RDZ01 Living Focus System

Operating Manual

Model：RDC6332M-RDZ01　　DSP Version：VER6.30.31

Catalogue

Safety

Live Focus System (LFS) is applied in laser processing machine. Laser is CLASS3 and CLASS4 protection. Please reference to GB7247.1-2001 and take some safety protection measures.

The following should be executed：

- Operation persons should wear protection glasses。
- Connection to the earth. A valid connection to earth should be done and the resistance should be less than 1 ohm.
- Please do not try to disassemble parts of the LFS. Or LFS will be fault
- Laser beam and the LFS sensor are integrated design. When the LFS is working, please do not touch the sensor. Or there are damage to your body
- When cutting metal, please notice the reflect laser beams from the metal surface. Some protection measure should be taken to avoid the body to be damaged.
- Keep the sensor and nozzle clean. Avoid the cooling water flow into it. If water and other conductor enter the sensor, the sensor will be fault. The laser power and other controllers should conform with the EMC standard and should be connect to the earth reliably.

Version History

Version	Date	Specification
V1.2	2013/11/01	LFS manual
V1.8	2014/3/4	Correct the connections

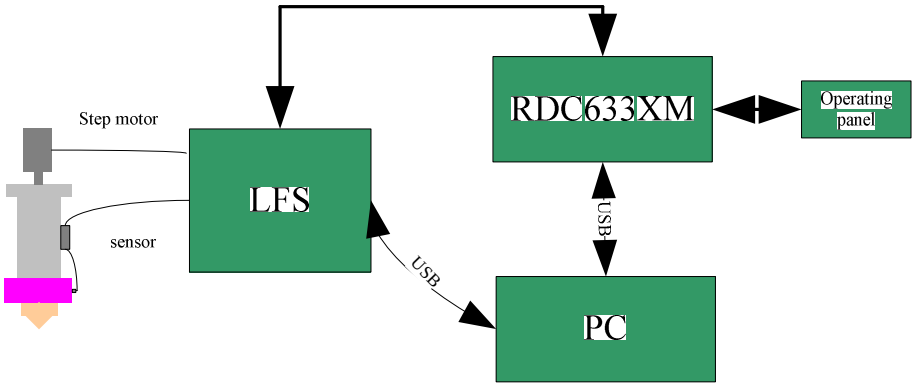
Chapter 1： System description

RDZ01 LFS is use together with RDC633XM mixed cutting control system. Structure diagram is as shown in picture 1-1. The system mainly includes the following parts:

- motion control card, operation panel, and software, etc
- LFS controller and sensor
- Laser head, step motor driver and motor
- Auxiliary gas switch relay and valve
- Limit switch
- Manual switch

Motion control system is mainly responsible for the control of the whole metal cutting and external accessories.
LFS controller and sensor are going up and down automatically according to the focus distance from nozzle to metal surface, to ensure it is always a fixed focus distance between the focus position to the metal surface.
Laser head is used to install the focus lens (long-focus and short-focus), protect lens and air/water cooling for lens.
Auxiliary gases generally choose O2, Air, etc, which is depending on the laser type. O2 or air is switched automatically according to the work mode. Limit switches is an option for users. Limit switches can protect laser head from crashing. Home switch is still an option for uses. The home switch is just for RDC633XG Z axis homing. To protect laser head from crashing when the LFS working on the manual mode. But the Z axis motion length should be configured. Manual switch is manual/automatic mode switch respectively, the movement of laser head is controlled by RDC633XG Z axis pulse when in manual mode and by LFS controller when in automatic mode.

There are two software running in the PC. One is LaserWorkV6 that named MetalCut. And the other is LFS software that named RD_Tracer. RDC633xM is connected to PC with USB or Ethernet. The LFS connects to PC with USB.
RDC633XM send the control signal to RDZ01 LFS controller. The RDZ01 receive the signal and feed back the status signal to RDC633XM. So the live focus control can be done in real-time according to the irregularity of the metal surface



Picture -1 System structure

Workflow of the mixed laser cutting system is as follows。

(1) Power on Reset

When RDC633XM power on, controller OUT1 is invalid to keep the LFS not moving.

(2) Start a work

When started, RDC633XM OUT1 output low level to control the LFS moving down. When reach to the focus point, blowing auxiliary gas and punching hole. And then executing a laser cutting. When a closed curve element is cut, LFS will close auxiliary gas and rise up the laser head to a referenced position.

Then jump to another closed curve element to start a new cutting. After all the curves are cut, the laser head will be moved to a higher referenced position.

(3) Pause/continue

Controller will drive the head up to the fixed height when pause. When continue, the head position will not move if the system is paused during jumping. System will move the head down and cutting if it was paused in laser cutting process.

(4) LFS test

When all the connections have been finished, a test of LFS can be done. Firstly check cooperation between LFS controller and RDC633XM. Different step drivers may have different definitions on the rotate direction according to the DIR level. Some may be CCW when DIR is high and some may be CW when DIR is high.

So a rule must be defined. Just like the follows:

During the RDC633XM is not busy and in a ready status, press "." on the panel, the laser head should moving down. Press again, the laser head rising up. This is the rule.

There a recommended connection for uses:

Leadshine company

Step motor model：42HS08（V2.0）

Driver: DM556

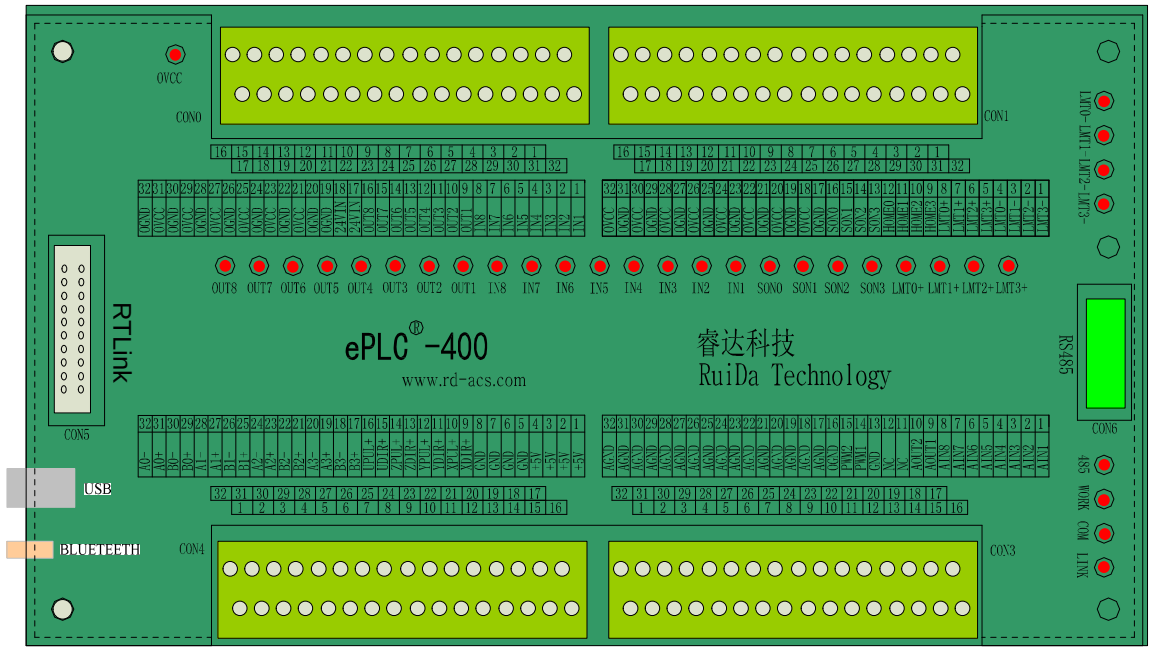
Motor : yellow connect to A+
red connect to A-
orange connect to B+
purple connect to B-

The connection will be described in appendix.

