Maintenance Manual

C 180

C 180 Maintenance Manual

Introduction

1. Serial Number.

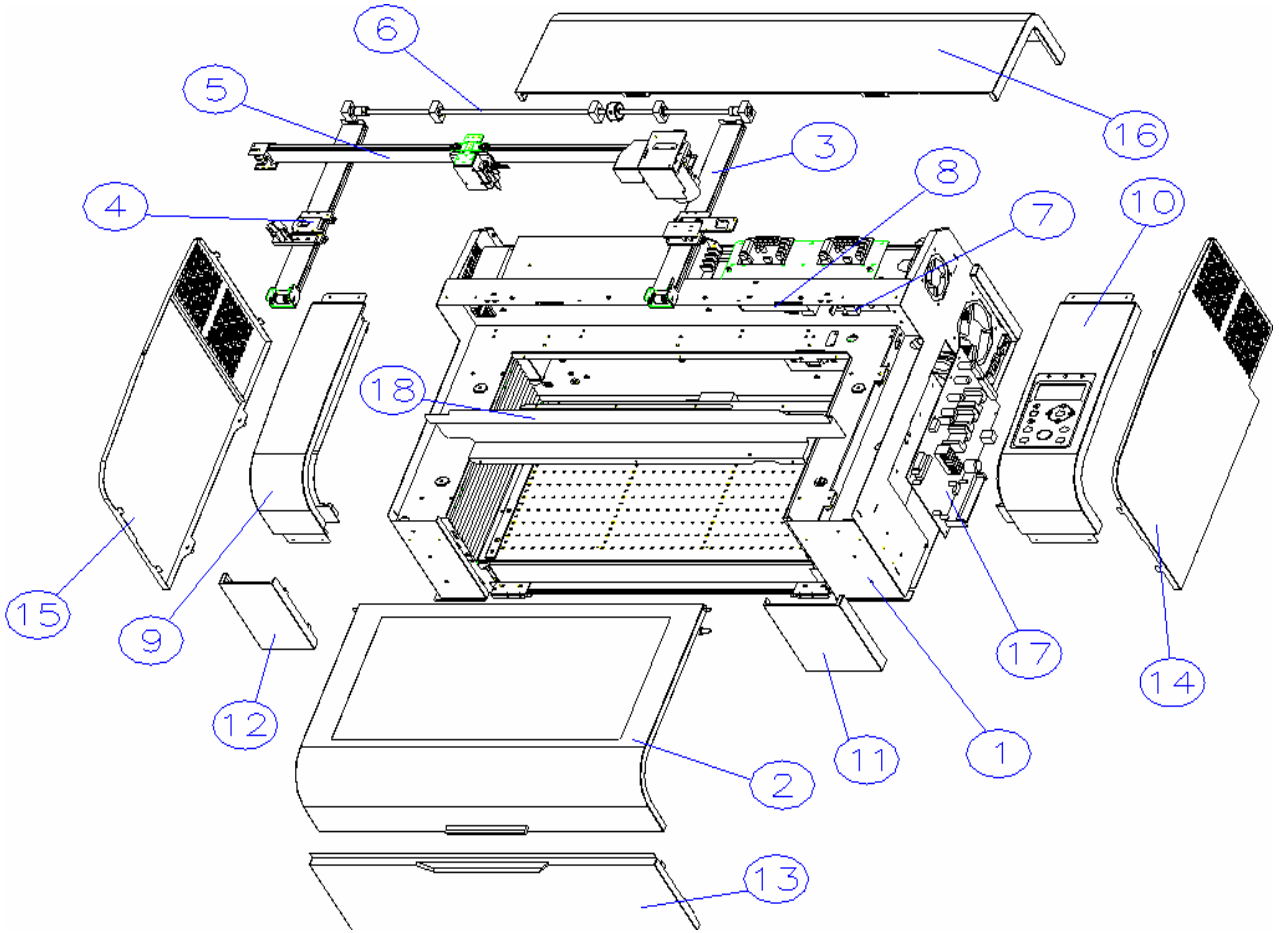
The Serial number of your machine is very important and unique. Please copy down the serial number and keep it for your records. Please include this serial number when you correspond with us for any kind of questions. Thank you.

2. Safety Precautions.

The machine should not be operated without supervision. Due to the dangerous nature of laser, we should always pay attention to what is going on with the machine. DO NOT leave a running machine unattended.

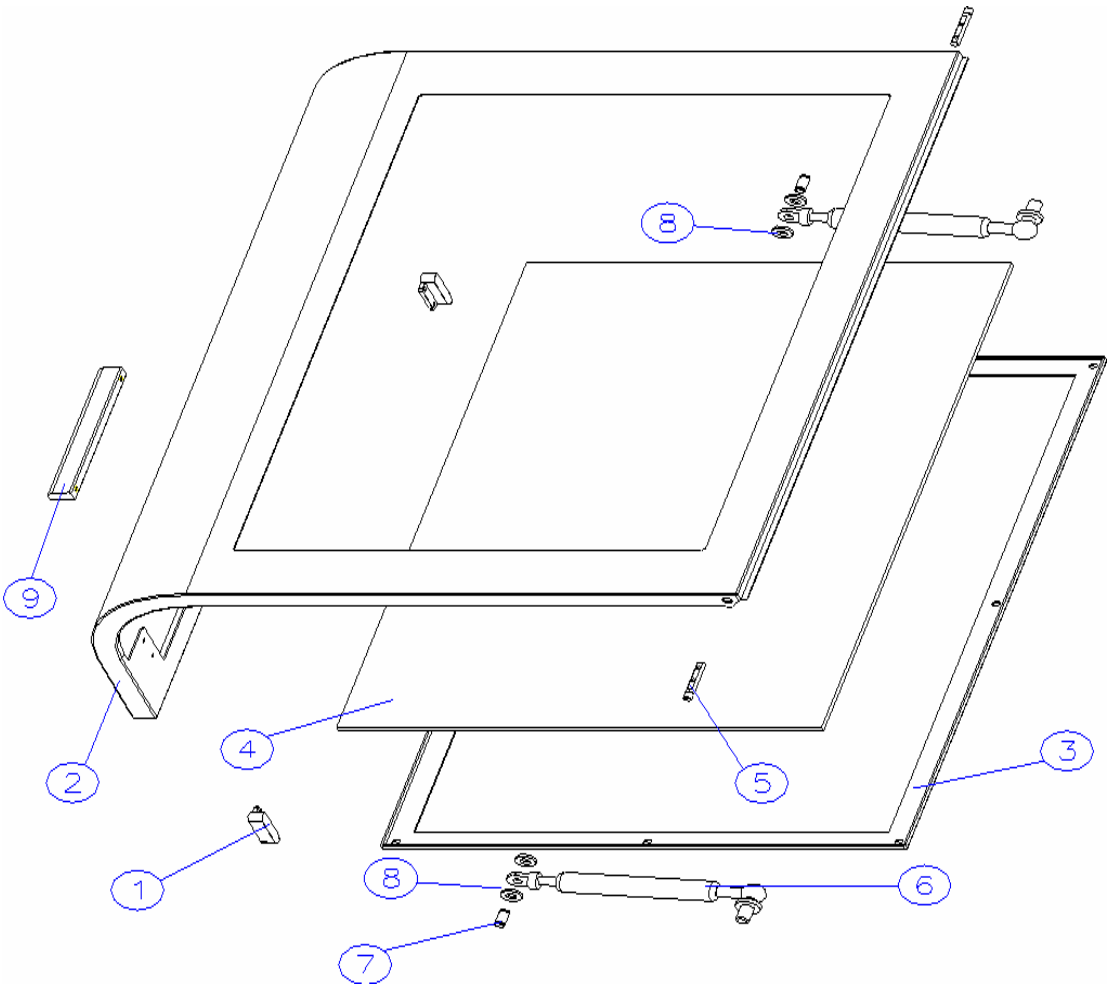
Chapter 1. Machine Overview

1. Overall



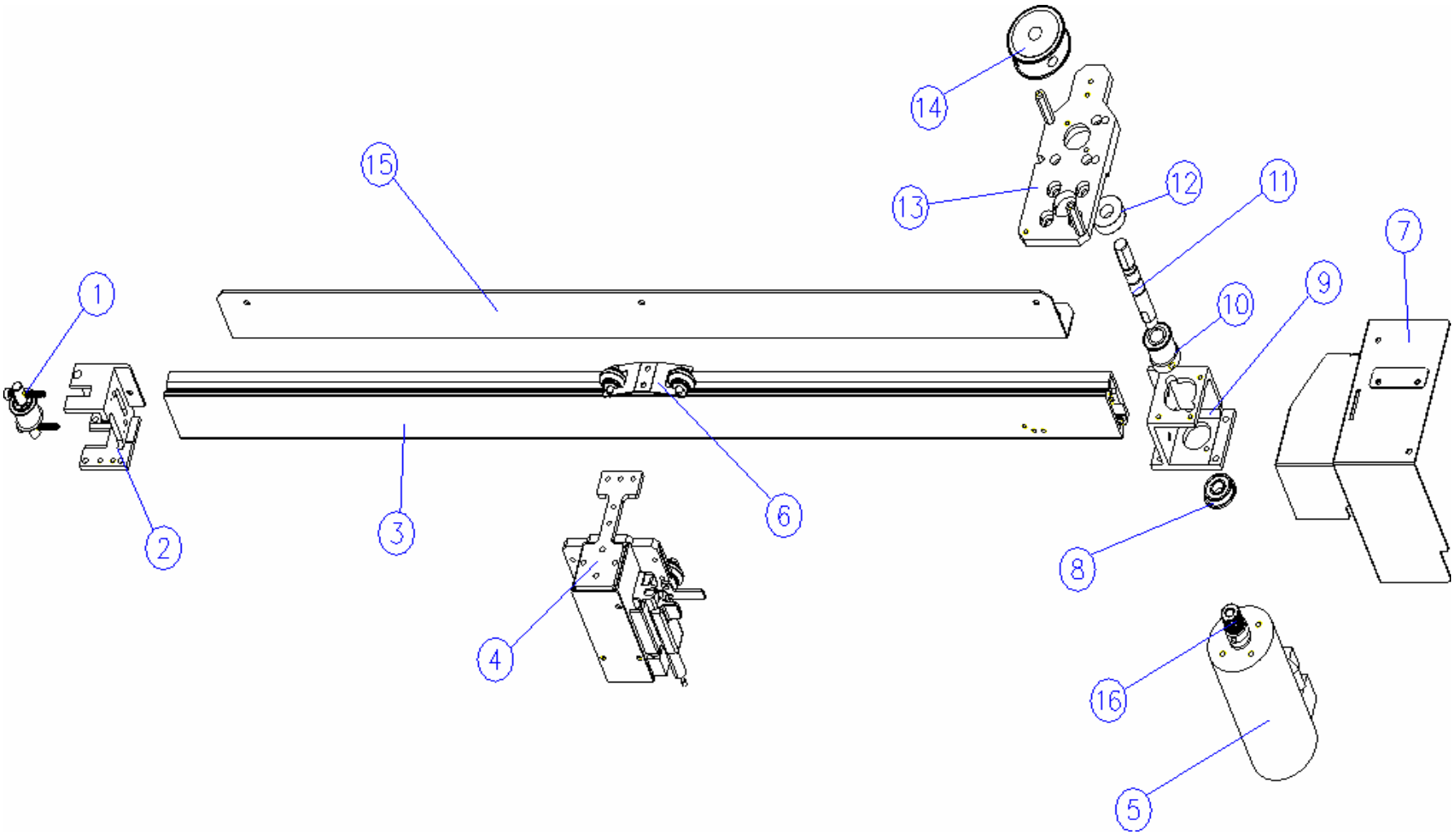
No.	Item	Description
1	20200167G	main unit Assembly - C180
2	29005132G	Top Cover asm. - C180
3	29004635G	Right Y-axis Assembly - C180
4	29004643G	Left Y-axis Assembly - C180
5	29004640G	X-axis Assembly - C180
6	29004642G	Y Transmit Shaft Assembly - C180
7	29004628G	C180Y-AXIS SET
8	23100013G	MOTOR 500COUNT(116-33224-8)
9	24402565G	COVER TOP-LEFT - C180
10	29005131G	right Top Cover asm. - C180
11	24402562G	COVER FRONT-RIGHT - C180
12	24402561G	COVER FRONT-LEFT - C180
13	24402568G	DOOR FRONT - C180
14	24402564G	COVER RIGHT - C180
15	24402563G	COVER LEFT - C180
16	24402567G	COVER TOP-REAR - C180
17	29005033G	MAIN BOARD(CCD FUNCTION) - Spirit & Spirit GE & Spirit GX & Mercury II & Venus II & C180
18	24402546G	Motor Cover - C180

2. Top Cover



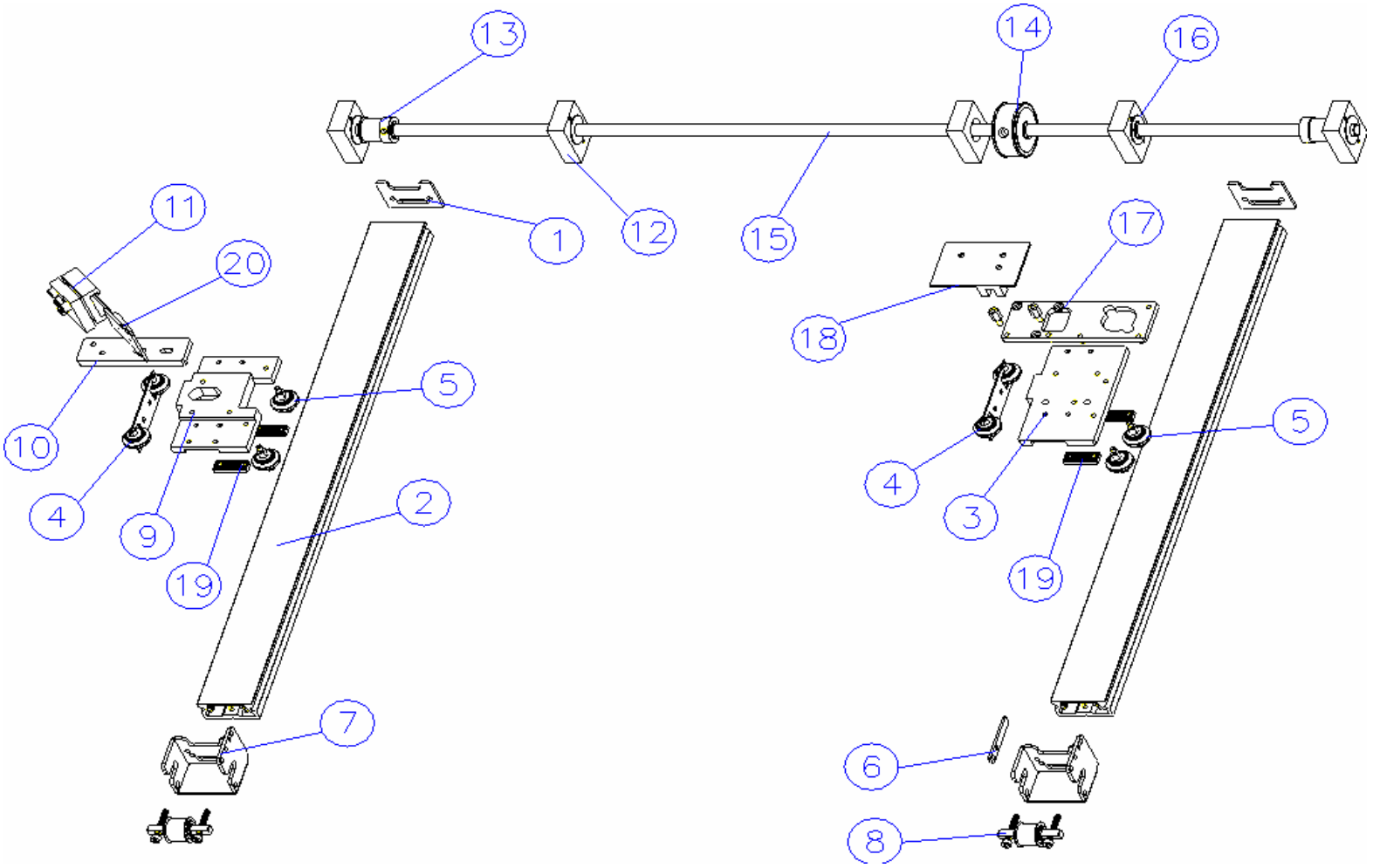
No.	Item	Description
1	22000045G	Magnet MC-12
2	24402686G	Door upper - C180
3	24402687G	Frame window - C180
4	22802382G	Window - C180
5	22802304G	SHAFT 1 - C180
6	23300887G	cylinder - C180
7	22802381G	Shaft 3 - C180
8	23300928G	Spacer (WS1276420B) - C180
9	23300956G	handle (LG-02.105.01) - C180

3. X-axis assembly



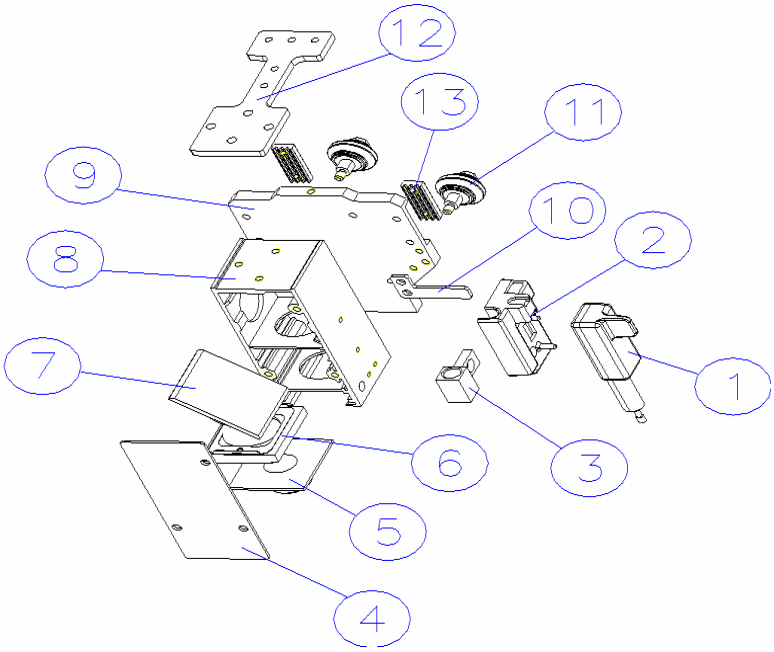
No.	Item	Description
1	29005135G	Tension idle pulley asm. - C180
2	22802044G	belt tuning bracket - C180
3	22801994G	X Bearing track - C180
4	29004654G	Lens Carriage Assembly - C180
5	23100048G	Hansen (X16-32624-8)500CPR Motor - C180
6	29004655G	A Wheel Assembly - C180
7	24402790G	Prevention Cover - C180
8	20700037G	bearing (F697FZZ)
9	22802646G	X axis transmission wheel set - C180
10	22802060G	X Axis pulley - C180
11	22802068G	transmit shaft x axis - C180
12	20700052G	Bearing (698ZZ)
13	22802040G	X-motor bracket - C180
14	22802062G	Y axis transmit pulley - C180
15	24402266G	X axis Tube Chain Holder - C180
16	21700009G	Motor pulley 2GT-P18

4. Y-axis assembly



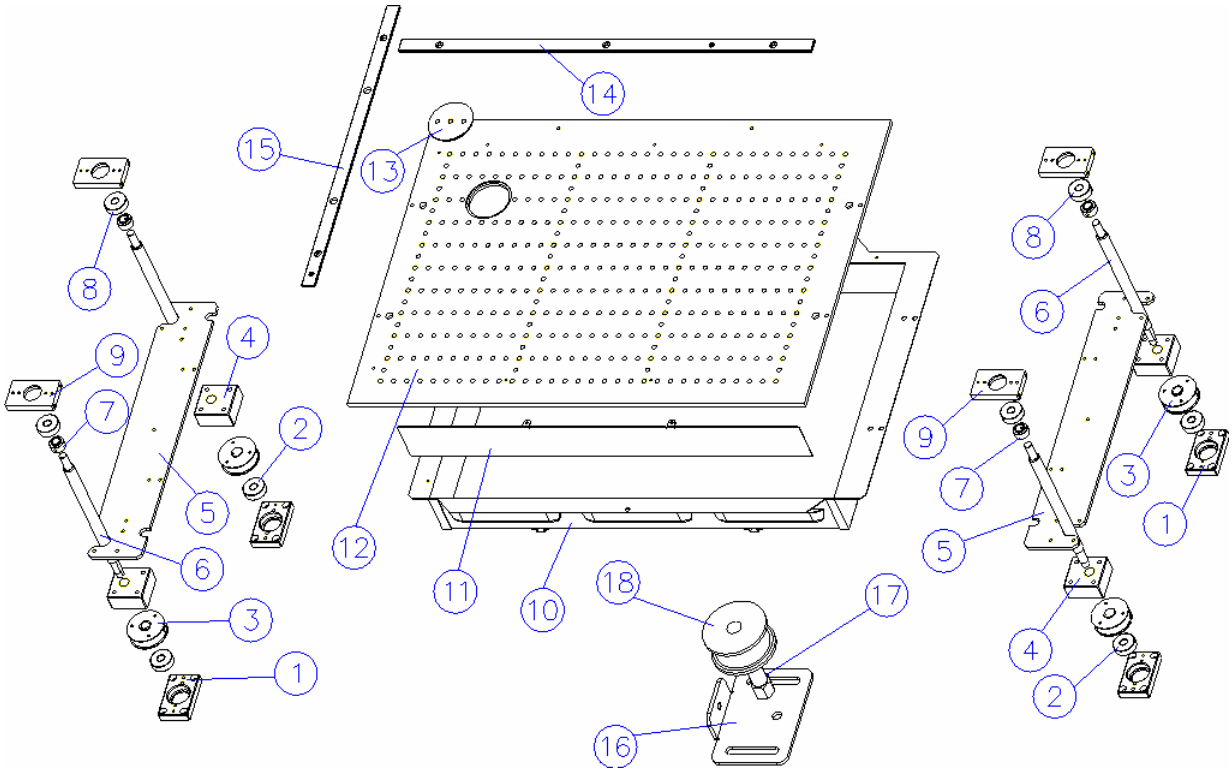
No.	Item	Description
1	24402267G	Y axis position block - C180
2	22801995G	Y Bearing track - C180
3	22802057G	Right base board - C180
4	29005358G	Y axis Wheel Assembly - C180
5	29004638G	Fixed Wheel Assembly - C180
6	29005214G	Y axis detector - C180
7	24402265G	belt tuning bracket - C180
8	29005135G	Tension idle pulley asm. - C180
9	22802056G	Left base board - C180
10	22802100G	M2 bracket - C180
11	20200185G	prism mounts Assembly
12	22802009G	Y axis Bearing supprt - C180
13	22802060G	X Axis pulley - C180
14	22802062G	Y axis transmit pulley - C180
15	22802061G	Y axis transmit shaft - C180
16	20700052G	Bearing (698ZZ)
17	22802059G	Right connect board - C180
18	29004513G	X-Motor PCB - C180
19	22802004G	belt retainer - C180
20	29002522G	Mirror Assembly

5. Lens carriage



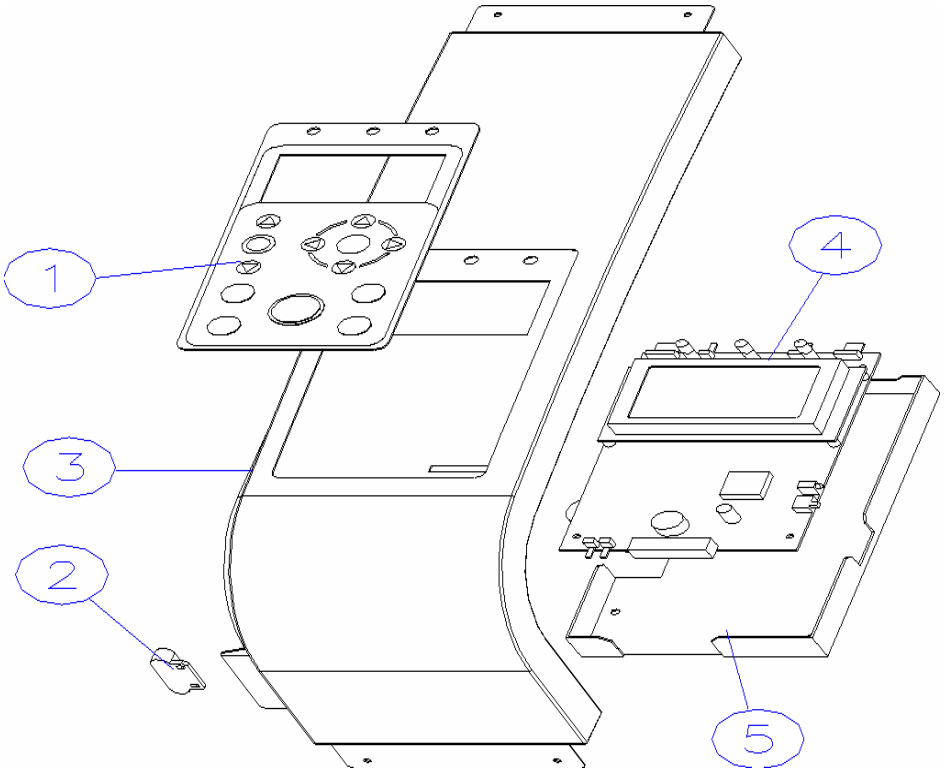
No.	Item	Description
1	29002547G	Auto focus pin Assembly.
2	29002546G	Auto focus seat Assembly.
3	22800955G	carriage airflow valve-Spirit
4	22802084G	Lens carriage front shingle - C180
5	22802117G	air nozzle - C180
6	29004737G	2.0" Focal lens Assembly - C180 & Spirit GX
7	29004736G	Carriage Reflector Hold - C180 & Spirit GX
8	22801996G	Lens carriage Assembly-V2 - C180
9	22801999G	Lens carriage base - C180
10	29005213G	X axis detector - C180
11	29004638G	Fixed Wheel Assembly - C180
12	24402273G	X axis transmit shaft bracket - C180
13	22802004G	belt retainer - C180

