Software for Laser Scanning System for Welding

SWDraw2

OPERATION MANUAL

ABOM1201123-08

About This Documentation

Thank you for purchasing our SWDraw2 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 SWDraw2 application for laser scanning system for welding. For installation, maintenance, and specifications of the laser scanning system for welding, refer to each manual for the laser scanning system for welding as needed.

1. Note

- This manual is intended for laser scanning systems for welding equipped with SWDraw2 (GWM-STD/SHG/MHP/PFL/DDL/FL/STD2-000/STD2-001/STD2-002/ MHP2-000/DDL2-000). Figures and screenshots are based on the GWM-PFL, unless information for other laser welding systems is significantly different.
- 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.

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 SWDraw2 Overview

1. Features

SWDraw2 is a high-speed multi-spot welding PC application which retains the ease-of-use and functions of LMDraw, a benchmark laser-marking software application.

By combining with following laser equipments, consistent, high-quality, high-speed multi-spot welding can be achieved.

GWM-STD/STD2-000: ML-2000 Series, ML-6000/6700/6800B Series
GWM-SHG: ML-8150A
GWM-MHP/MHP-000: ML-6900 Series
GWM-PFL/STD2-001: ML-3000 Series
GWM-DDL/DDL-000: ML-5100 Series
GWM-FL/STD2-002: ML-6800C/MF-C Series

- 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 SWDraw2, the Welding Application

The SWDraw2 application must be installed to control the laser equipment from a computer. For the corresponding operating system, refer to each manual for laser scanning system for welding.

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.

SWDraw2 is not intended for the touch panel operation with Windows 10 and Windows 11 (including tablet). Operations with keyboard and mouse are explained.

CAUTION	You must have Administrators rights to install and use SWDraw2. Only a user with Administrators rights can operate SWDraw2.

CAUTION	If SWDraw2 is already installed on your computer, uninstall it according to the following procedure by selecting [Control Panel] from the Start menu. Right-click [SWDraw2] from [Programs and Features], and select [Uninstall]. Do not start SWDraw2 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 SWDraw2.

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. In Windows Vista or later, 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.

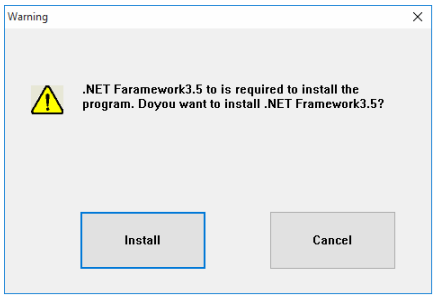
1 Close all applications.

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. When .NET Framework 3.5 has not been installed, go to Step 4. For other operating systems, go to Step 7.

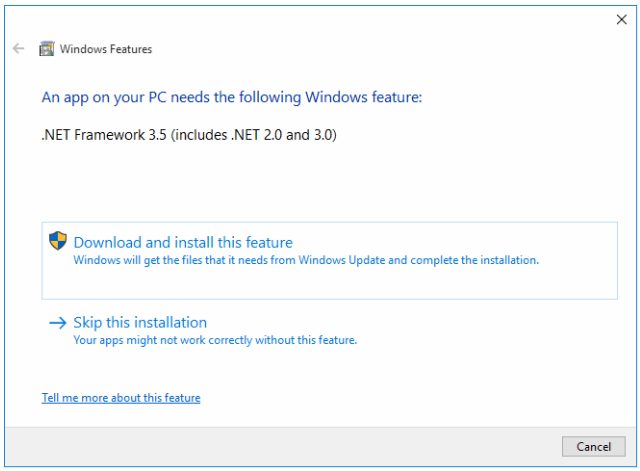
If the above screen is not displayed, open the DVD drive using the Explorer and double-click the Auto-run.exe.

4 When .NET Framework 3.0 or 3.5 has not been installed on the computer, the following screen is displayed. Click the [Install] button to install .NET Framework 3.5. When the [Install] button is selected, continue to Step 5.

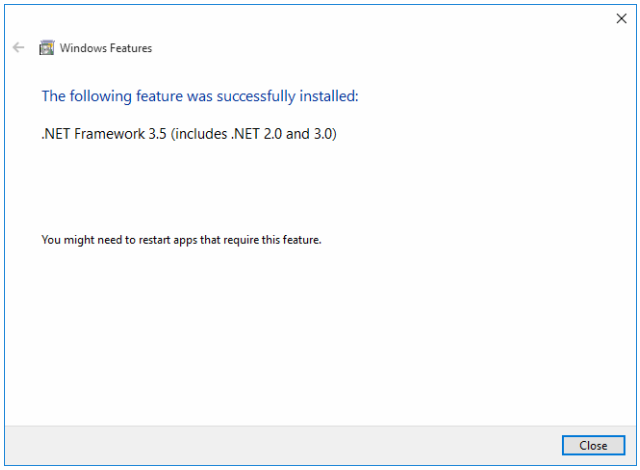


CAUTION	To install .NET Framework 3.5, internet environment is required to download the software.

5 Select [Install this feature]. Wait until the installation of necessary file is started. When the installation is complete, continue to Step 6.



6 After confirming that it was successfully installed, click the [Close] button.



7 Click the [Install Program] button of the launcher (Autorun.exe).

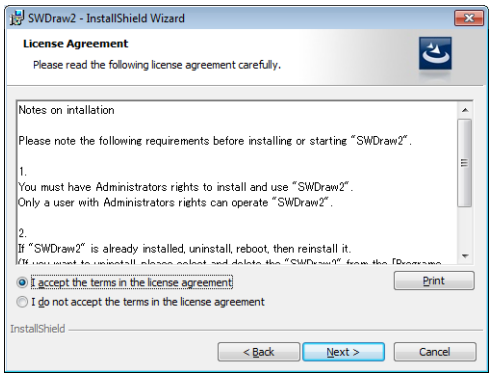
CAUTION	Do not double-click the [Install Program] button. You may fail to install it if more than one installer is launched at a time.

Both of programs for 32-bit and 64-bit are contained in the DVD. 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.

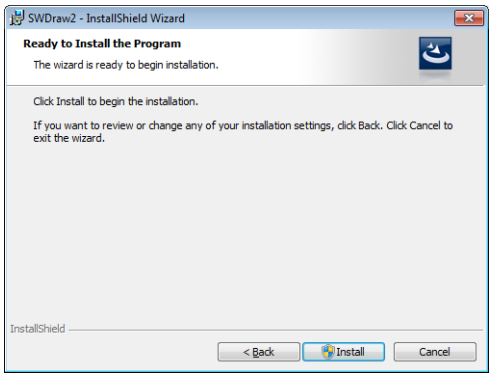
There are radio buttons for selecting language, and the program with the selected language is installed. If the Japanese version is installed on the English operating system and appropriate fonts are not installed on your computer, however, the characters are garbled and the application does not operate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

8 Click the [Next] button.

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

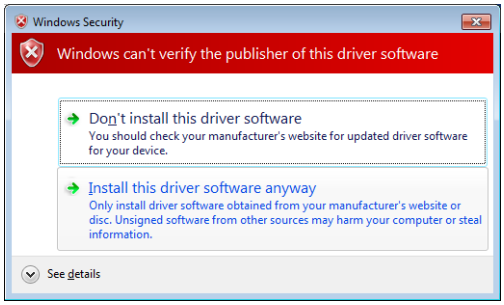


10 Cick the [Install] button.

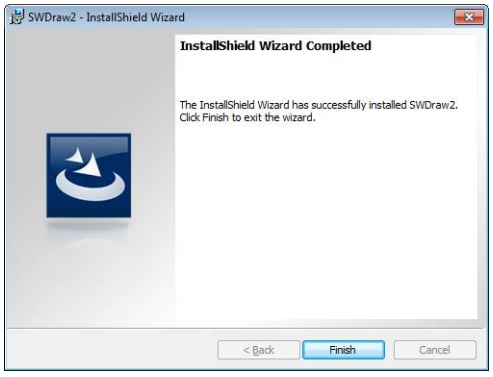


File copying will begin

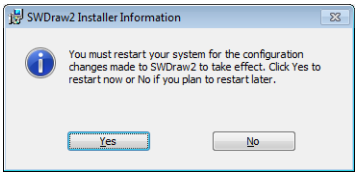
11 When the confirmation screen is displayed, click [Install this driver software anyway] to install it. (The screen display may differ.)



12 The following screen is displayed after SWDraw2 is installed. Click the [Finish] button to close the screen.



13 The screen which prompts you to reboot the computer is displayed. First, click the [Close] button to close the launcher (Autorun.exe). Next, eject the DVD from the computer. Finally, click the [Yes] button to reboot the computer.



SWDraw2 is now installed.

When starting SWDraw2 for the first time and there is no information on the connected model in the installation folder, a message which prompts you to reboot SWDraw2 is displayed. After being rebooted, SWDraw2 operates under the model detected online.

2.2. Driver Installation

If you intend to use a USB cable to connect a computer to the scanner controller, you must first install the appropriate driver. It is installed automatically. Follow steps given below to install the driver.

CAUTION	When connecting the scanner controller and the computer with the USB cable for the first time, 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.

2.2.1. When the Operating System is Windows 10 or Windows 11

This explanation is based on the assumption that SWDraw2 has been installed properly.

Even when the scanner controller and the computer are connected with the USB cable, no message appears.

2.3. When You Fail to Install the Driver

When you fail to install the driver, install the USB device driver from the device manager. There are some ways to operate the device manager. Typical way for each operating system is described here.

1 Close all applications.

2 Load the included DVD into the computer. When the launcher (Autorun.exe) starts, click the [Close] button to cancel the setup.

3 Plug one end of the USB cable into the scanner controller's USB Connector. Plug the other end into one of the computer's USB ports.

4 Turn on the scanner controller.

The computer recognizes the scanner controller.

5 Display the Device Manager screen. Procedures for displaying the screen depend on the operating system.

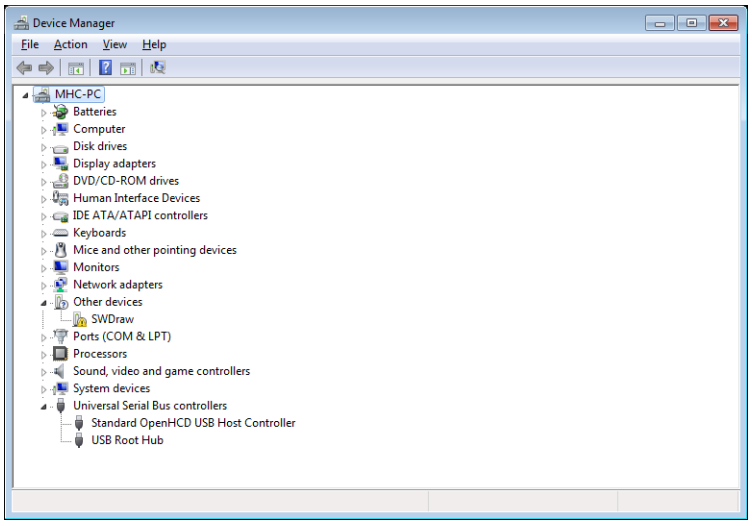
- Windows 10 / Windows 11

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

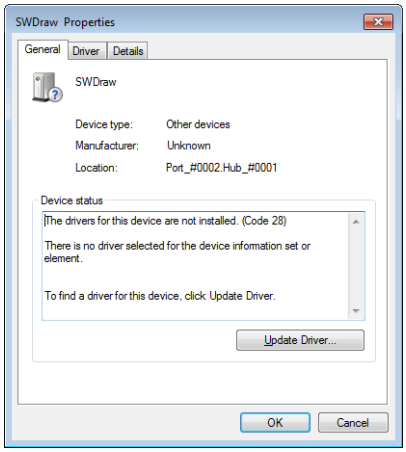
2) Click the Device manager from a pop-up shortcut menu.

You will see the [Device Manager] screen.

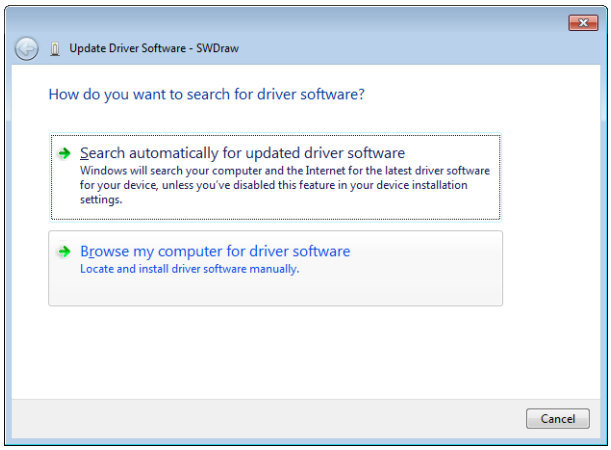
6 When the Device Manager appears, double-click [SWDraw] (or [Unknown device]). (If it does not appears, click the right mouse button to start the Scan for hardware changes.)



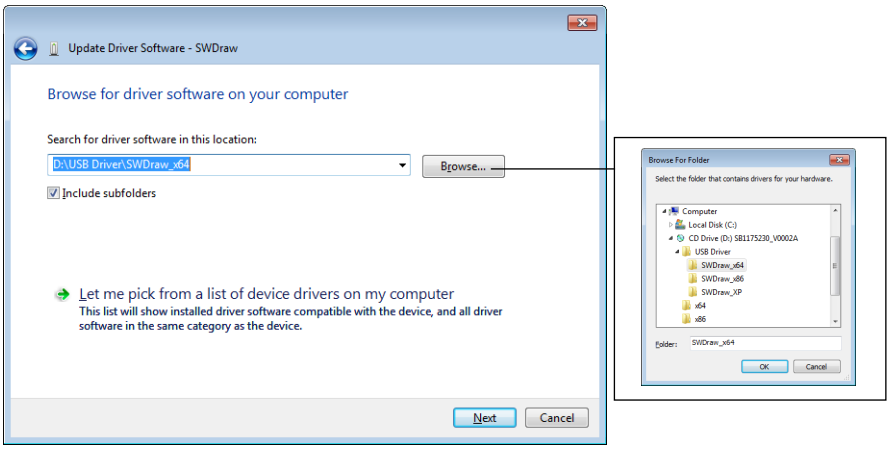
7 Click the [Update Driver] button. Depending on the operating system, there is the [Update Driver] button is in the [Driver] tab, not in the [General] tab.



8 Select [Browse my computer for driver software].



9 Click the [Browse] button at the following screen, and specify the folder where the device driver software is contained.



The device driver software is contained in the installation destination drive, folder, or set DVD.

Installation destination drive and folder

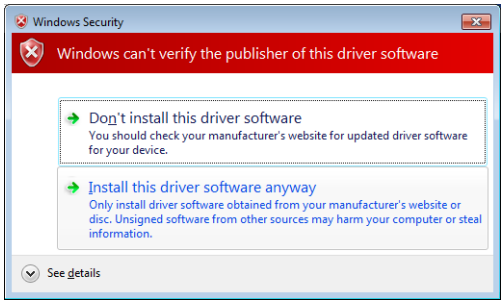
Installation destination folder: X:\Program Files\SWDraw2\MUS_0002
(X indicates the installation destination drive. Normally, it is the C drive. In case of 64-bit operating system, the Program Files folder is Program Files(x86).)

When the DVD drive is mounted on the D drive, specify each folder as follows. Be sure to select a folder of appropriate operating system.

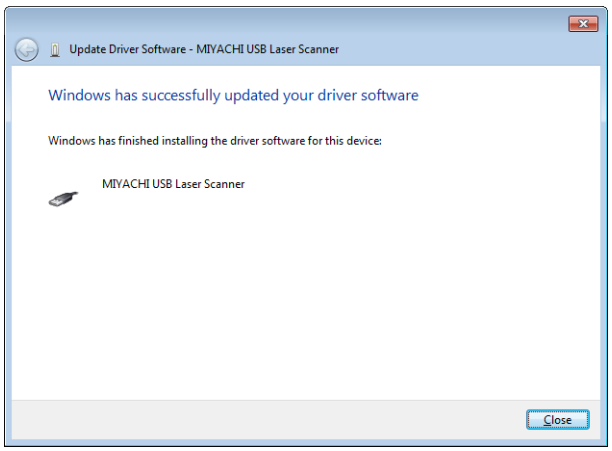
Windows 10 / Windows 11: D:\USB_Driver\SWDraw_x64

Select a folder and click the [OK] button. Confirm that the selected folder is displayed in [Search for driver software in this location] on the [Update driver software] screen and click the [Next] button.

10 When the [Windows Security] screen is displayed, select [Install this driver software anyway].



11 Close the Update Driver Software screen, the MIYACHI USB Laser Scanner Properties screen (The title changes from SWDraw2), and the Device Manager.



2.4. Checking the Operation of the USB Device Driver

Check that the device driver is installed in USB (Universal Serial Bus controller) on the Device Manager screen and it operates normally.

1 Plug one end of the USB cable into the scanner controller's USB Connector. Plug the other end into one of the computer's USB ports.

2 Turn on the scanner controller.

The computer recognizes the scanner controller.

3 Display the Device Manager screen. For procedures for displaying the screen on each operating system, see "2.3 When You Fail to Install the Driver."

4 When the Device Manager screen appears, click the USB to expand it. Right-click [MIYACHI USB Laser Scanner] to display [Properties].

Confirm that the message "Driver is working properly." is displayed at [Device status] in the [General] tab.

2.4.1. Updating the USB Device Driver

If you cannot confirm the normal operation in "2.4. Checking the Operation of the USB Device Driver", execute [Update Driver]. Operate as follows on the USB screen.

Click the [Update Driver] button in the [Driver] tab. Follow the procedure in "2.3. When You Fail to Install the Driver" to install the driver.

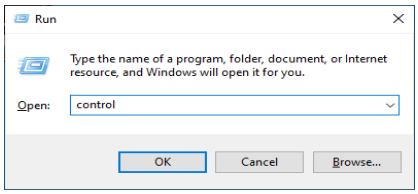
2.5. Computer Network Settings

To set schedules by the SWDraw2 laser equipment application, set the same network group as the laser equipment. Follow steps given below to set the appropriate computer network.

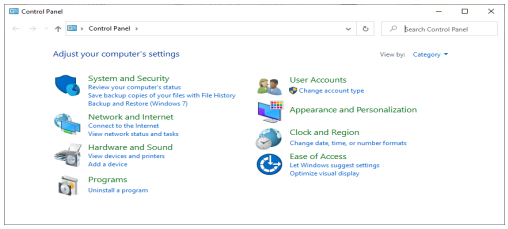
2.5.1. When the Operating System is Windows 10 or Windows 11

1 press the <Windows logo> and <R> keys on your keyboard at the same time.

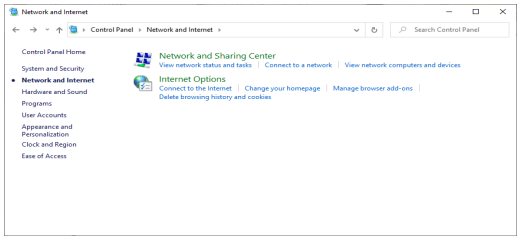
2 Specify the file name that appears and enter <control> in the name field of the Run dialog and press OK to open the Control Panel screen.



3 Click the [Network and Sharing Center] button on the [Network and Internet] screen.

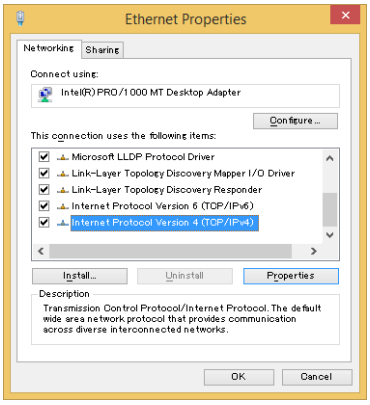


4 Select [Change adapter settings] on the [Network and Sharing Center] screen.



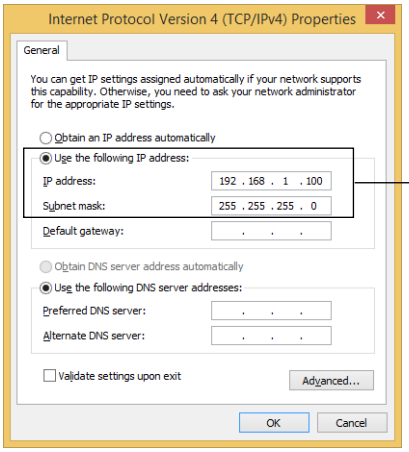
5 Right-click [Local Area Connection] for the adapter to use and select the Properties.

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



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

7 Set the IP address and the Subnet mask.



IP address: 192.168.1.100 (example)
* Anything except 10 since the laser equipment is [192.168.1.10].

Subnet mask: 255.255.255.0

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

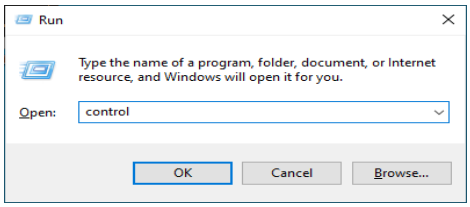
You have finished setting up the computer network.

2.6. Computer Environment Settings

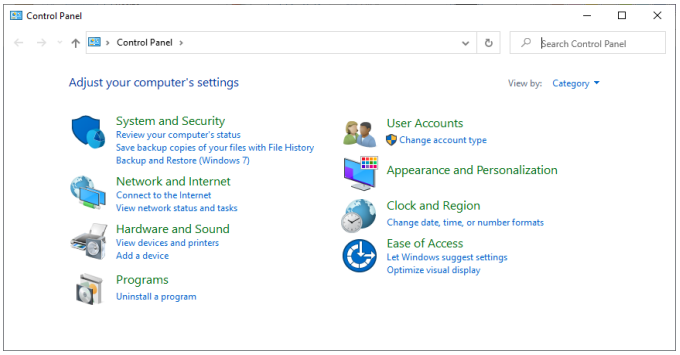
Before using the SWDraw2 laser equipment application, follow steps given below to set the appropriate computer environment.

2.6.1. When the Operating System is Windows 10 or Windows 11

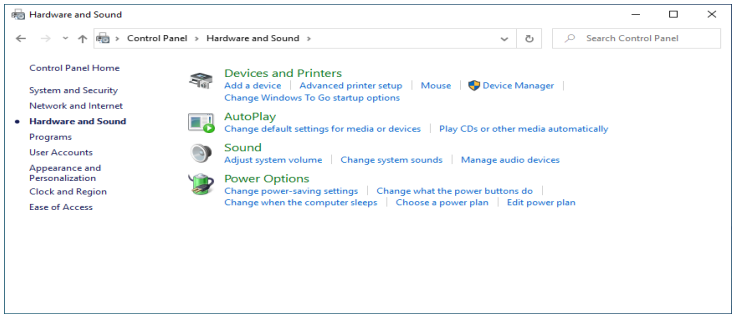
1 press the <Windows logo> and <R> keys on your keyboard at the same time.



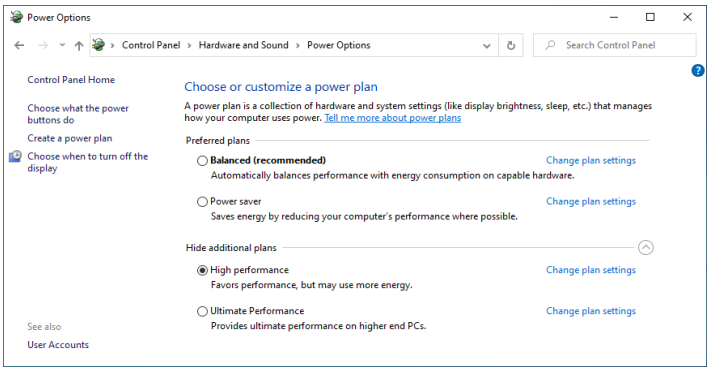
2 Specify the file name that appears and enter <control> in the name field of the Run dialog and press OK to open the Control Panel screen.



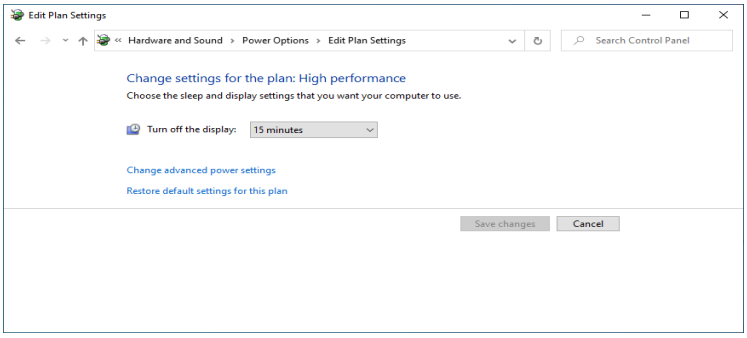
3 Click the <Choose a power plan> button on the <Hardware and Sound> screen.



Press <Show additional plans>, select <High performance>, and press Change plan settings.



4 In the edit plan settings, click <Change plan settings> Advanced settings are displayed.

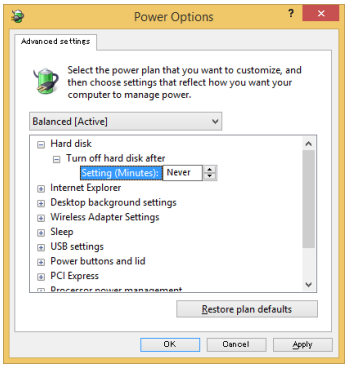


5 Complete the settings as shown below. For items not shown, leave them as the standard settings.

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.

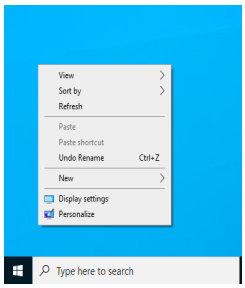
7 Click the [Cancel] button.

You will return to the [Power Options] screen.

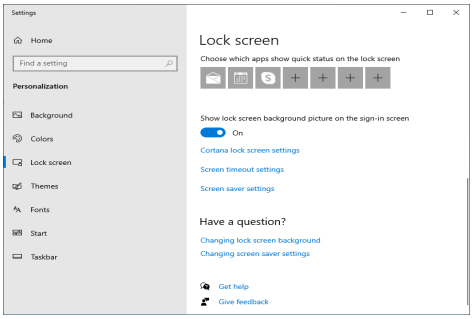
8 Click the [x] button to close the screen.

2.6.2. Change user screen settings.

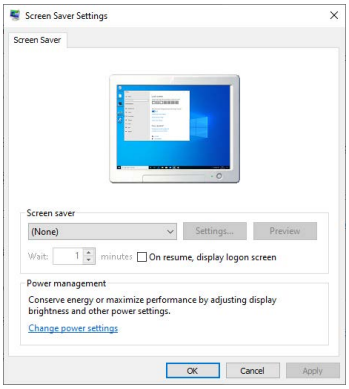
1) Right-click on an empty spot on the desktop and Click "Personalize" from the displayed list.



2) Click "Lock screen" on the left side of the screen, and then click "Screen saver settings".



3) "Screen saver settings" is displayed.Click (None) from the Screen Saver box, then click OK.



Chapter 2 [Quick Reference] Computer-based Welding

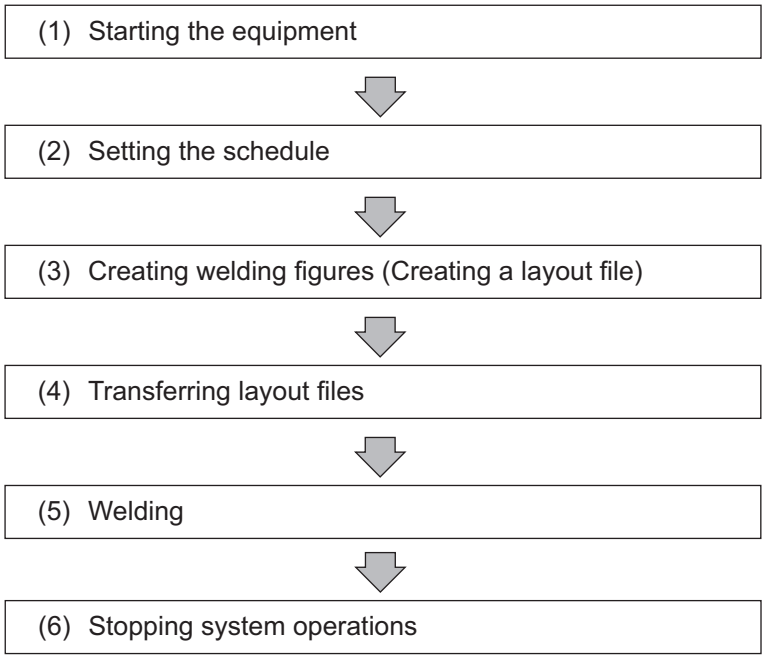
Welding Workflow

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 each manual for laser scanning system for welding for instructions on installation and connection.

(1) Starting the equipment

Before startup, confirm the following points.

- The laser equipment, scanner controller, and computer are off.
- The laser equipment, scanner controller, and computer are connected with the USB cable.
- The laser equipment and computer are connected with the LAN cable.
- A memory card is correctly inserted.

CAUTION	Before starting SWDraw2, exit all other applications.

1 (GWM-MHP/MHP2-000 only) Turn on the chiller cooler to put it into an enabled state.

2 Turn on the laser equipment.

3 Turn on the laser equipment Control key switch.

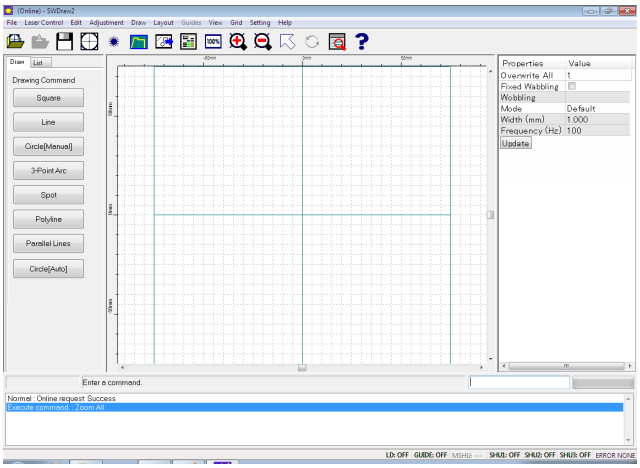
4 Turn on the scanner controller.

CAUTION	Do not remove memory cards or turn off the power switch during self-diagnosis. Otherwise, the data may become corrupted and the memory card may become unusable.

5 After self-diagnosis is complete, the Power indicator alone should remain lit. After confirming it is lit, go to the next step.

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

7 Double-click the [SWDraw2] icon on the desktop to start the SWDraw2 application.
After SWDraw2 starts, the Drawing screen is displayed.



8 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 scanner controller is online.

9 Turn on the [LASER CONTROL] button on the scanner controller.

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.

(2).1. GWM-STD/SHG/STD2-000

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

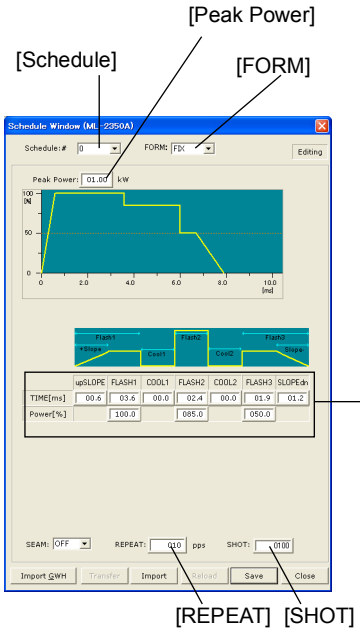
The [Schedule Window] screen appears.

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 [Peak Power], the number of laser outputs per second in [REPEAT], and the number of laser outputs in [SHOT] as shown below.

Peak Power	REPEAT	SHOT
1.00	10	100



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

	upSLOPE	FLASH1	COOL1	FLASH2	COOL2	FLASH3	SLOPEdn
TIME	0.6	3.6	00.0	2.4	00.0	1.9	1.2
Power	–	100.0	–	085.0	–	050.0	–

5 Click the [Transfer] button once the settings are complete.

The schedule file is sent to the scanner controller.

Schedule setting is now complete.

(2).2. GWM-MHP/MHP2-000

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

The [Schedule Window] screen appears.

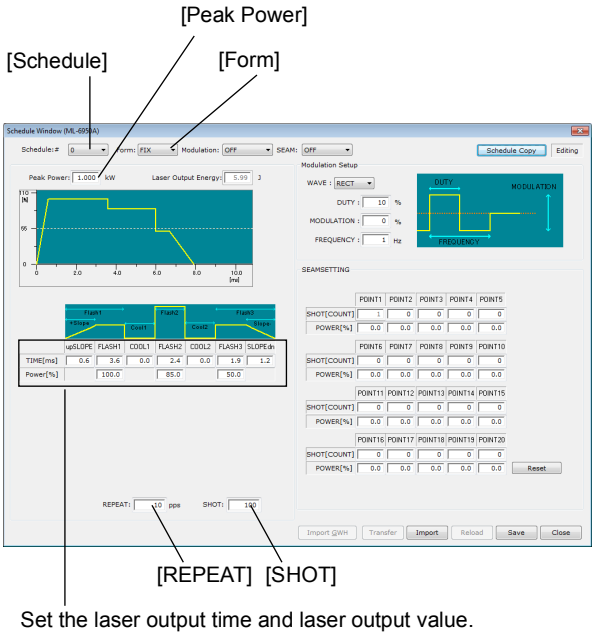
2 Set the desired schedule number in the [Schedule] box (e.g. “0”), and then select “FIX” in the [Form] box.

The FIX form screen appears.

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

Peak Power	REPEAT	SHOT
1.000	10	100

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



	upSLOPE	FLASH1	COOL1	FLASH2	COOL2	FLASH3	SLOPEdn
TIME	0.6	3.6	00.0	2.4	00.0	1.9	1.2
Power	–	100.0	–	085.0	–	050.0	–

5 Click the [Transfer] button once the settings are complete.

The schedule file is sent to the scanner controller.

Schedule setting is now complete.

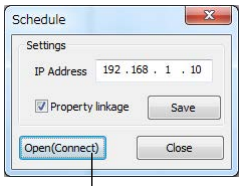
(2).3. GWM-PFL/DDL/STD2-001/DDL2-000

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

The [Schedule] screen appears.

2 When the laser equipment is online, click the [Open (Connect)] button.

The [SCHEDULE INPUT] screen appears



Open (Connect) button

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

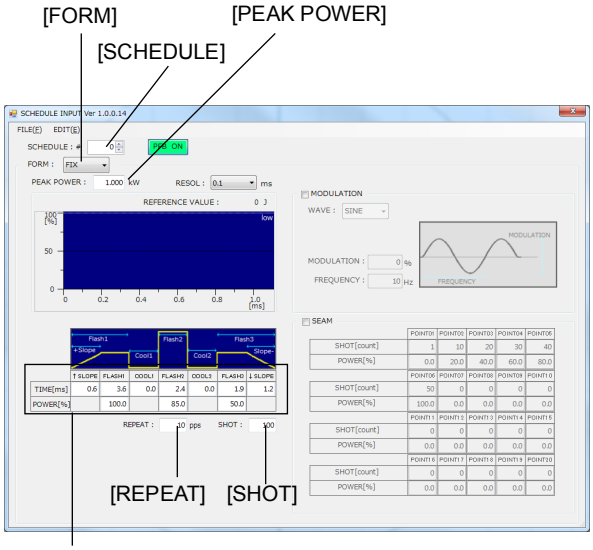
3 Set the desired schedule number in the [SCHEDULE] box (e.g. “0”), and then select “FIX” in the [FORM] box.

4 The FIX form screen appears.

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

PEAK POWER	REPEAT	SHOT
1.000	10	100

6 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	0.6	3.6	00.0	2.4	00.0	1.9	1.2
POWER	–	100.0	–	085.0	–	050.0	–

Schedule setting is now complete.

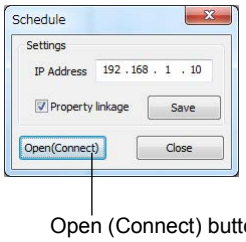
(2).4. GWM-FL/STD2-002

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

The [Schedule] screen appears.

2 When the laser equipment is online, click the [Open (Connect)] button.

The [SCHEDULE INPUT] screen appears



Open (Connect) button

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

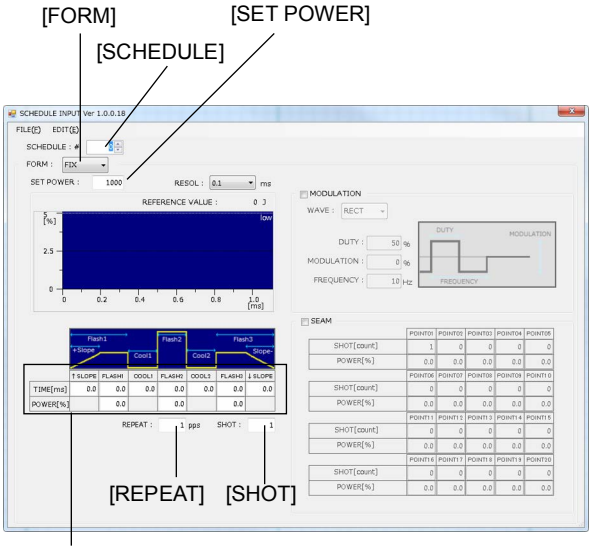
3 Set the desired schedule number in the [SCHEDULE] box (e.g. “0”), and then select “FIX” in the [FORM] box.

4 The FIX form screen appears.

5 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
100	10	100

6 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	0.6	3.6	00.0	2.4	00.0	1.9	1.2
POWER	–	100.0	–	085.0	–	050.0	–

Schedule setting is now complete.

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

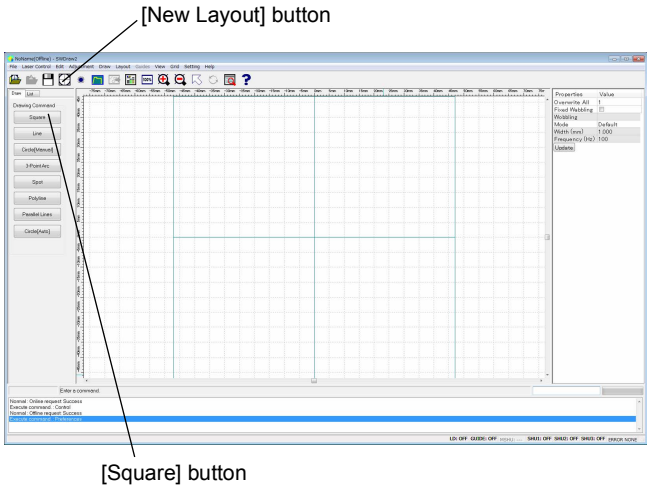
Arrange the figures to be welded and save them as a layout file.

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.

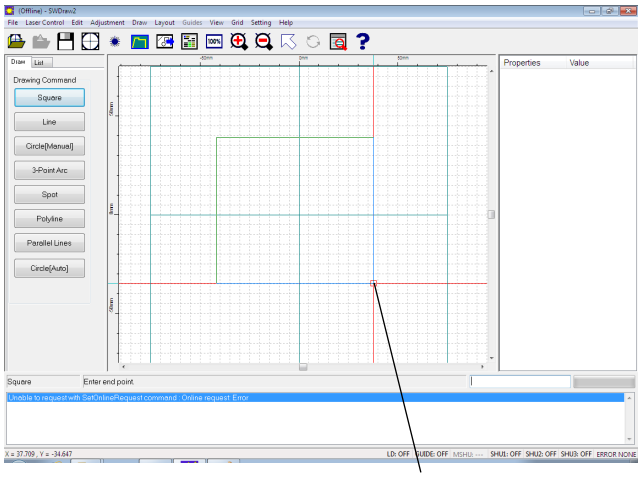


2 Click the [Square] button.

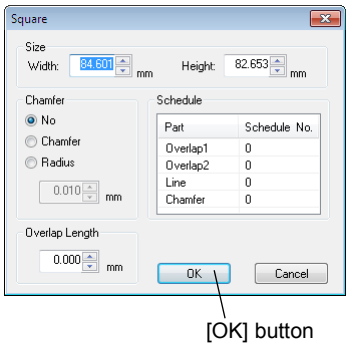
3 Position a rectangle.

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

The [Square] screen appears.

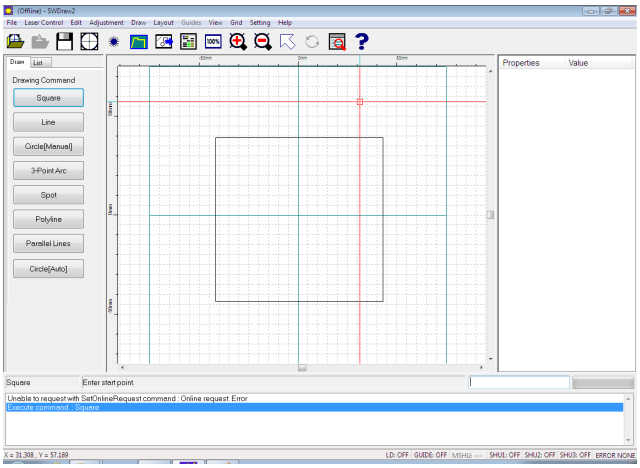


4 Enter the value, and click the [OK] button.

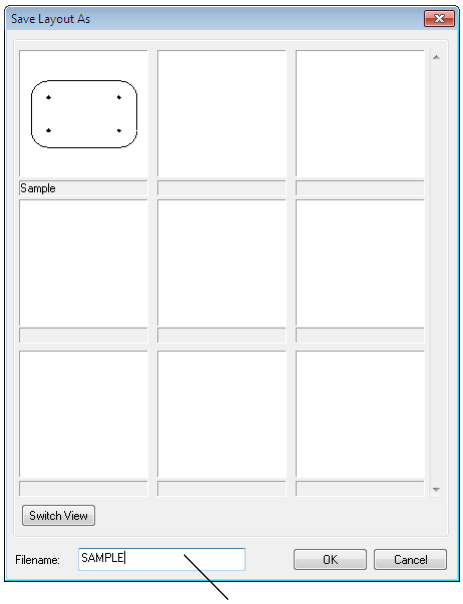


5 Save the layout file after arranging the rectangle.

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

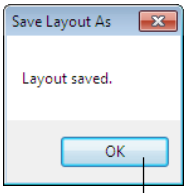


6 Enter the filename in [Filename] (e.g. SAMPLE), and click the [OK] button.



Enter the filename.

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



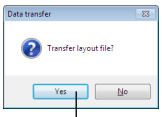
[OK] button

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 scanner controller. The scanner controller 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.

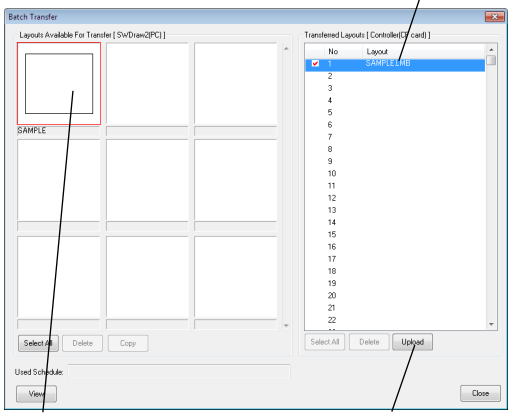
The [Batch Transfer] screen appears. The layout created in (3) is highlighted (red frame in thumbnail display or gray/blue background in list display).

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].

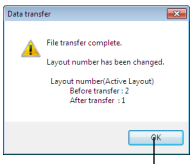
Select the layout number.



Double-click the layout file to be transferred.

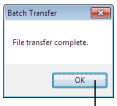
[Upload] button

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

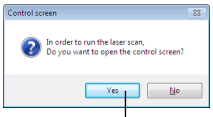
The layout file has now been transferred to the scanner controller and the layout number (active layout) is set.

(5) Welding

Commence welding.

CAUTION	Always wear protective eyewear when emitting the laser beam.

1 The confirmation screen appears.



[Yes] button

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

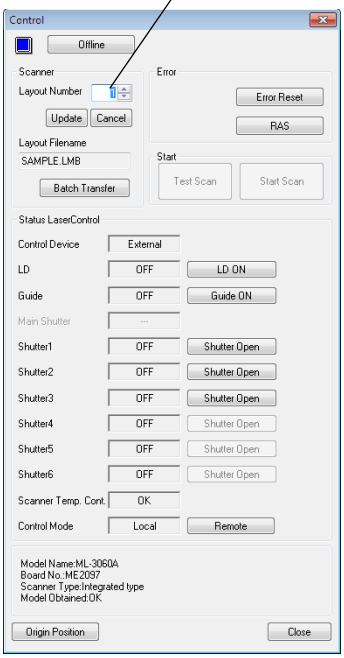
You will return to the Drawing screen by clicking the [No] button.

3 Mount the workpiece to be welded.

4 Confirm that the layout created in (3) is displayed in [Layout Number] (e.g. “1”).

This step identifies the layout file for welding.

[Layout Number]



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 scanner controller is controlled locally. The scanner controller is controlled locally if [Control Mode] appears as [Local]. If not controlled locally, click the [Local] button for [Laser Control].