Chapter 2: Live focus controller

1 LFS Structure

Structure of the LFS controller is as below:



Picture2-1： Structure of the LFS controller

2 Interface description

Figure2-1 CN0 definition

Pin	Signal	Definition	Description
PIN2	IN2	Automatically searches focus position.	An input interface. Low level is valid. When the input receives a low valid signal, LFS will move to the metal surface to search the focus point. This can be done after the LFS power on and the LFS is idle and locates on the highest point. ***During a cutting, this is not allowed!***
PIN3	IN3	Laser head crash alarm input	Laser head crash alarm signal input When LFS receive the crash alarm signal.

			The laser head will be raised up to a safe position. High level (+24V)valid
PIN4	IN4	Manual/automatic switch input	Switch input with self –lock. One terminal of the switch connects to GND. The other terminal of the switch connects to the input. When the switch closed, the mode is automatic mode. When the switch is opened, the mode is manual mode. Under the manual mode, Z axis motor is controlled by the RDC633XM. Under automatic mode, the Z axis motor is controlled by the LFS. High level (GND)valid
PIN5	IN5	Live focus signal input	When the level is low, the node is closed. LFS will control the laser head to move down and focus live. If the level is high, the LFS will control the laser head to rise up. ***From OUT1of the RDC633XM***
PIN6	IN6	Work status input	Receive the work finish status signal. When the input is valid, the laser head will be raised up to a higher position ***From OUT0of the RDC633XM***
PIN7	IN7	punch hole input	Receive the punching hole signal. When the input is valid, that indicate the LFS to be a punching hole status. ***From OUT2of the RDC633XM***
PIN9	OUT1	Manual/automatic mode control output. Driving Relay.	Output. Relay can be drived. Used to switch the motor pulse between RDC633XM and LFS. When IN4 is connected to GND, the output will control the relay to be closed. When IN4 is disconnected to GND, the output will control the relay to be opened
PIN10	OUT2	O2 relay control output For laser cutting	Control the relay of the O2 to be closed and opened. When starting cutting a curve, the output will be valid. The O2 with high pressure will

			blow. When finished cutting , stopping blowing O2 If user has select 1 channel auxiliary gas (set by LFS controller software), no matter in manual or automatic mode, the output is disconnected. If select 2 channels auxiliary gas, OUT2 ended and OUT5 conduct when in manual mode, and OUT5 ended In automatic mode.
PIN12	OUT4	O2 controls relay output. O2 for punching hole	
PIN13	OUT5	Compressed air relay control output	If user has select 1 channel auxiliary gas (set by LFS controller software), no matter in manual or automatic mode, the output is disconnected. If select 2 channels auxiliary gas, OUT2 ended and OUT5 conduct when in manual mode, and OUT5 ended In automatic mode.
PIN14	OUT6	Laser head crash alarm output	This signal is connect to DrProc of RDC633XM. When the signal is low, RDC633XM will stop motion and give the alarm information
PIN15	OUT7	Communication signal UpSign	Communication with RDC633XM
PIN16	OUT8	Communication signal DnSign	Communication with RDC633XM
PIN17	+24V	External 24V power supply input	
PIN18	+24V	External 24V power supply input	
PIN19	GND	External 24V reference GND	
PIN20	GND	External 24V reference GND	

Figure2-2 CN1 Interface definition

Pin	Signal	Definition	Description
PIN4	LMT_N	Down limit signal input	When live focusing, to protect the laser head from crashing. Low level is valid
PIN8	LMT_P	Upper limit signal input	When live focusing, to protect the laser head from crashing.

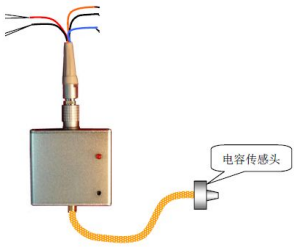
			Low level is valid

Figure2-3 CN3 interface definition

Pin	Signal	Definition	Description
PIN1	S+	Capacitance sensor position signal output	
PIN32	GND	Capacitance sensor position signal reference GND	
PIN14	DIR	LFS control motor direction signal	
PIN15	PULSE	LFS control motor PULSE signal	

Chapter 3 Sensor and Amplifier

Capacitive sensor and amplifier are show in below Picture 3-1, capacitive sensor and laser head integrated together and connect with transmitter through RF cable.



Picture 3-1 Capacitive sensor and amplifier

1 Function

Capacitance sensor can be used with many kinds of capacitive sensing heads, which can measure the physical quantities for relative capacitance change (distance, pressure, temperature, thickness, level, etc.) and adjust the sensitivity or measuring range. When sensing head touch the object under testing, indicator lights flash (red light), and give collision signal (+ 24V or 0V for optional). Crashing signal occurred when the distance is less than 0.1 mm between head and the object to be measured. Crashing signal output +24V when the red indicator light on the amplifier box, and signal output 0V without crashing occurs.

2 working principle

The capacitance sensor is to transform the capacitance change of sensing head when working into electrical signal, to measure the physical quantities under testing (distance, pressure, temperature, thickness, level, etc.) through the signal amplification, demodulation and filtering processing.

3 Technical Specification

3.1 power supply voltage: DC 24V±20%, ≥0.5 A, ripple wave noise < 240mVp-p
3.2 Interval setting range: 0.1...5 mm (diameter of the nozzle port face is φ 5)
3.3 Measurement repeat accuracy: < ±0.05 mm
3.4 Temperature drift is less than 0.01 mm
3.5 Response time: < 2 ms
3.6 5 core Φ 9 air connection plug with power supply input and output;
3.7 Main electrical box size: 43mm (length) x 50mm (width) x 20mm (height)
3.8 Working environment : the electrical box working temperature: - 40 ℃...60 ℃;Relative humidity < 80%;Without strong electromagnetic interference;

3.10 Alarm protection and state output

NOTICE:

Sensor measuring range is set as 0.1~ 5 mm before leaving factory, and default focus position is 1.1 mm.

