

First Machining with RDWorks V8 — RD Series Work Example

RSD-SUNMAX Series
SUNMAX LASER

About this document: This is an English translation of the Japanese original prepared by SUNMAX LASER for reference purposes. In case of any discrepancy, the Japanese original shall prevail. Specifications are subject to change without notice.

Work Example — First Machining (RDWorksV8)

- This document assumes that the laser machine has been set up correctly.
- This document assumes that the honeycomb table is installed.
- This document assumes that RDWorksV8, the control software for the RSD-SUNMAX series, has been installed correctly.

This work example walks through the whole process, from creating the design to machining it, using a design that combines engraving (blue) and cutting (black) as shown below.



Engraving / Cutting — Actual machined result

1. About First Machining

"First Machining" is a work example for machining for the first time with the RSD-SUNMAX series.

It is intended for cases where you did not receive the initial training at machine delivery. It assumes that the laser machine has been installed correctly by following the Setup Guide, that the control software RDWorksV8 has been installed correctly, and that the machine is ready to run.

In this document, a wooden board is machined. Depending on the type and thickness of the wood you use, the setting values given in this document may not produce a proper result. In that case, you will need to change the settings.

2. Preparation

Check that the laser machine and the control PC are connected correctly. Connect them with the dedicated USB cable supplied with the machine, or with a LAN cable.

2.1 Starting the Laser Machine

Turn on the laser machine.

Confirm that the main switch is in the OFF state (pressed in).

Turn the run key clockwise.



Caution: If the main switch is already in the ON state when you turn the run key, the breaker on the back of the machine may trip. If this happens, press the main switch, remove the run key, and then operate the breaker switch to reset it.

Turn the main switch clockwise.

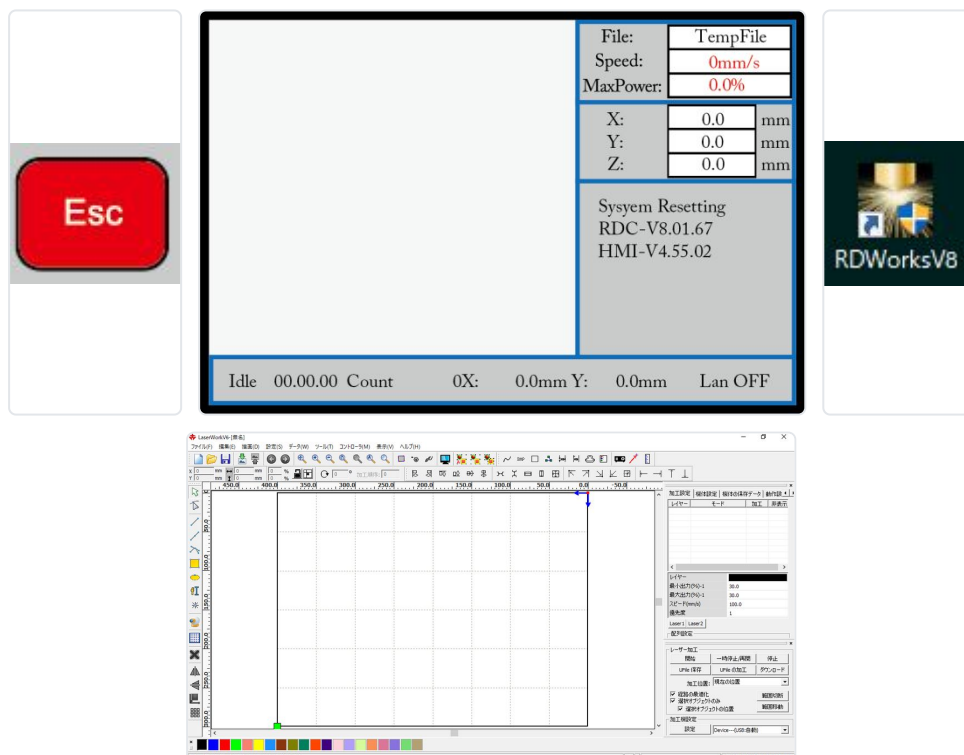
When the laser machine powers on, the startup screen appears on the machine's operation panel as shown below, and after a short while it switches to the normal screen — confirm that this happens. The area outlined by the red dashed line is the monitor screen, where information is displayed.



— Operation panel — / — Screen immediately after startup — ("Connecting to controller...")

Once the screen changes, the laser head performs a homing (origin return) operation. You cannot operate the machine while this is in progress. The process takes a few seconds.

Caution: If you press the Escape button during this operation, the homing operation is interrupted partway and homing will not complete correctly.



— Screen during homing —

2.2 Starting the Control Software RDWorksV8

Launch the control software on the PC. Place the cursor on the RDWorksV8 icon and double-click it.

Note: The icon on your desktop will be one of the two shown in the figure above.

— Startup screen —

Note: The startup screen contains version information. Depending on the production lot of your machine, the actual display may differ.

2.3 Checking That the Machine Operates Correctly

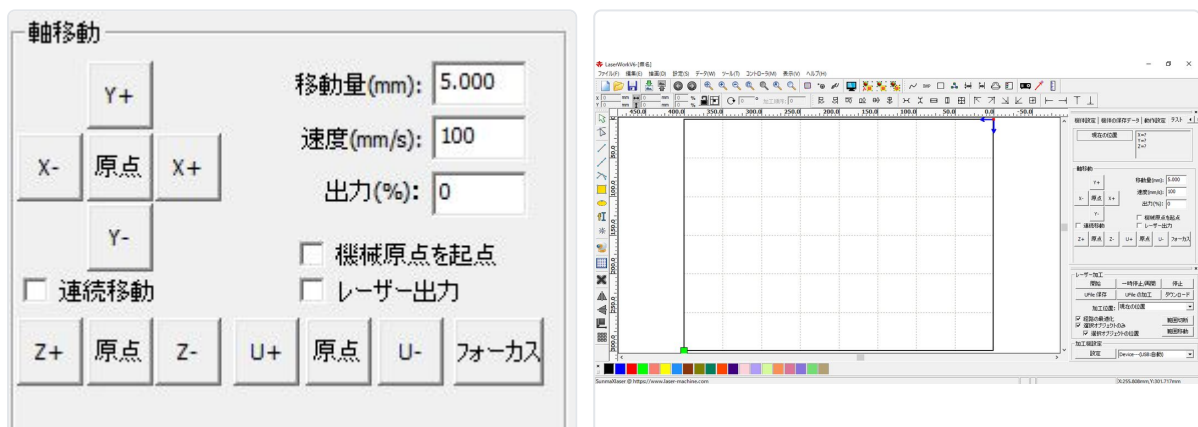
Use "Axis Move" on the "Test" tab of the machining settings pane at the top right of the screen to check that the laser head operates correctly.

Click the four buttons below with the mouse; if the laser head moves correctly, the connection between the laser machine and the control PC is good.

Clicking "X+", "X-", "Y+", or "Y-" moves the laser head in that direction. The laser head moves the distance set in "Offset" at the speed set in "Speed".

Note: If "Continuous move" is checked, the laser head keeps moving while the button is held down (the Offset value is ignored, but the Speed setting still applies).

Note: If the "Test" tab is not shown on the screen, click the arrow button to display it.



- Clicking "Y+" with the mouse moves the laser head toward the back.
- Clicking "Y-" with the mouse moves the laser head toward the front.
- Clicking "X+" with the mouse moves the laser head to the right.
- Clicking "X-" with the mouse moves the laser head to the left.

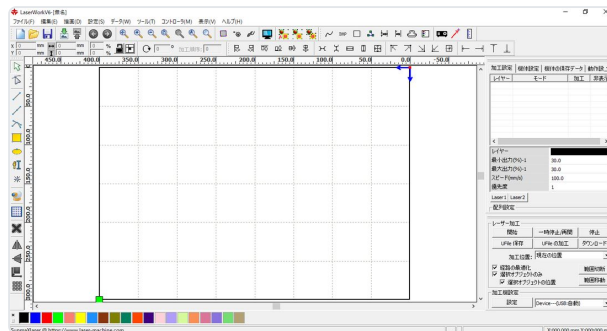
3. Creating the Cutting Design

Create the cutting design in RDWorksV8. The data to be created is a design that uses engraving (blue) and cutting (black), as shown below. First, create the rectangular frame needed for cutting.

3.1 Creating a Rectangle

Create a rectangle as the cutting design.

Click "Rectangle" in the drawing toolbox.



Drag at a suitable position within the work area to place the rectangle.

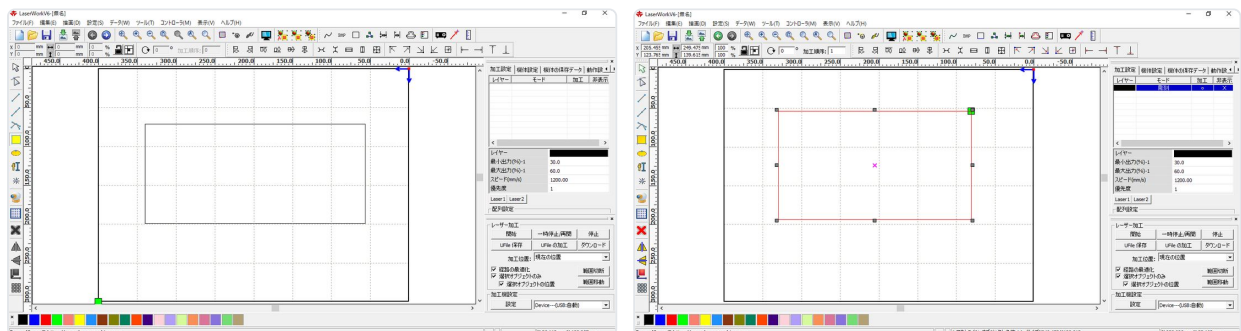
3.3 Positioning the Rectangle

Decide where to place the rectangle.

To move or position an object, you can use "Select", or move the object by entering values in the X and Y fields of the properties toolbar.

