HC4300

Portable Flame/Plasma Cutting Machine Control System

User Manual

Operation Skills

Motion Control Total Solution

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Adtech (Shenzhen) CNC Technology Co., LTD

Version Upgrading Instruction

Program No.	Version Number	Modification Date	Instruction
XT20090101	2.0	2009/06/25	The Second Version

Remarks: the meanings of the four numbers in the version number are as follows:

Bank Main Version Number/ Bank Secondary Version Number/ Reservation

Notes:

1. This user manual is strictly emended and checked by ADTECH (SHENZHEN) CNC TECHNOLOGY CO., LTD, however, it is not guaranteed that the user manual has no any mistake or error.

2. ADTECH (SHENZHEN) CNC TECHNOLOGY CO., LTD commits itself to improve the product functions and the service quality consistently. Therefore, the company reserves the right of changing any products as described, any software program, and the content of the user manual, without prior notice.

Content

Chapter I. Operation skills

☞Help information

You can get the relevant help information by pressing [INS] in the first level menu. For example, you can press [F1] (Auto) in start-up interface to enter the Auto interface, then, press [INS] to get the help information. Press [F6] (Help) in the upgrade interface to search the relevant help information.

☞Restore factory default

When the system parameter is adjusted by users to be abnormal, which causes incorrect speed and precision, the users can press [F6] (Upgrade) in the start-up interface → [F1] (Restore) → [F1] (Restore) → [OK] to restore the factory default. If the factory had not saved the parameters, the system will not allow restoring, and relevant dialogue boxes will be popped out.

☞Two kinds of operating speed

The system has two kinds of operating speed during the normal cutting and processing:

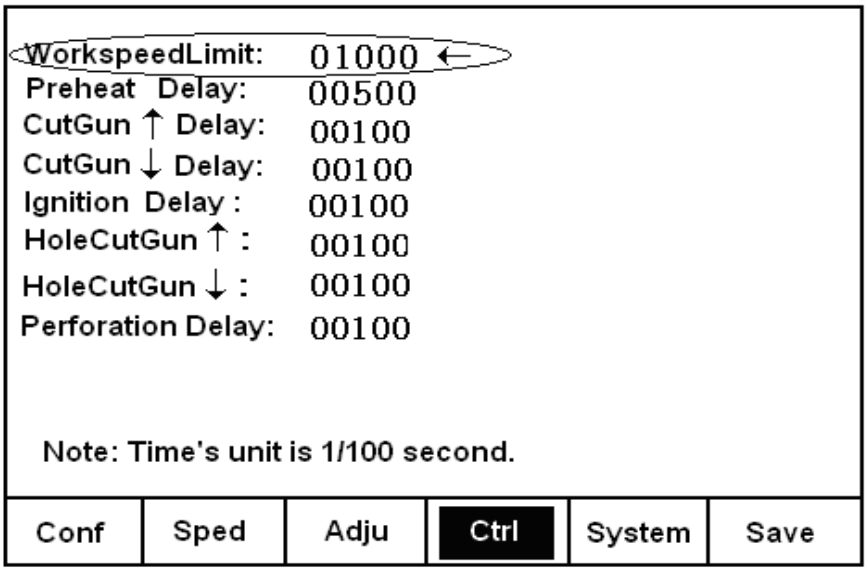
1) Processing speed (Cutting speed): It is used in processing instructions like G01 line, G02 clockwise circle, and G03 anti-clockwise.

2) Manual speed (operation speed when it is not cutting): It is used in the instructions such as G00 idle move, manual return, G26 X return, G27 Y return, G28 X & Y return, pressing X+, X-, Y+, Y- in auto/manual interface to move, and arcing in the manual interface.

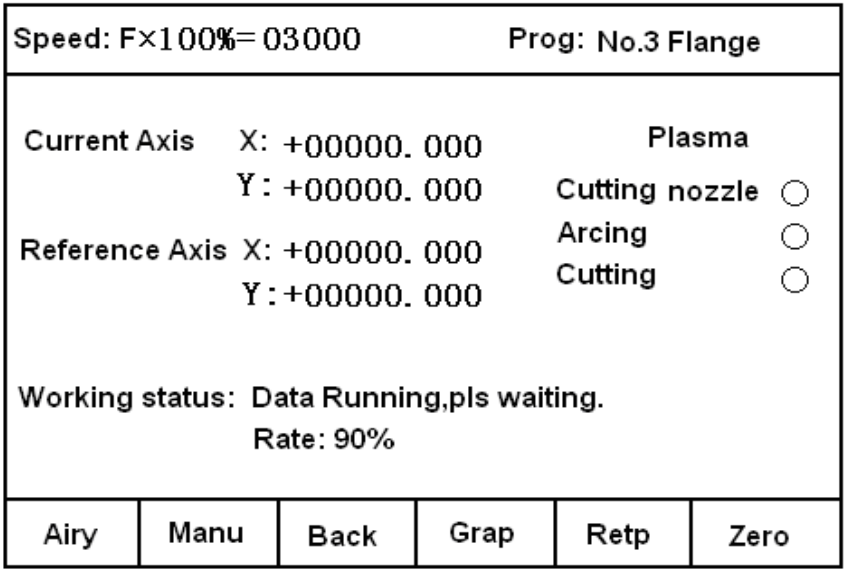
Therefore, the speed will be different in the normal processing based on the different parameters. Usually, the cutting speed is slower than the idle moving speed

☞**Adjustment of processing speed**

Processing speed is determined by the "Processing Limit Speed" in "Control" interface and the "Speed" rate in "Auto Processing" interface.