Chapter 4 RDZ01 LFS controller

1 Function

RDZ01 is live focus control system developed by RuiDa technology specially for metal and non-metal mixed cutting system. It use all-digital control circuit and advanced software control algorithm to achieve accurate Z axis focus control automatically. Its main functions as follows:

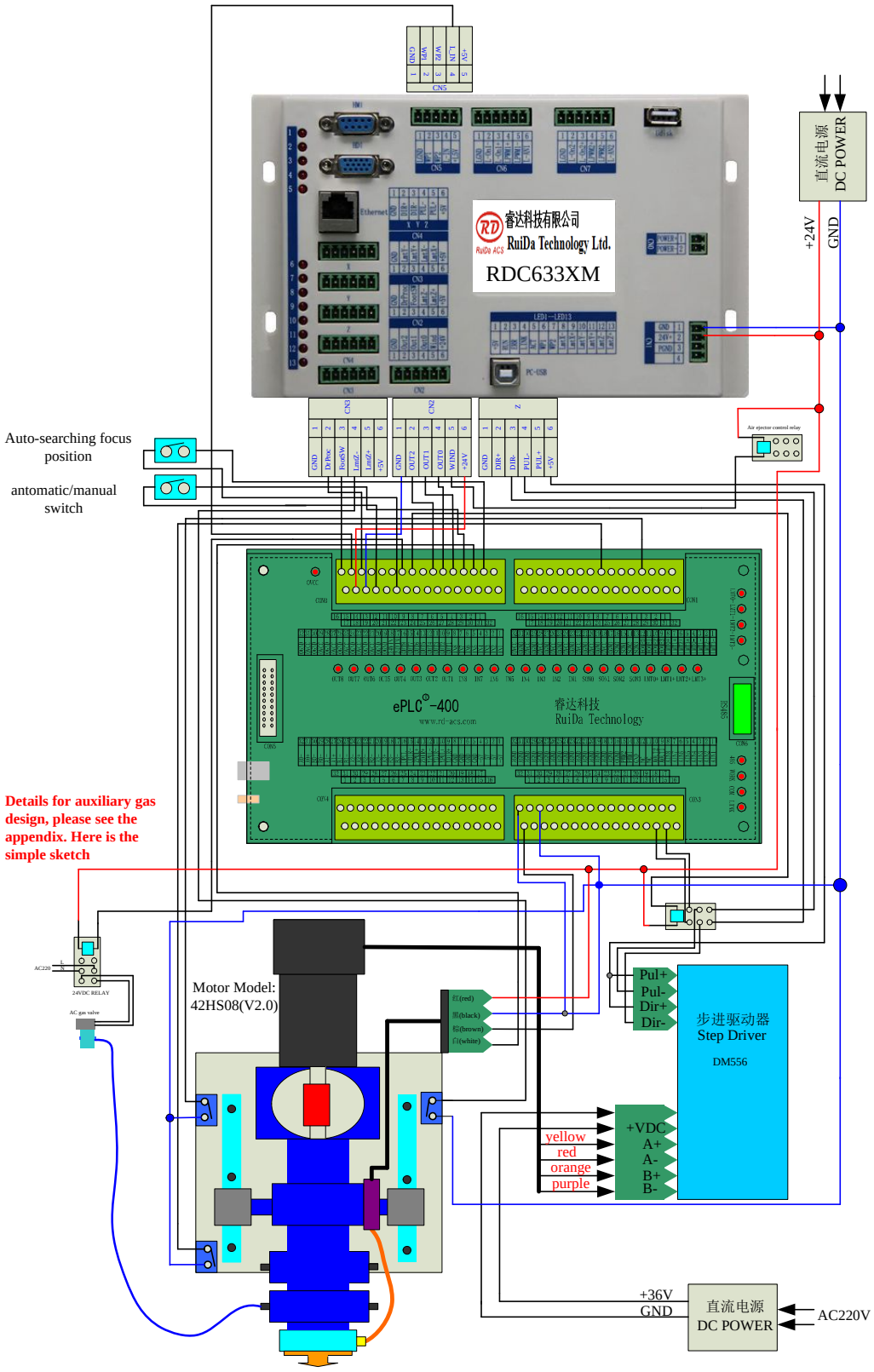
- Can control step motor and servo motor, speed up to 200 mm/s.
- crash alarm protection, double protection for LFS controller and RDC633XM
- Automatically search the focus
- Rising up and moving down speed can be set by software
- 3 Rising position points, height can be set independently by user
- Special technology for punching hole
- High-speed communication between height sensor and controller, no latency time, improve the efficiency greatly
- control the large torque stepper motor, can achieve higher response speed
- Optimized auxiliary gas blowing control, reduce the gas loss effectively. Dual-channel O2 gas control output and 1 channel air control, can be used for switching between metal cutting and non-metal cutting
- Upper/lower limit protection
- Manual/automatic switching function for metal and non-metal
- Software integrated LFS controller panel, to configure parameters through the software easily
- Set focus position through software.
- Temperature compensation function. Ensure focus position do not drift if the head work for a long time.

2 Connection diagram

Connection between RDC633XM control card and RDZ01 height sensor is as shown in figure 4-1.

Accessory of the whole control system is shown as the following:

(1) RDC633XM and operation panel
(2) RDZ01 LFS
(3) Manual/automatic mode switch with self-lock
(4) 24V DC power supply, for board, height controller as well as external relay
(5) 36V DC power supply, for stepper motor drives independently
(6) 4 pcs of 24V DC relay , one for control the exhaust fan, the other two for control the AC solenoid valve of external blowing, the last for switch motor control pulse.
(7) Limit switches, connected to limit input of height controller to protect the tracing-axis. Installation position refer to figure 4-1
(8) One home switch (don't need to return to the home, can be not install), connected to RDC633xM control card used to reset for tracing-axes, installation position refer to figure 4-1.



Picture4-1 Electric connection diagram

Chapter 5 LFS controller working process

1 Installation

Firstly install capacitive sensor and amplifier correctly. Amplifier should be installed in one side of the head, and ensure connection between BNC head and capacitance sensors are reliable. And the metal shell should be conducted with laser head.

Connect the sensor amplifier output signal to the interface of LFS controller. The cable between sensor amplifier to LFS controller should be not too long, standard length for cable RuiDa technology provided is 8 meters, if the user's machine do not need so long, to ensure the control precision they can remove part of it properly. Sensor amplifier installed near the head is recommended, and to ensure that shielded cable connected between sensor and the amplifier is not affected by stress.

Connecting sensor and RDC633XM correctly according to the wiring instructions after the connection between height sensor and controller,

2 System test

The power indicator on the sensor amplifier will light after system power on, alarm indicator not light, touch the nozzle with a metal plate, crash indicator on the amplifier will light. So the amplifier works normally.

Notice:

Before system test, amplifier should be calibrated. Please follow the steps.

