Note

This manual only applies to GC112A Model Gas Chromatograph, excluding large diameter capillary direct injector, capillary split injector, capillary cold column injector, and six-way plane switching valve, reformer, cracker, deaerator and other accessories. If you use these accessories, the corresponding manual will be attached in the package.

A & E Lab (UK) Co.,Ltd

Table of Contents

GC112A Product Standard Code: Q/YXLZ39

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1 Principles, Applications and Features

1.1 Principles

The gas chromatograph uses gas as the mobile phase (carrier gas). When the sample is "injected" into the sampler by the micro-syringe, it will be carried by the carrier gas into the capillary column. As the distribution or adsorption coefficient difference of the components of the sample in the chromatograph mobile phase (gas phase) and the stationary phase (liquid or solid phase), with the flushing of the carrier gas, the components in the two phases are repeatedly distributed, therefore, the components are separated in the column. Then, according to the physical and chemical properties of components which are connected to the detector in the back of the column, the components will be detected one after another.

1.2 Applications

The instrument is suitable for trace detection of environmental protection, air and water pollution, analyzing poisons, monitoring and research, biochemistry, clinical application, pathology and virus research, food,

petrochemicals, petroleum processing, oil analysis, geological , prospecting research, organic chemistry, synthesis, quarantine, and analysis and research of pollution detection.

1.3 Features

- Full-color large 7-inch LCD touch screen, with better human-computer interaction.
- High precision temperature control system, high control accuracy (better than ±0.05℃); the oven has a nine-order program preheating ;
- Manual flow / pressure adjustment, the screen shows the flow / pressure value;
- Gas leakage, lack of gas alarm function;
- System self-test, and fault recognition.

2 Technical Indicators and Specifications

2.1 Technical Specifications

Oven Temperature Control Indicators	
Temperature range	5℃～400℃/15℃～399℃ above room temperature (increment: 1℃)
Temperature accuracy	better than ±0.1℃(measured at 200℃)
Program temperature	9-orderprogram preheating
Rate setting	0.1℃～40℃/min (increment: 1℃), measured at 200℃
Constant temp time	0～999min (increment: 1℃)

Sampler, Flame Ionization Detector (FID) Indicators	
Temperature range	15℃～399℃ above room temperature (increment: 1℃)
Temperature accuracy	better than ±0.1℃(measured at 200℃)

Flame Ionization Detector (FID)	
Detection limit (Normal hexadecane in isooctane)	GC112A
	$D \leq 5\times10^{-11} g/s$
Max. limit temp	399℃
Baseline noise	$\leq 5\times10^{-14}$ A
Baseline drift	$\leq 6\times10^{-13}$ A

2.2 Specifications

	GC112A
Dimensions	568mm×560mm×490mm
Weight	40Kg
Power supply voltage	AC220V±22V，50Hz±1Hz

2.3 Optional Accessories

The basic type of GC112A gas chromatograph has following components, including chassis, capillary column injector, a full set of capillary column carrier gas and auxiliary gas path, computer temperature controller, flame ionization detector and micro current amplifier, general purifier, cylinder pressure reducing valve, and the connecting cable of the exterior gas pipeline.

- GC112A gas chromatograph 1 pc
- Operation Manual 1 pc
- product warranty card 1 pc
- Accessories and spare parts (see Packing List) 1 set

The following accessories of Model GC112A gas chromatograph are optional, and can be ordered with the basic instrument (if needed). They can also be ordered at any time after the instrument has been operated.

- Auto-sampler;
- Switching valve gas sampler

- Conversion furnace (containing methanation nickel conversion agent)
- XP-12 curie point cracker
- Chromatography workstation
- Deoxidizing tube

3 Installation Instructions

3.1 Installation Conditions

The instrument should be placed on a solid stable laboratory bench which complies with the environmental requirements. The ambience shall maintain clean, free of severe dust pollution.

To ensure that the instrument works normally, the working environment shall meet following criteria:

- The temperature shall remain between 5℃~35℃, with relative humidity not greater than 85%.
- It shall be free from direct sunlight, shock, dramatic turbulence, or erosion of corrosive substances.
- The power voltage is AC220V ± 22V, with frequency of 50Hz ± 1Hz, and must be equipped with a good grounding line.
- It shall stay away from high-intensity magnetic field, electric field and the occurrence of high-frequency waves of electrical equipment. The grounding line shall not share the same power outlet with other devices.

Note: If the power supply voltage fluctuates, it is recommended to use the AC electronic power supply with

power higher than 5000W.

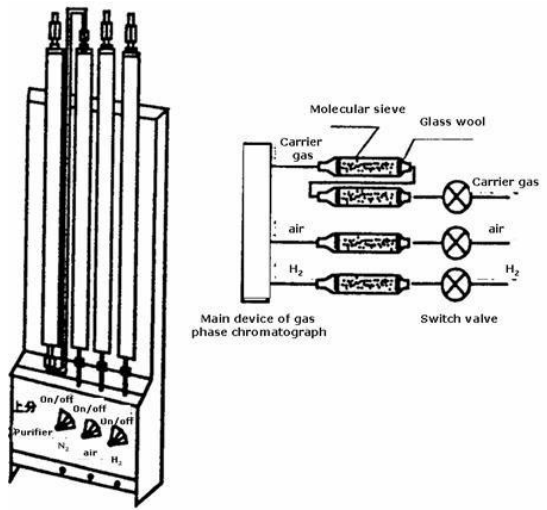
3.2 Unpacking Check

Keep the package box for the convenience of moving the product. Check that all items on the attached spare parts checklist are included. Contact the local distributor or directly with our sales department if there is any problems.

3.3 Preparation and Treatment of Gas Source

3.3.1 Gas Source

The FID detector of GC102AF needs three types of gas, i.e. carrier gas (generally, nitrogen), hydrogen and air. The purity of the nitrogen must not be lower than 99.99%, and that of the hydrogen not be lower than 99.9%. The air must not contain water, oil or contaminated gas.



3.3.2 Treatment of Gas Source

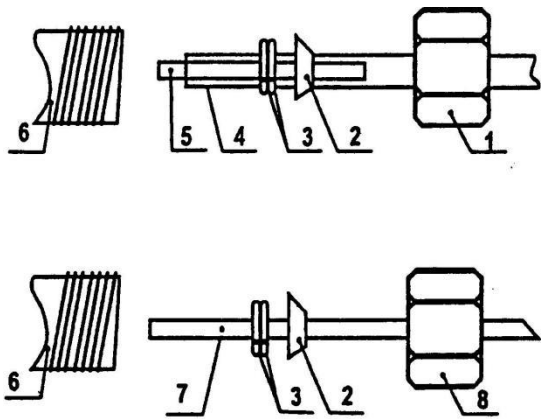
Before three types of gas enter the instrument, it must strictly undergo purification treatment. When the instrument is delivered from the factory, the general purifier will be provided. See Figure 3.3.2. The purifier consists of the purification pipe and switch valve, and it is connected between the instrument and the gas source. The purification pipe is added with activated “5A” molecular sieve and silica gel. If it is necessary to input the gas source into the chromatograph, the knob of the switch valve shall be turned to the “On” position. The duct connection of outdoor air should be stainless steel or copper pipes.

3.4 Connection of the External Gas Flow

3.4.1 Connection to the Gas Line Connector

The gas transmission pipe in the gas flow of GC102AF gas chromatograph mainly is ϕ3×0.5 polyethylene pipe (accessory 38#) or ϕ2×0.5 stainless steel pipe. The nut is M8×1, ϕ3.2 (accessory 22#) or M8×1, ϕ2.1 (accessory 35#). Figure 3.4.1 shows the schematic diagram of the connection of two types of pipe with the joint. In the figure, ϕ3×0.5 polyethylene pipe uses a seal gasket, in order to increase the strength of the pipe at the airproof point and ensure free

flowing of gas and airproof performance. If theϕ2×0.5 stainless steel connecting pipe is used, the ϕ2×0.5×20 seal gasket will not be used. The airproof coils in the figure may be replaced by a 5mm-long polyvinyl fluoride pipe. In the application, two pieces of airproof coils must be used; otherwise, it will not ensure airproof performance. The maximum airproof pressure is 0.5MPa ~ 0.8MPa (5kgf/cm^2 ~ 8kgf/cm^2). Examine the gas flow joint to see if there is any gas leakage. It is not permitted to use the ordinary (liquid) soap with strong alkali; this will corrode the part. It is recommended to use a diluted solution of dodecyl sodium sulfate as the leak testing liquid.



1. Nut (M8×1, ϕ3.2) (accessory 22#)
2. Airproof gasket (phosphor copper) (accessory 13#)
3. Two pieces of airproof coils (accessory 15#)
4. ϕ3×0.5 polyethylene pipe (accessory 38#)
5. Airproof gasket (ϕ2×0.5×20 stainless steel pipe)(accessory 21#)
6. Joint
7. ϕ2×0.5 stainless steel pipe
8. Nut (M8×1, ϕ2.1) (accessory 35#)

Figure 3.4.1 The connection of the external gas flow joint

3.4.2 Connection of External Gas Flow

Cut the polyethylene pipe of ϕ3×0.5 (accessory 38#) into 6 pieces according to requirements. Then, referring to Figure 3.4.1, use them to link the pressure-reducing valve joint and the purifier inlet (joint on the switch valve), and to link the purifier outlet (joint on the drying pipe) and the gas flow inlet of the main device. Now, the connection of the external gas flow is finished. For a guide to the connection of the external gas flow, refer to figure 3.4.3.

3.4.3 Inspection of External Gas Flow Leakage

After the connection of the external gas flow is completed, it is necessary to examine for leakage with following steps:

- Close the constant flow valve on the packed column gas flow of the main instrument and all the needle valves for the carrier gas, hydrogen and air.
- Open the high pressure valve of the steel bottle (before opening the high pressure valve of the steel bottle, the low pressure adjusting pole must be in a loosened state). Turn the low pressure adjusting pole slowly until the indication on the low pressure gauge shows 3kg/cm^2.
- Turn off the high-pressure valve on each steel bottle. Now, the indicated value on the low pressure gauge of the pressure-reducing valve should not decrease. Otherwise, there will be gas leakage in the external gas flow and it will be necessary to eliminate it.

