# Notice

This manual only applies to GC112N Model Gas Chromatograph, excluding large diameter capillary direct sampler, capillary split sampler, six-way plane switching valve, reformer, and other accessories. If you use these accessories, the corresponding manual will be attached in the package.

# Table of Contents

# 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-injector, it will be carried by the carrier gas into the capillary column. Due to the difference in the distribution or adsorption coefficient of each component in the chromatograph between the mobile phase (gas phase) and the stationary phase (liquid or solid phase) in the chromatograph, under the flushing of the carrier gas, each component is repeatedly repeated between the two phases. Participate in two times to separate the components in the column, and then use the detector attached to the column to detect the components in order according to their physical and chemical properties.

## 1.2 Applications

The instrument has a wide range of applications and is suitable for trace detection of environmental protection, air, water pollution and other pollution; analysis, monitoring, and research of poisons; biochemistry; clinical applications;

pathology and virus research; food fermentation; petrochemicals; petroleum processing; oil Product analysis; geology and prospecting research; organic chemistry; synthesis research; health and quarantine; pollution detection analysis and research.

## 1.3 Features

- The full-color large 7-inch LCD touch screen brings users better human-computer interaction.
- High-precision temperature control system, high control accuracy (better than ±0.05℃), the oven has a nine-phase programmed temperature;
- Manual flow/pressure adjustment of the gas path, the screen displays the flow/pressure value
- The gas path has air leak and air shortage alarm functions;
- System self-checking and fault identification functions;

# 2 Technical Indicators and Specifications

## 2.1 Technical Specifications

| Oven Temperature Control Indicators | |
|---|---|
| Temperature range | 5℃～400℃above room temperature (15℃～399℃ above room temperature) (increment: 1℃) |
| Temperature accuracy | better than ±0.1℃(measured at 200℃) |
| Programmed temperature | nine-phase programmed temperature |
| 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 | |
|---|---|
| Detection limit (Normal hexadecane in isooctane) | GC112N |
| | D≤3×$10^{-12}$g/s |
| Max. limit temp | 399℃ |
| Baseline noise | ≤5×$10^{-14}$A |
| Baseline drift | ≤1×$10^{-12}$A/30min |

## 2.2 Specifications

| | GC112N |
|---|---|
| Dimensions | 568mm×560mm×490mm |
| Weight | 40Kg |
| Power supply voltage | AC220V±22V, 50Hz±1Hz |

## 2.3 Optional Accessories

The basic type of GC112N gas chromatograph has following components, including chassis, capillary column sampler, a

full set of capillary column carrier gas and auxiliary gas flow, 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.

- Basic GC112N 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 GC112N 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.

- Autosampler
- Switch valve of gas sampler
- Reformer (conversion agent containing methanation nickel)
- 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

Open the package (please save the outer packing box in case you need to move it), and count the host and spare parts according to the accessory spare parts list. If there is any error, please contact your local sales agent or contact our company directly.

## 3.3 Preparation and Treatment of Gas Source

### 3.3.1 Gas Source

The FID detector of GC112N 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 Gas Source Treatment

Before three types of gas enter the instrument, it must strictly undergo purification treatment. You can choose the general purifier manufactured by our factory. 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, turn the switch valve knob to “On” position. The duct connection of outdoor air should be stainless steel or copper pipes.

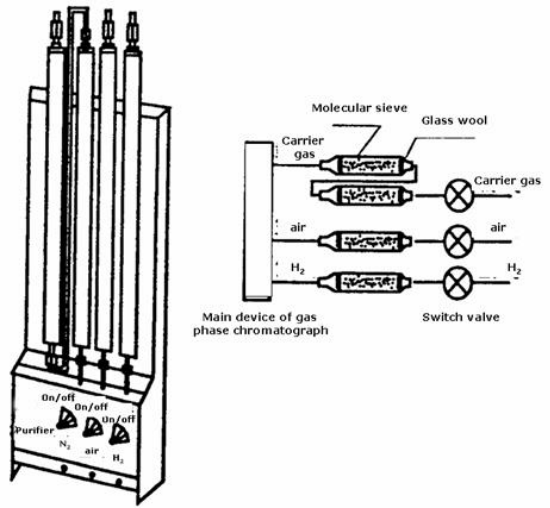
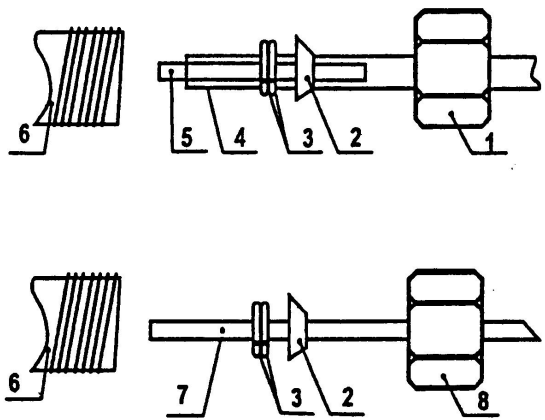



Figure 3.3.2

## 3.4 External Gas Flow Connection

### 3.4.1 Connect the pipeline to the connector

GC112N gas chromatograph gas pipeline mainly consists of 3×0.5 polyethylene duct (Annex 28 #) or 2×0.5 stainless steel duct. Nuts are M8×1, 3.2 (Attachment 24 #) or M8×1, 2.1 (Attachment 7 #). The connection diagram of these two kinds of conduits and joints is shown in Figure 3.4.1. In the picture, the purpose of the ϕ3×0.5 polyethylene pipe with sealing gasket is to enhance the strength of the pipe at the sealing point to ensure smooth gas and sealing performance. If ϕ2×0.5 stainless steel connecting pipes are used, ϕ2×0.5×20 sealing gaskets are not needed. The sealing ring in the picture can also be replaced by a ϕ5×1 PTFE tube cut into a length of 5mm. Two sealing rings must be used in use, otherwise the sealing performance will not be guaranteed. The maximum seal pressure is 0.5MPa~0.8MPa (5kgf/cm2~8 kgf/cm2). Check whether the gas circuit joints are leaking. Do not use ordinary soapy water with strong alkalinity to avoid corrosion of the parts. It is better to use a dilute solution of sodium lauryl sulfate as the leak test liquid.



1. Nut (M8×1, ϕ3.2) (accessory 24#)
2. Airproof gasket (phosphor copper) (accessory 21#)
3. Two pieces of airproof coils (accessory 22#)
4. ϕ3×0.5 polyethylene pipe (accessory 28#)
5. Airproof gasket (ϕ2×0.5×20 stainless steel pipe) (accessory 23#)
6. Joint
7. ϕ2×0.5 stainless steel pipe
8. Nut (M8×1, ϕ2.1) (accessory 7#)

**Figure 3.4.1 The connection of the external gas flow joint**

### 3.4.2 External Gas Flow Connection

Cut the polyethylene pipe of ϕ3×0.5 (accessory 28#) into six 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.

