

HZGC-1212A Gas Chromatograph



Dear user:

Thank you for choosing HZGC-1212A Gas Chromatograph.

We hope that this instrument can make your work easier and more enjoyable, so that you can get the feeling of office automation in the test and analysis work.

Before using the instrument, please read this manual, and operate and maintain the instrument according to the manual to prolong its service life. "Just a light press, the test will be completed automatically" is the operating characteristics of this instrument.

If you are satisfied with this instrument, please tell your colleagues; if you are not satisfied with this instrument, please call (0312) 6775656 to tell you to serve you at all times-Baoding Huazheng Electric Manufacturing Co., Ltd., our company will definitely make you satisfied !

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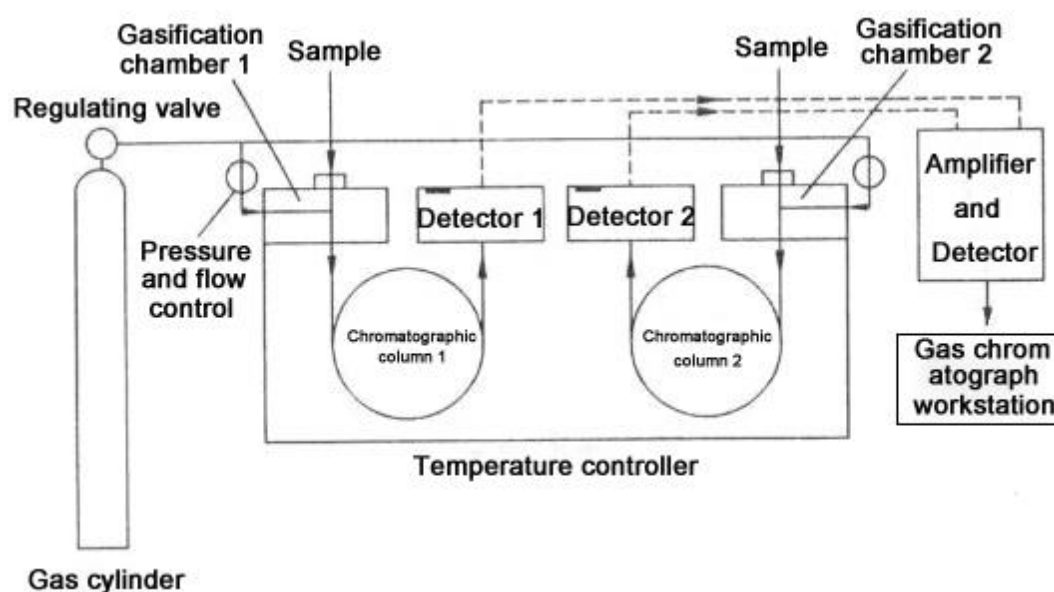
I.The Instrument Of Introduced

Welcome you to become a customer of HZGC-1212Agas chromatograph of Huazheng Electric Manufacturing(Baoding) Co.,Ltd

1. 1 The Working Principle Of Gas Chromatograph

Gas chromatographic analysis technique is an analysis of multicomponent mixture separation and analysis technology. It mainly uses the difference in boiling point and polarity of sample and in the chromatographic column adsorption coefficient, so that the various components in chromatographic column can be separated and analyzed qualitatively and quantitatively.

A gas chromatograph use gas as a liquid phase (carrier gas).When the sample is fed into the injector and gasified,it will get into the packed column or capillary column with the carry of carrier gas. due to the differences in boiling point, polarity and adsorption coefficient of sample the various components in column will be separated.Then detect the components by the column after the detector according to the physical and chemical characteristics of components.Finally sent it to the chromatography workstation through the local area network (or the Internet) ,recording and analysis the components of the gas chromatogram by chromatography workstation and obtain the components analysis report. The working principle diagram is shown below:



Pic1.1 Gas chromatograph working principle diagram

Because the method has characteristics of high separation efficiency, fast speed of analysis and less consumption of sample, so it has been widely used in petroleum chemical industry, biological chemistry, medicine and health, the health and quarantine, food inspection, environmental protection, food industry, medical and clinical departments. Gas chromatography has solved the industrial production of intermediates and quality

inspection of industrial products, scientific research, environmental testing, production control and other issues in these areas.

1. 2 Characteristics Of HZGC-1212ASeries Gas

Chromatograph

As we all knows, the traditional gas chromatograph is working with 1 chromatographs, 1 AD converters, 1 sets, 1 sets of computer printer mode. In this way the chromatograph should be equipped with more chemical factory, laboratory, colleges and universities ,the use and management of equipment is very inconvenient,the equipment should be invested dublicately and wasting seriously . Equipped with a large number of computers in the equipment management and data management also bring a lot of inconvenience to the user. At the same time, the traditional mode is often use the gas chromatograph of one manufacturer and workstation of another manufacturer to make the whole system.These make the function of the overall system difficult to express and the performance of the system difficult to improve.Not to speak of the function increasing raised by users (such as remote monitoring data transmission, the monitoring instrument etc.).

Aiming at the disadvantages of the traditional gas chromatograph, Huazheng Electric Manufacturing(Baoding) Co.,Ltd use its strong technology development strength and the brand new industrial modeling and electronic circuit, and apply the mainstream of the technology (IP Technology) to the gas chromatograph, then develop the new type of gas chromatograph. This instrument completely abandon the production of chips , disassemble the chip and RS232 serial communication which is on the out and use the latest high integration of industrial-grade chip, bussing technique, Ethernet technology, micro flow gas control technology and data processing technology, optimized the temperature program and gas control, improve the reliability of the instrument and the maintenance fundamentally .

Due to network technology and high precision AD conversion circuit,the series of HZGC-1212A gas chromatograph thoroughly break the work mode of existing of cumbersome bulky chromatograph and enables multiple chromatograph sharing 1 sets of computer to complete data analysis, printing, storage become a reality, and realize the remote transmission of remote monitoring and chromatographic data instrument the maximum degree, reduces the user laboratory investment and operation cost, convenient the management of real-time tracking of product quality. Figure 1.2 is the HZGC-1212A network chromatograph working diagram.

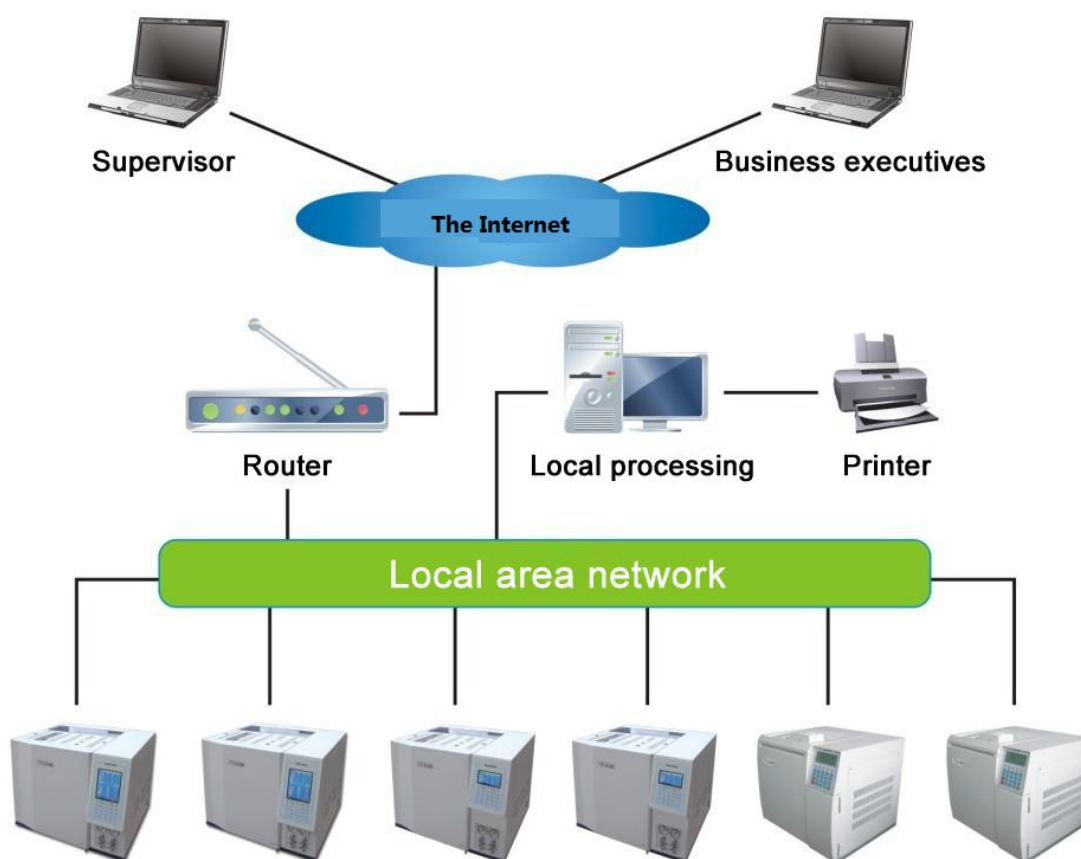


Fig.2 the HZGC-1212A network chromatograph working diagram

The series of HZGC-1212A gas chromatograph has the following functions and features:

- ★ Using the advanced technology of the 10/100M adaptive Ethernet communication interface, and a built-in IP protocol stack, so that the instrument can easily through the intranet, Internet to realize the long-distance data transmission; convenient laboratory erection, simplifies the laboratory configuration and convenient data management;
- ★ Within the instrument 3 independent connecting process is designed and can be connected to the local processing (Laboratory), head of unit (such as quality inspection, production director, chief), as well as the supervisor (such as environmental protection bureau, bureau of technical supervision and so on), can make the unit in charge of the main pipe and the real-time monitoring instrument and data analysis results easily;
- ★ The NetChrom™ workstation equipped with the instrument can simultaneously support many sets of chromatograph working at the same time, realize the data processing and countercharge, simplifies the document management, and reduce the maximum user laboratory investment and operating costs;
- ★ The instrument can be connected to the manufacturers through the Internet, to realize the remote diagnosis, remote program update (need user license);

- ★ The instrument can be equipped with a 5.7 inch color LCD screen or 192*64 monochrome LCD screen, meet the needs of different users;
- ★ System has 2 sets of operating system which are in English and Chinese and can be switched freely
- ★ Temperature control area can be named by the user, is convenient for the user to use;
- ★ The instrument uses a multiprocessor parallel working mode, the instrument is more stable and reliable; can be equipped with a variety of high performance detector selection, such as FID, TCD, ECD, FPD and NPD ,can be installed with 3 types of detector at the same time, up to three detector, which can meet the complex sample analysis. Also can use detector append mode, so that you can choose other detector conveniently after you purchase the instrument.
- ★ The instrument adopts modular structure design.The design is clear, convenient to replacement upgrade and protect the effectiveness of investment;
- ★ New microcomputer temperature control system, high precision of temperature control , reliability and anti-interference performance; have six completely independent temperature control system, can realize the sixteen step temperature-programmed, analysis enables the device to do a greater range of samples; has a pillar box after automatic door system, the temperature control precision is improved, heating-up/ cooling faster;
- ★ Instrument can be matching with advanced electronic flow controller (**EFC**) and electronic pressure controller (**EPC**),realizing the pneumatic digital control, can greatly improve the stability and reproducibility of the quantitative result;
- ★ The instrument has a timing start automatically program, can complete online analysis of gas samples easily (to be equipped with automatic sample parts);
- ★ Built-in chromatography machine with low noise, high resolution of 24 bit AD circuit, and has the functions of storage, baseline baseline deduction.
- ★ Random equipped with workstations is suitable for both Chinese and English WinXP, Win2000, Win7, Win8 operating system.
- ★ The chromatographic system with completely independent intellectual property rights has the standard interface of MODBUS/TCP, and can be easy docking with DCS .
- ★ The instrument can dock with many national and international manufacturers of the autosampler ; such as SHIMADZU AOC-20i, Italy HTA company's HT series automatic sampler.

1. 3 Model And Technical Indicators Of HZGC-1212AGas

Chromatograph

HZGC-1212AGas chromatograph is made up by injector, detector, chromatographic column box, gas flow control system, circuit control detection system and network version of dedicated workstations etc.

1. 3. 1 HZGC-1212A I gas chromatograph (Universal)

HZGC-1212A I network gas chromatograph is designed for routine sample analysis and to create cost-effective single retrieval models, it has all the advantages of network chromatograph . It can be matched with column (or capillary) injector, FID (or TCD) detector. Can be widely used in chemical, pharmaceutical, food and other fields of quality control, product testing.



Fig.1.3 The appearance of HZGC-1212A I gas chromatograph

The main technical indicators:

- operating display: 192*64 periodic lattice Chinesize liquid crystal
- temperature control area: 6 ways
- temperature: Room temperature above 5 °C ~ 400 °C.Increment:1 °C.Accuracy :±0.1 °C
- temperature-programmed order: 16 order
- programming: rate 0.1 ~ 39 °C /min (common type); 0.1 ~ 80 °C /min (high speed)
- external events: 4 ways
- injector types: packed column sampler, capillary injector.
- detector number: 1; FID, TCD, optional
- start sampling: manual, automatic optional
- communication interface: Ethernet: IEEE802.3

1. 3. 2 HZGC-1212A II gas chromatograph (general type)

HZGC-1212 A II network gas chromatograph is cost-effective injector, detector type builded for the analysis of complex samples. The instrument has been further improved in

performance and scope of application. She absorbed all advantages of the I machine, instrument air path arrangement is more scientific and reasonable, the appearance is more elegant.



Fig.1.4 The appearance of HZGC-1212A II gas chromatograph

The main technical indicators:

- operation: 192*64 periodic lattice Chinese liquid crystal
- temperature control area: 6 ways
- temperature: room temperature above 5 °C ~ 400 °C, increment: 1 °C, accuracy : ± 0.1 °C
- temperature-programmed order: 8 order
- programming rate: 0.1 ~ 39 °C /min (common type); 0.1 ~ 80 °C /min (high speed)
- the gas control: optional pressure flow control mode of the mechanical valve control mode, electronic
- gas pressure, flow measurement: pointer type pressure meter or electronic pressure, flow pattern
- all electronic gas pressure, flow measurement system

The single module maximum measuring way: 16

Range: 0 ~ 0.3MPa (pressure); 0 ~ 500sccm (flow)

Resolution: 0.01kPa (pressure); 0.01sccm (flow)

- EPC, EFC work mode: 3kinds: constant current mode, constant voltage mode
- EPC, EFC working gas: 4kinds: nitrogen, air, hydrogen, helium, argon
- EPC, EFC L: 4 order
- EPC, EFC: pressure control range: 0 ~ 0.6MPa; flow rate of 0 ~ 100sccm or 0 ~ 500sccm (air)
- EPC, EFC control precision pressure 0.01kPa; flow rate: 0.01sccm;
- external events: 4 road, 4 road; auxiliary control output

- injector types: packed column sample, the capillary inlet, six valve gas sampling, automatic headspace sampling.
- detector number: 3 (max); FID, TCD, ECD, FPD and NPD.
- start sampling: manual, automatic optional
- communication interface: Ethernet: IEEE802.3

1. 3. 3 HZGC-1212AIII gas chromatograph (high-end)

HZGC-1212AIII type network of gas chromatograph is in accordance with the elegant appearance and the reasonable structured of II type of gas chromatograph, simultaneously loaded color display technology and electronic control technology of gas flow that my company independently research and develop. The automation level and the overall performance is greatly improved. Especially ,the development and application of gas electron flow control technology has domestic and imported models with models of the gap, and the instrument unique network remote transmission and control function, make the instrument in unattended, decentralized monitoring, centralized control can be a reality.



Fig.1.5 The appearance of HZGC-1212AIII gas chromatograph

The main technical indicators:

- operating display: 5.7 inch periodic lattice Chinese color liquid crystal (can be equipped with touch screen)
- temperature control area: 6 ways
- temperature: room temperature above 5 °C ~ 400 °C, incremental: 1 °C, accuracy :± 0.1 °C
- temperature-programmed order: 16 order
- Temperature program rate: 0.1 ~ 39 °C /min (common type); 0.1 ~ 80 °C /min (high speed)
- the gas control: optional pressure flow control mode of the mechanical valve control mode, electronic
- gas pressure, flow measurement: pointer type pressure meter or electronic pressure, flow pattern

- all electronic gas pressure, flow measurement system

The single module maximum measuring way: 16

Range: 0 ~ 0.3MPa (pressure); 0 ~ 500sccm (flow)

Resolution: 0.01kPa (pressure); 0.01sccm (flow)

- EPC, EFC work mode: 3kinds:constant current mode, constant voltage mode, bypass mode
- EPC, EFC working gas: 4kinds:nitrogen, air, hydrogen, helium, argon
- EPC, EFC L: 4 order
- EPC, EFC: pressure control range: 0 ~ 0.6MPa; flow rate of 0 ~ 100sccm or 0 ~ 500sccm (air);
- EPC, EFC control precision pressure 0.01kPa; flow rate: 0.01sccm;
- external events: 4 road, 4 road; auxiliary control output
- injector types: packed column sample, the capillary inlet, six valve gas sampling, automatic headspace sampling.
- detector number: 3 (up); FID, TCD, ECD, FPD and NPD.
- start sampling: manual, automatic optional
- communication interface: Ethernet: IEEE802.3

1. 3. 4 Detector technology index

Hydrogen flame ionization detector (FID)

- The limit of detection: $\leq 1 \times 10^{-11}$ g/s (sixteen alkyl);
- baseline noise: $\leq 5 \times 10^{-14}$ A
- baseline drift: $\leq 1 \times 10^{-13}$ A/30min
- linear range: $\geq 10^6$

Thermal conductivity detector (TCD)

- sensitivity: $S \geq 2500$ mV•ml/mg (sixteen alkyl) (1, 2, 4, 8 times enlarged ,optional.)
- baseline noise: ≤ 20 μ V
- baseline drift: ≤ 30 μ V/30min
- linear range: $\geq 10^4$

Electron capture detector (ECD)

- The limit of detection: $\leq 1 \times 10^{-13}$ g/ml(C 666 - isooctane solution)
- baseline noise: ≤ 0.03 mV
- baseline drift: ≤ 0.2 mV/30min
- linear range: 10^3
- source: ^{63}Ni

Flame photometric detector (FPD)

- The limit of detection: (S) $\leq 5 \times 10^{-11}$ g/s, (P) $\leq 1 \times 10^{-12}$ g/s; methyl parathion - ethanol solution)
- baseline noise: $\leq 3 \times 10^{-13}$ A

- baseline drift: $\leq 2 \times 10^{-12} \text{A}/30 \text{min}$
- linear range: To sulfur $\geq 10^2$, To P $\geq 10^3$

1. 4 The HZGC-1212A Configuration Description

1. 4. 1 Gas flow control system

1. 4. 1. 1 The gas flow control system

The gas of HZGC-1212A gas chromatograph control system can be configured as follows:

- ☆ mechanical valve, pressure gauge pointer type gas path system;
- ☆ mechanical valve, pressure and flow gas path system;
- ☆ mechanical valve, part of the electronic pressure control and flow control in pneumatic system (EPC, EFC);
- ☆ full electronic pressure control and flow control in pneumatic system (EPC, EFC)

The carrier gas flow path

The carrier gas flow routing primary regulator valve provides input pressure stable (factory tune to about $3 \text{kg}/\text{cm}^2$), the three way divide to double gas circuit, dual carrier gas, respectively through the steady flow valve (or EPC, EFC module) to adjust the flow rate of carrier gas respectively enter the injector A, B.

The hydrogen flow path

Primary regulator valve provides input pressure stable (factory tune to about $2 \text{kg}/\text{cm}^2$) to hydrogen flow routing, the three way to double, double hydrogen respectively after the regulator valve (or EPC, EFC module) and resistance to adjust hydrogen flow, and enter the detector. Hydrogen adjusting knob and panel are at the top of the gas flow control system.

The air flow path

Air flow routing primary regulator valve provides input pressure stable (factory tune to about $2 \text{kg}/\text{cm}^2$), the three way to double, double air respectively through the regulator valve (or EPC, EFC module) and resistance to regulate the flow, entering the detector. Air conditioning knob and a panel are at the top of the gas flow control system.

The gas flow as shown below:

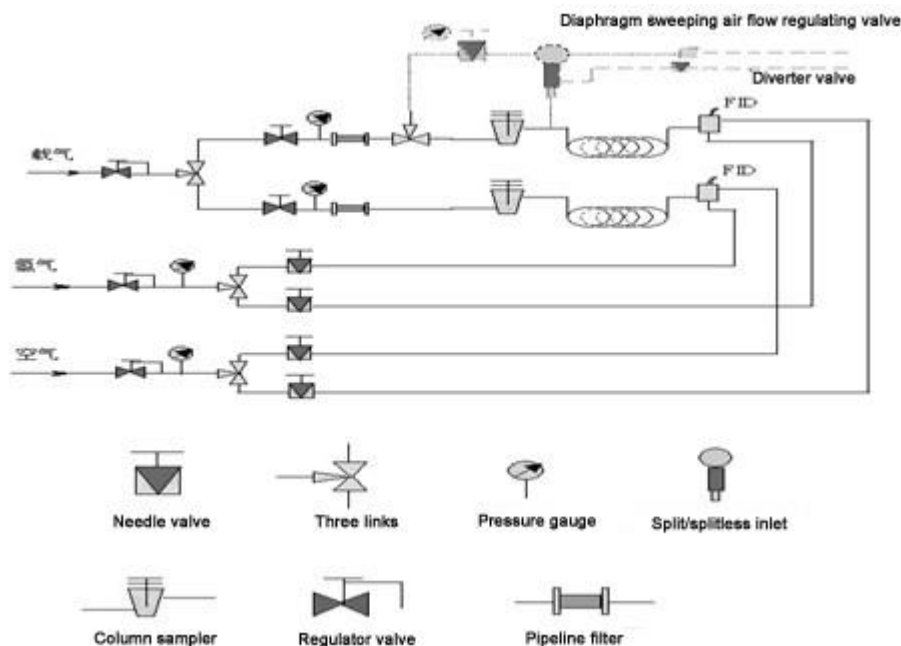


Fig.1.6 Flow chart of gas of HZGC-1212Agas chromatograph

Warning 1: the gas regulator valve (at the rear of the gas system) has been strictly debugging in factory, do not change the output pressure of the gas regulator valve yourselves, in order not to affect the calibration flow curve of the validity or accuracy!

Warning 2: pneumatic needle valve and flow valve knob is not suitable for dextral exactly, so as not to damage valve! To close the gas, you can directly close valve purifier!

1. 4. 1. 2 Electronic gas pressure, flow measurement system

When using a mechanical valve (steady flow valve, regulator valve) to control pressure and flow of gas, you can use traditional way of pressure gauge measuring method. You can also adopt the electronic gas pressure and flow measurement system, it can greatly improve the accuracy of pressure, also can display the gas flow rate and is easy to use.

When using the electronic gas pressure and flow measurement systems, it need to configure the electronic gas pressure and flow measurement module. The module adopts the high-quality pressure sensor with temperature compensation, flow sensor and high resolution digital circuit with temperature compensation, has high accuracy, stable performance, at the same time the internal integration of pressure - flow of gases calculation algorithm (capillary), and the instrument pressure, flow are clear at a glance.

The main index of module:

- ☆ pressure sensor: 13 (max);
- ☆ pressure range: 0 ~ 0.3MPa;
- ☆ pressure standard rate: 0.01kPa;
- ☆ pressure and flow calculation algorithm: 13ways; (temperature, atmospheric pressure automatic compensation algorithm)
- ☆ flow measuring sensor: 3 Road (at most); gas: nitrogen, air, hydrogen, helium, argon;

☆ flow measurement range: 0 ~ 500sccm;

Warning 1: when the instrument configure this module, due to the practical sensor plug position of the sensor must be correspond with instrument configuration parameters, so the practical plug position of sensor and the configuration parameters of instrument gas path couldn't be alter. If you need to change please consult the manufacturer!

Warning 1: when the instrument configure this module, gas path configuration parameters of the instrument (capillary column and gas resistance can not be arbitrarily modify configuration) couldn't be alter. After replacing the capillary column and gas resistance, you should modify it according to the actual value, otherwise it will make the gas flow calculation error. If you need to change please consult the manufacturer!

Note: when using a gas EPC, EFC module, the gas pressure and flow will be produce by EPC, EFC module;

1. 4. 1. 3 EPC, EFC Control System

EPC, EFC control system is a gas flow control system designed and produced by proportional valve with high accuracy , pressure sensor and flow sensor. Compared to traditional mechanical valve control, she has greatly improved the gas pressure, flow control accuracy, and improve the level of automation equipment, eliminates the deficiency that the traditional mechanical valve cannot compensate temperature, thus improving the overall performance of the instrument!

The HZGC-1212A can carry one or three EPC, the EFC control module. Instrument can configuration up to 24 Road gas pressure, flow control.

EPC, EFC control module operating in all workstations, instrument keyboard implementation. The specific operation is in 3.1.6 chapter.

Note: when the input pressure of EPC, EFC control module is less than 0.1MPa, the instrument will automatically shut down;

Note: when the EPC, EFC control module is working in shunt, blowing, blowing on the tail, the input pressure won't be judged, but when the module was unable to complete the set value your input , it will make the error prompt;

Note: when the EPC, EFC control module in a pressure mode, if the output pressure you set is larger than the input pressure, the module will not work and do error prompt;

1. 4. 2 Chromatographic Column Box

Column box of HZGC-1212A gas chromatograph has large volume, can be conveniently installed column and capillary column; built-in high power heating wire has a back door structure, so that the heating speed is greatly improved; the protection of column box temperature control use double software (see keyboard settings section) and hardware protection (fuse-links, see accessories in Appendix D 29), in order to protect column; column box heating wire is hidden behind half-tone, to avoid peak shape division of elastic quartz capillary column caused by thermal radiation;

Column box adopts low noise motor and high quality stainless steel wind to accelerate column temperature balance. Instrument run smoothly and operation and machine vibrate weakly.

1. 4. 3 Injector

The injector of HZGC-1212Agas chromatograph is installed at the top of the column box, its structure is shown in figure 1.7. It's set by the microcomputer controller and control its temperature. The top injector is a radiator cap, at the bottom of radiator cap embedded with silicon rubber pad injection. The injector of the carrier gas inlet and the steady flow valve outlet of pneumatic control system is connected.

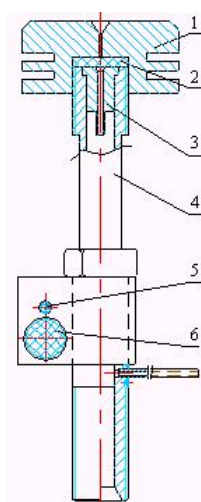
1 radiator cap 2 sample pad 3 guiding element 4 vaporizing tube 5 platinum resistance 6 heating pipefig. 1.7 Schematic diagram of injector structure HZGC-1212Agas chromatograph

Note: 1.HZGC-1212Agas chromatograph is equipped with a plurality of injector ,can be installed a plurality of packed column at the same time;

2. The injector of HZGC-1212Agas chromatograph can be directly installed with the packed column which snap is $\Phi 5\text{mm}$.By installing different liner tube, you can also install packed column which snap is $\Phi 3$ 、 $\Phi 4\text{mm}$;

3.The injector of HZGC-1212Agas chromatograph can compose split stream injector or splitless injector by installed attachment of capillary shunt tube or attachment of capillary splitless shunt tube,so that It can be installed with various diameters of stainless steel, glass or flexible quartz capillary column ;

4.HZGC-1212Agas chromatograph can be installed with appropriative capillary membrane to clean split stream injector and realize capillary shunt/no shunt sample injection . As shown in figure 1.8.



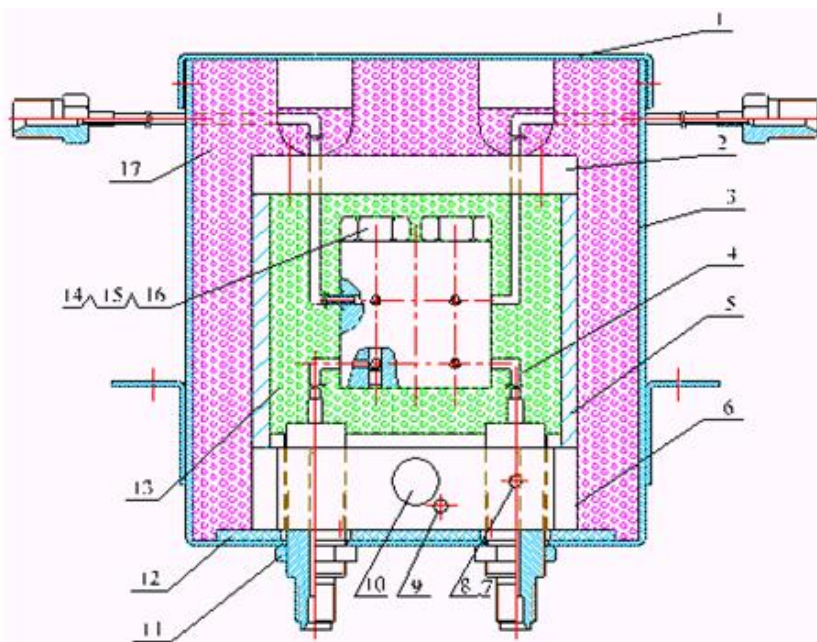
1 guide (capillary) 2 nuts (capillary) 3 sample injector 4 gasket 5 six 6 O washer nut
7 gasification pipe (capillary) 8 sliding sleeve 9 catheter 10 platinum resistance heating wire

11 heating wires 12 gasket 13 joint

Fig. 1.8 schematic diagram of membrane cleaning flow injector structure

1. 4. 4 Thermal Conductivity Detector (TCD)

HZGC-1212Agas chromatograph can be equipped with a thermal conductivity detector (TCD). The TCD detector structure as shown in figure 1.9.



1 shell cover 2 cover 3 TCD box 4 TCD detector 5 conductor 6 base 7 screws
8 tablet 9 platinum resistance 10 heating wires 11 nuts 12 asbestos washer 13 washer 16
nut 15 glass beads of 14 tungsten 17 cotton insulation

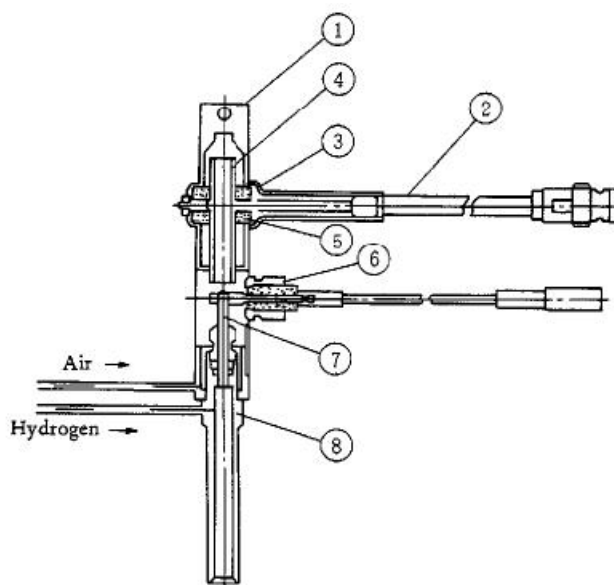
Fig. 1.9 schematic diagram of the TCD detector structure.

Its structure and working principle is: make four symmetric cavity in a heat chamber, put a thermosensitive element in each chamber. Among them, two chambers are measuring cells, the other two are reference cells. The thermosensitive elements in measuring cells and reference cells compose the four arms of Wheatstone bridge. This bridge is connected to the thermal conductivity detector signal processing board to control the work of the bridge and chromatography data processing. An electric heating element and a temperature sensor is installed in the thermal conductivity detector, which is connected with temperature control system to control the heating temperature.

The TCD reference cell only get into the measuring cell with the components of flowing from the chromatographic column through the carrier gas flow. When the reference cells and measuring cells only flow through carrier gas, the same gas has the same thermal conductivity. At this time, the bridge is balanced, the chromatograph outputs signal of the baseline. When sampling, after the sample is separated, it will get into the measuring cell carried by the carrier gas. Because the thermal conductivity of carrier gas and components is different, the balance of the bridge is damaged, the peak signal output spectrum chromatograph.

1. 4. 5 Flame Ionization Detector (FID)

FID detector belongs to quality detector, it not only has the characteristics of high sensitivity and wide linear range but also is insensitivity of the change in operating conditions and has good stability. It is particularly suitable for routine analysis of constant and trace. Because of quick response, it can complete the fast analysis of trace technology when matched with capillary analysis technology and is one of the most widely used detector in gas chromatography instrument. HZGC-1212A gas chromatograph can be equipped with two independent hydrogen flame ionization detector. Figure 1.10 is the schematic diagram of the FID detector.



1 dust cap of 2 signal lines 3 plate 4 collector 5 insulating film 6 polarization voltage of 7 nozzle 8 ion chamber.

Fig. 1.10 schematic diagram of the FID detector structure

FID detector is positioned on the front of the top of the host. Its base is arranged in a heat conductor. This conductor is also equipped with an electric heating element and a temperature sensor, and connect with temperature control system to control the heating temperature. Polarization are connected to polarization voltage of a FID micro current amplifier output. The collector output signal by connected to low noise cables and FID micro current amplifier. Hydrogen and air enter through stainless steel tube by the joint of pneumatic control system on the top of the host.

Principle of flame ionization detector: the sample under test combustion in hydrogen flames, engender ion fluxes, make the kation and anion moved directionally by mans of polarization electric field, reach the collector and produce weak electrical signals. Then it will be transported to the chromatographic data processing system after micro current amplifier amplification and dispose.

The flame ionization detector of HZGC-1212Agas chromatograph can be used as a single detector and reciprocal dual-detector as well (such as when execute the analysis of temperature programmed).

Note:

1. Do not open the hydrogen valve when the the chromatographic column has not been connected ,in case that hydrogen enters into a column box. Hydrogen should be closed off frist when turn off the instrument , and then close the carrier gas after cooling, ;
- 2.The FID is a high sensitivity detector, you must use high purity gas, hydrogen and air after purifying;
- 3.In order to prevent the detector from pollution, don't connect the column with the detector if the column is aged. The bottom of detector can be sealed with nut;
- 4.You should check whether the circuit connection is proper, whether the gas path connection is complete and whether the kind of gas is conform to requirements.

Warning: Polarization voltage is 220 ~ 250V high voltage when instrument works , please prevent electric shock!

Warning: Polarized also could keep high pressure even if the instrument off,! Please avoid electric shock! Discharging to the ground before operating!

1. 4. 6 Electron Capture Detector (ECD)

Electron capture detector (electron capture detector, ECD). Electron capture detector is also a kind of ionize detector, which is a selective high sensitivity of the detector, it only has response to the electronegative substances (such as halogen, sulfur, phosphorus, nitrogen) , the electronegativity is stronger, also is the electronic absorption coefficient is larger, the sensitivity of the detector is higher, and it has no response to the electrically neutral (no electronegativity) material.

The radiation(β line) emanated by the radioactive (^{63}Ni) sealed in ECD detection cell make the inert gas (N_2) ionize, pulse impulse voltage on collector of detecting cell, trap the current produced by electrons. When the strong electronegative molecules enter , it will absorbed electron, form anion . Because molecules with negative charge move more slowly than free electron , use more time to arrive at the positive electrode, and the probability of combining with kations increases, which make the electron density detector decreases, the number of electrons trapped by a pulse reduce . Add multiple pulse according to the number of electrons reducing , in order to maintain a constant current electron number per unit of time.Then the change of the member of is in direct proportion to the density of high voltage negative molecules. ECD equipment are as follows:

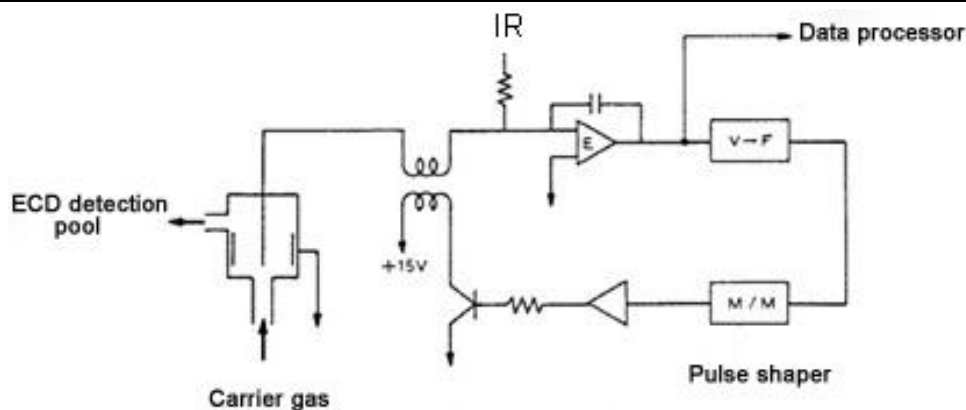


Fig. 1.11 sketch of ECD device

Through the amplifier E, comparing the average pulse current formed by setted current IR and ECD detection cell, send the voltage when they are equal to the next voltage-frequency converter (VFC) under section. Send the pulse given out by VFC to ECD detection cell after it was transferred to the appropriate pulse amplitude and pulse height, constitute a control circuit.

Warning: Radiation source (^{63}Ni) will make your personal damage, strictly prohibit dismantling ECD detector without professional protective measures!

Warning: Radiation source (^{63}Ni) is materials with strict control, it is strictly prohibited that throw ECD detector away as ordinary waste!

Warning: If equipment scraped , radiation source (^{63}Ni) should be recycled or disposed by professional factories!

1. 4. 7 Flame Photometric Detector (FPD)

Flame photometric detector (FPD) is a detector that has high selective and high sensitive to sulfur compounds and phosphorous compounds used by gas chromatograph. When the sample is burning in the hydrogen-rich flame, organic phosphorus compounds mainly emit light of 526nm wavelength in the form of HPO fragment, and sulfur-containing compounds mainly emit characteristic light of 394nm wavelength in the form of the S_2 molecule. The photomultiplier converts the optical signal into electrical signal, magnify by micro current and record it. The sensitivity of this kind of detector can reach tens to hundreds Coulomb / g, the minimum detection amount can reach to 10^{-11}g . At the same time, the ratio of the response of detector to the organic phosphorus and organic sulfur to the response of hydrocarbon is up to 10^4 , so we can exclude the interference of a large number of solvent peak and hydrocarbon, it is very beneficial to the analysis of measure phosphorus and sulfur, is a main tool of detection organic phosphorus pesticides and sulfur pollutants.

As shown in Figure 1.12, FPD is mainly composed of two parts: flame glowing and optical and electrical system.

Flame glowing is consist with burner and light emitting chamber, the gas flow path and nozzle consist burner, also known as the combustion head. Universal type of nozzle is composed of inner hole and annular external hole. The column exudation mixes with air and then enter into the center hole of gas chromatography, the excess hydrogen outflow from annular hole around .And this form is a larger diffusion hydrogen flame .

Hydrocarbons , sulphur compound and phosphorus compound resolve in flame, and generates a complex chemical reaction, emit characteristic of light. Sulfur and phosphorus diffusion luminescence in the upper part of the hydrogen-rich flame , the hydrocarbon mainly light in the bottom of oxygen flame , so we use lens hood to block the light in the bottom of a hydrocarbon flames , it can improve the selectivity of FPD. In order to reduce the volume of emission chamber , can install a glass or quartz tube above the nozzle to reduce the response time constant of detector.

