



## **Double-head Linkage System Specification**

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## Chapter 1 Overview

### 1.1 Briefing

The laser engraving/cutting control system developed by RuiDa Technology Co. Ltd., some models have the function of double heads linkage. In this paper, we elaborate the structure of the double-heads device, the controller connection mode, and the operation methods.

All controllers which support double heads linkage can be switched between double heads linkage control and conventional control.

### 1.2 What is double heads linkage

Double heads machine is a machine with two laser heads, and the relative distance between the two laser heads can be adjusted by the controller. This kind of machine processes N-array of graphics by two linked laser heads when cutting/scanning virtual array graphics. Assume that N is equal to 10 columns, the controller will intelligently adjust two laser spacing according to the width of each column graphics, and each laser head will point to the starting position of one of the columns, then the controller finishes processing 10 columns graphics. If the laser head 1 processes five columns, then laser 2 will process five columns too, if the laser 1 processes six columns, laser 2 will process four columns, and so on, finally, the spacing between each of the 10 columns graphics is the same. But, for two ordinary double heads laser machines with fixed distance which cannot be intelligently adjust by the controller, the middle part of the material will appear some different sizes of waste blank depending on the processing graphics, at that time, users can manually adjust the spacing between the two heads before processing, but this is a cumbersome work and the spacing is not accurate.

Therefore, the double laser heads linkage machine can synchronous complete process of array of graphics with double heads; which not only saves processing time, but also reduces the losses of materials to minimum.