Using the Select tool

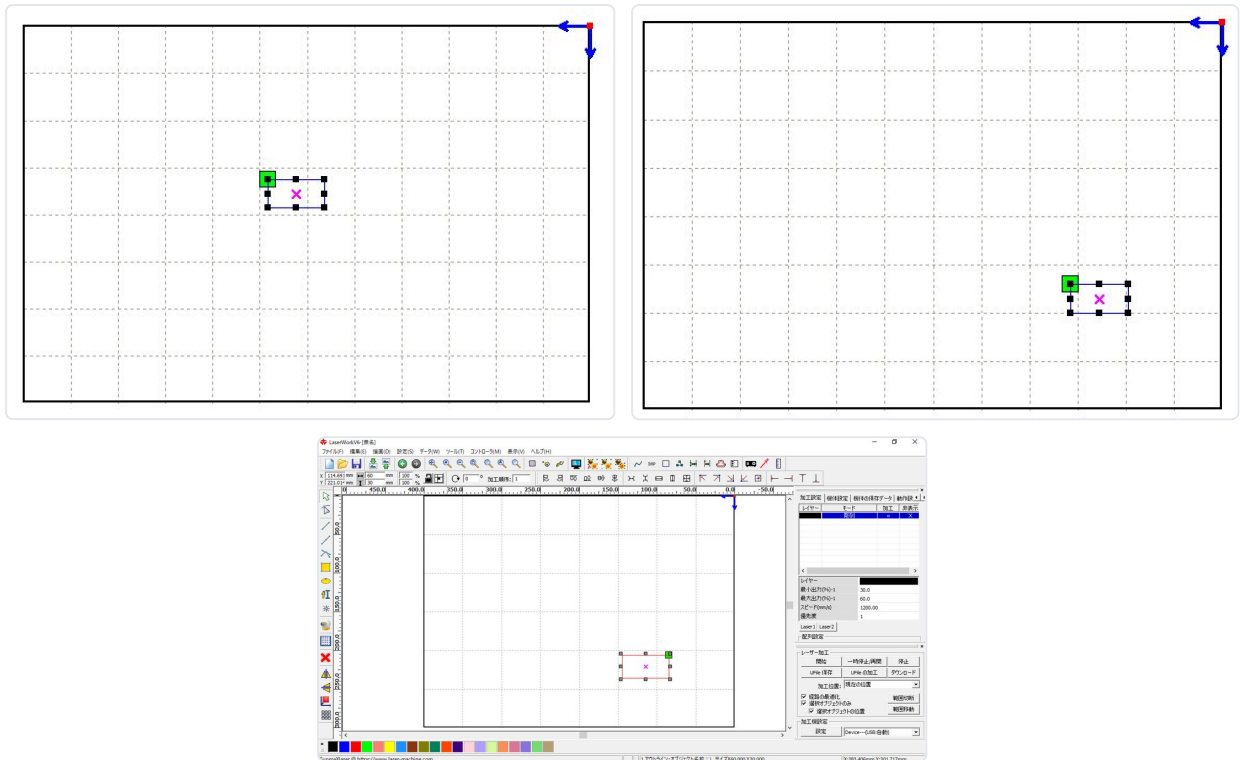
Click "Select" in the drawing toolbar, then click the object to put it in the selected state.



Drag at a suitable position and click / Click the line

Place the mouse cursor on the "x" mark at the center and drag with the mouse to change the position of the rectangle.

Also, when you place the mouse cursor on one of the eight black dots (■) around the object, the cursor changes to an arrow shape. If you drag with the mouse in that state, the rectangle stretches or shrinks in the direction you drag.

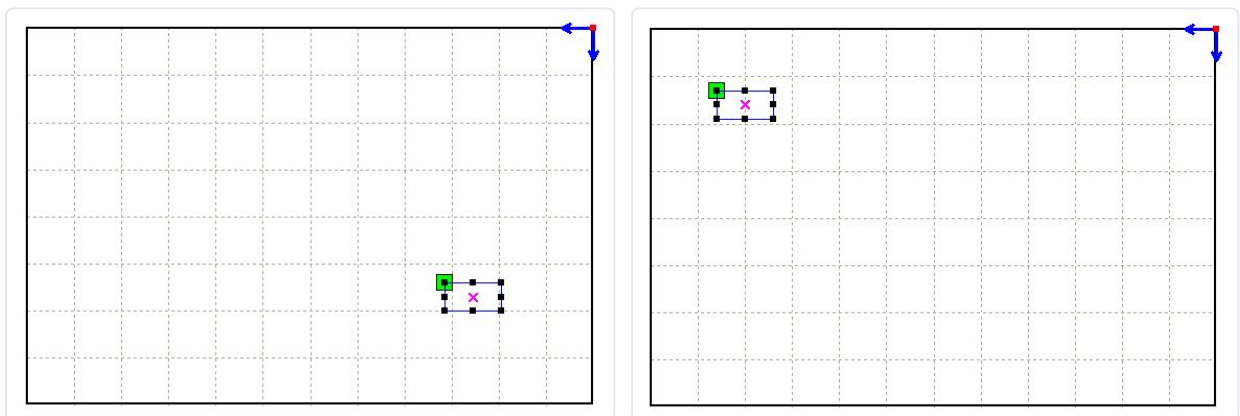


— Before moving — / — After moving —

Entering X and Y values

By entering values in the X and Y fields of the properties toolbar, you can place an object at a specific position within the work area.

When you enter values in X and Y, the object moves to the entered coordinates.



— Before entering values — / — After entering values —

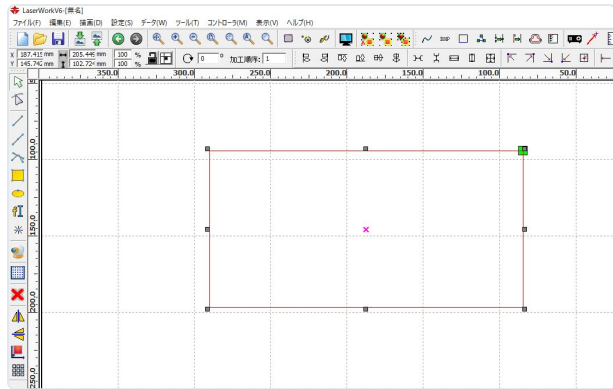
3.4 Resizing

Change the size of the rectangle.

Use "Length in X direction" and "Length in Y direction" on the properties toolbar to change the size.

- Properties toolbar -

Enter the desired value.



[Click the lock icon to lock or unlock the aspect ratio.]

When the aspect ratio is locked, change the width or height value and press the Tab key on the keyboard; the selected object is then scaled up or down while keeping its proportions.

When the aspect ratio is not locked, change the width or height value and press the Tab key; the width or height of the selected object changes to the value you set.

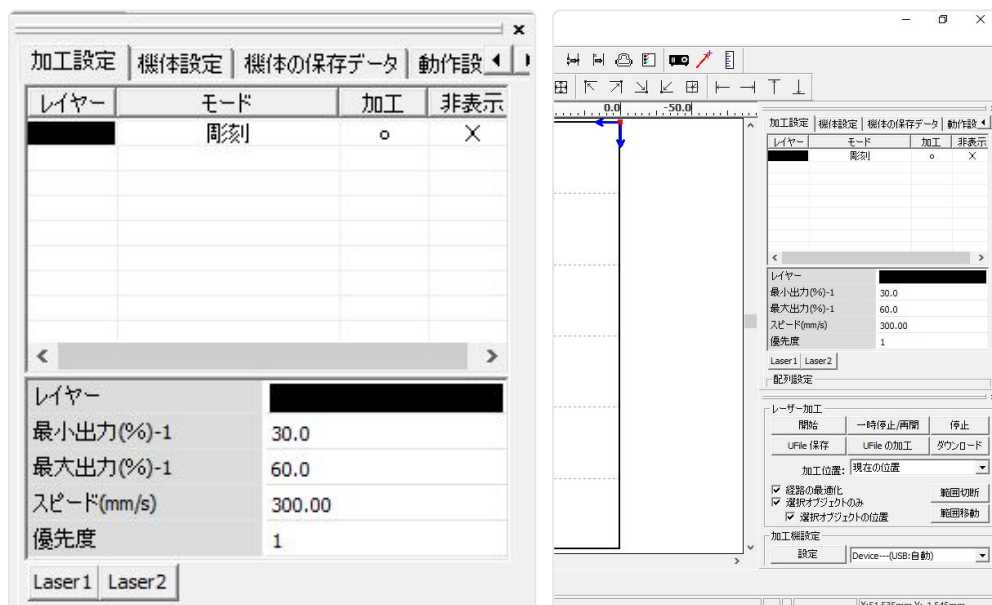
4. Configuring the Cutting Settings

Once the cutting design is ready, configure the cutting settings.

4.1 Displaying the Processing Pane

Click the "Processing Settings" tab in the processing settings pane to display the processing settings, place the cursor on the layer you want to configure, and double-click it.

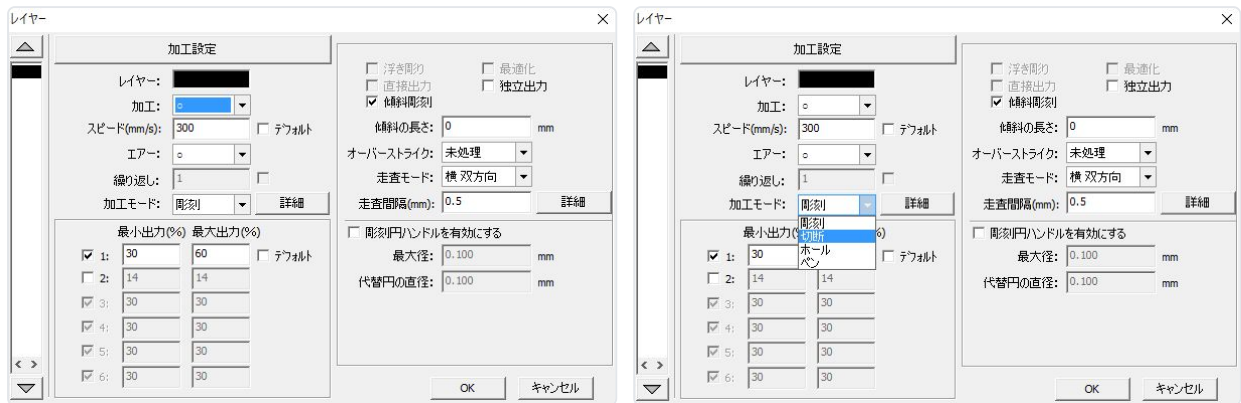
Note: If the "Processing Settings" tab is not visible on the screen, click the tab arrow to display it.