3.5 Installation of Packed Column

For the on-column injection, the side of the injection inlet should be allowed for a section of empty column (at least 50mm), in order to facilitate the needle of the injector to be fully inserted into the gasifier during injection.

Due to the rigidity of the column, ϕ5.7mm glass packed column must be installed on the side of the injection inlet and the detector inlet as well, with the same procedure for installation for each end.

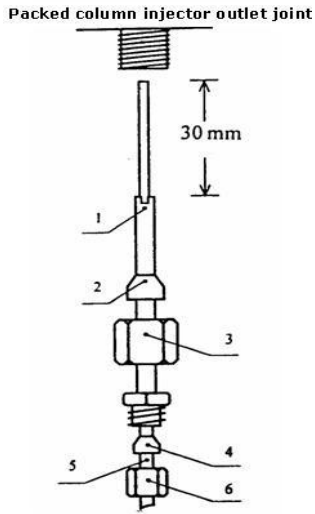
When the packed column is used for gasified sampling, it is not necessary to keep a section of column empty at the end of the injection inlet. However, a lining (ϕ5×ϕ2 quartz pipe) (accessory 12#) should be put at the front end of the packed column.

3.5.1 Installation of ϕ3mm and ϕ4mm Metallic Column to Packed Column Injection Inlet

Use Figure 3.5.1 as the installation instructions:

1) In turn install the nut (SN#: 6), graphite airproof gasket (SN#: 4) and packed column transition joint SN#: 1) into the packed column.
2) Extend the column head over the transition joint for 20mm~30mm (see the illustration). Hold the position and manually tighten the nut, then, using two appropriate wrenches, with one clamping the nut and the other clamping the transition joint, tighten them to the directions opposite of each other and seal them.

3) Install in turn the nut (M12×1, ϕ6.2) and graphite airproof gasket (ϕ6) into the transition joint.
4) Push the transition joint together with column head into the injector outlet joint and insert the column as deep as possible (Note: the lower end of the gasification tube must be inserted into the column head).
5) While maintaining this position, first tighten the nut (M12×1, ϕ6.2) with the injector outlet joint with hand. Then, tighten it with an M12 wrench to seal it.



SN#	Name	Specifications	
1	Transition joint	ϕ3mm (on the instrument)	ϕ4mm (accessory 33#)
2	Graphite gasket	ϕ6mm (accessory 16#)	ϕ6mm (accessory 16#)
3	Nut	M12×1, ϕ6.2 (accessory 24#)	M12×1, ϕ6.2 (accessory 24#)
4	Graphite gasket	ϕ3mm (accessory 17#)	ϕ4mm (accessory 19#)
5	Metallic column	ϕ3mm (outside diameter)	ϕ4mm (outside diameter)
6	Nut	M8×1, ϕ3.2 (accessory 27#)	M8×1, ϕ4.2 (accessory 28#)

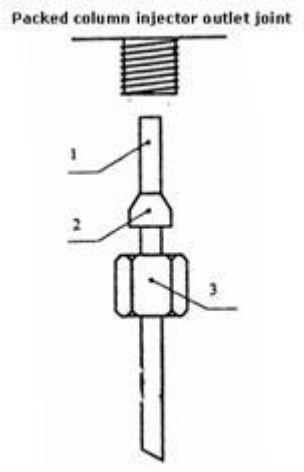
Figure 3.5.1

3.5.2 Installation of ϕ5mm and ϕ4mm Metallic and 5.7mm Glass Column to Packed column Injection Inlet

Use Figure 3.5.2 as the installation guide:

1) Put the nut (SN#: 3) and graphite gasket (SN#: 2) directly into the packed column in turn (without the assistance of transition joint).
2) Insert the column into the injector outlet joint as deep as possible (note: the lower end of the gasification tube must be extended into the column head, and ensure that the needle tip goes into the column while sampling).
3) Hold this position. First, tighten the nut to the injector outlet joint with hand. Then, tighten it with wrench M12 and seal it.

Warn: During the installation of glass column, if the nut is over-tightened, the column will be broken. Please be careful with the operation.



SN#	Item	Specification		
1	Packed column	ϕ5 metallic column	ϕ6 metallic column	ϕ5.7 glass column
2	Graphite airproof gasket	ϕ5 (accessory 18#)	ϕ6 (accessory 16#)	ϕ6 (accessory 16#)
3	Nut	M12×1, ϕ5.2 (accessory 25#)	M12×1, ϕ6.2 (accessory 24#)	M12×1, ϕ6.2 (accessory 24#)

Figure 3.5.2

3.5.3 Installation of Φ3mm and Φ4mm metallic column to gasification injector

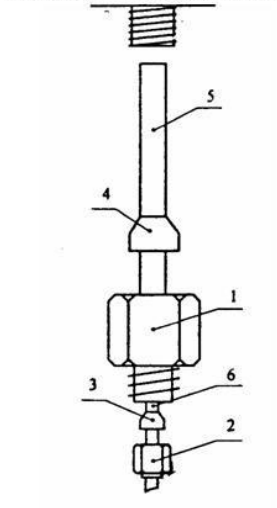
The difference from on-column injections system lies in the fact that when the filling device is used for the

gasification sampling, the quartz lining must be put in the injector with the unique joint to be equipped. Use figure 3.5.3 as the installation guide:

Put the quartz lining (SN#: 5) into the joint (SN#: 1)

1) The graphite gasket (SN#: 4) goes over the quartz lining.
2) Push the injector outlet end into the quartz lining as deep as possible (note: do extend the lower end of the gasification tube into the quartz lining. Refer to fig. 1 – 4 in chapter one).
3) Keep this position. Tighten the joint with the injector outlet end with hand. Then, tighten it with the wrench and seal it. (Be careful. Over-tightening may cause the quartz lining to be broken).
4) Put the nut (SN#: 2) and graphite gasket (SN#: 3) over the column head of the packed column in turn.
5) Hold this position. First, tighten the nut to the injector outlet joint with hand. Then, tighten it with wrench M12 and seal it.

Packed column injector outlet joint



For different caliber of chromatographic column, the accessories are different:

SN#	Item	chromatographic column ofϕ3 (outside diameter)		ϕ4 chromatographic column	
		Size (mm)	Accessory No.	Size (mm)	Accessory No.
1	Joint	ϕ3.2	31	ϕ4.2	30
2	Nut	ϕ3.2	27	ϕ4.2	28
3	Graphite gasket	ϕ3	17	ϕ4	19
4	Graphite gasket	ϕ5	18	ϕ5	18
5	Lining	ϕ5×ϕ2 quartz pipe	12	ϕ5×ϕ2 quartz pipe	12
6	Metallic packed column	ϕ3		ϕ4	

Figure 3.5.3

3.5.4 Installation of ϕ3mm and ϕ4mm metallic column to FID detector

Use figure 3.5.4 as the installation guide:

1) Mount the nut (SN#: 6), graphite airproof gasket (SN#: 4) and the packed column transition joint (SN#: 1) to the other end of the packed column.
2) Extend the column head over the transition joint about 1mm to 2mm (see the illustration in the figure). Hold the position and tighten the nut with hand. Then, use two appropriate wrenches, with one clamping the nut and the other clamping the transition joint and tighten it in opposite directions and seal it.
3) Mount the nut (M12×1, ϕ6.2) and ϕ6 graphite airproof gasket into the transition joint in turn.
4) Push the transition joint together with the column head into the FID inlet to be in contact with the root. Then, withdraw the column about 1mm.
5) Hold this position. First, tighten the nut (M12×1, ϕ6.2) to the injector outlet joint with hand. Then, tighten it with wrench M12 and seal it.

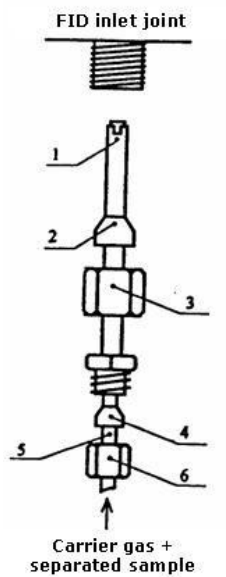


Figure 3.5.4

When used for gasification sampling, the installation method of the column to the FID detector is the same as described above.

3.5.5 Installation of ϕ5mm and ϕ6mm Metallic and ϕ5.7mm Glass Column to FID Detector

Use figure 3.5.5 as the installation guide:

1) Mount the nut (SN#: 3) and graphite airproof gasket (SN#: 2) directly to the other end of the packed column in turn (without use of the transition joint).
2) Push the column head into the FID inlet. After it touches the root, withdraw the column about 1mm to 2mm.
3) Hold this position. First, tighten the nut (M12×1, ϕ6.2) to the injector outlet joint with hand. Then, tighten it with wrench M12 and seal it.

After the installation of the column is finished, all the places with the joint or nut are to be examined for leakage under room temperature and operating temperature of the column oven, injector and detector. If necessary, retighten it with the wrench to prevent any leakage of gas.

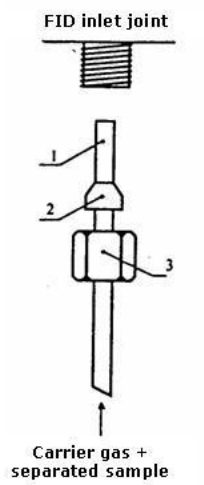


Figure 3.5.5

3.6 Installation of Split Injector

Installation of capillary split injector: the split gasification tube is the quartz glass lined tube (code No.: SFZ 8.490.001); the tube can be filled with a small amount of glass wool, so that the sample can be vaporized after sufficient mixing, to reduce distortion of the sample when shunting components. Both the inner wall of the shunt gasification tube and the glass wool were treated with dimethyldichlorosilane to remove the adsorbability of the glass surface. The installation procedure for the split injector is as follows (see Figure 3.7).