6. Z-platform



No.	Item	Description
1	22801998G	Bearing seat - C180
2	20700034G	Bearing 628ZZ
3	29002551G	Z-axis pulley Assembly.
4	22802008G	Z axis screw thread - C180
5	24402201G	Working table Bracket - C180
6	22801997G	Z-Axis Table Screw - C180
7	22800922G	Z axis top stopper
8	20700034G	Bearing 628ZZ
9	22802299G	top Bearing seat - C180
10	24402200G	Dust box. - C180
11	24402688G	Block Plate - C180
12	22802007G	Z axis Platform - C180
13	22802085G	Engraving Table s Hold Plug. - C180
14	22802022G	X Ruler - C180
15	22802023G	Y Ruler - C180
16	24402269G	Z axis belt tuning bracket - C180
17	22802003G	Core of Z-axis pulley - C180
18	22800084G	idle Pulley

7. Control Panel

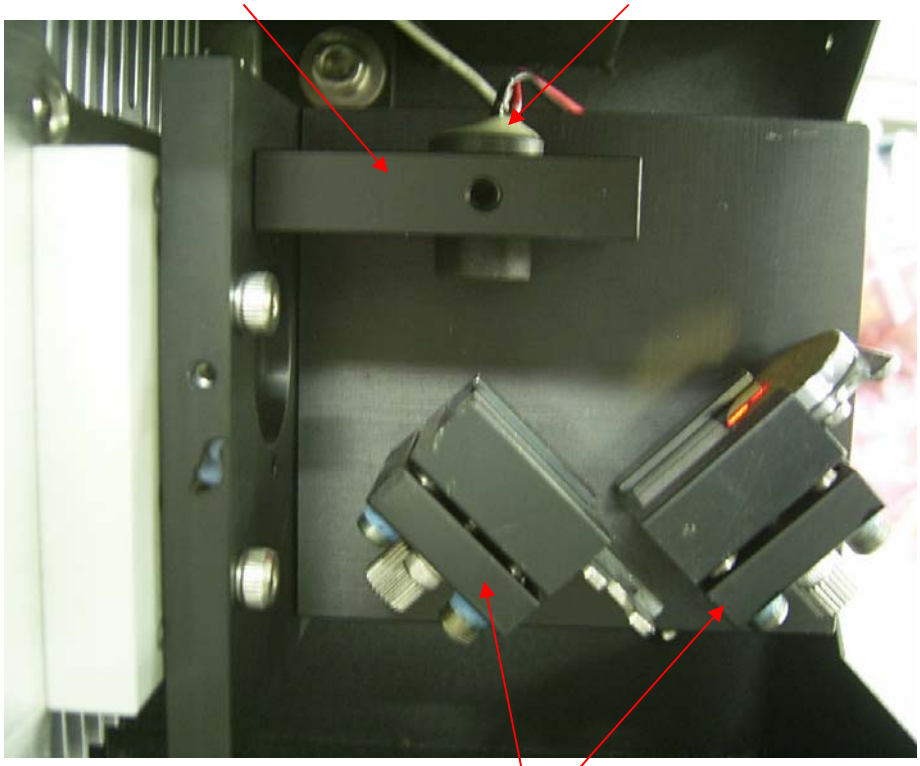


No.	Item	Description
1	23400025G	C180 Control Panel - C180
2	25700015G	Magnic Switch
3	24402566G	COVER TOP-RIGHT - C180
4	29005251G	Control panel assembly (C180)
5	24402625G	CP COVER - C180

9. Mirror 1/ Red beam (Laser Diode)

Red beam bracket 22802185G

Red beam (laser diode) 23600028G



Prism mount 20200185G

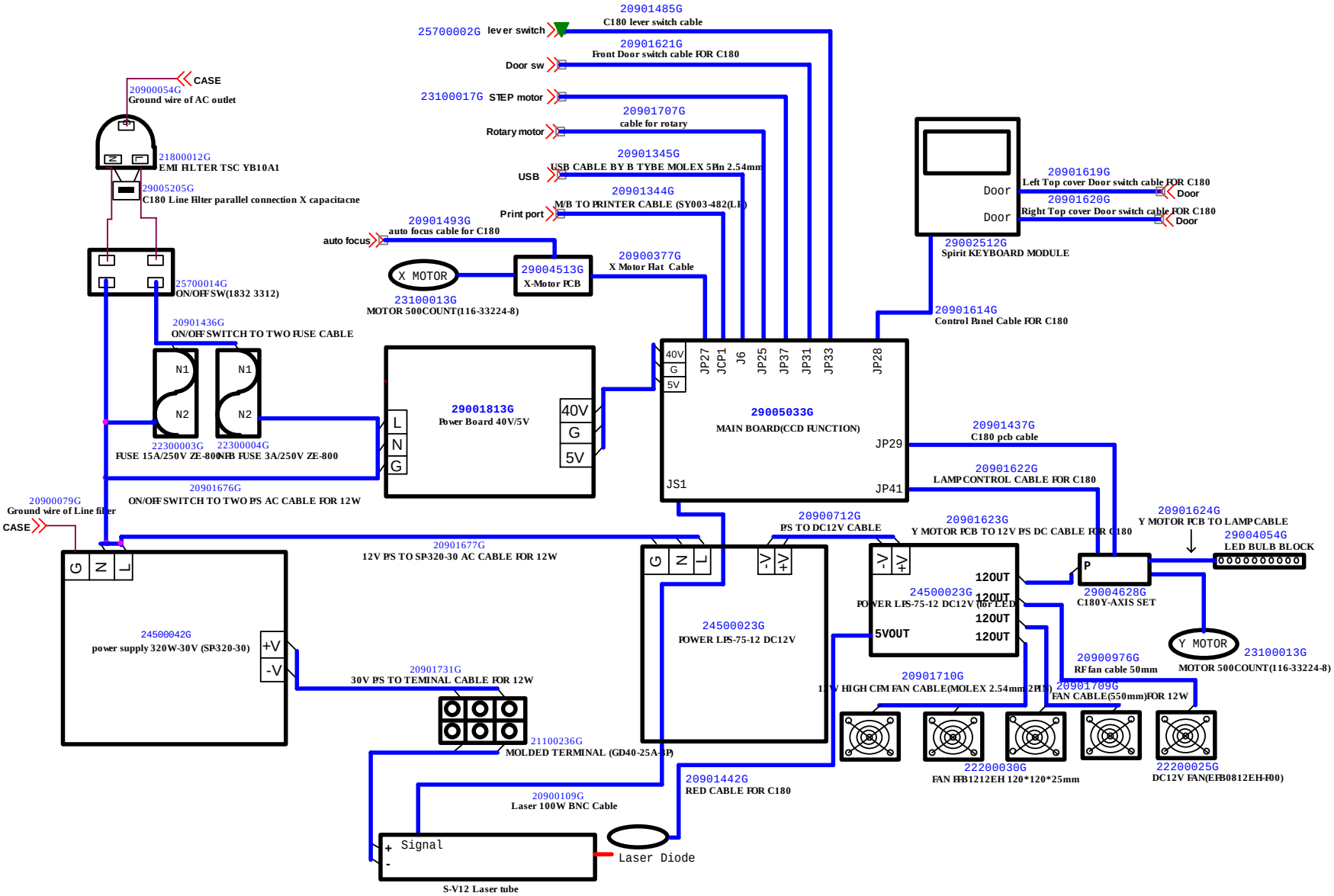
10. Power supply

Power supply for 12w laser tube 24500042G, 320W-30V(SP-320-30V)

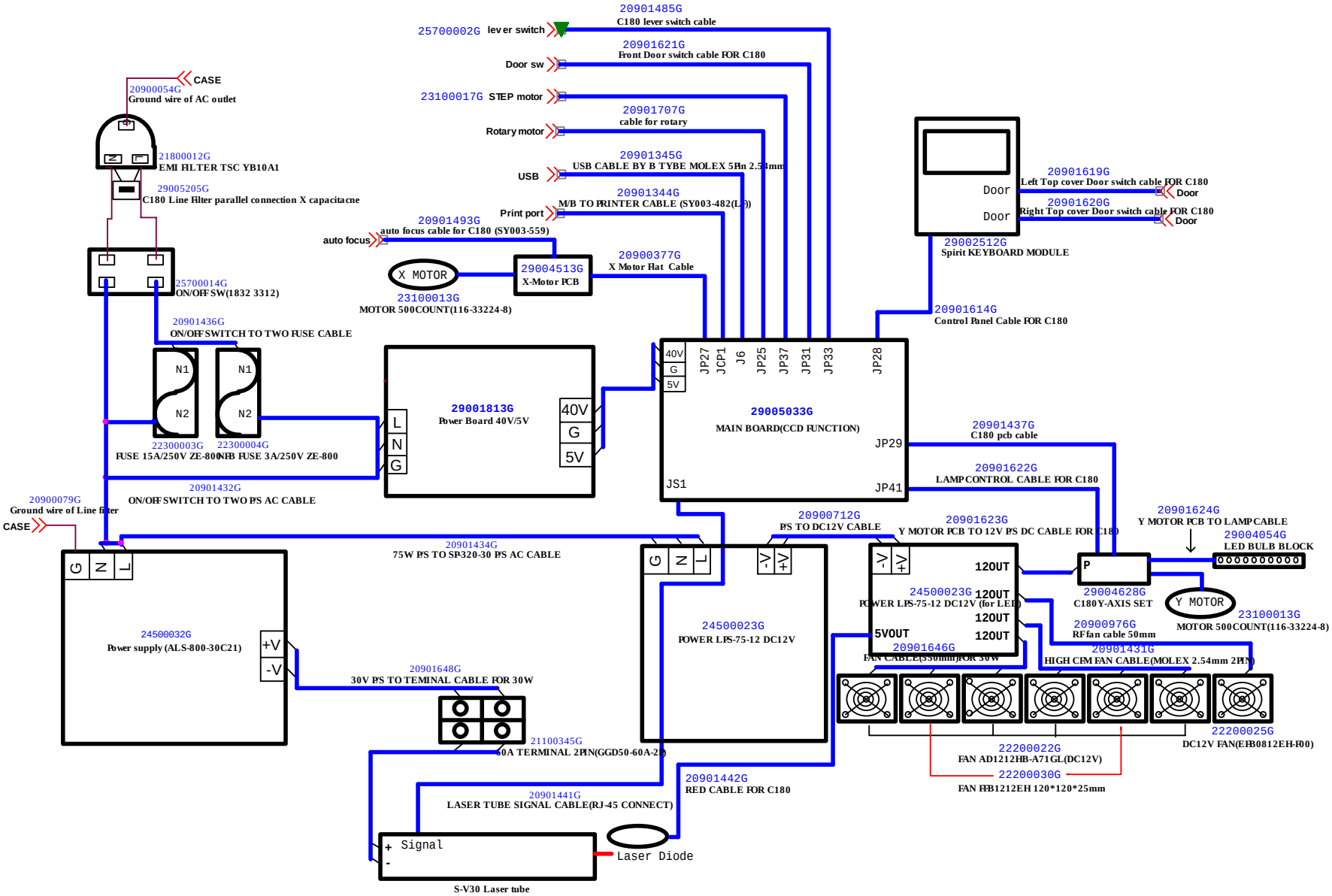
Power supply for 30w laser tube 24500032G, 800W-30V (ALS-800-30C21)

Power supply for 40w laser tube 24500064G, 1000W-48V (RSP-1000-48)

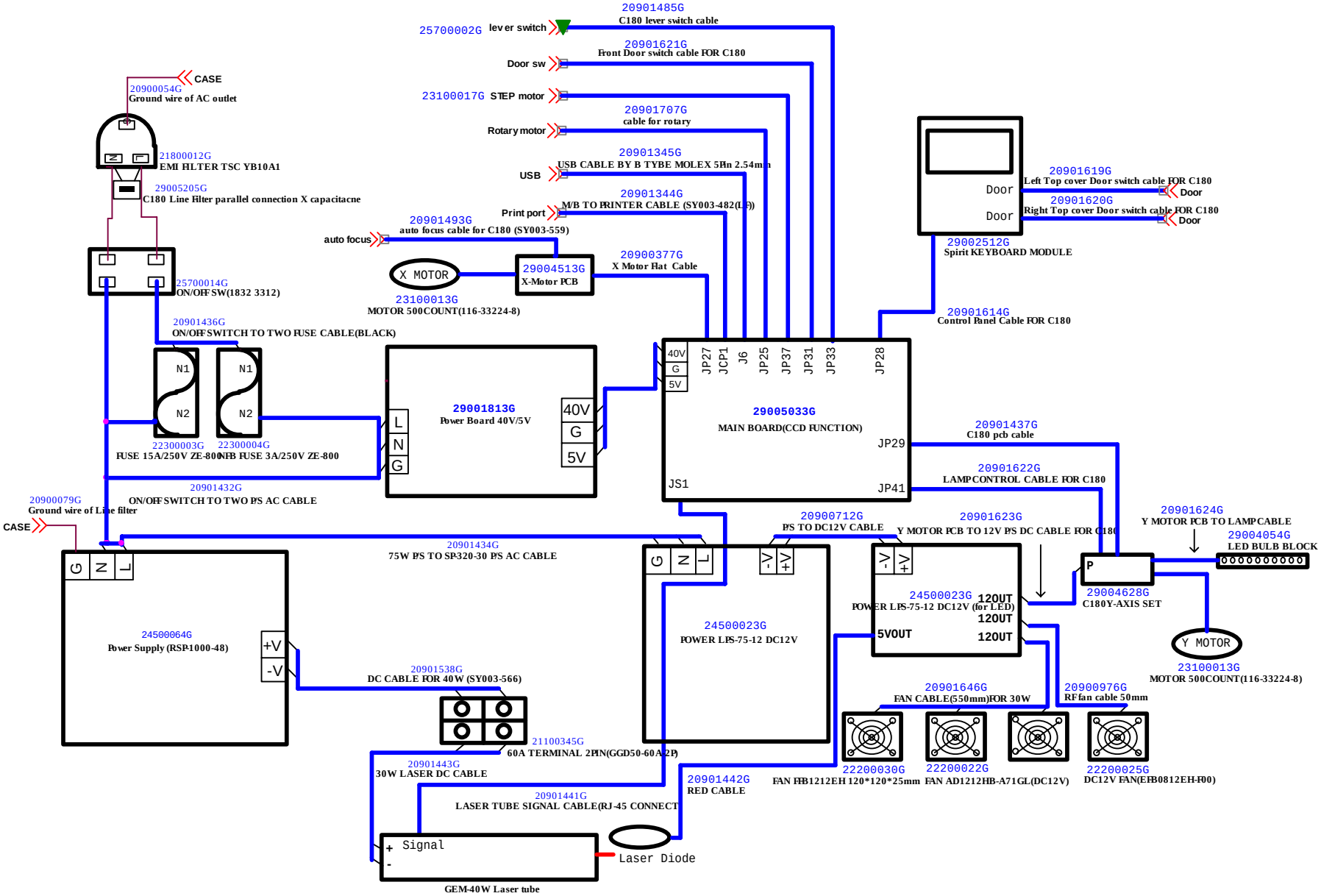
12W Power Cable Layout Diagram



30W Power Cable Layout Diagram

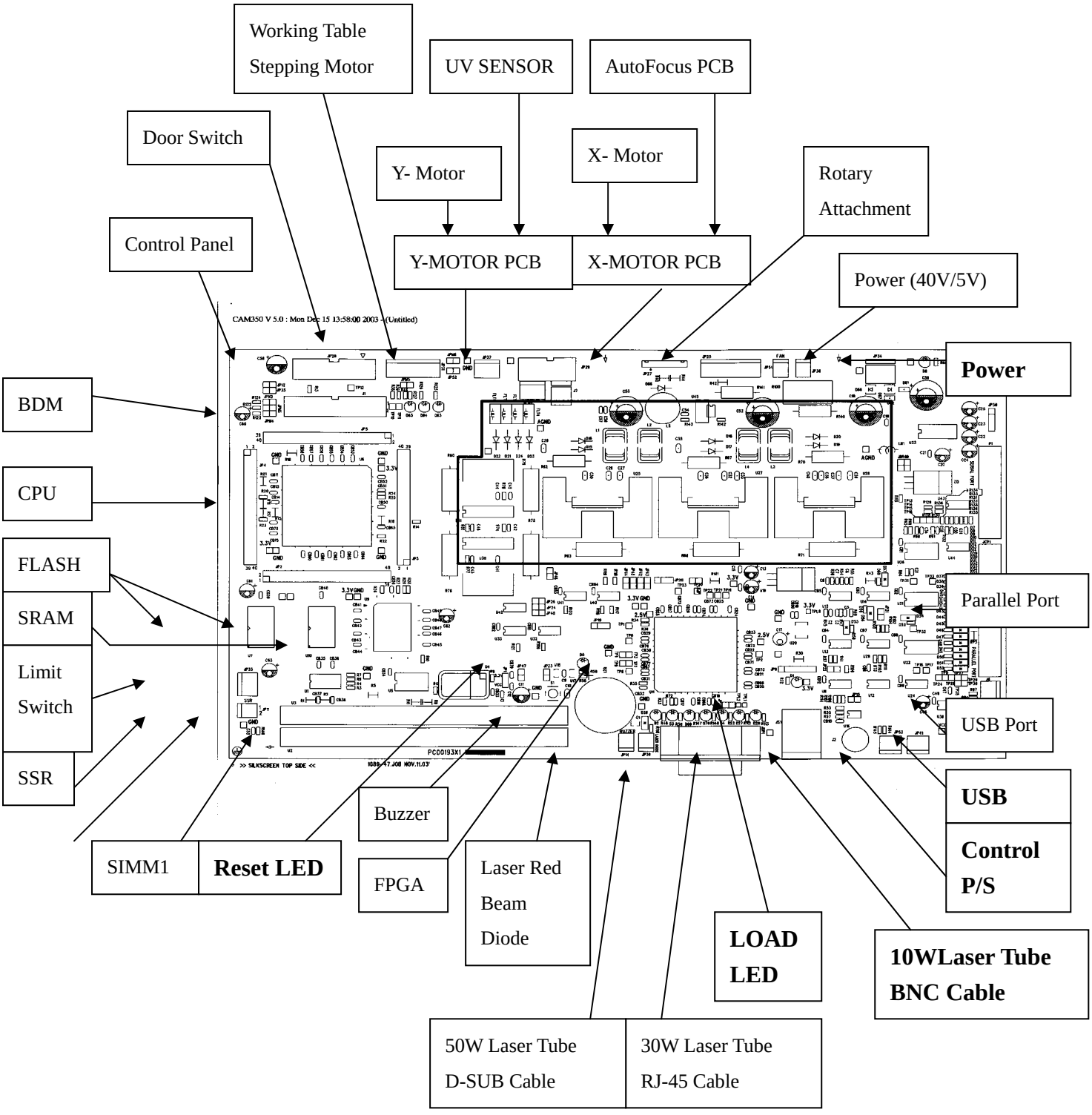


40W Power Cable Layout Diagram

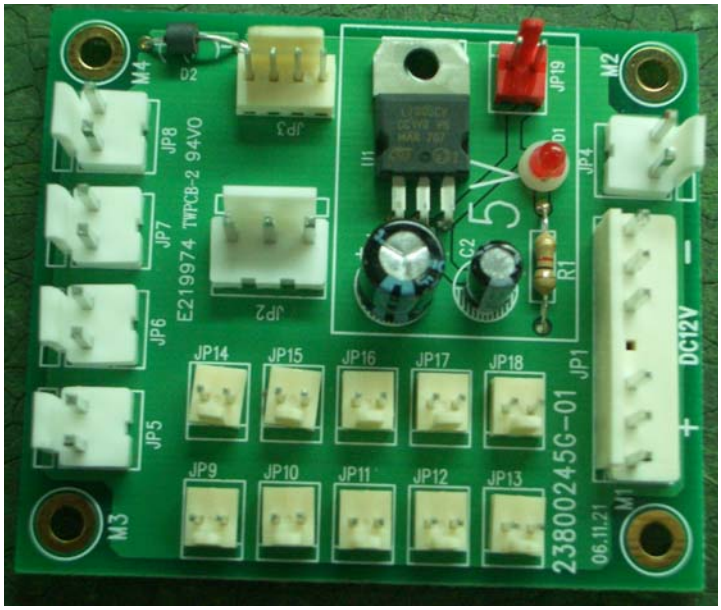


Section 3: Electrical System

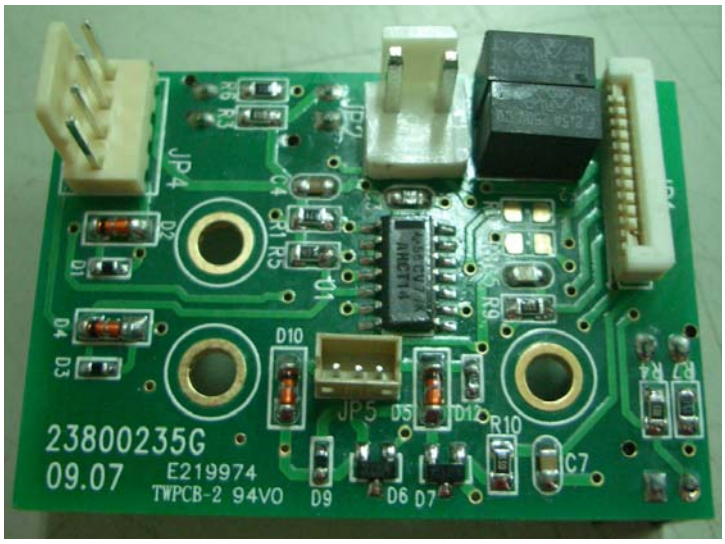
C180 MAINBOARD DIAGRAM



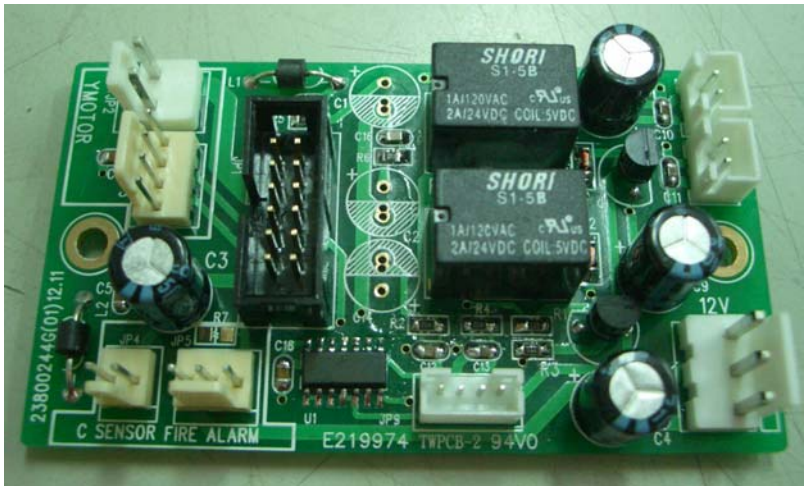
29005059G : DC12V Module



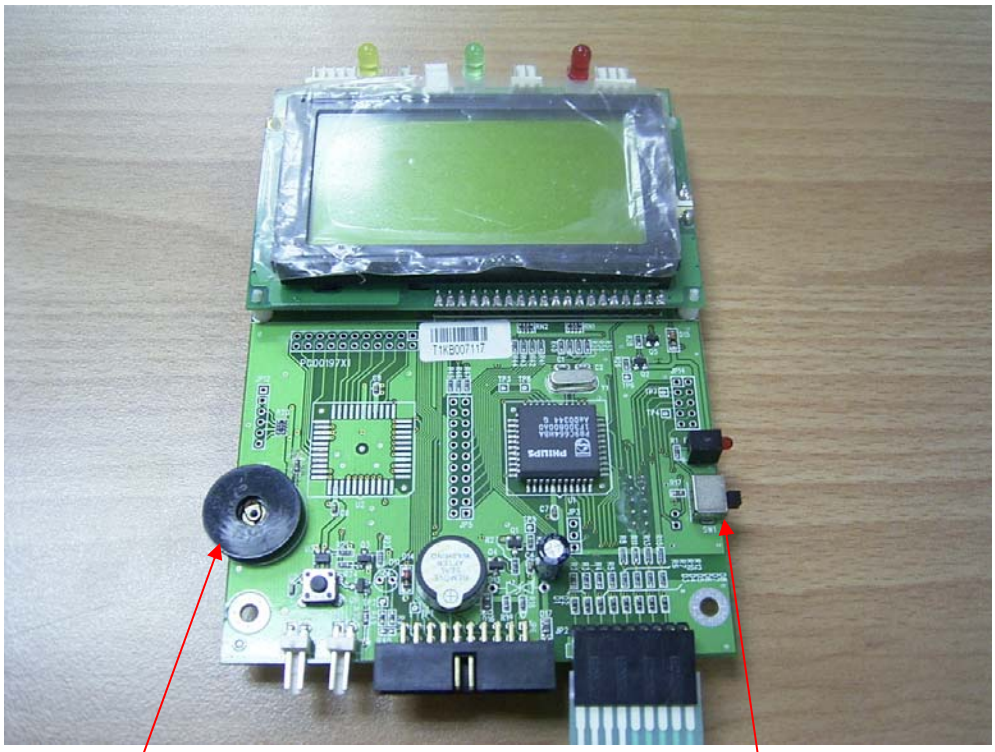
29004513G : X motor PCB



29004628G : Y motor PCB



Control Panel



Dial for adjusting contrast.

Load firmware button. (Button is at lower position at default.)

Section 4: Laser System

What is laser?

Laser is an acronym from Light Amplification by Stimulated Emission of Radiation.

How to measure the power output of a laser tube?

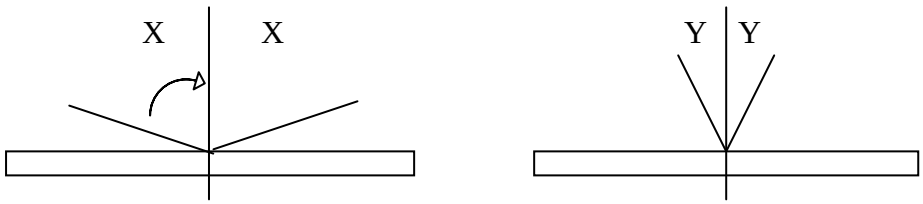
In order to measure the power output of a laser tube, we need to use a power meter that will measure the heat generated and convert it to a power reading. The best place to measure the laser output power is at the immediate output of the laser tube (before to mirror 1).

How does the laser beam travel to the working area?

The laser beam generated by the laser source is reflected and guided by 4 optical lenses on to the working area. Therefore the proper adjustment and maintenance of them are crucial.