First, move the laser head to about 1.1 mm distance from the metal surface. Switch to manual mode and press Z- to moves down the laser head until the distance between nozzle and the surface is about 1mm. Then measure the voltage between CON3-pin32 and CON3-pin1 on the EPLC. If the measured voltage is not 6.5V, you can adjust the potentiometer to set the voltage to be 6.5. So the calibration is finished. After that, switch to automatic mode, press the auto-searching focus button to carry out a auto-searching process. When auto-searching is finished. The whole calibration is finished and the focus point is set.

Before system test, Set Z axis parameter through "manufacturer parameter" of RDC633X M operation panel:

Direction polarity： Positive

Key motion direction： Positive

Step length: calculated according to pitch of screw and motor PPR

When configuration has been finished, under manual mode, pressing Z+, the motor will rise up. Pressing Z-, the laser head will move down (**Important: please make sure of this!!**)

If it moves to opposite direction, you can exchange each other for A+ and A- motor wiring directly, can change the rotating polarity of motor.

Focus position is set to 1mm in default. Jump height is 10mm, crash alarm rising up height is 20mm, work finish rising up height is 40 mm.

Design example:

Motor PPR: 4000

Pitch of screw: 4mm

（1） Confirm the home switch has been installed to the negative limit of RDC633XM before system power on. Confirm "manual/automatic" switch have move to "manual switch".

（2） Set the step length to 0.001 mm/pulse, the parameter would be modified according to different configuration. When pitch of screw is 4 mm and motor PPR is 4000.

（3） RDC633XM power on, cancel reset operation in the process of power on resetting, read manufacturer parameters by system software, set the Z axis to no reset when power on, then reset the controller again.

（4） System start to reset XY axes except Z axis. After XY reset, Users can reset Z axes for one time if they have installed the Z axis limit switch for upward direction, Z axis will move to the direction of negative limit. We can control the movement of the Z axis by Z+, Z- on the operation interface (Note 1).

（5） Set the breadth of Z axis according to its working distance, to ensure avoid crashing when manual control Z axis it is limited by breadth.

If Z axis limit switch is not installed or limit signal is not connected to Z axis limit input of RDC633XG card, then the Z axis can't reset, will lead to crash.

（6） Switch "manual/automatic to automatic mode, the laser head is under the control of the LFS controller.

（7） Firstly you must automatically search the focus (Note 2) through the "auto-search focus" key which use normally open mode. Connecting with GND when closed. After press the key, LFS controller began to automatically search the focus point. After press auto-searching key, laser head move down to the metal surface slowly until touch the surface slightly, then reverse move to the focus position and stay there for about 1 second. Rising up to the work finish point.

（8） The LFS controller is in standby state after automatically search the focus.

（9） Press the dot point "." key on the panel, the head will go down and live focusing, focus position is about 1 mm. Press the key again, the head goes up to 10 mm, this position is the jump height for LFS controller during cutting.

（10） If the focus position is not the wanted height, you can set the focus position again by the software. When the parameter has been write into LFS controller. An auto-searching process must be done. Or the focus position will be invalid.

All above step has been finished, the LFS can work normally

Note1:

If Z axis power on reset is not executed, press Z+ and Z- can move the Z axis. The initial coordinate position is 3000mm. So longest length of Z- is 3000mm. the length of the Z+ is limited by the machine work width..

Note2:

An auto-searching operation must be executed under the following conditions:

（1）Power on for the first time after machine assembled

（2）laser head has been working for a long time or there is metal dregs on the nozzle.

（3）change the parts of the LFS, such as nozzle, sensor, amplifier etc

3 Auto-searching focus

The LFS controller can automatically search focus position. When the system is idle, pressing the

"auto-searching focus position" button, an automatically searching focus point is executed. LFS controller will control the laser head to move down to the metal surface slowly. When the distance between nozzle and the metal surface is less than 0.1 mm, the crash alarm indicator led will be turn on and the LFS will stop the motion of the laser head. Then move to the reverse direction to reach to the focus point. Staying about 1 second and move to the highest point fast. So the LFS is ready.

at this time the head will stop and move to the focus has been set in reverse direction.

During auto-searching process, the LFS will not response any command from the RDC633XM. When the process is finished, the LFS can response the command from the RDC633XM. So during the process, every external command should be prevented.

4 Modify focus position

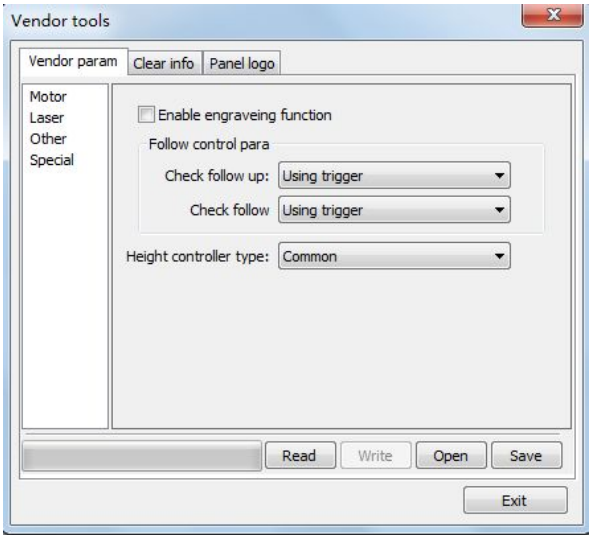
Focus position can be set by the software named RD_Tracer. The scale of the focus position is from 0.5mm to 4mm. When the focus position has been modified and write the parameter to LFS, a auto-searching focus point operation must be executed for every time.

5 LFS running

Before LFS running, the parameter of RDC633XM must be set correctly. Seen as follows:

● Manufacture parameter

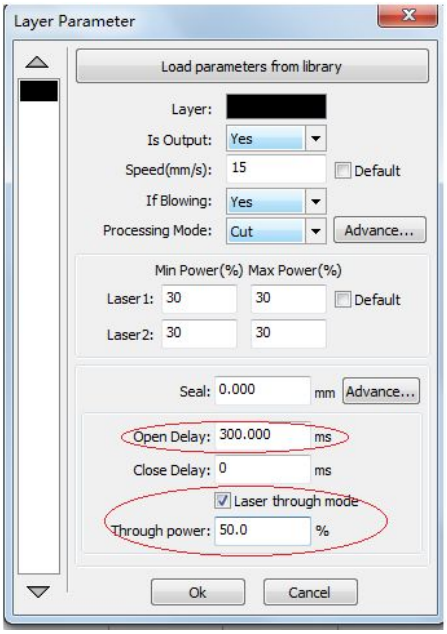
The parameter for the LFS control include of detecting the rising up to position and moving down to position. And the LFS model option is common. See picture 5-1.



Picture5-1 LFS control parameter configuration

● Working parameter

Work parameter include of punching hole enable, punching hole time and punching hole power. As shown in figure 5-3.