### 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:

- Shut down the constant flow valve for the carrier gas and the needle valves for hydrogen and air on the packed column gas flow of the main instrument.
- Turn on the high pressure valve of the steel cylinder (before doing so, the low adjustment lever must be in a relaxed state), slowly turn the low pressure adjustment lever until the low pressure gauge indicates 3kg/cm2.
- Turn off the high pressure valve of each steel cylinder. At this time, the low pressure indication value on the pressure reducing valve should not drop. Otherwise, there is a leak in the external air circuit, which needs to be eliminated.

## 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 sampler 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. For both side, the installation procedure is the same.

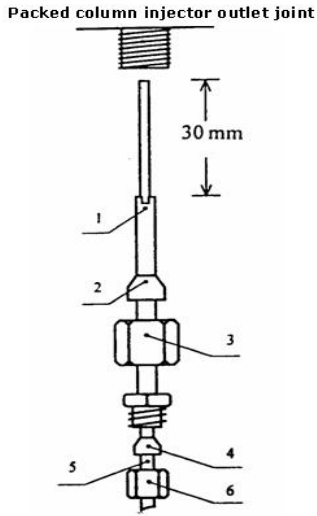
### 3.5.1 Install Φ3mm and Φ4mm metal columns to the inlet of packed column

Use Figure 3.5.1 as the installation instructions:

1) Mount the nut (SN#: 6), graphite airproof gasket (SN#: 4) and packed column transition joint (SN#: 1) into the packed column in sequence.
2) Make the column head extend out of the transition joint by 20mm~30mm (as shown in the figure), hold this position and tighten the nut by hand, then use two suitable wrenches, one clamped on the nut, the other clamped on the transition joint, reverse tightening and sealing.
3) Install the nut (M12×1, ϕ6.2) and graphite airproof gasket (ϕ6) into the transition joint in turn.
4) Push the transition joint together with column head into the sampler 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) Keep this position, first tighten the nut (M12×1, ϕ6.2) with the injector outlet connector by hand, and then tighten it with an M12 wrench and seal it.




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

**Figure 3.5.1**

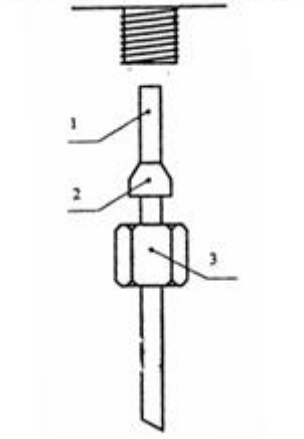
### 3.5.2 Install Φ5mm and Φ4mm metal columns and 5.7mm glass column to the inlet of packed column

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 sampler 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 sampler 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.**

Packed column injector outlet joint




| 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 Install ϕ3mm and ϕ4mm metal columns to FID detector

Use figure 3.5.3 as the installation guide:

1) Mount the nut (SN#: 6), graphite airproof gasket (SN#: 4) and the packed columr 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 with the column handle into the FID inlet and touch the heel.
5) Hold this position. First, tighten the nut (M12×1, ϕ6.2) to the sampler outlet joint with hand. Then, tighten it with wrench M12 and seal it.

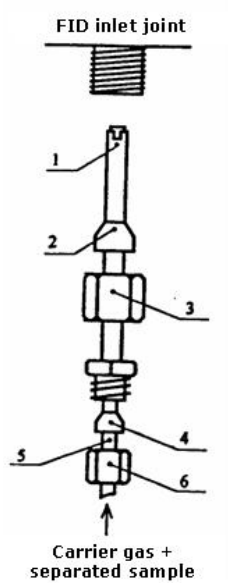



**Figure 3.5.3**

For gas sampling, install column to FID detector in the same manner as above.

### 3.5.5 Install ϕ5mm and ϕ6mm Metal Columns and ϕ5.7mm Glass Column to FID Detector

Use figure 3.5.4 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 sampler outlet joint with hand. Then, tighten it with wrench M12 and seal it.

After the column is installed, all joint nuts should be tested for leaks at room temperature and the operating temperature of the oven, sampler, and detector. If necessary, tighten with a wrench to prevent air leakage.

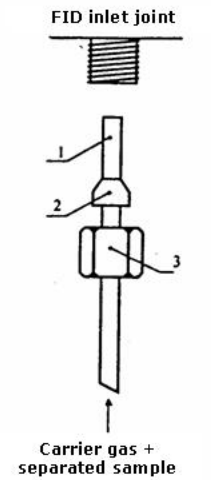



**Figure 3.5.4**

## 3.6 Installation of Liner and Spacer of Split Sampler

The installation of the capillary split sampler: the split vaporization tube is a quartz glass lined tube, code SFZ 8.490.001; the user can fill a little glass wool in the tube, the purpose is to make the sample vaporized enough to mix well, so that the sample Reduce distortion when splitting lightly. The inner wall of the split vaporization tube and the glass wool are treated with dimethyldichlorosilane to eliminate the adsorption of the glass surface. The installation steps of the split injector are as follows (see Figure 3.6).

1) Insert the high temperature resistant O-ring into the upper part of the quartz lined pipe (the bottom part is notched).
2) Carefully insert the quartz liner into the bottom of the injector base part.
3) Put the sample injection top part into the upper part of the quartz liner tube, and then fix it on the sampler base with M3×10 screws (two).
4) Unscrew the top cover of the sample injection top part by hand, remove the guide top, and replace the silicone rubber pad. Install the parts in place according to the above sequence and finally tighten the top cover.

**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 Figure 3.6. Replace the new adsorbent. Fill the tube with a little glass wool at both ends.**

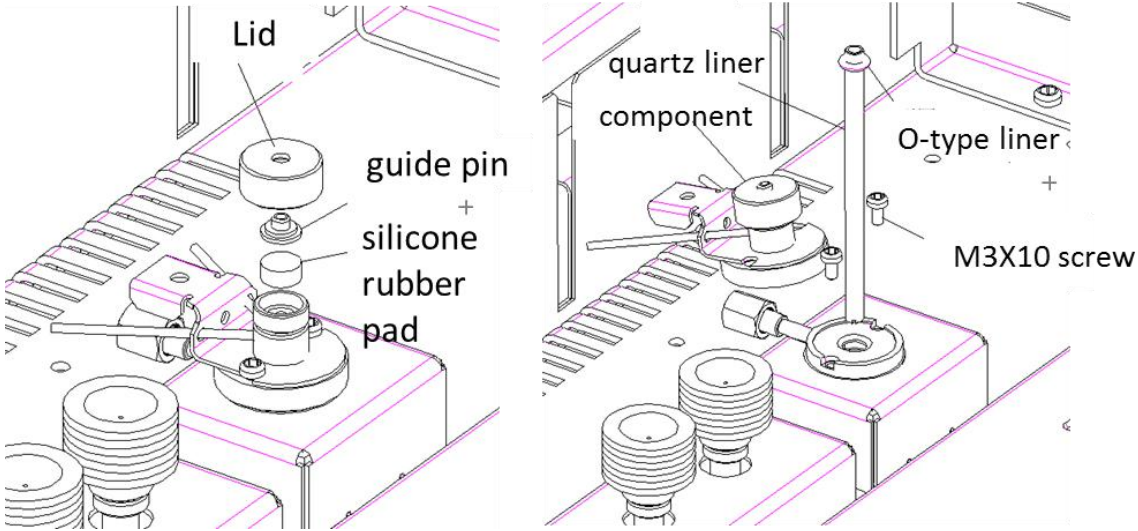

Lid
guide pin
+
silicone
rubber
pad
quartz liner
component
O-type liner
+
M3X10 screw