### 1.3 The Structure of Double Heads Linkage Device

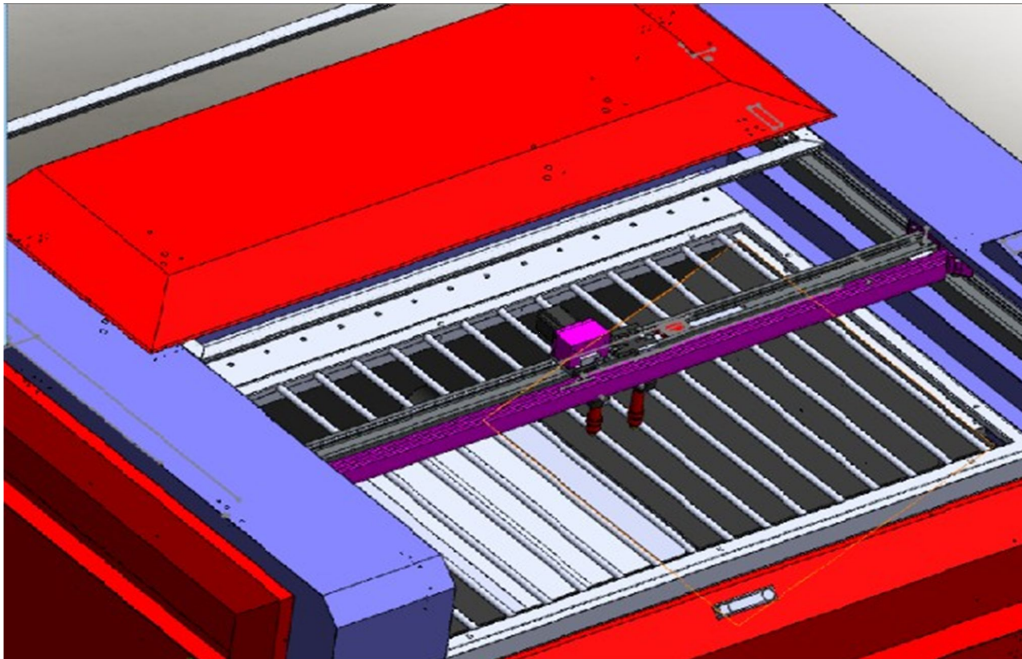


Figure 1-1

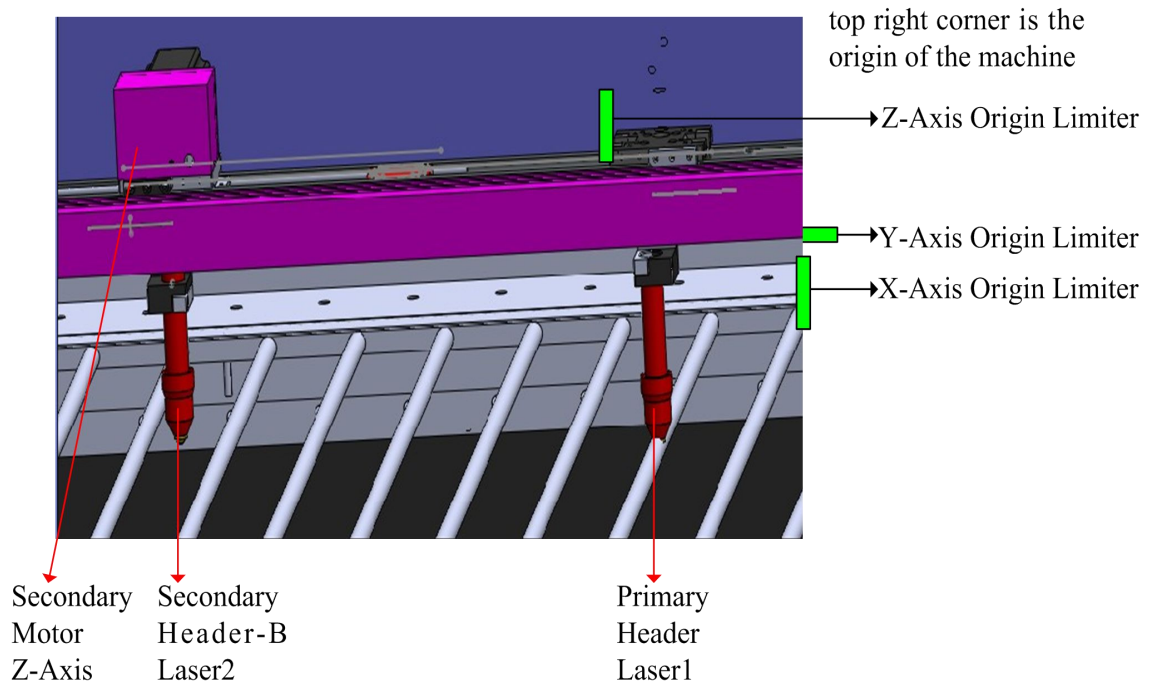


Figure 1-2

### Double-head Linkage System Specification

For the above-mentioned device structure, the absolute origin of the machine is at the top right corner, and X-axis & Y-axis will go back to the top right corner to look for their respective origin limit when resetting, then Z-axis will go to the right corner to find the origin limit of the Z axis. Among them, the main laser head is called A, the auxiliary laser head is called B. Head B can be moved alone at any time, at this time A will not move; But if users move A at any time, B will followed.

Head A must be connected to the first laser control port, to control opening or closing of Laser 1, and its movement is driven by X-axis driver interface; Auxiliary head B must be connected to the second laser control port Laser 2, and its movement is controlled by Z-axis driver interface, if the electric connection is not correct, which will cause some error in the processed graphics.

In the following article, the laser head controlled by X-axis is called main laser head A, the laser head controlled by Z-axis is called auxiliary laser head B.

## 1.4 The electric connection

The electric connection for double head linkage controller is shown as Figure 1-3. For more detail such as the various motor driver connections, the laser control interfaces, and the layout of the controller pin arrangement etc., please check the manual of the specific model of RuiDa company's products.