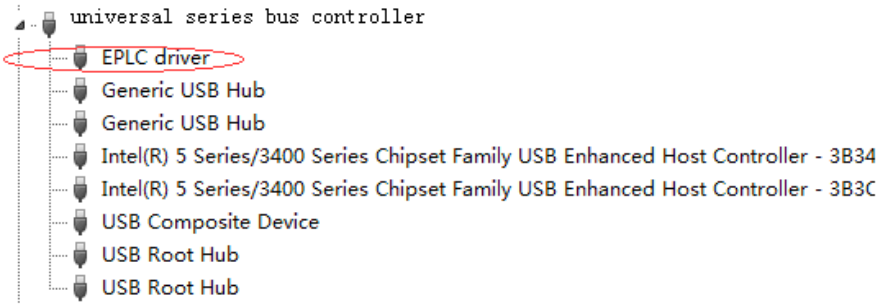


Picture 5-2 Work parameter

Open delay is the time of punching hole. Close delay is set to be zero. The laser through mode must be enabled. Through power is the laser power of punching hole.

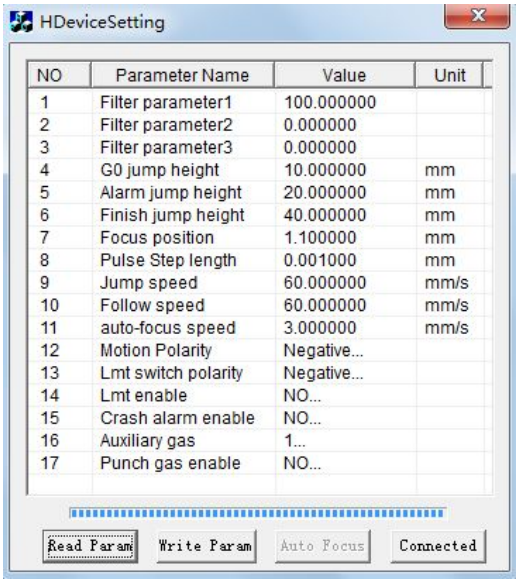
6 Software of LFS

Parameters for LFS controller are set through the USB. Please install the USB drivers correctly. If the driver is installed correctly, the device named EPLC driver is listed in the machine device.



After installing the USB driver for LFS, the parameter configuration software should be installed. The software named RD_Tracer in the CD. The interface of the software is shown as picture 5-3.

Click “Open USB” which on the right side of the interface, if there is no error feedback, that means the LFS and the PC communication successfully. Click on the "Read" to get the parameters of the LFS controller. Click "Write" to write parameters to LFS memory.



Picture5-3 Parameter setting interface of LFS controller

Note:

Before write or read parameters, the LFS must be in idle status or in work finish status. And then switch the work mode to manual mode. So user can write or read parameters.

Do not read or write into the LFS during the LFS is in busy status. When the LFS or the LFS is on the work finishing state, the parameters can be read or wrote.

Parameters include of:

- Filter parameters（parameter1，parameter2，parameter3）:

  The parameters are for LFS control. The initial value is 100,0,0 in default. These parameters have effect on the sensibility of live focus control. If the parameters are set incorrectly, the LFS may occur vibration.

- Height for jump

  When starting a cutting task, laser head will jump from a vector to another vector. The height is the rising up height when jumping. Usually the value is set to be less than 10mm.

- Height for crash alarm

  When the laser head has crashed to the metal surface, the LFS will rise up the laser head to prevent the laser head from damage. The rising up height is the value. 20mm is the default value.

- Height for finishing work

  When all the work has been finished, the laser head should stay a higher position. So user can set the height according his need. The value is 40mm in default.

- Focus position

  Focus position is the height from the metal surface to the nozzle. Usually the value is set to be 1mm.

- Z axis step length

  The step length is the ratio of the PPR and the pitch of slew. **The unit is mm.**

  The step length must be set correctly.

- Velocity limit

  The maximum velocity that LFS allows during motion control. If the step motor lose step, the value

should be decrease.

- Auto-searching focus velocity

  During auto-searching focus point, the laser head move down to metal surface with this velocity. The perfect value is from 1mm to 5mm. 3mm is the default value.

- Motor rotation polarity

  To change the moving direction during auto-searching focus position. When the laser head rising up during auto-searching focus, the parameter should be modified to ensure that that laser head move down to the metal surface. The default motor polarity is negitive.

  But there is another way to do this. If the laser head moving direction is not the desirable condition, the A+ and A- can be exchanged to change the moving direction.

- Limit enable and the limit polarity

  There are negative and positive limit inputs for protecting laser head during motion. If the limit is enabled and limit polarity is set correctly, the LFS will protect the laser head. During live focusing, the laser head touch the down limit; the laser head will rise up to a safe position. During rising up, if the upper limit is touched, the motor will stop motion immediately.

  If the limit switch is normally open, one terminal connects to GND. Another terminal connects to limit input of LFS. The parameter named limit polarity should be set to be negative.

  If the limit switch is NPN, The parameter named limit polarity should be set to be negative.

- Crash alarm enable

  If crash alarm is enabled, laser head will rise up to the crash alarm height when the laser head touches the metal surface. If the cash alarm is disabled, the crash alarm input will be neglected.

- Auxiliary gas control

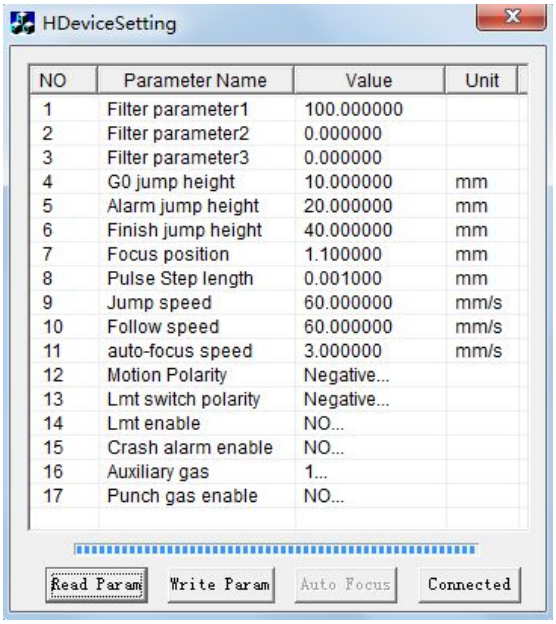
  The LFS supply 3 IO to control auxiliary gas. OUT2 is for the O2 with high pressure. OUT5 is for the compressed air. OUT4 is for the O2 with low pressure.

  During metal cutting, when punching hole, OUT4 is open for low pressure O2 and OUT2 is closed. After punching hole, the OUT2 is open and the OUT4 is closed for cutting.

  When switching to manual mode, air channel is enabled. Out2 and out4 is closed. Out5 is open.

Open the LFS parameter configuration interface. Switch to manual mode and press the button “open USB”. If the USB is opened correctly, the “read parameter” is enabled. If the USB connection is fault, the button will be always disabled.

First, parameters should be read. Then the parameter can be wrote into the LFS. See picture 5-4.