**Figure 3.6**

## 3.7 Installation of Capillary Column System

### 3.7.1 Installation of Capillary Column

The steps of installing capillary rack are as follows, refer to Figure 3.7.1:

1. Mount the rack 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
4. Capillary
5. Two ϕ3 screws to fix the rack assembly

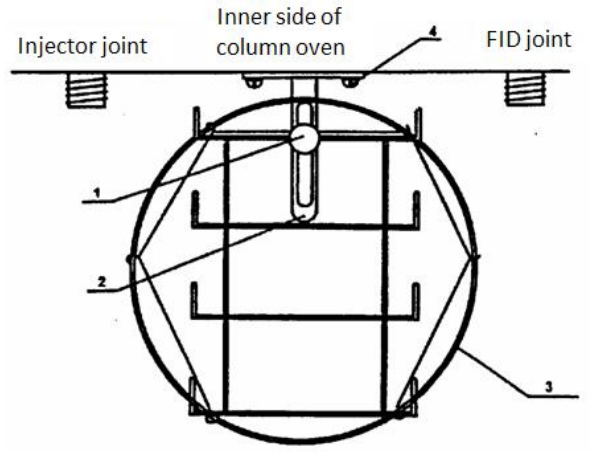



**Figure 3.7.1 Schematic Diagram of Capillary Rack**

The capillary analysis system of GC112N 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<br>(ϕ0.9mm~ϕ1mm) | Strip graphite gasket<br>(inner diameter ϕ0.9mm) | 3# |
| Flexible quartz capillary column<br>(ϕ0.375mm~ϕ0.45mm) | Strip graphite gasket<br>(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. | | |

If you choose a larger diameter capillary column (such as: inner diameter 0.53mm, 0.75mm, etc.), you can ream the sealing gasket with a drill bit (the diameter of the drill bit is similar to the outer diameter of the capillary).

### 3.7.2 Connection of Capillary Column with Split Sampler

1) Place the M5, ϕ1.6 nut and strip graphite gasket respectively onto the capillary column.
2) As shown in Figure 3.7.2, hold the position of capillary column which extends from the nut M5 for 27mm. First, hand-tighten the nut and the joint, then use an 8-inch wrench to tighten the nut.

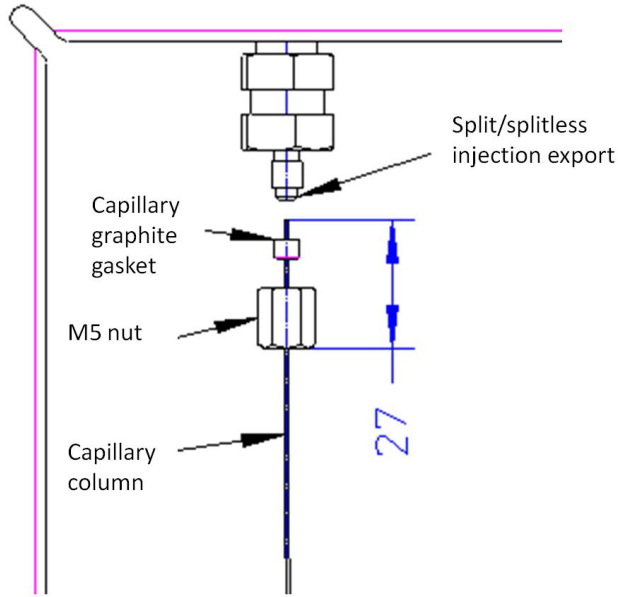



**Figure 3.7.2**

### 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 17# wrench.
5) Place the M5, ϕ1.6 nut and strip graphite gasket respectively onto the capillary column.
6) As shown in Figure 3.7.3, push the capillary to the bottom, hand-tighten the nut and the joint, then tighten and seal the M5 nut with the 8# wrench.

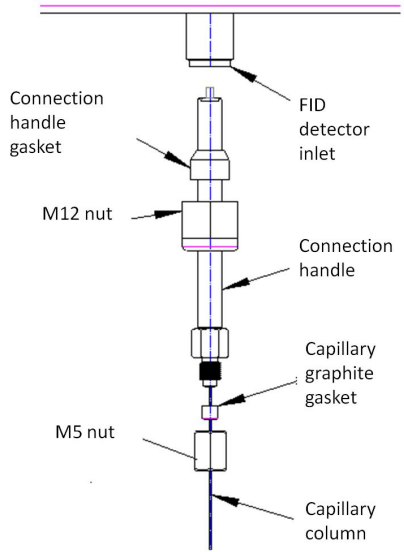
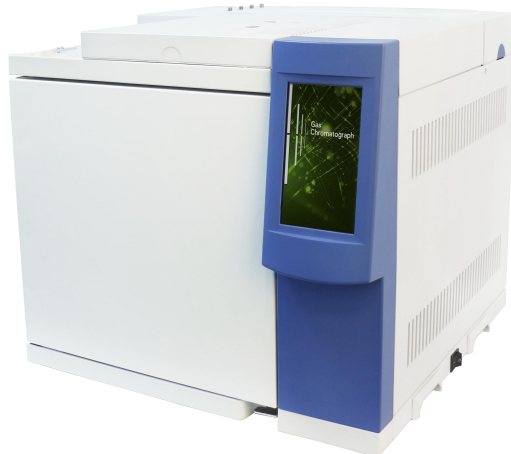



**Figure 3.7.3**

# 4 Appearance and Structure of the System

## 4.1 Appearance of the Instrument




GC112N gas chromatograph consists of the detector, sampler, column oven, flow control section means, temperature control and detector circuit parts and other components.

The middle part of the basic type is the oven, the upper right part is the microcomputer temperature controller, the outside on the right side is the FID micro-current amplifier, the left part of the instrument is the flow control part and the gas circuit panel, and the upper right part of the oven is the ionization detector installation Location (basic type has two flame ionization detectors and thermal conductivity cell detector (TCD) installation location, the upper left part of the oven is a split capillary column sampler.