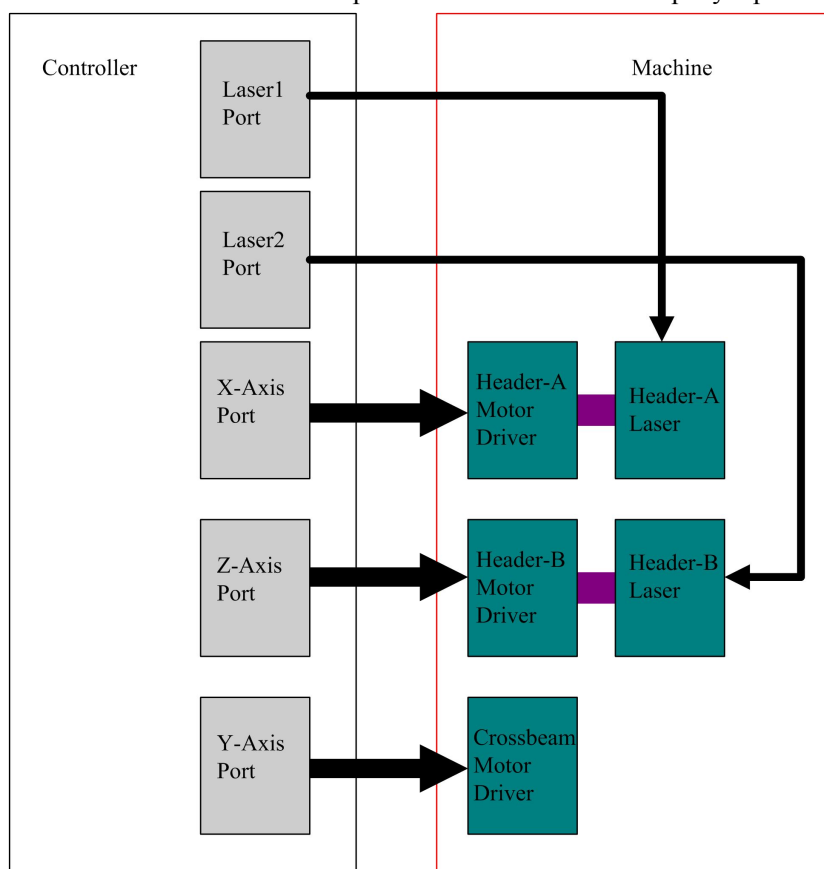
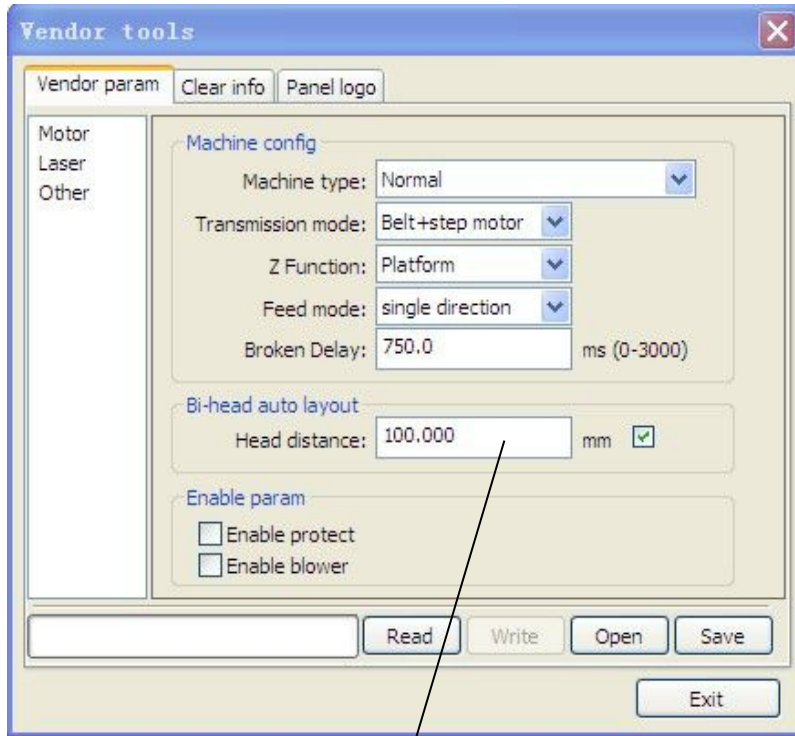


Figure 1-3

# Chapter 2 Operating Instructions

## 2.1 Function select ion for double-head linkage



Select and set the value

Figure 2-1

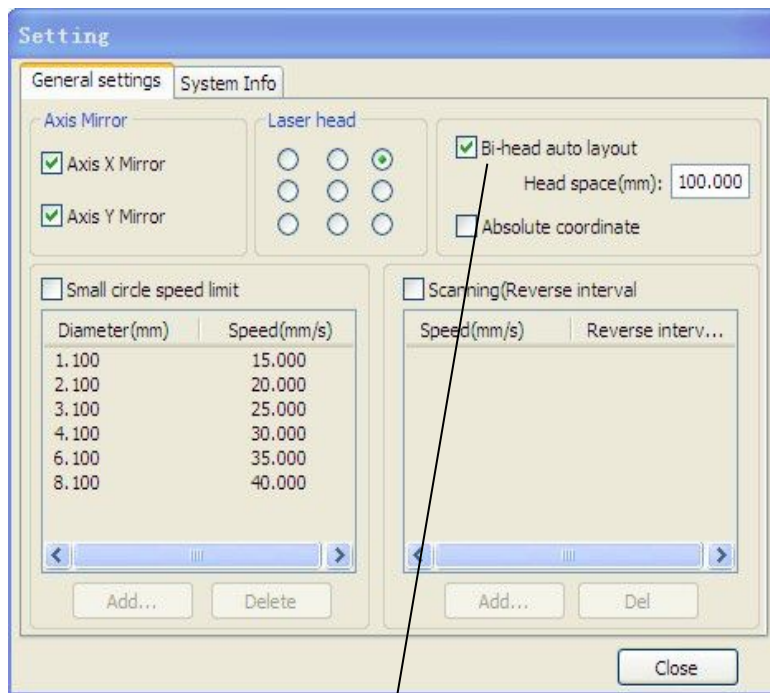
Please click on the PC software: file - > Vendor Settings - >, after enter the password to enter the manufacturer parameter settings interface, firstly, read the parameters, then click “other parameters” in the manufacturer parameters, pop-up menu as showed in Figure 2-1. In "Bi-head auto layout” item, when the box of "Head distance” is not checked, the spacing value will be gray and can't be set, only after the box is selected, the head distance can be set up.

In general, the origin limit of head B is near to head A. Head B will approach to head A until meets the limit. Head A and B can't approach more closely at that time, the minimum spacing between them is fixed, and it is inevitable when machine is designed, users should accurately measure the spacing value, and then fill it in the above parameters box. If the spacing value is not accurate, it will lead to inaccurate in the processed graphics. In general, only one time you need to set the value, unless there is a moving for limit switch location.

