ECLASSICAL 3200L UHPLC

USER MANUAL

Operation Manual

for D3230L/40L Diode Array Detector

V1.0.6

Statement

This manual is only for users to understand, use and maintain EClassical D3230L/40L Diode Array Detector. Elite Analytical Instruments Co., Ltd does not assume the responsibility caused by business or special purpose use of the manual.

The information in this document is subject to change without notice and should not be construed as a commitment by Elite Analytical Instruments Co., Ltd.

This manual is believed to be complete and accurate at the time of publication. Elite Analytical Instruments Co., Ltd assumes no responsibility for any errors that may appear in this document.

In no event shall Elite Analytical Instruments Co., Ltd be liable for incidental or consequential damages in connection with, or arising form, the use of this manual.

Please read the specification carefully before use D3230L/40L Diode Array Detector.

Foreword

Thank you for purchasing our equipment. To ensure correct and safe use of the instrument, please read it carefully before using.

The details of the equipment's composition, installation, method of using, maintenance, parts selection and other points are described in the manual. After reading, please keep it carefully. Please delivery the manual with the instrument.

For safe operation, please read the following **Safety Precautions** before using the instrument.

Safety Precautions

According to the level of danger and harm, safety signs here are divided into the following three categories:

【Warning】 **Failure to properly follow the instructions and precautions indicated by this sign may result in serious injury or damage to health and property. The property damage includes the environment around and the instrument.**

【Caution】 **Failure to properly follow the instructions and precautions indicated by this sign may result in slight injury or damage to health and property. Slight injury means no hospitalization is needed to the wounded. Slight property damage means the instrument can be recovery through simple maintenance.**

【Note】 **The sign is used wherever information is given to ensure optimal performance of the instrument.**

1. Precaution for usage

［**Warring**］**D3230L/40L** Diode Array Detector should only be used as a part of liquid chromatography. Do not use it for any other purpose. Except for special instructions, the instrument does not have explosion-proof function.

2. Ambient Conditions

［**Warning**］When the organic solvents are used，it is recommended that interior must be well ventilated and the firework should be prohibited. Also, a sink or equipment for washing eyes should be installed nearby in case of the organic solvent contacting with the eyes or skin.

［**Note**］In order to ensure high efficiency, keep the instrument away from caustic gas and dusty environment. The worktable should be neat, smooth, firm, and big enough. Ambient should be between 10℃ to 30℃ with a small fluctuation, and RH should be between 45% to 85%. Keep it away from cold or hot source as well as direct sunshine. The system should not be close to strong magnetic field.

3. Precaution for installation

［**Warning**］The instrument should be installed following the instructions strictly by professionals, make sure that the voltage of the power sockets the same as the power supply voltage indicated on the instrument. Using the wrong power voltage could result in danger and fire.

The accessory power cable should be used to connect the instrument to the power socket. Other cable should not be used.

Make sure the line cord is connected to a properly grounded power receptacle to prevent static and electric leakage.

［**Caution**］The instrument is so heavy, you should move it carefully and watch your hands at the same time.

［**Note**］The instrument should be connected following the instructions strictly. Wrong connection could cause communication error.

4. Precaution for use

［**Warning**］Do not use the instrument in places where heat resource, fire seat, magnetic resource, strong vibration exist or may exist. It is prohibited to play flammable nearby.

The bottle for storing the mobile phase should have pore in cap to prevent danger caused by negative pressure in the bottle.

A gap between waste tube and the cork of waste bottle is necessary to prevent the waste bottle bursting when it is overfilled. The gap should be smaller to insure less evaporate of hazardous solvents. Even though, the waste needs to be clean up promptly.

［**Caution**］When using organic solvents, please wear safety goggles, special lab coats, gloves mask etc. If your body is exposed to toxic solvent accidentally, wash it immediately, and then go to hospital for specialized treatment.

［**Note**］When preparing mobile phase, please use HPLC-grade or equivalent at this level solvents. Solvents must be prefiltered by the manufacturer with 0.45μm (or smaller) mesh filter. Degas all mobile phase before using it. Degassing can help to ensure a stable baseline and consistent analytical results.

Before first use, rinse the entire piping system according to the requirements of the manual, direct use is likely to block pipeline.

Before sample test, ensure that the pipeline in the system is filled with mobile phase without any bubble, otherwise it will affect the reliability of test results.

If an eluent is replaced with another eluent in which is insoluble, such as positive mobile phase (hexane) and reverse phase (methanol), be sure to operate according to the specified method in the manual, otherwise it will cause serious pipeline jam, and even system paralysis.

Do not use the following solvent: concentrated sulfuric acid, nitric acid, dichloroacetic acid, methylene chloride, chloroform, chloroform, dimethyl sulfoxide, acetone, tetrahydrofuran, etc. Such solvents always reduce the strength of the PEEK material, make it become fragile and broken, but the impact of short-term use of aqueous solution of acetone(lower than 0.5%) in gradient performance, the impact is receptible.

When using PEEK pipes, the pressure of system should be lower than the tolerance pressure of peek material, otherwise it may burst.

The bending radius of peek pipe should be more than 10mm, make the peek pipe natural relaxation during installation.

The PEEK pipe should be intercepted with professional tube cutter in order to make the pipe more smoothly. Pay attention to that there should be no cutting debris left in the pipe.

5. Repair, maintenance and parts replacement

［Warning］ Before repair, maintenance and parts replacement, please turn off the power in case of leakage and electric shock.

There is no need to open the host cover while daily maintenance and repair. If the repair needs to open the host cover please entrust agents or communicate with us.

You should clean the dust on the power cord plug regularly to reduce the electrostatic. Then, dry it before using, otherwise electric shock may occur.

Use dry cloth to wipe the instrument. Do not use water or alcohol. The use of these liquids may erase characters or color on the panel.

Do not replace parts (e.g., fuses, deuterium lamp, etc.) from other company or other type, all accessories are required to be specified to prevent danger.

6. Precaution for static electricity

[**Warning**]As the instrument may use a lot of flammable, explosive organic reagents which may contaminate laboratory air, when the reagent concentration is too high, any spark or flame could cause fire or explosion accidents. Do not use the pump near any fire resource or hot resource, and keep reducing the electrostatic in mind. To reduce static electricity, please take the following measures:

1） Make the instrument grounded. It is very important, please pay attention to it.

2） Maintain proper indoor humidity (humidity is greater than 65% can prevent static electricity effectively) and keep the environment clean.

3） Metal waste bottles (external conductive) should be grounded (no ground insulation). When using other materials container, you can insert one end of the wire into liquid in the bottle and make the other end earthed.

4） Replace a larger I.D. pipe when the flow of mobile phase flow is higher.

5） Wipe the instrument regularly.

6） Staffs should wear anti-static clothing. An anti-static bag is needed on the floor.

7） People and objects with static electricity is prohibited to touch the instruments.

7. Warning label instructions

To ensure the safety of staffs, we attach warning labels on the equipment where are dangerous. If the label is missing, please request new ones from the company, and attach to the correct position.

Contents

1. Chapter One： Introduction

1.1 Introduction

EClassical 3200L High Performance Liquid Chromatograph is a new generation of devices developed by Elite Analytical Instruments Co., Ltd., with intellectual property.

D3230L/40L Diode Array Detector (D3230L/40L for short), can be conveniently combined with pumps, autosamplers, column oven and other modules of HPLC, serving as a detection unit module, or used as an independent tool.

D3230L/40L has an advanced optical system differing from single wavelength uv-vis detector. The light beam from the deuterium lamp was focused on the flow cell, passed through the slit and entered into the light-splitting optical system. The grating disperses light into bands of wavelengths and focuses the onto the plane of the photodiode array. The detector measures the amount of light striking the photodiode array to determine the absorbance of the sample in the flow cell. The detector provides with chromatograms at any wavelength, as well as spectra at any time. In this way, users obtain 3D spectrum.

1.2 Features and Functions

Excellent Design

- D3230L/40L detector is a dedicated multiple wavelength detector, innovated by professional team. New optical system, corrected by unique wavelength calibration method, improves the detector's performance, with higher system light energy, lower baseline noise, higher S/N ratio, more excellent wavelength accuracy and wider wavelength detective range.
- Optical System, achromatic and aplanatic, constructed of ellipsoidal mirror and toroidal mirror, obtained higher light energy.
- Equipped with imported flat field imaging grating, the detector has higher diffraction efficiency and lower stray light.
- Using CMOS linear image sensor with 512/1024 pixels, the detector has spectral resolution of 1.2 nm/0.6 nm.
- With excellent mechanical design, D3230L/40L detector owns: optimized airduct system to lower the baseline drift; Reasonable cooling mode to extend the service life.
- Convenient operation on deuterium lamp replacement indicates that it is not necessary for users to recalibrate after that.

Intelligent System

- Fully automated power-on self-test to help users to realize circuit faults in time, avoids unnecessary damage.
- leakage alarm functions, and found that the flow of leakage fault in time
- Kromstation chromatography data processing workstation, which can realize automatic analysis of unattended.
- Real-time acquisition of both chromatograms and spectra makes it possible to obtain 3D spectrum for peak purity calculation and library searching.
- It displays signals from multiple channels, with flexible sample frequency, detection wavelength range and response time, better meeting demand for separating and analysis.
- can directly read from the workstation record and light open time and open

1.3 Performance Specifications

Table 1-1 Performance specifications of D3230L/40L detector

No.	Items	Specifications
1	Light source	Deuterium lamp (tungsten lamp, optional)
2	Exposure time	25ms, 50ms, 100ms
3	Sample frequency	2 Hz、5Hz（default）、10 Hz、20 Hz
4	Wavelength range	190-800nm
5	Wavelength repeatability	≤±0.1 nm
6	Wavelength accuracy	±1 nm
7	Spectral resolution	1.2 nm/0.6 nm
8	Photodiode array	512/1024 element
9	Noise	≤±1.0×10^{-5} AU (dry flow cell, 254 nm, 10 Hz)
10	Drift	≤2×10^{-4} AU/h (dry flow cell, 254 nm, 10 Hz, temperature change below 2 ℃/hour)
11	Minimum detection concentration	≤7.0×10^{-9} g/mL
12	Linearity range	≥2.0 AU(5 %)(254 nm)
13	Maximum backpressure on flow cell	≤8 MPa
14	Cell path length	10 mm
15	Communication mode	TCP

1.4 Physical Specifications

Table 1-2 Physical Specifications of D3230L/40L detector

No.	Items	Specifications
1	Weight	11 Kg
2	Size (length× width× height)	600 mm×380 mm×160 mm
3	Power supply	AC220 V ± 10 %, 50 Hz
4	Power	110VA

1.5 Principles

1.5.1 Optical System

The optical system of D3230L/40L Diode Array Detector is shown as Fig. 1-1. The light of illumination source is reflected and focused on the flow cell, and then reflected and focused on the slit. Light passes through the slit onto a holographic grating. The grating separates the light beam into all its component wavelengths and reflects the light onto the photodiode array. Every individual photodiode transmits the light into circuit signal, after which, the analog signal is converted into digital signal by DAD Mainboard. In the D3230L/40L optical system: The slit limits the spectral resolution and the light intensity as an entrance; The Diode Array is a series of 512/1024 linear photodiodes as a terminal. The widths of each photodiode and the adjacent photodiodes determine the diode resolution.