Picture5-4 Parameters configuration

NOTICE：

- **During LFS motion, the writing and reading parameter are disabled. During auto-searching focus, the writing and reading parameter are still disabled. Before reading and writing parameters, the manual/automatic switch should be set to be manual mode. When finishing parameter reading and writing, switch to automatic mode.**
- **During LFS live focus, auto-searching is disabled.**
- **If the focus position is modified with RD_Tracer, auto-searching must be executed to make sure that the LFS has remembered the point.**

Chapter 6: Appendix Wiring diagram

1 Z axis motor control diagram

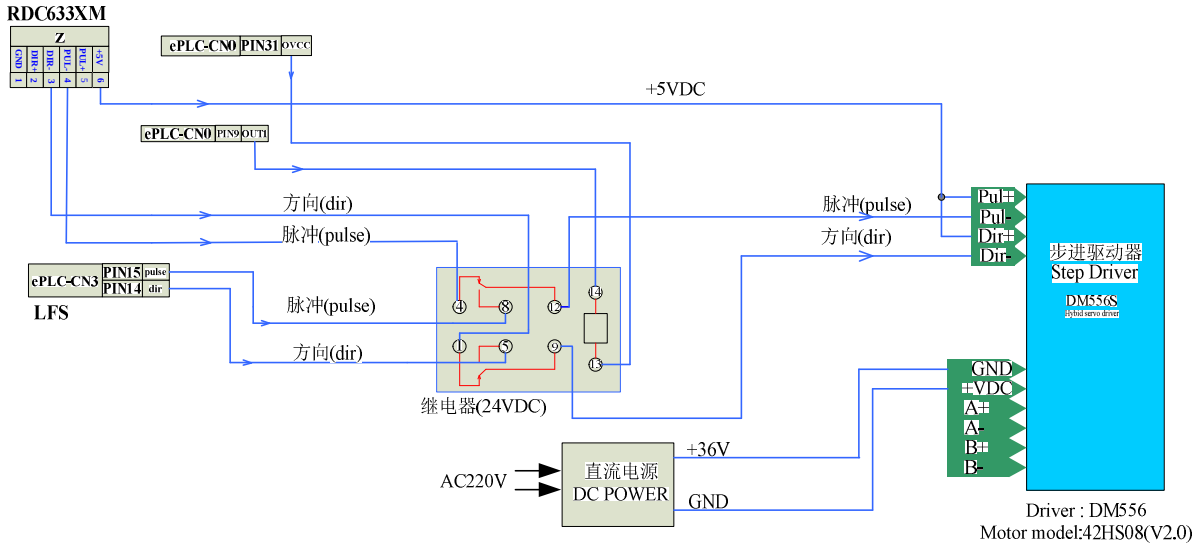
Z axis driving motor is used to drive the laser head moving up and down.

Mixed cutting system can cut metal and non-metal. For metal cutting, the Z axis motor is controlled by the LFS. For non-metal cutting, Z axis motor is control by RDC633XM. There is a 24VDC relay to switch the PULSE and DIR between LFS and RDC633XM.

The manual/automatic switching relay is controlled by the CN0-PIN9 (OUT1) of the LFS. The output is controlled by the input CN0-PIN4 (IN4).

When CN0-PIN4 connects to OGND, automatic mode is valid for metal cutting. When CN0-PIN4 is NC, manual mode is valid for non-metal cutting.

The diagram is shown as picture 6-1.



Picture 6-1 Motor wiring diagram

NOTE:

Z axis configuration:

Motor model：42HS08 (v2.0)

Driver model：DM556

PPR：4000 pulse/r

Peak current：2.1A；average current：1.5A

The switch is set as the follows:

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
ON	ON	ON	ON	ON	ON	ON	ON

2 auxiliary gas control diagram

Auxiliary gas control has two methods. One of them is need two output of LFS to control two relays. Another is one output to control one relay. The methods can be select in the RD_Tracer.

Method 1:

Compressed air and O2 are controlled independently by its own solenoid valve, air outlet of solenoid valve connect a three way joint, and then connect to the air inlet of laser head.

When auto/manual switch is set to manual mode, it is for non-metal cutting mode, CON0-PIN10 (OUT2) output high level, the relay is opened, O2 control valve closed. Then CON0-PIN13 (OUT5) output low level. The connected relay is closed, compressed air output to three ways joint. Compressed air blows into the laser head for non-metal cutting.

When automatic/manual switch is set to automatic mode, it is for metal cutting mode, CON0-PIN13 (OUT5) output high level, the relay is opened, compressed air control valve closed. Then CON0-PIN10 (OUT2) output low level. The connected relay is closed, O2 output to three ways joint. O2 blows into the laser head for non-metal cutting.