After the box of "Head distance” is checked and set up the spacing value, users clicks "write” button, write the parameter into controller, so the double heads linkage function will be enabled. Conversely, if the "Head

distance” box is not selected when writing parameter, this function cannot be enabled.

In addition, click on the PC software Menu -> Config -> System Setting -> General Settings, it will pop up the interface shown as Figure 2-2, there is a " Bi-head auto layout " item on the interface too, if does not select it, the spacing value will be gray and can't be set up, if the box is selected and then the value can be set, pay attention to that this value is only useful when drawing a virtual array graphics automatically bestrew breadth. PC software will finish automatically bestrewing breadth according to the paper's size and whether there is a double heads linkage function. If no need use the function of automatically bestrewing breadth, it is irrelevant that the parameter is checked or not. And, this parameter is clicked whether or not does not affect the controller with the function of double heads linkage, to enable or disable the double heads linkage function, it must be checked in the interface of Figure 2-1 showed.



Select and set the value

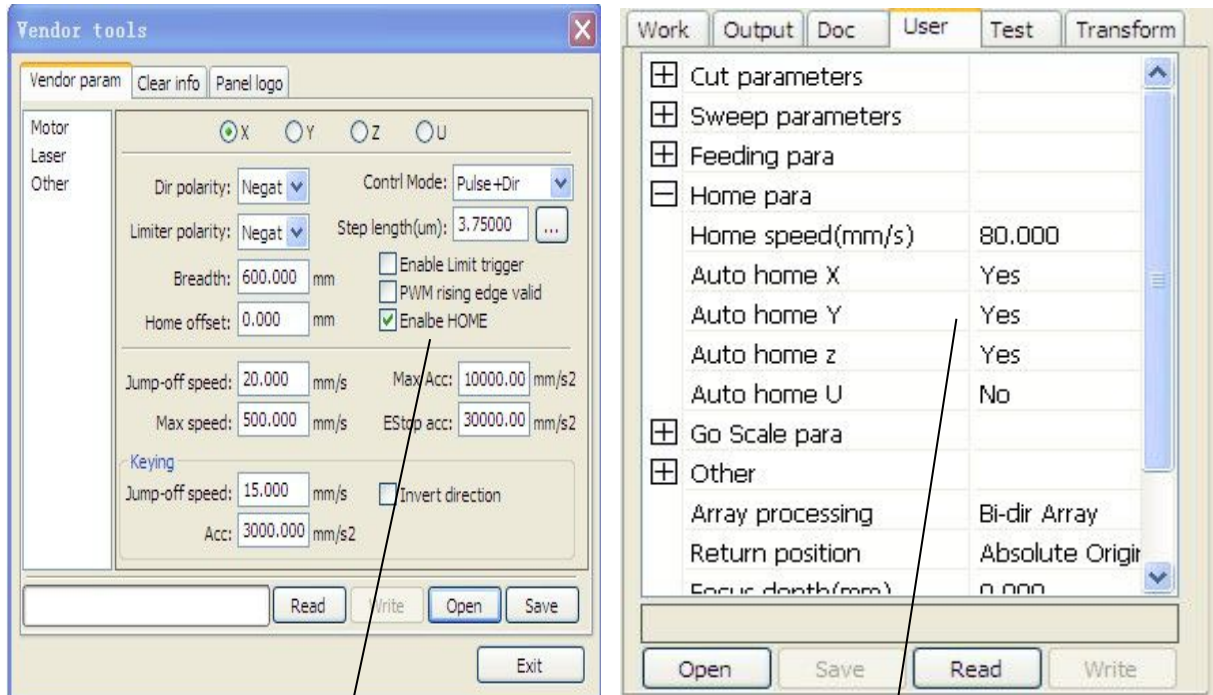
Figure 2-2

## 2.2 Reliable resetting

If the controller is enabled with the function of double heads linkage, X/Y/Z axis “Enable home” and “Auto home” functions must be enabled at the same time, the X/Y/Z axis reliably reset to their home to find the origin limit when power on. After X-axis and Y-axis have looked for the origin, the Z-axis (laser head B) will move to head A to look for origin.

The factory parameters are shown as Figure 2-3, the user parameters are shown as Figure 2-4, in these figures, please select the “Enable Home” items and select the “Auto home XYZ” items to “Yes” and write into parameters.





“Enable Home” in Factory Para.  
Figure 2-3

Enable XYZ “Auto Home “in User Para.  
Figure 2-4

### 2.3 The maximum breadth setting of X/Z axis

The maximum breadth of X and Z axis should be the same, it should be set to the same value. After set the accurate breadth, when moving X axis (head A) or Z axis (head B), there will not be any collision (all of head A and B will not collide to the edge of the machine, and, head A and B will not collide with each other).