Double-click here.

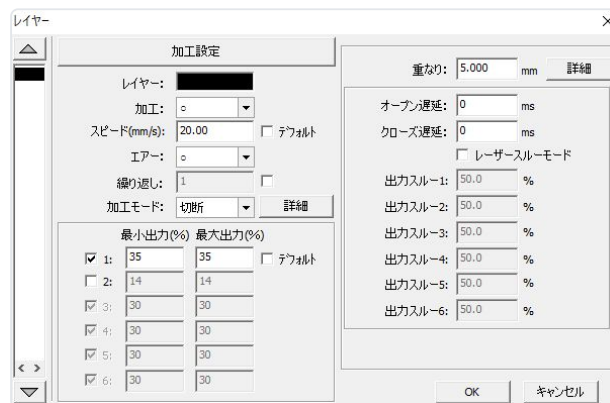
4.2 Changing the Processing Mode

When the layer dialog appears, set the processing mode to Cut.



Click the drop-down arrow for the processing mode to display the list of modes, then click "Cut."

4.3 Processing Settings



Item	Description
Speed	Sets the cutting speed. The unit is [mm/s]. For cutting, values up to about 20 are typical. Increasing the value makes the laser head move faster and shortens the processing time, but reduces the thickness of material that can be cut.
Air	Not supported on the RSD-SUNMAX series.
Min Power	Sets the low laser output. Set it to a value no higher than the Max Power setting. Normally, using the same value as Max Power causes no problems. The unit is %, and values from 0 to 100 can be set.
Max Power	Sets the laser output used during normal operation. The unit is %, and values from 0 to 100 can be set.
Overlap	If a closed design cannot be cut properly (the piece does not come free) due to the properties of the material or mechanical error, enter a correction value. Normally, a value of about 0.1 [mm] is used.
Open Delay	Sets the delay time for turning the laser output ON when laser irradiation starts (at the start of processing, or when irradiation resumes after moving between objects). Normally set to zero.

If the "Default" checkbox is selected, the Speed and Min/Max Power settings are disabled. When it is checked, processing is performed at the Speed set / Min Power / Max Power values configured on the operation panel. This applies both when starting processing from the "Start" button in RDWorksV8 and when running data saved to the machine via "Download" from the operation panel; in either case the machine uses the operation panel's Speed set / Min Power / Max Power settings.

Item	Description
Close Delay	Sets the delay time for turning the laser output OFF when laser irradiation ends (at the end of processing, or before moving between objects). Normally set to zero.
Laser Through Mode	When Laser Through Mode is checked, the laser head stops while the laser output ON/OFF is in the delayed state defined by the Open Delay and Close Delay settings.
Advanced	Clicking "Advanced" opens the "Cut Advanced Settings" dialog, where seam compensation can be configured.

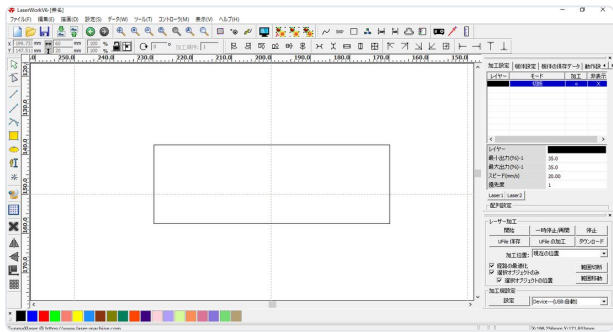
For details, refer to the RDWorksV8 User Manual, "Processing Settings (Layer Settings)" – "Cut Settings."

5. Creating the Engraving Design

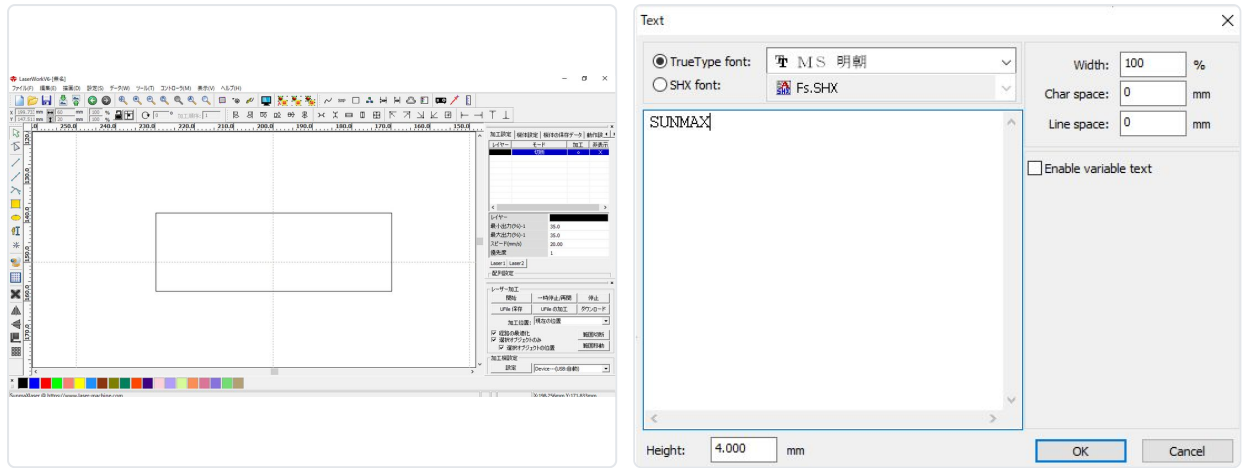
Create the design for engraving as a text string in RDWorksV8. For the engraving design, create blue text ("SUNMAX").

5.1 Text

Click "Text" on the drawing toolbar.



Click at any convenient position within the work area.



Click at any position.

5.2 Text Dialog

The text dialog appears.

Enter the characters to be engraved in the text editing area. (In this example, enter "SUNMAX.")

Item	Description
Height	Sets the initial height of the text string. The value can be changed freely later, so any value is acceptable; however, when making rubber stamps, setting it to about 4 improves workability.
Width	Sets the initial width of the characters. Leave it at 100% at all times; no change is needed.

Item	Description
Char Space	Character spacing is difficult to adjust later. For rubber stamps, if the height is set to 4, set this to 0.1.
Line Space	Sets the distance between lines.
TrueType / SHX(CAD)	By selecting TrueType or SHX, you can choose between the fonts on your PC and CAD line fonts. SHX fonts consist only of lines with no thickness and therefore cannot be engraved. Here, select TrueType.

For details, refer to the RDWorksV8 User Manual, "Menu – Draw" – "Text."

Click the "OK" button, and the text string data is generated on the screen.



5.3 Editing the Text

Positioning / Moving

To position or move the object, use "Select," or enter values for the X and Y axes on the properties toolbar.

See section 3.3 "Positioning the Rectangle" in this work example collection.

Resizing

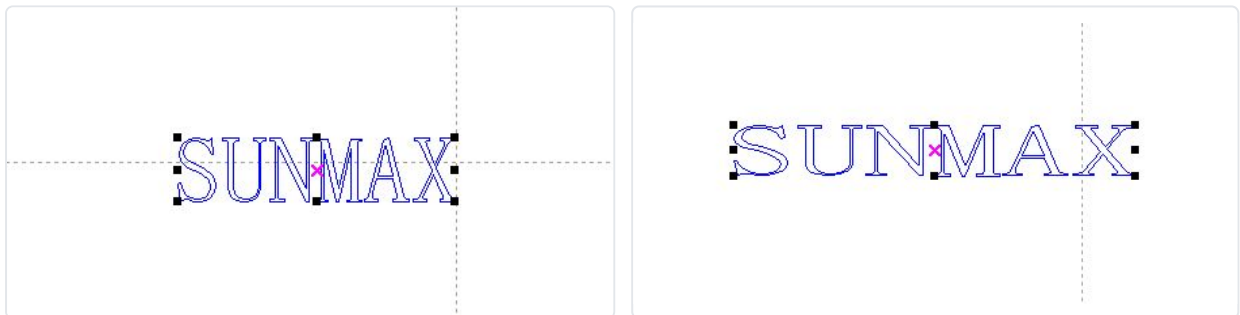
You can resize the object by entering the desired values in "Length in X direction" and "Length in Y direction" on the properties toolbar.

For text strings, if you change the size without locking the aspect ratio, the balance of the characters will be lost. Set the lock icon on the properties toolbar to the locked state before resizing.

When the aspect ratio is locked, change the width or height value and press the Tab key on the keyboard; the selected object is then scaled up or down while keeping its proportions.

When the aspect ratio is not locked, change the width or height value and press the Tab key; the width or height of the selected object changes to the value you set.

- With aspect ratio locked (X axis enlarged by 30 mm) - - Without aspect ratio lock (X axis enlarged by 30 mm) -



6. Configuring the Engraving Settings

Now that the engraving data has been created, the next step is to configure the engraving mode.

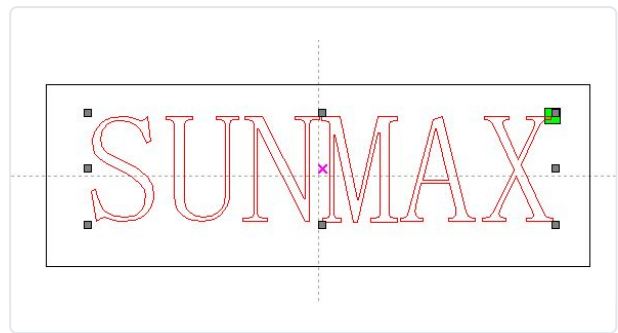
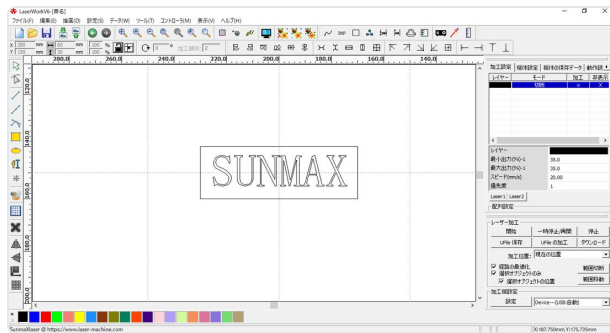
6.1 Creating an Engraving Layer

At this stage, the text string and the cutting rectangle are on the same layer, so the engraving object (the text string) must be placed on a separate layer. To move it to a separate layer, change the layer color from the layer toolbar.