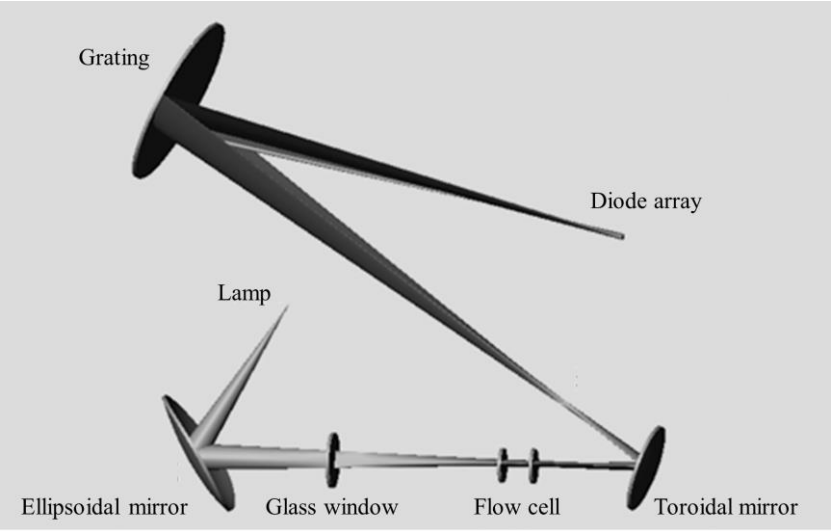


Fig. 1-1 Optical system of D3230L/40L detector

1.5.2 Circuit System

In the circuit system of D3230L/40L detector, optical signals collected by photoelectric sensor is converted to digital signal with pre-amplification electric circuit and AD converter. Then digital signals are transferred to DAD Mainboard CPU and processed; DAD Mainboard control the lamp, light filters and other functions. The DAD Mainboard communicates with the chromatography workstation with handshake agreement, in monitor of fault status as well. In the event of an exception, the mainboard upload error code to the workstation to prompt it. Two switching power supplies constitute the power supply system.

The circuit system is shown as Fig. 1-2.

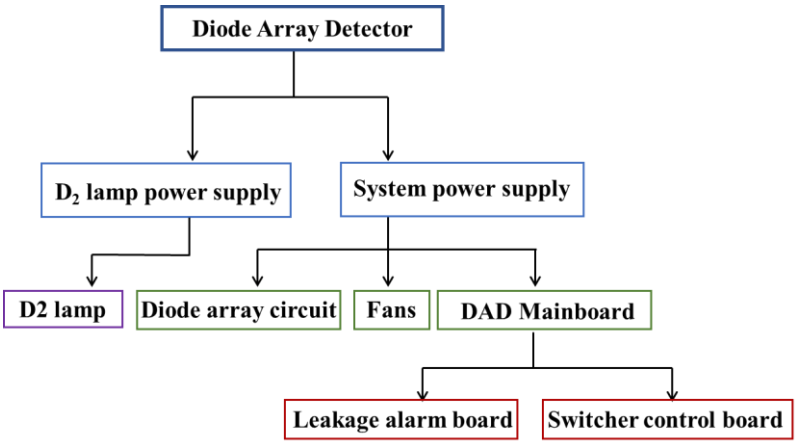


Fig. 1-2 Circuit system of D3230L/40L detector

1.6 Appearance

Instrument appearance of D3230L/40L detector, as follow:

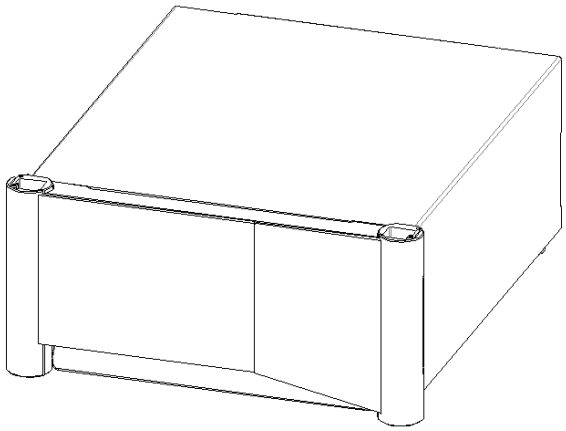


Fig. 1-3 3D view of D3230L/40L detector

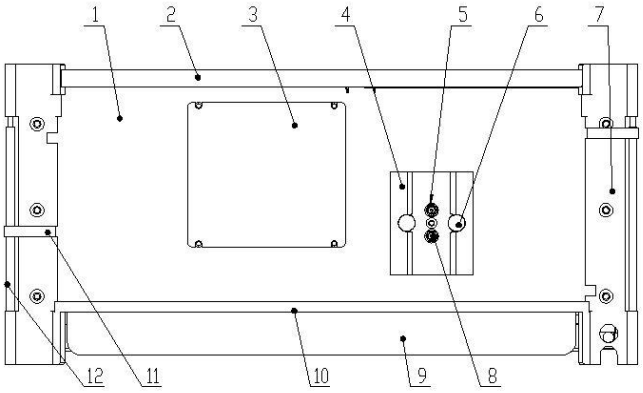


Fig. 1-4 Front view of D3230L/40L detector

1.Front plate；2.Upper beam；3.Lamp cover plate；4.Flow cell；5.Export union；6.Finger-tight screw；7.Inner stand column；8.Entrance union；9.Bottom beam；10.LED bracket； 11.Fixation clamp； 12. Fixation stand column

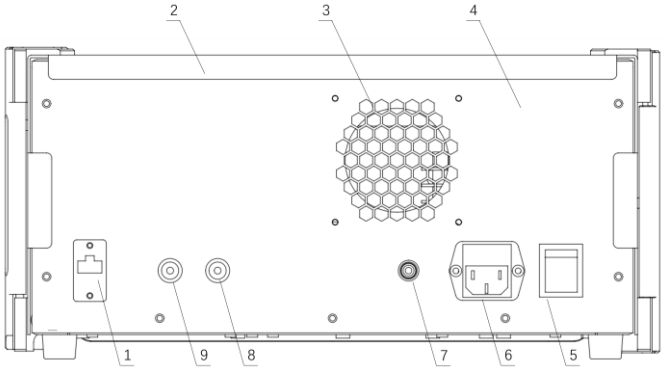


Fig. 1-5 Rear view of D3230L/40L detector

1.LAN interface；2.Enclouser；3.Fan；4.rear plate；5.Power switcher；6.AC-IN power interface； 7. Ground terminal； 8.Analog output； 9. Trigger terminal

1.7 Structure and Layout

As shown in Fig. 1-6, D3230L/40L detector is constructed of precision machinery structure, optical and electronic components. Reasonable layout and high precision machining make sure of excellent quality of the instruments.

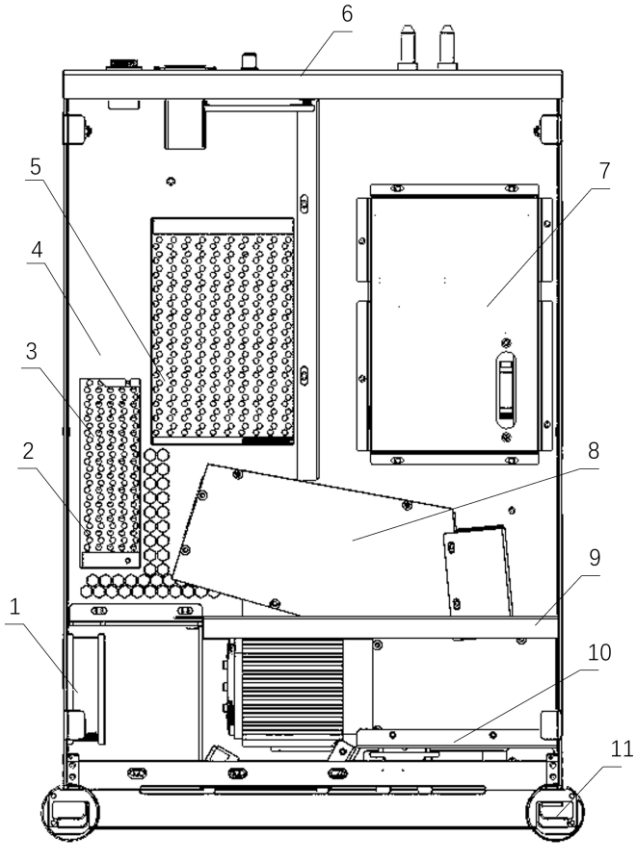


Fig. 1-6 Layout of D3230L/40L detector

1.Lateral fan；2.Partition；3.D_2 lamp power supply；4.Bottom plate；5. System power supply； 6. Rear plate；7.Circuit boards；8.Polychromator；9.Air duct；10.Upper beam；11.Stand column

2. Chapter Two：Installation and Transport

2.1 Unpacking acceptance

D3230L/40L Detector is packed with corrugated boxes and foam lined structure. When you receive the instrument, check the packaging first. If the packaging is damaged, please contact with Elite Analytical Instruments CO., Ltd. or local dealer.

【Warning】 **If there are signs of damage, please do not attempt to install the module. Inspection by Elite Analytical Instruments CO., Ltd is required to evaluate if the instrument is in good condition or damaged.**

2.1.1 Unpacking

Put the detector on level ground with the face of the packing box up. Cut the tape on the top, take out the detector and accessories package, and place them on the table. Then, remove foam, open the instrument protective film.

2.1.2 Delivering Checklist

Table 2-1 Deliver list of D3230L/40L detector

NO.	Items	Units	Qty
1	D3230L/40L Diode Array Detector	pc.	1
2	User Manual (USB)	pc.	1
3	Certificate	pc.	1
4	Service Card	pc.	1

2.2 Stack Order

In order to guarantee the best working state of the instrument, it is recommended that the instruments should be stacked as shown in Fig 2-1.

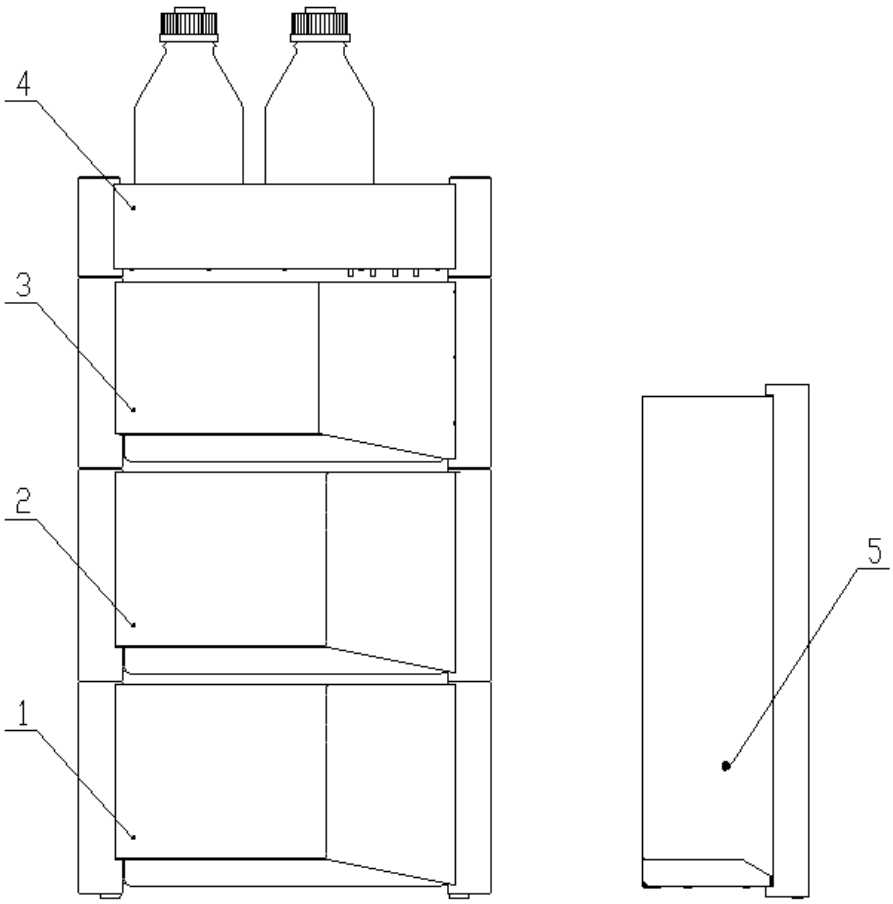


Fig. 2-1 Recommended Stack Configuration for EClassical 3200L

1. Pump；2. Autosampler；3. Detector；4. Solvent cabinet；5. Column oven

2.3 Installation Requirements

2.3.1 Site Requirements

- *Environment*

Detector need to work under ambient conditions in Table 2-2 below.