## 4.2 Layout

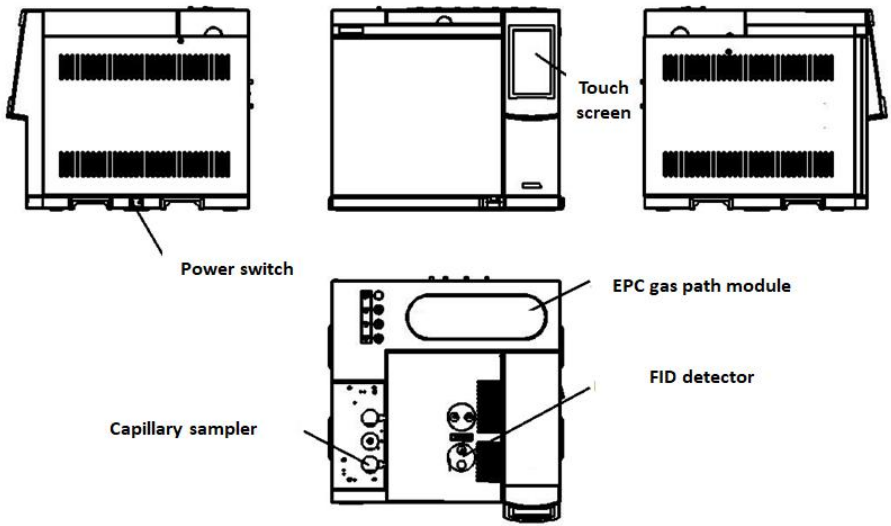



**Figure 4.2.a GC112N Front View/Left View/Right View/Top View**

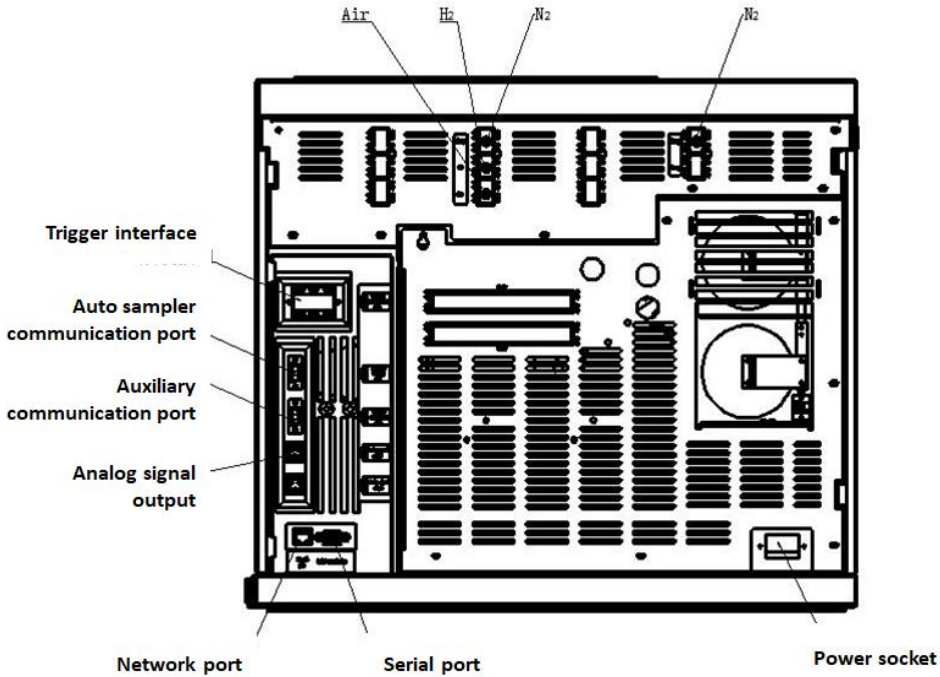



**Figure 4.2.b GC112N Back View**

## 4.3 Structural System

### 4.3.1 Sampler System

The capillary column sampler of this instrument can be a capillary column split analysis, and the packed column sampler can be a packed column analysis. This chapter mainly introduces the installation and operating instructions of the split injector. The basic accessories of the GC112N instrument contain the corresponding liners and connectors for the capillary split injector. If users need to order other samplers for capillary columns, the instructions are attached separately.

GC112N can choose split injection, and packed column injection;

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

### 4.3.2 Column Oven

The GC112N gas chromatograph has a large-volume column box, which can be easily installed with capillary columns and has the characteristics of fast heating and cooling speed. The heating wire of the column box is hidden behind the mesh plate to avoid the peak split of the elastic quartz capillary column caused by the radiation of the heating wire. This instrument adopts a low-noise motor, running smoothly with little vibration. When the oven needs to be cooled, the lower part quickly sucks in cold air from the outside and exhausts hot air from the upper door of the rear door to achieve the purpose of rapid cooling. The total power of the heating wire of the oven is about 1200W. When the temperature of the oven exceeds 420℃, the fuse of the heating wire will melt immediately (the fuse is installed at the rear right part of the screen) to cut off the heating wire loop to protect the oven. Before restart, the fuse must be replaced (6 pieces in parallel). Fuses are provided in the accessories.

### 4.3.3 Detector System

GC112N detector configuration: hydrogen flame ionization detector (FID), thermal conductivity detector (TCD).

The user can choose to mount either one or both, FID and TCD. The FID detector of GC112N is installed on the top front end of the main unit, and its base is installed in an aluminum thermal conductor. The heat conductor is also

equipped with a heating rod and a platinum resistance, and is connected with the main wiring board in the microcomputer temperature controller. The signal lead wire is connected to the signal inlet on the shielding box in the FID micro-current amplifier through a high-frequency cable. The lead wire of the emitter-ignition pole (sharing a platinum wire coil) is transferred to the ignition switch of the FID amplifier of the electric box through a wire-to-wire plug seat on the top of the main unit. The outlet end of the chromatography column is inserted into the inlet end of the FID detector on the top of the column box, and it is connected and sealed with a nut and a graphite gasket. Hydrogen and air are introduced from the joint of the gas control system above the host by stainless steel pipes.

# 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 Profile 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 profile display area. This area in the programmed temperature state, you can see the programmed temperature curve and where the current temperature is.

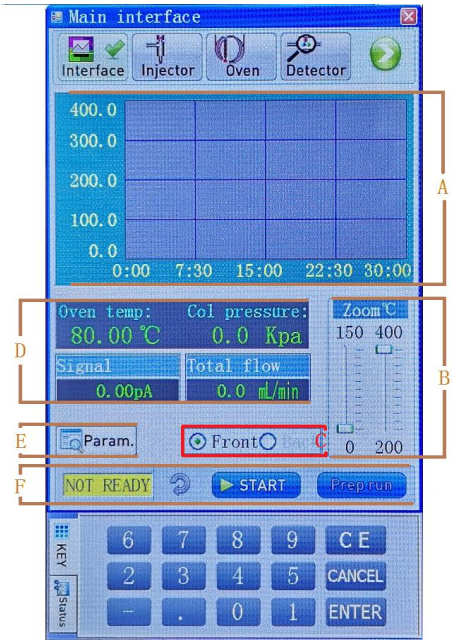



**Figure 6.1 Monitor Interface**

### 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 Sampler

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

### 6.1.4 Status Display Area

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.