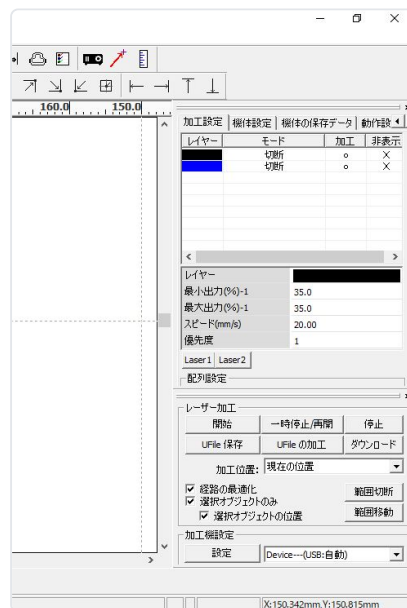
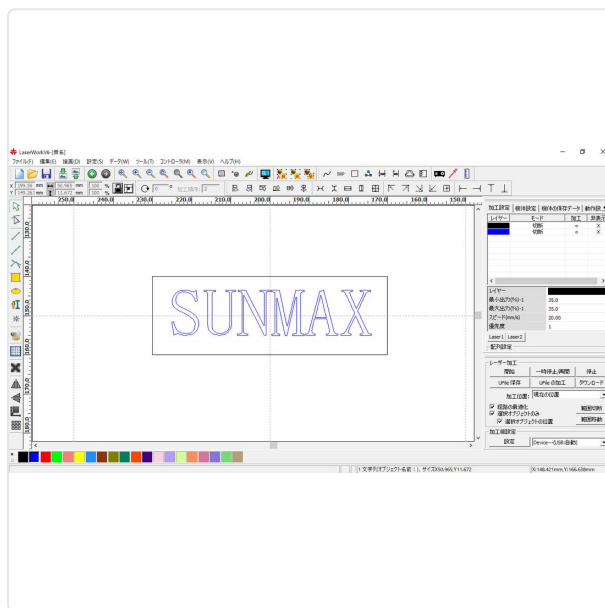
First, use "Select" to click the text string (SUNMAX) and put it in the selected state.

Click any color other than black on the layer toolbar at the bottom right of the screen.

Select blue as the engraving layer (any color other than black is fine).



Confirm that a new layer has been added to the layer list in the processing settings. (The object in the work area also reflects the layer color.)



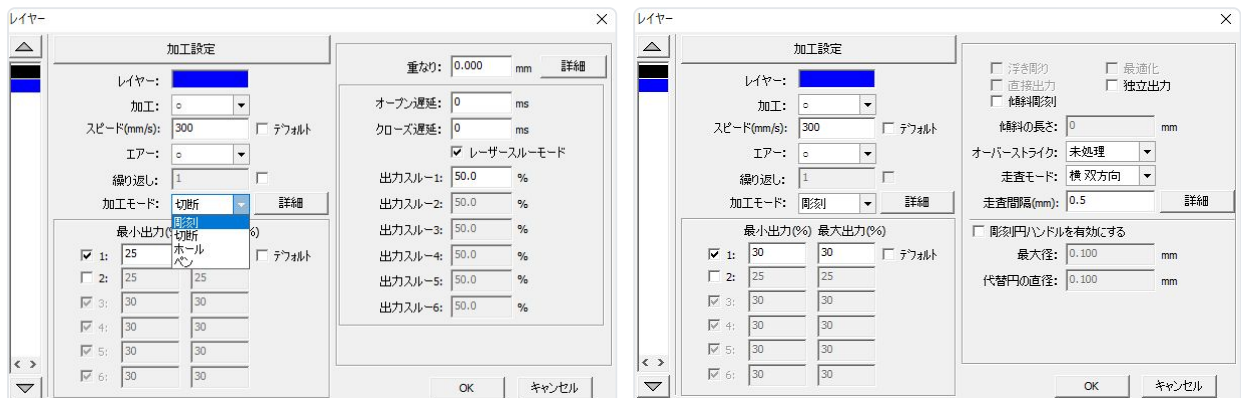
6.2 Displaying the Processing Pane

As with the cutting settings, display the processing settings from the tab at the upper right of the screen, place the cursor over the layer you want to configure, and double-click it.

Note: If the "Processing Settings" tab is not shown on the screen, click the tab arrow keys to display it.

6.3 Changing the Processing Mode

When the layer dialog appears, set the processing mode to "Engrave."



6.4 Processing Settings

Setting	Description
Speed	Sets the processing speed, in [mm/s]. For engraving, set the processing speed (mm/s). The appropriate value varies with the job content, the material, the processing mode, and so on. In general, engraving uses values up to about 600. Increasing the value makes the laser head move faster and shortens the processing time, but the engraving becomes shallower.
Max Power	Sets the maximum laser output, in [%]. The setting range is 0–100, and decimal values can also be entered. Increasing the value makes the laser output stronger and the engraving deeper. To limit the load on the laser tube, the setting is generally kept to a maximum of about 90 [%].
Scan interval	Specifies the scan interval for engraving, in [mm]. The minimum value is 0.025 [mm], and settings are basically made in 0.025 steps (the setting itself can be made from 0.01 in 0.01 steps, but because of the laser spot diameter and the positioning accuracy of the machine, going as fine as 0.01 is meaningless). Normally 0.05 is appropriate. In general, smaller values improve the mechanical processing precision, but depending on the material and the data, making the interval too fine serves no purpose. Larger values shorten the processing time. If you want to speed up production even at the cost of a rougher finish, raising this value shortens the production time. For example, if a job engraved at 0.05 is changed to 0.1 and engraved again, the production time is halved.
Scan mode	Select horizontal bidirectional. The laser fires on both passes of the scan; if bidirectional is not selected, the laser fires in one direction only. With horizontal unidirectional scanning, the processing quality may improve in some cases, but the processing time doubles.
Air	Not supported on the RSD-SUNMAX series.
Advanced	Not normally used.

For details, refer to "Processing Settings (Layer Settings)" – "Engraving Settings" in the RDWorksV8 User Manual.

If "Default" is checked, the Speed and Min/Max Power settings are disabled. When it is checked, processing is performed using the Speed set/Min Power/Max Power values set on the operation panel. This applies both when starting processing from the "Start" button and similar controls in RDWorksV8, and when processing data saved to the machine via "Download" from the operation panel.

6.5 How to Determine Engraving Setting Values

The engraving settings must be adjusted according to the material, the depth, and the required quality. No single set of values can be applied uniformly to every material.

For example, even when engraved with identical settings, cedar and ebony produce completely different engraving depths because of the difference in hardness of the wood itself. Rubber and glass also engrave to different depths depending on their composition. For materials that melt (i.e., melt under laser irradiation and harden again as they cool), such as resins, the finish varies with the balance among the engraving speed, maximum power, and scan interval settings.

Basically, you need to engrave repeatedly while changing the conditions and checking the finish until you find settings that meet the required quality.

An efficient way to determine the settings is as follows.

Easily combustible materials include wood, rubber, paper, leather, resin, and cloth. Materials that do not burn easily include stone, glass, ceramic, and metal.

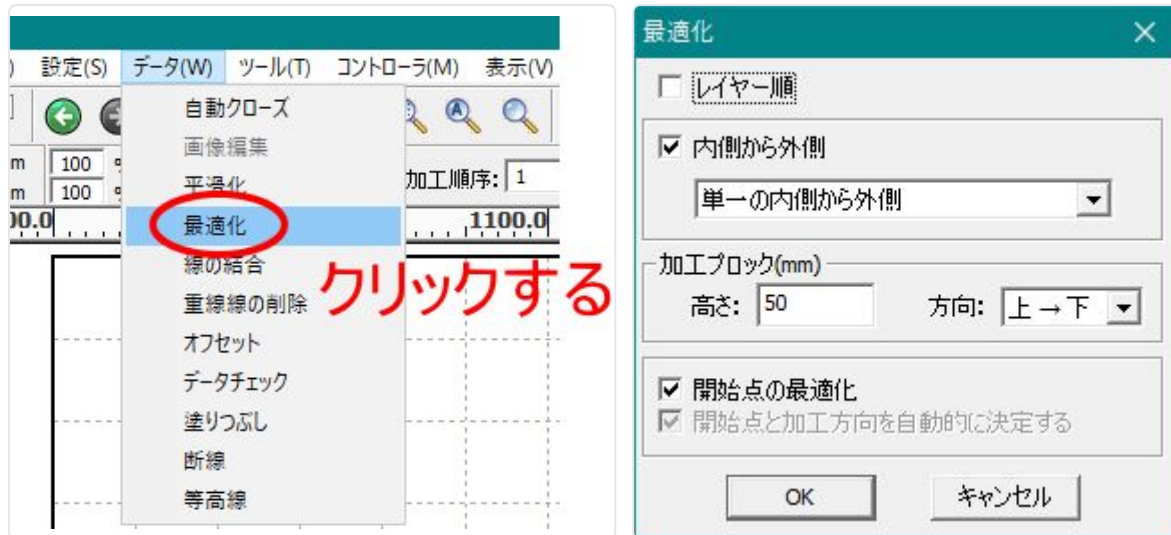
For easily combustible materials, it is efficient to start with a relatively high engraving speed and low maximum power, gradually raise the maximum power, and then lower the engraving speed while checking the finish.

For materials that do not burn easily, it is efficient to start with a relatively low engraving speed and high maximum power, gradually raise the engraving speed, and then lower the maximum power while checking the finish.

7. Processing Order

When multiple layers exist, the processing order can affect the processing result. If the outline is cut before engraving is performed, a proper processing result cannot be obtained.

The processing order depends on the RDWorksV8 settings. Normally, RDWorksV8 automatically processes in an order that avoids problems. Click "Data" – "Optimize" in the RDWorksV8 menu to display the "Optimize" dialog and configure the processing order for each layer.