Optical Alignment

Understanding Reflection.



Light enters at an angle and leaves at an angle.

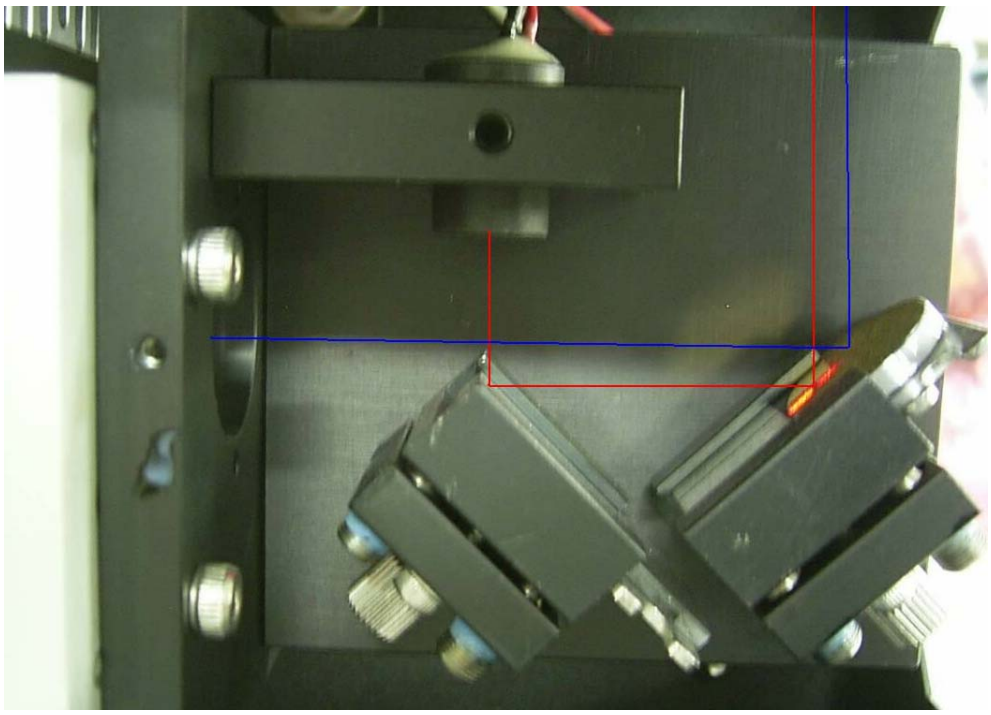
If light enters at an angle X, it will leave at an angle X.

If light enters at an angle Y, it will leave at an angle Y.

Beam Alignment

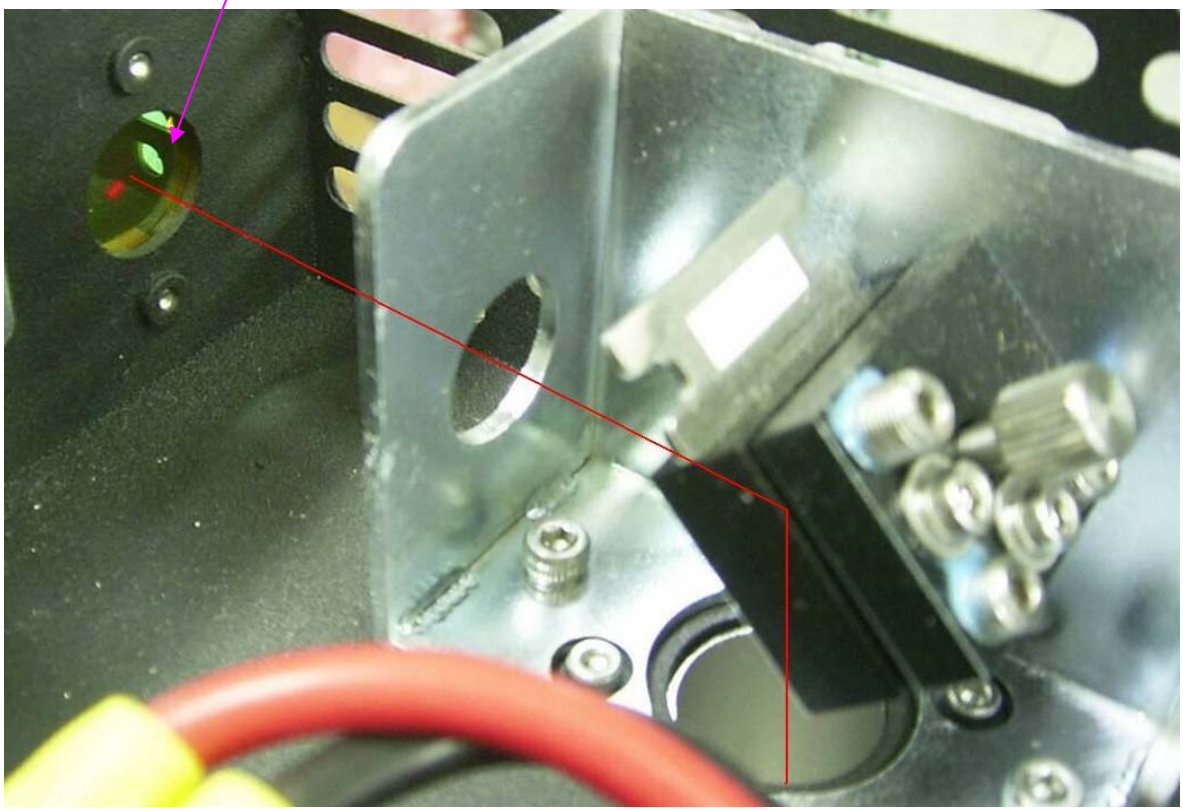
The laser beam is guided to the top of the working area by using 4 reflective mirrors. Therefore, these mirror adjustments are crucial to the proper functioning of the machine. If the laser beam is not aligned correctly, the beam path will be shifted or tilted and both rastering and vectoring quality will be affected.

Step 1: Unscrew the back panel of the machine revealing the laser tube and Mirror 1. Turn on the machine and enter the hidden diagnostic menu by holding down the Enter keys while turning on the machine. Select test laser source. Set laser power to about 5~10%. Remove the protective cover of Mirror 1 and remove Mirror 1. Place a cardboard or paper about 1.5 meters away from the laser source. Fire the laser until you get a small burnt mark on the cardboard. (Determine the laser beam and the red beam are aligned by seeing if the burnt hole is at the exact location of the red beam. If they are not, adjust the red beam diode so that the red beam and the burnt mark are at the same location.) Place Mirror 1 back to the mirror holder.



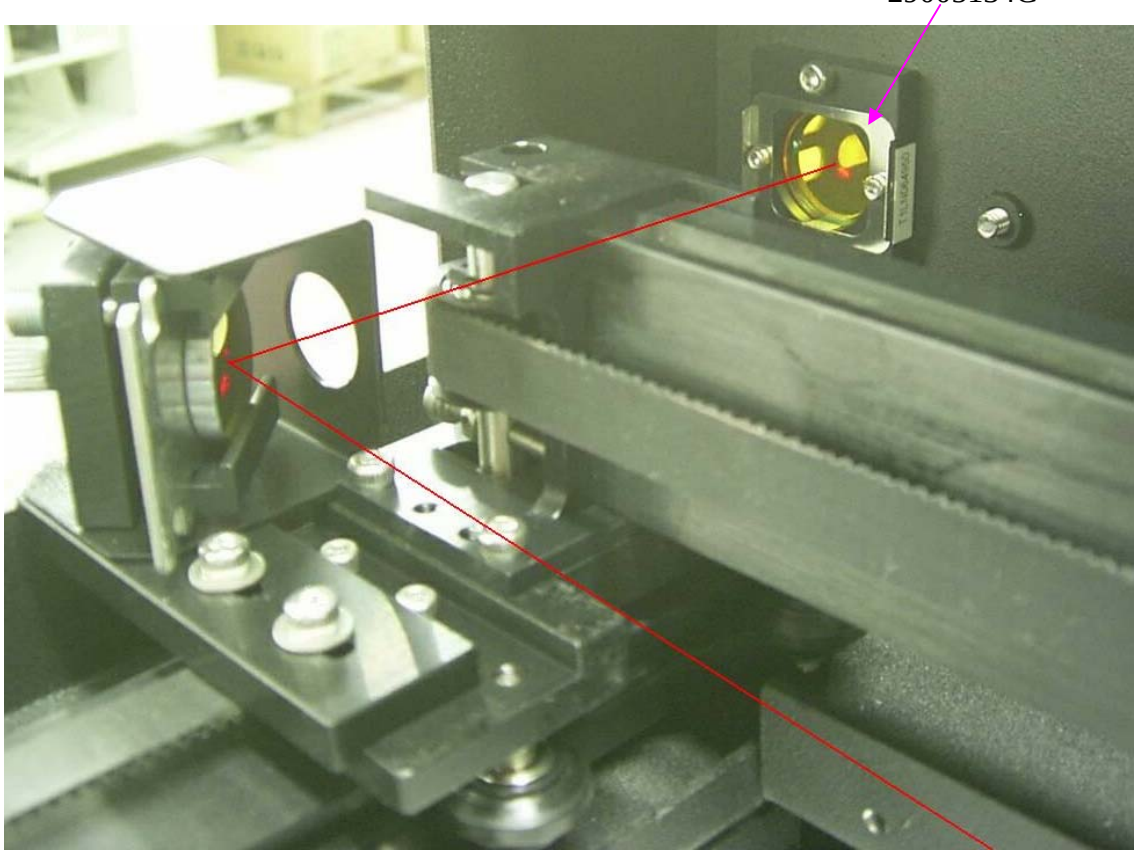
Step 2: Place a piece of masking tape over the tube opening that leads to Mirror 2. Fire the laser and let laser beam pass though dust prevention lens and see if it leaves a burnt mark in the center of the hole. Also check that the burnt mark left by the laser beam is circular in shape. If it is not circular, i.e. oval or other shape, then the laser beam might have hit the inner tubing and get reflected on the way from Mirror 1 to Mirror 2. If this is the case, place a piece of masking tape before the tube entrance, fire laser and adjust Mirror 1 so that laser passes through the center of the opening.

Dust prevention lens
29005134G



Step 3: Place a masking tape on the opening before Mirror 3. Move the rail along the Y-axis so that Mirror 3 is close to Mirror 2 (or dust prevention lens). Fire the laser and see if the laser beam goes through the center of the circle. Then move the rail so that Mirror 3 is to the far end of Mirror 2. Fire the laser and see if it leaves a mark at the same location when it was close to Mirror 2. Adjust Mirror 2 repeatedly so that the burnt mark is at the center and on top of one another when Mirror 3 is both close and far from Mirror 2.

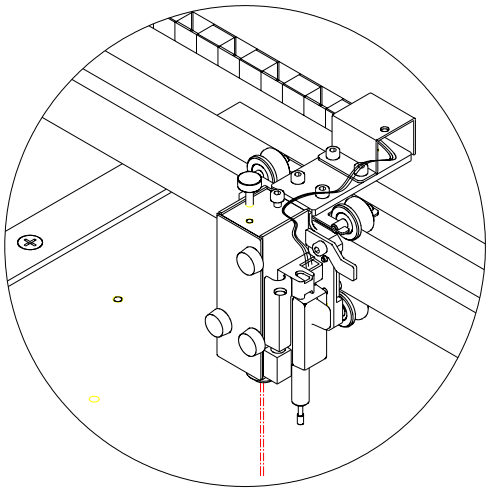
Dust prevention lens
29005134G



Step 4: Place a masking tape on the opening before Mirror 4. Move the pen carriage to the upper left corner of the working area. Fire the laser and adjust Mirror 3 so the laser beam passes through the center of the opening. Move the pen carriage to the upper right end of the working table. Fire the laser and adjust Mirror 3 so the laser beam passes through the center of the opening. The laser should pass through the same spot when the pen carriage is positioned at upper left and upper right. Do the same for the bottom left corner and bottom right corner.

Place a masking tape over the nozzle opening. Position the pen carriage at one of the 4 corners of the working area. Fire the laser and adjust Mirror 1 so the laser passes through the center of the nozzle opening. Repeat for all 4 corners of the working area. After adjusting Mirror 1, you may have to re-adjust Mirror 2 and Mirror 3 as well. (Repeating Steps 2 & 3.)

If the laser beam passes through the center of the nozzle opening at all 4 corners, then the laser beam should have been aligned properly. Cut four 20x20 mm squares at the four corners of the working area to double check that the edges of the square are not slanted

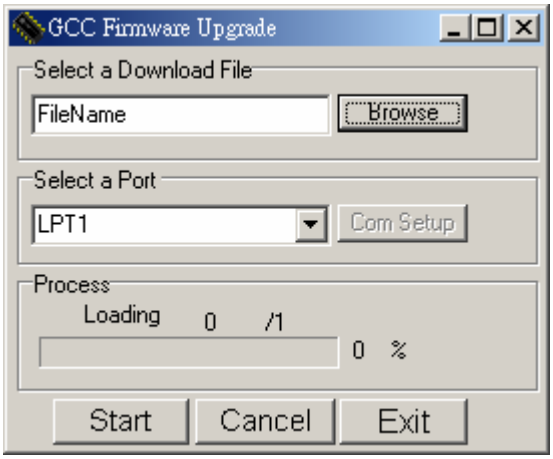


Section 5: Firmware

How to upgrade the firmware?

From www.gccworld.com website, you can logon with a distributor account and download an utility tool called “uploader.exe” With this utility tool you can upgrade the machine to the newest firmware or the firmware of your choice.

1. Turn on the machine while holding down the Auto Focus button will allow you to send the firmware via the parallel port.
2. Run the uploader.exe file.
3. Change the Com Setup to LPT1.
4. Locate the firmware file on your computer.
5. Click on the “Start” button and wait until the machine re-initialize.



Chapter 2. System Diagnostics

Section 1. Hidden Diagnostics

To enter the hidden Diagnostics menu, hold down the Enter button and turn on the machine.

There are 11 tests under the hidden diagnostics menu.

1. LCM Key Test

   LCM Key test will test the functionality of the keys on the keypad.

2. LCM Interface Test

   LCM Interface test will display a series of different shapes on the LCM to allow user to detect any malfunction on the display unit.

3. Parallel port test

   Parallel port test checks that the parallel port is functional by asking the user to send a file through the parallel port.

4. Serial port test

Serial port test checks that the serial port is functional by asking the user to send a file through the serial port. (The serial port is for diagnostic purposes only. Please do not use.)

5. USB test

USB port test checks that the USB port is functional by asking the user to send a file through the USB port.

6. DRAM test

DRAM test checks the functionality of the DRAM.

7. Laser test

Laser test allow you to fire the laser tube at a selected laser power. (This is also the utility that you use to perform beam alignment.)

8. X motor test

X motor test checks that the X motor is functional by asking user to use the keys on the control panel to move the pen carriage along the X axle.

9. Y motor test

Y motor test checks that the Y motor is functional by asking user to use the keys on the control panel to move the pen carriage along the Y axle.

10. Z motor test

Z motor test checks that the Z motor is functional by asking user to use the keys on the control panel to move the platform up and down the Z axle.

11. Hard Stop test

Hard Stop test checks that the X and Y sensors are functional by asking the user to manually move the pen carriage towards the X and Y sensor flags

Chapter 3 Preventive Maintenance

1. Cleaning of optical lenses

In order to prolong the usability of the optical lenses, it is recommended that we clean the optical lenses once every week or as required. Since these lenses are coated with a chemical substance that protects the lens itself from the intensive laser power, we have to take great care when cleaning the lenses so that we do not scratch or peel off the chemical substance.
The following are three consumable items that you can purchase to clean the mirrors and lenses.

1. Cotton buds 26500193G

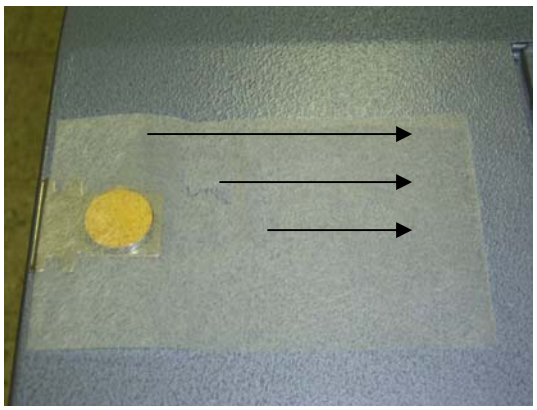
2. Lens cleaning paper 26500192G

3. Lens cleaning solution 26500191G

Cleaning the optical mirrors:

Release the screws holding the mirrors in place. Place a piece of lens cleaning paper and add a drop of lens cleaning solution.

Slowly pull the wetted paper from one side to another.

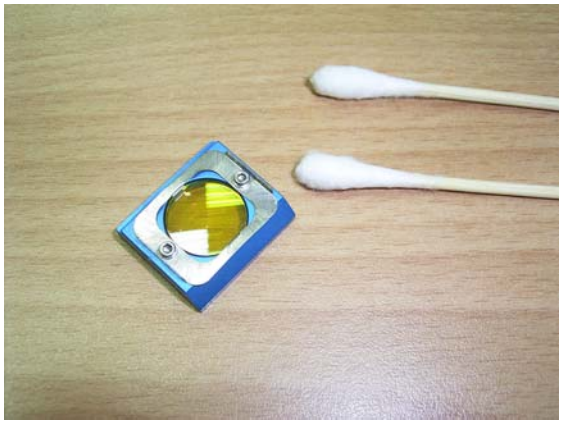


Make sure the lens is cleaned, dried and does not have any debris on the surface.

Cleaning the focusing lens:

First remove the lens from the pen carriage. To remove the focusing lens, release the three screws on the pen carriage as shown below and locate the focusing lens in the pen carriage.

Apply a drop or two of the cleaning solution on a cotton bud and lightly clean the focusing lens. Use a second cotton bud to dry or air dry the lens.



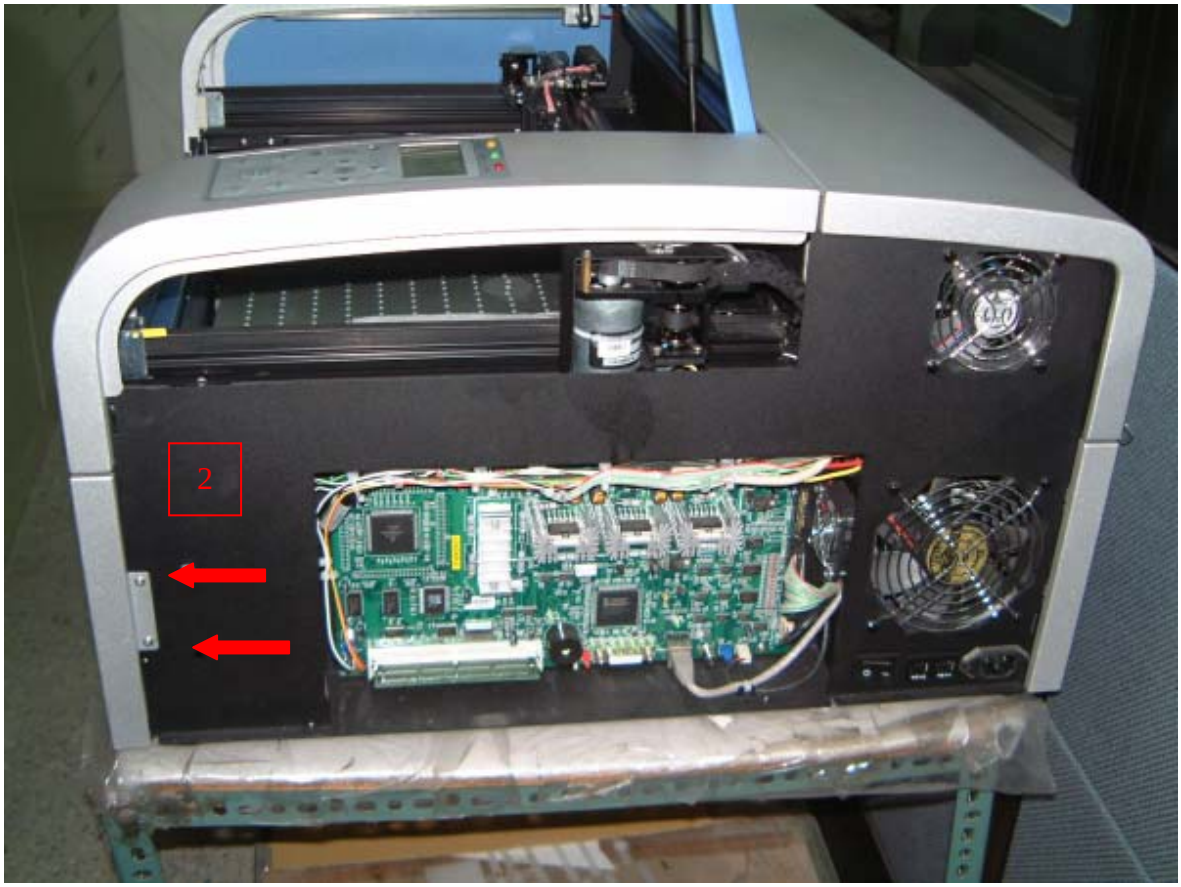
Make sure the lens is clean and dried before putting it back in the pen carriage unit.

Parts Replacement:

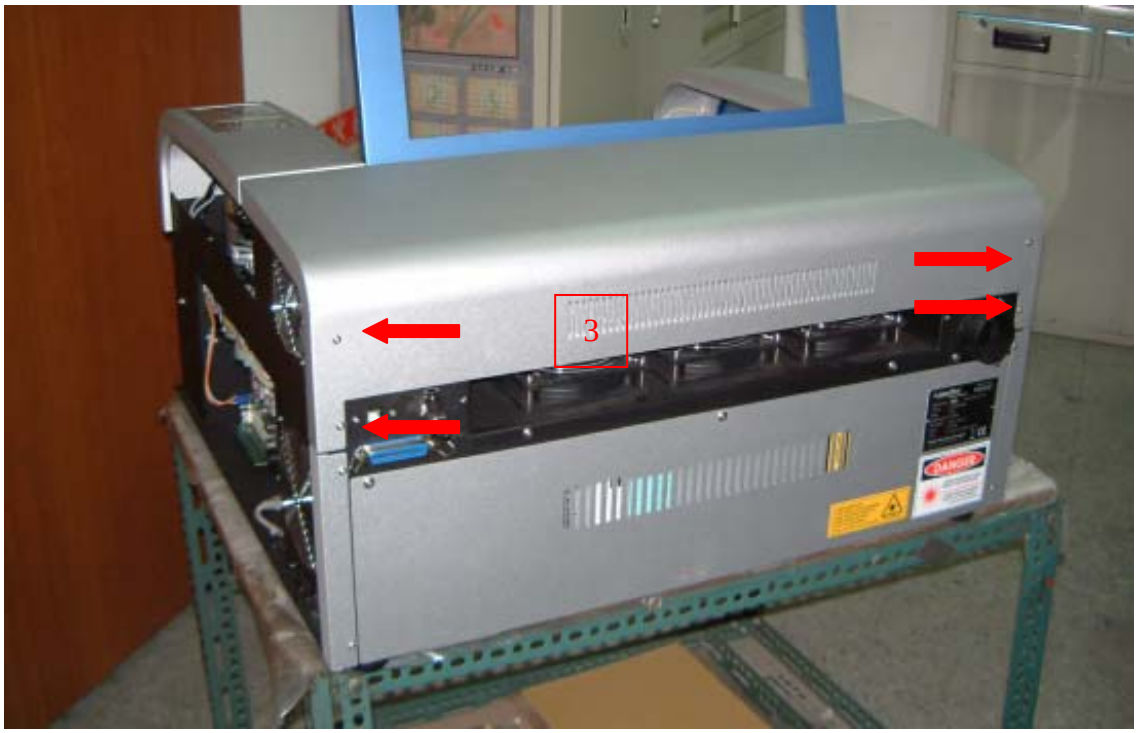
1. Changing the X motor

1. Dismount two screw on the bottom of side panel (see red arrows below)

2. Dismount two screws of right-front cover(M3 *2)

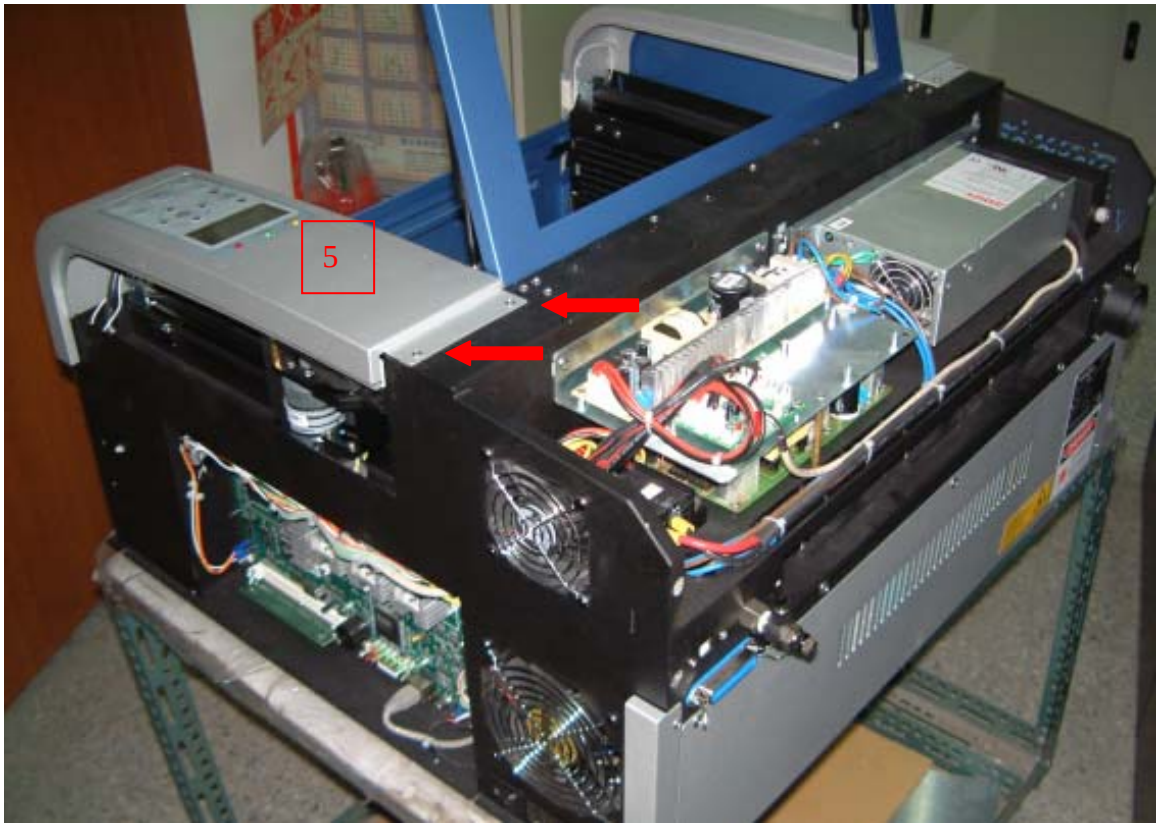


3. Dismount 4 screws of back cover(M3 *4)



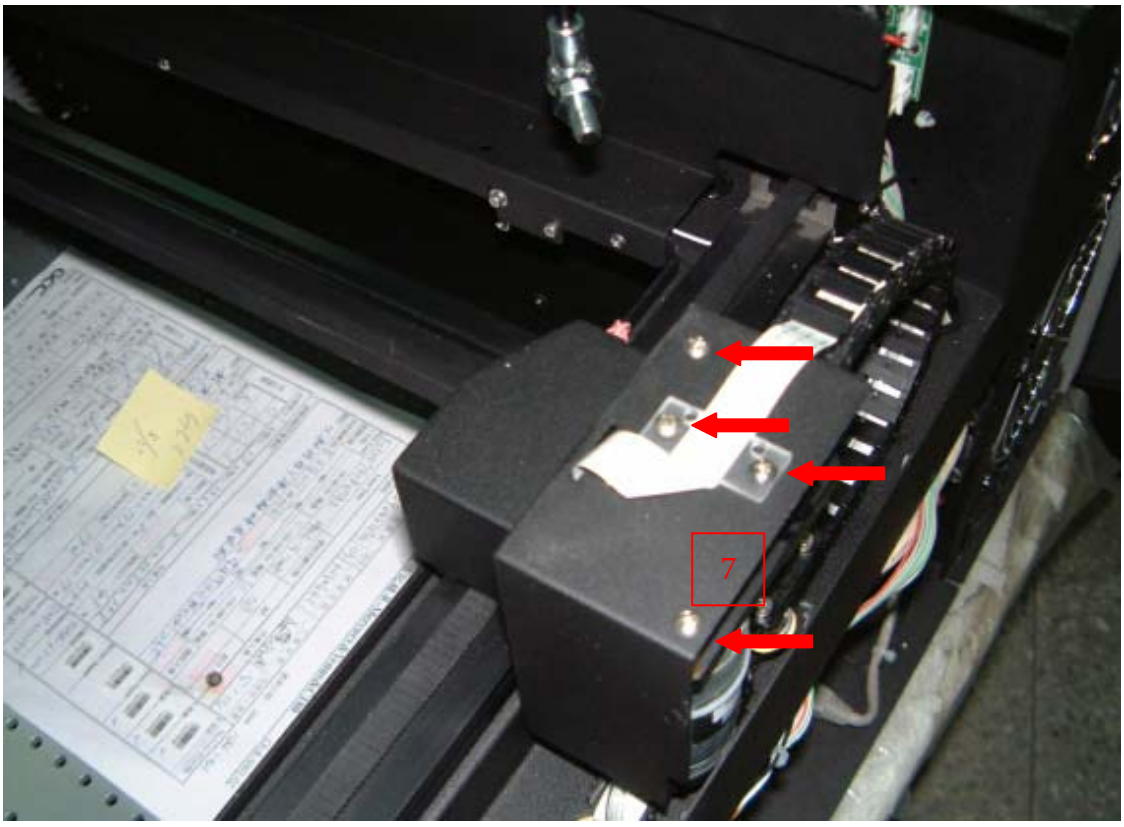
4. Dismount right window cylinder

5. Dismount 4 screws of right top cover (where the control panel locates)

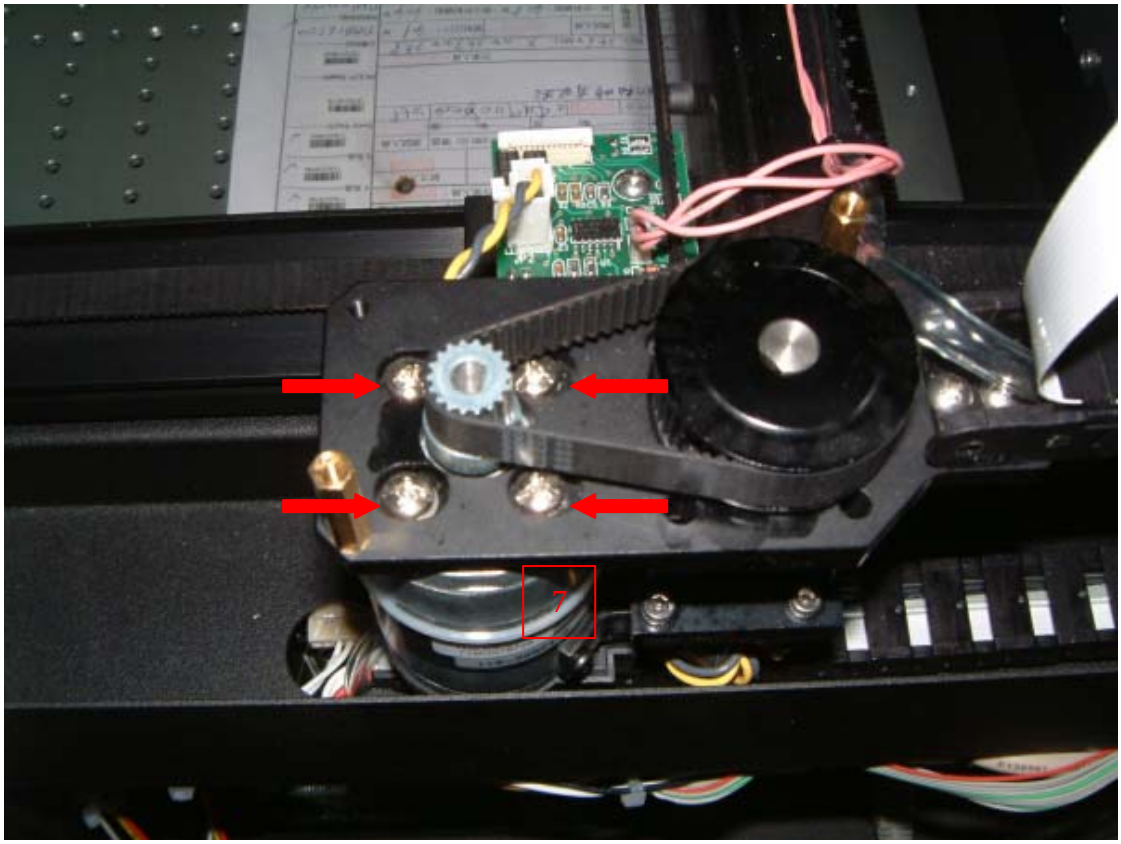


6. Hanging the right top cover to the right side.

7. Dismount 4 screws of x motor cover(M3 *4)

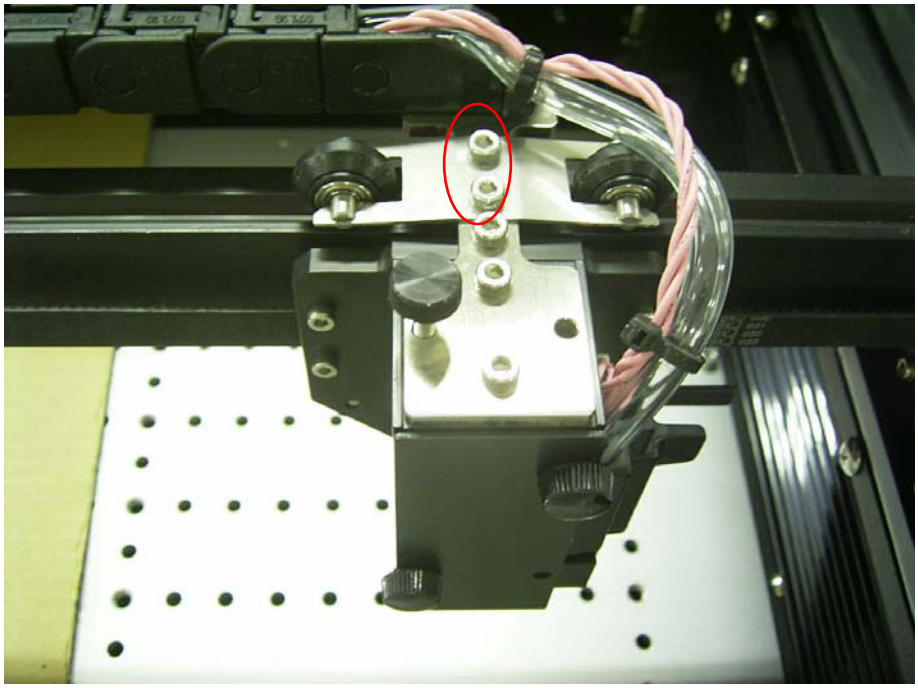


7-1. Dismount 4 screws of x motor(M4 *4)



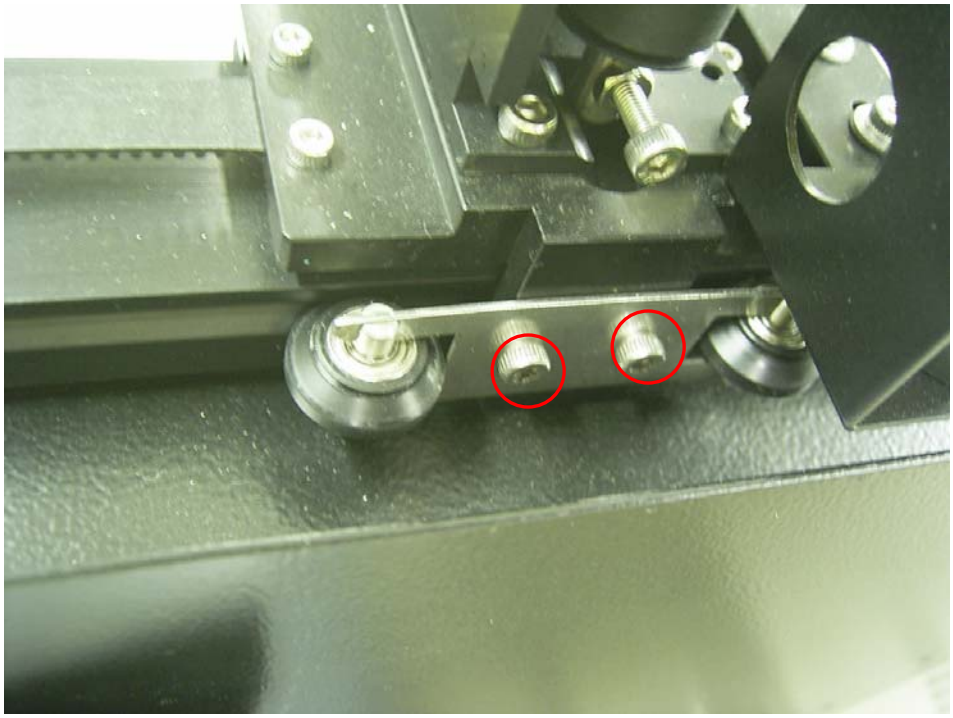
2. Changing the X rollers

The estimated life of a set of rollers is about 500 working hours. To change rollers, simply remove the hex bolts using a size 3 Allen key as shown below.

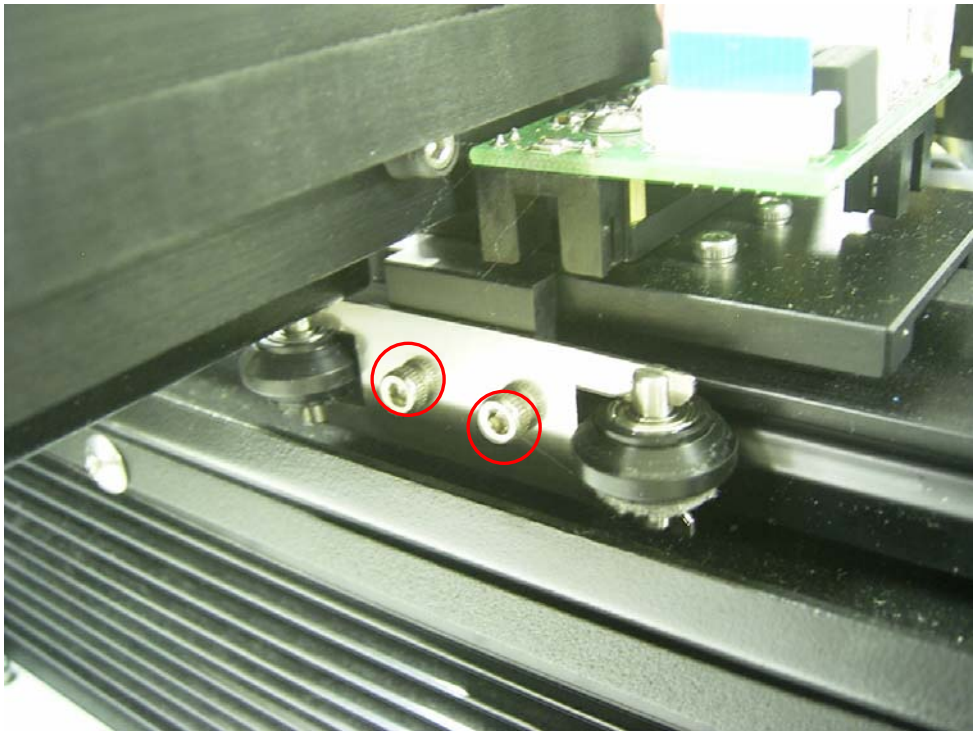


3. Changing the Y rollers.

Remove the following screws to completely remove the Y rollers.



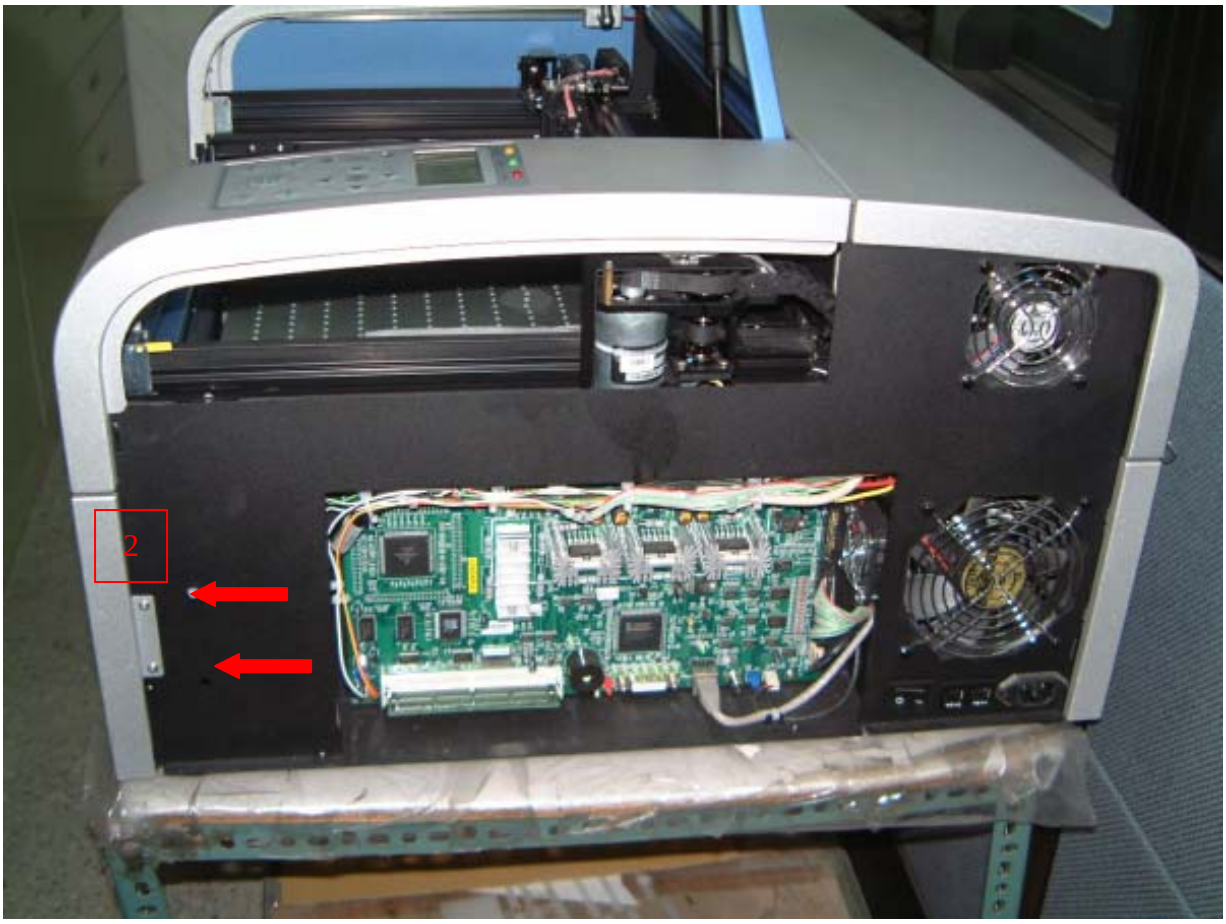
Unscrew the following screws to remove the side rollers.



4. Changing the Y motor & Y motor belt.

1. Dismount two screws on the bottom of side panel (see red arrows below)

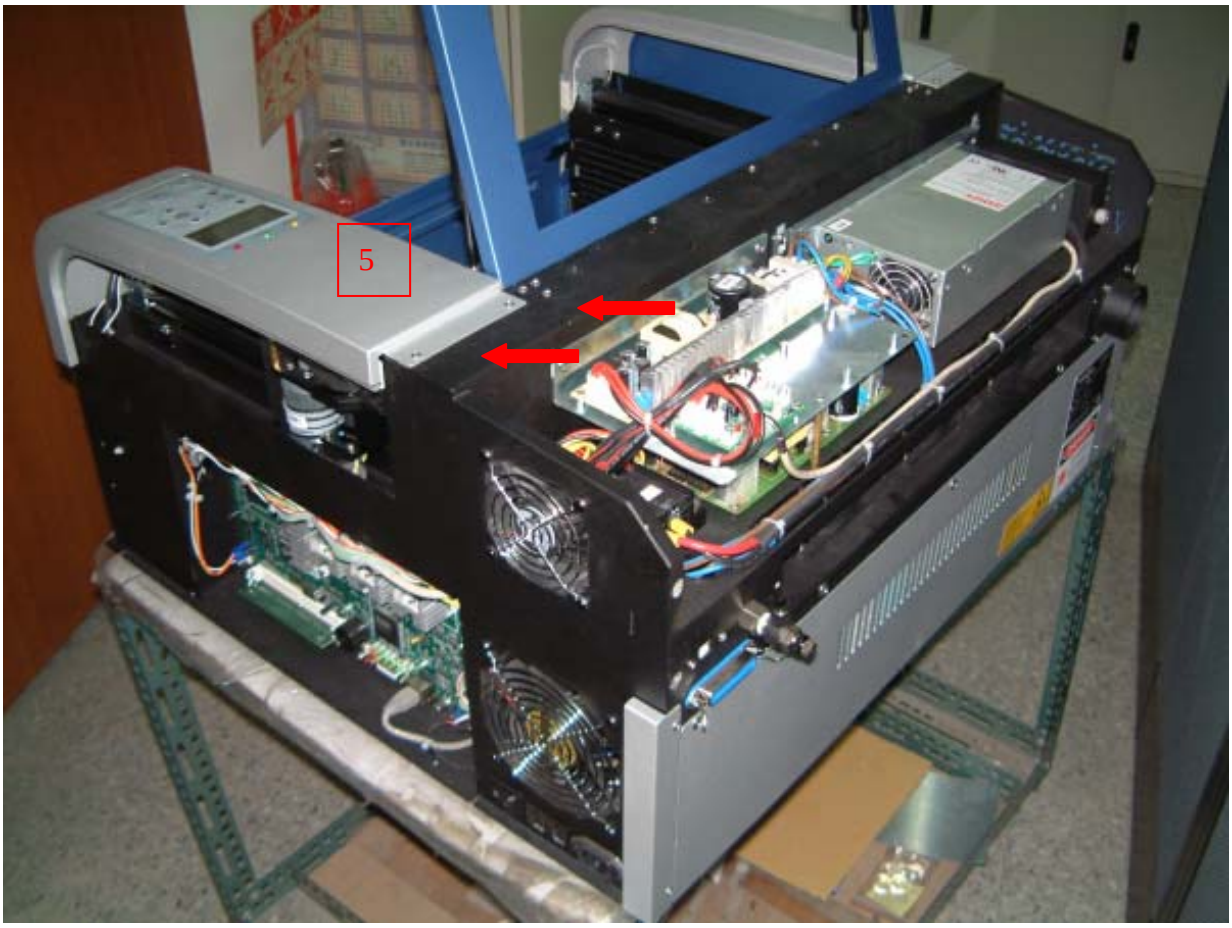
2. Dismount two screws of right-front cover(M3 *2)



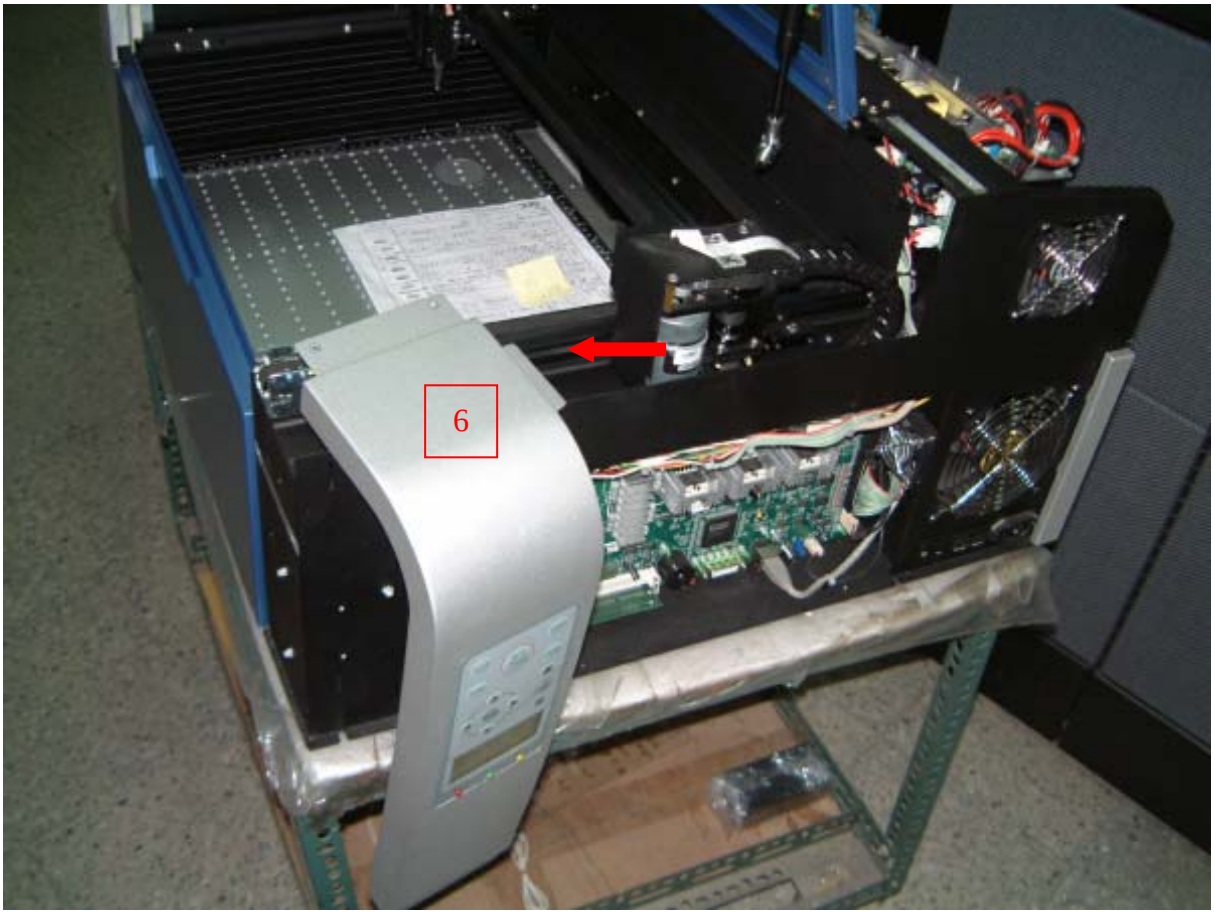
3. Dismount 4 screws of back cover(M3 *4)

4. Dismount right window cylinder

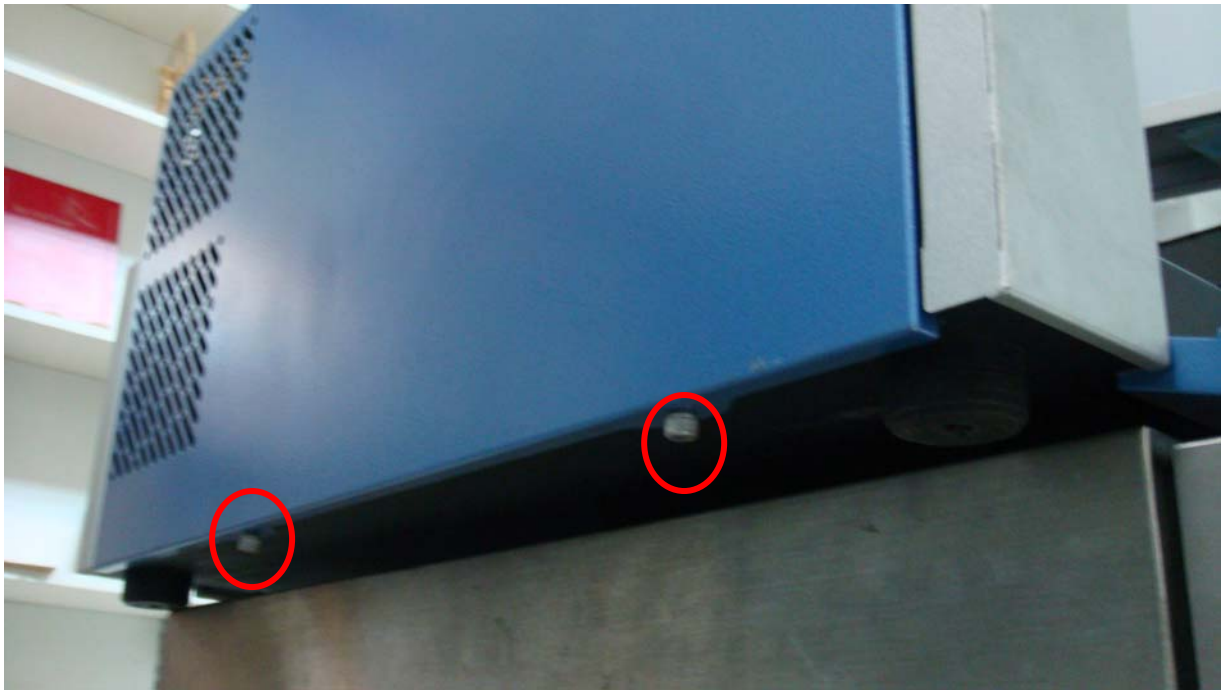
5. Dismount 4 screws of right top cover (where the control panel locates)