Press [F4] (Parameter) in start-up interface → [F4] (Control)



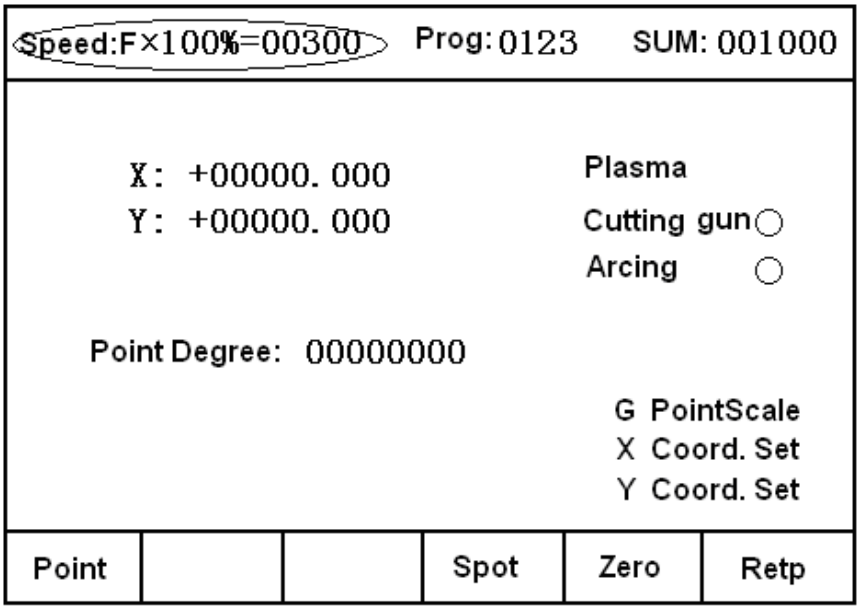
Press [F1] (Auto) in start-up interface

Actual Processing Speed = Processing Limit Speed × Speed Rate

Note: Speed rate can be adjusted by pressing [F↑] and [F↓] on the panel, or just the [F] key.

☞Adjustment of Manual Speed

Manual speed is determined by the "Manual Limit Speed" in "Control" interface and the "Speed" rate in "Manual Processing" interface.



Press [F1] (Auto) in start-up interface → [F2] (Manual)

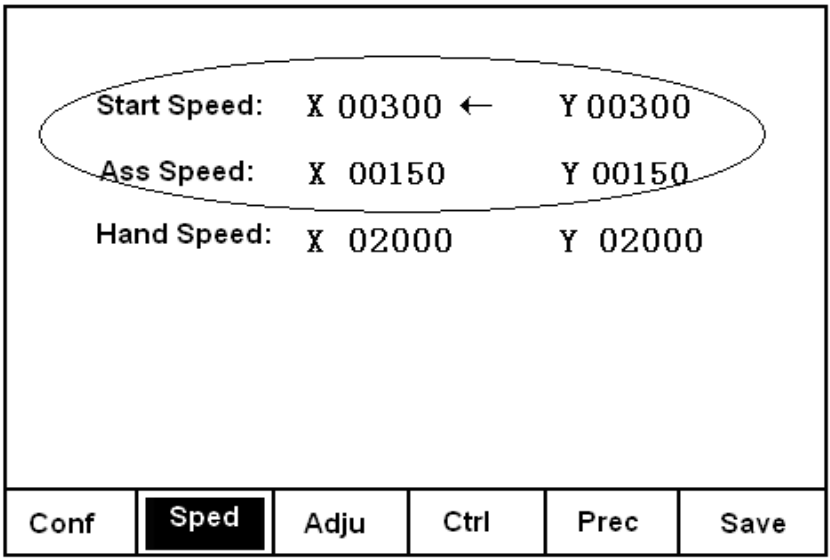
Actual Processing Speed = Manual Limit Speed × Speed Rate

Note: Speed rate can be adjusted by pressing [F↑] and [F↓] on the panel, or just the [F] key.

☞**Control of Turning Quality**

During the flame cutting and plasma cutting, there is a process of acceleration and deceleration when turning. Whether the acceleration or the deceleration is properly set or not, it directly influences the cutting quality of the turning. **Especially when it is flame cutting, the fast speed of turning may easily cause flameout or halfway cutting; and if the turning speed is too slow, it may easily burn the turning to be circular arc shape.**

The system acceleration and deceleration are set as follows: Press [F4] (Parameter) in the start-up interface, and press [F2] (Speed), then, set the speed in “Start-up speed” and “Acceleration” (See picture below). Detailed definitions are as follows:



Press [F4] (Parameter) in start-up interface → [F2] (Speed)

1. Start-up speed: Track-Move, a speed of starting up. For example, if the “Start-up speed” is set to be 300, the speed of Track-Move will be 0.3m. The value of start-up speed is determined by the processing speed. The following list shows the reference value of start-up speed; actual data are subject to the on-scene cutting effect.

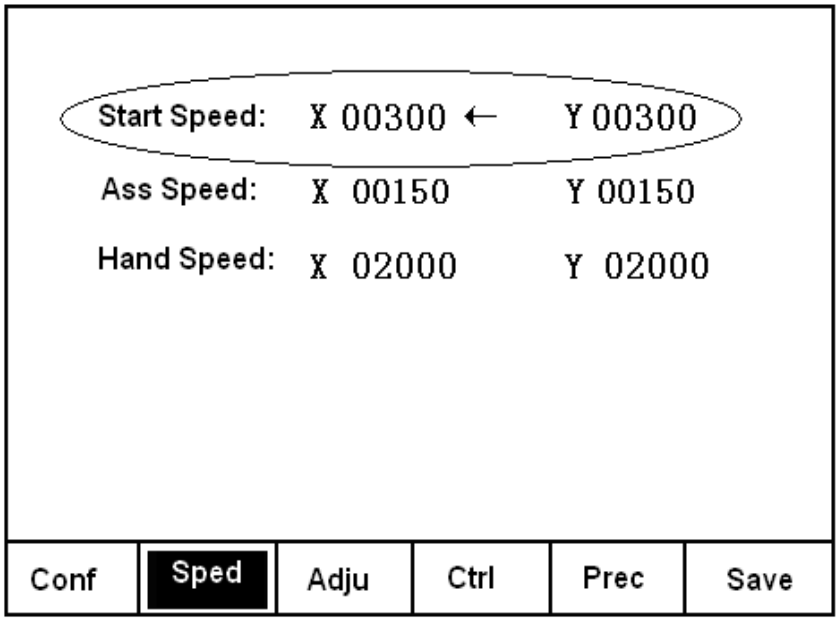
Processing speed (mm/minute)	Start-up speed (mm/minute)
100-200	100
200-500	200
500-700	300
700-800	500
800-1000	600
1000-1300	700
1600-2000	1000
2000-3000	1500
3000-4000	2000