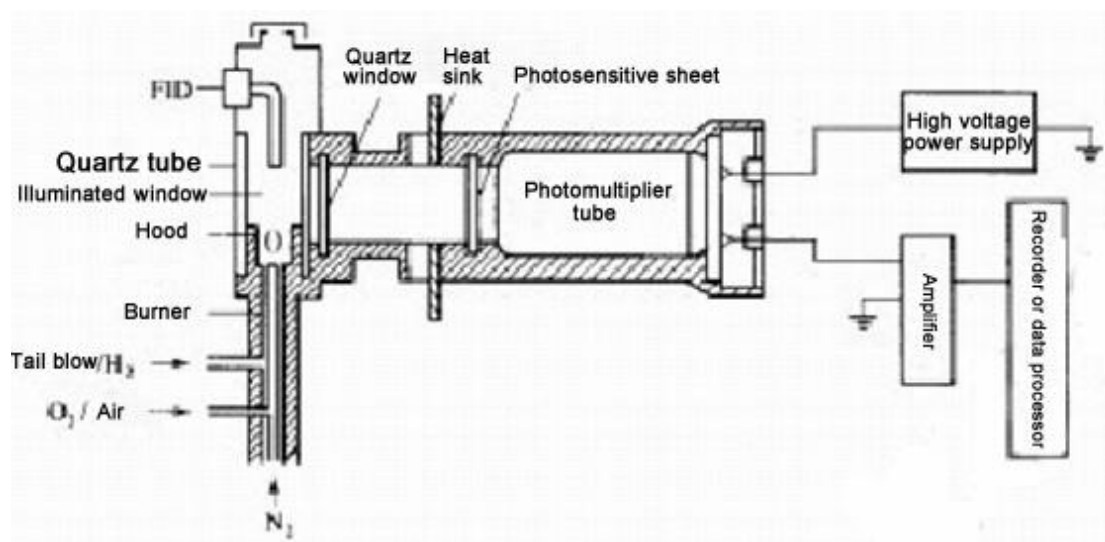


Fig. 1.12 schematic diagram of FPD system

The right is the part of optical and electrical signals. In order to avoid a large amount of water vapor ,combustion products and high temperature produced in glowing effect the light and electric system, we use quartz window and heat sink to separate the light emitting chamber and the light and electric system. Because FPD is not turn all the light into electrical signals but use light filter to choose characteristic light of sulfur and phosphorus.

Warning: never open the high voltage power under the case of detector light-leaking!

1. 4. 8 Nitrogen Phosphorus Detector (NPD)

Nitrogen phosphorus detector (NPD) is also called thermal ionization detection (TID) .It is detector with high sensitivity,high selectivity and wide linear range which analyze compounds containing N and P. In 1961,firebox thermal ionization detector Cremer originally developed add heating alkali source above the nozzle of FID detection. As the alkali source it used is volatile alkali metal, its life is short and the sensitivity of the detector is instable, so it has no promotion value; in 1974 ,Kolb used less volatile rubidium

carbonate and silica burning into rubidium silicate beads, solved the problem of short life of the rubidium silicate beads. Due to the rubidium bead should be heated in the cold hydrogen flame with electric, the stability and sensitivity of detector have improved obviously, the background base flow falls from 10^{-9}A to 10^{-13}A , which makes NPD suddenly become one of the most common equipment detector of gas chromatograph, become a special gas chromatography detector of detect nitrogen and phosphorus compounds, is widely used in environmental protection, pharmaceutical, clinical, biological and chemical, food and other fields.

Structure and operation of NPD for product models vary, typical structure as shown in Figure 1.13

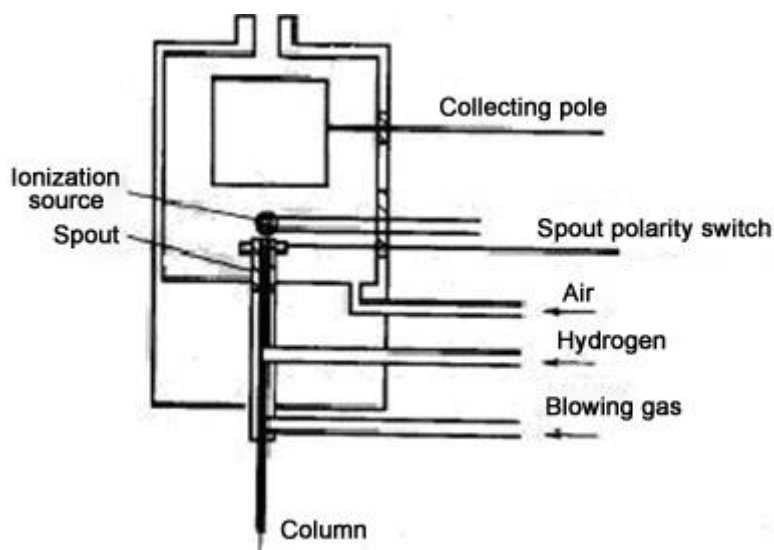
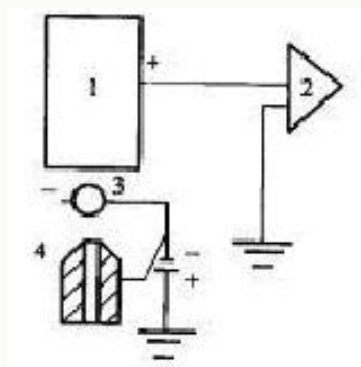


Fig1.13 Structure diagram of NPD

The mode of operation of HZGC-1212A detector NPD is nitrogen and phosphorus type operation, the nozzle is not grounded, as shown in fig.,



1 - collector 2 - amplifier 3 - ion source 4 - nozzle

Fig. 1.14 nozzle not grounding diagram

The flow rate of air and hydrogen is smaller [$V_{air} < 150 \text{ ml/min}$, $V_{H_2} < (4 \sim 9 \text{ ml/min})$], is heated by electricity to red-hot ionization source, form cold flame around ionization source, organic compounds containing N and P react of cracking and evoked reaction at here, forming selective detection of N and P, the selectivity of hydrocarbons can reach to $10^2 \sim 10^4$.

1. 4. 9 The Display Screen And Keyboard

HZGC-1212 A I and HZGC-1212AII screen are 192*64 Chinese characters LCD ,HZGC-1212AIII is 5.7 inch color Chinese characters LCD (can be equipped with touch screen), the user can check the working state of instrument as plain as print.

Keyboard is designed concise, functions is complete, operation is simple and is easy to use. Because operation of various models of HZGC-1212A instrument keyboard is similar, so the book just introduces operation of the HZGC-1212AIII keyboard detailedly of. It is described in detail in the 3.1 chapter, the other types of users can use it as a reference.

1. 4. 10 External Event Control And Communication Output

The external event control of HZGC-1212A gas chromatography is in the instrument . On the left of control board is pneumatic control output ,and at the right side is external events to control the output. From top to bottom two terminals are a group. Pneumatic control output respectively are: the carrier gas, hydrogen, air, ignition control; external events are: Event 1, event2, event3 (or alarm output),event 4 (or rapid cooling control) output. event5, event6, event7,event 8 is designed for special users and please consult the manufacturer if you need.

The communication of instrument using 10M/100M adaptive Ethernet interface. It connecting with workstation computer through the local area network .

Note: In order to keep the high resolution and high stability of the instrument, we integrate 24 bits AD circuit in the instrument,common analog signal won't be put out no longer, and can only be connected with the our company's workstation.

Note:When the event 3 (or alarm output) do alarm output, is the third time the program without external events (all clear);

Note: When the event 4 (or rapid cooling control) do a quick cooling control, is the fourth time program without external events (all clear);

1. 4. 11 The Power Switch

The power switch is machine's.

Warning: when open the machine,you may touch on the electrical part, so you should pull the plug from the power supply! Turn off the power switch,some parts of appliances in chromatographic still has high pressure!

1. 4. 12 HZGC-1212A Chromatograph Workstation Network Edition

To adapt to the gas chromatograph's need of the network, solve the traditional chromatography using malpractice fundamentally, the company developed a breakthrough for traditional network workstation. The workstation is suitable for all HZGC-1212A chromatograph.

The traditional workstation software is usually designed to support RS232 communication interface. As we all know, the communication interface will be eliminated (many computer manufacturers no longer use this device). In addition, because this communication interface is point-to-point communication, the communication speed is low, we can't run multiple instruments at the same time with the communication mode. This network workstation keeps the function of traditional workstation as well as adds more innovation capabilities. This network workstation adopts the Ethernet communication mode whose mechanism is advanced, communication capacity is large, interface is convenient, has overcome the shortcomings of traditional workstation software. A traditional workstation software only can support data processing of 2 channels, but this network workstation can support multiple channels of multiple chromatograph (maximum support 5000 chromatograph linking). Because the network version of the workstation can simultaneously support multiple chromatography, spectral file management is particularly important. This system has the function of automatically generate chromatograph folder, automatic generation of time folder, and named spectral file according to the time, shift or sequence, simplified the document management, be more convenient for users to use.

The network version breaks the mode that traditional workstation only can output paper report, develop the function that the analysis results can be delivered to the place that users need through a variety of transmission mode (Internet, CAN bus, MODBUS/TCP, GPRS communication, 3G communication, wireless network, remote transmission). This function is greatly convenient for users to use, make artificial feeding (with automatic sample), artificial transmission report become history, save manpower and material resources.

The network edition workstation can be equipped with "component content monitoring system" to complete chromatography composition statistics, analysis, monitoring, can be used in the production of chemical products (such as: reaction, shunt, distillation) each component data statistics, content change trend, threshold detection, alarm threshold for sample, the group divides content change tendency stick out a mile. The data in one day can be archived automatic, eliminates the manual analysis of spectra, manual sorting spectrum, artificial judgment results, improve the level of automation of the factory.

The characteristics and function :

- chromatographic data processing organically combined with instrument operation control , making operation convenient and interface friendly;
- Use of 10/100M adaptive Ethernet communication technology; high communication speed, support the long-distance data transmission and control;
- Use multi-thread technology realize acquisition of signal , data processing and user management can work together at the same time;
- Unique software architecture realize a rich configuration of a system with multiple monitor agent; it makes the users who has not many instrument can view management analysis results in a single computer; users with a large number of instrument can equip multiple monitoring agent to meet many people work at the same time;
- equipped with analysis results extended communication interface, support for user's secondary development and expansion of functions;
- Unique intelligent peak identification technology , minimize the need to map processing parameters set by the user, mainly realize automatic processing to peak, baseline correction and overlapping peaks segmentation automatically;
- can read-in sample data by CDF file which conform the A/A (American Institute of) standard , from this it can be connected with Agilent, Waters chromatography workstation;
- adopt the unique Hi-Fi digital filtering algorithm , has a strong capability of resisting noise, can be detect small peak as baseline noise level;
- data processing has: normalization, normalization method, single point calibration (single point of internal standard method, single point external standard method), multi-point correction (multiple internal standard method, multiple point external standard method);
- workstation supports the MODBUS/TCP protocol, can access to DCS conveniently, complete DCS analysis results;

1. 5 Environmental Of Instruments Application

1. 5. 1 The installation environment

HZGC-1212Agas chromatograph were used in temperature of 5 ~ 35 °C and relative humidity of 0 ~ 85% range. But it is best to be used under the environment that people feel comfortable (the appropriate temperature, humidity conditions). In this way the instrument can play the best performance and the service life is long.

If the instrument is exposed to corrosive substances (whether it be gas, liquid or solid), it will endanger the materials and parts of HZGC-1212Agas chromatograph and should be avoided.

Test installation of HZGC-1212Agas chromatograph must be firm. The test bench vibration will affect the stability of the instrument. In order to make the hot air of column

oven discharge, behind the instrument there should be at least 30cm space (and do not place flammable items in the back!) , and 30 - 40cm channel , for the purpose of installation and maintenance.

HZGC-1212Agas chromatograph need 10/100M Ethernet.You can use HUB or exchange board to structure Ethernet.

1. 5. 2 Power Supply Environment

Access power of HZGC-1212Agas chromatograph is 220V $\pm$ 10% (50Hz $\pm$ 0.5 Hz), power can provide is not less than 2000W. In order to protect the personal safety,the panel and the chassis of HZGC-1212Agas chromatograph use three core power line to ground according to the request of International Electrotechnics Association, .

Note: in order to reduce electrical noise instrument,it must ground well.

Warning: it is strictly prohibited to use water pipes, gas pipes, the zero line instead of the grounding wire!

1. 5. 3 Gas Environment

In order to play the best performance of HZGC-1212Agas chromatograph, gas must reach the relevant purity level. We recommend the following value of purity.

Detector	Effect of gas	Name of gas	purity
FID	The carrier gas	He or N2	$\geq 99.99\%$
TCD	The carrier gas	N2or He	$\geq 99.99\%$
ECD	The carrier gas	N2	$\geq 99.99\%$ (deoxidation)
NPD	The carrier gas	N2orHe	$\geq 99.99\%$
FPD	The carrier gas	N2orHe	$\geq 99.99\%$
	Tail gas	N2	$\geq 99.99\%$
	Gas	H2	$\geq 99.99\%$
	Auxiliary gas	Air	Clean, dry

We suggest to install purifier on the gas circuit !After a period of time using Gas purifier , you should activate the molecular sieves and silica gel.

II.Instrument Installation

2. 1 Dismantle Of Instrument

Please check the outer packing quality of the instrument when arriving, if damaged, please contact with the manufacturer or seller immediately. After devanning, please check the components according to the invoice, if you found the components inconsistent or the appearance of instrument damaged , please contact with the manufacturer or seller immediately, so that you can avoid unnecessary economic loss or delay your work.

2. 2 Instrument Installation

After check it, place the instrument carefully in the right position of the worktable. The worktable must be steady. Do not pile up flammable items behind the instrument and save maintenance space.

2. 2. 1 The installation of gas source

Please equip gas source according to chapter 1.5.3 and the type of detector you want to use. Before using HZGC-1212A gas chromatograph.

Source please install in a safe place. If you use cylinder gas, the cylinder gas should be fixed to prevent accidents. No matter what form the source (such as: gas generator, air cylinder, air compressor, etc.) you choose, you should carefully check whether the quality of gas produced meet the HZGC-1212A gas chromatograph's gas requirement. So as not to affect the analysis results or cause pollution or damage!

2. 2. 2 Installation of relief valve

If use cylinder gas, the installation of relief valve steps are as follows:

1. Unscrewing off low pressure outlet heads of two oxygen relief valve and one hydrogen relief valve, connect the joint of relief valve, screw on low voltage output adjusting rod (not tighten);
2. Install pressure relief valve on a cylinder, tighten the nut, open the cylinder pressure valve, the pressure gauge of pressure relief valve shall be indicated;
3. Turn off pressure valve of the cylinder, relief valve pressure gauge instructions should not fall, otherwise there is a leak, should be excluded before use.

2. 2. 3 The installation of external gas circuit

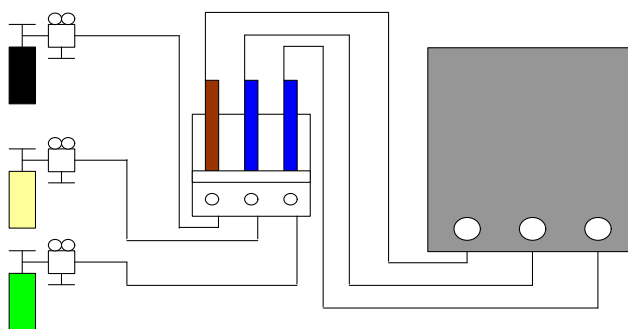


Fig. 2.1 schematic diagram of external gas circuit connection

Gas path pneumatic pipeline of the gas chromatograph is mainly $\Phi 3 \times 0.5$ polyethylene tube (parts 16) or $\Phi 3 \times 0.5$ stainless steel tube (provide oneself). Cut the pipeline into six segments according to the length you need, connect gas source - purifier-chromatography as shown in Figure 2.1.

Connect joint of polyethylene pipe or stainless steel tube as shown in figure 2.2.

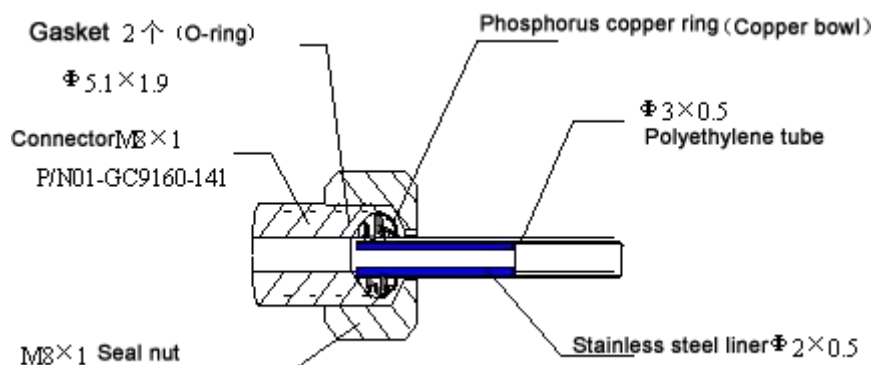


Fig. 2.2 schematic diagram of polyethylene pipe gas path connection

Note: 1, clipping appropriate length of the tube, and inserting a stainless steel liner of $\Phi 2 \times 0.5$ ether of the two ends of it.

2, M8x1 seal nut, copper ring and 2 O-type rings install into one of the polyethylene tube end.

3, M8x1 sealing nut is screwed on the cylinder connection (M8 x 1), and screwed tightly , and ensure good seal.

4, M8x1 seal nut, copper ring and 2 O-type rings install into the other end of the polyethylene tube .

5, M8x1 sealing nut is screwed in the corresponding joint purifier (M8 x 1), and screwed tightly , and ensure a good seal.

The rest of the externally connected with the same.

HZGC-1212A gas chromatograph can also adopt $\Phi 3 \times 0.5$ diameter stainless steel or copper as the connecting pipe of the external gas road.

The connection method as shown in figure 2.3:

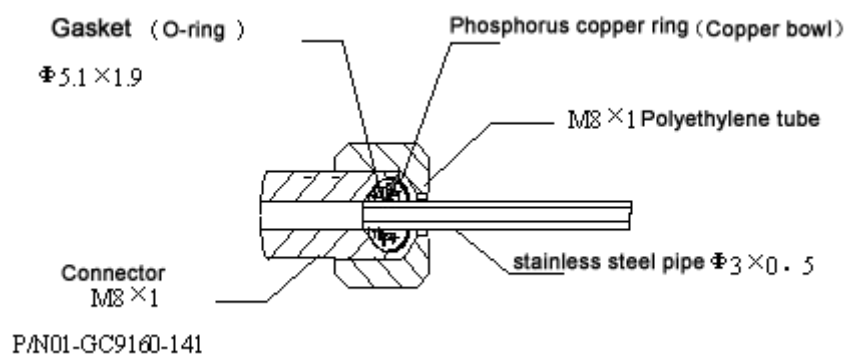


Fig. 2.3 schematic diagram of the metal tube and gas connection

Note:

1. gas path split vent and the detector vent should use pipe to let out gas into the outside, in order to avoid polluting indoor air when analyze toxic and harmful substances;

2. In the actual operation, notice that often detect leak ! Once it leaking.This will influence the normal work of the instrument, even may caused heavy accidents (such as hydrogen leakage may cause an explosion)!

3.The pressure that the carrier gas enter into gas chromatograph: 0.5MPa;

4.The pressure that the air enter into gas chromatograph: 0.5MPa;

5.The pressure that the hydrogen enter into gas chromatograph: 0.5MPa;

2. 2. 4 System leak hunting

After the external gas path has been installed ,you should detect leak , so as to avoid the accident. Leak detection according to the following steps:

(1) turn off all the carrier gas flow stabilizing valve, hydrogen, air needle valve on the host;

(2) put the cylinder pressure adjusting rod in a relaxed state, open a cylinder pressure valve, and then slowly adjust voltage regulating rod, the low pressure indicator show as 0.5MPa;

(3) close the cylinder valve. The valve on the pressure meter indication should not fall.

Otherwise, there is leakage of the road, should be carefully examined and excluded.

2. 3 The Workstation Software Installation

2. 3. 1 The software running environment

HZGC-1212Agas chromatograph is different from the general gas chromatograph, it requires adaptive network environment of 10/100M (Internet access service is needed when required the remote data transmission by Internet) and a set of computer which have already installed by Chinese Windows2000, XP, win7, win8 operating system .

Construction of network environment is very simple. If the user's laboratory already has network environment(this network environment has IP remaining), you can directly access the equipment by network cable . If the user has no network in the laboratory or isolate network and office network on purpose, can construct a special network with switches and HUB. Switch, HUB can be purchased in the local computer store, also can ask the manufacturer to buy when order the instrument.

The workstation software running the computer does not have any special requirements. Requirements for computer are:

1, Pentium CPU more than 2.0G, more than 1G of memory;

2, installation of the Chinese Windows2000, XP, win7, win8 operating system;

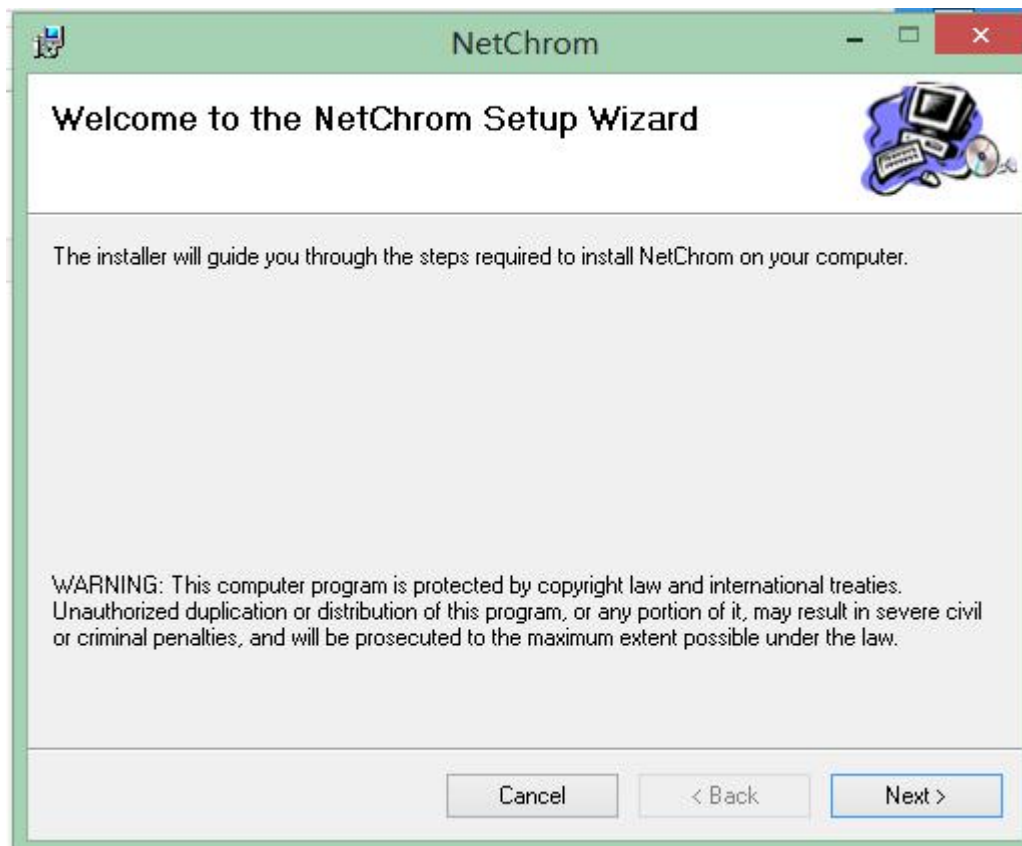
3, the 10/100M adaptive network port;

4, the installation of CD-ROM (if you want to backup CD spectra data, you can choose CD-ROM with recording function.);

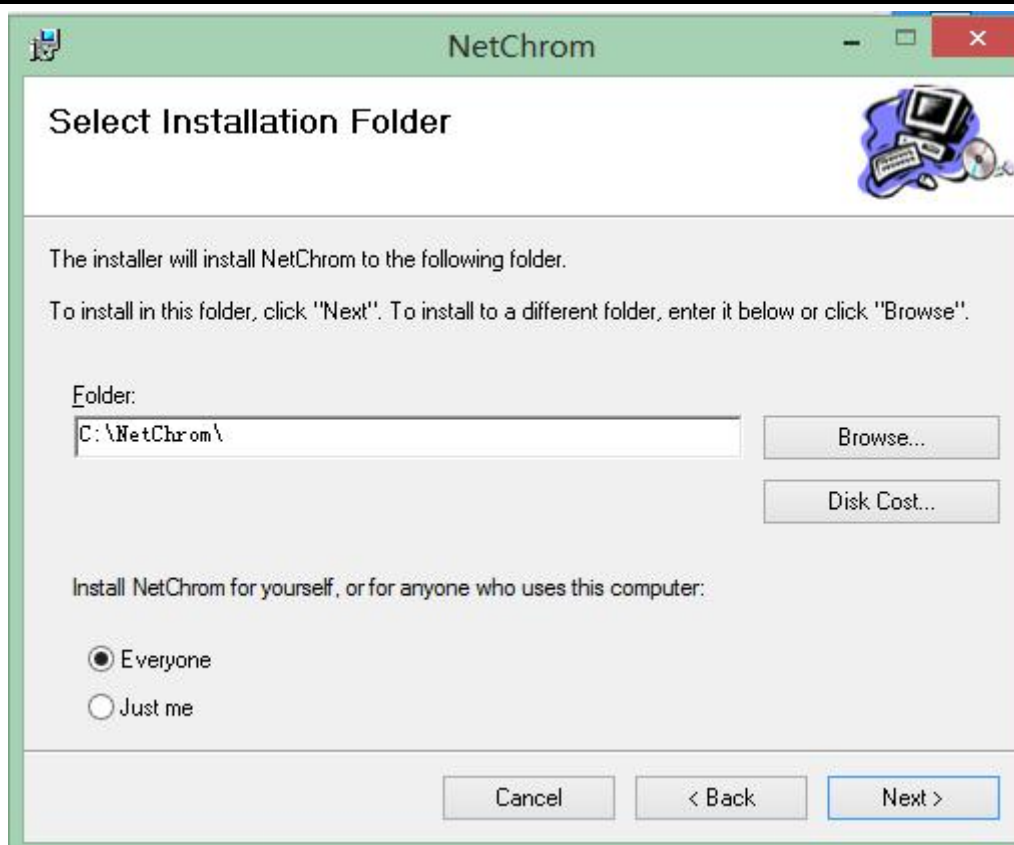
5, install a local printer or a network printer.

2. 3. 2 The workstation software installation

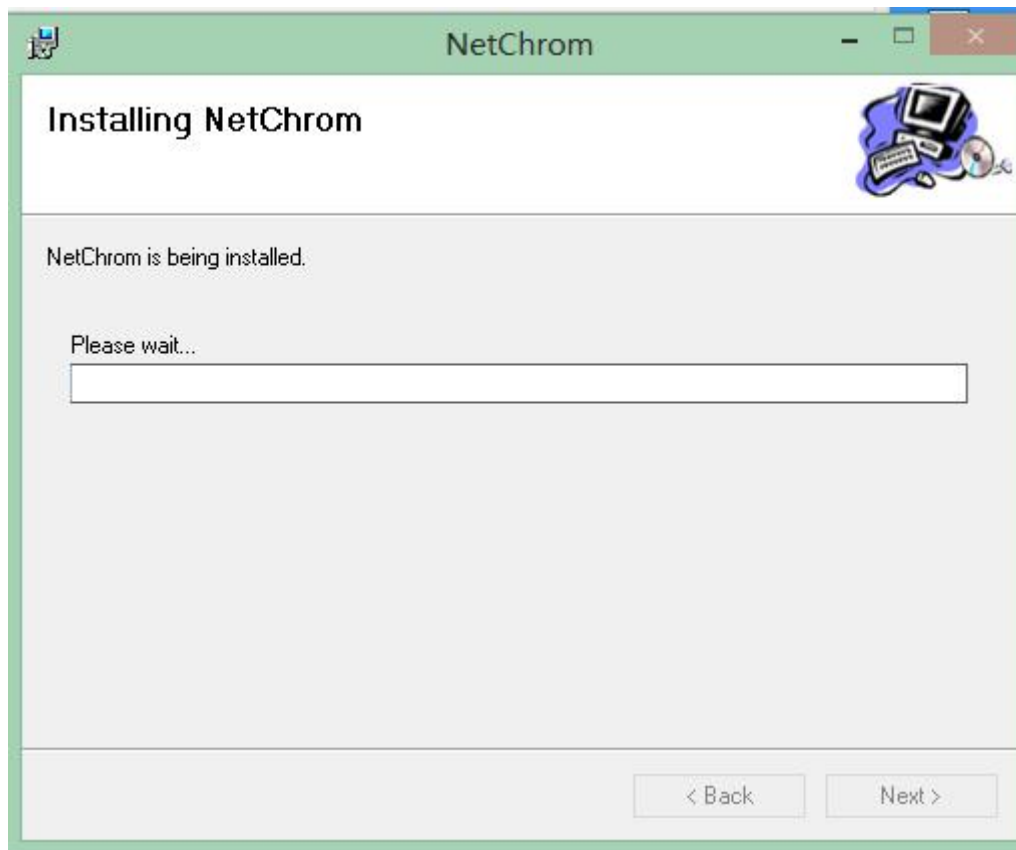
Put the software CD into the CD-ROM drive, double-click the setup file, the installation program will start. The interface will display:



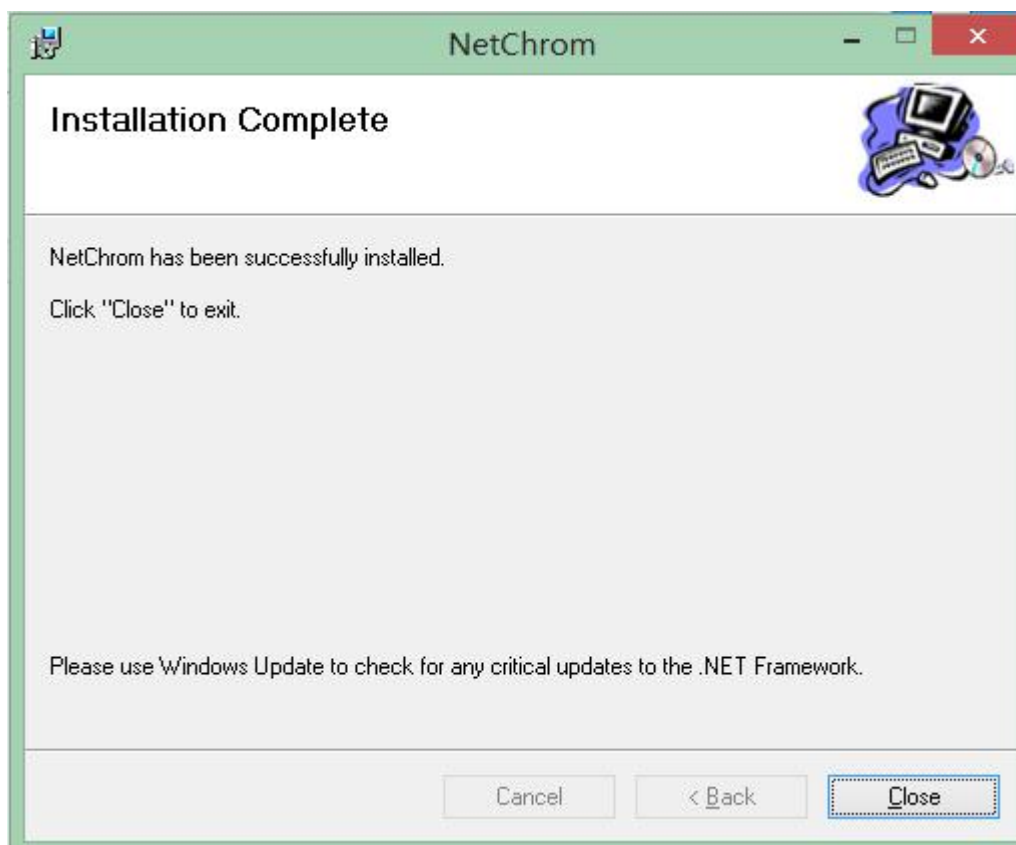
Click "Cancel" to exit setup, click "next" to enter the installation



The system will default files to be installed in the "C:\NetChrom\" directory. If at this time you want to exit the setup, click "Cancel"; if to return to the previous step, click the "back"; if it is determined to install in the directory, then click "next" launched a program installed; if you choose to install other directory, in the "Browse" and choose the installation directory and click "next" to start the installation program; "data processing" into "workstation" software installed after the installation, will display the following interface:



If at this time you want to exit the installation, click "cancel". To continue with the installation, wait a few seconds will appear the following interface:



It shows that software installed, click "close".

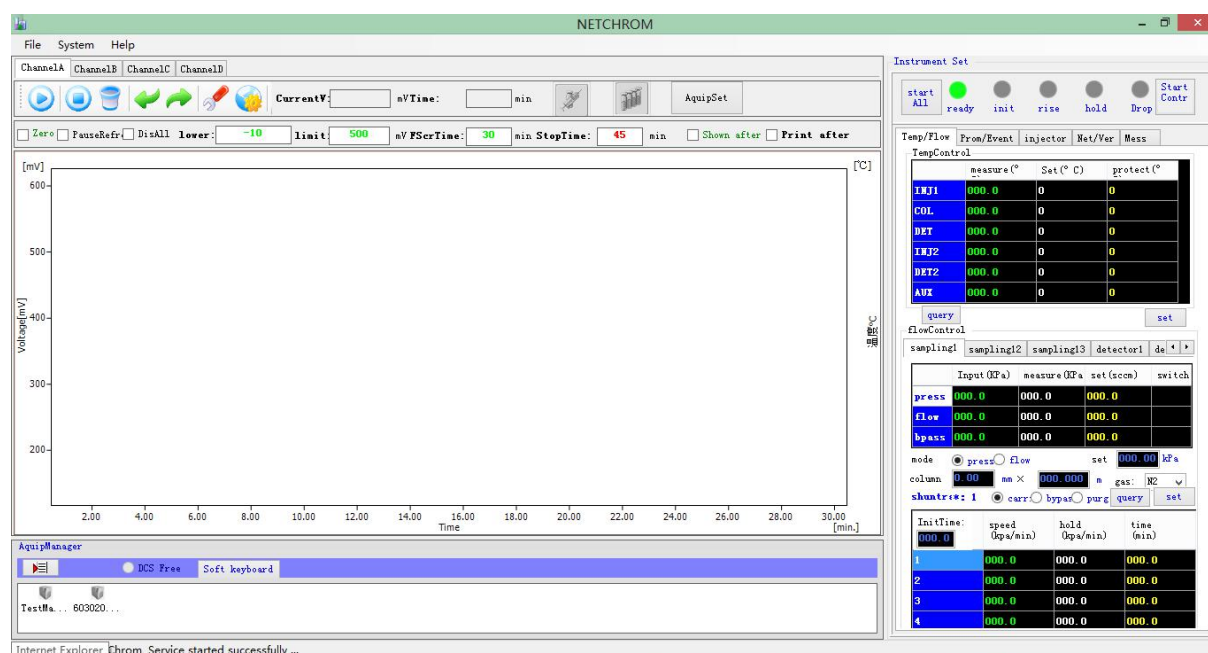
Click "close", the interface will automatically disappear, the desktop will appear two icon,"NetChrom" and "NetChromoffline" .



Among them, "NetChrom" is a network of chromatography workstation, "NetChromoffline" is a network of off-line processing workstation.

Double-click the "NetChrom" icon to run the network chromatography workstation.

Interface as shown below:



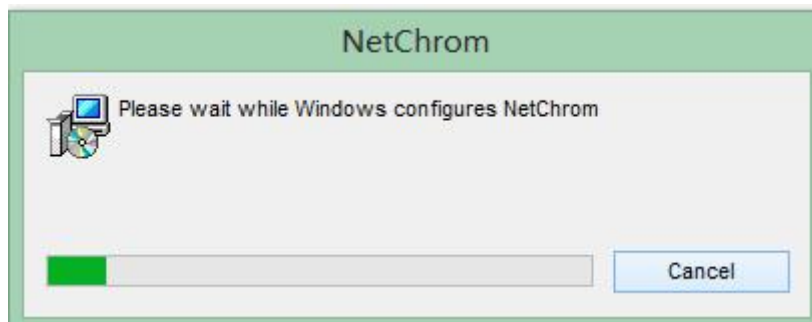
The detailed instruction is shown in chapters 4and 5.

2. 3. 3 The workstation software uninstall

When you need to uninstall this system, click Start -> all programme >unloading in NetChrom, pop up the following interface.



If you give up the unloading, click "NO" to return; if you want to uninstall, click "YES", then enter the system unloading state; as shown below:



Uninstall is complete, interface exit.

2. 3. 4 The workstation software upgrade

Detail is shown in: 4.2.3.3 to check for updates.

2. 4 The system boot

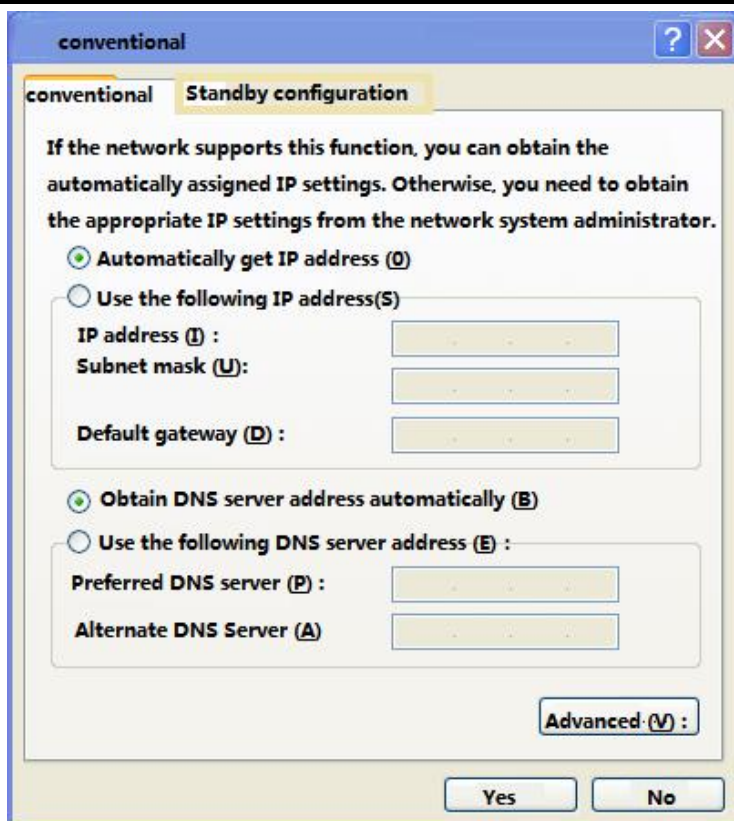
When the system is completed, you can boot and set network parameter.

The network parameters (including computer and chromatograph) setting is an important setting in the system. If the settings are not correct, some function in the system cannot be achieved, even the system cannot run. So before the setting of the distribution system IP address ,you must plan the distribution of your IP address, don't make IP conflict between the network IP address and other computer or device. When using routers and "DHCP" function of router , the system of computer and network instrument should try to avoid the IP used "DHCP", to prevent other computer or device be assigned to the IP address of the system.