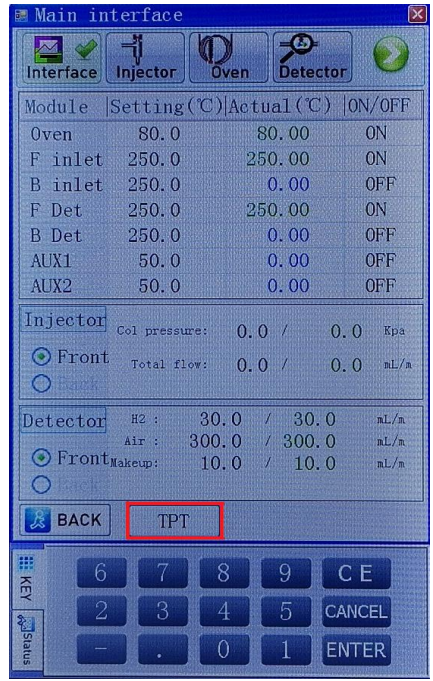



**Figure 6.1.5 Parameter View Window**

### 6.1.5 Parameters View

Refer to area [E] in Figure 6.1.
Click the [Parameters] button to jump to the parameter window, as shown in Figure 6.1.5. This function makes it easy for the user to view the temperature of each sampler, detector and oven and the data of the gas flow of the sampler 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.

### 6.1.6 Current Status

Refer to area [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" status. 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 Sampler Interface

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

### 6.2.1 Temperature Control Area

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 sampler.

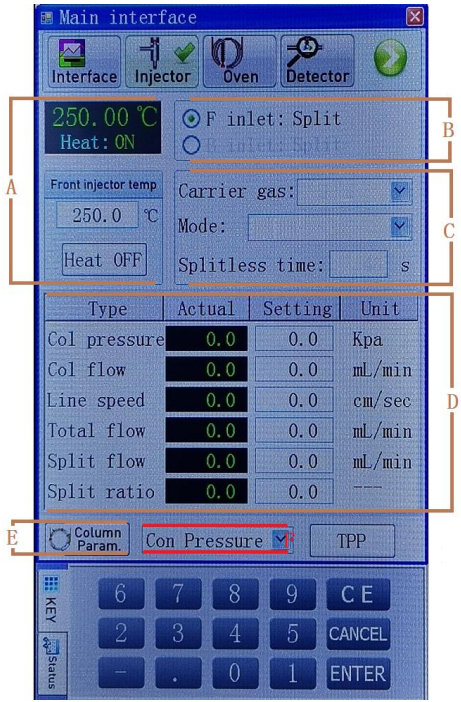



**Figure 6.2 Sampler Interface**

### 6.2.2 Sampler Interface Display

Refer to area [B] in Figure 6.2.
When the user adjusts the flow knob, the sampler interface displays the flow value: total flow, split flow, pre-column pressure, and column flow.

### 6.2.3 Injection method

Refer to area [C] in Figure 6.2.
Select injection method.
Operation method: directly use the touch pen to click the drop-down button, there are several types to choose from in the drop-down menu, and the current type will be automatically displayed, and the user can select from the available types.

## 6.3 Column Oven Interface

In other interfaces, click [Column Oven] in the menu to enter this functional module. As shown in Figure 6.3.

### 6.3.1 Temperature Control

Refer to area [A] in Figure 6.3.

For the Temp Control function, it includes temperature setting, and 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 curre

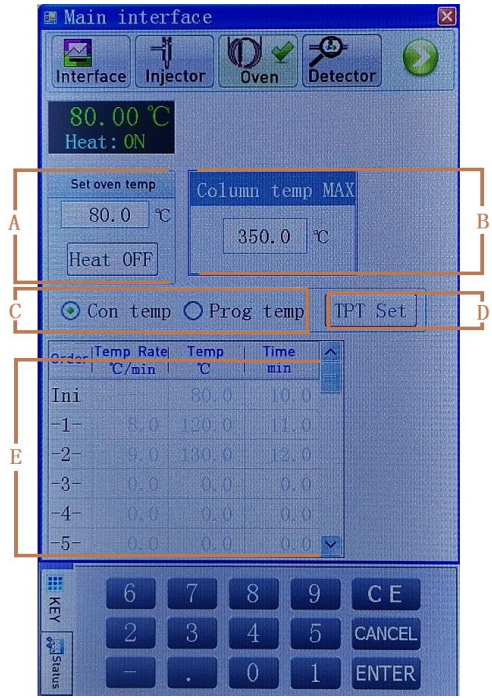



**Figure 6.3 Column Oven Interface**

### 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 in case the temperature is too high.

### 6.3.3 Constant/Programmed Temperature 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 programmed temperature control.

### 6.3.4 Programmed Temp Control Setting

See area [D] in Figure 6.3.
The switch of [Programmed 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 Programmed Temp Control Data Area

See area [E] in Figure 6.3.

For programmed temperature setting, when the oven is set as the programmed 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 phase must be higher than the temperature of the previous one, and the user can set up to nine-phase programmed 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

In other interfaces, click [Detector] in the menu bar to enter this functional module.

GC112N provides logarithmic FID detector (Figure 6.4).

### 6.4.1 Temp Control Area

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].

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 confirm. For the heating switch, click [Heating On] to start, and click [Heating off] to stop.

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

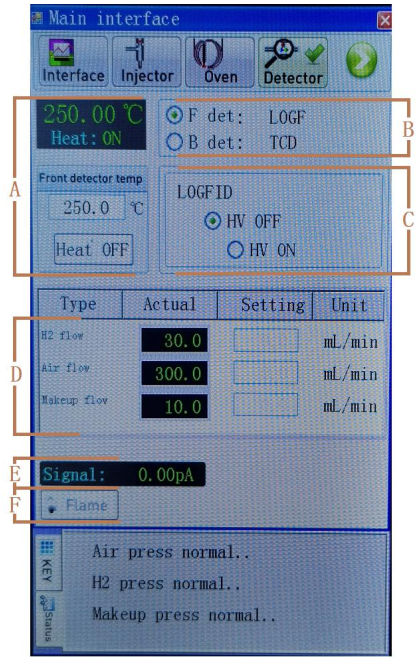



**Figure 6.4 Detector interface (logarithmic FID)**

### 6.4.2 Display Options

See area [B] in Figure6.4.
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 High Pressure Switch

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

### 6.4.4 Gas flow Data Settings /Display

As shown in the [D] area of Figure 6.4.
Detector flow setting control area, it can set the flow of hydrogen, air, and makeup gas. When the user adjusts the corresponding flow knob, the above flow value will change.
**Typical FID (capillary column) values are as follows:**
**Hydrogen is 30 ml/min, air 300 ml/min, and makeup gas 20 ml/min.**

### 6.4.5 Signal Value

For the logarithmic FID detector interface, it's shown as the [E] area in Figure 6.4.
The signal value is indicated as pA.

### 6.4.6 Ignition

Refer to area [F] in Figure 6.4.
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 (For Automatic Model)

This function is for the automatic model only. In other interfaces, 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 area [C] is the contents of the file.