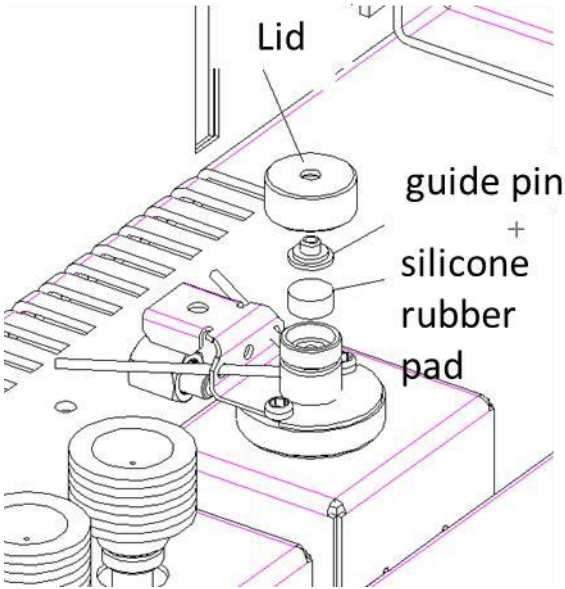
1) Put the high temperature resistant O-type ring into the upper end of the quartz liner (the gap is the bottom).

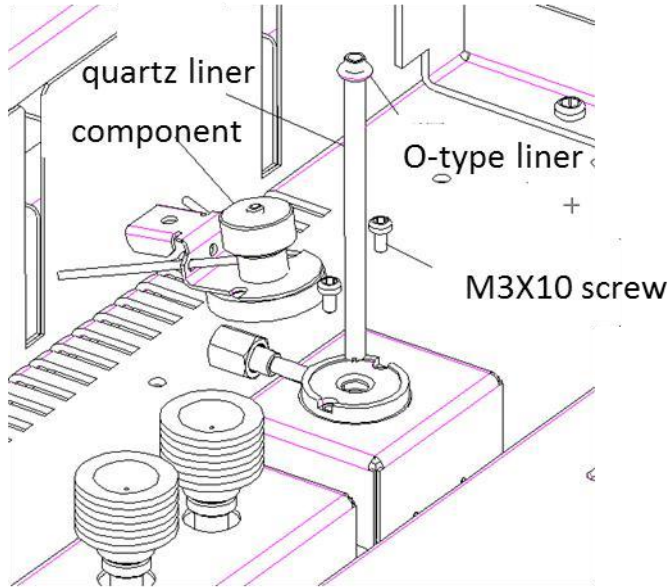
2) Carefully insert the quartz liner into the bottom of the injector base.

3) Fit the inlet top piece over the upper end of the quartz liner and secure it to the injector base with two M3 × 10 screws.

4) Unscrew the cap from the top of the injector by hand, remove the guide pin, and replace the silicon rubber pad. Follow the above order and put all parts in place and tighten the top component.

WARNING: When performing capillary analysis and using hazardous chemicals, the exhaust gas from the shunt outlet should be connected to the hood or the corresponding chemical purge line. After using for a period of time, remove the adsorption tube (filter) which is installed in the middle of the oven. Refer to Fig. 3.7. Replace the new adsorbent. Fill the tube with a little glass wool at both ends.


Lid
guide pin
+
silicone
rubber
pad


quartz liner
component
O-type liner
+
M3X10 screw

3.7 Installation of Capillary Column System

3.7.1 Installation of Capillary Column

The steps of installing capillary rack are as follows:

1. Mount the rack (accessory 46#) which can be found in the accessories on the top of the column oven (and fix the rack with the ϕ3 screws at the two screw places). Finally, hang the capillary column (with the frame) on the rack.
2. Use the knurled screw to adjust the height of rack
3. Rack assembly (accessory 4#)
4. Capillary
5. Two ϕ3 screws to fix the rack assembly

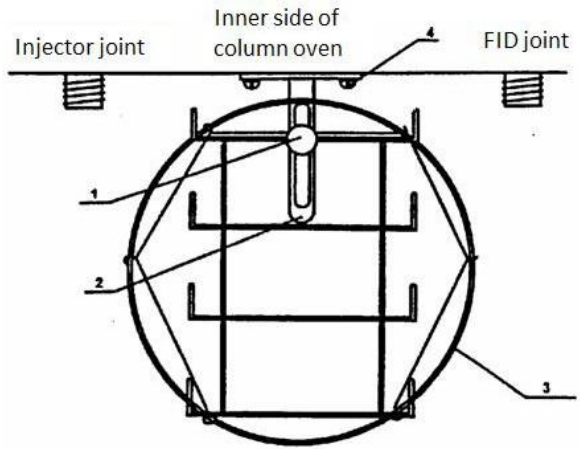


Figure 3.8 Schematic Diagram of Capillary Rack

The capillary analysis system of GC102AF series can use a variety of capillary columns, such as a glass capillary

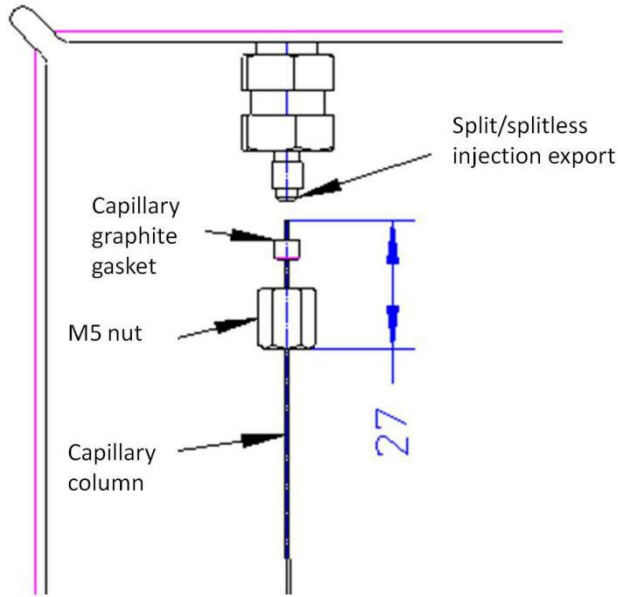
column and a flexible quartz capillary column (fused silica capillary column). The external diameter of optional glass capillary column is 0.9mm ~ 1mm; the outer diameter of flexible quartz capillary column is 0.375mm ~ 0.45mm. For different capillary column, different capillary seal gasket should be used. See the table below.

Column Type (outer diameter)	Capillary Seal Gasket	Accessory #
Glass capillary column (ϕ0.9mm~ϕ1mm)	Strip graphite gasket (inner diameter ϕ0.9mm)	3#
Flexible quartz capillary column (ϕ0.375mm~ϕ0.45mm)	Strip graphite gasket (inner diameter ϕ0.35mm)	4#
Note: for general capillary column with inner diameter 0.05mm~0.25mm, the outer diameter is 03.75mm; for the inner diameter 0.32mm, the outer is 0.45mm; for the inner 0.53mm, the outer is 0.69mm.		

For capillary column with larger diameter, say, the inner diameter is 0.53mm or 0.75mm, users can ream the inner diameter of gasket with drill (the diameter of drill head is close to the outer diameter of capillary).

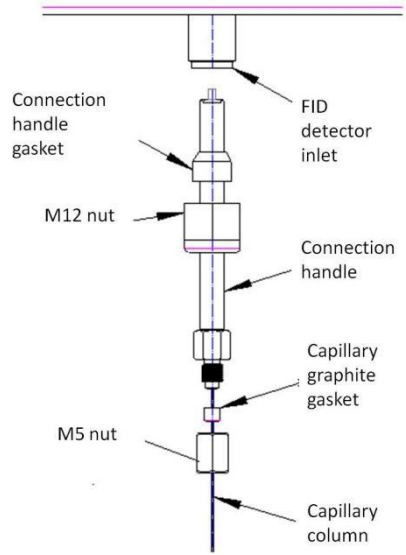
3.7.2 Connection of Capillary Column with Split/splitless Injector

1) Place the M5, ϕ1.6 nut (accessory 24#) and strip graphite gasket (accessory 16 #) respectively onto the capillary column.
2) As shown in Figure 3.9, hold the position of capillary column which extends from the nut M5 for 27mm. First, hand-tighten the nut and the joint, then use a wrench (#8) to tighten the nut.



3.7.3 Connection of Capillary Column and FID

1) Put the M12×1, ϕ6.2 nut and ϕ6 connection graphite gasket respectively onto the connection handle.
2) Place the capillary in the hole on the top of the connection handle, exposing 2mm
3) Hold this position and hand-tighten the M5 nut and the joint.
4) Push the connection handle and capillary to the top and hand-tighten the M12 nut. Finally tighten and seal the nut with wrench (#17).
5) Place the M5, ϕ1.6 nut (accessory 24#) and strip graphite gasket (accessory 16 #) respectively onto the capillary column.
6) As shown in Figure 3.10, push the capillary to the bottom, hand-tighten the nut and the joint, then tighten and seal the M5 nut with the wrench (#8).



4 Appearance and Structure of the System

4.1 Appearance of the Instrument

GC112A gas chromatograph consists of the detector, injector, column oven, flow control section means, temperature control and detector circuit parts and other components.

The middle part of the basic model is the column oven, the upper right side is the temperature controller of the microcomputer, the right side is the middle FID micro-current amplifier, the lower part of the right side is the flow control member and the pneumatic panel, the upper left portion of the oven is the mounting location of ionization detector (the basic type is mounted with the flame ionization detector or thermal

conductivity detector (TCD)), and the top right part of the oven is the injector.