As shown in below Figure 2-5, the maximum breadth of the machine is 2 meters for X axis and Z axis, assuming that the minimum spacing between head A and B is 100 millimeter, the machine can cut the largest 2.1 meters of graphics.

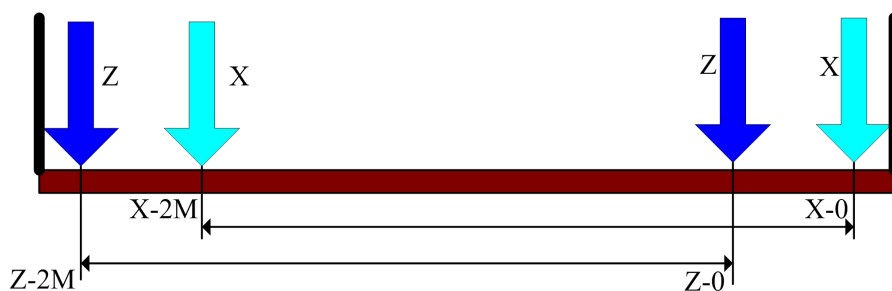


Figure 2-5

## **2.4 Z-Axis stop position instructions**

To save the processing time, after running a work, Z-axis (head B) will no longer go back to his origin, that is to say, the relative position of head A and B will not change after finishing a work. The next time when starting a work, if it is the same graphics, the head B will be no longer separated, if it is a different work, head B will redistribute the right position.

## Chapter 3 Virtual Array Graphics Introductions

Assuming that the maximum breadth of X/Z axis is 2 meters, and the minimum spacing between A and B head is 100.00 millimeters.

### 3.1 Graph 1

The total width of the whole virtual array graphics is less than 100 mm, and the location of the graphics is not beyond 2 meters, then all the graphics will be done by laser head A.

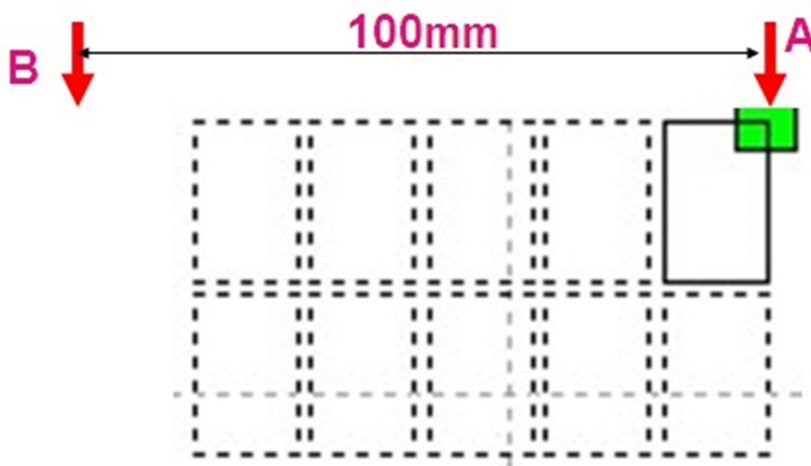


Figure 3 -1

### 3.2 Graph 2

The total width of the whole virtual array graphics is beyond 100 mm, but the width of a single graphics is less than 100 mm, then the whole graphics is cut together by laser head A and B.

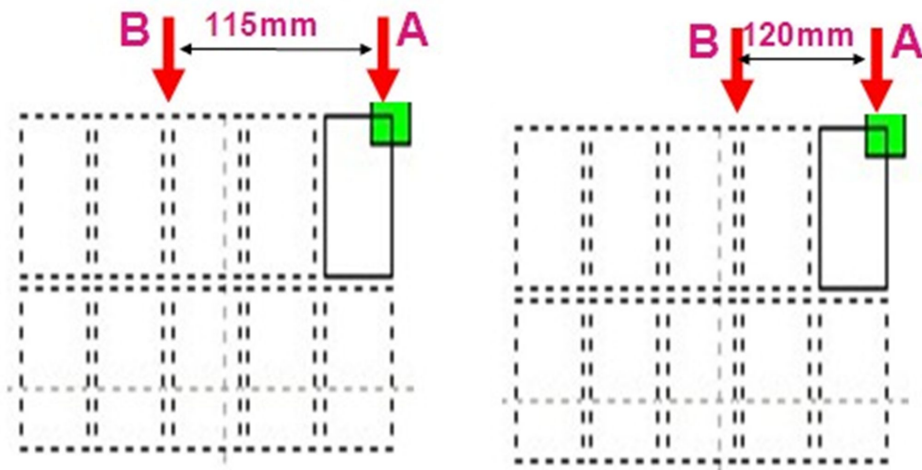


Figure 3-2

### 3.3 Graph 3

The position of the whole virtual array graphics is in the scope between 2 meters and 2.1 meters, and then all the graphics will be cut by laser head B.