When the user does not store the file, the file name is always displayed as "Current", and shows 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

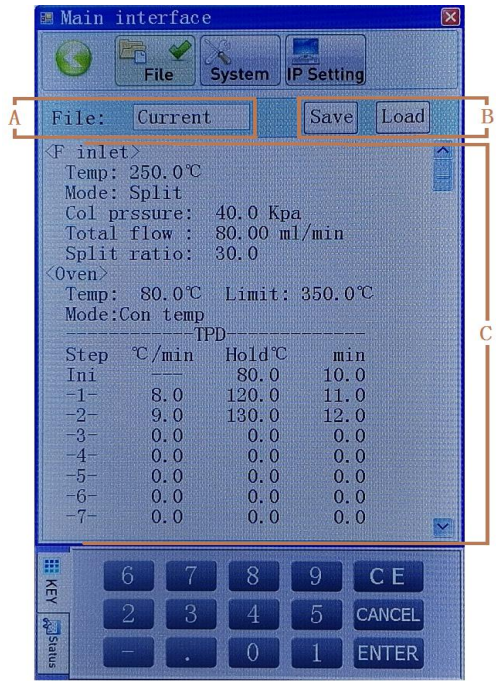



**Figure 6.5 File Management Interface**

instrument is switched on, it will automatically recall the latest saved file.
It is also very convenient and simple to recall any test information which is saved before.
The user can also save the status information of each modification with another file name, or 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 recalled by the user.

### 6.5.2 Store/Load

Refer to area [B] in Figure 6.5.
Click [Store], as shown in Figure 6.5.2-A. Click the alphanumeric keys to input the file name, and then click [upper case] to switch between the upper and lower case letters. For different sample, choose different conditions. It is best to name the file with the sample name. Later when testing the sample, you can directly call the file, and the instrument will automatically resume the original 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.
Select the storage location as needed in the "File Sequence", as shown in Figure 6.5.2-C. Click [YES] to save the current file to the selected location. Click [NO] to cancel the storage.

Click [Load] to recall the previously saved file, as shown in Figure 6.5.2-B. Select the file to be loaded, confirm it and the file will be loaded to “file 1” position, and all current information will be updated. The contents of the original file remain unchanged.

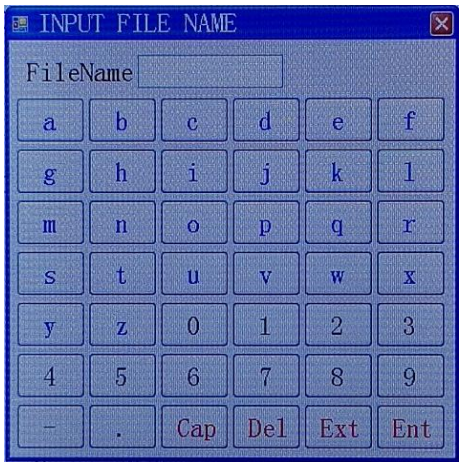



**Figure 6.5.2-A Input File Name**

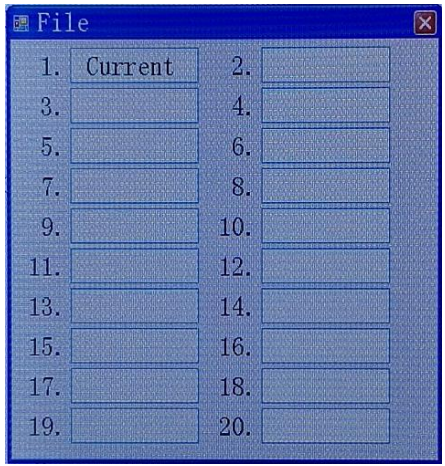



**Figure 6.5.2-B File Sequence**

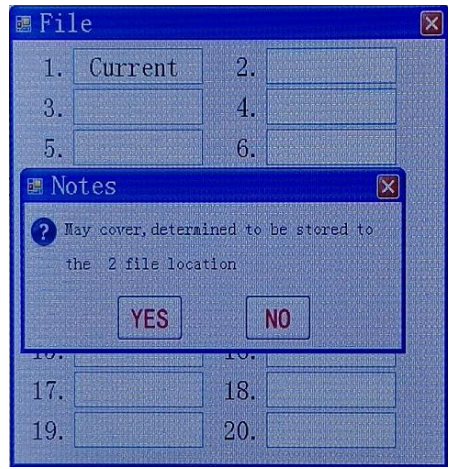



**Figure 6.5.2-C Prompt Message**

### 6.5.3 File Contents

As shown in Figure 6.5 [C] area, it displays t the current file contents which are consistent with current settings of the instrument. To facilitate the user to view all information in one place, scroll the bar to view the rest information which is not displayed.

## 6.6 System Configuration Interface

In 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 sampler and the detector, the current display is the connection between front sampler and detector.

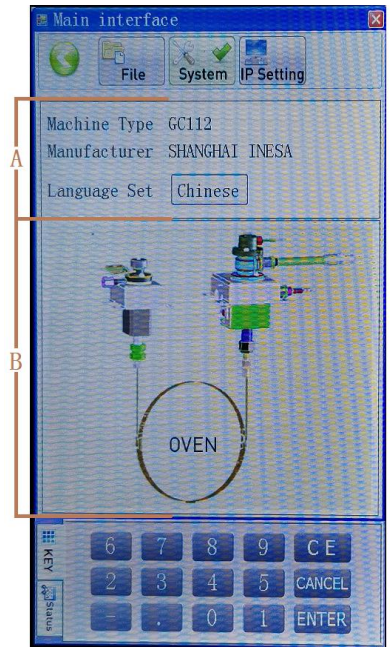



**Figure 6.6 System Configuration Interface**

### 6.6.3 Switch / Connect settings

As shown in area [C] of Figure 6.6, use [NEXT] button to switch the connection between another set of samplers and detectors. The button is grayed out since the unit is connected to a single sampler and single detector. It is automatically activated when two or more sets of samplers 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 sampler and the detector when the button is activated.

## 6.7 Online Configuration Interface

In other interfaces, click [Online Configuration] in the menu bar to enter this functional module. As shown in Figure 6.7. It is used for direct networking interaction between instruments and workstations

### 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 is used to set up the networking configuration of the GC. The user can select static or dynamic IP address. When selecting a static IP address, you can set a specific static IP address below.

**Note: The IP address of the equipment needs to be set on the same network**

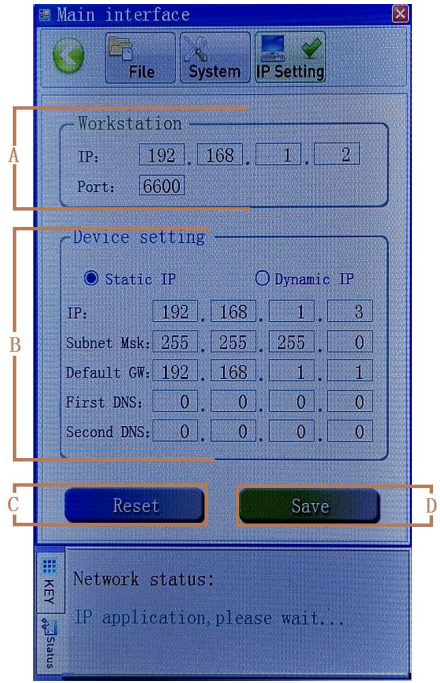



**Figure 6.7 Online configuration interface**

**segment as the IP address of the workstation.**

### 6.7.3 Restore 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 the contents of the online configuration are modified, click the [Save Current Configuration] button, the system will save the updated information. If you fail to not click, the previous changes will not be saved.