4.2 Layout

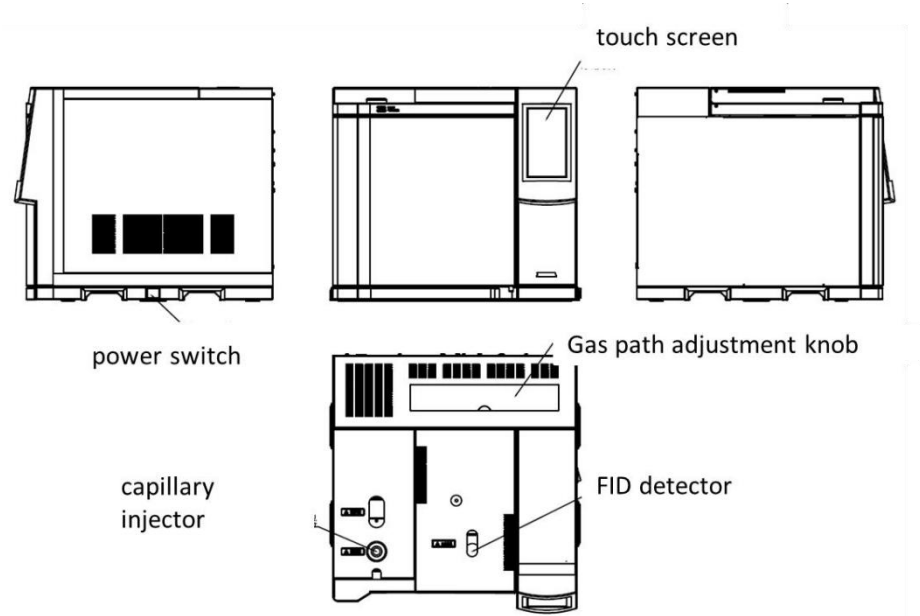


Figure 4.2 GC112A Front View Left View Right View Top View

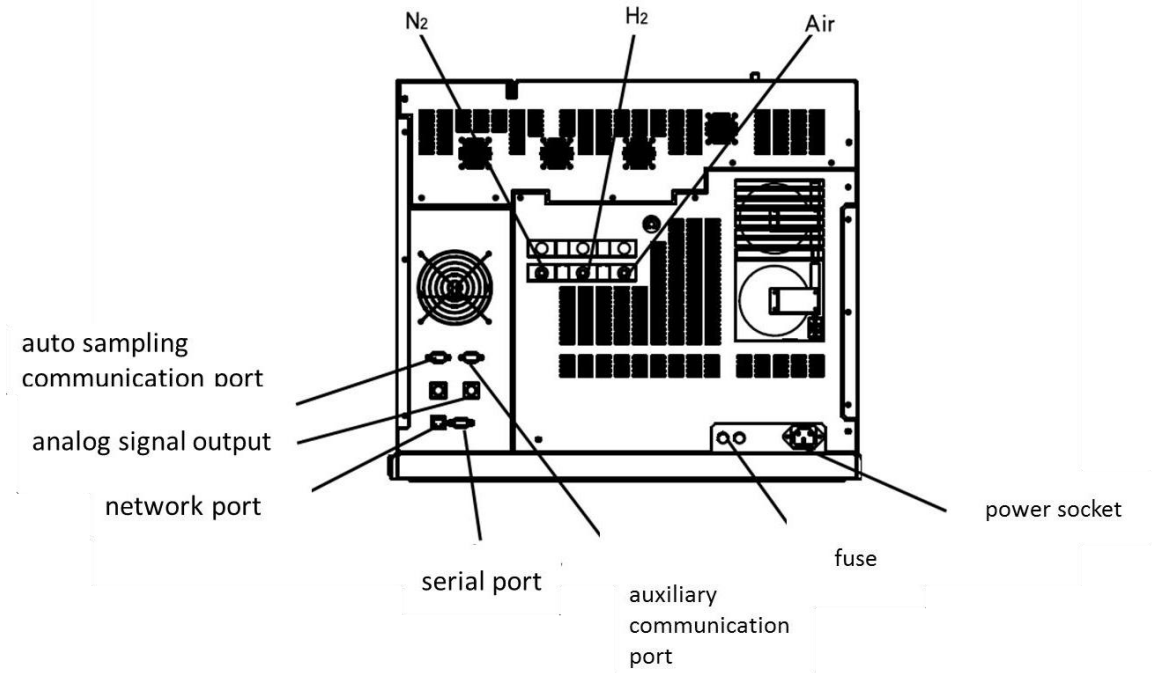


Figure 4.2 GC112A Rear View

4.3 Structure of System

4.3.1 Injector

The capillary column injector of the instrument can be capillary column shunt analysis, and the packed column injector can be packed column analysis. This chapter introduces the installation and operating instructions for the split sampler. The accessories of GC112A basic type include the corresponding liner and fittings for the capillary shunt sample. If other injectors for the capillary column for are ordered, the instructions will be attached.

GC112A: Optional shunt injection, packed column injection

Carrier gas flow, pre-column pressure, and split ratio can be displayed on the touch screen. The automatic models can be set directly on the screen.

4.3.2 Column Oven

The column oven of GC112A gas chromatograph features a large volume (280mm×300mm×180mm) adequate for mounting both the capillary column and double packed column, with rapid heating and cooling. The heating wire of the column oven is hidden behind the mesh, so it avoids the peak- shaped crack of the elastic quartz capillary column

caused by the radiation of the heating wire. The instrument uses a low-noise and stable motor, which runs with little vibration. When the oven needs to be cooled, the rear door will open automatically; the lower part draws in the cold air from the outside and discharges hot air from the rear door, in order to cool down rapidly.

The total power of the heating wire in the column oven is about 1000W. When the temperature in the column oven exceeds 420℃, the fuse link of the heating wire in the oven melts immediately (with the fuse link mounted at the rear right of the mesh), to cut off the circuit of the heater for the protection of the column oven. The fuse links (6 pieces in series) must be replaced before the instrument is restarted. The fuse link (accessory #6) can be found in the accessories.

4.3.3 Detector System

GC112A detector is equipped with either hydrogen flame ionization detector (FID) or thermal conductivity detector (TCD). Only one can be chosen.

The FID detector of GC112A is on the top front of the main device and its base is housed in an aluminum thermal conductor. The thermal conductor is also equipped with a heating rod and platinum resistance, and computer temperature controller within the total wiring board. And the signal lead-out line is connected with the signal entrance on the shield box of the FID micro-current amplifier through the high-frequency cable. The emitter-emitter pole (which shares a platinum wire coil) is routed through a wire-to-wire connector at the top of the host to the ignition switch on the FID amplifier. The column outlet end is inserted into the inlet end of the FID detector at the top of the oven and is

connected and sealed with a nut and a graphite gasket. Hydrogen and air are introduced by stainless steel tubing from the joint of the pneumatic control system above the main engine.

5 Operations

5.1 Self-test

5.1.1 Self-test

When the instrument is turned on, it enters the welcome interface, as shown on the right figure.

Then the system starts self-testing.

When the self-test is finished, the system will show a window to select whether to perform auto ignition. Click [YES] and the system enters the main interface and turn on the auto ignition system. Click [NO] to enter the main interface and turn off the auto-ignition system, and the user can manually execute ignition.

5.2 Keypad Operations

The keypad and status area of the model series can be switched, as shown in Figure 5.2.

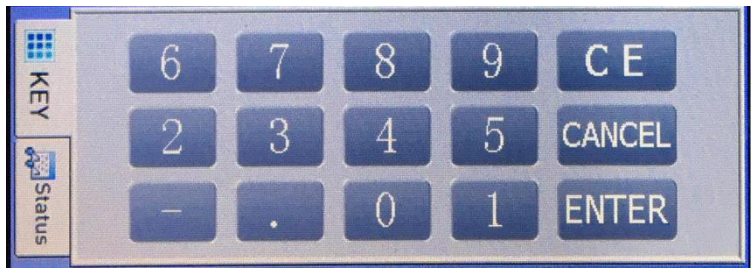


Figure 5.2 Keypad/Status

6 Basic Operations

6.1 Monitor Interface

After self-testing, the system enters monitor interface. Or under other interfaces, click [Monitor Interface] from the menu to enter the module, as shown in Figure 6.1.

6.1.1 Temperature Graph Display Area

Refer to area [A] in Figure 6.1.

The upper part of the interface, the area marked in blue and gray is the temperature graph display area. This area in the program preheating state, you can see the program preheating temperature curve and where the current temperature is.

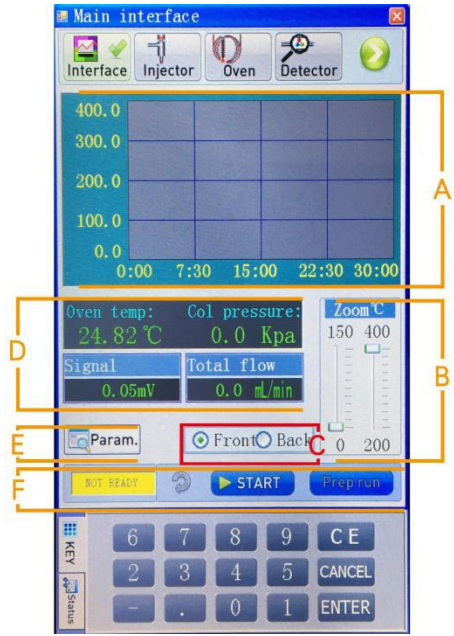


Figure 6.1 Monitor Interface

6.1.2 Scaling

Refer to area [B] in Figure 6.1.

This function is used to assist the temperature profile display. Move the slider to adjust the range and scale of the display to facilitate a clear view.

6.1.3 Front/rear injector

Refer to area [C] in Figure 6.1. It indicates the position where the instrument is connected with injector. It's just for display only and can't be edited.

6.1.5 Status Info

Refer to area [D] in Figure 6.1.

This area is mainly for users to view the basic information, including the real-time data of oven temperature, pre-column pressure, the signal value and the total flow.

