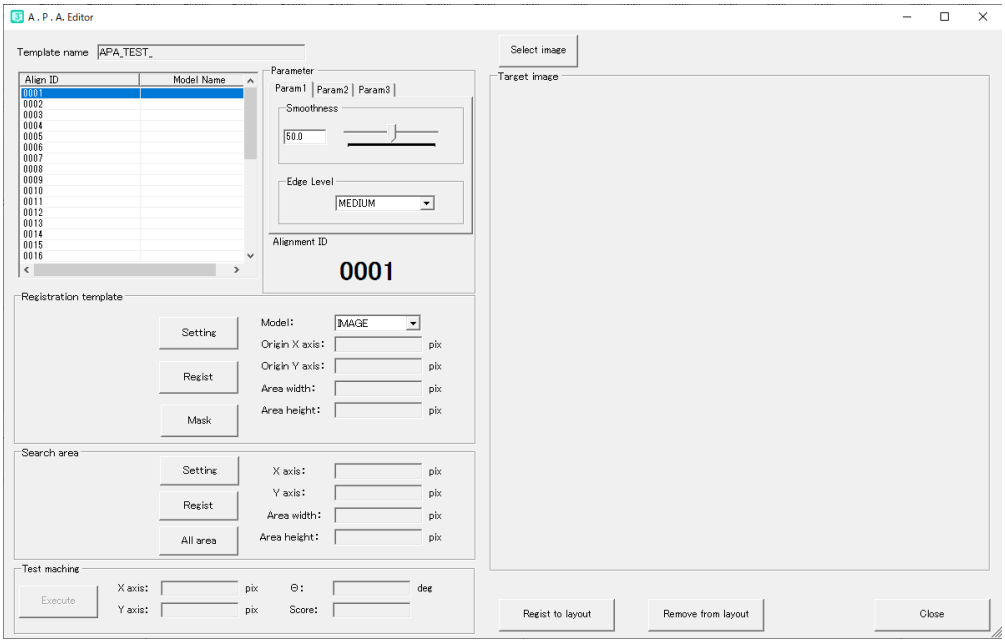


3 Enter a desired template name and click the [Next] button.

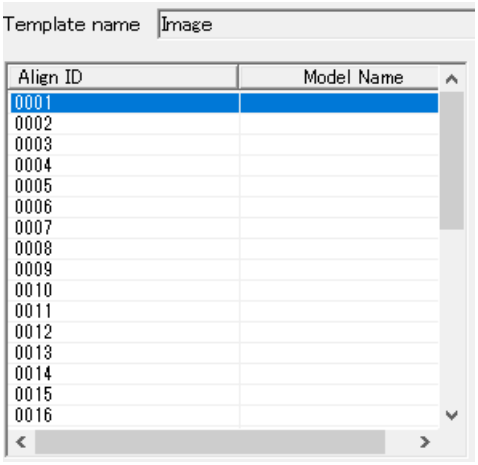


The [A.P.A. Editor] screen is displayed.

4 Click the [Select image] button to display the image aquired by the Gridwork in the Target image area.

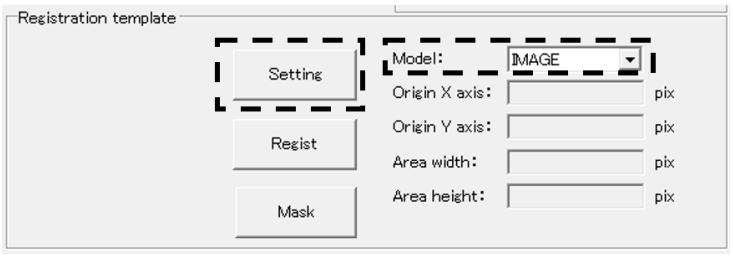


5 Associate the alignment ID with the model. Select an alignment ID in the list displaying Align ID and Model Name by clicking it. To delete the set alignment ID, click the right mouse button and choose Delete.



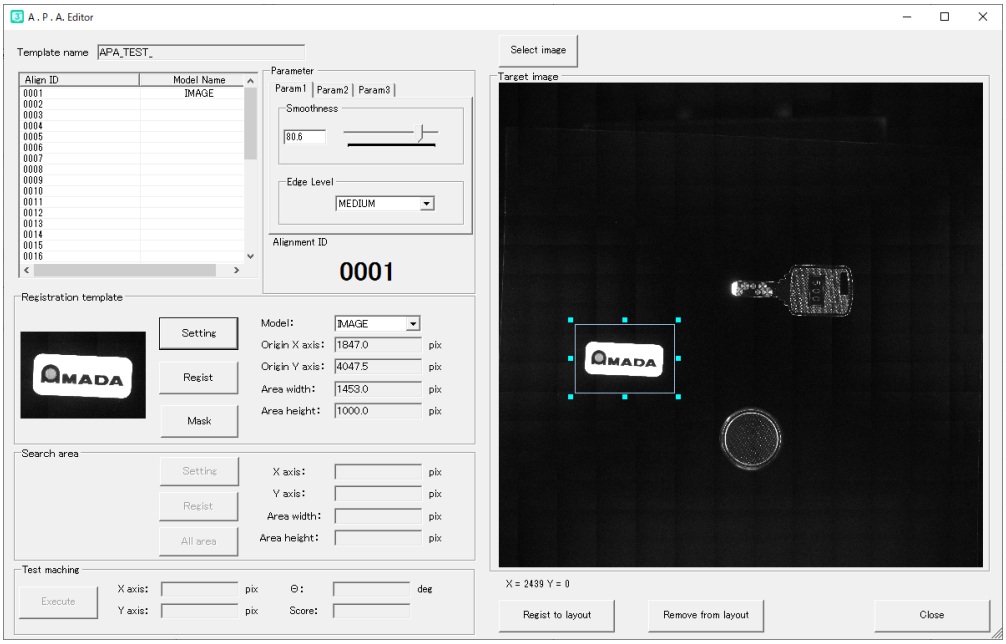
The currently selected alignment ID is displayed in Alignment ID in Parameter.

6 Select a model and make setting of it. Select a model to use for pattern matching in the Registration template area. After selection, click the [Setting] button to display the setting contents corresponding to each model.



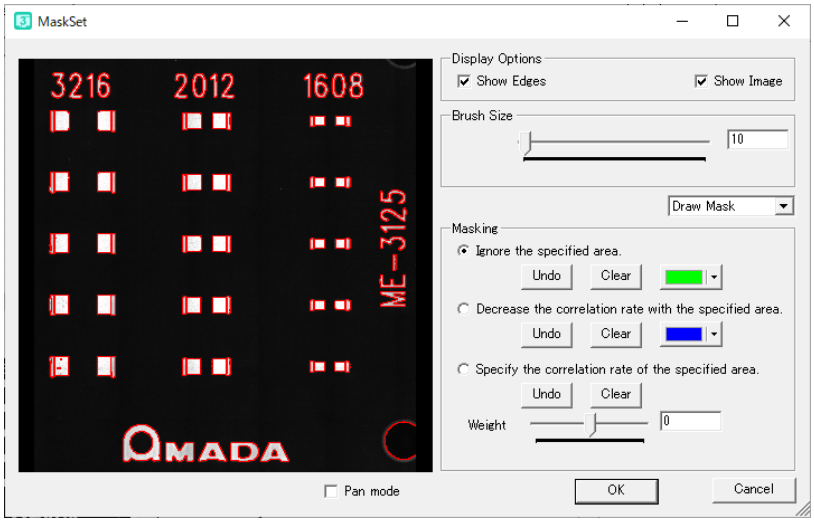
- When IMAGE is selected

  When the [Setting] button is clicked, the area to register as a template is displayed. Specify the area to register with a drag operation. When the [Regist] button in the Registration template area is clicked with the area set, image and its positions, area width and area height used for pattern matching are displayed and registered as the reference position information.



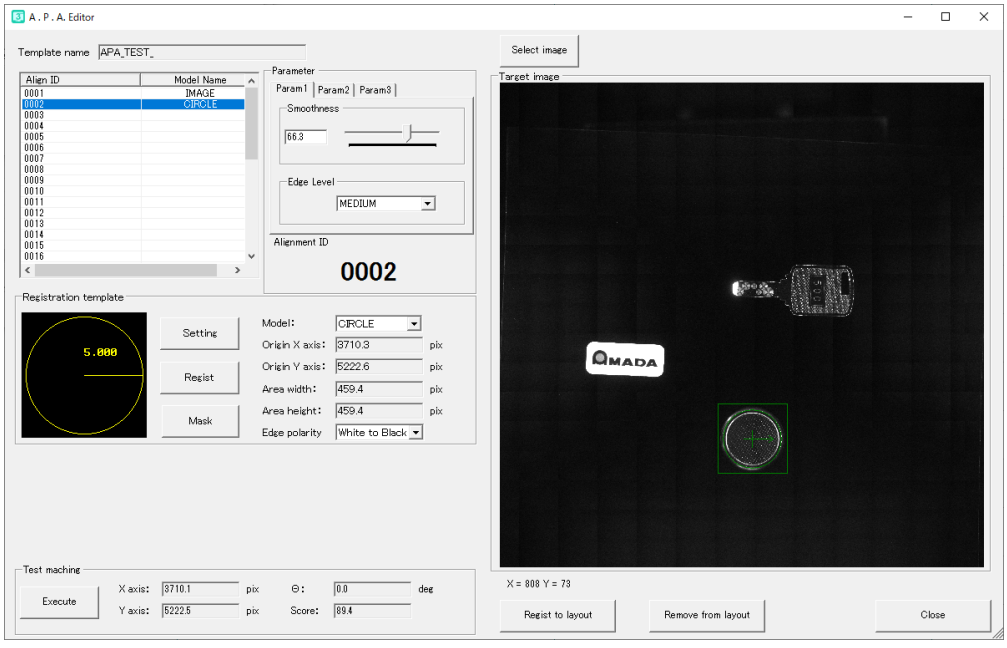
- When performing mask processing

  When the [Mask] button is clicked, the [MaskSet] screen for setting correlation to the specific part of the image is displayed. By painting the part to set correlation to the image in the screen, mask processing is added to the registered IMAGE model.



- When CIRCLE is selected

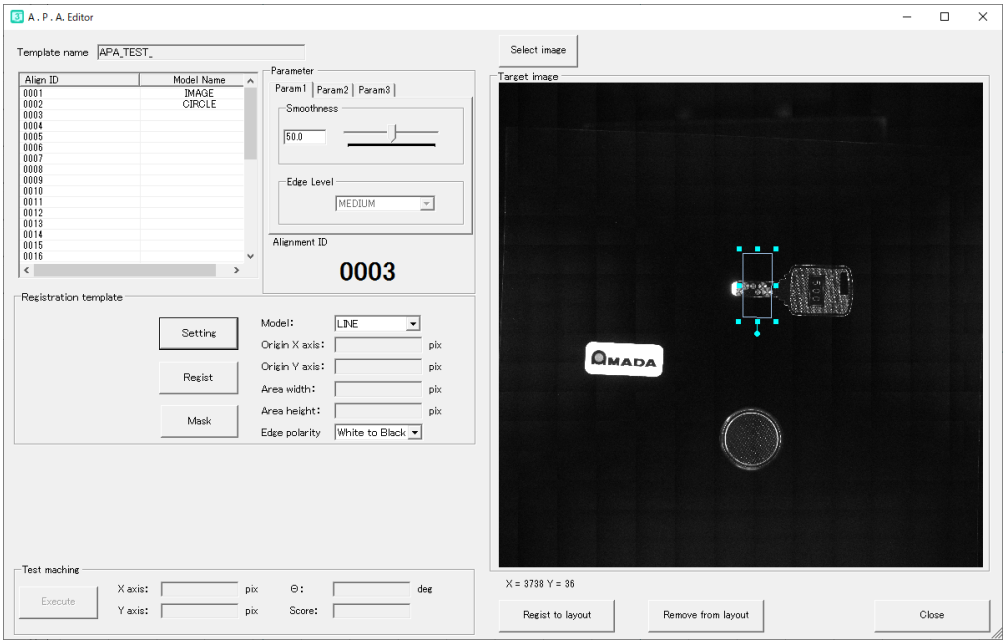
  When the [Setting] button is clicked, a dialog for inputting the radius of the circle is displayed. Input the radius of the circle (in mm) and click the [OK] button. To cancel, click the [Cancel] button.



CAUTION	The minimum value of radius that can be input is 1. The maximum value depends on the image size of the Target image area.

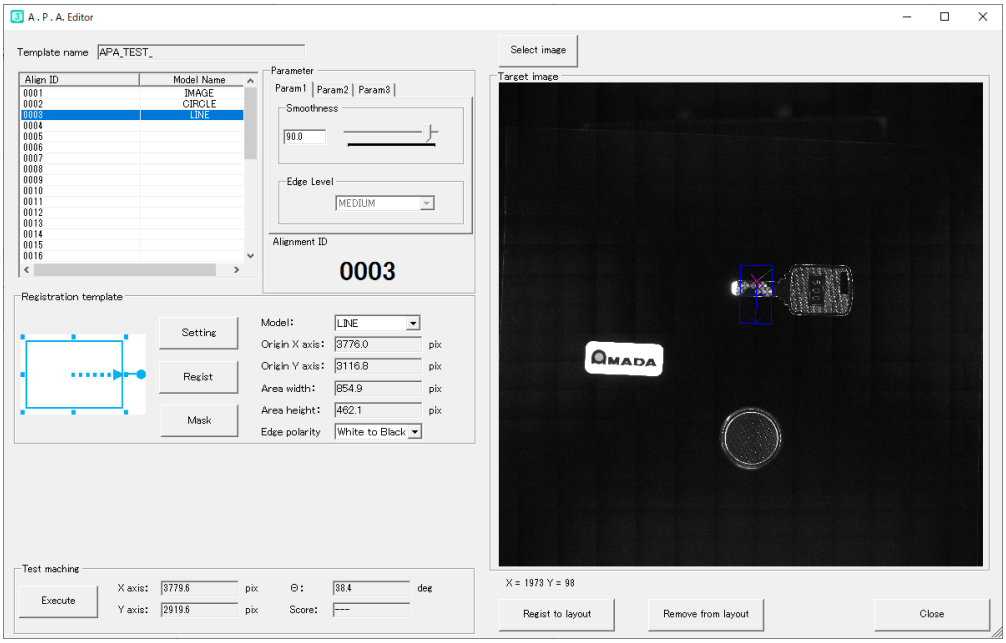
After inputting the radius of the circle, the search range of the reference circle is displayed at the upper left of Target image. Specify the search range, and then

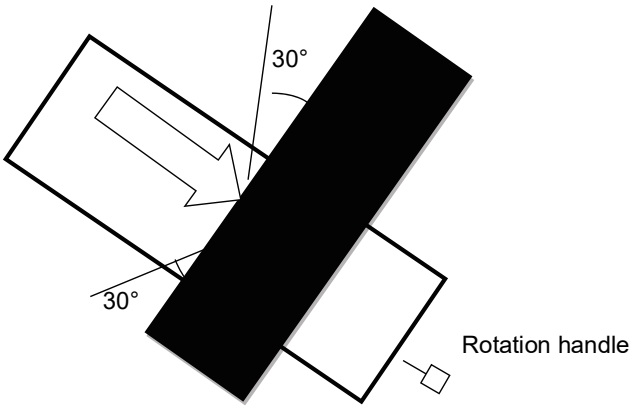
select a search method in Edge polarity under Registration template. After selection, click the [Regist] button to display the radius value to register at area width and area height.



- When LINE is selected

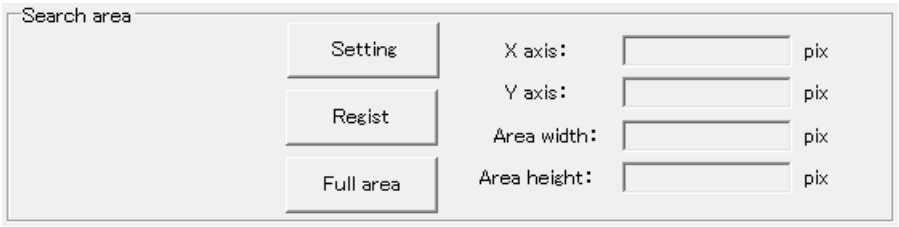
  When the [Setting] button is clicked, the search range of LINE is displayed. Specify the search range as the range where a desired line appears. The angle can be changed by the rotation handle. After specifying the range, select the edge polarity. After selection, when the [Regist] button under Registration template is clicked, positions, area width and area height of the set search area are displayed and registered as the reference position information. Also, the search angle of LINE is ±30 degree.



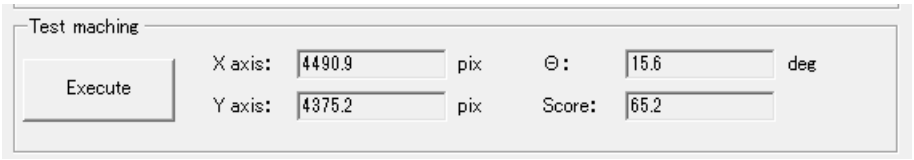


Search angle of LINE

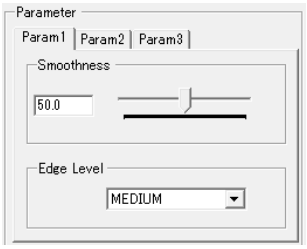
7 When IMAGE is selected for Model, set the search area and register it. Click the [Setting] button to display the area to register as a search area. Specify the area to register with a drag operation. To register the entire Target area, click the [Full area] button. When the area is set and the [Regist] button under Search area is clicked, positions, area width and area height of the set search area are displayed and registered as the search area. When the search area is set, the time used for pattern matching can be reduced. To cancel the area setting, right-click during setting.



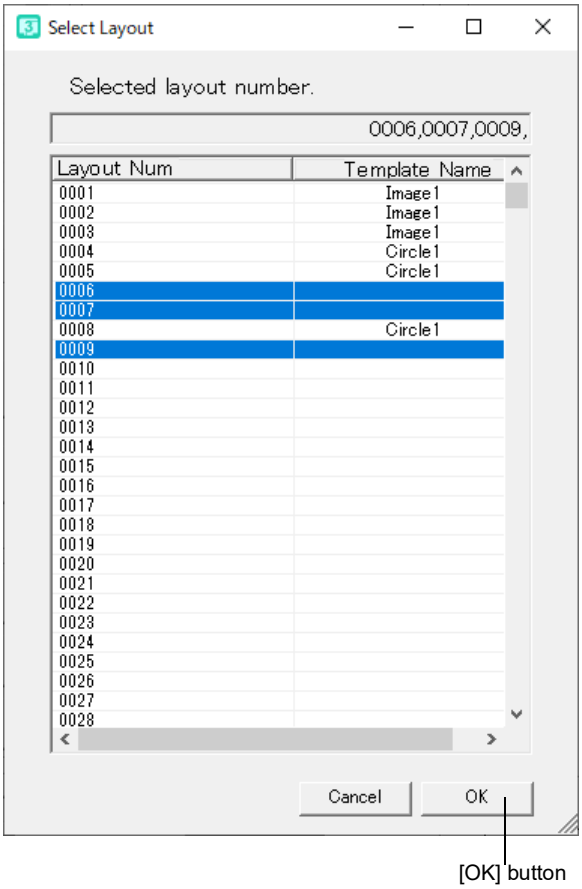
8 Performs test matching. In test matching, you can check that the registered template and search area operate as set. To perform test matching, click the [Execute] button. When pattern matching is successful from the range registered in the search area in Target image, the detection result is displayed in Target image. The detection result is also displayed in the Test matching area. When LINE is selected for Model, Score is not displayed.



9 Performs parameter settings. By operating Smoothness and Score displayed in the Parameter area, noise reduction at the model detection and the threshold of the matching degree with template can be set. When LINE is selected for Model, Score cannot be set.
When changing parameters, click the [Regist] button under Registration template to reflect them to the template information.

CAUTION	When the [Regist] button under Registration template is not clicked, values in Parameter are not reflected in the template. 

10 Associate a template with the layout name. Click the [Regist to layout] button to display a list of the associated layout number and template name.
Select the layout number to associate and click the [OK] button. (To select multiple numbers, click the button while pressing the <Ctrl> key.)



The alignment ID in the associated layout and the specified Align ID in the template are associated. When the Auto position alignment manual (A.P.A. Manual) or the Auto position alignment automatic (A.P.A. Auto) described later is performed, the processing position including pattern matching can be corrected.

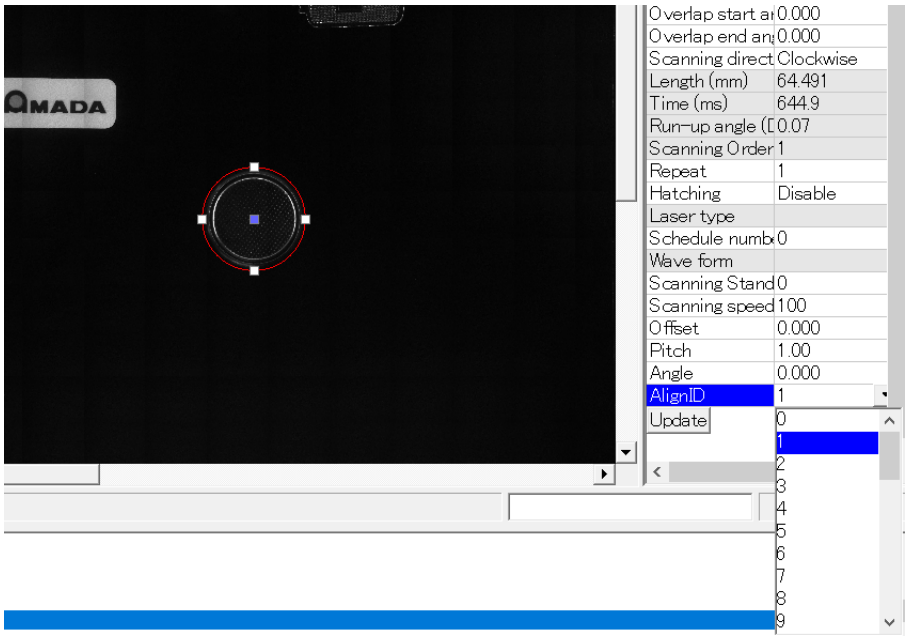
2.7. Performing the Auto Position Alignment Manual (A.P.A. Manual)

Follow these steps to perform the Auto position alignment manual (A.P.A. Manual).

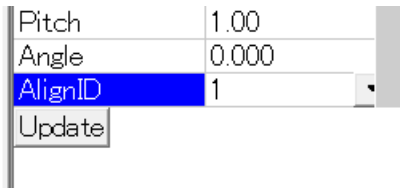
- The Auto position alignment manual (A.P.A. Manual) is available in a laser start state.
- Create a template with the Auto position alignment setting in advance.

For creating a template, see "Chapter 7-2.6. Setting the Auto Position Alignment" (page 134) .

1 Set the Align ID for the object to perform the Auto position alignment. When the object is selected, the combo box to set the Align ID is displayed in the properties.



2 After selecting the Align ID specified in the Auto position alignment setting and clicking the [Update] button, save and transfer the layout by [File / Save (or Save as)] from the menu. Set Align ID to 0 for a figure that you do not want to correct the position by the Auto position alignment.



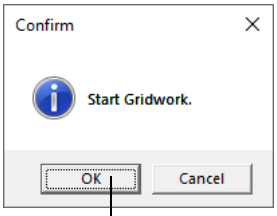
3 Transfer data and reflect the layout data to CL-E100A. Data is transferred to the layout number set when the layout is registered in the Auto position alignment setting.

CAUTION	Note that the position is not corrected to an intended position when the layout is not saved and transferred with the specified Align ID.

4 Click the [Auto position alignment manual (A.P.A. Manual)] button on the toolbar.

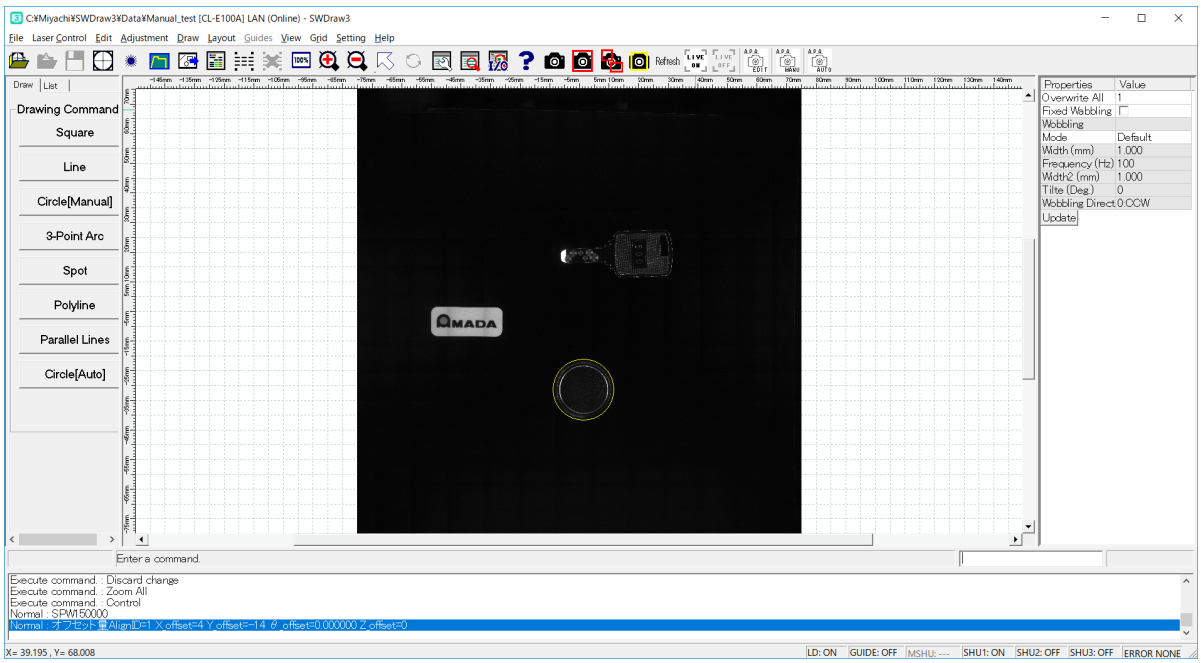
[Auto position alignment manual (A.P.A. Manual)] button

5 The capture image is displayed. When a message confirming that the Gridwork is performed is displayed, select the [OK] button.



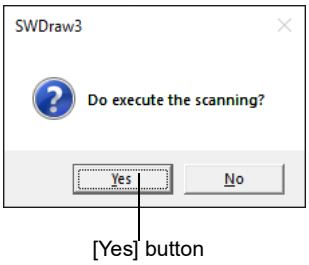
[OK] button

6 When pattern matching is successful in the Auto poisition alignment after performing the Gridwork, the object in layout is moved. When the Auto position alignment setting is wrong or the detection is failed, the object is not moved. When any AlignID in a template fails to pattern matching, execution of subsequent AlignIDs is interrupted.



CAUTION	The pattern matching is applied to all Align IDs in the created template. When multiple patterns are detected in an image that the Gridwork is performed, the result of Align ID not registered in the object in the Drawing screen may be displayed in the operation history of SWDraw3.

7 A message asking whether to perform scanning is displayed. Select the [Yes] button.



CAUTION	Data obtained by the Auto position alignment is not cleared even if the [No] button is selected. When selecting the [No] button, perform scanning or test scanning from the [Control] screen.

8 Scanning is performed at the position specified in the Auto position alignment setting.

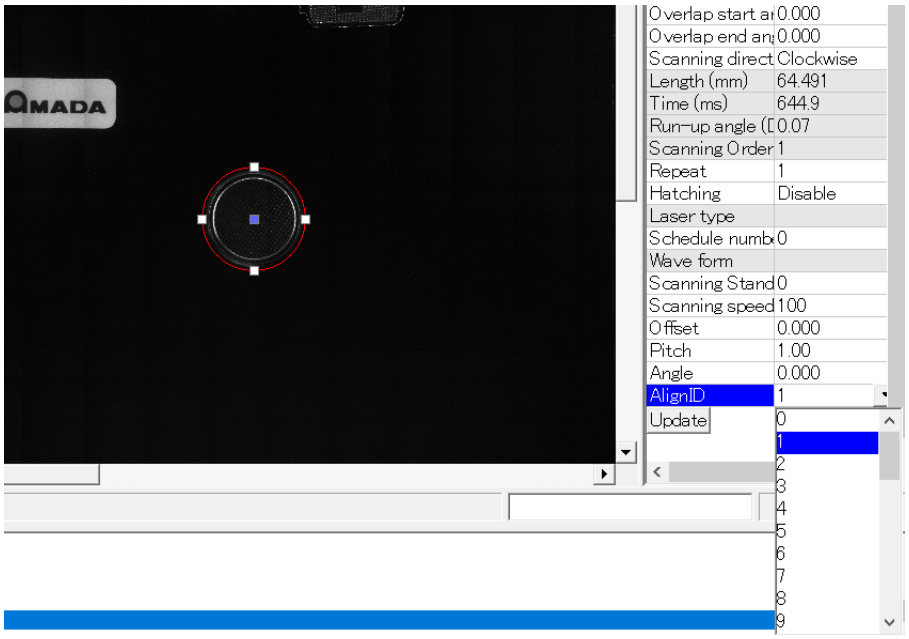
2.8. Performing the Auto Position Alignment Automatic (A.P.A. Auto)

Follow these steps to perform the Auto position alignment automatic (A.P.A. Auto).

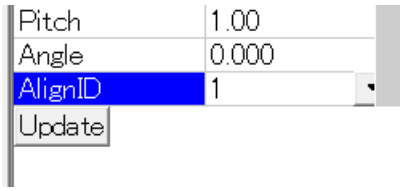
- The Auto position alignment automatic (A.P.A. Auto) is available in a laser start state.
- Create a template with the Auto position alignment in advance.

For creating a template, see "Chapter 7-2.6. Setting the Auto Position Alignment" (page 134) .

1 Set the Align ID for the object to perform the Auto position alignment. When the object is selected, the Align ID can be selected from the properties.



2 Select the Align ID specified in the Auto position alignment setting and clicking the [Update] button, and save and transfer the layout.



3 Transfer data and reflect the layout data to CL-E100A. Data is transferred to the layout number set when the layout is registered in the Auto position alignment setting.

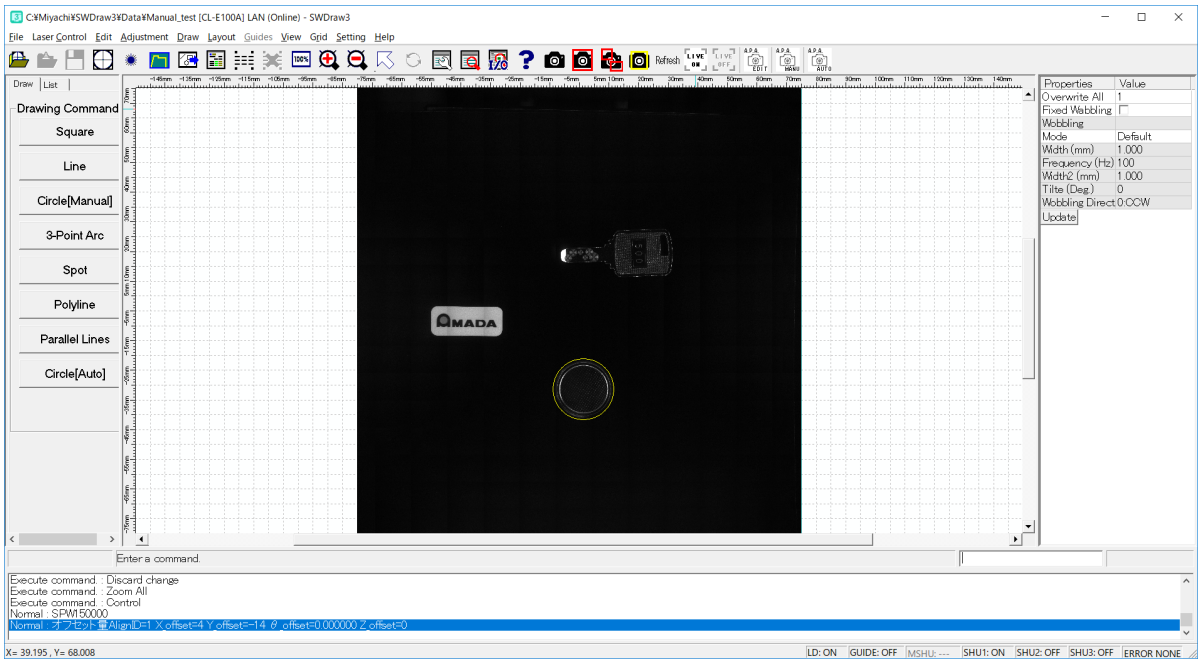
CAUTION	Note that the position is not corrected to an intended position when the layout is not saved and transferred with the specified Align ID.

4 Click the [Auto position alignment automatic (A.P.A. Auto)] button on the toolbar.

[Auto position alignment automatic (A.P.A. Auto)] button

5 A system becomes a waiting state of the scan start signal of the external I/O. When the scan start signal is sent from the external I/O, the Auto position alignment automatic (A.P.A. Auto) is performed after the Gridwork is performed.

6 When pattern matching is successful as a result of the Auto position alignment, the object in layout is moved. When the Auto position alignment setting is wrong or the detection is failed, the object is not moved. When any AlignID in a template fails to pattern matching, execution of subsequent AlignIDs is interrupted.