2. Acceleration: It is a process of increasing the processing speed from start-up speed to the highest speed. For example, if the start-up speed is 300, acceleration is 100, and highest speed is 1000, then, the speed is increased to 300, 400, 500…1000 at 100 intervals; if the acceleration is 50, then, the speed is increased by 50 each time.

The acceleration is determined by the impulse equivalent in start-up interface [F4] (Parameter) → [F5] (Precision).The following list shows the reference value of start-up speed and the acceleration; actual data are subject to the on-scene cutting effect.

Impulse Equivalent	Acceleration (mm/minute)
0.001000-0.002000	10
0.002000-0.003000	20
0.003000-0.004000	30
0.004000-0.005000	40
0.005000-0.006000	50
0.006000-0.007000	60
0.007000-0.008000	70
0.008000-0.009000	80
0.009000-0.010000	90
0.010000-0.011000	100
0.011000-0.012000	110
0.012000-0.013000	120

☞**Adjustment of low speed when cutting the thick plate**

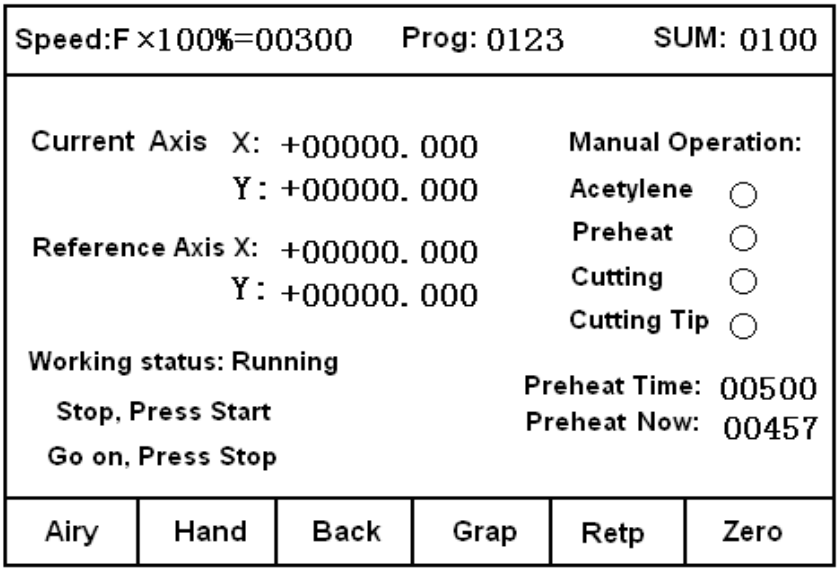


Press [F4] (Parameter) in start-up interface → [F2] (Speed)

During the flame cutting when there needs to cut the thick steel plate, and the cutting speed cannot achieve the required slow speed even the speed rate has been adjusted to limit low percent, then, you just have to set a corresponding number in the "Start-up speed" option as above picture. For example, if the "Start-up speed" is set to be 100, then, the lowest speed during the processing can be as low as 0.1m.

(Principle: If the processing speed is lower than start-up speed, the system is run at start-up speed.)

☞ **Preheating time extend of flame cutting**



Total preheating time and the current preheating time will be shown on the right bottom of the interface when preheating is carried out; on the left bottom there will show “Stop preheating, press [START]; Extend preheating, press [STOP].” As prompted, if you press [START], the system will stop preheating immediately and go to the next action; if you press [STOP], the preheating time will be extended without limit. Press [START] to stop if the preheating is enough, and the system will save the “Current preheating time” automatically as the “Total preheating time” in the future.

☞Power Failure Treatment

In order to avoid the waste of raw materials caused by the sudden power failure, the system equips with a power-off protection function. If the device is powered off during the processing, the system will automatically save the last processing track as a break point. When the power supply is resumed and you want to resume the coordinate before power-off, you just have to press [F6] (Break point) in the Auto interface or [F4] (Break point) in the Manual interface.

Note: Do not move the cutting nozzle when the power is off, and make sure to set the current coordinate when the power is resumed; otherwise, all the memory coordinate will be wrong.

☞Break point setup

If you exit the automatic processing interface and want to return next time, you need to resume to the current stop coordinate. This can be made by pressing “Pause” during the automatic processing and pressing [F6] (Break point), then, the system will automatically save the current processing point (where the cutting nozzle is located) as a break point. This point is saved forever; no matter it is power off or on. The coordinate will be the saved break point coordinate when you enter the “Auto” interface next time, as long as the current program has not changed.

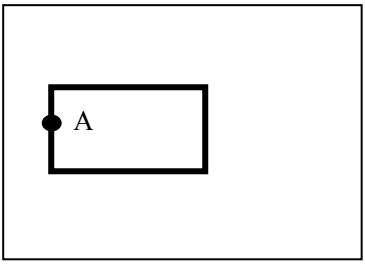
If you restart the device after the power-off, you just have to press [F6] (Break point) in the "Auto" interface to restore the break point, and press the corresponding function keys (Preheating & Perforating, open the cutting Oxygen, etc.) to resume processing.