6 The scanner controller is running if [HV] or [LD] appears as [ON]. If not running, click the [HV ON] or [LD ON] button for [Laser Control].

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

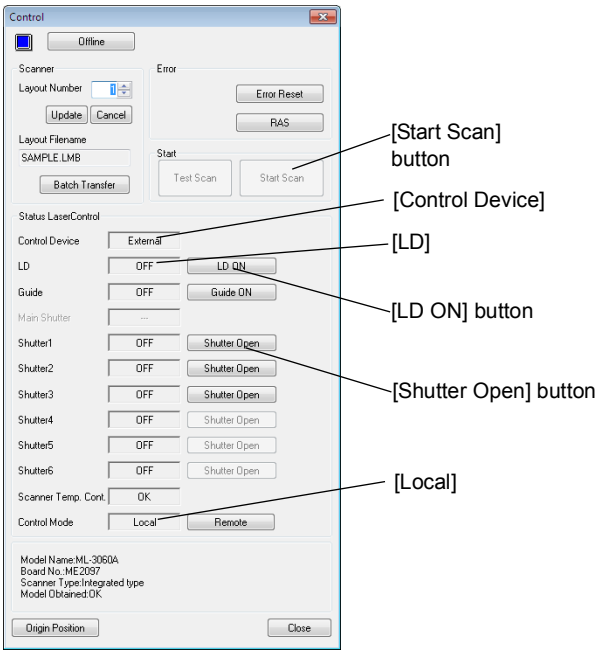
8 Click the [Start Scan] button.

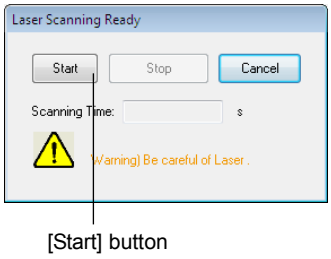
The [Laser Scanning Ready] screen appears.

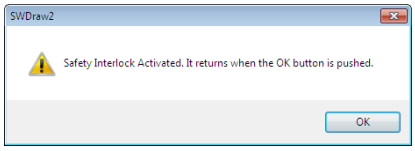
9 Click the [Start] button.

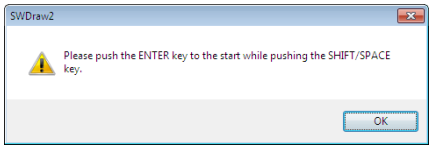
Welding starts.

This completes the welding procedure.





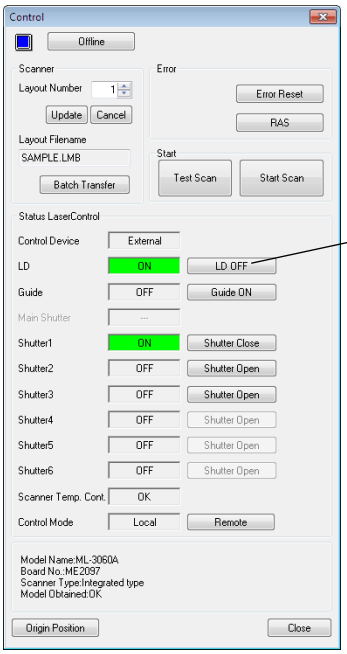
ATTENTION	When 5 seconds has passed while the mouse cursor is placed over the [Start] button on the [Laser Scanning Ready] screen or immediately after completion of laser scanning, the screen is locked for safety and the following screen appears. Click the [OK] button to return to the [Laser Scanning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

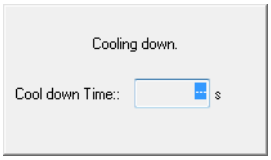
1 From the menu, select [Laser Control] -> [Control].
The [Control] screen appears.

2 Click the [HV OFF] or [LD OFF] button.



[LD OFF] button

3 The READY indicator on the scanner controller flashes and the “Cooling down” message is displayed on the Drawing screen while operation is stopped. The length of time for which the SCAN READY indicator flashes depends on the laser equipment.



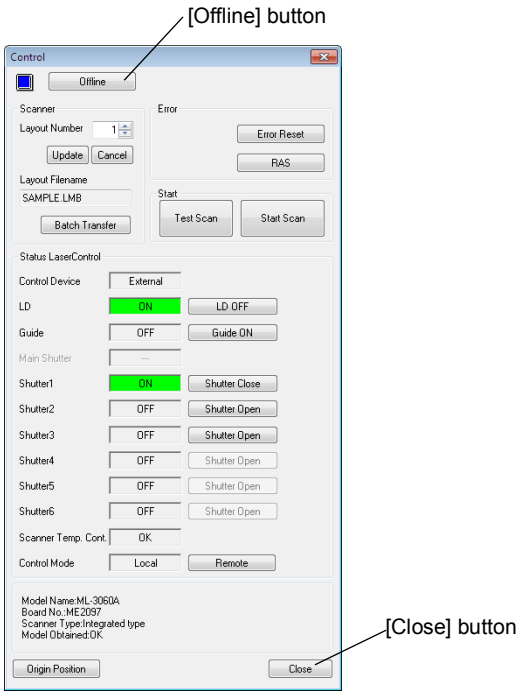
CAUTION	Do not turn off the power switch while the Drawing screen displays the “Cooling down” message. Shutting off the power switch while the system is stopped will significantly reduce the life of the laser equipment.

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 SCAN READY indicator on the scanner controller will go out after the HV or LD has finished shutting down. The “Cooling down” message disappears on the Drawing screen.

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

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



7 To exit SWDraw2, select [File] -> [Exit] from the menu or click the Close box ([x] button) in the top-right corner of the screen.

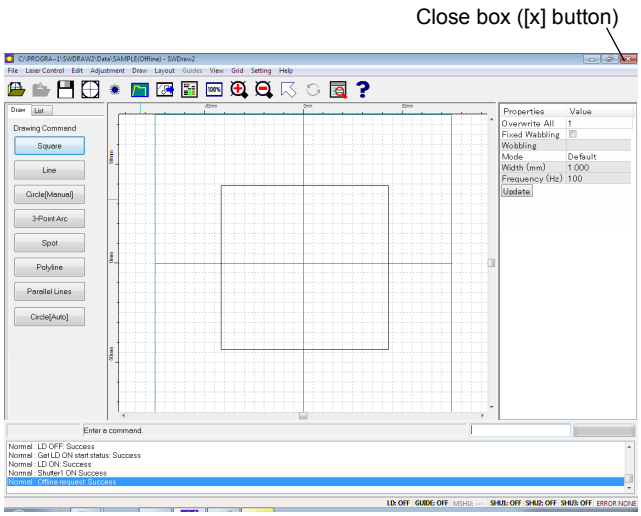
8 Exit Windows by selecting [Turn Off Computer] from the Start menu, and then turn off the computer.

9 Turn off the power of scanner controller.

10 Turn off the laser equipment.

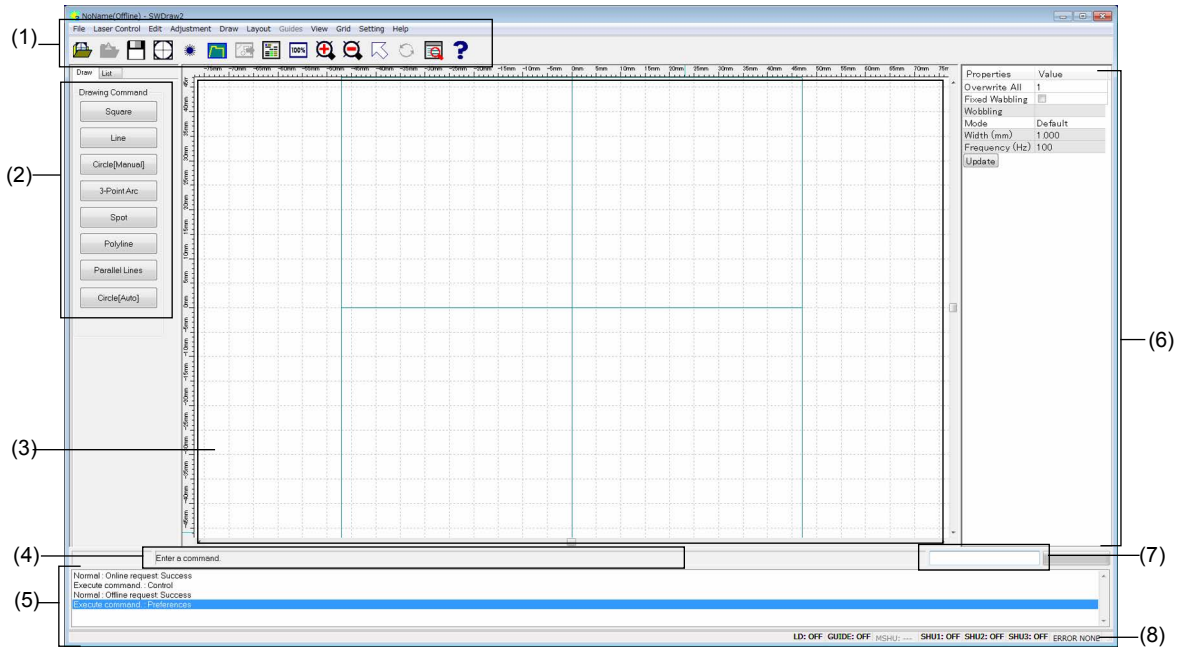
11 (GWM-MHP/MHP2-000 only) Turn off the chiller cooler to stop the water.

System shutdown is now complete.



Chapter 3 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 3-2. Drawing Screen Functions" (page 42) .)

(2) Drawing commands

These buttons are used for common drawing functions. (Refer to "Chapter 3-2. 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. [Overwrite All] and [Fixed Wobbling] cannot be used together. 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 5-4. System Parameters (Setting Laser Equipment Operating Conditions)" (page 112) .)

(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.
HV ON/OFF 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 4-1.1. New (Creating New Layout Files)" (page 48) .)
	Open		Opens a layout file. (See "Chapter 4-1.2. Open (Editing an Existing Layout File)" (page 49) .)
	Save		Saves the open layout file under the same name. (See "Chapter 4-1.3. Save (Saving Layout Files)" (page 50) .)
	Save As	—	Saves the open layout file under a different name. (See "Chapter 4-1.4. Save As (Saving Layout Files under a New Name)" (page 50) .)
	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 4-1.5. Save Layout PrevVer (Saving Layout Files in the Format of the Previous Version)" (page 51) .)
	Import -> Import DXF	—	Imports a DXF file created in CAD software. (See "Chapter 4-2.1. Import DXF (Importing DXF Files)" (page 55) .)
	Import -> Import GWH	—	Imports a file created on the GWH-□□-□□. (See "Chapter 4-2.2. Import GWH (Importing GWH Files)" (page 55) .)
	Merge Layout	—	Imports a plurality of existing layout files to newly create a merged layout. (See "Chapter 4-3. Merging Layouts" (page 57) .)
	Exit	—	Quits SWDraw2. (See "Chapter 4-4. Exit" (page 59) .)
Laser Control	Control		Sends layout files performs welding, and sets control devices. (See "Chapter 5-1. Control" (page 60) .)
	Schedule		Sets the waveform creation method, the laser emission time, and laser output parameters. (See "Chapter 5-(1) Output conditions" (page 89) and "Chapter 5-(2) Output conditions" (page 101) .)
	Batch Transfer		Transfers layout files to the scanner controller. (See "Chapter 5-2.1. Layout File Transfer" (page 68) .)
	Adjust	—	Sets the scanner operating conditions. (See "Chapter 5-1.2. Scanner Adjust" (page 65) .)

Drawing Screen Functions (2 / 6)

Menu	Submenu	Button	Function
Laser Control (continued)	System Parameters	—	Specifies basic laser equipment operating conditions. (See "Chapter 5-4. System Parameters (Setting Laser Equipment Operating Conditions)" (page 112) .)
	RS232C Setting	—	Making communication settings on the GWM controller side in RS-232C communication between the control computer and the GWM controller. (See "Chapter 5-5. RS232C Setting" (page 119) .)
	Event Information	—	Displays the contents of events. (See "Chapter 5-6. Event Information" (page 120) .)
	External I/O Monitor Test		Monitors the I/O signals connected to the external I/O connector. (See "Chapter 5-7. External I/O Monitor Test" (page 121) .)
Edit	Undo	—	Undoes the previous action. (See "Chapter 6-1. Undo (Undoing an Operation)" (page 122) .)
	Redo	—	Repeats the action that was undone. (See "Chapter 6-2. Redo (Redoing an Operation)" (page 122) .)
	Delete	—	Deletes the selected figures. (See "Chapter 6-3. Delete (Deleting a Figure)" (page 122) .)
	Copy	—	Creates a copy of the figures. (See "Chapter 6-4.1. Copy (Arranging Copied Objects)" (page 123) .)
	Copy and Rotate	—	Copies and rotates figures. (See "Chapter 6-4.2. Copy and Rotate (Arranging Rotated Copies)" (page 124) .)
	Copy and Invert	—	Copies and inverts figures. (See "Chapter 6-4.3. Copy and Invert (Arranging Inverted Copies)" (page 125) .)
	Move	—	Moves figures. (See "Chapter 6-5.1. Move (Moving Figures)" (page 126) .)
	Move and Rotate	—	Moves and rotates figures. (See "Chapter 6-5.2. Move and Rotate (Moving and Rotating Figures)" (page 127) .)
	Move and Invert	—	Moves and inverts figures. (See "Chapter 6-5.3. Move and Invert (Moving and Inverting Figures)" (page 128) .)
	Edit Comment	—	Edits the created comment. (See "Chapter 6-5.3. Move and Invert (Moving and Inverting Figures)" (page 128) .)
	Resize Sketch	—	Adjusts sketch size. (See "Chapter 6-5.4. Resize Sketch" (page 129) .)
	Array -> Create		Copies the figure to create an array. (See "Chapter 6-7.1. Creating Arrays" (page 131) .)
	Array -> Cancel		Clears arrays and returns it to the original figure. (See "Chapter 6-7.2. Canceling Arrays" (page 132) .)

Drawing Screen Functions (3 / 6)

Menu	Submenu	Button	Function
Adjustment	Trim	—	Removes or extends a portion of lines. (See "Chapter 7-1.1. Trim (Deleting Parts of Lines)" (page 133) .)
	Trim Junction	—	Trims unneeded lines from intersection of two lines. (See "Chapter 7-1.2. Trim Junction (Deleting Extra Lines from Junctions)" (page 134) .)
	Selection Mode		Switches to Selection Mode. (See "Chapter 7-2.1. Selection Mode (Switching to Selection Mode)" (page 135) .) Displays the properties of selected figures. (See "Chapter 7-3.1. Using Properties" (page 137) .)
	Rotation Mode		Rotates line segments in Selection Mode. (See "Chapter 7-2.2. Rotation Mode (Rotating Line Segments in Selection Mode)" (page 136) .)
	Poly Resolve	—	Splits polylines created at their construction points into line segments. (See "Chapter 7-4. Poly Resolve (Splitting Figures)" (page 148) .)
	Square Resolve	—	Splits squares into line segments or arcs. (See "Chapter 7-5. Square Resolve (Splitting Squares)" (page 149) .)
	Divide	—	Divides figures created at any point. (See "Chapter 7-6. Divide (Dividing Figures)" (page 150) .)
	Arc to Poly	—	Divides arcs into polylines in the specified number. (See "Chapter 7-7. Arc to Poly" (page 152) .)
	Unite	—	Joins two line segments or arcs into one. (See "Chapter 7-8. Unite (Joining Two Figures into One)" (page 153) .)
	Unite Poly -> Auto	—	Joins two line segments into one automatically. (See "Chapter 7-9.1. Auto (Joining Lines into One Automatically)" (page 155) .)
	Unite Poly -> Manual	—	Joins two line segments into one manually. (See "Chapter 7-9.2. Manual (Joining Lines into One Manually)" (page 156) .)
	Fillet	—	Rounds off corners created with two line segments or polyline in the specified radius. (See "Chapter 7-10. Fillet" (page 157) .)
	Add Const. Pt	—	Adds a construction point. (See "Chapter 7-11. Add Const. Pt" (page 159) .)
	Delete Const. Pt	—	Deletes a construction point. (See "Chapter 7-12. Delete Const. Pt" (page 160) .)
	Hatch to Poly	—	Converts hatching set in circles or squares into polylines. (See "Chapter 7-13. Hatch to Poly" (page 161) .)
	Scanning Order -> Auto	—	Automatically sets the scanning order and direction of the continuous objects in contact with the selected object. (See "Chapter 8-2. Automatic Scanning Order Function" (page 163) .)
	Scanning Order -> Reverse	—	Switches the start and end points for the selected object. (See "Chapter 8-3. Reverse Scanning Order Function" (page 168) .)

Drawing Screen Functions (4 / 6)

Menu	Submenu	Button	Function
Adjustment (continued)	Scanning Order -> Check	—	Indicates the continuous objects in contact with the selected object and the scanning direction. (See "Chapter 8-4. Scanning Order Confirmation Function" (page 171) .)
Draw	Line	Drawing Commands: [Line] button	Draws a line. (See "Chapter 9-1. Line (Drawing Lines)" (page 175) .)
	Polyline	Drawing Commands: [Polyline] button	Draws a polyline (polyline: a continuous line of multiple line segments; e.g., a zig-zag). (See "Chapter 9-2. Polyline (Drawing Polylines)" (page 176) .)
	Parallel Lines	Drawing Commands: [Parallel Lines] button	Draws a line parallel to the current line. (See "Chapter 9-3. Parallel Lines (Drawing Parallel Lines)" (page 190) .)
	Square	Drawing Commands: [Square] button	Draw a rectangle. (See "Chapter 9-4. Square (Drawing Rectangles)" (page 191) .)
	Circle [Manual]	Drawing Commands: [Circle [Manual]] button	Draws a circle with overlap. (See "Chapter 9-5.1. Drawing Circles with Overlap (Manual)" (page 194) .)
	Arc	—	Draws an arc of specific radius. (See "Chapter 9-6. Arc (Specifying a Radius to Draw an Arc)" (page 198) .)
	3-Point Arc	Drawing Commands: [3-Point Arc] button	Draws an arc from three specific points on a circle. (See "Chapter 9-7. 3-Point Arc (Specifying 3 Points to Draw an Arc)" (page 200) .)
	Spot	Drawing Commands: [Spot] button 	Draw a dot. (See "Chapter 9-8. Spot (Drawing Dots for Spot Welding)" (page 201) .)
	Axis Control	Drawing Commands: [Axis Control] button	Arranges the axis control command. (See "Chapter 9-9. Axis Control (Communicates with External Devices)" (page 202) .)
	Circle [Auto]	Drawing Commands: [Circle [Auto]] button	Draws a conventional circle. (See "Chapter 9-5.2. Drawing Conventional Circles (Auto)" (page 196) .)
	Comment	—	Adds a comment for layout data regardless of scanning. (See "Chapter 9-10.1. Creating a Comment" (page 205) .)
Layout	Align Left	—	Aligns figures to the left. (See "Chapter 10-1. Align Left" (page 208) .)
	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.

Drawing Screen Functions (5 / 6)

Menu	Submenu	Button	Function
Layout (continued)	Justify Horizontally	—	Justifies figures horizontally.
	Justify Vertically	—	Justifies figures vertically.
View	Zoom Extents	—	Narrows view to the area containing the figures. (See "Chapter 11-1. Zoom Extents" (page 212) .)
	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 11-7. Show/Hide Grid" (page 215) .)
	Refresh	—	Updates the screen display.
Grid	Show/Hide Sketch	—	Shows or hides the sketch. (See "Chapter 11-9. Show/Hide Sketch" (page 215) .)
	Edit Sketch	—	Switches Sketch Edit mode on or off. (See "Chapter 11-10. Edit Sketch" (page 215) .)
	Show/Hide Overlap	—	Shows or hides the overlap portion of square object. (See "Chapter 11-11. Show/Hide Overlap" (page 215) .)
	Grid Spacing	—	Specifies grid spacing. (See "Chapter 12-1. Grid Spacing" (page 216) .)
	Grid Origin	—	Positions the grid. (See "Chapter 12-2. Grid Origin" (page 217) .)
	Snap Setting	—	Allows selection of elements to snap to the grid. (See "Chapter 12-3. Snap Setting" (page 218) .)
	Angle Correction	—	Activates or deactivates angle correction. (See "Chapter 12-4. Angle Correction" (page 219) .)
	Distance Measurement	—	Measures the distance between specified two points. (See "Chapter 12-5. Distance Measurement" (page 219) .)
Setting	Preferences		Used to specify operation involving basic application functions. (See "Chapter 13-1. Preferences" (page 220) .)
Help	About SWDraw2		Displays SWDraw2 version information. (See "Chapter 15-1. About SWDraw2 (Checking SWDraw2 Version Information)" (page 230) .)

Drawing Screen Functions (6 / 6)

Menu	Submenu	Button	Function
Help (continued)	About the Controller	—	Displays the Scanner Controller Software Version. (See "Chapter 15-2. About the Controller (Checking the Scanner Controller Software Version)" (page 230) .)

Chapter 4 File

1. Creating, Saving and Transferring Files

1.1. New (Creating New Layout Files)

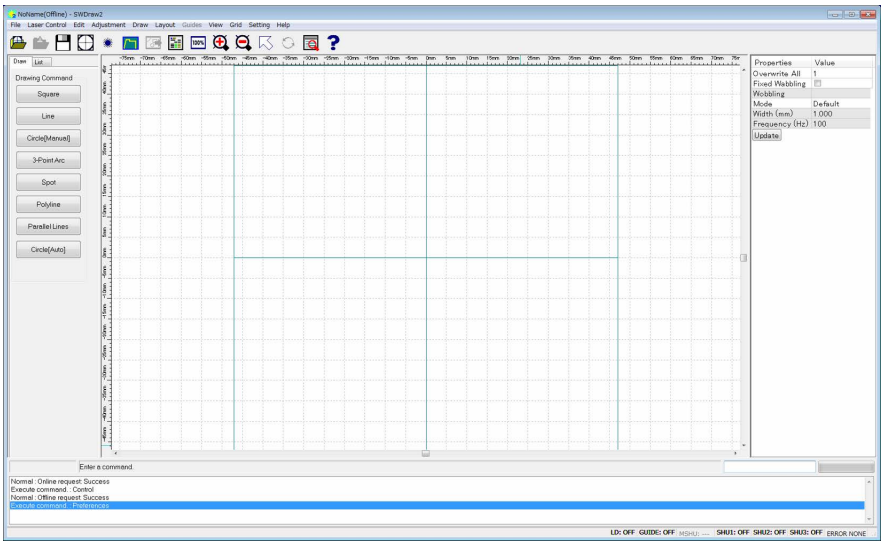
The layout and welding conditions for figure data for welding are saved in a layout file. You must prepare a new layout file to create new welding data.

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 4-1.3. Save (Saving Layout Files)" (page 50) .

1.2. Open (Editing an Existing Layout File)

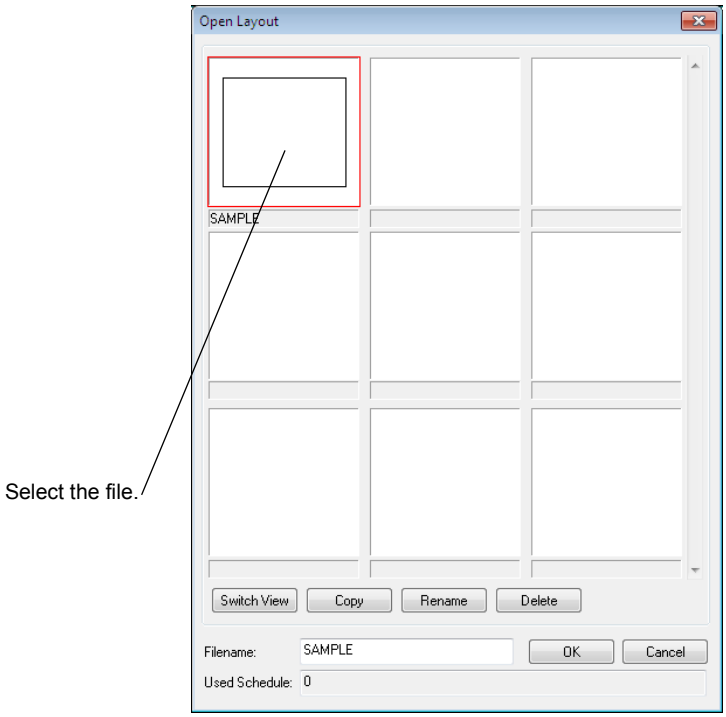
Follow the steps given below to edit existing layout files.

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 4-1.6. Layout File Transfer" (page 52) .)
Click the [No] button to return to the Drawing screen.

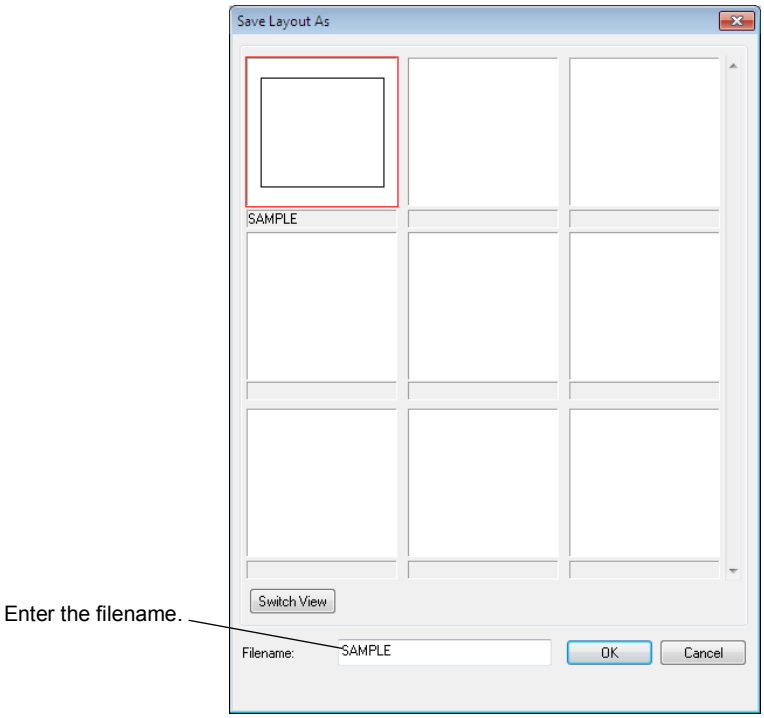
1.4. Save As (Saving Layout Files under a New Name)

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].

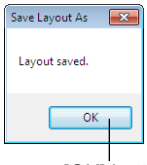


CAUTION	• Enter up to 255 single-byte characters (including drive name and path information) for the filename. • Symbols (\/:*?"<>|), one-byte space, CON, AUX, COM1 to COM9, LPT1 to LPT9, PRN, and NUL may not be used in filenames.

ATTENTION	Click the [Switch View] button to view a list of filenames instead of thumbnails. The setting remains even after restarting SWDraw2.

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 4-1.6. Layout File Transfer" (page 52) .)
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)

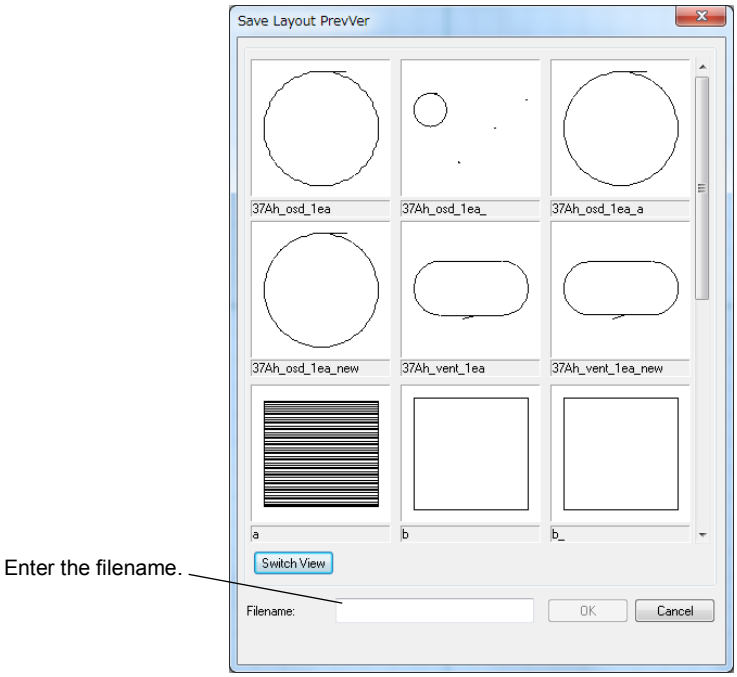
Save layout files in the format of the previous version as follows.

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 7-13. Hatch to Poly" (page 161) .) 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 (\V:*?"<>|), 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 SWDraw2.

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.

[OK] button

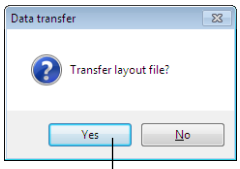
1.6. Layout File Transfer

This step transfers the created layout file to the scanner controller. The scanner controller manages layout files by file numbers. You must assign a number to the file.

The layout file can be transferred to the scanner controller 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.



[Yes] button

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 5-1. Control" (page 60) .)
You will return to the Drawing screen by clicking the [No] button.

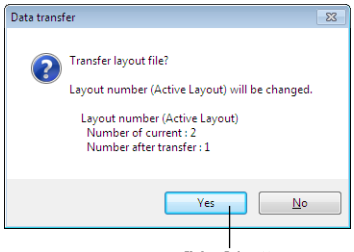
1.6.1. Layout File is Transferred and Layout Number is the Same

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

1.6.2. Layout File is Transferred and Layout Number is Different

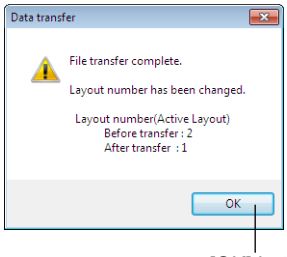
1 To transfer the layout file, click the [Yes] button.

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



[Yes] 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.

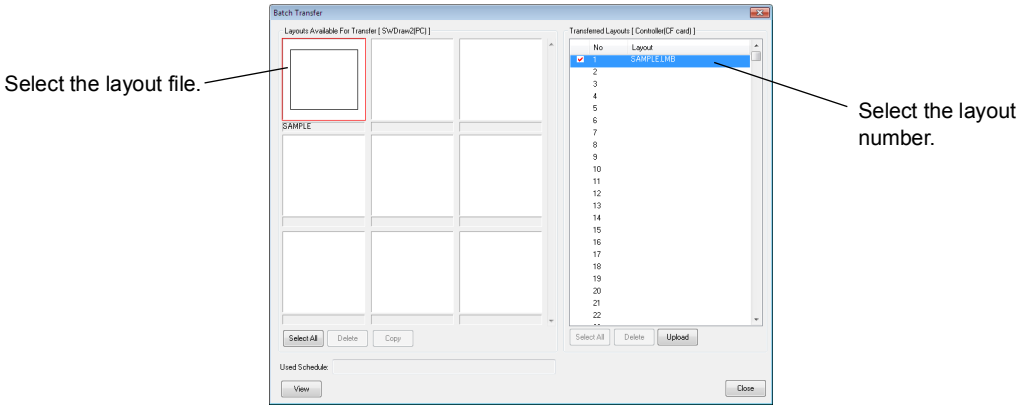


[OK] button

CAUTION	When [Control Mode] is [Remote], the layout number (active layout) of the scanner controller is not switched. (For details, refer to "Chapter 5-2. Dara Transfer (Transferring, Deleting, and Copying Layout File)" (page 67) .)

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.

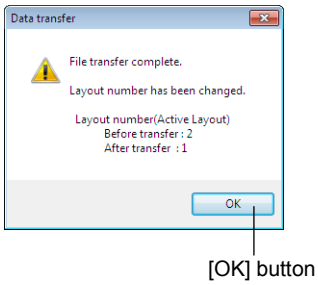
The message “File transfer complete” is dipalyed. Click the [OK] button to close.

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 scanner controller is not switched. (For details, refer to "Chapter 5-2. Dara Transfer (Transferring, Deleting, and Copying Layout File)" (page 67) .)

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.

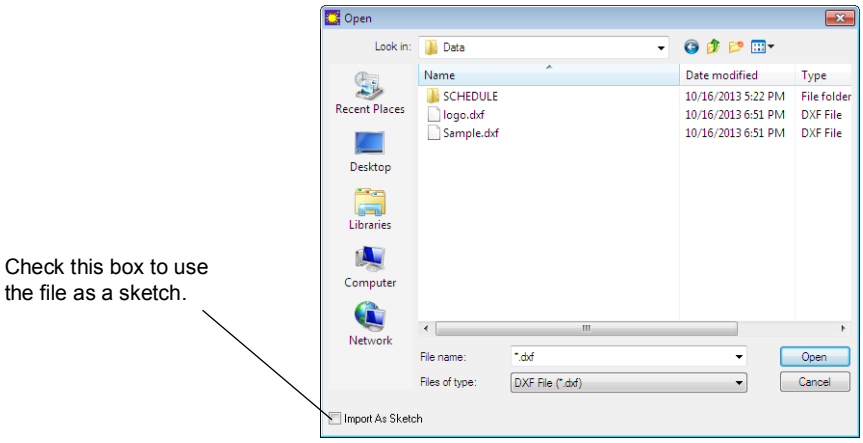
ATTENTION	• DXF data that can be imported: lines, circles, arcs, ellipses, elliptical arcs, broken lines, text, curves, blocks (parts), and dots. • When a DXF file is imported, the origin specified within the CAD program is used as the center coordinate for welding. Thus, adjust the origin accordingly 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.

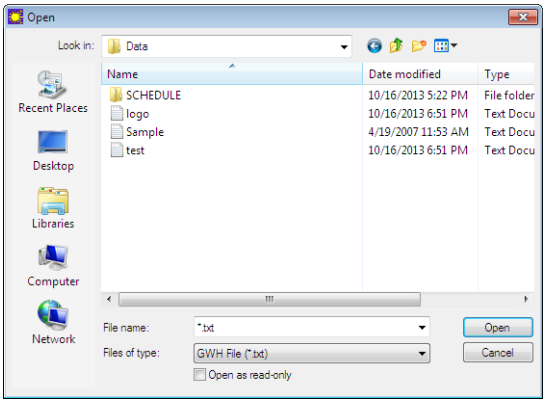
2.2. Import GWH (Importing GWH Files)

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].

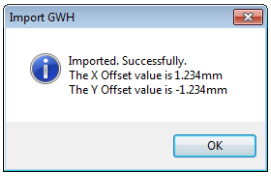
You will see the [Open] screen.

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	×	

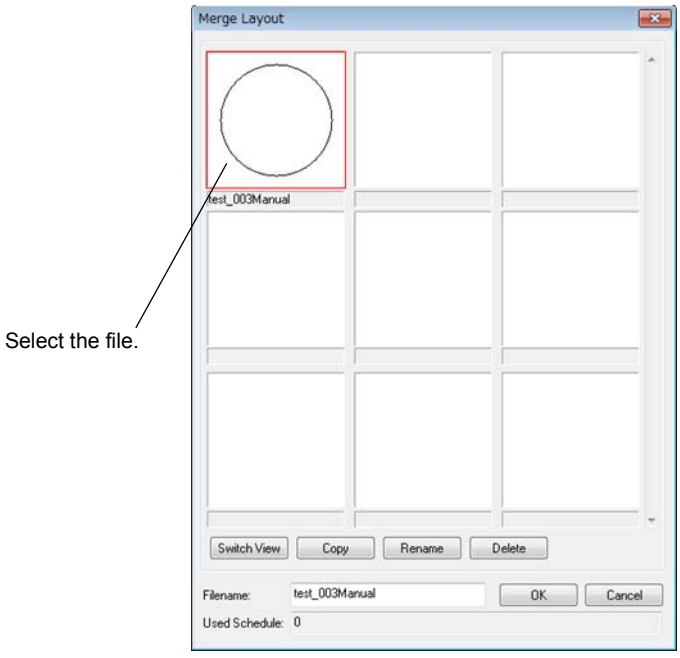
○ : Available ×: Unavailable

3.2. Merge Layout (Merging Existing Layout Files)

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

This displays the [Merge Layout] screen.

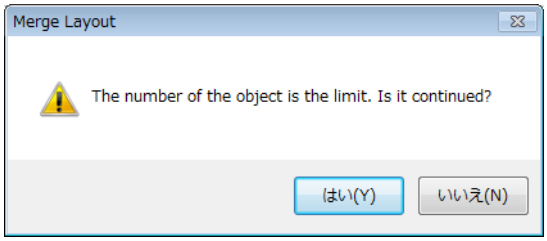
2 Select the file to merge.



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.



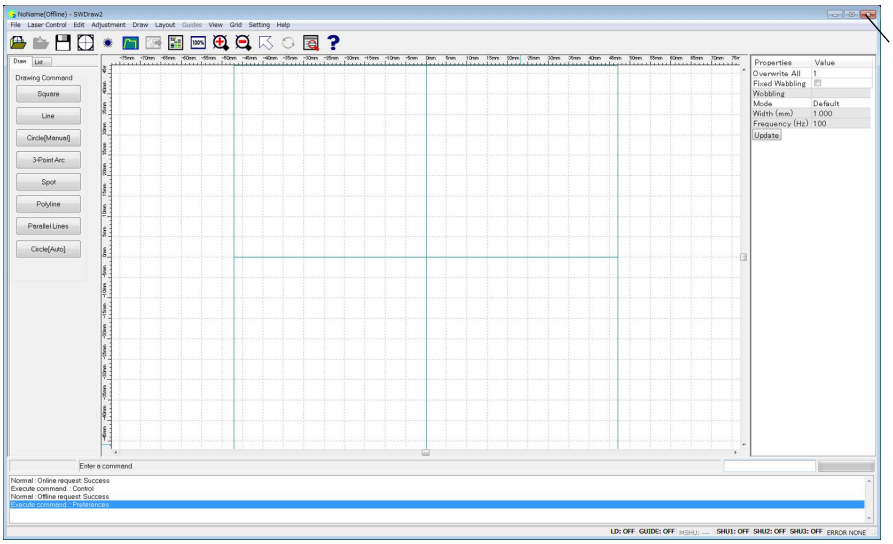
Click the [Yes] button to merge up to 1000 objects. Click the [No] button to close the screen without merging layouts.

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 SWDraw2, 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 2- (6) Stopping system operations" (page 38) .

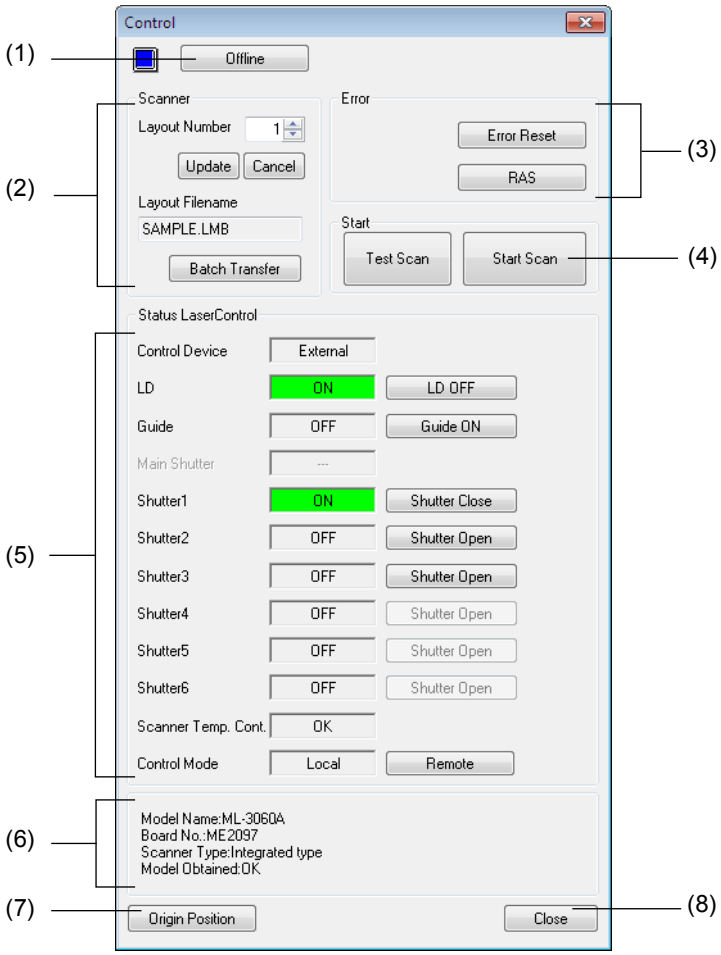
Chapter 5 Laser Control

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.

1.1. [Control] Screen Arrangement

ATTENTION	The following screen is for GWM-PFL (ML-3060A). Available buttons and conditions differ depending on the connected model.



(1) [Online]/[Offline] button

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

CAUTION	Reboot SWDraw2 if the model set when SWDraw2 is offline is different from the model connected when it is online.

(2) Scanner

Confirms the scanner status and sets the scanner. The following items can be set.

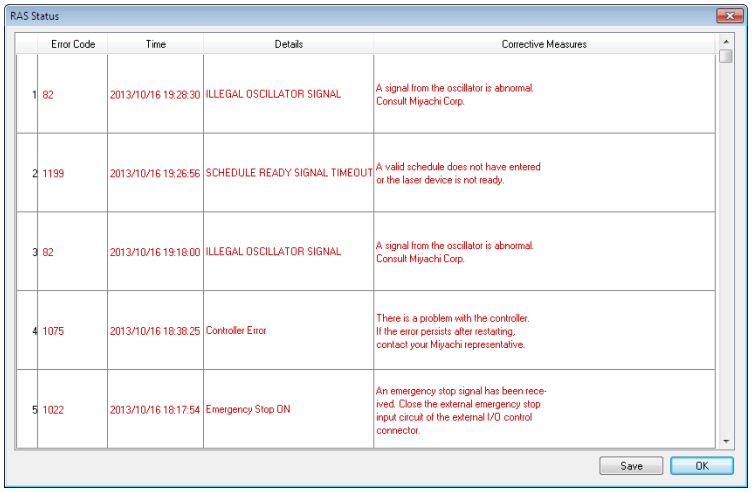
Scanner Settings

Item	Setting Details
Layout Number	Selects the layout number for welding.
Layout Filename	Displays the filename for the layout number selected in [Layout Number]. Click the [Update] button to update the filename for the layout number set in [Layout Number]. Click the [Cancel] button to return [Layout Number] to the last update status.

- [Batch Transfer] button
  This button is used to transfer layout files to the scanner controller and perform file maintenance such as deleting and copying of the layout file on the scanner controller. Click this button to display the [Batch Transfer] screen. (For details, refer to "Chapter 5-2. Dara Transfer (Transferring, Deleting, and Copying Layout File)" (page 67) .)

(3) Error

- [Hard Error] lamp
  Lights if an error occurs in the scanner controller 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.

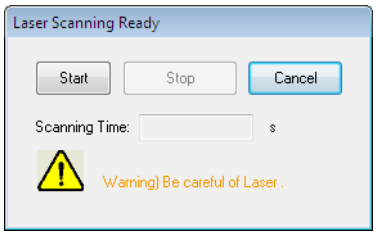
(4) Start

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

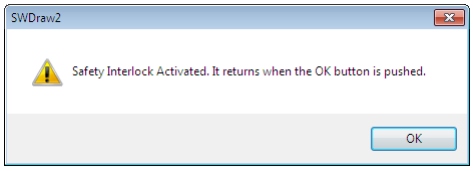
CAUTION	External signals and the schedule-switching signal of the laser equipment are output whether laser is output or not.

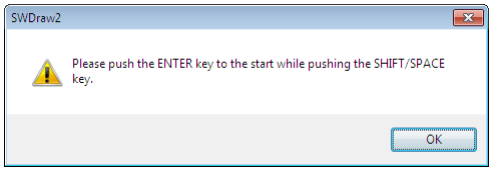
- [Start Scan] Button

Click this button to display the [Laser Scanning Ready] screen.



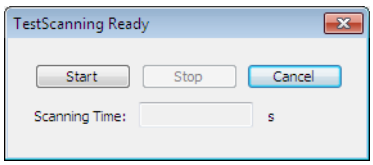
Click the [Start] button to start welding. Once welding starts, the button cannot be used until welding ends. Welding stops automatically when there are no more figures to scan.

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. 

- [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.

(5) Status Laser Control

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

Status indications

Item	Indication	Meaning
Control Device	Panel	The laser equipment is controlled independently.
	External	The laser equipment is controlled by the scanner controller.
HV/LD	ON	The laser equipment is running.
	OFF	The laser equipment is stopped.
Guide	ON	The guide beam is on.
	OFF	The guide beam is off.
Main Shutter	ON	The main shutter inside the laser equipment is open.
	OFF	The main shutter inside the laser equipment is closed.
Shutter1 - 3	ON	The branch shutter inside the laser equipment is open.
	OFF	The branch shutter inside the laser equipment is closed.
Scanner Tempera-ture	OK	The flow rate of the scanner head cooling system is within the appropriate range.
	NG	The flow rate of the scanner head cooling system is outside the appropriate range.
Control Mode	Local	The scanner controller is controlled locally.
	Remote	The scanner controller is controlled remotely.