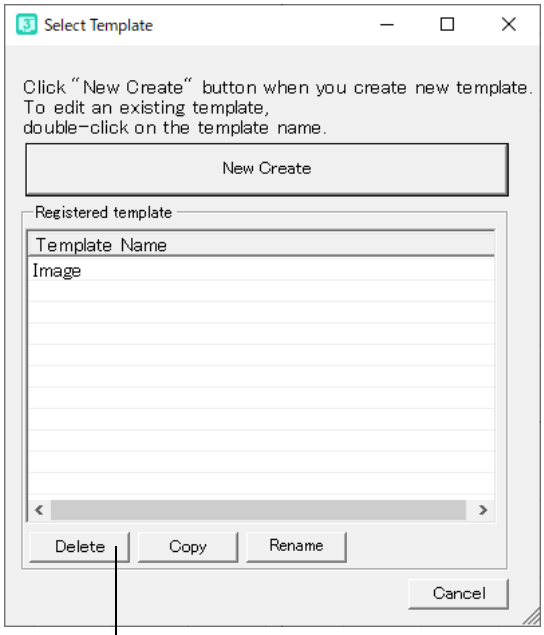


CAUTION	The pattern matching is applied to all Align IDs in the created template. When multiple patterns are detected in an image that the Gridwork is performed, the result of Align ID not registered in the object in the Drawing screen may be displayed in the operation history of SWDraw3.

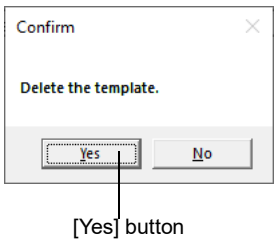
2.9. Deleting the Template in the [Select Template] Screen

Follow these steps to delete the template set on the [A.P.A. Editor] screen.

1 Select the created template on the [Select Template] screen and click the [Delete] button.



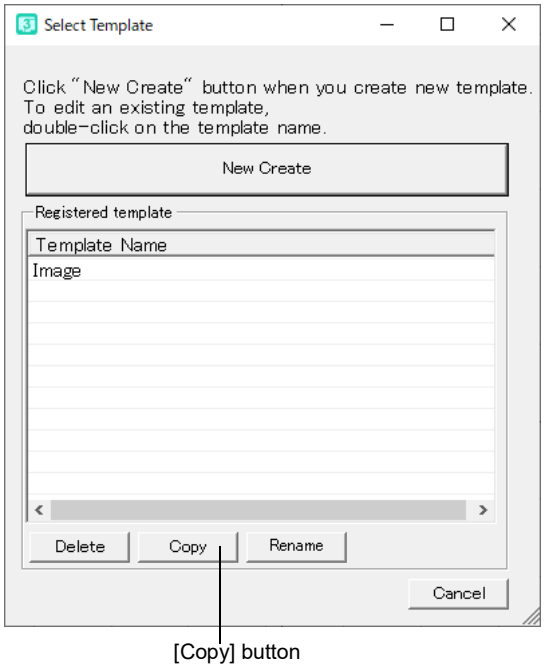
2 A dialog for confirming deletion is displayed. Click the [Yes] button.



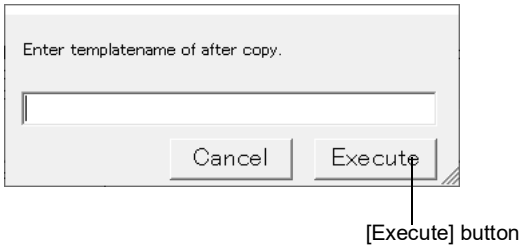
2.10. Copying the Template in the [Select Template] Screen

Follow these steps to copy the template set on the [A.P.A. Editor] screen.

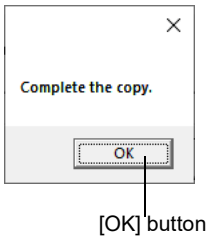
1 Select the created template on the [Select Template] screen and click the [Copy] button.



2 A dialog for copying template is displayed. Enter the template name and click the [Execute] button.



3 A dialog confirming the completion of the copying is displayed. Click the [OK] button.

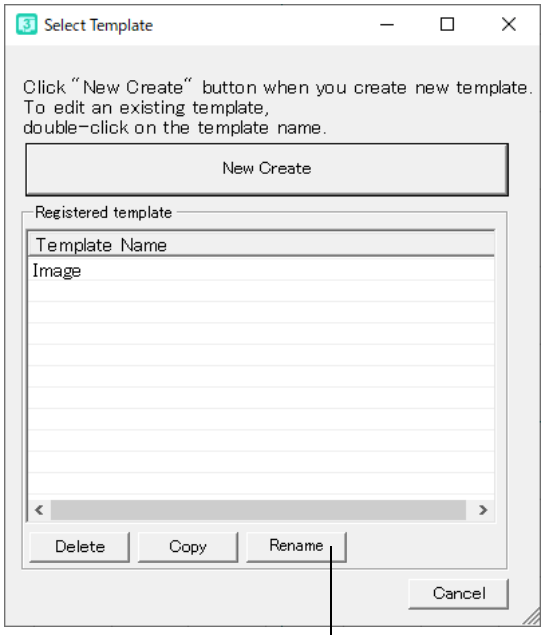


4 The copied template name is displayed in the template list on the [Select Template] screen.

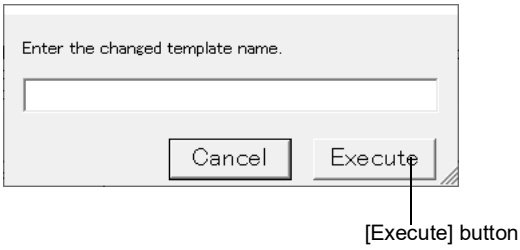
2.11. Renaming the Template in the [Select Template] Screen

Follow these steps to rename the template set on the [A.P.A. Editor] screen.

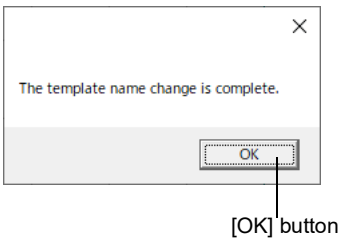
1 Select the created template on the [Select Template] screen and click the [Rename] button.



2 A dialog for renaming template is displayed. Enter the template name and click the [Execute] button.



3 A dialog confirming the completion of the renaming is displayed. Click the [OK] button.



4 The renamed template name is displayed in the template list on the [Select Template] screen.

Chapter 8 Edit

1. Undo (Undoing an Operation)

You can undo unintended actions by selecting [Edit] -> [Undo] from the menu.

CAUTION	Artifacts (unwanted images) from a previous action may remain on the screen after the previous action has been undone. (This does not affect the editing data.) Select [View] -> [Refresh] from the menu to redraw the screen.

2. Redo (Redoing an Operation)

You can also redo actions that you have undone. Select [Edit] -> [Redo] from the menu to redo the action.

3. Delete (Deleting a Figure)

Delete selected figures as follows:

1 From the menu, select [Edit] -> [Delete].

CAUTION	All elements in the bounded area including the object are selected if you marked the area without selecting [Edit] -> [Delete] from the menu. The process can be time-consuming in cases involving complex figures such as imported DXF files. Thus, always select [Delete] from the menu before deleting figures.

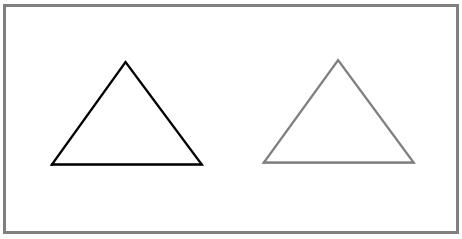
2 Select the object to delete.
Select by specifying the start and end points of the area containing the object.

The selected figure is deleted.

4. Copying Figures

4.1. Copy (Arranging Copied Objects)

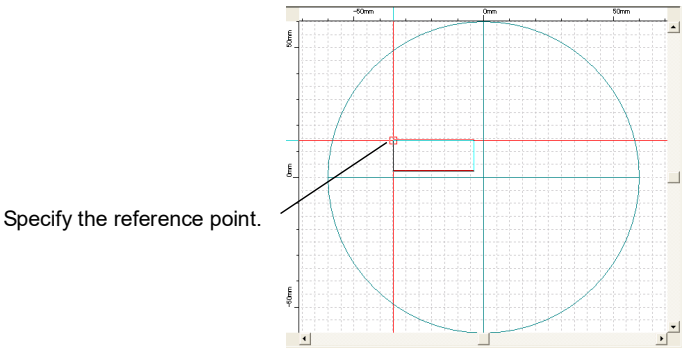
Duplicate created figures as follows:



1 From the menu, select [Edit] -> [Copy].

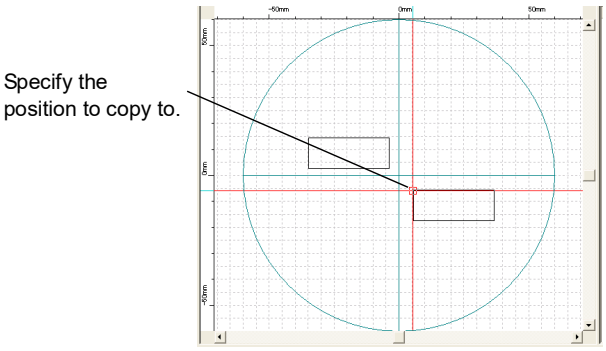
2 Select the object to copy.
Select by specifying the start and end points of the area containing the object.

3 Specify a position as the reference point.



A position relative to the object to be copied and the cursor is specified as the reference point.
Normally, specify the object to be copied as the reference point.

4 Specify the position to copy to.

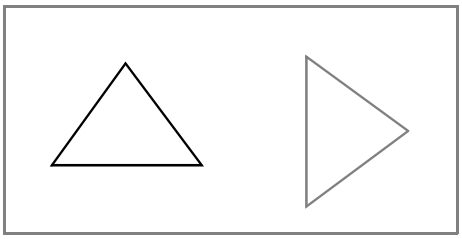


A copy of the figures is produced.

4.2. Copy and Rotate (Arranging Rotated Copies)

Copies of figures can be rotated as follows:

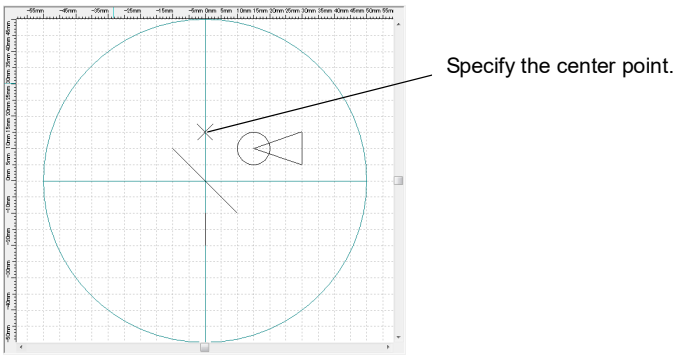
CAUTION	• This function does not handle square objects. • Large figures that fill the layout area cannot be rotated, as they will protrude from the area while being rotated.



1 From the menu, select [Edit] -> [Copy and Rotate].

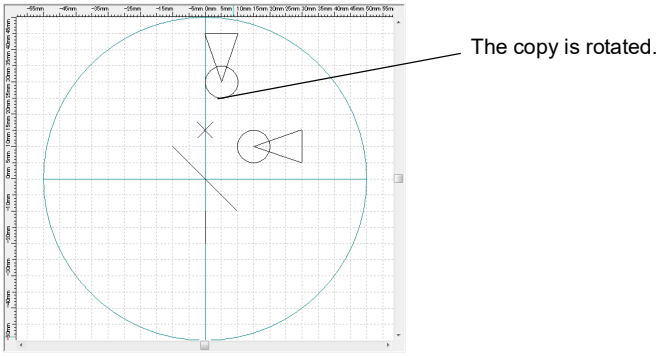
2 Select the object to copy.
Select by specifying the start and end points of the area containing the object.

3 Specify a point as the center of rotation.



4 In the command field, enter the angle of rotation and press the <Enter> key.

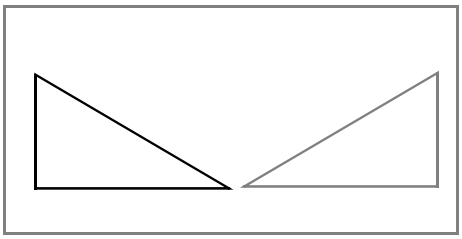
The copied figure is rotated.



4.3. Copy and Invert (Arranging Inverted Copies)

Copies of figures can be inverted as follows:

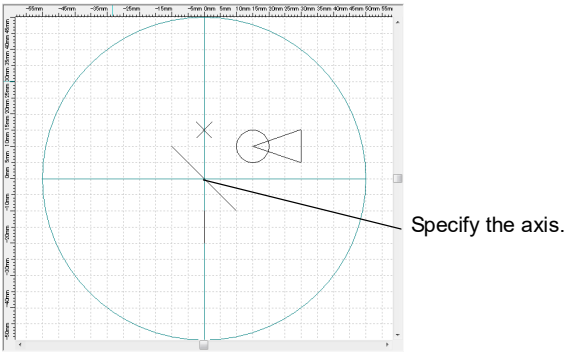
CAUTION	• This function does not handle square objects. • Large figures that fill the layout area cannot be inverted, as they will protrude from the area while being inverted.



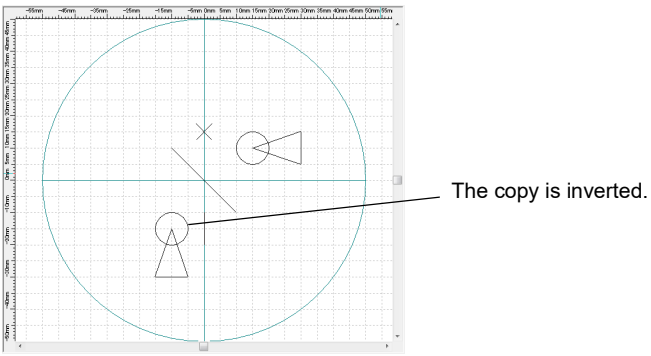
1 From the menu, select [Edit] -> [Copy and Invert].

2 Select the object to copy.
Select by specifying the start and end points of the area containing the object.

3 Specify a line as the axis for inversion.
If you have already arranged a line to serve as this axis, select that line.
If not, specify the axis start and end points.



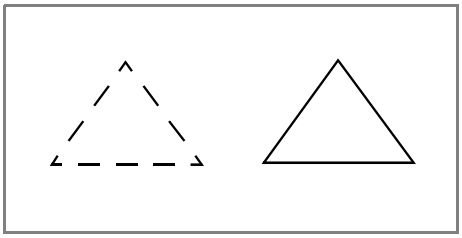
The copied figures are arranged inverted relative to the axis.



5. Moving Figures

5.1. Move (Moving Figures)

Move figures as follows:

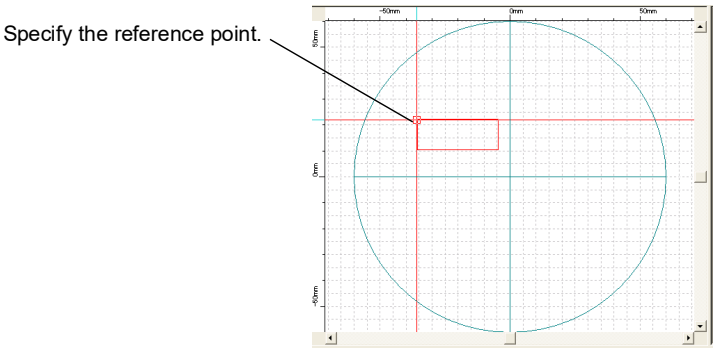


1 From the menu, select [Edit] -> [Move].

CAUTION	All elements in the bounded area including the object are selected if you marked the area without selecting [Edit] -> [Move] from the menu. The process can be time-consuming in cases involving complex figures such as imported DXF files. Thus, always select [Move] from the menu before moving figures.

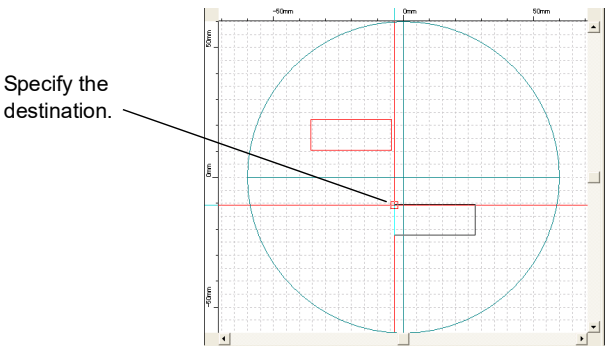
2 Select the object to move.
Select by specifying the start and end points of the area containing the object.

3 Specify a position as the reference point.



A position relative to the object to be moved and the cursor is specified as the reference point.
Normally, specify the object to be moved as the reference point.

4 Specify the destination.

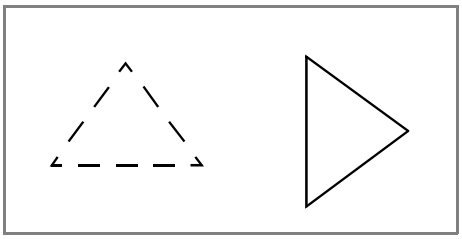


The figure is moved.

5.2. Move and Rotate (Moving and Rotating Figures)

Move and rotate figures as follows:

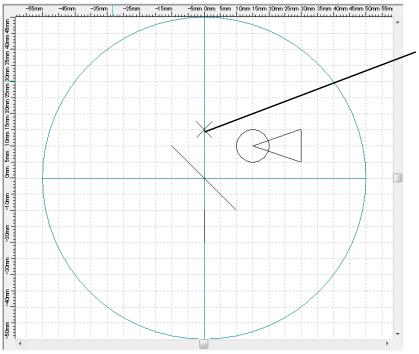
CAUTION	• This function does not handle square objects. • Large figures that fill the layout area cannot be rotated, as they will protrude from the area while being rotated.



1 From the menu, select [Edit] -> [Move and Rotate].

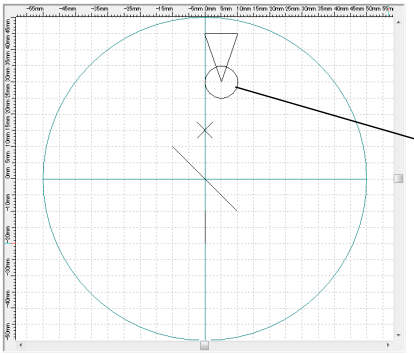
2 Select the object to move.
Select by specifying the start and end points of the area containing the object.

3 Specify a point as the center of rotation.



4 In the command field, enter the angle of rotation and press the <Enter> key.

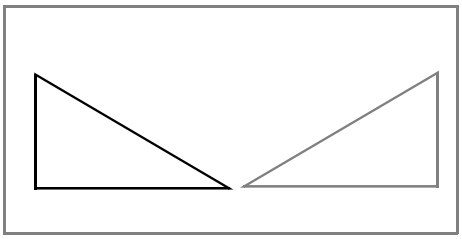
The figures are moved and rotated.



5.3. Move and Invert (Moving and Inverting Figures)

Move and invert figures as follows:

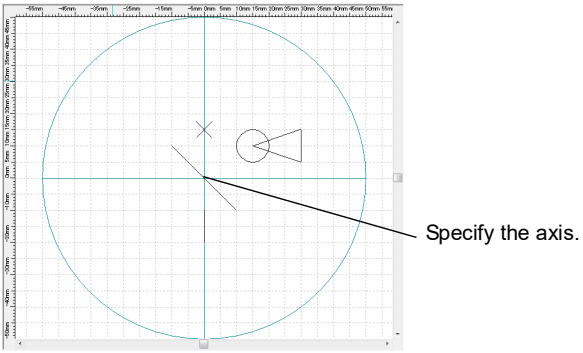
CAUTION	• This function does not handle square objects. • Large figures that fill the layout area cannot be inverted, as they will protrude from the area while being inverted.



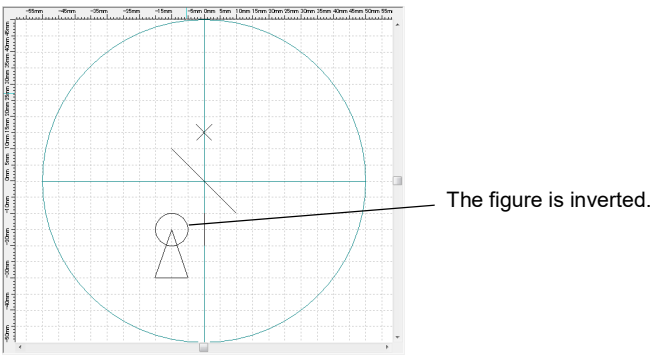
1 From the menu, select [Edit] -> [Move and Invert].

2 Select the object to move.
Select by specifying the start and end points of the area containing the object.

3 Specify a line as the axis for inversion.
If you have already arranged a line to serve as this axis, select that line.
If not, specify the axis start and end points.



The figures are moved inverted relative to the axis.



5.4. Resize Sketch

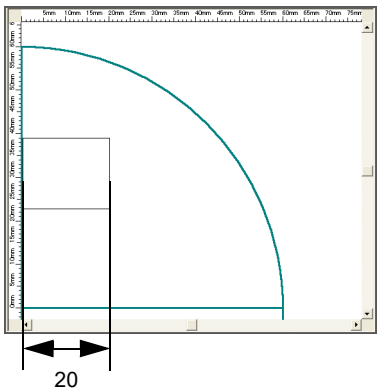
In Sketch Edit mode, follow these steps to enlarge or reduce sketches.

1 From the menu, select [Edit] -> [Resize Sketch].

2 To identify a line as a guideline for resizing, specify two points as desired on the sketch.

3 Enter the new length (for enlarging or reducing) between the two points designated in step 2 in the command field using single-byte numbers.

Enter a larger number for the length of the line selected in step 2 to enlarge the sketch. Enter a smaller number to reduce it.
For example, if the length of the line in step 2 is 20, entering 60 in the command field triples this length, so the area becomes nine times larger.

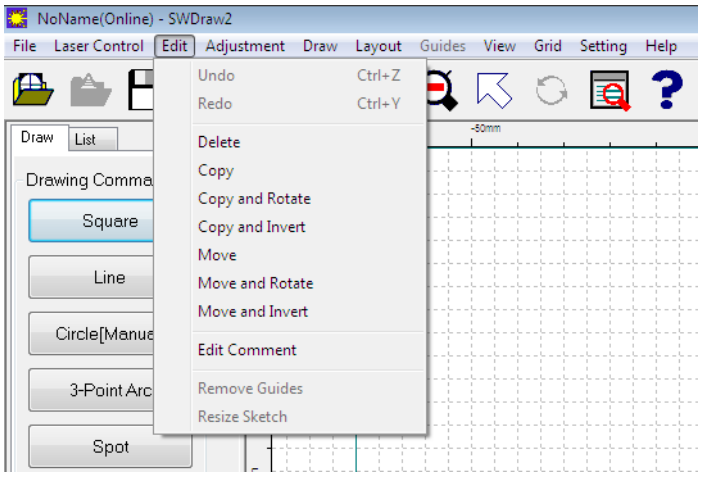


Entering 60 in the command field increases the guideline length to 60 mm.

6. Comment (Editing a Comment)

Edit comments created as follows:

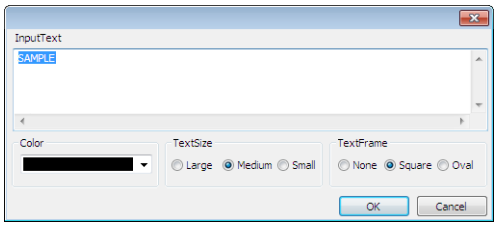
1 From the menu, select [Edit] -> [Edit Comment].



2 Select the comment to edit.

The [Comment] screen is displayed.

3 Make a change and click the [OK] button. To cancel the change, click the [Cancel] button. See "Chapter 11-10. Comment (Entering Comments)" (page 232) .



7. Arranging and Canceling Arrays

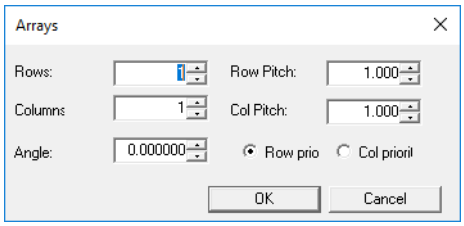
Use this command to copy character figures in the drawing area to create an array as follows:

7.1. Creating Arrays

CAUTION	• After an array is arranged, the figures cannot be edited until the array is canceled. • After an array is created, other figures cannot be arranged in the drawing area. • Processing may take a long time for arrays larger than 50x50.

1 From the menu, select [Edit] -> [Array] -> [Create].

A dialog box is displayed for array settings.



2 Complete the array settings.

Array Settings

Item	Setting Details
Rows *1	Specify the number of rows to arrange vertically.
Columns *1	Specify the number of rows to arrange horizontally.
Row Pitch *2	Specify vertical spacing (in mm).
Col Pitch *2	Specify horizontal spacing (in mm).
Angle	To arrange copies of the original item at an angle, specify the angle (in a range from -179.999 to 180.000).
Row priority/ Col priority	Select whether to use columns or rows as the basis for determining the scanning order.

*1 [Rows] x [Columns] should be 10000 or less.
*2 The maximum value varies depending on the lens.

3 Click the [OK] button.

The array is arranged under these conditions.

Array Properties

Item	Setting Details	Range (Default)	Pitch
Row	Indicates the number counted vertically of the selected array.	—	—
Column	Indicates the number counted horizontally of the selected array.	—	—

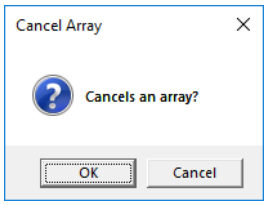
Array Properties

Item	Setting Details	Range (Default)	Pitch
Rows	Indicates the number of rows arranged vertically.	—	—
Columns	Indicates the number of columns arranged horizontally.	—	—
Row Pitch	Indicates vertical spacing (in mm).	—	—
Col Pitch	Indicates horizontal spacing (in mm).	—	—
X Offset	Specify the X coordinate at the reference position (lower-left position) of the selected element (in mm).	Lens dependant	0.001
Y Offset	Specify the Y coordinate at the reference position (lower-left position) of the selected element (in mm).	Lens dependant	0.001
Angle of Rotation	To arrange arrays at an angle, specify the angle.	-179.999 to 180.000	0.001
Delete (Hide/Show)	Indicates whether scanning is performed.	Hide, Show (Show)	—
Scanning Order	Indicates the order of scanning.	1 to 1000	—

7.2. Canceling Arrays

1 From the menu, select [Edit] -> [Array] -> [Cancel].

A confirmation message is displayed.



2 Click the [OK] button.

The array is canceled, and the figure is restored to its original state.

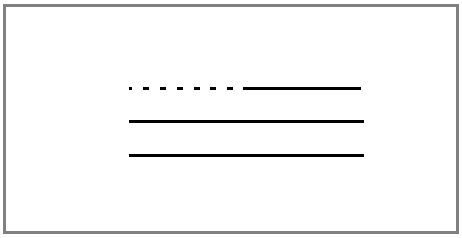
CAUTION	If you attempt to arrange an array again immediately after it was cleared, the dialog box for array settings is displayed with the array parameters still intact. Clicking the [OK] button without changing the values in the dialog box at all will restore the array to the state it was before you cleared it, including offset values for array elements.

Chapter 9 Adjustment

1. Deleting Unneeded Lines

1.1. Trim (Deleting Parts of Lines)

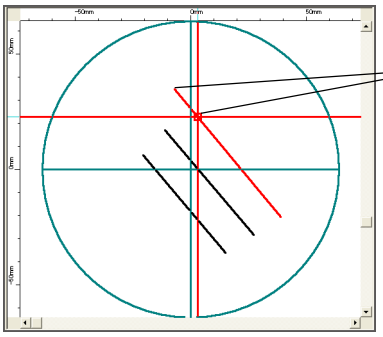
You can reduce or increase parts of lines.



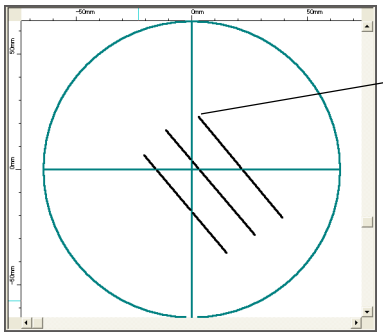
1 From the menu, select [Adjustment] -> [Trim].

2 Select the line to trim.

3 Specify the start and end points on the line for deletion.

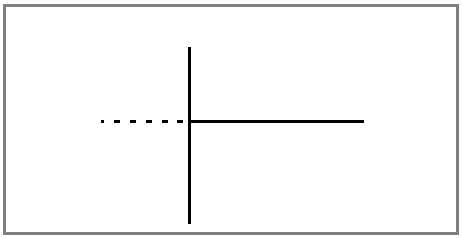


The specified segment is deleted.



1.2. Trim Junction (Deleting Extra Lines from Junctions)

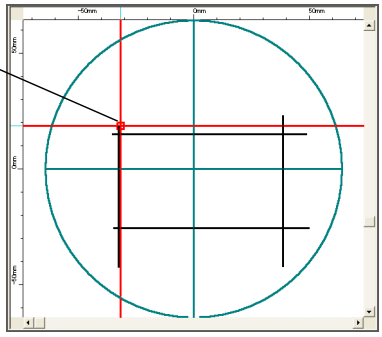
Trim unneeded lines from junctions as follows. You can create attractive corners by deleting all unnecessary lines from these junctions.



1 From the menu, select [Adjustment] -> [Trim Junction].

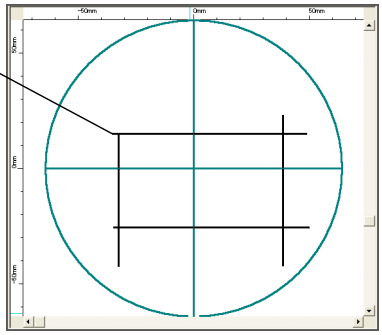
2 Select the line to delete extending from the junction.

Select the line to delete extending from the junction.



The line is deleted all the way to the junction.

The line is deleted up to the junction.



2. Selecting Figures

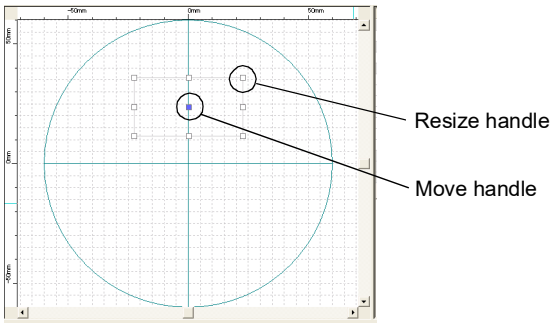
2.1. Selection Mode (Switching to Selection Mode)

Functions in the [Edit] and [Adjustment] menus are normally used to edit the figures you created. The mouse can also be used for rough repositioning and resizing. The following section describes how to edit figures with the mouse after clicking the [Selection Mode] button in the toolbar to switch to Selection mode.

To alter the properties of a figure or move or resize a figure using the mouse, use one of the following methods to switch to Selection mode.

- From the toolbar, click the [Selection Mode] button.
- Click the <Esc> key several times to exit the command.
- From the menu, select [Adjustment] -> [Selection Mode].
- From the right-click menu, select [Selection Mode] with no figure selected.

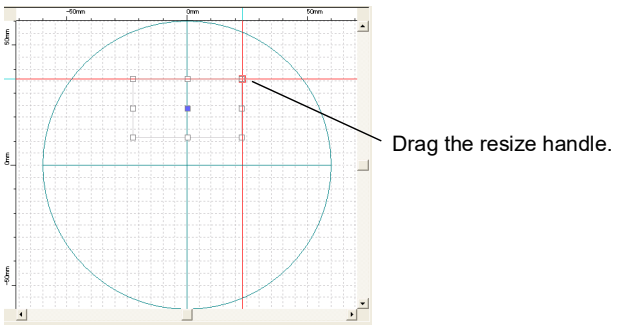
Selecting a figure by clicking on it with the mouse in Selection mode displays a gray or red frame around the figure with a blue move handle and white resize handles. When a polyline is selected alone, however, the [Poly] screen is displayed. For details of the [Poly] screen, refer to "Chapter 11-2.2. [Poly] Screen Arrangement" (page 204) .



To select multiple figures, hold the <Ctrl> key while clicking.

2.1.1. Resizing figures in Selection mode

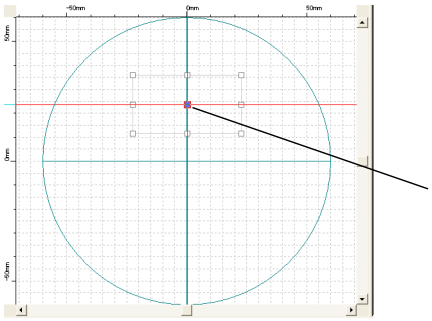
Selecting a figure by clicking on it with the mouse in Selection mode displays a gray or red frame around the figure with resize handles. Figures can be resized as desired by dragging these handles.



Figures can also be resized by changing their properties.