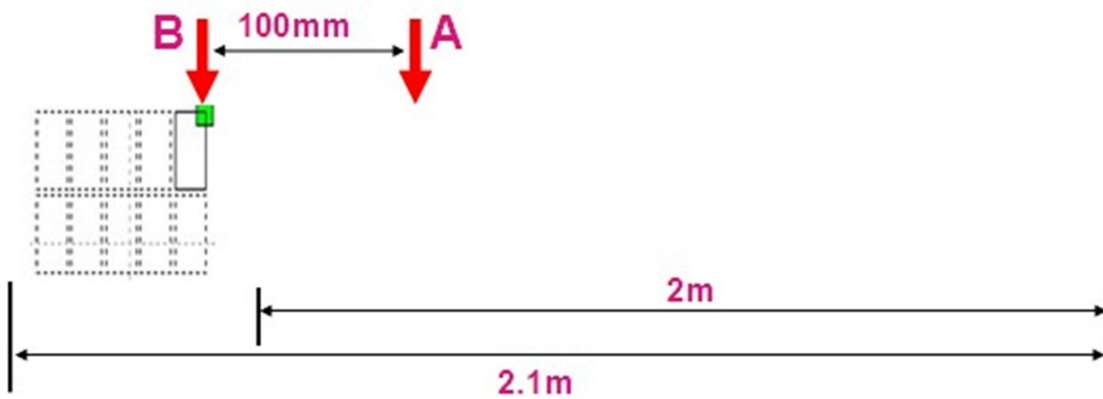


Figure 3-3

### 3.4 Multiple graphics in virtual array respective

As shown in the below Figure 3-4, the first virtual array graphics is ellipse, the second is the rectangle, the controller will process each virtual array using the head A and B co-working automatically, ellipse array will be processed firstly, then the rectangle array, before the each collaborative processing, the controller will automatically adjust the spacing between head A and B.

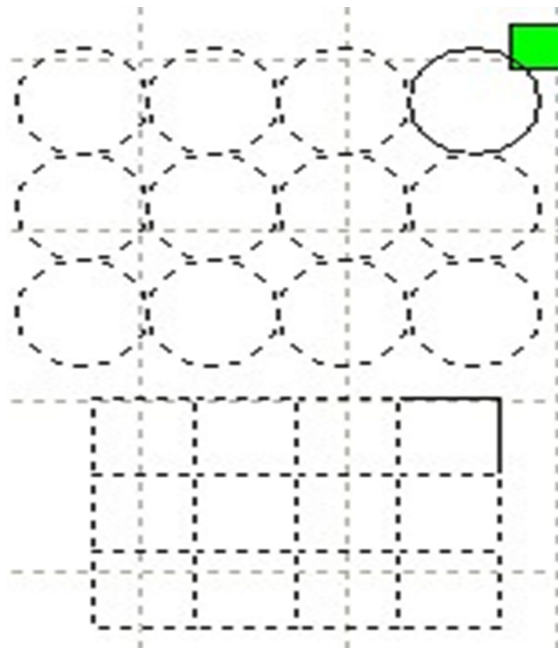


Figure 3-4

### 3.5 The dislocation array

Dislocation array can make every graphic arranged compactly on the processing material, which can save materials effectively.

As shown in the below Figure3-5, it is the result of an elliptical dislocation virtual array, there is a 15 mm dislocation in X-axis negative direction for even line, in this way, the second line graphics can be moved up 4 mm without causing overlap (The spacing of Y-direction is set to -4 mm), so that the total height of the two lines ellipse decreased by 4 mm, this finally saved the processing materials.