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

CAUTION	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.

- [Shutter Open]/[Shutter Close] button
  Click the [Shutter Open] button to open the branch shutter built in the laser equipment.
  Click the [Shutter Close] button to close the branch shutter built in the laser equipment.

(6) Hardware information

Displays the information of the connected equipment.

(7) [Origin Position] button

Click this button to return the scanner to the origin.

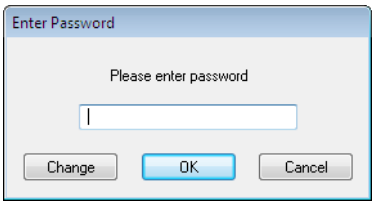
(8) [Close] button

Click this button to close the [Control] screen.

1.2. Scanner Adjust

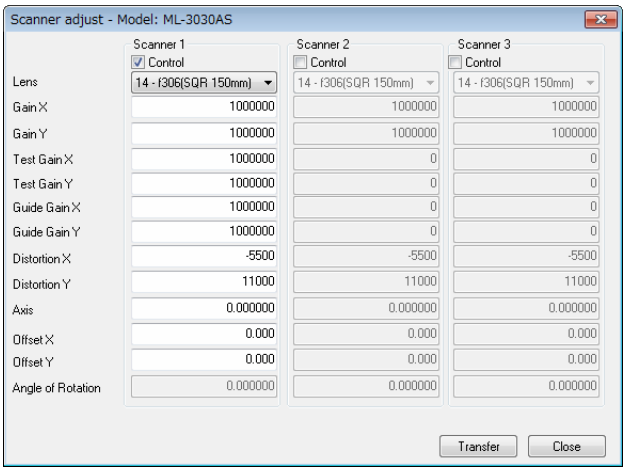
Select [Laser Control] -> [Adjust] on the menu to set the scanner operating conditions.

First, the [Enter Password] screen is displayed.



No password is set by default, and so pressing 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
	Guide Gain Y	Sets the scaling factor for the Y-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	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.

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

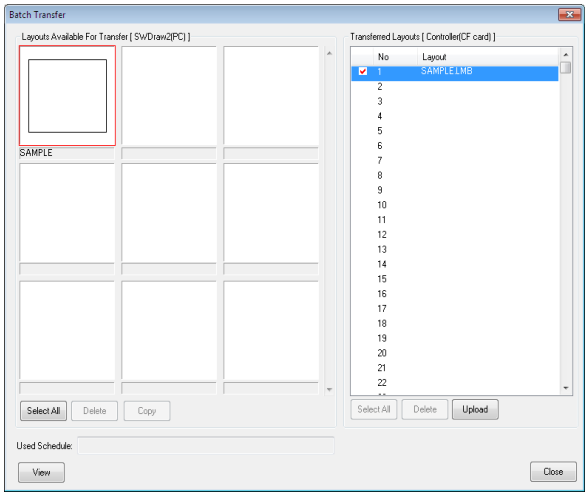
This step transfers the created layout file to the scanner controller. The scanner controller manages layout files by file numbers. You must assign a number to the file.

The layout file can be transferred to the scanner controller 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 SWDraw2.

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

2.1. Layout File Transfer

This step transfers the created layout file to the scanner controller. The scanner controller 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.

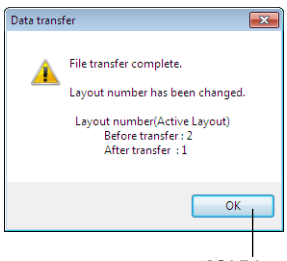
Uncheck the file names if you decide not to transfer particular files. For clearing, refer to "Chapter 5-2.2. Clearing Transfer of Layout File and Changing the Transfer Reservation Number" (page 70) .

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 [Layout Number] 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 the [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 scanner controller 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 5-1. Control" (page 60) .)
You will return to the Drawing screen by clicking the [No] button.

All selected layout files have now been transferred to the scanner controller.

The transferred layout file is saved in the ZIP folder in CF (compact flash) 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 SWDraw2 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 scanner controller is deleted, the ZIP file is also deleted. However, the created ZIP folder is not deleted even if all transferred layout files are deleted.

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

2.2.1. 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.

2.2.2. Clearing Transfer Reservation of [Transferred Layouts]

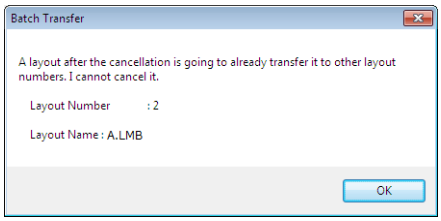
To clear transfer reservation of “reserved” layout file which has a check mark in [Transferred Layouts] on the right, double-click the desired file. At this time, operation differs according to whether the file selected in [Layouts Available For Transfer] on the left is the same or different.

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.

2.2.3. 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 scanner controller, 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 scanner controller cannot be changed in this way. You need to transfer the file to a new number again after deleting it.

2.3. Layout File Delete

This step deletes the layout file.

2.3.1. 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.

2.3.2. 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 scanner controller 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.

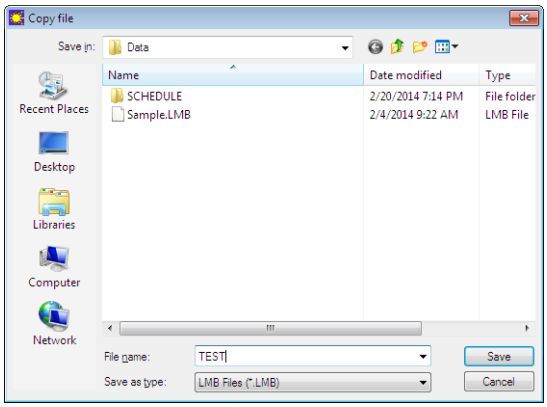
CAUTION	If a reserved file exists, the file cannot be deleted. (The [Delete] button becomes invalid.) To delete it, you need to clear all transfer reservations.

2.4. 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 SWDraw2. 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.

3. Schedule

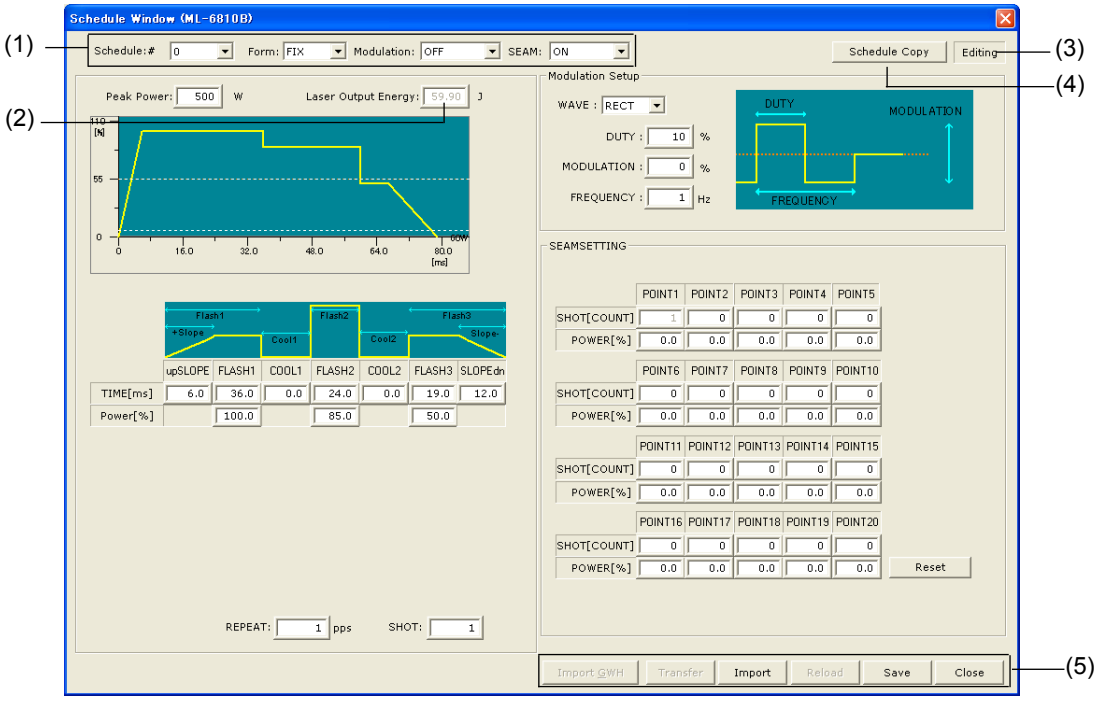
Before starting welding, the waveform creation method, the laser emission time, and laser output parameters must first be set.

The laser output parameters for this system are referred to as a schedule. The schedule is displayed on the [Schedule Window] screen (GWM-STD/SHG/MHP/STD2-000/MHP2-000) or the [SCHEDULE INPUT] screen (GWM-PFL/DDL/FL/STD2-001/STD2-002/DDL2-000).

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

3.1. GWM-STD/SHG/STD2-000

3.1.1. [Schedule Window] Screen Arrangement



(1) Output conditions

Item	Setting Details
Schedule	Selects the schedule number to display or edit.
Form	Specifies the welding method (FIX / FLEX).
Modulation	When ON is selected, the right screen is displayed to make the modulation setting.
SEAM	When ON is selected, the right screen is displayed to make the seam setting.

(2) [Laser Output Energy]

Displays the reference value of the laser output energy for the displayed graph.

(3) [Editing]

Displayed when the schedule is editing.

(4) Schedule Copy

Specifies the schedule number to copy to and copies the currently displayed contents.

(5) Buttons

Button	Function
Import GWH	Imports a schedule from a GWH file.
Transfer	Transfers the displayed schedule to the laser equipment. (Can be used only when the equipment is online.)
Import	Imports a schedule saved in the work folder.
Reload	Loads a schedule on the laser equipment in the displayed schedule number. (Can be used only when the equipment is online.)
Save	Saves the displayed schedule in the work folder.
Close	Closes the [Schedule Window] screen. If any schedule has been edited, the message “Unsaved or no transferred data is existing. Terminating?” is displayed.

3.1.2. Setting Schedule using FIX Form

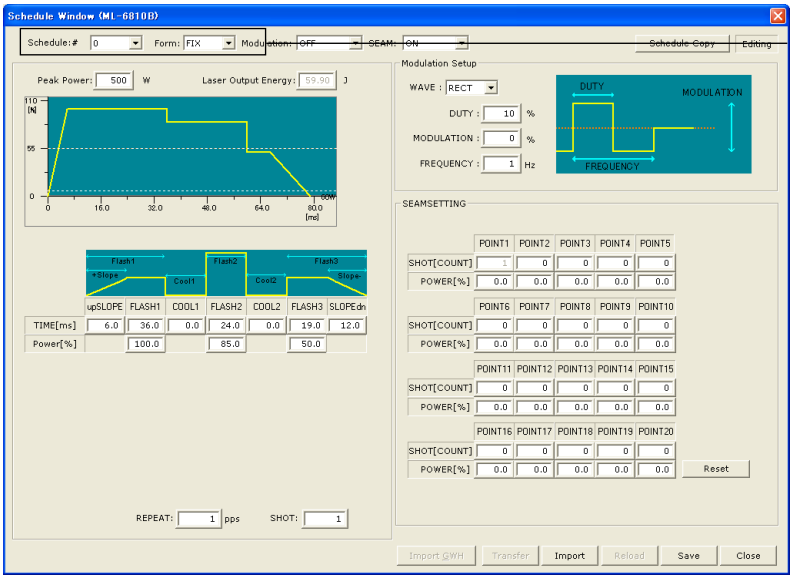
The FIX form is a welding method that generates the waveform using pulse laser excitation and setting the three particular combinations of laser output time and peak output. Gradients can be added for the waveform start-up and drop-off sections.

The schedule can be set as follows.

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

The [Schedule Window] screen appears.

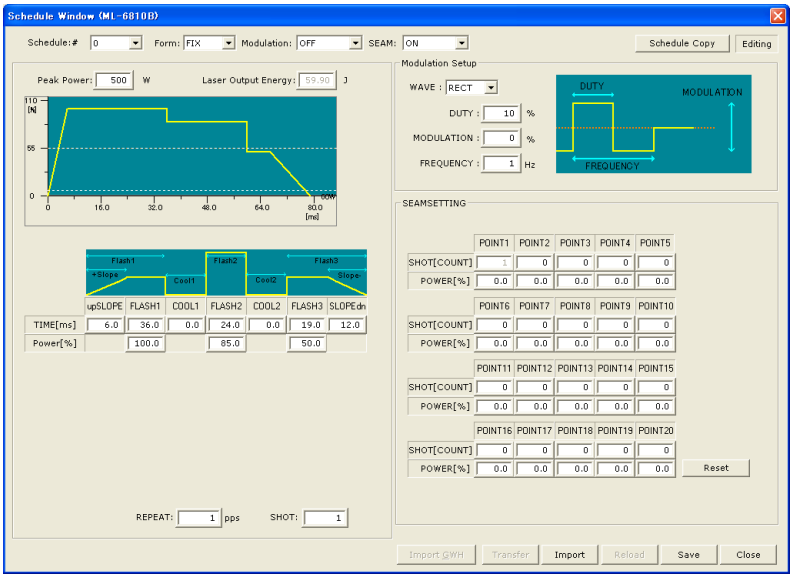
2 Set the desired schedule number in the [Schedule] box, and then select "FIX" in the [Form] box.



Select schedule number and welding method.

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

Item	Setting Details	Range
Peak 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.
upSLOPE	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 upSLOPE FLASH1. Set FLASH1 before setting upSLOPE.	Depends on laser equipment.
FLASH1 to 3	Set the laser output time (TIME) and output (Power) values.	Depends on laser equipment.
COOL1 to 2 (Not available with ML-2050A/2051A/ 2150A)	Set the time (TIME) for which the laser is not output.	Depends on laser equipment.
SLOPEdn	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 SLOPEdn last FLASH.	Depends on laser equipment.
REPEAT*1	Set the number of laser output cycles per second. Set REPEAT to "1" or more for repeated output.	Depends on laser equipment.
SHOT*1	Set the number of laser output cycles. Set SHOT to "1" for single output.	Depends on laser equipment.

*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.

CAUTION	Set the FLASH value ensuring that the conditions below are not exceeded. • 0.25 ms ≤ FLASH1 + FLASH2 + FLASH3 ≤ Upper limit of the used laser equipment • FLASH1 + FLASH2 + FLASH3 + COOL1 + COOL2 ≤ Upper limit of the used laser equipment

4 Click the [Transfer] button once the settings are complete.

The schedule file is sent to the scanner controller.

CAUTION	When the [Transfer] button is clicked after two or more parameters are simultaneously changed, the transfer error may occur. In that case, click the [Transfer] button each time changing a parameter.

Schedule setting is now complete.

CAUTION	The value (range) for error check can vary depending on the status or setting of the laser equipment. Therefore, error check of SWDraw2 and the actual error check of the laser equipment can be different. In SWDraw2, error check is performed at the maximum settable range. For strict error check, confirm that of the laser equipment.

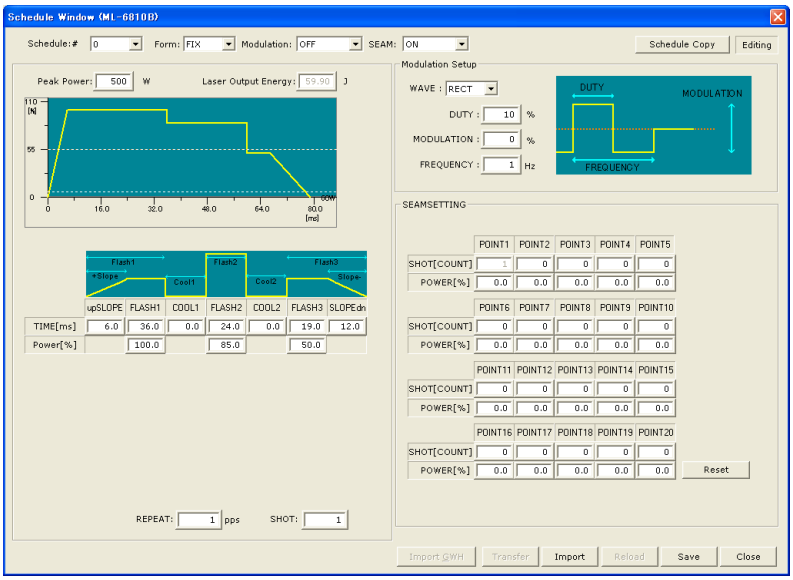
3.1.3. Setting Schedule using FLEX Form

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.

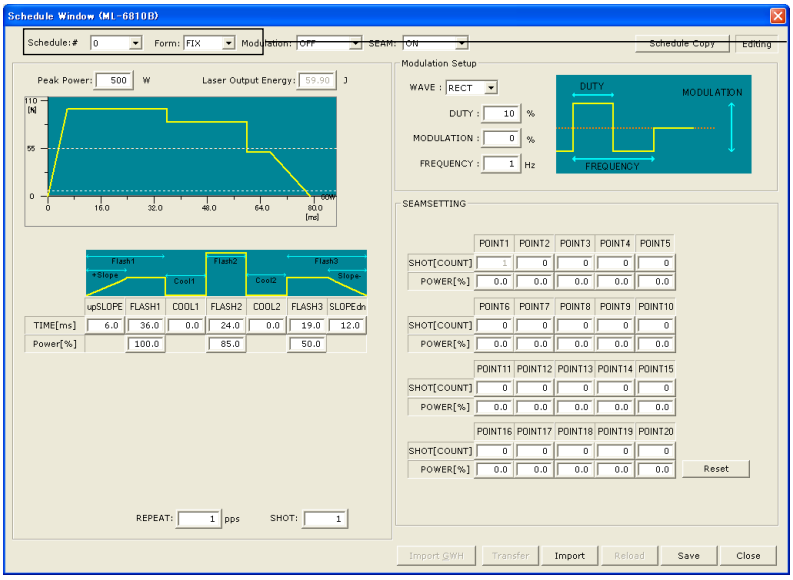
The schedule can be set as follows.

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

The [Schedule Window] screen appears.



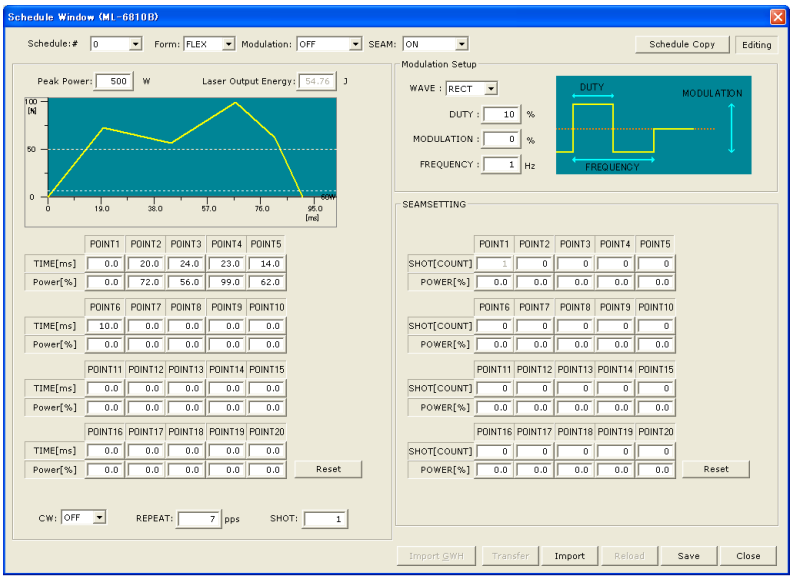
2 Set the desired schedule number in the [Schedule] box, and then select "FLEX" in the [Form] box.



Select schedule number and welding method.

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. Click the [Reset] button to reset all of the TIME and Power settings to 0.



FLEX Form Settings

Item	Setting Details	Setting Range
Peak 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.
POINT1 to 20	Set the laser output time and laser output peak values for each corresponding output time.	• Laser output time: Depends on laser equipment.*1 • Laser output peak value: Depends on laser equipment.
REPEAT*2	Set the number of laser output cycles per second. Set REPEAT to "1" or more for repeated output.	Depends on laser equipment.
SHOT*2	Set the number of laser output cycles. Set SHOT to "1" for single output.	Depends on laser equipment.

*1 An error will occur if the total for POINT1 to 20 exceeds the upper limit of the used laser equipment.

*2 The difference between single output 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.

4 Click the [Transfer] button once the settings are complete.

The schedule file is sent to the scanner controller.

Schedule setting is now complete.

CAUTION	The value (range) for error check can vary depending on the status or setting of the laser equipment. Therefore, error check of SWDraw2 and the actual error check of the laser equipment can be different. In SWDraw2, error check is performed at the maximum settable range. For strict error check, confirm that of the laser equipment.

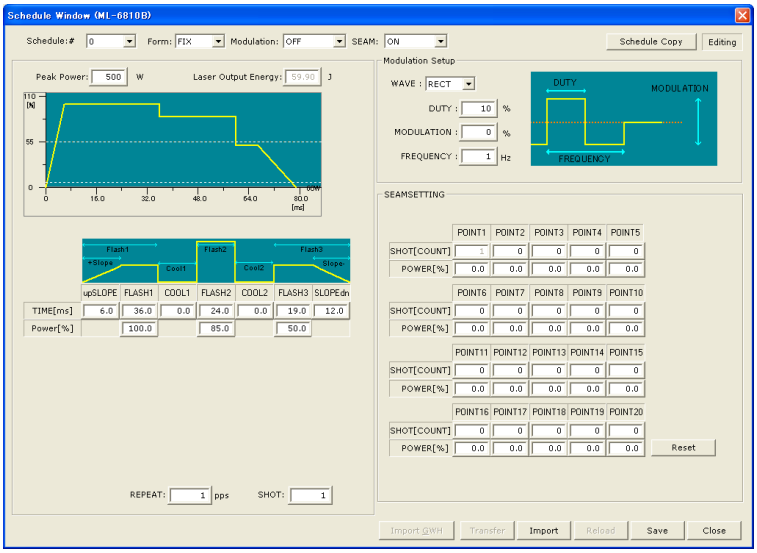
3.1.4. Setting Schedule using CW Form

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.

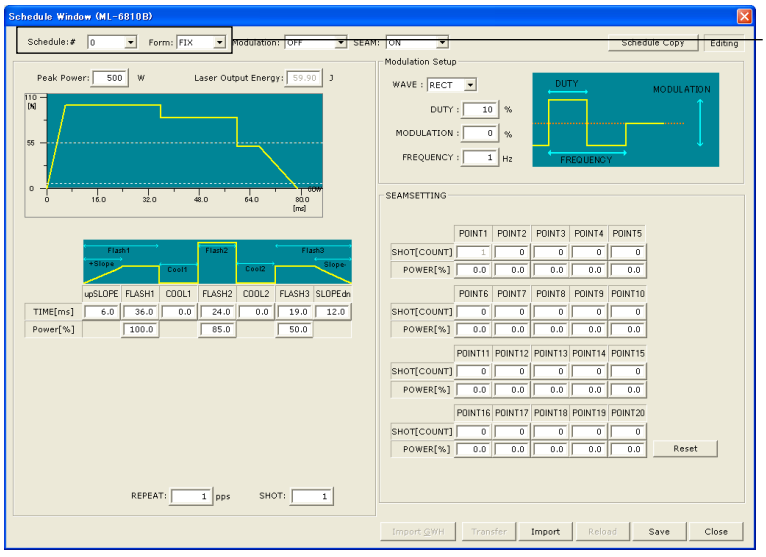
The schedule can be set as follows.

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

The [Schedule Window] screen appears.



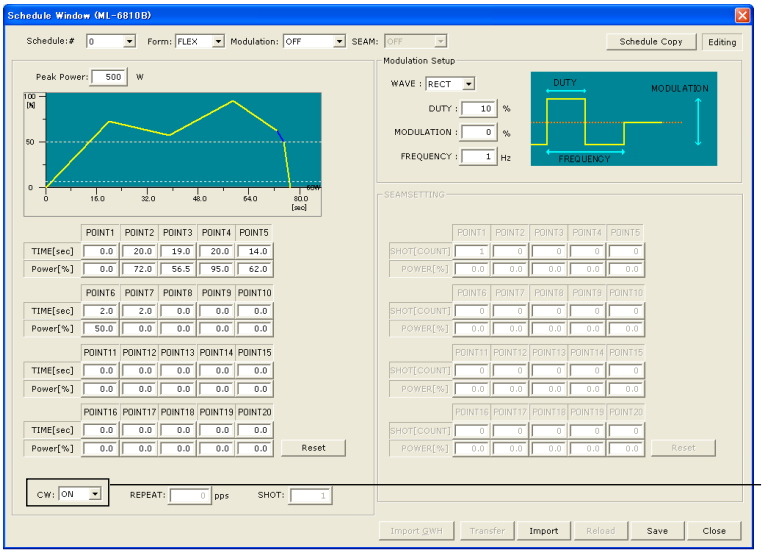
2 Set the desired schedule number in the [Schedule] box, and then select "FLEX" in the [Form] box.



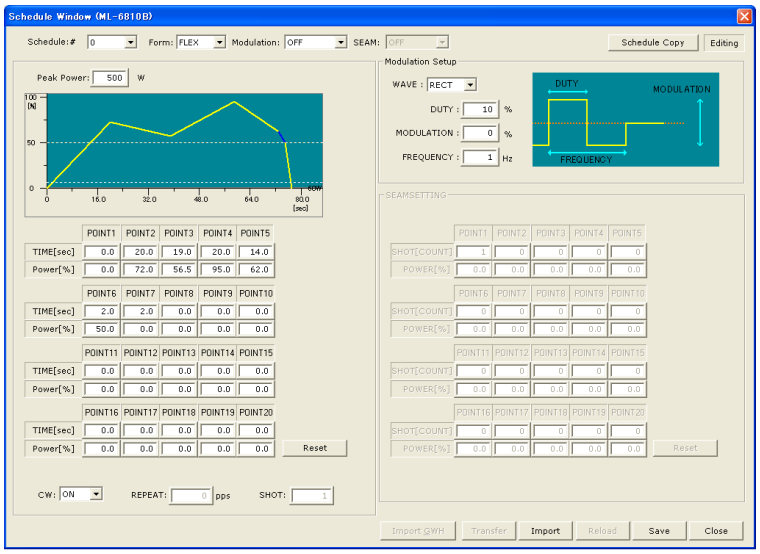
Select schedule number and welding method.

The CW form screen appears.

3 Select "ON" in the [CW] box.



4 Enter the laser output time and output values referring to the table below. The graph is automatically updated to show the values set here. Click the [Reset] button to reset all of the TIME and Power settings to 0.



CW Form Settings

Item	Setting Details	Setting Range
Peak 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.
POINT1 to 20	Set the laser output time and laser output peak values for each output time.	• Laser output time: Depends on laser equipment.*1 • Laser output peak value: 000.0% to 200.0%

*1 An error will occur if the total for POINT1 to 20 exceeds the upper limit of the used laser equipment.

5 Click the [Transfer] button once the settings are complete.

The schedule file is sent to the scanner controller.

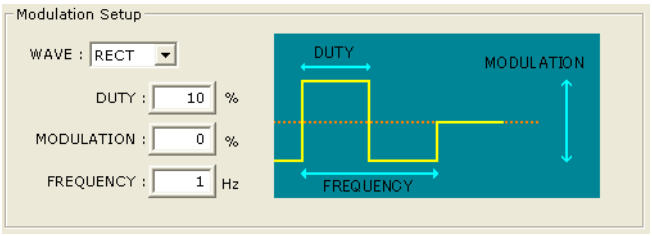
Schedule setting is now complete.

CAUTION	The value (range) for error check can vary depending on the status or setting of the laser equipment. Therefore, error check of SWDraw2 and the actual error check of the laser equipment can be different. In SWDraw2, error check is performed at the maximum settable range. For strict error check, confirm that of the laser equipment.

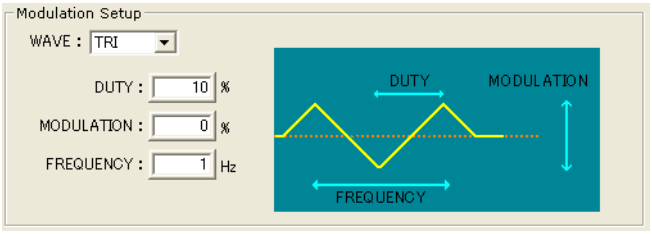
3.1.5. Setting Modulation Form in Schedule (ML-6040A/6700B/6810B only)

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 rectangular wave (RECT), the triangular wave (TRI) and the sinusoidal wave (SINE) to generate a waveform.

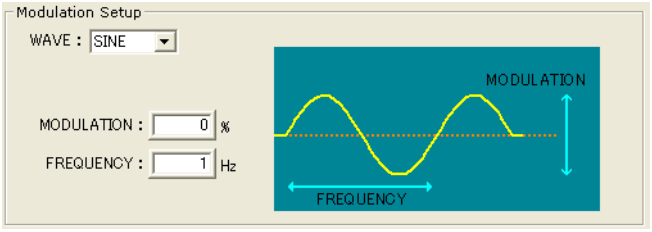
- Rectangular wave (RECT)



- Triangular wave (TRI)



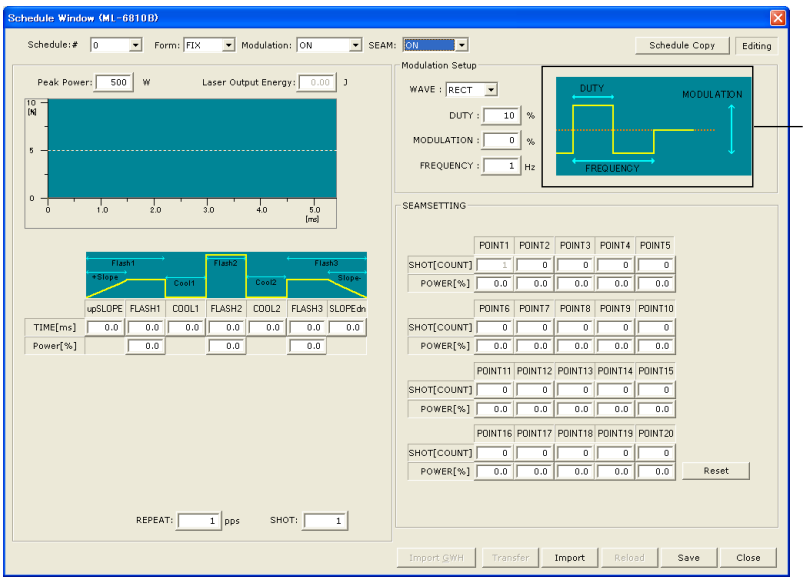
- Sinusoidal wave (SINE)



The modulation form can be set as follows.

1 Select "ON" in the [Modulation] box.

2 Enter the laser output time and output values referring to the table below. The graph is automatically updated to show the values set here. Click the [Reset] button to reset all of the TIME and Power settings to 0.



The graph is updated to show the values set.

Modulation Form Settings

Item	Setting Details	Setting Range
WAVE	Set the type of madulation waveform from rectangular wave (RECT), triangular wave (TRI), or sinusoidal wave (SINE).	—
DUTY	Set the duty ratio.	10 to 90
MODULATION	Set the modulation degree.	0 to 100%
FREQUENCY	Set the frequency.	Depends on laser equipment.

3 Click the [Transfer] button once the settings are complete.

The schedule file is sent to the scanner controller.

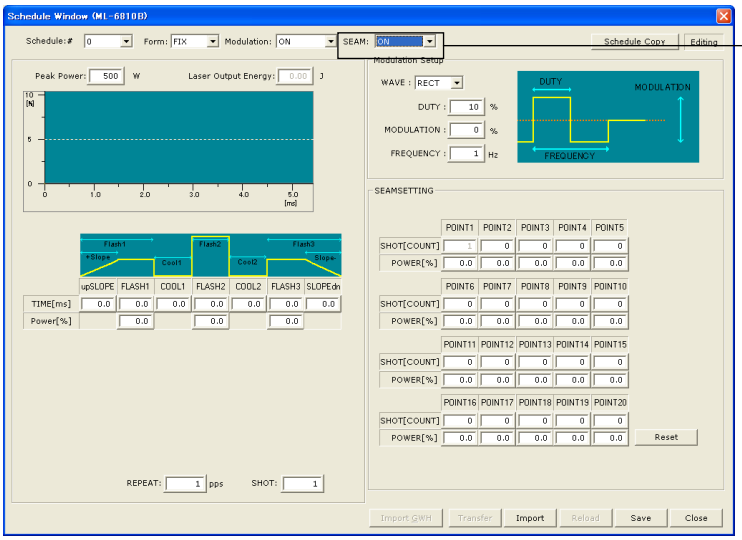
Modulation form setting is now complete.

3.1.6. 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.

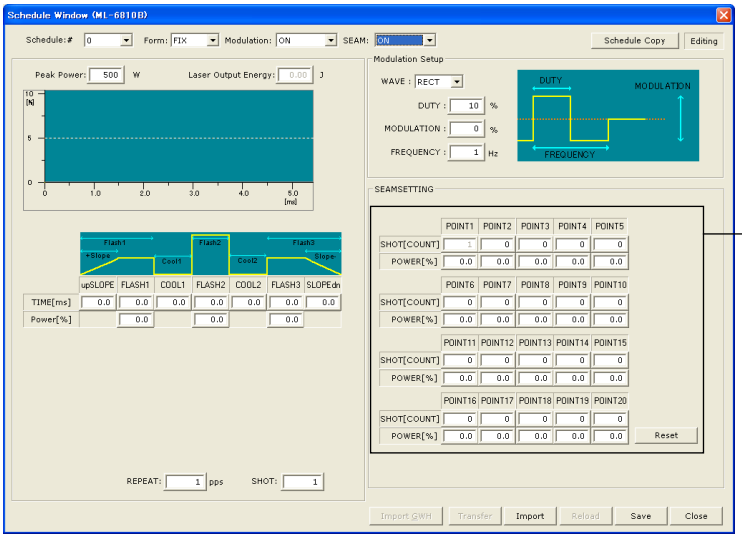
The seam function can be set as follows.

1 When "FIX" or "FLEX" is selected in the [Form] box and "OFF" is selected in the [CW] box, select "ON" in the [SEAM] box.



Select “ON” in the [SEAM] box.

2 Enter the laser output count and a percentage for [Peak Power] referring to the table below. Click the [Reset] button to reset all of the SHOT and POWER settings to 0.



Set values.

Seam Function Settings

Item	Setting Details	Setting Range
POINT1 to 20	Set the laser output count and a percentage of laser output.	• SHOT: 2 to 9999 counts*1 • POWER: 0 to 150%

*1 SHOT for POINT1 is fixed to 1. The value larger than the previous POINT can be input, for example POINT2 < POINT3.

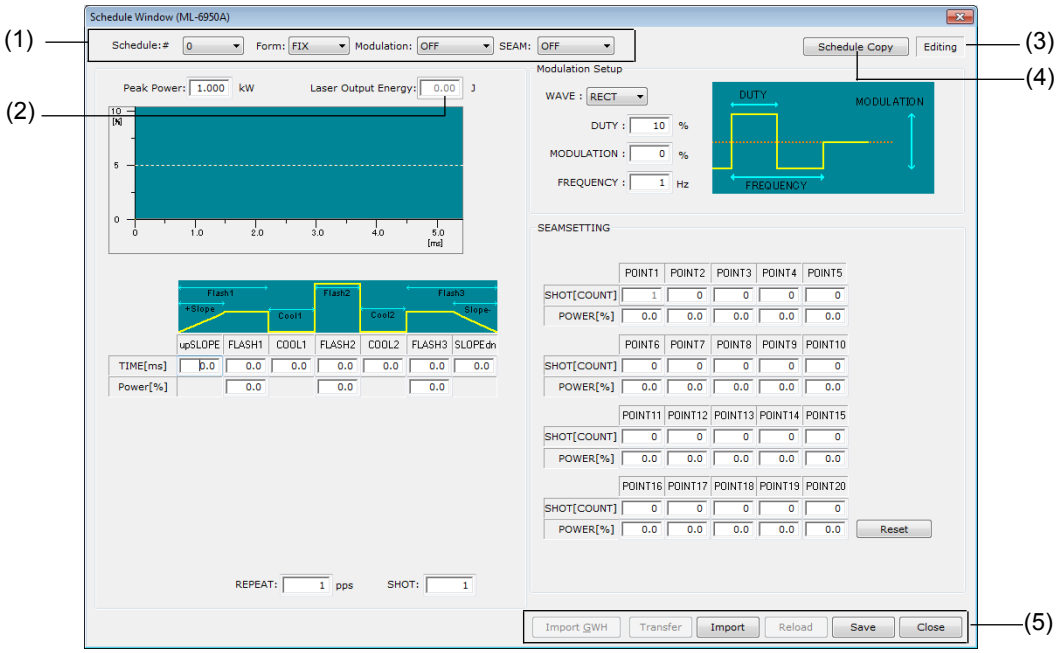
3 Click the [Transfer] button once the settings are complete.

The schedule file is sent to the scanner controller.

Seam function setting is now complete.

3.2. GWM-MHP/MHP2-000

3.2.1. [Schedule Window] Screen Arrangement



(1) Output conditions

Item	Setting Details
Schedule	Selects the schedule number to display or edit.
Form	Specifies the welding method (FIX / FLEX).
Modulation	When ON is selected, the right screen is displayed to make the modulation setting.
SEAM	When ON is selected, the right screen is displayed to make the seam setting.

(2) [Laser Output Energy]

Displays the reference value of the laser output energy for the displayed graph.

(3) [Editing]

Displayed when the schedule is editing.

(4) Schedule Copy

Specifies the schedule number to copy to and copies the currently displayed contents.

(5) Buttons

Button	Function
Import GWH	Imports a schedule from a GWH file.
Transfer	Transfers the displayed schedule to the scanner controller. (Can be used only when the equipment is online.)

Button	Function
Import	Imports a schedule saved in the work folder.
Reload	Loads a schedule on the laser equipment in the displayed schedule number. (Can be used only when the equipment is online.)
Save	Saves the displayed schedule in the work folder.
Close	Closes the [Schedule Window] screen. If any schedule has been edited, the message “Unsaved or no transferred data is existing. Terminating?” is displayed.

3.2.2. 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.

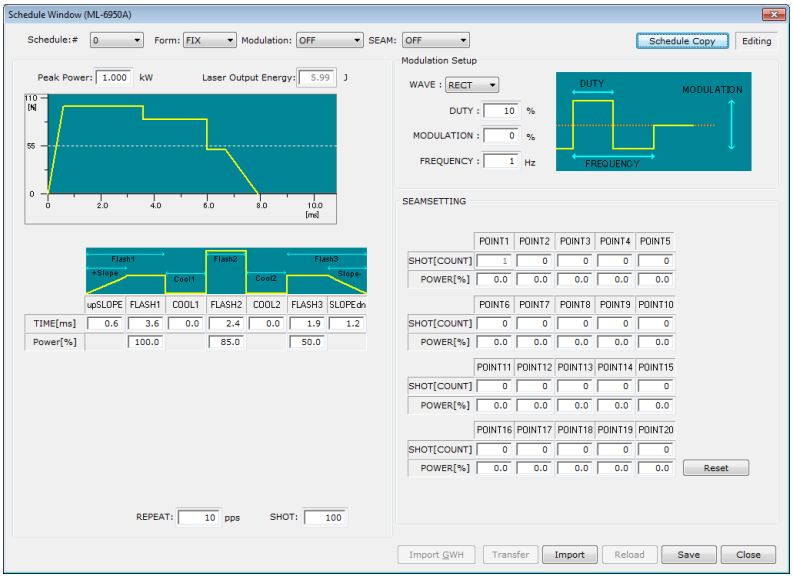
1 From the menu, select [Laser Control] -> [Schedule].

The [Schedule Window] 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
Peak 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.
upSLOPE	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 upSLOPE FLASH1. Set FLASH1 before setting upSLOPE.	Depends on laser equipment.
FLASH1 to 3	Set the laser output time (TIME) and output (Power) values.	Depends on laser equipment.
COOL1 to 2	Set the time (TIME) for which the laser is not output.	Depends on laser equipment.
SLOPEdn	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 SLOPEdn last FLASH.	Depends on laser equipment.

FIX Form Settings (2 / 2)

Item	Setting Details	Range
REPEAT*1	Set the number of laser output cycles per second. Set REPEAT to "1" or more for repeated output.	Depends on laser equipment.
SHOT*1	Set the number of laser output cycles. Set SHOT to "1" for single output.	Depends on laser equipment.

*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.

4 Click the [Transfer] button once the settings are complete.

The schedule file is sent to the scanner controller.

Schedule setting is now complete.

CAUTION	The value (range) for error check can vary depending on the status or setting of the laser equipment. Therefore, error check of SWDraw2 and the actual error check of the laser equipment can be different. In SWDraw2, error check is performed at the settable range. For strict error check, confirm that of the laser equipment.

3.2.3. Setting Schedule using FLEX Form

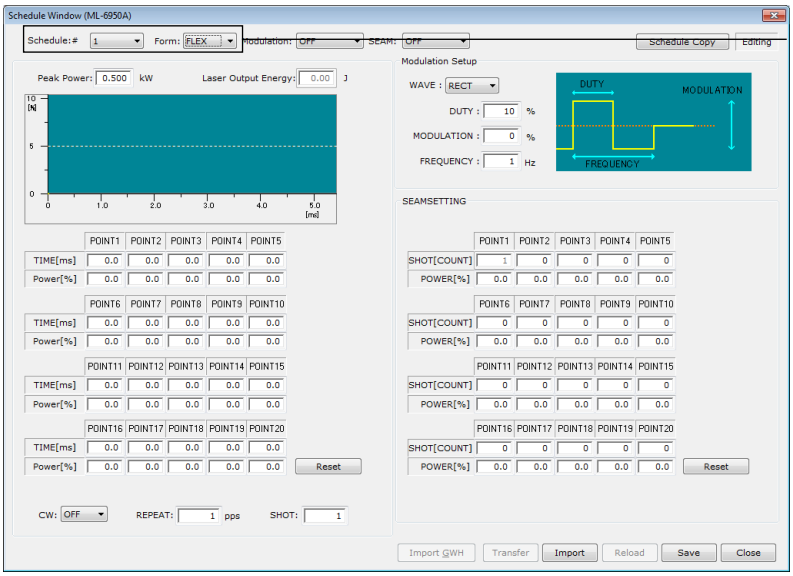
The FLEX form is a welding method that generates the waveform using pulse laser excitation and setting the peak output values for each laser output time. Up to 20 different output times can be set.

The schedule can be set as follows.

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

The [Schedule Window] screen appears.

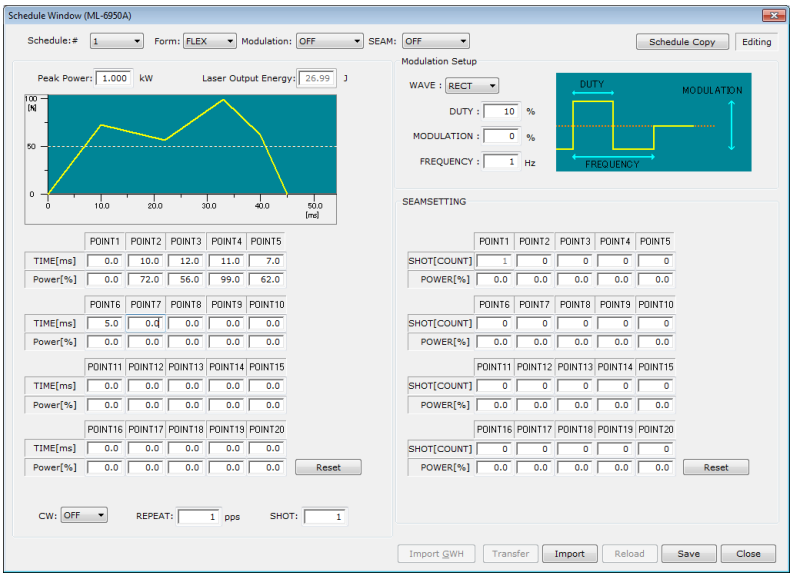
2 Set the desired schedule number in the [Schedule] box, and then select "FLEX" in the [Form] box.



Select schedule number and welding method.

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. Click the [Reset] button to reset all of the TIME and Power settings to 0.



FLEX Form Settings

Item	Setting Details	Setting Range
Peak 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.
POINT1 to 20	Set the laser output time and laser output peak values for each corresponding output time.	• Laser output time: Depends on laser equipment. • Laser output peak value: Depends on laser equipment.
REPEAT*1	Set the number of laser output cycles per second. Set REPEAT to "1" or more for repeated output.	Depends on laser equipment.
SHOT*1	Set the number of laser output cycles. Set SHOT to "1" for single output.	Depends on laser equipment.

*1 The difference between single output 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.

4 Click the [Transfer] button once the settings are complete.

The schedule file is sent to the scanner controller.