2.1.2. Moving figures in Selection mode

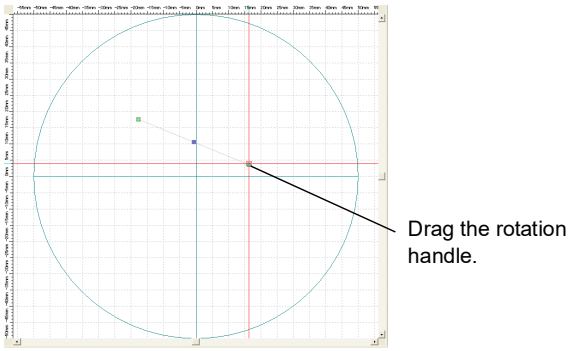
Selecting a figure by clicking on it with the mouse in Selection mode displays a gray or red frame around the figure with a blue move handle in the center. Reposition figures by dragging this handle.



Figures can also be moved using the menu.

2.2. Rotation Mode (Rotating Line Segments in Selection Mode)

In Selection mode, select a line segment using the mouse and click the [Rotation Mode] button on the toolbar or select [Adjustment] -> [Rotation Mode] from the menu to display the rotation handles at the both ends of the line segment. Rotate the line segment as desired by dragging these handles. Also, the center of rotation can be changed by moving the central handle.



3. Changing Figure Properties

3.1. Using Properties

Properties are detailed information on arranged figures.

In Selection Mode, you can display the properties on the Drawing screen in the properties field by clicking on the figures. Modify the values in the properties field to change the shape, welding schedules, and other aspects of the figures.

The following example describes how to change the properties to edit and reposition a spot.

Example Conditions

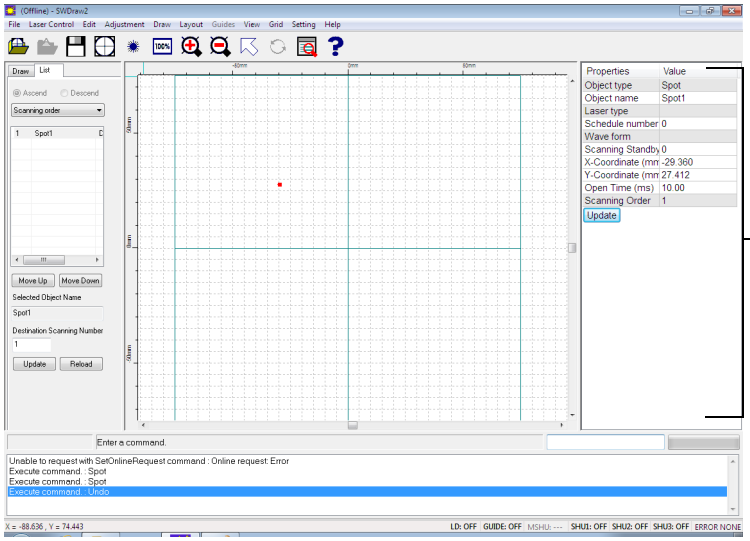
- Change the open time from 10 ms to 5 ms.
- Change the coordinates to the origin (0,0).

1 Click the [Selection Mode] button in the toolbar or press the <ESC> key repeatedly to escape the current command mode.

The screen switches to Selection Mode.

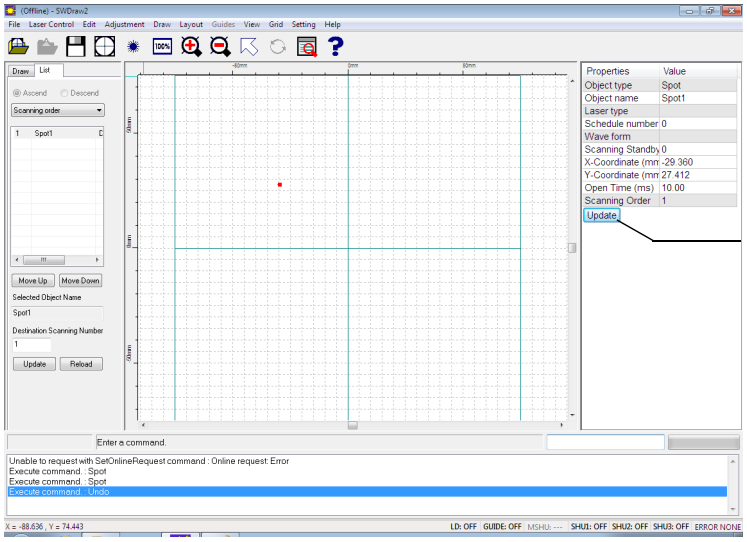
2 Click to select the spot.

3 Change the values for both [X-Coordinate] and [Y-Coordinate] in properties to 0. Change [Open Time] to 5.



4 Click the [Update] button.

The changes to the spot content and position are applied.



Confirm your choices with the [Update] button

CAUTION	If your entry exceeds the properties setting range, the previous values will automatically be restored when you click the [Update] button.

3.2. Properties Items

The following table lists the items in the properties field. The specific items available depend on the particular figure and its shape.

Items displayed in gray rows (such as the object type) cannot be edited.

Properties Setting Items (1 / 9)

Figure type	Item	Setting specifics	Range (Default)	Pitch
Common to all types	Scanning Order	Displays the scanning order.	1-4294967295	1
	Scanning Standby *1	Specifies the time period from the jump to the start point of the laser output to the start of the laser output after the wait time.	0-30000 ms (0 ms)	1 ms
Square	Object type	Displays the type of the figure (object).	SQUARE	—
	Object name (default)	Specifies the name of the figure (object).	SQUAREx	256 characters max.
	Laser type Overlap1	Displays the laser type for Overlap1. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule Overlap1	Displays the number of the schedule data to use for Overlap1. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form Overlap1	Displays the waveform method for Overlap2. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	Laser type Overlap2	Displays the laser type for Overlap2. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule Overlap2	Displays the number of the schedule data to use for Overlap1. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form Overlap2	Displays the waveform method for Overlap2. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	Laser type Line	Displays the laser type for Line. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule Line	Displays the number of the schedule data to use for Line. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form Line	Displays the waveform method for Line. The contents of this item changes depending on the schedule number.	FIX or FLEX	—

Properties Setting Items (2 / 9)

Figure type	Item	Setting specifics	Range (Default)	Pitch
Square (continued)	Laser type Chamfer	Displays the laser type for Chamfer. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule Chamfer	Displays the number of the schedule data to use for Chamfer. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form Chamfer	Displays the waveform method for Chamfer. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	Scanning Speed *2	Specifies the moving speed of the scanner.	1-Lens dependant (100 mm/s)	1 mm/s
	Left-Bottom X	Specifies the X coordinate from the origin.	Lens dependant	0.001 mm
	Left-Bottom Y	Specifies the Y coordinate from the origin.	Lens dependant	0.001 mm
	Width	Specifies the width of side.	Lens dependant	0.001 mm
	Height	Specifies the height of side.	Lens dependant	0.001 mm
	Scan Start	Specifies the scanning start point among four corners.	Left-Top, Left-Bottom, Right-Top or Right-Bottom (Drawing data dependant)	—
	Scanning Direction	Specifies the scanning direction.	Clockwise or Counterclockwise (Drawing data dependant)	—
	Chamfer Type	Specifies the chamfer type.	None, Chamfer or Radius (None)	—
	Chamfer Size	Specifies the chamfer dimension.	Drawing data dependant (0.000 mm)	0.001 mm
	Overlap Length	Specifies the length of overlap portion.	Drawing data dependant (0.000 mm)	0.000 mm
	Length	Displays the total of the perimeter of the figure (object) and the overlap length.	—	0.001 mm
	Time	Calculates the approximate scanning time by Length, Scanning Speed.	—	0.1 ms
	Repeat	Repeatedly scans the figure (object) by the specified times.	1-5000 (1)	1
	Hatching	Specifies whether or not to set hatching.	Enable or Disable (Disable)	—

Properties Setting Items (3 / 9)

Figure type	Item	Setting specifics	Range (Default)	Pitch
Square (continued)	Laser type Hatching	Displays the laser type for Hatching. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule Hatching	Displays the number of the schedule data to use for Hatching. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form Hatching	Displays the waveform method for Hatching. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	Offset	Specifies the distance between outer figure and the hatching range.	0.000-max. Y coordinate value of drawing range (0.000)	0.001
	Pitch	Specifies the interval of hatching lines.	0.01-max. Y coordinate value of drawing range (1.00)	0.01
	Angle	Specifies the hatching angle. This is an absolute angle regardless of the outer figure.	0.000-360.000 (0.000)	0.001
Line	Object type	Displays the type of the figure (object).	LINE	—
	Object name (default)	Specifies the name of the figure (object).	LINEx	256 characters max.
	Laser type	Displays the laser type. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule	Displays the number of the schedule data to use. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form	Displays the waveform method. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	Scanning Speed *2	Specifies the moving speed of the scanner.	1-Lens dependant (100 mm/s)	1 mm/s
	Starting X-Coord / X-Coordinate	Specifies the X coordinate for the start point.	Lens dependant	0.001 mm
	Starting Y-Coord / Y-Coordinate	Specifies the Y coordinate for the start point.	Lens dependant	0.001 mm
	Ending X-Coord	Specifies the X coordinate for the end point.	Lens dependant	0.001 mm
	Ending Y-Coord	Specifies the Y coordinate for the end point.	Lens dependant	0.001 mm

Properties Setting Items (4 / 9)

Figure type	Item	Setting specifics	Range (Default)	Pitch
Line (continued)	Length	Displays the length of the figure (object).	Lens dependant	0.001 mm
	Time	Calculates the approximate scanning time by Length, Scanning Speed.	—	0.1 ms
Circle (Auto)	Object type	Displays the type of the figure (object).	Auto_CIRCLE	—
	Object name (default)	Specifies the name of the figure (object).	CIRCLEx	256 characters max.
	Laser type	Displays the laser type. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule	Displays the number of the schedule data to use. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form	Displays the waveform method. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	Scanning Speed *2	Specifies the moving speed of the scanner.	1-Lens dependant (100 mm/s)	1 mm/s
	Central X-Coord	Specifies the X coordinate at the center.	Lens dependant	0.001 mm
	Central Y-Coord	Specifies the Y coordinate at the center.	Lens dependant	0.001 mm
	Radius	Specifies the radius of the circle.	Lens dependant (20 mm)	0.001 mm
	Angle	Specifies the angle formed by the start point and at the center of the circle.	0-360° (0°)	0.001°
	Scanning Direction	Specifies the scanning direction.	Clockwise or Counterclockwise (Drawing data dependant)	—
	Length	Displays the perimeter for the figure (object).	—	0.001 mm
	Time	Calculates the approximate scanning time by Length, Scanning Speed.	—	0.1 ms
	Run-up angle	Calculates and displays the run-up angle by shutter open delay time and Scanning Speed.	—	0.01°
	Repeat	Repeatedly scans the figure (object) by the specified times.	1-5000 (1)	1
	Hatching	Specifies whether or not to set hatching.	Enable or Disable (Disable)	—
	Laser type Hatching	Displays the laser type for Hatching. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—

Properties Setting Items (5 / 9)

Figure type	Item	Setting specifics	Range (Default)	Pitch
Circle (Auto) (continued)	Schedule Hatching	Displays the number of the schedule data to use for Hatching. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form Hatching	Displays the waveform method for Hatching. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	Offset	Specifies the distance between outer figure and the hatching range.	0.000-max. Y coordinate value of drawing range (0.000)	0.001
	Pitch	Specifies the interval of hatching lines.	0.01-max. Y coordinate value of drawing range (1.00)	0.01
	Angle	Specifies the hatching angle. This is an absolute angle regardless of the outer figure.	0.000-360.000 (0.000)	0.001
Circle (Manual)	Object type	Displays the type of the figure (object).	CIRCLE	—
	Object name (default)	Specifies the name of the figure (object).	CIRCLEx	256 characters max.
	Laser type Overlap1	Displays the laser type for Overlap1. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule Overlap1	Displays the number of the schedule data to use for Overlap1. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form Overlap1	Displays the waveform method for Overlap2. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	Laser type Overlap2	Displays the laser type for Overlap2. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule Overlap2	Displays the number of the schedule data to use for Overlap1. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form Overlap2	Displays the waveform method for Overlap2. The contents of this item changes depending on the schedule number.	FIX or FLEX	—

Properties Setting Items (6 / 9)

Figure type	Item	Setting specifics	Range (Default)	Pitch
Circle (Manual) (continued)	Laser type Circle	Displays the laser type for Circle. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule Circle	Displays the number of the schedule data to use for Circle. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form Circle	Displays the waveform method for Circle. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	Scanning Speed *2	Specifies the moving speed of the scanner.	1-Lens dependant (100 mm/s)	1 mm/s
	Central X-Coord	Specifies the X coordinate at the center.	Lens dependant	0.001 mm
	Central Y-Coord	Specifies the Y coordinate at the center.	Lens dependant	0.001 mm
	Radius	Specifies the radius of the circle.	Lens dependant (20 mm)	0.001 mm
	Overlap Start Angle	Specifies the start angle of overlap.	0-360° (0°)	0.001°
	Overlap End Angle	Specifies the end angle of overlap	0-360° (0°)	0.001°
	Scanning Direction	Specifies the scanning direction.	Clockwise or Counterclockwise (Drawing data dependant)	—
	Length	Displays the perimeter for the figure (object).	—	0.001 mm
	Time	Calculates the approximate scanning time by Length, Scanning Speed.	—	0.1 ms
	Run-up angle	Calculates and displays the run-up angle by shutter open delay time and Scanning Speed.	—	0.01°
	Repeat	Repeatedly scans the figure (object) by the specified times.	1-5000 (1)	1
	Hatching	Specifies whether or not to set hatching.	Enable or Disable (Disable)	—
	Laser type Hatching	Displays the laser type for Hatching. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule Hatching	Displays the number of the schedule data to use for Hatching. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form Hatching	Displays the waveform method for Hatching. The contents of this item changes depending on the schedule number.	FIX or FLEX	—

Properties Setting Items (7 / 9)

Figure type	Item	Setting specifics	Range (Default)	Pitch
Circle (Manual) (continued)	Offset	Specifies the distance between outer figure and the hatching range.	0.000-max. Y coordinate value of drawing range (0.000)	0.001
	Pitch	Specifies the interval of hatching lines.	0.01-max. Y coordinate value of drawing range (1.00)	0.01
	Angle	Specifies the hatching angle. This is an absolute angle regardless of the outer figure.	0.000-360.000 (0.000)	0.001
Arc/3-Point Arc	Object type	Displays the type of the figure (object).	ARC	—
	Object name (default)	Specifies the name of the figure (object).	ARCx	256 characters max.
	Laser type	Displays the laser type. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule	Displays the number of the schedule data to use. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form	Displays the waveform method. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	Scanning Speed *2	Specifies the moving speed of the scanner.	1-Lens dependant (100 mm/s)	1 mm/s
	Central X-Coord	Specifies the X coordinate at the center.	Lens dependant	0.001 mm
	Central Y-Coord	Specifies the Y coordinate at the center.	Lens dependant	0.001 mm
	Radius	Specifies the radius of the circle.	Lens dependant (20 mm)	0.001 mm
	Angle	Specifies the angle formed by the start point and at the center of the circle.	0-360° (0°)	0.001°
	End Angle	Specifies the angle formed by the end point and at the center of the circle.	0-360° (0°)	0.001°
	Scanning Direction	Specifies the scanning direction.	Clockwise or Counterclockwise (Drawing data dependant)	—
	Length	Displays the length of the figure (object). Displays the perimeter for square and circle.	—	0.001 mm
	Time	Calculates the approximate scanning time by Length, Scanning Speed.	—	0.1 ms
Spot	Object type	Displays the type of the figure (object).	SPOT	—

Properties Setting Items (8 / 9)

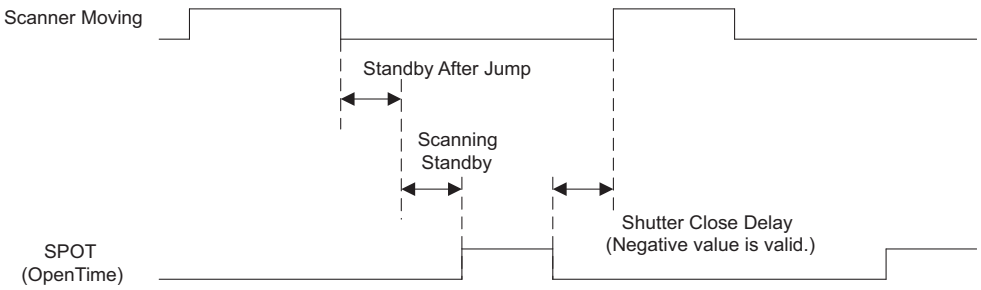
Figure type	Item	Setting specifics	Range (Default)	Pitch
Spot (continued)	Object name (default)	Specifies the name of the figure (object).	SPOTx	256 characters max.
	Laser type	Displays the laser type. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule	Displays the number of the schedule data to use. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form	Displays the waveform method. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	X-Coord / X-Coordinate	Specifies the X coordinate.	Lens dependant	0.001 mm
	Y-Coord / Y-Coordinate	Specifies the Y coordinate.	Lens dependant	0.001 mm
	Open Time	Specifies the time to emit the laser. Pulse with of the schedule to use + 2 ms.	0-20000000 ms (10 ms)	0.01 ms
Polyline	Object type	Displays the type of the figure (object).	POLY	—
	Object name (default)	Specifies the name of the figure (object).	POLYx	256 characters max.
	Laser type	Displays the laser type. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule	Displays the number of the schedule data to use. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form	Displays the waveform method. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	Repeat	Repeatedly scans the figure (object) by the specified times.	1-5000 (1)	1
Axis Control	Object type	Displays the type of the figure (object).	AXIS	—
	Object name (default)	Specifies the name of the figure (object).	AXISx	256 characters max.
	Laser type	Displays the laser type. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—

Properties Setting Items (9 / 9)

Figure type	Item	Setting specifics	Range (Default)	Pitch
Axis Control (continued)	Schedule	Displays the number of the schedule data to use. Double-clicking this item displays the [Schedule Window] screen in 5.3. according to the set schedule number.	0-Depends on laser equipment (0)	1
	Wave form	Displays the waveform method. The contents of this item changes depending on the schedule number.	FIX or FLEX	—
	Axis Move	Specifies whether or not to move the coordinates.	Yes or No (No)	—
	X-Coord / X-Coordinate	Specifies the X coordinate of destination.	Lens dependant	0.001 mm
	Y-Coord / Y-Coordinate	Specifies the Y coordinate of destination.	Lens dependant	0.001 mm

*1 Scanning Standby

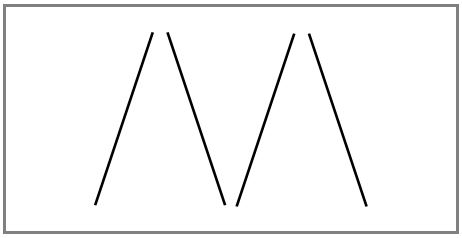
If the OVERRATE error occurs when SPOTs are used, specify [Scanning Standby] in the properties field or [Shutter Close Delay] on the [System Parameters] screen and insert a wait time between SPOTs.



*2 A setting effect may not be obtained depending on the object shape in the layout.

4. Poly Resolve (Splitting Figures)

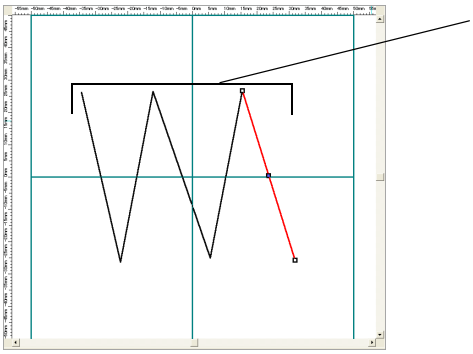
Polylines created can be split at their construction points into line segments or arcs. Only polylines can be split.



1 From the menu, select [Adjustment] -> [Poly Resolve].

2 Select the figure to split.

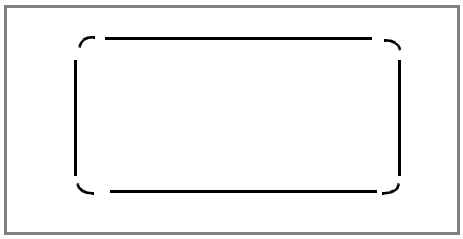
The figure is split into multiple line segments or arcs. Polylines are split at each construction point.



CAUTION	Even if the Repeat has been set, it becomes invalid line when the figure is split. The original figure is split into line segments or arcs.

5. Square Resolve (Splitting Squares)

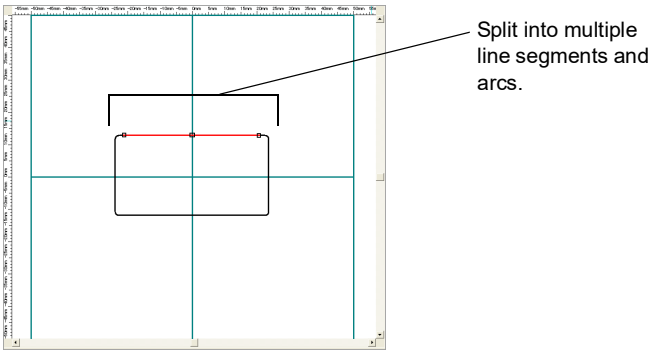
Squares created can be split into line segments and arcs.



1 From the menu, select [Adjustment] -> [Square Resolve].

2 Select the square to split.

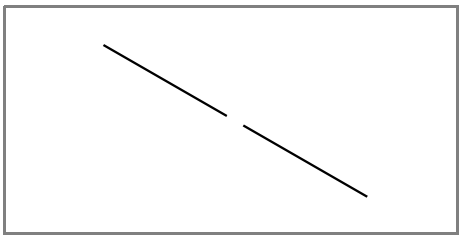
The square is split into multiple line segments. When the square is created with chamfer or radius specified, it is split into multiple line segments and arcs.



CAUTION	• When hatching is applied to the square, a message is displayed to confirm whether you convert hatching into polylines or delete hatching. • Even if the Repeat has been set, it becomes invalid line when the figure is split. The original figure is split into line segments or arcs.

6. Divide (Dividing Figures)

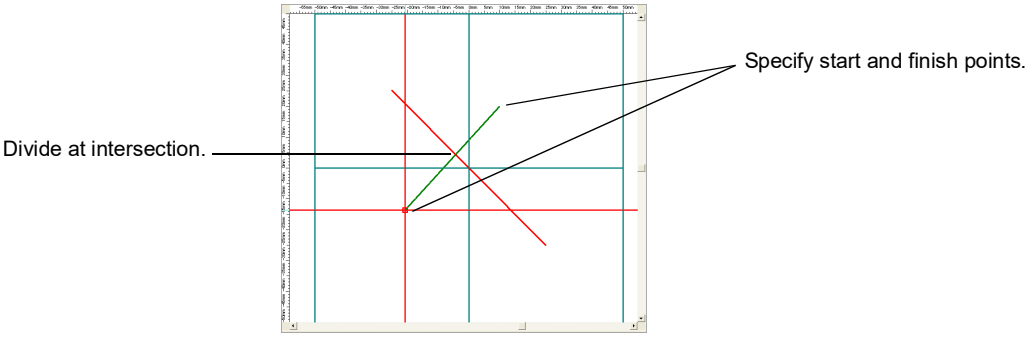
Figures created can be divided at any point. Only line segments and arcs can be divided.



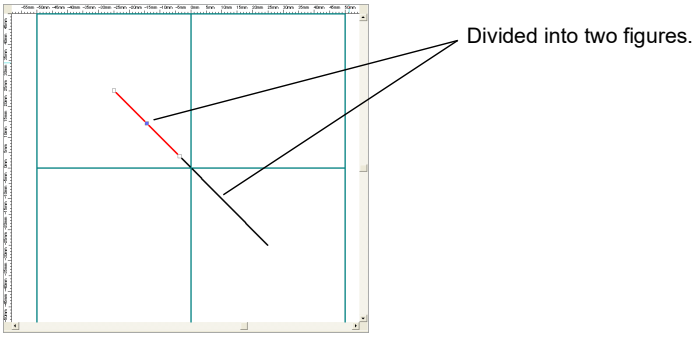
1 From the menu, select [Adjustment] -> [Divide].

2 Select the figure to divide.

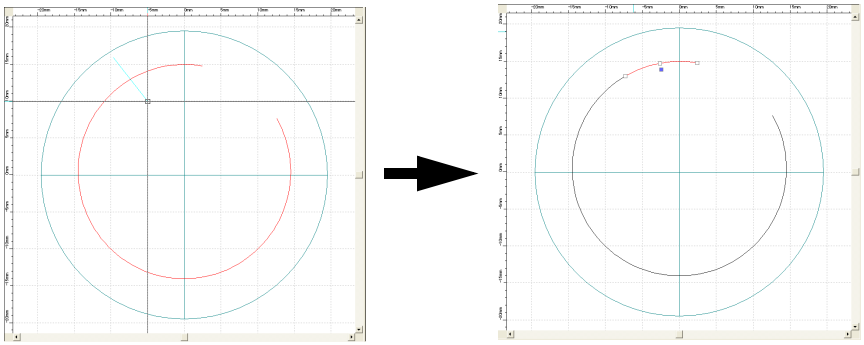
3 Specify the start and finish points for the divide. The figure is divided at the intersection with the line specified by the start and finish points.



The figure is divided into two separate figures.

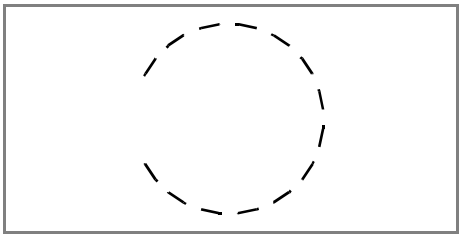


- Dividing an arc



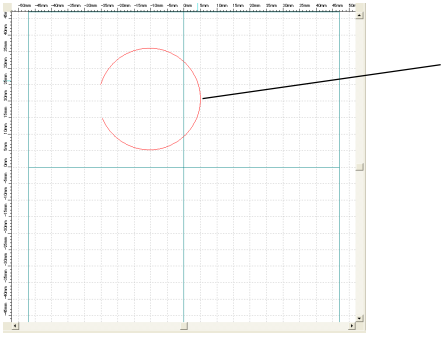
7. Arc to Poly

Arcs created can be divided into the desired number of polylines.



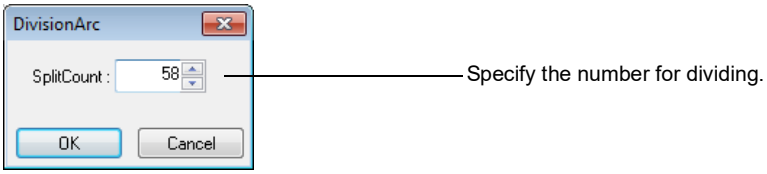
1 From the menu, select [Adjustment] -> [Arc to Poly].

2 Select the figure to divide.

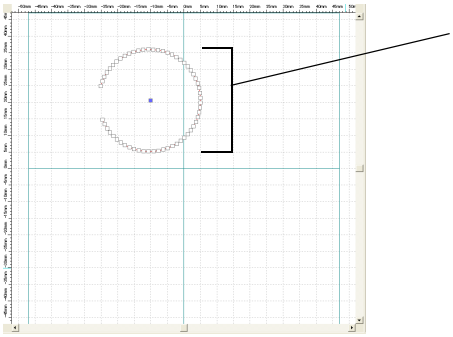


The [DivisionArc] screen is displayed.

3 Specify the number for dividing.

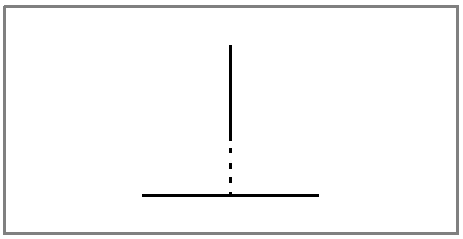


The arc is divided into the specified number of polylines.



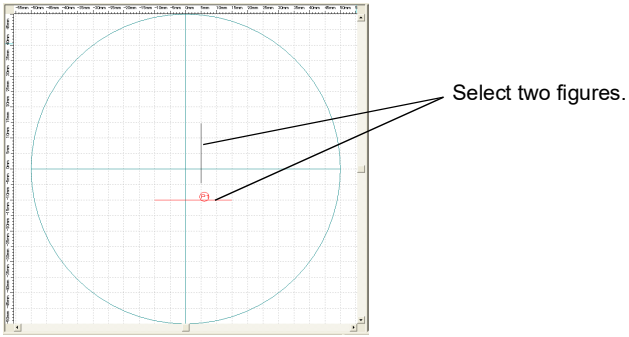
8. Unite (Joining Two Figures into One)

Two line segments or arcs can be joined into one. Line segments and arcs can be joined with other line segments and arcs. Only line segments and arcs can be joined.

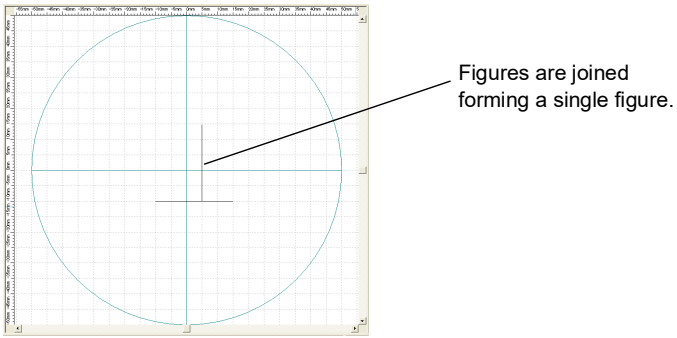


1 From the menu, select [Adjustment] -> [Unite].

2 Select the two figures to join and specify the join point (P1).



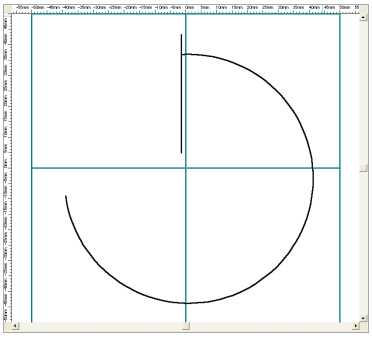
The two figures are joined forming a single figure.



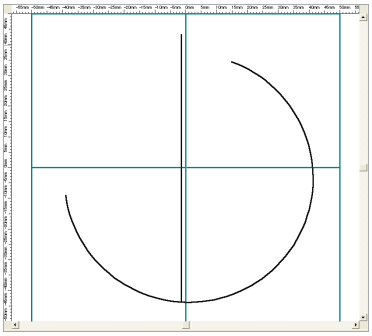
CAUTION	• The specified figures cannot be joined if they are not convergent. • Even if they are convergent, figures cannot be joined if the length of the extended line exceeds the maximum value. The length of the extended line can be set in [Setting] -> [Preferences] -> [Other] -> [Max. Combined] in the menu.

The join point (P1/P2) can be selected when joining a line segment with an arc.

- When joining at P1



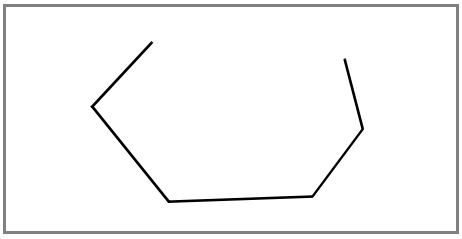
- When joining at P2



CAUTION	The figure cannot be joined if the length to the join point (P1/P2) exceeds the maximum value. The length to the join point can be set in [Setting] -> [Preferences] -> [Other] -> [Max. Combined] in the menu.

9. Unite Poly

Lines, polylines and arcs created can be joined into one automatically or manually.

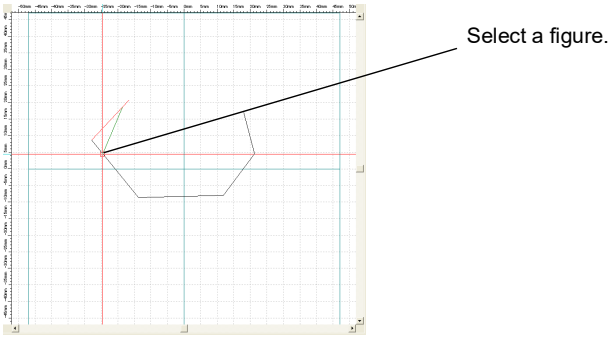


9.1. Auto (Joining Lines into One Automatically)

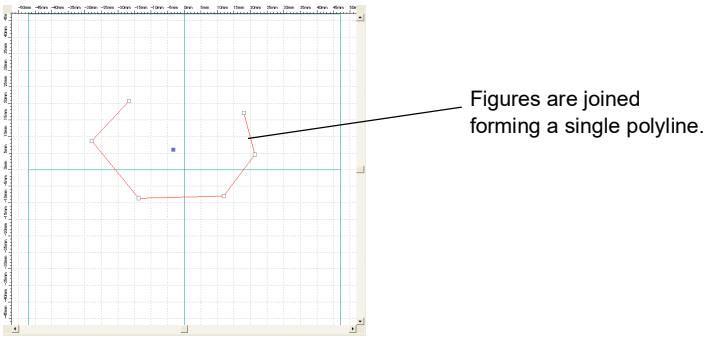
1 From the menu, select [Adjustment] -> [Unite Poly] -> [Auto].

2 Select a figure.

3 Select a figure to join it with the figure selected in step 2.



The two or more figures are joined forming a single polyline.