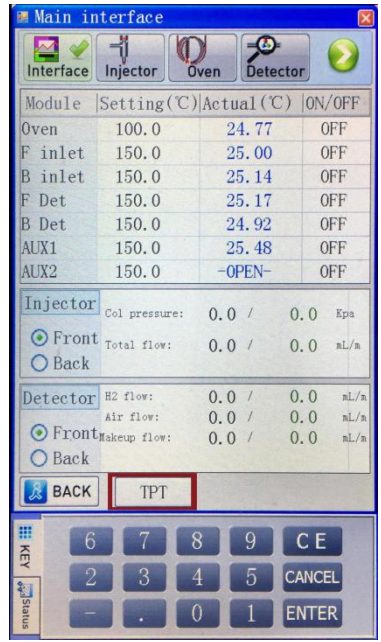


Figure 6.1.4 Parameter View Window

6.1.6 Parameters

Refer to area [E] in Figure 6.1.

Click the [Parameters] button to jump to the parameter window, as shown in Figure 6.1.4. This function makes it easy for the user to view the temperature of each injector, detector and oven and the data of the gas path of the injector and detector. It is for display only and cannot be modified. Click [Back] to exit to the initial monitoring interface.

Click [Temperature] to view the data. Click [Exit] to return to the [Parameters] interface.

6.1.7 Current Status

Refer to are [F] in Figure 6.1. This function shows the current status of the instrument.

After the equipment is turned on, it'll show the yellow "NOT READY" state. When it detects the temperature of each module, the data of gas channel will reach the set value range (for the FID detector, the ignition needs be successful), it will display the green "READY" state, indicating that instrument is ready for testing.

6.2 Injector Interface

Under other interface, click [Injector] on the menu to enter this function. See Figure 6.2.

6.2.1 Temp Control

Refer to area [A] in Figure 6.2.

For the Temp Control function, it includes temperature setting, display the real testing value and [Heating On]/ [Heating Off].

Operation method: Click the temperature setting box by hand or with touch pen. The setting value will be displayed automatically. Use the keypad to input the temperature (the minimum input figure is 0.1 degree). Click [ENTER] to finish. For the heating switch, click [Heating On] to start heating, and click [Heating off] to stop heating.

The upper black box shows the actual temperature and switch status of the current injector.

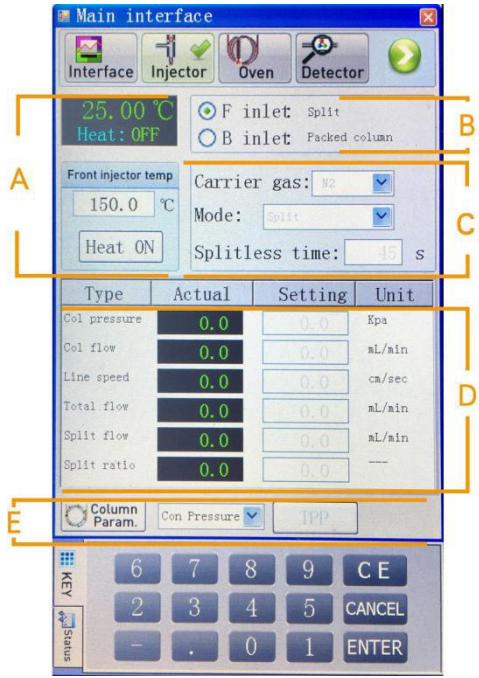


Figure 6.2 Injector Interface

6.2.2 Display of Injector Interface

Refer to area [B] in Figure 6.2.

When the user turns the flow knob, the interface will show the corresponding flow values, such as total flow, split flow, column pressure and column flow.

6.2.3 Injection method

Refer to area [C] in Figure 6.2.

Select the injection method.

Operation method of selecting injection: use the touch pen to click the dropdown button, which has several types of methods for the user to select from. The current method will be disabled and the user can select from the rest of options.

6.3 Column Interface

Under other interface, click [Column] to enter this function module. See Figure 6.3.

6.3.1 Temp Control

Refer to area [A] in Figure 6.3. For the Temp Control function, it includes temperature setting, temperature display of the real testing value and [Heating On]/ [Heating Off].

Operation method: Click the temperature setting box by hand or with touch pen. The setting value will be displayed automatically. Use the keypad to input the temperature (the minimum input figure is 0.1 degree). Click [ENTER] to finish. For the heating switch, click [Heating On] to start heating, and click [Heating off] to stop heating.

The upper black box shows the actual temperature and switch status of the current injector.

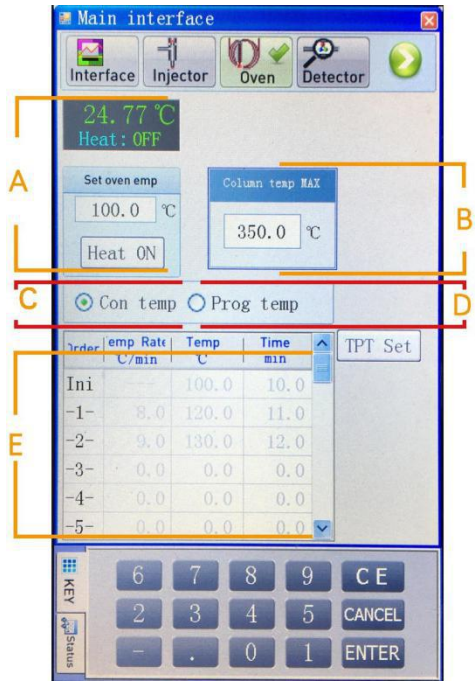


Figure 6.3 Column Oven Interface

6.3.2 Maximum temperature of column oven temperature

See area [B] in Figure 6.3.

Set the maximum temperature of the oven temperature, in order to protect the selected column from damage when the temperature is too high.

6.3.3 Constant/Program Temp Control Switch

See area [C] in Figure 6.3.

For oven temperature control method, there are two options, one is constant temperature control method and the other is the program temperature control.

6.3.4 Program Temp Control Setting

See area [D] in Figure 6.3.

The switch of [Program Temp Control Setting] is to send the information of area E to the corresponding function module. To confirm any modifications in area E, this button shall be clicked.

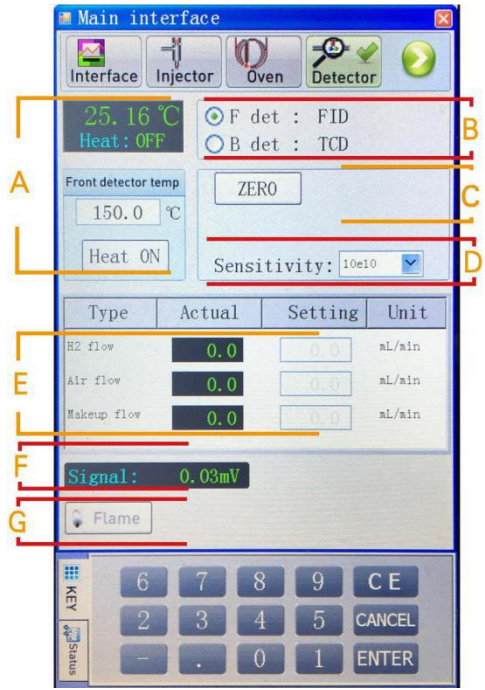
6.3.5 Program Temp Control Data Area

See area [E] in Figure 6.3.

For program temperature setting, when the oven is set as the program temperature control method, the user can modify the contents in the area, including the holding temperature, time and the next heating rate. Note that the temperature of the next stage must be higher than the temperature of the previous one, and the user can set up to nine stage temperature.

Note: After the data of each stage is set, the user must click the button in D area to save the data.

6.4 Detector Interface



Under other interface, click [Detector] to enter this function module. GC112A has two types of FID detector, and linear FID amplifier is one of them. (See Figure 6.4)

6.4.1 Temp Control

Refer to area [A] in Figure 6.4. For the Temp Control function, it includes temperature setting, display the real testing value and [Heating On]/ [Heating Off].

Click the temperature setting box by hand or with touch pen. The setting value will be displayed automatically. Use the keypad to input the temperature (the minimum input figure is 0.1 degree). Click [ENTER] to finish. For the heating switch, click [Heating On] to start heating, and click [Heating off] to stop heating. The upper black box shows the actual temperature and switch status of the injector.

Figure 6.4 Detector Interface (Linear FID)

6.4.2 Display Options

See area [B] in Figure6.4_a.

It shows the type and installation position of current detector.

The detector module in the instrument is FID detector. The following operations are for the FID detector module.

6.4.3 Baseline zero / high voltage switch

In the linear FID detector interface, see [C] in Figure 6.4_a. Click the [Baseline Zero] button to directly zero the detector signal value.

In the logarithmic FID detector interface, the [C] area is shown in Figure 6.4_b. Click [High voltage OFF], there is no high voltage output. Click on the high voltage [ON], for the high-voltage output.

6.4.4 Sensitivity

See area [D] in Figure 6.4_a.

Click the sensitivity drop-down button, there are three sensitivity options: 10e10, 10e9, and 10e8. The user can select according to their needs.

6.4.5 Gas Path Data Settings /Display

As shown in the [E] area of Figure 6.4_a, the detector flow display area, shows the flow of hydrogen flow, air flow, and makeup gas flow. When the operator adjusts the corresponding flow knob, the above flow values will change.

Typical FID (capillary column) values are as follows

Hydrogen is set at 30 ml/min, air at 300 ml/min, and makeup gas at 20 ml/min.

6.4.6 Signal Value

The linear FID detector interface is shown as the [F] area in Figure 6.4_a.

The user can directly view the magnitude of the analog signal value in this area. This area is only for display without any content to be configure.

For the logarithmic FID detector interface, it's shown as the [F] area in Figure 6.4_b.

The range of signal value has 5.5 orders (1pA-0.56uA), with linear height of 0.9999. It's unnecessary to do sensitivity switch, or zero. The high-voltage output can be controlled. The signal value is indicated as pA.

6.4.7 Ignition

Refer to area [C] in Figure 6.4_a.

The detector's ignition status switch is used when the detector needs to be ignited or if the flame is re-ignited after flameout. Click the button, the interface will be prompted. To confirm the ignition, click [YES]; or to cancel, click [NO]. Whether the ignition is successful, a prompt box will show.

6.5 File Management Interface

This function is for the automatic model only.

