

Gas Chromatograph

Nexis™ GC-2030

Operation Guide

Read this manual thoroughly before you use the product.
Keep this manual for future reference.

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Introduction

Read this Instruction Manual thoroughly before using the product.

Thank you for purchasing this product.

The following two manuals and Maintenance Help are supplied with this product.

Document name	Document No.	Format	Description
GC-2030 Instruction Manual	221-79204	DVD-ROM*1	This document includes information other than maintenance operation, such as overview and functions of the product. Read this Instruction Manual thoroughly before using the product.
GC-2030 Operation Guide (this document)	221-79201	Booklet	The descriptions about daily operations are excerpted from Instruction Manual and Maintenance Help. Store this booklet near the product, and use it for reference.
GC-2030 Maintenance Help	-	DVD-ROM*1	This Help document describes maintenance operation of GC-2030. Use this for the maintenance of the product.

*1 For the usage of DVD-ROM, see "How to Use the DVD-ROM" P. 4.

Keep this manual for future reference.

Only people who get training about gas chromatograph can use the product.

This manual describes how to use the product and accessories and peripherals associated with the product. Please read this manual carefully and use the product correctly following the instructions.

Important




- If the user or usage location changes, ensure that this manual is always kept together with the product.
- If this manual or a product warning label is lost or damaged, immediately contact your Shimadzu representative to request a replacement.
- To ensure safe operation, read "Safety Instructions" and "Electromagnetic Compatibility" thoroughly before using the product.
- To ensure safe operation, contact your Shimadzu representative if product installation, adjustment, or repair is required. If relocation is required after installation, the user should not move the product. Ask your Shimadzu sales/service representative.

Notice





- Information in this manual is subject to change without notice and does not represent a commitment on the part of the vendor.
- Any errors or omissions which may have occurred in this manual despite the utmost care taken in its production will be corrected as soon as possible, although not necessarily immediately after detection.
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- In this manual, "AOC" refers to both the AOC-20 series and the AOC-30 series.

Indications Used in This Manual

Warnings, cautions, and notes are indicated using the following conventions:

Indication	Meaning
 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or possibly death.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury or equipment damage.
 NOTE	Emphasizes additional information that is provided to ensure the proper use of this product.

The following symbols are used in this manual:

Indication	Meaning
 Prohibitions	Indicates an action that must not be performed.
 Instructions	Indicates an action that must be performed.
 Hint	Indicates information provided to improve product performance.
 Reference	Indicates the location of related reference information.
Text bracketed by []	On-screen items and screen names are bracketed by square brackets. Example: Click [OK].
Text enclosed by " "	Numbers, texts, keys to be entered are enclosed in double quotation marks. Example: Hold down "Ctrl" key and press "N" key.

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Introduction

How to Use the DVD-ROM

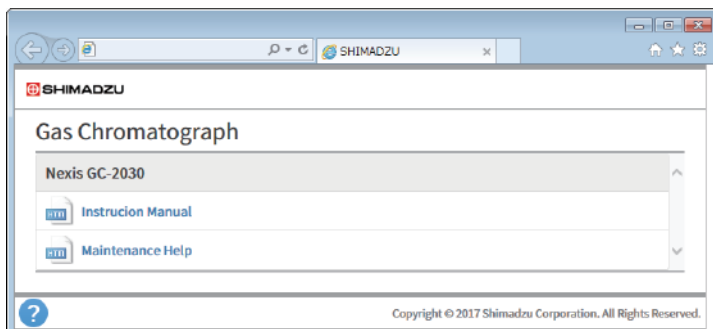
The DVD-ROM contains "Instruction Manual" and "Maintenance Help".
Use the DVD-ROM according to the following procedure.

NOTE

- Log in to the PC as a user with administrator permissions before running the DVD.
- System requirements to see Instruction Manual and Maintenance Help are shown below:
Internet Explorer® 10, Internet Explorer® 11, Microsoft Edge®, Chrome™ 45, Safari® 8

- 1** Insert the DVD-ROM into your PC.
- 2** Click [GC2030Manual.msj].
- 3** Click [Next].
- 4** Click [Install].
If [User Account Control] screen is displayed, click [Yes].
- 5** Click [Complete].
An icon is created on Desktop, and installation is completed.
- 6** Double-click  on Desktop.

The following screen appears.



- 7** Click an item to see it.
HTML manual opens.