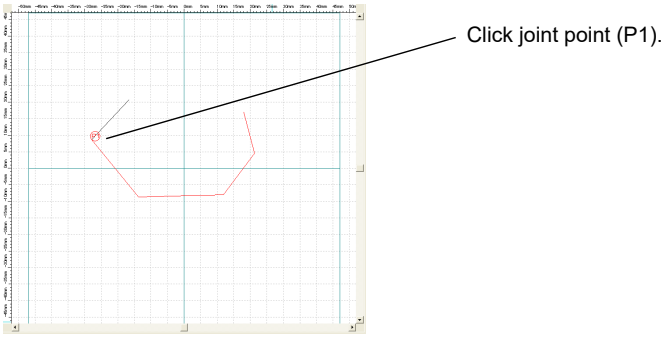


9.2. Manual (Joining Lines into One Manually)

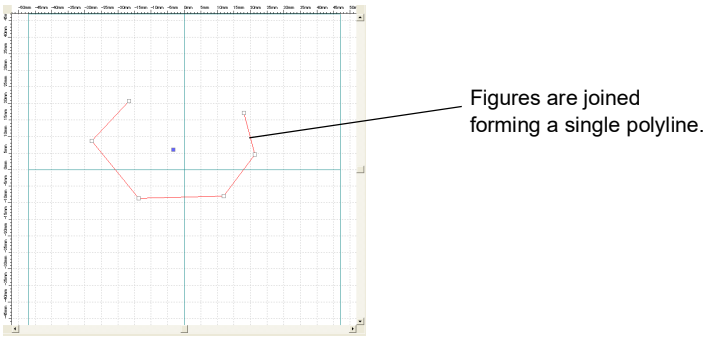
1 From the menu, select [Adjustment] -> [Unite Poly] -> [Manual].

2 Select a figure.

3 Select a figure to join it with the figure selected in step 2 and click the join point (P1).



The two or more figures are joined forming a single polyline.

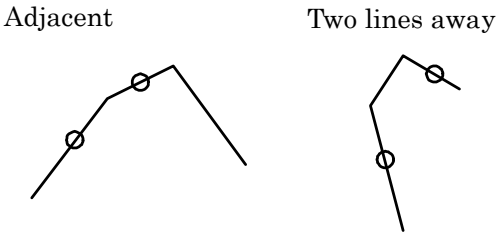


CAUTION	Make sure that there is no small line segment between arc and line. If it is difficult to unite them, select [Adjustment] -> [Arc to Poly] from the menu to divide arcs into polylines.

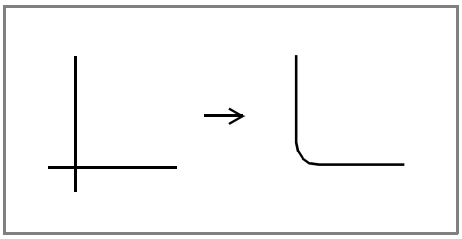
10. Fillet

Corners created with two line segments or two elements of polyline can be rounded off in the specified radius.

"Two elements" means:

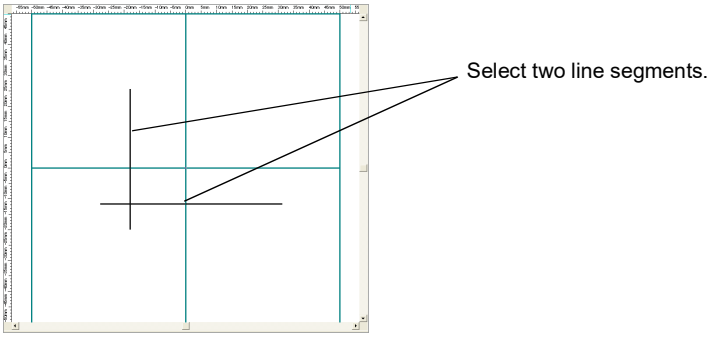


* For polyline, a fillet can be canceled by specifying radius 0 or negative element.



1 From the menu, select [Adjustment] -> [Fillet].

2 Select the two line segments to be filleted.

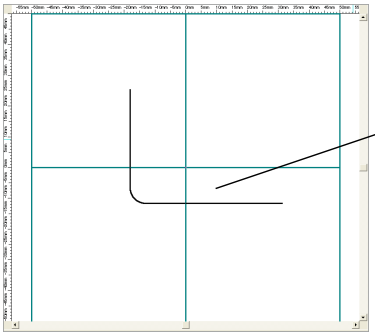


3 Enter the connecting arc radius in the command field.

CAUTION	An arc radius larger than the distance from the intersection to the ends of the lines cannot be entered.

4 Press the <Enter> key.

The two line segments are connected with an arc.

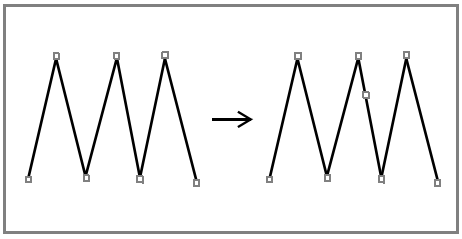


The last specified arc radius will be used if the <Enter> key is pressed without specifying the arc radius. The default value can be set in [Setting] -> [Preferences] -> [Other] -> [Radius of Fillet] in the menu.

To undo the operation, select [Edit] -> [Undo] from the menu, change the arc radius, and then select [Adjustment] -> [Fillet] again.

11. Add Const. Pt

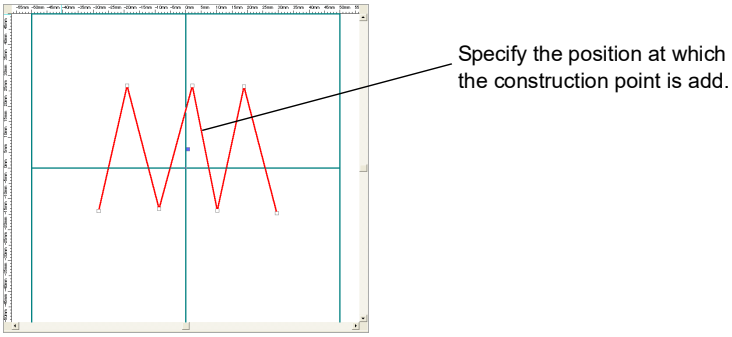
Construction points can be added to line segments or polylines created.



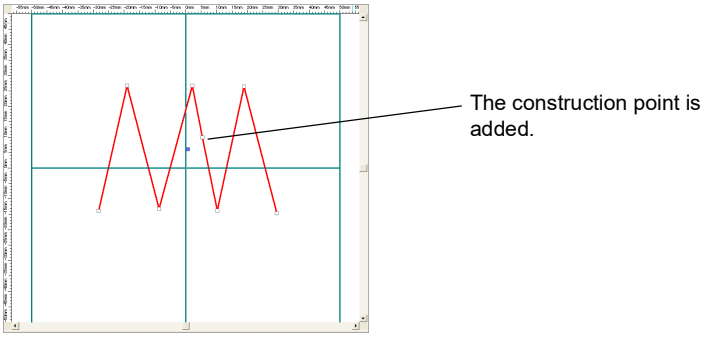
1 From the menu, select [Adjustment] -> [Add Const. Pt].

2 Select the line segment or polyline to be added the construction point to.

3 Click the position at which you want to add the construction point.

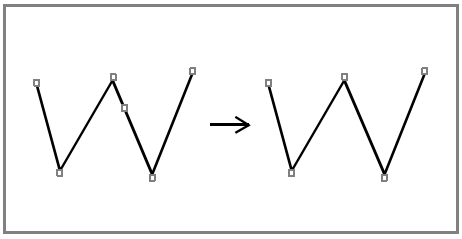


The construction point is added at the specified position.



12. Delete Const. Pt

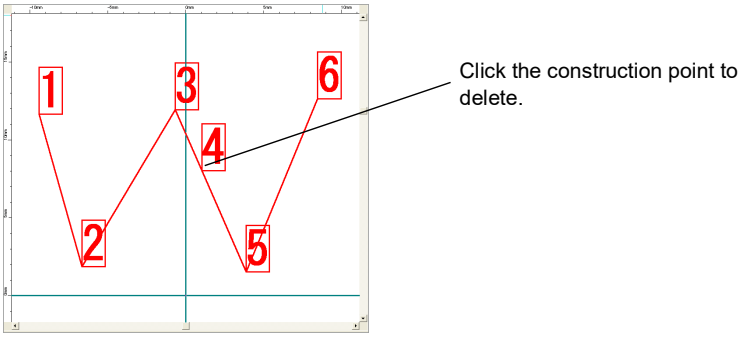
Construction points can be deleted from line segments or polylines created.



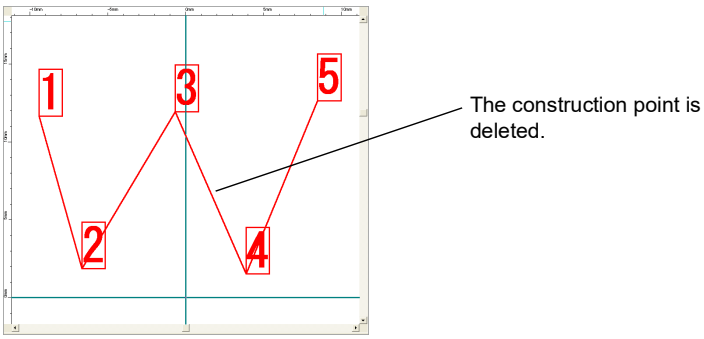
1 From the menu, select [Adjustment] -> [Delete Const. Pt].

2 Select the line segment or polyline to be deleted the construction point from.

3 Click the position of the construction point number which you want to delete.

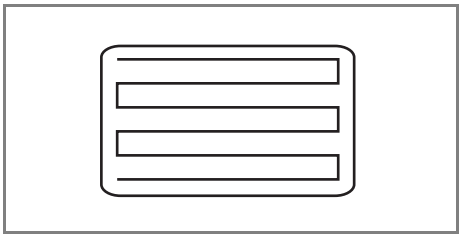


The construction point at the specified position is deleted.



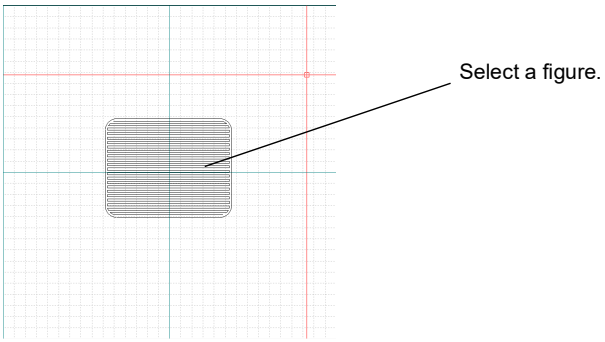
13. Hatch to Poly

Hatching set in circles or squares can be converted into polylines.

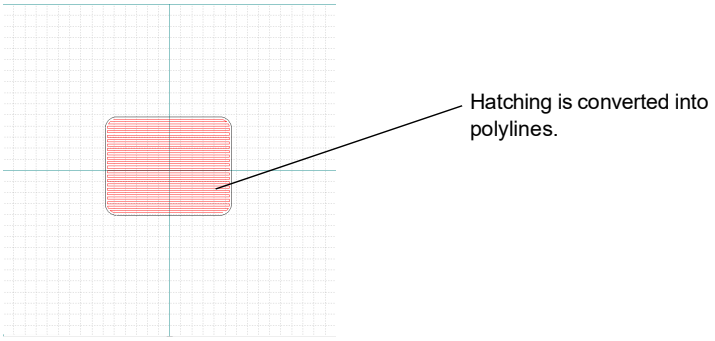


1 From the menu, select [Adjustment] -> [Hatch to Poly].

2 Select the hatched circle or square.



Hatching is converted into polylines.



Chapter 10 Scanning Control Specifications

1. Scanning Direction Control Function

The following three scanning direction control functions in the [Adjustment] menu list are available for scanning order.

- Automatic Scanning Order Function
- Reverse Scanning Order Function
- Scanning Order Confirmation Function

1.1. Applicable Objects and Caution Points

Applies to all objects except dots.

Note that this does not apply to objects with no contact points.

Caution points for individual objects

Object	Details
Line	• The contact point with the previous object forms the start point.
Arc	• The contact point with the previous object forms the start point.
Circle [Auto]	• The contact point with the previous object forms the start point. • The start and end angles are determined when the circle is drawn. (1) When using the mouse for drawing, the start and end angles are the points clicked (or right-clicked) to specify the circle radius. (2) When using the keyboard for drawing, the start and end angles are fixed at 0°.
Polyline	• The contact point with the previous object forms the start point. • The order of intermediate points will also be changed if the start and end points are switched for polyline objects.
Square	• The contact point with the previous object forms the start point.

1.2. Determining Scanning Direction

If multiple contact points exist, the scanning order of the objects in contact is used (lowest scanning number first).

1.3. Identifying Objects within the Program

For automatic scanning order and scanning order confirmation, unique object items are controlled using SetTag() and GetTag() to identify that object when there are multiple objects in contact with the initial one.

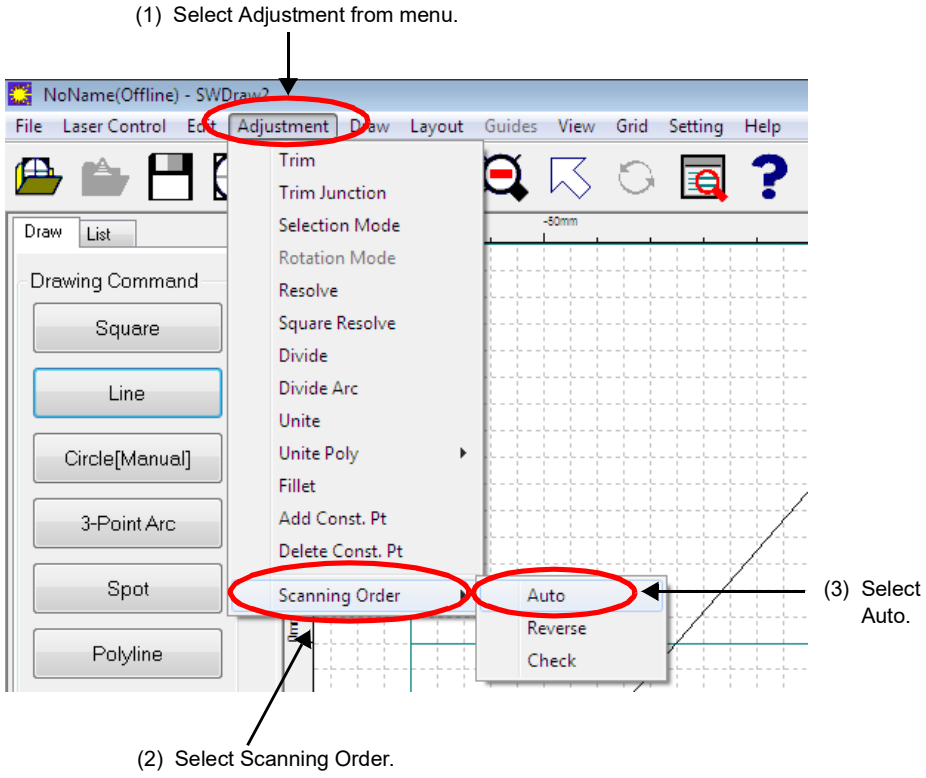
2. Automatic Scanning Order Function

This function sets the scanning order and direction of continuous objects with contact points to allow objects arranged on the drawing screen to be drawn in the desired sequence by the creator.

CAUTION	This function does not handle circle (manual), square, and spot objects.

2.1. Automatic Scanning Order Function Operations

- From the menu, select [Adjustment] -> [Scanning Order] -> [Auto].



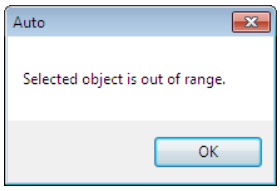
- The following message is displayed in the guidance bar.

Auto	Select an object used as a starting point.

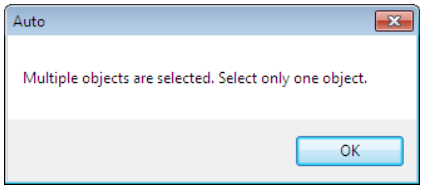
2.2. Automatic Scanning Order Error Control

A message box appears for each specific error detected. Click the [OK] button in the message box to continue using the automatic scanning function. (The guidance message in section 2.1 is displayed.)

(1) The following message is displayed if a dot is selected as the starting object.



(2) The following message is displayed if more than one object is selected as the starting object.



2.3. Automatic Scanning Direction Control

The scanning direction is determined as described below, and the scanning order is applied to the connected objects with the object forming the starting point as 1. Objects not selected here will be assigned subsequent scanning order.

(1) If an object is connected to the end point of the object forming the starting point selected, scanning order control is applied to all the continuous objects (with contact points at the start and end points). Objects subject to scanning direction control are indicated in red, with the scanning order assigned to continuous objects with the object forming the starting point as 1. Other objects will be assigned subsequent scanning order.

Note that when more than one object is connected at a contact point, scanning order is applied to the object with the lowest scanning number first. Objects not selected here will be assigned subsequent scanning order.

The Automatic Scanning Order function is continued even after processing is complete. (The guidance message in section 2.1 is displayed.)

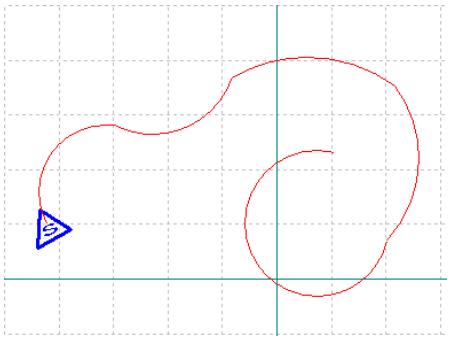
(2) If no object is connected to the end point of the object forming the starting point selected, and an object is connected to the starting point, scanning order control is applied to all the continuous objects (with contact points at the start and end points). Objects subject to scanning direction control are indicated in red, with the scanning order assigned to continuous objects with the object forming the starting point as 1. Other objects will be assigned subsequent scanning order.

Note that when more than one object is connected, scanning order is applied to the object with the lowest scanning number first. Objects not selected here will be assigned subsequent scanning order.

The Automatic Scanning Order function is continued even after processing is complete. (The guidance message in section 2.1 is displayed.)

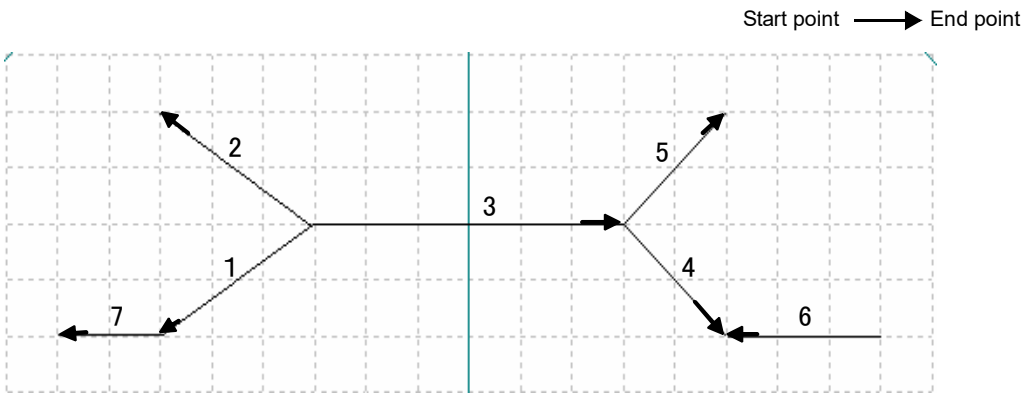
(3) If no object is connected to the end point or start point of the object forming the starting point selected, the message "No connected object could be found" (see 2.2 (2)) is displayed. Click the [OK] button to continue using the automatic scanning function. (The guidance message in section 2.1 is displayed.)

The figure below shows the situation after automatic control is complete. The scanning direction is indicated at the start point of the object forming the start point.

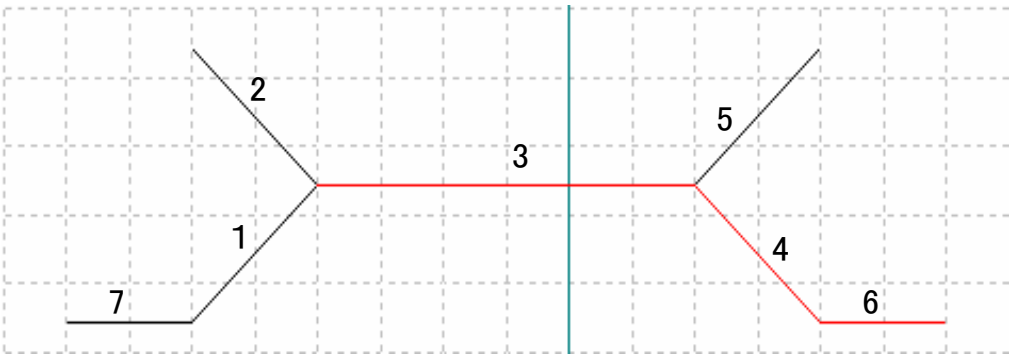


(4) Automatic scanning example 1

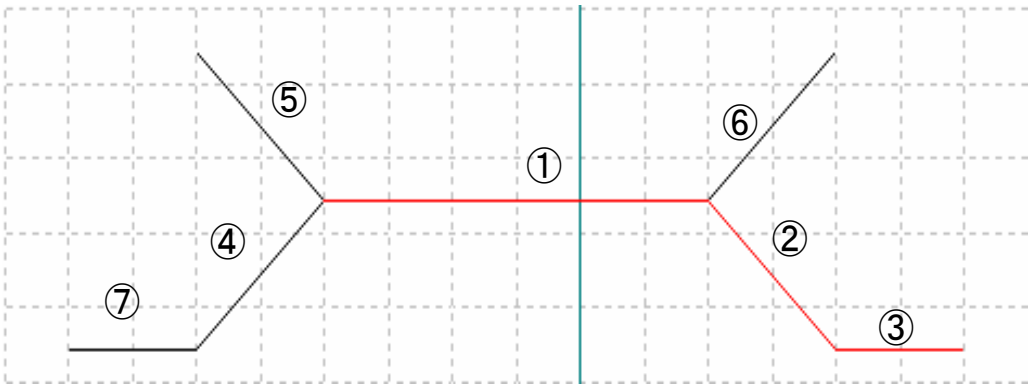
Ex 1: Confirming the scanning direction and order for the figures shown below.



a.) The connected objects are shown as follows when sequence object 3 is selected.

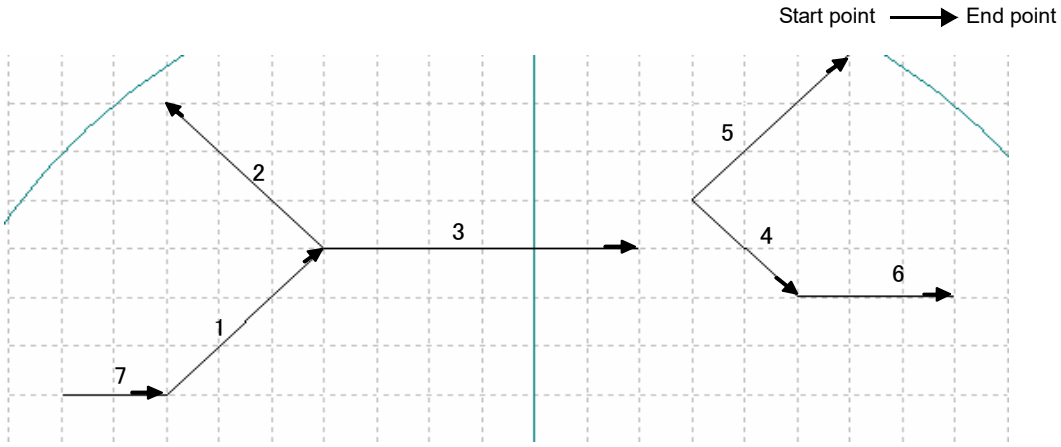


b.) Reorder the scanning order as follows.

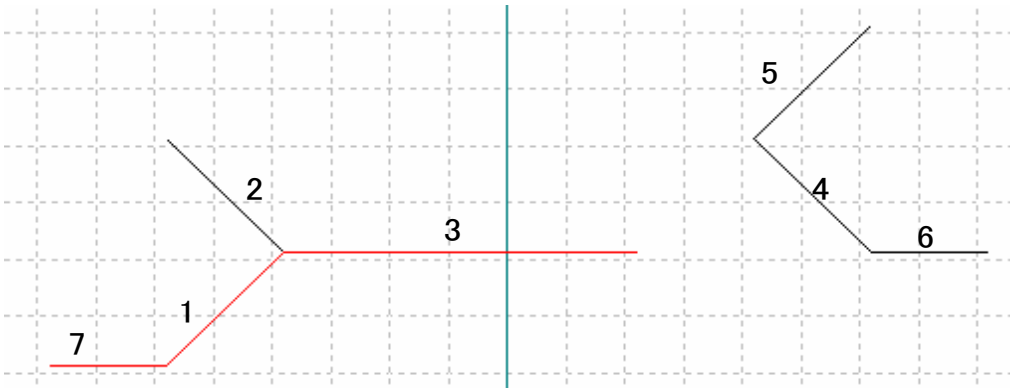


(5) Automatic scanning example 2

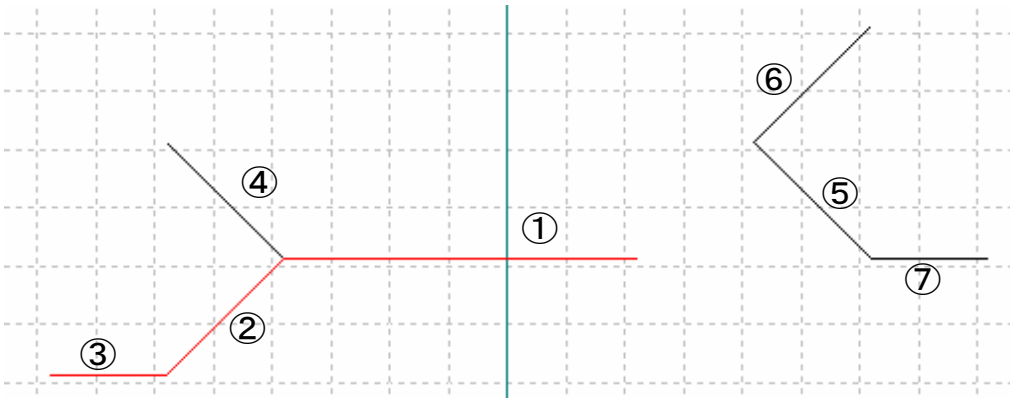
Ex 2: Confirming the scanning direction and order for the figures shown below.



a.) The connected objects are shown as follows when sequence object 3 is selected.



b.) Reorder the scanning order as follows.

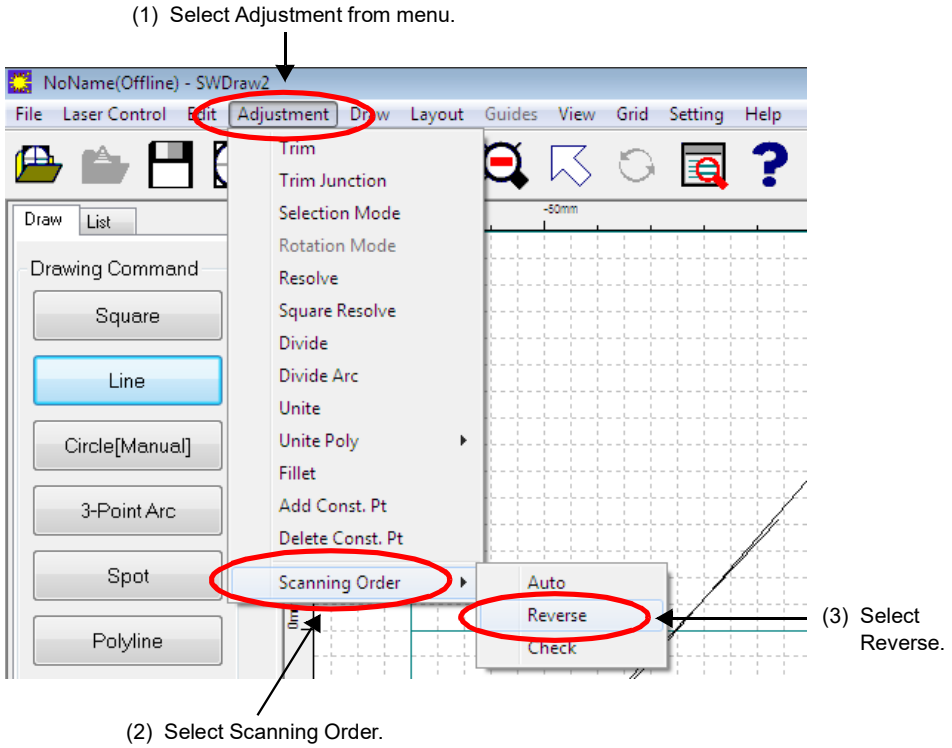


3. Reverse Scanning Order Function

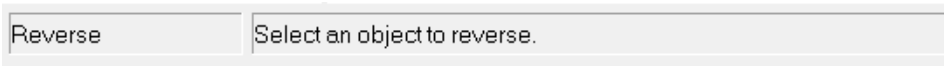
CAUTION	This function does not handle square and spot objects.

3.1. Reverse Scanning Order Function Operations

- From the menu, select [Adjustment] -> [Scanning Order] -> [Reverse].



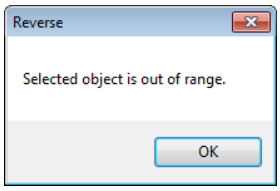
- The following message is displayed in the guidance bar.



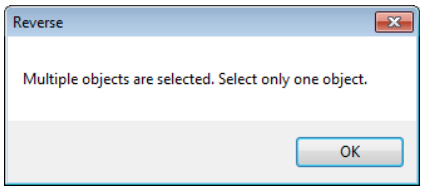
3.2. Reverse Scanning Order Error Control

A message box appears for each specific error detected. Click the [OK] button in the message box to continue using the automatic scanning function. (The guidance message in section 2.1 is displayed.)

(1) The following message is displayed if a dot is selected as the starting object.



(2) The following message is displayed if more than one object is selected as the starting object.



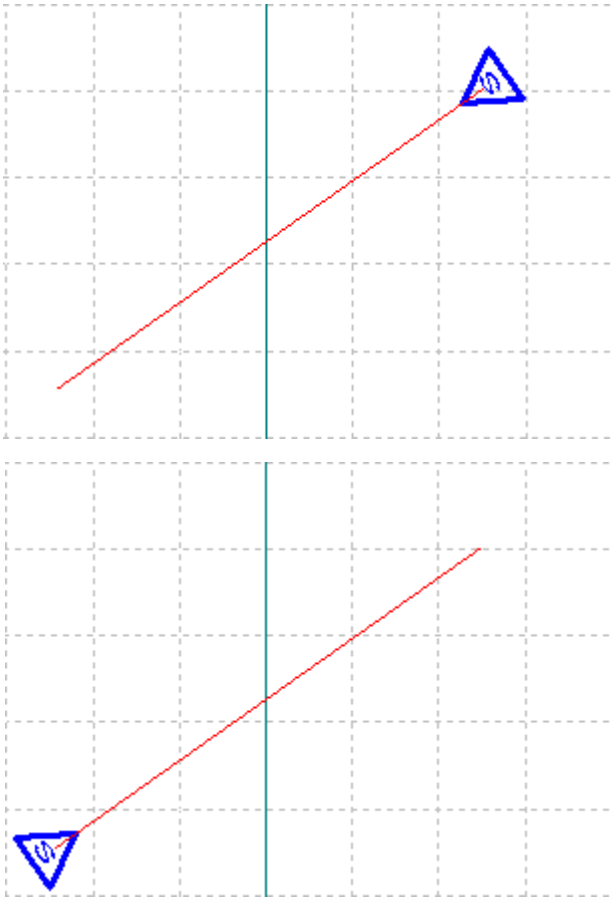
3.3. Reverse Scanning Order Control

The Reverse Scanning Order function controls by switching the start and end points for the object selected.

- The start and end points for the selected object are switched, and a blue triangle with the letter "S" (for Start) is displayed over the start point, with the top vertex indicating the scanning direction.

  The Reverse Scanning Order function is continued. (The guidance message in section 3.1 is displayed.)

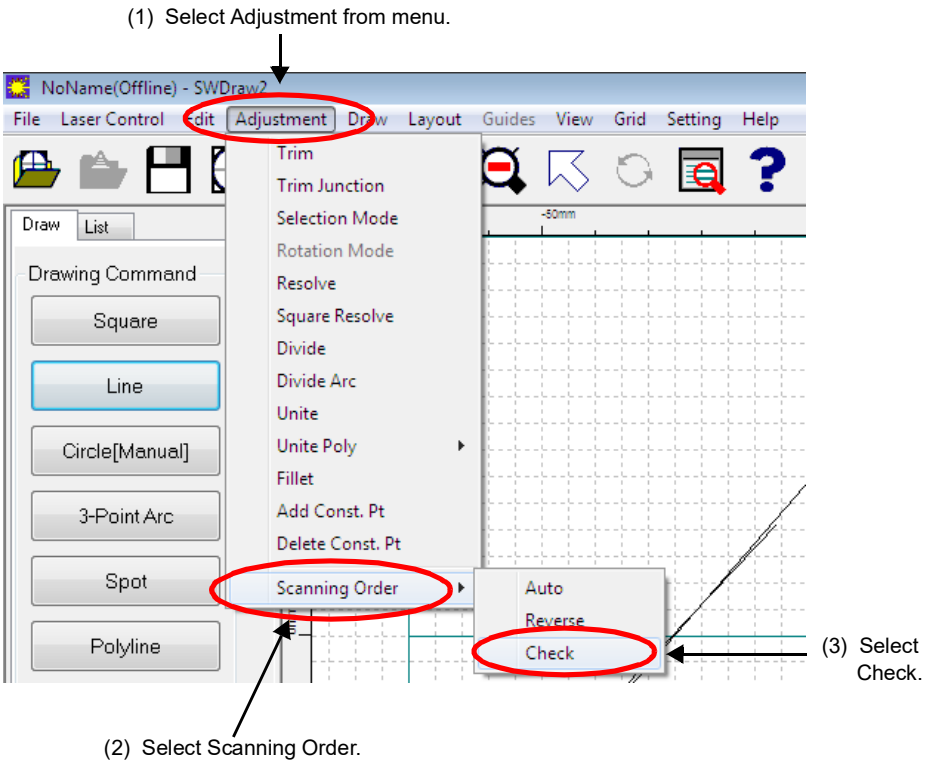
  Ex: The figures below show the same line object with the start and end points switched.