Table 2-2 Environment requirements

Items	Specifications	Requirements
1	Work environment	Room should be free of dust, inflammable and explosive materials, good ventilation is also important
2	electromagnetic field	No electromagnetic noise nearby
3	Operating temperature	4~40 ℃(39~104 °F)
4	Humidity	20 % ~ 80 %, non-condensing
5	Temperature fluctuation	< ± 2 °C /hour

【Caution】

Do not use the detector under conditions of temperature fluctuations. If the ambient temperature is too low, make the room temperature increase slowly to avoid condensation inside caused by rapid heating.

- *Bench space*

The D3230L/40L detector can be placed on any normal laboratory bench. If you want to display the complete EClassical 3200L system on the bench, make sure that the table can bear the weight of all components. It needs additional space of 50 mm on the left,150 mm on the right, 150 mm on the back to facilitate the circulation of air and electrical connections.

【Warning】

The instruments should be placed on a horizontal position, otherwise there is a danger of falling!

2.3.2 Power Line

To ensure the instrument can be normal and safe, please use a dedicated power line within the specified voltage range.

- Grounding, ac power to 220 v ± 10%, 50 Hz;
- Please choose T2AL250V fuse.

【Warning】

- **Please choose the special power cord provided by us. If you choose another brand or unknown power cord, it may cause damage to electronic components or personal injury!**
- **If the instrument is connected to a grid above the scope of application, it may cause electrical shock or damage to the equipment and staff.**
- **Please unplug the power cord before replacing the fuse to avoid electric shock. The external fuse is installed in the back of instrument.**
- **For personal safety and instrument protection, an external fuse is installed at the rear of the instrument.**

2.4 Communication Connection

Communication management of EClassical 3200L system is completed by P3200L infusion pump, via LAN cables. Communication and power connection is shown as Fig. 2-2.

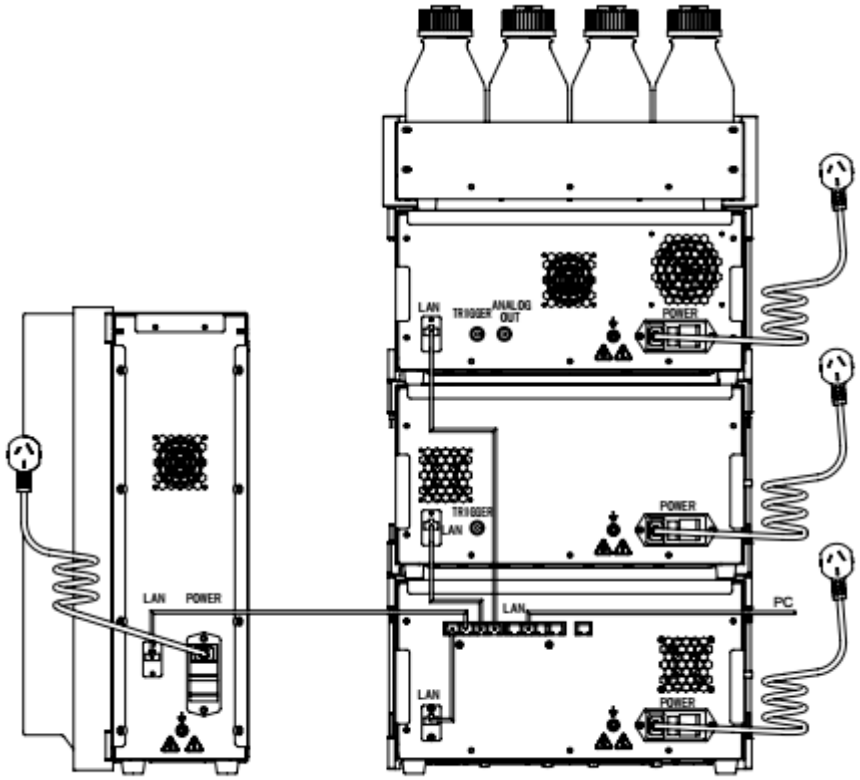


Fig. 2-2 EClassical 3200L system communication

2.4.1 Circuit connection

Finish power connection of D3230L/40L detector as follows:

1) Lay the detector as Fig. 2-1 and 2-2.

2) Plug of each part of the power cord into the power input socket.

2.4.2 Communication connection

Finish communication connection D3230L/40L detector as follows:

1) Make sure the power supplies of the detector and pump are “OFF”.

2) Connect the computer and “PC” port of P3200L with LAN cable.

3) Connect the LAN port of the detector and one port of switch on P3200L.

【Caution】

- **There are 8 yellow LAN ports in parallel on the switch of P3200L pump. Connect each module to the pump separately.**
- **Please select dedicated communication lines provided by Elite. Otherwise failed communication maybe happens.**
- **Under the condition of no pump, the router can be used instead.**

2.5 Flow Connection

Fig. 2-3 shows the procedures of tube and flow connection of EClassical 3200L system.

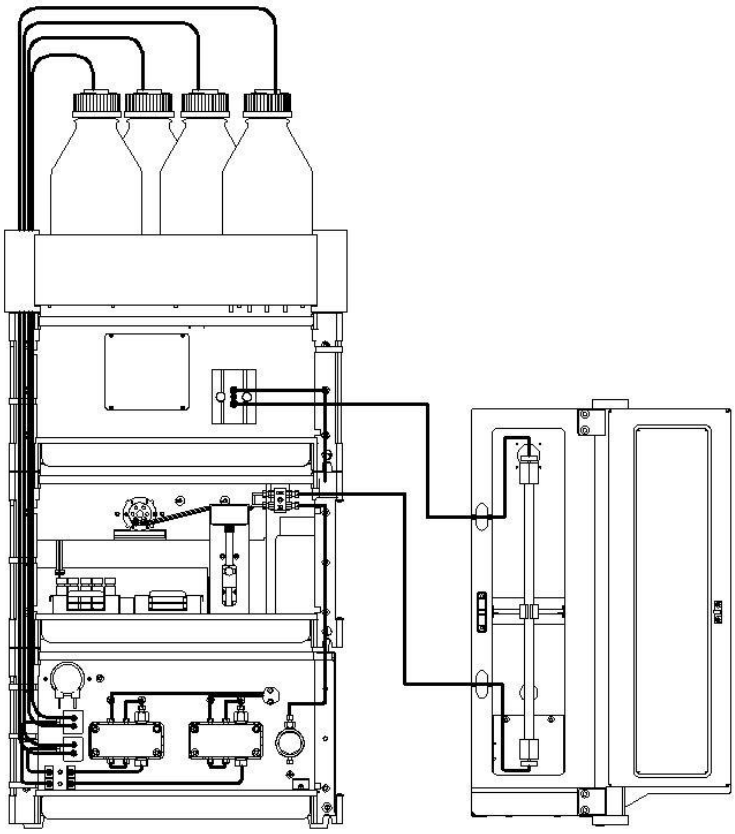


Fig 2-3 EClassical 3200L system flow connection

Tab.2-3 Flow connection

NO.	Name
1	A1 solvent bottle to solvent switch A1 inlet tube
2	A2 solvent bottle to solvent switch A2 inlet tube
3	B1 solvent bottle to solvent switch B1 inlet tube
4	B2 solvent bottle to solvent switch B2 inlet tube
5	Pump outlet to sampler inlet pipe
6	Injector outlet to column inlet tube
7	Column outlet to detector inlet tube
8	Detector outlet drain pipe

2.5.1 Tube Connection

- ***Cutting tube***

Please select the dedicated stainless steel tubing cutter to cut tubing into proper lengths ensuring the cross-section clean and trouble-free. Bend it up and down and from side to side to cut off.

【Caution 】 **Make the cutting surface of the pipe flush as much as possible to avoid birth and death volume.In addition, the inner diameter of the tube is not deformed, which causes the tube to be blocked.**

- ***Connect the metal sealing ring***

The correct way of connecting screws and metal sealing rings for stainless steel pipes as shown in Fig.2-4 and 2-5.

【Caution 】 **Please use the matching screw and blade ring. Stainless steel corresponds to stainless steel and peek corresponds to PEEK.**

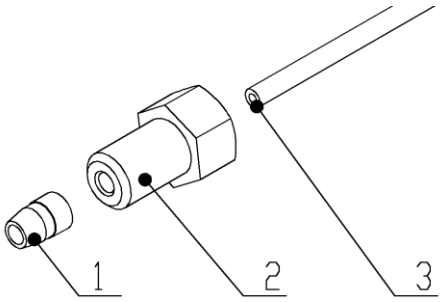


Fig. 2-4 Standard stainless steel fittings

1. Stainless steel nut；2. Stainless steel ferrules；3. Stainless steel tube

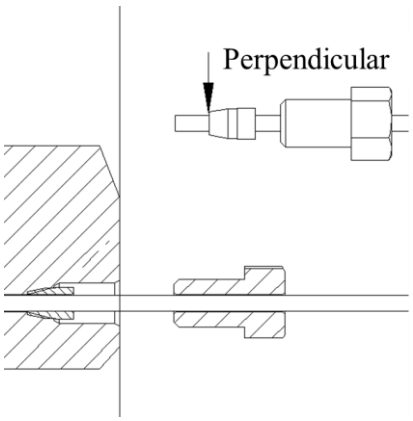


Fig. 2-5 Seal ring and tube

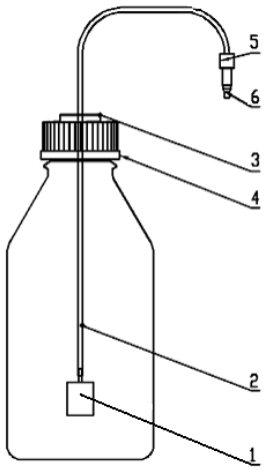
【Caution 】 **Insert and touch the bottom of the opening, otherwise dead volume will be generated. The strength is subject to no leakage. Excessive force will cause screw damage.**

2.5.2 Flow Connection

The following procedures show flow connection of EClassical 3200L system:

1) ***Solvent filter cup assembly and infusion line connection.***

Connect in order according to the label on the Fig



1.Solvent filter；
2.Solvent tube；
3.PTFE cork；
4.Bottle cap (with hole)；
5.Flangeless nut；
6. Omni-Lok

Fig. 2-6 Solvent filter assemblies

1. Solvent filter head;2. Infusion tube;3. Teflon stopper;4. Bottle cap (with hole); 5. Solenoid valve connecting screw; 6. 1/8 "Omni-Lok Solenoid Valve blade ring

2) ***Connecting solvent reservoir to the pump***

Connect the FEP infusion tube and solvent filter cup assembly provided with the instrument with the pump inlet as shown in Fig. 2-7.