Under other interface, click [File Management] to enter this interface, as shown in Figure 6.5.

6.5.1 File Name

Refer to area [A] in Figure 6.5.

The figure shows the file name of the current file, for display purposes only, and the [C] area is the contents of the file.

When the user does not store the file, the file name is always displayed as "Current", and the contents are the initialization data of the system. When the user changes the instrument information, and save it, the file name will be displayed as a user-defined name, the content will also be updated. On the next day, when it instrument is turned on, it will automatically recall the contents of the last file.

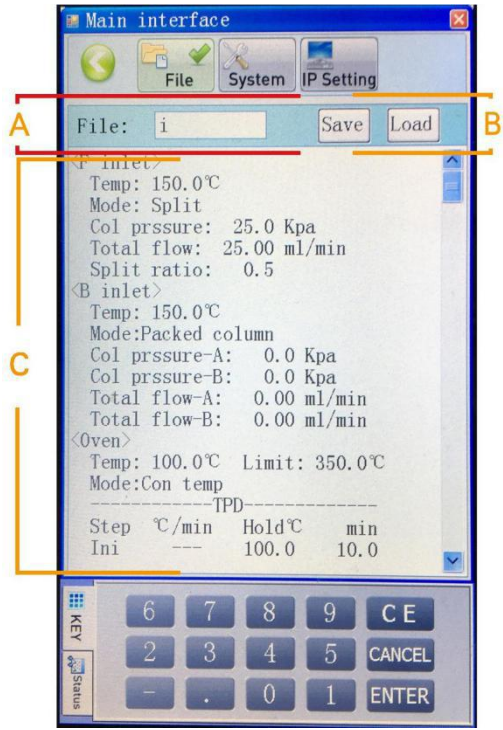


Figure 6.5 File Management Interface

The user can also recall any test information which are saved before, which is very convenient and simple.

You can also save the status information of each modification to another file name. You can load different saved files according to your needs. The file information and instrument status can also be changed depending on the content of the file called by the user.

6.5.2 Store/Load

Refer to area [B] in Figure 6.5.

Click [Storage], as shown in Figure 6.5.2-A. You can click the alphanumeric keys to input the file name, and then click [uppercase] to switch between the upper and lower case letters. This is mainly for different samples to choose different conditions. It is best to name the file with the sample name, so later when test the sample, you can directly call the file, and the instrument will automatically restore the test state.

After entering the file name, click [OK] to display the file sequence window as shown in Figure 6.5.2-B. There are 20 storage locations to choose from.

In the "File Sequence", select the location you want to store, as shown in Figure 6.5.2-C. Click [YES] to save the current file contents to the selected storage location. Click [NO] to cancel the storage.

Click [Load] to recall the previously stored file, as shown in Figure 6.5.2-B. Select the file to be loaded, confirm it and load it to the location of file 1, and modify all the current information. The contents of the original file remain unchanged.

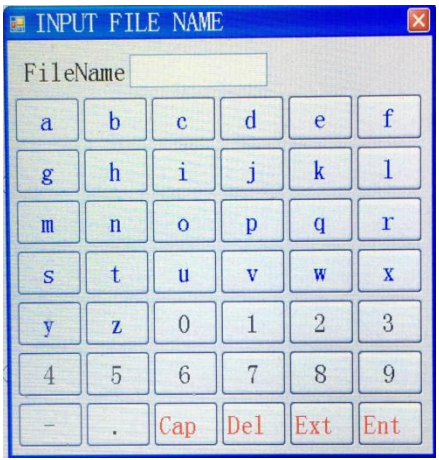


Figure 6.5.2-B File Sequence

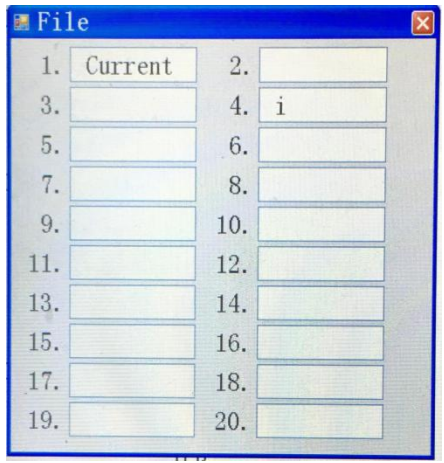


Figure 6.5.2-C Prompt Message

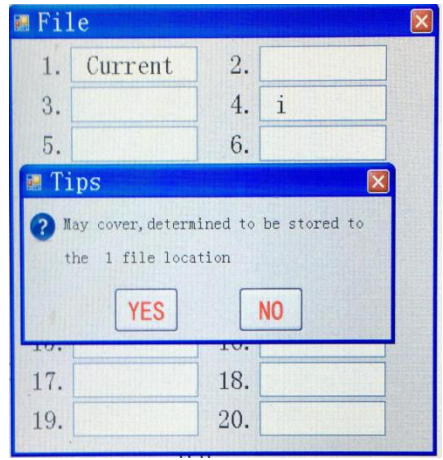


Figure 6.5.2-A Input File Name

6.5.3 File Contents

As shown in Figure 6.5 [C] area, this area displays the contents of the current file and the current settings of the instrument are consistent. It's convenient for the user. You can use scroll bar to view the information which is not displayed.

6.6 System Configuration Interface

Under other interface, click [System Configuration] to enter this function module. Refer to Figure 6.6.

6.6.1 Information

Refer to area [A] in Figure 6.6.

The basic information of the instrument is set at the factory, and the user can only view the information and not be able to modify it.

6.6.2 Structure Diagram

It shows the relationship between the injector and the detector, the current display is the connection between front injector and detector.

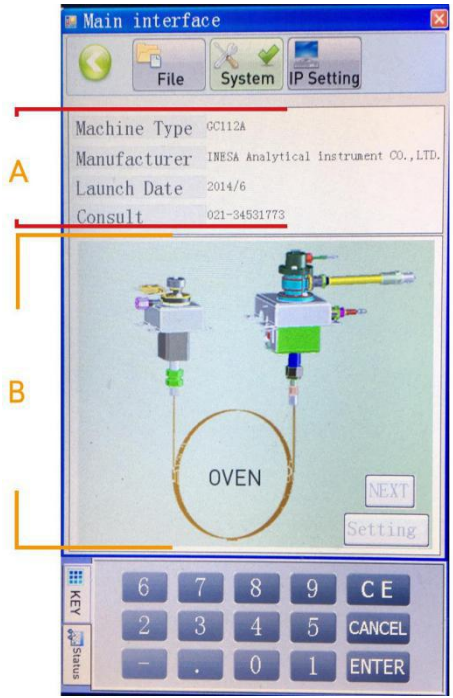


Figure 6.6 System Configuration Interface

6.6.3 Switch / Connect settings

As shown in the [C] area of Figure 6.6, use [NEXT] button to switch the connection between another set of injectors and detectors. The button is grayed out since the unit is connected to a single injector and single detector. It is automatically activated when two or more sets of injectors and detectors are connected. You can use this button to view the relationship between several groups of injections and detections.

As in the [D] area of Figure 6.6, press [Connection Setting] button to set the connection between the injector and the detector when the button is valid.

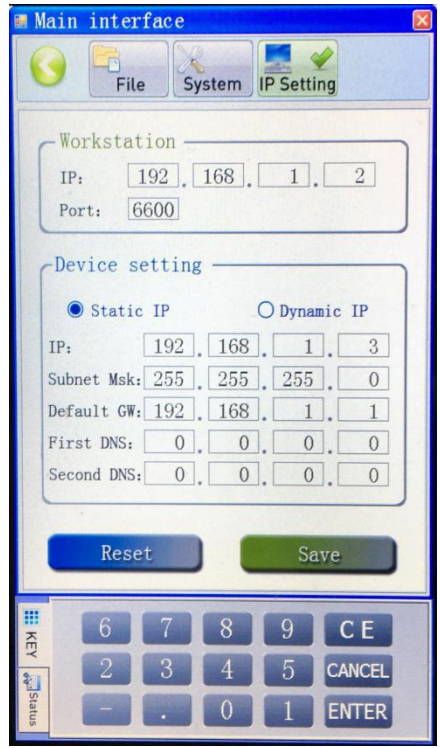
6.7.1 Workstation configuration

As in the [A] area of Figure 6.7, the user can set the networking configuration of the linked station, the IP address and port number of the PC.

6.7.2 Configuration

As shown in the [B] area of Figure 6.7. It's used to set up the networking configuration of the GC. The user can select static or dynamic IP addresses. When selecting a static IP address, you can set a specific static IP address below.

Note: The IP address of GC112A needs to be set on the same network segment as the IP address of the workstation.



6.7.3Restore Factory / Save Current Configuration

See area [C] in Figure 6.7.

Click the [Restore factory configuration] button, the network configuration of the instrument and the workstation will be initialized, please use it carefully.

See area [D] in Figure 6.7.

If you modify the contents of the online configuration, click the [Save Current Configuration] button, the system will save the modified configuration If you do not click, the previous changes will not be saved.

7 Operation Examples

7.1 FID Detector

7.7.1 FID Constant temperature analysis operation

After the installation is complete, you can run the instrument and perform analysis. Under constant temperature, the FID detector operation steps are as follows:

1) Connect the exterior gas path of carrier gas, air and hydrogen and detect whether the path leaks.

2) Install the aged column (from the injector to the FID detector).

3) Install the FID detector collector to the high-frequency cables between the FID amplifier signal input ports, and connect FID to dual-detector operation.

4) Connect the recorder's power cord.

5) Turn on the carrier gas source and rotate the low pressure regulator until the carrier gas pressure gauge indicates 3.5kg/cm^2~ 6kg/cm^2. Adjust the two carrier gas flow regulator knobs on the gas panel to adjust the A and B

carrier gas flow to the appropriate value (according to the separation conditions, the number of turns required for the scale knob can be found in the flow calibration curve table).

6) Turn on the power, and follow the above instructions in Chapter II to set the oven, detector and injector temperatures, for example: oven: 150C; injector: 180C; detector: 180C.