4. Scanning Order Confirmation Function

4.1. Scanning Order Confirmation Function Operations

- From the menu, select [Adjustment] -> [Scanning Order] -> [Check].



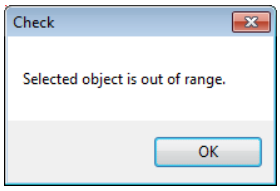
- The following message is displayed in the guidance bar.

Check	Select an object used as a starting point.

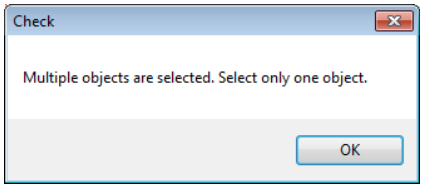
4.2. Scanning Order Confirmation Error Control

A message box appears for each specific error detected. Click the [OK] button in the message box to continue using the scanning order confirmation function. (The guidance message in section 4.1 is displayed.)

(1) The following message is displayed if a dot is selected as the starting object.



(2) The following message is displayed if more than one object is selected as the starting object.



4.3. Scanning Order Confirmation Direction Control

The scanning direction is determined as follows.

(1) If an object is connected to the end point of the selected object forming the start point (contact point forms end point of first object and start point of next object), it is indicated in red.

The object number becomes the scanning number of the previous object + 1.

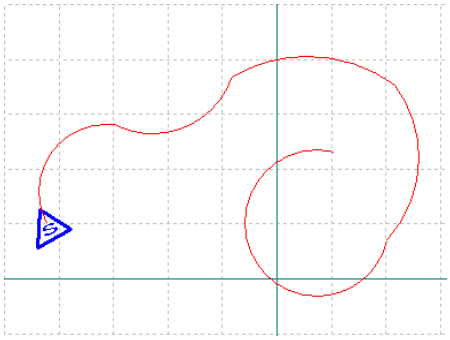
(Searches for the object with scanning number + 1 even when there are multiple contact points.)

The Scanning Order Confirmation function is continued even after processing is complete. (The guidance message in section 4.1 is displayed.)

(2) If no object is connected to the end point of the object forming the starting point selected, the message "No connected object could be found" (see 4.2 (2)) is displayed. Click the [OK] button to continue using the automatic scanning function. (The guidance message in section 4.1 is displayed.)

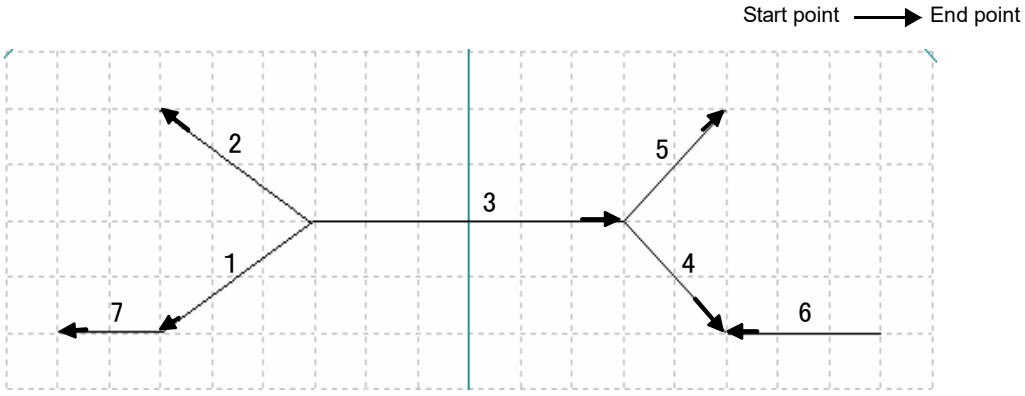
The figure below shows the situation after confirmation is complete. The scanning direction is indicated at the start point of the object forming the start point.

The same scanning direction is indicated after automatic control is complete.

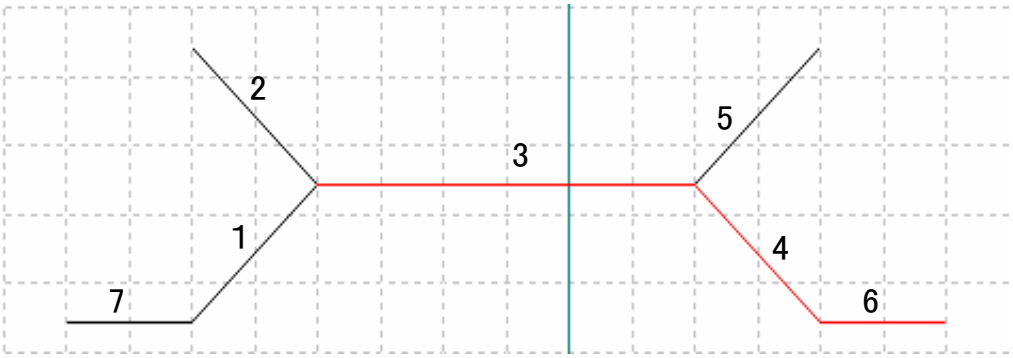


(3) Scanning order confirmation Ex 1

Ex 1: Confirming the scanning direction and order for the figures shown below.

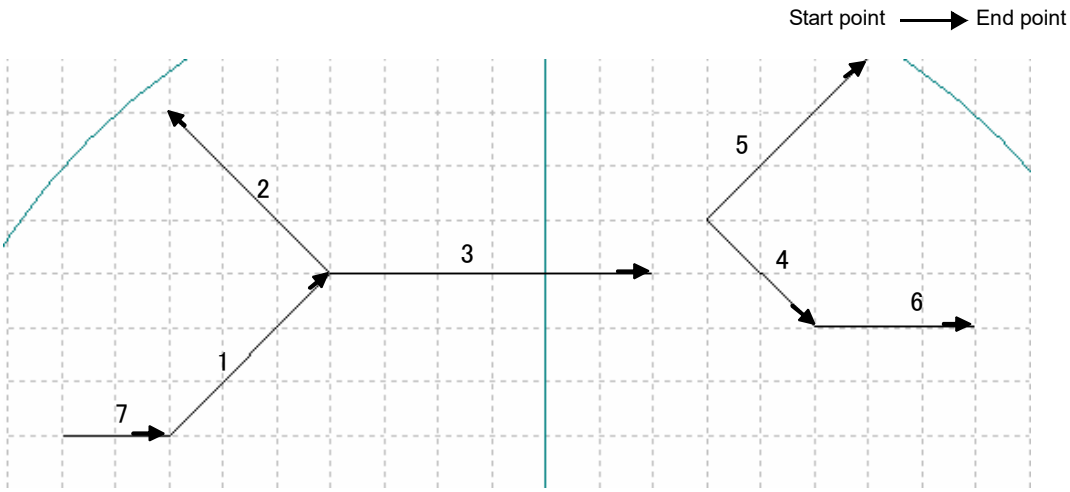


- The connected objects are shown as follows when sequence object 3 is selected.



(4) Scanning order confirmation Ex 2

Ex 2: Confirming the scanning direction and order for the figures shown below.



- The connected objects are shown as follows when sequence object 3 is selected.

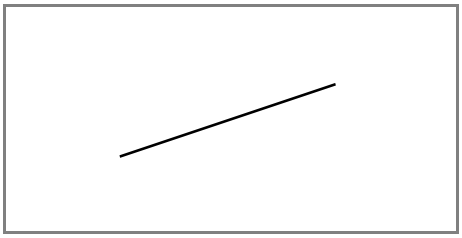
  No object is connected to the end point of the starting object here, so the "No connected object could be found" message box is displayed.

Chapter 11 Draw

CAUTION	Using commands other than those listed below while drawing will delete the object being drawn. [Zoom Extents], [Zoom All], [Zoom In], [Zoom Selection], [Zoom Out], [Pan], and [Refresh] in the View menu.

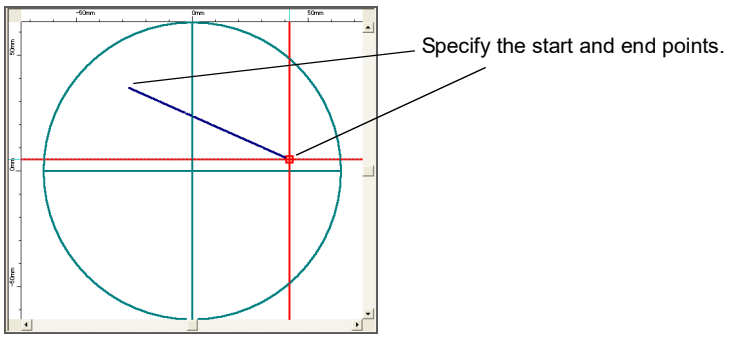
1. Line (Drawing Lines)

Specify two points to draw a line.



1 Click the [Line] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [Line].

2 Specify the start and end points for the line.



A line connecting the start and end points is drawn automatically.

The content of the entered figures, size, and other details can be adjusted in properties. Separate machining conditions can also be applied.

2. Polyline (Drawing Polylines)

Polyline is an object that consists of multiple lines or arc.

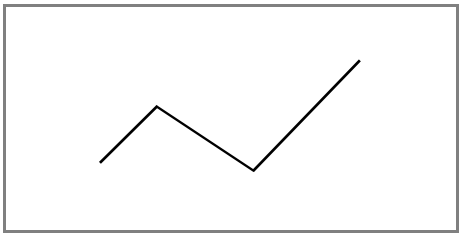
Polylines with arc cannot be created from the start.

To create polylines with arc, the following operation is required.

- Making fillet at the line portion of polyline with [Fillet]
- Combining with arc with [Unite Poly]
- Pasting data including a radius value in the property

2.1. New Polyline

Draw polylines as follows:

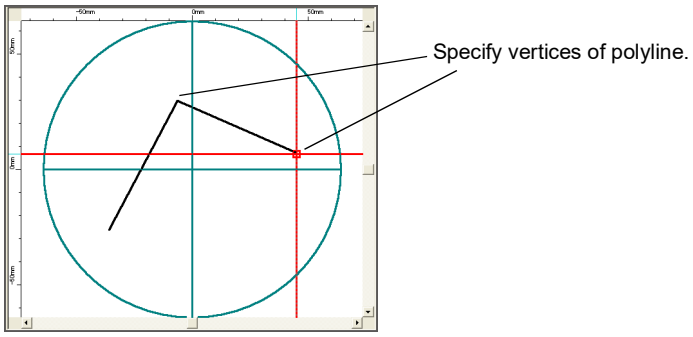


1 Click the [Polyline] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [Polyline].

2 Specify the first and second points in the line.

A line connecting the first and second points is drawn automatically.

3 As you continue specifying points, lines are drawn connecting them to the polyline.

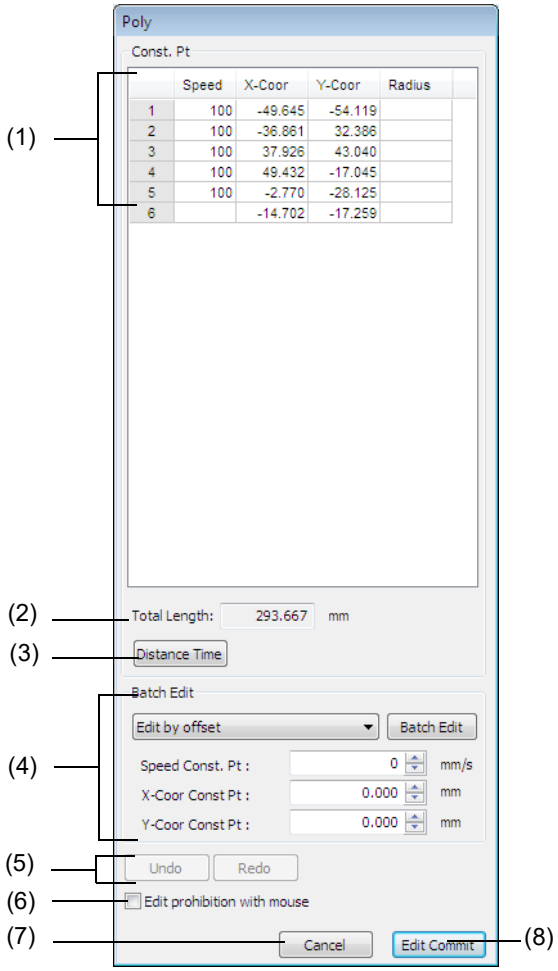


4 When drawing is complete, press the <Enter> key.

The polyline is now complete.

The entered details and size can be adjusted in properties. Separate machining conditions can also be applied.

2.2. [Poly] Screen Arrangement



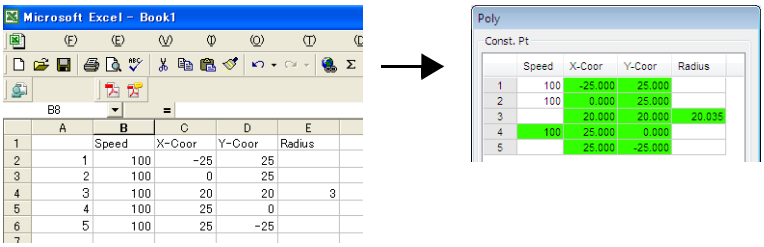
(1) Const. Pt

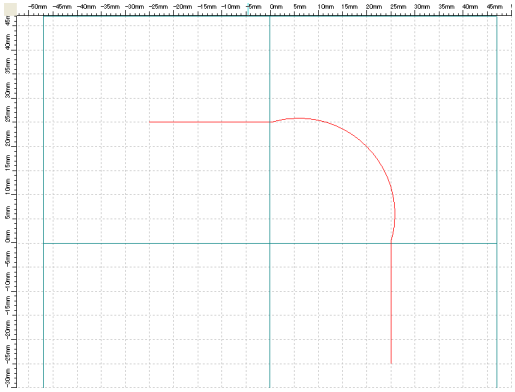
Cells for inputting parameter values of construction points.
The polyline requires at least start point of the first line, end point of the first line/start point of the second line, and end point of the second line, it consist of three lines or more.
The line requires start point and end point, it consist of two lines.
The arc requires start point, middle point and end point, it consist of three lines.

Const. Pt Settings

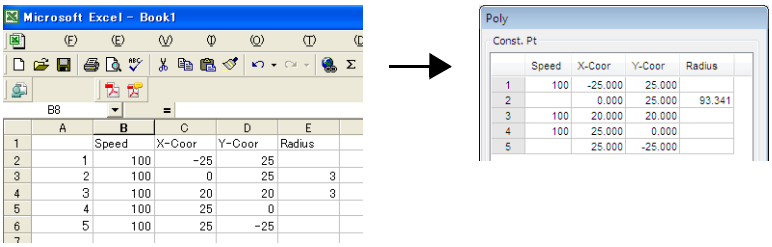
Item	Setting Details	Range (Default)	Pitch
Const. Pt	Displays the construction point number of polyline.	1 to 500	1
Speed	Sets the moving speed of the scanner between construction points.	1 to Lens dependant (100 mm/s)	1 mm/s
X-Coor	Sets the X-coordinate of the construction point of polyline.	Lens dependant	0.001 mm
Y-Coor	Sets the Y-coordinate of the construction point of polyline.	Lens dependant	0.001 mm
Radius	Sets the radius of arc included in polyline.	Construction point coordinate dependant	0.001 mm

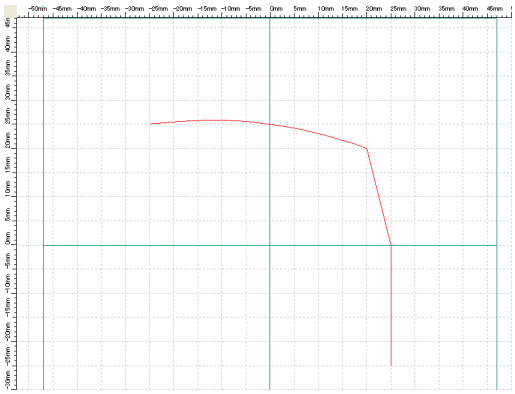
- Displaying data at once
  Displays speed, X-coordinate and Y-coordinate at once. When the number of construction points are large, drag the scroll bar to display the hidden data.
- Changing data directly
  Changes values by numerical entry. The values are increased/decreased with the <PageUp>/<PageDown> key, and the drawing of polyline also changes simultaneously with the value. However, the drawing does not change if an error has occurred.
- Copying/pasting data
  The data can be exchanged with a text editor such as “Microsoft Excel” to edit the polyline already created. Clicking the right mouse button on the table without selecting a row displays the copy/paste menu to copy/paste the whole table. The specified row cannot be copied and a row cannot be pasted in the specified row or later. For the data to be pasted, be careful of the followings.
  ・The speed data with a decimal point is truncated at a decimal point.
  ・The coordinate data with four or more decimal places is rounded off to four decimal places.
  ・When the polyline data having an arc is pasted in properties for the already created polyline, the radius is automatically calculated by three points (start point, middle point and end point) that make up an arc. With a value in radius field, the data is judged as an arc.



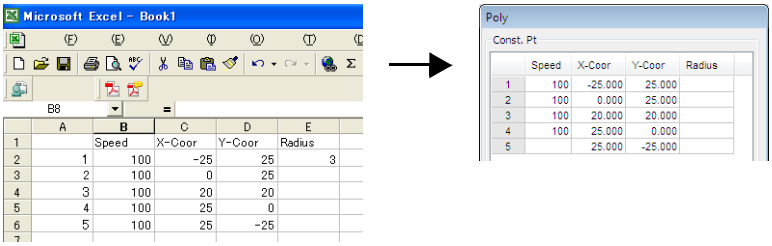


- An arc consists of three points (start point, middle point and end point). When the radius data continues, the second radius becomes invalid.

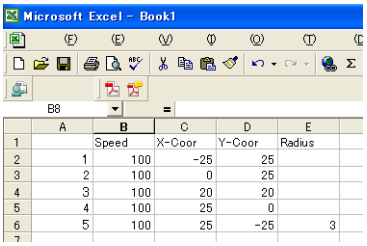


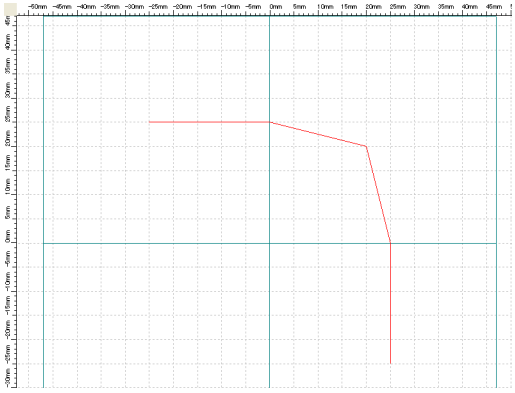


- Since the radius data is the middle point of arc, the radius value of the first point or the end point becomes invalid.



or





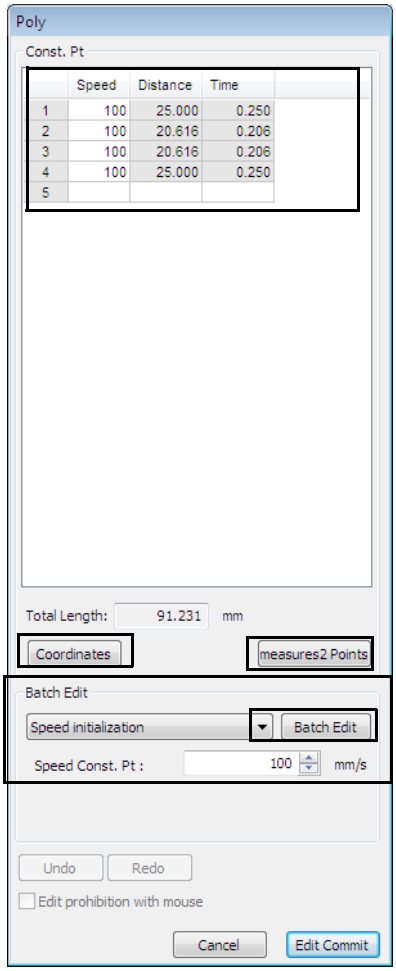
- Checking data
  The background color of cell changes when a value is input in, and you can find that the value is changed. The background color is green for normal values and red for abnormal values.
  In both cases of pasting and changing at once, the error check is carried out in a similar manner. An error occurs in the following cases.
  ・A value outside the range is input.
  ・No value is input.
  ・Values of both X- and Y-coordinates are the same consecutively.
  ・The number of construction point exceeds the limit (The maximum number of construction points per object is 500.)
- Adding/deleting construction point (row)
  Just as adding/deleting construction points, construction points (rows) can be added/deleted. In case of addition, the coordinate of construction point is the center between the previous and next construction points (rows). However, for the first row, a construction point is added at the origin.
  When clicking the right mouse button while selecting a construction point (row) (or with pressing the <Delete> key or the <Insert> key), the add/delete menu is displayed. To add the bottom row, select the add menu with pressing the <Shift> key.
- Checking construction position by selecting construction point (row)
  When a construction point is selected, the position can be checked in the lay-out area.
- Selecting multiple construction points (rows)
  To select any multiple rows, click them on with the mouse while pressing the <Ctrl> key.
  To select multiple rows within the specified range, click them on with the mouse while pressing the <Shift> key.

(2) Total Length

Displays the reference value of distance of the whole polyline. However, this is not displayed if an error has occurred with the input coordinate.

(3) [Distance Time] button

Click this button to switch to the confirmation screen for the distance and the reference time between construction points. However, the button becomes grayout and cannot be clicked if an error has occurred with the input coordinate. The following functions can be used on the confirmation screen.



Confirmation Screen Settings

Item	Setting Details
Const. Pt	Displays the distance and the reference time for each construction point (except the arc middle point). Speed can be changed, but Distance and Time cannot be changed, only displayed. Also, they can be copied, but not pasted.
[Coordinates] button	Switches to the screen to input coordinate values of construction points.
[measures 2 Points] button	Calculates the speed and the reference time between any two points.
Batch Edit	Changes speed only.

(4) Batch Edit

Changes a menu selected among offset, speed initialization, zoom, and rotation function at once.

Select a menu and click the [Batch Edit] button after inputting values. The values are reflected in cells for inputting parameter values of construction points.

When cell (row) is selected, the setting is valid for the selected row only. When no cell (row) is selected, the setting is valid for all rows. However, the zoom function is valid for all rows only.

- [Edit by offset]
  Offsets speed, X-coordinate and Y-coordinate. ± setting is available. The range depends on the lens setting. Only speed can be set on the confirmation screen.

- [Speed initialization]
  Initializes all speed settings at once.
- [Edit by expansion rate]
  Zooms with reference to the coordinate of construction point 1. The range is -100.0 to +100.0. This cannot be set on the confirmation screen.
- [Edit by rotate]
  Rotates with reference to the XY coordinates of center point. The range is 0.000 to 360.000.

(5) [Undo] / [Redo] button

Click the [Undo] button to undo an action that you have done.

Click the [Redo] button to redo an action that you have undone.

The [Undo] button can be clicked more than once, but the [Redo] button can be clicked only once.

(6) Edit prohibition with mouse

Check the checkbox to prohibit (lock) the drawing data from being moved with the mouse.

(7) [Cancel] button

Click this button to cancel all changes made after the [Poly] screen is displayed.

(8) [Edit Commit] button

Click this button to enter the data finally. However, the button cannot be clicked if an error has occurred with the input coordinate.

2.3. Modifying Polyline

Polylines created can be modified with using the mouse or in properties.

2.3.1. Moving the Whole Polyline

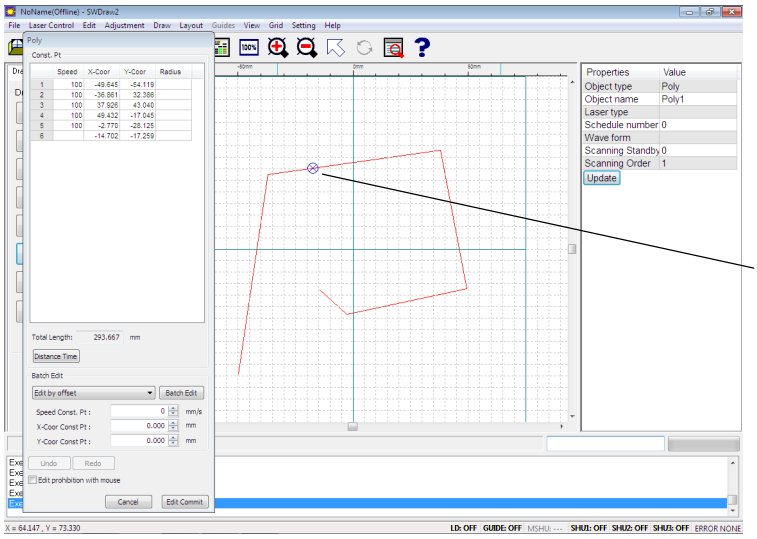
Fine adjustment of construction points such as speed and coordinates can be made on the dedicated screen for editing polylines displayed in the left side of the screen ([Poly] screen). For the details of functions on the [Poly] screen, see "Chapter 11-2.2. [Poly] Screen Arrangement"(page 204) .

1 When a polyline is selected, the [Poly] screen is displayed.

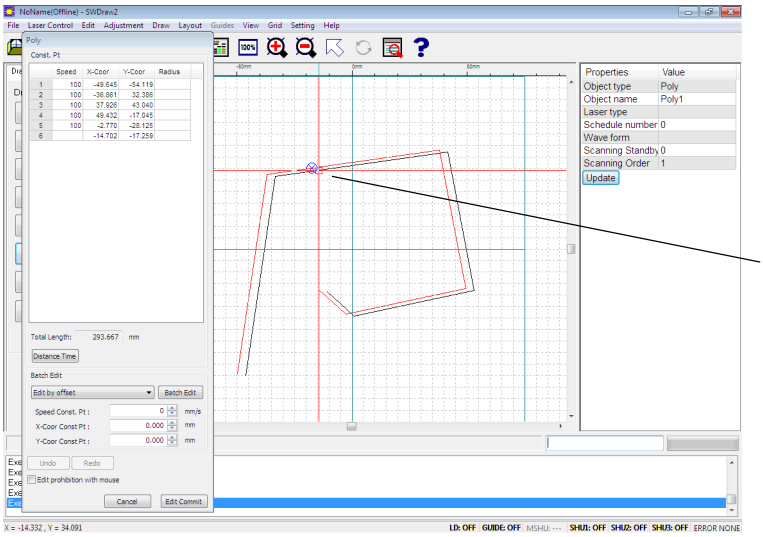
ATTENTION	The [Poly] screen is displayed only when a polyline is selected. When multiple polylines are selected, the screen is not displayed.

2 Specify an element to change or move.

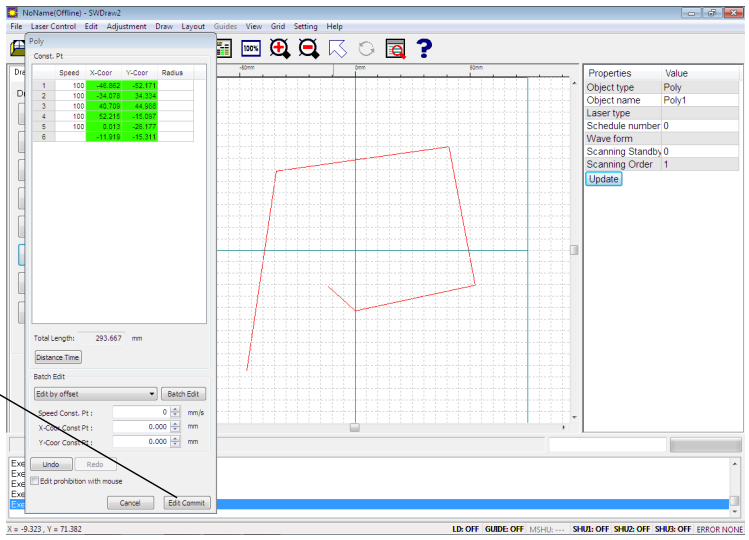
3 Click the place where there is no construction point on the polyline to display "⊗" at the construction point.



4 When "⊗" is clicked, the whole polyline can be moved. Clicking the left mouse button after moving it to determine the position and update parameter values in the [Poly] screen in the left side of the screen.



5 When modification is complete, click the [Edit Commit] button.



2.3.2. Changing in Shape

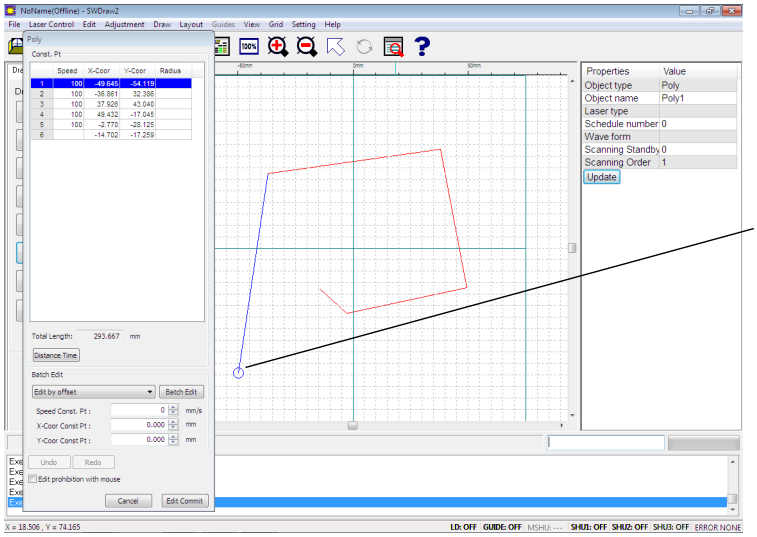
Fine adjustment of construction points such as speed and coordinates can be made on the dedicated screen for editing polylines displayed in the left side of the screen ([Poly] screen). For the details of functions on the [Poly] screen, see "Chapter 11-2.2. [Poly] Screen Arrangement"(page 204) .

1 When a polyline is selected, the [Poly] screen is displayed.

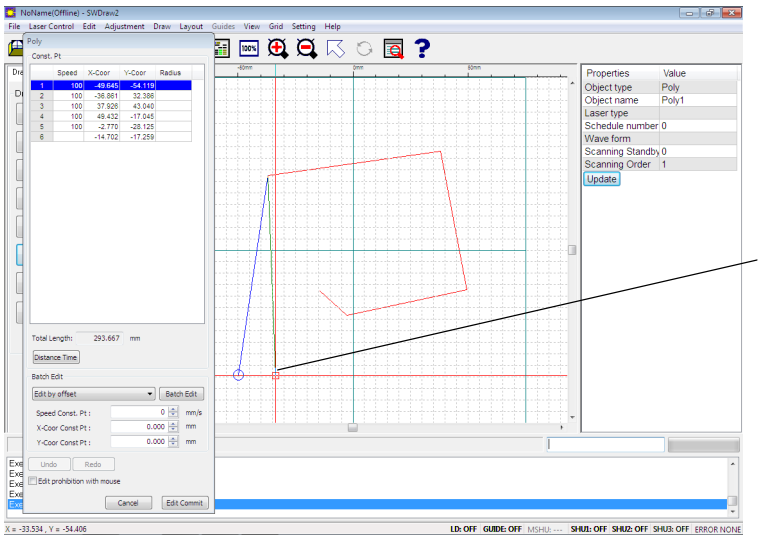
ATTENTION	The [Poly] screen is displayed only when a polyline is selected. When multiple polylines are selected, the screen is not displayed.

2 Specify an element to change or move.

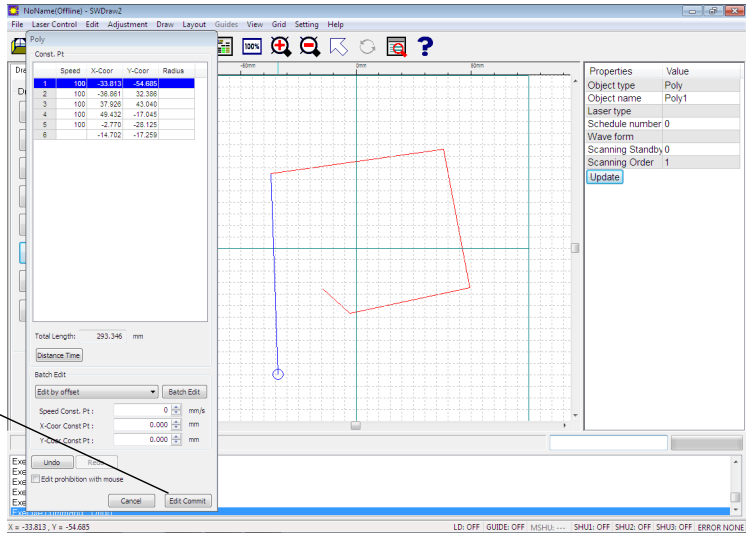
3 Click around the place where there is a construction point on the polyline to display "O" at the construction point or select a line on the Object Browser. (The line start and end points, and arc start, end and middle points can be selected by clicking.)