☞Change of cutting gun nozzle

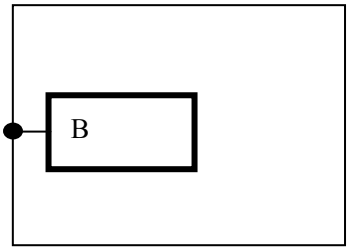
If cutting gun nozzle is damaged during the processing, please follow the following steps to change it:

① In automatic processing → ② Press [STOP] → ③ Press [F6] (Break point) → ④ Press the corresponding [X+], [X-], [Y+], and [Y-] keys to move the cutting gun to a proper place for changing the nozzle → ⑤ Press [START], and the coordinate will be moved to the current break point automatically → ⑥ Press [Cutting Oxygen], and [START] key to go on the follow-up processing.

☞Displacement perforating



Picture 1

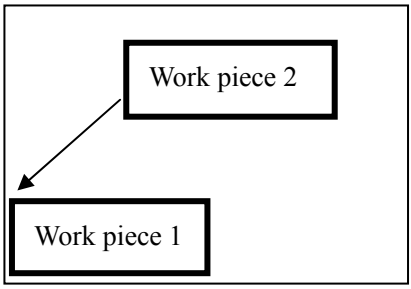


Picture 2

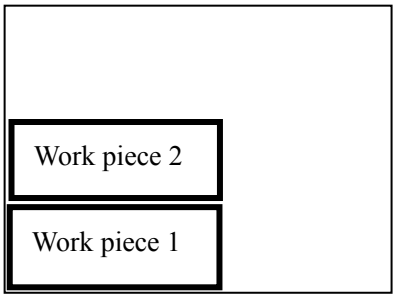
As Picture 1, the out square is the steel plate and the inside square is the work piece to be cut. Assuming that it is to cut the work piece from point A and the steel plate is of thick materials; then, it will cost a lot of time to perforate. However, if it is to cut from the edge of steel plate (point B), the time of preheating perforating may be saved. Detailed operations are as follows:

① In automatic processing → ② Press [STOP] → ③ Press [F6] (Break point) → ④ Press the corresponding X, and Y keys to move the cutting gun to the edge of the steel plate → ⑤ Preheating → ⑥ Press [Cutting Oxygen], and [START], and it will automatically cut the work piece to the break point before, then, go on cutting the follow-up tracks.

☞**Movement of work piece**



Picture 1



Picture 2

To save the steels during the processing, you can move the tracks of work piece to a certain place for processing when cutting some kinds of figures. As shown in above pictures, the out frame is the steel plate, and the inside frame is the figure to be cut. For example, it may waste many materials if you cut the "work piece 2" directly after having cut the "work piece 1", because they are a certain distance away. Therefore, you can move the track of work piece to a proper place as Picture 2 before cutting, which can save many materials. Detailed operations are as follows:

Press [STOP] key after you have cut the "work piece 1" → Press [X+], [X-], [Y+], and [Y-] to move the cutting gun to the proper position.

☞Line and point selection

When a processing piece consists of many lines or perforating points and it is required to start cutting from one of the lines or perforating points in the actual cutting, you can press [F1] (Auto) → [F4] (Figure) → [F4] (Process) and [F2] (Select the line) or [F3] (Select the point) to select the line and point.

☞**Array**

When you need to cut a single figure for several times, you can use the array function to copy the figure first as the following picture. G code has the following requirements when arraying:

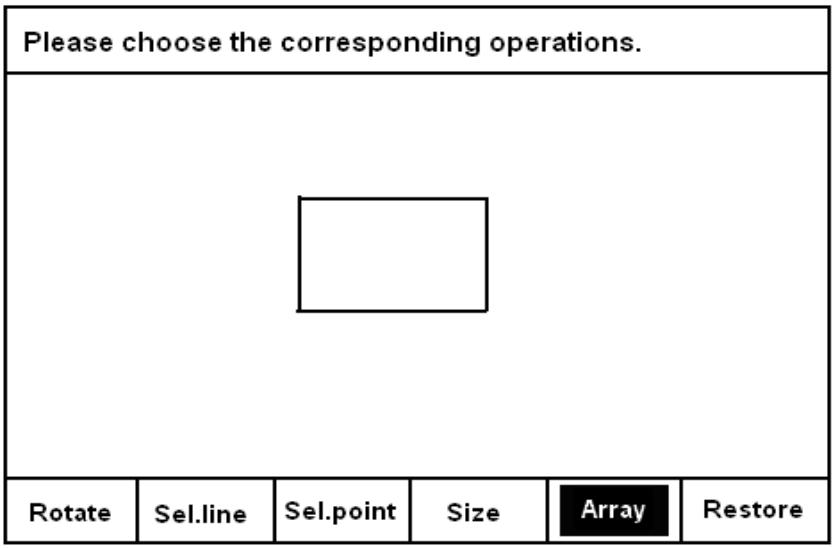
1） The processing code is required to return to the original point after the processing. If it has not returned, you can add a line of G28 under the last M08 instruction of the processing file, which means X and Y-axis return to the reference point at the same time.

2） The end of processing file should be ended with M02.