Safety Instructions

To ensure safe product operation, read these important safety instructions carefully before use and follow all WARNING and CAUTION instructions given in this section. The gas cylinders used with this product must conform to the "High Pressure Gas Safety Law". Be sure that the "High Pressure Gas Safety Law" and "Security Regulations for General High-Pressure Gas" are strictly observed. Additionally, be sure that regulations in the "Road Law", "Act on Port Regulations", "Aviation Law", "Ship Safety Law" and "Fire Services Act" as well as SDS (Safety Data Sheet) published by the gas manufacturer are also strictly observed.

■ Precautions for Use

⚠ WARNING



Instructions

Safety regulations and standards.

For notifications on installation and safety controls, follow the necessary procedures in compliance with the laws and regulations applicable in the country where the product is used.



Prohibitions

Do NOT use the product for other than intended use.

The product is a device to perform qualitative/quantitative analysis. If you use the product for other than intended use, that may cause accidents.

■ Precautions for Installation Site

⚠ WARNING



Prohibitions

Do NOT install the product in an atmosphere with flammable or explosive gases.

May cause fire or explosion.



Prohibitions

Do NOT install the product in the vicinity of combustibles.

The product exhausts hot air from the openings. If hot air blows directly on combustibles and burn them, that may cause burn and fire.



Instructions

Install the product in a well-ventilated area.

Poor ventilation may cause oxygen deficiency depending on the kind of gases.

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Introduction

! CAUTION



Instructions

Avoid exposure to gases which include corrosive gas/ organic solvent/halogen compound/siloxane, oil mist, or excessive dust/dirt.

May cause poor performance or shorten the life.



Prohibitions

Do NOT use the product in the presence of strong electromagnetic waves. Do NOT use power sources with strong noise.

May cause malfunctions. You may not be able to obtain data as the specification.



Instructions

Install the product on a flat and stable table or base with the depth of more than 1040 mm which can carry the total weight of the system.

The weight of the main body of the system is 43.5 kg (for SPL/FID model). If the conditions are not satisfied, that may cause accident due to toppling over or drop.

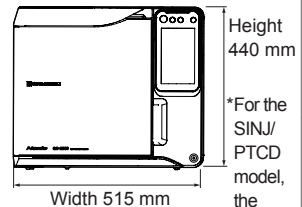
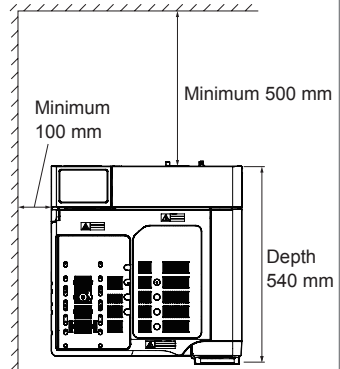


Instructions

Keep the rear of the product more than 500 mm away from the wall.

Hot air is discharged from the vent on the rear of the product while cooling the column oven. Comply with the following conditions for installation.

- Do NOT put combustibles near the rear of the product.
- Keep the rear of the product more than 500 mm away from the wall.
The distance from the wall should be more than 250 mm when optional exhaust duct (P/N: S221-80955-41) is installed.
- Leave a space for maintenance and inspection of the rear.



*For the SINJ/PTCD model, the height is 500 mm.



Instructions

Keep the left side of the product more than 100 mm away from the wall.

The slit on the left side is important to cool the outer wall of the column oven. The vent on the side is required to improve the efficiency of cooling of the column oven.

! CAUTION



Instructions

For optimal performance, comply with the following instructions during installation:

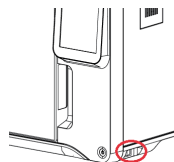
- Keep room temperature at 5 to 40 °C with small fluctuation
- Keep humidity from 5 to 90 % (no condensation)
- Prevent the air conditioner from blowing directly on the instrument
- Avoid direct sunlight
- Avoid strong vibration
- Avoid condensation
- Comply with standards for installation environment (IEC) (category II, pollution degree 2, altitude below 2000 m, indoor)
- Keep the rear of the product more than 500 mm away from the wall to leave a space for maintenance and inspection
- Leave a space of more than 100 mm on both sides of the instrument



Instructions

Install the instrument so that you can easily press the power button.

You need to turn OFF the main power of the instrument in an emergency.



■ Precautions for Installation

To ensure safe operation, contact your Shimadzu representative if product installation or adjustment is required. If relocation is required after installation, the user should not move the product. Ask your Shimadzu sales/service representative.