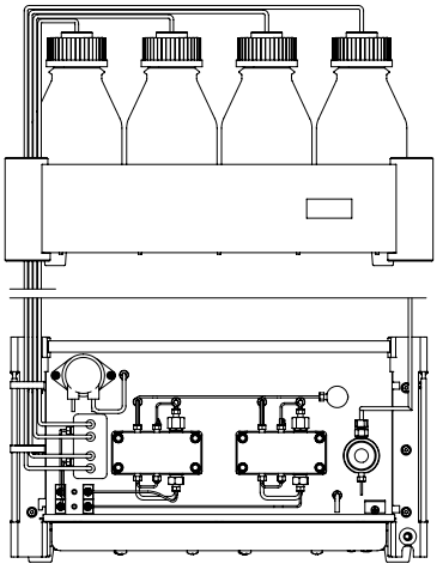


Fig. 2-7 Connection diagram

【Note 】

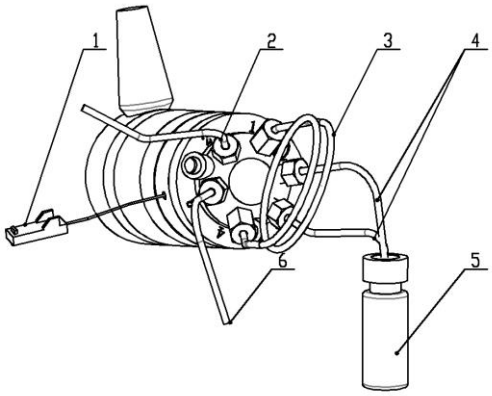
- **The solvent filter assemblies should keep clean to avoid polluted.**
- **The liquid in the dissolving bottle must be degassed.**
- **Mobile phase must be filtered through 0.45-μm mesh filter.**

3) ***Connection between pump outlet and sampler inlet***

Connect the outlet of the infusion tube from the pump with the inlet of the automatic sampler.

- **Pump outlet and manual sampling valve connection**

Connect the outlet of the pump to the inlet of injection valve (Port 2# is usually the inlet for the mobile phase on Rheodyne valve) with stainless steel tube (with screw connection and sealing edge ring). Port #3 of injection valve should be connected to the inlet of column as shown in Fig.2-8.



1.Trigger port;
2.Mobile phase inlet;
3.Sample loop;
4.Waste tubing;
5.Waste bottle;
6.Mobile phase outlet

Fig. 2-8 Flow connections for sample injection valve

- **Connecting the inlet of autosampler to the pump**

Connect the outlet tubing from the pump to the inlet of the autosampler as Fig. 2-9.

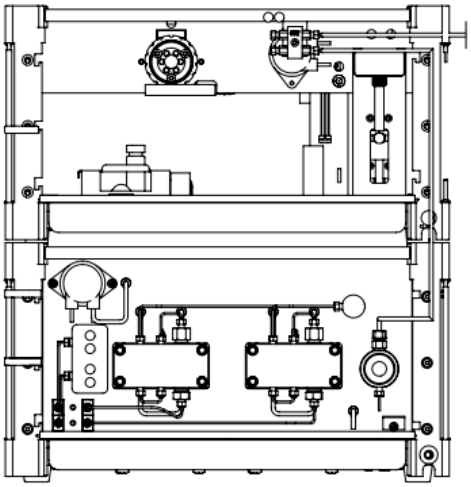


Fig. 2-9 Connection between pump outlet and sampler

4) Sampler and column connection

The outlet of the sampler is connected with the inlet of the column, and the connection is shown in Fig. 2-10.

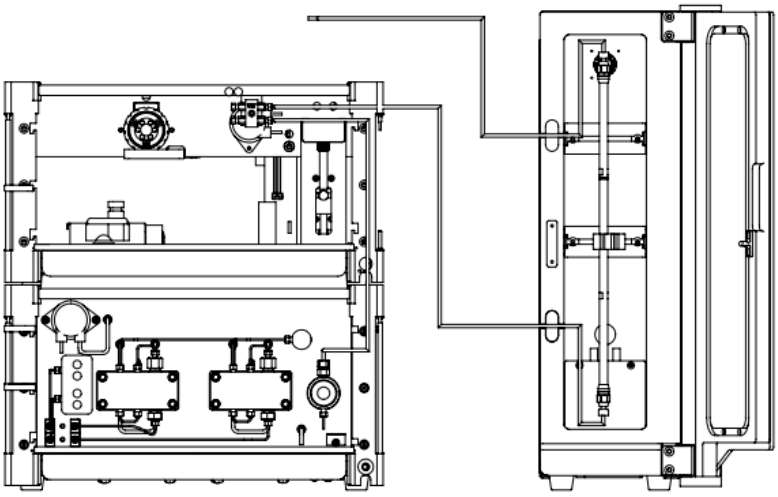


Fig. 2-10 Flow connections between autosampler and column

5) Column and detector connection

The column and the detector connection is shown in Fig 2-11. The outlet of the column is connected to the inlet on the atomization pipe of the detector.

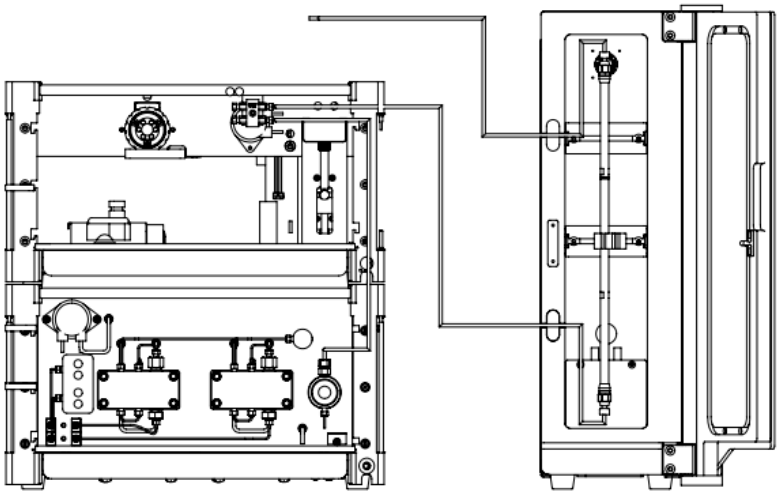


Fig. 2-11 Flow connections between column and detector

6) Piston clean flow connection

Silicon tubing from clean solvent reservoir is connected to the inlet of peristaltic pump. The outlet of peristaltic pump is inserted into the Y-type connector of the system waste tubing, as Fig.2-12.

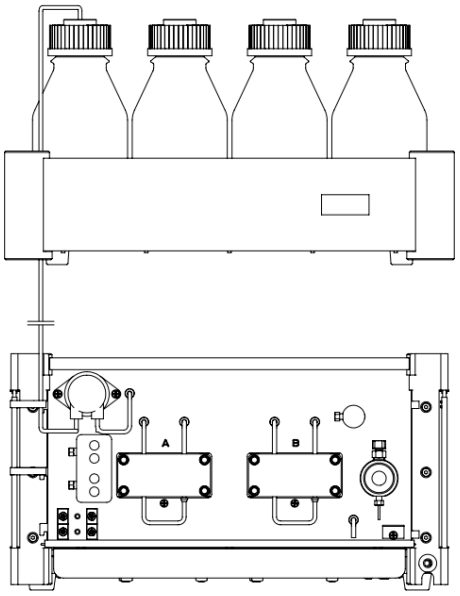


Fig. 2-12 Flow connection of piston clean tubing

【Note 】 **The solvent waste bottle should be place at a lower position with respect to the equipment**

7) Multi-channel body tubing connection

Multi-body is the system waste liquid collection place, including mobile phase waste, clean solvent waste, relief tubing waste, and unexcepeted leakage. The outlet tubing from the multi-channel body is connected with the waste tubing of column oven by a Y-type connector. All waste is then discharged to the waste container.

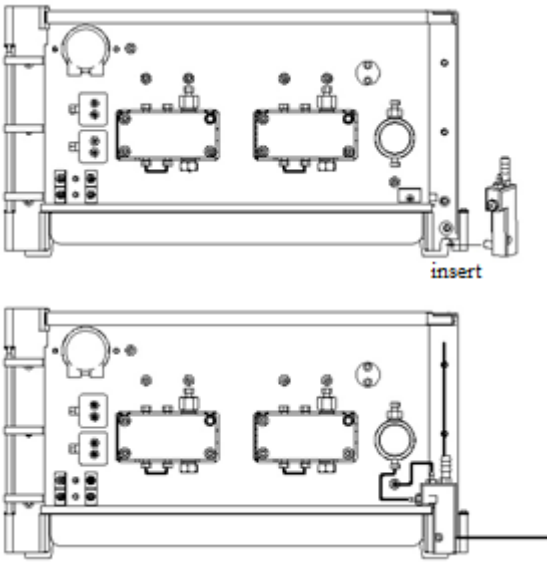


Fig. 2-13 Multi-body pipeline connection

2.6 Air Remove

New installed HPLC system and solvent tubing must be filled up with mobile phase. Select isopropyl alcohol as the solvent for Normal Phase LC, because it is intermixed with almost any HPLC solvent, and has excellent wettability. Select methanol for Reverse Phase LC. Procedures are shown as follows:

1) Rotate relief valve to “ON”.
2) Set flow rate of one flow channel as 100%, 10.000mL/min.
3) Examine whether there is solvent out from the tubing. If there is no, draw the solvent out by a rubber pipette bulb or an injection, until it flows out.
4) Rotate relief valve to “OFF”.
5) Relieve about 30 mL solvent to remove air from the system.
6) Switch to other channels, respectively, and repeat step 1 to 5.

【Caution】 **Solvent may be harmful to health, if there is leakage from the interface of tubing. Please take precautions.**

2.7 Verification

Instruments are factory verified qualified products in normal situations, so users don't have to do it again. If necessary to verify the instruments status and performance, follow these steps below.

1) Choose an applicable column, SiO_2 column for NPLC, or C18 column for HPLC.
2) Use mobile phase and sample following the column evaluation report offered by column producer.
3) After removing air bubbles from the HPLC system, inject test sample.

4) Compare the chromatogram and the column efficiency with data provided by producer. If it is in the allowed error range, the system meets the demands.

2.8 Transportation

The detector is a precision instrument, please gently while long-distance transportation, severe vibration, drops are likely to cause damage to the internal parts of the instrument. The random original packaging can effectively protect the instrument. When the instrument is required to move or returned for service, please follow these steps for packaging.

1) Turn off the power.
2) Unplug the power cord and communication lines.
3) Removing the connecting pipe and other elements between components.
4) Remove the detector from chromatography system, put it into special sealed bag on a large platform.
5) Put the detector into the original packaging foam, and fix it.
6) Placed the fixed detector and other accessories into original packaging carefully.
7) Tape the box sealed to prevent liquid from entering. Cover the packaging box with plastic wrap is recommended.
8) Transport the packaged instruments.