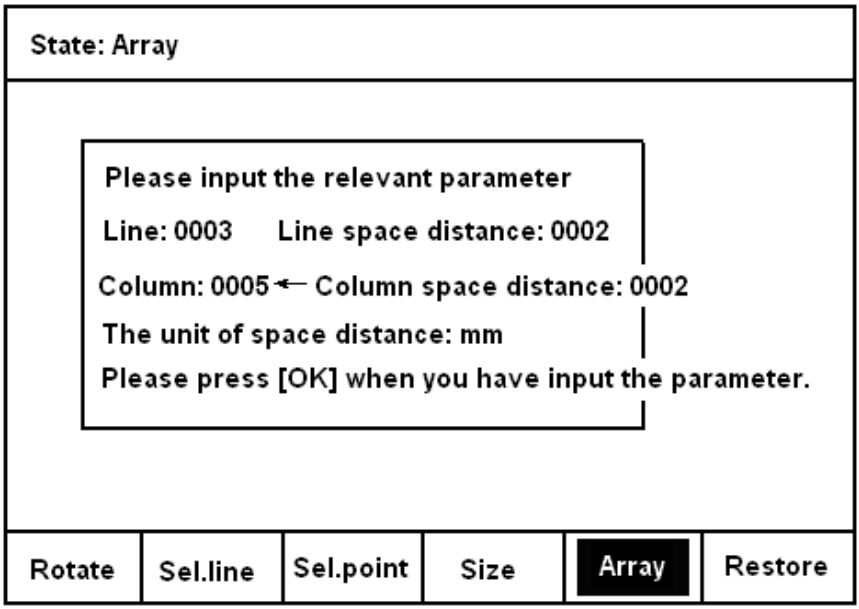
1） You can rotate the figure after the arraying, but you cannot array after the figure rotating.

2） You cannot rotate the figure when it is processed halfway, or after the point and line are selected.

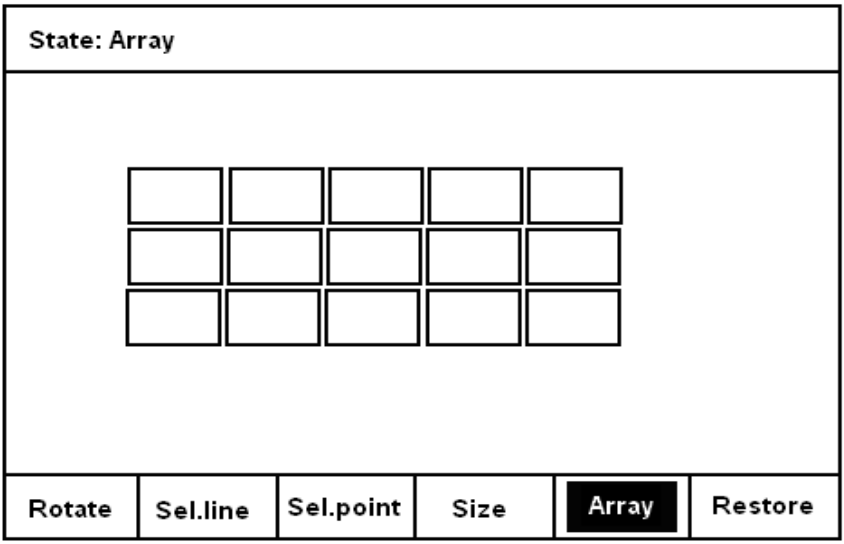
3） Press [F4] (Size) after the arraying to see whether the size fit the steel plate. Press [F6] (Restore) if you want to array again.