! WARNING



Prohibitions

Do NOT share circuit breaker and wall outlet with other devices such as data processing device.

Current more than the rated value may cause fire.



Prohibitions

Do NOT put heavy objects on the power cable. Do NOT put the cable in the vicinity of heating devices.

Do NOT modify, bend, or pull the power cable.

Do NOT fix the power cable with nails or stapler.

Failure to observe these can cause fire, electric shock, and malfunction. If the power cable is damaged, contact your Shimadzu sales/service representative.

WARNING



Instructions

Use a wall outlet which satisfies the following conditions only for GC-2030.

- Rated current

Power voltage	Standard model with FID	The maximum value for models with peripherals
AC100 V	18 A	26 A
AC115 V	15.7 A	22.6 A
AC230 V	11.3 A	14.8 A

- Independent earth leakage breaker
- Three-prong grounded-type

NOTE

Earth leakage breaker automatically shuts off the power upon detecting of current leakage from circuits and devices to prevent electric shock and fire.



Instructions

Connect the power cord to the power supply equipped with a circuit breaker at an easily accessible position. In addition, explicitly indicate that the circuit breaker is dedicated to the product.

The circuit breaker must be used to shut off the power supply in case of emergency.



Instructions

Comply with the rated current of the outlet.

Failure to observe this can cause fire, electric shock, and malfunction.

WARNING



Instructions

Connect the power supply complying with the power-supply voltage shown on the label on the rear of the product.

Otherwise, fire or electric shock could result. Check that the power supply voltage is stable and that its current capacity is sufficient to operate all the components of the system. If not, the instrument will not operate at its rated performance.

Power Supply Voltage*1 (indicated on the instrument)	Power Consumption	Frequency	Rated Breaking Capacity*2
AC100 V (100 V~)	1800 VA	50 Hz/60 Hz	80 A
AC115 V (115 V~)	1800 VA	50 Hz/60 Hz	80 A
AC230 V (230 V~)	2600 VA	50 Hz/60 Hz	50 A

*1 Mains supply voltage fluctuations are not to exceed 10 % of the nominal supply voltage.

*2 Connect the instrument to a power outlet that is equipped with a circuit breaker that shuts off the current at the described value or less.



Instructions

Fix or bundle the metal gas lines to prevent them from getting near the wall outlet, the power cable, and the power plug.

If metal gas lines come into contact with power sources, explosion or burn due to heating may occur.



Instructions

Take measures to prevent the instrument from falling over during an earthquake.

Earthquake may cause falling over or drop of the instrument resulting in injuries.



Instructions

Ground the instrument.

Failure to observe this may cause electric shock when malfunction or current leakage occurs. Grounding is important to ensure stable operation.



Instructions

Insert the power cable into a wall outlet which you can reach easily.

You need to disconnect the power cable from the wall outlet in an emergency.

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Introduction

CAUTION



Prohibitions

Do NOT put other devices or objects on the product. Or do NOT put the product on other devices.

That may cause accident due to toppling over or drop.



Instructions

Ventilate your room adequately after installation.

The instrument may emit a smell when the oven is heated to a high temperature.

This smell is caused by paste inside insulation of the oven (material: corn starch etc.) and it will disappear after a few hours.



Instructions

Ground the PC, peripheral devices, and the optional units with equal potential grounds.

Otherwise, communication between units may be interrupted and system failure may occur.

■ Precautions for Operation

WARNING



Prohibitions

Do NOT put combustibles near the openings or the rear.

Hot air is exhausted from the openings and the rear. If hot air blows directly on combustibles, that may cause ignition and fire.



Prohibitions

Do NOT disconnect the power cable while the main power switch is turned on.

A spark due to discharge occurs and may cause fire (for example, organic solvents may catch fire).



Instructions

When using flammable solvent or sample (such as carbon disulfide), seal the vial (including bottles for solvent and waste fluid) with septum cap and secure it tightly.

If vapors of solvent or sample fill inside the room, fire may occur because the vapors catch fire.

NOTE

Make sure to use sample cooling fan (P/N: S221-44995-91) especially when using very flammable solvent such as carbon disulfide for AOC-20. It is also recommended to use sample cooling fan when using the other flammable solvent or sample.



Instructions

Use waste fluid vial within the allowable capacity so that fluid does not overflow.

If fluid overflows or vapors of solvent or sample fill inside the room, they may catch fire from the heat at inlet, which results in fire.