Schedule setting is now complete.

CAUTION	The value (range) for error check can vary depending on the status or setting of the laser equipment. Therefore, error check of SWDraw2 and the actual error check of the laser equipment can be different. In SWDraw2, error check is performed at the settable range. For strict error check, confirm that of the laser equipment.

3.2.4. Setting Schedule using CW Form

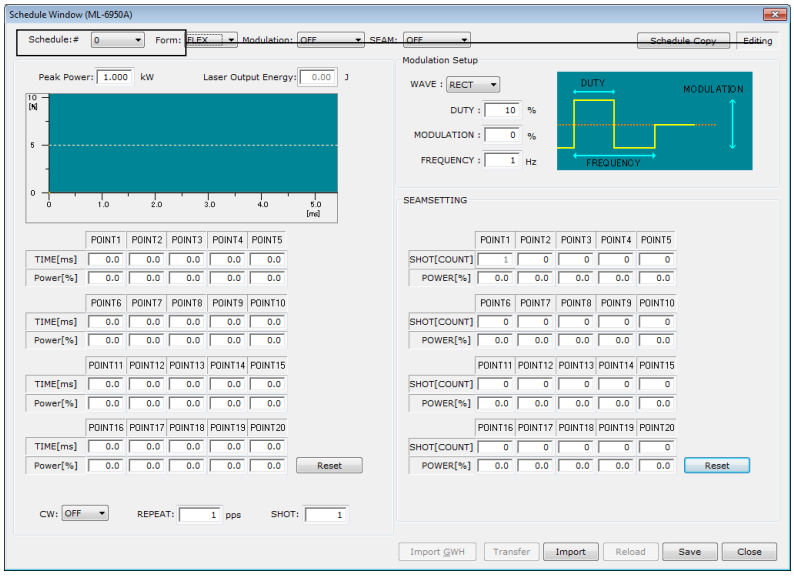
The CW form is a welding method that generates the waveform using continuous laser excitation and setting the peak output values for each laser output time. Up to 20 different output times can be set. Unlike the FIX and FLEX forms, SEAM settings and repeated/single output cannot be set, reducing output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

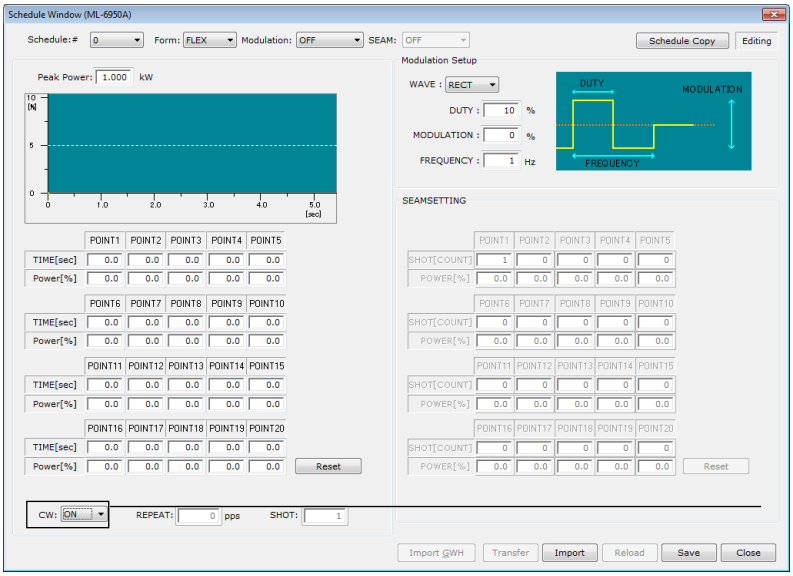
2 Set the desired schedule number in the [Schedule] box, and then select "FLEX" in the [Form] box.



Select schedule number and welding method.

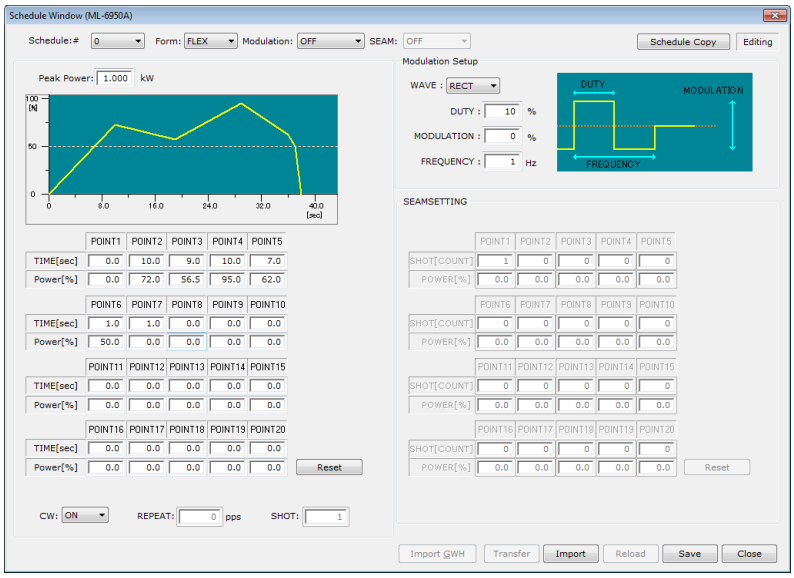
The CW form screen appears.

3 Select "ON" in the [CW] box.



Select "ON" in the [CW] box.

4 Enter the laser output time and output values referring to the table below. The graph is automatically updated to show the values set here. Click the [Reset] button to reset all of the TIME and Power settings to 0.



CW Form Settings

Item	Setting Details	Setting Range
Peak 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.
POINT1 to 20	Set the laser output time and laser output peak values for each output time.	• Laser output time: Depends on laser equipment. • Laser output peak value: Depends on laser equipment.

5 Click the [Transfer] button once the settings are complete.

The schedule file is sent to the scanner controller.

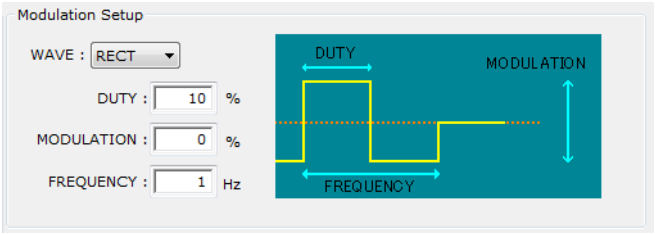
Schedule setting is now complete.

CAUTION	The value (range) for error check can vary depending on the status or setting of the laser equipment. Therefore, error check of SWDraw2 and the actual error check of the laser equipment can be different. In SWDraw2, error check is performed at the settable range. For strict error check, confirm that of the laser equipment.

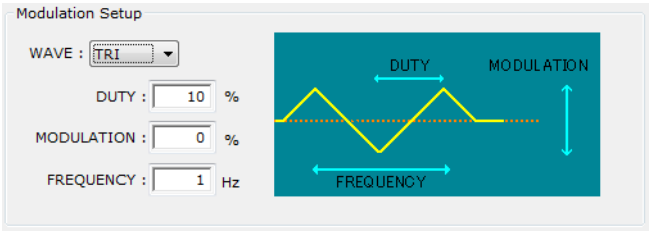
3.2.5. Setting Modulation Form in Schedule

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 rectangular wave (RECT), the triangular wave (TRI) and the sinusoidal wave (SINE) to generate a waveform.

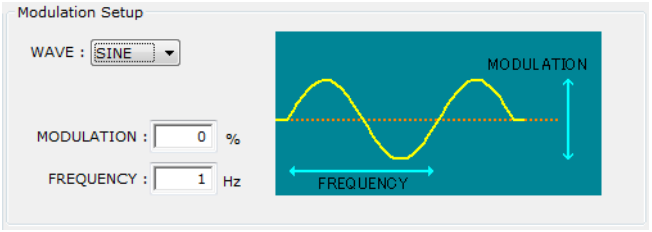
- Rectangular wave (RECT)



- Triangular wave (TRI)



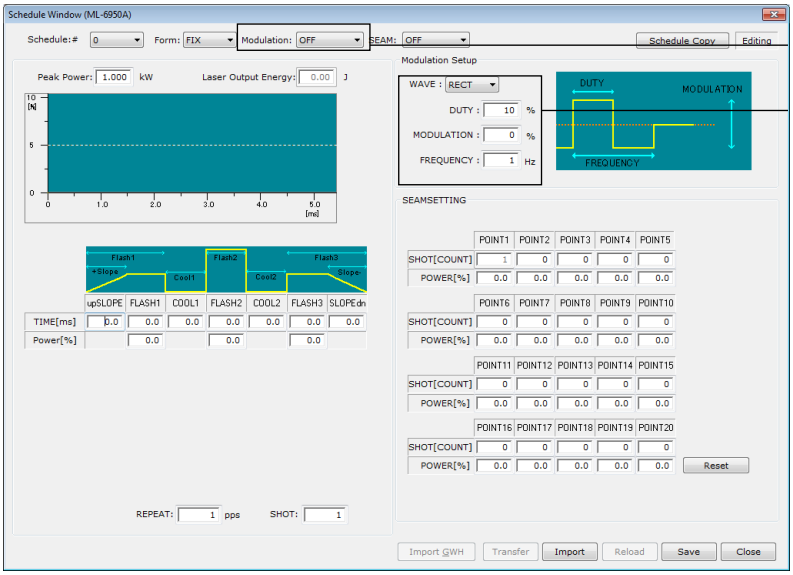
- Sinusoidal wave (SINE)



The modulation form can be set as follows.

1 Select "ON" in the [Modulation] box.

2 Enter the laser output time and output values referring to the table below. The graph is automatically updated to show the values set here. Click the [Reset] button to reset all of the TIME and Power settings to 0.



Select “ON” in the [Modulation] box.

Set values.

Modulation Form Settings

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

3 Click the [Transfer] button once the settings are complete.

The schedule file is sent to the scanner controller.

Modulation form setting is now complete.

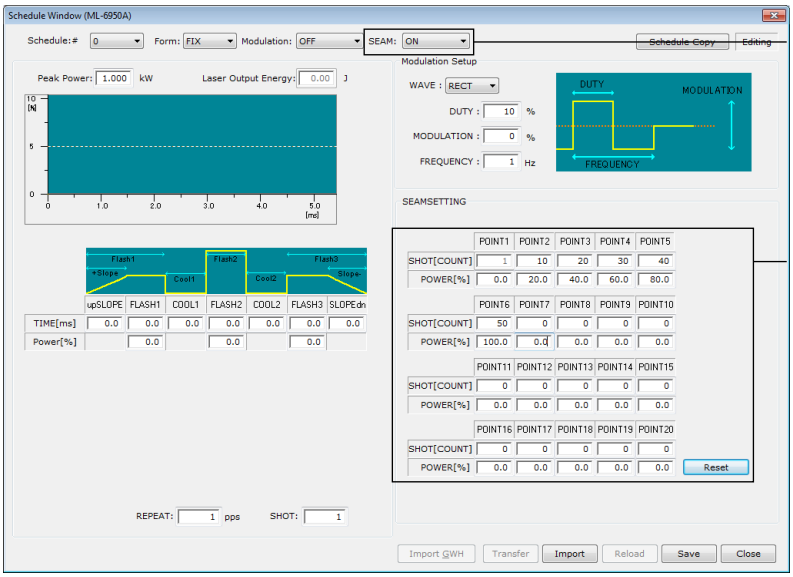
3.2.6. Setting Seam Function in Schedule

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 and "OFF" is selected in the [CW] box, select "ON" in the [SEAM] box.

2 Enter the laser output count and a percentage for [Peak Power] referring to the table below. Click the [Reset] button to reset all of the SHOT and POWER settings to 0.



Select “ON” in the [SEAM] box.

Set values.

Seam Function Settings

Item	Setting Details	Setting Range
POINT1 to 20	Set the laser output count and a percentage of laser output.	• SHOT: 2 to 9999 counts*1 • POWER: 0 to 150%

*1 SHOT for POINT1 is fixed to 1. The value larger than the previous POINT can be input, for example POINT2 < POINT3.

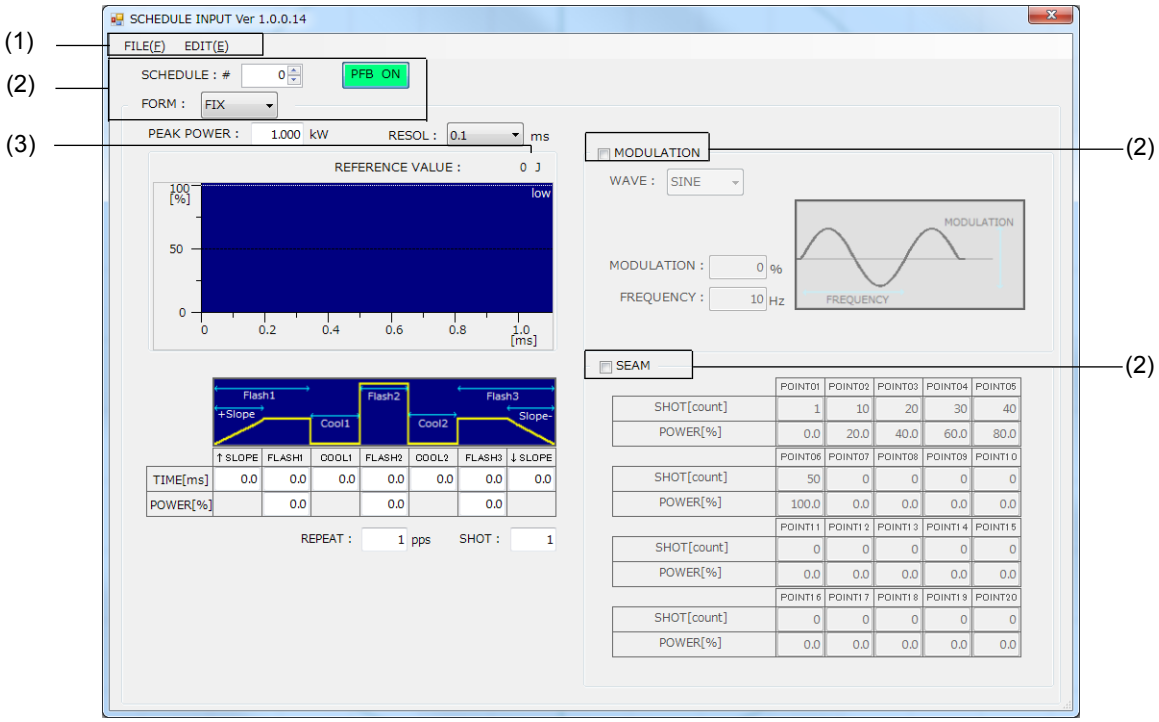
3 Click the [Transfer] button once the settings are complete.

The schedule file is sent to the scanner controller.

Seam function setting is now complete.

3.3. GWM-PFL/DDL/FL/STD2-001/STD2-002/DDL2-000

3.3.1. [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 CSV 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 CSV format and waveform image (bitmap) are created. Values of acquired schedule data are output in CSV format.
EDIT	Copy *1	Copies the specified schedule data 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 specified schedule data. After reset, reaquires the schedule data to display it.

*1 Copy and Paste functions can be used only in SWDraw2. For data interaction with other applications, use Import and Export functions.

(2) Output conditions

Item	Setting Details
SCHEDULE	Selects the schedule number to display or edit.
PFB ON/ PFB OFF (GWM-PFL/ STD2-001 only)	Sets and displays ON / OFF of the power feedback.
FORM	Specifies the welding method (FIX / FLEX / CW).
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.

(3) [REFERENCE VALUE]

Displays the reference value of the laser output energy for the displayed graph.

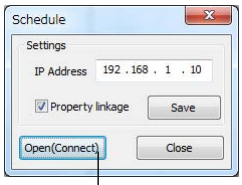
3.3.2. Setting Schedule using FIX Form

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] screen appears.



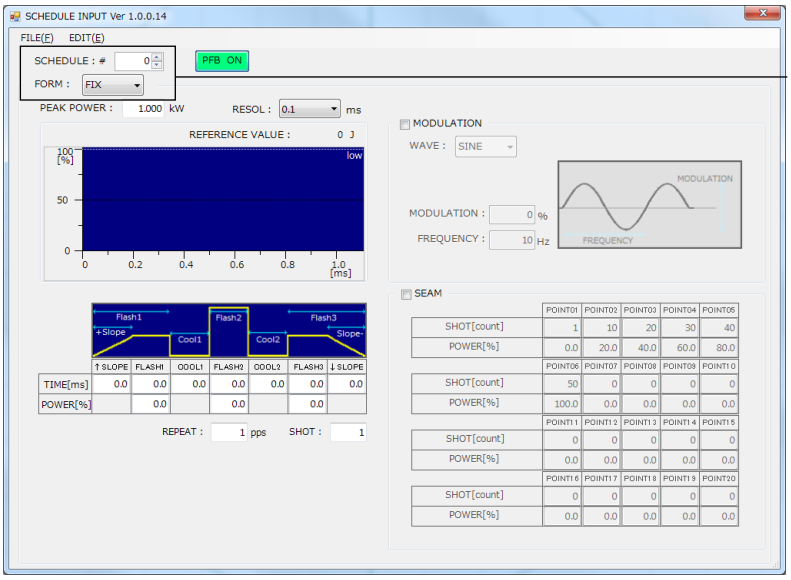
Open (Connect) button

CAUTION	Input the IP address set for the laser equipment. The default is [192.168.1.10]. Refer to "Chapter 1-2.5. Computer Network Settings" (page 20) .

2 When the laser equipment is online, click the [Open (Connect)] button.

The [SCHEDULE INPUT] screen appears.

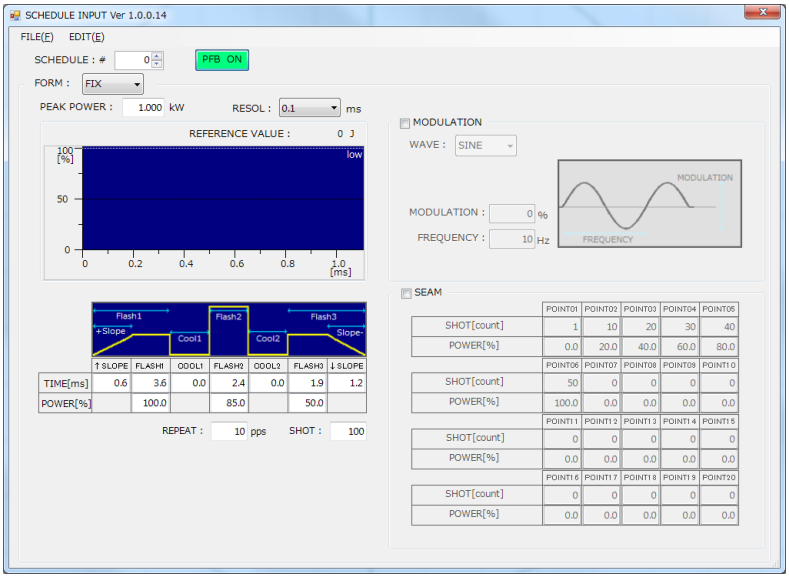
3 Set the desired schedule number in the [SCHEDULE] box, and then select "FIX" in the [FORM] box.



Select schedule number and welding method.

The FIX form screen appears.

4 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

Item	Setting Details	Range
PEAK POWER (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 / 0.05 ms). The laser output time is displayed with the specified resolution.	—
↑ 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 (Power) values.	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. Set REPEAT to "1" or more for repeated output.	Depends on laser equipment.
SHOT*1	Set the number of laser output cycles. Set SHOT to "1" for single output.	Depends on laser equipment.

*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.

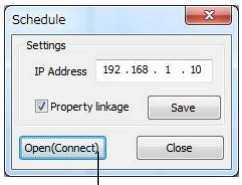
3.3.3. Setting Schedule using FLEX Form

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] screen appears.



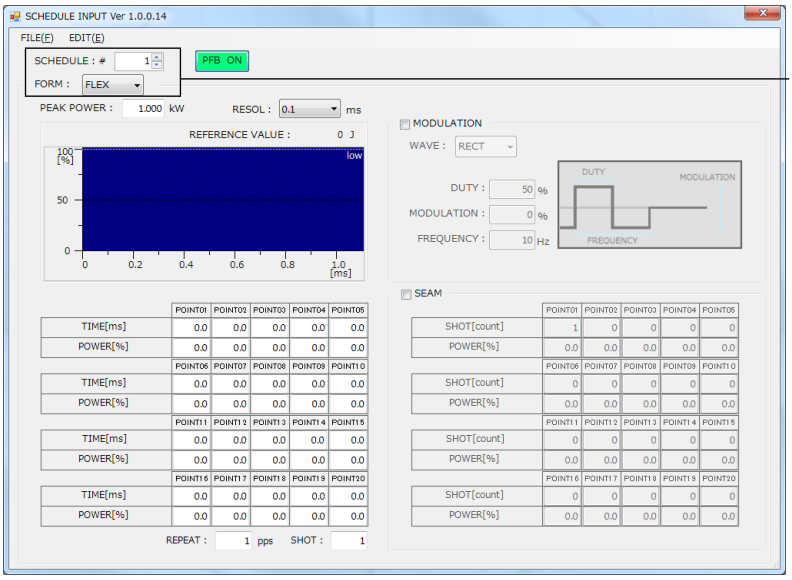
Open (Connect) button

CAUTION	Input the IP address set for the laser equipment. The default is [192.168.1.10]. Refer to "Chapter 1-2.5. Computer Network Settings" (page 20) .

2 When the laser equipment is online, click the [Open (Connect)] button.

The [SCHEDULE INPUT] screen appears.

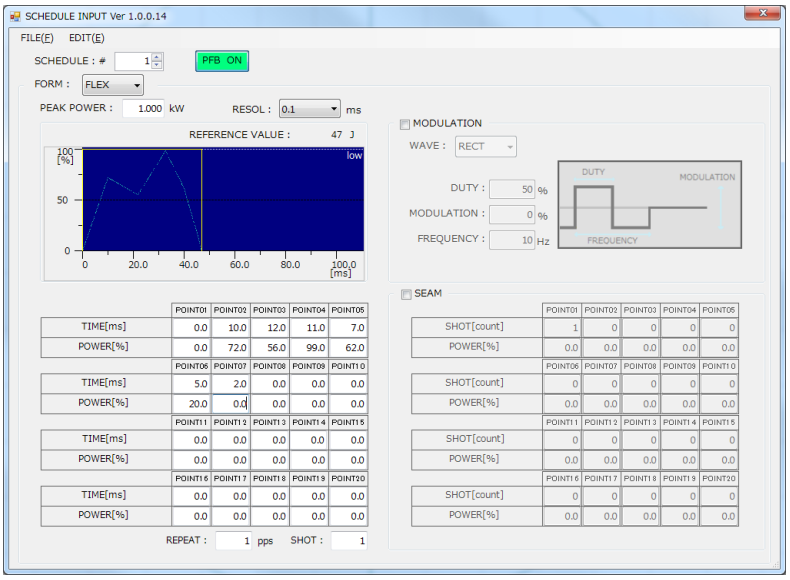
3 Set the desired schedule number in the [SCHEDULE] box, and then select "FLEX" in the [FORM] box.



Select schedule number and welding method.

The FLEX form screen appears.

4 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. From the menu, select [File] -> [Reset] to reset all of the TIME and Power settings to 0.



FLEX Form Settings

Item	Setting Details	Setting Range
PEAK POWER (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 / 0.05 ms). The laser output time is displayed with the specified resolution.	—
POINT1 to 20	Set the laser output time and laser output peak values for each corresponding output time.	• Laser output time: Depends on laser equipment. • Laser output peak value: Depends on laser equipment.
REPEAT*1	Set the number of laser output cycles per second. Set REPEAT to "1" or more for repeated output.	Depends on laser equipment.
SHOT*1	Set the number of laser output cycles. Set SHOT to "1" for single output.	Depends on laser equipment.

*1 The difference between single output 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.

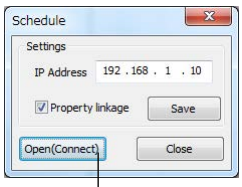
3.3.4. Setting Schedule using CW Form

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] screen appears.



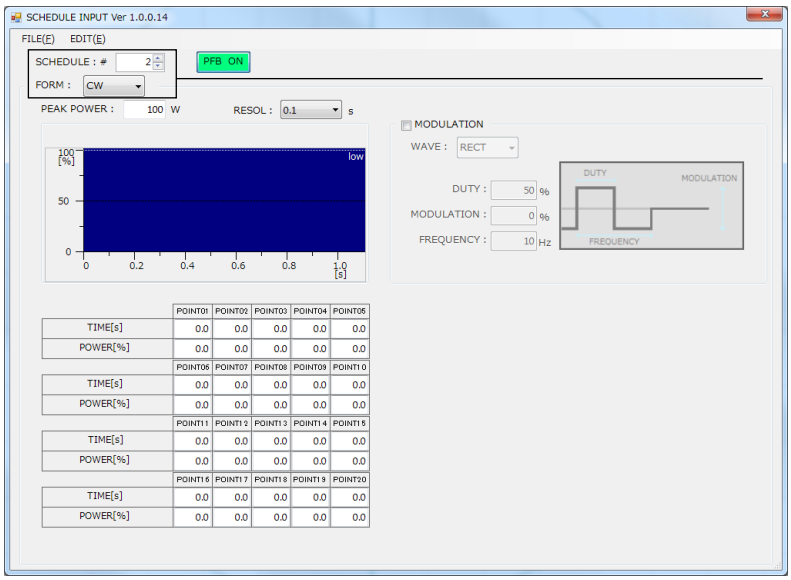
Open (Connect) button

CAUTION	Input the IP address set for the laser equipment. The default is [192.168.1.10]. Refer to "Chapter 1-2.5. Computer Network Settings" (page 20) .

2 When the laser equipment is online, click the [Open (Connect)] button.

The [SCHEDULE INPUT] screen appears.

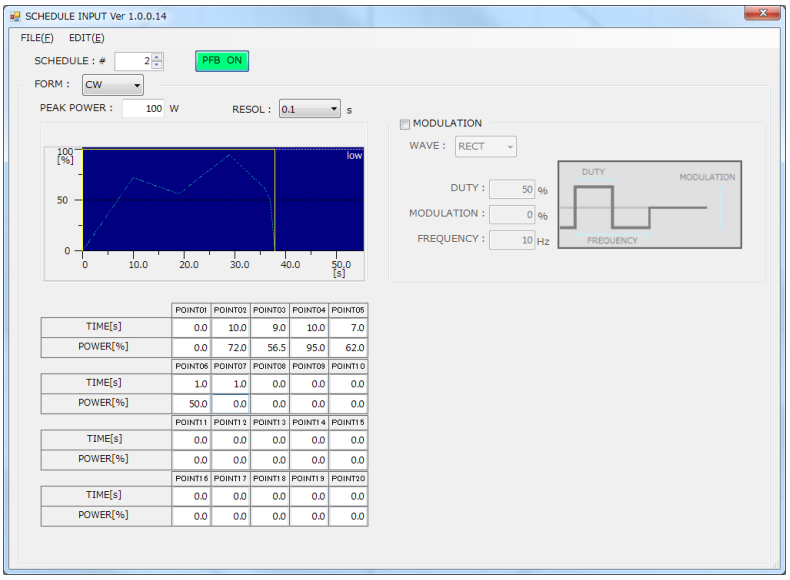
3 Set the desired schedule number in the [SCHEDULE] box, and then select "CW" in the [FORM] box.



Select schedule number and welding method.

The CW form screen appears.

4 Enter the laser output time and output values referring to the table below. The graph is automatically updated to show the values set here. From the menu, select [File] -> [Reset] to reset all of the TIME and Power settings to 0.



CW Form Settings

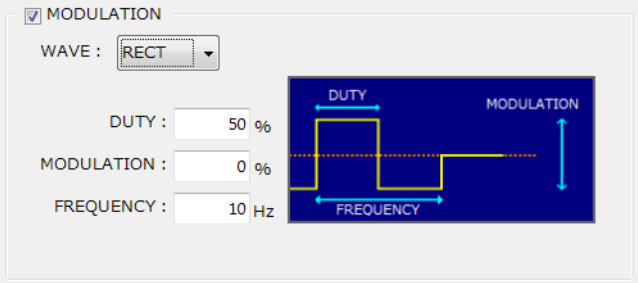
Item	Setting Details	Setting Range
PEAK POWER (SET POWER)	Set the reference value for the laser output peak value. The actual laser output is set as a percentage of this value.	Depends on laser equipment.
RESOL	Set the resolution (1 s / 0.1 s / 0.01 s / 0.001 s). The laser output time is displayed with the specified resolution.	—
POINT1 to 20	Set the laser output time and laser output peak values for each output time.	• Laser output time: Depends on laser equipment. • Laser output peak value: Depends on laser equipment.

Schedule setting is now complete.

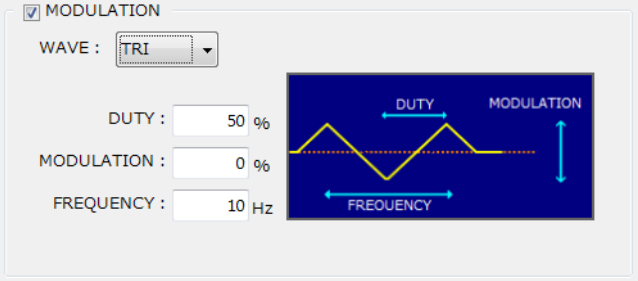
3.3.5. Setting Modulation Form in Schedule

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 rectangular wave (RECT), the triangular wave (TRI) and the sinusoidal wave (SINE) to generate a waveform.

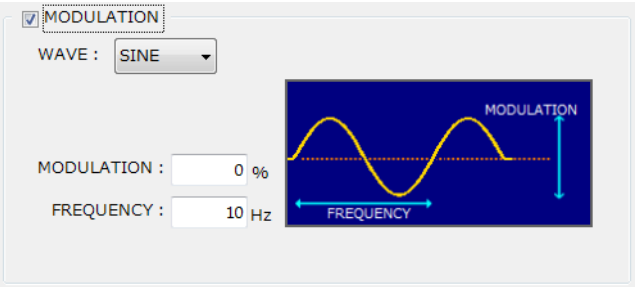
- Rectangular wave (RECT)



- Triangular wave (TRI)



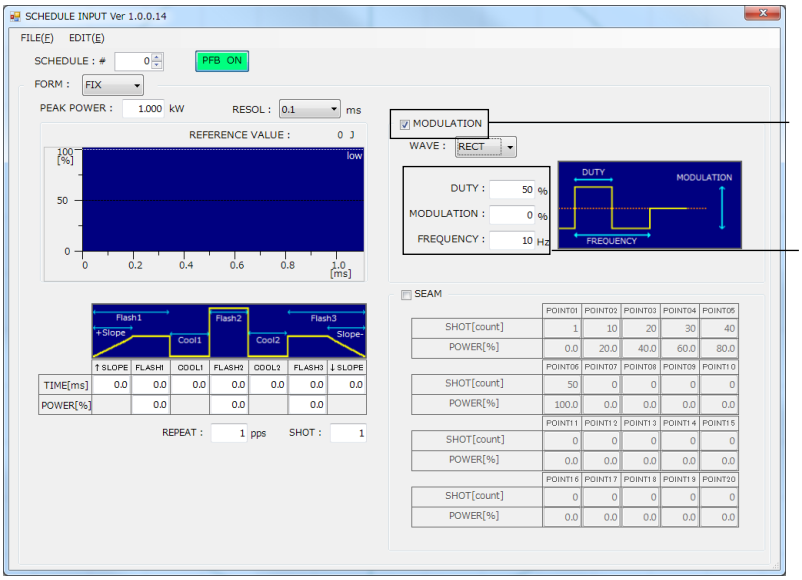
- Sinusoidal wave (SINE)



The modulation form can be set as follows.

1 Check the checkbox for the [MODULATION].

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



Modulation Form Settings

Item	Setting Details	Setting Range
WAVE	Set the type of madulation waveform from rectangular wave (RECT), triangular wave (TRI), or sinusoidal wave (SINE).	—
DUTY	Set the duty ratio.	10 to 90
MODULATION	Set the modulation degree.	0 to 100%
FREQUENCY	Set the frequency.	Depends on laser equipment.

Modulation form setting is now complete.

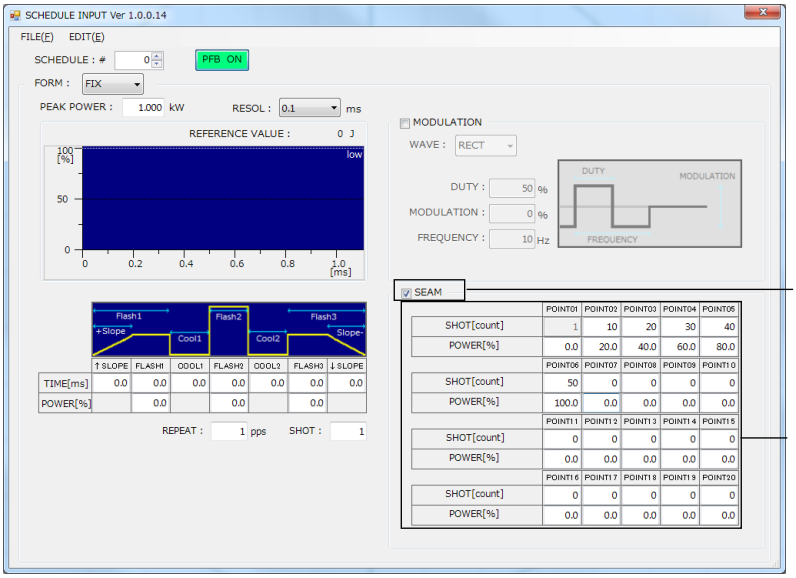
3.3.6. Setting Seam Function in Schedule

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 [Peak Power] referring to the table below. From the menu, select [File] -> [Reset] to reset all of the SHOT and Power settings to 0.



Seam Function Settings

Item	Setting Details	Setting Range
POINT1 to 20	Set the laser output count and a percentage of laser output.	• SHOT: 2 to 9999 counts*1 • POWER: 0 to 150%

*1 SHOT for POINT1 is fixed to 1. The value larger than the previous POINT can be input, for example POINT2 < POINT3.

Seam function setting is now complete.

4. System Parameters (Setting Laser Equipment Operating Conditions)

Follow these steps to specify basic laser equipment operating conditions.

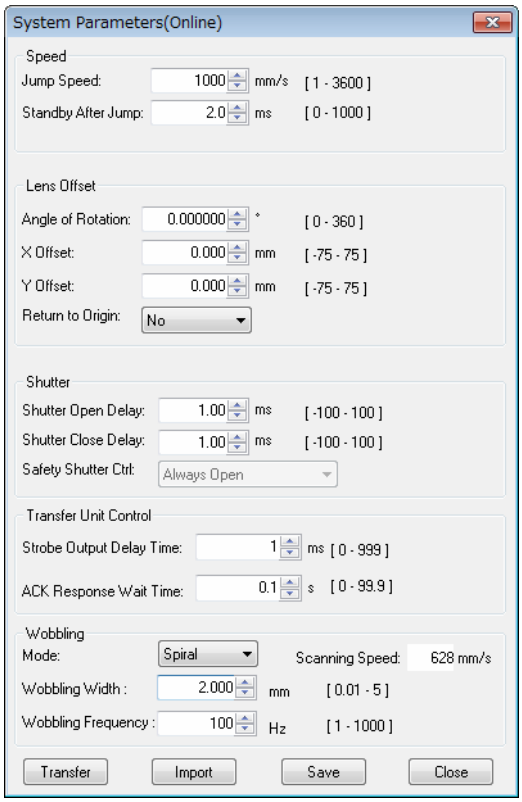
1 From the menu, select [Laser Control] -> [System Parameters].

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 / 2)

Item		Setting Details	Range (Default)	Pitch
Speed	Jump Speed*1	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 / 2)

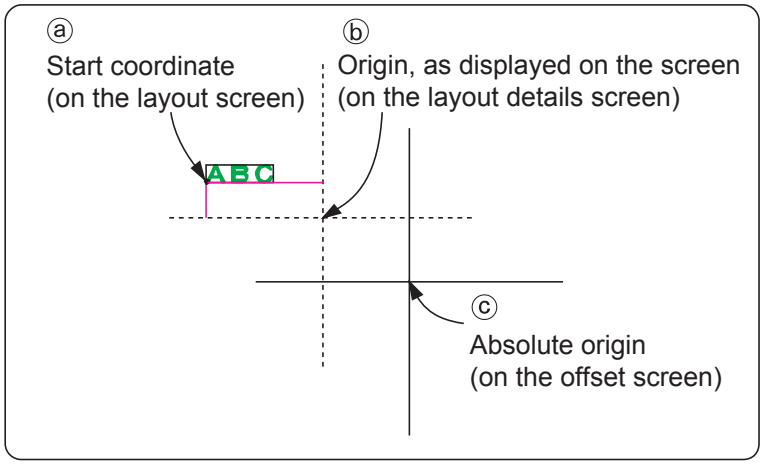
Item			Setting Details	Range (Default)	Pitch
Lens Offset*2	Angle of Rotation		Rotates the layout file by the specified amount before welding.	0 to 360° (0°)	0.000001°
	X Offset*1*2		Moves the X axis of the layout file by the specified amount before welding.	Lens dependant (0 mm)	0.001 mm
	Y Offset*1*2		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 *4*5		Adjusts the timing for laser emission.	–100.00 to 100.00 ms (0 ms)	0.01 ms
	Shutter Close Delay *4*5		Adjusts the timing when laser emission stops.	–100.00 to 100.00 ms (0 ms)	0.01 ms
	Safety Shutter Ctrl*6	Always Open	The shutter is always open when HV or 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*7	Mode	None	The wobbling does not function.	—	—
		Spiral	Performs scanning spirally.	—	—
		Sine curve	Performs scanning sinusoidally.	—	—
	Wobbling Width		Specify the width (line width) of the wobbling.	0.01 to 5 mm (1.000 mm)	0.001 mm
	Wobbling Frequency		Specify the frequency for the wobbling.	1 to 1000 Hz (100 Hz)	1 Hz
	Scanning Speed*8		The speed obtained from Wobbling Width and Wobbling Frequency is displayed.	—	1 mm/s

*1 Refer to each manual for laser scanning system for welding for the range of settings for various lenses.

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

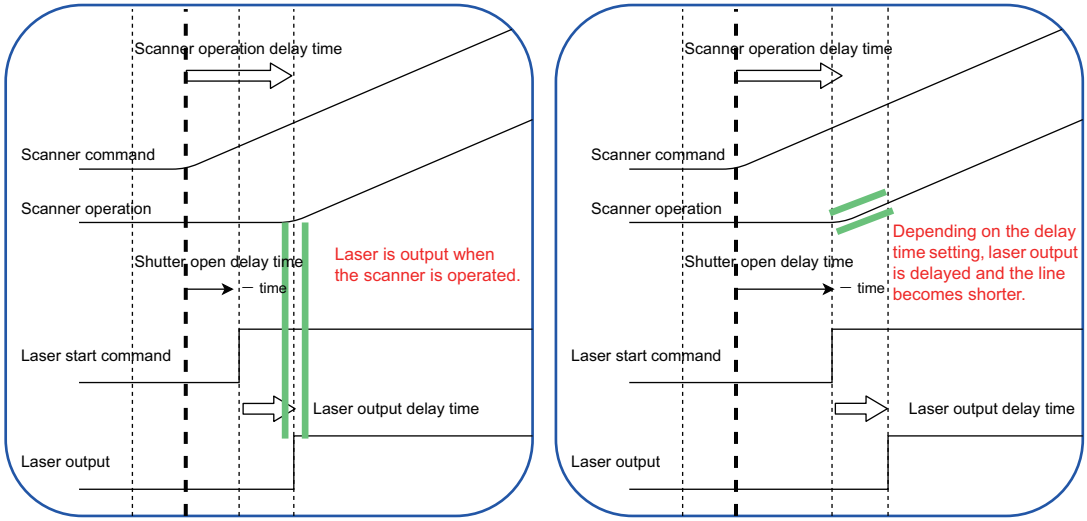
*3 Lens Offset

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].

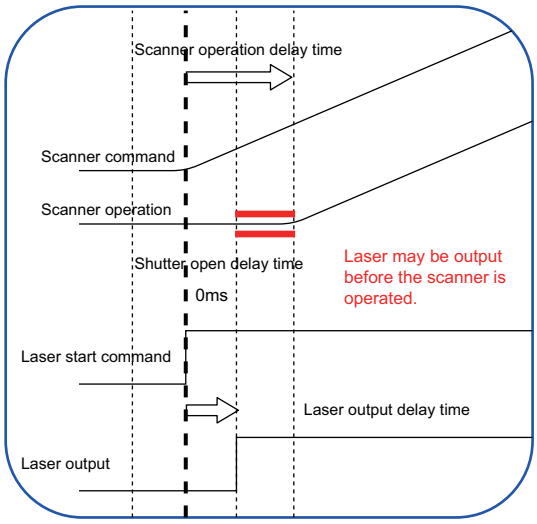


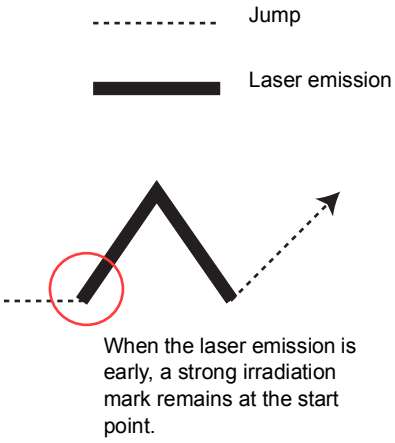
*4 A start command is output for the scanner and the laser engine. When the timing of scanner operation and laser emission do not coincide due to each response time, the drawing start point may be shifted.
To adjust the timing, set [Shutter Open Delay] and [Shutter Close Delay].

<Timing of scanner operation and laser output coincides> <Timing of scanner operation and laser output coincide does not coincide>

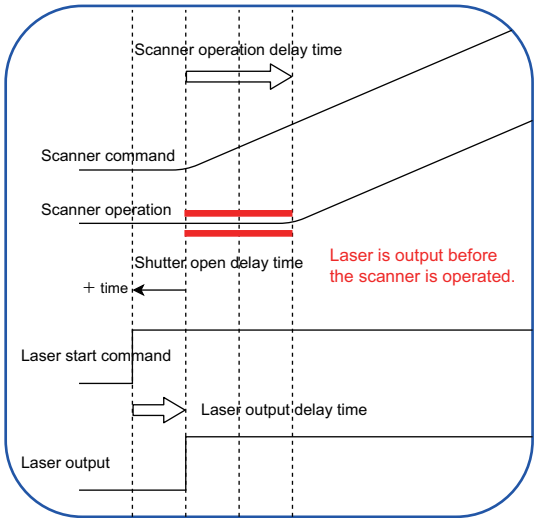


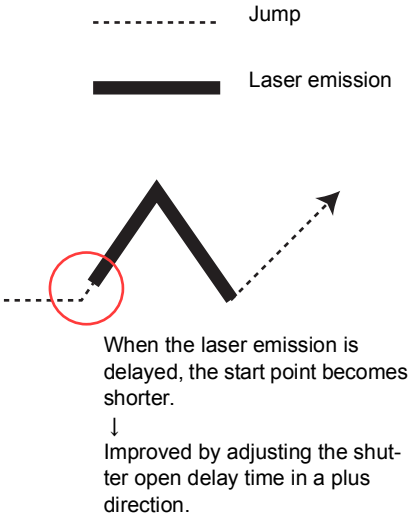
- Shutter Open Delay "0 ms"
The laser start command is turned on simultaneously with the scanner command. There is a slight delay from the laser start command to the laser output. When the timing with the scanner operation delay time is off, laser may be output before scanner operation. (A strong irradiation mark remains at the start point.)





- Shutter Open Delay "+ (-) ms"
After the laser start command is turned on, a plus set time is waited and then the scanner command is output. In case of a plus setting, laser is output before the scanner moves. (A strong irradiation mark remains on the start point.) In case of a minus setting, the set time is waited after the scanner command and then the laser start signal is output. (The start point becomes shorter.)





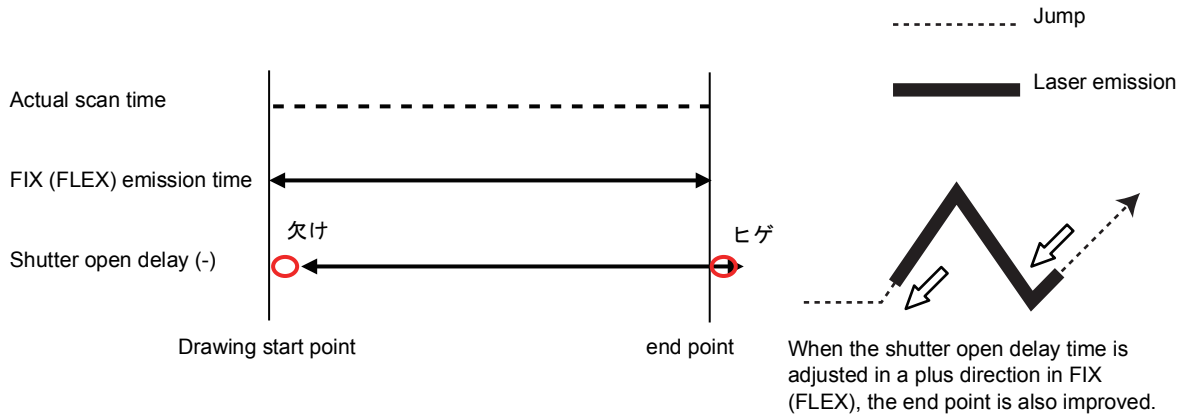
In summary, operation of the shutter open delay time is as follows:
When a strong irradiation mark remains at the start point, adjust the shutter open delay time in a minus direction.
When the start point becomes shorter, adjust the shutter open delay time in a plus direction.