If "Layer order" in the "Optimize" dialog is not checked, RDWorksV8 determines the processing order automatically according to the settings below it.

If "Layer order" is checked, processing is performed from the top to the bottom of the list in the processing settings pane.

For details on the processing order, refer to "Processing Settings Pane" – "Processing Settings" – "Processing Settings Section" – "Processing Order" in the separate RDWorksV8 User Manual.

Example: Processing in list order with "Layer order" checked

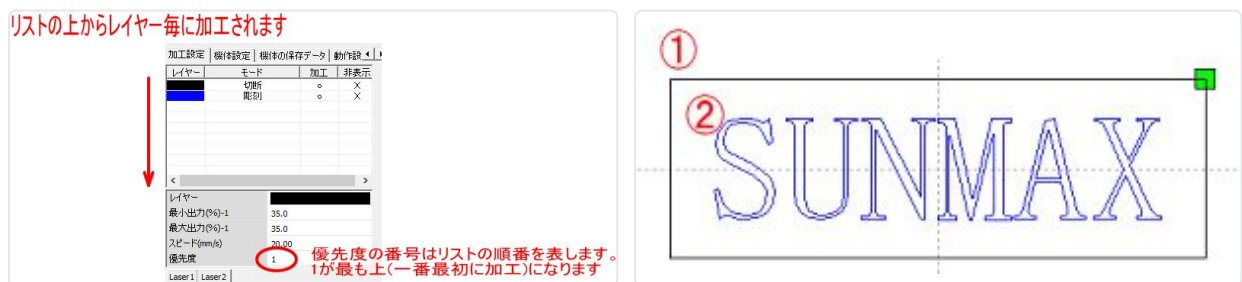
You can control the processing order yourself.

This job has two layers, engraving and cutting, so the processing order must be checked.

Processing is performed in order from the top of the list.

At this stage the cutting layer comes first, so the order must be changed so that the engraving operation starts first.

Click the layer whose order you want to change; the order can be changed with "Priority" in the processing settings pane.



In this example, either click the black cutting layer to select it and set its priority value to 2, or select the blue engraving layer and set it to 1; the order will then change.

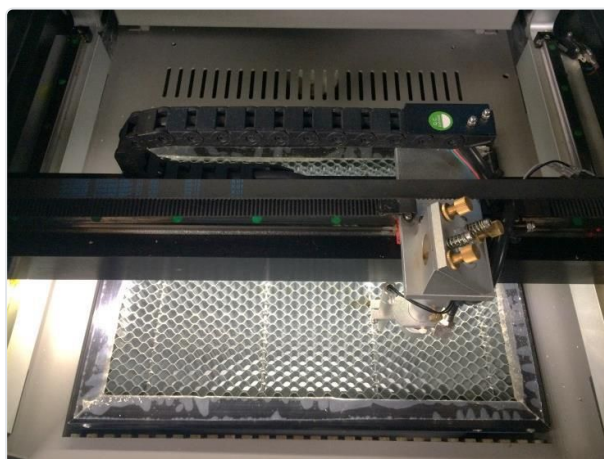
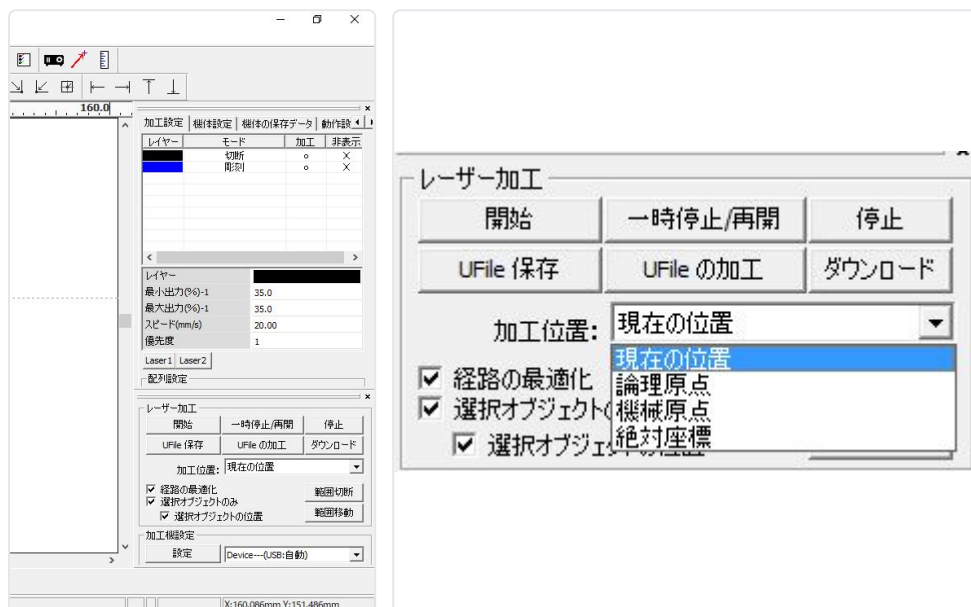
In general, when the job contains no "holes," processing with "Path optimization" checked is the most efficient way to work.

8. About the Origin

Before starting processing, you must check and set the processing start position.

When starting processing from the operation panel, the logical origin is always the processing start position. Refer to "Machine Operation Panel" – "About the Logical Origin" in the separate RDWorksV8 User Manual.

When starting processing from RDWorksV8, you can choose from four origin options, depending on the setting.



8.1 Current Position

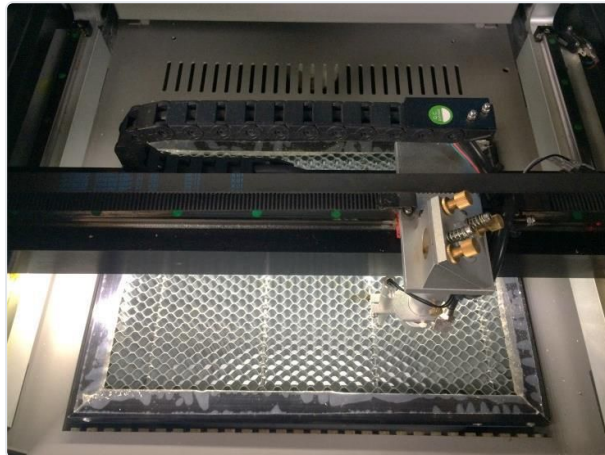
When "Current position" is set, clicking the "Start" button in RDWorksV8 performs the job using the current position of the laser head as the data origin.

8.2 Logical Origin

When "Logical origin" is selected: clicking the "Start" button in RDWorksV8 runs the job using the logical origin position — the position set with the "Origin" button on the laser machine — as the data origin.

Move the laser head to the desired position, then press the "Origin" button on the machine's operation panel.

When the job starts, the laser head moves to the logical origin and begins machining.

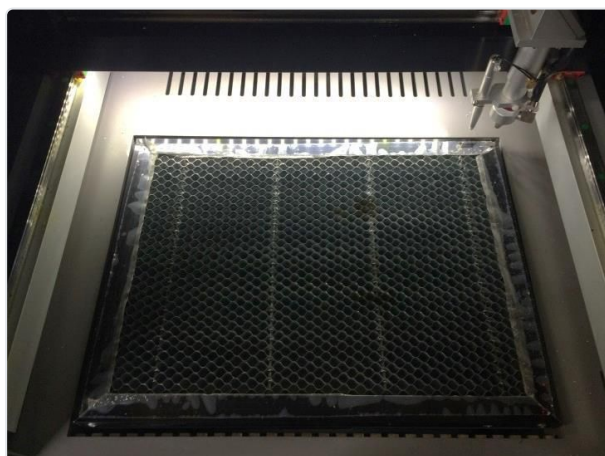


8.3 Machine Origin

When "Machine origin" is selected: clicking the "Start" button in RDWorksV8 runs the job using the machine origin position (rear right — the position the machine homes to at startup) as the data origin.

When machining from the machine origin, only cutting is possible.

When the job starts, the laser head moves to the machine origin and begins machining.



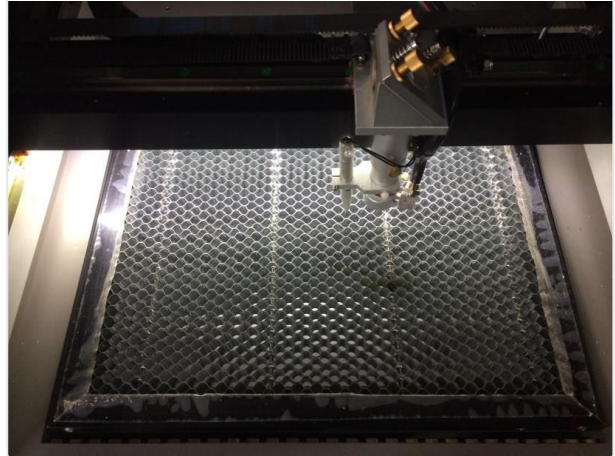
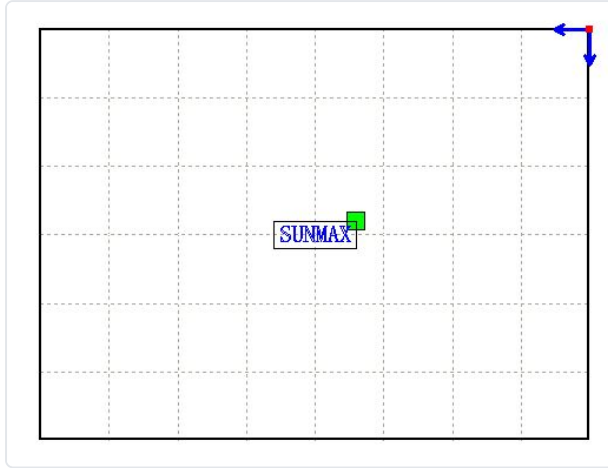
8.4 Absolute Origin

When "Absolute origin" is checked, the logical origin set with the "Origin" button on the operation panel and the position settings used when starting a job from RDWorksV8 are disabled; machining is performed

at the position shown on the RDWorksV8 design screen.

Place the objects in RDWorksV8.

When the job starts, the laser head moves to the same coordinates as on the RDWorksV8 design screen and begins machining.