一、Before arraying



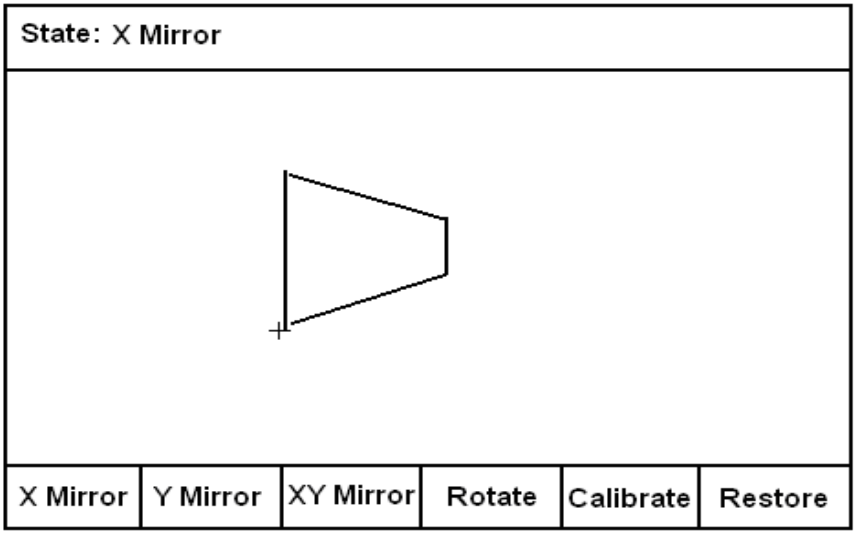
二、Array parameter setup



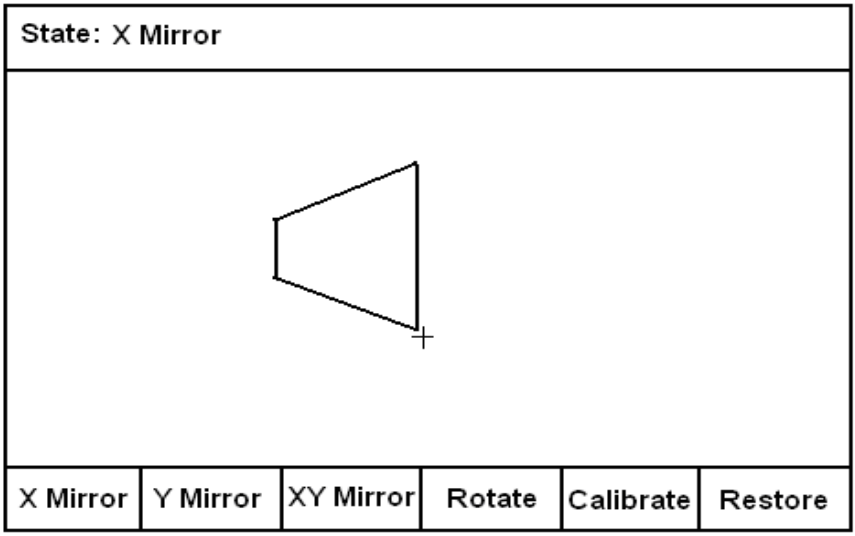
三、After arraying

☞**Mirror**

If you needs to exchange the start point and the final point of the figure horizontally at 180˚ during the cutting, you can press [F1] (Auto) → [F4] (Figure) → [F4] (Process) → [F1] (Rotate) → and press [F1] (X mirror) / [F2] (Y mirror) / [F3] (XY mirror). As shown in the following picture:



1、Before X mirroring



2、 After X mirroring

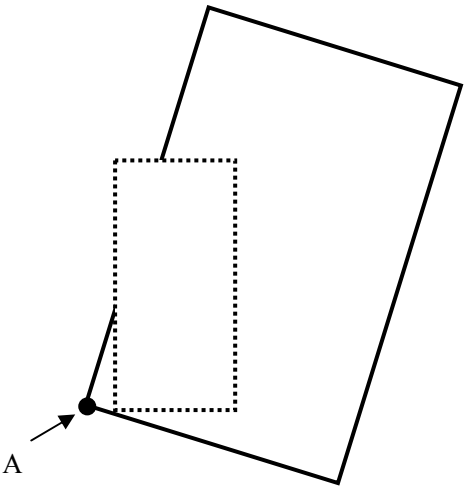
☞**Rotating**

Sometimes, the position and angle of the steel plate are required to meet the XY axis of the cutting machine during the cutting. However, in the actual processing, it is hard to avoid the deviation of steel plate position and the XY axis coordinate of cutting machine because of the operator's operation, which puts the cutting machine inclined on the steel plate. Therefore, you can calibrate the steel plate with the calibration function without moving the steel plate or the cutting machine. Detailed operations are as follows: Press [F1] (Auto) in the main interface → [F4] (Figure) → [F4] (Process) → [F1] (Turn) → [F4] (Rotate).

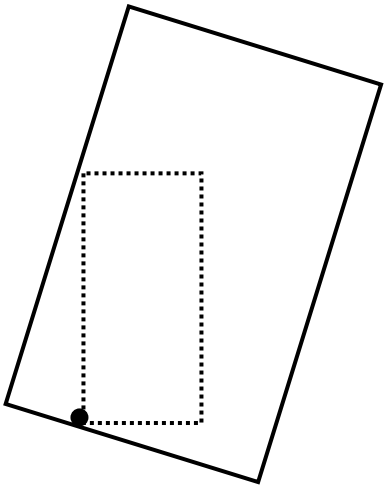
☞**Calibration**

When rotating angle is uncertain, we can get the rotating angle from the calibration. Detailed operations are as follows:

Calibration principle:



Picture 1

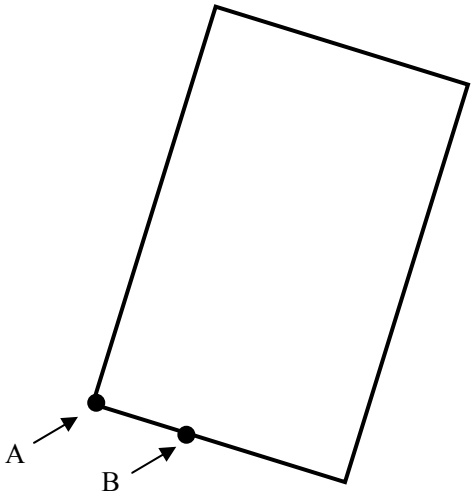


Picture 2

1). In Picture 1, the large frame (Real line) is the steel plate, the small frame (Dashed line) is the figure to be cut, and point A is the start point of the cutting gun. If it is cut according to Picture 1, the figure outside may not be cut; and if it is cut when the start point is moved to the middle of the steel plate as Picture 2, obviously it will waste the steel plate.

2). At this point, without moving the steel plate, you just have to figure out the slope angle of the plate, and incline the figure to be processed at the corresponding angle before cutting effectively.

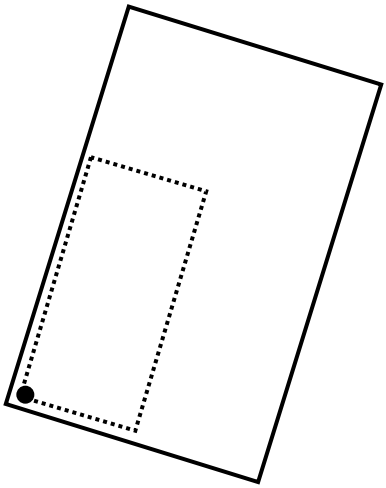
Way of calibrating the steel plate:



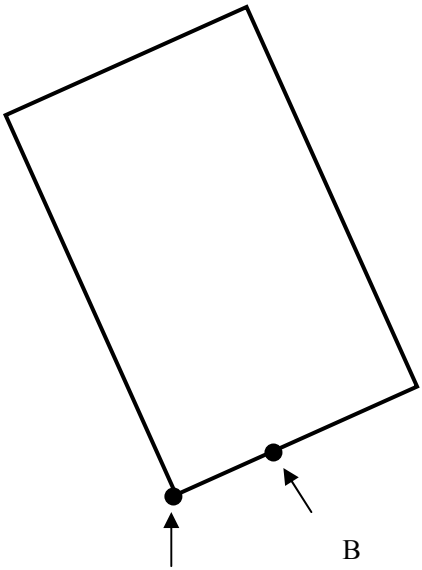
1） As above picture, point A is the start point of cutting gun. You can figure out the slope angle of the steel plate by

moving the cutting gun to any point of its base line. Press [X+] → [Y-], or [Y-] → [X+]; then, press [OK] to confirm.