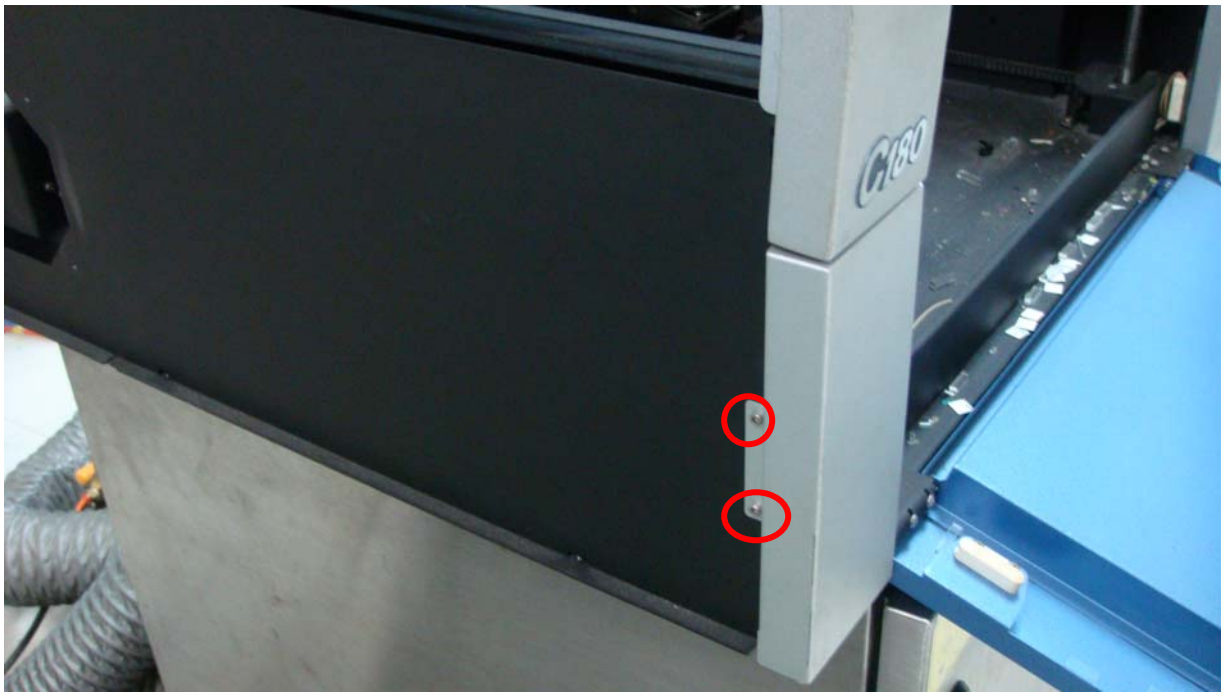
6. Hanging the right top cover to the right side.



7. Remove left side cover: first remove the two screws on the bottom (red circles)



8. Then remove the left two screws

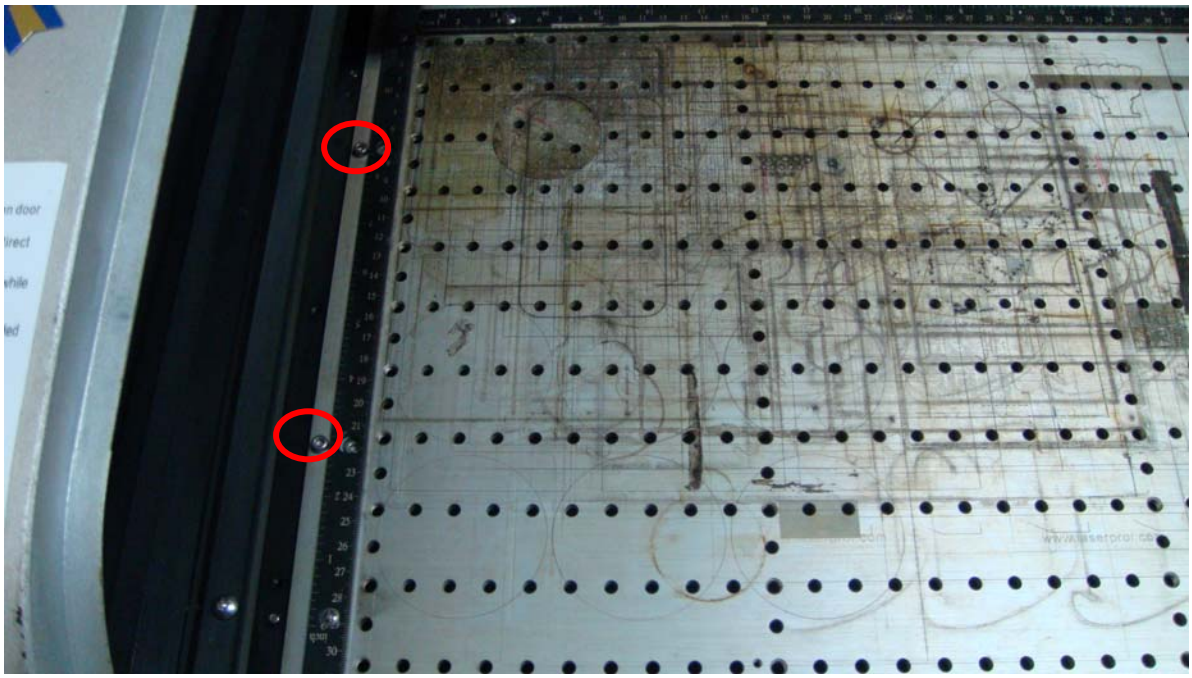


9. Remove left-front two screws

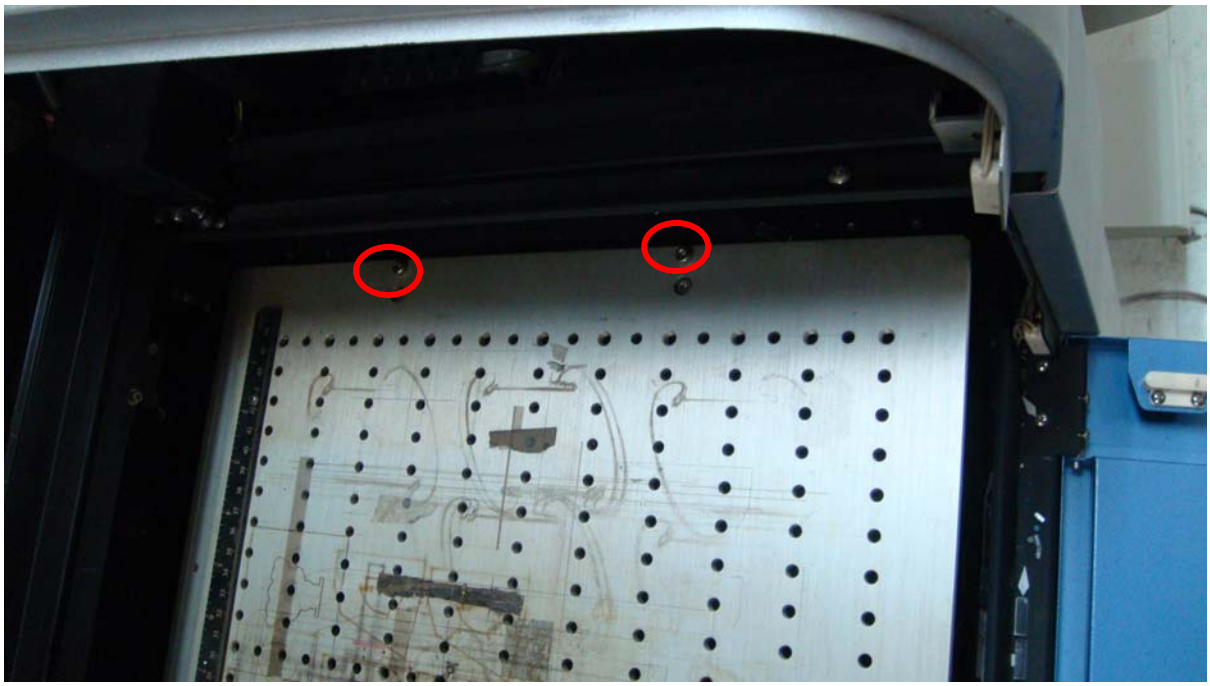
10. Then remove the back panel. There are three screws on front

11. for back panel. There are three screws on top (from back side)

12. Then remove the working table. First remove two left screws



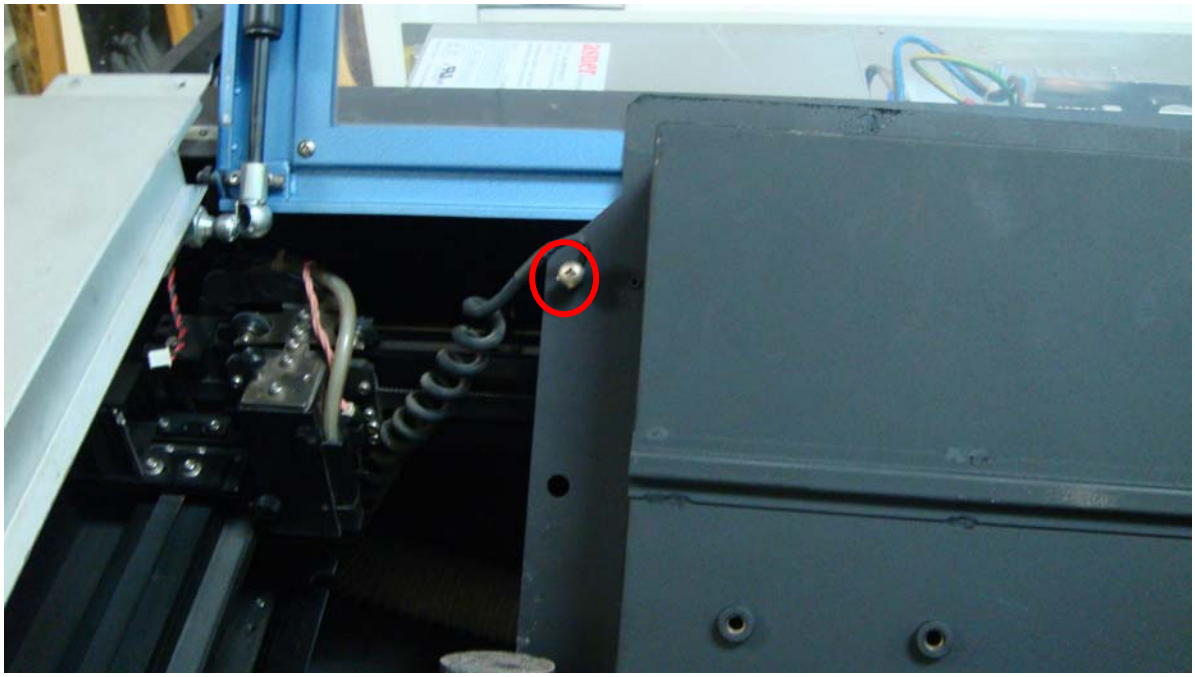
13. Then remove two right screws



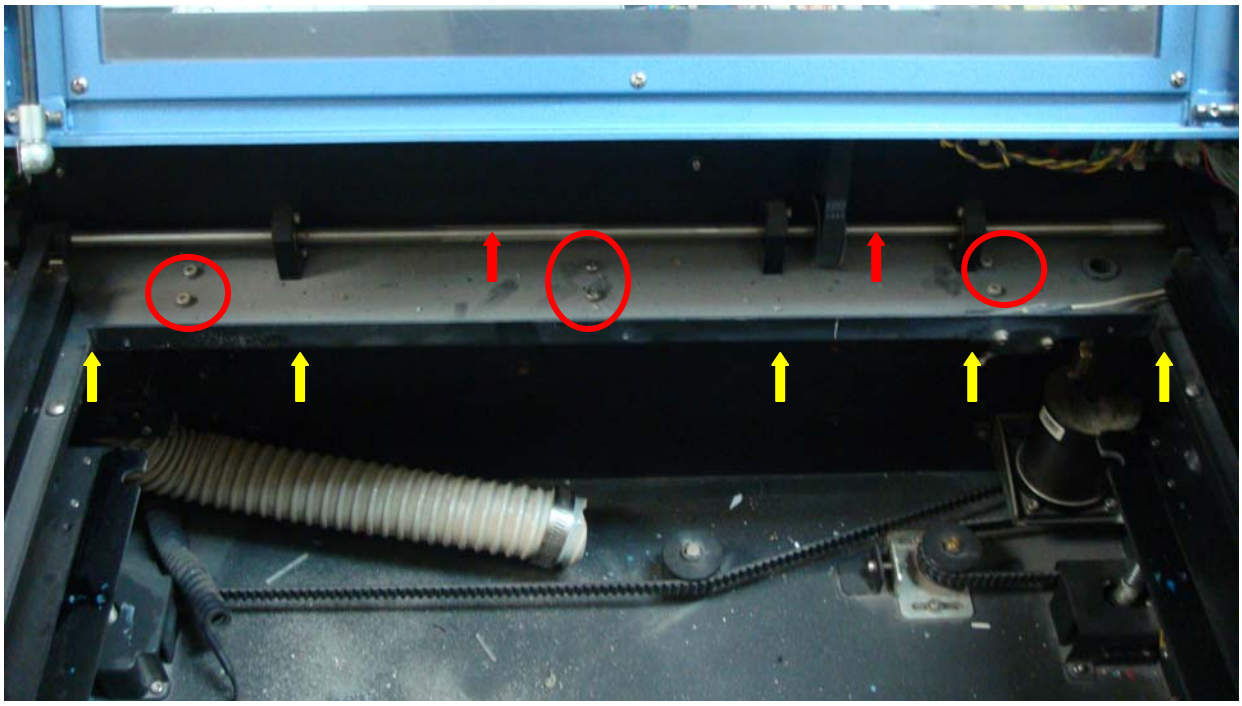
14. Then remove the bottom tray. First remove four screws

15. Then remove the dust pipe by removing screw

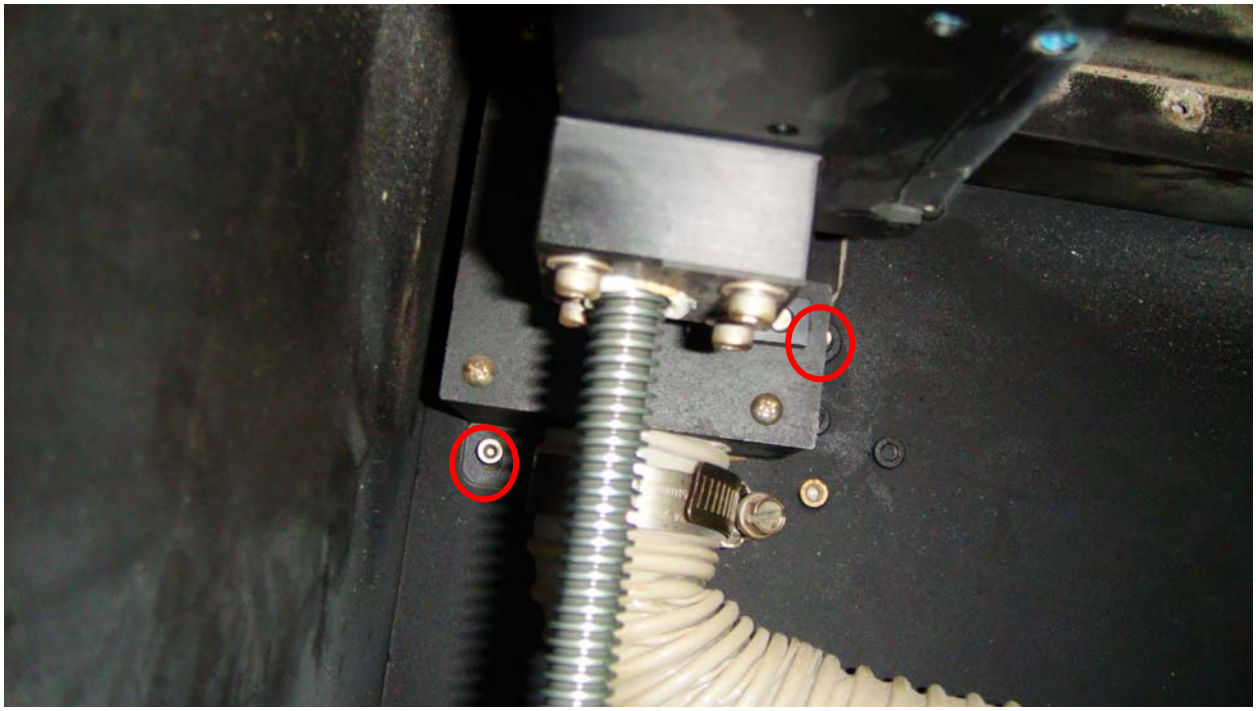
16. Then remove the ground cable screws. The bottom tray can be removed now.



17. To remove the y axis synchronizer bar (the red arrows pointed) need to remove the screws of synchronizer bar holders and they are at the bottom (the yellow arrow pointed). The screws of synchronizer bar holders cannot be reached until the dust guide pipe is removed. The screws of dust guide pipe have 6 screws on top (the red circles)



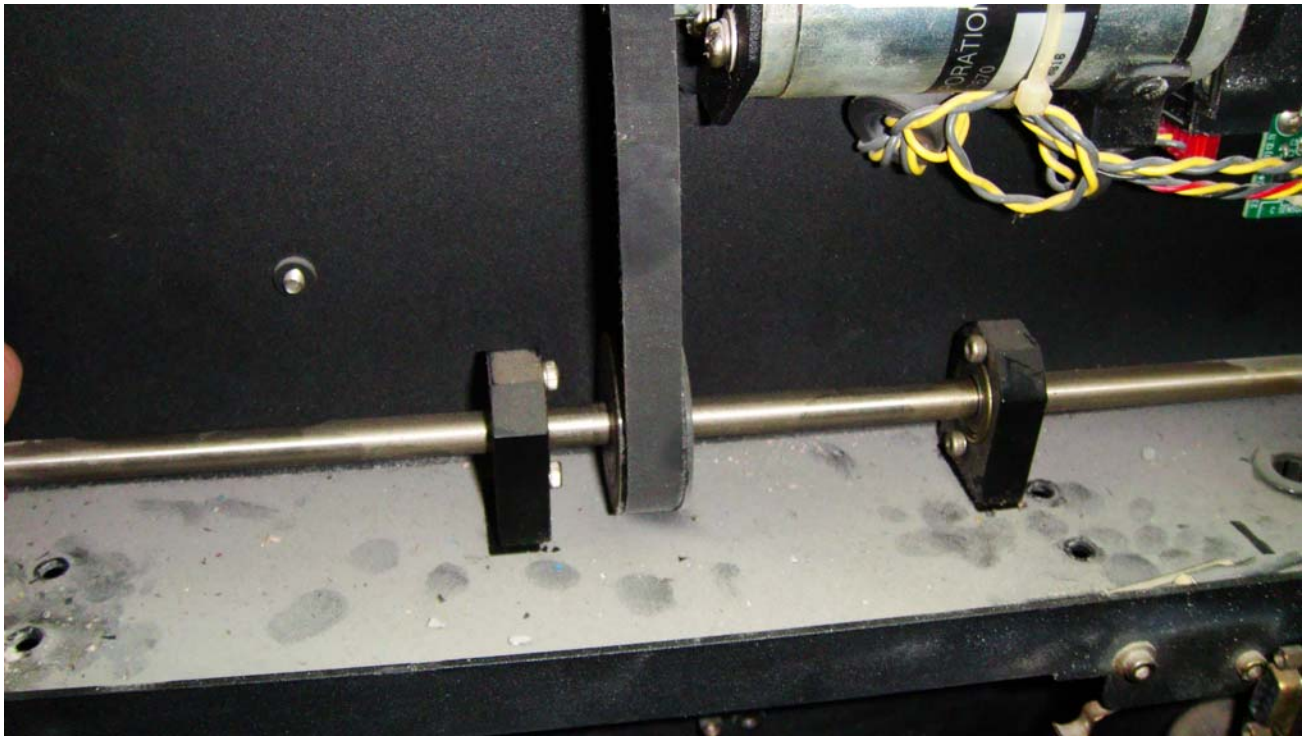
18. The dust guide pipe screws are two more screws on bottom (red circles). It is not easy to take photo for both screws together.



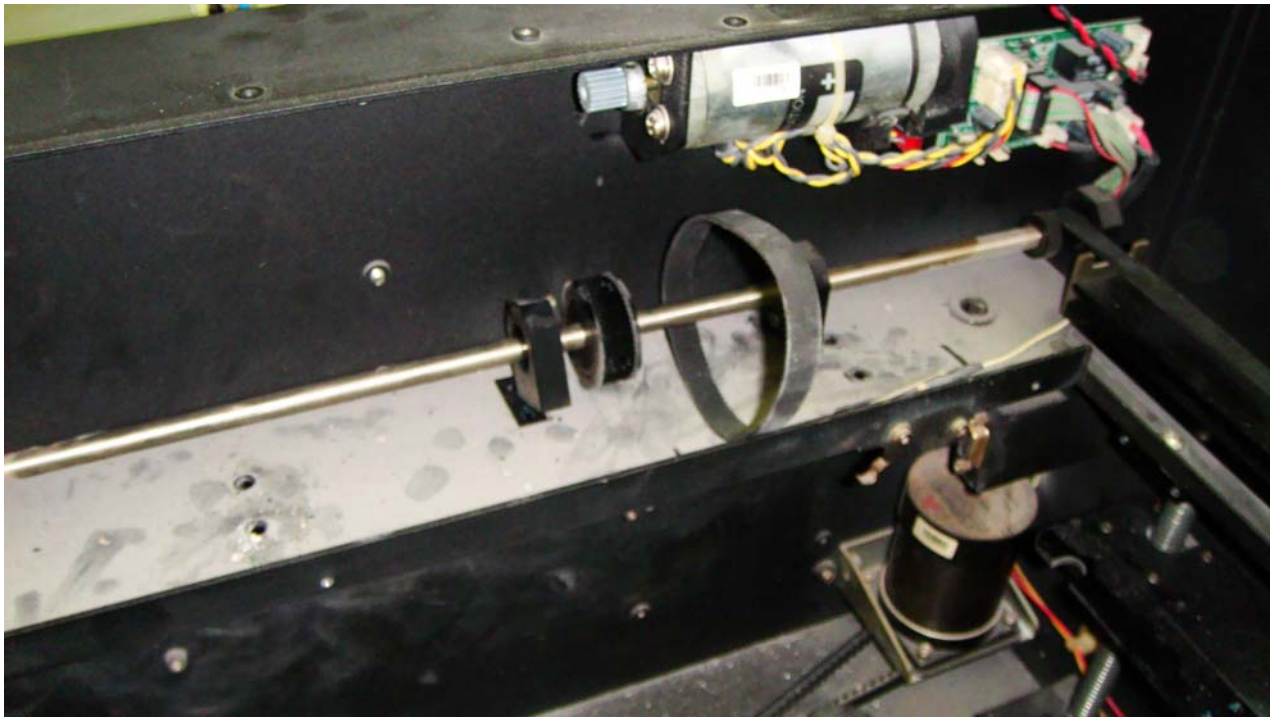
19. The screws of synchronizer bar holders (below picture only show four screws. They are 10 screws in total)

20, To move up the y axis synchronizer bar, the y axis belt need to be remove or loosen. To remove the left y axis belt will be easier by loosen the two screws of belt retainer (the red circle).

21. Now the whole y axis synchronizer bar can be move up a little. So the y motor belt is loosen also and can be removed.



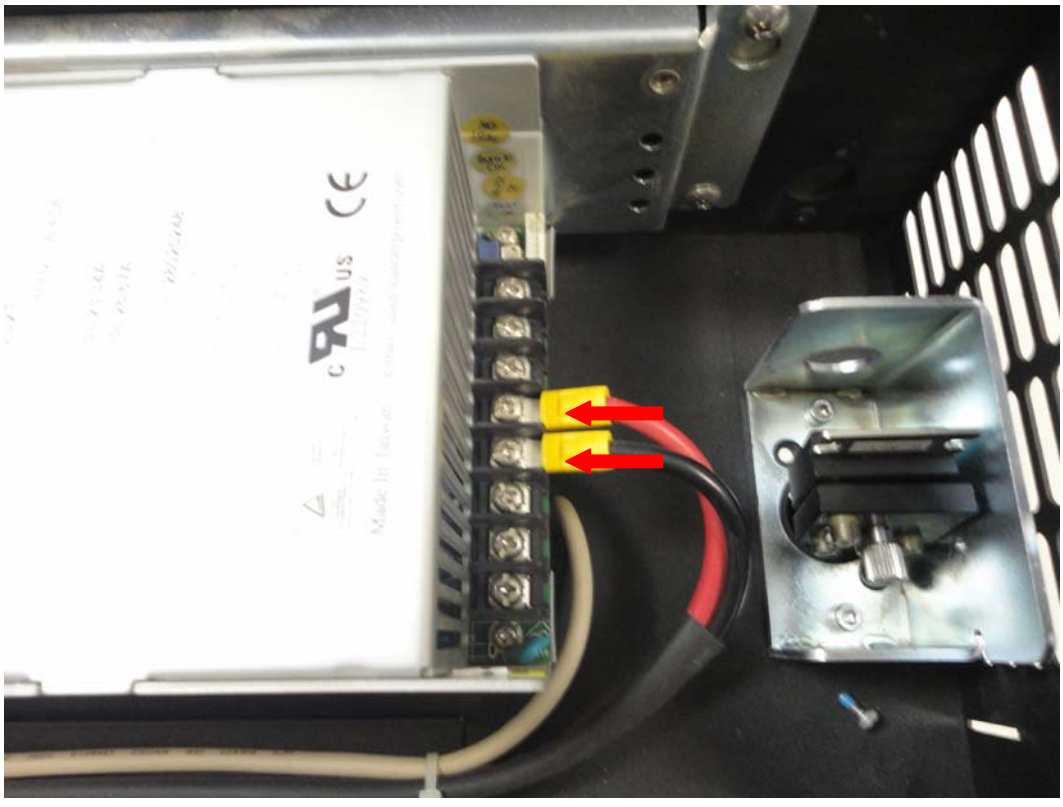
22. The y motor belt can move cross the synchronizer bar and holders. The y motor belt can be removed or changed new one.