9. Downloading the Data

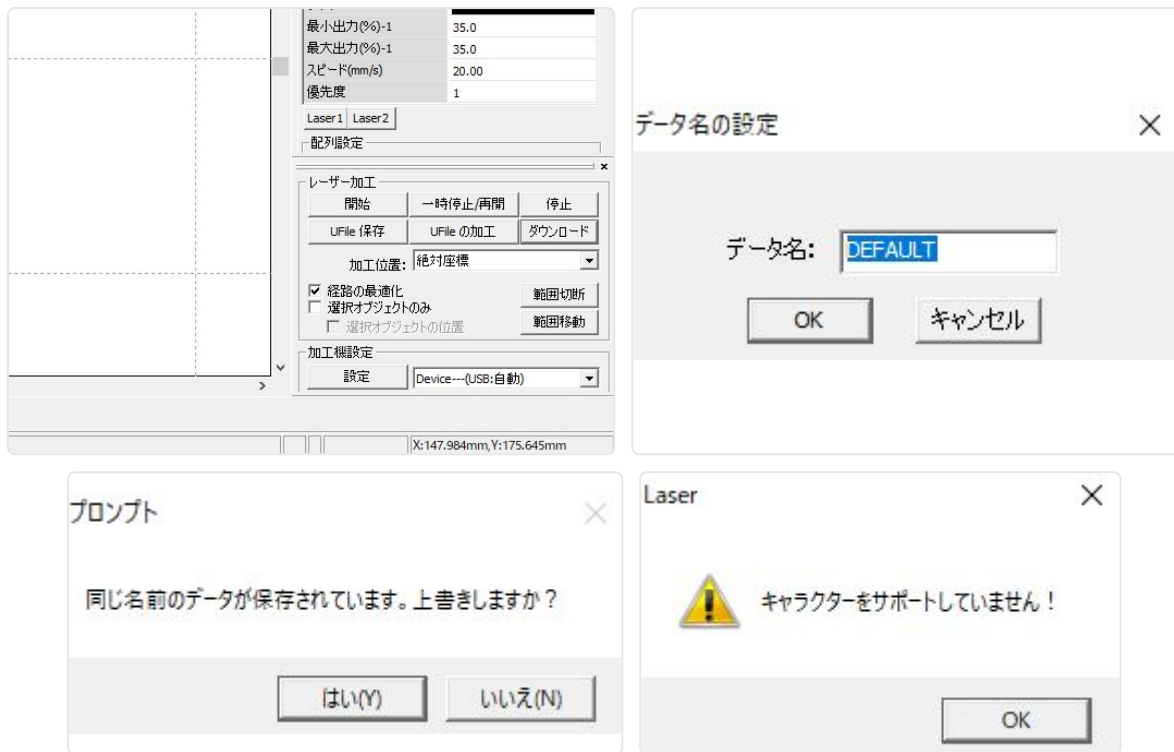
Once the machining settings and machining position have been set, send the job data to the laser machine.

When you download the data and run the job, you will start it from the operation panel, so the machining start position is always the logical origin position.

Note: When starting the job from the "Start" button in the RDWorksV8 machine control pane, no data download is performed.

Click "Download" in the "Laser work" section at the bottom right of the screen.

When you click the Download button, the "Set data name" dialog appears. Enter a name of your choice.



Caution: If a file with the same name already exists on the laser machine, a dialog asking whether to overwrite it is displayed. Only single-byte alphanumeric characters can be used in the name; entering Japanese characters causes an error.

Starting the Download

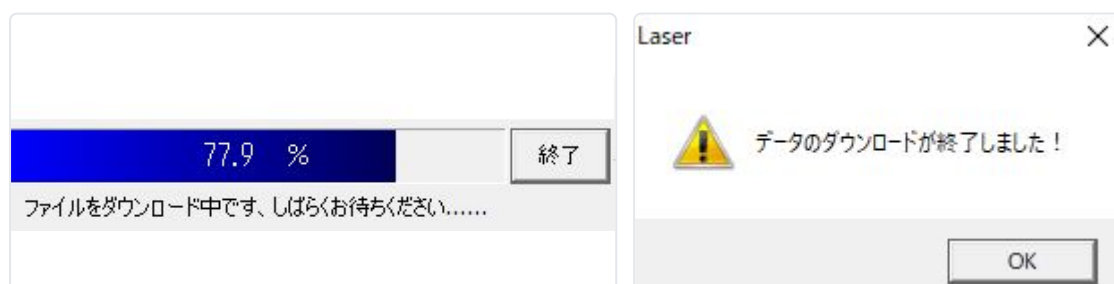
Click to start downloading the data. When the download progress bar reaches 100%, the data download is complete.

Note: If the data file is large, this step may take some time.

Download Complete

When the progress reaches 100%, the download-complete dialog appears.

Click the OK button.



10. Machining

In this work example, we laser-cut and engrave 2 mm thick wood. The actual machining procedure is described below.

10.1 Setting Up the Table

The RSD-SUNMAX series can be used with three types of machining tables, chosen to suit the job.

Engraving Table

With the engraving table, no attachment is used: place the material directly on the laser machine's lift table and machine it.

- As a rule, use the engraving table only for engraving; do not use it for cutting. Cutting requires the laser beam to pass through the underside of the material, but the engraving table is a flat plate, so the beam cannot pass through. It is therefore used for engraving.
- Cutting on the engraving table becomes possible if you place spacers between the table and the material to create a gap. In general, a gap of about 2–5 mm is needed between the table and the material.
- The engraving table is well suited to holding and machining thick materials.



Honeycomb Table

The honeycomb table is used by placing it on the lift table. Both engraving and cutting are possible. In addition, by connecting an exhaust blower to the honeycomb table box, the material is held by suction from below, so even light materials such as cloth and paper can be fixed in place.

Cutting Table

In addition to the honeycomb table, the RSD-SUNMAX series comes with a cutting table. By installing the supplied cutting-table parts on the table, you get a cutting surface that produces less scorching and melting on the underside of the material from laser reflection than the honeycomb table. When the cutting table is installed, autofocus cannot be used; focusing is adjusted with the laser head cylinder.

For this job, we use the honeycomb table. For how to install and remove each table, refer to the machine's instruction manual.



10.2 Focusing

The correct distance from the laser head differs for each workpiece material. You can focus either automatically using autofocus, or manually by adjusting the height with the focus gauge.

Caution: Always refocus whenever the height of the workpiece material changes. When using the cutting table, autofocus cannot be used — focus manually.

Using Autofocus

With autofocus, the focal distance is adjusted automatically by the autofocus switch mounted on the machine.

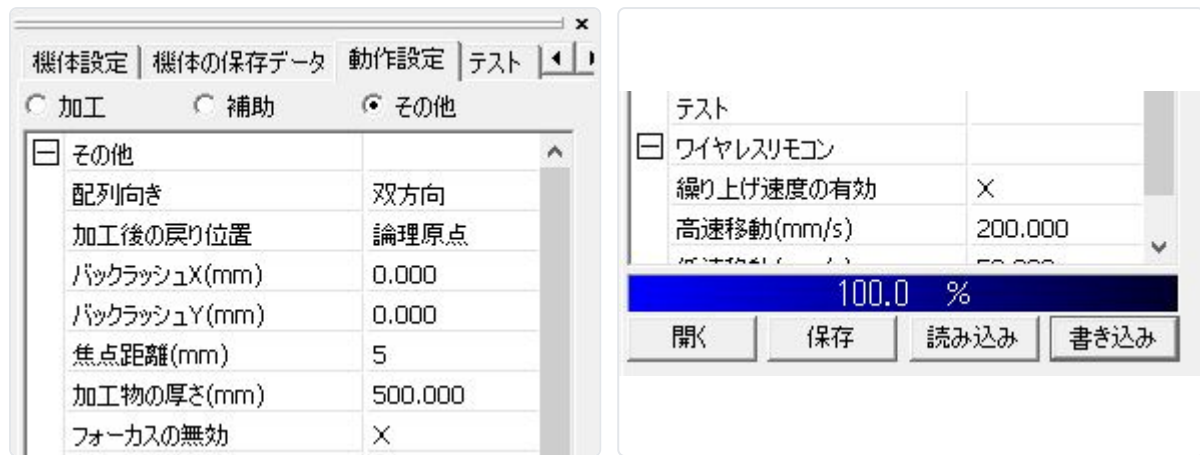
Adjustment method

The autofocus focal distance is set by entering a value in RDWorksV8 under "Operation settings" > "Other" > "Focus distance", which sets the autofocus return amount. Adjust the setting value using the focus gauge so that the head stops at the correct position.

After entering the setting value, write the data to the machine.

Press the "Z/U" button on the machine's operation panel to display the options screen.

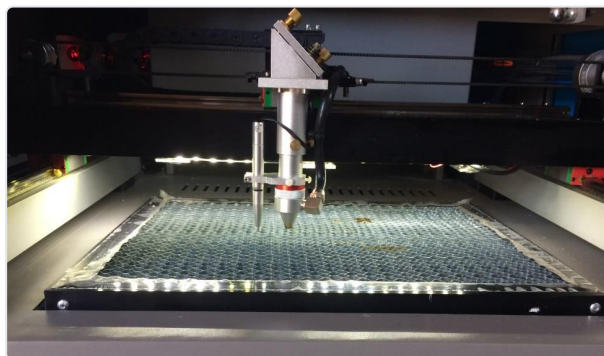
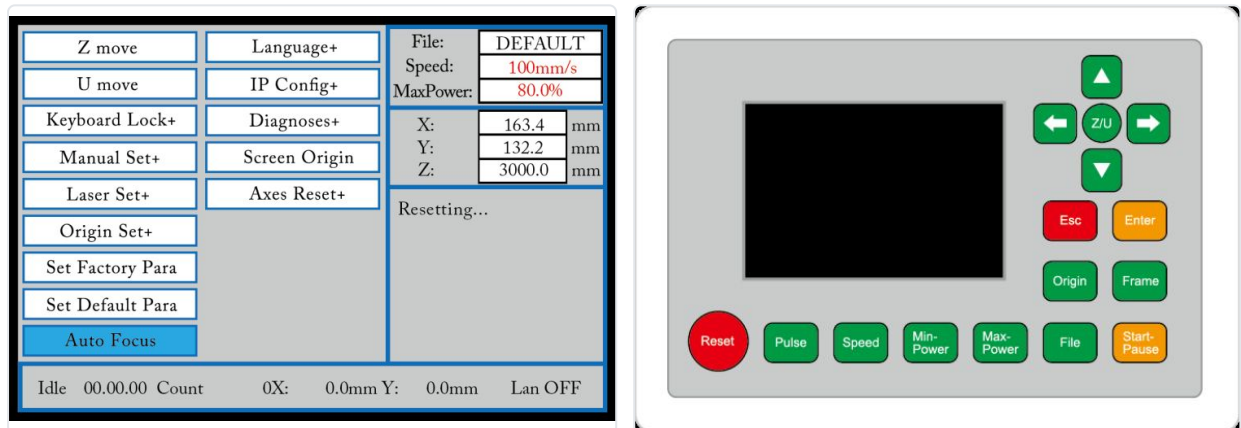
— Operation panel — Press the button.