WARNING



Instructions

Be careful of hot air exhausted from the openings and the rear.
Hot air is exhausted from the openings and the rear. Hot air may cause burn and fire.

CAUTION



Prohibitions

Do NOT use mobile phone near the detector (especially TCD, PTCO and FTD).

May cause malfunctions. You may not be able to obtain data as the specification.



Instructions

Use specified gases.

If not, that may cause malfunction and accident.



Instructions

If liquid such as water and organic solvent spills on the product, wipe it immediately.

May cause malfunction.



Instructions

When using OA equipment including PC with this product, caution must be exercised not to spill liquid.

Failure to observe this can cause fire and electric shock.



Instructions

Follow the instructions below during operation of the power cable and plug.

- Do NOT connect/disconnect the power plug with wet hands.
- Grasp the power code by the plug and connect/disconnect it in a straight line.
- Ensure that the power plug is inserted completely.
- Do NOT use the power plug when the connection of the plug and the outlet is too loose or the plug is not fixed securely.
- Do NOT use the power cable in a bundle.
- Do NOT use an extension cord or a outlet strip.
- Do NOT extend the power cable.



Instructions

Clean dust on the power plug with a dry cloth.

Do it every 6 months. It prevents fire due to tracking phenomena.

If the power plug is kept inserted into the wall outlet for a long time, the connection of the plug and the wall outlet becomes covered with dust.

When the dust takes on moisture, sparking occurs repeatedly between pins of the plug. The heat caused by sparking is applied on the insulation in contact with the wall outlet, which results in degradation of the insulation. Thus, current comes to pass between pins of the plug, then cause ignition.

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Introduction

■ Risk of Repair/Disassembling/Modification

CAUTION



Prohibitions

Do NOT modify/disassemble the product without permission.

Accident due to electric shock or short may occur. It may also cause malfunction or injury.



Instructions

Ask your Shimadzu sales/service representative for repair.

Repair by yourself may cause fire, electric shock, or injury.

■ Precautions for Inspection/Maintenance

WARNING



Prohibitions

During cleaning of the instrument exterior, do NOT keep the instrument wet and do NOT wipe the instrument with a cloth dampened with alcohol or thinner or the similar solvent.

May cause poor performance or shorten the life.

Clean the exterior of the instrument with a soft cloth dampened with a small amount of water or mild detergent and wipe it dry with a dry cloth.



Instructions

Ensure that the column oven temperature drops below 40 °C on [Temp Monitor] screen.

Ensure that the temperatures of the injection port and the detector drop below 50 °C on [Temp Monitor] screen.

- Temperatures of parts may be high immediately after the GC stops. Operate them after temperatures of parts drops to a temperature where you can perform maintenance.
- Operation at a high temperature may cause burns. Tightening the nut or ClickTek connector (optional) at a high temperature may cause the seizing (galling) of the sliding part.

▶▶ **Reference:** GC-2030 Instruction Manual, "7.2.3 [Temp Monitor] Screen"



Instructions

For parts replacement, use items listed in "2 Standard Accessories" P. 40, "Gas Chromatograph Accessories and Supplies", and "Maintenance Help".

When you use items not on the lists, the part may be damaged and may not operate properly. It may also cause malfunction or injury.

WARNING



Instructions

Check the operation of earth leakage breaker periodically.

Malfunction of the earth leakage breaker increases the risk of electric shock and fire.

Inspection procedure

1. Ensure that the main power of the instrument is turned off.
2. Disconnect the power plug from the wall outlet.
3. Press test button of earth leakage breaker.
4. Ensure that the breaker trips off and shut off the current.
5. Reset the breaker.
6. Insert the power plug into the wall outlet.

NOTE

- Appropriate power source is required for correct operation and precise temperature control. If either of the voltage and current value of the power source is not appropriate, a problem may occur during basic operation, for example, the rate of temperature rise of column oven may not satisfy specifications.
- The instrument has several large-capacity heaters to control temperatures of column oven, injection port, and detector during analysis.

CAUTION



Instructions

Wear safety glasses during maintenance and inspection.

The sample may squirt and be got in your eyes causing damage of your eyes.



Instructions

Before use of the instrument, periodically check that insulation on the inner wall of column oven door does not become deformed.

If insulation becomes deformed, heat in column oven is lost from the gap and you may not be able to obtain data as the specification. When insulation becomes deformed, stop using the instrument immediately and contact your Shimadzu sales/service representative.