# 7 Operation Examples

## 7.1 FID Detector

### 7.1.1 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 external gas flow of carrier gas, air and hydrogen and check whether the path leaks.
2) Install the aged column (from the sampler to the FID detector).
3) Connect the network cable (between computer and host device).
4) Turn on the carrier gas source and rotate the pressure regulator until the carrier gas flow reaches the appropriate value (according to the separation conditions).
5) Turn on the power, and follow the above instructions in Chapter II to set the temperature of oven, detector and sampler, for example: oven 150℃, sampler 180℃, and detector 180℃.

6) After the temperature of the sampler, detector (FID) and oven are in equilibrium, turn on the air and hydrogen gas source. Adjust the air needle valve on the air panel and two hydrogen needle valve knobs to the appropriate flow rate, according to the required operating conditions. (The flow rate will display on the screen.)

7) 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) Press the ignition box on the screen detector dialog box to see the signal change, and thenthe ignition is successful.

   b) A metal or glass sheet with a clean surface is placed in the "vent" of the ion chamber. If the surface of the metal body or glass sheet is condensed by water vapor, the fire has ignited.

**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.**

### 7.1.2 Notes for Operating FID

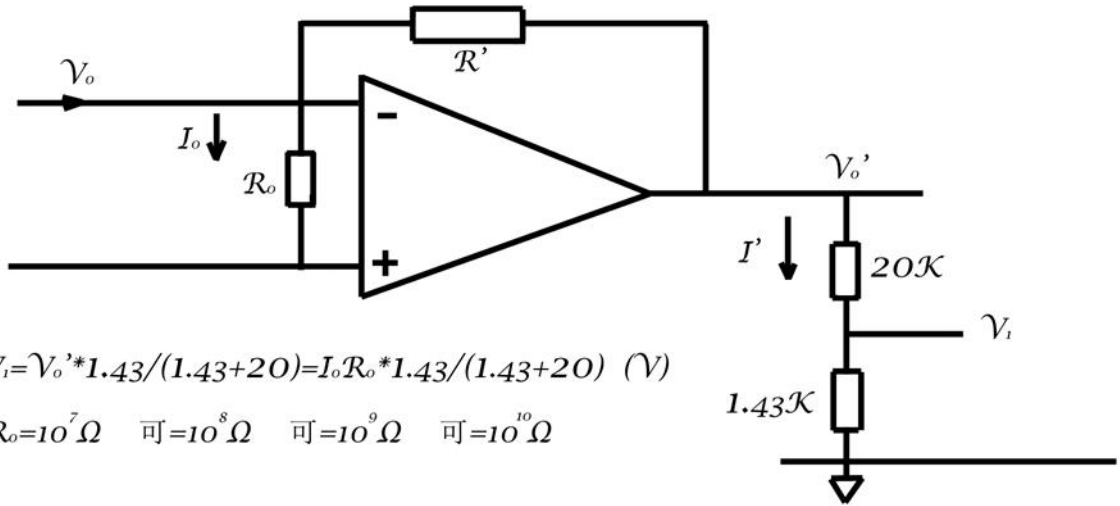
1) The detector is a high sensitivity detector, must be high-latitude carrier gas (99.99% N2) and the carrier gas,

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 programmed 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 sampler and the detector inlet of the FID or screwed into the M12 × 1 nut with a ϕ6 graphite gasket 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 GC112N, the pressure should be set at 343000Pa (equivalent to 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 Clean 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 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 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 (accessory#14) should also be replaced by a new one. Then turn the nozzle tight to prevent gas leakage.

### 8.2.2 Clean the Sampler

The sampler can easily be contaminated, especially the gasification tube. Therefore it is quite important to clean the sampler. First take off the chromatography 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 sampler 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 chromatography 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.<br>2) The ionic line is broken. | 1) Inspect the amplifier and the fuse.<br>2) Inspect the ionic line. |

| | | | |
|---|---|---|---|
| | | 3) There is no flow of the carrier gas.<br>4) The sample has too low a temperature and it has not vaporized yet.<br>5) The micro-injector is blocked.<br>6) There is leak of the sampler's silica gel.<br>7) The connection of the chromatography column is loose.<br>8) There is no fire (FID).<br>9) FID polarization voltage is not connected or is in poor contact. | 3) Check that if the carrier gas flow path has been blocked or the gas in the gas cylinder has run out.<br>4) Increase the sampler's temperature.<br>5) Replace the sampler.<br>6) Replace the silica gel.<br>7) Turn the chromatography column tight.<br>8) Ignite the fire.<br>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.<br>2) There is insufficient sample.<br>3) There is a loss of the sample when injecting it<br>4) The sampler is leaking or blocked.<br>5) The carrier gas is leaking, in particular it is leaked in the sampler.<br>6) The flow rate of hydrogen and air is not | 1) Turn down the attenuation and increase the high resistance.<br>2) Increase the sample.<br>3) Manage to inject the sample completely into the system.<br>4) Replace or dredge the sampler<br>5) Examine for the leak<br>6) Regulate the flow rate of hydrogen |

| | | | |
|---|---|---|---|
| | | properly set<br>7) There is no high pressure of the detector (FID). | and air.<br>7) Examine or install the high voltage power supply. |
| 3. | Tailing peak | 1) The injection temperature is too low<br>2) The injection tube is contaminated (leftover of sample or silica gel).<br>3) The temperature of the chromatography column oven is too low.<br>4) The injection technique is underdeveloped.<br>5) Wrong choice of chromatography column (sample reacts with column support or stationary liquid). | 1) Adjust the sampler's temperature again.<br>2) Clean the sampler's tube with the solvent.<br>3) Increase the temperature of the chromatography column.<br>4) Improve the injection technique and achieve fast-speed sample injection.<br>5) Choose the appropriate chromatography column. |
| 4. | Leading peak | 1) The column is over-loaded with too much sample.<br>2) There is an agglutination of the sample in the system. | 1) Reduce the sample.<br>2) Raise the column temperature, and then choose the appropriate sampler and the chromatography column and set the temperature of the detector. |
| 5. | No separated | 1) The column temperature is too high. | 1) Reduce the column temperature. |

| | | | |
|---|---|---|---|
| | peak | 2) The column is too short.<br>3) Loss of stationary liquid.<br>4) Wrong choice of stationary liquid or support.<br>5) The carrier gas flow is too fast.<br>6) Injection technique is too poor. | 2) Choose a longer chromatography column and set the temperature of the detector.<br>3) Replace the chromatography column or the aging column.<br>4) Select proper column.<br>5) Slow down the carrier gas flow.<br>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) The detector is low at temperature.<br>2) There is no increase or control of the temperature for the chromatography column. | 1) Raise the detector's temperature to over 100 ° C and clean the detector or increase the temperature to 200 ° C to exhaust the steam.<br>2) Maintain the temperature control system and heat platinum wire resistance |