Use the arrow buttons to select "Auto Focus" and press "Enter"; the autofocus operation is performed.

— Operation panel screen — (1) Select, (2) Press.

The lift table rises until it touches the autofocus switch, and the height is adjusted automatically to the focal distance value you set.



Manual Focusing (Using the Focus Gauge)

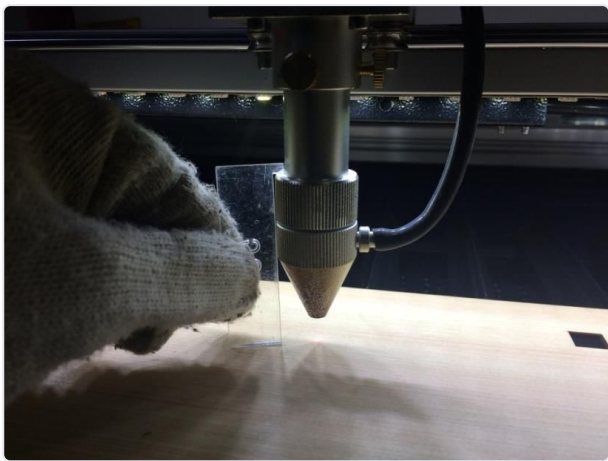
In the manual method, you operate the lift table by hand and set the focus using the focus gauge. This allows you to focus more accurately than with autofocus.

Focus gauge

<Adjustment Procedure>

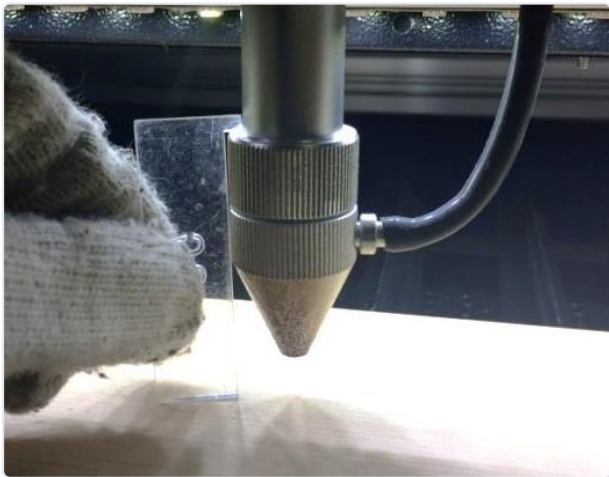
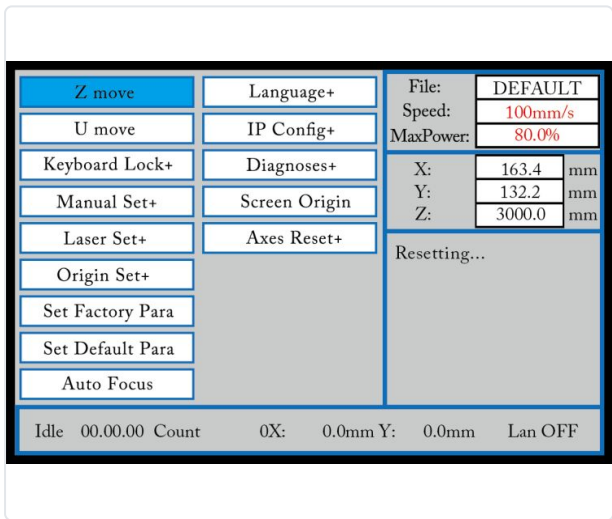
Insert the focus gauge between the laser head and the workpiece.

Press the [Z/U] button on the operation panel to display the option screen.



Operation panel — Insert the focus gauge / Press the button

Select "Z move" and press the left/right arrow keys on the operation panel; the lift table moves up and down.



Operation panel screen — Up / Down

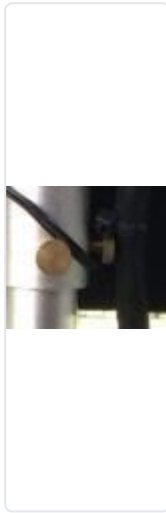
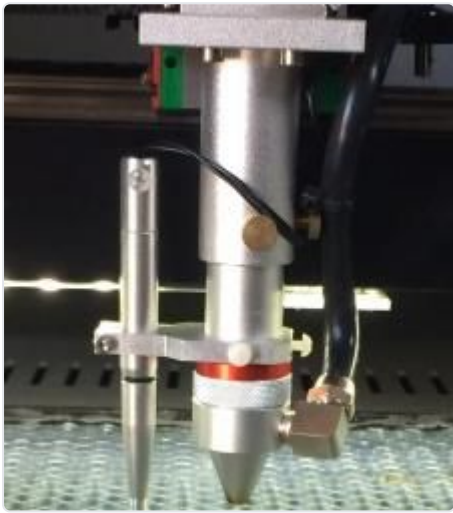
Adjust the height until the focus gauge just lightly rubs against the workpiece.

When Using the Cutting Table

When the cutting table is used, the lift table cannot be raised or lowered, so the focus must be adjusted manually (the procedure differs from the normal manual adjustment method).

<Adjustment Procedure>

Loosening the screws on the laser head allows you to adjust the length of the head. (There are screws in two places.)



Turn counterclockwise to loosen, clockwise to tighten.

After loosening the screws, insert the focus gauge and adjust the height until the gauge just lightly rubs, then tighten the screws.

Once the height is set with the focus gauge, tighten the screws.

10.3 Cover

Once the preparations are complete, close the top door.

Note: The laser will not fire while the top door is open.

10.4 Power for External Equipment

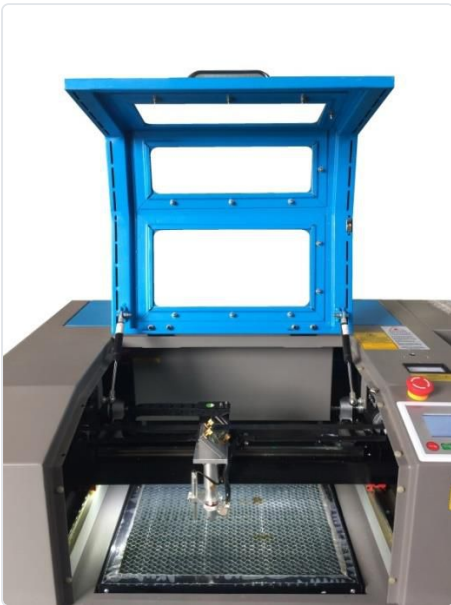
Confirm that the automatic water chiller, the air compressor, and the exhaust blower are all switched ON.

10.5 Starting Machining

How you start machining depends on the machining-position setting. All five ways to start machining are described below.

a) The [Start-Pause] Button on the Operation Panel

When you start machining by pressing the Start-Pause button on the operation panel, the logical origin becomes the machining start position.

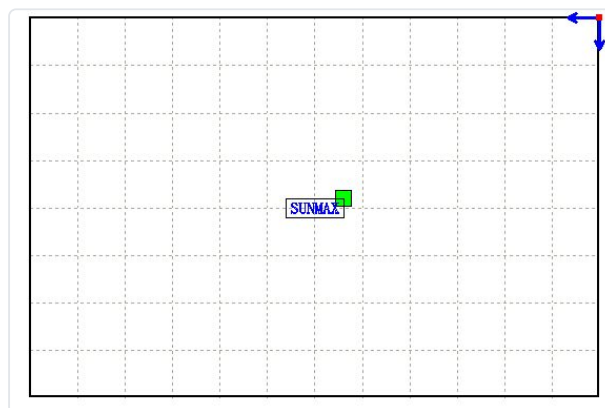
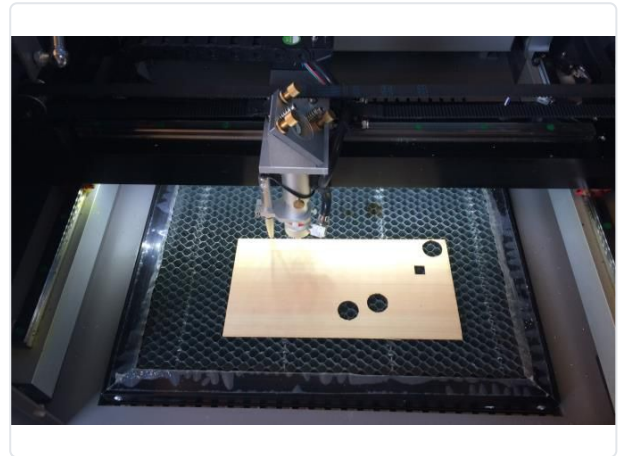
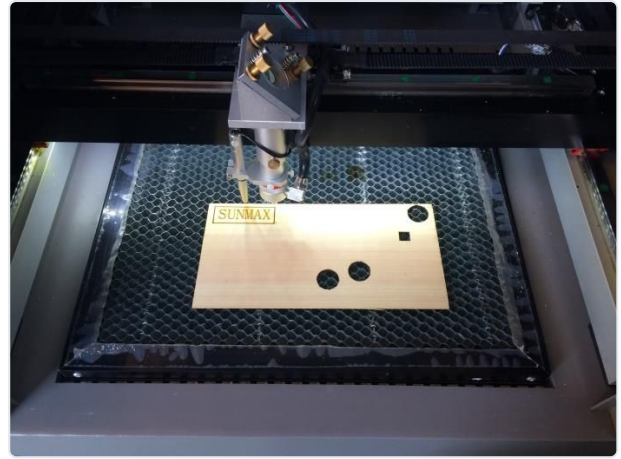


b) Setting "Current Position" and Machining with the [Start] Button in RDWorksV8

In this method, the current position of the laser head becomes the origin, and machining is started from the PC. The position shown on the RDWorksV8 design screen is not reflected.