【Warning】 **Before packing, please check the box, if the original packaging has been damaged, do not use it, you should consult your local dealer or Elite Analytical Instruments Co., Ltd. customer service staff to solve!**

3. Chapter Three: Basic Operation

3.1 Power On and Off

Power On: Please plug the power cord into the power outlet. The power switch is turned off at this time (“O” position). Turn on the power switch(“I” means on, and “O” means off, on the rear panel). While the power indicator light, detector begins power-on self-test. When detector enters the normal startup state, the status indicator will change from breathing beat to blue. (If the indicator blinks frequently, the detector sends out liquid leakage alarm.)

Power Off: Turn off the power switch (“I” means on, and “O” means off), and then the power indicator and lamp status indicator will be off, as well as the cooling fans.

【Warning】 **There is no electric charge inside the instrument after turn off the power switch on the rear. The instrument can be powered off by Unplugging the power cord, but this operation is not recommended.**
If the instrument is shutdown, an Interval of more than 10 minutes is need before it is turned on again.

【Caution】

- **The detection wavelength, wavelength range and other parameters are set as the last shutdown status.**
- **At the first time running, all parameters are default values for factory settings.**

3.2 Software installation

D3230L/40L detector control software is divided into two types: Kromstation chromatography data workstation (including D3230L/40L evaporative light scattering detector control module) and D3230L/40L detector control module

Users of our EClassical 3200L chromatographic system can use the Kromstation (including the D3230L/40L detector control module), which provides complete control of the instruments and evaporative light scattering detector in the system.

Other customers can use the D3230L/40L detector control module to control the detector.

3.2.1 Computer Requirements

Hardware Requirements

- Minimum hardware requirements：Intel Core 2 CPU，2G RAM，1G hard disk (PDA module ; requires more than 8 G);
- Minimum display resolution：1024×800，64K color（16 bits ture color）;
- Others： at least two USB ports and one network port;
- Network management requirements: it is recommended that used to connect to the HPLC computer without internet connection. If it is necessary to connect to the internet, please complete the connection under the guidance of engineers from Elite Co., LTD.

Software requirement

- Kromstation workstation requires the operating system is Windows 10 or higher version of the operating system (such as Windows 10, 11) Windows.
- Confirmation for running Kromstation workstation's operating system for the original。
- Confirmation firewall closed
- Make computer operating systems "to sleep" option is set to "never".

- Set properties for the network adapter, identify the network adapter "power management" option in the "allow the computer to turn off this device to save power" in have not been selected.
- Computers used to connect to HPLC are not advised to install anti-virus software and touch other virus devices.

3.2.2 Computer Network IP Settings

Before installing the software, set up the computer network (take win10 OS as an example).

Right click the “Network ” on the desktop and left click the “Properties”.

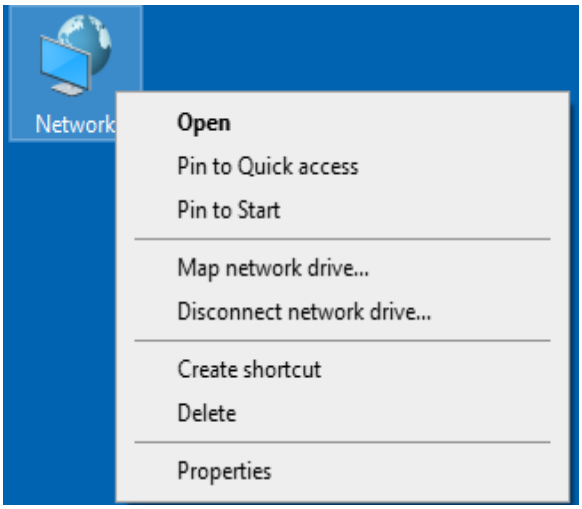


Fig.3-1 Set up Computer Network 01

After entering the “Network and Sharing Center” window, left click “Change Adapter Settings”.

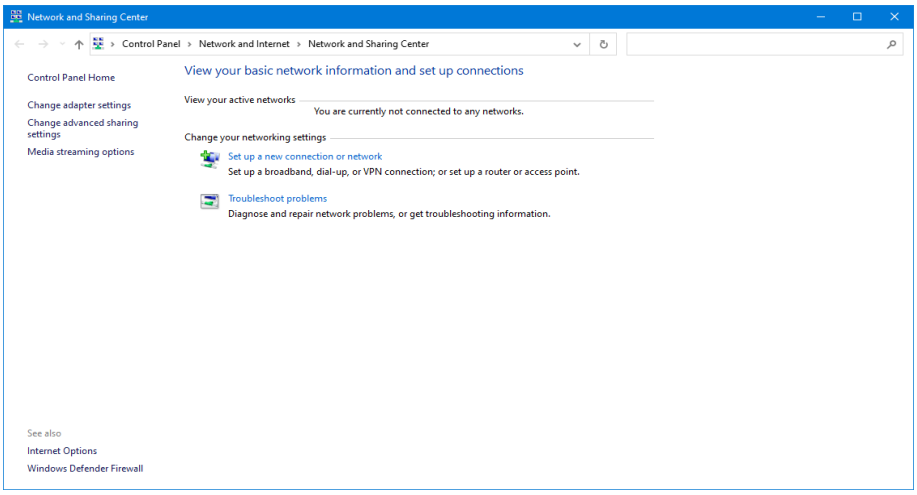


Fig.3-2 Set up Computer Network 02

After entering the “Network Connection Interface”, right click the “Ethernet” and left click the “Properties”.

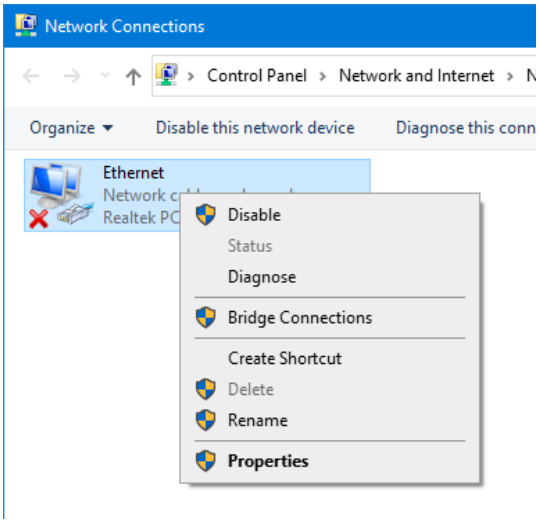


Fig.3-3 Set up Computer Network 03

Select the "Internet Protocol Version 4 (TCP/Ipv4)" into the "this connection uses the following items", and then click the "Properties".

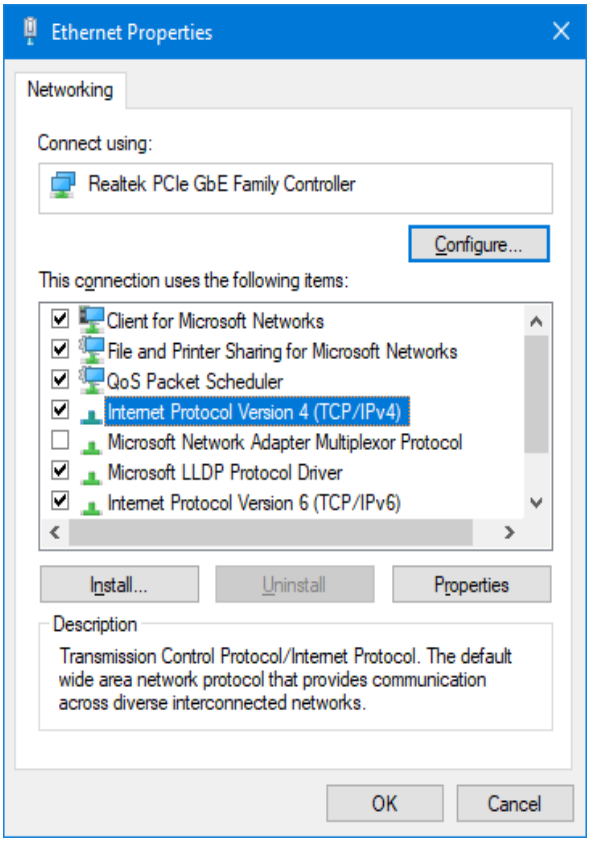


Fig.3-4 Set up Computer Network 04

After entering the "Internet Protocol Version 4 (TCP/Ipv4) Properties" dialog box, select the "Obtain an IP address automatically"

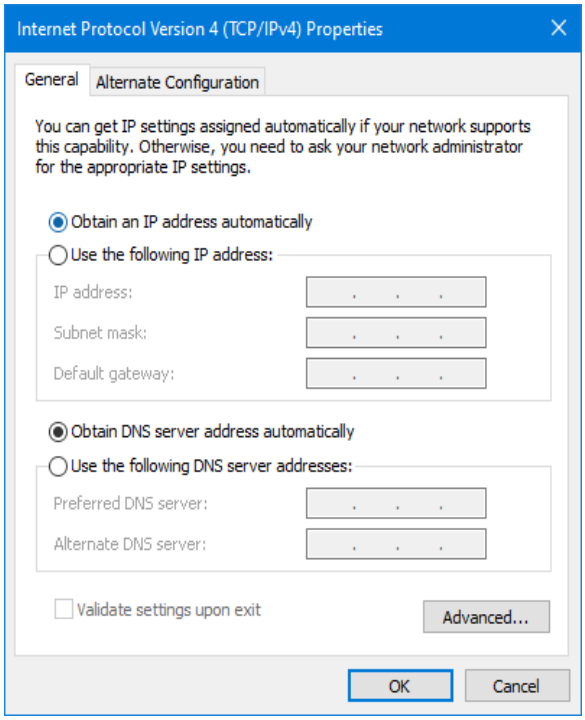


Fig.3-5 Set up Computer Network 05

【Note】 **With LAN interface as the hardware communication mode, the client computer must be conFigd with network communication card and corresponding driver.**

3.2.3 Kromstation instal

For installation of the workstation, please refer to the instruction manual that comes with the Kromstation Chromatographic Data workstation software.

3.3 Workstation structure

All the methods and most functions of the detector can be realized by the control of chromatographic data workstation. Fig 3-6 shows the structure of the chromatographic data workstation.