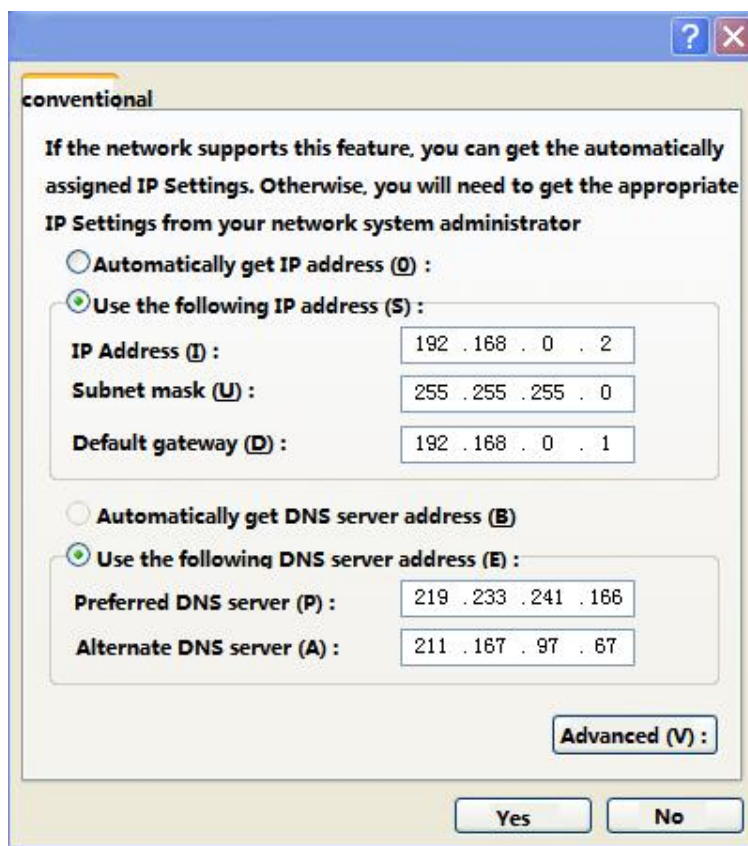
2. 4. 1 Computer network settings

Firstly, set the IP address, subnet mask, gateway of "the local computer" and "the unit in charge of the computer (if needed)" . When set the network parameters should be avoided conflict with IP address of other network equipment in the network (such as the other computer, network printer, network chromatograph, network telephone and etc.) .

Set the IP address of the computer may refer to the following methods: in the operating system desktop click "network neighborhood" on right click, select "properties", click "local connection" on right click, select "properties" and click; click "Internet protocol (TCP/IP)" and then click "properties" or double-click "Internet protocol (TCP/IP)", will display the following interface:



Click "use the following IP address (S)", input "IP address (I)", "the subnet mask", "default gateway" in turn, click "OK". As shown below:that is to set the computer's IP address to "192.168.0.2".



Note: if the computer users also need to log on to the Internet (commonly known as: surf the Internet), you need to set the DNS server address. The address of the DNS server may consult the Internet service provider.

2. 4. 2 Set the network parameters of the chromatograph

Set network chromatograph IP address should also follow the principle in 2.4.1. Only the color spectrometer IP address settings for a free IP address. Detailed reference: 3.1.8.

2. 4. 3 System port mapping setting

If the system processing computer and network instrument and use the same network in the same LAN, port mapping is not need to set the system (usually set in routers and other network equipment).

If this system is connected through the Internet, you need to do port mapping in the router. For example: unit charge of the computer (or a superior management computer) are not in the same LAN with analysis laboratory , and the supervisor computer and analytic laboratories have the service of accessing to the Internet , you can set the router port mapping to complete the connection of system .

Here we only need to deploy the "virtual server" in "forwarding rules" of the supervisor computer. For example: we assume that "the computer" IP address is "192.168.0.2",we only need to deploy the 8000 port configuration to the IP address. See below:

Virtual server

A virtual server, simply put, you can specify as such that access to any one or a segment of the router's protocol port (access through a WAN port) can be redirected to a specific network server within the Local area network.

ID	Service port	IP address	agreement	start using
1	8000	192.168.0.2	ALL	☒
2	8001	192.168.0.2	ALL	☒
3		192.168.0.	ALL	☐
4		192.168.0.	ALL	☐
5		192.168.0.	ALL	☐
6		192.168.0.	ALL	☐
7		192.168.0.	ALL	☐
8		192.168.0.	ALL	☐

Common service: DNS (53) ID: 1

previous page next page empty preservation

Here we should pay special attention to: the IP address of the unit in charge of computer(or a superior computer) setting in the chromatograph is not the computer network IP address, but is the public network IP address of local area network where computer stayed . That is: not "192.168.0.2", but public network IP address this router assigned . The public network IP address can be accessed through the router to view, also can consult the Internet service provider.

Note: router configuration access interface of different manufacturers will be different, but similar.

2. 4. 4 The initial test system.

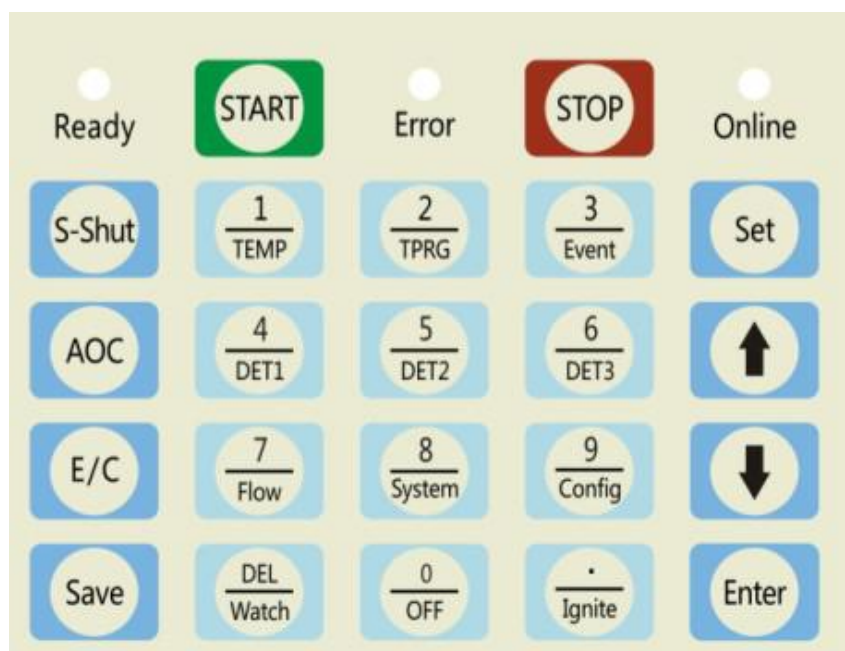
Completion of the above configuration, you can start connection preliminary survey of system. Run the computer "NetChrom" workstation software and open power source of chromatograph. If the linking is normal, it will appear color icons (Gray icons mean the chromatographs are not online) in the "equipment management" of "NetChrom" software (icons below is ecru spectrometer ID code). Double-click the icon, right functional area will display the running parameters of the instrument, spectrum zone is shown empty baseline. The operation of the system can be start.

III. Chromatographic Instrument Operation

3. 1. Keyboard Operation

HZGC-1212A gas chromatograph has been designed with six temperature control algorithm, can control the temperature control setting and temperature control of the six temperature control areas. And chromatographic column box has 8 order (or 16 order) programme heating function. Column box's back door will automatically open and close according to the temperature control algorithm.

HZGC-1212AI and HZGC-1212AII screen are 192*64 Chinese characters LCD display, HZGC-1212AIII is a 5.7 inch color LCD display, can stick out a mile of the work state of the instrument. Keyboard is designed concise, functions are complete and operation is simple. Because of various models of HZGC-1212A instrument keyboard operation is similar, so the book introduces operation of the HZGC-1212AIII keyboard detailedly, the user can use it as a reference for other types of.



Keyboard operation HZGC-1212A power gas chromatograph consists of 22 keys and 3 state indicating lamp:

start The key to control the start button (boot the first press) or signal processing, temperature programmed start button (temperature control state).

Note: as in the ready lamp has not been lit, press the start key process or invalid.

stop The key to end signal analysis or programmed state of the stop temperature programmed buttons;

S-Shut The key to control the display of the closed or opened state, does not affect the working conditions of instrument. Can prolong the service life of the liquid crystal display;

AOC The key is that the user can enter the automatic sampler interface;

E/C The key to switch interface language state, which shows english or Chinese;

Save The key to close the gas source, to save cost, such as expensive helium, argon, EPC configuration.

Set The key to make the instrument into the set state; into the set state, to be set against the explicit content; this button is pressed again to exit the setup status.

↑ The key for the display interface on the turn button; in the set of States, mobile location;

↓ The key for the display interface down button; in the set of States, mobile location;

Enter The key is to set the parameters confirmation key;

Intermediate compound key 12. Set the state for key parts of digital, "DEL" and "." the function keys; in non setting state, as the key part is shown the function keys, press lightly the function key will make the instrument into the corresponding interface display.

Ready The lights that allow control each control unit measured temperature reaches the set value, the column temperature furnace as the set value of $\pm 1\text{ }^{\circ}\text{C}$, the other for the set temperature of $\pm 6\text{ }^{\circ}\text{C}$, at this point you can sample.

Error The light indicates instrument failure, and will show the cause of the fault, please promptly eliminate.

Online The lamp is long dark short light indicates instrument working but not with the workstation on-line, long light, short dark said instrument is working and successful online and workstation; long bright or dark said instrument internal fault, need to be checked.

When the fault occurs in the temperature control system, may cause the temperature control, when the measured temperature of a temperature control area reaches the set temperature protection, microcomputer controller will automatically cut off the heating power, and display area display over-temperature alarm content hints in the display state (see chapter and eliminate the fault). When the temperature inside the column exceeds $450\text{ }^{\circ}\text{C}$, fuse-links chromatographic column box that is melting, to cut off the

chromatographic column box heating power, protect column box. Reboot before replacing fuse-links. HZGC-1212A power gas chromatograph attached with fuse-links (accessories: appendix D 29).

Note: into the set state, no keyboard, set the state will automatically quit after 5 minutes.

3. 1. 1 View and the set temperature.

In the boot of the state, press the **TEMP** key to enter the state of temperature display instrument, can see various temperature control operation.

AREAS is the display name 6 road temperature control, the name has been configured at the factory; if you need to modify the can be modified through the workstation software, see: 4.2.2 chapter.

Enable is the 6 unit arranged to state or an off state. "Open" state, "off" the closed state. When a unit is set to "ON" state, the temperature control in heating temperature control in the START, and the temperature error will be ready to light the basis. When a unit is set to "OFF" state, the temperature control in the START is not in the heating state, and is independent of the path and the **RAEDY** lights.

SETPOINT is showing 6 road temperature setting temperature.

ACTVAL is to show the measured temperature 6.

MAX-TEMP is displayed temperature protection 6. The temperature is the instrument according to the user set temperature automatically calculated, no need to modify the.

STATE is showing 6 road temperature control is in the heating state. The state is the instrument according to the temperature control conditions automatically calculated, no need to modify the.

Press the **SET** key to allow a parameter display (this time for the set state, similarly hereinafter!) If not, need to set, then press the **SET** key, you can exit the settings. Set status, press down arrow keys, **↑** bond can choose other parameters, press the number keys can set parameters, press **ENTER** button to set the parameters into the instrument and automatically into a set. In the non - set state (without any explicit interface state), if press down arrow keys, **↑** bond can be switched to the other interface, parameter setting procedure similarly.

3. 1. 2 To open or close the temperature control system operation

In the instrument on state, first press the start button to make instrument enter the state of temperature control , EPC module (if installed) will automatically open the gas control. This time you will hear the interior of instrument has noise of relay suction ,each temperature control area which "enable" is "open" will heat temperature control. At the same time "status" bar will show all the heating state of each way. If not enter the state of temperature control, the "status" bar is all shown "off".

When the temperature of column box reaches the setted $\pm 1^{\circ}\text{C}$, the remaining ways whose "enable" is "open" reaches the setted $\pm 6^{\circ}\text{C}$, the "prepare" lamp is lit, the display area below the keyboard will appear "ready".

Note: when the "ready" lamp was lit, if press the **start** button will start the workstation into analysis state; at the same time, if the temperature programmed parameters, external event parameters are valid, will make the instrument into the programmed state, external event control state at the same time.

In the instrument temperature condition, press the **off** button will display the following interface:

Det 1	Det 2	Det 3	Stopwatch	off	about
Close temperature control?					
Attention: after turn off temperature controlling, turn off power and carrier gas according to the operating instruction!					

When the "close temperature control?" in interface reverse display, if press the **input** key, namely close temperature control. And you will hear the noise from the internal of instrument released by relay, the back door will open automatically to cool down; if you press the **Set** keys, "close temperature control?" Stop reverse display, exit the interface settings, press other key can switch interface at this time.

3. 1. 3 Check and set the temperature programme

In the instrument on state, press the **temperature programming** button to make the instrument into the program temperature display state (can also enter by press **↓** or **↑** at non-setting state), as shown below:

temp eratu re	Tempe rature progra mming	event	flow	file	network
initialization time					005.0 min
1 order	10.0°C/min		250°C		010.0 min
2 order	00.0°C/min		000°C		000.0 min
3 order	00.0°C/min		000°C		000.0 min
4 order	00.0°C/min		000°C		000.0 min
5 order	00.0°C/min		000°C		000.0 min
6 order	00.0°C/min		000°C		000.0 min
7 order	00.0°C/min		000°C		000.0 min
8 order	00.0°C/min		000°C		000.0 min
9 order	00.0°C/min		000°C		000.0 min
10 order	00.0°C/min		000°C		000.0 min

order			
11	00.0℃/min	000℃	000.0 min
order			
12	00.0℃/min	000℃	000.0 min
order			
13	00.0℃/min	000℃	000.0 min
order			
14	00.0℃/min	000℃	000.0 min
order			
15	00.0℃/min	000℃	000.0 min
order			
16	00.0℃/min	000℃	000.0 min
order			
waiting...			000.00
10:02			

Temperature programming indicates the process that during sample analysis, temperature of column box set up according to the set value.

Above the interface is the initialization time, is the time needed to wait for the start warming up; the first line in the middle is the temperature program order; the second line is heating rate; the third line is the termination of temperature; the fourth line is to hold time. At the bottom of interface is behavior state display area, display running status of equipment at present, waiting time that stopwatch record and time at that moment

Note: the set of parameters is the same as 3.1.1 temperature setting.

Note: the temperature settled of temperature program should be higher than the column oven, the next order temperature should be higher than the last order temperature.

Note: when an order of the heating rate is 0, it will make the temperature-programmed of this order and step after this invalid; the first step heating rate of 0 would make the temperature program content is invalid.

Temperature programming operation:

In the boot of the state, press the **start** button to make the instrument into the temperature control system, when the instrument is in the "ready" state, and then press the **start** button will make the instrument begin program temperature control. The mStopwatch(000.00) of status display area will start timing. At the same time it also shows the process of rise to which the order, as shown in NO.01 execution is the first step temperature-programmed, followed by analogy.

When the chromatograph executing temperature program, instrument get into the initial temperature maintain state, display area display "initial temperature";

When the chromatograph executing temperature program, instrument get into the heating state, display area will display "warming";

When the chromatograph executing temperature program, instrument get into the heating temperature maintain state, display area will display "keep";

When the chromatograph executing temperature program, instrument get into the cooling condition, display area will display "cooling";

When the instrument is executed a complete program heating cycle, mStopwatch of state display area will end timing and clear; the instrument will automatically open the oven door, so that the temperature of column box will decreases to the initial temperature, shorten cooling time of instrument. When the temperature of column box reduce to initial temperature ($\pm 1\text{ }^{\circ}\text{C}$), "ready" light is illuminated again, waiting for the next programmed start. So repeatedly.

When the instrument is in the execution of programmed temperature, in the temperature control system, press the "stop" button will interrupt the programmed state. The mStopwatch(000.00) of status display area will end timing and clear, the instrument will return to a state of constant temperature.

3. 1. 4 Check and set the external events

In the instrument on state, press the "Event" key to make the instrument into the external event time program display state. The following diagram:

temp eratur e	progr amm ed	event	flow	file	network
No.1road time program(min)					
00.00	00.00		00.00		00.00
00.00	00.00		00.00		00.00
No.2road time program(min)					
00.00	00.00		00.00		00.00
00.00	00.00		00.00		00.00
No.3road time program(min)					
00.00	00.00		00.00		00.00
00.00	00.00		00.00		00.00
No.4road time program(min)					
00.00	00.00		00.00		00.00
00.00	00.00		00.00		00.00
Note: this time program Run to the odd time output is closed, Run to even time output is disconnected. Time is 0, time program end.					
end					

等待...

000.00

10:02

Note: the set of parameters is the same as 3.1.1 temperature setting.

Note: when the third-way's time program is set to all 00, the external events of the third-way output alarm signal. When the third-way time program has nonzero parameter, will be output with the 1, 2 time program .

Note: when the fourth-way time program is set to all 00, the output fourth external events is rapid cooling control. When the fourth-way time program has nonzero parameter, will be output with the 1, 2 time program .

Note: when the fourth time program is effective, when analyze the time run to even-order, it will sends "start analysis" command to the workstation automatically, in order to meet the special needs of users.

Note: when you don't need the fourth-way time program, please set the fourth-way time program to all 0; to prevent sending "start analyze "command to the workstation automatically.

3. 1. 5 Check and set the detector

In the instrument on state, press **detect1**, **detect2**, **detect3** can respectively view and set the detector has been installed. When a position sensor is not installed on the detector, the system will display:

The detector is not installed
Please check!

When has installed 1 - 3detector , press **detect1**, **detect2**, **detect3**key instrument will automatically display the following interface:

When FID1 is installed, then display:

FID1 polarity0 range*10 20time/s
Run baseline emptily ; deduct
ineffectively
FID1singnal: 0,000,000uV

When FID2 is installed, then display:

FID2 polarity0 range*10 20time/s
Run baseline emptily ; deduct
effectively
FID2singnal: 0,000,000uV

When FPD1 is installed, then display:

FID1 polarity0 range*10 20time/s
Run baseline emptily ; deduct
ineffectively
FID1singnal: 0,000,000uV

When FPD2 is installed, then display:

FID2 polarity0 range*10 20time/s
Run baseline emptily ; deduct
Ineffectively
FID1singnal: 0,000,000uV

When NPD1 is installed, then display:

NPD1 polarity0 range*10 20time/s
Run baseline emptily ; deduct
Ineffectively; current0.00A
NPD1 signal: 0,000,000uV

When NPD2 is installed, then display:

NPD1 polarity0 range*10 20time/s
Run baseline emptily ; deduct
Ineffectively ;current0.00A
NPD1 signal: 0,000,000uV

The range of the several detection above can only enter "7", "8", "9" or "10"; the other digital input is invalid, and will make the alarm prompt. It is the same below.

When ECD1 is installed, then display:

```
ECD1 polarity0 base flow0.05nA 20time/s
Run baseline emptily ; deduct
Ineffectively
ECD1 signal:      0,000,000uV
```

When ECD2 is installed, then display:

```
ECD2 polarity0 base flow0.05nA 20time/s
Run baseline emptily ; deduct
Ineffectively
ECD2 signal:      0,000,000uV
```

Range ECD detector can only choose to input "0" or "1". "0" means remain ; "1" means range enlarges one times. Base flow may choose to input "0.05", "0.1", "0.2", "0.5", "1" or "2" ,other value is invalid,.

When TCD1 is installed, then display:

```
TCD1polarity0 bridge flow000mA
20time/s
Run baseline emptily ; deduct
Ineffectively
TCD1 signal:      0,000,000uV
```

When TCD2 is installed, then display:

```
TCD2 polarity0 bridge flow000mA 20time/s

Run baseline emptily ; deduct
Ineffectively

TCD1 signal:      0,000,000uV
```

The range of current bridge's input value that can be selected : 0 ~ 220mA. Other value is invalid.

"Running empty baseline": when the instrument get into the ready state and the baseline is steady (baseline drift does not exceed the technical index),execute temperature program without sampling , but record the baseline drift data caused by temperature program.Stop the cursor on **running empty baseline** and press **input**, the instrument will automatically start program temperature (temperature programmed parameters is valid), and began recording baseline data; press **end** to stop the recording of walking empty baseline . The maximum recording time of walking empty baseline is for 2 hours, and stored by the instrument .The empty baseline data stored will be automatically updated on the next "running empty baseline" command start.

"deduct effective", "deduct invalid" means whether the baseline instrument in the analysis state stored participate in baseline deduction.

Note: the set of parameters is the same to 3.1.1 temperature setting.

Note: the polar figures can only input "0" or "1", the other figure is invalid. "0" means the output data doesn't changed, "1" means the sign of the output data change, the corresponding spectrum will flip.

Note: currently the instrument internal sampling rate must be set to 20 /S, in order to adapt to the data processing software.

Note: if set the deduction to effective, baseline data stored in the internal of instrument must be correct baseline, otherwise output of the instrument will be unknown state.

Note: the work of TCD detector must comply with the rules that "first after heating, ventilation, and then current". That is when the TCD detector hasn't aerated carrying gas, do not set the bridge current, otherwise, it will damage the tungsten wire! When turn off the machine, you must first turn off the bridge current, cooling, the TCD temperature to room temperature and then turn on the carrier gas near!

Note: During the TCD operation, please try not to use too high current . High current operation will accelerate the oxidation of tungsten, detrimental to the life of TCD detector.

Note: to prevent damage to the TCD detector, in the design of this machine adopt the bridge, current settled value not to be shut down to save. The machine boot TCD bridge current setting value of automatic 0 ma.

Warning: the carrier gas contains oxygen, shortens the life of TCD filament. The carrier gas should be deoxidized completely!

3. 1. 6 Check and setting gas protection function and EPC, EFC module

This instrument can adopt mechanical valve or EPC, EFC module to control the gas flow or pressure. You can read mechanical valve operation in: Chapter 3.2 gas flow control valve.

This instrument can install an "electronic pressure, flow measurement module" , 18 road EPC, EFC module. Each EPC, EFC intelligent module can work in N₂ , H₂ , air, He, Ar and other gases state at most, it can be set to constant voltage, constant current 2 working state.

3. 1. 6. 1 Check and set the electronic pressure, flow

In the instrument on state, press the **flow** button make the instrument get into state of display the gas parameters. When the device is not installed EPC, EFC intelligent module, but equipped with the traditional mechanical valve as the control of gas flow, use electron pressure and flow sensor to measure the pressure and flow, press the **flow** button and it is showed as follows:

N2:000.00	H2:000.00	AIR:000.00
INJ1-EFC:		
Column: 000.0sccm	000.00sccm	
Split-flow: 000.0sccm	000.00sccm	

Purge: 000.0sccm	000.00sccm
Split ratio:1/1	1/1
Programmed set: initial time	000.0min
---Rate-----	hold----- time-----
000sccm/min	000sccm 000.0min
000sccm/min	000sccm 000.0min
000sccm/min	000sccm 000.0min
000sccm/min	000sccm 000.0min
Mold set:steady flow	gas set:0
Column:D=0.32mm	L=015.000m
Split-flow:D=0.10mm	L=000.040m
Purge:D=0.10mm	L=000.040m
Kinds of gas:N ₂ :0 H ₂ :1 air:2 He:3	

The first row shows the valve pressure after N₂ , H₂ ,air .

In the middle is the setting parameters of the central display sampler 1 (INJ1)'s set flow, flow measured, set the split ratio, measured the split ratio and column heating pressure (or flow)

The lower part is a sample injector 1 (INJ1) 's working mode, gas types and specifications parameter of the chromatographic column and the air resistance parmenters for shunt and blowing.

At this time, press  and  can check or set the sample injector 2 (INJ2), injector3 (INJ3), detector1 (DET1) ,the EFC module parameters of detector 1 (DET1) .

The detector EFC 's display and interface settings:

N2:000.00	H2:000.00	AIR:000.00
DET1-EFC:		
H ₂ : 000.0sccm	000.00sccm	
Air: 000.0sccm	000.00sccm	
Tail blow:000.0sccm	000.00sccm	
	Tail blow gas:0	
H ₂ : D=0.10mm	L=000.040m	
Air:D=0.25mm	L=000.040m	
Tail blow:D=0.10mm	L=000.040m	
DET2-EFC:		
H ₂ :000.0sccm	000.00sccm	
Air:000.0sccm	000.00sccm	
Tail blow:000.0sccm	000.00sccm	
	Tail blow gas:0	
H ₂ :D=0.10mm	L=000.040m	
Air:D=0.25mm	L=000.040m	
Tail blow: D=0.10mm	L=000.040m	

Press the Set button can set pressure, flow rate and gas species, working mode, column parameters (or air resistance parameters). Parameter settings is the same as 3.1.1 temperature setting.

Note: only when the instrument is equipped with "electronic pressure, flow measurement module", "EPC and EFC control module", this parameter is meaningful.

Note: the gas species, gas chromatographic column, shunt gas resistance, purge gas resistance is very important parameter of EFC control module , only when configurate correctly , module can work normally. Shunt gas resistance and purge gas resistance is configurate according to the actual production is factory, user can't alter it. If the data is missing or incorrect, please consult the manufacturer.

Note: when the EFC module is used to control the column injector filling, parameters of chromatographic column has no significance.

3. 1. 6. 2 Check and set the electronic pressure , gas configuration of flow measurement module and dynamic configuration parameters

The function of electronic pressure and flow measurement module's is to replace the traditional pointer type pressure meter, and it adopt pressure sensor and flow sensor to measure the working gas pressure and flow. Compared with the traditional pointer pressure gauge ,it has advantages of : precise measurement, visual display, remote viewing instrument working state.

When the instrument is equipped with electronic pressure and flow measurement module, in working condition, press **flow**, then press **↓** , it can check or set the parameters of gas configuration and dynamic configuration of gas protection, electronic pressure and flow measurement module . The interface is as follows:

Gas shield	N ₂ :on	H ₂ :on	AIR:off
Gas set:	N ₂ :0	H ₂ :1	AIR:2 He:3
01->0	02->1	03->2	04->3
05->0	06->1	07->2	08->3
09->0	10->1	11->2	12->3
13->0	14->1	15->2	16->3
Dynamic allocation:	turn off and not use: 88		
01->00	02->01	03->02	04->10
05->10	06->12	07->13	08->14
09->15	10->16	11->17	12->18
13->88	14->88	15->88	16->88
Total pressure:	N ₂ 00	H ₂ 01	air02
injector1:	carrier gas10	split-flow11	purge12
injector2:	carrier gas13	split-flow14	purge15
detector1:	H ₂ 20	AIR21	tail blow22
detector2:	H ₂ 23	AIR 24	tail blow2
Please check the instrument configuration ,modify it carefully!			

Gas protection refers to the use of a pressure sensor or a EPC module and other technical measures, when a gas input pressure is not up to the 0.1MPa, the instrument turn off temperature control, TCD detector bridge stream function automatically. When is set to "on", the instrument will close automatically when the pressure of this gas not to 0.1MPa when ; when set to "off", the gas pressure will not participate in gas protection.

When the instrument is not equipped with "gas protecting" hardware (such as: not equipped with a pressure sensor or a EPC module), setting no longer has any meaning. The instrument can open normally, but no protection function.

The electricity pressure, flow measurement module is installed in the back of column box, is designed with 13 ways pressure sensor interface and 3 ways flow sensor interface. Among them 1 ~ 13 ways is pressure sensor interface, 14 ~ 16 ways is flow sensor interface.

The 1 ~ 13 ways pressure measurement of module is independent to working gas; but if we want to calculate the gas flow rate, you must set the correct parameters are as follows: gas setting (nitrogen: 0 hydrogen: 1 air: 2 helium: 3 argon: 4), capillary tube and the air resistance configuration (see the next Chapter).

To adapt to users' different requirements of instrument configuration, the module uses a dynamic allocation method. "Dynamic allocation" refers to 1 ~ 16 road sensor interface of module can be configured to either position detection.

For example: if configure the first road as a nitrogen pressure, only need to set the "01->00"; configure it as the total air pressure, only need to set the "01->02"; configure it as the carrier gas pressure of 1 stigmas, only need to set the "01->10"; when you need to shut down the road calculating, simply set the "01->88".

"gas setting" and "dynamic configuration" setting method is the same as the temperature setting in Chapter 3.1.1.

Note: each instrument is configured according to your demand in factory, randomly equipped "configuration record" is posted on the back of the circuit box cover, please preserve it carefully!

Note: when you need to change the configuration in using, please carefully check the actual position of 1 ~ 16 road sensor installed, configure correctly in the configuration parameters, otherwise it will cause the display parameters error.

Note: only when the instrument is equipped with "electronic pressure, flow measurement module", "EPC and EFC control module", this parameter is meaningful.

Warning: unless it is incorrect, please do not alter the parameter that the instrument configured arbitrarily!

Warning: after dismounting air pressure sensor, flow sensor or gas path, you must detect leak carefully again!

3. 1. 6. 3 Check and set the parameters of pressure, flow measurement module of the capillary parameter or air resistance

When the instrument is equipped with electronic pressure and flow measurement module, in working condition, press and then press 2 times can check and set electronic pressure, the capillary parameter of flow measurement module or air resistance parameter . The interface is as follows:

```
capillary column and air-resistor
configuration:
Air-resistor01:
D=0.10mm      L=000.115m
Air-resistor02: D=0.10mm
L=000.115m
Air-resistor03: D=0.10mm
L=000.115m
Air-resistor04: D=0.10mm
L=000.115m
Air-resistor05: D=0.10mm
L=000.115m
Air-resistor06: D=0.10mm
L=000.115m
Air-resistor07: D=0.10mm
L=000.115m
Air-resistor08: D=0.10mm
L=000.115m
Air-resistor09: D=0.10mm
L=000.115m
Air-resistor10: D=0.10mm
L=000.115m
Air-resistor11: D=0.10mm
L=000.115m
Air-resistor12: D=0.10mm
L=000.115m
Air-resistor13: D=0.10mm
L=000.115m
Air-resistor14: D=0.10mm
L=000.115m
Air-resistor15: D=0.10mm
L=000.115m
Air-resistor16: D=0.10mm
L=000.115m
```

"D" of gas resistance parameter is bore of capillary column or choke's diameter; "L" is the length of capillary column or the air resistance. Because the gas flow calculated is to the fourth power of "D" and is inversely proportional to "L", so whether this parameter setting is correct or not is directly related to the settlement result.

Has been calibrated and corrected in the randomly equipped gas resistance strictly, the value can not be arbitrarily modified!

When installing or replacing the capillary column , should check the nameplate (or consulting manufacturers of capillary column), input inner diameter and column length correctly. In order to avoid the calculated flow is inconsistent with the actual, delay your test.

The setting method of "capillary column and gas barrier configuration" is the same with the temperature setting in Chapter 3.1.1.

Note: the air resistance parameters is the parameters of electronic pressure and flow measurement module, has no thing to do with the EFC control module.

Note: each instrument is configured according to your demand in factory , randomly equipped "configuration record" is posted on the back of the circuit box cover , please preserve it carefully !

Note: 14 ~ 16 road of module is flow sensor interface, parameter of 14 ~ 16 road's "capillary column and gas resistance configuration" has nothing to do with the flow measurement!

Note: only when the instrument equipped with "electronic pressure, flow measurement module", this parameter is meaningful.

3. 1. 6. 4 Electronic pressure, flow rate of zero

For the convenience of production and users' zero setting after replacing the sensor , interface of "electronic design pressure, flow of zero" is designed in the instrument.

Press  or  to choose getting to the interface of "EPC&EFC correction", will show:

Dete1	dete2	dete3	stopwa tch	injector	about
EPC&EFC correction					
EPC14-ADJ:00.00	00.00	00.00			
EPC14-ADJ:00.00	00.00	MI/min			
EPC15-ADJ:00.00	00.00	00.00			
EPC15-ADJ:00.00	00.00	MI/min			
EPC16-ADJ:00.00	00.00	00.00			
EPC16-ADJ:00.00	00.00	MI/min			
EPC01-ADJ:00.00	00.00	00.00			
EPC01-ADJ:00.00	00.00	MI/min			
EPC02-ADJ:00.00	00.00	00.00			
EPC02-ADJ:00.00	00.00	MI/min			
EPC03-ADJ:00.00	00.00	00.00			
EPC03-ADJ:00.00	00.00	MI/min			
After disconnect all gas source turn on the power for 15 minutes and reached thermal equilibrium Zero?					

Press "set" button to enter the set state, press  and  to choose "zero setting", press "enter" button is ok.

Warning: under the situation that the gas source is open , it can not perform this operation! Otherwise it will cause the measurement results that can not be expected!

3. 1. 7 Check and set the executable file, automatic sampling, start mode, stop time, screensavers, clock and language

In the boot of the state, press **time** (or **system**) to make the instrument enter the display state of the system parameters. As shown below:

temp eratu re	Temp eratur e progr amm ed	even t	flow	file	network
The currently executing file:No.1 files					

Gas autosampler program settings					
Automatic sampling 0006 times at					
intervals of 008.0 minutes					
Start mold 0-1-2s Sampling for 999.9					
minutes					
Screen time: 05 minutes (when 99 is normally					
on)					
FID,FPD detector ignition time:3 s					
Clock set: 10/06/21 14:09:20					
Language choice:0 0:Chinese 1:English					
Machine number: 60F9-990A-4A48-485D					
Mainboard version: GCM-SUN-V2-1005					
Display versions: GCD-SUN-V3-1005					
EPC version: GCF-SUN-V1-1006					
DEF1 version: GCT-SUN-V1-0911					
DET2 version: GCT-SUN-V1-0911					
DET3 version: GCF-SUN-V1-0911					
wait---		00.00		10:02	

Note: the set of parameters is the same as temperature setting in Chapter3.1.1 .

Keep 8 instrument operating parameters file in the instrument. You can choose 0 - 7 document as the current instrument executing files. When alter the executing file, the instrument will be reinitialized. It takes a few seconds.

"Sample: 0006 times" means to let the system automatically completes 6 times sampling; when it is 0 time, it does not start automatically sampling program; when for the 9999 times, the instrument won't be limited by sampling frequency, sampling automatically permanently, until the user stop manually;

"Intervals:008.0 minutes" means time interval that the system perform sampling automatically. It includes automatically repeat temperature-programmed (in the situation that temperature programmed parameters is valid),under external events time programme (in the situation that the time program parameters is valid) and remote boot workstation software to analysis. When it is 0 minutes, it does not start automatically sampling procedure;

"Start mode 0-1-2s" is whether chromatograph start sampling automatic detection. The first bit is 0 means don not start sampling automatic detection;is1 means start sampling automatic detection; the second bit is to set which detector start automatic detection, usually is TCD;the third bit is to set that after has detected the fluctuation of sample peak delay a few seconds to give order of "start analysis", which can eliminate fluctuant baseline due to sampling ;

"Sampling 999.9 minutes" is to set the sampling time of workstation. When set to 999.9, chromatograph do not send command of " stop analysis".

"Screen Saver" is the time automatically turn off backlight settted without press any keyboard.

The ignition time setting of FID, FPD detector. It can also be directly operated through the keyboard, detailed illustrate is below.

"Clock" is true-time clock inside the instrument, respectively are; year / month / day hour:minutes: seconds. The clock can also be modified by remote workstation software.

Note: when the screen time is set to 99 minutes, the backlight won't be closed.

Note: when boot up,the screen saver time is defaulted to 5 minutes; when pressing any keyboard, the actually running screen time operation is settted screen time.

Note: the backlight shutting can cause the baseline FID has mutations of 10-20uV, in order not to affect the analysis, please adjust backlight time for appropriate values or set to 99 minutes.

Note: in the "preparation conditions" and sampling frequency and sampling interval are not 0, press the **start** button or start analysis on the workstation, the instrument will enter the "automatic sampling time" execution state, in the status bar will blinking display "INJ0001". "INJ0001" indicates instrument has entered the automatic sampling, and the current sample analyzed is the first .

The **language selection**, 0 means the Chinese operation interface, 1 means the English operation interface. Can also be directly switch operation interface by press the **language** button , so it will be more convenient.

Note: the machine number below is the electronic label chromatograph automatically generated, can not modify. The version information is all part of software version information of the instrument, can not modify.

3. 1. 8 Check and set the network parameters.

In the instrument on state,press **network(or configuration)** to make the instrument enter into display state of network parameters. The interface is shown as follows:

temperat ure	Tempera ture program	event	flow rate	file	network
Chromatograph the network parameters IP of this machine: 192.168.018.202 Subnet mask: 255.255.255.000 gateway: 192.168.018.001					
The workstation network parameters Local processing IP: 192.168.018.003 Competent business IP:192.168.018.199 Superior IP : 192.168.018.198					
Connection status					
Local processing Competent business Superior : <—>					
wait...		00.00		10:02	

Note: the set of parameters is the same as temperature setting in 3.1.1 .

Note: when modify the network parameters of chromatograph, will disrupt the link of chromatograph and workstation, and trying to initialize the network parameters of chromatograph itself and link to the workstation again.

Since Ethernet technology is very complexity, it is difficult to describe it in a limited space. IP address setting information please refer to the relevant books or set by the network administrator. Here only do the basic description.

"The IP" refers to the IP of this chromatograph. General set an IP address which is same network segment with the enterprise local area network and other instrument or computer are not using.

"The subnet mask" set the same subnet mask as the enterprise local area network used. Generally is 255.255.255.0.

"Gateway" set the same gateway which the enterprise local area network used. Generally is: 192.168.x.1

"Local" refers to the IP address of the computer workstation software working . It is the IP address of the computer setted as workstation software working. This parameter must be

set correctly, otherwise the chromatograph will not be able to connect to the workstation software.

The IP address of the computer which working the workstation software can be check in the "Internet protocol (TCP/IP)" of "local connection"'s attribute of "network neighborhood"'s attributes. You can also check it in the command state of operating system by the "IPCONFIG" command . (see 4.2.2).

"The competent business" refers to the competent business in units (such as chief engineer, quality inspection officer) install the workstation software on the IP address of his own computer to focus on running state color spectrometer and analysis of data . If you want to use this function, the parameter must be set correctly, otherwise the chromatograph will be unable to connect to the competent business workstation. Of course, if business executives do not focus on the running state of chromatograph and analysis data, needn't install workstation software, as long as set the IP address to an IP address that is not used in the LAN .

"Supervisor" refers to units superior administrative units (such as: Technology Supervision Bureau, Health Bureau, environmental protection bureau) establish the public IP dress of monitoring system (usually via the Internet) to focus on running state color spectrometer and analysis of data. If the supervisor hasn't such requirement, as long as set the IP address to an IP address that is not used in the LAN .Behind the "Supervisor" shows "< -- >" sign means chromatograph and workstation connected successfully; or the connection to workstation is not successful.

Note: in the LAN case, IP address of chromatograph and IP address of workstation computer must be in the same subnet.

Namely: the first 3 sets of data of the IP address is consistent!

Note: the IP address of chromatograph and the computer of workstation can't conflict (consistent) with other IP address of other network equipment.

Note: the IP address of chromatograph using a static IP address mode. Does not support the "obtain IP address automatically" function.

Note: because our chromatograph's working mode is automatically connected to workstation after booting. In order to stabilize the work system, so the IP address of workstation computer must be fixed. The workstation computer IP address should use a static IP address mode, do not use "obtain an IP address automatically" mode.

Warning: set local processing, business director, supervisor setted in chromatography is strictly prohibited to be the same! This will make the baseline data of workstation irregular! If the business supervisor and supervisor are not used, can set the two IP addresses into IP address in LAN that does not exist.

3. 1. 9 Stopwatch operation

HZGC-1212Agas chromatograph is design with mStopwatch (00.00). The mStopwatch is used in instruments performing programmed temperature or time program. When the chronograph is not used by system, users can use the stopwatch timing (as measured by the peak time, gas flow rate). Press **stopwatch** the stopwatch button will start the stopwatch, then press **stopwatch** again will end timing.

The stopwatch interface diagram:

Dete 1	Dete 2	Dete 3	stopw atch	inject or	about
stopwatch function set the soap bubble flowmeter readings: 50ml Measurement of gas flow rate: 000.0ml/min					

Note: the set of parameters is the same as temperature setting in 3.1.1 .

Note: the stopwatch function keys and delete is composite keys, in the non - setting conditions is stopwatch function; in setting state is the delete function key.