In the laser work pane of RDWorksV8, set the machining position to "Current position" and click [Start].

Laser machining begins. The machining position is the current position of the laser head.



Laser head position on the machine / Coordinates in RDWorksV8

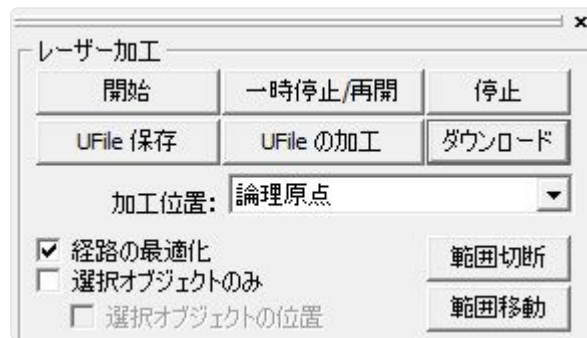
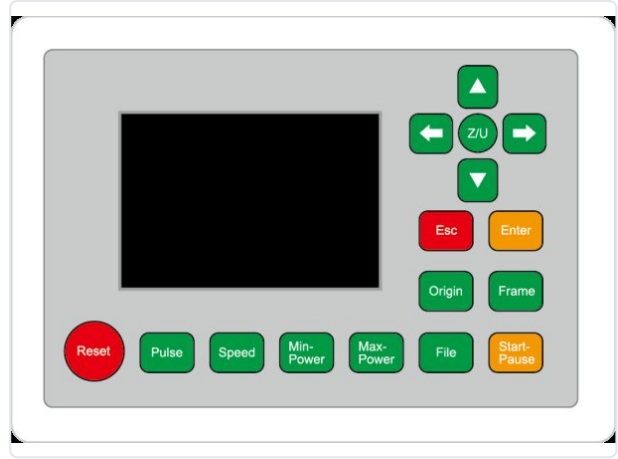
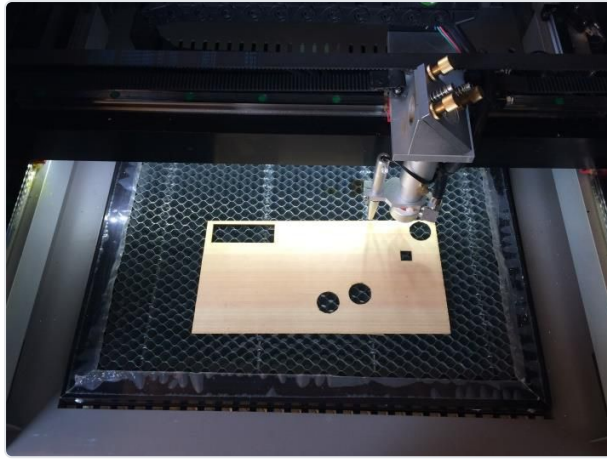
c) Machining at the "Logical Origin"

In this method, you set the origin from the laser machine's operation panel and then machine. As with "Current position," the position shown on the RDWorksV8 design screen is not reflected.

Using the machine's operation panel, move the laser head to the position where you want to machine. (You can move the laser head with the arrow keys on the operation panel.)

Once the position is decided, press [Origin] on the operation panel to set the origin.

After setting the origin, press [Start] on the panel or click [Start] in RDWorksV8 to begin machining.

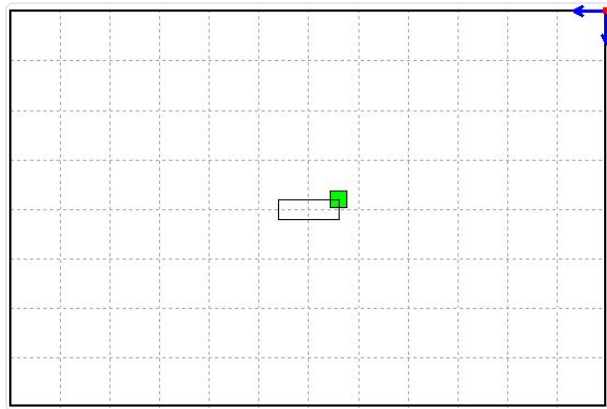
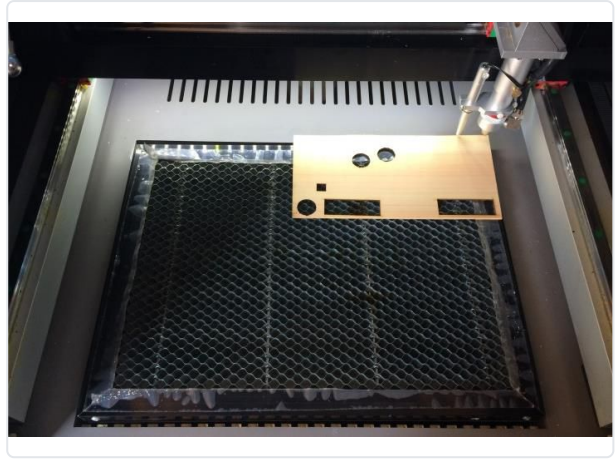


Operation panel / RDWorksV8 (on the PC screen)

Note: With the logical origin, even if the laser head has moved to another position after the origin was set with [Origin], pressing the [Start] button (on the panel or in RDWorksV8) moves the laser head back to the logical origin set with [Origin] and starts machining.

d) Machining at the "Machine Origin"

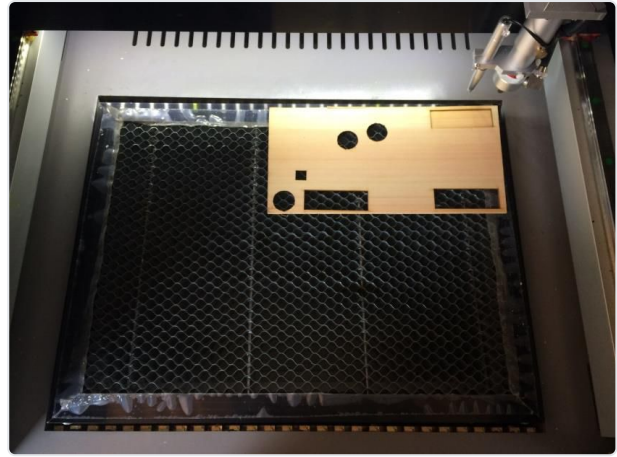
In this method, machining always starts from the machine origin (the far right rear of the work area). Because there is no run-up section, engraving may not be possible (depending on its position). In this example, we perform only the cutting of the rectangle, without engraving.



Laser machine / RDWorksV8 (PC screen)

Note: The objects placed in RDWorksV8 do not need to be moved to the machine origin.

Move the workpiece to the machine origin and click [Start] to begin machining.



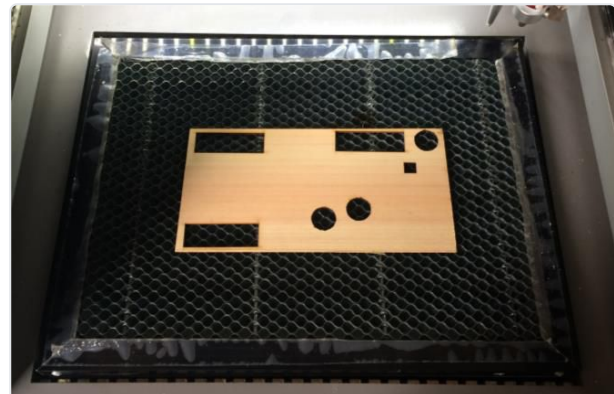
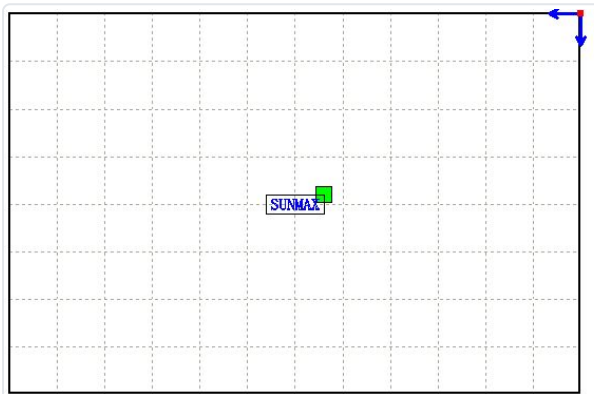
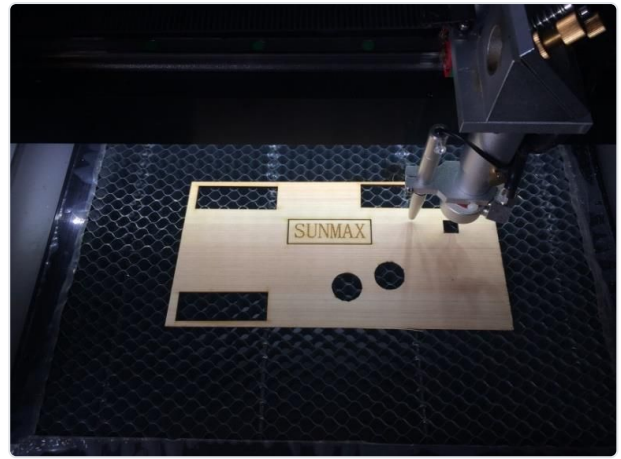
Note: When "Machine origin" is selected, always set the data origin to the upper right. Because the machine origin is at the right rear, if the data origin is anywhere other than the upper right, the job will extend outside the work area and cannot be machined.

This can be configured from the tabs on the screen: open Config → System Setting.

e) Machining with "Absolute Coordinates"

In this method, machining is performed at the coordinates shown in RDWorksV8 (on the PC screen).

Once you have finished positioning the objects you want to machine in RDWorksV8, click the [Start] button to begin machining.



Coordinates in RDWorksV8 / Laser machine — Machining position