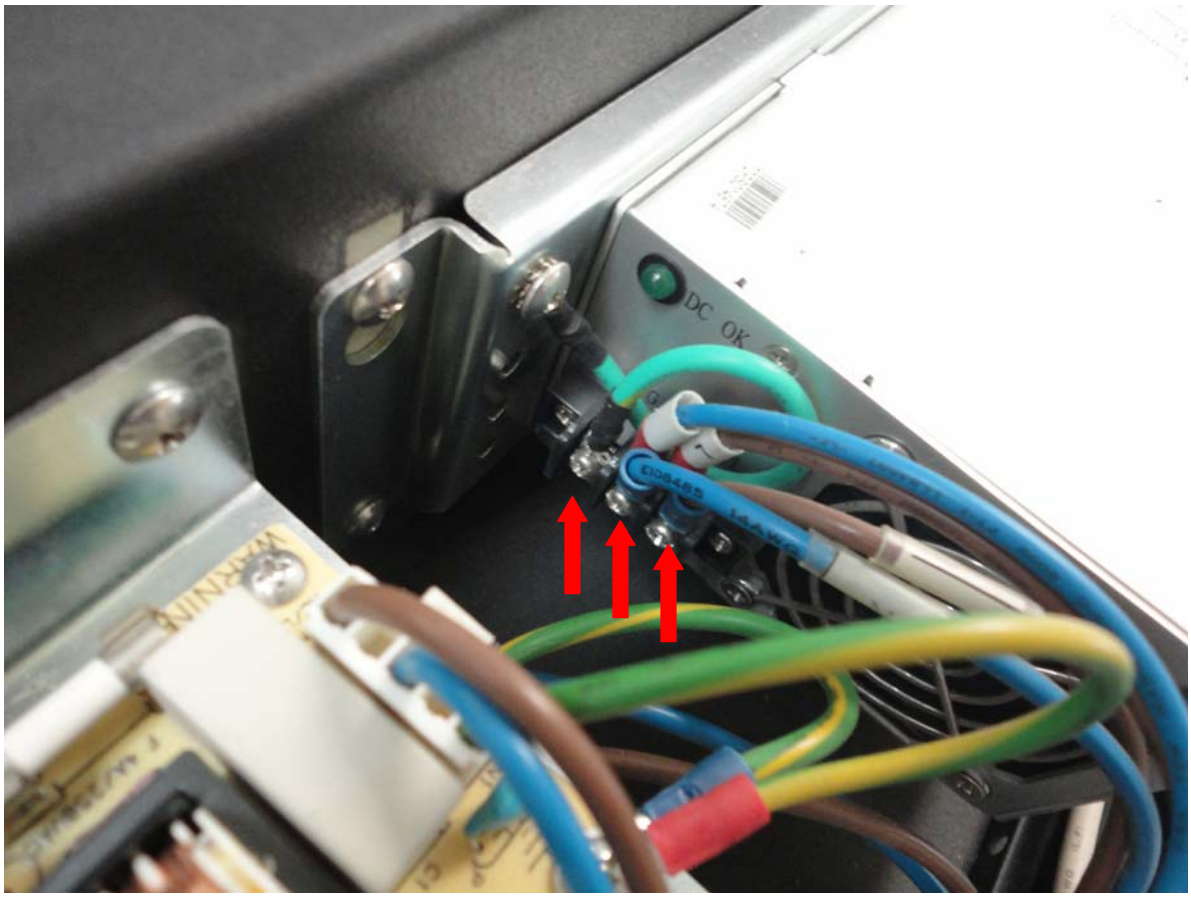
5. Changing power supply.

1. Dismount four screws on the top back panel (see red arrows below)

2. Loosen the screws and remove the two power supply AC side cable (red arrow)



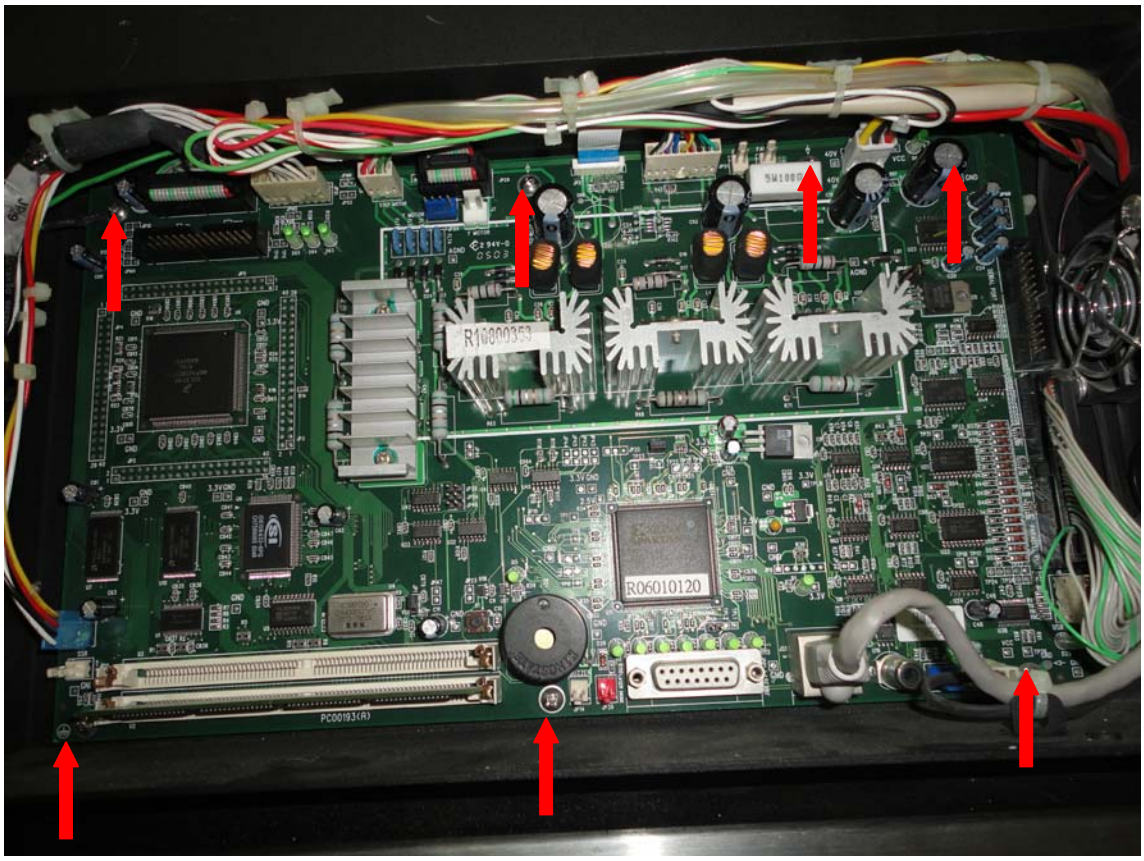
3. Remove the DC side 3 cables (see red screws)



6. Changing main board

1. Dismount two screws on the bottom of side panel (see red arrows below)

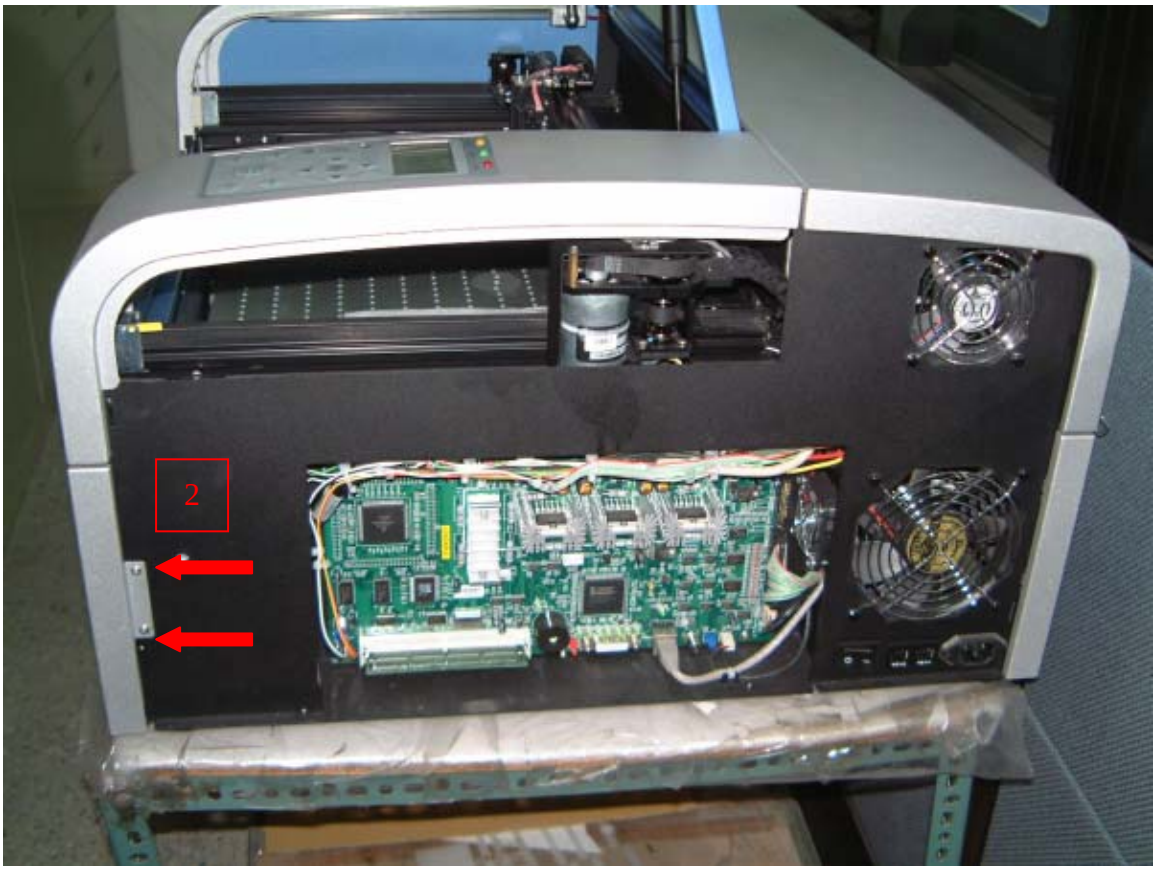
2. Dismount 7 screws (see red arrows below)
and remove all cables connecting to main board and can change new main board.



7. Changing control panel

1. Dismount two screws on the bottom of side panel (see red arrows below)

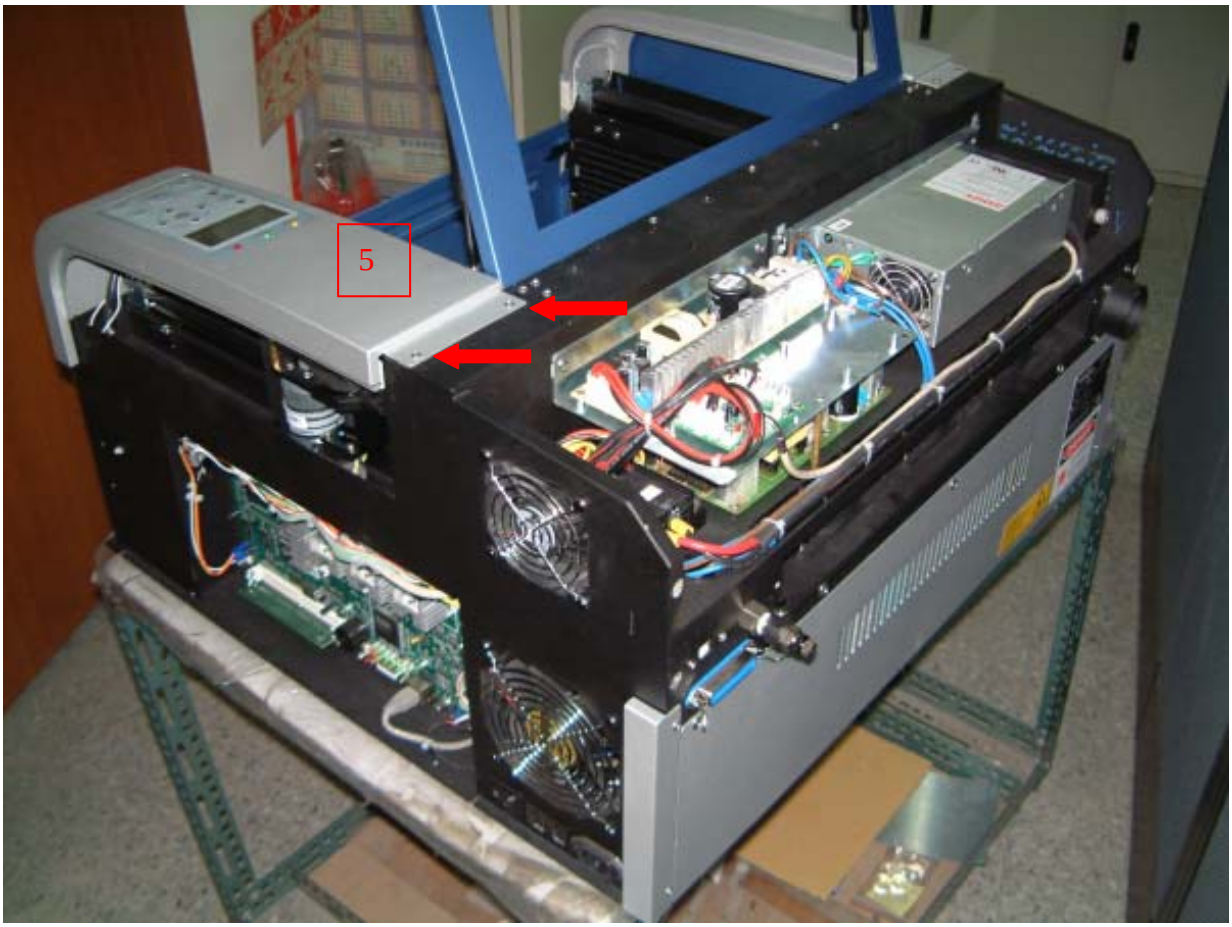
2. Dismount two screws of right-front cover(M3 *2)



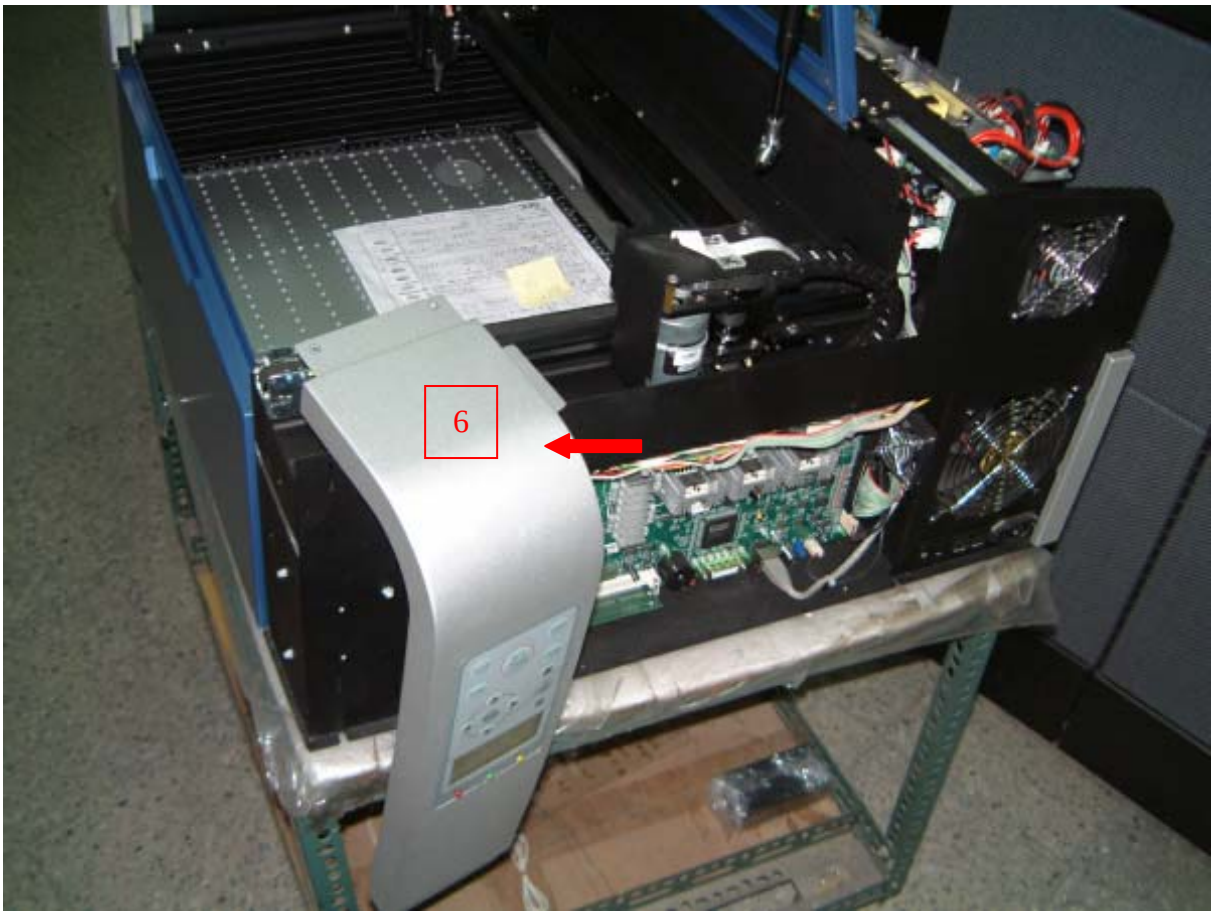
3. Dismount 4 screws of back cover(M3 *4)

4. Dismount right window cylinder

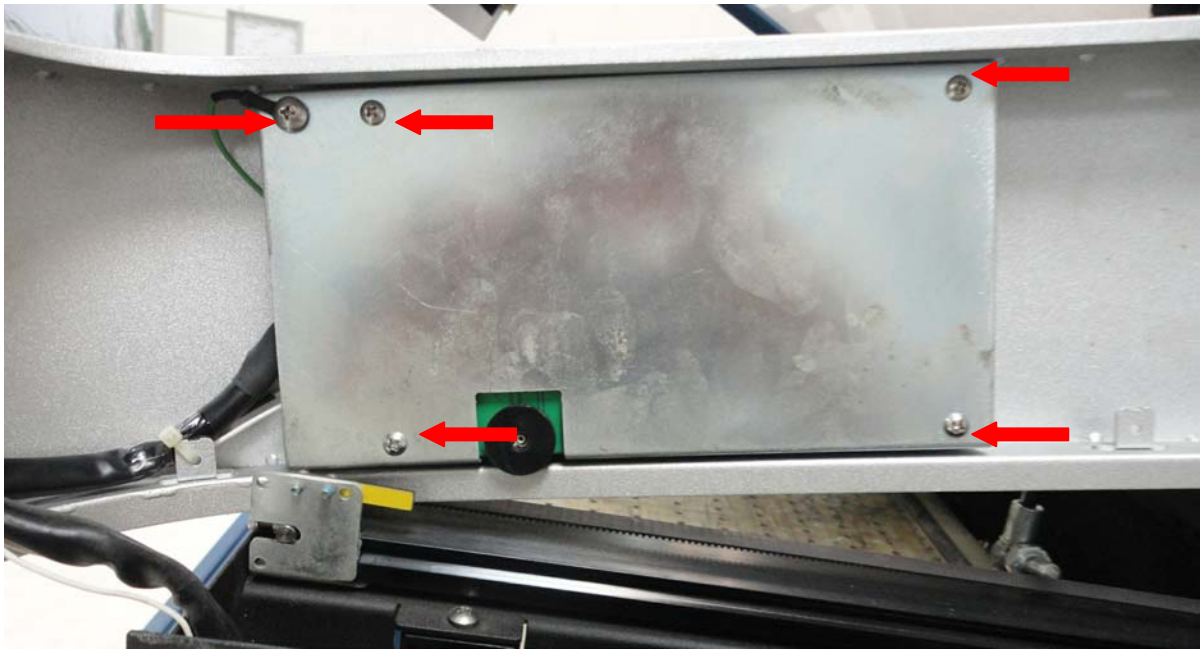
5. Dismount 4 screws of right top cover (where the control panel locates)



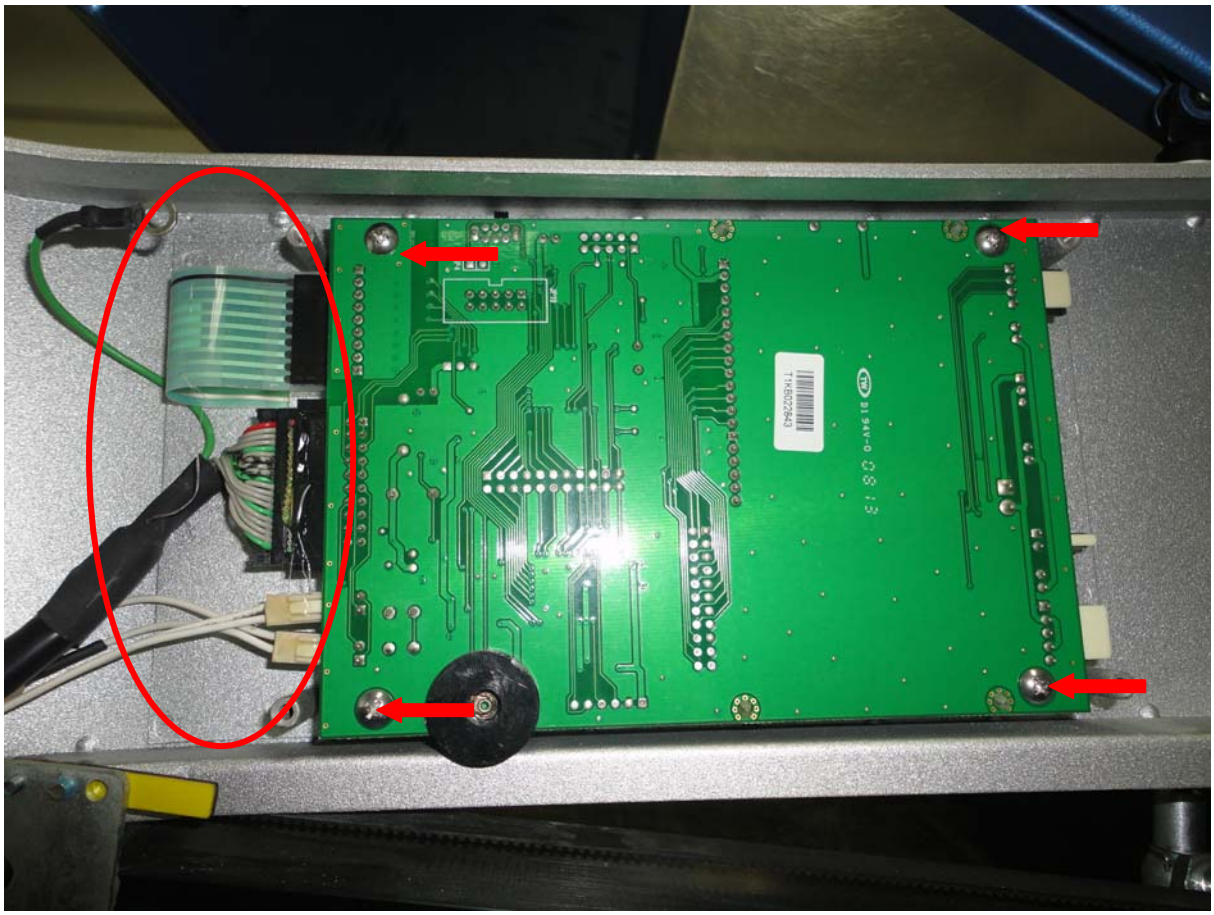
6. Hanging the right top cover to the right side.



7. Dismount 5 screws for cover of control panel and ground cable screw



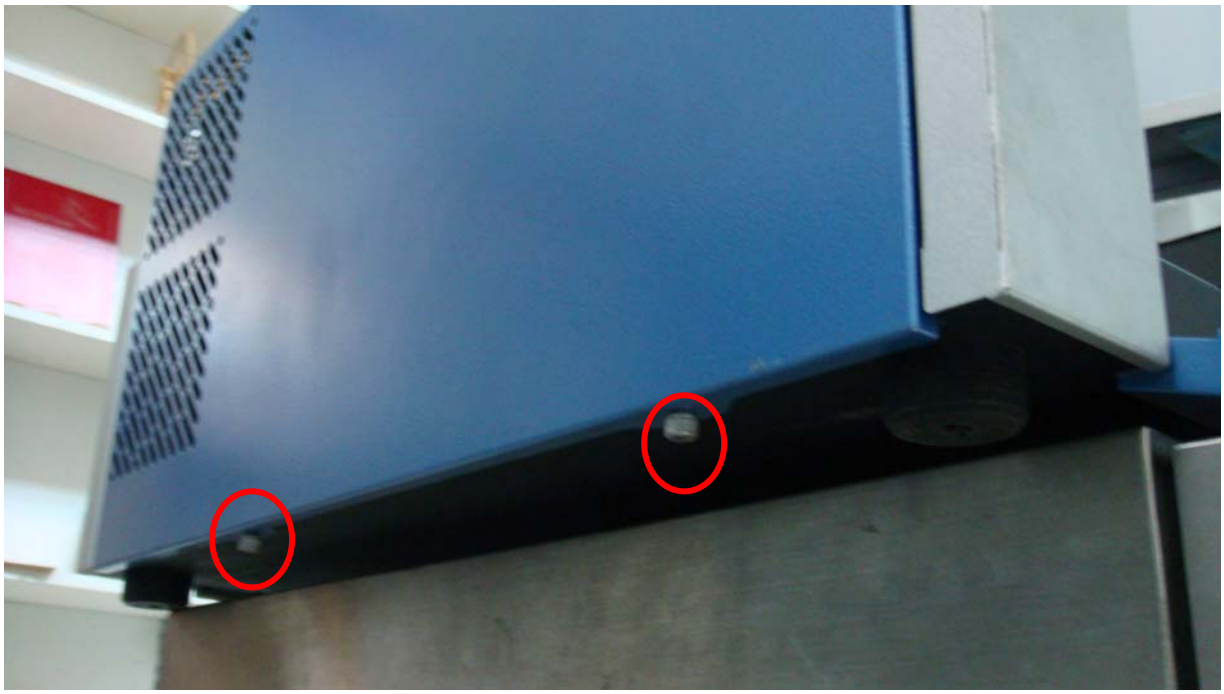
8. After control panel cover is removed, there are 4 screws needs to be removed and the four cables (in the red circle). Then the control panel can be removed and changed new one.