Warning: when needn't EPC&EFC setting zero, not to implement the "zero" confirmation! Otherwise it will cause the measurement results can not be expected!

3. 1. 10 Check and set the autosampler

"Sampler" refers to the liquid injector equipped with instrument (such as: AOC-20i).

Press **↓** or **↑** to choose "sample" interface, will switch to the interface of "injector" check and settings. As the following diagram:

Dete 1	Dete 2	dete 3	stopw atch	inject or	about
Liquid autosampler program settings					
Order	No.	Sample T/bottle interval			
1:	002-003	01.0uL	003	010min	
2:	000-000	08.0uL	000	000min	
3:	000-000	08.0uL	000	000min	
4:	000-000	08.0uL	000	000min	
Liquid autosampler parameter settings					
Automatic sampler: model 0 inlet: 0					
solvent cleaning before sampling: 000time					
sample cleaning before sampling:000time					
solvent cleaning after sampling:000time					
pump sample times:000time					
viscosity delay:00.0s					

```

sample resides:00.0s
Sample mode:0 needle speed:0
Stylet speed:0 start delaying:00.0h
State: offline spare   current:003-001

```

On the upper of interface is a batch program setting of autosampler settings, such as from second to third sample vial, sample 1 microliters each time , each sample vial do 3 times of analysis, each interval time of analysis is 10 minutes.

In the middle of the interface is basic parameters of setting autosampler.

The bottom of the interface is the current state of the autosampler, such as "online", "offline", "free", "sampling" etc.. The current bottle number refers that when sampling actually , automatic sampler has been performed to which number of sample and which needle of the sample .

Note: when not equipped with autosampler,the parameters has no meaning.

Note: the basic parameters of the autosampler is determined by the type of sampler equipped with. Parameters setted of different models of autosampler are slightly different, please carefully read the autosampler instructions equipped with!

Warning: the automatic injector is a precision instrument, please strictly follow the instructions when using and installing the autosampler, so as to avoid damage!

3. 1. 11 Ignition operation of FID

Our apparatus is designed with automatic ignition function.

Conditions of automatic ignition:

☆ installed FID detector;

☆The actual temperature of FID detector reaches to above 130℃, instrument will open air automatically;

☆After the instrument open air, about 1 minutes, will automatically perform ignition;

☆When instrument execut Ignition automatically, it will urn down the air flow automatically t(non EPC), will automatically increase the hydrogen flow rate (EPC);

When reaching the ignition condition, also can be manual ignition.

FID manual ignition can be executed at the detector interface, can also directly perform by pressing lighting on the keyboard (non-setting status is the ignition key, setting status is the decimal input keys), can also directly operating and performing on the workstation software. The ignition time is automatically controlled by time setted by "detector ignition is 3 seconds long" , users need not intervene.

Note: the instrument is designed with air automatically closing function: not in temperature controlled state, has no ignition conditions (FID temperature does not reach more than 130°C), the air is automatically closed.

Note: in order to facilitate ignition, in the instrument is designed of " automatically decrease the air flow when ignition" function. It is a normal phenomenon.

Note: the electronic ignition components is component for choose, if the instrument is not installed electronic ignition device ,then use the lighter, burning torch to igniting.

Note: according to actual application, generally set the ignition time to **3 seconds**. Too long will completely shut off air, it will be extinguished after lighting ; too short it can't be easily ignited.

Warning: in the instrument is designed the function that ignited automatically after booting(equipped with FID detector) , to **avoid electric shock**, do not disassemble high voltage discharge wire in the boot state !

3. 2 Gas flow control operation

This instrument can adopt mechanical valve or EPC and EFC module to control the gas flow or pressure.

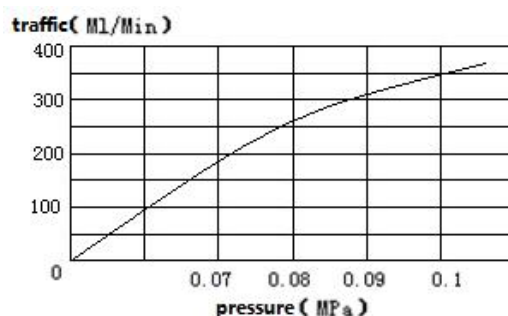
3. 2. 1 operation of mechanical valve controlling flow

The carrier gas path first go through the regulator valve to steady pressure , steady the pressure at about 0.3MPa (has been adjusted in factory , the user can not adjust by themselves!). Then the carrier gas go through the steady flow valve and output constant flow of carrier gas.

Adjust the "carrier gas flow regulating valve A" (or "carrier gas flow regulating valve B") and you can adjust the flow rate of carrier gas A (or carrier gas B).

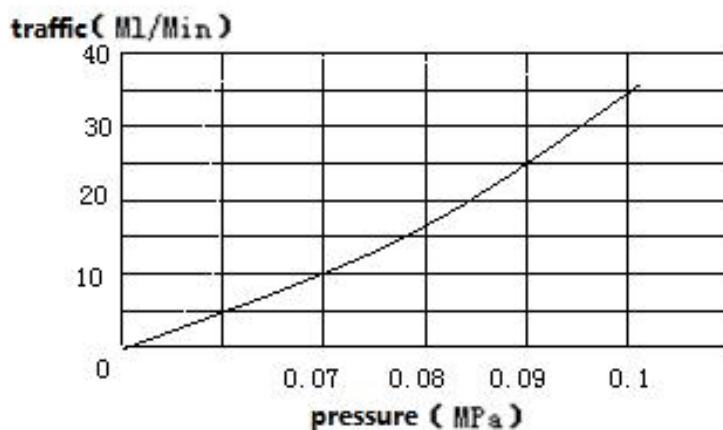
"A pre-column pressure A" (or "pre-column pressure A") the pressure indicator indicates the corresponding column load pressure.

The air through the regulator valve to steady pressure, steady the pressure at about 0.2Mp (has been adjusted in factory , the user can not adjust by themselves!). Then the air through secondary pressure regulator and combine fixed gas resistance to output flow of air. In the gauge 0.1Mp, the flow is 350ml/min, such as the instrument air flow curve shown in the table.



The air pressure-flow diagram of curves

The hydrogen gas first go through the regulator valve to steady pressure, stable pressure at about 0.2MPa (has been adjusted in factory, the user can not adjust by themselves!). Then hydrogen go through secondary stage stabilized and combine fixed gas resistance to output flow of hydrogen. In the gauge 0.1Mp ,the flow is 35ml/min, such as the instrument of hydrogen flow rate curve shown in the table.



Hydrogen pressure - flow diagram

Note: when equipped with electronic pressure and flow measurement module, can read the pressure and flow numeral from the instrument directly ,you have no need of checking the curve above.

3. 2. 2 Operation of EPC&EFC module control flow

The instrument can adopt EPC, EFC module to control the gas flow or pressure.

Operation of EPC, EFC module both using keyboard or workstation digital setting. See: chapter3.1.6 .

VI.operation of chromatograph workstation

4. 1 Workstation logon

Workstation of NetChrom gas chromatograph is designed with user management . The user management includes: login name, password, validity and user level. The different user levels will enable visitors to have different permissions. The validity will determine the effective login time of the user .

When the software first installed on a computer , it will give the system administrator login name, password are all: admin, with the highest level. With this login name, password can be logged in as an administrator, create or delete other users, and can modify their own login name and password.

When the user doesn't modify the system administrator's user name and password , and doesn't create other user, start the NetChrom gas chromatograph workstation will skip the user login interface, in case that every time you start the workstation to enter your user name and password.

When modifying the administrator user name and password or create other user, start the NetChrom gas chromatograph workstations will display the interface of user login. As shown below:



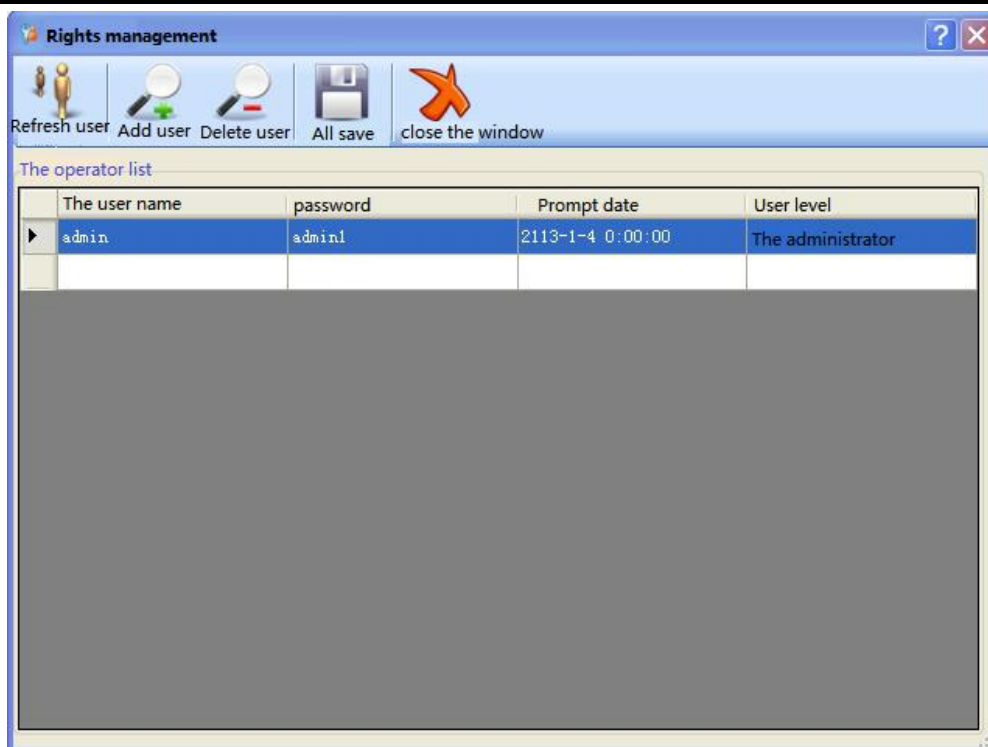
At this point, you must input the user name and the correct password that has already been configured in system, then click "login" to start the workstation; if there's any error, the system will exit.

4. 1. 1 User management

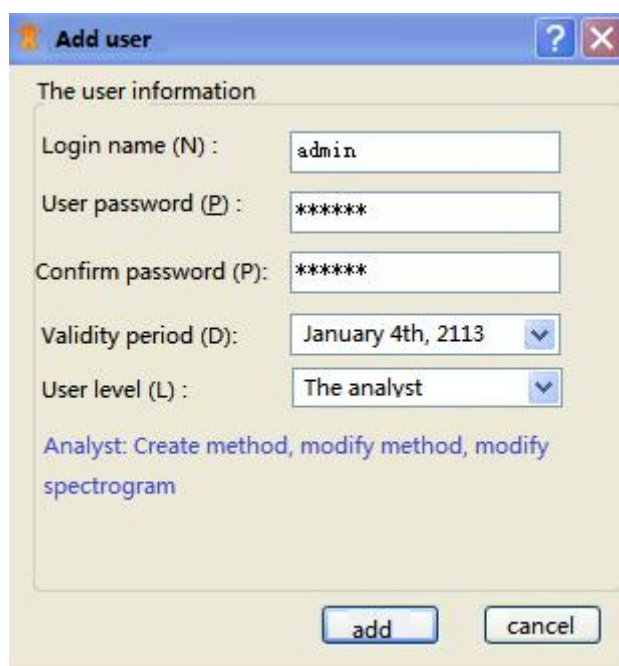
Select "start" -> "program" -> "NETCHROM", select the "user management", the system will pop up "permissions login management" interface, as shown below:



Now enter the administrator's login name and password, click "login" to access permission management interface, as shown in the following figure:



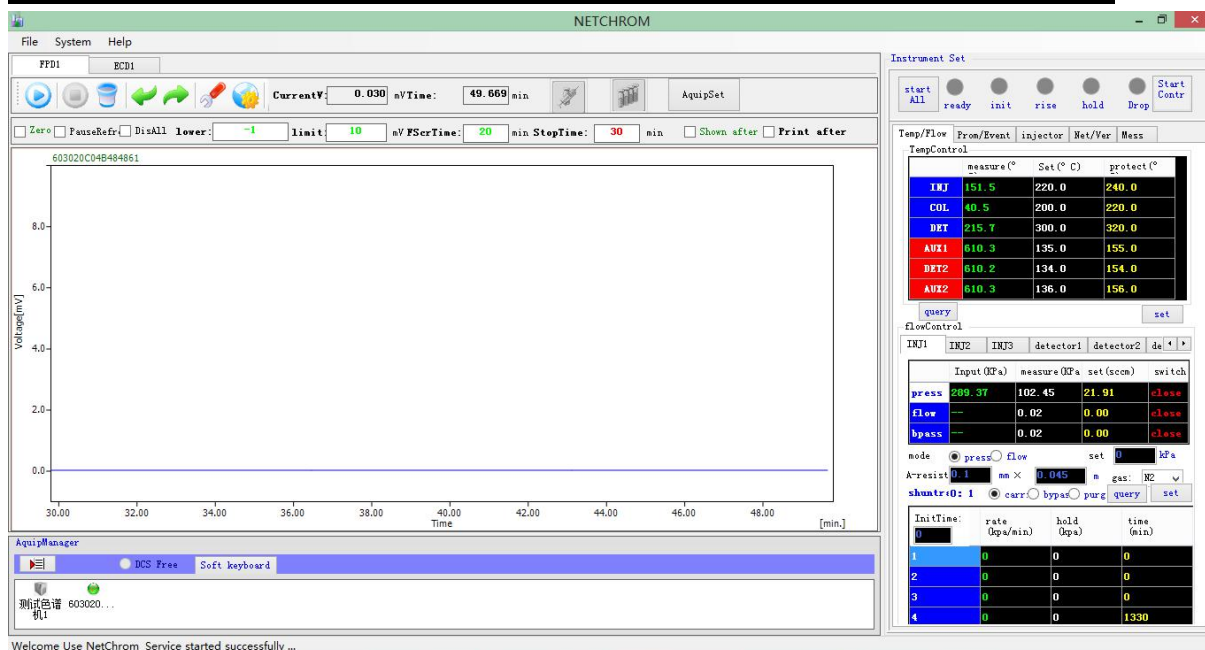
According to you need you can "add user", "delete user"; if you need to modify a user's information, click the user, then will popping the user's information, modify corresponding contents and then click "confirmation".



After modification, click "save all" button, then click "close the window".

4. 2 The main interface function of workstation

It will display the following interface when NetChrom gas chromatograph workstation software running:



The top of the screen is a drop-down menu; below the drop-down menu is detector operating parameters and screen display parameter; in the middle is the data display area of spectrum; the bottom is chromatograph status display area; the lower left corner shows whether the communication service connection state is successful; on the right is spectrum graph processing parameter and operating parameters of chromatograph. Click on the "instrument settings" button, "parameters" and "spectrum processing parameters" on the right of interface will switch.

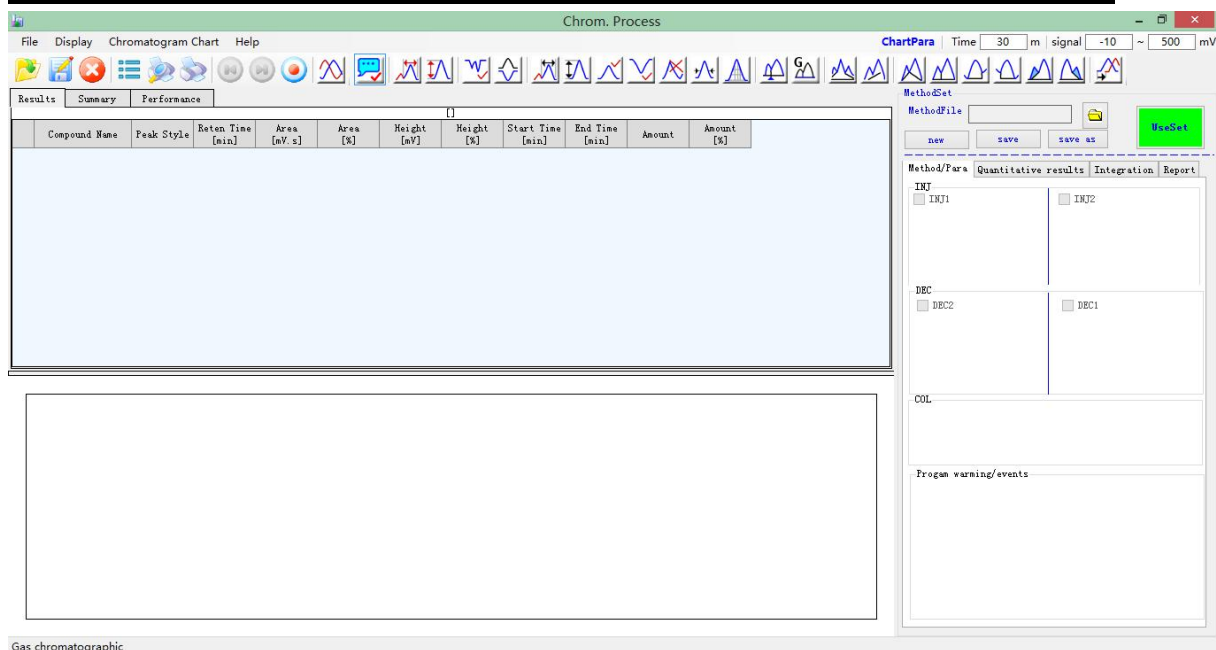
4. 3 The introduction of drop-down menu

4. 3. 1 File (F)

The file menu from top to bottom has: spectrum processing, editing component table, exit. Move the mouse, click the selected items can enter the next step.

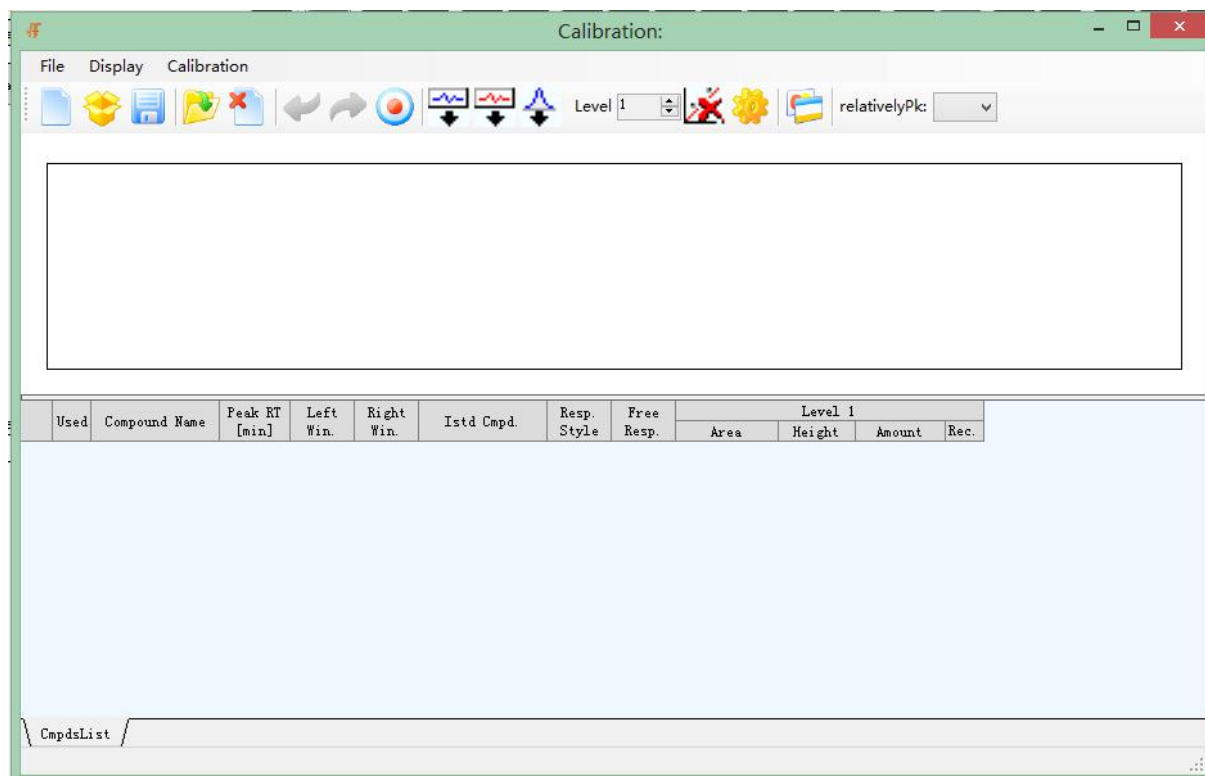
4. 3. 1. 1 Spectra processing.

"Spectra processing" is for the aftertreatment of spectral graph processing. Click "Spectra processing" and it will pop-up interface of the spectrum after treatment, namely: interface of spectrum off-line processing. Spectra processing see in Chapter 5.



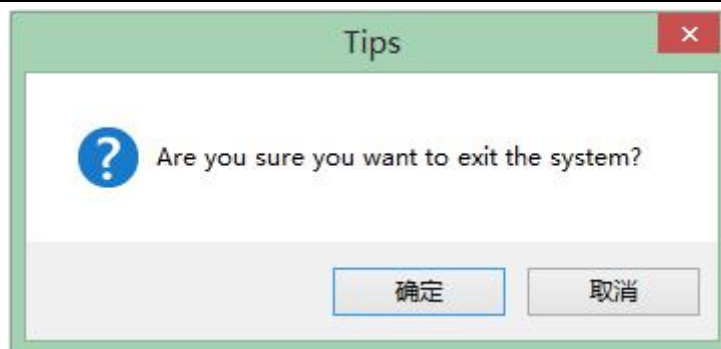
4. 3. 1. 2 The quantitative component editor

"Quantitative component editor" to perform spectrum after treatment. Click "Spectra processing" will pop-up interface of spectrum after treatment, namely: interface of spectrum off-line processing diagram. Spectra processing see in Chapter 5.



4. 3. 1. 3 Sign out

Click the "exit", the system will pop-up:



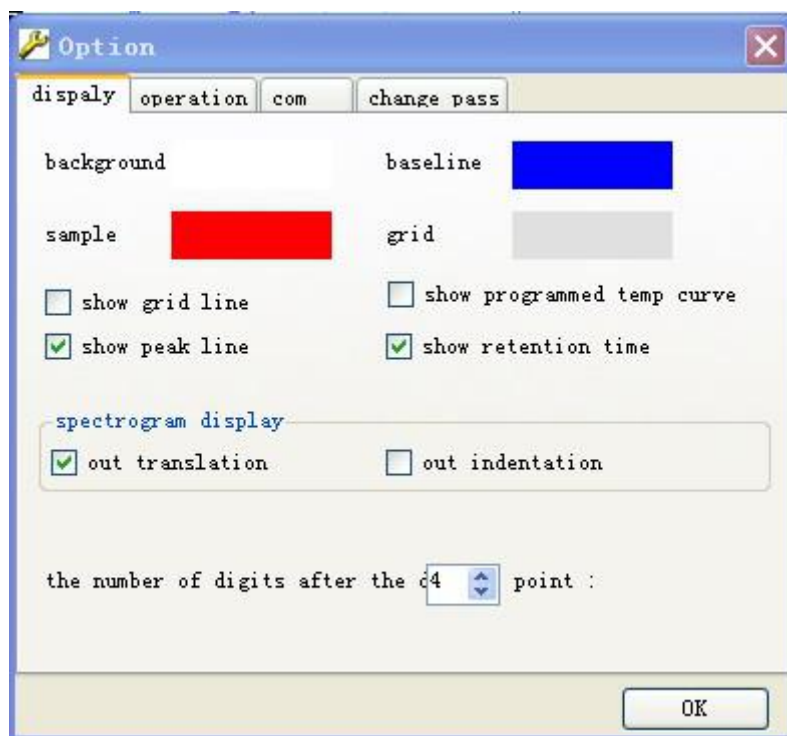
Click "OK", the workstation will be closed; click "Cancel" it won't exit.

4. 3. 2 System (S)

4. 3. 2. 1 Options

In the "options" you can configure the color the workstations spectra showed, the deposit contents of spectra and the user's password.

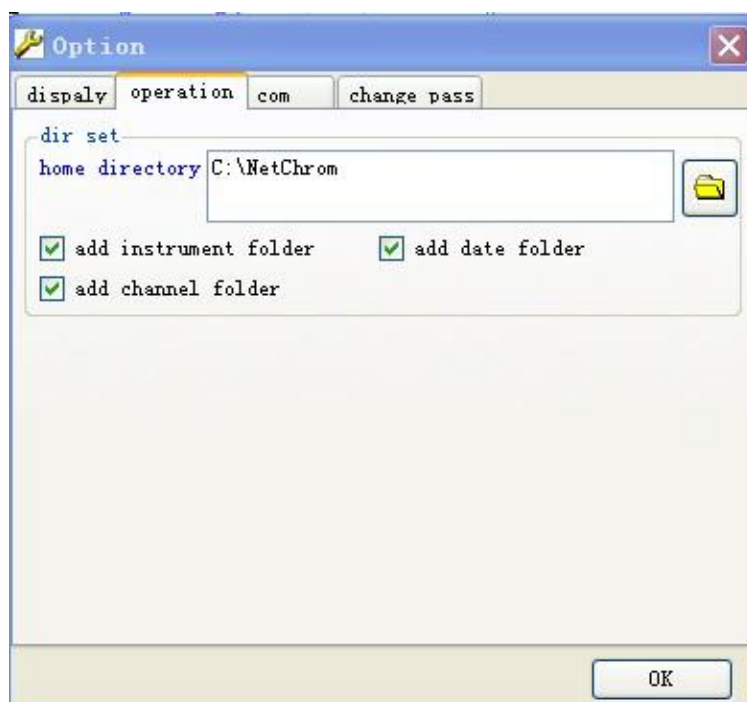
In the display tab control you can configurate color of spectrum background, color of baseline, color of sampling and color of gridding according to your preferences. Click the color system will pop-up color palette, select the color you like, click "OK";



At the same time, in the tab you can also set whether the grid lines, heating curve, peak separation line and retention time display or not and whether the range of beyond the time axis of spectrum displayed is "translation" or "indent".

Note: it is best not to use the same color on "baseline", "sample" and "background", it will make the spectrum cannot see.

You can set spectrum directory and naming of spectral file in operation tab.



Spectral file working directory is the directory that all the spectrogram file generated by instruments in this system to preserve in .

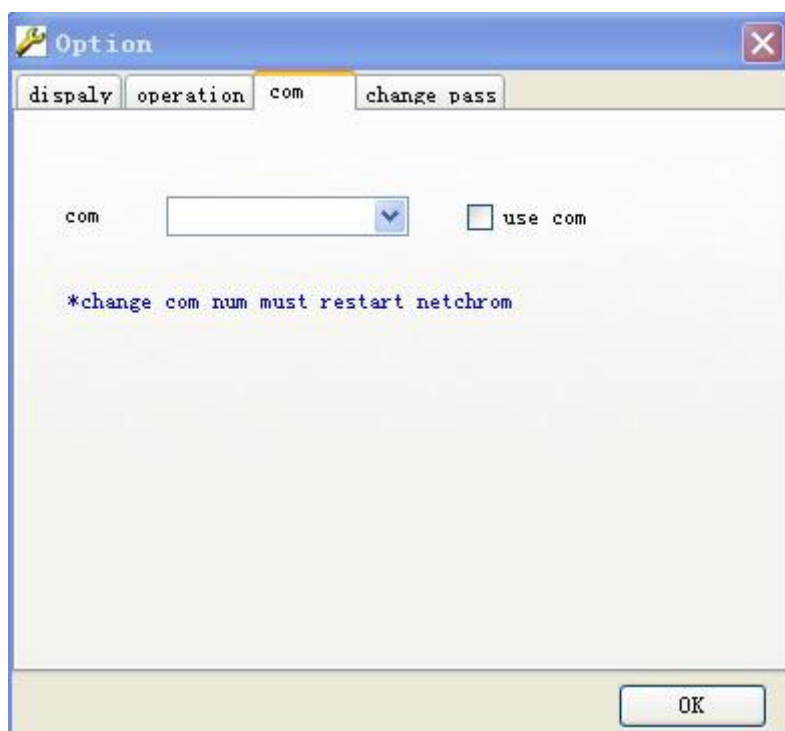
When setting the directory, please create a directory (for data safety, do not recommend users to create a folder in the C drive) and select the directory.

And can choose whether to let the system automatically generate instrument folder,date folder, channel folder according to need.

In the change password tab you can modify the login password.

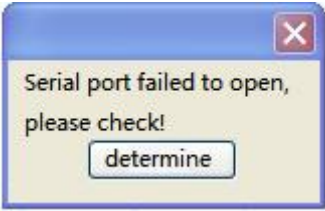


In the com.tab you can choose the com' s name and whether or not to use the com .
The com is designed to support the chromatograph which communicate through the RS232 interface .



Before choosing the serial port name , please confirm the serial port name which the chromatograph access the computer. The serial port of computer can be checked in the "device manager". If you select a nonexistent serial port or the serial port is already in use

by another program, when restart again "NetChrom", the system will pop up error prompt.
As shown below:



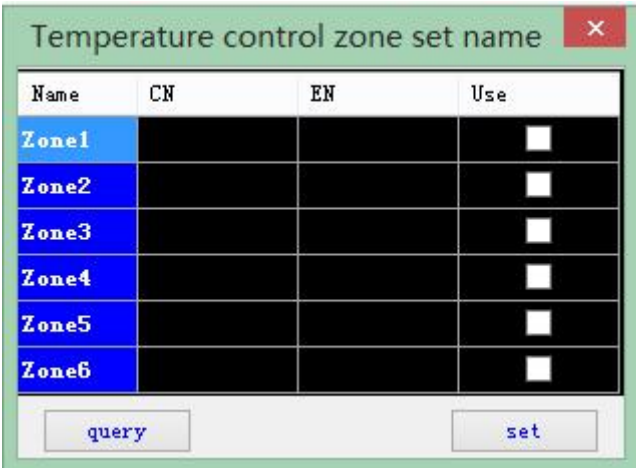
4. 3. 2. 2 Correction clock

Correction clock: the system provides remote revise chromatograph clock function (clock can also be modified directly through the keyboard). Click the drop-down menu in the "system", then click "correction clock" to complete the clock correction.

Note: this correction clock is based on the computer clock as standard. If the computer clock is not accurate, please correct the computer clock.

4. 3. 2. 3 Temperature control configuration

Click the menu, you can check and configurated six road temperature control’ s Chinese and English name and enable, as shown below:



Among them, Chinese and English name should be edited according to the actual situation.The picture above is the default name in factory. The altered name will be delivered to the corresponding position of chromatograph . Such as when the square frame below the “use” hasn’ t choice state, means the corresponding control area is closed, on the contrary, the state choice means corresponding control area is on.

4. 3. 2. 4 Time program



4. 3. 3 Help(F)

4. 3. 3. 1 Help

In the "help" drop-down menu, , click will be transferred to the electronic document of instructions. There are detailed instructions above ,you can scroll to view.

4. 3. 3. 2 About

In the "about" section will display the software ' s name, version number and other information.



4. 3. 3. 3 Check for updates

"Check New Version" is function that our workstation is designed to support remote upgrade the software update . After clicking it, the software will check whether there is newer software version that need to update and installed. If it has a newer version, then the system popping the following interface:



In the component name and version number bar will display the response prompt. At this point if you click on the "next", software upgrade; if you click "Cancel", then exit.

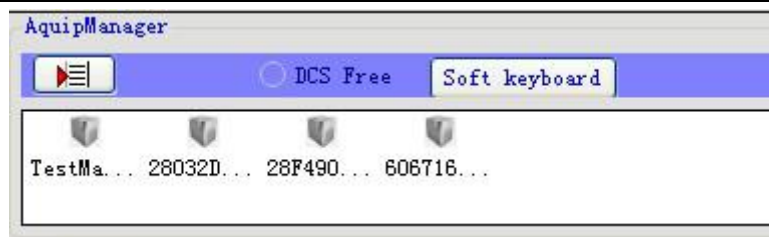
If your software is the latest version, the component name is empty, click "cancel".

Note:The realization of "check new version" function must rely on that your computer has access to the internet! Or you cannot upgrade.

Warning: when once confirmed the update operation (upgrade version, and click the "next step"), don't click "cancel the operation" in midway, or is likely to cause unknown key fault !

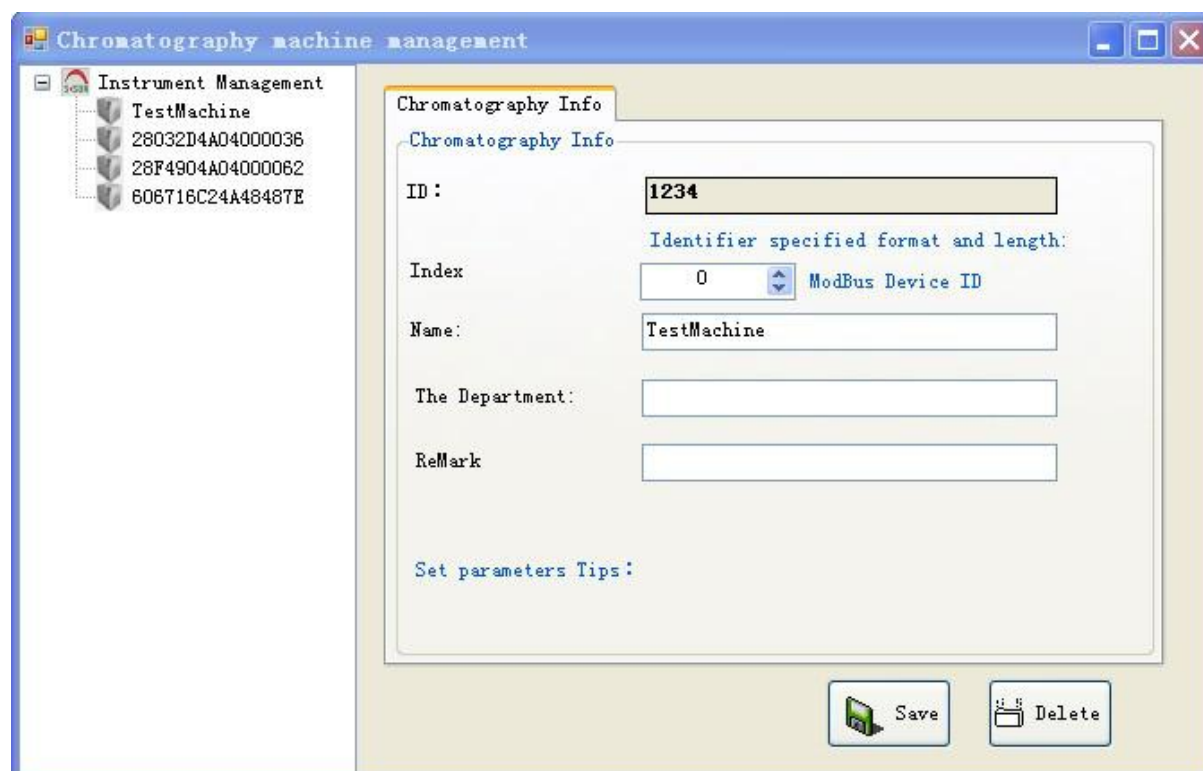
Warning: once the software upgrade error, resulting in NetChrom workstation was unable to run normally, at this point upgrading and repairing in the "start" - > "all programs" -- > "NetChrom" > "remote upgrade" . If the upgrade is not successful, please contact the manufacturer.

4. 4 Chromatograph management



As shown above, the interface shows the information of the chromatograph that the system has connected previously (or other analysis instruments). Gray icon indicates that this instrument has no connection, color icon indicates that this instrument has been connected, box with red hook means what the main interface shows is the spectrum curve and instrument information parameters. If you want to check spectrum curve and the parameters of other instruments, double-click corresponding icon.

As in an icon on the right point, and then point "Edit", then pop-up editing interface of chromatograph basic information:



4. 4. 1 Device identifier

"Device identifier (ID)" is ID code of chromatograph (the ID code can be in the "warranty card", can also directly read from the chromatograph, see: checking and setting of network parameters in Chapter 3.1.8). Can not modify!

4. 4. 2 Device name

In "name" blank fill out the name your love and easy to remember, such as: a workshop, quality inspection department 1, quality inspection department-FID, Central Laboratory of -TCD.

4. 4. 3 The equipment serial number (MODBUS/TCP communication ID code)

"Index" is the ID code MODBUS/TCP communication . When the system needs to access DCS or read analysis results through the MUDBUS , the ID code must be set, and can not be repeated.

4. 4. 4 Other information

In "the department" and "remark" blank fill out some relevant information of the instrument. The information just marking to use, won't affect the operation of the system, but also can not fill. Fill in the above information,press the "save" button.

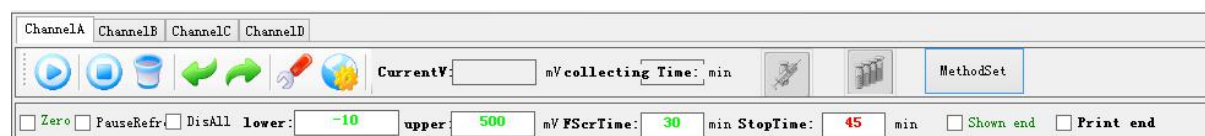
If you want to delete a column, click the "delete" button.

Note: "name" is a very important instrument parameters. It will be used in establishing instrument file directory and spectral graph file storage . That is to say, what name you fill (such as: quality inspection department 1) ,it will automatically set up what kind of file directory (1 folder of quality inspection department) and storing what spectral file (quality inspection department1_FID1_1st in December 2008_8 hours 58 minutes 58 seconds.SDA);

Note: Chromatograph which is On-line cannot be deleted.

4. 5 Checking and setting parameters spectral displayed

Checking and setting parameters spectral displayed can check and set directly in the interface. As shown below:



When the mouse pointer is put on these icon, below the mouse will automatically display the icon function, its function from left to right is: start collecting, stop collecting, give up collecting, last view, next view, baseline deduction and file name, detector set. Click on the icon to start the corresponding function.

4. 5. 1 Start analysis

Click  only start sampling spectrum diagram of this channel .

4. 5. 2 Stop analysis

Click  only stop spectrum diagram of this channel ,and performs spectra processing, calculate the results.

4. 5. 3 Give up analysis

Click  is to abandon the current sampling baseline or blank baseline.

4. 5. 4 The last view

Click  is to check the last baseline displayed.

4. 5. 5 The next view

Click  is to check the next baseline displayed.

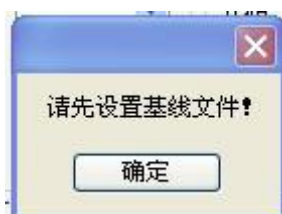
4. 5. 6 Baseline deduction

Baseline deduction refers that the user do temperature program, program boost (up-flow) first without injecting and get a blank baseline spectrogram file as reference of baseline subtraction afterwards, in order to reach that the workstation can automatically deducted baseline drift caused by program heating and program boost (upwelling) in sample analysis in the later .

If you want the workstation automatically deducted the baseline file stored after each running, please select the frame of "baseline file" . Appoint the file name ,and then tick before “baseline deduction ”. Chromatogram analysis will be carried out in the execution after deduction.



When not selected baseline deduction documents or the selected file is not in the correct format, the system will pop-up prompt frame of “unable to operate” if you tick before “baseline deduction” :



When the channel began sampling, the chosen baseline deduction file has been deleted, the system will prompt "baseline deduction file does not exist, please check!".

Note: the baseline file selection should include the complete and correct file path and file name.

4. 5. 7 File name

System file name also can be selected according to need . Among them,the machine name and time parameter is the system should adopt; whether the channel name, random number, automatic sampling and custom content is added to the name of spectrum file, is freely ticked by the users. As shown below:



Note: the channel name is chromatograph's channel name. Such as FID1, TCD2 etc..