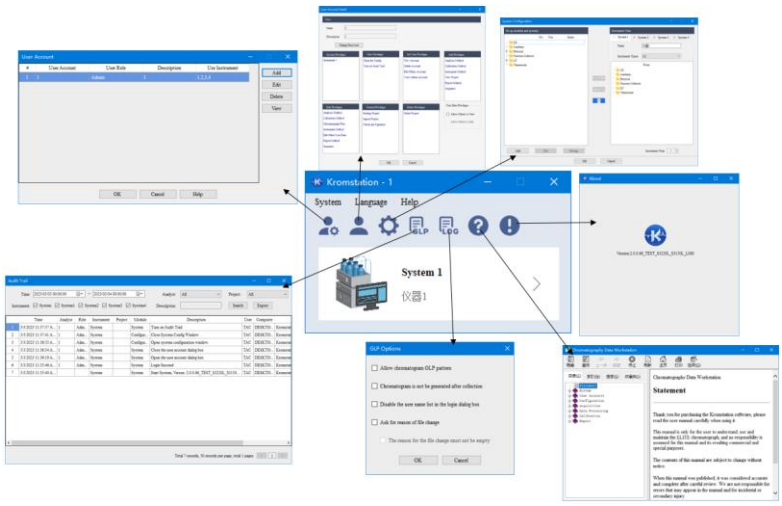


Fig.3-6 Kromstation workstation structure diagram

3.4 Control module

3.4.1. Add detector

Step by step, as follow：

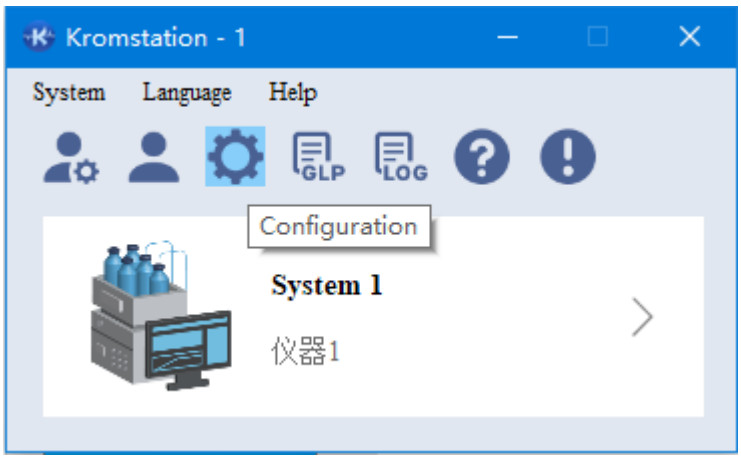


Fig.3-7 Configuration Interface 01

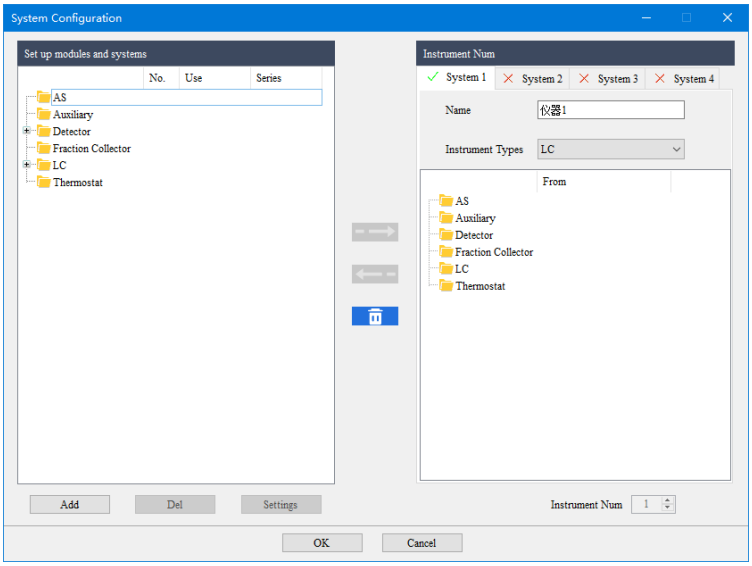


Fig.3-8 Configuration Interface 02

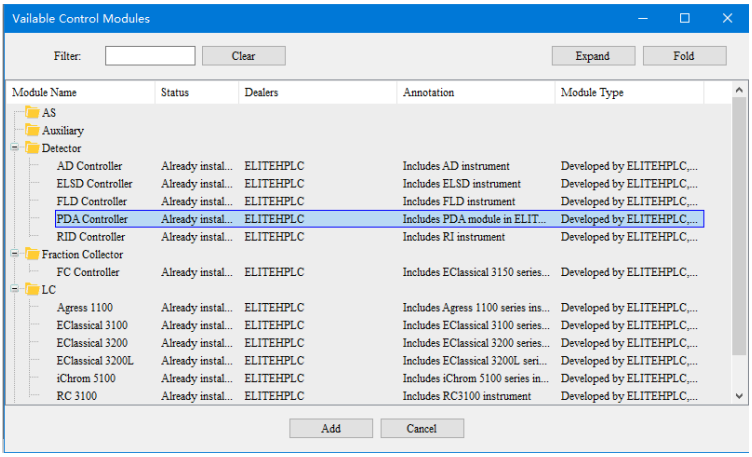


Fig.3-9 Selet" PDA Controller"

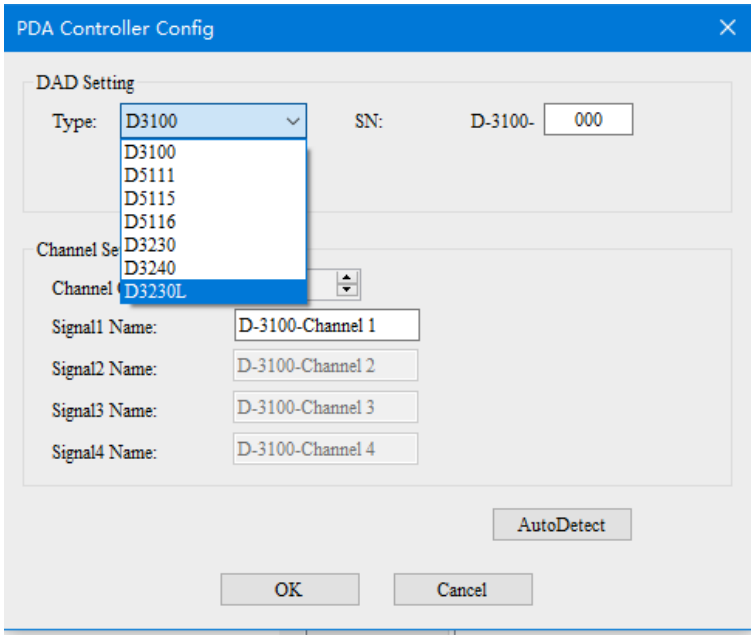


Fig.3-10 Select a model from the drop-down list

(D3230L forexample)

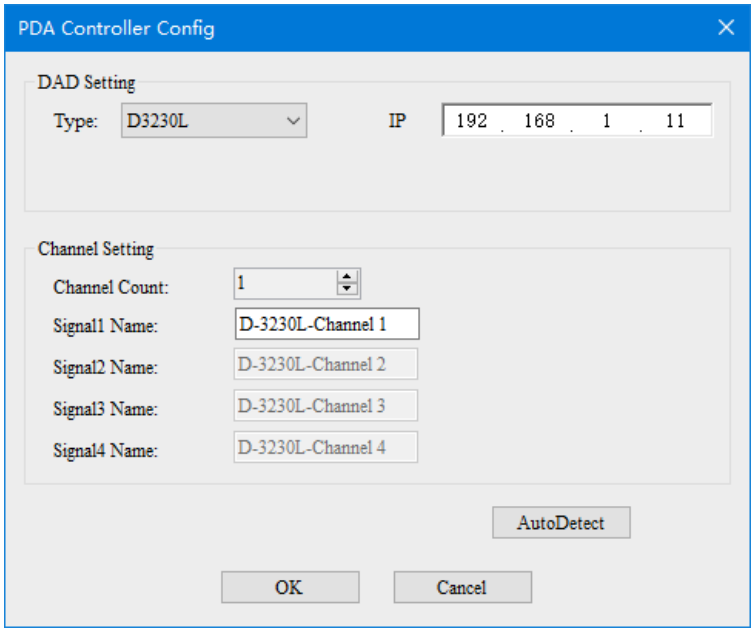


Fig.3-11 Select a model from the drop-down list

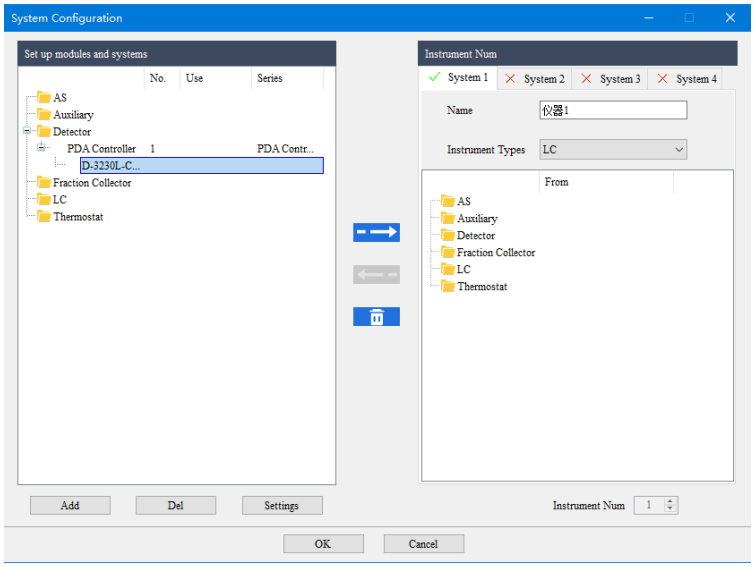


Fig.3-12 Returning to the system configuration interface, PDA module appears under the detector. Click the "blue arrow" to put it into the system

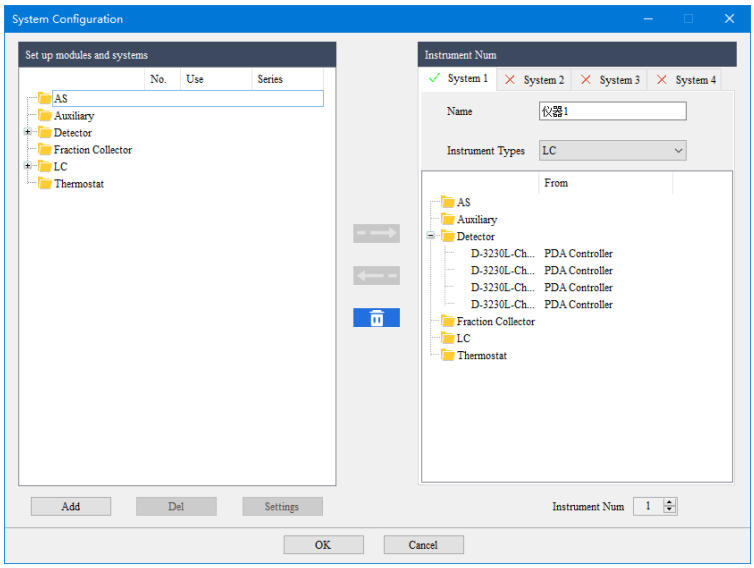


Fig.3-13 Add to workstation

(4 channels for example)

3.4.2. Parameter setting

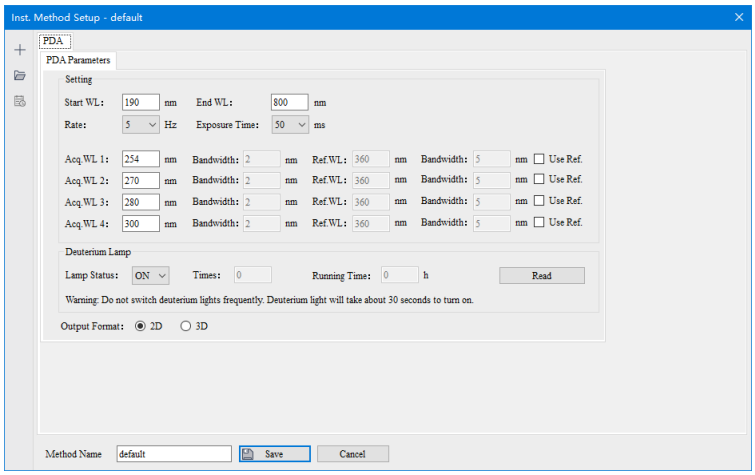


Fig.3-14 Detector parameter setting

3.5 Instrument Preheating

The purpose of detector preheating is to bring the circuit system and the light source to a stable state. Circuit board electrical performance and light source to achieve a stable state, the general preheating time needs about 30 minutes.