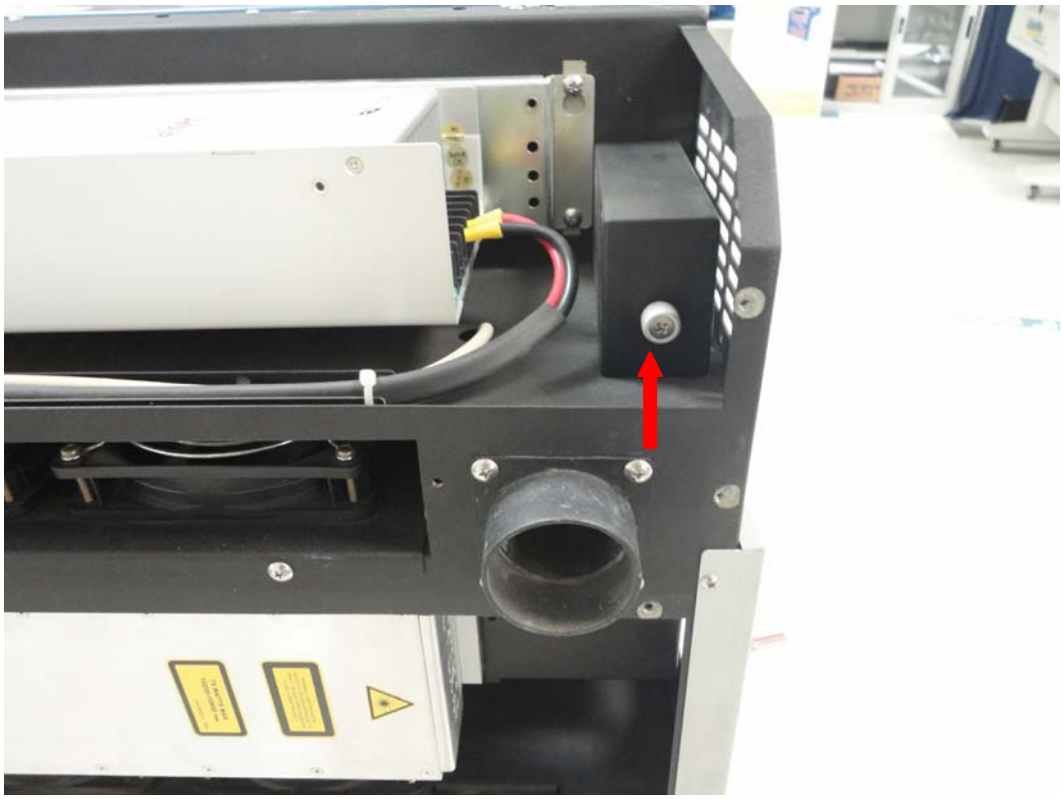
8. Changing laser tube & cooling fans

1. Dismount 7 screws of back covers (back top and back bottom cover)

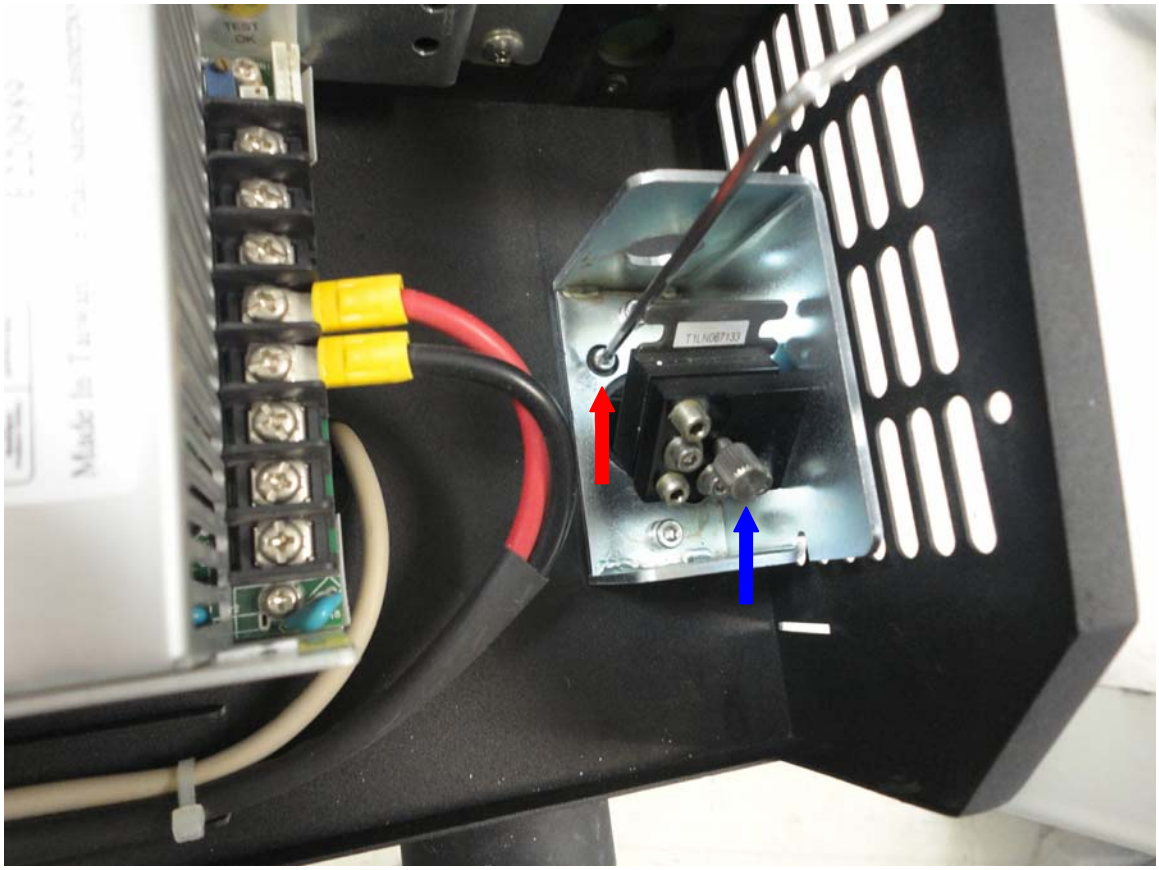
2. Remove left side cover: first remove the two screws on the bottom (red circles)



3. Then loosen screw and remove for the second mirror dust cover

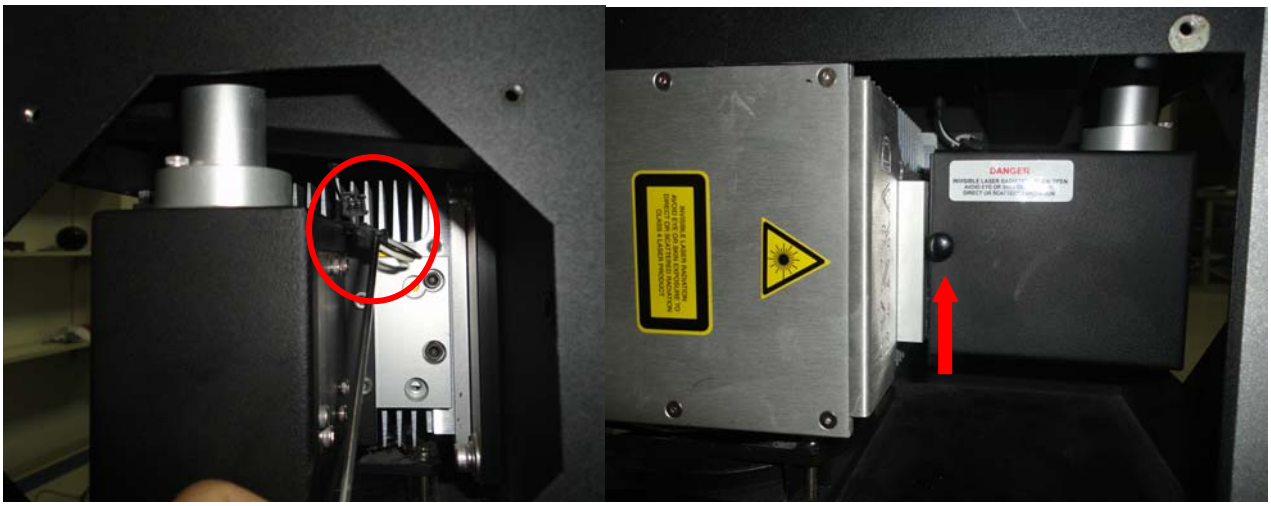


4. There are two screws for dust prevention pipe. The top screw(red arrow) can be reached easily, but the bottom screw (blue arrow) will be blocked by mirror 2 bracket

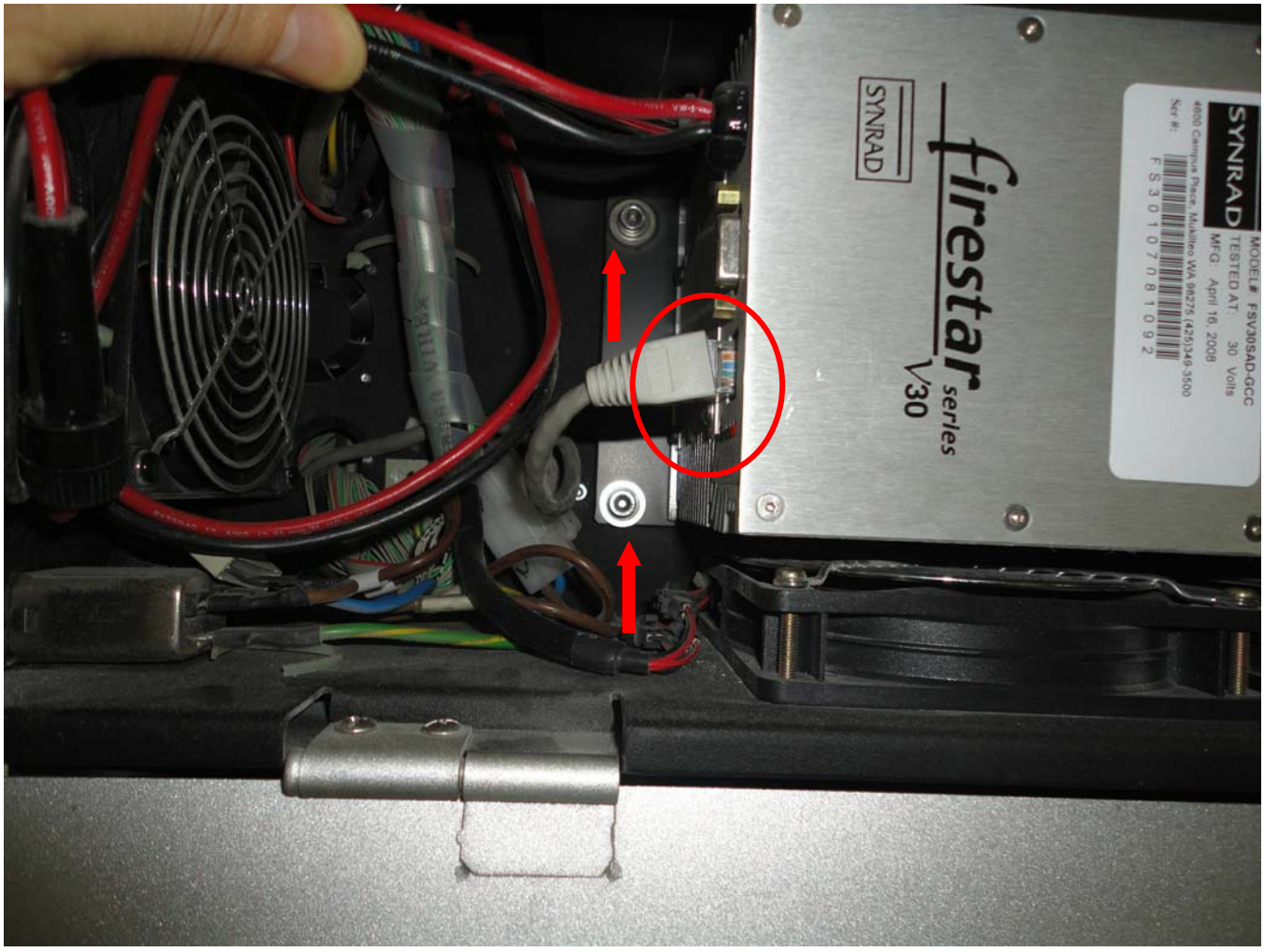


5. The mirror 2 bracket has two screws. Loosen one screw and remove one screw can let mirror 2 bracket rotate some angle and let the Allen key reach the bottom screw of mirror 2 bracket (the blue arrow)

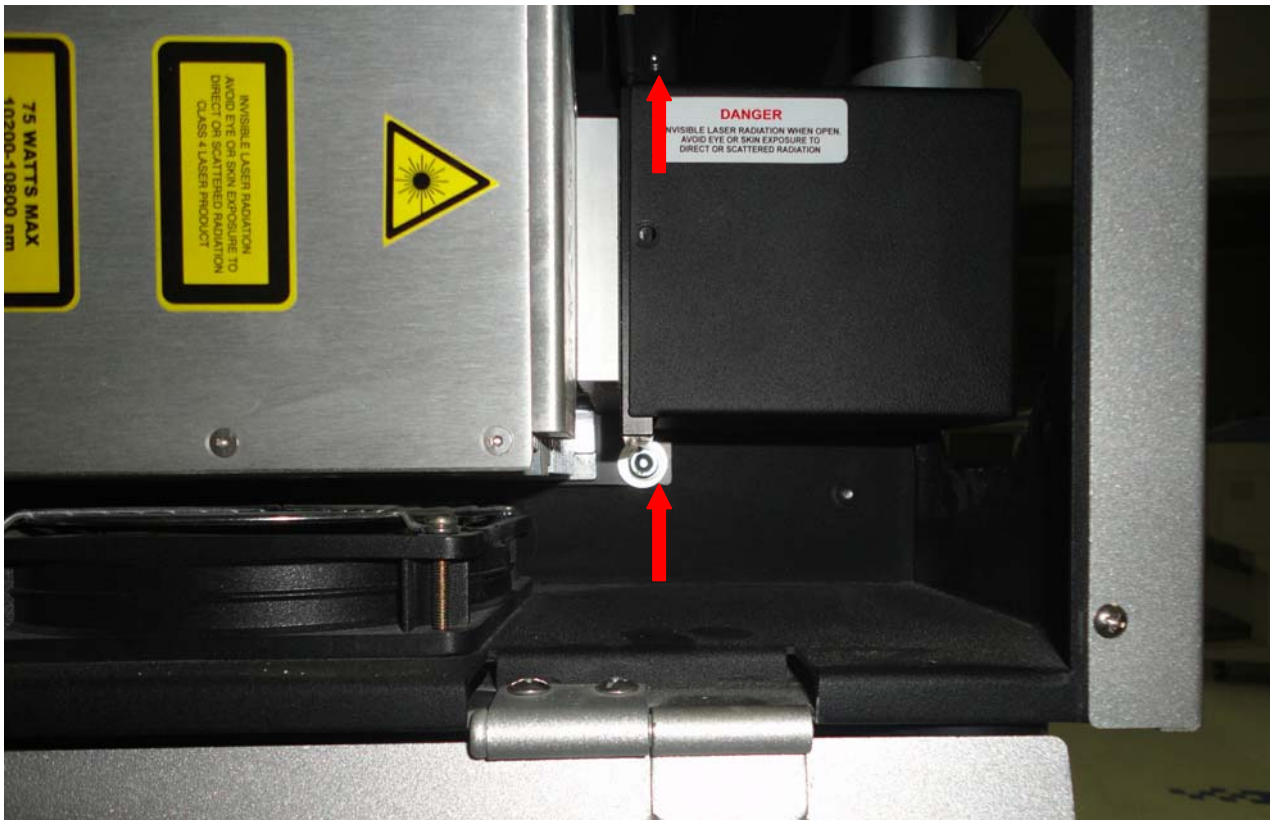
6. Remove the red beam mirror cable (see red circle) and remove the screw of mirror 1 dust cover(see red arrow). When laser tube is removed, the mirror 1 dust cover can still stay at same place.



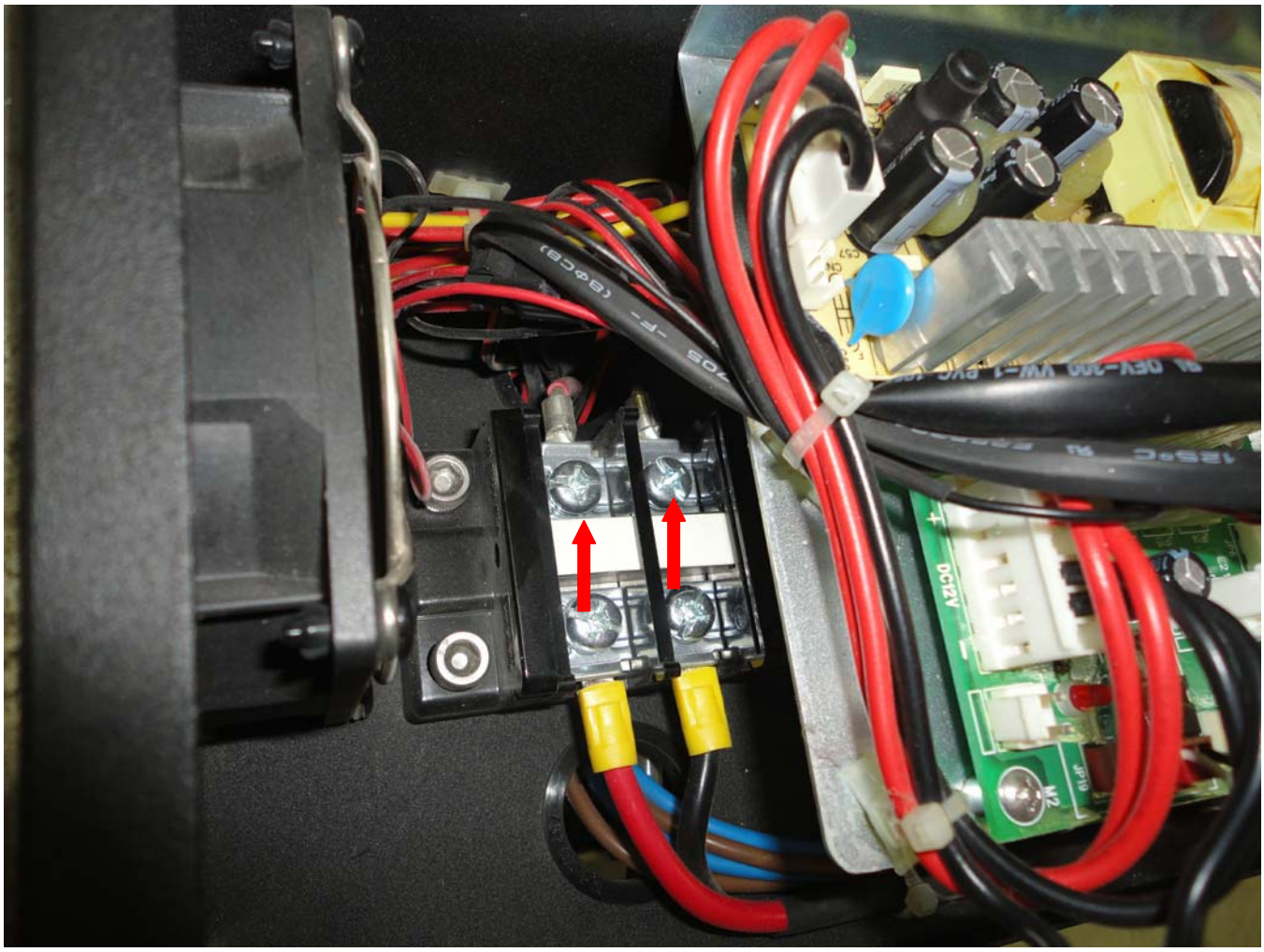
6. Remove the laser tube signal cable (red circle) and two screws of laser tube bracket (on left side).



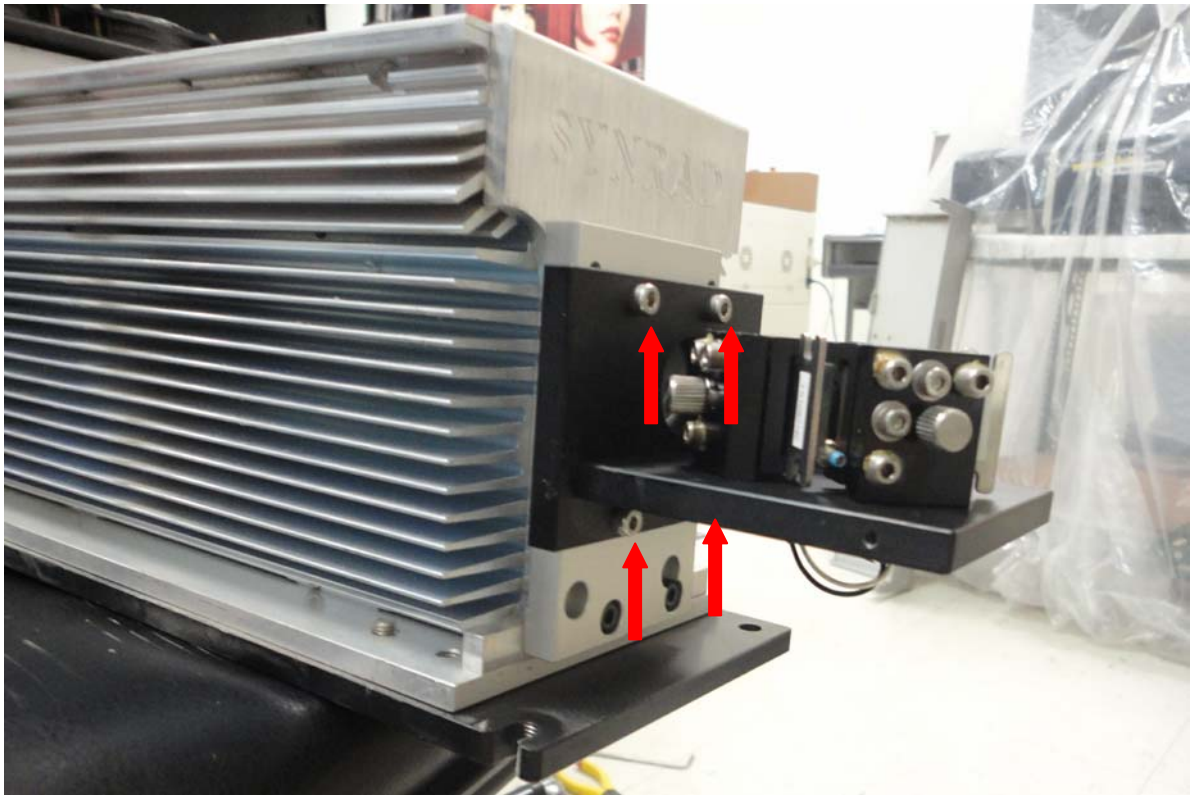
8. Remove the two screws of laser tube bracket on right side (see red arrows)



9. Loosen the two screws (red arrows) and remove the laser tube power cable.



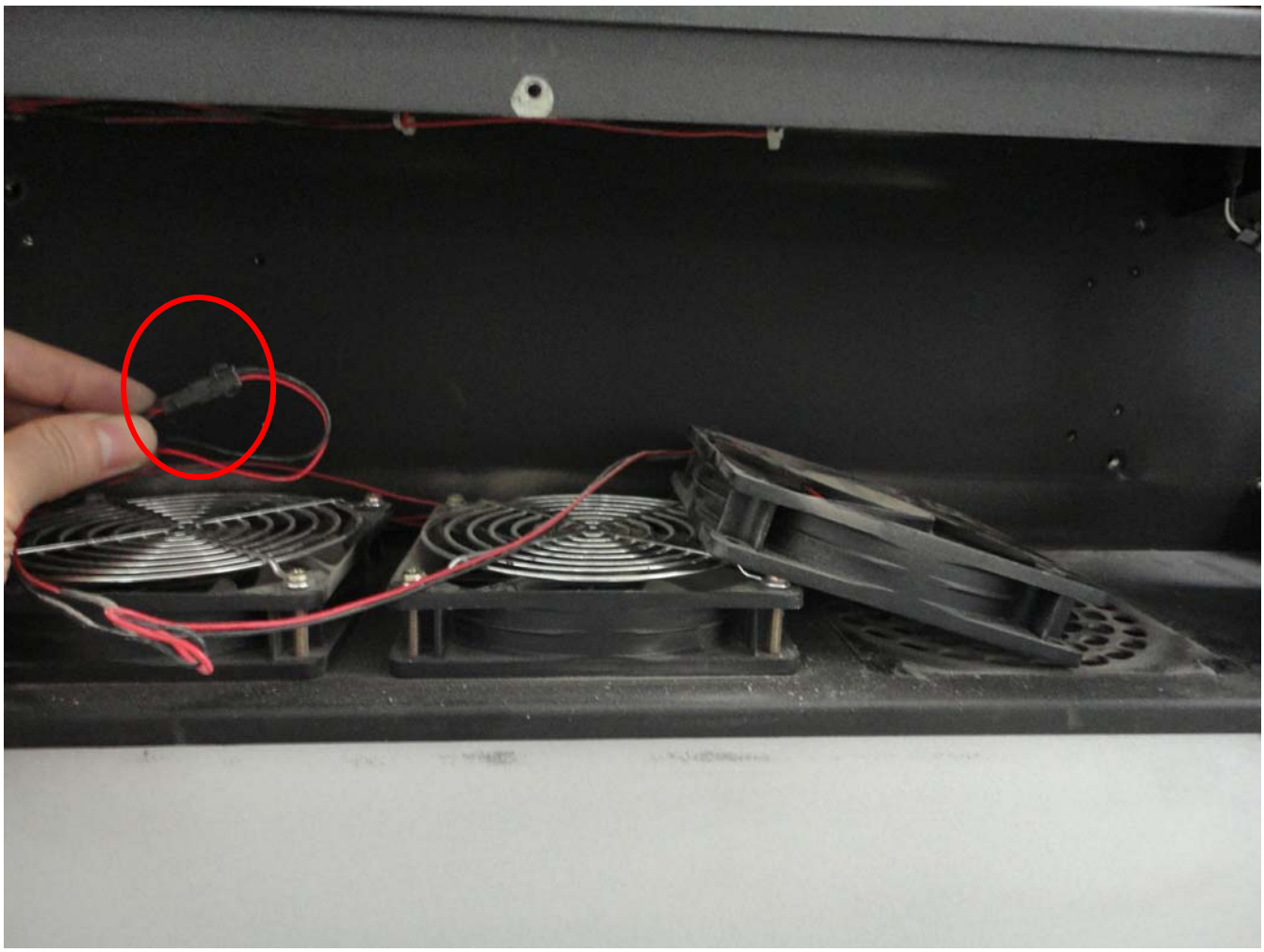
10. When replace new laser tube and send back laser tube for repair, the front bracket need to be removed (remove four screws that red arrows pointed) and do not send back this bracket.