Note: the custom channel is the content you fill in according to your own needs , the content will be referenced in the file name.

Note: the automatic sample is "which number of sample -- how many times of analysis" added for tagging spectral file when selecting automatic sampler for sampling analysis.

4. 5. 8 The detector set

Detector set is the operating parameters to set instrument detector (such as FID, TCD, FPD, ECD, NPD) .

Among them,click , the system will pop up the following query setting interface.



Set the appropriate parameters, click "OK"; if not, press the "cancel".

Note: the "polar" is to control whether the polarity of the signal that the channel output is adopted the contrary(to change the data symbol);

Note: "the instrument baseline deduction" is to control whether the output signal complete the baseline deduction firstly and then output;

Note: before selecting "deduction", you must firstly run empty baseline according to the actual requirements, and record it in the chromatograph;

Note: different detectors, the setting interfaces that pop-up are different.

4. 5. 9 Baseline data

In each channel of each instrument there are baseline numerical value display window of the channel - the current voltage and sampling time.

The current voltage is detector's actual output signal value (non-zero state) or output signal value after the zero setting. The unit is mV (MV).

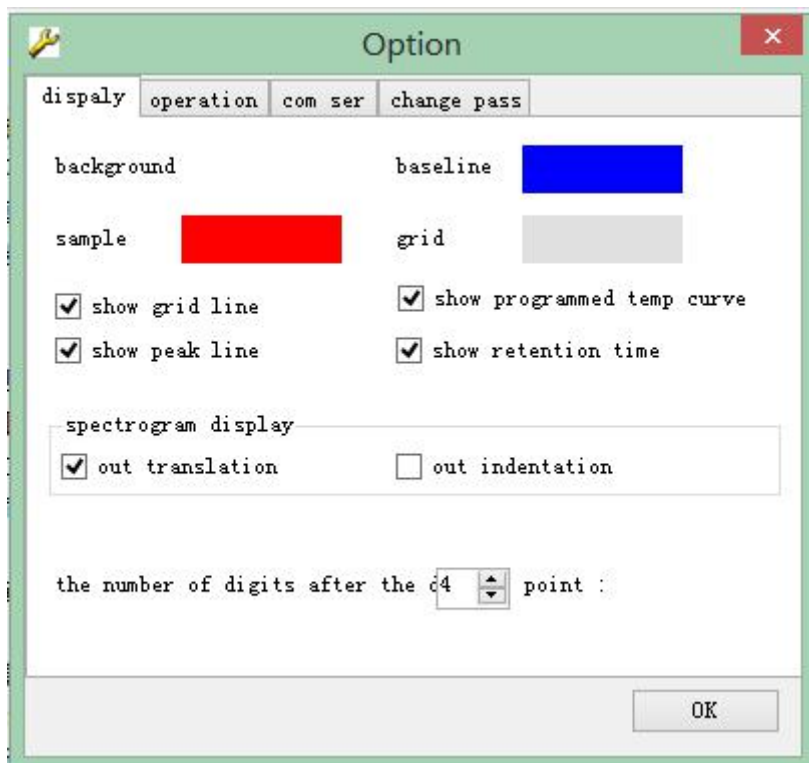
The acquisition time is timing of the baseline. The unit is min (minutes). When giving up baseline or starting sampling, the timing will be cleared.

Note: the current voltage and the acquisition time is an important manifestation of whether the instrument and the current channel is working normally. When the device is normal, the current voltage will bounce up and down in millivolt level, the acquisition time will also be normal. If the acquisition time stop, it means the instrument or the channel is not working properly.

4. 5. 10 Display spectrogram

In the system we have designed display lower limit, display upper limit and full screen time. Modify these parameters can make the baseline display in appropriate screen, and convenient for observation.

At the same time in the "system" -> "display" you can set whether to "translate" or "indent" if the spectrum beyond the scope of the time axis is. Tick in corresponding choice box according to your need.



In order to make it convenient for users to enlarge the spectrum partly, the system has been designed the spectrum partly enlarging function. Press the left key of the mouse in the pre-magnifying area, dragging to draw a rectangular frame and then left the left key, then you can enlarge the display region; Double-click the mouse in the spectra, it will restore to the original display size.

In the condition of spectral amplification, in order not to make the spectrum moving and obstruct observation, you can tick on **pausing refresh**. After observing, will tick off.

Note: the upper limit should be larger than the display shows!

4. 5. 11 Stop time

Stop time means after sampling the system will stop the analysis time automatically. This time is set by the user according to the actual need.

Note: **stop time** can not be set to 0, it should be integer ≥ 1 .

4. 5. 12 The display after ending

The **show end** means after stopping analysis manually or reaching the stop time whether the analysis result pop-up.

Note: when not selected "**show end**", the results will still be kept in the spectrum of the working directory you specified, but does not display.

4. 5. 13 printing after the end

Print end means after stopping analysis manually or reaching the stop time whether analysis result will be immediately printed out.

Note: when selected print end, you must set up the correct configuration of printer , or the operating system will report errors.

4. 5. 14 baseline zero setting

When ☐ Zero tick to activate,will set the baseline data of the channel to zero.when the channel don't need to set zero,please tick to cancel activate.

4. 5. 15 pause refreshing

When ☐ Print end tick to activate,the baseline in this channel will pause refreshing,when magnify the baseline,pause the retroposition of baseline,in order to observe the details of the baseline.

4. 5. 16 multichannel spectrogram comparison

In the first channel display interface in every chromatograph,it will has “display all ” option.when tick to activate “display all ”,will display baseline of multichannel in this chromatograph by the first channel baseline display interface,in order to contrast related chromatograph peaks.

Note: the Y axis of each channel (voltage) scale is setted separately, the X axis (time) scale is time scale for the first passage .

4. 5. 17 Instrument setting and switch of method setting

The right of the system's display window is the shared interface of instrument management and method set . When press “instrument management” or “method sett” ,the interface will switch, thus completing the related settings. See: the 4.5 and 4.6 chapters.

4. 6 The instrument set

4. 6. 1 The display of the instrument

When the system is switched to the instrument settings interface,on right of the top of the screen will display temperature of instrument :



Five lights respectively are preparation, initial temperature, heating, maintain,cooling . The meaning is as follows:

Ready : when the actual temperature of each temperature zone chromatograph has reached the set temperature, the lamp is lit up;

Init : when the temperature program was executed, the instrument get into the state of initial temperature maintaining , the lamp is lit up;

Rise : when the temperature program was executed, instrument get into the heating state, the lamp is lit up;

Hold : when the temperature program was executed, instrument get into the state of heating temperature maintaining , the lamp is lit up;

Cooling : when the temperature program was executed, instrument get into the cooling state, the lamp is lit up.

4. 6. 2 Temperature / flow setting

When choosing "temperature / flow" display card, the interface will display the following interface:

Temp/Flow	From/Event	injector	Net/Ver	Mess
TempControl				
	measure(°)	Set(° C)	protect(°)	
IHJ	151.5	220.0	240.0	
COL	40.5	200.0	220.0	
DET	215.7	300.0	320.0	
AUX1	610.3	135.0	155.0	
DET2	610.2	134.0	154.0	
AUX2	610.3	136.0	156.0	
query		set		

These respectively are the measured temperature, the setted temperature control and temperature protection of the six temperature controlling areas .

When you need to set up, click on the corresponding window, input number, click **set**.

Note: when the name of a controlled area is red, it means that the channel of temperature controlling is in the closed state.

Note: The protecting temperature is the setted temperature automatically adds 20 °C. The system will automatically change according to the set temperature. But the highest using temperature of the instrument is 450 °C, so the highest protecting temperature is 450 °C.

In addition,the protecting temperature is the highest temperature that the **temperature programming setting** adds 20 °C.

Note: the name of the first line of temperature control area appears as red means that the road is closed, if it is blue means the road is open.The open / closed state of this circuit can be controlled through the"enable" of the "control configuration"of the "system" in the drop-down menu . You can refer to 4.2.2.3.

Note: if a unit of temperature control input doesn't connect to a temperature measuring device (PT100), the display column of measured temperature's temperature is not the real temperature.

4. 6. 2 The gas flow setting

Click the "temperature / flow" page, the running parameters of flow is in the middle of the right of the interface of workstation, as shown below:

flowControl

INJ1 INJ2 INJ3 detector1 detector2 de

	Input (kPa)	measure (kPa)	set (sccm)	switch
press	289.37	102.45	21.91	close
flow	---	0.02	0.00	close
bpass	---	0.02	0.00	close

mode ☒ press ☐ flow set 0 kPa

A-resist 0.1 mm × 0.045 m gas: N2

shunt: 0: 1 ☒ carr ☐ bypas ☐ purg query set

InitTime:	rate (kpa/min)	hold (kpa)	time (min)
0			
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	1330

Click each icon shown in the picture above below the "flow control", "INJ1" will show the running condition of gas path, click corresponding number of setting area, modify digital, and then click "Set" button. The measured values are actual values the instrument measured, can not be changed.

Because that the chromatograph can support a variety of gas path control mode (mechanical valve + pointer type pressure meter, mechanical valve + electronic pressure and flow measurement mode, EFC mode), only when in the actual configuration of electronic pressure, flow measurement module or EFC module, the measured values and setted values in the region have meaning.

Each EFC module all input "input pressure", "output pressure" and "output flow". Parallel work under pressure or flow mode.

In order to make sure module running correctly, relevant parameters must be correct. Such as: the inner diameter and length of the column (or resistance) and species of working gas. The inner diameter and length of gas resistance are setted according to the reality in factory, can not be altered arbitrarily.

When you need to set up, click on the corresponding setting window, input number, click **set**.

Note: measured value and set value in this area, is valid only after the instrument is loaded corresponding EFC module.

Note: after the equipment loaded related EFC module, whether various gases is opened or closed is according to the actual need of the instrument automatically. For example:

when starting temperature control, system will first open the carrier gas flow, the working gas of detector (such as FID detector) is open automatically after the measured temperature is over 120 °C. When close the temperature control, selects the opposite shutdown sequence.

Note: the instrument is loaded EFC module, in the boot and column furnace's temperature is higher than 50 °C, no matter the state is control temperature or not, carrier gas will be opened!

4. 6. 3 Programmed temperature and external events setting

Click the "prom / event" page, will display the temperature programmed and external events, the setting interface.

Parameters of **program control** is in the upper part of it, the parameters of **event control** is in the lower part of it, as shown below:

The screenshot displays the 'Prom/Event' control interface. At the top, there are tabs: 'Temp/Flow', 'Prom/Event' (selected), 'injector', 'Net/Ver', and 'Mess'. Below the tabs, the 'Program control' section features an 'InitTime' input field set to '0'. It contains a table with 8 rows and 4 columns: 'Index', 'rate', 'hold', and 'time'. All values in the table are '000.0'. Below the table are 'query' and 'set' buttons. The 'eventControl' section below it contains a table with 8 rows and 5 columns: 'Index', 'event1 [min]', 'event2 [min]', 'event3 [min]', and 'event4 [min]'. All values in this table are '0.00'. Navigation arrows are visible at the bottom of the eventControl table.

Index	rate	hold	time
1	000.0	000.0	000.0
2	000.0	000.0	000.0
3	000.0	000.0	000.0
4	000.0	000.0	000.0
5	000.0	000.0	000.0
6	000.0	000.0	000.0
7	000.0	000.0	000.0
8	000.0	000.0	000.0

Index	event1 [min]	event2 [min]	event3 [min]	event4 [min]
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00

Temperature programmed means the process that during sample analysis, the temperature of column box rising program according to the setted values.

Click numbers in corresponding setting area ,modify the digital, click "Settings" button.

Note: The temperature program setting temperature should be higher than the column oven's setting temperature, the next order temperature should be higher than the last order, the first heating rate is 0, temperature program is invalid. The temperature program curve in the spectrum display area is displayed automatically (when selected **identity range rise curve**, see: 4.2.2.1).

In order to make the instrument control some additional parts (such as: sampling valve), complete some specific functions (such as: sampling), instrument design 4 independent external events to control the output. So in instrument control you need to set 4 parameters of external events. 4 independent external events to control the output in the main control board of the instrument. Generally corresponding equipment is installed by the manufacturer in factory, and set related time parameters according to the actual need of analysis. The unit is minutes.

Click setting numbers in corresponding area ,modify the digital, click **set** button.

Note: programmed temperature and external events is initiated by "analysis of the trigger".

4. 6. 4 Injector setting

"injector" refers to the liquid injector equipped with a instrument (such as: AOC-20i).

Click the "injector" page, will switch to the "injector" checking and settings interface.

The following diagram:

The interface is divided into several sections:

- Temp/Flow Prom/Event injector Net/Ver Mess**: Navigation tabs at the top.
- status**: Shows 'Sampler' status as 'OffLi' (Offline) and 'free'. It includes a 'bottle/need' field.
- Application settings**: A table for configuring sampling parameters.

Index	Version	inL [uL]	Times/bot	apart [min]
- basic setting**: Contains various configuration options:
 - ☐ install
 - model: AOC-20i
 - injector: 0
 - Injection of sol: 0
 - Injection of sa: 0
 - After sample in: 0
 - Viscosity delay: 99.9 S
 - sampling holed: 99.9 S
 - Start delay: 99.9
 - h: sampling metho
 - Injection speed: low
 - needle speed: low
- queryType setType query set**: Action buttons for the basic settings.
- AutoSampler**:
 - SamplerTimes: 0
 - timeinterval: 0 min
 - BackLight Ti: 99 S
 - query set: Buttons for AutoSampler settings.

On the top of the interface is the current state of autosampler, such as "online", "offline", "free", "sampling" etc.. The bottle number means when the actual sampling, automatic sampler has been executed to which number of samples and which time the samples have been analyzed.

In the middle of interface is batch program setting of the autosampler settings. As from No.2 to No.3 samples, each time sampling 1 microliters, each sample bottle repeated 3 times to do analysis, each time interval of analysis is 10 minutes.

The basic setup interface is the basic parameters of the autosampler.

Below the interface is the parameter settings that to control automatical sampling and analysis of instrument. The setting parameters of the batch is different from the batch of liquid autosampler. Batch settings of liquid autosampler is autosampler to control liquid automatical sampling, and **sampling times** and **time interval** in automatic sampling is to control instrument get into automatic sample status and do sample analysis according to a set value, such as the control of external events, temperature programmed automatically starting.

Note:when the system selects the injector installation, the instrument will proceed judgment off pull needle signal; has not detected pull needle signal, instrument will sent order to start sampling.

Note: when not equipped with autosampler,the parameters has no meaning.

Note: the basic parameters of the autosampler is determined by the type of sampler equipped .The parameters setted by different types of autosampler has some difference , please carefully read the instructions of autosampler!

Warning: the automatic injector is a precision instrument, , please strictly follow the instructions when installing and using the autosampler, so as to avoid damage!

4. 6. 5 Network parameter setting

Click "net / version" page, will display the network parameters of the on-line chromatography and the version information of hardware .

Instrument network information is shown below:

NetChromNetPara	
IP:	127.0.0.1
subnetmask:	127.0.0.1
gateway:	127.0.0.1

NetChromNetPara	
LheadIP:	127.0.0.1
CoOIP:	127.0.0.1
higherIP:	127.0.0.1

Flow save query set

Click setting numbers in corresponding area ,modify the digital, click "Set" button.

Note: Please consult the setting method of network parameter and instruction: "checking and setting network parameters in 3.1.8" and "computer network settings in 2.4.1 ".

Note:After modify the network parameters of chromatograph, will disrupt the link between chromatograph and workstation,and trying to initialize network parameters of the chromatograph itself and link to the workstation.

4. 6. 6 Version information query

Click "net / version" page, you can query to the chromatograph version information.

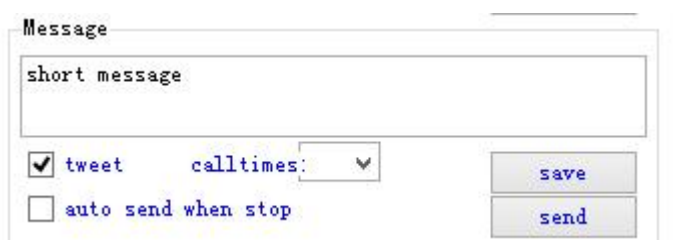
This information can only be checked, cannot be modified. As shown below:



Will display version information of every control circuit instrument in the interface. This information is read-only information, can not be modified.

4. 6. 7 Editing and sending short message.

To meet the application of some special occasions(such as:the prompt after the analysis, the prompt and alarm when results of analysis exceed standard etc.), system is designed a short message transmission function, can deliver prompt text you setted to the screen of chromatograph and make singing tips setted by you.



Edit prompt content you need in the "message" text edit box, tick the **tweet** (if needed), select the tweeting times, click the **Save** button to save. When you need transmitting, click the **Send** button to send the short message. If you need to send the message after the end of each analysis , select **auto send when stop** .

Note: when the chromatograph workstation receives short message sent by the workstation, will be displayed on the display screen,at this time press any key to clear away the short message.

4. 6. 8 Start and end temperature control

When the system is switched to the instrument settings interface, on the top right of the screen will display temperature of instrument :



Click the "start temp" that turn on the chromatograph and start temperature control and work of EFC module , at the same time icon will automatically become "ending temp".

Click “end temp” is to close the temperature control of the chromatograph, the icon will automatically become “start temp”.

4. 6. 9 Start and end analysis

Click “start analysis” to turn on chromatograph and start sampling. Then the baseline of workstation become the color selected after sampling (the default color is yellow), at the same time the icon turn into “end analysis”, and the icon of begin sampling  turn from green to gray , the stop sampling icon  turn from grey to red .

Click “end sampling” and the chromatograph stop sampling, at this time the baseline of the workstation become the selected colors such as green (the default color is green), at the same time icon turn to “start analysis”, sampling began icons turn from grey to green, stop sampling icon turn from red to grey.

In the case that the "ready" lamp is lit, click start analysis icon on workstation or icon

 or press the start button on the keyboard of the instrument operation, chromatograph start the program temperature control, at the same time start sampling and analysis;

Click "stop sampling" icon, "ending" icon or press the “ending” key on a keyboard of the instrument operation keyboard, chromatograph will end the sampling analysis, and start to cooling it to the setted temperature, workstation displays the state of running baseline.

Note: click “start analysis” is to start all analysis in each channels of the instrument.

Note: click “ending analysis” to end all the analysis in each channels of instrument.

Note: click icon  to start the analysis in the channel.

Note: click icon  to end the analysis in the channel.

4. 7 Establishment of the method

Method means the parameters set that make effective and reasonable treatment to baseline data sent by chromatograph and make quantitative calculation according to the peaks of each components.

Any time acquisition and (or) to process the data file again will use method. It contains the following contents: instrument operating parameters, data acquisition (running time, sampling rate), integral, correction and peak information, reports, and optional features (such as export data and user program). Each method can collect multiple independent channels from a single chromatographic data. Each channel has its own independent method file. Although the method file is independent file, but information included in the method will be stored in the original data file when collecting information. So, you can copy the original method (even then modify method file).

4. 7. 1 The basic concept

In order to understand the processing of spectrum, it is necessary to understand the concept of spectrum processing, chromatographic peak identifying and quantitative calculation first.

Spectrum processing's main task is to detect the peaks in spectrum graph correctly, and establish appropriate baseline for these peaks, and establish the appropriate parting line for overlapping peaks. The program will perform real-time process the spectrum in the process of collecting spectrum, but you also can reprocess the spectrum after the acquisition of spectrum and adjust the "spectrum processing parameters" or make "spectrum processing scheme", until you satisfied. After complete this step, the program acquire all the information of peak position, peak area and height detected in spectrum.

Chromatographic peak identifying is to detect chromatographic peak based on peak retention time. When the retention time and definition of a chromatographic peak is matched, the chromatographic peak is considered as a compound.

Quantitative calculation is to turn the chromatographic peak's area or high into the concentration (or amount) of compound. There are different calibration methods (external standard method ESTD, the internal standard method ISTD, normalization method Norm%) can turn chromatographic peak response (area or height) into density or relative density.

Here intensively introduces the quantitative method

4. 7. 1. 1 Correction factor

The correction factor is the proportional constant of quantitative calculation formula, its physical meaning is the component to be measured of unit area. Expressed the following equation

$$m_i = f_i \cdot A_i$$

m_i — i the quantity of components; f_i - i the correction factor of component; A_i - i peak area of components

The basis of quantitative analysis is that the quantity of the component to be measured is direct proportion to response signal, but due to difference of physical and chemical properties, even signal generated in the same detector are different, directly use the response signal to quantify will lead to big error inevitably. So we introduce correction factor.

4. 7. 1. 2 Normalization method

Set the sum of all component in the samples of 100%. The quantitative method of calculate percentage composition of one component:

Among them:

$$X_i \% = \frac{f_i A_i}{\sum (f_i A_i)} \times 100$$

X_i - percentage composition of sample component i

f_i - the correction factor of components i

A_i - area or height of peak of the component i

Note: if alter to peak high quantify, peak height will instead of peak area in formula .

4. 7. 1. 3 Normalization method correction.

This is also a kind of quantitative methods calculating percent concentration , and what different from normalization method is : this method need to set all correction factors needed to participate calculation component in the quantitative composition table set. If all the correction factors in component are equal, this method actually converted into normalization method normalization method, but this normalization method can choose peak that need to participate in calculation , but not as real normalization method that all detected peaks are involved in the calculation.

$$\text{Sample concentration} = (K * A + B) / \sum(K_i * A_i + B_i) * SF$$

Among them:

K is the slope of the calibration curve

B is the intercept of the calibration curve

A peak area

SF proportional factor, input in the sample volume.

The calibration curve consider the abscissa as standard peak area, the ordinate as the sample concentration ,drawing a picture and get the result.

Note: if alter to peak high quantitative, peak height will instead of peak area in formula .

4. 7. 1. 4 The external standard method

Under the same analysis conditions ,compare chromatographic peak area and peak height between the standard material and sample.

That is to use the known standard substance to compose different standard samples , measuring various concentrations of peak height or area, draw relation curve of corresponding signals and the percent content; then measure peak area or height of samples, calculate the corresponding percentage on the calibration curve. Requirements: the amount of sample, chromatographic analysis condition strictly invariant;

$$\text{The sample concentration} = ((K * \text{peak area} + B) / \text{sample volume}) * 100$$

Among them:

K is the slope of the calibration curve

B is the intercept of the calibration curve

The calibration curve consider the abscissa as standard peak area, the ordinate as standard sample concentration * sample amount of standard samples /100 ,drawing a picture and get the result.

Note: 1. if alter to peak high quantitative, peak height will instead of peak area in formula .

2 if the user needn't to use the sample parameters in the formula, please set to 100.

(because the numerator and denominator can be divide out)

4. 7. 1. 5 Internal standard method

Select the appropriate material to be the reference material of component to be measured , applied to the sample quantificationally, basis and reference, than quantitatively analyze according to the ratio of response value of components to be tested to reference component tested and the quantity of reference component added.

Requirements of internal standard substance:

- ① Does not exist in the sample and is convenient to get;
- ② Do not react with the sample or solid
- ③ Can miscible with the sample mutually;
- ④ Can be separated well with components to be measured;
- ⑤ The retention time is close;
- ⑥ The quantity of internal standard added is close to the measured components.

The basic formula: $m_i = f_i \cdot A_i$ component to be measured
 $m_s = f_s \cdot A_s$ internal standard components

So we get:
$$m_i = \frac{f_i}{f_s} \cdot \frac{A_i}{A_s} \cdot m_s = f_{is} \cdot \frac{A_i}{A_s} \cdot m_s \quad (1)$$

$$f_{is} = \frac{f_i}{f_s} = \frac{m_i \cdot A_s}{m_s \cdot A_i} \quad (2)$$

First, use the standard sample of preparation of analyte and internal standard substance to compound standard solution ,acquire the calibration factor ratio, namely the relative correction factor:

Then, added known amount of internal standard substance in the samples , get the response value of each other, using the constant of relative correction factor ,calculate the result by formula (1) .

$f_{is} = f_i / f_s$ - the ratio of correction factor of internal standard and the measured component ;

m_i - content of tested component i ; m_s - quantity of internal standard added

A_s - the peak area of the internal standard ;

A_i - the peak area of component I ;

Can also use the following formula to express:

The sample concentration = $(K \cdot (\text{peak area} / \text{internal standard peak area}) + B) \cdot (\text{internal scalar} / \text{sample volume}) \cdot 100$

Among them:

K is the slope of the calibration curve

B is the intercept of the calibration curve

In the calibration curve:

{the abscissa is: the standard sample peak area / standard sample internal peak area}

{the ordinate is: standard sample content / sample standard content}

Drawing a picture and get the result

Note: 1. if altered to peak high quantitate, then peak height will instead of peak area in formula.

2. if the user does not need to use the sample parameters in formula , please set to 100. (because the numerator and denominator can be divide out)

4. 7. 1. 6 Index method

Because the FPD detector's response to S is because of exponential , so for this kind of detector,you should use index method to calculate sample concentration:

The concentration of sample =exp (K*lnA + B)

Among them:

K is the slope of the calibration curve

B is the intercept of the calibration curve

A is the sample peak area

The calibration curve consider the abscissa as: ln (standard peak area) ,the ordinate as: ln (standard sample concentration) .Drawing a picture and get the result.

Note:if altered to peak high quantitate, then peak height will instead of peak area in formula.

4. 7. 1. 7 Single level calibration

It refers to create a first-level calibration curve by the use of standard sample of a concentration (level) in operation. The calibration curve for each peak is a line passing through the origin and a data point , the data points represent the area /height of standard sample spectrum peak .

This is the most common correcting way to be used in the daily analysis work.

You should preparat standard sample of a concentration before using this method, calculate the correction factor of each components to be measured and put the result in the quantitative composition table,and then conversely calculate the concentration of the the samples to be measured in each component by using the correction factor in quantitative component table.

Fill the content of each peak in the concentration level 1 peak in column table. And "internal standard (ISTD.ID)" must not be entered the internal standard peak ID, otherwise the workstation will consider it is doing internal calibration. In addition, zero must be selected, because the monopole correction is actually a single point of concentration fit the zero point. If you do not select zero,it is just an isolated point, unable to get a straight line.

For the single point correction method with internal standard, the quantitative formula is as follows:

$$C_i = \frac{W_{\text{内标}} f_i A_i}{A_{\text{内标}}}$$

Among them:

C_i : Concentration of the sample to be measured of component I

A_i : The peak area (or peak height) of the sample to be measured of components I)

f_i : The correction factor of component I

$W_{\text{内标}}$: Amount of additive(weight or volume) of samples to be measured

$A_{\text{内标}}$: Peak area(or peak height) of internal standards in samples to be measured

If there is no internal standard, calculation formula of the above is simplified as:

Note: if there is internal standard, before calculating the correction factor you should fill in the internal standard's addition amount (weight or volume) in the frame of "concentration" in "quantitative component table".

4. 7. 1. 8 Multilevel correction

The same as the single level calibration, this also is a kind of quantitative method of calculating absolute concentration of sample to be measured, the concentration unit calculated is the same as the standard sample .

To use this method you need to prepare a series of (not one)concentration standard sample first ,calculate and get working curve of each components by this series of different concentrations of standard sample (i.e. Curve of relation between component peak area or height and component concentration), then according to the measured peak area(or height) of sample to be measured ,conversely calculate the concentration of the sample to be measured by working curve . So when you use this method to calculate the concentration of the component in the sample ,you must obtain all components of the working curve in advance , at the same time, must fill in the quantitative composition table to indicate that which peak need to quote working curve to calculate concentration in the spectrum , the program will automatically quote working curve for them according to the order .

In using this method,if you have specified internal standard, then the peak area (or height) of the component mentioned above is changed to the ratio of the peak area (or height) of the component and the peak area (or height) of internal standard .

Based on single level correction, can fill concentration or other data from level.2 to the last level in the calibration table of peak / group, storage the method, find out the concentration data of level.2, click analysis / single-stage correction below the analyze menu , correction level choose 2, but don't choose to clear all calibration, click Start to

start calibration, and then find out data of level 3 , repeat these steps, pay attention that the correction level is corresponding of data.

Through the menu popup when click the right of calibration curve , we can conveniently set many parameters, such as:

- ☆ whether fitting curve forced to crossing zero.
- ☆ check or change the fitting type, such as linear, square etc..
- ☆ change definition of response factor ,to be content / area or area / content.
- ☆ to change the fitting results by proportional. For example, log (the number) /log (response value) is the common fitting way of FPD detector.

4. 7. 1. 9 Quantitative basis

According to the need, use peak area, peak height, peak area of the square root of square root or peak height as the basis of quantitative calculated .

As to the sulfide,when select quantitative method of single point correction , can choose the "peak area of square root" or "square root calculation of peak height" to calculate. Among them,"peak area square root" is actually the sum of square root of height of the section composed the peak .

4. 7. 1. 10 Working curve calculation

Using multi-point correction method you need to calculate working curve of components, namely get the relation of concentration and peak area (or height) of component to be measured. To calculate the working curve, we must first prepare a series of different concentration of standard samples, and then severally sampling, measure peak area (or height) of components to be measured at different concentration. Each peak area and peak height data measured of the component and known concentration of each component should "archive" in "quantitative results table" . Attention, an important function of "file" in the software is to storage the data calculation work curve. When all the results concentrations of standard sample are kept in the archives, you can appoint order of working curve to be calculated in the " the quantitative method table", such as the first order (linear), the second order(parabola), the third order or higher order curves, and click the " calculation" button of working curve combination frame in the "quantitative method table" , program that regression curve of each component.

For some substances (such as sulfide)'s detection, concentration is not in proportional to the "peak" but to the "square root of peak height " . When do this work curve, in this software, you only need to alter the "quantitative method table" in the "quantitative basis" from the conventional "peak" to "square root of peak height " and then do the work curve , does not need to specially make working curve that transverse and longitudinal both are logarithmic (that is, we usually say "index method" quantitative $Y=kX^a$, equivalent to $\lg Y=b+a*\lg X$). In addition, if you choose to do "logarithmic" working curve, then regardless of the order of working curve choice is how much and whether

forced to zero, it only can be first power curve in the form of $\lg Y = b + a \cdot \lg X$ that does not enforce to cross zero.

Obtained by several parallel results can be directly filed, because these files is in the same concentration (but peak area or height have some differences), so before these file data is removed for calculating working curve, the program will automatically compose these archives into a average archive internally and then participate in the calculation of working.

If only the "save" a archive of concentration and peak area or height relationship data to calculate curve, the program will automatically turn the working curve to a line through the zero. Zero means that when the concentration of components is 0, the peak area (or height) is also 0, at this time, multi-point correction method is actually the single point correction method, the slope of the line is equal to the single point correction method of correction factor.

The longitudinal axis of the working curve generally is the peak area (or peak height), but if specify internal standard substance in the quantitative composition table when calculating working curve, the vertical axis of the working curve will change to the ratio of peak area (or peak height) of the current component and the internal standard substance and then multiply by the internal scalar. The internal scalar should be filled in "quantitative component table" belongs to the concentration of internal standard substance.

In each component defined in "quantitative composition table", after date when using "multi-point correction method" to calculate concentration, each component take a working curve in turn, has how many working curve and you can calculate how many components. If there's only one component in the standard sample, and many similar components in sample need the working curves of it to quantify, you can copy (with the right mouse button) the only one row of content to multiple rows in "quantitative results table" of samples to be measured later and then "archive", to calculate the number of working curve for the same. So, after date, you will have sufficient number of working curve can be used when processing "multi-point correction method" to calculate a number of similar components in sample to be measured (such as all kinds of sulfide).

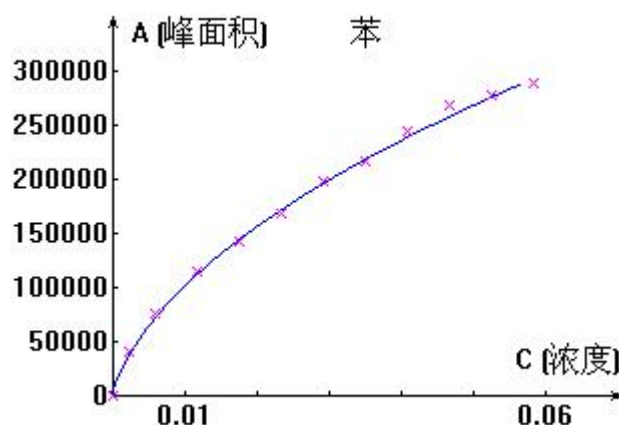
Because the "archive" is public to all opening spectrum windows, so the archive "quantitative results table" do not have to come from the same spectrum window. Each open spectrum window can also remove all the data from the "file", in its own window calculating and get the work curve.

Here the calculated working curve will saved with other tabular data along with the spectral file, so if you open the file again, the working curve calculated previously still exist. Working curve can also be saved to a template file that specially record content of

form by using "saving template" in menu of "file", if the stored template file named "default template.tab", then the newly established spectrum window will automatically import the same working curve.

Working curve display

After calculating and getting working curve, can choose any component in working curve combination frame to show its working curve. The original data used in calculating working curve is marked "X" in working curve, as shown below:



If the original data points are all close to the regressive working curve, then it means working curve fit well with the original data points. If individual data point deviates from the working curve, it shows that this data is suspicious, need to analyze the corresponds standard sample of this data point(click "clear file" button in "quantitative results table", clear the file correspond the data points according to the number of files, and then use the corresponding concentration of standard to redo a file, or put out errors of the original spectral file and reenter into a file after adjusting it, then recalculate the working curve). If most of the data points are regularly deviate from the working curve, then need to appoint a new curve order according to the variation trend shown by these data points.

4. 7. 2 Instrument parameters

The parameters of the instrument is an important parameter in the method of operating the instrument. It includes: the temperature parameters of the instrument, temperature programmed parameters, flow parameters and so on. As shown below:

方法仪器参数		定量结果计算	积分事件	报告打印
进样器				
☒ 进样器1	☐ 进样器2			
进样器1: 131℃	进样器2: 135℃			
柱流量: 0 sccm	柱流量: 0 sccm			
分流流量: 0 sccm	分流流量: 0 sccm			
吹扫流量: 0 sccm	吹扫流量: 0 sccm			
载气: 氮气	载气: 氮气			
检测器				
☒ 检测器1	☐ 检测器2			
检测器1: 133℃	检测器2: 134℃			
H2流量: 0 sccm	H2流量: 0 sccm			
Air流量: 0 sccm	Air流量: 0 sccm			
尾吹流量: 0 sccm	尾吹流量: 0 sccm			
尾吹气: 氮气	尾吹气: 氮气			
柱箱				
柱箱: 132℃				
色谱柱: 0.1m×0.045mm×0.25 μm				
程升及事件				
程升: 无		外部事件:		
		1.00 2.00 3.00 4.00		
		1.00 2.00 3.00 4.00		
获取仪器参数		下载到仪器		

In this interface, each parameter is designed to be read-only. You can through the setting of instrument parameter (see: instrument settings in 4.5), through the "get the parameters of the instrument" button to loaded into this interface , become the instrument parameters in the method.

It will record operating conditions of produce analysis results in this channel.

Tick in front of the sample injector 1 ,sample injector2, detector1, detector2. The choice means the data channel use which injector and which detector. The choice will be saved in **method** of the channel. In the post processing of the spectra , you will see the instrument conditions of produce the spectrum.

When you have selected another **method**, you can click "download to instrument" and downloaded the instrumental parameters in this method to the instrument to perform.

Note: in the spectrum post-processing software, you will see the instrument parameters.

This parameter cannot be changed.

4. 7. 3 Quantitative results calculation

Click on “quantitative results” tab, will display the following interface:

The quantitative component list file contains all the correction and peak information.

In **spectra processing**, select quantitative component table file have produced, is also the peak identification documents. If this event has not quantitative composition table file, the system will sample analysis with normalization method.

In **result**, you can choose hidden internal standard peak according to your need (in quantitative results table will not display the internal standard component results); and display all the detected peak (showing all identified components), display all identification peak (the component results table shows all component that can match with composition table) or display all corrected peak (component results table shows all the components in the presence of components table, set unmatched component null).

In **use scale factor**, you can choose scaling or dilution factor according to your need. It means that if you concentrate or dilute the samples. After scaling, unit can be filled in In **add sub** of spectrum diagram, you can use the existing spectrum and other spectrum for addition and subtraction, to compare.

no change: directly aligning and plus/subtract two spectra time alignment;

offset chrom: aligning and plus/subtract the highest peak of two spectrum;

Scale chrom: the same as above, but not translation but scaling, two spectrum start time is 0.

In the column calculation, you should analysis results according to your actual need and the actual column length input, and thus calculate the column correction in the analysis report. To set the parameters to column efficiency : non retention time, the column length.

In summary , the main function is collecting the analysis of the data aggregation concentration, if you do not fill that program acquiesce in summing all concentrations to give total concentration, at this time the divisor is total concentration of concentration addition when calculating concentration percentage , if we have determined know the total concentration, here you can fill "as the denominator of the calculating concentration percentage, total concentration percentage that calculated may be greater than 100% or less than 100%, to adjust the sample is qualified or not, of course, the more close to 100% is more accurate.

In results summary options, concentration of internal standard modified in the quantitative component.

Note: when choosing "normalization method" to calculate spectrum ,you needn't to input quantitative component list file; when the selected "correction normalization method", "external standard method", "internal standard method", "index method" for spectrum calculation, it must call in the quantitative component list file.

Note: when choose the "correction normalization method", "external standard method", "internal standard method", "index method" for spectrum calculation, then to set it in the quantitative composition table file.

4. 7. 3. 1 The quantitative component list file

When choosing "normalization", "external standard method", "internal standard method", "index" for spectrum calculation method, then you must call in the quantitative component list file.

4. 7. 3. 2 Transfer and clear of the quantitative composition table file

If you want to use correction normalization method, external standard method, internal standard method, index method, you must select the quantitative component list file.

Click "open" in "spectra processing" column, choose quantitative composition table file (.cal) that has been made , click the "Settings" to activation.

If use the normalization method, then click "clear" button quantitative composition table file (.Cal), click the "Settings" to activation.