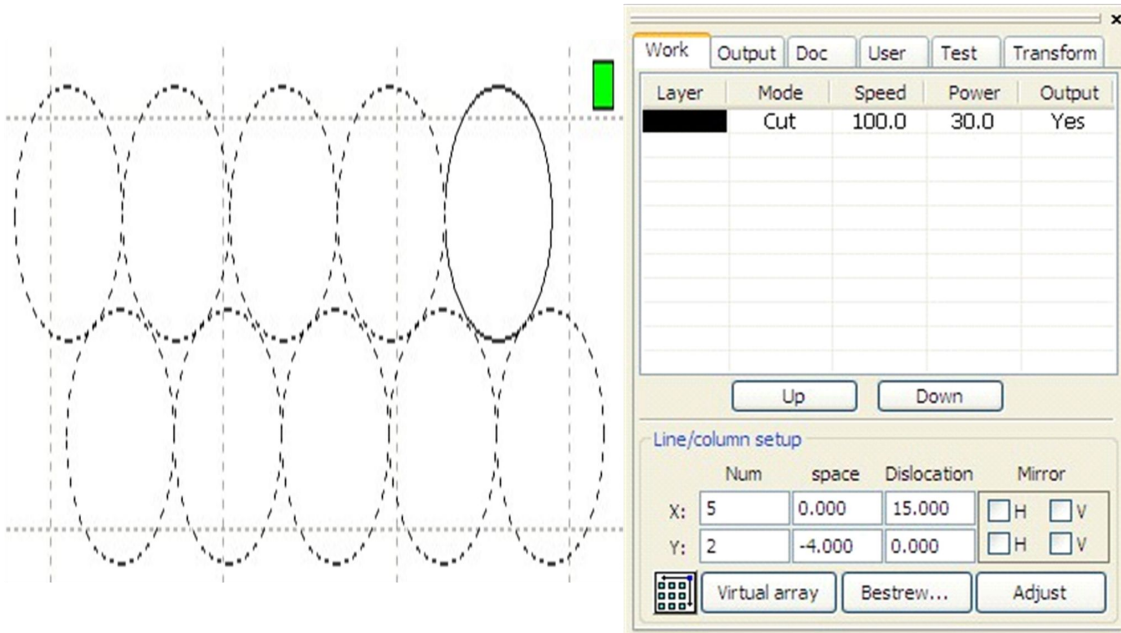


Figure 3-5

### 3.6 Mirror array

Mirror array, just like the dislocation array, also can make each figure arranged compactly on the processing material; which also can save materials effectively.

As shown in Figure 3-7, the even column graphics is set mirror function in vertical direction, so that it can be set minus 15 mm intervals in X direction without causing any overlap, after compressing in X direction, the total width of the whole graphics is reduced greatly, thus also greatly saved the materials.

In addition, the dislocation array and the mirror array functions can be used at the same time, to maximize save processing materials.