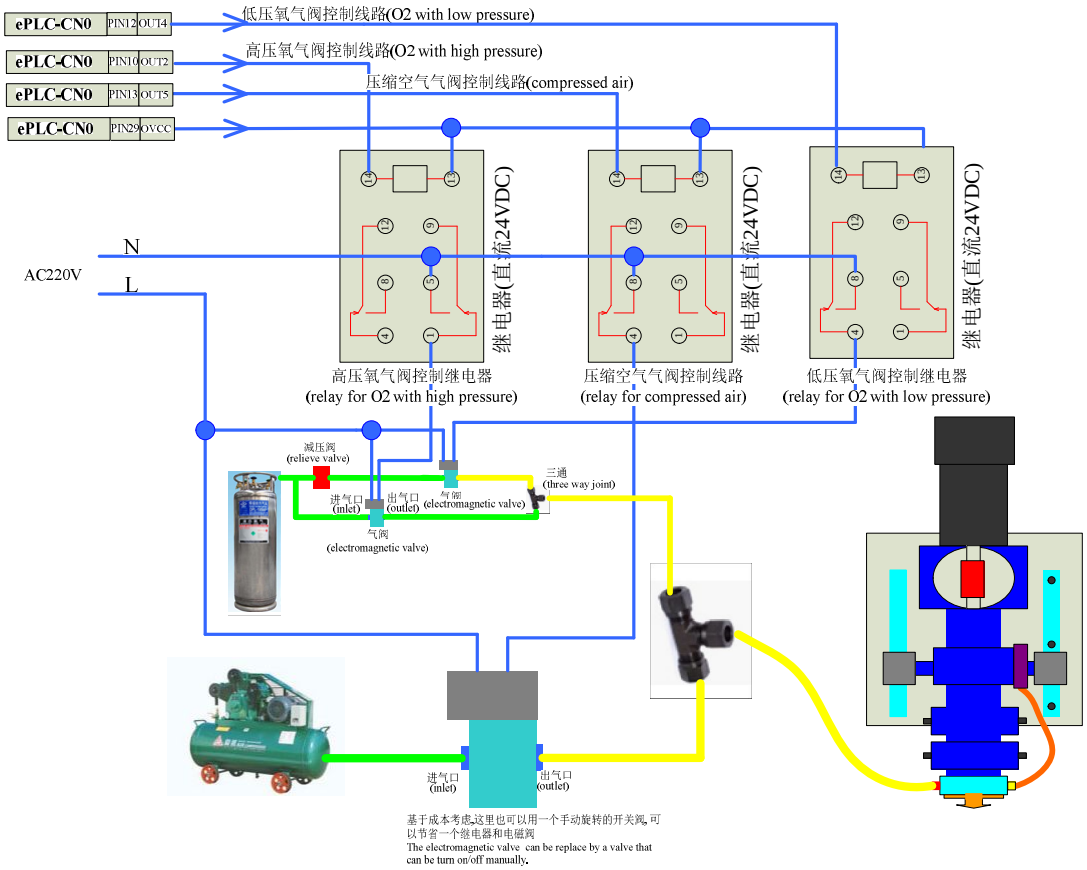


Figure 6-2 compressed air control diagram

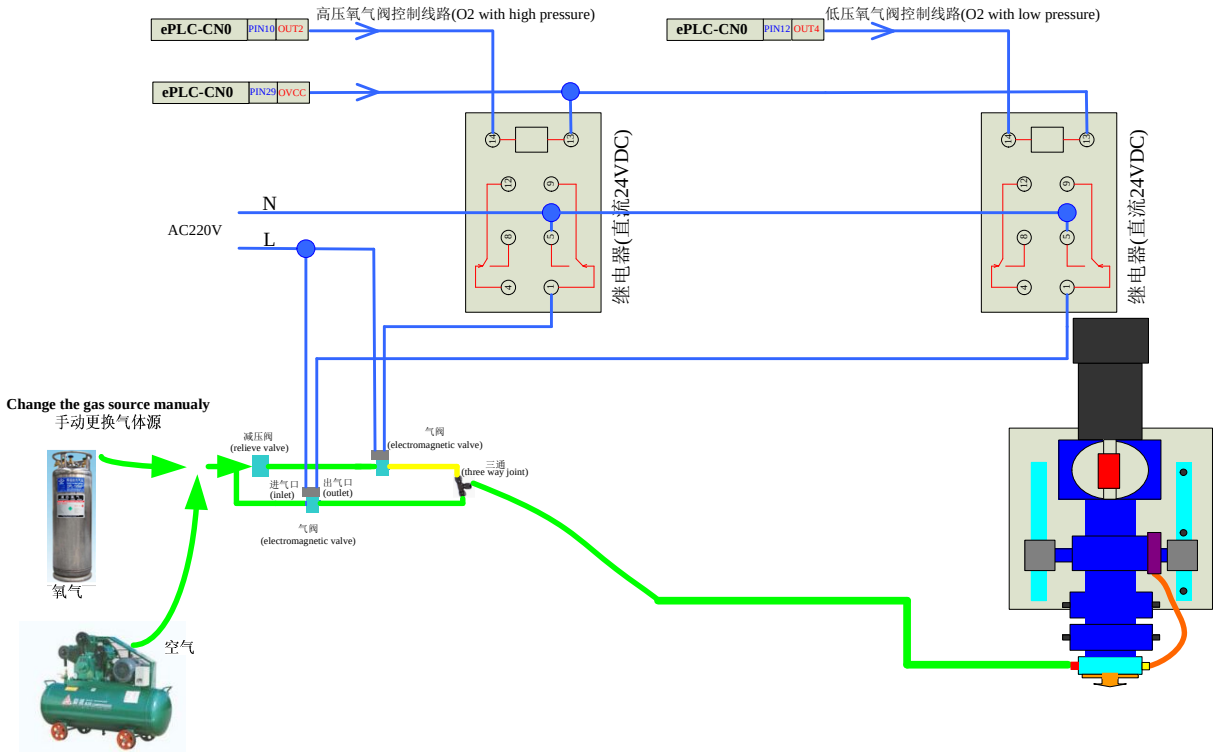
Method 2:

Method 2 is simple and economic, as shown in the figure 6-3 below. Auxiliary air only uses one valve. Gas source must be replaced manually in the process of metal cutting and nonmetal cutting. Gas pipeline must connect to compressed air manually for non-metal cutting. And gas pipeline must connect to oxygen pipeline manually for metal cutting,

When switching to automatic mode to cut metal, O2 gas is controlled by LFS controller. O2 is closed when the laser head rising up. The O2 will blow when the laser head move down to the focus position. When punching hole, the O2 with low pressure is opened. The O2 with high pressure is opened when cutting.

While switching to manual mode to cut non-metal, CON0-PIN10 (OUT2) output low level all the time, the relay is always closed. So the compressed air is always blowing.

Switching from manual mode to automatic mode, CON0-PIN10 (OUT2) output high level, the relay is opened.



Picture 6-3 Auxiliary gas control wiring diagram (Method 2)

3 Manual/automatic switching and auto-searching focus

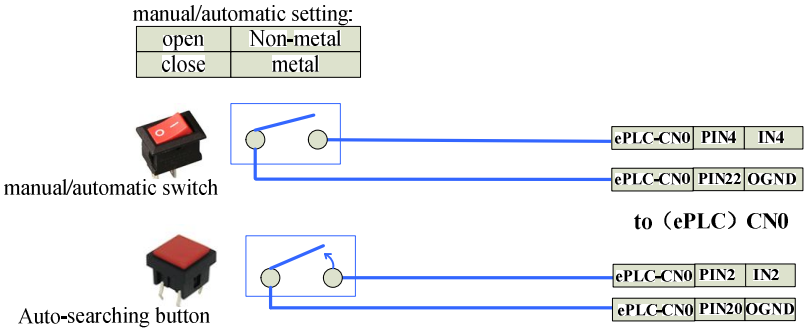
3.1 Manual/automatic mode switching

This is for non-metal and metal mode switch control. Manual mode is non-metal cutting mode, Automatic mode is metal cutting mode.

The manual/automatic switch is the switch with self-lock. When the current mode is manual mode, the laser head is controlled by the RDC633XM. Press Z+ and Z- can move the laser head.

When the current mode is automatic mode, the laser head is controlled by the LFS.

Auxiliary gas control is different for manual mode and automatic mode.



Picture 6-4 manual/automatic switch and auto-searching focus diagram

NOTICE：Manual mode is for non-metal cutting and automatic mode is for metal cutting.

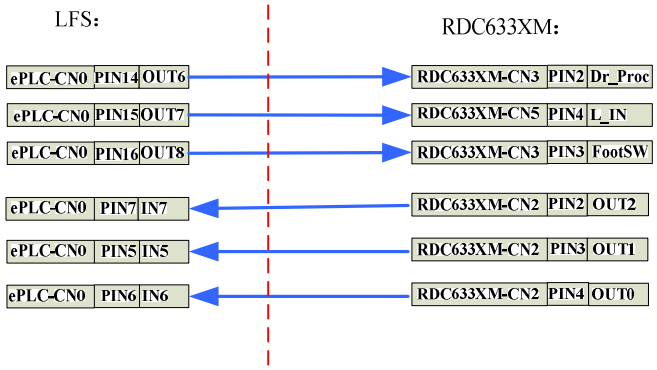
3.2 Auto-searching focus control

The auto-searching button is for the laser head to find the focus point. When power on for the first time after assembling, the auto-searching should be executed. If the parts of the LFS are changed, an auto-searching process should be executed again.