4 When "O" is clicked, a construction point can be moved. Clicking the left mouse button after moving it to determine the position and update parameter values in the [Poly] screen in the left side of the screen.



5 When modification is complete, click the [Edit Commit] button.

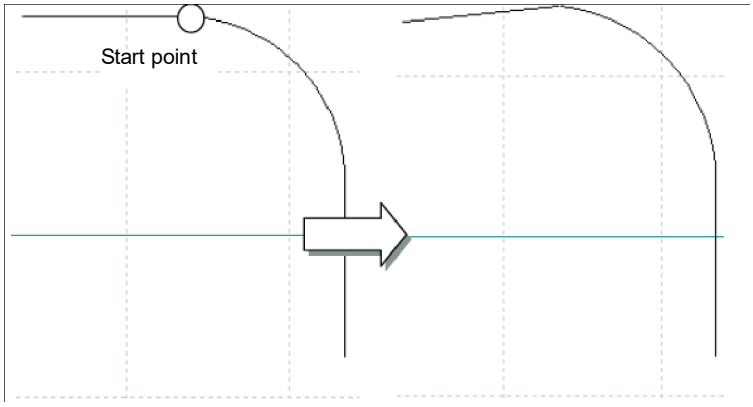


You can also make modifications in properties.
However, the following rules are applied.

■ Changing the coordinate value with the mouse (changing by directly entering the coordinates in the point coordinates list)

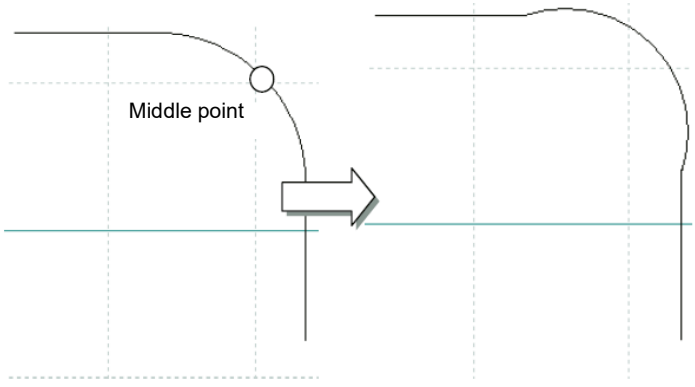
- When the start point is changed, its coordinate and radius is changed. The middle and end points are not changed.

  (The radius is automatically calculated by the start, middle and end points.)



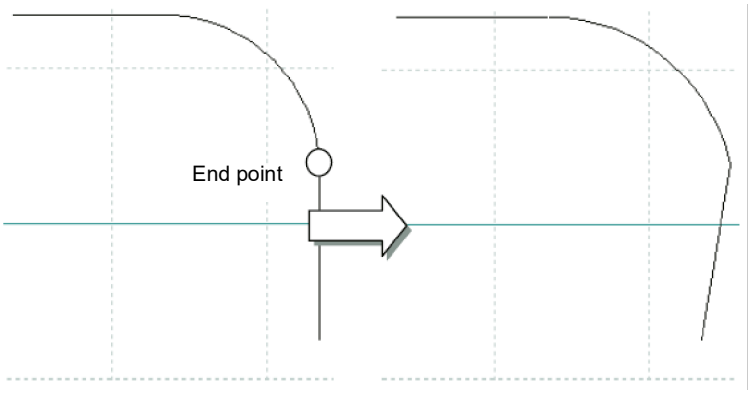
- When the middle point is changed, its coordinate and radius is changed.

  (The radius is automatically calculated by the start, middle and end points.)



- When the end point is changed, its coordinate and radius is changed.

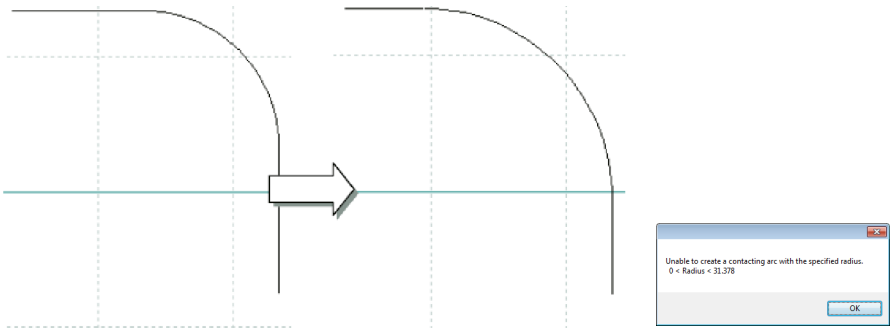
  (The radius is automatically calculated by the start, middle and end points.)



■ Changing the radius in properties (changing by directly entering the radius in the point coordinates list)

- When the arc start and end points are connected smoothly.

  The start and end points are adjusted to connect smoothly with a changed radius. However, the settable range of radius is displayed when an arc cannot be created with the input radius.

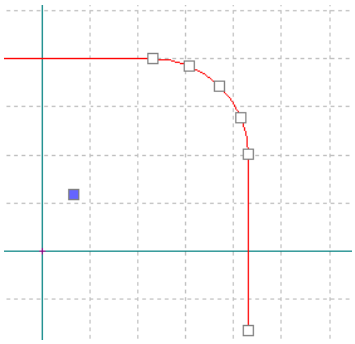


2.3.3. Adding/Deleting Construction Points

■ Using the mouse

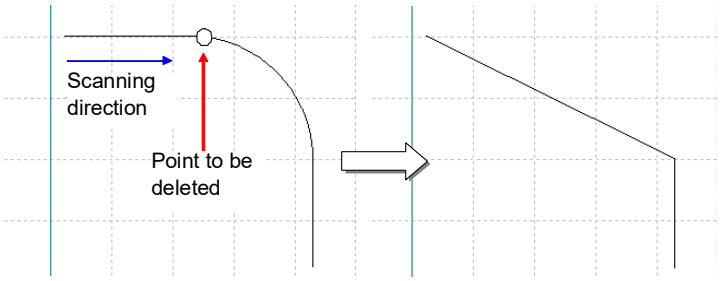
- Adding the construction point in drawing area

  In addition to the conventional function that allows the construction point to be added to the line portion of polyline, the construction point can be added to the arc portion. When the construction point is added on an arc, the specified arc is divided into two.

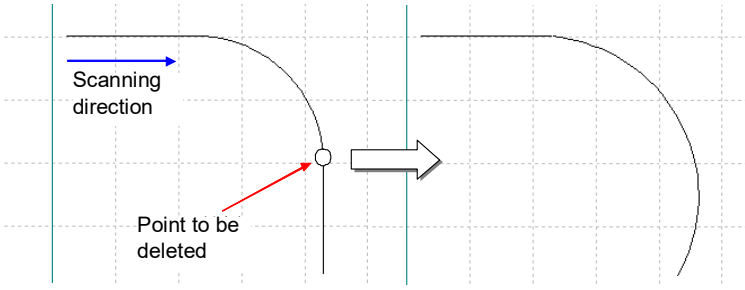


- Deleting the construction point in drawing area

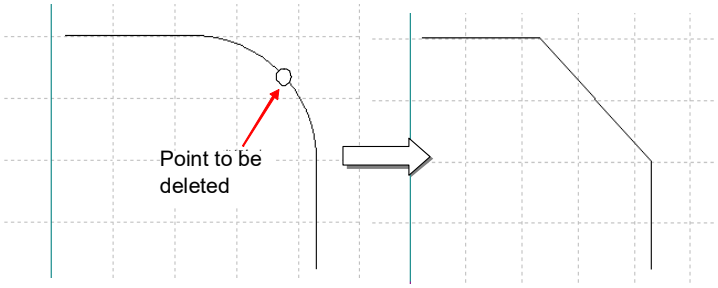
  When the arc start point is deleted (viewed from the scanning direction), the arc middle point is also deleted.



  When the arc end point is deleted (viewed from the scanning direction), an arc is created with the arc start point, the arc middle point, and the next point of the deleted point.

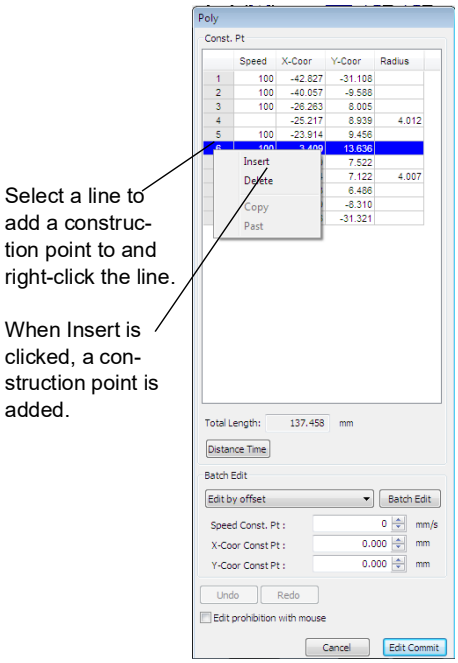


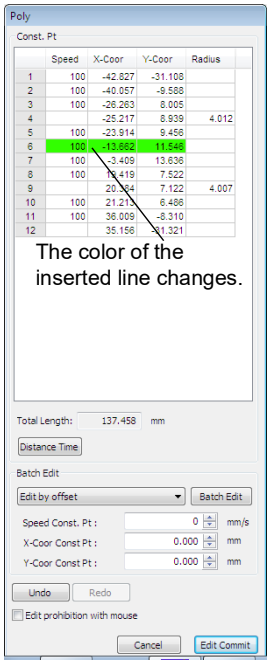
  When the arc middle point is deleted, the arc start point and the arc end point are joined with a line.



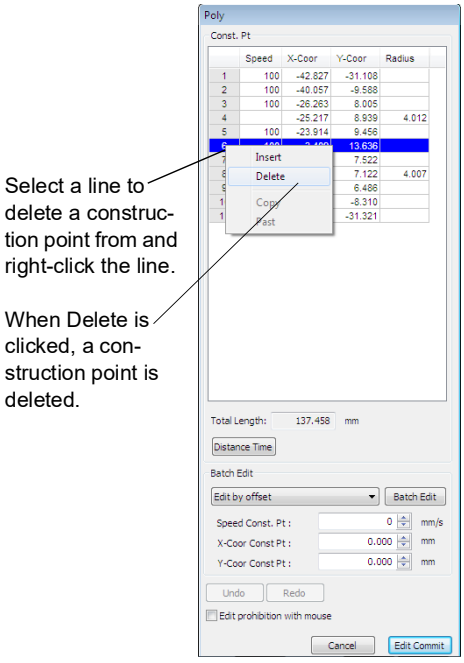
■ By setting in properties

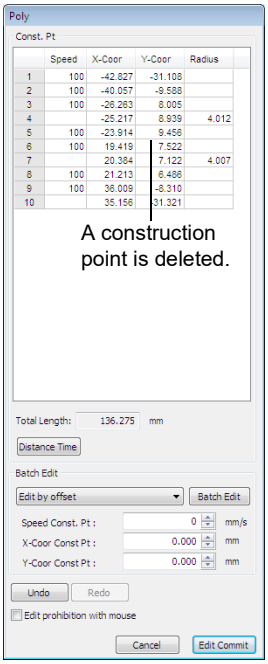
• Adding the construction point in properties





• Deleting the construction point in properties

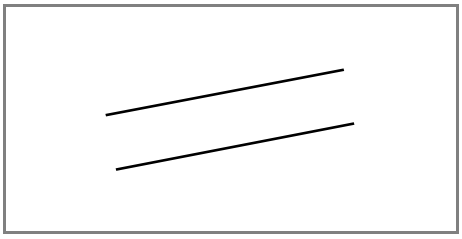




3. Parallel Lines (Drawing Parallel Lines)

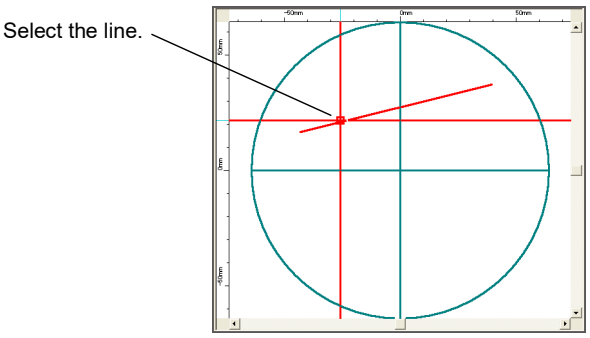
Draw a line parallel to an existing line as follows:

CAUTION	Using any of the commands listed below while drawing a parallel line will delete the parallel line and draw a normal line. [Zoom Extents], [Zoom All], [Zoom In], [Zoom Selection], [Zoom Out], [Pan], and [Refresh] in the View menu.

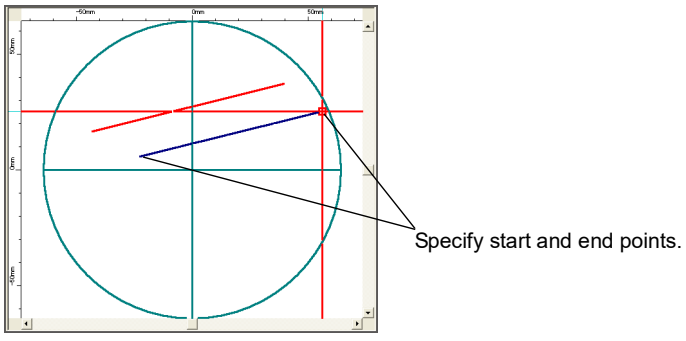


1 Click the [Parallel Lines] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [Parallel Lines].

2 Select the line (line segment) to be used as the reference line to determine the angle of the parallel line.



3 Specify the start and end points of the line to draw.

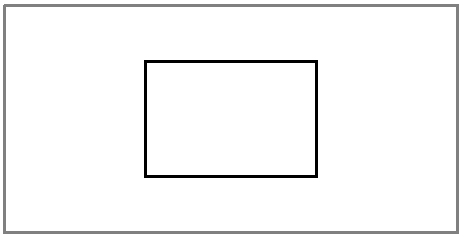


A line is drawn parallel to the one chosen in step 2.

The entered details and size can be adjusted in properties. Separate machining conditions can also be applied.

4. Square (Drawing Rectangles)

Draw rectangles as follows:

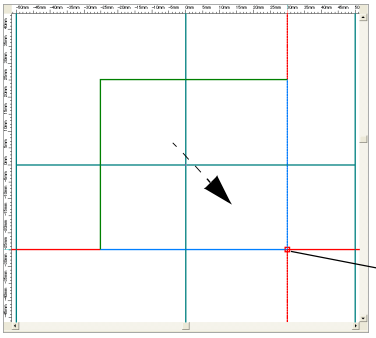


1 Click the [Square] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [Square].

2 Specify the start point.

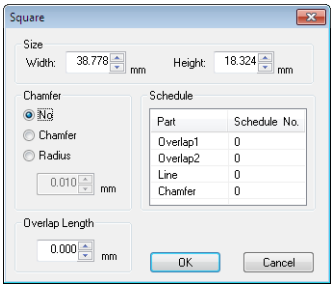
3 Specify the size of the rectangle.

Move the mouse to enlarge or reduce the rectangle. Click when the rectangle is the desired size.



The [Square] screen is displayed.

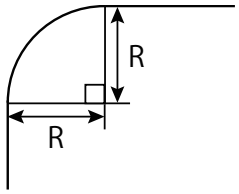
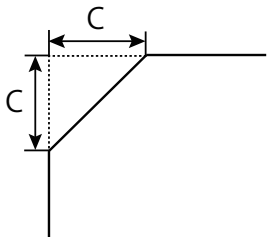
4 Specify the values, referring to the table below. Click the [OK] button when finished.



Square Settings

Item		Setting specifics	Range (Default)	Pitch
Size	Width	Specifies the width of side.	Lens dependant	0.001 mm
	Height	Specifies the height of side.	Lens dependant	0.001 mm

Square Settings

Item		Setting specifics	Range (Default)	Pitch
Chamfer	No	Does not perform chamfering.	—	—
	Chamfer	Chamfers four corners by specifying the radius of arc. The setting is applied to all of the four corners. 	0.01-Drawing data dependant (0.000 mm)	0.001 mm
	Radius	Chamfers four corners by specifying the line length to cut. The setting is applied to all of the four corners. 	0.01-Drawing data dependant (0.000 mm)	0.001 mm
Schedule	Overlap1	Specifies the number of the schedule data to use for the overlap portion starting from the start point.	0-Depends on laser equipment (0)	1
	Overlap2	Specifies the number of the schedule data to use for the overlap portion ending at the end point.	0-Depends on laser equipment (0)	1
	Line	Specifies the number of the schedule data to use for the lines.	0-Depends on laser equipment (0)	1
	Chamfer	Specifies the number of the schedule data to use for the chamfer portion.	0-Depends on laser equipment (0)	1
Overlap Length		Specifies the length of overlap portion.	Drawing data dependant (0 mm)	0.001 mm

A rectangle is drawn.

The entered details and size can be adjusted in properties. Separate machining conditions can also be applied.

[Scanning Direction]

Scanning direction (clockwise or counter-clockwise) will be set depending on how the rectangle is drawn. The scanning direction can be checked or changed in the [Scanning Direction] field in Properties.

- When the end point is to the right of the start point:

  Scanning will be in the clockwise direction.

- When the end point is to the left of the start point:

  Scanning will be in the counter-clockwise direction.

Click the [Scanning Direction] field in Properties to change the scanning direction. Click the [Update] button to apply the settings.

CAUTION	The settings will not be applied unless the [Update] button is clicked.

CAUTION	When changing the scanning direction of a rectangle, do not select [Adjustment] -> [Scanning order] -> [Reverse] in the menu.

5. Circle (Drawing Circles)

There are two types of circle. Select the function depending on the intended use.

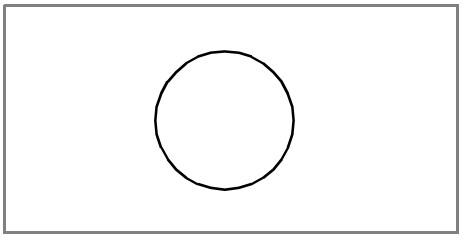
Circle (Manual): The drawing start and end points can be arbitrarily set. Circles with overlap* can be drawn.

Circle (Auto): The system calculates previous object to automatically decide the drawing start point. Circles with overlap cannot be drawn.

* "Overlap" is the function to weld the welded portion again for hermetically closing the circular area.

5.1. Drawing Circles with Overlap (Manual)

Draw circles with overlap as follows:



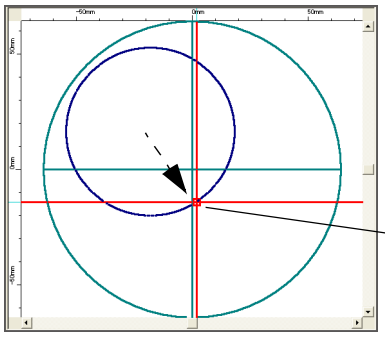
1 Click the [Circle [Manual]] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [Circle [Manual]].

2 Specify the start point.

3 Specify the size of the circle.

- Using the mouse

  Move the mouse to enlarge or reduce the circle. Click when the circle is the desired size.

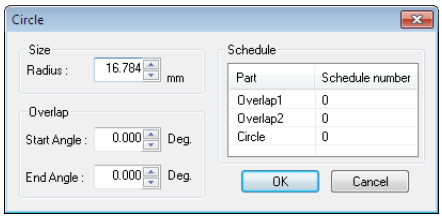


- By specifying points

  Enter the radius or diameter in the command field. (single-byte alphanumeric) Add the prefix "D" when entering diameters.

  The [Circle] screen is displayed.

4 Enter values, referring to the following table. Click the [OK] button when you have finished setting.



Circle Settings

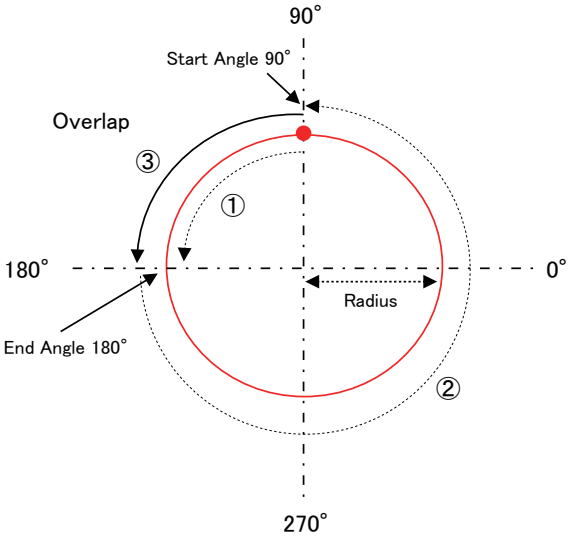
Item		Setting specifics	Range (Default)	Pitch
Size	Radius	Specifies the radius of circle.	Lens dependant	0.001 mm
Overlap	Start Angle	Specifies the start angle for the overlap portion.	0-359.999°	0.001°
	End Angle	Specifies the end angle for the overlap portion.	0-359.999°	0.001°
Schedule *1	Overlap1	Sets the schedule number used for the first overlap portion.	0-Depends on laser equipment (0)	1
	Overlap2	Sets the schedule number used for the second overlap portion.	0-Depends on laser equipment (0)	1
	Circle	Sets the schedule number used for the arc other than overlap portion.	0-Depends on laser equipment (0)	1

A circle is drawn based on these conditions.

The entered details and size can be adjusted in properties. Separate machining conditions can also be applied.

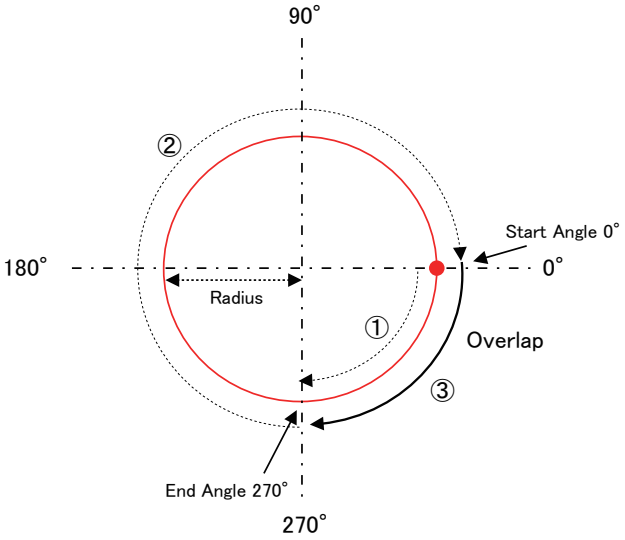
Counter clockwise

(when [Start Angle] is 90° and [End Angle] is 180°)



Clockwise

(when [Start Angle] is 0° and [End Angle] is 270°)



Schedule number to be used

① Schedule number set in Overlap1

② Schedule number set in Circle

③ Schedule number set in Overlap2

[Scanning Direction]

The scanning direction can be checked or changed in the [Scanning Direction] field in Properties.

- When the end point is to the right of the center point:

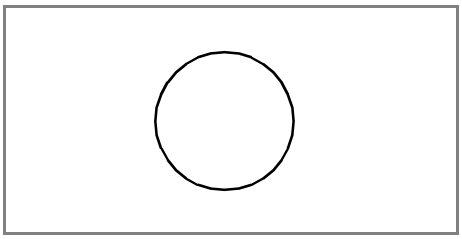
  Scanning will be in the clockwise direction.

- When the end point is to the left of the center point:

  Scanning will be in the counter-clockwise direction.

5.2. Drawing Conventional Circles (Auto)

Draw conventional circles as follows:



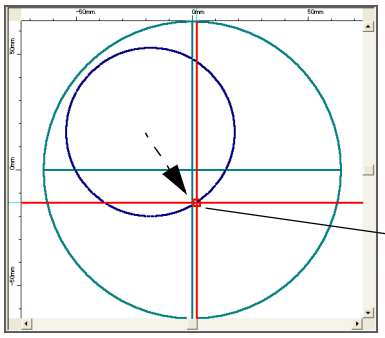
1 Click the [Circle [Auto]] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [Circle [Auto]].

2 Specify a point as the center of the circle.

3 Specify the size of the circle.

- Using the mouse

  Move the mouse to enlarge or reduce the circle. Click when the circle is the desired size.



- By specifying points

  Enter the radius or diameter in the command field. (single-byte alphanumeric) Add the prefix "D" when entering diameters.

A circle is drawn based on these conditions.

The entered details and size can be adjusted in properties. Separate machining conditions can also be applied.

[Scanning Direction]

The scanning direction can be checked or changed in the [Scanning Direction] field in Properties.

- When the end point is to the right of the center point:

  Scanning will be in the clockwise direction.

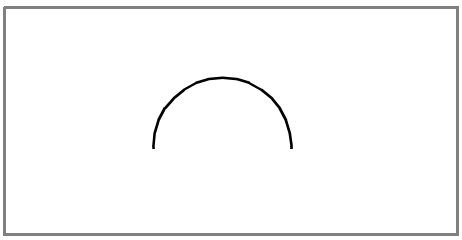
- When the end point is to the left of the center point:

  Scanning will be in the counter-clockwise direction.

6. Arc (Specifying a Radius to Draw an Arc)

A radius can be specified to draw an arc as follows:

CAUTION	The scanning area error may occur depending on the arranged figures such as those the center coordinate is positioned outside the marking area due to its large radius. In such cases, change the arc object into the polyline object with Poly Resolve. It can be ready for scanning.



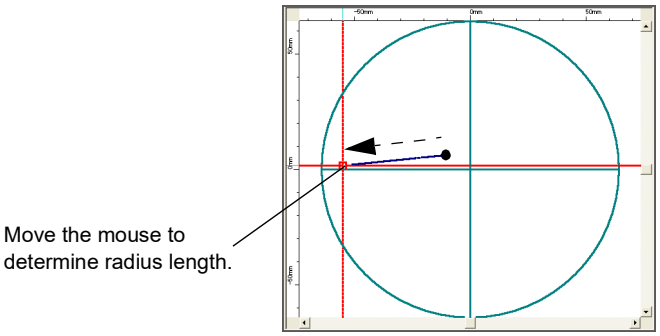
1 From the menu, select [Draw] -> [Arc].

2 Specify a point as the center of the circle.

3 Specify the radius of a circle that includes the arc.

- Using the mouse

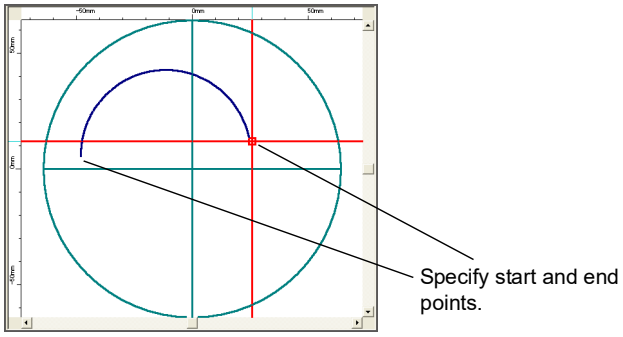
  Move the mouse to lengthen or shorten the line representing the radius. Click when the radius is the desired size.



- By specifying points

  Enter the radius in the command field. (single-byte alphanumeric)

4 Specify the start and end points of the arc.



An arc is drawn based on these conditions.

The entered details and size can be adjusted in properties. Separate machining conditions can also be applied.

[Scanning Direction]

Scanning direction (clockwise or counter-clockwise) will be set depending on how the arc is drawn. The scanning direction can be checked or changed in the [Scanning Direction] field in Properties.

- When the end point is in the clockwise direction from the start point:

  Scanning will be in the clockwise direction.

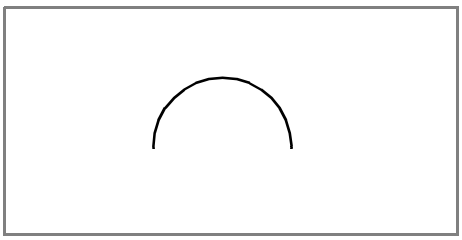
- When the end point is in the counter-clockwise direction from the start point:

  Scanning will be in the counter-clockwise direction.

7. 3-Point Arc (Specifying 3 Points to Draw an Arc)

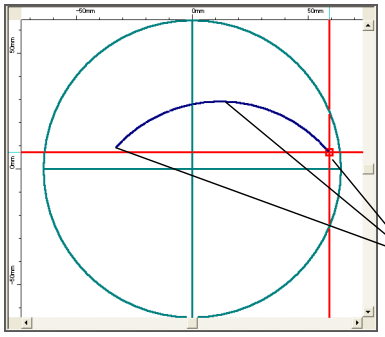
Specify three points along a circumference to draw an arc, as follows:

CAUTION	The scanning area error may occur depending on the arranged figures such as those the center coordinate is positioned outside the marking area due to its large radius. In such cases, change the arc object into the polyline object with Poly Resolve. It can be ready for scanning.



1 Click the [3-Point Arc] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [3-Point Arc].

2 Specify the arc start point, middle point, and end point (in this order).



An arc is drawn based on these conditions.

The entered details and size can be adjusted in properties. Separate machining conditions can also be applied.

[Scanning Direction]

Scanning direction (clockwise or counter-clockwise) will be set depending on how the 3-point arc is drawn. The scanning direction can be checked or changed in the [Scanning Direction] field in Properties.

- When the end point is in the clockwise direction from the start point:

  Scanning will be in the clockwise direction.

- When the end point is in the counter-clockwise direction from the start point:

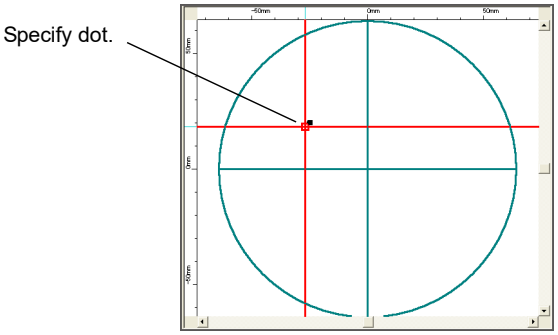
  Scanning will be in the counter-clockwise direction.

8. Spot (Drawing Dots for Spot Welding)

The scanning laser welding system can perform seam welding along lines created using SWDraw3. Spot welding can be performed by creating spots (dots for spot welding).

1 Click the [Spot] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [Spot].

2 Specify the position to place the dot.



Dots are arranged as specified.

The entered details and size can be adjusted in properties. Separate machining conditions can also be applied.

CAUTION	The dot size displayed on the screen differs from the size when welded. You can adjust the welding size and the time the shutter remains open in [Preferences].

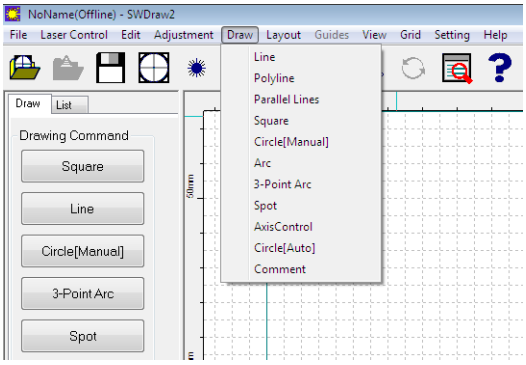
9. Axis Control (Communicates with External Devices)

This function (object) can be used for communicating with external devices.

Especially, this function is used for moving a scanner to the specific position and stopping scanning at the position temporarily. For settings for the whole transfer control, see "Chapter 6-7. System Parameters (Setting Laser Equipment Operating Conditions)"(page 101) .

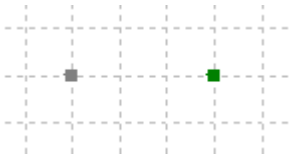
9.1. Using the Axis Control Command

1 From the menu, select [Draw] -> [Axis Control] and arrange the axis control command.



2 When arranged, the object is displayed in gray.

3 The gray object is an axis control command without coordinate translation. The green object is one with coordinate translation.



When Axis Move is [No].

Properties	Value
Object type	Axis
Object name	Axis1
Laser type	
Schedule number	0
Wave form	
Scanning Standby	0
AxisMove	No
Scanning Order	1

Update

When Axis Move is [Yes].