The method of adjusting the length of the laser end point differs depending on the FORM type.

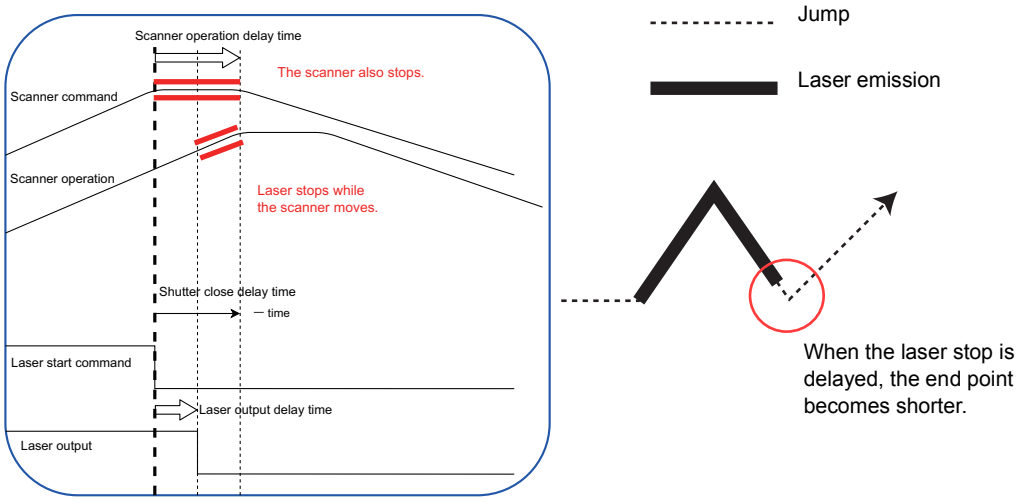
Method of adjusting the length of the laser end point depending on the FORM type

FORM	Shutter close delay time	Adjustment of the length of the laser end point
FIX	Invalid	Adjust the laser emission time of the schedule.
FLEX		
CW	Valid	Adjust the setting of the shutter close delay time. (the end point becomes longer プラスを増やすと)

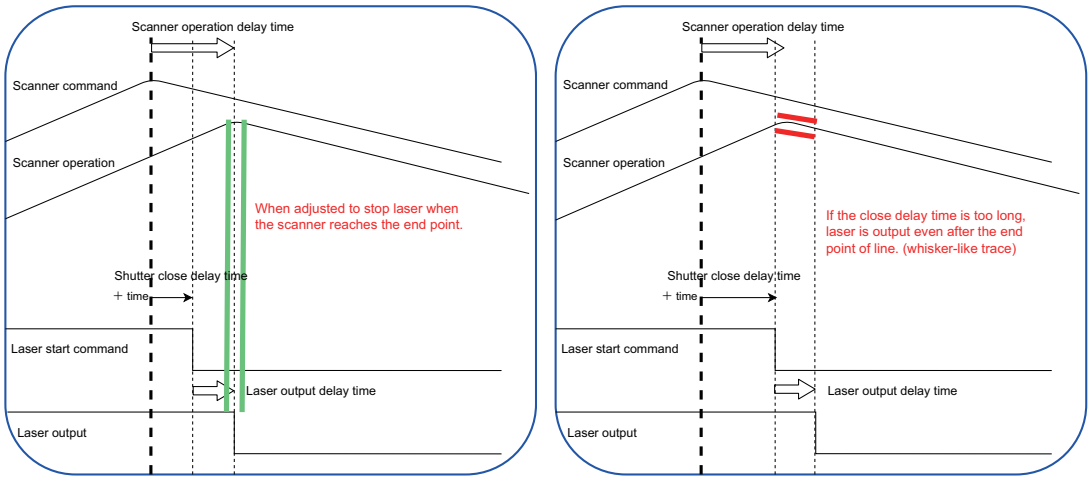
When FIX or FLEX is set in the welding schedule, the laser emission time is set in the laser welder. When the start point is delayed, the end point is also shifted and delayed and then a whisker-like trace may occur at the drawing end at the beginning of the next scan operation. In this case, the phenomenon is improved by adjusting the laser emission time or adjusting the shutter close delay time in a plus direction.



- Shutter Close Delay "0 ms / - ms" (Valid only in CW)
After the laser start command is turned off, the processing is paused for the set time. (The scanner operation is also stopped.) The laser output is stopped after the laser output delay time. Therefore, the end point becomes shorter depending on the scanner operation delay time.



- Shutter Close Delay "+ ms" (Valid only in CW)
The laser start command is turned off when a set time elapses after the scanner command processes up to the end point. The shutter close delay time is adjusted to match the timing of scanner operation and laser output. If the shutter close delay time is too long, laser is output even after the end point and a whisker-like trace may occur.



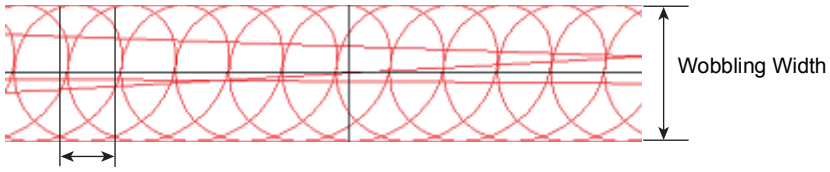
In summary, operation of the shutter close delay time is as follows:
When a strong irradiation mark remains at the end point, adjust the shutter close delay time in a minus direction.
When the end point becomes shorter, adjust the shutter close delay time in a plus direction.

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

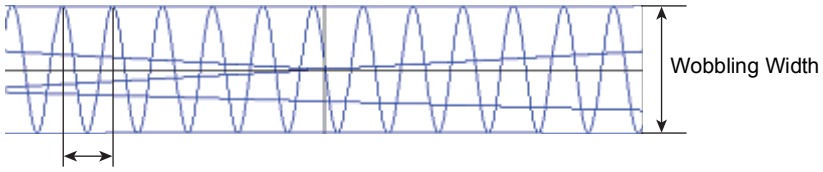
*6 Not used normally.

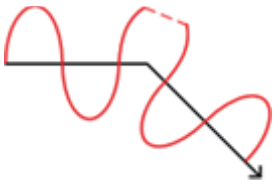
*7 Wobbling
Scanning is performed as shown below by setting [Wobbling Width] and [Wobbling Frequency].

- 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. 

*8 When the value that may exceed the scanner capability is set, the background of characters “Scanning Speed” is displayed in yellow.

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.

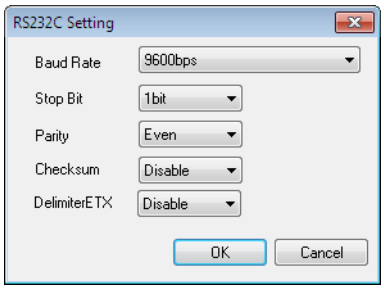
5. RS232C Setting

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

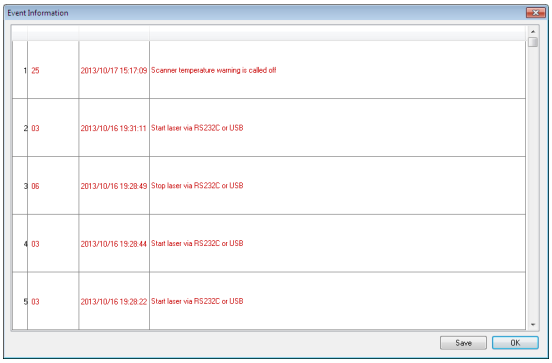
3 Click the [OK] button to save the settings.

6. 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.

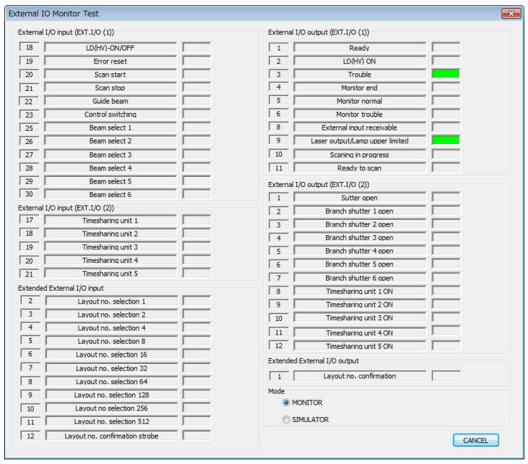
7. External I/O Monitor Test

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.

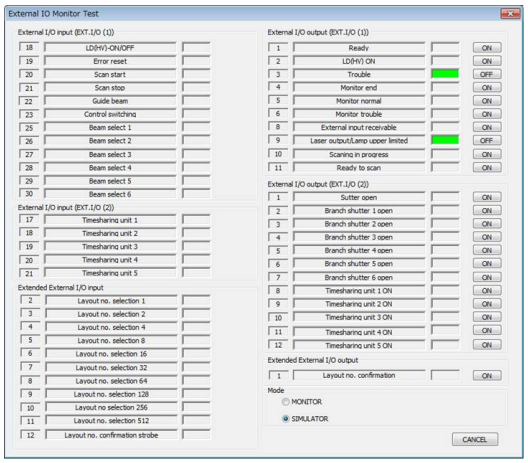
1 When online, select [Laser Control] -> [External I/O Monitor Test] from the menu.

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 6 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.

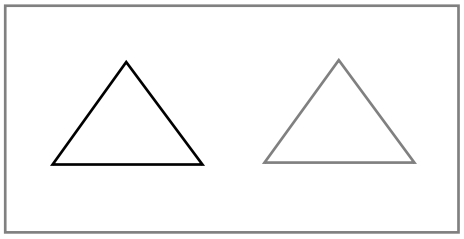
2 Select the object to delete.
Select by specifying the start and end points of the area containing the object.

The selected figure is deleted.

4. Copying Figures

4.1. Copy (Arranging Copied Objects)

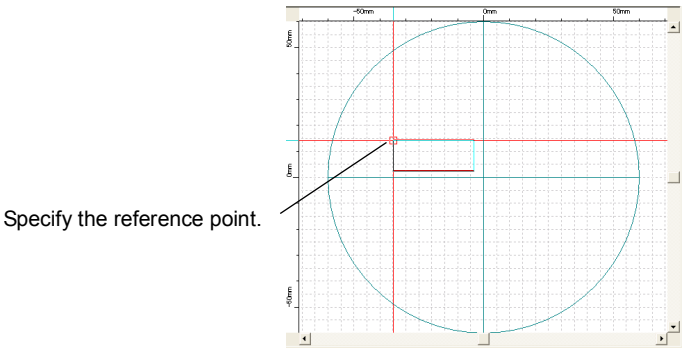
Duplicate created figures as follows:



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

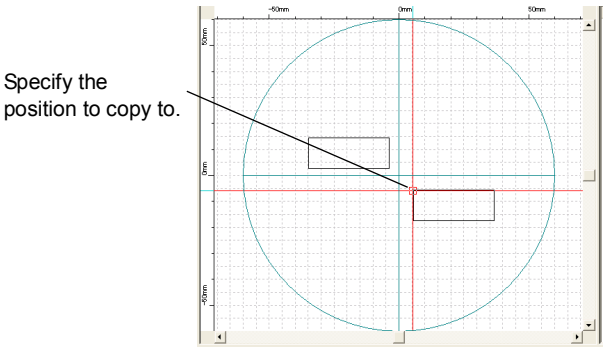
2 Select the object to copy.
Select by specifying the start and end points of the area containing the object.

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.

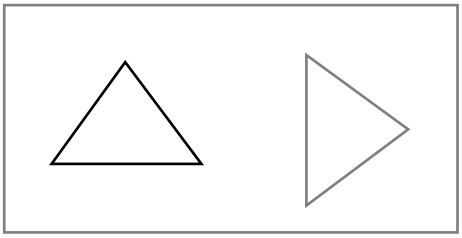


A copy of the figures is produced.

4.2. Copy and Rotate (Arranging Rotated Copies)

Copies of figures can be rotated as follows:

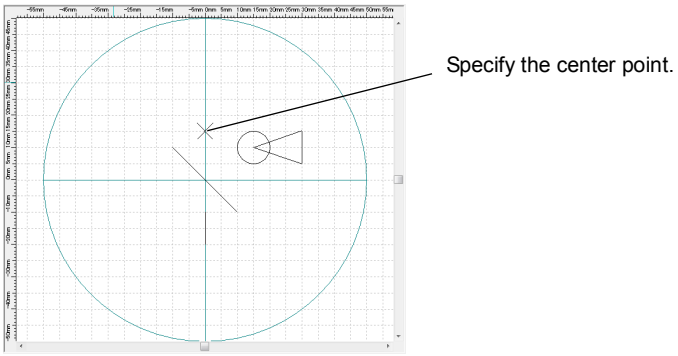
CAUTION	• This function does not handle square objects. • Large figures that fill the layout area cannot be rotated, as they will protrude from the area while being rotated.



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

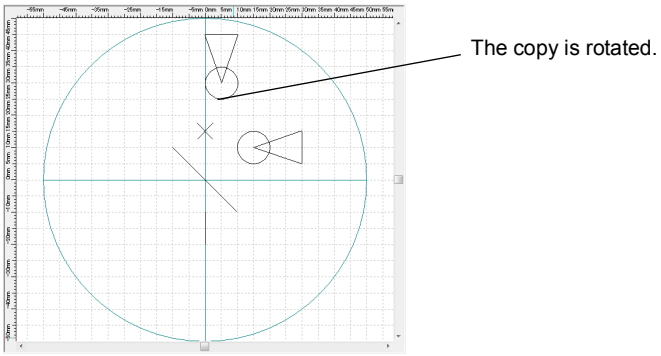
2 Select the object to copy.
Select by specifying the start and end points of the area containing the object.

3 Specify a point as the center of rotation.



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

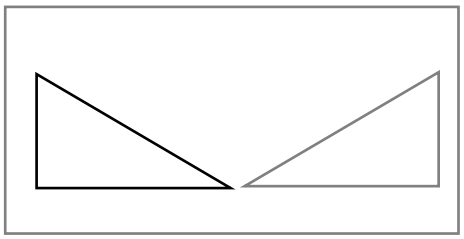
The copied figure is rotated.



4.3. Copy and Invert (Arranging Inverted Copies)

Copies of figures can be inverted as follows:

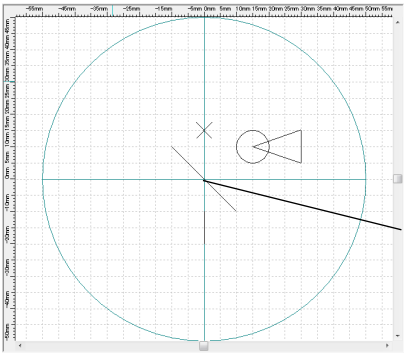
CAUTION	• This function does not handle square objects. • Large figures that fill the layout area cannot be inverted, as they will protrude from the area while being inverted.



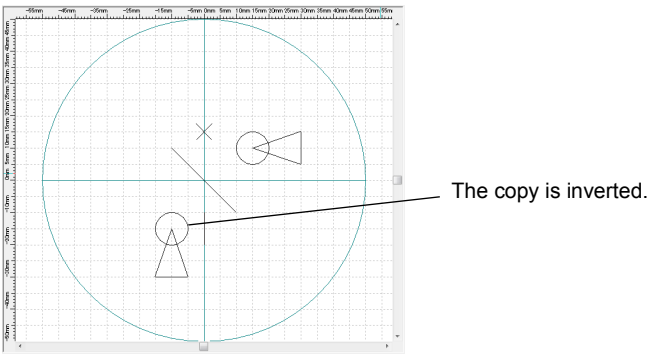
1 From the menu, select [Edit] -> [Copy and Invert].

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.



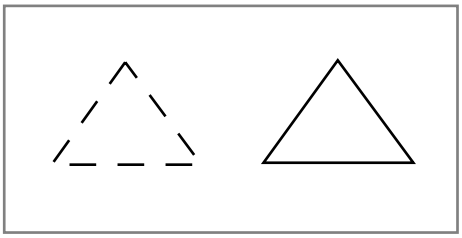
The copied figures are arranged inverted relative to the axis.



5. Moving Figures

5.1. Move (Moving Figures)

Move figures as follows:

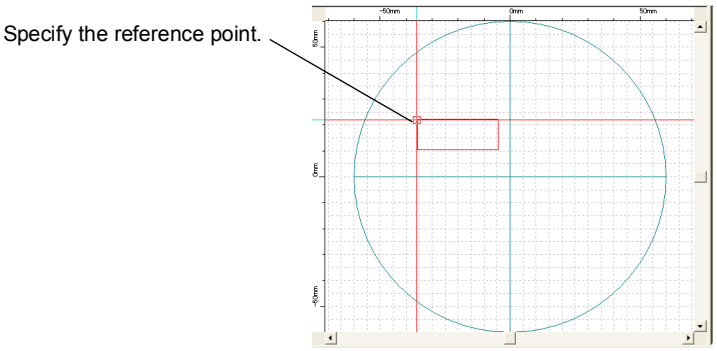


1 From the menu, select [Edit] -> [Move].

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.

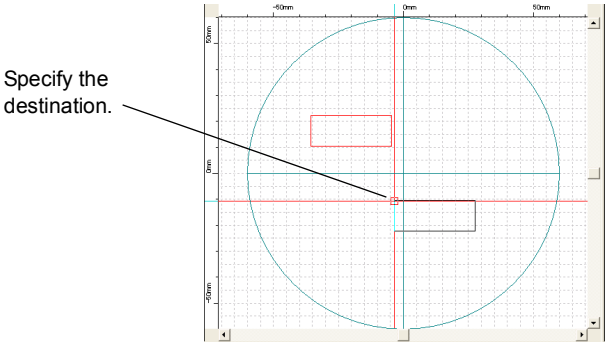
2 Select the object to move.
Select by specifying the start and end points of the area containing the object.

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.

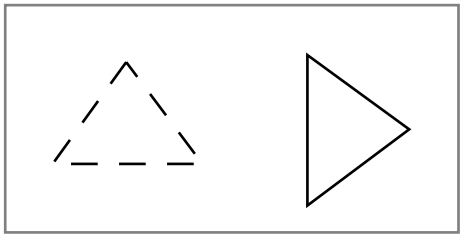


The figure is moved.

5.2. Move and Rotate (Moving and Rotating Figures)

Move and rotate figures as follows:

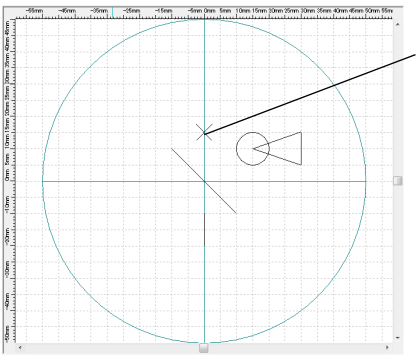
CAUTION	• This function does not handle square objects. • Large figures that fill the layout area cannot be rotated, as they will protrude from the area while being rotated.



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

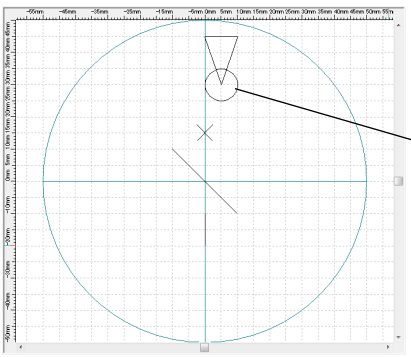
2 Select the object to move.
Select by specifying the start and end points of the area containing the object.

3 Specify a point as the center of rotation.



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

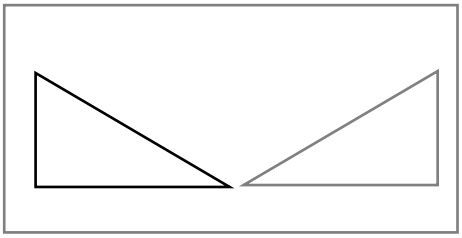
The figures are moved and rotated.



5.3. Move and Invert (Moving and Inverting Figures)

Move and invert figures as follows:

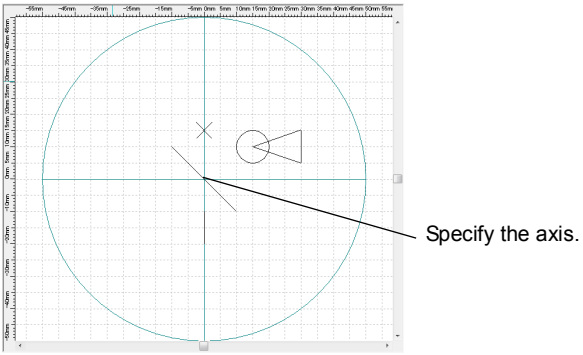
CAUTION	• This function does not handle square objects. • Large figures that fill the layout area cannot be inverted, as they will protrude from the area while being inverted.



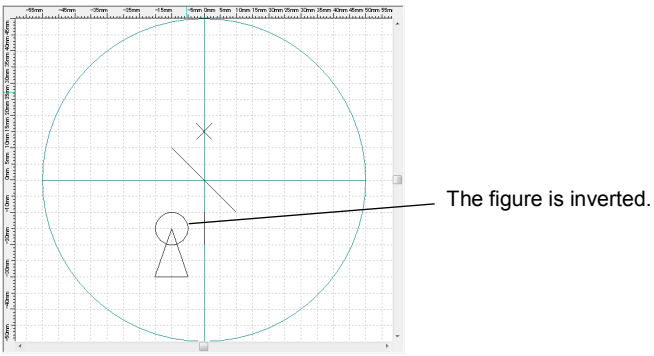
1 From the menu, select [Edit] -> [Move and Invert].

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

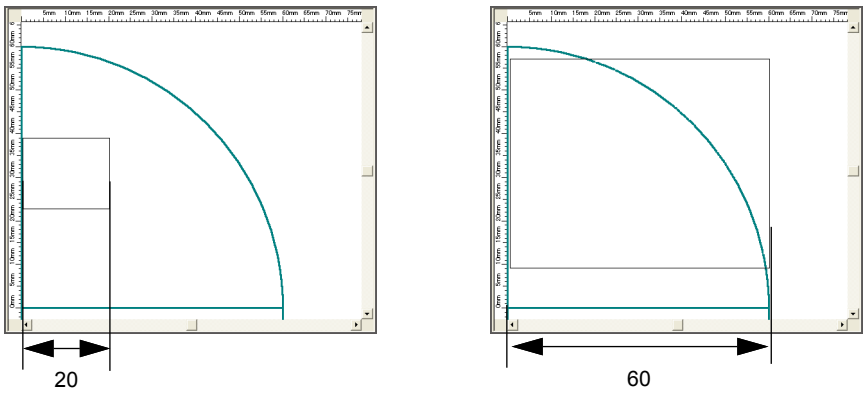
In Sketch Edit mode, follow these steps to enlarge or reduce sketches.

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.

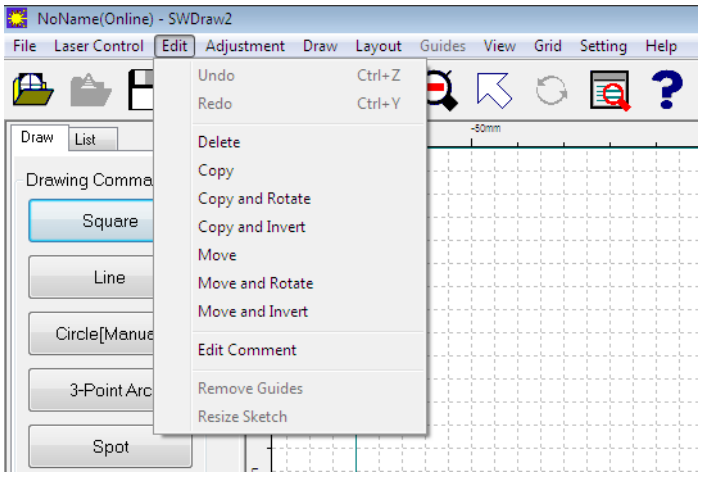


Entering 60 in the command field increases the guideline length to 60 mm.

6. Comment (Editing a Comment)

Edit comments created as follows:

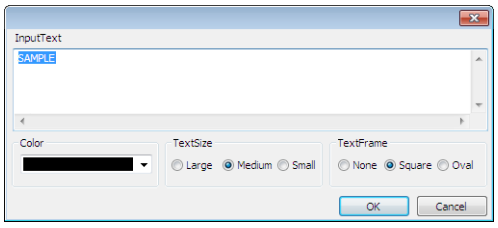
1 From the menu, select [Edit] -> [Edit Comment].



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 9-10. Comment (Entering Comments)" (page 205) .



7. Arranging and Canceling Arrays

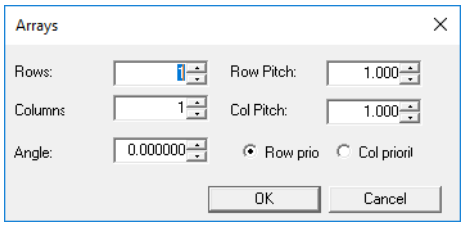
Use this command to copy character figures in the drawing area to create an array as follows:

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

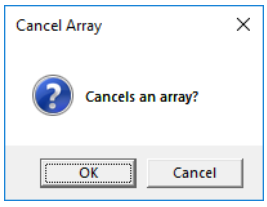
Item	Setting Details	Range (Default)	Pitch
Rows	Indicates the number of rows arranged vertically.	—	—
Columns	Indicates the number of columns arranged horizontally.	—	—
Row Pitch	Indicates vertical spacing (in mm).	—	—
Col Pitch	Indicates horizontal spacing (in mm).	—	—
X Offset *1	Specify the X coordinate at the reference position (lower-left position) of the selected element (in mm).	Lens dependant	0.001
Y Offset *1	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	—

*1 The setting range varies depending on the type of lens. For details, refer to each manual for laser scanning system for welding.

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.

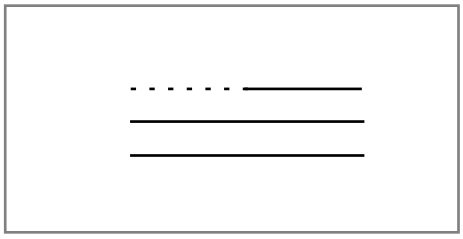
CAUTION	If you attempt to arrange an array again immediately after it was cleared, the dialog box for array settings is displayed with the array parameters still intact. Clicking the [OK] button without changing the values in the dialog box at all will restore the array to the state it was before you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

Chapter 7 Adjustment

1. Deleting Unneeded Lines

1.1. Trim (Deleting Parts of Lines)

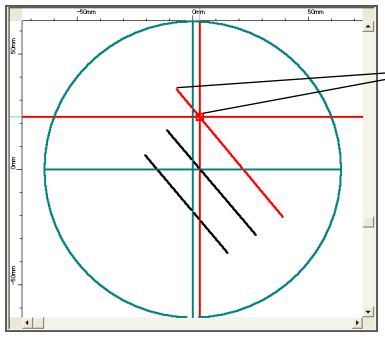
You can reduce or increase parts of lines.



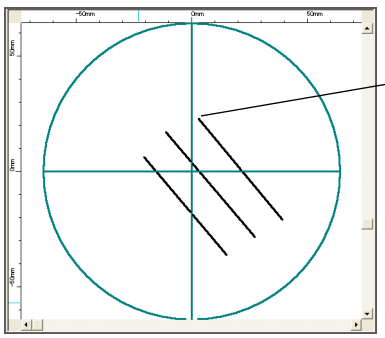
1 From the menu, select [Adjustment] -> [Trim].

2 Select the line to trim.

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

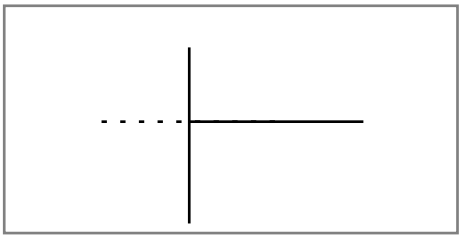


The specified segment is deleted.



1.2. Trim Junction (Deleting Extra Lines from Junctions)

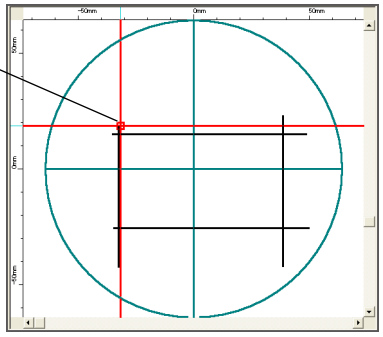
Trim unneeded lines from junctions as follows. You can create attractive corners by deleting all unnecessary lines from these junctions.



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

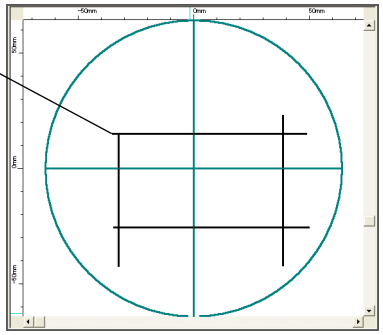
2 Select the line to delete extending from the junction.

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

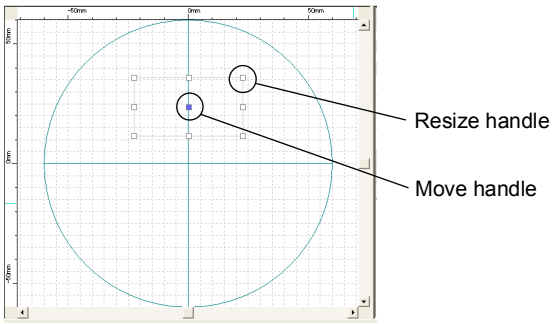
2.1. Selection Mode (Switching to Selection Mode)

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.

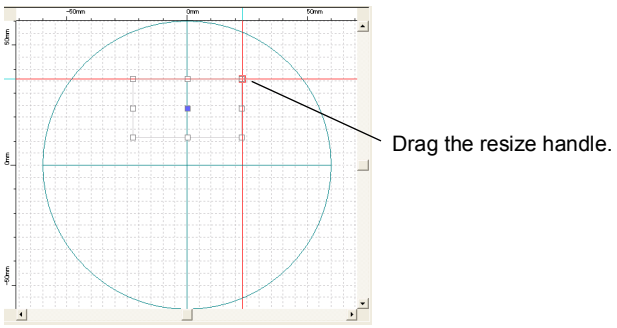
Selecting a figure by clicking on it with the mouse in Selection mode displays a gray or red frame around the figure with a blue move handle and white resize handles. When a polyline is selected alone, however, the [Poly] screen is displayed. For details of the [Poly] screen, refer to "Chapter 9-2.2. [Poly] Screen Arrangement" (page 177) .



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

2.1.1. Resizing figures in Selection mode

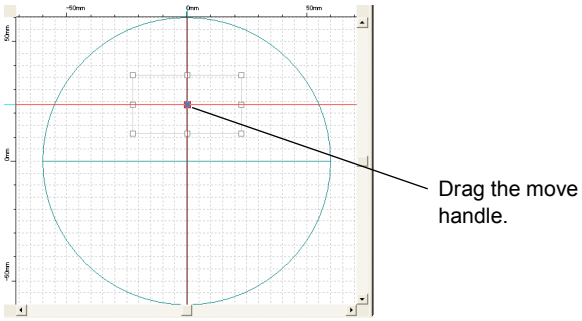
Selecting a figure by clicking on it with the mouse in Selection mode displays a gray or red frame around the figure with resize handles. Figures can be resized as desired by dragging these handles.



Figures can also be resized by changing their properties.

2.1.2. Moving figures in Selection mode

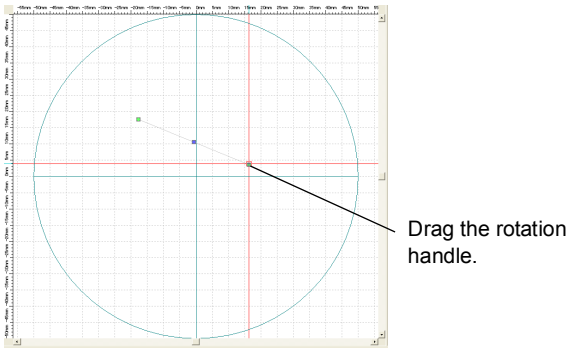
Selecting a figure by clicking on it with the mouse in Selection mode displays a gray or red frame around the figure with a blue move handle in the center. Reposition figures by dragging this handle.



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

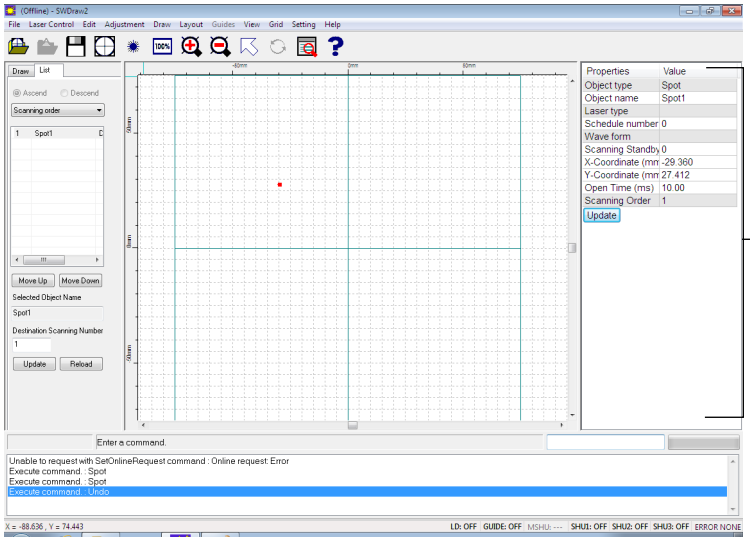
- Change the open time from 10 ms to 5 ms.
- Change the coordinates to the origin (0,0).

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.

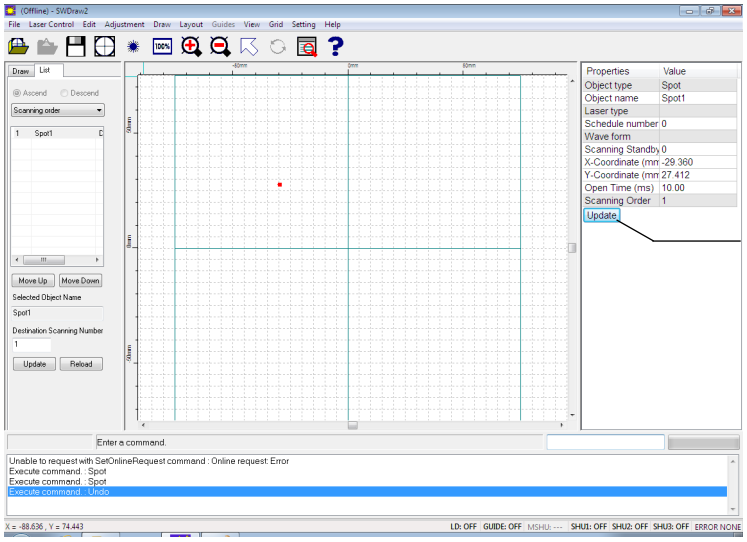
2 Click to select the spot.

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)

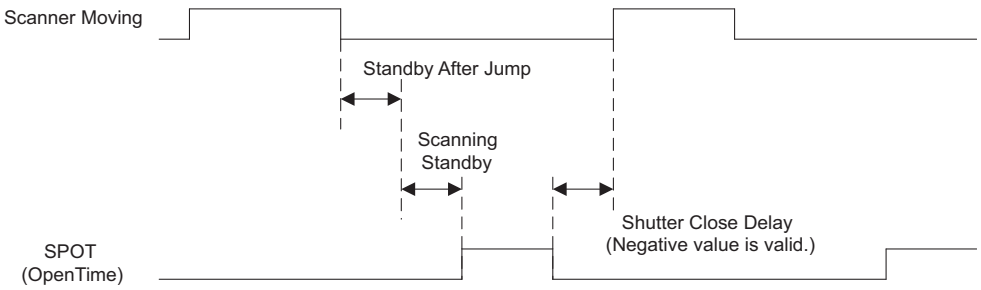
Figure type	Item	Setting specifics	Range (Default)	Pitch
Spot (continued)	Object name (default)	Specifies the name of the figure (object).	SPOTx	256 characters max.
	Laser type	Displays the laser type. The contents of this item changes depending on the schedule number.	SPOT, SEAM, or CW	—
	Schedule	Displays 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

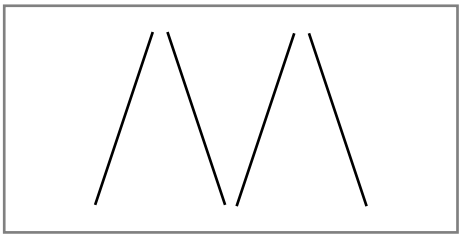
If the OVERRATE error occurs when SPOTs are used, specify [Scanning Standby] in the properties field or [Shutter Close Delay] on the [System Parameters] screen and insert a wait time between SPOTs.



*2 A setting effect may not be obtained depending on the laser equipment.

4. Poly Resolve (Splitting Figures)

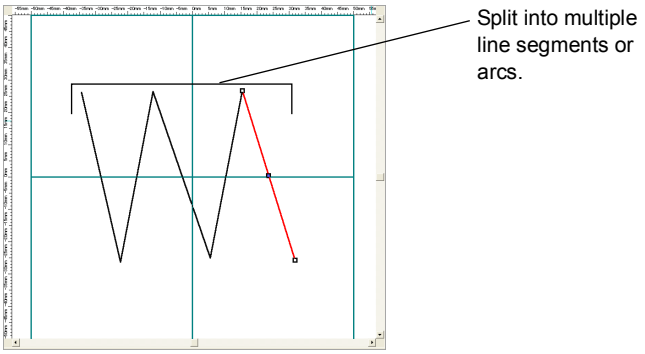
Polylines created can be split at their construction points into line segments or arcs. Only polylines can be split.



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

2 Select the figure to split.

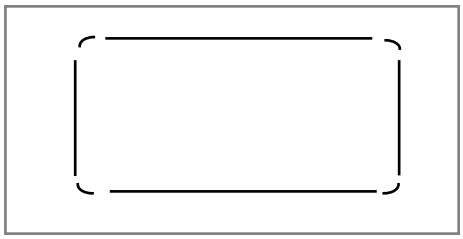
The figure is split into multiple line segments or arcs. Polylines are split at each construction point.



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)

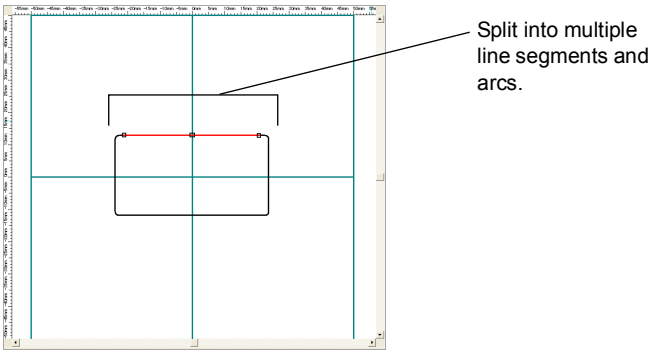
Squares created can be split into line segments and arcs.



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

2 Select the square to split.

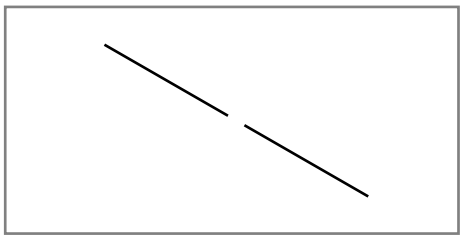
The square is split into multiple line segments. When the square is created with chamfer or radius specified, it is split into multiple line segments and arcs.



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)

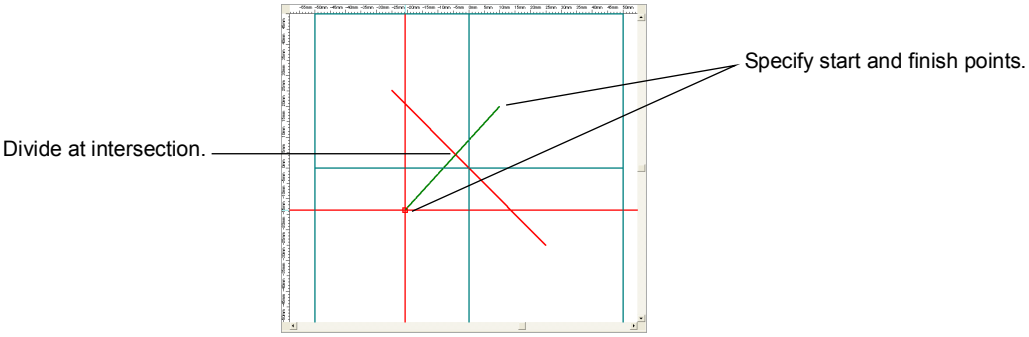
Figures created can be divided at any point. Only line segments and arcs can be divided.



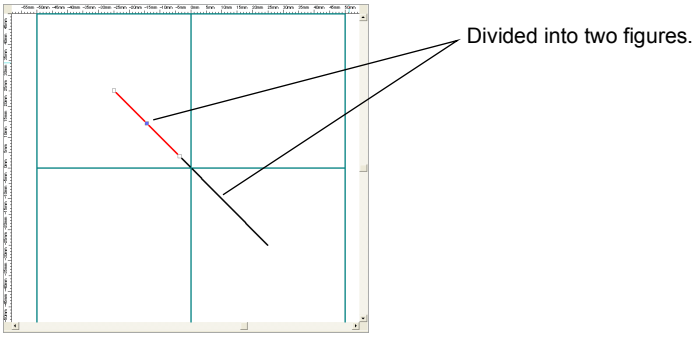
1 From the menu, select [Adjustment] -> [Divide].

2 Select the figure to divide.

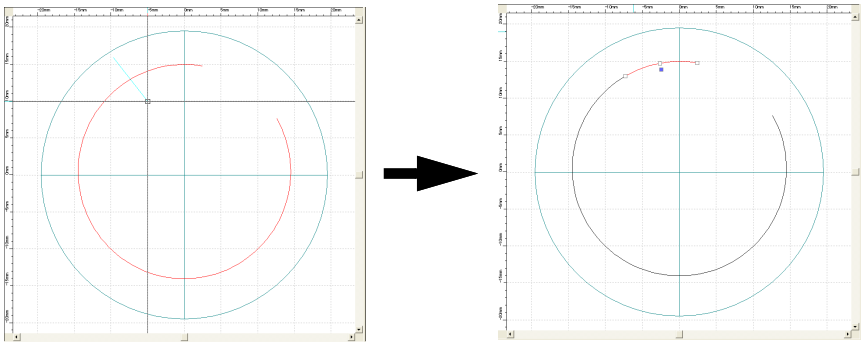
3 Specify the start and finish points for the divide. The figure is divided at the intersection with the line specified by the start and finish points.



The figure is divided into two separate figures.

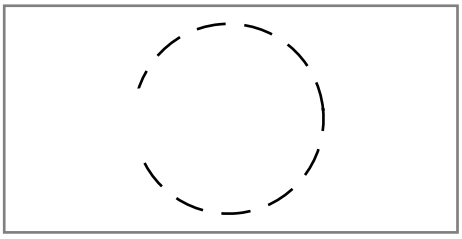


- Dividing an arc



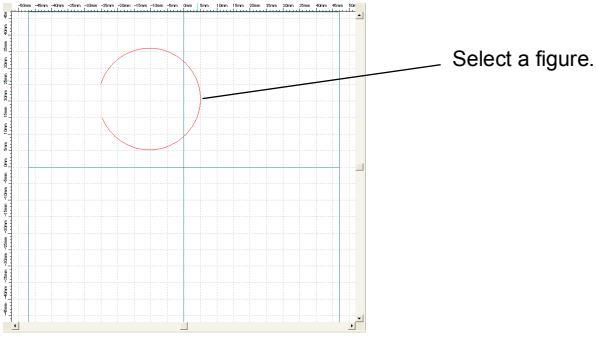
7. Arc to Poly

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



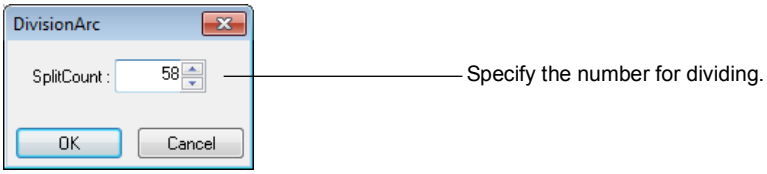
1 From the menu, select [Adjustment] -> [Arc to Poly].