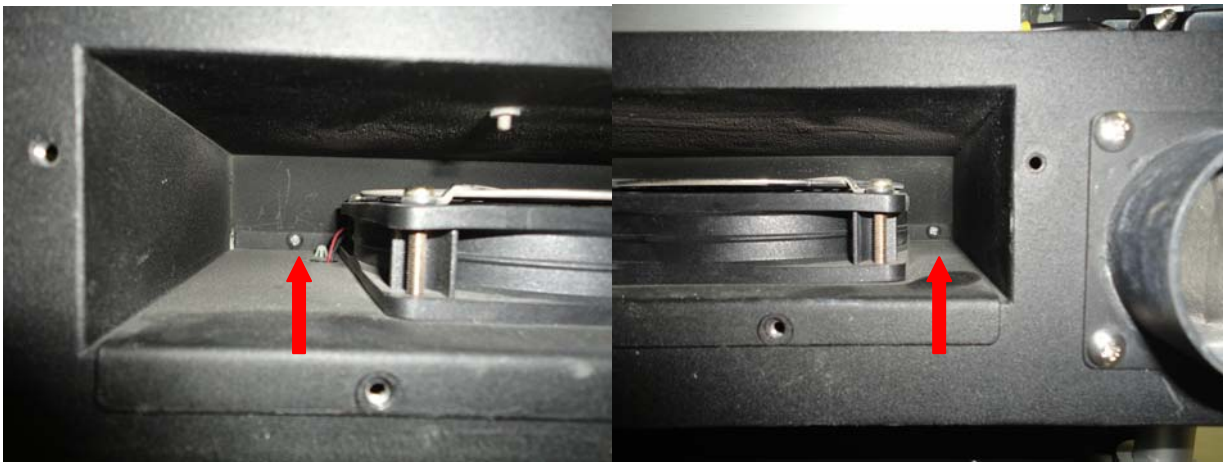
11. Remove the three screws (red arrows) from laser tube bottom bracket. Then the laser tube changing process is finished

12. For changing bottom cooling fans, the laser tube need to be removed first and then the screws driver can reach the fan screws

13. When four screws of cooling fans are removed, the cooling fan cable also needs to be disconnected (see red circle).



14. For changing top cooling fans, there are 6 screws need to be removed. See red arrows on below two pictures.



15. Then remove the 4 screws of that defective fan and then also remove the cable of those defective fans.

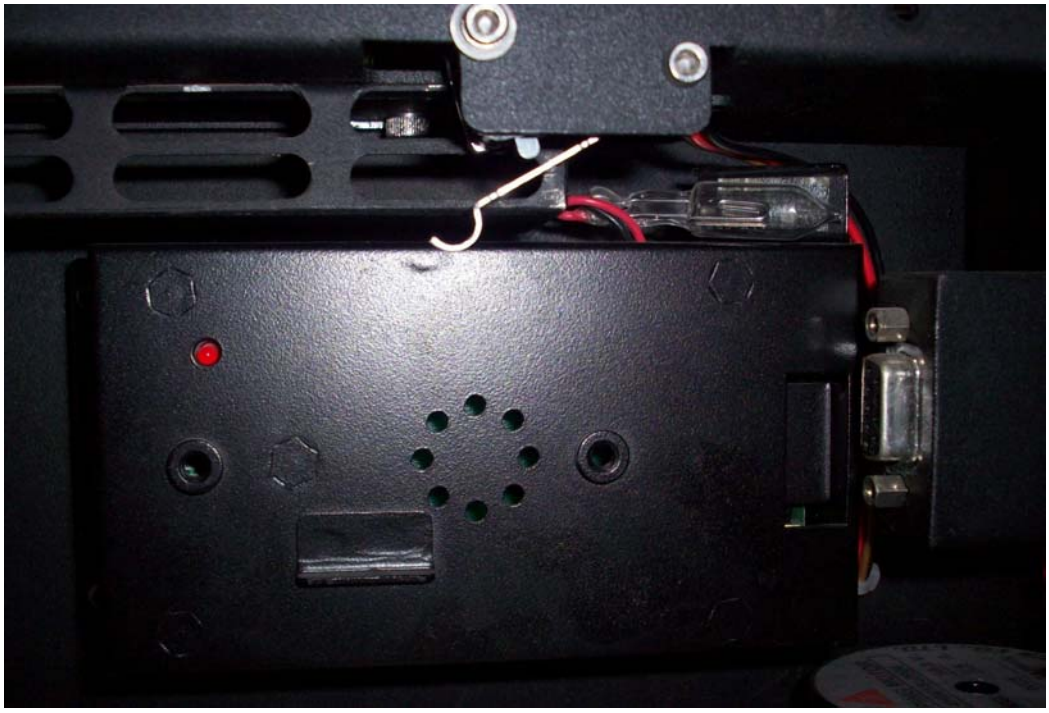
9. Fire alarm installation process

1. Remove back-top cover by removing four screws (see red circles below).

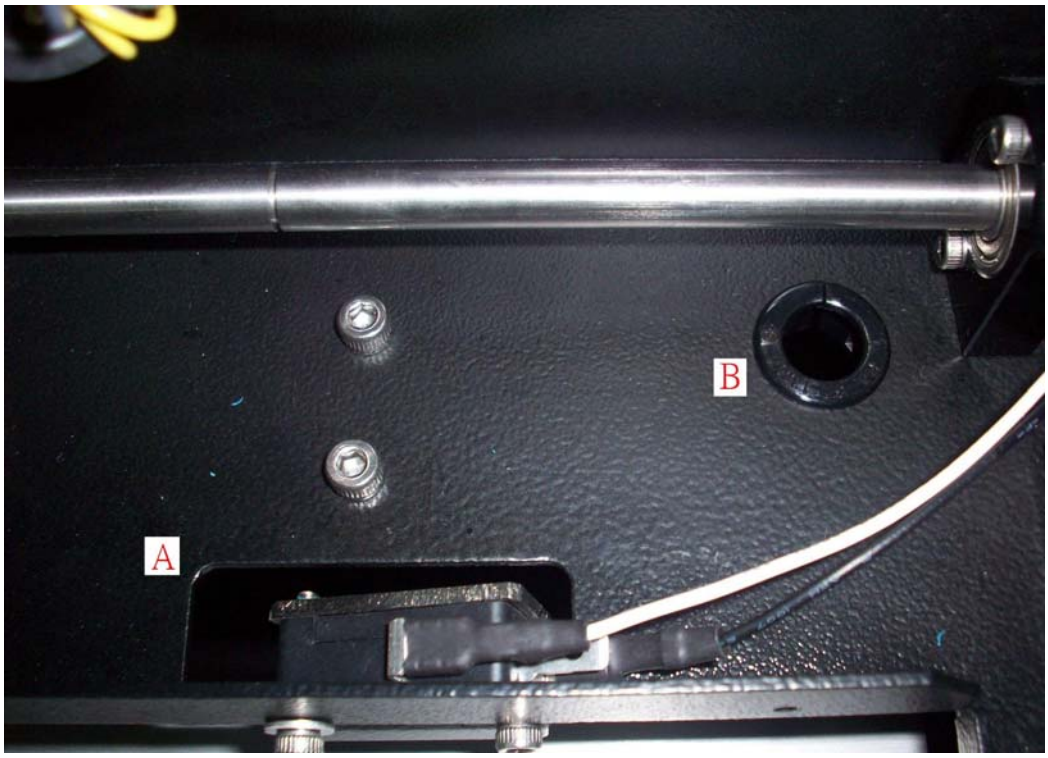
2. Remove shield cover by removing 6 screws. 3 screws on top and 3 screws inside (see below red circles).

3. Fire Alarm (or called Smart Guard) is mounted on the four screws(see red circles below).

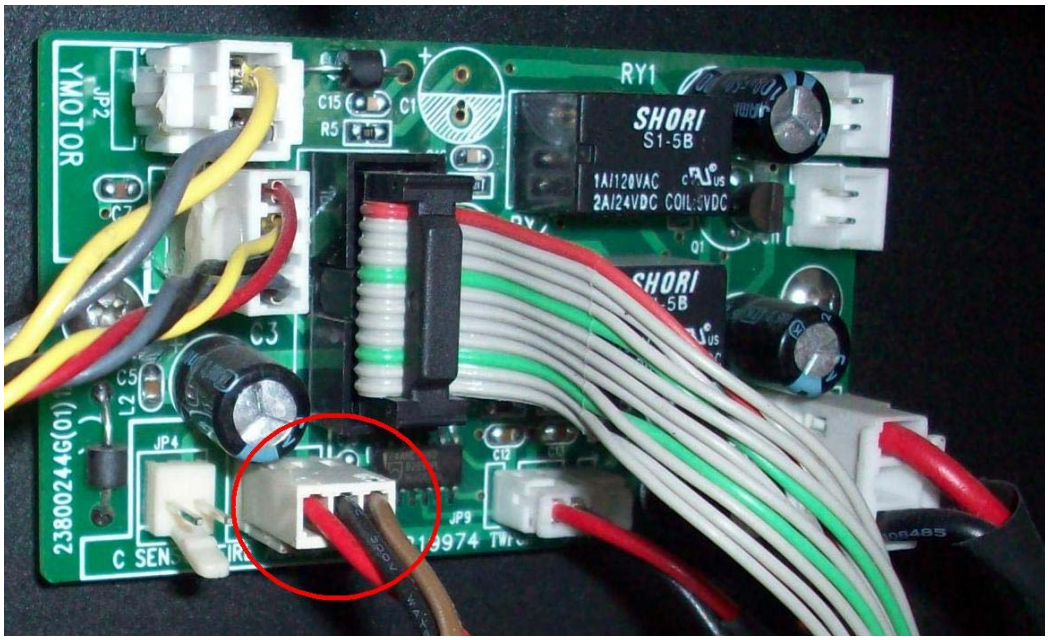
4. After mounted, it looks like picture below.



5. For signal cable, it can pass through hole A (old version C180 only has A hole) or hole B(new version C180 has this hole).



6. Put the signal cable on y axis board (See the red circle).



7. Mount all the screws of shield cover and back-top cover.

Chapter 4. Troubleshooting

Section 1. Error messages

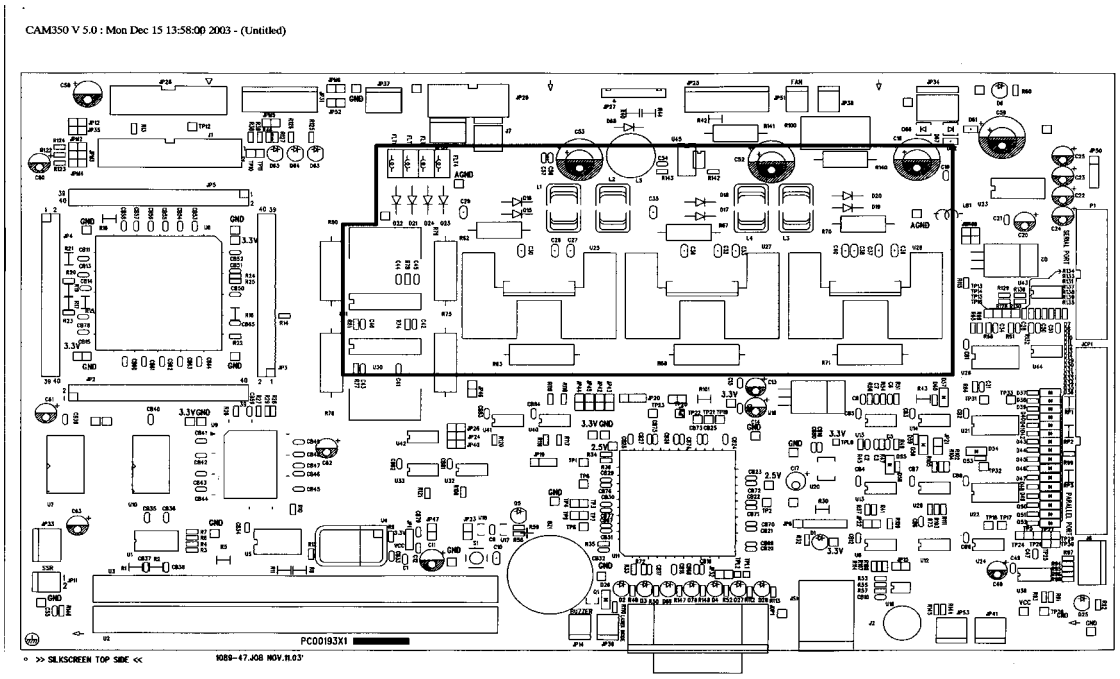
Error Message	What does it mean?	What to do?
"Laser Tube Error Laser tube is over heat please press any key to stop."	This means that the laser tube's temperature is too high or the laser tube is dead.	1. Turn off the machine to allow the laser tube to cool off. 2. Restart the machine to see if the same message shows.
"HPGL Command Error Get an odd number of parameters please press any key to stop"	This means error has occurred during the transfer of data from driver to firmware.	1. Resend the data file.
"WARNING! SmartGUARD fire alarm system is activated, please reboot machine"	The SmartGuard fire alarm system has been activated.	1. Turn off the machine. 2. Check for fire or smoke. 3. Clear any hazards. 4. Turn on the machine.
"WARNING! Emergency stop is activated, please free the emergency stop to continue next job"	The Emergency button has been pushed down.	1. Release the emergency button by turning it clockwise.
"Please install the Auto Focus pin first before performing the auto focusing or focus tuning"	User is attempting to use the Autofocus function while the Autofocus pin is not installed.	1. Press "F1" to return previous menu. 2. Install the autofocus pin and to perform Autofocus. 3.
" HPGL Command Error Command: Address: Please press any key to stop"	The firmware on the machine and the driver is not compatible.	1. Find out the firmware and driver versions that are being used. 2. Upgrade to the most up-to-date firmware and driver versions or use compatible versions.
"Machine Moving Limit reach upper limit switch please move opposite direction"	The Z-platform has reached the top most limit.	1. Press any key to return the previous page. 2. Check that the Z-limit switch sensor is working properly. 3. Continue work or lower the Z-platform if necessary.
"PCL Command Error Command: Address: Please press any key to stop"	The firmware on the machine and the application driver is not compatible.	1. Find out the firmware and driver versions that are being used. 2. Upgrade to the most up-to-date firmware and driver versions or use compatible versions.

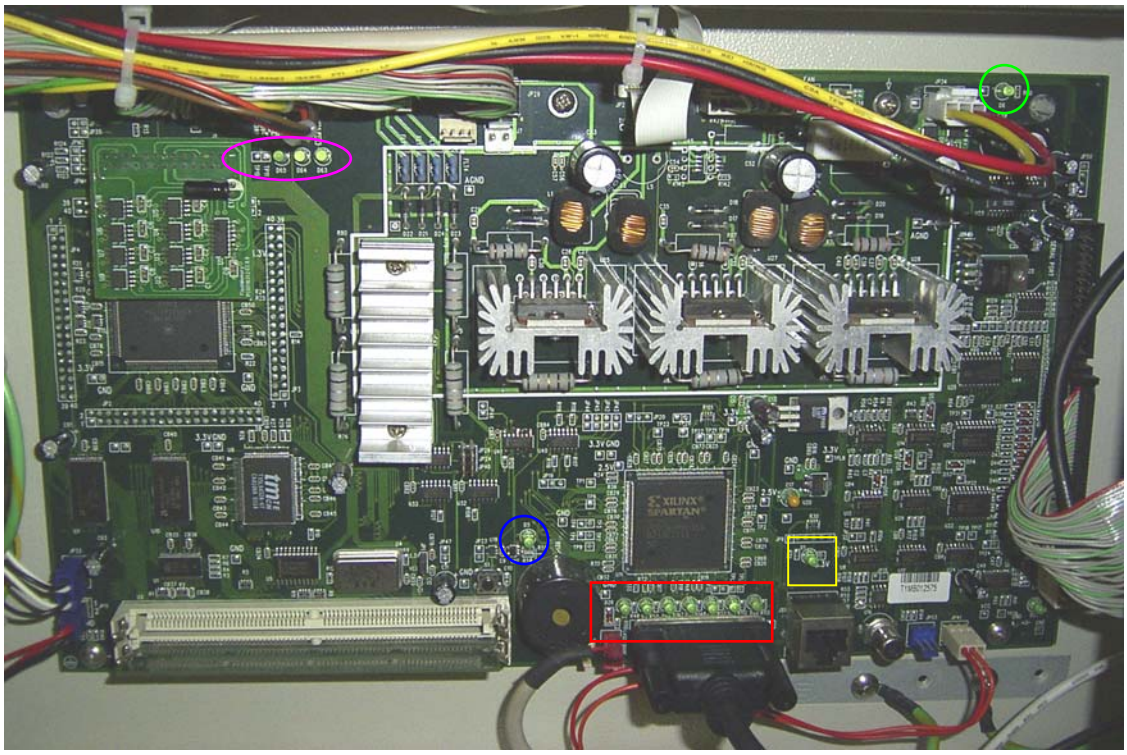
"Error! Please check the lens carriage position under relative mode"	The output object is out of the working area and cannot be outputted.	1. Check that the output object can be outputted on the working area under the correct position mode. 2. Adjust the pen carriage to an open area. For e.g Origin point for relative mode or center of the table for Center mode. 3. Restart the job.
"No Language Data Display in English Please download language data first"	The file that contains the Language data is missing.	1. Set the language back to English. 2. Upload the missing language file to the machine. 3. Set the language mode to the desired language again.
"Storage total file size out of 4M bytes. Please remove some file"	The file being stored exceeds the 4M size limit.	1. Reduce the size of file to be stored to below 4M. 2. Save the file again.
"No Flash Memory. Please check the device on machine."	The flash memory is not detected.	1. Make sure that the flash memory is installed properly. 2. Save file again.
"X motor malfunction. For service please inform your local distributor"	X-motor failed or its related components failed.	1. Turn off the machine. 2. Move the lens carriage from left to right by hand freely to make sure the rail is not blocked. 3. Check for loosed connections and bad wirings. 4. Change the X-motor PCB to see if the error is with the PCB. 5. Replace the X-motor and check to see if fixed. 6. If error remains after the X-motor change, replace the main board as well.
"Y motor malfunction. For service please inform your local distributor"	X-motor failed or its related components failed.	1. Turn off the machine. 2. Move the lens carriage from back and forth by hand freely to make sure the rail is not blocked. 3. Check for loosed connections and bad wirings. 4. Change the Y-motor PCB to see if the error is with the PCB. 5. Replace the Y-motor and check to see if fixed.

		6. If error remains after the Y-motor change, replace the main board as well.
"Z motor malfunction. For service please inform your local distributor"	Z-motor failed or its related components failed.	1. Check that the connections of the wiring are not loosed or damaged. 2. Replace the Z-motor.

Section 2. Error lights

Identifying problems by looking at the lights on the mainboard.



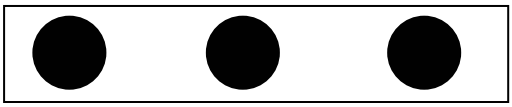


The LED circled in green is the 5V light. This light should always be “ON“ showing that there is a 5V supplied to the mainboard. Check that the power supply next to the mainboard that provides the 5V power is working properly if it is not “on”.

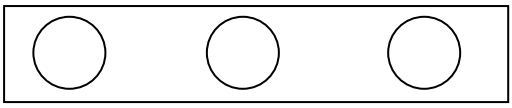
The LED circled in blue is the reset light. This light should only turn on when the reset button is hit. If it stays “on” all the time then the mainboard needs to be changed.

The LED circled in yellow is the initialization light. This light turns on when the machine is turned on. It will turn off after the initialization process. If it stays on, then mainboard is damaged.

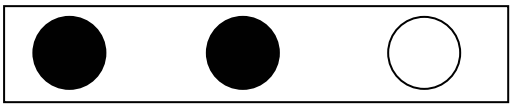
The LEDs circled in purple are the door sensor lights.
When all doors are closed, all three LEDs will stay “on”.



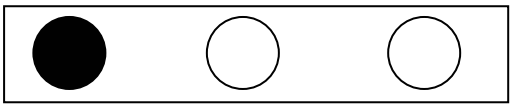
When the front door is open or front door sensors malfunctioning, all the LED will turn off.



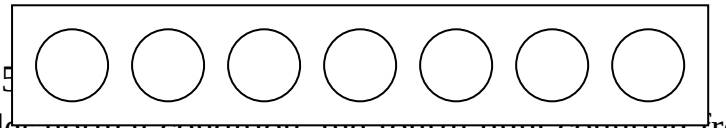
When the backdoor is open or the backdoor sensors are malfunctioning, the two leftmost LEDs will turn “on”.



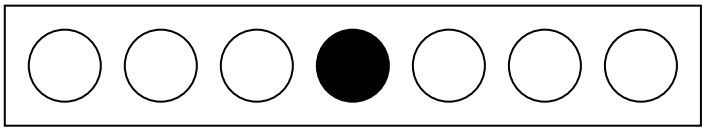
When the top cover is open or the top cover sensors are malfunctioning, the left most LED turns to “on”.



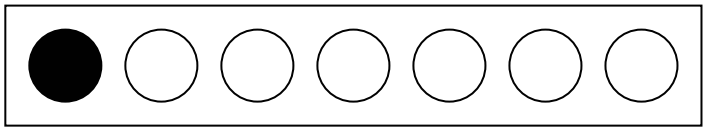
The LEDs circled in red are the laser tube status lights.



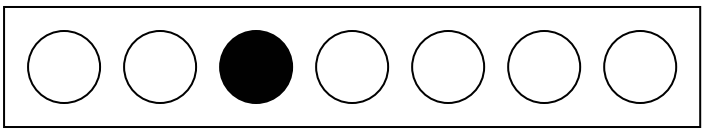
For 5
Under normal condition, the fourth light counting from the left will be “ON.” However, the brightness of the LED depends on the power level used.



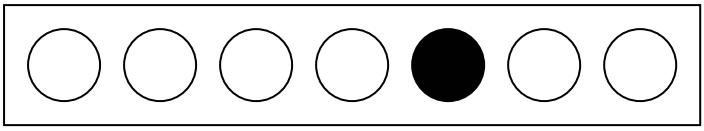
When the first LED from the left turns “ON”, check that the RF cable is connected.



When the third LED from the left turns “ON”, either the laser head or the RF cable is bad.

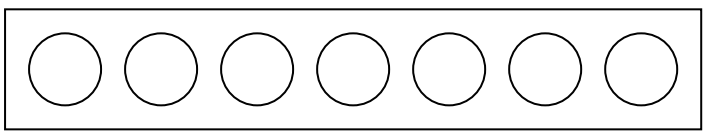


When the fifth LED from the left turns “ON”, the RF power supply has gone over temperature.

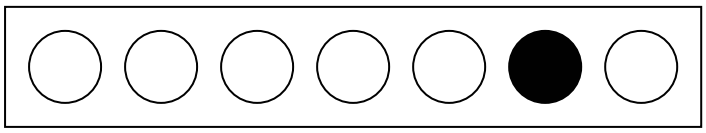


For 30W models:

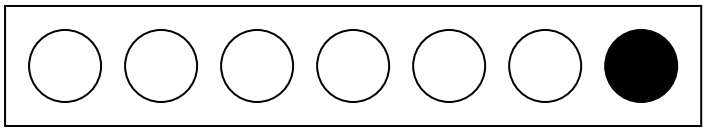
Only the two right most LEDs are used for 30W models. Under normal condition, all LEDs will **not** turn “ON”.



During initialization, the sixth LED from the left will turn “on” by default. The LED will turn “off” after the initialization meaning that the laser is ready to fire. However, if the LED stays on afterwards, that means the laser source is malfunctioning.



When the last LED from the left turns “ON”, the incoming voltage to the laser source is incorrect. Check that the output voltage to the laser source is correct.



Note: If the electrical circuit in the laser source has been damaged then the signals shown may not reflect the exact problem.

Setting tickle pulse on Spirit machines equipped with Synrad laser sources.

By nature, Synrad laser sources require a tickle pulse to keep the laser ready for firing. The tickle pulse signal required depends on the individual laser tube. The usual setting is at 5k, however, it may be required to adjust the tickle pulse rate. If the laser is too weak, we can set it to 7k and if the laser is bleeding, then we can set it to 3k.

Hold the “down arrow key” when turning on the machine until “Laser Tube Model Number” shows on the display. Wait till the lens carriage comes to a stop. Press the Enter key to get to the Model Number selection page. Select the corresponding laser tube model from this page. Press F4 and then the Start/Stop key to save and restart the machine.