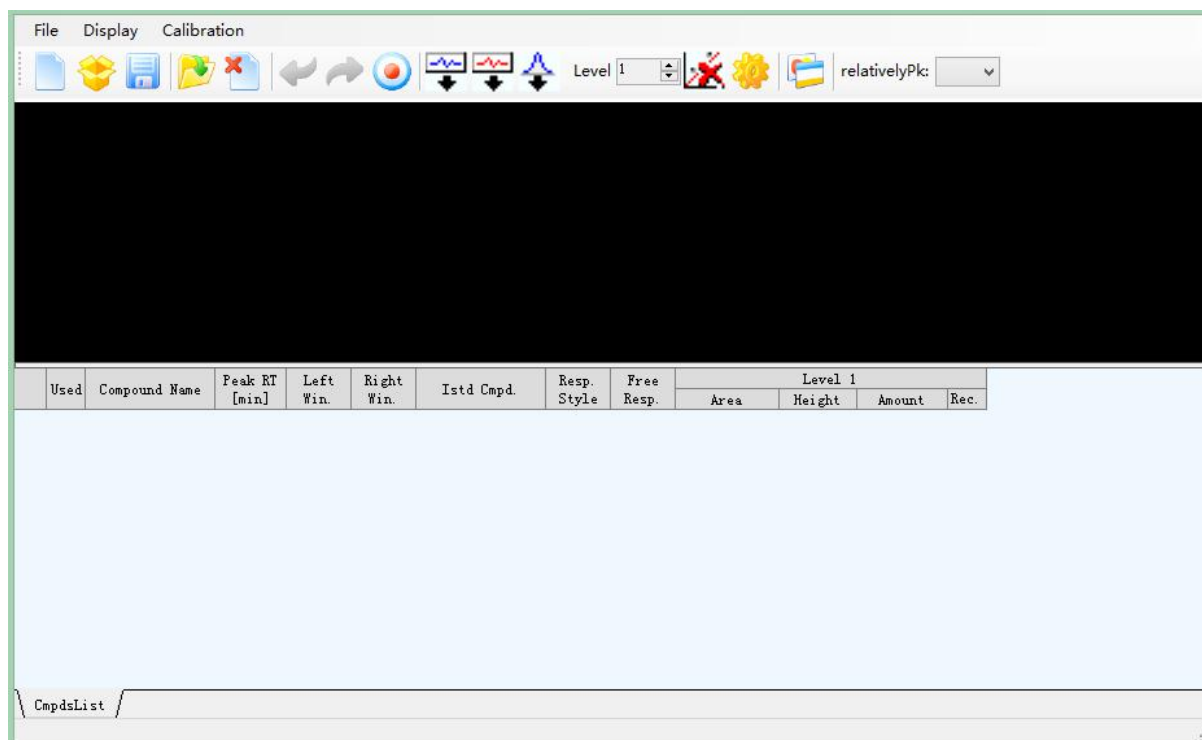
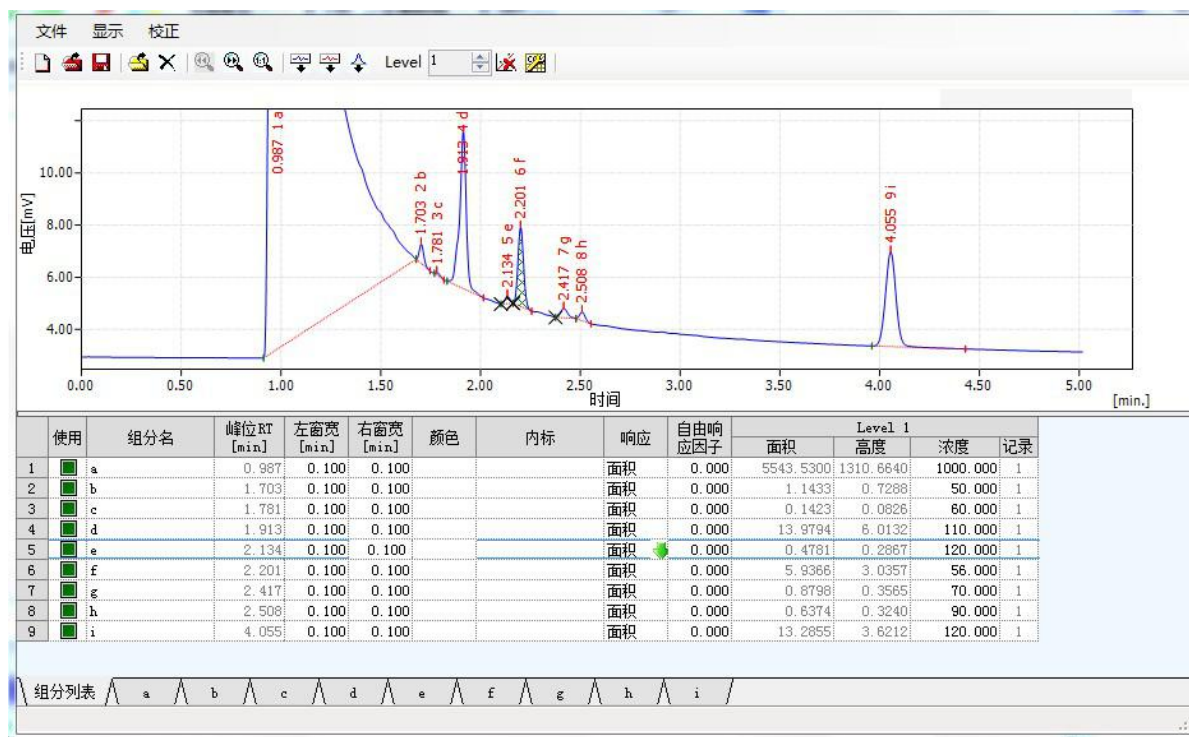
4. 7. 3. 3 Making a component table file

Making calibration curve is the focus of data processing, is to make the standard sample spectrum information and data into a standard,for the sample spectra to use.

In this system, you can open the "quantitative component editor table" from multiple entrance. For example: file →edit component table; spectra processing→ rebuilt

according to standard sample; and you can rebuild edit from the above-mentioned entrance in spectrum post-processing system.

The editor component table window as shown below:



shortcut buttons bar :

New calibration: a component table window of initialization;

Open calibration: open the component table file;

Save calibration: save the component table file;

Open chrom: open the sample spectra after pretreating;

Close chrom: closed the standard sample spectrum;

Previous zoom:

Next zoom:

Unzoom:

Add all : the standard spectrum of all peaks of information added to the component surface current Level;

Add exists:add peaks that in both sample spectrum and component table to current Level on component Level;

Add peak: add the selected peaks in the standard sample spectra to the component surface current Level;

Level: select surface current concentration level of the component; for example, when need to make a plurality of concentration levels component table file.

Delete compound: delete the currently selected components in component table ;

Options: set the component file attribute.

Get correct factor:

The upper portion of the window for the spectrum display area samples, lower component table.

introductions: 1, the correction system has a total of 20 concentration levels, namely a component can have a maximum of 20 calibration point;

2, first determine the Level, three"add" buttons will automatically add peak information to the components of the currently selected Level level;

3, the original record number of Level is 1, every time you "add", the Level record number plus 1. When it contain multiple recording in Level, "re-correction"method will be restricted by "options";

4, about "re-correction", when an Level has a plurality of recording, relates to correction.

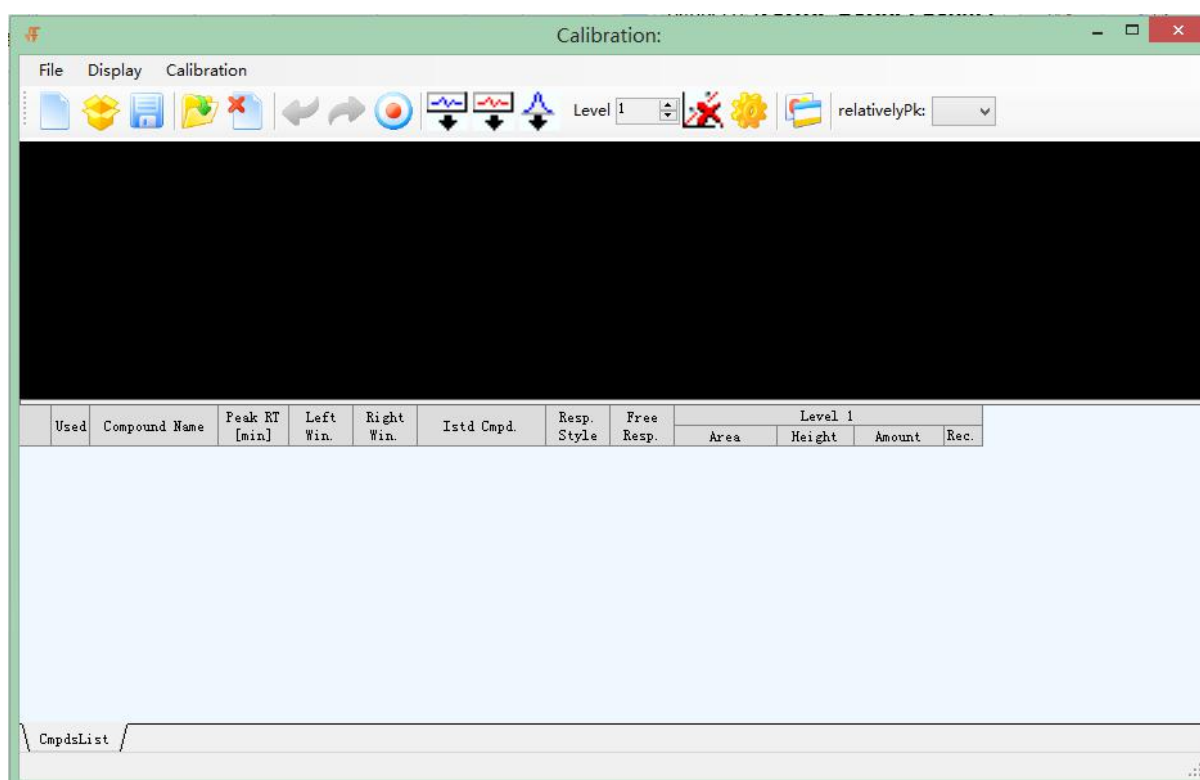
"Average"method will be the average of all the area / height recorded of this Level.

"replacement" will use new value to cover the original value.

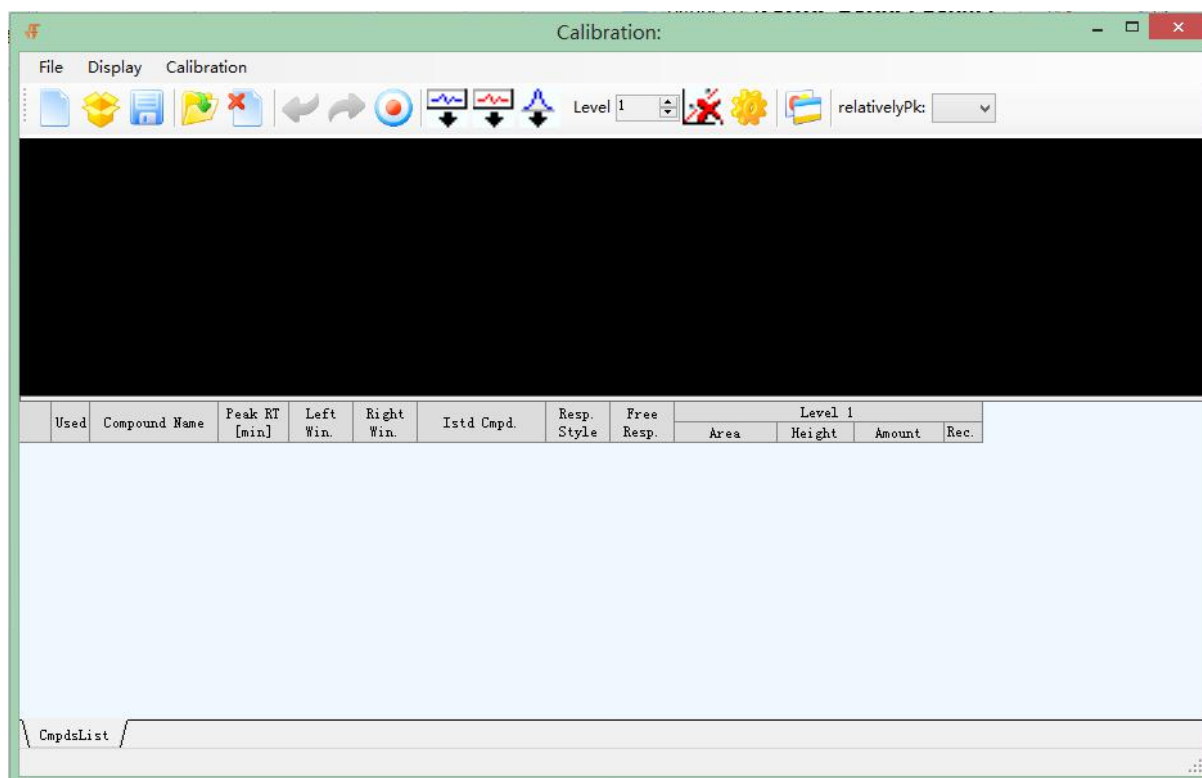
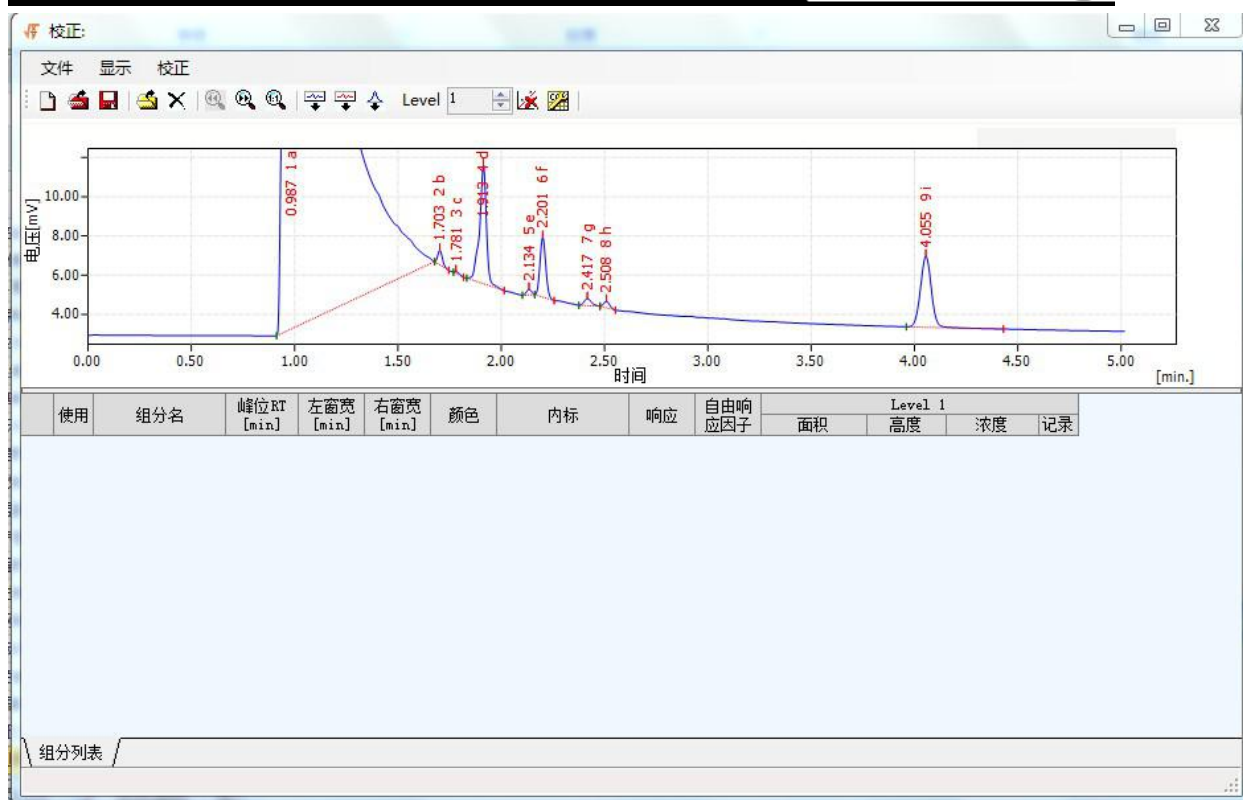
4. 7. 3. 4 Sample pretreatment

Before making calibration curves, should first pretreat samples, such as the eliminate some unnecessary peak, and observe condition of judgment peak. Before it you'd better learn about the spectrum window. [consult spectra handle. Manual integration]

Now take the sample project which has been collected as an example, as shown in the figure, the sample has 4 pieces of samples, open the "1.sda" properly.



Appropriate manual processing, such as fig:



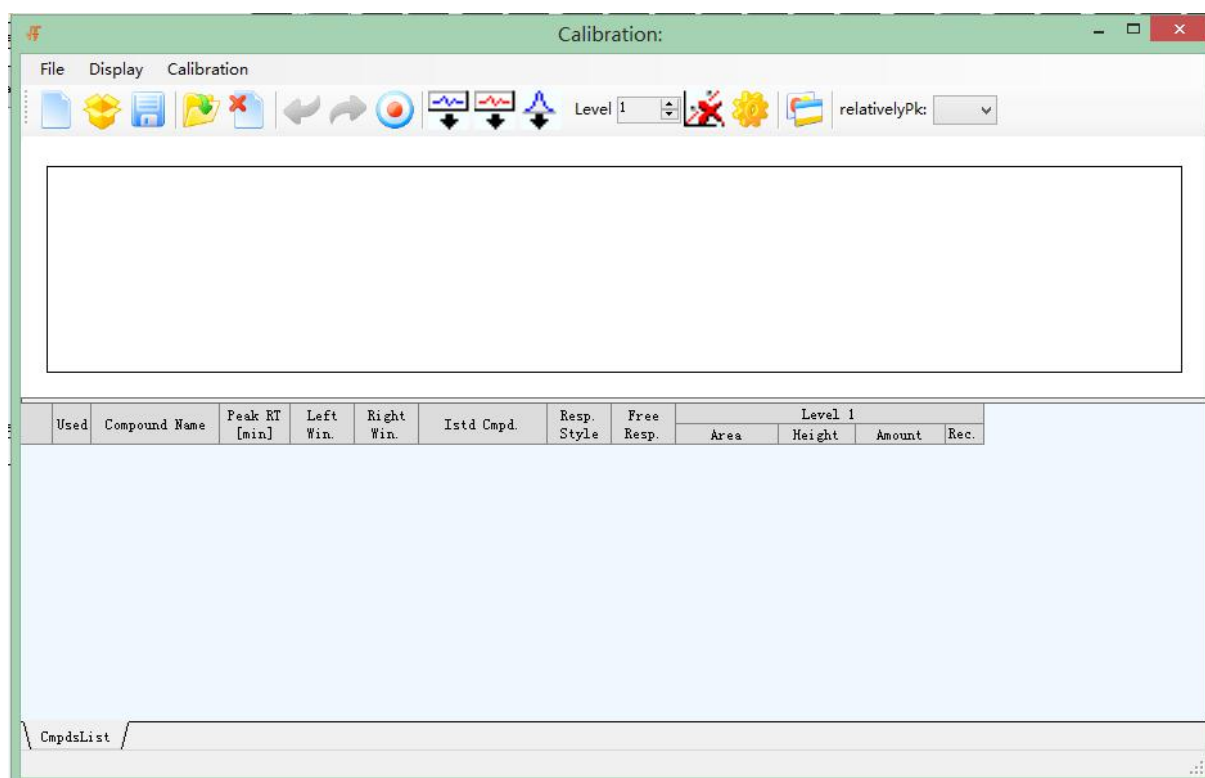
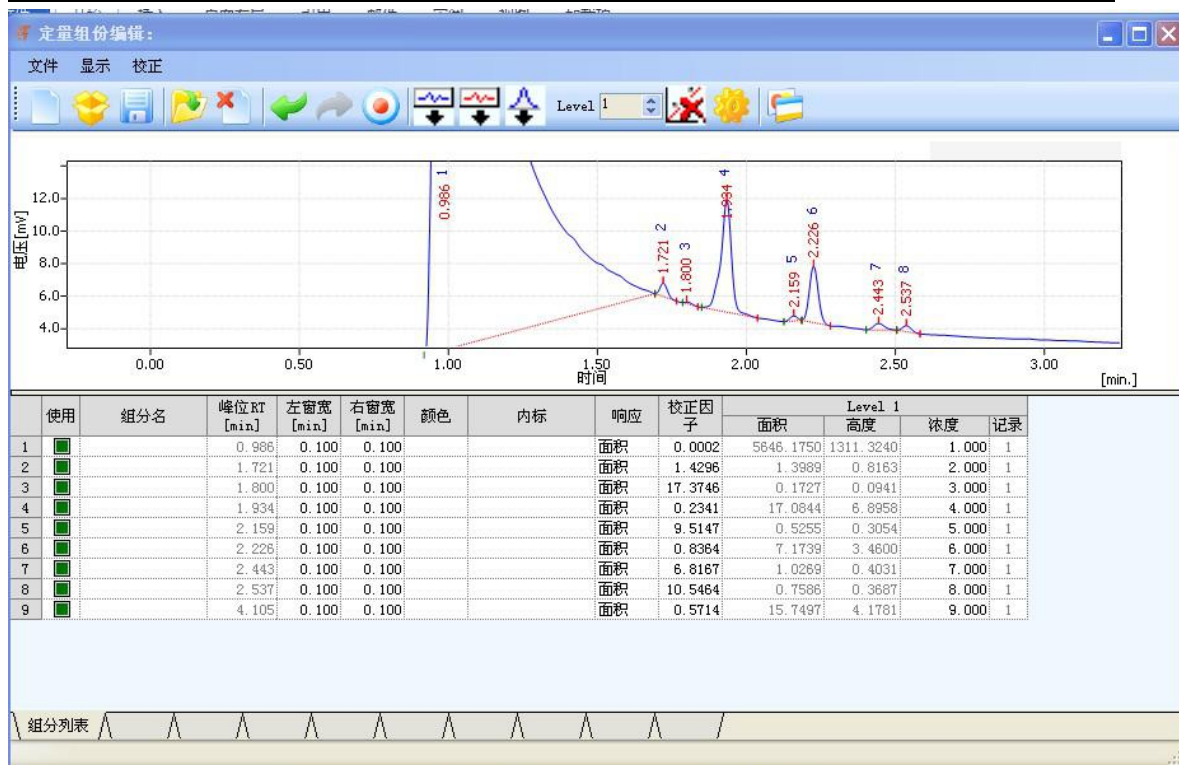
The manual processing of - 1 samples

Similarly 2.sda, 3.sda, 4.sda

4. 7. 3. 5 Making a component table

1, open the "calibration", set "LEVEL" to "1", call in the spectral file to be processed.

The following diagram:



2, press "add all", "add exists" or "add peak" according to the actual need.

3, enter the group name (if known), adjust the "left window width" and "right window width" of the retention time .

4, fill the concentration of each component in the "quantitative component editor" .

5, if add internal standard in the sample , is required to specify which component is "internal standard" in the line of "internal standard" , and fill volume of addition in a column of "concentration" (weight or volume).

6, click on the "take correction factor" button, it can calculate the correction factor of the component. If you need to calculate average correction factor by a few needle same he standard sample, tick the average of the "re-correction" in the "correction options", then calculate the average correction factor.

7, set the "LEVEL" to "2, 3, 4... ..", and then open the spectra file produced by the series of parallel sample, repeat 4 to 6 steps, the average correction factor and the concentration curve of other concentration can be generated .

8, select "save" or "save as" in the "file" menu, save the component list file.

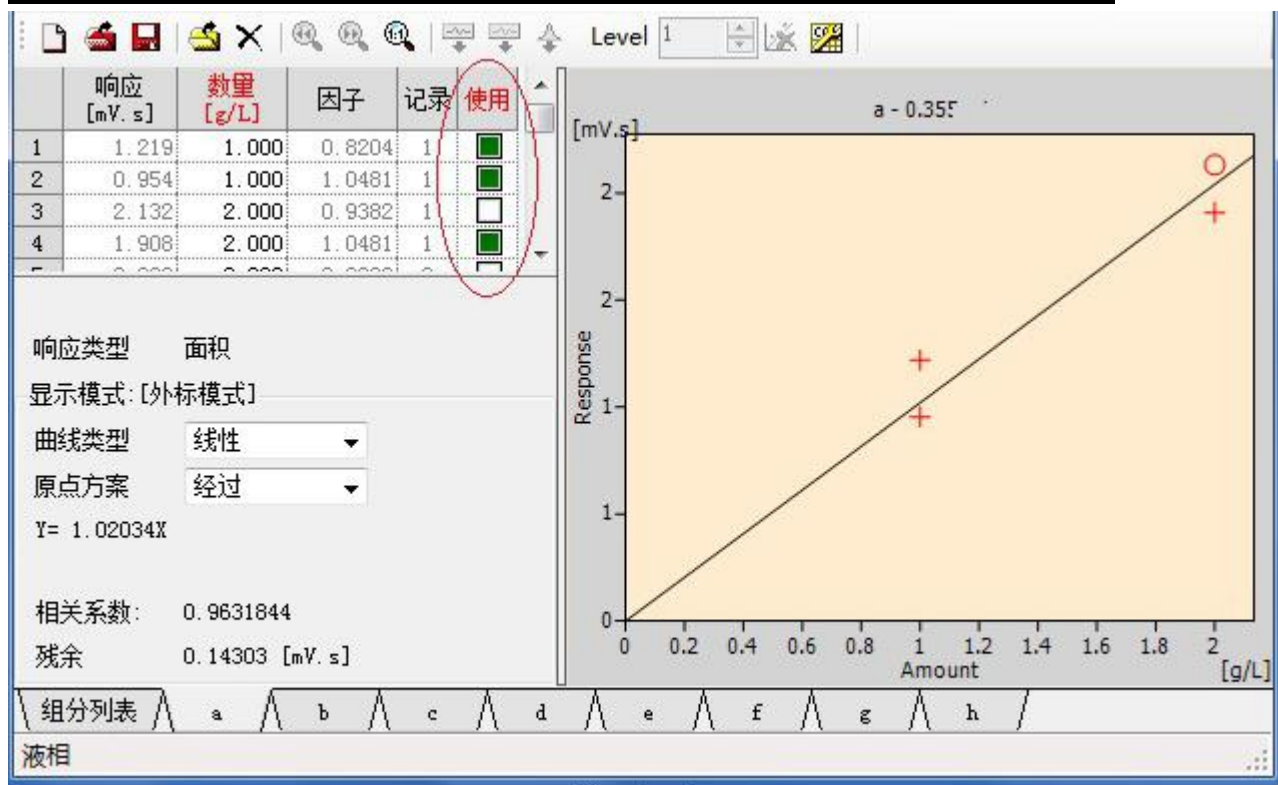
Note: the first time build component table (no components), the simplest is the "add all ".

Close the 01.saq, open the second spectra, modified Level 2, click the "add existing components", namely the existing components in component table, and the spectrum also has some components, added to the component table Level 2. Similarly, 03.saq, 04.saq were severally added to Level3, Level4, in this way ,the 4 Level is 4 calibration point in each components, each level contains only 1 records; observe 4 sample spectrum it can be found that 01, 02 data (area / height) is very close, similar repeated sampling, 03 and 04 is also very close , so you can consider to use two Level, Level 1 contains 01, 02, Level 2 contains 03, 04, so the record number of Level is 2. Finally, write the number (Amount). Here, set the amount of Level1 and 2 to 1, set the number of Level3, 4 to 2.

4. 7. 3. 6 Internal, external standard equation

Now set equation for each component :

Tick "use" four point in the front of each component , namely on the right of image there are four sample points (the point identification used is ten, unused point identification is zero), default selected .



Select the calibration point

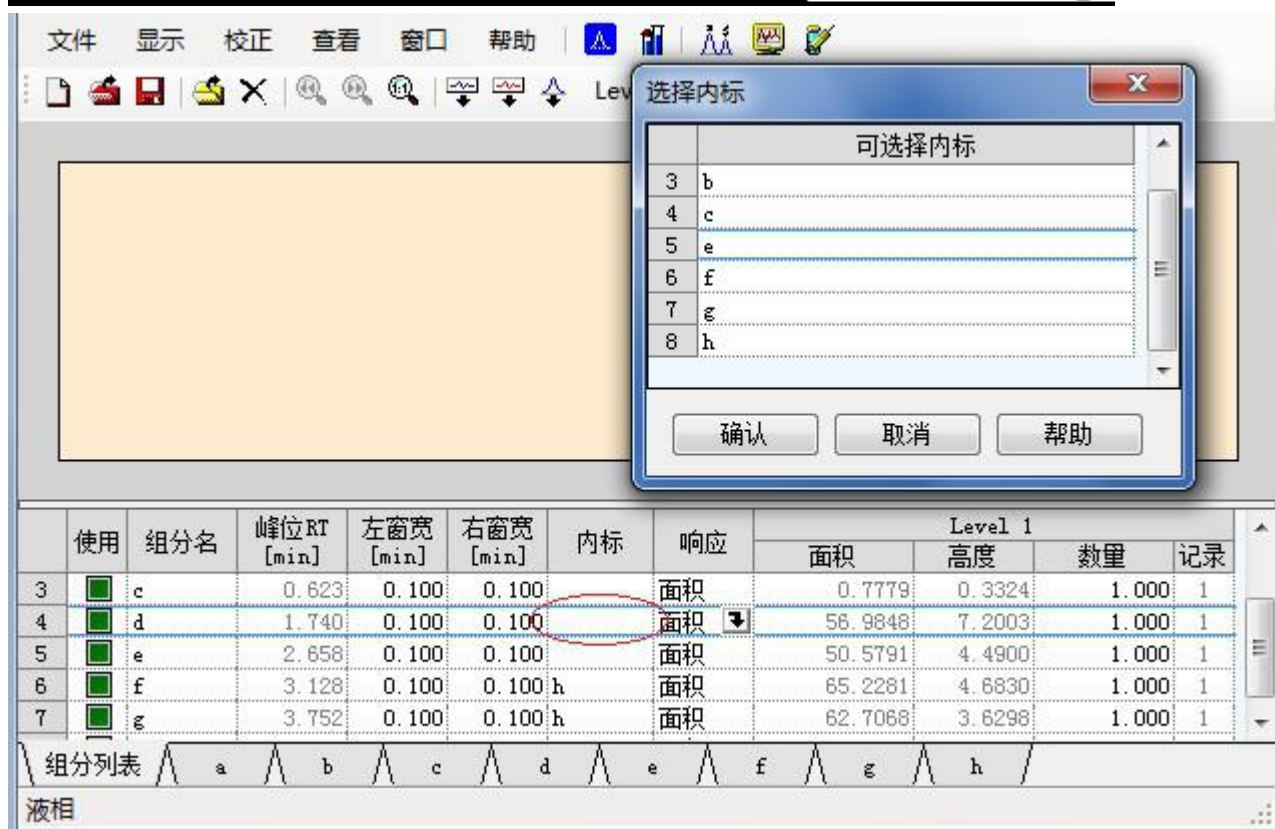
All equations can be adjust the curve type and origin scheme.

In this liquor samples: each component has four points for the selection.

More than to see the external standard mode, namely the external standard equation of components, if you want to make the internal standard calibration, you can set display mode in the correction option: internal standard mode. Each components is provided with two equations of external standard, internal standard .

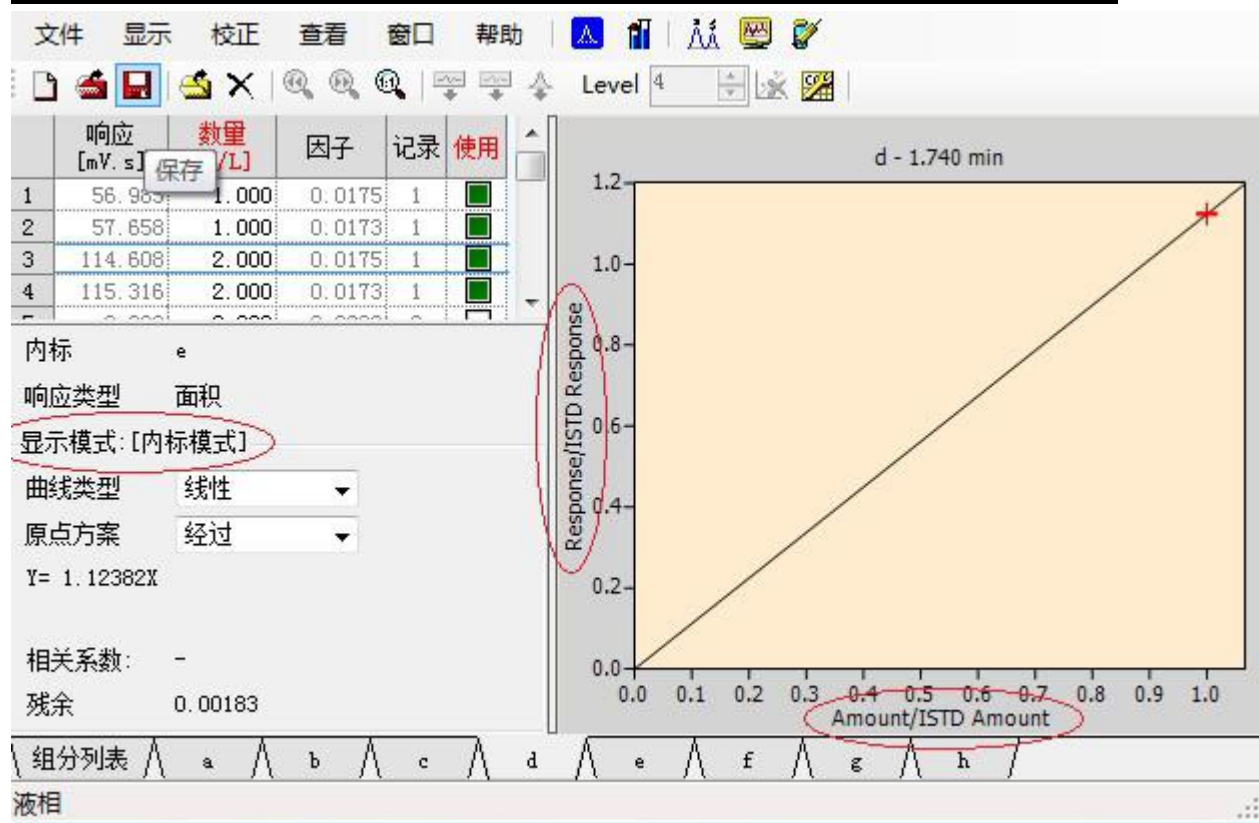
The internal standard mode:

Making the internal standard, need to set up internal standard in the composition table, any component can be set to different internal standard, such as drawing, f, g components both consider h as internal standard; while d component select e as internal standard.



Set the internal standard

Check the components: no internal standard components, and internal standard components, display as external standard equation. With internal standard components, use internal standard equation, as shown in fig.:



The internal standard equation

To this, the calibration curve is finished, "save": xxxx.cal files, select the file in "4.6.4.2 quantitative component settings".

4. 7. 4 Integral events

When adding integral events to the "integration" event table, integral changing will be used for all subsequent samples using the method for analysis (assuming has saved the method). This is often used to modify the default peak integration event selection.

When you click the **integration** tab, the interface will display:

Method/Para	Quantitative results	Integration	Report
Integration			
	Chromatogram Operation	Time A [min]	Time B [min]
1	Peak Width Para		
2	Peak Height Para		
3	Peak Slope		

In this table, the system default peak width parameters, peak height parameters, peak slope. The start time and end time is not filled (expressing that all the time are valid in spectrum graph processing). The default values are: 0.01min, 0.015mV, 0.05. It is an important parameter identification of distinguishing chromatographic peaks and filtrating chromatographic peak.

The peak width parameters is 0.01min means: the peak which peak width is less than 0.01 minutes will be filtered, and will not be processed as chromatographic peak.

This parameter is control signal for eliminate of the low frequency noise in chromatography signal .

The exact definition of peak width is the half height of peak width , in this system unit is minutes. The setting principle is to consider the half width that is a little less than the most narrow peak as the setting value. This parameter setting can filter out some very sharp interference burrs. But when it is used for high-speed chromatography data processing, should adjust the parameters according to the actual situation.

The peak height parameters is 0.015mV express:chromatographic peaks which peak height is less than 0.015mV will be filtered, and will not be processed as chromatographic peak. This parameter setting can filter out the noise of a certain size baseline. But when used in the baseline noise is slight , while the actual signal is weaker (such as for bad quantity analysis), the parameters should be adjusted according to the actual situation.

Peak slope is an important parameter for judging peak point, is used to distinguish peak's starting point, end point. Slope value must be appropriate.

The set value is too small, will mistake some volatility on the baseline for peak,open a lot of peaks in the spectrum, even will separate one peak into two or more peaks on the top of peak.

Setting value is too big , will omit take some sharper peaks.

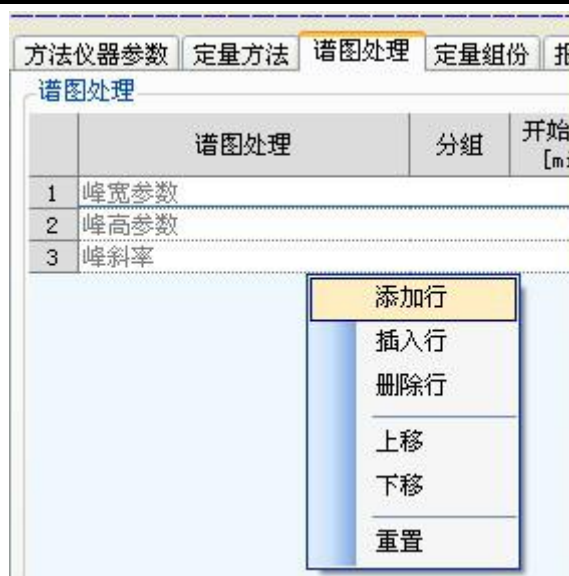
The system default value is empirical value setted according to the experience of conventional analysis. The parameters can be adjusted according to the actual situation to peak.

Except3 parameters the system default, the integral event list, you can also add the peak and the other processing parameters according to need . As shown in the following table:

name	startin g time	endi ng time	value	function
Peak-reset.detect negative peak			non	Erset baseline and detect negative peak
Peak-reverse negative peak			non	turn the negative peak been detected into positive peaks
Peak-min peak width			X (min)	Detecting if the current peak is less than the minimum peak width
Peak-min peak height			X (mV)	detecting if the current peak is less than the min peak height
Peak-add positive peak			non	add positive peak in time quantum
Peak-add negative peak			non	add negative peak in time quantum
Peak-elimination peak			non	eliminating peak in time quantum
Peak-min half peak width			X (min)	the peak larger than the min half peak height is effective
Peak-min area			X (mV)	peak that larger than the min peak area is

				effective
Peak-valley point			non	the point neighbouring two peak
Peak-solvent peak			non	label this kind of peak as solvent peak
Peak-flow rate identification			non	add flow rate identification
Peak-adding group			A-Z	add single peak or multi-peak as one group
Peak-elimination group			A-Z	Eliminating group/eliminating peak from this group
baseline-shoulder cutting parameters			X, X, X	adjust the peak baseline to valley bottom without influence interfacing baseline
Baseline-valley.slope of valley			X	reset slope of valley from current valley point
Baseline-integrated baseline			non	flare-out baseline(baseline doesn't pass valley point)
Baseline-horizontally forward			non	adjust peak horizontal line,the ending of the peak doesn't change(it's of no effect after peak separated)
Baseline-horizontally backward			non	peak baseline adjust to horizontal line,the beginning of the peak doesn't change((it's of no effect after peak separated)
Baseline-forward tangency			non	adjust the beginning of this peak
Baseline-tail tangency			non	adjust the ending of this peak(can be used in dragging tail peak processing)
noise assess			X (min)	calculate the current baseline noise(it is effective when don't sampling and the instrument is stabilize)
drift assess			X (mV/min)	calculate the current baseline drift(it is effective when don't sampling and the instrument is stabilize)
detector time-lapse	non	non	X (min)	adjust all the persisted time in the set(can be used in solve the difference of persisted time caused by different analysts' different operating skill)

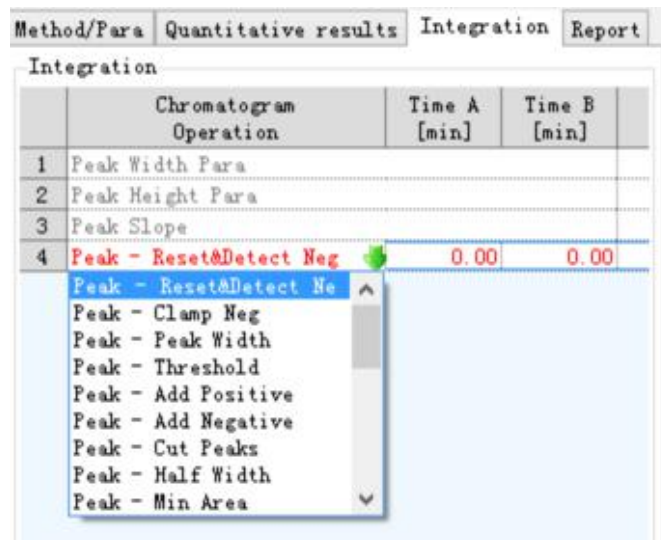
When need to set the **integration** , move the mouse to the place needed to be modified or added of **integral events** ,click right key will pop-up interface system:



According to the need to choose the add rows, insert rows, delete rows, upwards or downwards; the "add rows" command only add a new blank rows in the cursor location. "Insert rows" command only insert a blank rows in the cursor location. "Delete rows" command to remove the current cell or the selected content of row . "Reset" command to clear all the content of entire spreadsheet (restore default value).