2 Select the figure to divide.

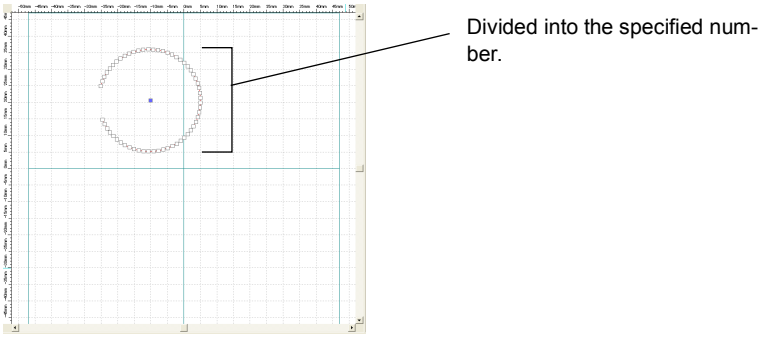


The [DivisionArc] screen is displayed.

3 Specify the number for dividing.

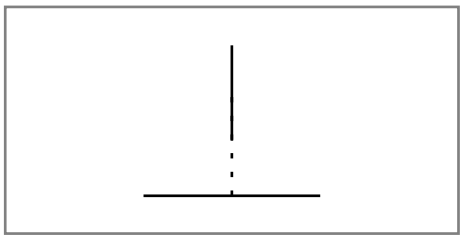


The arc is divided into the specified number of polylines.



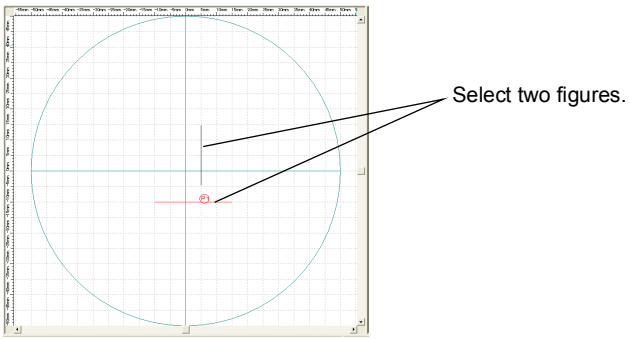
8. Unite (Joining Two Figures into One)

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.

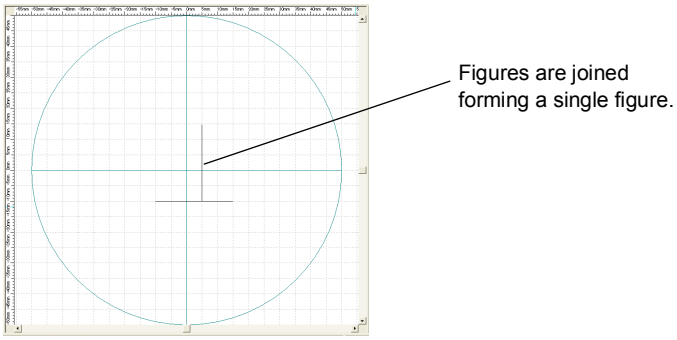


1 From the menu, select [Adjustment] -> [Unite].

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



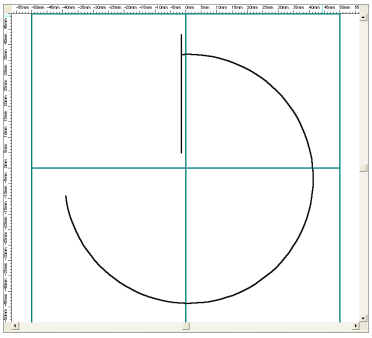
The two figures are joined forming a single figure.



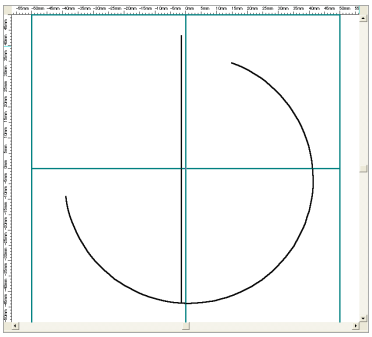
CAUTION	• The specified figures cannot be joined if they are not convergent. • Even if they are convergent, figures cannot be joined if the length of the extended line exceeds the maximum value. The length of the extended line can be set in [Setting] -> [Preferences] -> [Other] -> [Max. Combined] in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

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

- When joining at P1



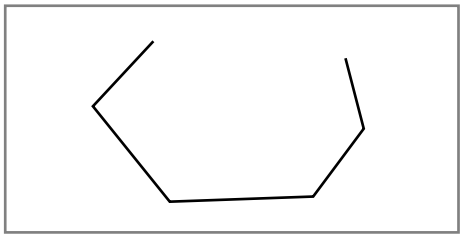
- When joining at P2



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.

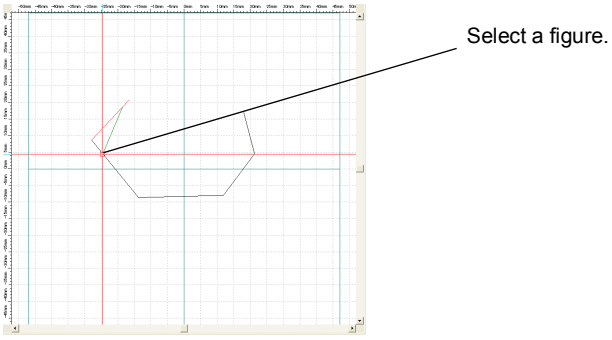


9.1. Auto (Joining Lines into One Automatically)

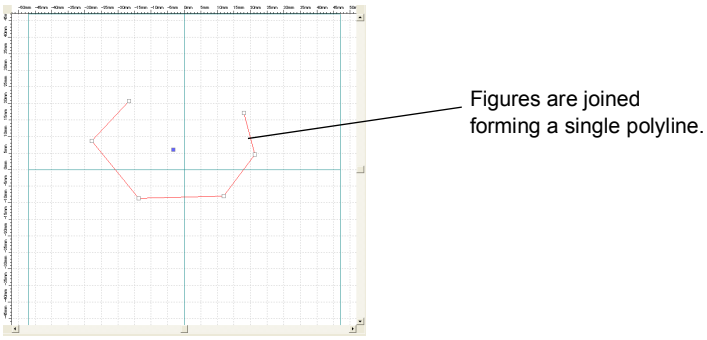
1 From the menu, select [Adjustment] -> [Unite Poly] -> [Auto].

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.

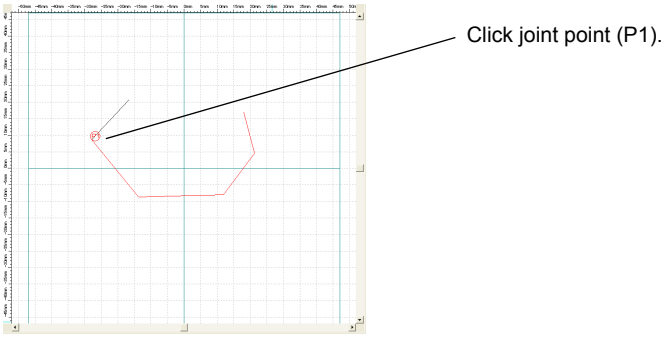


9.2. Manual (Joining Lines into One Manually)

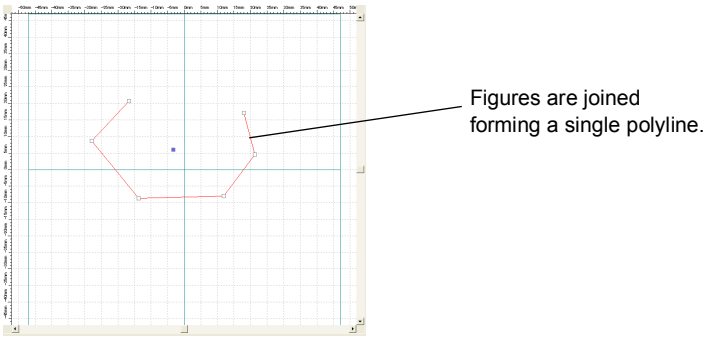
1 From the menu, select [Adjustment] -> [Unite Poly] -> [Manual].

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.

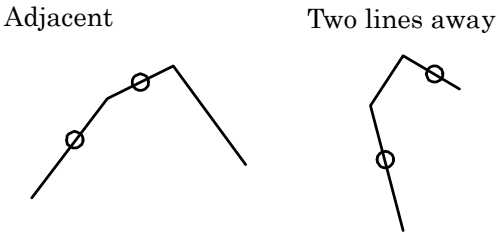


CAUTION	Make sure that there is no small line segment between arc and line. If it is difficult to unite them, select [Adjustment] -> [Arc to Poly] from the menu to divide arcs into polylines.

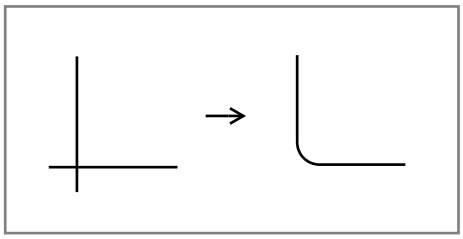
10. Fillet

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

"Two elements" means:

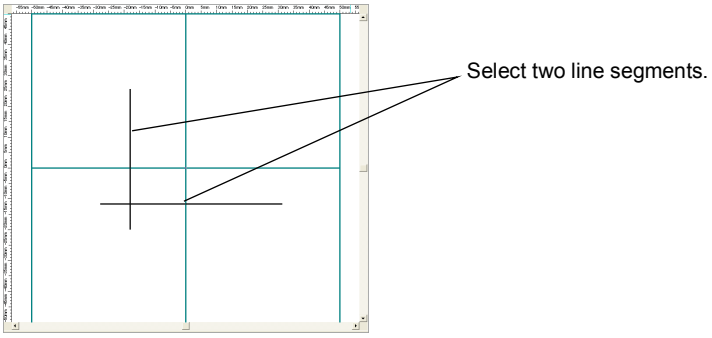


* For polyline, a fillet can be canceled by specifying radius 0 or negative element.



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

2 Select the two line segments to be filleted.

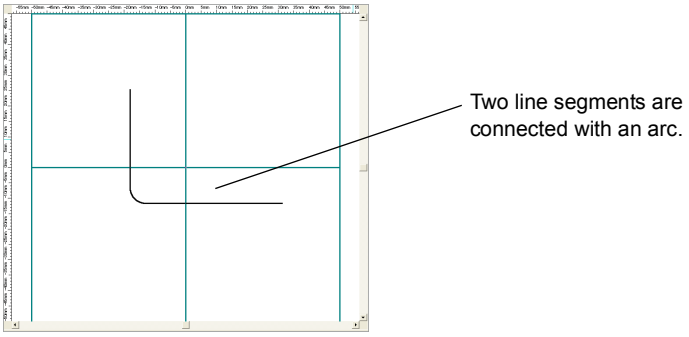


3 Enter the connecting arc radius in the command field.

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.

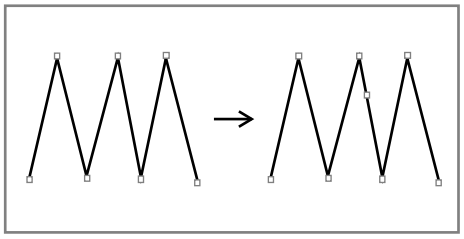


The last specified arc radius will be used if the <Enter> key is pressed without specifying the arc radius. The default value can be set in [Setting] -> [Preferences] -> [Other] -> [Radius of Fillet] in the menu.

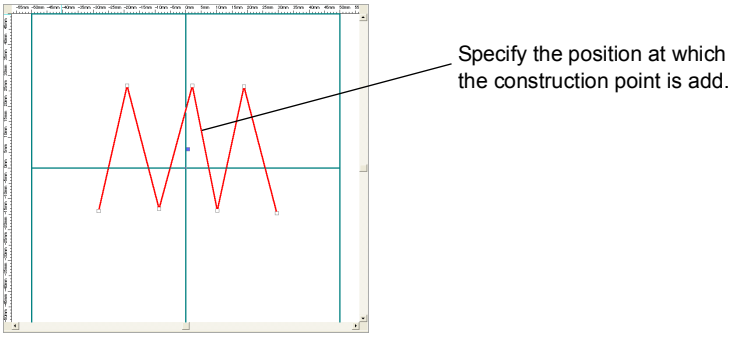
To undo the operation, select [Edit] -> [Undo] from the menu, change the arc radius, and then select [Adjustment] -> [Fillet] again.

11. Add Const. Pt

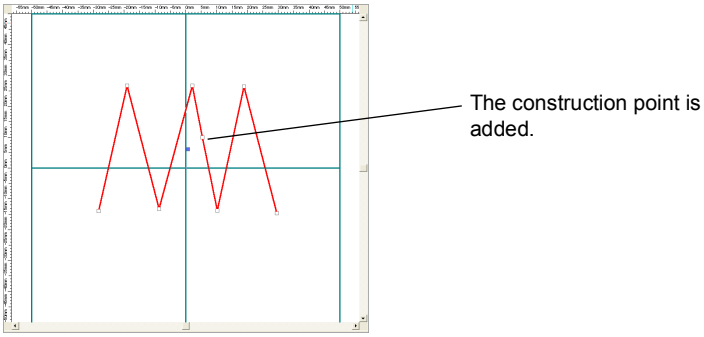
Construction points can be added to line segments or polylines created.



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.

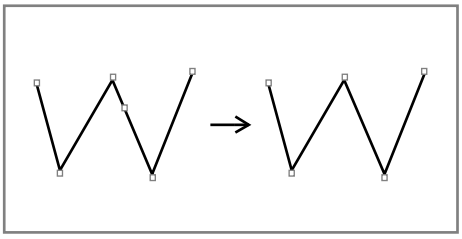


The construction point is added at the specified position.

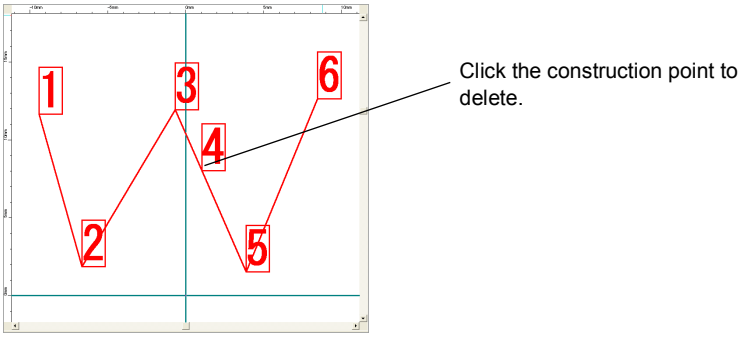


12. Delete Const. Pt

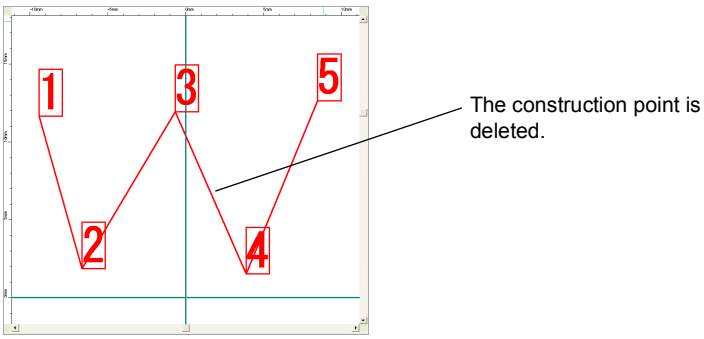
Construction points can be deleted from line segments or polylines created.



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.

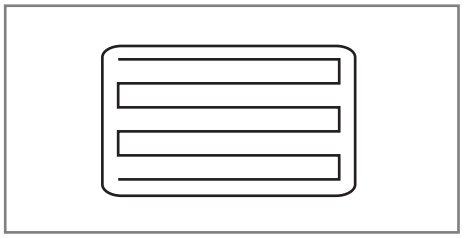


The construction point at the specified position is deleted.



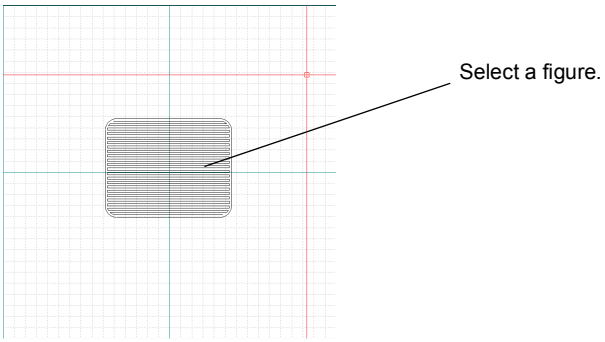
13. Hatch to Poly

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

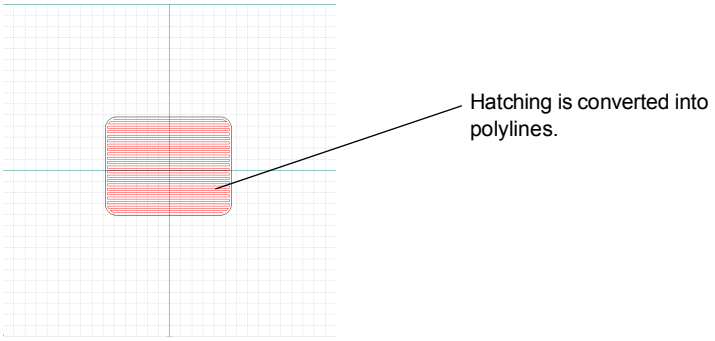


1 From the menu, select [Adjustment] -> [Hatch to Poly].

2 Select the hatched circle or square.



Hatching is converted into polylines.



Chapter 8 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.

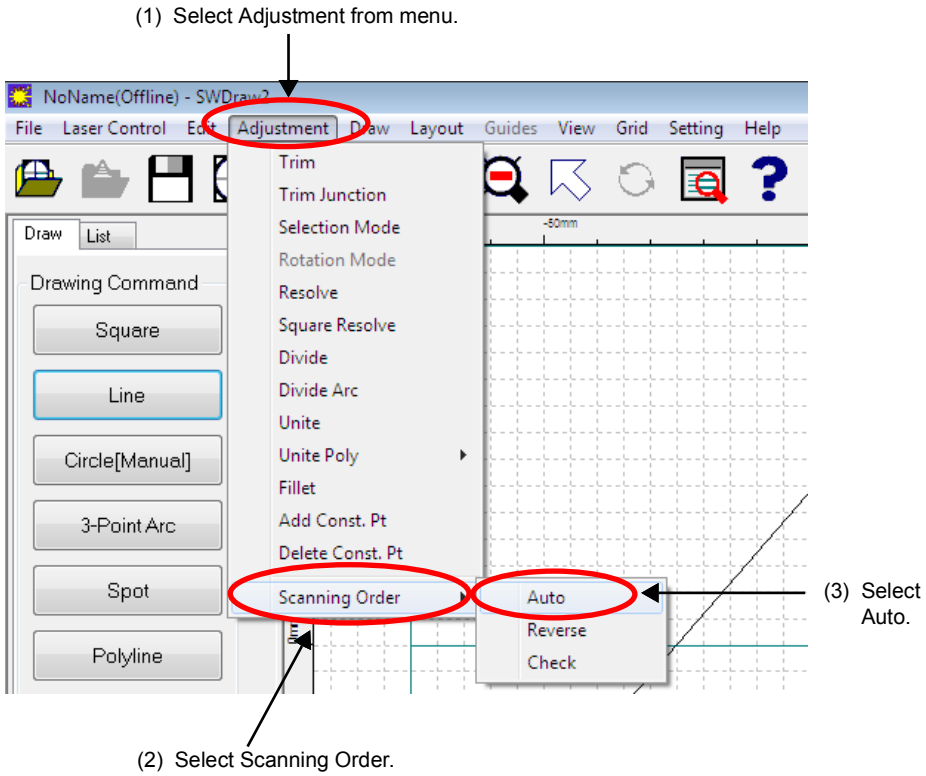
2. Automatic Scanning Order Function

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].



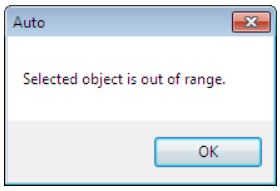
- The following message is displayed in the guidance bar.

Auto	Select an object used as a starting point.

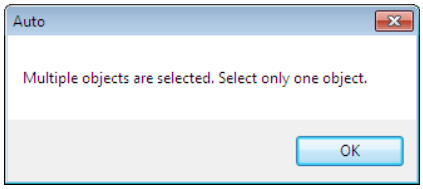
2.2. Automatic Scanning Order Error Control

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.)

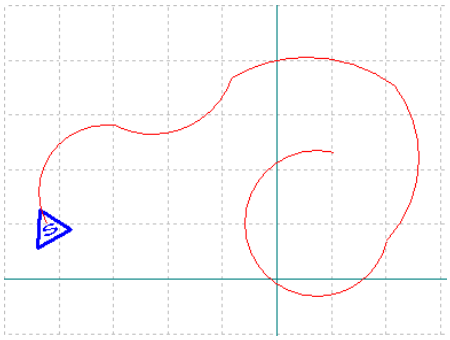
(2) If no object is connected to the end point of the object forming the starting point selected, and an object is connected to the starting point, scanning order control is applied to all the continuous objects (with contact points at the start and end points). Objects subject to scanning direction 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.)

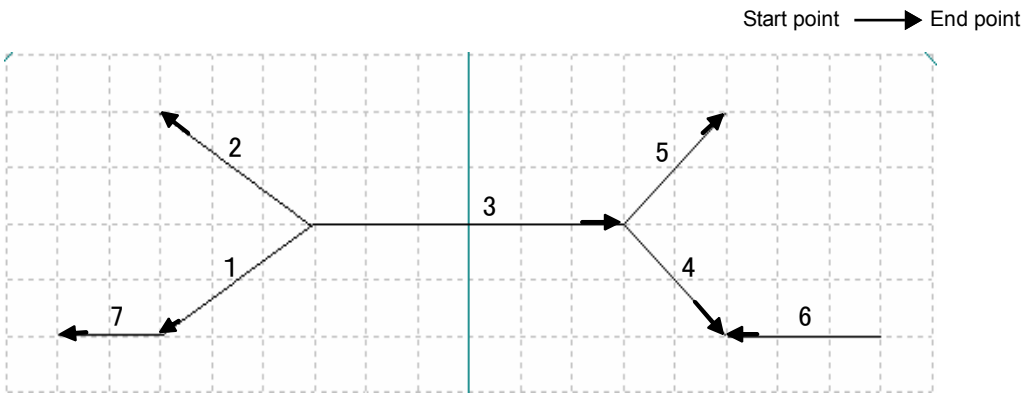
(3) If no object is connected to the end point or start point of the object forming the starting point selected, the message "No connected object could be found" (see 2.2 (2)) is displayed. Click the [OK] button to continue using the automatic scanning function. (The guidance message in section 2.1 is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

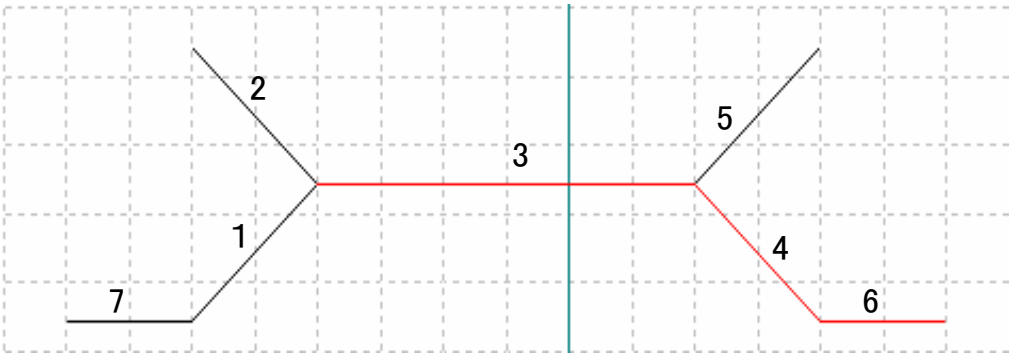


(4) Automatic scanning example 1

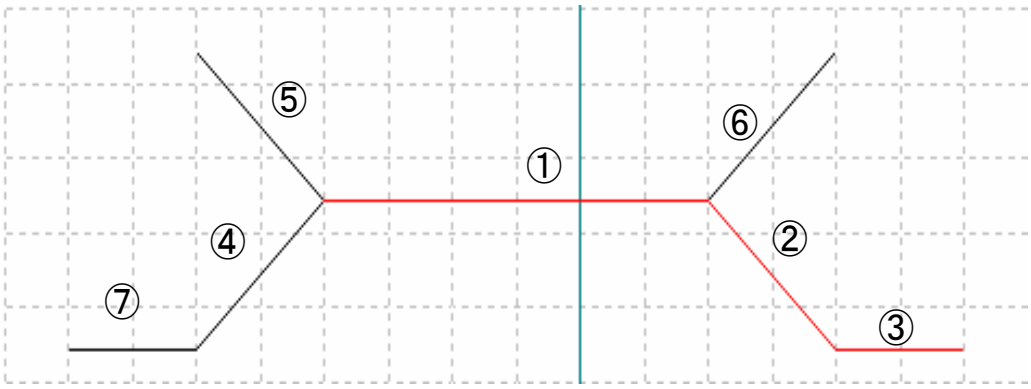
Ex 1: Confirming the scanning direction and order for the figures shown below.



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

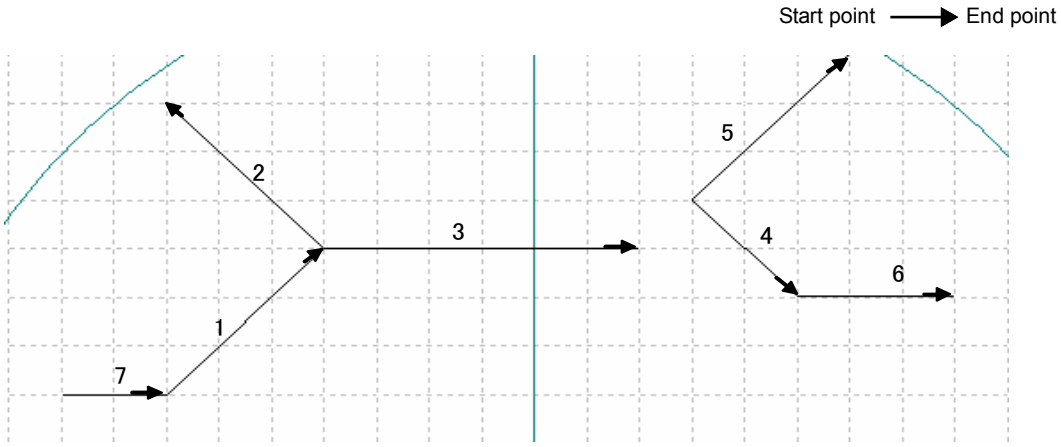


b.) Reorder the scanning order as follows.

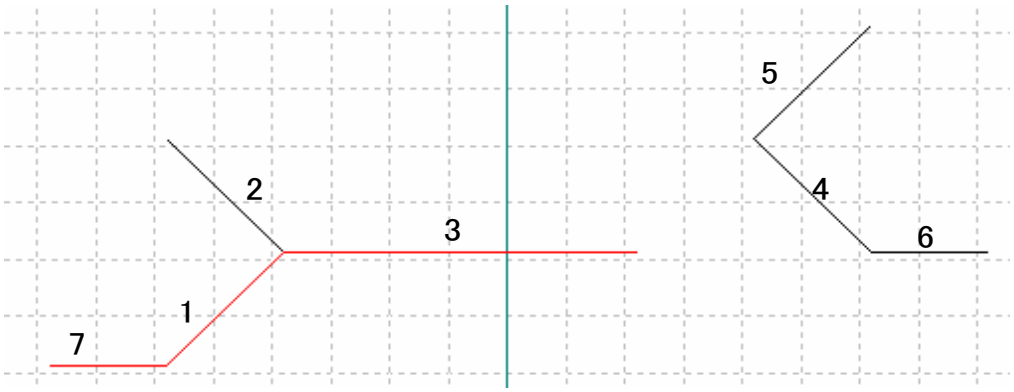


(5) Automatic scanning example 2

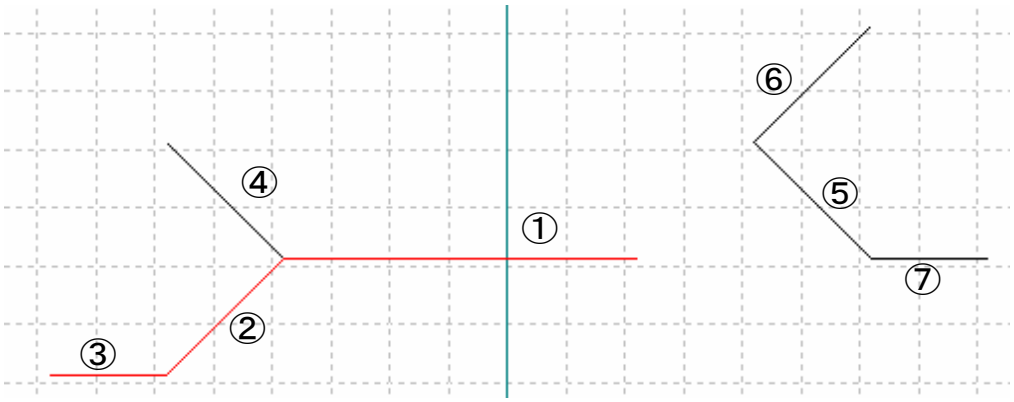
Ex 2: Confirming the scanning direction and order for the figures shown below.



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



b.) Reorder the scanning order as follows.

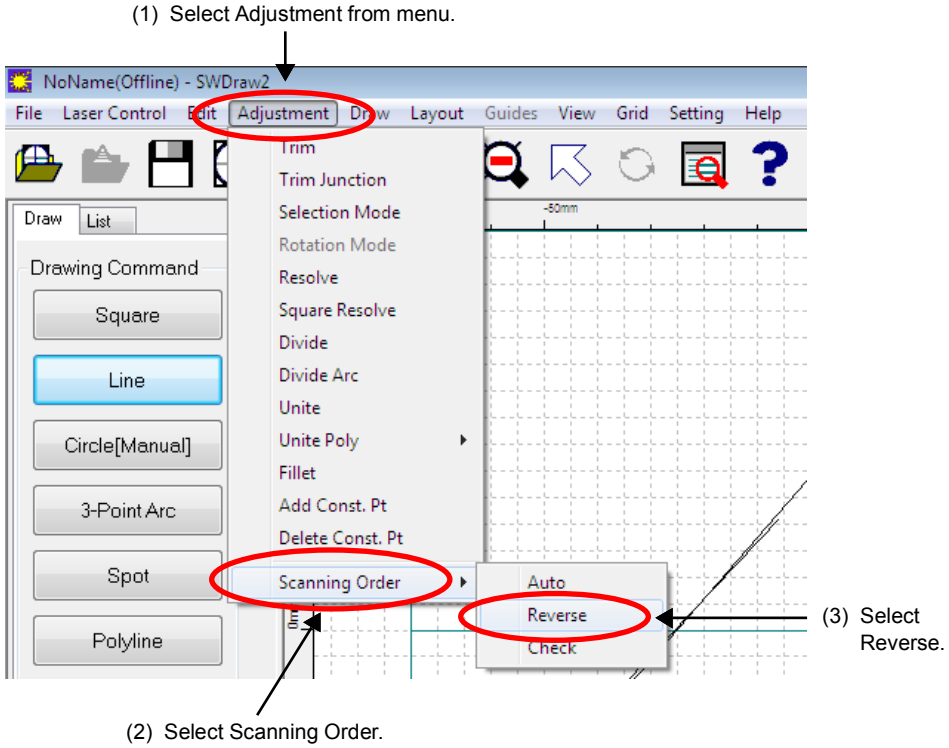


3. Reverse Scanning Order Function

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].



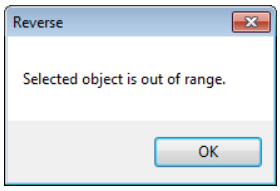
- The following message is displayed in the guidance bar.

Reverse	Select an object to reverse.

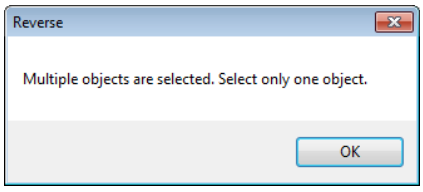
3.2. Reverse Scanning Order Error Control

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.



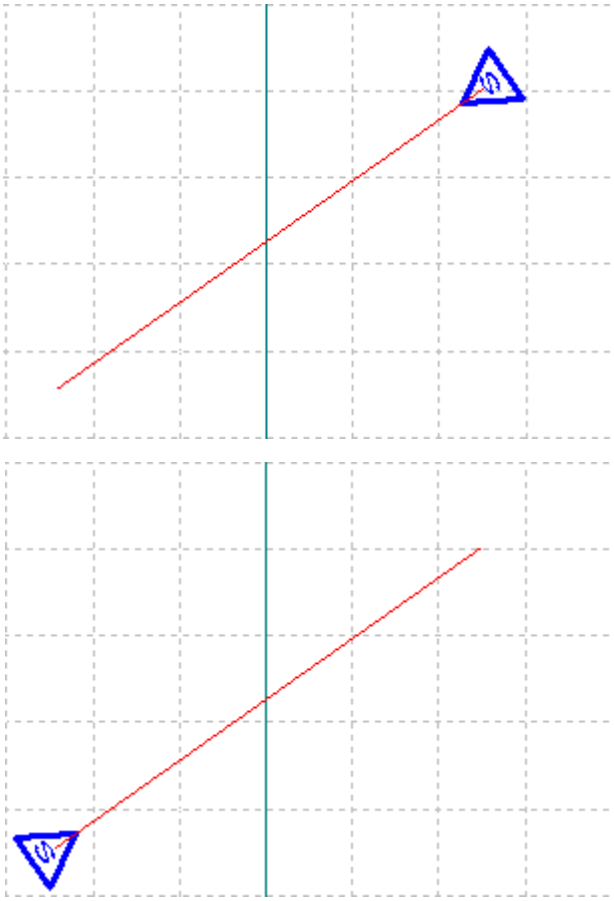
3.3. Reverse Scanning Order Control

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.)

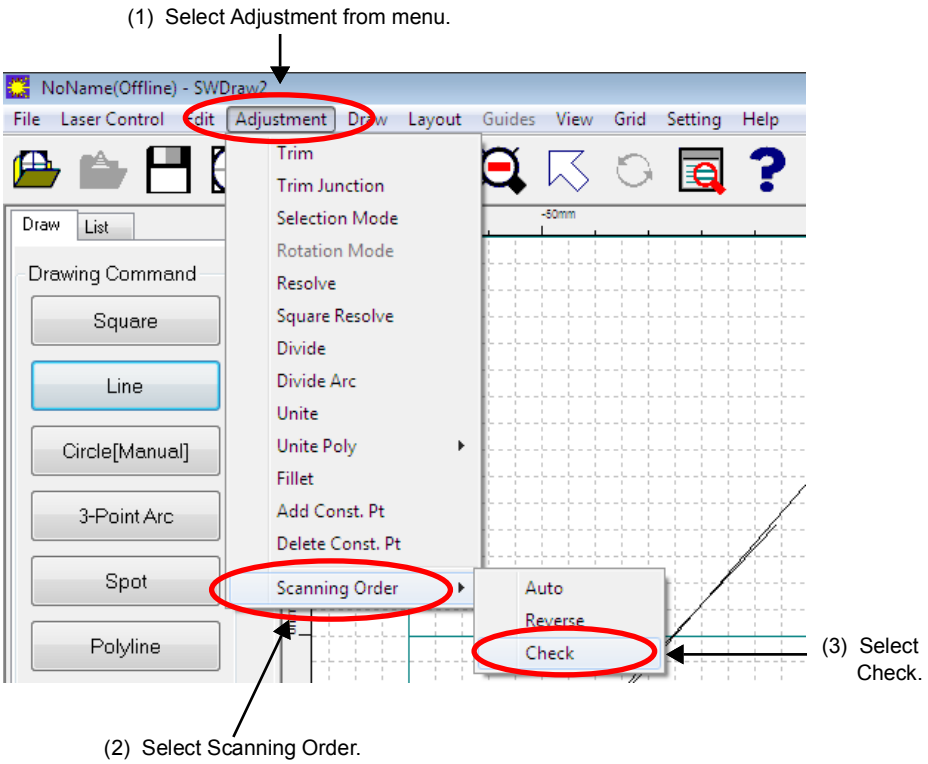
  Ex: The figures below show the same line object with the start and end points switched.



4. Scanning Order Confirmation Function

4.1. Scanning Order Confirmation Function Operations

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



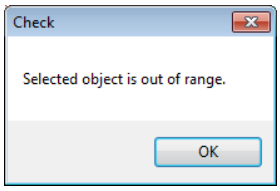
- The following message is displayed in the guidance bar.

Check	Select an object used as a starting point.

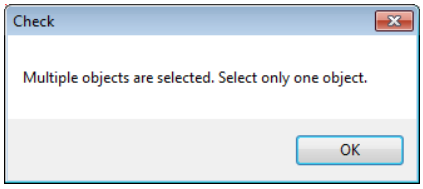
4.2. Scanning Order Confirmation Error Control

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.

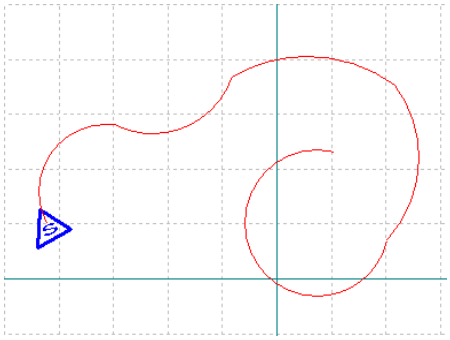
(Searches for the object with scanning number + 1 even when there are multiple contact points.)

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.)

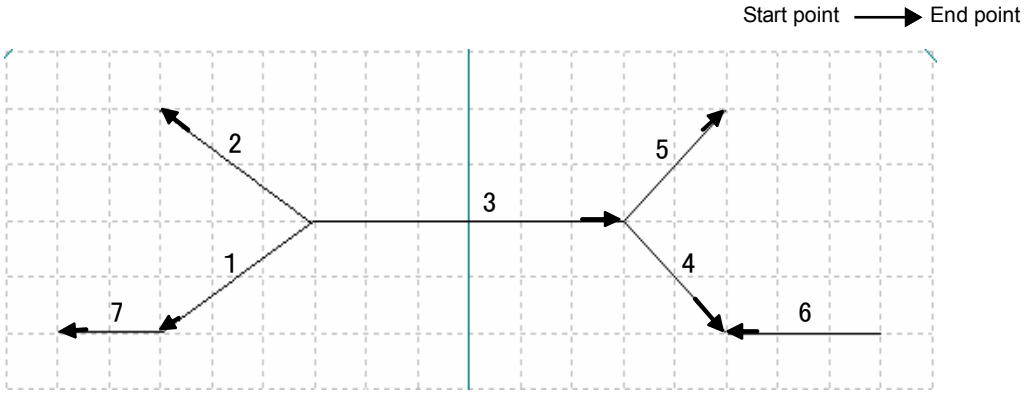
The figure below shows the situation after confirmation is complete. The scanning direction is indicated at the start point of the object forming the start point.

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

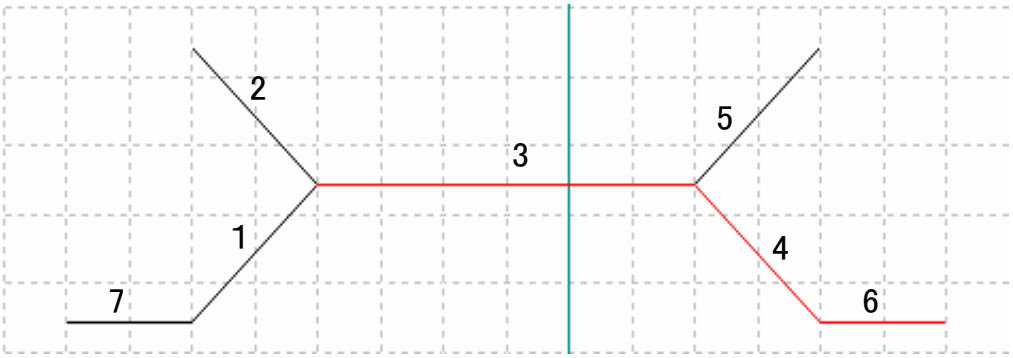


(3) Scanning order confirmation Ex 1

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

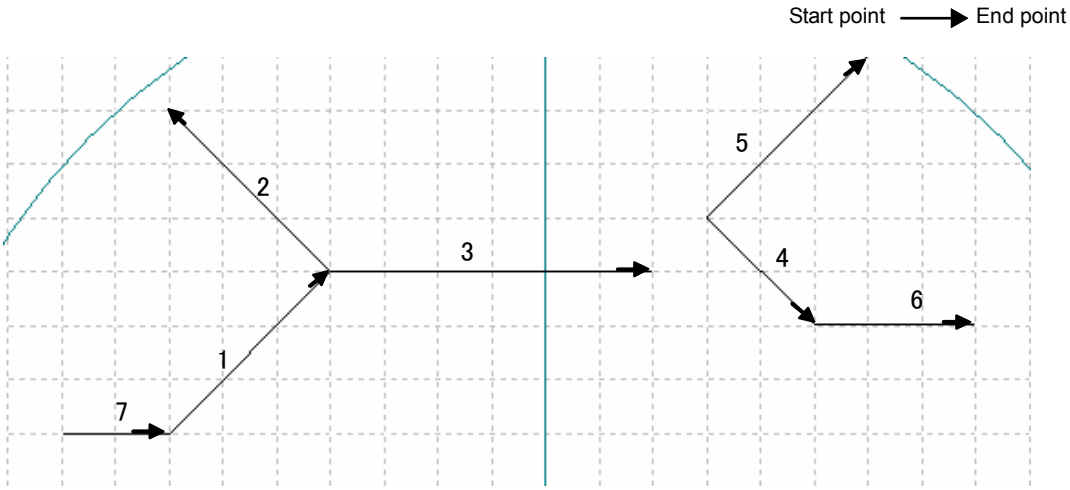


- The connected objects are shown as follows when sequence object 3 is selected.



(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.

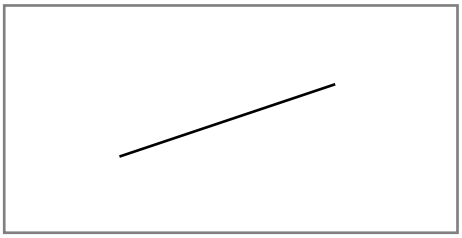
  No object is connected to the end point of the starting object here, so the "No connected object could be found" message box is displayed.

Chapter 9 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.

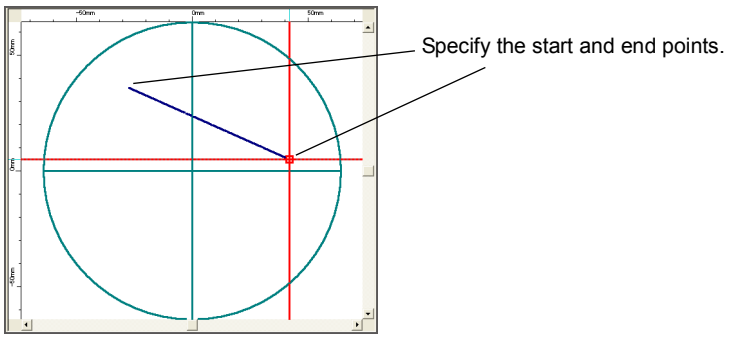
1. Line (Drawing Lines)

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.

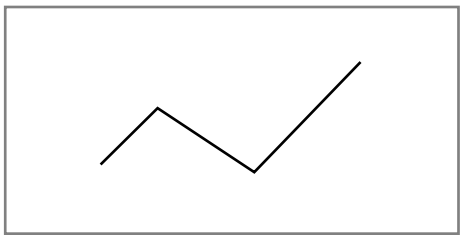
Polylines with arc cannot be created from the start.

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:

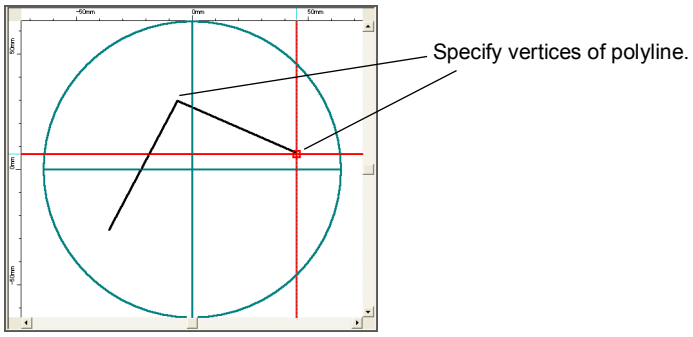


1 Click the [Polyline] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [Polyline].

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.