7) PC panel FID amplifier is in the required working state, for example: Sensitivity (span): 108; Polarity: "1" (output set to "+").

8) Recorder zero: turn on the recorder power and the corresponding recorder pen switch, put the three points on the recorder input end in short circuit, and place the recorder at the range of 1mV, adjust the corresponding zero potentiometer, so that the pen will be in the proper position, i.e. the baseline position.

9) Connect the signal (accessory 9 #), that is: one end of the signal line is connected to the recorder input, the other to the signal end of the right side of the box. If using a data processor, the associated wire assembly is the accessory #8; for chromatographic workstations, refer to the previous section.

10) After the temperature of the injector, detector (FID) and oven are in equilibrium, turn on the air and hydrogen gas source, and turn the low pressure adjusting lever until the low pressure gauge of air indicates 3kg/cm^2~6kg/cm^2 and the hydrogen 2kg/cm^2~3.5kg/cm^2. Adjust the air needle valve on the air panel and two hydrogen needle valve knob, according to the required operating conditions, put A, B air and A, B hydrogen to the appropriate flow rate. (The relationship between the number of turns and the flow rate can be found from the corresponding flow rate - scale.)

11) Ignition: Press the two ignition buttons (FID A and FID B) on the FID amplifier panel, and the stylus will deviate from the original position after the flame is ignited. There are two common methods to determine whether a fire

ignites:

A) Change the flow rate of hydrogen gas by two turns. If the stylus has a reaction, the fire will ignite.

B) A metal or glass sheet with a clean surface is placed in the "vent" of the ion chamber (see Chapter 3-1, Fig. 3-1). If the surface of the metal body or glass sheet is condensed by water vapor, the fire has ignited.

12) Use the "coarse", "fine" base flow compensation knob on the FID amplifier to adjust the stylus to the appropriate position until the baseline is stable.

Note: To make it simple, the back-end equipment only uses a recorder as an example. If you are using a chromatographic data processor or a chromatographic workstation, refer to the specific operating instructions, including the operation of necessary signal attenuation.

7.1.3 Notes for Operating FID

1) The detector is a high sensitivity detector, must be high-latitude carrier gas (99.99% N2) and the carrier gas, hydrogen and air should be purified by the purifier.

2) When aging the column, do not connect the column to the detector, so as not to pollute the detector. The temperature of the attached column is 230℃. Do not open the hydrogen gas source when aging the column.

3) Close the hydrogen and air sources before each operating temperature is unbalanced and prevents the detector from accumulating in the water.

4) During the ignition, do not make the button pressed for too long, so as not to damage the ignition ring.

5) When using the instrument's highest sensitivity profile or program temperature analysis, the column used should be thoroughly aged.

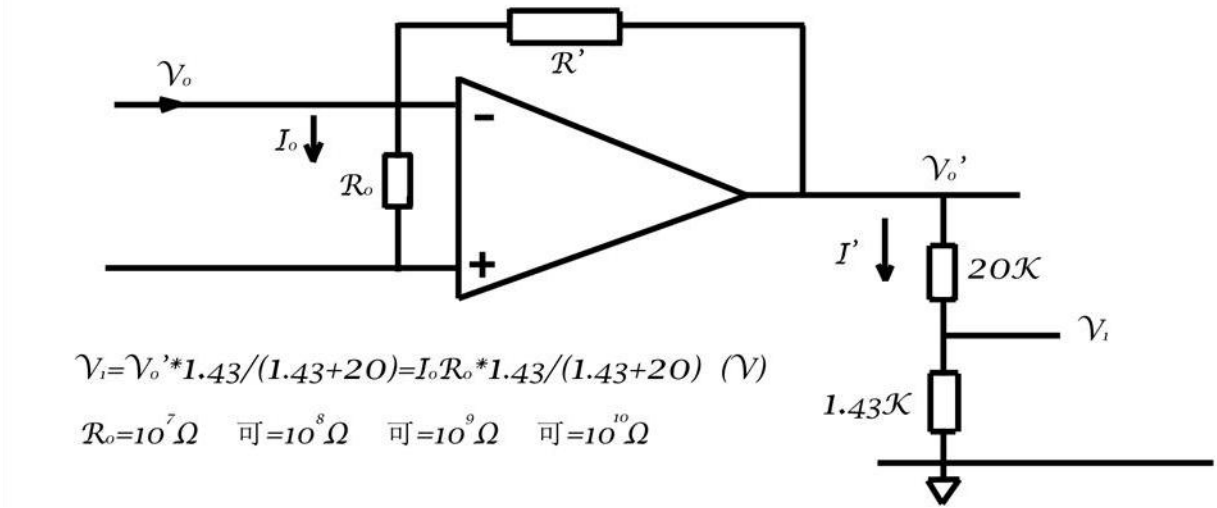
6) After the instrument is switched on, the temperature of the carrier gas should be raised first, then the FID detector will be ignited when the humidity exceeds 100℃.

7) In order to facilitate ignition, it is recommended to adjust the hydrogen flow rate faster first, and then to ignite. After ignition, slowly adjust the hydrogen flow back to the required flow value for analysis.

8) Before the instrument is shut down, the hydrogen (fire) should be closed off, cooling, and then close the carrier gas.

Warning: The flame ionization detector uses H_2 as the fuel. If the column is not connected to the detector inlet joint when H_2 is turned on, H_2 will flow into the heating chamber and cause an explosion. Therefore, once the hydrogen is connected to the instrument, the column must always be connected between the injector and the detector inlet of the FID or screwed into the M12 × 1 nut (accessory 26 #) with a ϕ6 graphite gasket (accessory 16 #) FID Detector inlet, tighten and seal with wrench.

FID detector current and voltage conversion formula



$V_i=V_o'*1.43/(1.43+20)=I_oR_o*1.43/(1.43+20)$ (V)

$R_o=10^7\Omega$ 可=$10^8\Omega$ 可=$10^9\Omega$ 可=$10^{10}\Omega$

8 Maintenance and Troubleshooting

8.1 Maintenance of the Instrument

Proper maintenance will not only help the instrument work normally but also prolong its life. Pay attention to the following four points during the maintenance:

1) The instrument can only work under the required conditions. Take some corrective measures when certain required conditions are not met.
2) The operation must strictly abide by the operating regulations. Prevent oil, organic matter and other substances from contaminating the detector and the tube. Otherwise the tube will be blocked or the performance of the instrument will be degraded.
3) The column temperature should be no higher than the recommended temperature range in the stationary phase. Generally, the column temperature is lower than the recommended temperature range in the stationary phase. When the high sensitivity operation is going on, the column temperature should be set lower.
4) When the carrier gas is transmitted into GC102AF, the pressure should be set at 343000Pa (equivalentto

3.5kg/cm^2 ~ 6kg /cm^2). As for air, the pressure should be established at 294000Pa ~ 588000Pa (equivalent to 3kg/cm^2~6kg/cm^2). The hydrogen pressure should be at 196000Pa ~ 343000Pa (equivalent to 2kg/cm^2 ~ 3.5kg/cm^2). If hydrogen is used as the carrier gas, the carrier gas pressure at the GC122 inlet should be 343000Pa (equivalent to 3.5kgf/cm^2).

8.2 Cleaning of the Instrument

8.2.1 Cleaning of the FID

Method to remove the cover: Use a screwdriver to unscrew two fixing screws from the layering which suppresses the emitter electrode and remove the layering. Hold the bottom of the cover with hand, and pull the cover upward with force. Then you can use an appropriate wrench (accessory 39#) to easily remove the special nut which fixes the emitter (where the electrode lead emitter ignition comes from it) and pull the electrode out. To replace or remove the nozzle for cleaning, first unscrew the wind ring with hand, then vent will completely be exposed. Finally, use the appropriate wrench (accessory 39 #) to unscrew the nozzle. The method to remove the upper part of the FID cover (collector section): unscrew the two central knurled screws from the FID cover with hand, hold of the collector terminal, and pull upward with force the upper part of the cover.

Caution: To replace a new nozzle, make sure that the nozzle airproof gasket should also be replaced by a new one.

Then turn the nozzle tight to prevent gas leakage.

8.2.2 Cleaning of Injector

The injector can easily be contaminated, especially the gasification tube. Therefore it is quite important to clean the injector. First take off the chromatographic column, remove the heat dissipation gasket and take out the airproof silica gel gasket and the gasification tube. Then clean the heat dissipation gasket and the gasification tube with acetone or alcohol and dry them. The inside wall of the injector tube can be directly cleaned by acetone or alcohol sponge repeatedly. Then blow a large flow of carrier gas into the tube (mainly to blow out the cotton fiber and dry the solvent). Then assemble the gasification tube and the chromatographic column, place in a new airproof silica gel gasket and turn the heat dissipation gasket tight.

8.2.3 Chromatographic Signal Determination and Troubleshooting

The common methods of chromatographic signal determination and troubleshooting can be found below.

Phenomena	Causes	Solutions
1. No peak	1) The amplifier is power-off. 2) The ionic line is broken. 3) There is no flow of the carrier gas. 4) The sample has too low a temperature and it has not vaporized yet. 5) The micro-syringe is blocked. 6) There is leak of the injector's silica gel. 7) The connection of the chromatographic column is loose. 8) There is no fire (FID). 9) FID polarization voltage is not connected or is in poor contact.	1) Inspect the amplifier and the fuse. 2) Inspect the ionic line. 3) Check that if the carrier gas flow path has been blocked or the gas in the gas cylinder has run out. 4) Increase the injector's temperature. 5) Replace the injector. 6) Replace the silica gel. 7) Turn the chromatographic column tight. 8) Ignite the fire. 9) Connect the polarization voltage or make sure that the polarization voltage is in good contact.