If need to add integration events,add a new row in electronic form , click the left key on "event" in add rows, the system will pop out integration events options, as shown below:





And select the event you want to add , according to the integral event parameters you need to fill the start time, end time and value successively(if needed).

Repeat the above steps, you can add other integration events.

4. 7. 5 settings of printing report

Click the printing report tab, system pop-up setting interface of printing report :

Method/Para	Quantitative results	Integration	Report
PrintContent			
Title XXXX分析报告			
☒ PrintTime ☒ SamplingTime original data ☒ FileName ☒ RData ☒ drawFrame Font: 4 ☒ chromatog 1326 H: 528 ☐ SpectralLine			
Table Content			
☒ Index ☒ Rt ☒ PkName ☐ factor ☒ Amount ☒ Area ☐ Height ☐ W05 ☐ PkV ☒ AmountPer ☒ AreaPer ☐ HeightPer ☐ equation ☐ correlation ☐ Resolution ☐ Efficiency ☐ effective ☐ capacityF ☐ tailingFac			
Report Title			
质检(E)字第()号 送样单位: 仪器型号: 取样日期: 年 月 日 收样日期: 年 月 日 样品批号: 样品名称: 固液			
Report tail			
备注: 按 检验, 浓度含量单位: g/l 检测结果: 检验部门: 检验员: 审核员:			
PreView			
☐ Word ☒ NetChromPrint			

Fill in the content you need in the **title**. Such as: methane sample test. If the "title" is set for the blank, the program will automatically take the first row of "report head" in the "analysis report "out as a title)

Select the print options you need, to determine content of each part of the analysis report.

Fill in the "**report title**" and "**report tail**"In the report head and report tail , the two part of the content will be wholly intact into the head and tail of the analysis report.

Choose to use Word, Word Pad or program generate to make format of the printed report.

V. Off-line Processing Of Graph Spectra

In this system, at the end of analysis, system will immediately use the method adopted by this channel to carry out calculating and analyzing of the spectrum, analysis report will be automatically saved in your set working directory.

Whether the current ending sampling channel is in the current display interface, will not affect the spectrum analysis and calculation of the executive. This is a big technology breakthrough of NetChrom™ workstation!

Diagram directory being saved is in workstation spectrogram catalog → chromatograph name folder → date folder → channel folder.

If needed, you can invoke the spectral graph off-line processing to carry out results viewing, analysis and printing of spectrum.

Click to select the system file - > **spectra processing** drop-down menu, the system will pop up software interface of spectrum off-line processing, as shown below:



5. 1 Interface

5. 1. 1 Interface Overview

The interface of this software is standard 32 bits Windows program interface, the frame is composed of standard interface elements that is the **menu**, **toolbar**, **status bar** and so on, between the toolbar and status bar is the display region and the spectrum processing method for spectrum window region (sometimes in order to expand the spectrum window display area, can cancel the spectrum processing method of the display region).

5. 1. 2 The title bar

The title bar is located at the top of the program window. The above shows the application window title bar contains order from left to

right:  谱图处理: c:\netchrom\test.sda

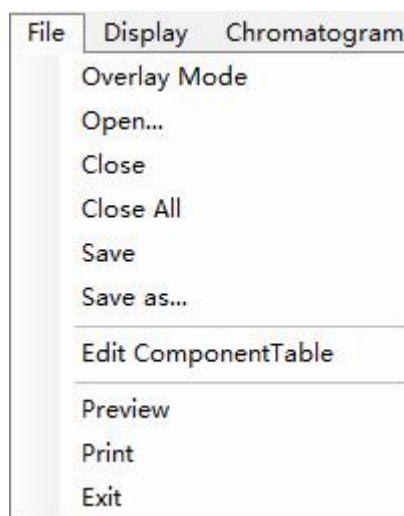
The application window control menu icon, the name of the application, the current open map file's path and file name.

5. 1. 3 The drop-down menu

The drop-down menu includes: file, display, chromatogram chart, help. As shown below:

5. 1. 3. 1 File

Click the **file** drop-down menu, the system pop-up the following view:



Describe every part the drop-down menu severally.

➤ **overlay mode**

Whether to display multi-spectrogram in the same spectrum area at the same time. This function is convenient for different spectrum diagram file to make comparison. The system default is **non overlay mode**.

When the system is in **overlay model**, will tick before **overlay mode** of

drop-down menu ; at the same time overlap mode icon  will tick to prompt.

When the system is in a **non overlay mode**, the tick before the **overlay mode**

of drop-down menu will cancel ; at the same time overlap mode icon  tick will cancel.

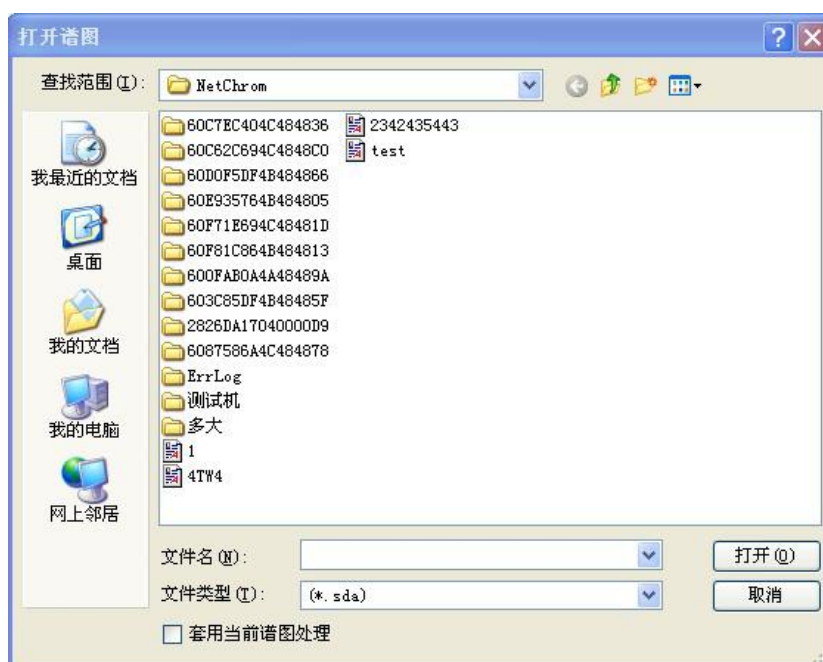
In **overlay mode**, only taking the first spectrum method file.

In the **non overlay mode** only shows a single spectrum. Open a new spectrogram, the original spectrogram will automatically shut down.

➤ **Open:**

Use this command to open the map file to one or more existing the content load spectrum window.

Click to open the command, the system will pop open map file box:



Select the file type that you want to open , and then select the file directory you want to select , click the file need to **open** , click open. When you want to apply mechanically the original spectrum file you have opened,tick before **“applying the current spectrum processing”**. The system default is not to apply.

Note: the default file type is "chromatography workstation data file" with suffix "SDA" (be called "spectral file" for short). If you choose "all file types" in here, then the file list box will be listed all file types under the current folder including spectral file,such as the template file generated with software that the suffix **"tab"** . But the non spectrogram file type can't open dialog frame with this file , can only delete and copy them by the function provided by shortcut menu with the right mouse button.

- **Clos:** close spectrum files currently open,do no operation on unopened spectral file .
- **Close all:** close all opened spectrogram (for example: open all spectrogram in **overlay mode**).
- **Save:**this command uses the original file name and location to save spectral file in the current spectrum window. If you decide to save spectrogram window with file name to other name or location of the file, please choose the **“save as”** command, and input the file name you need.
- **Save as:** save as the spectrogram opened to other file.

Use this command save the content of current figure window spectrum (often change based on the original content, for example recollecting spectrogram in the window) to another new spectrogram file that has different name with original spectrogram file, this can continue to retain the original map file content. If you want to use the content in spectrum window of the original spectral file name after modified , please use the save command.

Save as dialog box

This dialog box is mainly used for specifying spectrogram file name for spectrum window to be stored . Can directly input spectrum file name in the file name edit box type , the program will automatically on the file name to add the default suffix ".SDA".

This dialog box and file opened dialog is both the standard file dialog box, in fact the two dialog box also has function of managing the file, folder. You can delete a file or folder and create a new folder in the two dialog box, can also sort all the file according to name or time in a folder. You can follow the "tree" directory of **Windows** , arrange the spectrogram file produced by chromatography workstation to different folder under categories, and manage the spectrogram storeroom produced by the two dialog box. A spectral storeroom management system has nothing but functions of increased, delete, search and sort, and the two dialog box complete has these functions.

- **Edit component table:** open the component list editor window, making component document . See: 4.6.4.2 quantitative component editing
- **Preview:** print spectra results Preview
- **Print:** print spectra processing result print.
- **Exit:** close the spectrum processing window

Note: uninstall and reinstall the software will not delete chart file saved in the hard disk, even if they are saved in the installation directory. You should regularly backup spectrogram file on HDD to floppy disk or CD-ROM, in case when hard disk break up or damaged by a virus the spectrogram file is destroyed on one day ! Backup the spectrogram file to floppy disk, adopt software tools that can backup while compression such as Winzip, "backup" program, then the spectrogram file can be compressed to 1/4 of the original size . In addition, you can use the Windows "start" menu in the "search" function to find all the documents meet the specified conditions, such as finding the starting position, the "file creation date" (don't choose "modification date"), the belonging file type (i.e. "HW spectral file") and so on, then directly copy, Winzip, delete the file being found and listed by click the right mouse button.

5. 1. 3. 2 Display

- Previous zoom: back on the last display, double-click the spectrum display area ;
- Next zoom: if have ever backward display, you can reply forward ;
- Unzoom: carry out logic display of full time second peak height to current spectrogram , double-click the spectrogram name on the upper right of display area is logic display of full time first peak height ;

5. 1. 3. 3 chromatogram chart

- Create label: create a text or line identification in the spectrum display area to .
- Remove label: delete text or lines identification in the spectra creation.

5. 1. 3. 4 Help

- Help: help to open the document
- About : about the dialog frame in the software .

5. 1. 4 Spectral graph operation tools

On the left of the commonly used tools column designed spectrum operation tools. Icon button provides a quick way of some commonly used commands to access the menu. This toolbar button respectively is open file, save , close , file list, preview, print, last view, next view, normal view and multi open mode. This is corresponds with the menu command. Spectral graph operation toolbar as shown in fig.:



When the mouse is placed in the toolbar, below it will show in the name of the tool.

Detailed as follows:

- Open: open the map file; the same a menu commands.
- Save: save trace file; the same as menu commands.
- Close: close the spectrum; the same as menu commands.
- File list:
- Print preview: print preview; the same as menu commands.
- Print : print; the same as menu command .
- Forward: Spectrum zoom on the view; the same as menu command
- Backward : the next view; the same menu commands
- Resetting : restoring spectrum full size; the same menu commands.
- Multi open mode : open a plurality of spectrogram file in the same spectrogram display area with menu command;

5. 1. 5 Integration events toolbar

Manual integration is used for the integral specific peaks of chromatogram or regional custom .

There are two ways to get the integral timing events added to the method:add events to the integral timing events table by manually, or add by clicking on the chromatogram spectrogram in graphics mode.

In the system the tools bar integrate manual integration tools bar. As shown in fig.:



When the mouse is placed in the toolbar, name of the tool will show below it .

5. 1. 5. 1 Integral event operations

Click the icon to make the function activated (mouse transplantation spectrum display area, display a vertical dotted line), move the dotted line to the pre-beginning on the spectrogram and click the left mouse button, and then moved to pre-ending in spectrogram and click the left mouse button. If the event requires parameters, it also will pop-up interface to require you to adjust or input parameters. Add the event in the integral case at this time.

The basic starting point: the starting and ending valley point of single peak , for shoulder tangency extension of the peak, valley point spread out isn't basic valley point of main peak .

command range: many commands have acting scope,after selecting command ,click two times in the spectrum display area can namely setting start / end point of acting scope , if the command need an assignment, it will pop up a temporary dialog.

Induction short-cut value: many commands need assignment, you can enter in the temporary dialog popup, can also click the "..." induction button, select sensing range from spectra display area to get a reference value, the value is automatically fill to the value text frame of the temporary dialog. The operation process of induction is the same, but different orders have different induction parameters, such as the "minimum peak width" command induction select domain time wide, "minimum peak" command induction selection field amplitude rather than start - ended points absolute signal difference.

order cancellation: adding orders may be canceled, the add command failed. For example, selecting the scope (or selection of induction selecting domain), mouse move out spectrum display area, will lead to cancellation of the order.

If the system cannot process integration events you set, the event will be prompted with red . The integral events cannot be handled does not delay the operation of the system, you can click the event, and then click the right mouse button, select "delete" to delete it.

5. 1. 5. 2 Integration events

The name and action of tool set are summarized as follows:

dynamic help

"The dynamic help" refers to when the dynamic help enabled (icon has a tick mark), when operate to activate following integral events, at the bottom of interface will prompt meaning of the synchronous operation synchronously. when do not enabled (icon tick mark canceled), don not prompt.

peak width

"peak width" event is used to calculate a peak value, before applying the integral algorithm this value is the minimum peak width parameter of entire spectrum graph processed .

Note: in most cases, based on the narrow peak in the chromatogram of the "width" initial values for all peaks of appropriate integral is big enough. However, should enter new width timing event in each peak width increases to two times of the original.

peak height

"peak height " event is used to calculate a peak height value, before the application of integral algorithm using this value as a minimum peak height parameter of whole spectrum graph processing.

Negative peak detection

This event will cause in a certain period of time part of spectrogram under the baseline will use normal peaks logic to process integration.

Reverse negative peak

This event will cause negative peak reverse to positive peak within a certain period of time , and reported as true peak.

minimum peak width

This event is to set minimum peak width of spectrum graph processing in the specified time range . Peak less than the peak width value is not identified.

minimum peak height

This event is to set minimum peak height of spectrum graph processing in the specified time range .

Add positive peak

Use this command to define positive peak hasn't been detected before graphically . When you want to force a peak integrating, but does not change the whole integration parameters, it will be very convenient.

Add negative peak

Use this command to graphically define negative peak hasn't been detected before . When you want to force a peak integral, but does not change the overall integration parameters, it will be very convenient.

Delate peak

This event can close the peak recognition chromatogram in the specified range. If your specific area of the chromatogram is not interested, and didn't want to the region of the peak generate report, this event will be very useful.

minimum half-peak width

This event is set to the specified time range minimum half-peak graph processing spectral width.

minimum half-peak width

This event is to set the minimum peak area in specified time range spectrum graph processing.

manually baseline

This event make you do not have to change the integral parameters to change the peak base rendering mode. When you want to change a peak's drawing location ,but not change the other peaks in chromatographic baseline's drawing mode, it will be very convenient.

To draw a new baseline, select "manually baseline" command, and then click the mouse on the required baseline point , and click the required baseline end point again.

Add group

Is considering all chromatographic peaks is a retention time as a peak to carry out quantitative calculation.

tangent shoulder parameters

Carry out shoulder tangency calculation according to the parameters .

This is a partial order, need to set the acting scope and related parameters. Here is the focus on the parameters and algorithm, it has four parameters of area ratio, slope ratio, the left shoulder cut coefficient and right shoulder cut coefficient. A minimal shoulder cutting process, in the overlapping peaks group is consider the largest peak as the main peak,consider the before / after peak (Group)shoulder cut as shoulder tangency peak, when certain conditions are satisfied, the main peak carry out front / back shoulder cut extension. To further forward / back extension, the area of main peak, the slope parameter according to the current value of the last extension.

Peak area ratio:the ratio of the area of main peak and the shoulder tangency peak (Group), require to be greater than or equal to this value, (generally the main peak area is larger, peak area required larger).

slope ratio: the ratio of shoulder tangency peak (Group) and baseline slope's absolute value of main peak , to meet the mathematical specification, such as forward shoulder tangency, baseline of shoulder tangency peak (Group) must be low on the left and high on the right. Demand to be greater than or equal to the value (generally,the steeper the shoulder tangency peak (Group)'s baseline is, the steeper the shoulder tangency peak (Group) baseline requirements is .)

left / right shoulder tangency coefficient: adjustment of "slope ratio" , namely the really used slope ratio is "product slope ratio" and this coefficient's product. The right shoulder cut factor generally will be smaller, reflect the peak tailing.

Valley -valley point slope

'Valley -valley point slope' boundary value to determine whether the peak overlap , when less than or equal to the value , the peak ahead is adjusted as single peak, otherwise cut vertically and integrate with subsequent peak (Group) .

Through the valley point(peak valley to peak valley)

This event will lead to baseline of peak that incomplete separation (i.e., did not return to baseline) was drawn to the peak's minimum point. If you do not use this event, baseline will be set to spectrogram to return to the next point of baseline , and draw a vertical line for the peak that does not reach the baseline.

need to select a range of command, two clicks to determine the command range: first click confirm [start point], second click confirm [end point].

Integration of baseline

Adjust the peak (Group) into single peak;

flatly forward

This event allows you to set flatly forward baseline in the specified period of time.

Flatly backward

The event will be used to force the direction of horizontal baseline to the direction of chromatogram beginning. Reverse horizontal baseline will be created in the specified by the event time.

Tangency tail(back tangent skimming)

This event is used to integral the small peak located on the back porch of the peak . Baseline of small peaks become the tangent drawn from peak valley of big peak to point of tangency of chromatogram .

Use integral of"tangent skim" event

Tangent forward(forward tangent skim)

This event is used to force the tangential baseline of child peak to in front of mother peak.

Signal delay

Signal delay, balance mistiming of different signal under multi-acquisition card .

5. 1. 6 Spectrogram window

Each spectrum window containing the spectrogram original sampling signal data , spectrum processing parameters and quantitative results and other information.

Spectrum processing parameters and quantitative results is the same with 4.6 chapters - method setting. Here are no longer descried.

In the spectral region, you can see the original spectrum or some attached tag added by program. larger or smaller the display of spectrogram with mouse; can also modify the time axis and the signal value display parameters to modify the display pattern, so as to facilitate the observation.



If you want to completely observe chart, click the "original spectrum" button, make the signal curve filling the whole spectrum area in the longitudinal and transverse.

System make green short-term marker point system in the detected peaks overlapping peaks between the starting point and , in the end the peak marked with a red short-term marker and , mark summit peak time in peak vertex.

The system's distinguish of peak point and valley point is related to its partitioning about peak group in spectrogram, so in the observed spectrum peak decision situation, special pay attention whether the system to correctly distinguish the peak end (with a red short-term marker) and the lowest point(is marked with green short-term marker). After the system divide a peak group, immediately show as established baseline of this peak group and the established dividing line of the peak (these additional line is gray). Because the baseline and position of segmentation line have a big impact on calculation of each peak area, so you should also observe the baseline correcting method that program establish for peak and whether the segmentation method is reasonable , when necessary, to use the overlapping peaks, peak separation scheme in "spectrum processing table" to divide the peak group.

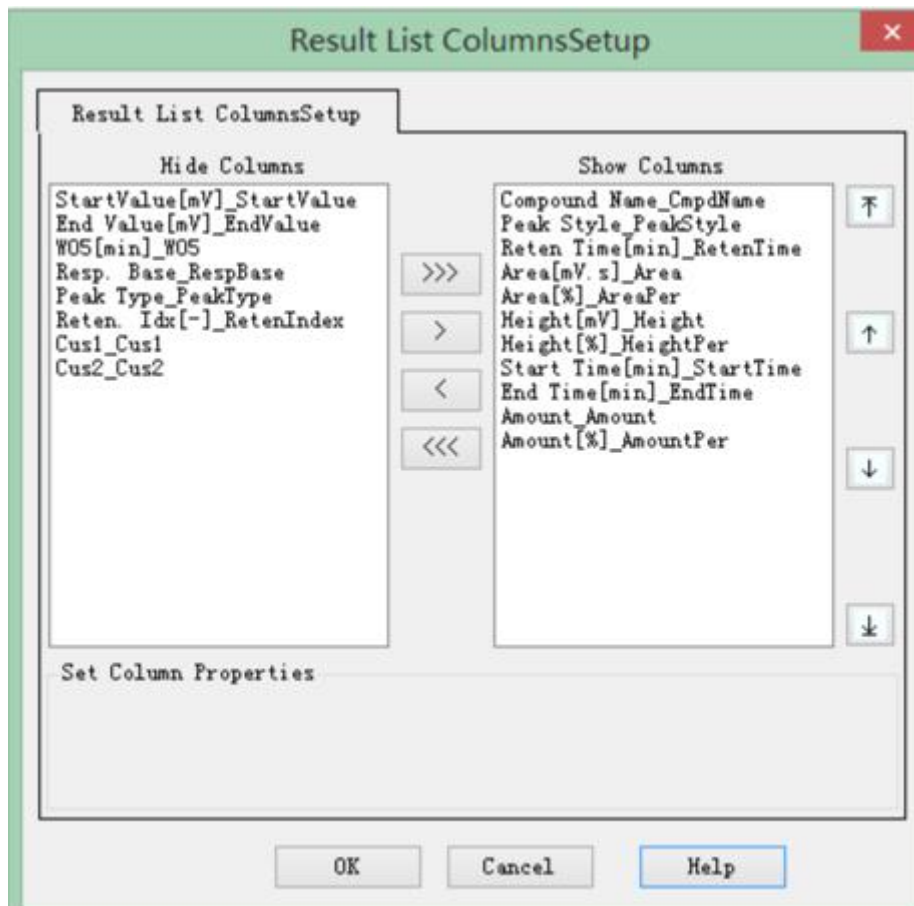
For all peak time setting in quantitative composition table, the program will use vertical short-term(called the set of peak line) at the bottom of the spectral region to mark their corresponding position in the spectrum diagram. If a set of peak fall between the start and end tags range of one peak in spectrogram, the program consider that the component in the time of set of peak in the quantitative component table is corresponding to this peak in spectrogram; if a set of peak line does not fall within the start-stop range of any peak the program has detected in the spectrogram, it means in the quantitative component table the component of the time of the set of peak has not found. If there are multiple sets of peak line falls in the spectrum of a peak period range, the program only considered the most close to the peak of the set of vertex peak corresponding to the peak.

As mentioned above, the program add various auxiliary marker in the original spectrum , when need to observe the spectrogram without interference ,you can turn off the display of various additional markers in the"options" command of "tools" menu.What need to be explained is, program leave option that can make the background of spectrogram region showing as black, is because that even if observe spectrogram for along time will not be easy to cause visual fatigue.

5. 1. 7 Method editing

According to the need, you can select the column setup, restore default columns, clear component name

When you select column setup, system will pop-up window column settings, as shown below:



You can move the option being concerned to "show columns" according to your own requirements, move the option doesn't being concerned to "hide columns", click **ok**.

When choosing to restore the default column settings, the system will restore to the column setting option in factory.

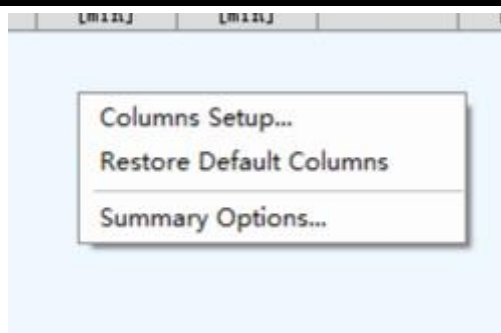
When choosing clear the component name, system will remove the component name.

Note: double click the analysis results display area to the component name in cell, can quickly modify the corresponding components, also can setting component name when making components table according to retention time and time window .

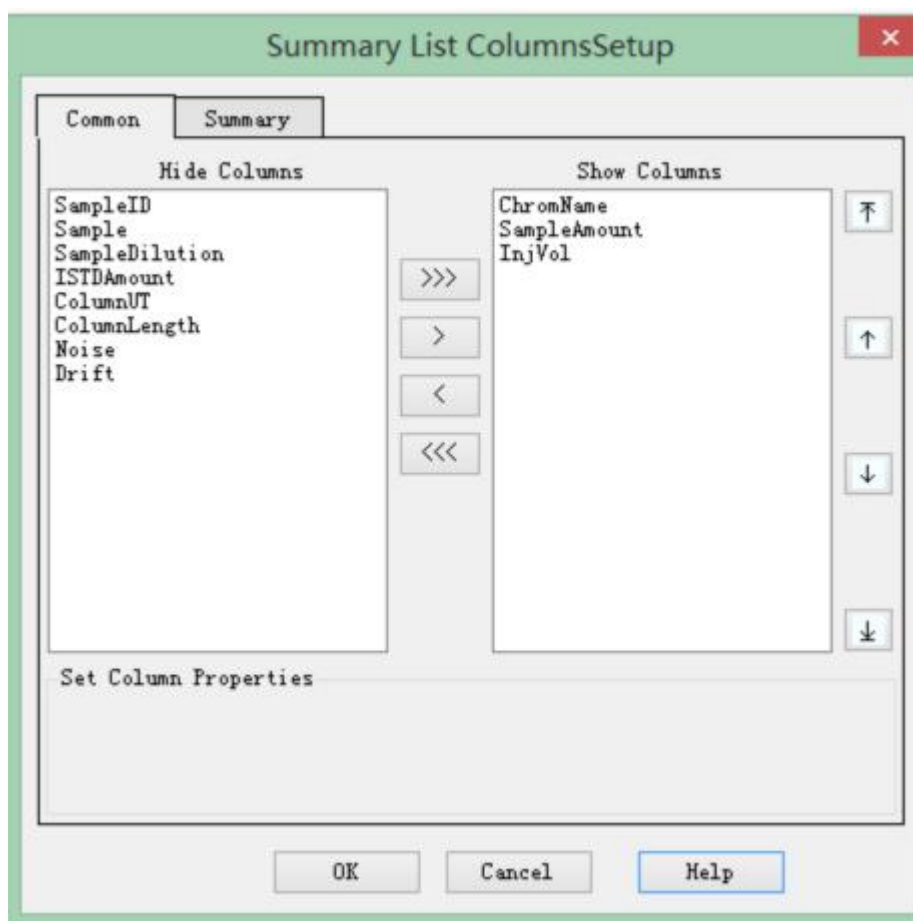
5. 1. 8. 2 Summary of result and average of results

In the summary of results and average of results, can display each component's parameters of the current analysis spectrogram and average value and relative standard deviation (% RSD) of the same kind of analysis results for a plurality of spectrogram.

In the results list area click right button, the system will pop up the following interface:

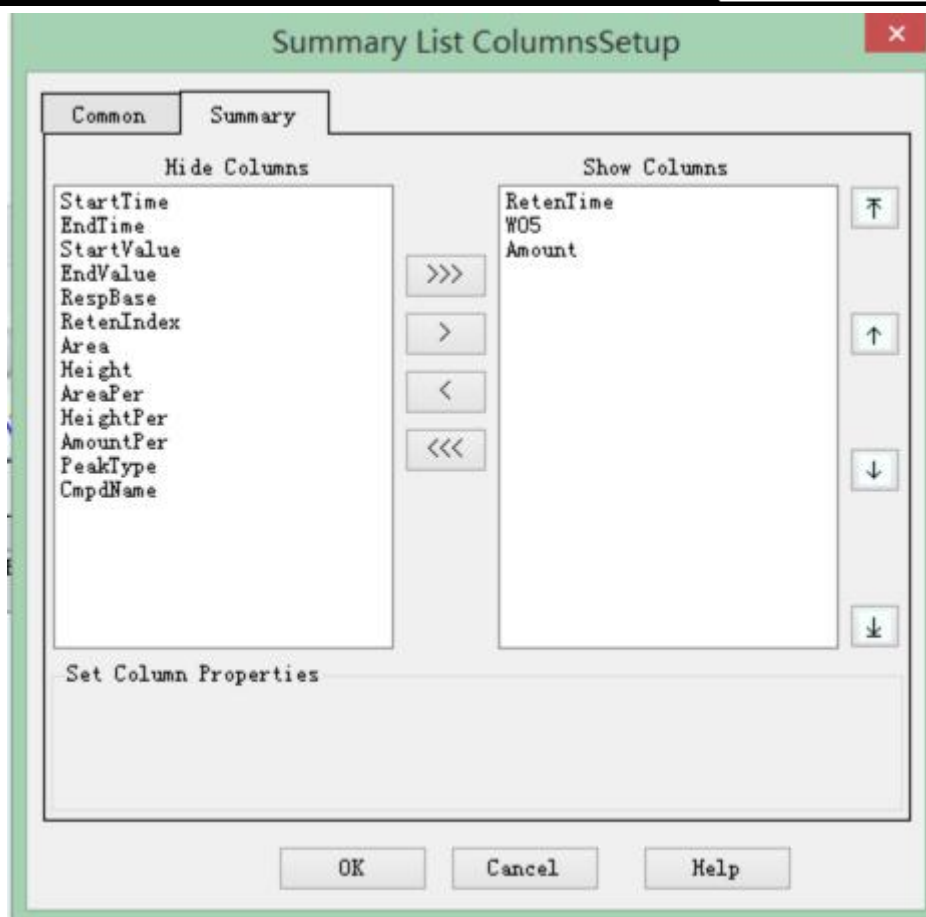


Select the "column setup" can set the content you pay attention to .



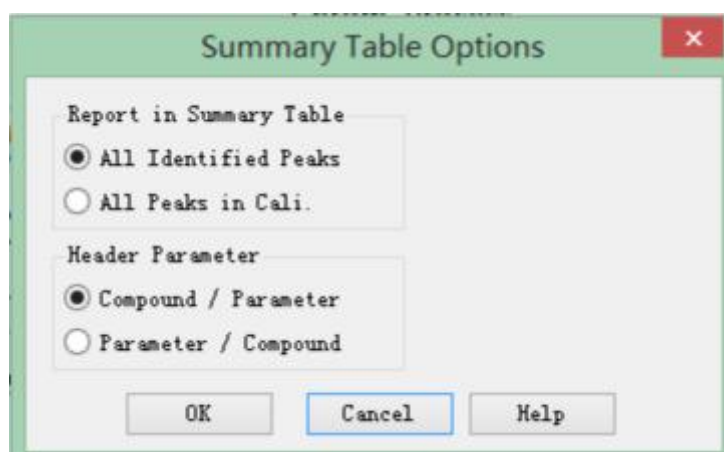
☆ in "common" column, you can move the spectral file you focus on content to the right, move the spectrogram file you don't pay attention to to the left.

☆ in the "summary " column, you can move the spectrum parameter you focus on to the right,move the spectrum parameter content you do not pay attention to to the left. Such as "retention time", "amount", "area", "height" as the object of interest, reference may be shown below:



Select "restore default settings" can restore the display content of the factory;

Select the "summary options" will pop up the following settings box, according to need to check.



When you need to averagely calculate the analyze results of multiple sampling of the same sample and calculate its quantitative repeatability, select "spectrum superposition



open" mode, open a spectrogram file in the same component, called the analysis method to do results calculation , and then open the other spectral file the same component, and calls to the same analysis method for calculation, in the results display

area, will calculate the average value and RSD value of the same component of these spectrogram, as shown below:

结果	总结	柱效					
	谱图	样品 浓度	体积 [ul]	A			
				保留时间 [min]	半峰宽 [min]	浓度	面积 [mV.s]
1	1			0.987	0.061	10.000	5543.530
2	2			0.990	0.063	10.270	5692.979
3	平均值					10.135	5618.254
4	R S D					1.884	1.881

5. 1. 8. 3 Column efficiency calculation

Click on the "performance" tab, the system will display the page column efficiency:

Results		Summary		Performance					
	Reten Time	W05 [min]	Asymmetry [-]	Capacity [-]	Efficiency [th.pl]	Eff/1 [t.p./m]	Symmetry/ Tailing [	Resolutio n	Compound Name

Peak retention time:

The time from the injection begin to appear after the column component concentration maximum of separation of sample components, namely the time from the injecting began to appear apex of some component chromatographic peak, called the retention time for this component, use t_R to denote, often use min for unit of time. The time solute through the column required, namely is the time required for component to be measured from the sample to the peak maximum.

Determinants of retention time: retention time is determined by the thermodynamic factors in chromatographic process, in definite chromatographic operating conditions, any material has a certain retention time, is similar to the shift value the same effect, can be used as the basis for qualitative analysis.

W05:

Peak width at half peak height, also known as the half width. Through the midpoint of peak height to make a line parallel to the peak base, the distance between the straight line and two intersecting points of both sides of the peak. The expressing unit is the same as the peak width. Half peak width equal to the 2.354 times of standard deviation.

Asymmetry:

The ratio of left and right sides of peak.

Capacity:

For a given chromatographic system and operation conditions, in a certain period of time, at most can wash out a certain resolution number of peaks from the column. The peak capacity depends on board number of chromatograph theory tower and the ratio of the retention time and dead time of the last peak. Increase the plate number of column theoretical tower, improve the column stationary phase volume, reduced the ratio, will make the peak capacity increase.

Efficiency:

Column efficiency's high-low in common chromatographic curves (often called the differential curve) is intuitively showed as peak band concentration or dispersion, high efficiency column concentrate and the peak is narrow, conversely the band diffusion, the peak is wide.

Column efficiency is represented by the plate number n , and the plate number has theoretical plate number and effective plate number, the formula used commonly to calculate effective plate number is:

$$n_{\text{有效}} = 5.54 \cdot \left(\frac{t_r'}{2\Delta t_{1/2}} \right)^2$$

Column efficiency:

Column efficiency refers to the ability of a column restore a compound without the diffusion. The efficiency of the column is a column obtain narrow band and relative ability of improve separation.

Symmetry:**Resolution:**

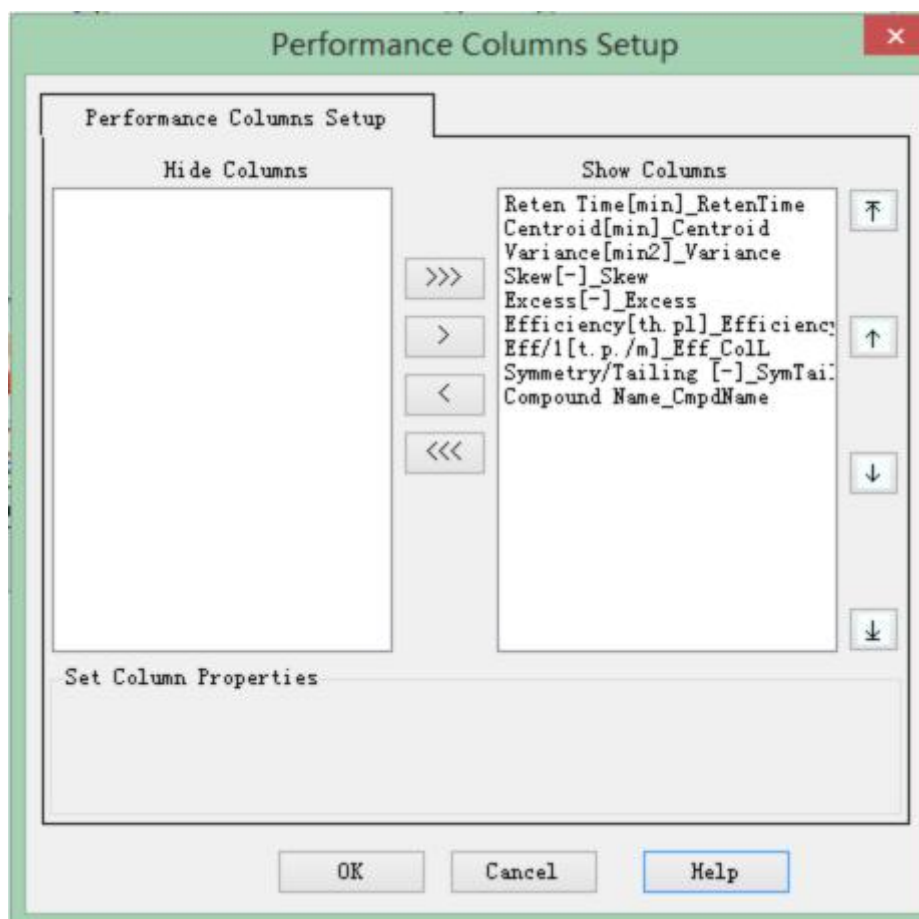
Resolution is the main index to quantitatively describe the mixture of two adjacent components in the chromatographic column's separation conditions. Chromatographic resolution equal to the ratio of the difference of retention values between two adjacent component chromatograph and the half of the sum of the two components of chromatographic peak baseline width: in the formula: $t_R(1)$, $t_R(2)$ were two component retention time; $Y(1)$, $y(2)$ is the corresponding component's width of baseline. The same unit as the retention time. Chromatographic resolution marks the separation efficiency the chromatograph column on a "material pair". The R value is more than 1, two peaks were separated obviously. $R=1.5$, the two peaks completely separately. Chromatographic resolution ratio summed up the dynamics and thermodynamic properties of chromatographic process, makes a comprehensive review on the column efficiency.

Understanding the correlation name and its meaning of "column efficiency calculation", you can select the column efficiency list content according to your own concerns. If you want to adjust the display of information content, click right button in the results list area, the system will pop up the following interface:

Columns Setup...
Restore Default Columns

According to the need, you can select the column setup, restore default columns.

When select column setup, system will pop-up window column settings, as shown below:



You can move the option you concern to "display column" according to their own requirements , move the option you don't pay attention to "hide columns" , click confirm.

When choosing to restore default columns, the system will restore to the column in factory .

5. 2 Analysis Method

5. 2. 1 Normalization Method Operation Steps

- 1, empty the quantitative component table file .
- 2, after sampling, press the start button to start the spectrum acquisition and processing the measured spectrum data samples.
- 3, press the end key to stop sampling.
- 4, save the map file.

5. 2. 2 Normalization Method Steps

1,operating generates component table file according to the "4.6.4.3 making component table file" .

2, put the "component list file" in the **quantitative component**.

3,after sampling, press the start button to start the spectrum acquisition and processing the measured spectrum data samples.

4, press the end key to stop sampling.

5, save the map file.

5. 2. 3 Single Point Calibration (single Point External Standard Or Single Point Internal Standard) Operation Procedure

1,making single concentration level component list file in accordance with the "4.6.4.3 component table file" .

2, put the "component list file" in the **quantitative component** .

3, after sampling, press the start button to start the spectrum acquisition and processing the measured spectrum data samples.

4, press the end key to stop sampling.

5, save the map file.

5. 2. 4 Multi-point Correction (Multi Point External Standard Or More Internal Standard Operation Procedure)

1,making a plurality of concentration level component list file in accordance with the "4.6.4.3 component table file" .

2, put the "component list file" in the **quantitative component** .

3, after sampling, press the start button to start the spectrum acquisition and processing the measured spectrum data samples.

4, press the end key to stop sampling.

5, save the map file.

5. 2. 5 Cooperate Automatic Injector Operation Steps

The gas chromatograph support to connect with automatic injector. The use of an autosampler can be read in the description equipped with autosampler .Chromatograph installed the autosampler instrument in automatic sample state will automatically trigger the software into the analysis of state.

After the automatic injector installation, the sample to be analyzed may be more. So the system can tick "automatic sample" option in the "file naming settings" . At this time generated file name will contain this information, you can easily distinguish the spectral file is which number of samples and of which time sampling of the samples.

5. 3 Report Printing

The system will be based on settings in "4.6.5 print report settings" , print out the results of the analysis report.