| | | | |
|---|---|---|---|
| 9. | Baseline breaking | 1) The power outlet is in poor contact.<br>2) There is a disturbance of the external electric field.<br>3) The hydrogen flow and air flow are not properly set (FID). | 1) Fasten the connection of power outlet and receptacle.<br>2) Eliminate the external electric field which can affect the normal work of the instrument<br>3) Readjust the hydrogen flow and air flow, especially the air flow |
| 10. | The retention time is prolonged and the sensitivity is low. | 1) The carrier gas flow rate is too slow.<br>2) There is a change of the carrier gas flow rate after the sample injection.<br>3) The silica gel of the sampler leaks. | 1) Increase the flow rate of carrier gas. If the carrier gas flow is blocked, fix it.<br>2) Replace the sampling silica gel.<br>3) Replace the sampler's silica gel. |
| 11. | Irregular wave of the baseline during the isothermal operation | 1) The instrument is placed in the right position.<br>2) The instrument is poorly grounded.<br>3) The stationary liquid leaks.<br>4) The carrier gas leaks.<br>5) The detector is contaminated.<br>6) The flow rate of the carrier gas is not proper. | 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.<br>2) The instrument and the recorder should be well grounded. |

| | | | |
|---|---|---|---|
| | | 7) The hydrogen flow and air flow are not properly selected (FID).<br>8) The amplifier is not stabilized. | 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)<br>4) Investigate the leak.<br>5) Clean the detector.<br>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$^2$<br>7) Adjust the volume hydrogen flow and air flow.<br>8) Examine the amplifier and fix it. |
| 12. Extra peak<br>*A sudden | | 1) The recorder has low sensitivity.<br>2) The recorder is poorly grounded. | 1) Inject the sample after the previous sample has all gone out. |

| | | |
|---|---|---|
| increase of peak width at half height | 3) There is an air peak.<br>4) The sample is decomposed.<br>5) The sample is contaminated.<br>6) The sample reacts with the stationary liquid, the support or the absorbent.<br>7) The glass wool at the chromatography column end is contaminated or the sampler is contaminated.<br>8) The sampling silica gel is contaminated or the low molecular weight components leak out. | 2) Install or renew the purifier and establish the appropriate operating conditions.<br>3) Exhaust the air in the sampler<br>4) Reduce the sampler's temperature (the stationary liquid or the support which can be easily catalyzed or decomposed is not recommended for use).<br>5) Ensure that the sample is clean with no impurity or other components.<br>6) Make use of other chromatography columns to prevent the reaction between the sample and the stationary phase.<br>7) Replace the glass wool at the column end or clean the sampler.<br>8) Dry the silica gel at 200°C for 16 hours before using |
| 13. The fire is | 1) The sample volume is too large. | 1) Reduce the sample volume. |

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| | extinguished when the peak appears (FID). | 2) The flow of hydrogen or air is too small.<br>3) The flow rate of the carrier gas is too high.<br>4) The flame nozzle is contaminated (or blocked)<br>5) The hydrogen is consumed | 2) Re-adjust the flow of hydrogen or air.<br>3) Set a suitable carrier gas flow rate.<br>4) Clean the flame nozzle (or remove the blockage from the flame nozzle).<br>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).<br>2) The detector is contaminated. | 1) Use the chromatography column with less bleeding.<br>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).<br>2) The insulator leaks or the high resistance connecting relay gets damp and leaks.<br>3) The amplifier is broken down.<br>4) The flame is flickering. | 1) Eliminate the water from the tubing and replace or activate the desiccant in the hydrogen filter.<br>2) Check the leak.<br>3) Eliminate the impurities in the flow path. If there are impurities in the chromatography column, increase the column temperature.<br>4) Adjust the flow rate of hydrogen and air. |

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| 16. | Short burrs at even intervals | 1) Water condenses in the hydrogen tube (the water usually comes from the hydrogen source).<br>2) There is a gas leakage.<br>3) There is a blockage on the flow path.<br>4) The flame is flickering. | 1) Eliminate the water from the tubing and replace or activate the desiccant in the hydrogen filter.<br>2) Check the leak.<br>3) Eliminate the impurities in the flow path. If there are impurities in the chromatography column, increase the column temperature.<br>4) Adjust the flow rate of hydrogen and air. |
| 17. | Loud noise of the baseline | 1) The chromatography column is contaminated or there is an excessive column bleeding.<br>2) The carrier gas is contaminated.<br>3) The carrier gas flow rate is too high.<br>4) The carrier gas is leaking.<br>5) The instrument is poorly grounded.<br>6) The high resistance is contaminated.<br>7) The sampler is contaminated | 1) Replace the chromatography column.<br>2) Replace or renew the carrier gas filter.<br>3) Re-regulate the flow rate of the carrier gas.<br>4) Examine for the leak.<br>5) Make sure that the instrument is well grounded.<br>6) Identify the contaminated high resistance and clean it. |

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| | 8) The hydrogen flow rate is too high or too low (FID).<br>9) The air flow rate is too high or too low (FID).<br>10) The hydrogen or air is contaminated.<br>11) The water condenses in FID.<br>12) The detector cable is in poor contact.<br>13) The detector's insulation turns smaller (the ionization detector).<br>14) The electrode, the nozzle or the base of the detector is contaminated. | 7) Clean the sampling tube of the sampler and remove the residue of silica gel.<br>8) Re-adjust the hydrogen flow rate.<br>9) Re-regulate the air flow rate.<br>10) Replace both the hydrogen filter and the air filter.<br>11) Remove the water by increasing the FID temperature. (14) Replace the cable or repair it.<br>12) Clean the detector insulator.<br>13) Clean the detector. |
| 18. Periodical baseline | 1) The detector's temperature control is deficient.<br>2) The control of the chromatography column oven is deficient.<br>3) The carrier gas flow is not set properly.<br>4) The pressure of the gas flow is too low.<br>5) Air and hydrogen are not adjusted well (FID). | 1) Check the platinum insulator and improve the control precision.<br>2) Check the platinum insulator and improve the control precision<br>3) Adjust the flow rate of the carrier gas<br>4) Replace the carrier gas cylinder.<br>5) Regulate the hydrogen and air flow. |

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| 19. | One-way baseline drift | 1) There is a significant increase or decrease in the detector temperature.<br>2) The amplifier is in zero drift.<br>3) There is a significant increase or decrease in the column temperature.<br>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<br>2) Check the amplifier.<br>3) Stabilize the column temperature. If the temperature changes just after the power-on, it is a normal phenomenon.<br>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.<br>2) The column flow rate is not corrected.<br>3) The chromatography column is contaminated.<br>4) The volume of the stationary liquid in the two columns is different | 1) Select the appropriate chromatography column or age the column.<br>2) Calibrate the column flow rate.<br>3) Replace the chromatography column.<br>4) The weight of the stationary liquid coating on the two chromatography columns should be equal. |
| 21. | Irregular baseline change appears when the | 1) The leak in the column is too much.<br>2) The operating conditions are not appropriate. | 1) Select an appropriate chromatography column. The operating column temperature should be far lower than |

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| temperature increases. | 3) The column is contaminated.<br>4) There are ghost peaks when the silica gel is heated. | the highest operating temperature of the stationary liquid<br>2) Set the suitable operating conditions<br>3) Replace the chromatography column.<br>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).