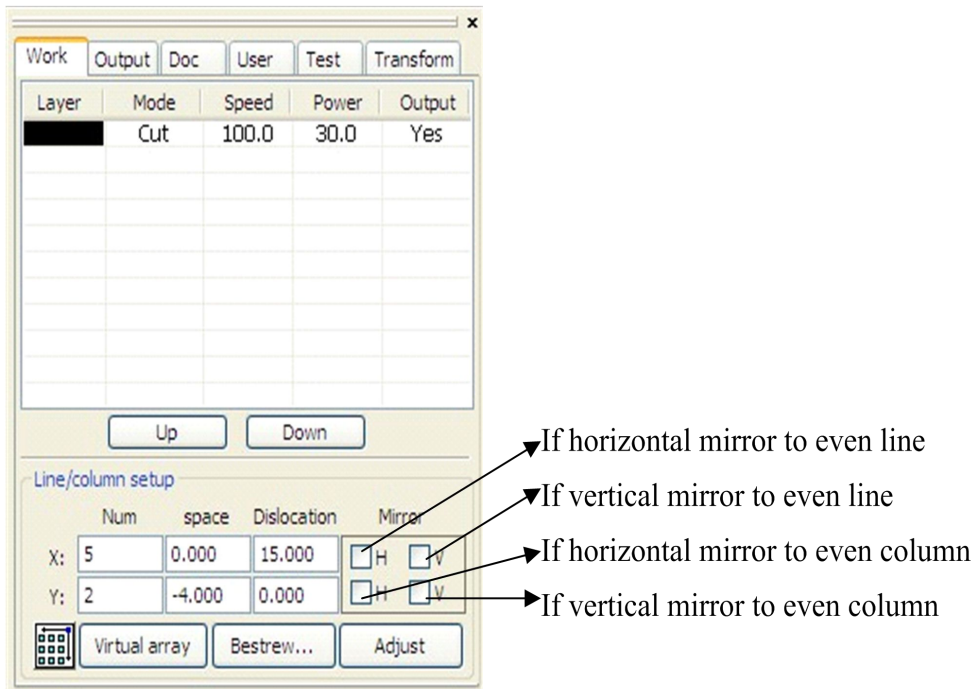


Figure 3-6

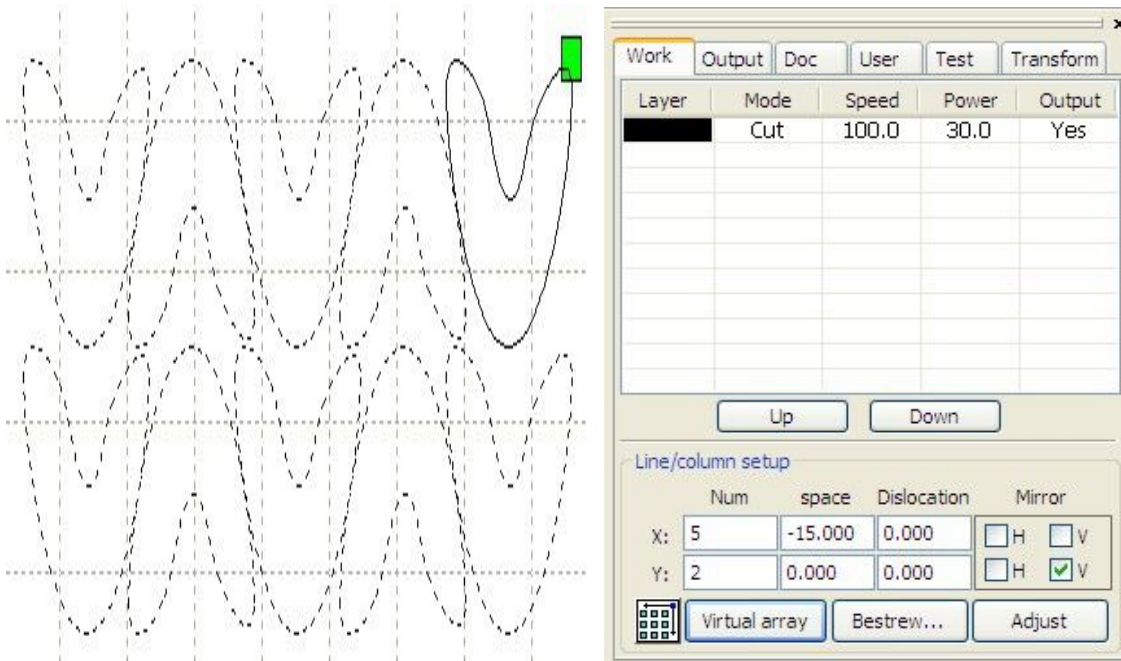


Figure 3-7

### 3.7 Leftover Material Cutting

Due to the difference of a specific array graphics, in some processing materials with the known width, there may not be able to fully use the entire materials, which caused some waste of the material, at this point, the extra space in material is available to cut some expect graphics alone.

As shown in the below Figure 3-8, in the processing materials with the width 2.1m, after cutting two big virtual array graphics (virtual array 1 and 2), there have some spare parts in the left, middle and the right of the material, at this point some different small graphics (leftover materials) can be put in those spare parts respectively, which can save the materials.

It is important to take note that for the leftover material 1, 2 and 3 as shown in Figure 3-8, users must select leftover material 1, 2 and 3 respectively, and then set the virtual array to 1 line & 1 column to 1 to respectively, if no, the PC software will default the leftover material 1, 2 and 3 as a whole graphics, then the width of the single graphics is more than the maximum 2 meters, this graphics can't be cut using head A or (and) B. Therefore, users must select one of the three methods:

- (1) Leftover material 1, 2 and 3 is virtually arrayed respectively in 1 line and 1 column;
- (2) Leftover material 1 and 2 can be virtually arrayed in 1 line and 1 column as a whole graphics, and then leftover material 3 separately arrayed in 1 line 1 column;
- (3) Leftover material 2 and 3 can be virtually arrayed in 1 line and 1 column as a whole graphics, and then leftover material 1 separately arrayed in 1 line 1 column;

After doing the above work, virtual array 1 and virtual array 2 will be processed by head A and B with the collaboration, and leftover material 1, 2 and 3 will be separately processed by head A or B.

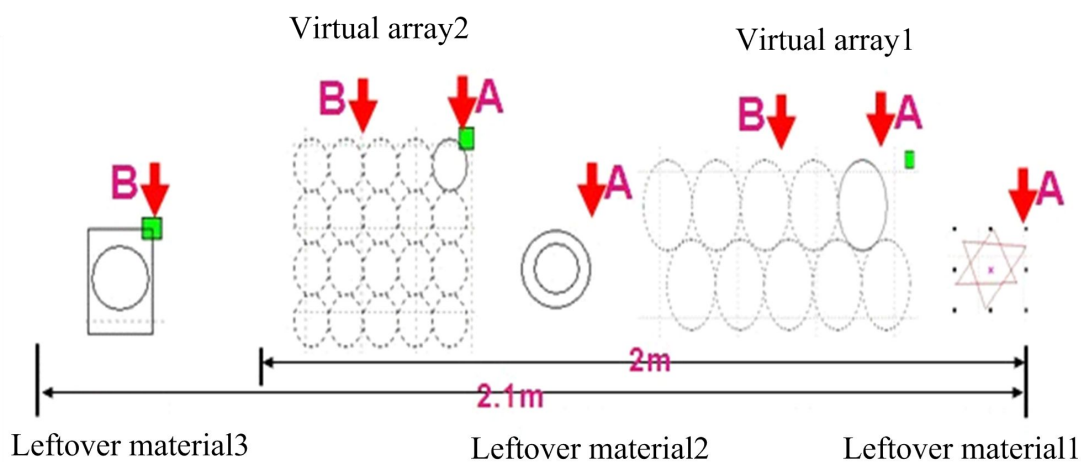


Figure 3-8



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