When you don't know the report style to be printed , you can click on the **print preview** button, view the report if is satisfying. If not satisfied, can close the preview to continue to adjust; such as satisfaction, press the print.

VI.Data Collector Operation

In order to adapt to the application of other network interface chromatograph,at the same time to satisfied other chromatograph manufacturers' demands, we design and manufacture the **workstation data collector**.

Traditional workstation data collector generally only design 2 analog channels, a RS232 communication connector(or USB connector). Unlike traditional data acquisition workstation is: the collector integrated 10/100M adaptive Ethernet port as the communication interface and a workstation; integrated 3 analog channels; at the same time the collector design RS232 connector, the connector is prepared to countercharge other manufacturers of chromatography .

As everyone know, RS232 communication interface is a communication mode will be eliminated (many computer manufacturers to produce the computer no longer assemble this device); and the USB interface is also known for unstable (I believe you also often encountered plug U rod restart experience); and due to the two communication interface support only point-to-point communication, using this communication mode unable to complete the data processing of multiple instruments at the same time, resulting in a chromatograph need to configure a set of computer to work, and only can process 2 channels of processing of spectrogram data, which not only increase the equipment investment and energy consumption of the laboratory, is not conducive to the spectrum management. Traditional workstation relying on the RS232 interface (or USB interface which reliability is not high) for data transmission is no longer adapt our centralized management, remote data transmission, simplified laboratory configuration requirements.

6. 1 Data Acquisition System Introduction

The data acquisition use the same communication protocol as HZGC-1212A gas chromatograph, may therefore be used with HZGC-1212A chromatograph "combine network". It can achieve the centralized management, remote transmission, simplified laboratory configuration requirements of data.

6. 1. 1 The Characteristics Of Data Acquisition

- Use 10/100M adaptive Ethernet communication technology; high communication speed, support the long-distance data transmission and control;

- Design 3 channel signal interface, convenient application in dedicated workstations (such as: power chromatography); internal design baseline switching flat technology, reach to smooth butt-joint of switching baseline.

- Can finish the $\pm 1V$ (or $2V$) signal conversion.
- support user twice developing and expanse of functions.
- support "end" or "start" operation on the control starting button.

6. 1. 2 Technical Indicators Of Data Collector

- The input voltage range: 3 channel; $\pm 1V$ or $\pm 2V$; 2500V isolation
- integral sensitivity: $0.05 \mu V \cdot s$
- the minimum resolution: $1 \mu V$
- dynamic range: $10^{-7} \mu V$
- linearity: $\pm 0.005\%$
- repeatability: $\pm 0.005\%$
- sampling period: 10, 20, 40, 80, 160 times / sec ,adjustable
- The communication interface 1: 10/100M (communicate with workstations)
- The communication interface 2: RS232 (communicate with other non network port chromatograph; related communication protocol please consult)
- trigger sampling mode: interface mouse, keyboard shortcuts, manual button, needle automatic detector

6. 1. 3 Data Acquisition's Direction

The data acquisition is designed with signal indicating lamp (ch1, CH2, CH3) of channel 1, 2, 3 in the front ; the indicating lamp will indicate the collector to work in which channel. For example, if it is designed with time program, channel 2, 3 will be lighted up according to the time. Indicating method of the indicating lamp is :often bright occasionally goes out, short out means the road of the analog-digital conversion circuit work normally.

In front of the data acquisition meanwhile design a GC, PC, SD indicator light; respectively denote whether connected with GC, PC, SD. When it connect well with the chromatograph: GC lamp will light up, will occasionally go out when communicating; when connecting well with the workstation: PC lamp will light up, will occasionally go out when communicating ; when operating the SD card or U disk, SD lamp will light up, will occasionally go out when accessing ;

6. 1. 4 Data Acquisition Interface

On the back of the data acquisition is designed with: USB interface, the restore button, power supply, network interface, RS232 communication interface, and the 3 analog signal interface, the 2 starting switch interface.

The power interface input by random micro power adapter insert.

3 analog interface are used isolation technology (not sharing ground), can directly access $\pm 2.5V$ chromatographic signal.

Warning: do not connect other models of power adapter to the local data collector.

To prevent burn!

Warning: analog signal accessed can not be more than 5V! Access will cause permanent damage!

6. 2 Data Collector Installation

6. 2. 1 Access Network

① Amend the IP address of the computer which installed pre-installed workstation as: 192.168.18.200 or 192.168.18.199 or 192.168.18.198; the subnet mask is 255.255.255.0; the gateway is: 192.168.18.1;

② Install the NetChrom workstation on the computer (if has installed, skip the installation), double-click the NetChrom workstation icon to run the NetChrom workstation ;

③ Directly connect the network computer and data acquisition (with random distributed cable one end is connected to the computer network, the other end access data acquisition network port);

④ Connect the power of data collector. Will hear the startup sound, at the same time will see the lights are lit;

⑤ If the equipment is normal, "equipment management" in the workstation will generate a color icon (indicates that online normal. If waiting for color icon seconds still does not appear, please check the network parameters of computer).

⑥ Double click the color icon, check the network parameters of chromatograph in "network / version" of the "instrument setting". You will see the data collector's default network parameters: IP address: 192.168.18.10; subnet mask: 255.255.255.0; gateway: 192.168.18.1. Complete this step, you can modify the network parameters of the data collector!

6. 2. 2 The Modification Of Network Parameters

Because the data collectors when in the factory the IP address are all 192.168.18.10, while in the LAN IP address can not be conflict (the same), so when you run **multiple** data collector in a local area network, you need to modify the network parameters of the data collector firstly.

① According to the distribution of your IP address (for example: set the data acquisition device 1 IP address for: 192.168.18.21; data collector 2 IP address for: 192.168.18.22; data collector 3 IP address for: 192.168.18.23; data collector 4 IP address for: 192.168.18.24; and so on) and the local supervisor, business supervisor, the allocation of the IP address of the supervisor, enter the corresponding parameters in network

parameters , workstation network parameter information box of the chromatograph, click Set to input.

Note: this setting should be after all information are completely revised, approved to be correct , then press Set to input! This is because: when you press the set, the data collector will restart parameters according to your new setting! If you set is not correct, it may not connect to your workstation, you will not be able to operate the data collector!

Note: when you cannot know the internal network parameter data , can perform a reset operation, to restore the factory value!

② Press Set to modify the network parameters, turn off the NetChrom workstation , and restart. The data collector is again connected to the workstation, check whether the network parameter is the value you set. If correct, record the network parameters values . Repeat the steps above to modify of network parameters of other data acquisition. After network parameters of data acquisition are modified (each is given a **different local IP address!**) , you can connect all the data collector to HUB, switch or router access .

③ Connect all the data acquisition to network , power up in turn, and observe the connection is correct or not. When the IP address conflict, you can see chromatograph icon frequent on-off!

6. 2. 3 Data Acquisition System Restore To Factory Value

When you are unable to know the internal network parameter of data acquisition , can perform a reset operation, to restore the factory value!

- ① Unplug the power plug of data collector;
- ② Press the restore button does not let go;
- ③ After connect the power supply plug of data acquisition (after 2-3 seconds), loosen the restore button, the will restore to factory value.

6. 2. 4 Data Acquisition Network Parameter Query

Beside the method above to check the network parameters, you can also use the gorgo tool to check:

- ① find a computer with RS232 communication interface ;
- ② Connect the RS232 communication to the connecting computer and data acquisition;
- ③ Open the SSCOM32 software; the software in the random software "software"; icon as shown below:



- ④ Open the software, will display the following interface:



Select the serial port number you used (such as: com1, com2, com6 and so on, which will be based on the computer hardware configuration , if this computer has no RS232 serial port, you cannot choose); the baud rate is 38400, the data bits is 8, stop bit can be 1, 1.5 or 2 , check bit is none, flow control is none; open the serial port; remove the hook in front of the HEX display ;

① switched on the power of data acquisition , data receiving window of SSCOM32 software will display network parameters of workstation, as shown below:



② Based on this information displayed, you can re using 6.2.1 and 6.2.2 methods to modify the network parameters of the data collector.

6. 2. 5 Data Collector Installation

When you have finished the modification of the network parameters mentioned above, you can install data collector.

① Connect respectively the analog output channels of other chromatograph without network interface to than the1, 2, 3 channel of data collector ;

② Connect one end of the random distributed cable line to the network port of data acquisition, the other end to the computer network (if use single data collector, and the computer needn't to use other network source, such as surf the Internet) or switch machine; when connect to switch machine, computer cable line also use the same method to access the switch machine.

③ Start the NetChrom workstation; power on the data acquisition ;

④ Move the teleswitch to where is convenient for you;

⑤ Check whether on-line is normal, baseline is normal, remote starting sampling is normal. If not normal, check according to the above method.

⑥ Waiting for chromatograph boot normal, sample test, observe whether the peak is normal. If all the chromatographic peak are inverted peak, either in the chromatograph switching polarity, either on a NetChrom workstation switching polarity, or the 2 signal line of the analog output interface can be reversed.

Note: when connecting analog signal line, pay attention to check the signal grounding and the instrument grounding! Don't take the wrong!

6. 2. 6 The Selection Of Measuring Range

The data acquisition support users to select the full measuring range value : $\pm 1V$ or $\pm 2V$. When choosing $\pm 1V$, will enable the system noise is smaller; when the choosing $\pm 2V$, will makes the system has wide measurement range.

In NetChromTM workstation,select range , press **set**. As shown below:



6. 3 The Use Of Data Acquisition

The use of this data acquisition is basically equal to the data acquisition of other workstations

6. 3. 1 Stating Sampling

Click remote switch of data collector, will start data acquisition of the channel.

Note: in the sampling condition, invalid.

6. 3. 2 The End Of The Sample

Double-click remote switch of data acquisition, will be the end of the channel data acquisition.

Note: in the non - sampling condition, invalid.

6. 3. 3 Countercharge Connection With Other Chromatograph Control Please consult the manufacturer.

6. 3. 4 Using U Disk For Data Acquisition

Data acquisition of general configuration does not support U disk, SD card operation. If you need this function, please consult the manufacturer.

VII.Maintenance Of Equipment

7. 1 Clean The Injector

The injector is easy to pollution, especially the generatingtube, it is more important to clean the sample injector, injector generatingtube can be directly worn wash by the solvent cotton balls, after worn wash blow with the air flow (mainly blow out of cotton fiber and dry solvents), and install the vaporization pipe gasket and seal nut.

7. 2 The Cleaning Of Hydrogen Flame Ionization Detector

Removable FID cover, remove the electrode and the insulating washer, cleaning and drying cover, electrode and insulating washer with acetone or alcohol. If the pollution is serious, can put the parts to be cleaned in ultrasonic cleaning liquid, after ultrasound, rinse with water clean and then cleaned with alcohol and drying. If it is stationary liquid contamination detector, select solvents can dissolve the stationary liquid to dissolve.

7. 3 Installation Of Chromatographic Column

7. 3. 1 Packed column installation

Packed column's installation on the injector and detector is similar. One end of injector of packed column should be set aside an empty column enough (at least 50mm), in case that the syringe needle inserted reach to glass fiber or column packing filled in end-column ; at other end of the detector, should also leave an empty column enough (at least 4mm), to prevent the nozzle end reach to glass fiber and packing filled in the end-column. As shown in figure 6.1:

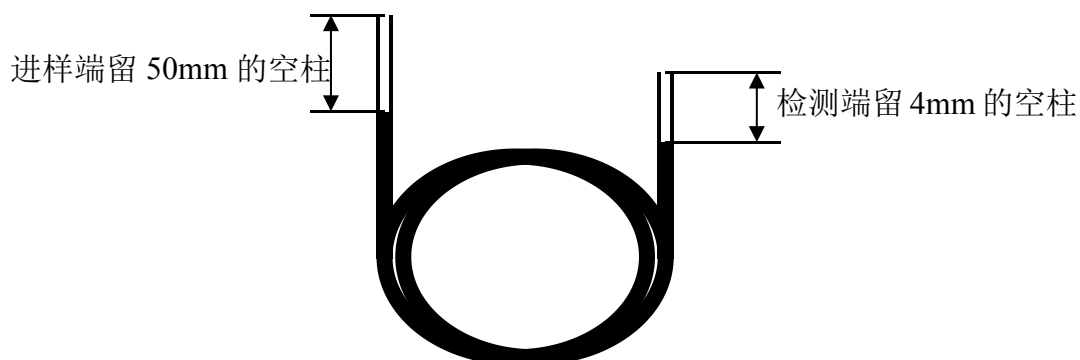


Fig. 6.1 schematic diagram of leaving empty pipe of both ends packed column

Because of the rigidity of glass, glass packed column must be installed at both end of the injector and detector . Installation program at each end is the same, installation of the end of detector please consult the corresponding section according to detector you used.

HZGC-1212Agas chromatograph's $\Phi 3$ 、 $\Phi 4$ mm packed column are connected to injector connections.

Installation steps are as follows:

- 1) Embolia theM10×1 $\Phi 3$ mm diameter column nuts on both side of the column ;
- 2) Install $\Phi 3$ mm graphite ring on both ends of the column with diameter, and then install screened pip with corresponding inner diameter . Upward into the detector at the bottom (to push the end), tighten the nut;
- 3) The ends of injector should adjust chromatograph column's high-low according to the specific requirements, tighten the nut;
- 4) Use neutral soap to check leak, leakage phenomenon is not allowed;
- 5) Dry soap lye;
- 6) $\Phi 4$ mm column installation steps is the same as above;

Note: the sampling side of the packed columns should keep empty pipe of about 50mm length , con't go so far as to meet difficulty in sampling, the sampling end of chromatographic column can't be mixed up with detector , should make a mark when filling parked column. At one end of detector , should also leave an empty column enough (at least 4mm), to prevent the nozzle end contact to fill in the column end glass fiber or column packing.

7. 3. 2 Capillary column installation

Fused silica capillary column is structured, don't need to be neatened. But on the ends of the column should be newly cut , glabrous, edge neat, get rid of particulate matter from column, stationary phase, sealing gasket, these are very important.

Therefore, column end need to be new cut, with a suitable glass cutting tools, to scratch on the part will be cut. Generally first install column nuts and washers ,then cutting.

Note: wear protective glasses to prevent the flying particles produced by cutting glass or fused silica capillary column from damage your eyes. should also be careful to prevent skin injuries when disposing capillary column . Because the pillar has quite rigid, therefore in the treatment of capillary column, to pay attention to these very important.

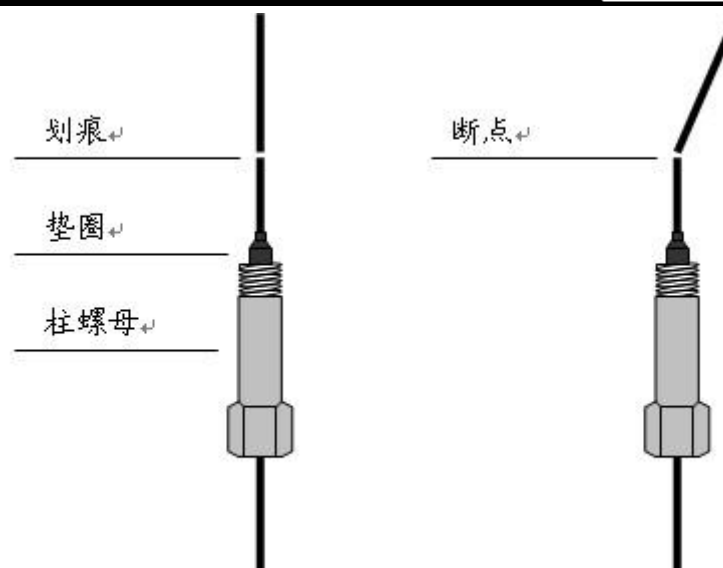


Figure 6.2: preparation of fused silica capillary column

Capillary columns roll around the metal box, this frame hanging on capillary column frame in the column. The hanging position depends on the diameter of the diameter, you'd better put the column in the central column box. Both ends of column extend from the bottom of frame, smoothly curved toward the injector and detector interface interface, don't let the column touch any part of the inner wall of the column box. Graphite gasket through the column may pollute the column, can cut ends of column according to description in the "prepare fused silica capillary column".

7. 4 Maintenance Of The Gas Purifier

In flow path control system, connected with a filter, which is arranged with 5A molecular sieve. 5A molecular sieve needs to be replaced or activation timely. Activation temperature is 260 °C, time is 24 hours.

VIII. Bug And Exclusion Of Instrument

8. 1 Boot Problem

8. 1. 1 Boot no response

Fault judgment	Methods of examination and repair
problem of electric supply	Check the power supply
blown fuse	Check fuse, and replace
Display does not light	Check the display panel

8. 1. 2 The boot is not initialized

fault judgment	methods of examination and repair
Power supply board problem	check +12V、+5V、+15V、-15V on power supply board
Electrical component RS485 problem	demolish the signal board in turn, one by one to eliminate signal board problem
Display panel RS485 problem	demolish the display board in turn, excluding signal board problem

8. 1. 3 Not online

fault judgment	methods of examination and repair
Cable problem	Check the cable, at the PC PING the GC
IP address setting error	Check the IP address, set the correct
Computer operating system firewall blocking	Cancel the firewall
Computer anti-virus software blocking	Cancel the antivirus software to block
Computer network or chromatograph indicator light does not shine	Check the cable, switch, instrument or computer
online but break for a while and then connect for a while	Check whether the network and IP address conflict

8. 1. 4 But don't go online baseline

fault judgment	methods of examination and repair
Monitor signal board fault 1	Check whether the recognition to the detector in GC
Monitor signal board fault 2	check whether the detector signal is normal in the GC
Monitor signal board fault 3	check whether the detector plate number of the same type is set to repeat

8. 2 Chromatographic Peak Problem
8. 2. 1 No baseline

fault judgment	methods of examination and repair
Install test board without	check whether inspection board is installed
Detection of fault	change the inspection board
Baseline and background color set to the same color	change the color
The sampling rate is not correct	Modification of the sampling rate (20 / sec)
The chromatograph and computer is not online	Check the network and network parameters

8. 2. 2 No chromatographic peak

fault judgment	methods of examination and repair
sample injector temperature too low	raise the temperature of sample injector
Injector clogging	change injector
Amplifier power off	check the amplifier
No carrier gas through	check whether carrier gas flow road is blocked, the cylinders run out
Silicon rubber leakage	change silicon rubber
no fire	light
FID polarization voltage connecting badly	Eliminate polarization voltage connected bad phenomenon

8. 2. 3 Normal residence time and sensitivity decreased

fault judgment	methods of examination and repair
sample injector leakage	change sample injector
The sensitivity of the improper selection	select proper sensitivity
The carrier gas leakage	Leak hunting and make corresponding processing

Hydrogen and air flow selected improperly (FID)	adjust their flow
Detector without hypertension (FID)	fit on high voltage

8. 2. 4 Peak tailing

fault judgment	methods of examination and repair
Sample tube polluted	clean the sample tube
The chromatographic column temperature is too low	raise the temperature of chromatographic column
Sample temperature too low	raise the temperature of sample injector
The column selection	choose proper column

8. 2. 5 peak fronting

fault judgment	methods of examination and repair
The volume of goods is too large	reduce the volume of goods
Sample agglutination in the system	improve the column temperature first, and then select the proper sample injector, column, detector temperature

8. 2. 6 Chromatographic separation is not good

fault judgment	methods of examination and repair
column is too short	choose longer column
Loss of stationary liquid	Change the column or aging chromatographic column
The column temperature is too high	reduce the temperature
incorrect selection of stationary liquid	choose proper column
The carrier gas flow rate is too high or too low	adjust the flow of carrier gas

8. 2. 7 Flat peak

fault judgment	methods of examination and repair
The input of the amplifier saturation	Reduced sample volume, reduce the amplifier sensitivity
The recorder zero position changes	Check the recorder zero position and make corresponding processing

8. 2. 8 Baseline mutations

fault judgment	methods of examination and repair
External electric field interference	To eliminate the effect of external electric field interference the normal operation of the instrument
Bad contact plug	The power supply socket is installed firmly
Hydrogen, the improper selection of air flow	Flow adjustment to hydrogen and air

8. 2. 9 Constant temperature operation with irregular baseline fluctuation

fault judgment	methods of examination and repair
Position of instrument installation is not good	install instruments in where has no strong vibration, the best to put instrument on the cement without vibration.
Instrument grounding is not good	inspection and do well grounding
incorrect selection of stationary liquid	select the appropriate stationary liquid
Improper choice of carrier gas flow rate	adjust the flow of carrier gas properly
the carrier gas leakage	leak hunting
detector polluted	clean the detector
the improper selection of hydrogen and air (FID)	Appropriately adjust regulation of hydrogen, air flow

8. 2. 10 Prolonged retention time of low sensitivity

fault judgment	methods of examination and repair
the carrier gas flow rate is too slow	increase the flow of carrier gas
the change of carrier gas flow rate after sample	change the silicone rubber of sampler
the silicone rubber of sampler leaking	change the silicone rubber of sampler

8. 2. 11 the signal suddenly back to below baseline and fire died out when peaking

fault judgment	methods of examination and repair
quantity of sample is too large	reduce the quantity of sample
the flow rate of carry gas is too fast	choose proper rate of carry gas
flow of hydrogen and air is too low	re-adjust the flow of hydrogen and air
flame ejector polluted	clean the flame ejector
stationary liquid in chromatographic column run off	re-aging the chromatographic column

8. 2. 12 Baseline does not return to zero

fault judgment	methods of examination and repair
detector polluting	clean the detector
amplifier break up	check the amplifier

8. 2. 13 Irregular distances have Spikes

fault judgment	methods of examination and repair
insulator leakage	leak hunting and do corresponding processing
amplifier break up	eliminate impurities in flow path
flame beating	adjust proper flow rate of hydrogen and air
high frequency signal wire break up	check high frequency signal wire
detector has dust	use auralave to blow away

8. 2. 14 At equal intervals in a certain burrs

fault judgment	methods of examination and repair
water congealed in hydrogen path	clear up water from the path and changing or active the desiccant
clogging in flow path	eliminate impurities in flow path
gas leakage	leak hunting and do processing of sonorant
flame beating	adjust proper flow rate of hydrogen and air

8. 2. 15 Round peak

fault judgment	methods of examination and repair
beyond linearity rang of detector	reduce amount of sample
select amplifier improperly	reselect proper amplifier

8. 2. 16 Baseline noise is large

fault judgment	methods of examination and repair
the column polluted	change column
carry gas polluted	change or rebirth carry gas filter
the flow rate of carry gas is too high	re-adjust the flow rate of carry gas
grounding badly	check and do well grounding
high resistance polluted	clean the high resistance
injector polluted	clean the injector tube in injector
the rate of hydrogen and air is too high or too low	re-adjust the rate of hydrogen and air
hydrogen and air polluted	change hydrogen or air filter
water congealed in FID	raise the temperature of FID to remove

	water
high frequency signal wire break out	check high frequency signal wire

8. 2. 17 Additional peaks

fault judgment	methods of examination and repair
high resistance peak of the last sample	to sampling after the last sample has all slipped out
water condensate in chromatographic column and then output the peak	the operation conditions of install or rebirth purifiers should be selected proper
Sample decomposition	Lower the injector temperature
Samples contaminated	Ensure a clean sample

8. 2. 18 Zigzag baseline

fault judgment	methods of examination and repair
Steady flow valve diaphragm fatigue	Change or repair the valve diaphragm
Cylinder valve output pressure changes contained	Reduced pressure regulating valve set at another location
Improper air flow	Reset the flow of air

8. 2. 19 Anti-peak

fault judgment	methods of examination and repair
Excessive hydrogen stream (FID)	Hydrogen flow adjustment
Positive and negative switching mistake	Changing the sign switch to the correct position
Reference cell and measuring cell tungsten wire mistake (TCD)	Check the reference cell and measuring cell tungsten wire situation.

8. 2. 20 The baseline sample did not change in one direction (FID)

fault judgment	methods of examination and repair
Detector temperature is too low	Detector temperature increase
Spectrum column stop runaway warming or out of control	Temperature control system and overhaul platinum resistance heating wire
Leak	Leak detection

8. 2. 21 Baseline drift in one direction

fault judgment	methods of examination and repair
Substantial change in the detector temperature	Detector temperature stability
Zero Drift Amplifiers	Maintenance amplifier components
Substantial increase or decrease the column	Column temperature stability
leak	leak hunting

8. 2. 22 When the temperature changes from baseline irregular

fault judgment	methods of examination and repair
Excessive column bleed	子 Select the appropriate column, use the column should be much lower than the fixative highest temperature, aging pillars
No choosing the appropriate operating conditions	Select the appropriate operating conditions
Column contamination	Replace the column

8. 2. 23 Cyclical fluctuations in the baseline

fault judgment	methods of examination and repair
Detector Thermostat bad	Check the contact is good
Carrier gas flow pressure is too low	Replace the carrier gas cylinder

Column oven temperature improperly adjusted	Check the platinum resistance contact is good
Improper carrier gas flow regulator	Readjust the carrier gas flow rate
Air, hydrogen improperly adjusted (FID)	Readjust hydrogen, air flow rate

8. 2. 24 After the programmed temperature change from baseline

fault judgment	methods of examination and repair
Temperature rises, the column bleed increases	Select the appropriate column or aging column
Column flow is not good correction	Correction column flow
Column contamination	Replace the column

IX.Maintenance Of Thermal Conductivity Detector

9. 1 Thermal Conductivity Detector Precautions

In TCD detector during use, must pay attention to and comply with the following

- There is no pass into the carrier gas stream prohibition set bridge to avoid tungsten burn accident.
- Initial aging pillars, do not access the post-column carrier gas thermal conductivity, the column should be directly vented box; aging can not use hydrogen! ! Generally with nitrogen. There is absolutely prohibited during aging bridge current settings.
- thermal conductivity detector is a precision part, do not disassemble pool vivo tungsten wire, so as to avoid unnecessary losses.

9. 2 Thermal Conductivity Detector Failure Analysis And Troubleshooting

9. 2. 1 sampling but no peak output

fault judgment	methods of examination and repair
Not set current	First set the current
了 Tungsten broken	Replace tungsten wire
TCD thermal conductivity internal connectors and power supply unit cable is not plugged in	Re-plugged the associated plug socket
Syringe leakage or blockage	Replace the syringe
Silicone rubber leak	Replace silicone rubber

9. 2. 2 Signal amplitude is too large (not injections,)

fault judgment	methods of examination and repair
Tungsten touch the body wall	Contact factory for repair
Tungsten resistance mismatch	Contact factory for repair
TCD thermal conductivity internal connectors and power supply unit cable is not plugged in	Re-plugged the associated plug socket

9. 2. 3 Baseline noise is large

fault judgment	methods of examination and repair
Impure carrier gas (carrier gas purity is very important)	Before making the carrier gas such as oxygen purification and drying
Thermal conductivity contaminated	Cleaning the cell body and injector
Column unaged	Re-aging column.

Silicone rubber leak	Replace silicone rubber
Air system and column connections with leak	Leak detection detect leakage Department, handled accordingly.
TCD running current settled is too large	Reduce the operating current setting to an appropriate value.
Thermal conductivity unstable power supply	Contact factory for repair

X.Precautions

High voltage risk:

- In equipment operation, it is strictly prohibited to remove the cover plate cover. In instrument operation, high voltage instrument internal may lead to personal injury, removing the cover plate may make some electrical components exposed.
- When replacing fuse and disassembling and maintaining equipments, you should unplug the power plug first . Turning off the power switch instrument is just to stop instrument operation, the high voltage won't be cut off completely.
- If electric wire is worn-out and damaged, you must replaced it immediately .

High temperature risk:

- After a period of time the instrument work or shutdown, the sample injector, detector, column box and outlet component of the instrument will have sufficiently high temperatures, you should avoid contacting with it to prevent burns. If you need replacement components of a machine, please wait until the instrument temperature decreases or the use of protective measures !
- Please pay attention to the hot gas that the instrument cooling system exhausting, prevent scald injured.
- Combustible material should not be placed behind the instrument, or the hot gas that the instrument cooling system exhausting may light the combustible material.
- The gas pipes as polyethylene should avoid to be placed behind the air outlet of the instruments , hot gas them exhausting may melt the gas pipes and cause greater dangers!

Air supply risk:

- For gas cylinders and air source of instruments, you should observe the relevant regulation when transport, storage and manage gas cylinders .
- when using hydrogen as carrier gas or FID gas, you should pay attention that hydrogen may flow into the column box and cause explosion. So you should turn off the gas supply before the pipeline is connected .You couldn't open the hydrogen source until you have installed the joint column ,connected the joint of injector and detector and chased leaks all the connection pipeline and valve leaks to prevent hydrogen leaks into the post box and cause explosion.

- when analysing special sample (such as toxic substance), the instrument may discharge toxic substances. You should discharge toxic substances into safety place of outdoor, to prevent indoor pollution and poisoning.

Appendix A Electric Equipment Conditions Rules

A qualified electrical technicians should be able to send the right power to the system. No matter to transform electrical equipment existing or install new equipment all require so.

- * estimate the region's total electricity demand.
- * assemble more convenient output line.
- * draft program for electrical safety.
- * to ensure all wiring in accordance with local regulations.

Determine the demand of power

Calculate area of electricity you require.

Note: the total quantity of electricity including the original equipment and equipment when plan will be extended needed to increase later.

Voltage limit

In any instrument installation location, when the system has delivery of current supply phase -central line voltage both shall remain in the rated voltage of the +10% ~ -10% range, to measure voltage from the power input side of system.

Frequency limit

the circuit frequency limit allowed depends on device whose range of limit is the narrowest in the system(measure it from the power input side of instrument).The limit of HZGC-1212A network gas chromatograph is very wide, can be operating in the 50Hz to 60Hz range.

Harmonic wave quantity

The highest total amount of harmonic wave of Instrument feeder line is not more than 5% (instruments into power after the power input of a measuring instrument).

Unexpected condition of power

In some areas, power line used by instrument system may appear excessive voltage drop phenomenon, or impulse voltage, transiently changing voltage, interruption of power supply or other unforeseen circumstances, in this way, instrument system operation is not reliable. Therefore, must check the quality of power supply. If there are some projects that do not meet the system requirements found during inspections, which should be corrected.

Current source noise

The structure designed of HZGC-1212A network analysis instrument is able to tolerance reasonable noise from input line. But many noise from other electric public program HZGC-1212A network analysis instrument is unable to control. The main source

of the electrical noise is from other electrical equipment nearby, such as motor, electromagnetic valve, silicon controlled rectifier and X-ray machines.

In addition, it may also be due to the poor connection of the midline caused by "midline -- landing noise" and the "landing -- landing" noise caused by the poor connection of landing of floors. The largest wire noise allowed is 3V (rms), from 30Hz to 50Hz.

Can use an oscilloscope to measure small voltage of "ground-- the midline", because, if the voltage is distorted deviation, the indication on the analog gauge outfit will be distorted. Generally speaking, it is a problem if the voltage is lower than the measurement results.

Noise elimination

If you want to eliminate the noise of the existing electrical equipment or the electrical equipment will be installed in future, we insist on such advice that install a qualified feeder between the main deployed switchboard and switchboard distributed by instrument. To check the line contact and the landing is good (see below section "landing").

If after install qualified feeder, there are still poor transiently changing phenomena, it would have to install a device which can reduce the input electrical noise.

The interference of power source

Both the power source noise that can disturb the power output and the power source noise that can disturb signal line input in the system will cause the dysfunction of the instrument system. These input disturbance can be classified into shock, pressure drop and transiently changing, now severally account below: "shock" and "fall" is a sudden change of negative and positive value of the input voltage, the last time is in 5 milliseconds. Generally speaking, the "shock" and "fall" should not be beyond about $\pm 15\%$ of normal rated line voltage, and recover to steady state in 17 ms (60Hz) to 20 ms (50Hz).

"The power source voltage transiently changing" is the positive and negative value of input voltage suddenly change, the duration is between 1 ms and 5 ms. If the transient time is larger than 20% of rated voltage (depends on its energy) will cause the dysfunction of instrument.

In monitoring the quality of input power and evaluating the characteristics of interference, a power source input disturbance monitor is very useful. Because interference of power line may happen every hour, every day and every week, so the monitor should be connected at least one week. Don't consider the measured results as an absolute value, because of seasonal changes, the interference value will be different.

The test method is the using spiked peak signal with 0.5 microseconds of rise time and 10 microsecond of impulse duration, the amplitude is two times of the power source voltage.

Power processing equipment

If after install specified feeder and landing, there still have transiently changing phenomenon, then equipments which can reduce the interference of input power line should be installed. Device can fulfill the task basically has four kinds:

1. isolation transformer
2. The power source voltage regulator
3. The motor --generator equipment
4. uninterrupted power supply system

Circuit conditioning equipment must meet the needs of current and future. The lowest rated value my factory recommended is 5KVA, which can meet the requirements of now, also can meet the requirements of future expansion.

Appendix B landing

In order to make the instrument can run safely and reliably, the good landing of equipment is very important. Generally speaking, most countries and regions require to install earth wire for electrical equipment, to ensure personal safety.

Safety landing

Various standards generally require to install safety conductor for electrical equipment. In these standards generally have such requirement : each live wire (midline) must be accompanied by a security of conductor. Size of safety conductor must be the same size with live wire.

Generally , safety standards all require to connect the safety conductor to electric surface of electrical equipment that operation staff may touch, or to electric surface that may be inspired due to electrical accident . Under normal operating conditions, the wire should not contain reverting AC. If the instrument frame didn't landing, or live wire infrequently touch the frame, the voltage on the frame is likely to reach a certain level of harm.

Connect the safe earth wire to the batholith of instrument can avoid the danger of electric shock, because in this way, it forms a very low impedance return circuit, it will make the plug-in strip of circuit tripping or fuse burn down. Every instrument should have safety landing device, as long as to connect the instrument to joint with earth wire, or connect the landing ring in the instrument to earth wire according to the specifications customer required, this return circuit is finished.

As described below, safe earth wire in instrument is usually connected to the catheter of the building through the insulating landing device ,in this way, conversely make power distribution of circuit landing. In any case must conform to the local and national safety regulations .

Safe earth wire must be properly connected to the terminal of total distribution earth generatrix. Generally we should know that, the earth wire impedance from any load return to earth generatrix must be less than 11 ohm.

No noise landing

In order to make the HZGC-1212A network equipment running in good condition, we insist on adopt no noise landing device. This landing is also called "insulated landing", because it is apart from other electrical landing device in the building. When connecting the HZGC-1212A network instrument and other instruments, the use of "insulation ground" will help to keep the reliability of system.

In most cases, common landing can not meet requirements, because this landing device could not bring in non noise that caused by the bad landing. Noise may also come from radio broadcaster, this earth wire may also take common steady current.

Typical landing condition of easily produce noise are shown as following:

- 1, the catheter
- 2, the roof and the crossbeam of building.
- 3, a sprinkling pipe (connecting earth wire to these tubes is not allowed by most fire codes).
- 4, enhance the supporting structure of the floor.
- 5, the coal gas pipe

Connecting earth wire to these tubes is very easy to be impacted by the noise from buildings due to poor landing, at the same time, because effect by the antenna, they will also received power frequency interference.

Things can landing are as follows (should consulted to the local appliance inspecting department, select a landing method can be received locally):

- 1, connect a suitable size wire to fore-overman wire of the building or to the place that the chief catheter get into ground.
- 2, drive the long nail for landing into wet soil and connect to place that it get into ground.
- 3, can also connect to other reliable place that getting into ground.

Insulated earth wire must be firmly connected to the device. Do not use the clip to clip the earth wire to the pipe or landing pole. Don't use other methods that will loose joints to connect. Joint must be brazed or soldered, to reduce the grounding connector insulation resistance increasing as far as possible. If it doesn't installed improperly, You can measure the resistance at the joints, and with resistance on earth wire, potential that we don't want will emerge on insulation landing device. When install earth wire, you should prevent it connect to other earth wire, this will bring bad influence to insulation. Insulated wire must be connected to isolated bus switchboard, and then severally connected to each unit in instrument system on the switchboard through joint and power source earth wire. Insulated bus can be composed of landing board on switchboard.

Wire sizes used should make the landing resistance from the farthest point to the main switchboard landing place minimum. Please consult size of wire to be used with local electrical inspection departments.

When installing power grid processing device in the multilayer building , you should connect the shell of power grid processing device with rebar in structure of building , so as to reduce landing noise. One end of the earth wire shall be connected to shell of power grid processing device, the other end should be welded on the vertical beam steel of the nearest building. Connect the earth wire to the rebar of building is better than connect it to the individual landing column in basement.

Midline - earth wire connection quality

In market you can buy several special device used for measuring the quality of landing system . These devices include grounding detector,used for guiding the current in earth wire, and then test, and can indicate the landing quality (display lamp or scale represented by ohm). An other kind is earth tester, used for measuring the resistance of landing system.

If the grounding impedance is too high, should check several projects. If haven't installed grid processing equipment and no specified landing device,you should check the connection of the building total distribution panel middle wire - earth wire (N - G) is good or not, if you have installed the wire path processing equipment, also should check again the N - G junction of wire path processing device . If the place where install the N- G connector was not appropriate,you should move it to right position, because if the position is not correct, unwanted currents will emerge on earth wire.

Should check the connection of the grounding conductor is good or not. If the sizes of earth wire is smaller than wire on circuit, or, if the earth wire is not insulating, we suggest to change it to insulated wire which size is the same as the wire in circuit.

The negative charge balance

The negative charge balance in using three-phase and split phase is very important. Because:

- Can reduce the adverse effects produced by external voltage drop and the voltage change to the equipment that the individual transformer drive.
- can improve the performance of insulative transformer.
- can prolong the service life of transformer.

Unbalanced negative load can generate voltage difference between the center line and the earth wire. Measuring the voltage can know if the negative load is balance. In balancing negative load, you need to use a clip-on ammeter. You should first measure every current, and then remove the power line from the instrument system , then rearrange the negative load, and then measure again. To repeat the process, until the current dropped to the lowest value.

Measuring voltage difference between midline and earth wire can also be used to verify if the negative load is balance. After sent power to the instrument, to measure the voltage difference between the midline and earth wire on input terminal of instrument power source with a oscillograph. The connection of earth wire clip probe is shorter is better. Move the power wire off the switchboard in system , rearrange the negative load, and then repeated measurement. Repeated this procedure, until the voltage of middle wire- earth wire reduce to a minimum value.

In balancing other negative load of feeder, middle wire - earth wire voltage may be further reduce, or when increasing the size of the feeder, it will fall down too. If the voltage of middle wire--earth wire in switchboard of system is too high, then hang out a special feeder from the total switchboard .

Appendix C HZGC-1212A Accessories

No.	Name	Specification	Quantity
1	Gas Chromatograph Host + FID Detector + TCD Detector	HZGC-1212A	1
2	Pneumatic nut	M8x1 Φ3.2	8
3	Pressure reducing valve connector		3
4	Column nut	Φ4.2	2
5	Stainless steel air line lining	Φ2x30	10
6	Air circuit gasket		10
7	Vaporization pad		20
8	Graphite pad	Φ3.2	6
9	Graphite pad	Φ4.2	6
10	Graphite pad	Φ5.2	4
11	Fuse tube	2A 10A	Each2
12	screw	M3x5	5
13	Polyethylene gas pipe	Φ3	20
14	Electronic fire gun		1
15	battery	5#	1
16	7820 packed column vaporization chamber liner		2
17	7820 "O" ring		4
18	Screwdriver (flat)	50mm 70mm	Each1
19	Screwdriver (cross)	50mm 70mm	Each1
20	Drain wrench	8-10	1
21	Drain wrench	12-14	1
22	Drain wrench	14-17	1

23	Sharp nosed pliers		1
24	Combined ground		1
25	Signal line		2
26	Electronic key		1
27	Certificate		1
28	Test Report		1
29	Instruction manual		3