2.	Sensitivity decreasing during the normal retention time	1) Attenuation is too high. 2) There is insufficient sample. 3) There is a loss of the sample when injecting it 4) The injector is leaking or blocked. 5) The carrier gas is leaking, in particular it is leaked in the injector. 6) The flow rate of hydrogen and air is not properly set 7) There is no high pressure of the detector (FID).	1) Turn down the attenuation and increase the high resistance. 2) Increase the sample. 3) Manage to inject the sample completely into the system. 4) Replace or dredge the injector 5) Examine for the leak 6) Regulate the flow rate of hydrogen and air. 7) Examine or install the high voltage power supply.
3.	Tailing peak	1) The injection temperature is too low 2) The injection tube is contaminated (leftover of sample or silica gel). 3) The temperature of the chromatography column oven is too low. 4) The injection technique is underdeveloped. 5) Wrong choice of chromatography column	1) Adjust the injector's temperature again. 2) Clean the injector's tube with the solvent. 3) Increase the temperature of the chromatography column. 4) Improve the injection technique and achieve fast-speed sample injection. 5) Choose the appropriate chromatographic

		(sample reacts with column support or stationary liquid).	column.
4.	Leading peak	1) The column is over-loaded with too much sample. 2) There is an agglutination of the sample in the system.	1) Reduce the sample. 2) Raise the column temperature, and then choose the appropriate injector and the chromatographic column and set the temperature of the detector.
5.	No separated peak	1) The column temperature is too high. 2) The column is too short. 3) Loss of stationary liquid. 4) Wrong choice of stationary liquid or support. 5) The carrier gas flow is too fast. 6) Injection technique is too poor.	1) Reduce the column temperature. 2) Choose a longer chromatographic column and set the temperature of the detector. 3) Replace the chromatography column or the aging column. 4) Select proper column. 5) Slow down the carrier gas flow. 6) Improve the injection technology.
6.	Round peak	1) It exceeds the linear range of the detector.	1) Reduce the volume of sample.
7.	Flat peak	1) The input of the amplifier is saturated.	1) Reduce the volume of sample and

				lower the sensitivity of amplifier.
8.	No sample, and an one-way change of the baseline (FID)	1) 2)	The detector is low at temperature. There is no increase or control of the temperature for the chromatographic column.	1) 2)	Raise the detector's temperature to over 100 ° C and clean the detector or increase the temperature to 200 ° C to exhaust the steam. Maintain the temperature control system and heat platinum wire resistance
9.	Baseline breaking	1) 2) 3)	The power outlet is in poor contact. There is a disturbance of the external electric field. The hydrogen flow and air flow are not properly set (FID).	1) 2) 3)	Fasten the connection of power outlet and receptacle. Eliminate the external electric field which can affect the normal work of the instrument Readjust the hydrogen flow and air flow, especially the air flow
10.	The retention time is prolonged and the sensitivity is low.	1) 2) 3)	The carrier gas flow rate is too slow. There is a change of the carrier gas flow rate after the sample injection. The silica gel of the injector leaks.	1) 2) 3)	Increase the flow rate of carrier gas. If the carrier gas path is blocked, fix it. Replace the sampling silica gel. Replace the injector's silica gel.

11. Irregular wave of the baseline during the isothermal operation	1) The instrument is placed in the right position. 2) The instrument is poorly grounded. 3) The stationary liquid leaks. 4) The carrier gas leaks. 5) The detector is contaminated. 6) The flow rate of the carrier gas is not proper. 7) The hydrogen flow and air flow are not properly selected (FID). 8) The amplifier is not stabilized.	1) Place the instrument in a position with no violent vibration and no strong air convection. Keep the instrument horizontal. It is recommended to place the instrument on a cement platform or the table covered with rubber. 2) The instrument and the recorder should be well grounded. 3) Choose the proper stationary liquid and process the column with thoroughly aging treatment. The column temperature should not be raised to the operating limit of the stationary liquid (especially the high sensitivity detector) 4) Investigate the leak. 5) Clean the detector. 6) Adjust the carrier gas constant current valve so that the carrier gas flow becomes appropriate. Ensure that the

			total pressure in the carrier gas cylinder is between 50kg/cm^2 and 150kg/cm^2 7) Adjust the volume hydrogen flow and air flow. 8) Examine the amplifier and fix it.
12.	Extra peak *A sudden increase of peak width at half height	1) The recorder has low sensitivity. 2) The recorder is poorly grounded. 3) There is an air peak. 4) The sample is decomposed. 5) The sample is contaminated. 6) The sample reacts with the stationary liquid, the support or the absorbent. 7) The glass wool at the chromatographic column end is contaminated or the injector is contaminated. 8) The sampling silica gel is contaminated or the low molecular weight components leak out.	1) Inject the sample after the previous sample has all gone out. 2) Install or renew the purifier and establish the appropriate operating conditions. 3) Exhaust the air in the injector 4) Reduce the injector's temperature (the stationary liquid or the support which can be easily catalyzed or decomposed is not recommended for use). 5) Ensure that the sample is clean with no impurity or other components. 6) Make use of other chromatographic columns to prevent the reaction between the sample and the stationary phase.

			7) Replace the glass wool at the column end or clean the injector. 8) Dry the silica gel at 200°C for 16 hours before using
13.	The fire is extinguished when the peak appears (FID).	1) The sample volume is too large. 2) The flow of hydrogen or air is too small. 3) The flow rate of the carrier gas is too high. 4) The flame nozzle is contaminated (or blocked) 5) The hydrogen is consumed	1) Reduce the sample volume. 2) Re-adjust the flow of hydrogen or air. 3) Set a suitable carrier gas flow rate. 4) Clean the flame nozzle (or remove the blockage from the flame nozzle). 5) Ensure that there is sufficient hydrogen in the source.
14.	Baseline is not able to go back to zero.	1) It is due to the excessive column bleeding (FID). 2) The detector is contaminated.	1) Use the chromatographic column with less bleeding. 2) Clean the detector.
15.	Sharp-burred peaks appear at irregular distances.	1) Dust particles or foreign material is irregularly burning in the flame (FID). 2) The insulator leaks or the high resistance connecting relay gets damp and leaks. 3) The amplifier is broken down.	1) Eliminate the water from the tubing and replace or activate the desiccant in the hydrogen filter. 2) Check the leak. 3) Eliminate the impurities in the flow path.

		4) The flame is flickering.	If there are impurities in the chromatographic column, increase the column temperature. 4) Adjust the flow rate of hydrogen and air.
16.	Short burrs at even intervals	1) Water condenses in the hydrogen tube (the water usually comes from the hydrogen source). 2) There is a gas leakage. 3) There is a blockage on the flow path. 4) The flame is flickering.	1) Eliminate the water from the tubing and replace or activate the desiccant in the hydrogen filter. 2) Check the leak. 3) Eliminate the impurities in the flow path. If there are impurities in the chromatographic column, increase the column temperature. 4) Adjust the flow rate of hydrogen and air.
17.	Loud noise of the baseline	1) The chromatographic column is contaminated or there is an excessive column bleeding. 2) The carrier gas is contaminated. 3) The carrier gas flow rate is too high. 4) The carrier gas is leaking.	1) Replace the chromatographic column. 2) Replace or renew the carrier gas filter. 3) Re-regulate the flow rate of the carrier gas. 4) Examine for the leak. 5) Make sure that the instrument is well

	5) The instrument is poorly grounded. 6) The high resistance is contaminated. 7) The injector is contaminated 8) The hydrogen flow rate is too high or too low (FID). 9) The air flow rate is too high or too low (FID). 10) The hydrogen or air is contaminated. 11) The water condenses in FID. 12) The detector cable is in poor contact. 13) The detector's insulation turns smaller (the ionization detector). 14) The electrode, the nozzle or the base of the detector is contaminated.	grounded. 6) Identify the contaminated high resistance and clean it. 7) Clean the sampling tube of the injector and remove the residue of silica gel. 8) Re-adjust the hydrogen flow rate. 9) Re-regulate the air flow rate. 10) Replace both the hydrogen filter and the air filter. 11) Remove the water by increasing the FID temperature. (14) Replace the cable or repair it. 12) Clean the detector insulator. 13) Clean the detector.
18. Periodical baseline	1) The detector's temperature control is deficient. 2) The control of the chromatographic column oven is deficient. 3) The carrier gas flow is not set properly.	1) Check the platinum insulator and improve the control precision. 2) Check the platinum insulator and improve the control precision 3) Adjust the flow rate of the carrier gas

		4) The pressure of the gas flow is too low. 5) Air and hydrogen are not adjusted well (FID).	4) Replace the carrier gas cylinder. 5) Regulate the hydrogen and air flow.
19.	One-way baseline drift	1) There is a significant increase or decrease in the detector temperature. 2) The amplifier is in zero drift. 3) There is a significant increase ordecrease in the column temperature. 4) The carrier gas gradually runs out.	1) Stabilize the detector temperature. If the temperature changes after the instrument is powered on of, it is a normal phenomenon 2) Check the amplifier. 3) Stabilize the column temperature. If the temperature changes just after the power-on, it is a normal phenomenon. 4) Replace the carrier gas cylinder.
20.	A change of the baseline after the programmed temperature rise	1) When the temperature increases, the column bleeding increases. 2) The column flow rate is not corrected. 3) The chromatographic column is contaminated. 4) The volume of the stationary liquid in the two columns is different	1) Select the appropriate chromatographic column or age the column. 2) Calibrate the column flow rate. 3) Replace the chromatographic column. 4) The weight of the stationary liquid coating on the two chromatographic columns should be equal.

21. Irregular baseline change appears when the temperature increases.	1) The leak in the column is too much. 2) The operating conditions are not appropriate. 3) The column is contaminated. 4) There are ghost peaks when the silica gel is heated.	1) Select an appropriate chromatographic column. The operating column temperature should be far lower than the highest operating temperature of the stationary liquid 2) Set the suitable operating conditions 3) Replace the chromatographic column. 4) Pre-heat the silica gel at the temperature of 200 ° C for 16 hours before use.

9 Warranty

Within 12 months after the user purchased the instrument, if it doesn't work properly without any physical damages, the factory is responsible for repair free of charge (not including the consumable parts; source lamp and cuvette not covered by the warranty).