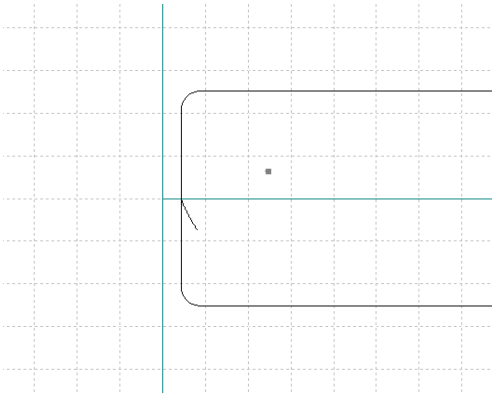
Properties	Value
Object type	Axis
Object name	Axis1
Laser type	
Schedule number	0
Wave form	
Scanning Standby	0
AxisMove	Yes
X-Coordinate (mm	-20.051
Y-Coordinate (mm	28.622
Scanning Order	1

Update

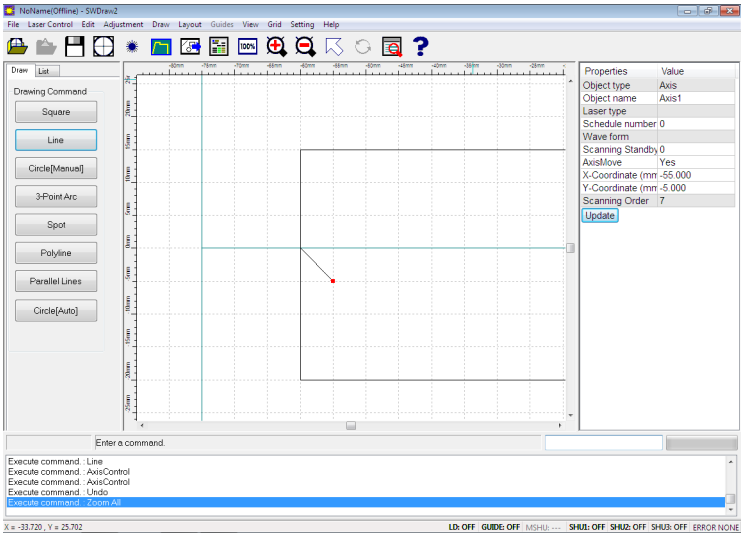
9.2. Example of Axis Control Command

Check the position (manipulate an image) at the side end.

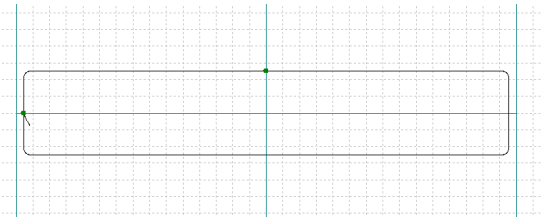
1 From the menu, select [Draw] -> [Axis Control] and arrange the axis control command.
The command should be arranged within the area.



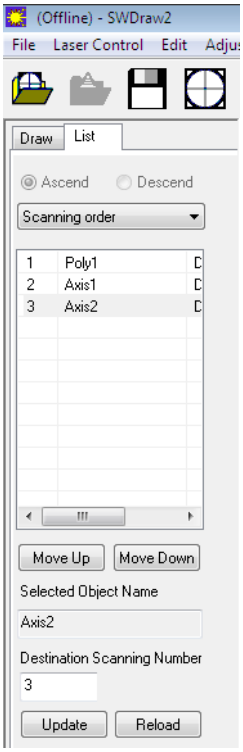
2 Select the arranged object and change the property.
Select “Yes” for [Axis Move] and input the coordinate value for moving the scanner.



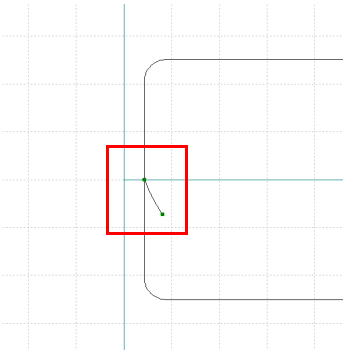
3 Similarly, arrange axis control commands on other positions you need.



4 Change the order of executing the axis control command.
When an axis control command is added, it is added to the end of the scanning order.
Change the scanning order on the Object Browser.



* The axis control command is executed in the scanning order of object. Take care of the order.
To stop the scanner at the position of orbiting scanning data, the axis control command needs to be arranged at the start point of orbiting object.



5 Save the layout as new file.

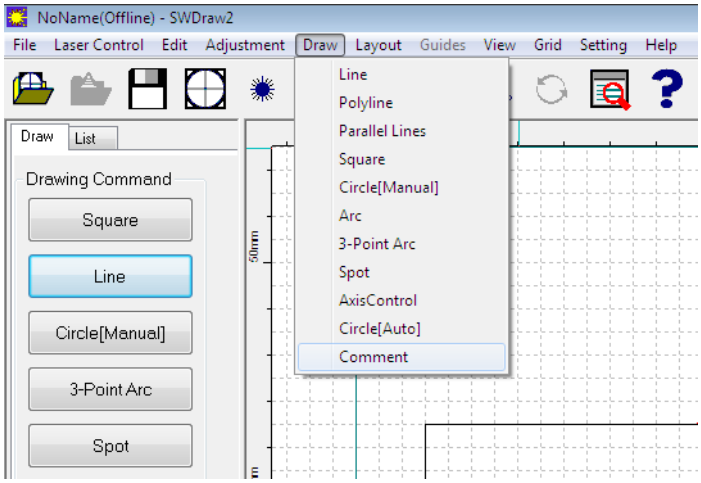
10. Comment (Entering Comments)

The information for layout data can be added regardless of scanning.

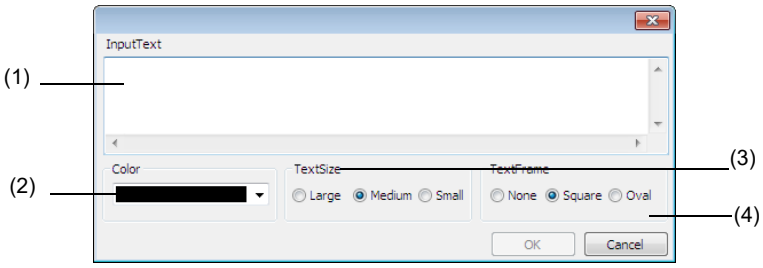
As long as the comment is arranged within the area, it does not effect the scanning even if it gets beyond the area.

10.1. Creating a Comment

1 From the menu, select [Draw] -> [Comment].



2 Enter the comment information, referring to the descriptions below.



(1) Input Text

Enter a comment.
For multiline comment, insert line feeds with the <Ctrl> + <Enter> keys.

(2) Color

Select the color used for displaying comments.

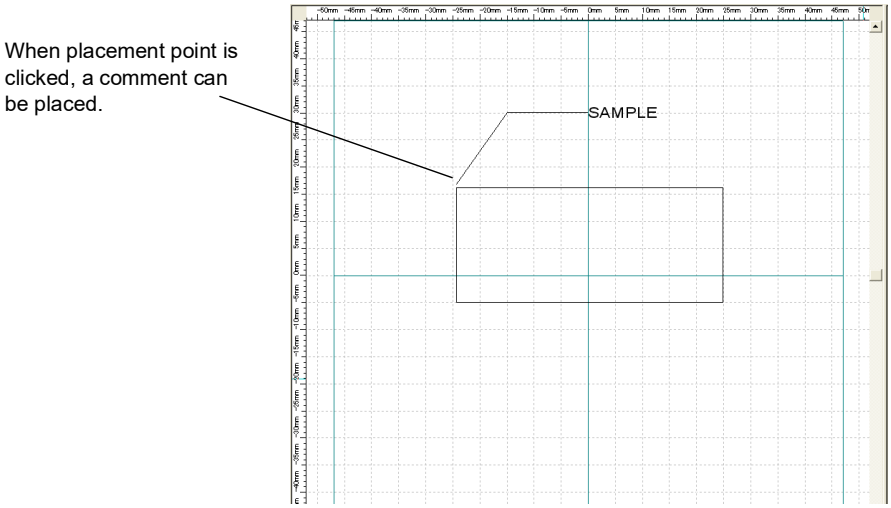
(3) Text Size

Specify the text size of comment.
The mutual text size assigned to large, medium and small is stored in SWDraw.INI to be described.

(4) Text Frame

Specify the character frame used for displaying comments.

3 Click on the coordinate to place.
1 to 3 placement points can be input.
When 2 point or more is input, a lead line is created.
For 2-point lead line, press the <Enter> key after inputting the second point.



10.2. Initial Value of Comment Information

Parameters for inputting comments are stored in “Comment” section and later in SWDraw.INI in the execution environment.

Key name	Details
TextColor	Color number which shows the comment color (0 to 31: descending order of pull-down list) Initial value: 0
TextSize	Text size 0 to 2 (0: Large 1: Midium 2: Small) Initial value: 0
FrameType	Text frame type FrameType 0 to 2 (0: None 1: Square 2: Oval) Initial value: 0
LargeSize	Text size of “Large” (in units of 0.1 mm) Initial value: 90
MediumSize	Text size of “Midium” (in units of 0.1 mm) Initial value: 60
SmallSize	Text size of “Small” (in units of 0.1 mm) Initial value: 30
FontName	Font name for single-byte “Courier New” This font is used only when all texts are single-byte. When using a text frame, be sure to specify a non-proportional font.
FontNameJP	Font name for two-byte “MS Gothic” This font is used when texts are two-byte or mix of single- and two- byte. When using a text frame, be sure to specify a non-proportional font.

Setting Example

[Comment]

TextColor=3

TextSize=0

FrameType=0

LargeSize=90

MediumSize=60

SmallSize=30

FontName=MS Gothic

10.3. Relation with Other Commands

All commands other than the Delete and the Move commands do not apply to comments.

Also, comments are not displayed in thumbnail images, which is viewed with the Open command after saved.

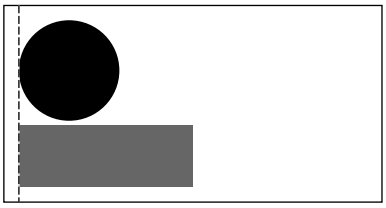
Chapter 12 Layout

1. Align Left

Figures can be aligned to the left as follows:

1 Access Selection mode. Hold the <Ctrl> key while selecting the figures for alignment.

2 From the menu, select [Layout] -> [Align Left].



The selected figures are aligned as specified.

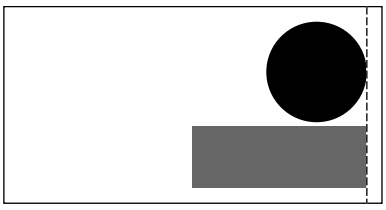
* When the figures will overlap if aligned, they are automatically adjusted to prevent them from overlapping.

2. Align Right

Figures can be aligned to the right as follows:

1 Access Selection mode. Hold the <Ctrl> key while selecting the figures for alignment.

2 From the menu, select [Layout] -> [Align Right].



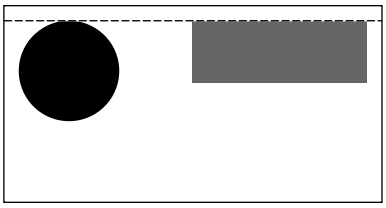
The selected figures are aligned as specified.

3. Align Top

Figures can be aligned to the top as follows:

1 Access Selection mode. Hold the <Ctrl> key while selecting the figures for alignment.

2 From the menu, select [Layout] -> [Align Top].



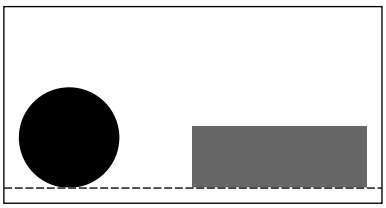
The selected figures are aligned as specified.

4. Align Bottom

Figures can be aligned to the bottom as follows:

1 Access Selection mode. Hold the <Ctrl> key while selecting the figures for alignment.

2 From the menu, select [Layout] -> [Align Bottom].



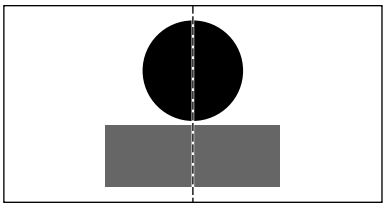
The selected figures are aligned as specified.

5. Center Horizontally

Figures can be centered horizontally as follows:

1 Access Selection mode. Hold the <Ctrl> key while selecting the figures for alignment.

2 From the menu, select [Layout] -> [Center Horizontally].



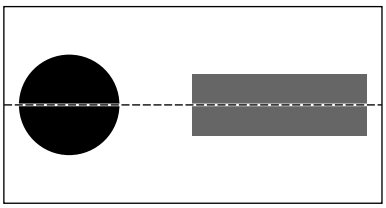
The selected figures are aligned as specified.

6. Center Vertically

Figures can be centered vertically as follows:

1 Access Selection mode. Hold the <Ctrl> key while selecting the figures for alignment.

2 From the menu, select [Layout] -> [Center Vertically].



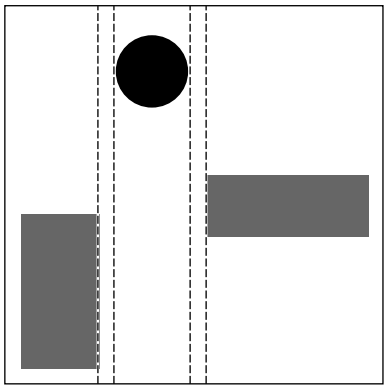
The selected figures are aligned as specified.

7. Justify Horizontally

Figures can be justified horizontally as follows:

1 Access Selection mode. Hold the <Ctrl> key while selecting the figures for alignment.

2 From the menu, select [Layout] -> [Justify Horizontally].



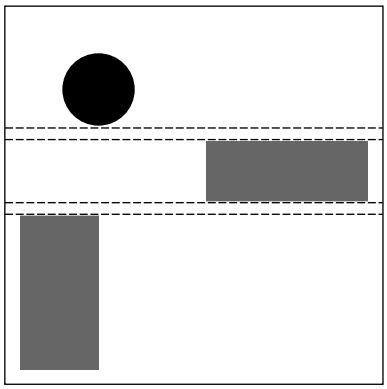
The selected figures are aligned as specified.

8. Justify Vertically

Figures can be justified vertically as follows:

1 Access Selection mode. Hold the <Ctrl> key while selecting the figures for alignment.

2 From the menu, select [Layout] -> [Justify Vertically].

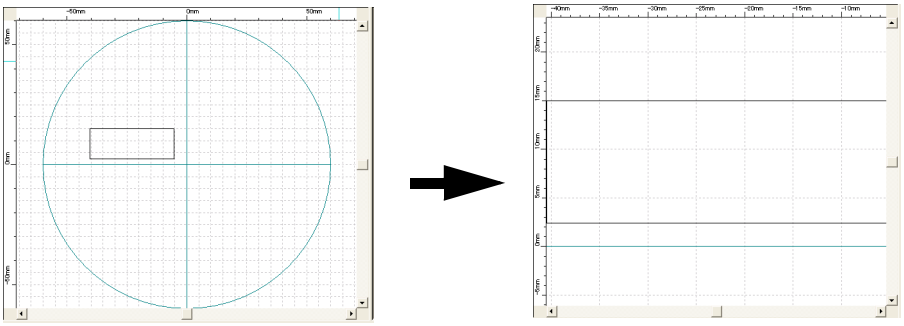


The selected figures are aligned as specified.

Chapter 13 View

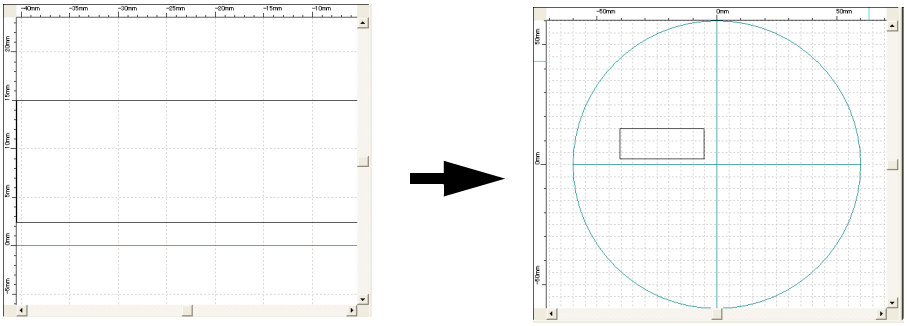
1. Zoom Extents

To display only the area occupied by figures, from the menu select [View] -> [Zoom Extents]. Only the area occupied by figures will be enlarged and displayed.



2. Zoom All

To return the display to the default view, from the toolbar, click the [Zoom All] button or select [View] -> [Zoom All] from the menu. The screen reverts to a 100% view.

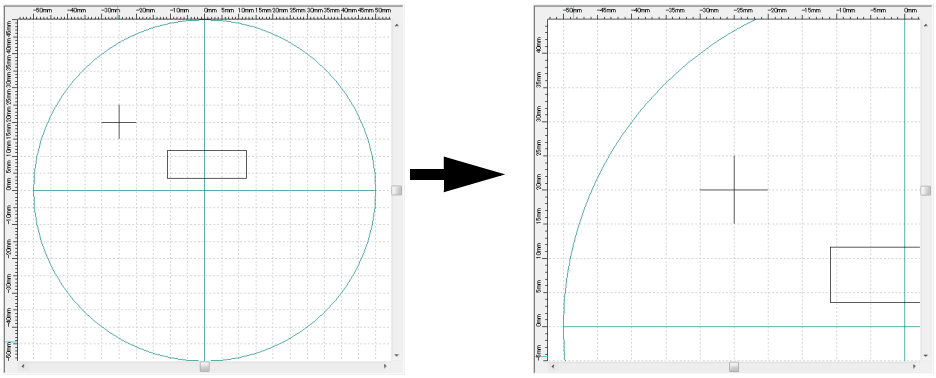


3. Zoom In

To zoom in, from the toolbar, click the [Zoom In] button. Or select [View] -> [Zoom In] from the menu.

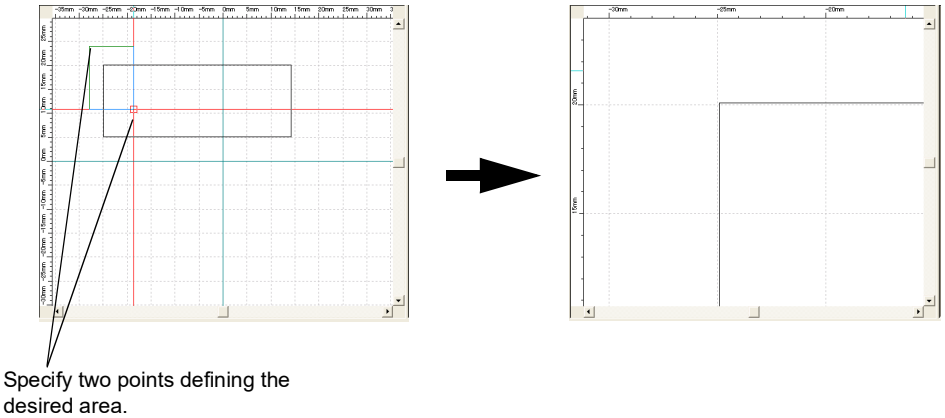
Clicking the [Zoom In] button from the toolbar zooms in for a closer view, focusing on the center of the screen.

When selecting the command from the menu, click the left mouse button at a point to display the point at the center of the screen (layout). After zooming, shift the layout so that the specified point is located at the center.



4. Zoom Selection

To zoom in by specifying the viewing area, select [View] -> [Zoom Selection] from the menu. Specify two points around the desired area in the layout area to display an enlarged view of that area.

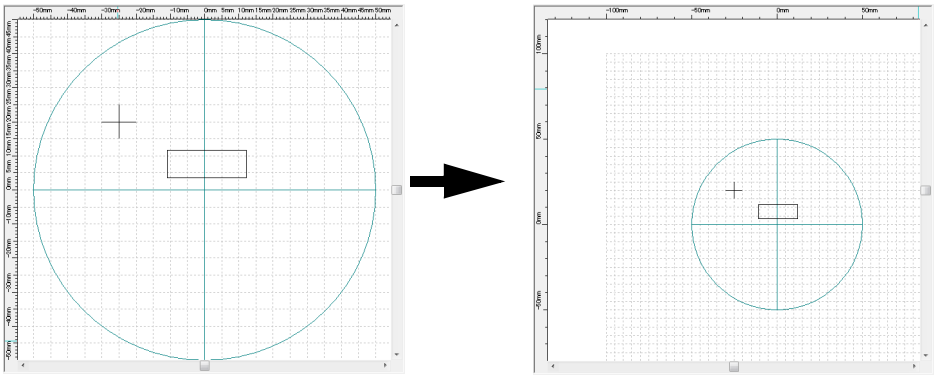


5. Zoom Out

To zoom out, from the toolbar, click the [Zoom Out] button. Or select [View] -> [Zoom Out] from the menu.

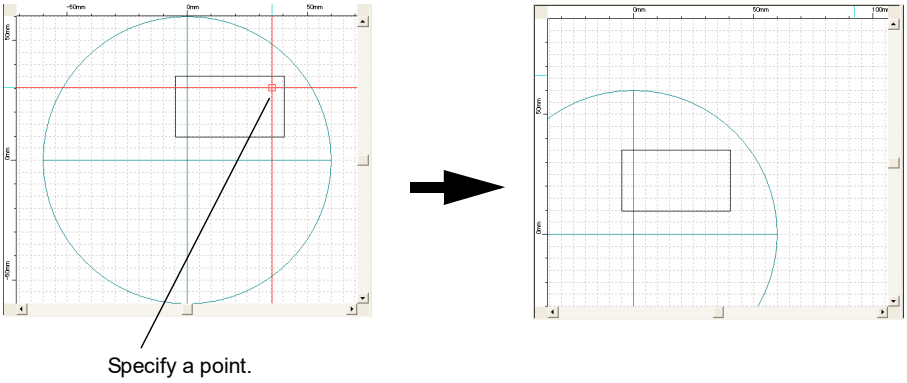
Clicking the [Zoom Out] button from the toolbar zooms out for a broader view, focusing on the center of the screen.

When selecting the command from the menu, click the left mouse button at a point to display the point at the center of the screen (layout). After zooming, shift the layout so that the specified point is located at the center.



6. Pan

To pan the view by specifying the center point, from the menu, select [View] -> [Pan]. Specify one point in the layout area to become the center of the viewing area.



7. Show/Hide Grid

The grid is a set of evenly spaced dots displayed in the active layout area to help in figure arrangement. These dots are only displayed in the layout area. They are not welded.

The grid can be used with the snap function to snap the cursor to the grid. In this way, accurate drawings are possible even with rough mouse operations.

To show the grid, from the menu, select [View] -> [Show/Hide Grid].

For details, refer to "Chapter 14-1. Grid Spacing" (page 244) .

8. Refresh

Select [View] -> [Refresh] from the menu to clear artifacts (images inappropriately left on the screen).

9. Show/Hide Sketch

To toggle between showing and hiding sketches, choose [Show/Hide Sketch] from the [View] menu.

10. Edit Sketch

Sketches cannot be edited in regular Layout Edit mode. Instead, select Sketch Edit mode from the menu. Select [View] -> [Edit Sketch] and then select the [Edit Sketch] menu. Note that in Sketch Edit mode, you cannot edit figures other than sketches.

To exit Sketch Edit mode, select [Edit Sketch] again from the [View] menu.

Figures are edited using the same drawing operations used in regular drawing in the layout area. The [Adjustment] menu can be operated only in the Selection mode.

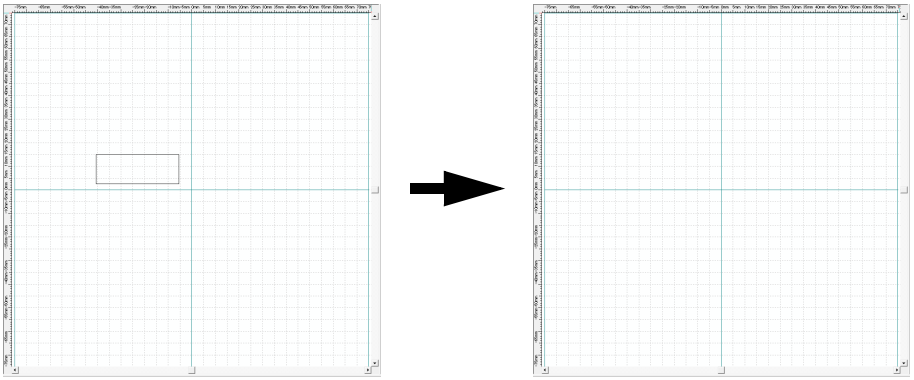
11. Show/Hide Overlap

To toggle between showing and hiding overlap portions, choose [Show/Hide Overlap] from the [View] menu.

12. Show/Hide Gridwork Area

To toggle between showing and hiding the Gridwork area, choose [Show/Hide Gridwork Area] from the [View] menu.

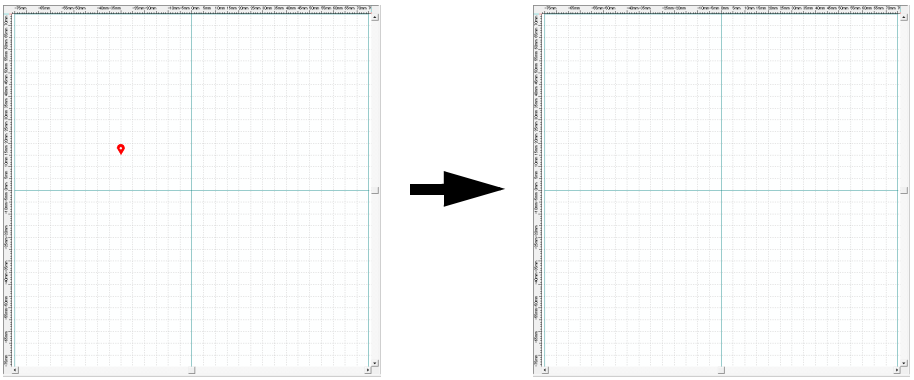
For details, refer to "Chapter 7-1.3. Using Partial Range as Sketch" (page 116) .



13. Show/Hide Landmark

To toggle between showing and hiding landmarks, choose [Show/Hide Landmark] from the [View] menu.

For details, refer to "Chapter 7-1.1. [Capture] Screen Arrangement" (page 111) .



Chapter 14 Grid

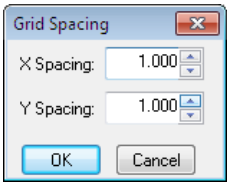
1. Grid Spacing

Set the grid dot spacing as shown below.

1 From the menu, select [Grid] -> [Grid Spacing].

The [Grid Spacing] screen is displayed.

2 Specify the values, referring to the table below. Click the [OK] button when finished.



Grid Settings

Item	Setting Details	Range (Default)	Pitch
X Spacing	Specifies the spacing along the horizontal axis.	0.1 to 100 (1.000)	0.1
Y Spacing	Specifies the spacing along the vertical axis.	0.1 to 100 (1.000)	0.1

2. Grid Origin

To draw with the cursor using the snap to grid function, follow these steps.

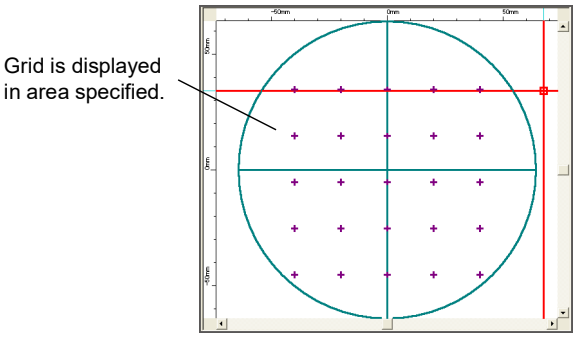
1 Display the grid.

1) From the menu, select [Grid] -> [Grid Origin].

2) Specify the grid origin in the layout area.

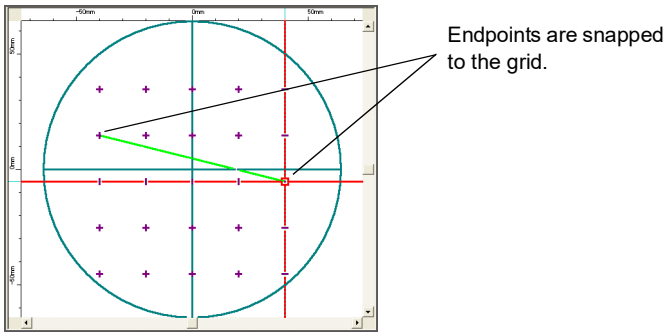
3) Specify the area in which to display the grid.
This can be selected by specifying the start and end points of the area.

The grid is displayed in the specified area.
To adjust the grid spacing, repeat this procedure from step 1.



2 Draw figures as desired. Draw lines here as an example.

The cursor snaps to the grid and cannot be clicked at other locations in the grid display area. Figure defining points will therefore always be arranged on the grid points.



The grid cannot be permanently removed.

It can be hidden, however, to deactivate grid functions and to permit free drawing. To toggle the grid display on and off, select [View] -> [Show/Hide Grid] from the menu.

3. Snap Setting

Set the snap function for endpoints and center points to snap the cursor to the grid when drawing lines using the mouse. In this way, accurate drawings are possible even with rough mouse operations.

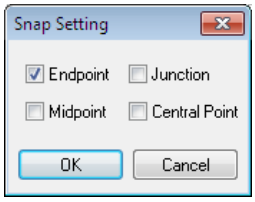
To have the cursor snap to specific points on objects as you draw, follow these steps.

1 Define the points to snap to.

1) From the menu, select [Grid] -> [Snap Setting].

The [Snap Setting] screen is displayed.

2) Select the points to snap to, referring to the table below. In this example, [Endpoint] is selected.

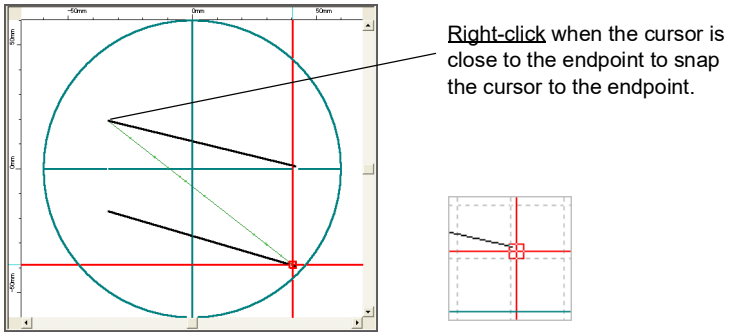


Snap Settings

Item	Setting Details
Endpoint	Snap to line endpoints.
Junction	Snap to line intersections.
Midpoint	Snap to the middle points of lines.
Central Point	Snap to the center point of circles or arcs.

3) Click the [OK] button.

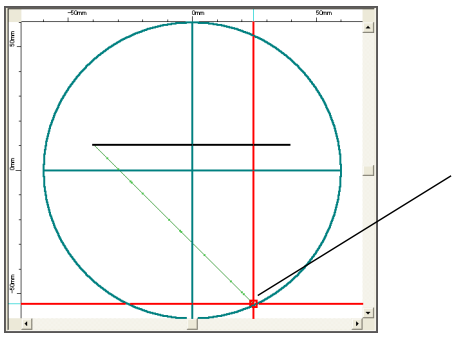
2 When the cursor is close to the specified point (in this example, an endpoint), right-click. The cursor snaps to the point.



ATTENTION	When the cursor is at the middle of line, it snaps to the closer endpoint.

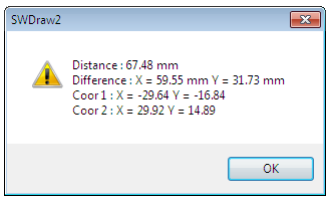
4. Angle Correction

To restrict the angle of drawn lines automatically to 45-degree increments, from the menu, select [Grid] -> [Angle Correction].



5. Distance Measurement

To measure the distance between specified two points, from the menu, select [Grid] -> [Distance Measurement].



Chapter 15 Setting

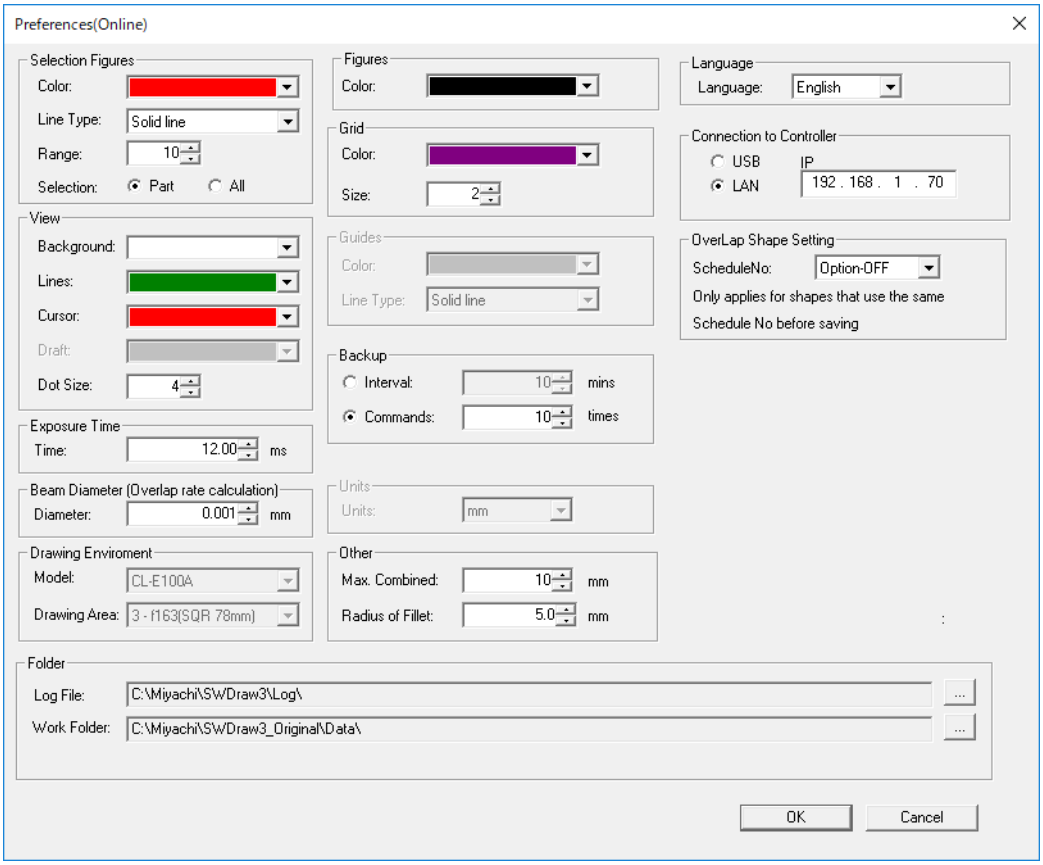
1. Preferences

Follow these steps to specify operations for basic Drawing screen functions.