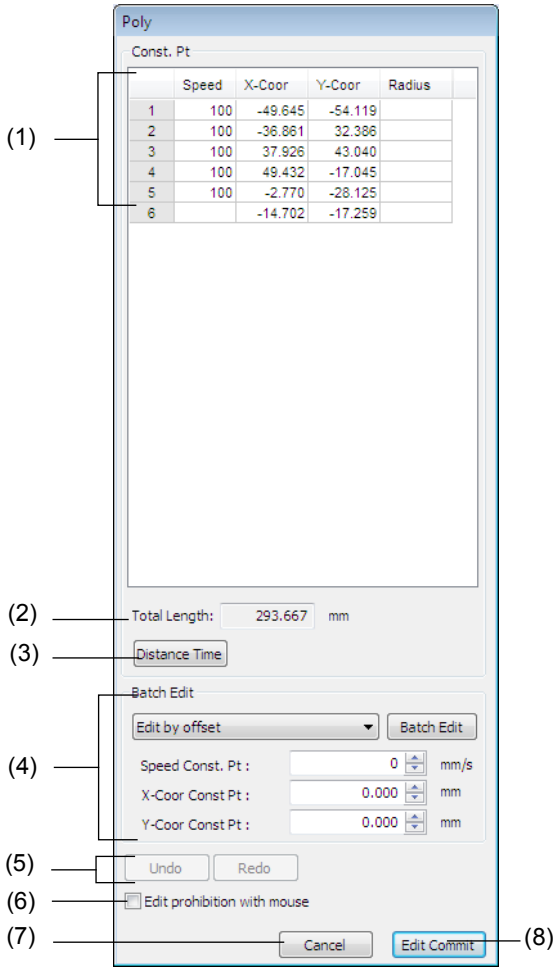


4 When drawing is complete, press the <Enter> key.

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



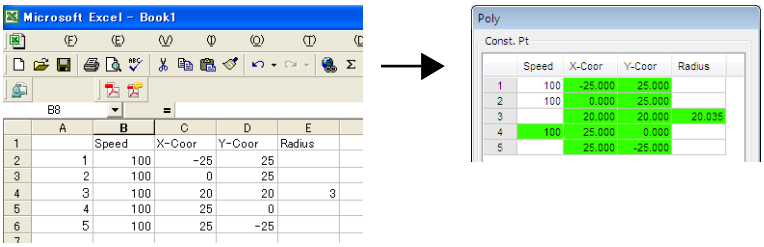
(1) Const. Pt

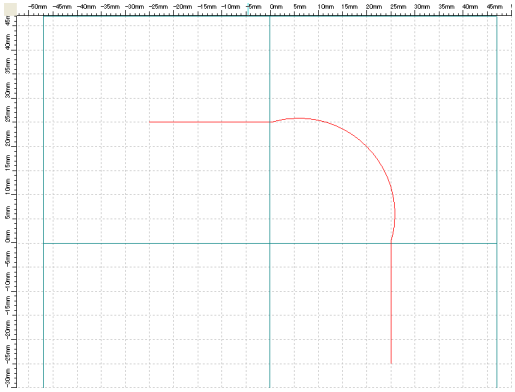
Cells for inputting parameter values of construction points.
The polyline requires at least start point of the first line, end point of the first line/start point of the second line, and end point of the second line, it consist of three lines or more.
The line requires start point and end point, it consist of two lines.
The arc requires start point, middle point and end point, it consist of three lines.

Const. Pt Settings

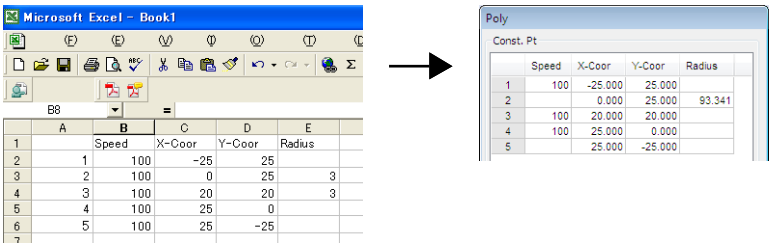
Item	Setting Details	Range (Default)	Pitch
Const. Pt	Displays the construction point number of polyline.	1 to 500	1
Speed	Sets the moving speed of the scanner between construction points.	1 to Lens dependant (100 mm/s)	1 mm/s
X-Coor	Sets the X-coordinate of the construction point of polyline.	Lens dependant	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

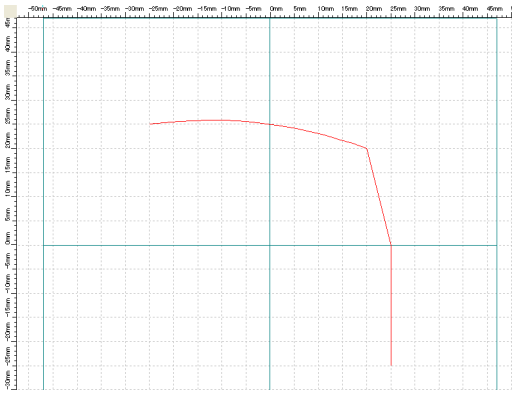
- Displaying data at once
  Displays speed, X-coordinate and Y-coordinate at once. When the number of construction points are large, drag the scroll bar to display the hidden data.
- Changing data directly
  Changes values by numerical entry. The values are increased/decreased with the <PageUp>/<PageDown> 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.



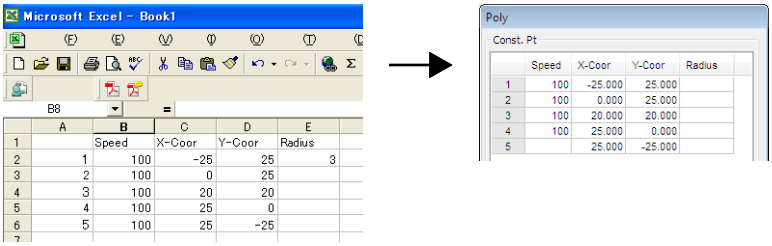


- An arc consists of three points (start point, middle point and end point). When the radius data continues, the second radius becomes invalid.

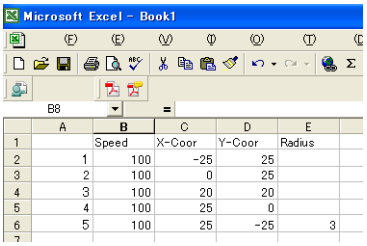


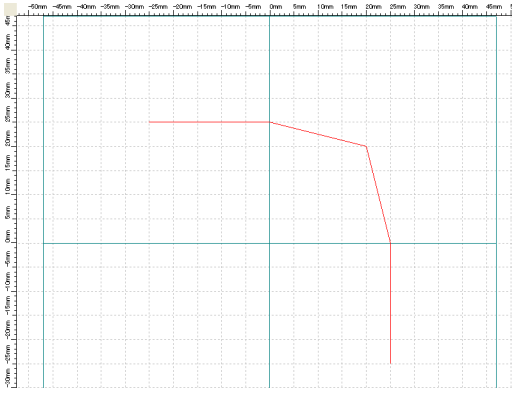


- Since the radius data is the middle point of arc, the radius value of the first point or the end point becomes invalid.



or





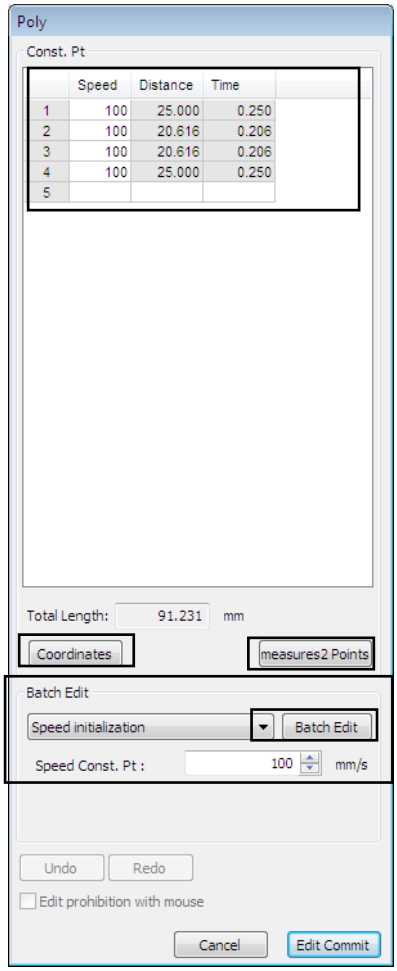
- Checking data
  The background color of cell changes when a value is input in, and you can find that the value is changed. The background color is green for normal values and red for abnormal values.
  In both cases of pasting and changing at once, the error check is carried out in a similar manner. 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

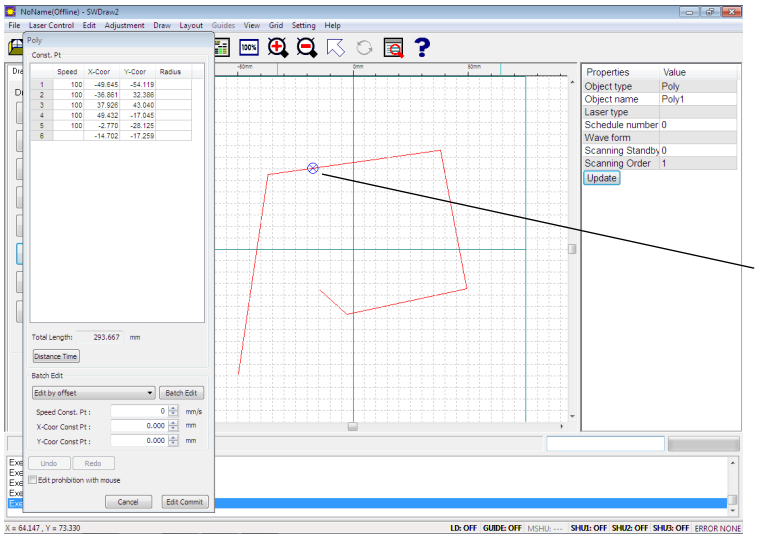
Fine adjustment of construction points such as speed and coordinates can be made on the dedicated screen for editing polylines displayed in the left side of the screen ([Poly] screen). For the details of functions on the [Poly] screen, see "Chapter 9-2.2. [Poly] Screen Arrangement"(page 177) .

1 When a polyline is selected, the [Poly] screen is displayed.

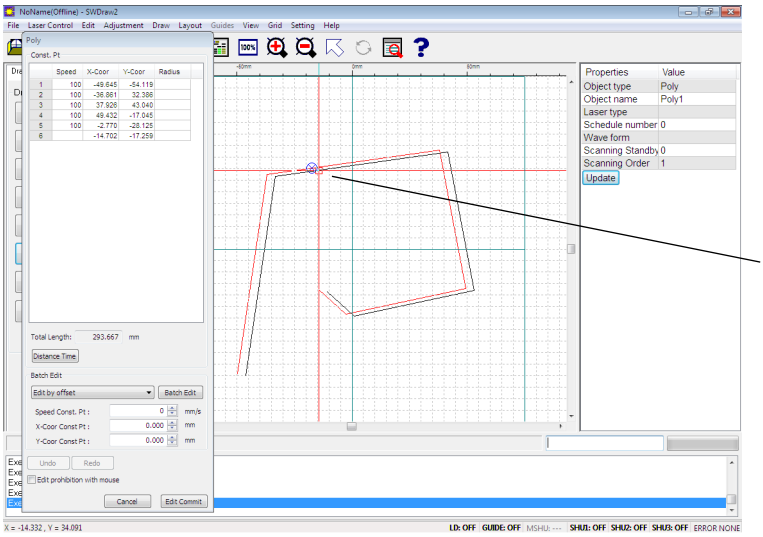
ATTENTION	The [Poly] screen is displayed only when a polyline is selected. When multiple polylines are selected, the screen is not displayed.

2 Specify an element to change or move.

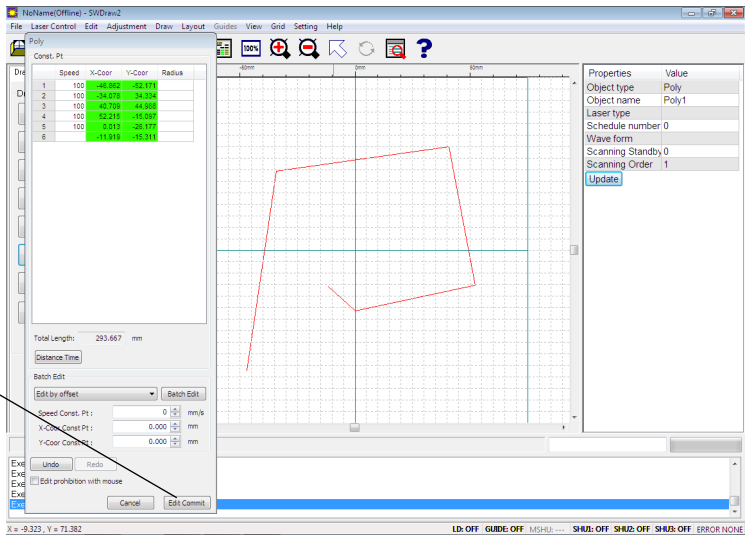
3 Click the place where there is no construction point on the polyline to display "⊗" at the construction point.



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

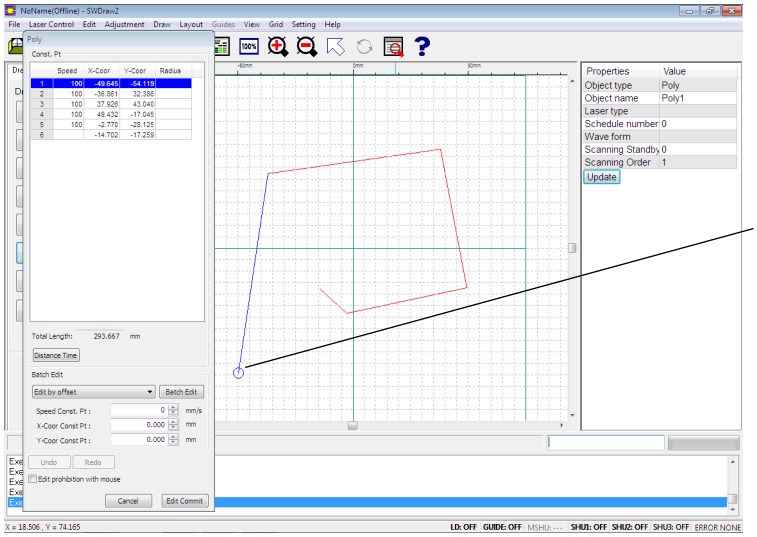
Fine adjustment of construction points such as speed and coordinates can be made on the dedicated screen for editing polylines displayed in the left side of the screen ([Poly] screen). For the details of functions on the [Poly] screen, see "Chapter 9-2.2. [Poly] Screen Arrangement"(page 177) .

1 When a polyline is selected, the [Poly] screen is displayed.

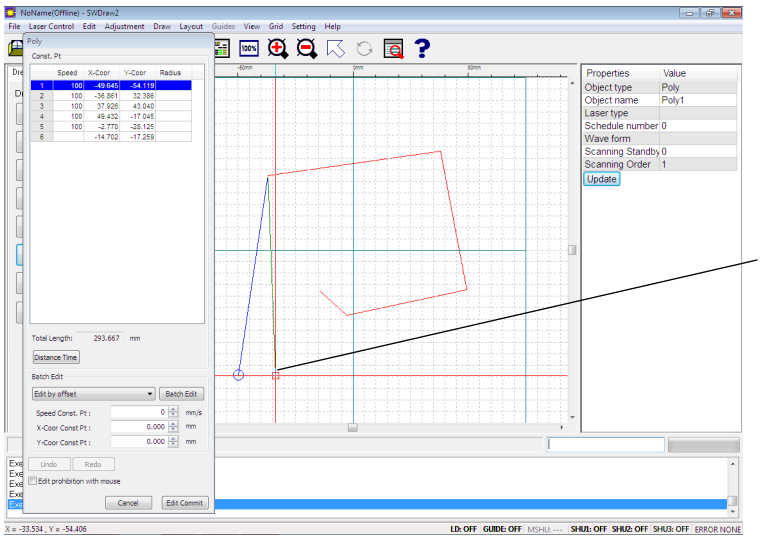
ATTENTION	The [Poly] screen is displayed only when a polyline is selected. When multiple polylines are selected, the screen is not displayed.

2 Specify an element to change or move.

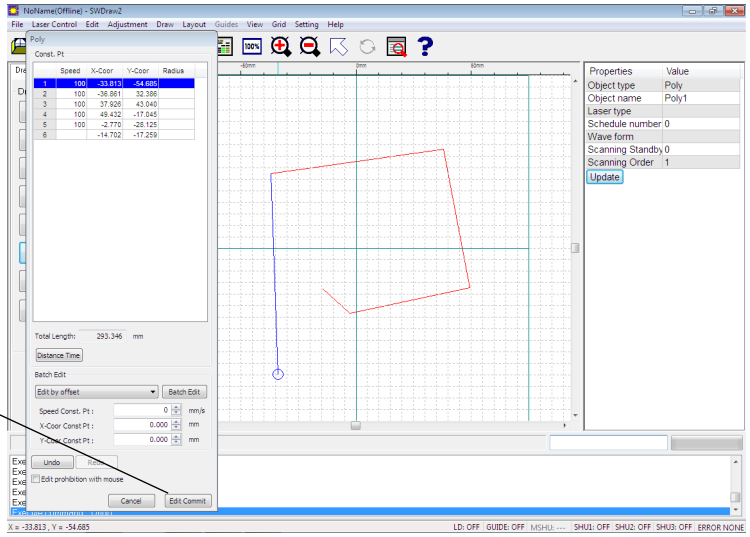
3 Click around the place where there is a construction point on the polyline to display "O" at the construction point or select a line on the Object Browser. (The line start and end points, and arc start, end and middle points can be selected by clicking.)



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.

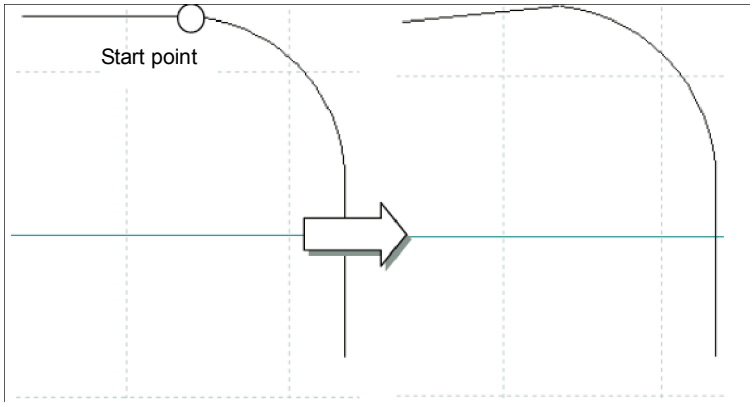


You can also make modifications in properties.
However, the following rules are applied.

■ Changing the coordinate value with the mouse (changing by directly entering the coordinates in the point coordinates list)

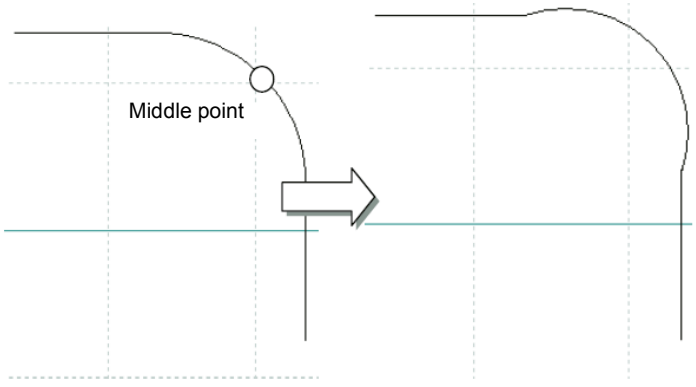
- When the start point is changed, its coordinate and radius is changed. The middle and end points are not changed.

  (The radius is automatically calculated by the start, middle and end points.)



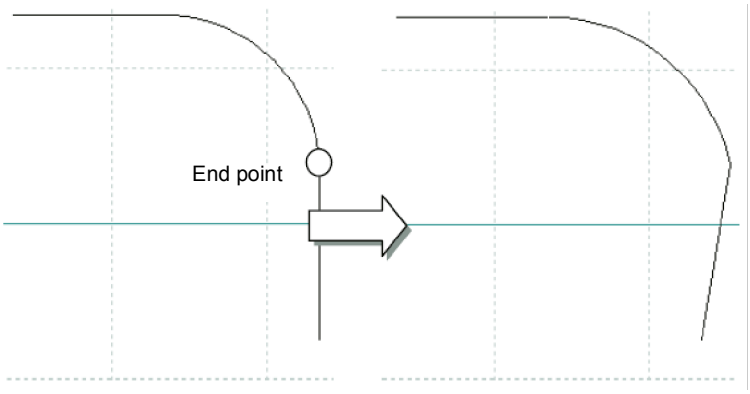
- When the middle point is changed, its coordinate and radius is changed.

  (The radius is automatically calculated by the start, middle and end points.)



- When the end point is changed, its coordinate and radius is changed.

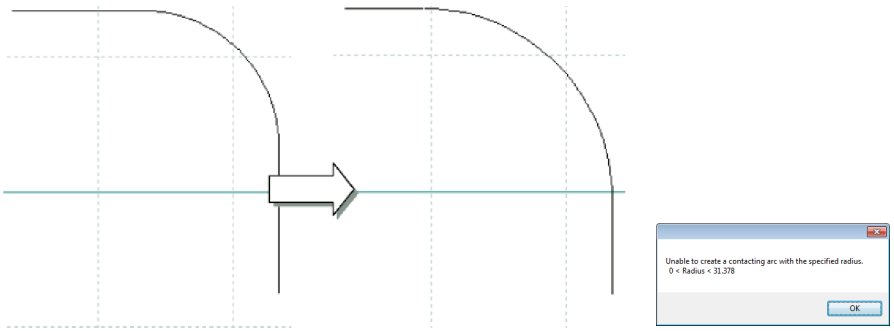
  (The radius is automatically calculated by the start, middle and end points.)



■ 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.

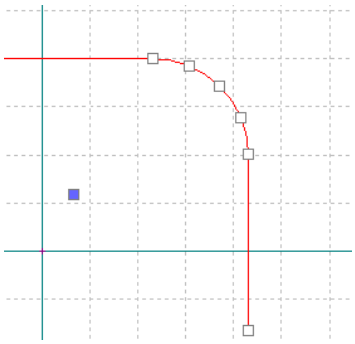


2.3.3. Adding/Deleting Construction Points

■ Using the mouse

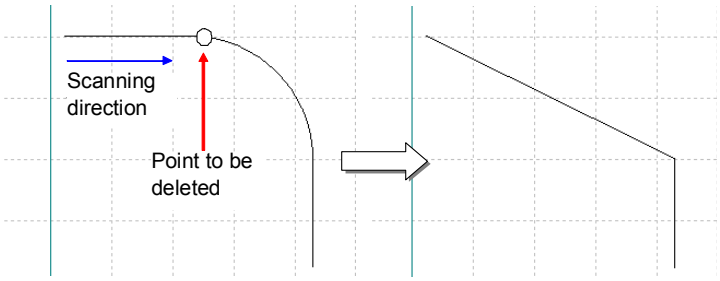
- Adding the construction point in drawing area

  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.

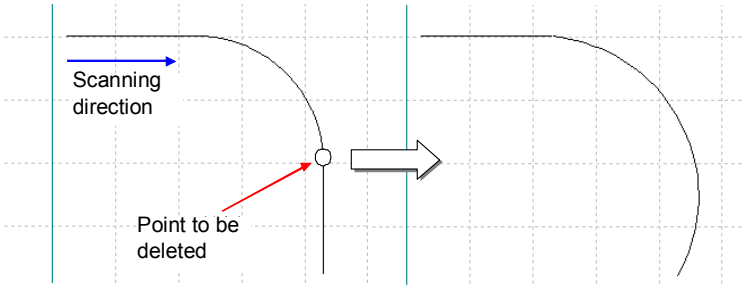


- Deleting the construction point in drawing area

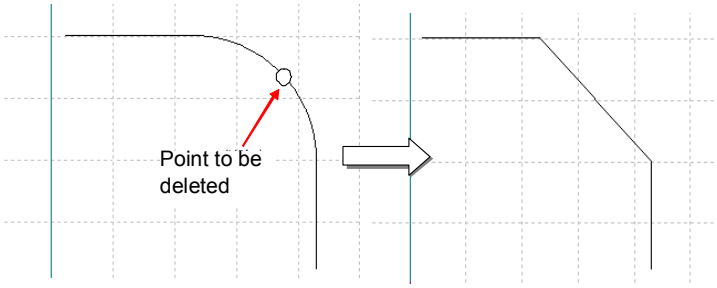
  When the arc start point is deleted (viewed from the scanning direction), the arc middle point is also deleted.



  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.

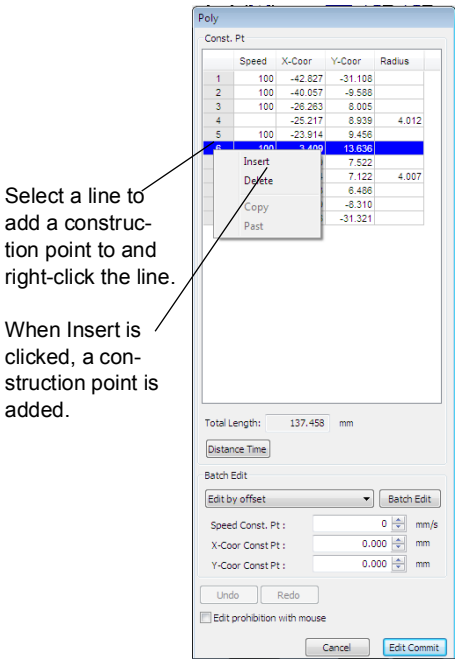


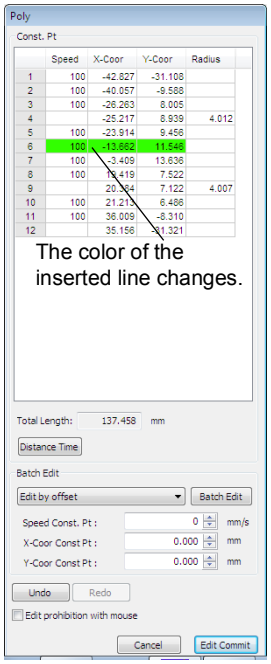
  When the arc middle point is deleted, the arc start point and the arc end point are joined with a line.



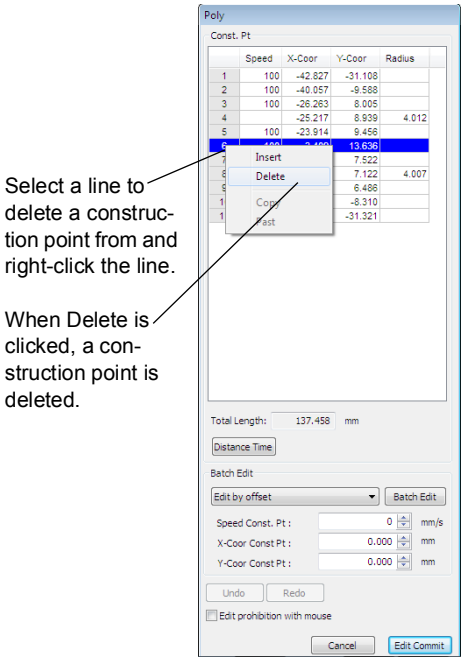
■ By setting in properties

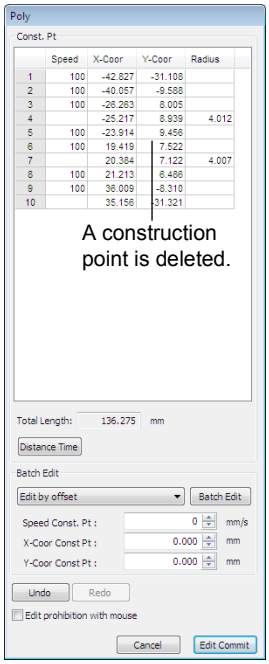
• Adding the construction point in properties





• Deleting the construction point in properties

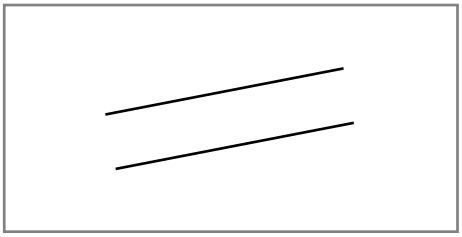




3. Parallel Lines (Drawing Parallel Lines)

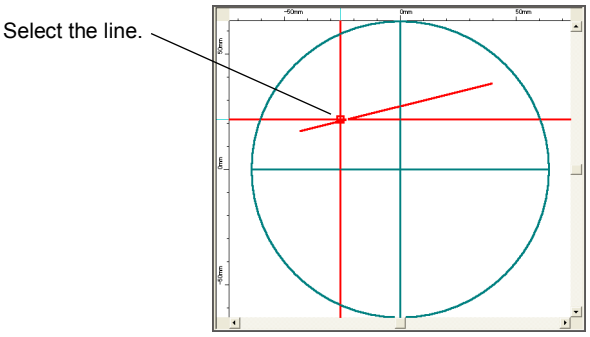
Draw a line parallel to an existing line as follows:

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.

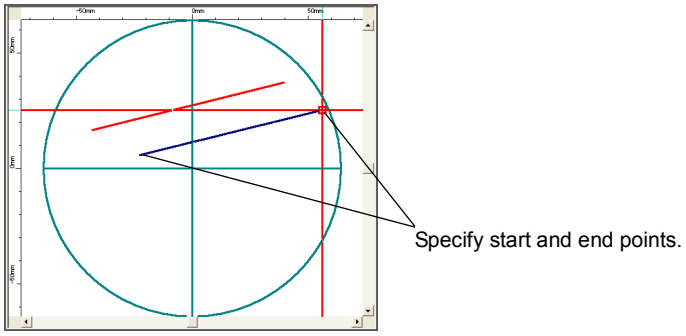


1 Click the [Parallel Lines] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [Parallel Lines].

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.

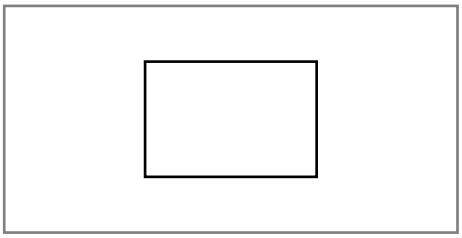


A line is drawn parallel to the one chosen in step 2.

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:

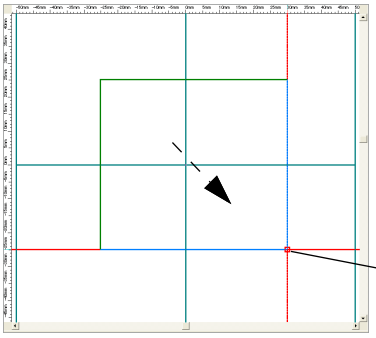


1 Click the [Square] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [Square].

2 Specify the start point.

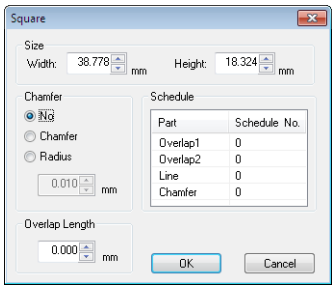
3 Specify the size of the rectangle.

Move the mouse to enlarge or reduce the rectangle. Click when the rectangle is the desired size.



The [Square] screen is displayed.

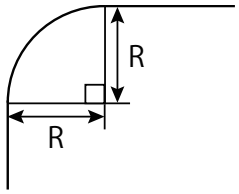
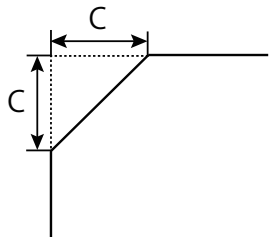
4 Specify the values, referring to the table below. Click the [OK] button when finished.



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.

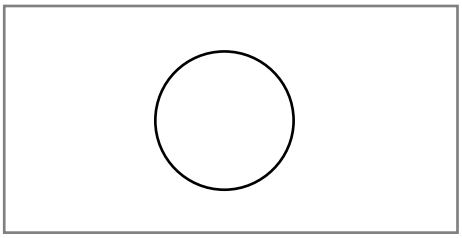
Circle (Manual): The drawing start and end points can be arbitrarily set. Circles with overlap* can be drawn.

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:



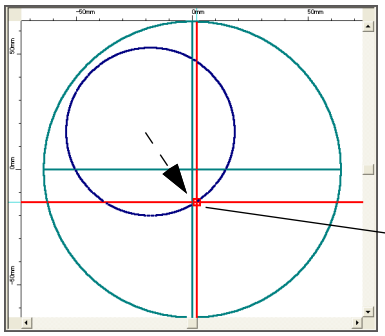
1 Click the [Circle [Manual]] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [Circle [Manual]].

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.

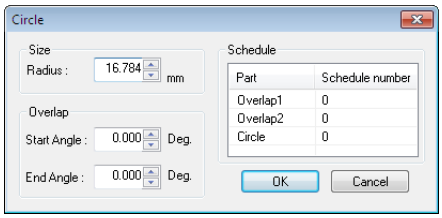


- By specifying points

  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

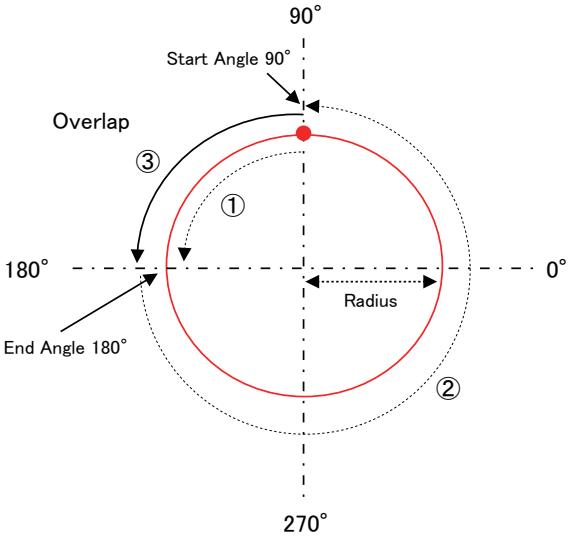
Item		Setting specifics	Range (Default)	Pitch
Size	Radius	Specifies the radius of circle.	Lens dependant	0.001 mm
Overlap	Start Angle	Specifies the start angle for the overlap portion.	0-359.999°	0.001°
	End Angle	Specifies the end angle for the overlap portion.	0-359.999°	0.001°
Schedule *1	Overlap1	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.

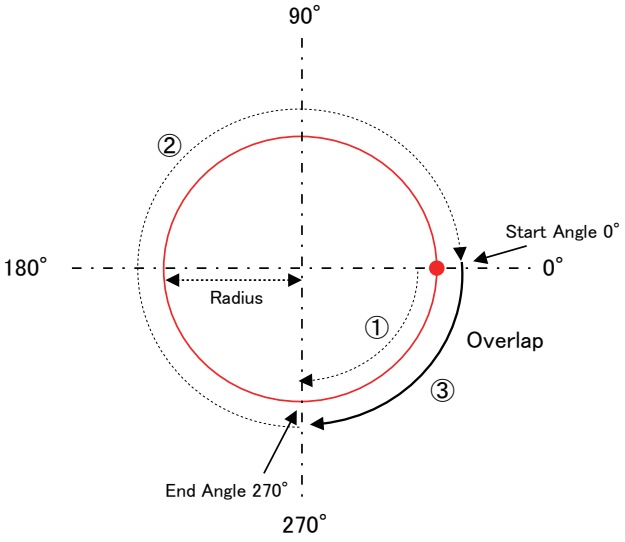
Counter clockwise

(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:

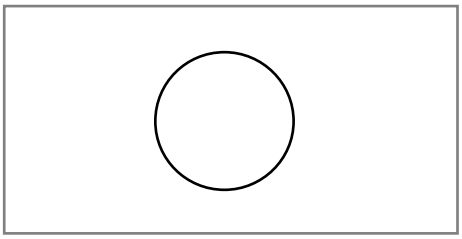
  Scanning will be in the clockwise direction.

- 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:



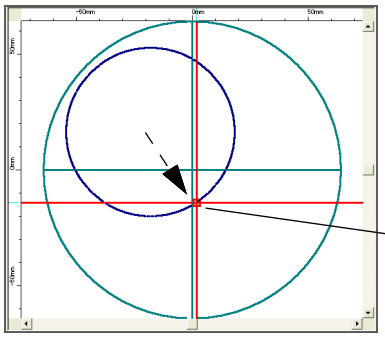
1 Click the [Circle [Auto]] button, located in Drawing commands. Alternately, from the menu, select [Draw] -> [Circle [Auto]].

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.

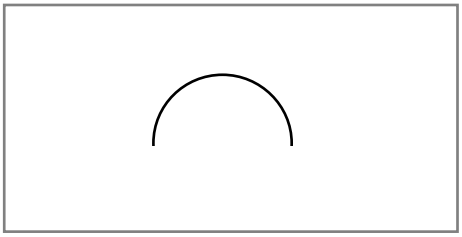
- When the end point is to the left of the center point:

  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.



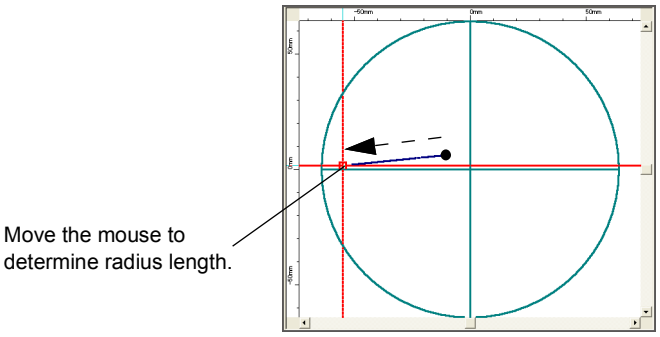
1 From the menu, select [Draw] -> [Arc].

2 Specify a point as the center of the circle.

3 Specify the radius of a circle that includes the arc.

- Using the mouse

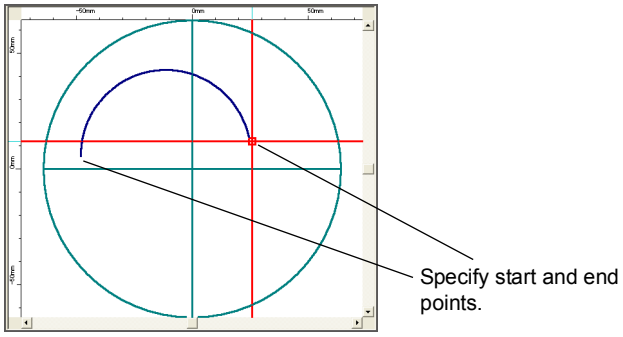
  Move the mouse to lengthen or shorten the line representing the radius. Click when the radius is the desired size.



- 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.

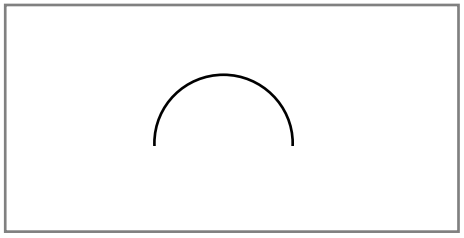
- When the end point is in the counter-clockwise direction from the start point:

  Scanning will be in the counter-clockwise direction.

7. 3-Point Arc (Specifying 3 Points to Draw an Arc)

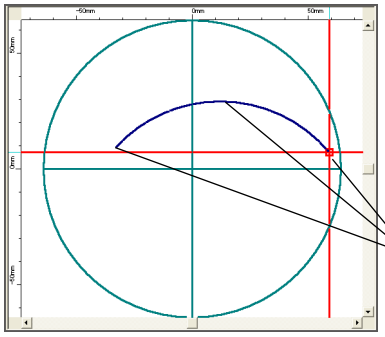
Specify three points along a circumference to draw an arc, as follows:

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:

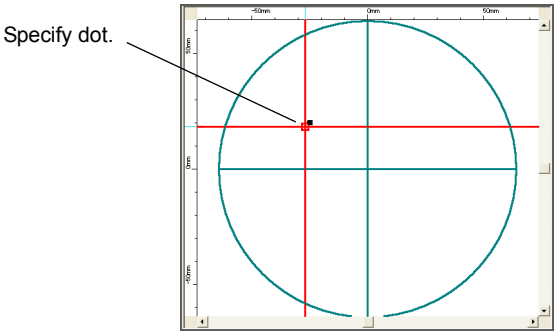
  Scanning will be in the counter-clockwise direction.

8. Spot (Drawing Dots for Spot Welding)

The scanning laser welding system can perform seam welding along lines created using SWDraw2. 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].

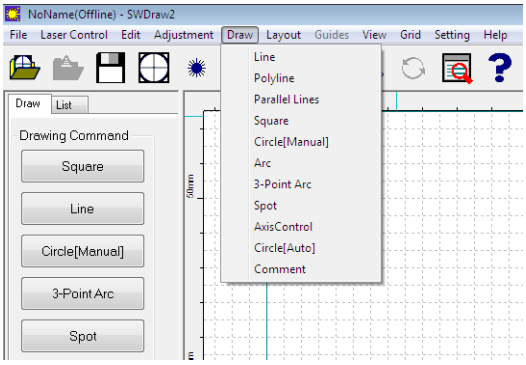
9. Axis Control (Communicates with External Devices)

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 5-4. System Parameters (Setting Laser Equipment Operating Conditions)"(page 112) .

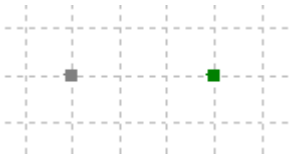
9.1. Using the Axis Control Command

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].

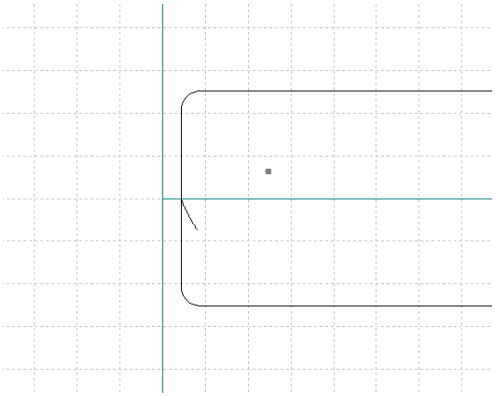
Properties	Value
Object type	Axis
Object name	Axis1
Laser type	
Schedule number	0
Wave form	
Scanning Standby	0
AxisMove	Yes
X-Coordinate (mn	-20.051
Y-Coordinate (mn	28.622
Scanning Order	1

Update

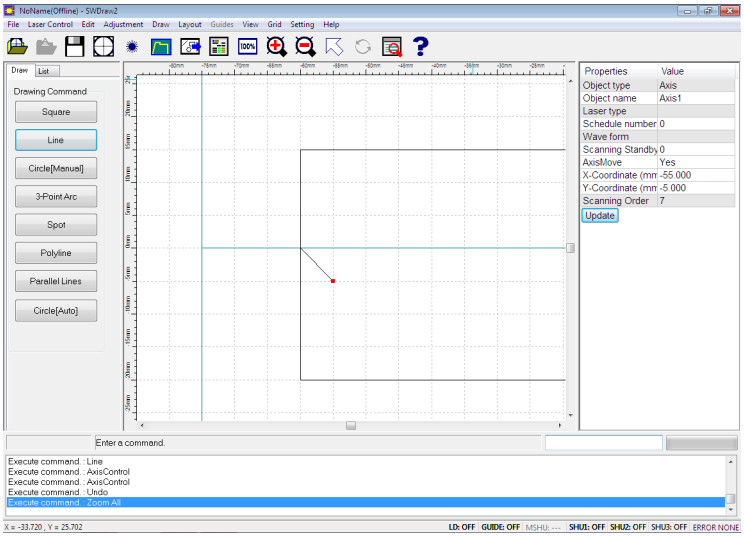
9.2. Example of Axis Control Command

Check the position (manipulate an image) at the side end.

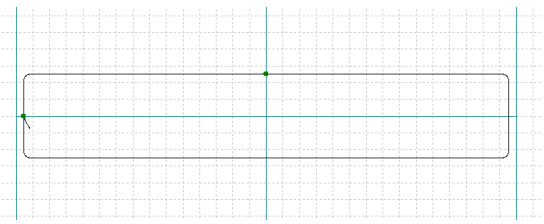
1 From the menu, select [Draw] -> [Axis Control] and arrange the axis control command.
The command should be arranged within the area.



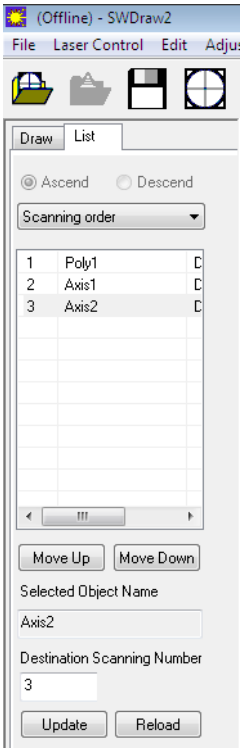
2 Select the arranged object and change the property.
Select “Yes” for [Axis Move] and input the coordinate value for moving the scanner.