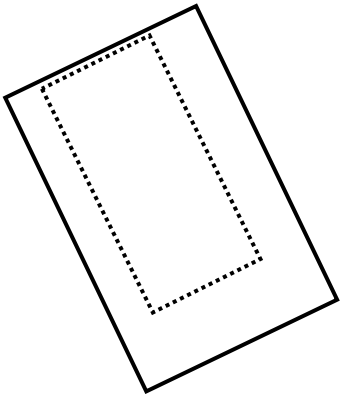
2） Then, the figure displayed on the controller will be rotated at a certain degree. The position of figure to be processed and the steel plate is shown as follows:



3). If the steel plate is inclined as follows, then, the calibration method is as below:

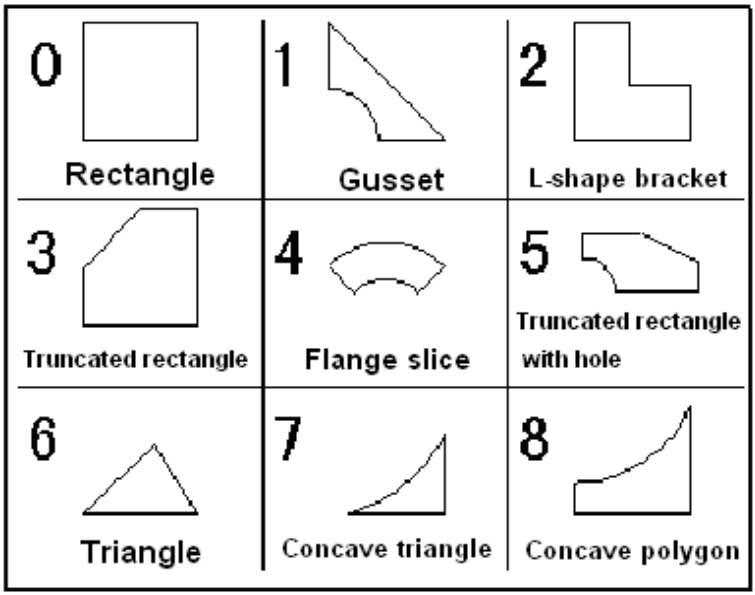


Press [X+] → [Y+], or [Y+] → [X+], then, press [OK] to confirm. The position of figure to be processed and the steel plate is shown as follows:



☞Figure library

For the convenience of the processing, and for decreasing the workload and increasing the usability of the system, the system especially includes 33 figures of normal machining parts. Users can press [F2] (Figure library) in the start-up interface to enter the figure library, and choose the corresponding figure to process. The figures are as follows:

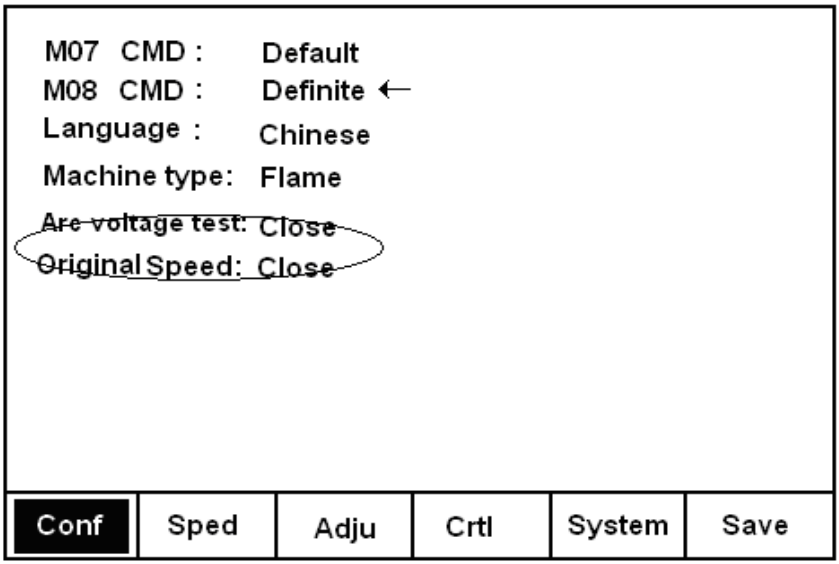


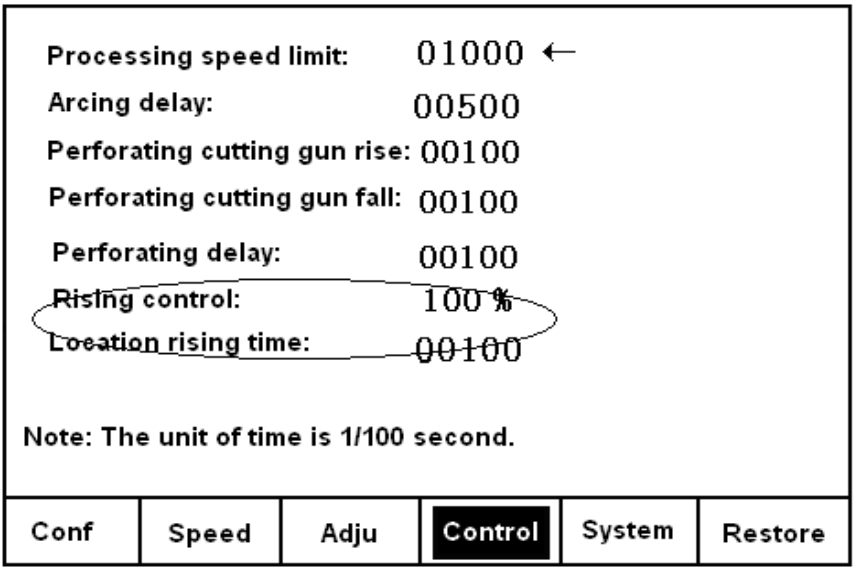
☞Copy of processing files

You can either copy the processing file of U-disk to the controller, or copy the processing file of controller to the U-disk. When copying files from controller to U-disk, the copy is saved in the “PRG” folder created by the system automatically.