1 Click the [Preferences] button on the toolbar, or from the menu, select [Setting] -> [Preferences].

The [Preferences] screen is displayed.

2 Specify operations for basic Drawing screen functions, referring to the following table.



Preference Settings (1 / 2)

Item		Setting Details	Range
Selection Figures	Color	Selects the display color of selected figures.	—
	Line Type	Selects the line type.	—
	Range	Specifies the cursor size.	1 to 50
	Selection	Specifies the way in which objects are selected by specifying an area. Part: Objects are selected when an area containing part of the object is selected. All: Objects are selected when an area containing the entire object is selected.	Part/All
View	Background	Selects the layout area background color.	—
	Lines	Selects the color of lines when drawing.	—
	Cursor	Selects the cursor color.	—
	Dot Size	Specifies the display size of dots to be welded using shutter control.	1 to 50
Exposure Time*1		Specifies the laser emission time from the moment the shutter is opened.	0.00 to 20,000,000.00 ms
Beam Diameter (Overlap rate calculation)		Input the beam diameter to calculate the lap rate for reference when the object other than spot is selected alone. The lap rate depends on the laser equipment.	0.001 to 10 mm
Drawing Environment	Model	Indicates the laser equipment type currently set in the laser control unit when online. This cannot be changed. The laser equipment can be set as desired when offline.	—
	Drawing Area	Indicates the drawing area currently set in the laser control unit when online. This cannot be changed. The drawing area can be set as desired when offline.	—
Figures	Color	Selects the figure color.	—
Grid	Color	Selects the grid color.	—
	Size	Specifies the grid point size.	0 to 50
Backup*2	Interval	Backs up data at the specified interval.	1 to 32767
	Commands	Backs up data after the specified number of commands.	1 to 32767
Other	Max. Combined	Sets the permissible distance for two figures when joined together. Ignored when an arc is transformed into a circle.	1 to 9999 mm
	Radius of Fillet	Sets the default fillet radius for filleting.	0.0 to 99.9 mm
Language*3		Switches the language between Japanese and English when a Japanese operating system is used.	—

Preference Settings (2 / 2)

Item		Setting Details	Range
Connection to Controller		Specifies the way to connect between the computer and the laser control unit. (See "Chapter 2-2. Basic Settings" (page 25) .) USB:Connects with the laser control unit by USB. LAN:Connects with the laser control unit by LAN. Set the IP address.	USB/LAN
OverLap Shape Setting		Select [Option-ON] to re-set the schedule and switch the schedule for the overlapped figure with successive same schedule number when the layout is saved.	—
Folder	Log File	Specifies the location in which the system log file is saved. Select a directory from the displayed dialog box after clicking the Browse button.	—
	Work Folder	Specifies the location in which user-created files (layouts, figures, machining conditions) are saved. Select a directory from the displayed dialog box after clicking the Browse button.	—

*1 This setting becomes the default value for [Open Time] of spot.

*2 Open layout files and figure files are saved automatically during drawing to prevent accidental loss of data.

*3 When selecting English, set the setting of computer to the English mode not to garble characters.

3 Click the [OK] button to save the settings.

A message is displayed confirming that you have saved the preferences. Click the [OK] button to close.

4 Click the [Cancel] button or the Close box ([x] button) in the top-right corner of the screen when you have finished performing the settings.

CAUTION	If you have not saved the settings details described in step 3, the changes you have made will not be applied.

System preferences settings are now complete.

Chapter 16 Object Browser

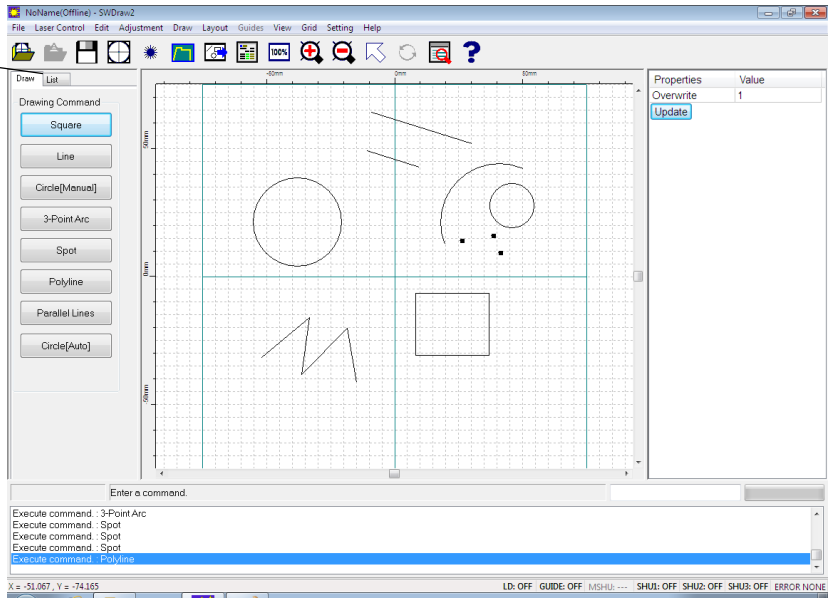
1. Overview

The Object Browser is a function which lists all of the figures (objects) that are currently arranged. It is useful for checking what figures make up a layout and for checking and changing machining conditions by selecting individual figures.

2. Checking Object Properties in Object Browser

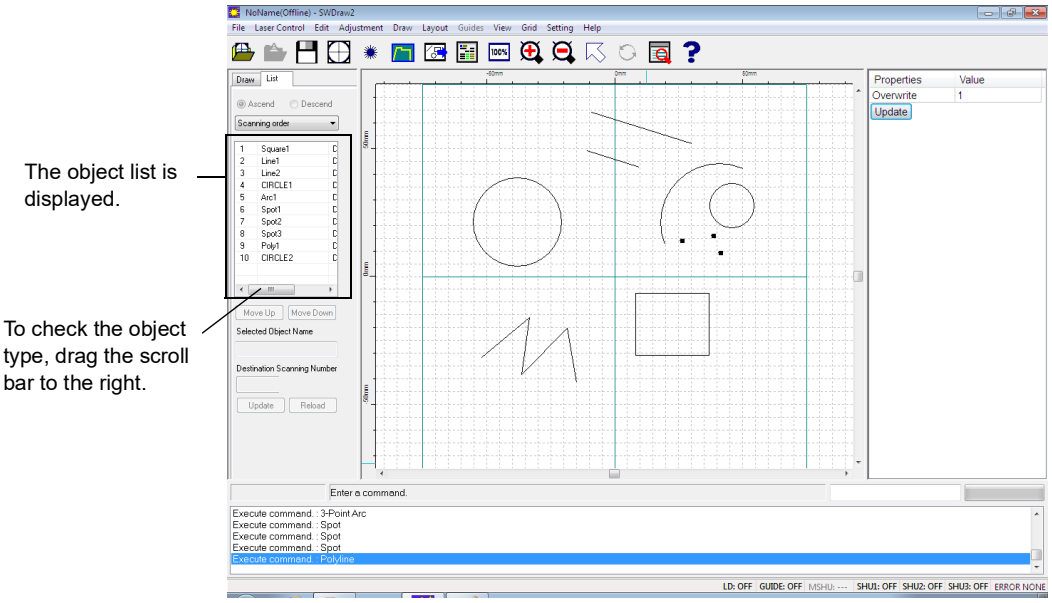
1 Select the [List] tab.

Select [List] tab.

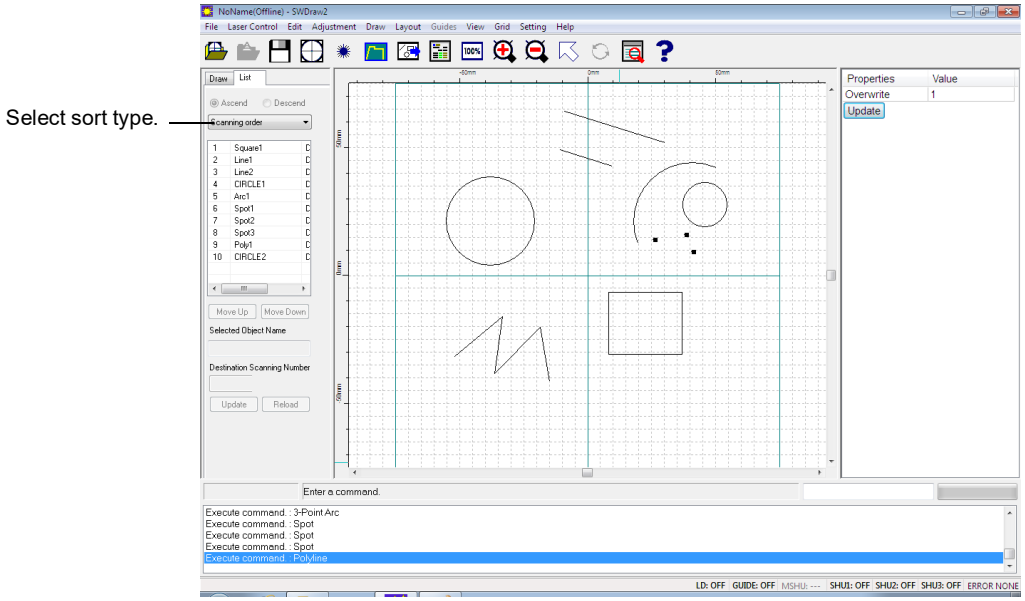


The Object Browser is displayed.

2 Check the object list. The Object Browser lists the object scanning numbers, assigned names (object names), and object types. The object names are determined by the figure type.



3 To sort the list, click the list box at the top of the list, and select the sort criteria. The list can also be sorted in ascending or descending order depending on the sort type. The list can be sorted according to the following types.



Object Browser Sort Item

Item	Ascending Order	Descending Order	Remarks
List	Object names are sorted in alphabetical order.		• Since the same name cannot be specified, the secondary key is not specified. • Names are compared as character strings. For example, the ascending order of names is [Line1, Line10, Line11, Line2].

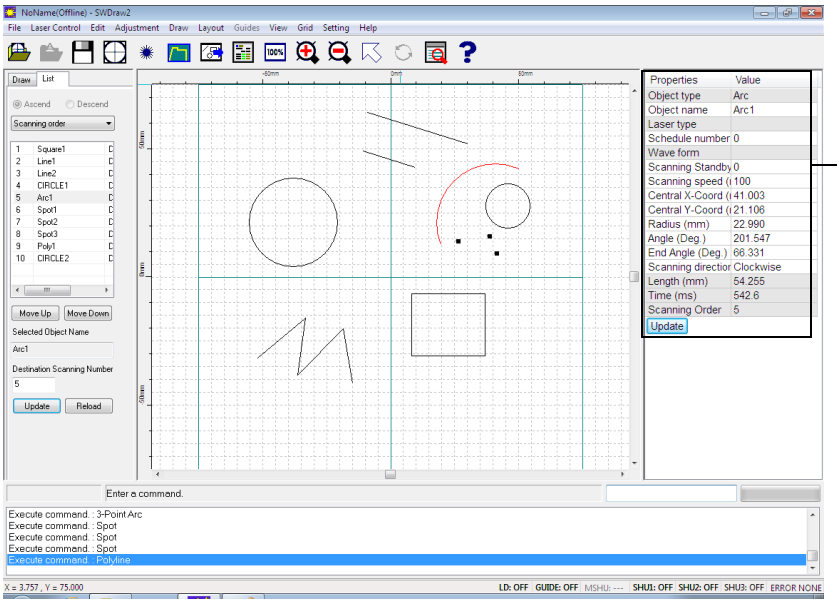
Object Browser Sort Item

Item	Ascending Order	Descending Order	Remarks
Type	Objects are sorted by type. Objects of the same type are sorted in scanning order.		The ascending order of object type is as follows: Line Polyline Square Arc Circle [Auto] Spot Circle [Manual] Axis Control
Scanning order	Sorted in scanning order.*1		
Distance & Time	Objects are sorted in scanning order and the distance and time from the previous object are displayed.*1		

*1 Ascending Order and Descending Order cannot be selected.

4 Select an object from the list to check its properties. Objects can also be selected on the layout area.

The object properties are displayed in the Properties box. The properties can be altered as necessary.



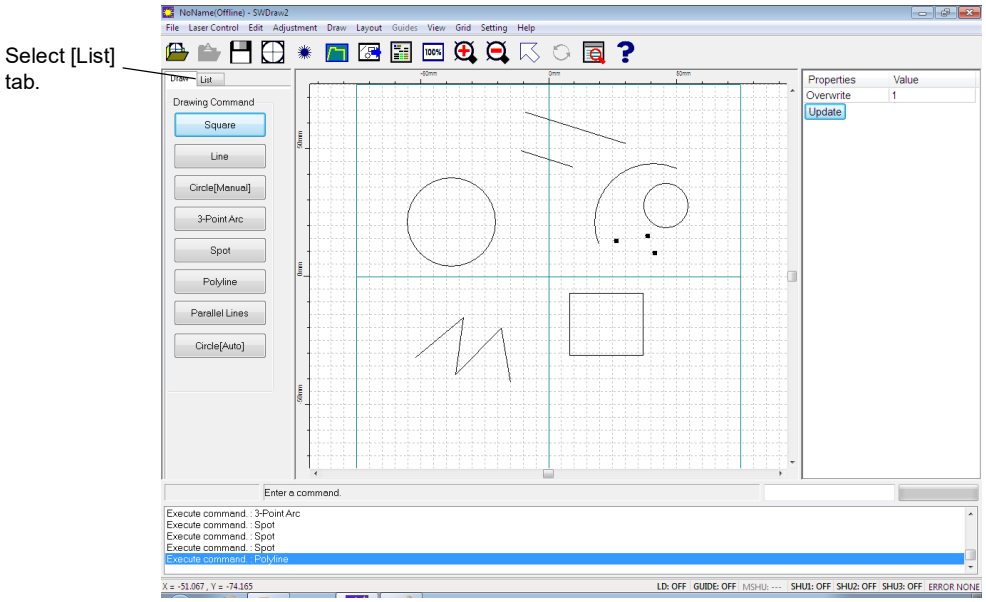
5 Select the [Draw] tab to return to the Drawing command.

Checking is now complete.

3. Changing Scanning Order in Object Browser

The scanning order can be checked and changed using Object Browser.

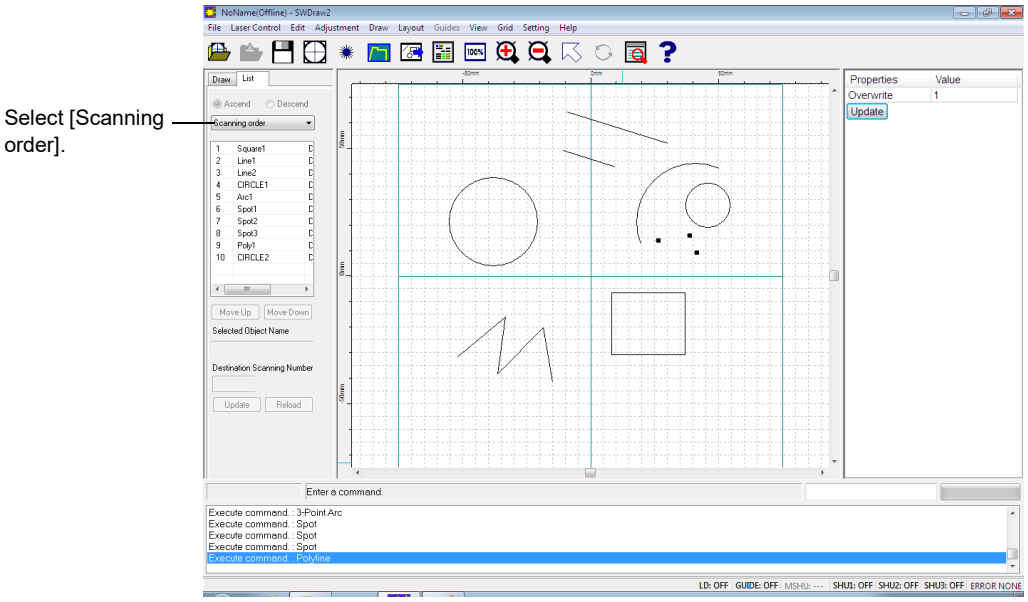
1 Select the [List] tab.



The Object Browser is displayed.

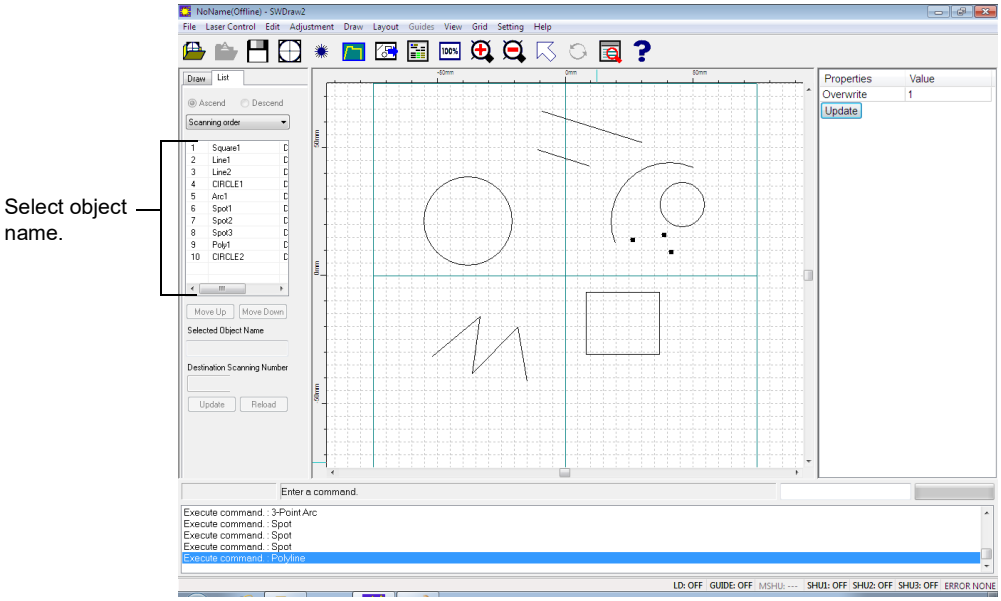
CAUTION	This cannot be selected while editing parts or sketches.

2 Select [Scanning order] in the list box at the top of the list.



Sorted in scanning order.

3 Select a figure to change its scanning order.

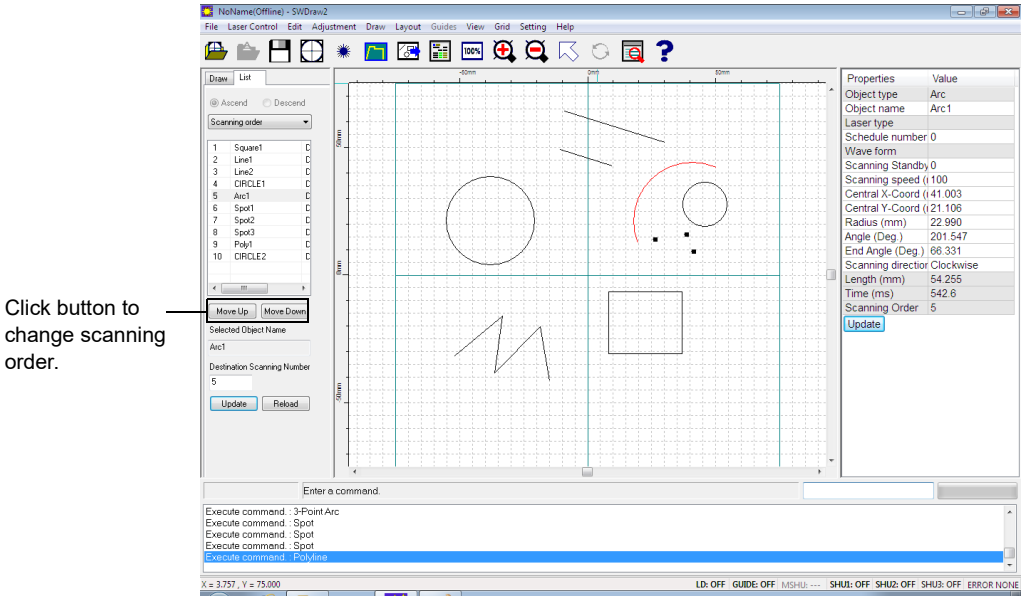


The object name selected in [Selected Object Name] is displayed and the corresponding figure is displayed in red on the layout area.

4 Change the scanning order.

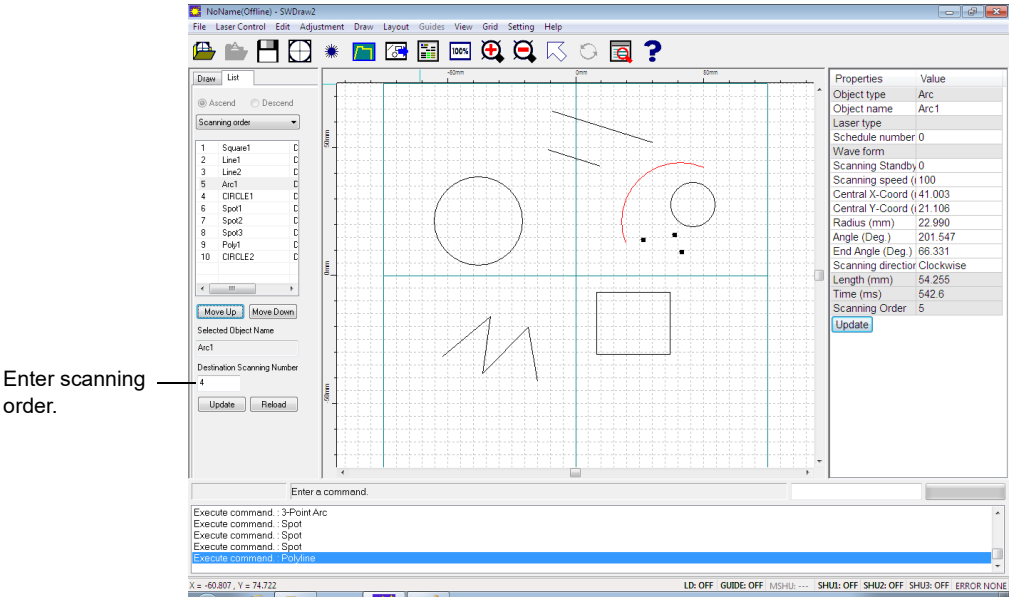
- To increment or decrement the scanning order:

  Click the [Move Up] or [Move Down] button to increment or decrement the scanning order.



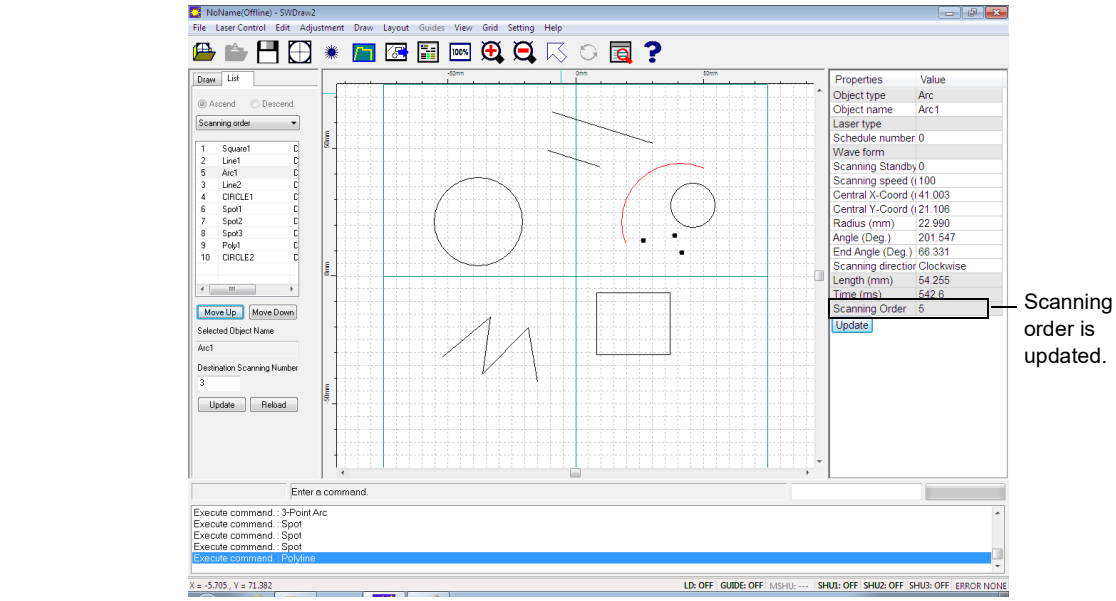
- To specify the new scanning order:

  Enter the scanning order in [Destination Scanning Number].



5 Click the [Update] button.

The scanning order is set and the [Scanning Order] is updated in the Properties box. Setting the scanning order increments or decrements the scanning order of the other objects accordingly.



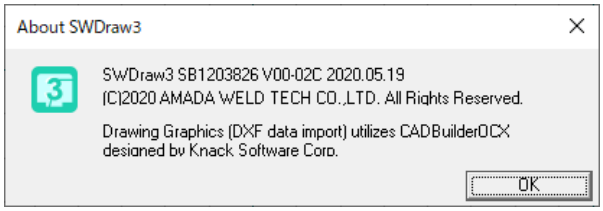
Click the [Reload] button to return to the original Object Browser scanning order without setting the scanning order.

Chapter 17 Help

1. About SWDraw3 (Checking SWDraw3 Version Information)

1 Either click the [Help] button on the toolbar, or from the menu, select [Help] -> [About SWDraw3].

The [About SWDraw3] screen is displayed.



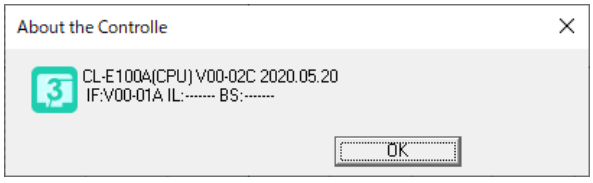
2 After confirming the version, click the [OK] button.

The version screen closes.

2. About the Controller (Checking the Laser Control Unit Software Version)

1 When online, select [Help] -> [About the Controller] from the menu.

The [About the Controller] screen is displayed.



2 After confirming the version, click the [OK] button.

The version screen closes.

Chapter 18 Right-click Menus

1. General Right-click Menu

The following table lists the general right-click menus and their corresponding functions.

General Right-click Menu Function List

Menu	Submenu	Function
Undo	—	Undoes the previous action. <Ctrl> + <Z> also has the same action.
Redo	—	Repeats the action that was undone. <Ctrl> + <Y> also has the same action.
Delete	—	Deletes the selected figures.

2. Right-click Menu When No Figure is Selected

The following table lists the right-click menus and their corresponding functions when no figure is selected.

Right-click Menu List When No Figure is Selected (1 / 2)

Menu	Submenu	Function
Selection Mode	—	Switches to Selection Mode. Displays the properties of selected figures.
Copy	—	Creates a copy of the figures.
Move	—	Moves figures.
Laser Control	Control	Checks the laser equipment status, performs welding, and performs laser control.
	Schedule	Specifies the laser output conditions.
	Batch Transfer	Transfers layout files to the laser control unit.
Draw	Line	Draws a line.
	Polyline	Draws a polyline.
	Parallel Lines	Draws a line parallel to an existing line.
	Square	Draws a rectangle.
	Circle [Manual]	Draws a circle with overlap.
	Arc	Draws an arc of specific radius.
	3-Point Arc	Draws an arc from three specific points on a circle.

Right-click Menu List When No Figure is Selected (2 / 2)

Menu	Submenu	Function
Draw (continued)	Spot	Draws points by controlling the shutter.
	Axis Control	Communicates with external devices.
	Circle [Auto]	Draws a conventional circle.
View	Zoom Extents	Narrows view to the area containing the figures.
	Zoom All	The screen reverts to a 100% view.
	Zoom In	After zooming, centers the point clicked on with the left mouse button.
	Zoom Selection	Zooms in on the selected area.
	Zoom Out	After zooming, centers the point clicked on with the left mouse button.
	Show/Hide Grid	Shows or hides grid lines.
	Refresh	Updates the screen display.
Setting	Preferences	Sets the operation of the basic application functions.

3. Right-click Menu When a Figure is Selected

The following table lists the right-click menus and their corresponding functions when one figure is selected.

Right-click Menu List When One Figure is Selected

Menu	Submenu	Function
Rotation Mode	—	Rotates the line segment in Selection Mode.
Copy Selected*1	—	Copies the figure currently selected.
Move Selected*1	—	Moves the figure currently selected.
Adjustment	Resolve Selected	Splits the selected figure.
	Divide Selected	Divides the selected figure.
	Unite Selected	Transforms the selected arc into a circle.
	Add Const. Pt Selected	Adds a construction point to the selected figure.
	Delete Const. Pt Selected	Deletes a construction point of the selected figure.
	Unite Poly Selected	Transforms the selected figure into a polyline.

*1 Right-click menu items used after selecting a figure

There are three ways to use right-click menu items such as Copy Selected and Move Selected after selecting figures, as shown below.

- Right-click on the figure to be selected.
- Right-click while pressing the <Ctrl> key with a figure selected.
- Right-click outside the drawing screen with a figure selected.

This enables only the required figures to be selected for setting. For example, using the normal Copy command selects the figures to be copied within an area, and so may also select unwanted figures. Copy Selected allows figures to be copied without including unwanted figures.

4. Right-click Menu When Multiple Figures are Selected

The following table lists the right-click menus and their corresponding functions when multiple figures are selected. Multiple figures can be selected in one go by dragging around the figures with the mouse.

Right-click Menu List When Multiple Figures are Selected

Menu	Submenu	Function
Copy Selected*1	—	Arranges copies of the selected figures.
Move Selected*1	—	Moves the selected figures.
Adjustment	Unite Selected*1	Joins the selected figures.
	Unite Poly Selected*1	Joins the selected figures to create a polyline.
Layout	Align Left	Aligns figures to the left.
	Align Right	Aligns figures to the right.
	Align Top	Aligns figures to the top.
	Align Bottom	Aligns figures to the bottom.
	Center Horizontally	Centers figures horizontally.
	Center Vertically	Centers figures vertically.
	Justify Horizontally	Justifies figures horizontally.
	Justify Vertically	Justifies figures vertically.
Object	(Displays the object names of the figures arranged.)	Selects the selected objects. Deselects the objects selected so far.

*1 Right-click menu items used after selecting figures

There are two ways to use right-click menu items such as Select Copy and Move Selected after selecting figures, as shown below.

- Right-click while pressing the <Ctrl> key with a figure selected.
- Right-click outside the drawing screen with a figure selected.

This enables only the required figures to be selected for setting. For example, using the normal Copy command selects the figures to be copied within an area, and so may also select unwanted figures. Select Copy allows figures to be copied without including unwanted figures.

Chapter 19 Available Functions Depending on Object Type

		Line	Polyline	Parallel Lines *1	Square	Circle [Manual]	Arc *2	3-Point Arc *2	Spot	Axis Control	Circle [Auto]	Comment
Delete		○	○	○	○	○	○	○	○	○	○	○
Copy		○	○	○	○	○	○	○	○	○	○	×
Copy and Rotate		○	○	○	×	○	○	○	○	○	○	×
Copy and Invert		○	○	○	×	○	○	○	○	○	○	×
Move		○	○	○	○	○	○	○	○	○	○	○
Move and Rotate		○	○	○	×	○	○	○	○	○	○	×
Move and Invert		○	○	○	×	○	○	○	○	○	○	×
Trim		○	×	○	×	×	×	×	×	×	×	×
Trim Junction		○	○	○	×	○	○	○	×	×	○	×
Selection Mode		○	○	○	○	○	○	○	○	○	○	×
Rotation Mode		○	×	○	×	×	×	×	×	×	×	×
Poly Resolve		×	○	×	×	×	×	×	×	×	×	×
Square Resolve		×	×	×	○	×	×	×	×	×	×	×
Divide		○	×	○	×	×	○	○	×	×	×	×
Arc to Poly		×	×	×	×	×	○	○	×	×	×	×
Unite		○	×	○	×	×	○	○	×	×	×	×
Unite Poly		○	○	○	×	×	○	○	×	×	×	×
Fillet		○	○	○	×	×	×	×	×	×	×	×
Add Const. Pt		○	○	○	×	×	×	×	×	×	×	×
Delete Const. Pt		○	○	○	×	×	×	×	×	×	×	×
Scanning Order	Auto	○	○	○	×	×	○	○	×	×	○	×
	Reverse	○	○	○	×	○	○	○	×	×	○	×
	Check	○	○	○	○	○	○	○	×	×	○	×

○ : Available ×: Unavailable

*1 Parallel Lines is the same as Line after drawn.

*2 Arc and 3-Point Arc are the same properties after arranged.

Index

S

T

U

V

X

Y

Z