The switch for the auto-searching focus is the switch without self-lock.

4 Live focusing control diagram

The diagram describes the wiring between LFS and the RDC633XM. Just as picture 6-5.

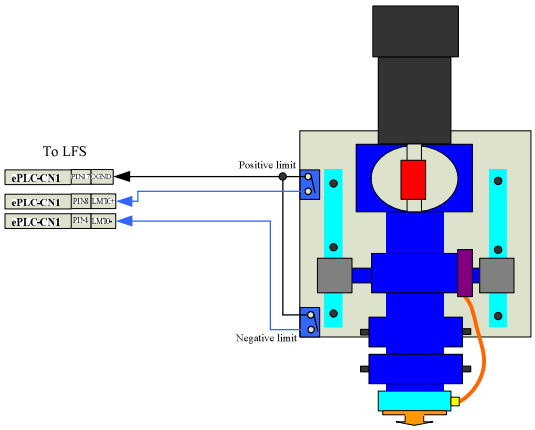


Picture6-5 RDC633XM and LFS wiring diagram

5 Limit and alarm diagram

When laser head touch the positive limit, the laser head will stop motion immediately. If the laser head touches the negative limit when focus lively, the laser head will rise up to a safe position.

The limit switch is normal open。See as picture6-6：



Picture 6-6 Limit wiring diagram

NOTICE：

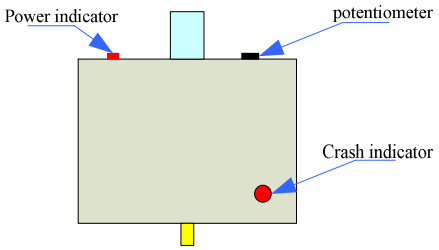
Limit input can be enabled or disabled. When limit is disabled, the laser head will neglects the status of the limits. The laser head will not be protected.

The above wiring diagram means the limit switch is valid when it closed with OGND. So in the RD_Tracer, the polarity of the limits must be set to be negative.

Low level will trigger protection is default.

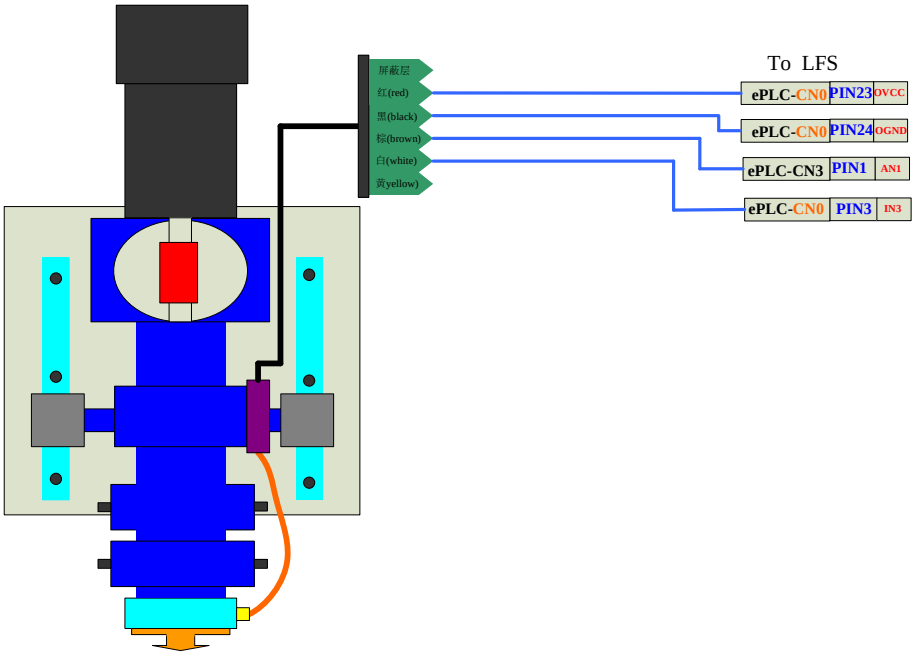
6 Sensor and amplifier diagram

The power for amplifier is +24VDC， When power on， the power led will turn on. See as picture 6-7



Picture6-7 Amplifier

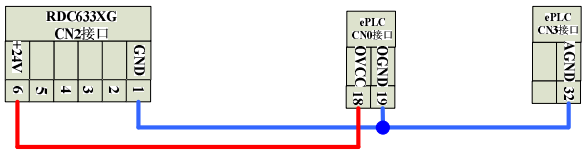
Connection between sensor amplifier and LFS controller as shown below:



Picture 6-8 Connection between amplifier and LFS controller

7 Controller and LFS Power circuit

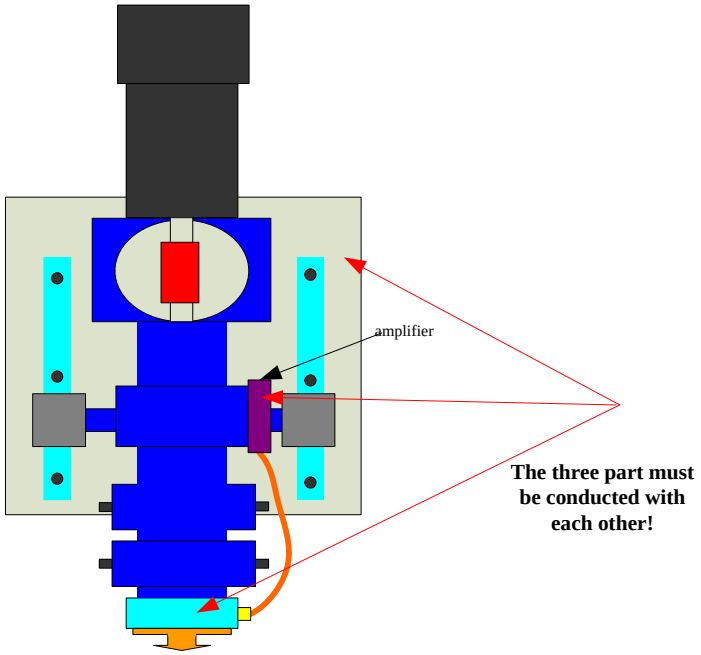
The power for LFS, amplifier and RDC633XM is 24VDC. The power for motor driver is 36VDC.



Picture6-8 Power supply

8 NOTICE FOR LFS

When install the amplifier to the laser head, the shell of the amplifier must be conducted with sensor shell. This is very important. See picture 6-9.



Picture6-9 Common GND installation