3.6 Operation Method

After the detection method is set, click the "Save" button, and then click the interface "Send method". The workstation will immediately send the method command to the lower computer and start running.

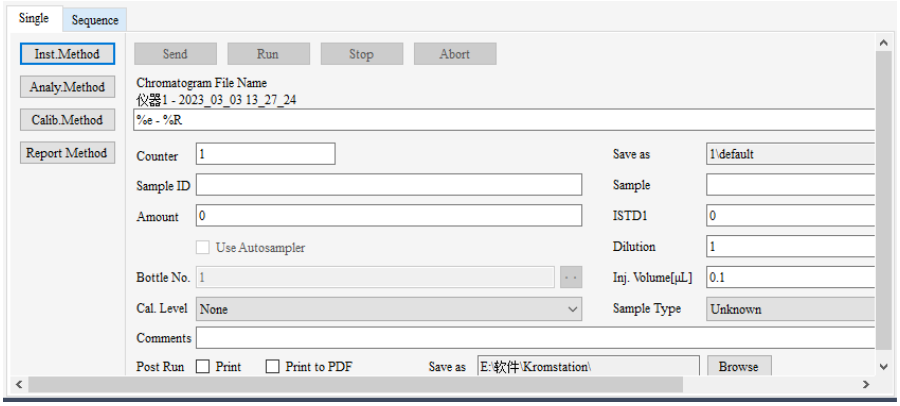


Fig.3-15 Sending method

【注意】 After setting the method, click "Send Method" to send the method to the instrument

3.7 Data collection

In the single analysis interface, click "Send method" after method setting, corresponding data collection will appear below:

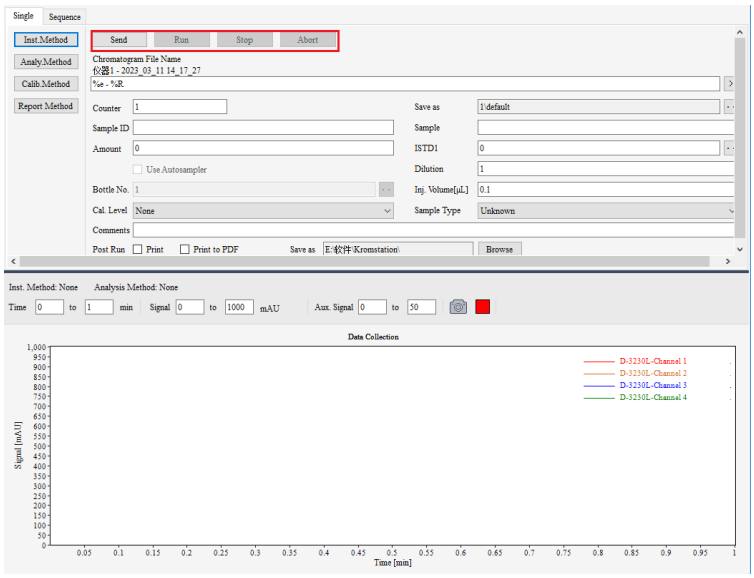


Fig.3-14 Single analysis - Data acquisition

On this screen, you can perform data collection and stop data collection.

After setting the method, click"  " "Run sequence" to start collecting data on the data acquisition interface.

4. Chapter Four: Troubleshooting and diagnosis

4.1 Indicator Status and Meaning

An LED light is installed below the front panel of the detector, serving as the status indicator, as Figure 4-1.

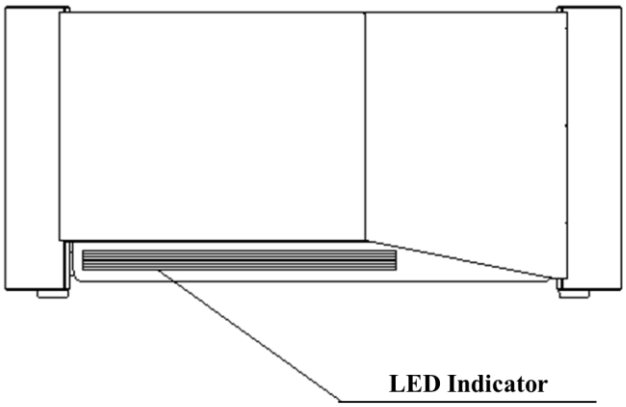


Fig. 4-1 LED indicator on the front panel

The indicator light is blue in design, with combination status of breathing pulsation, frequent flashing, and constant, to indicate the status of existing instruments and a failure alarm. Refer to Figure 4-2 for the meanings.

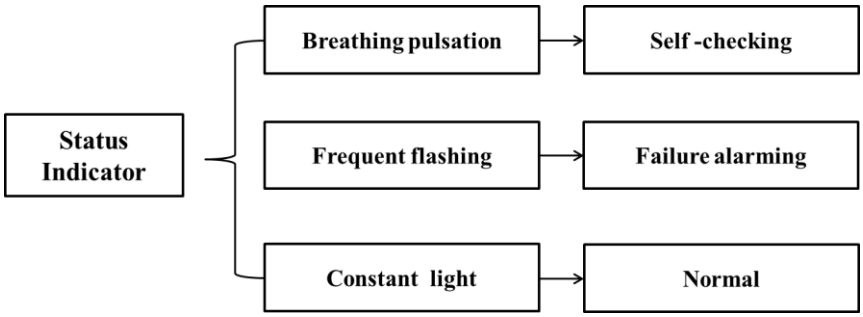


Fig. 4-2 Indicator status diagram

4.2 Error Code

There will pop out error dialog box if the workstation detects failure. Users judge the troubles and take proper measures to solve according to the error codes.

Table 4-1 Error code

No.	Code	Trouble	Indicator
1	DB00	System CPU fault	----
2	DB01	EEPROM fault	----
3	DB02	8M crystal vibration fault	----
4	DB03	32K crystal vibration fault	----
5	DB04	Operation fault	----
6	DB05	Leakage	Blue light flash
7	DS00	System CPU fault	----
8	DS01	EEPROM fault	----
9	DS02	8M crystal vibration fault	----
10	DS03	Wavelength stepper motor fault	----
11	DS04	Eliminating secondary spectral device fault	----
12	DS05	Deuterium lamp power supply fault	----
13	DS06	Wavelength calibration failure	----
14	DS07	Light intensity over range	----

4.3 Other Faults

Table 4-2 A summary of other faults

No.	Symptoms	Cause	Solutions
1	Detector doesn't work	Fuse burn-out	Change fuse
		Power supply interruption	Power recover
2	Deuterium lamp is out	Lamp beyond service life	Change lamp
		Deuterium lamp wiring malfunction	Rewire
		Deuterium lamp power supply fault	Check the power supply
		Deuterium lamp switching off	Switch on the lamp
3	Energy of the sample and reference ends display as 0	Lamp burn-out	Change lamp
		Lamp switching off	Switch on the lamp

4.4 Examples of Abnormal Detector Signals

4.4.1 Periodically changing abnormal signals

There is regular cycle of change of abnormal signals, shown as Figure 4-3.

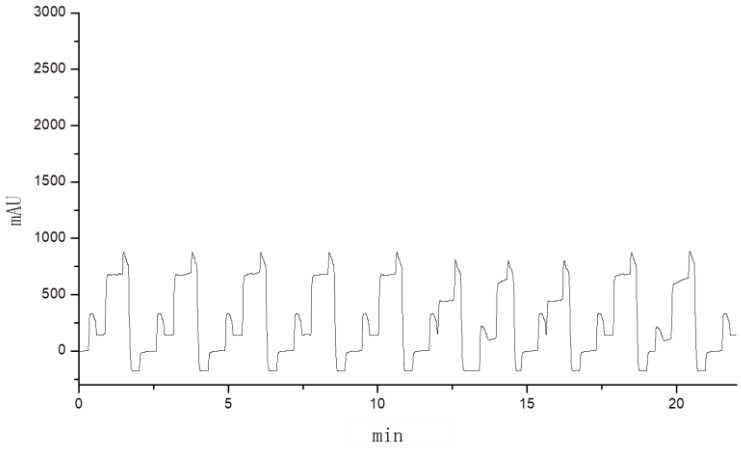


Fig. 4-3 Periodically changing abnormal signal 1

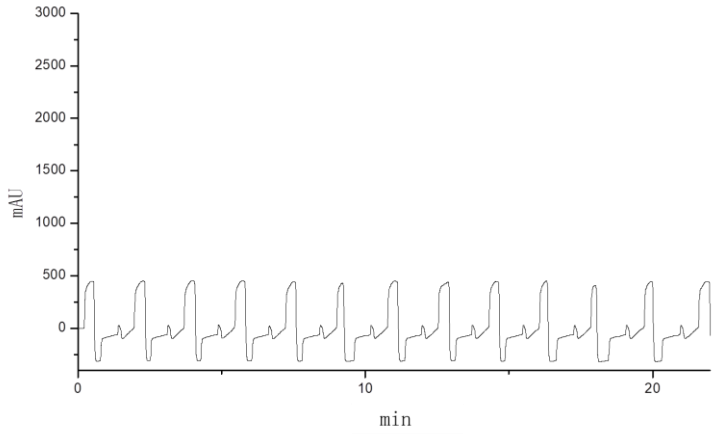


Fig. 4-4 Periodically changing abnormal signal 2

If there regular cycle of change of abnormal signals, as shown above, it is generally caused by air bubbles mixed in flow cell. To drive out bubbles, replace the column to a two-way joint and then increase the flow rate to 3-5 mL/min.

4.4.2 Straight baseline with large signals fluctuated

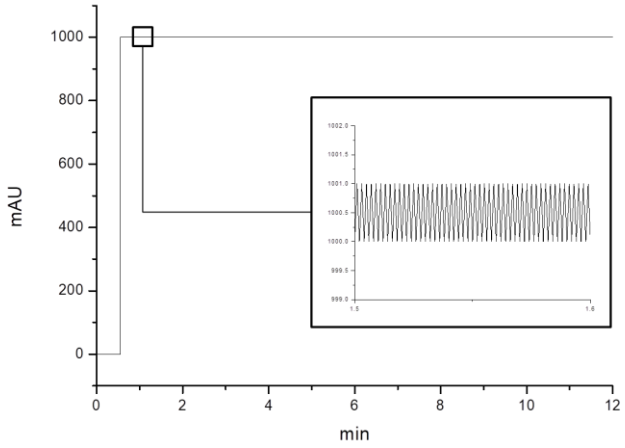


Fig. 4-5 Baseline without signals

If baseline performs straight with large signals fluctuated, as Fig. 4-5, it is usually caused by that Deuterium lamp failed to light. Check whether the lamp setup option is “ON”. If not, switch to “ON”.

5. Chapter Five: Maintenance and Repair

In order to guarantee the normal run of the detector, it is necessary to maintain or replace some components. Maintenance is referred to easy repair operations, where there is no need to open the cover. However repair is referred to get rid of the cover and change internal parts.