☞Parameter adjustment of flame/plasma cutting

The system has two kinds of cutting techniques, flame cutting, and plasma cutting. If the device supports flame/plasma cutting, and the user wants to switch between these two techniques, make sure to press [F4] (Parameter) in the start-up interface → [F1] (Configuration) and [F4] (Control) to change the corresponding parameter. Here is the introduction of plasma cutting setup. See the following picture:





Please set the parameter according to the actual requirements as the above picture:

1). Arc voltage detection:

If the device is equipped with auto-adjusting device, which usually has the arc voltage detecting-instrument, you need to set the arc voltage detection “On”. If there is no this function, you can set it to be “Off”.

2). Initial location:

It is an action of auto-adjusting location of cutting gun before plasma arcing. If the device owns this function, it is necessary to set it to be “On”, and set the “Location rising time” according to the actual requirements.

3). Height-adjusting control:

The system will have a process of acceleration and deceleration when cutting the turning of the steel plate. If the device is equipped with auto-adjusting instrument, it is necessary to turn it off when the system speed is decreased to a certain degree; otherwise, the feedback change of arc caused by the decrease of the speed will lower the cutting gun, touching the steel plate. It is usually to set the “Height-adjusting control” to be 80%, which means that the system will cancel/enable the auto-adjusting function automatically when the turning speed is lower to /over the 80% of the processing speed.

Chapter II Troubleshooting

☞Why the U-disk cannot be read?

Answer: If the controller cannot read the U-disk, you can change the "File system" of U-disk on the computer, and then format it. Detailed operations are as follows: Insert the U-disk to the computer → Open "My Computer" → Find the removable U-disk → Right click the mouse → Click "Format (A)" → change the format of "File system" from "FAT32" to "FAT" → Click "Start" to start formatting. Copy the processed files to the U-disk to test again. Change for a new U-disk if it still cannot be read.

☞Why there is an error in the cutting?

Answer: Check whether the impulse equivalent in the precision setup has been changed; or calibrate the impulse equivalent again.

☞Why the cutting quality of the turning is poor?

Answer: Please check whether the start-up speed and the acceleration are set to be the reasonable values.

☞Why the cutting square is changed to rectangle?

Answer: please check whether the impulse equivalent is correct, and whether the actual precision of X or Y movement is correct. If these two values are correct, check whether the roller and the slide rail of the machine are of no failures.

☞Why the cutting circle is changed to ellipse?

Answer: please check whether the impulse equivalent is correct, and whether the actual precision of X or Y movement is correct. If these two values are correct, check whether the roller and the slide rail of the machine are of no failures.

☞Why there is wave shake in the opposite angles when cutting the circle?

Answer: Please adjust the backlash of the "Adjustment" in "Parameter".

☞Why the motor does not work or is similar to death when it is in "Auto" state?

Answer: Please check the "Auto speed limit" to see whether it is a proper speed, and check whether percentage of manual processing is too low.

☞Why the motor does not work or is similar to death when it is in "Manual" state?

Answer: Please check the "Manual speed limit" to see whether it is a proper speed, and check whether percentage of manual processing is too low.

☞The processing code has the "Return" instructions. However, why the device does not return to the home position after having finished the track?

Answer: Please check the "Manual speed limit" to see whether it is a proper speed, and check whether percentage of manual processing is too low.

☞Why the right angle of the cutting square is not vertical?

Answer: Debug the start-up speed and the acceleration of "Speed" in "Parameter" again.

☞Why the anti-interference performance of plasma is poor?

Answer: Check whether all ground wires are connected well, or whether the external power filter is isolating the high frequency.

☞Why, one of the solenoid valves cannot work?

Answer: You can judge whether it is caused by the system damage or relay/solenoid valves damage in the following ways.

1). Change for a new solenoid valve of the same type to judge whether it is broken, or press [Ignition] in the "Auto" interface, and press [Preheat Oxygen], [Acetylene] and [Cutting Oxygen] to output a signal manually, then, use a multimeter to test the input end of the solenoid valve to see whether there is voltage signal.

2). If there is no voltage signal in the input end of the solenoid valve, then, open the case and use the same method as above to test the input end of the relay to see whether there is voltage signal, and to judge whether it is damaged or not.

3). If the relay has no voltage signal, that may be the damage of output end of NCS. Change for the backup output according to the following steps.

4). Open the case and the output port as the following picture:

5). Find out the corresponding backup output pin according to the following list:

Serial number	Default Pin	Backup Pin
Ignition	3	7
Preheat oxygen	17	18
Acetylene	1	5
Cutting Oxygen/Arcing	14	19
Cutting gun rising	2	6
Cutting gun falling	15	20
Turning speed ratio	4	8

6). Weld the default pins of the plug shown in the following picture to

the backup pins according to the above corresponding connection.

7). Connect to the power supply after the installation; in the start-up interface, press [F5] (Diagnose) → [F2] (Define), use [Y↑] and [Y↓] to select upwards and downwards, and use [X→], [X←] to select the state, then, press “Save” to change the corresponding port to the backup state.