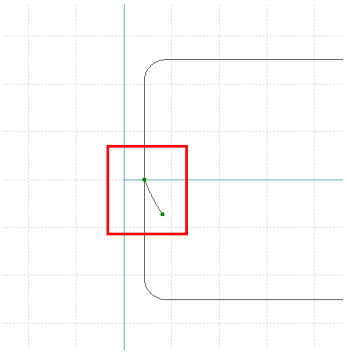
3 Similarly, arrange axis control commands on other positions you need.



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.

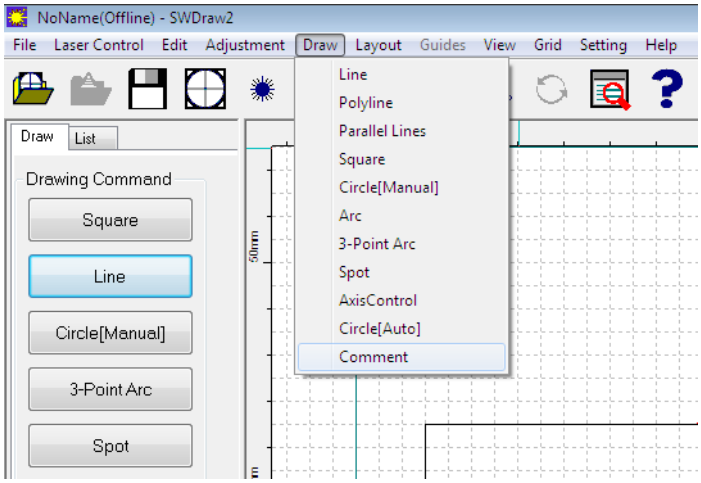
10. Comment (Entering Comments)

The information for layout data can be added regardless of scanning.

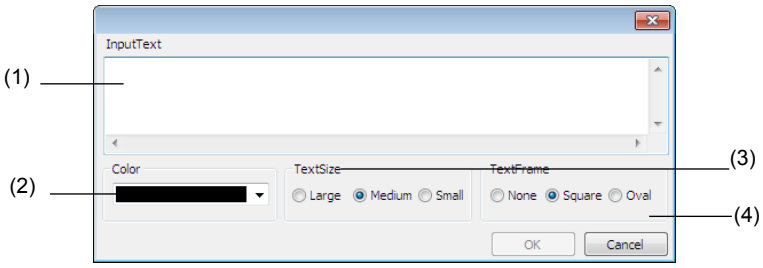
As long as the comment is arranged within the area, it does not effect the scanning even if it gets beyond the area.

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

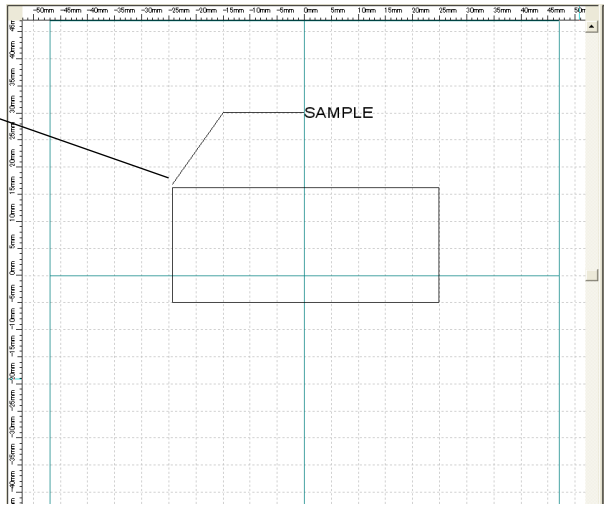
Specify the text size of comment.
The mutual text size assigned to large, medium and small is stored in SWDraw.INI to be described.

(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.

When placement point is clicked, a comment can be placed.



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.

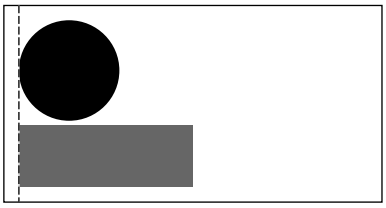
Chapter 10 Layout

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.

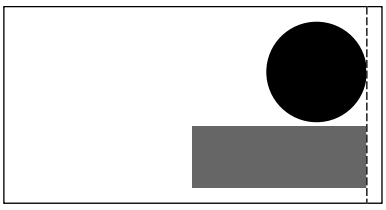
* When the figures will overlap if aligned, they are automatically adjusted to prevent them from overlapping.

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].



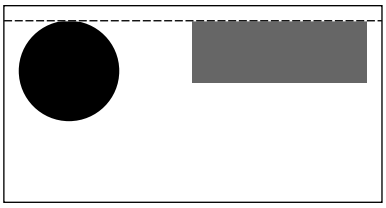
The selected figures are aligned as specified.

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].



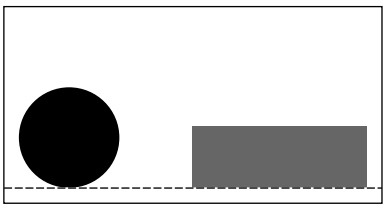
The selected figures are aligned as specified.

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].

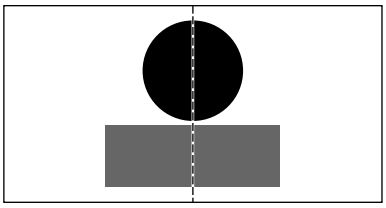


The selected figures are aligned as specified.

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].

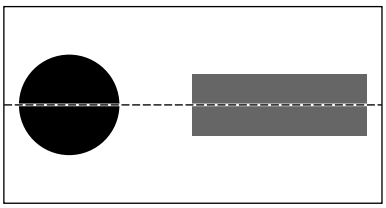


The selected figures are aligned as specified.

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].



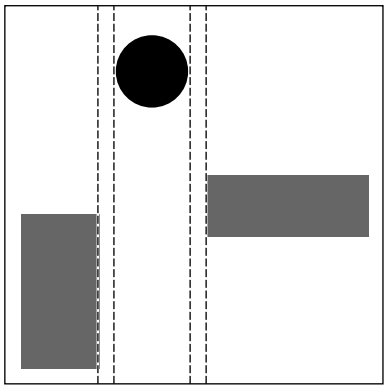
The selected figures are aligned as specified.

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].



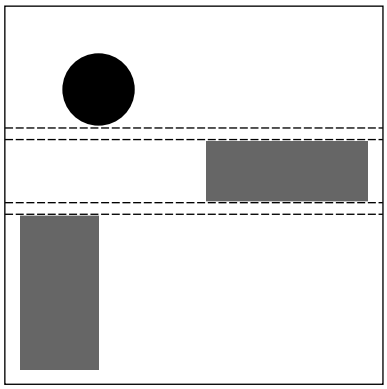
The selected figures are aligned as specified.

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].

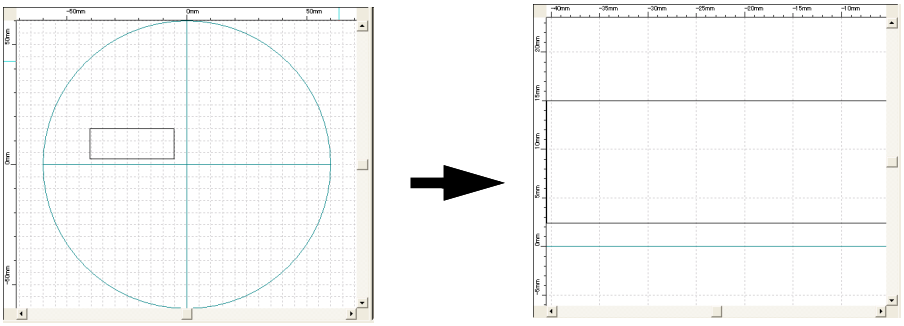


The selected figures are aligned as specified.

Chapter 11 View

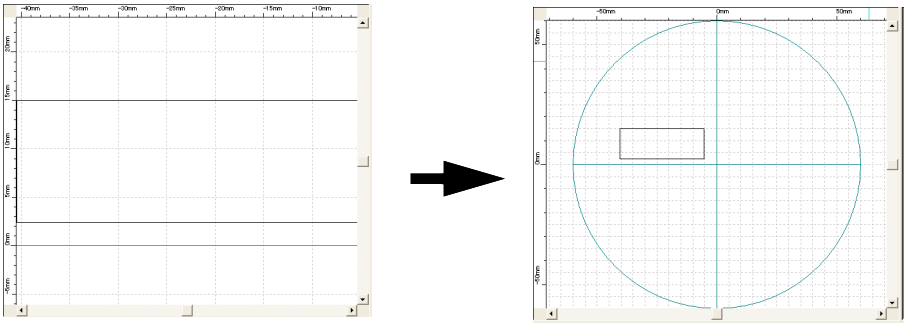
1. Zoom Extents

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.

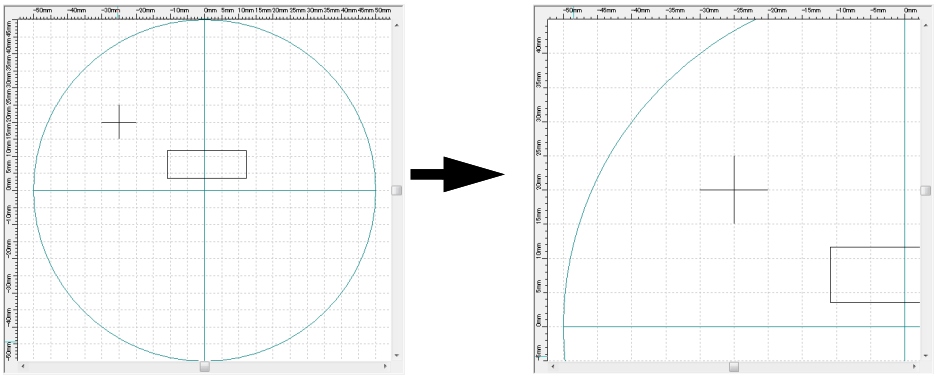


3. Zoom In

To zoom in, from the toolbar, click the [Zoom In] button. Or select [View] -> [Zoom In] from the menu.

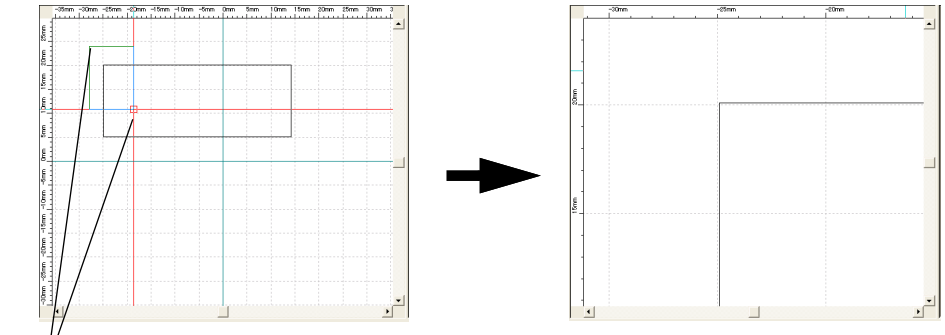
Clicking the [Zoom In] button from the toolbar zooms in for a closer view, focusing on the center of the screen.

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.



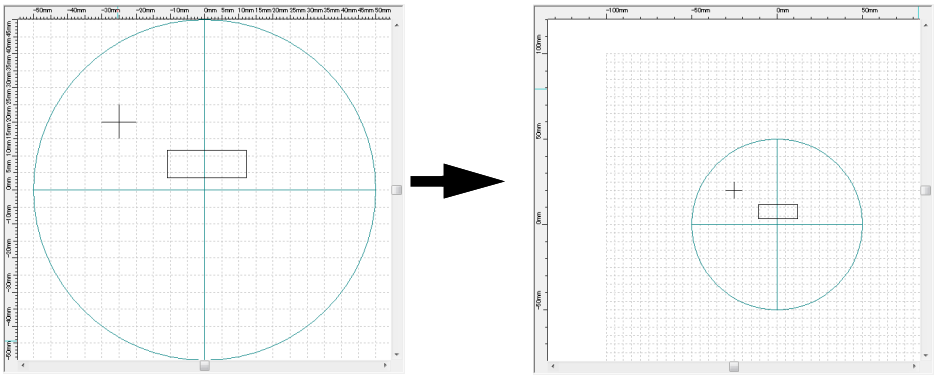
Specify two points defining the desired area.

5. Zoom Out

To zoom out, from the toolbar, click the [Zoom Out] button. Or select [View] -> [Zoom Out] from the menu.

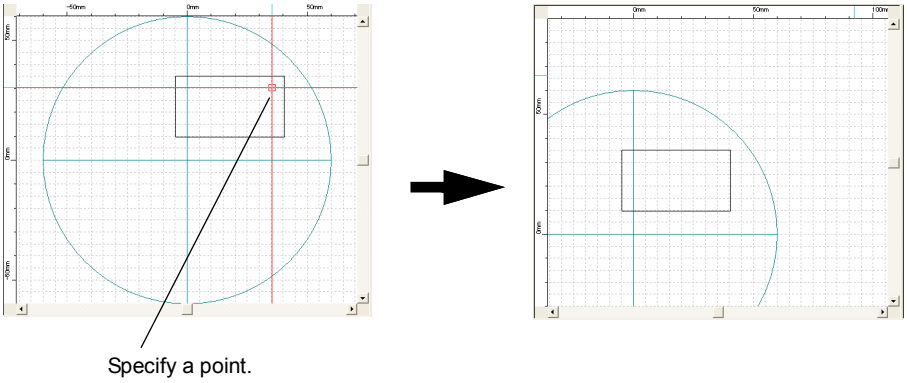
Clicking the [Zoom Out] button from the toolbar zooms out for a broader view, focusing on the center of the screen.

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 12-1. Grid Spacing" (page 216) .

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.

Chapter 12 Grid

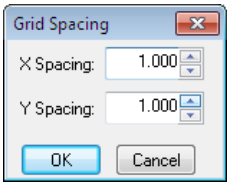
1. Grid Spacing

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.

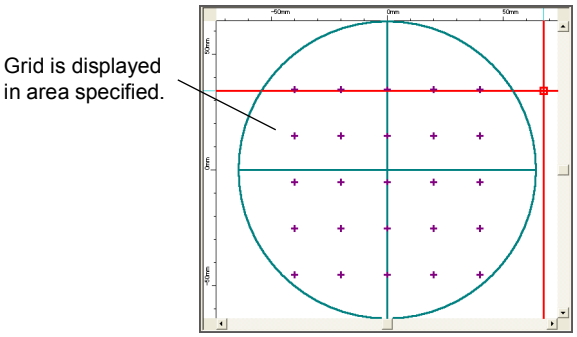
1 Display the grid.

1) From the menu, select [Grid] -> [Grid Origin].

2) Specify the grid origin in the layout area.

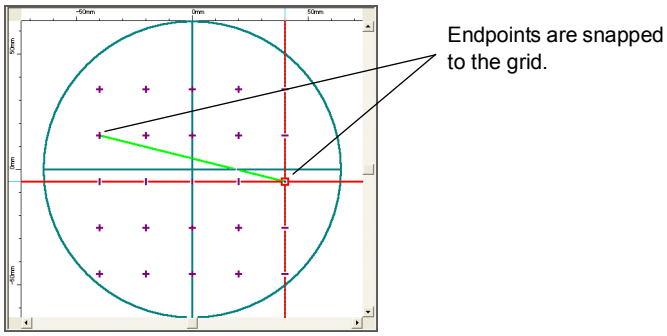
3) Specify the area in which to display the grid.
This can be selected by specifying the start and end points of the area.

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.

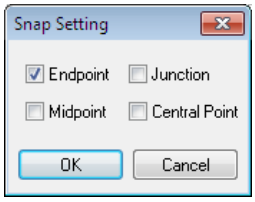
To have the cursor snap to specific points on objects as you draw, follow these steps.

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.

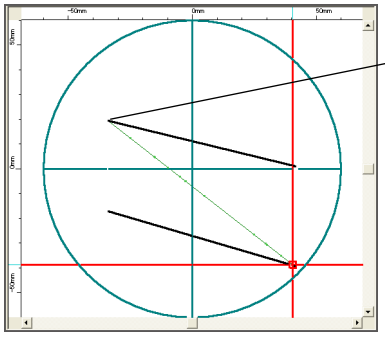


Snap Settings

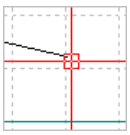
Item	Setting Details
Endpoint	Snap to line endpoints.
Junction	Snap to line intersections.
Midpoint	Snap to the middle points of lines.
Central Point	Snap to the center point of circles or arcs.

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.



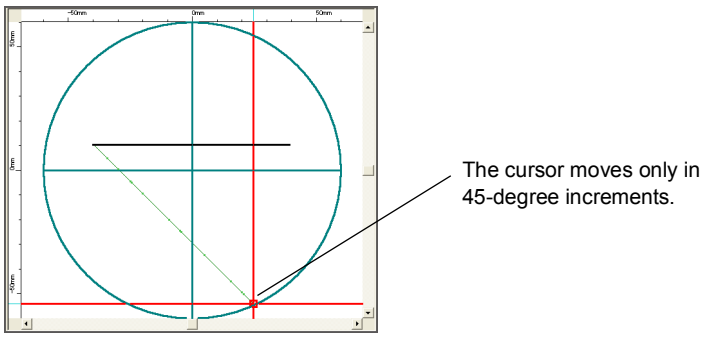
Right-click when the cursor is close to the endpoint to snap the cursor to the endpoint.



ATTENTION	When the cursor is at the middle of line, it snaps to the closer endpoint.

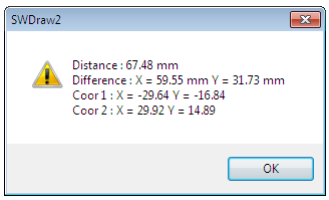
4. Angle Correction

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 13 Setting

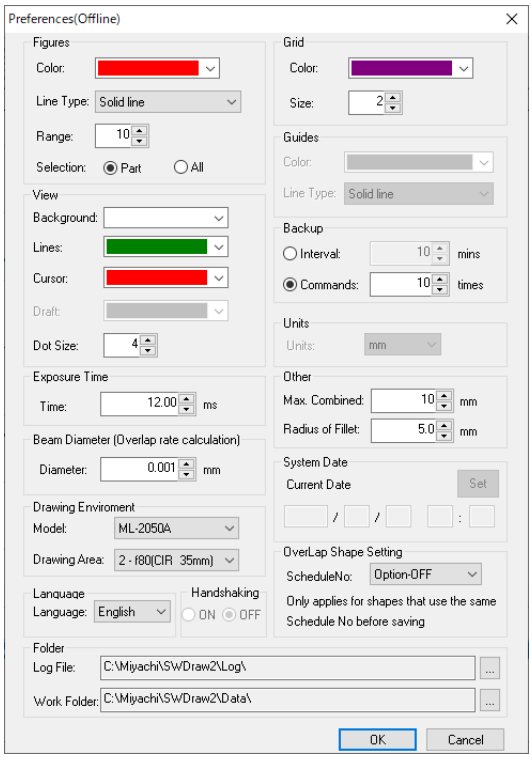
1. Preferences

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
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 scanner controller 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 scanner controller when online. This cannot be changed. The drawing area can be set as desired when offline.	—
Language*2		Switches the language between Japanese and English when a Japanese operating system is used.	—
Handshaking*3		Selects ON or OFF of the schedule hand-shake function. When toggling the ON/OFF setting, restart SWDraw2 and the GWM controller to reflect the settings.	—
Grid	Color	Selects the grid color.	—
	Size	Specifies the grid point size.	0 to 50
Backup*4	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

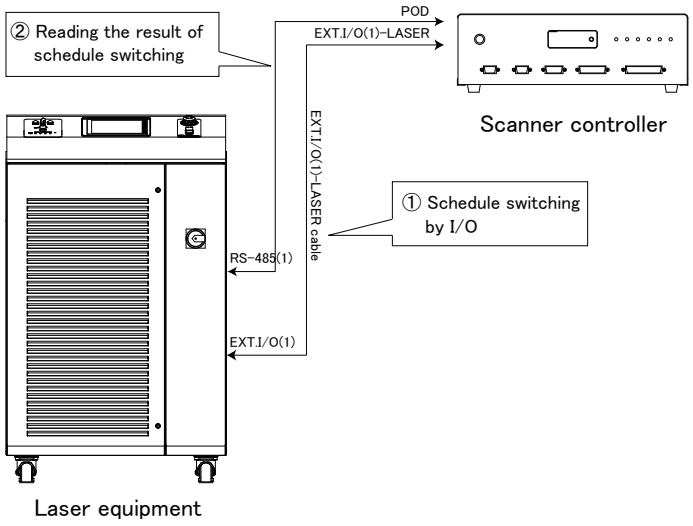
Preference Settings (2 / 2)

Item		Setting Details	Range
System Date		Indicates the system age currently set in the scanner controller only when online. This can be changed by entering the required value and then clicking the [Set] button.	—
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*5	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.	—

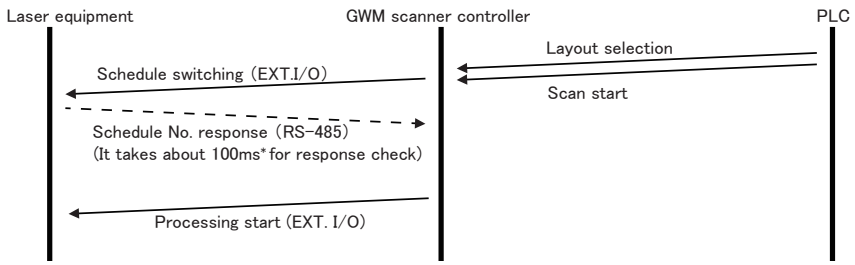
*1 This setting becomes the default value for [Open Time] of spot.

*2 When selecting English, set the setting of computer to the English mode not to garble characters.

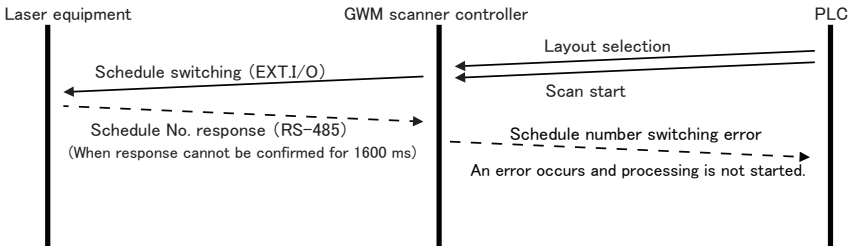
*3 About the schedule handshake function
The GWM scanner controller switches a schedule of the welder through the EXT. I/O (1)-LASER cable. The open-loop control is adopted for speeding up the schedule switching when [Handshaking] is set to OFF, but the check function by the handshake using the RS-485 cable is available by setting it to ON.



[At normal operations]



[At abnormal operations]



* Compared with operation when [Handshaking] is OFF, about 100 ms of takt increases for each schedule switching for checking the response of a schedule number. Also, when the response of a schedule number cannot be confirmed for 1600 ms, the schedule number switching error occurs.

*4 Open layout files and figure files are saved automatically during drawing to prevent accidental loss of data.

*5 In V00-02A or later, the default specified folder has been changed so that UAC (User Account Control) can be used in the operating system by default (Program folder → Miyachi folder). If upgrading the software, change the folder or copy the data.

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.

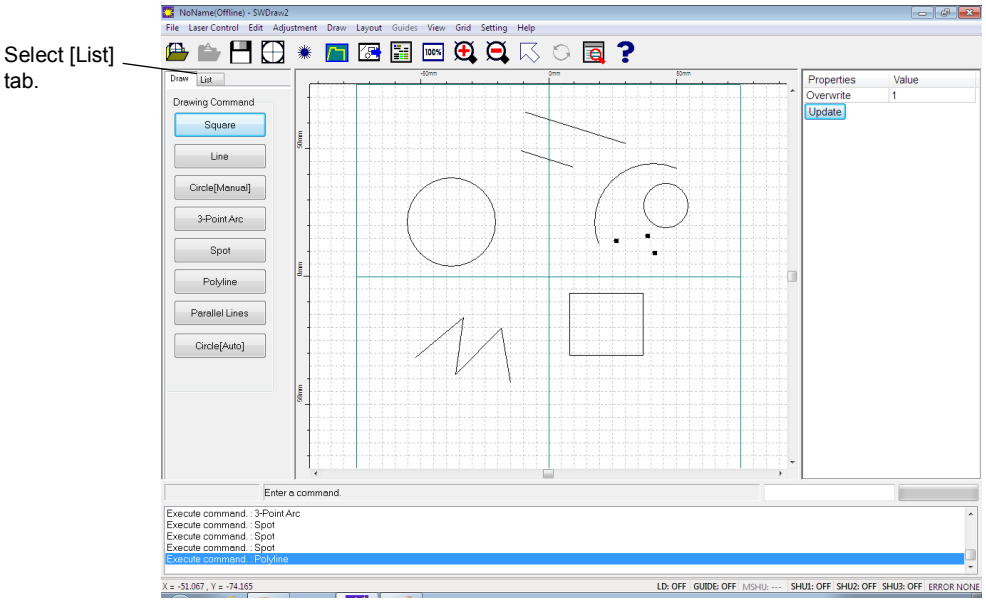
Chapter 14 Object Browser

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.

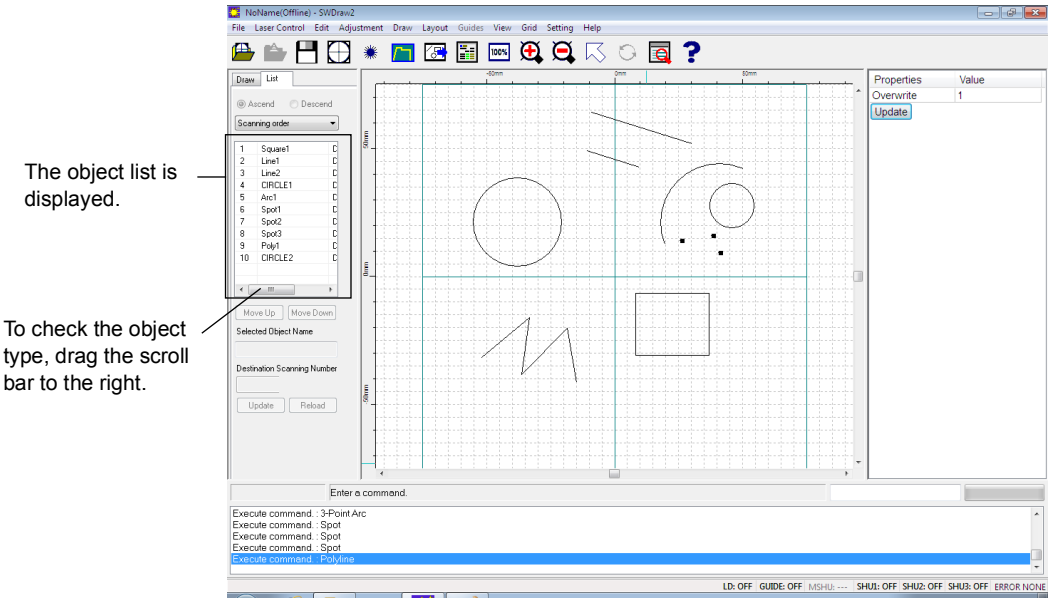
2. Checking Object Properties in Object Browser

1 Select the [List] tab.

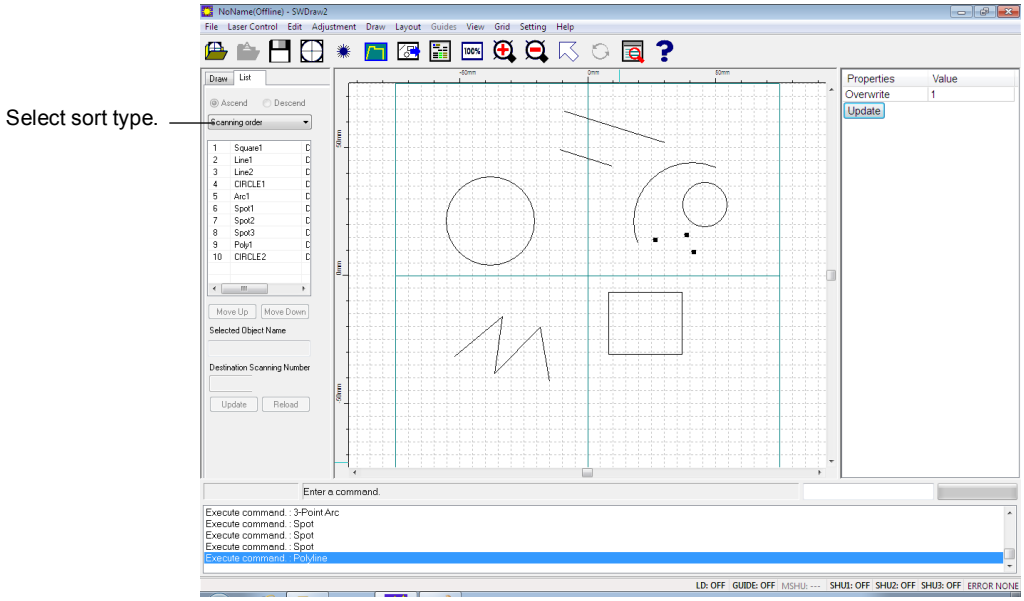


The Object Browser is displayed.

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].

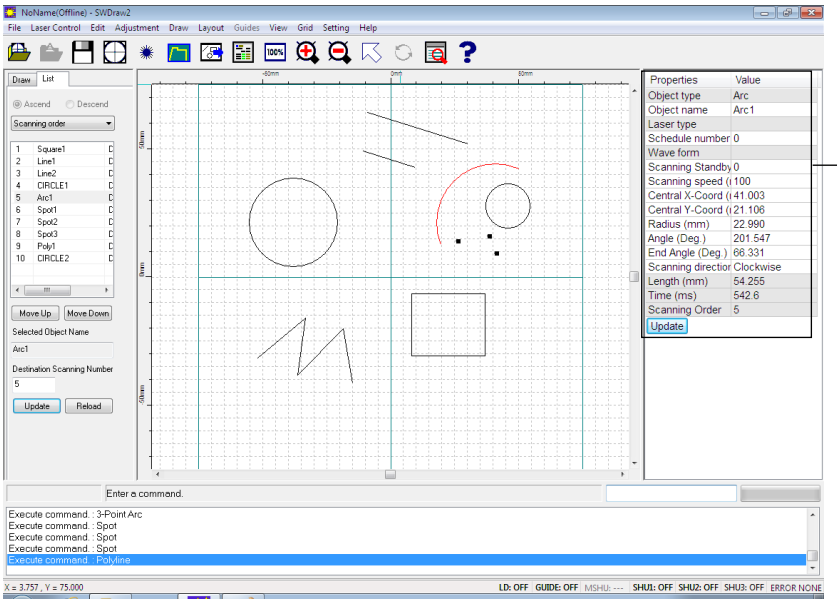
Object Browser Sort Item

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.



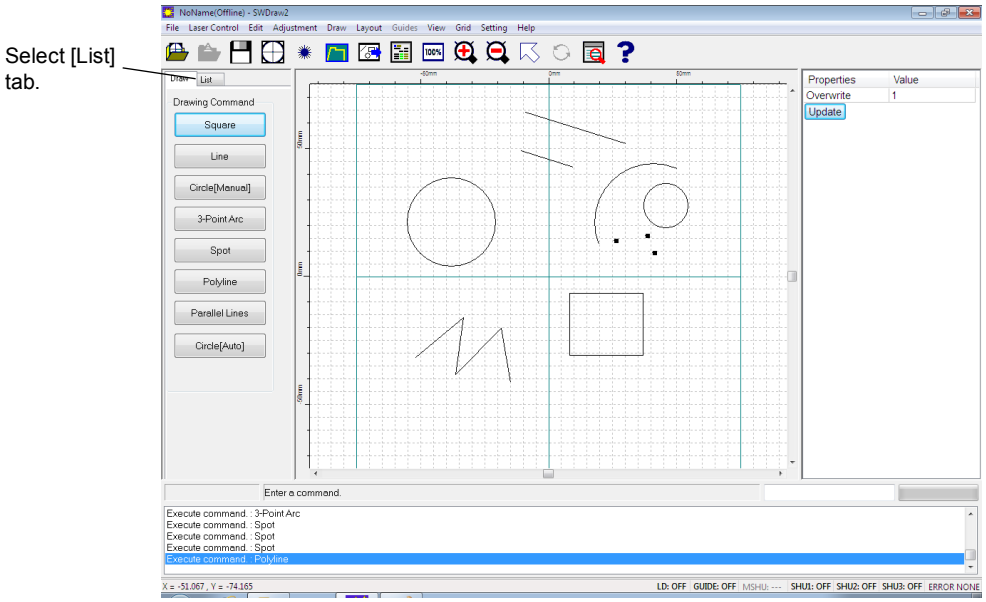
5 Select the [Draw] tab to return to the Drawing command.

Checking is now complete.

3. Changing Scanning Order in Object Browser

The scanning order can be checked and changed using Object Browser.

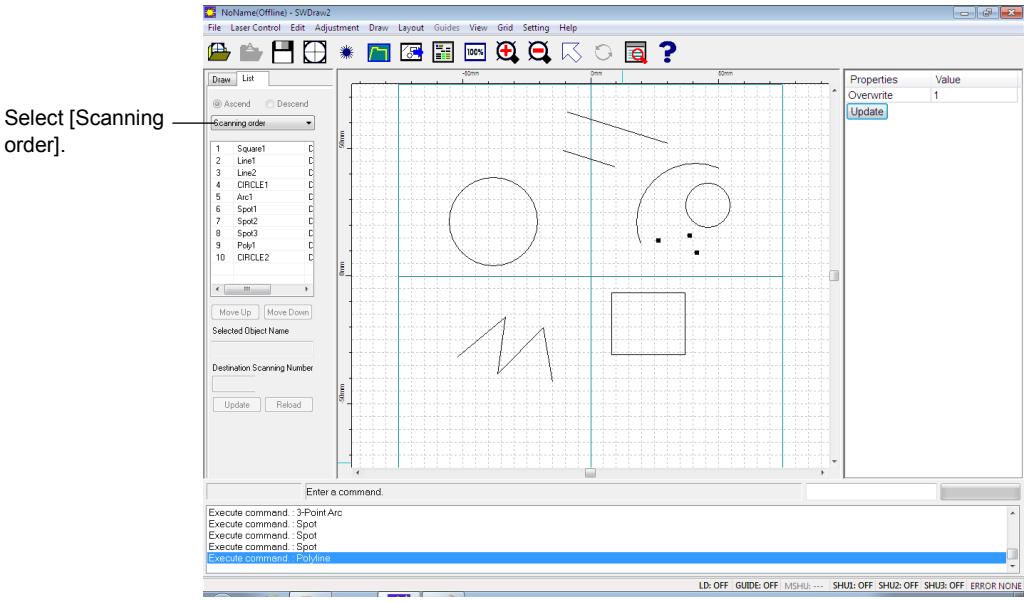
1 Select the [List] tab.



The Object Browser is displayed.

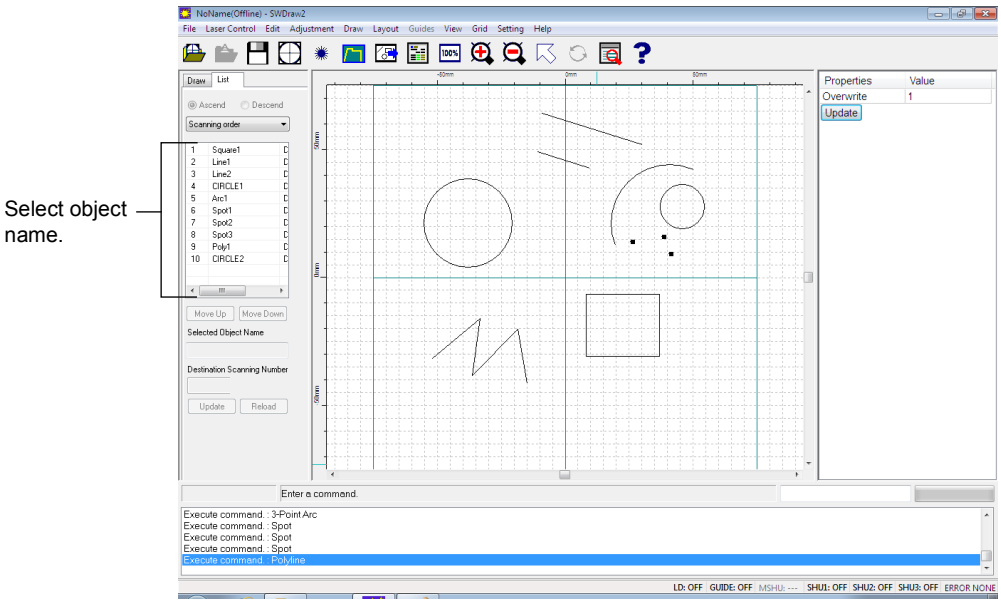
CAUTION	This cannot be selected while editing parts or sketches.

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.

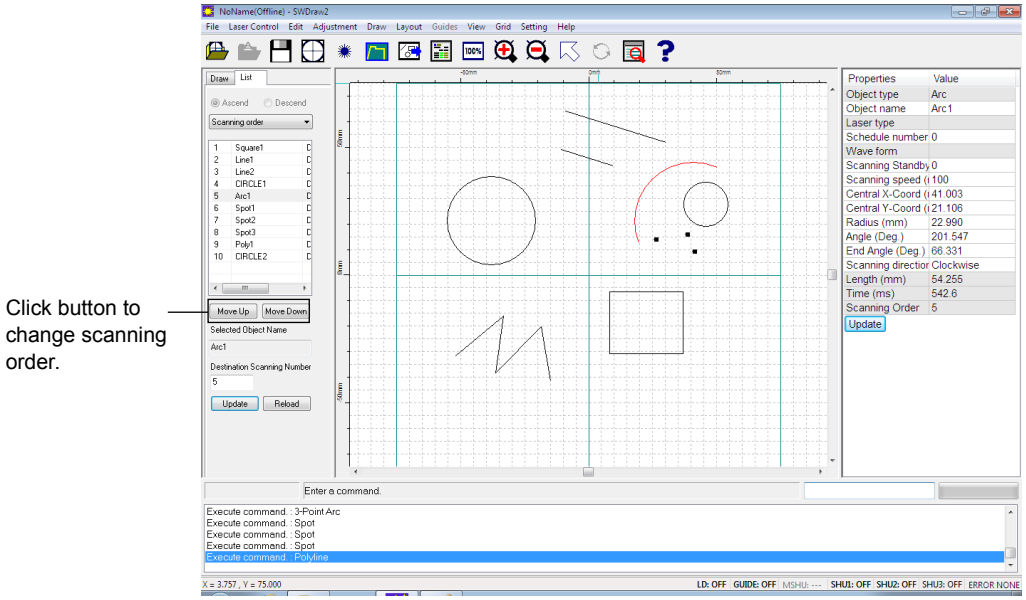


The object name selected in [Selected Object Name] is displayed and the corresponding figure is displayed in red on the layout area.

4 Change the scanning order.

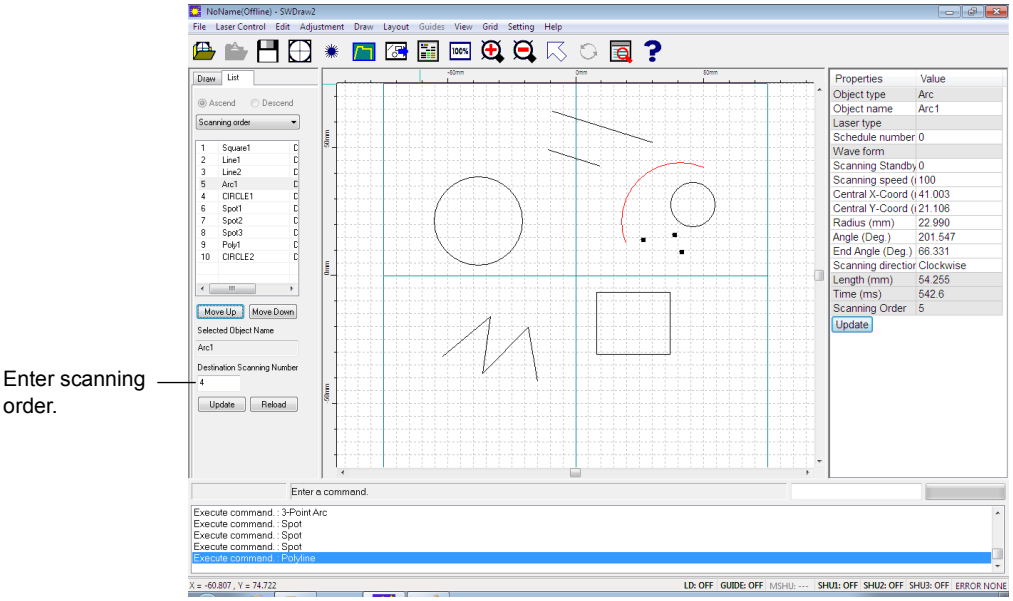
- To increment or decrement the scanning order:

  Click the [Move Up] or [Move Down] button to increment or decrement the scanning order.



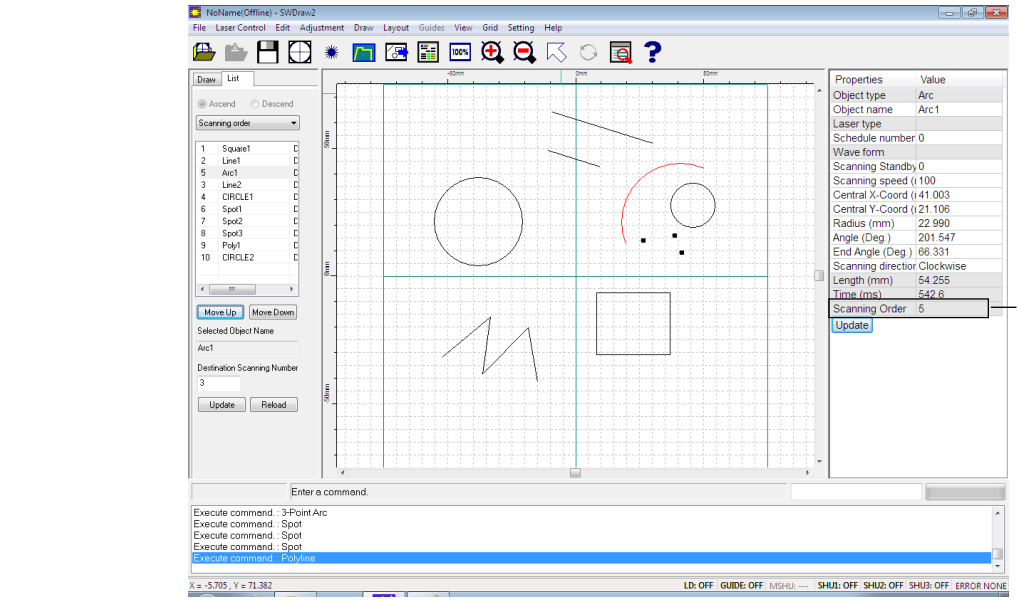
- To specify the new scanning order:

  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.



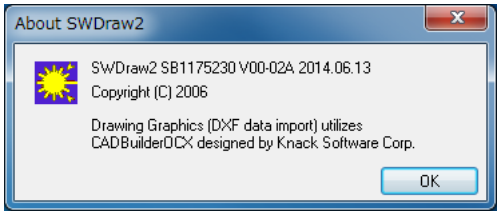
Click the [Reload] button to return to the original Object Browser scanning order without setting the scanning order.

Chapter 15 Help

1. About SWDraw2 (Checking SWDraw2 Version Information)

1 Either click the [Help] button on the toolbar, or from the menu, select [Help] -> [About SWDraw2].

The [About SWDraw2] screen is displayed.



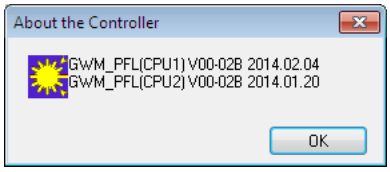
2 After confirming the version, click the [OK] button.

The version screen closes.

2. About the Controller (Checking the Scanner Controller 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 16 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 scanner controller.
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 17 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.

Appendix A LMDraw6 system requirement

Minimum system requirements to run LWDraw6.

Computer	CPU	Dual-core Intel Celeron, Core i or better
	Memory	4 GB or more
	Hard disk space	5 GB or more
	Display resolution	1366 x 768 dots or more
	Optical drive	DVD-ROM drive
	Interface	Keyboard/mouse/USB 1.1 4-pin x 1/LAN
	Operating system	Windows 10 Pro 64 bit Japanese/English version Windows 11 Pro Japanese/English version

Index