If you encounter any repair issue, contact with Elite Analytical Instrument Co., Ltd.

【Note】 **Without guidance, please do not open the detector cover, in case of any damage to body or instrument.**

5.1 Cleaning the Flow Cell Online

Please follow these steps to clean the flow cell online:

1) Turn off the pumps, and take off the column.

2) Connect the flow cell entrance to the sampler export, and then pump miscible solvent or water (for example, mobile phase is with water miscibility) into the flow cell and rinse it. If mobile phase is immiscible with water, rinse it with transitional solvent.

3) Add the column again.

4) If impurities cannot be cleared, please contact with Elite Customer Service.

【Warning】 **Please do not flush the flow cell with nitric acid nor acetone！Flow cell may be polluted by these solvents.**

5.2 Cleaning the Tubing

Newly acquired tube needs to be cleaned before use.

Solvent for cleaning stainless tube should be in the following sequence: CCl3-Methanol (or absolute alcohol)- water- 1.0mol/L HNO3 aq.- Methanol- Nitrogen. For PTFE, clean with methanol before use.

5.3 Flow Cell Replacement (Please contact Customer Service)

If flow cell is damaged or broken, replace the new one as following:

1) Unpack and check the new flow cell.

2) Please keep the detector power off, and then remove the entrance/ export connection tubing.

3) Unscrew the two thumb screws and gently remove the flow cell.

4) Install the new flow cell in the proper direction.

5) Tighten the two thumb screws.

6) Once again connect the entrance/ export tubing and clean it with suitable solvent.

7) Turn on the detector.

5.4 Deuterium Lamp Replacement

Depending on the self-property of deuterium lamp, lamp energy decreases while the working time increases. As a result, the signal to noise ratio decreases. To keep the optimum performance of the lamp, once it runs more than 2000 hours, users have to consider changing a new one. If the testing consequence is not influenced, users may go on using it with periodic maintenance and observation. It is suggested to get good prepared for the lamp replacement, avoiding a bad influence on experiments.

When the following conditions are met, please replace the deuterium lamp:

- The deuterium lamp cannot be lit while starting the detector.
- The baseline noise is too high, meanwhile the sensibility is too low.

【Note】 **If the deuterium lamp cannot be lit for many times, it is suggested to replace it. In general, the service life of the lamp is 2000 hours.**

【Warning】 **Before take off the deuterium lamp, please make sure the detector is powered off. Because there will be intense ultraviolet radiation directly harm eyes or skin if you do not do this.**

【Caution】 **The temperature of the lamp box and around is so high to burn skin. So, please take off the deuterium lamp after turning off the detector power for 30 minutes.**

Please replace the deuterium lamp as following:

1) Unscrew two fixing screws of the front panel, and remove the front panel lamp cover, as shown in Figure 5-1.

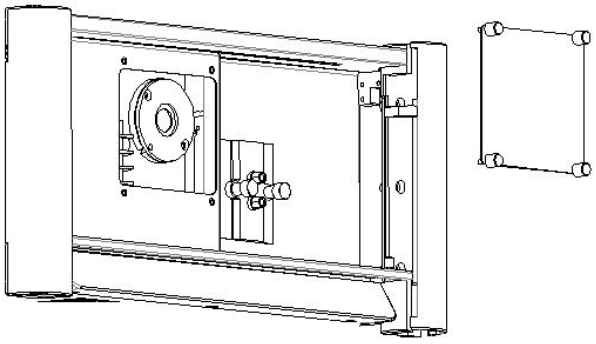


Fig. 5-1 Remove the front lamp cover

2) Remove the inner lamp cap, as shown in Figure 5-2.

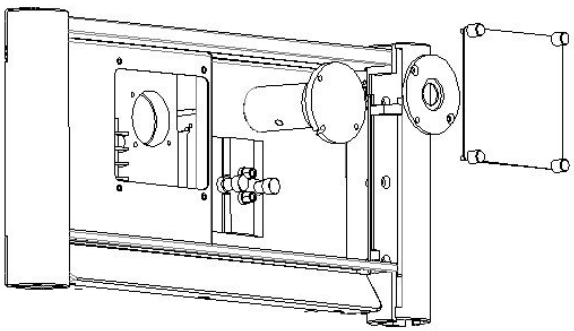


Fig. 5-2 Remove the lamp cap

3) Unscrew the 3 lamp connecting terminals, as shown in Figure 5-3. Then loosen the 2 deuterium lamp mounting screws, and pull the lamp out of the lamp housing.

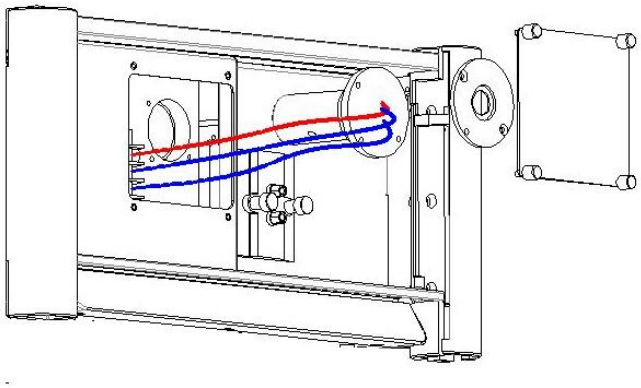


Fig. 5-3 Pull the lamp out

4) Re-install the D2 lamp assembly to its original condition in the instrument.

5) Fasten the 3 lamp connecting terminals referring to the color (red-red, blue-blue, blue-blue). Double check the line sequence and tighten the screws.

6) Re-install the front panel lamp cover.

【Note】

◆ Glass covers the deuterium lamp, so please handle it gently. Fingers and other hard things can not touch the lamp aperture. Do not touch the lamp glass directly. Hold its lamp lines or flange.

◆ Never observe alight deuterium lamp with naked eye. Please put on UV protective goggles while observing it. Make a short observation after replacing a new deuterium lamp.

◆ fingers or other objects in contact with the deuterium lamp bulbs outside, please wipe with anhydrous ethanol or lens paper gently wipe the bulb.

【Note】 **Make sure that the detector power is cut off during replacement of the deuterium lamp. After the replacement, make sure to turn on the detector and preheat for at least 10 minutes.**

6. Chapter Six: Appendix

6.1 Consumption parts

NO.	Describe	PN
1	SS Finger Tight	14993017
2	PEEK ferrule	14990128
3	Finger Tight I (PEEK)	3215F-120X
4	1/16″-1/32″-500mm SS tubing	18990147
5	PEEK Tubing OD1/16″*ID0.007″	13010014
6	Silicon Tubing	13010119
7	Tetrafluorotube OD1/16" × ID0.01"	13010029
8	T-tee plastic joint	14992920
9	Trigger line	18020091
10	Power Cable	17000119
11	LAN cable	17000116
12	T2AL250V fuse	15080006
13	De lamp	16010005
14	Wu lamp	16020006
15	Wu lamp base	14070693
16	De lamp screw	14992352

6.2 Renewal Parts

NO.	Describe	PN
1	DA module	18990058
2	Signal line	18990063

【Note】 If you need to load DA module, please contact my company for your upgrade, installation.

Safety information

- ***General safety information***

At different stages of the instrument operation, maintenance and repair, everyone should abide the following general safety rules.Breaking these rules may cause damage to instruments or staffs, Elite Analytical Instruments Co., Ltd. will not be responsible for the impact s caused by non-standard operation.

- ***safety standard***

For marked with this symbol of the equipment, the user should refer to the instruction manual, so as not to cause harm to the operator and equipment damage.

Symbols	Descriptions
	Please do not operate beyond the scope of caution, unless you have been fully understood and meet the required conditions.
[Warning]	Casualties may appear. Please do not operate beyond the scope of warning, unless you have been fully understood and meet the required conditions.
[Caution]	Data loss or equipment damage may appear. Please do not operate beyond the scope of caution, unless you have been fully understood and meet the required conditions.
【 Note 】	Unsatisfactory experimental data and instrument failure may appear. Please do not operate beyond the scope of note, unless you have been fully understood and meet the required conditions.

Common solvent information

Absorptive character of some typical functional groups

Name	Groups	λ_{max}	ε_{max}	λ_{max}	ε_{max}	λ_{max}	ε_{max}
ether	-O-	185	1000				
thioether	-S-	194	4600	215	1600		
amine	$-NH_2$	195	2800				
mercaptan	-SH	195	1400				
disulphide	-S-S-	194	5500	255	400		
bromide	-Br	208	300				
monoiodide	-I	260	400				
oximido	-NOH	190	5000				
nitrine	>C=N-	190	5000				
ethylene	-C=C-	190	8000				
keto-	>C=O	195	1000				
thioketone	>C=S	205	Strong	270-285	18-30		
aldehyde	-CHO	210	Strong				
acid	-COOH	200-210	50-70				
sulfoxide	>S→O	210	1500				
nitro	$-NO_2$	210	Strong				
Nitrous acid ester	-ONO-	220-230	1000-2000				
	(no-loop)						
	$-(C=C)_3-$	260	25000				
	$-(C=C)_4-$	300	52000				
	$-(C=C)_6-$	330	118000				
	$-(C=C)_8-$	230-260	3000-8000				
	(annulate)						
	C=C-C≡C	219	6500				
	C=C-C=N	220	23000				
	C=C-C=O	210-250	10000-20000				
	$C=C-NO_2$	229	9500				
Benzene		184	46700	202	6900	255	170
Biphenyl		246	20000				
Naphthalene		220	112000	275	5600	312	175
Anthracene		252	199000	375	7900		
Pyridine		174	80000	195	6000	251	1700
Quinoline		227	37000	270	3600	314	2750
Isoquinoline		218	80000	266	4000	317	3500

【State】When choosing the best absorption wavelength, the lowest wavelength getting through mobile ph ase ought to be considered at the same time(UV cutoff wavelength in the appendix 2). To sample who h ave multiple characteristic absorption wavelength, the wavelength corresponding to the biggest ε_{max} is the best choice.

Ultraviolet cut-off wavelength of common solvents

No.	Name	cutoff wavelength（nm）
1	trichloromethane	245
2	1–nitropropane	380
3	glycol	210
4	2–butoxyethanol	220
5	isooctane	215
6	acetone	330
7	isopropanol	205
8	acetonitrile	190
9	2- chloropropane	225
10	amyl alcohol	210
11	isopropyl ether	220
12	amyl chloride	225
13	methyl alcohol	205
14	benzene	280
15	methyl acetate	260
16	carbon disulfide	380
17	butanone	330
18	carbon tetrachloride	265
19	methyl isobutyl ketone	334
20	dichloromethane	233
21	cyclohexane	200
22	n-pentane	190
23	cyclopentane	200
24	normal propyl alcohol	210
25	diethylamine	275
26	l-chloropropane	225
27	dioxane	215
28	nitromethane	380
29	ethyl alcohol	210
30	petroleum ether	210
31	ethyl acetate	256
32	pyrimidine	330
33	diethyl ether	220
34	tetrahydrofuran	230
35	ethylthioethane	290
36	methylbenzene	285
37	dichloroethylene	230
38	xylene	290
39	lauryl sodium sulfate	190
40	1% acetic acid	230
41	1 M sodium chloride	207
42	10 mM ammonium acetate	205
43	10 mM sodium citrate	225
44	10 mM ammonium bicarbonate	190
45	10 mM sodium formate	200

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