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Introduction

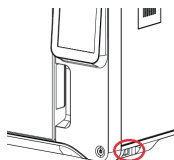
■ Emergency Operating Procedure

If you find any abnormality such as unusual noise or smell, stop the instrument urgently.

Inspect the instrument before reboot after emergency stop, and contact your Shimadzu sales/service representative as needed.

Emergency stop

1. Turn off the main power of the instrument.



2. Turn off all of the associated devices.
3. Shut off the main valve of the cylinder of carrier gas, hydrogen, air, makeup gas, and oxygen.
4. Disconnect the power plug from the wall outlet, and shut off the power supply.
 - If BID detector is installed, unplug the power cable of "Helium Purifier Assy" attached to the rear of the instrument.
 - If SCD detector is installed, unplug the power cable of the SCD detector.
 - If the power cable is secured on the power switchboard by screws, turn off the power switchboard.
5. Open doors and windows of the room where the instrument is installed for ventilation.

■ Operation After Power Failure

Operate the instrument according to the following procedure.

1. Shut off the hydrogen gas and oxygen supply immediately.
2. Turn off the main power of the instrument.
3. Turn off all of the associated devices.
4. Open doors and windows of the room where the instrument is installed for ventilation.
5. After recovery, see "precautions for installation" and "precautions for operation" and start up the instrument in the usual way

▼ NOTE

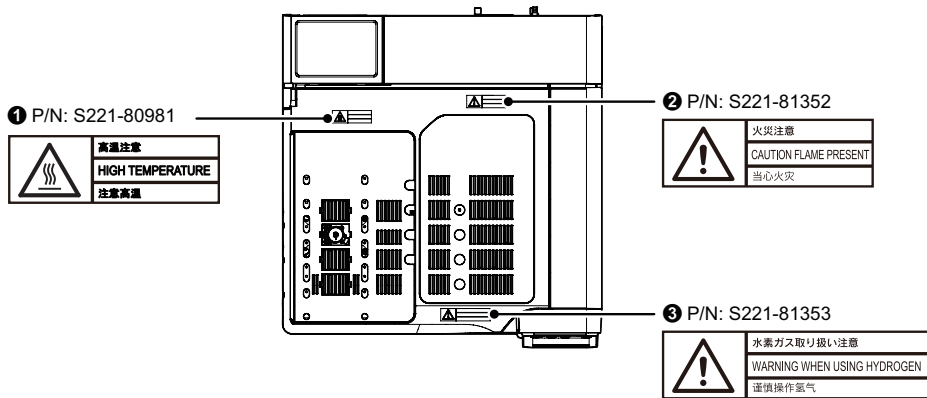
In the case of power failure, gas supply automatically stops.
We provide Protection Kit Against Power Failure (P/N: S221-81005-41) to prevent degradation due to carrier gas stop during power failure.
Use it as needed.

Warning Labels and Residual Risk Information

In order to ensure safety, warning labels are attached in places requiring caution. If a warning label is lost or damaged, obtain a new label through your Shimadzu representative and attach it in the correct position.

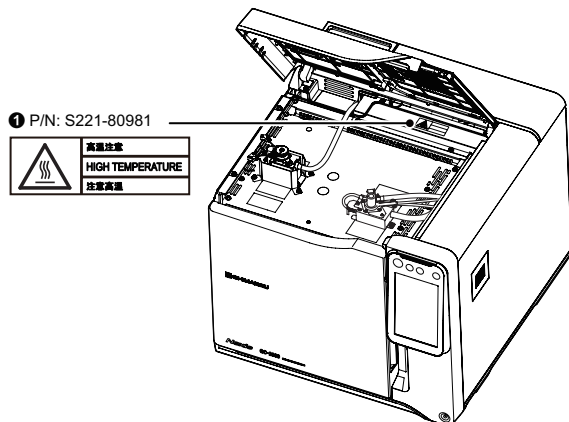
A residual risk indicates a risk that could not be reduced or eliminated in the process of design and manufacture. Read and understand "Description" before use.

■ Top Face



No.	Description
①	HIGH TEMPERATURE Do NOT touch injection port, detector and INJ/DET cover during analysis. May cause burn.
②	CAUTION FLAME PRESENT Do NOT put objects on INJ/DET cover. May cause fire.
③	WARNING WHEN USING HYDROGEN Close all unused valves for hydrogen pressure control and seal the column fittings. If hydrogen fills the oven, it may cause explosion.


■ Inside of the Instrument

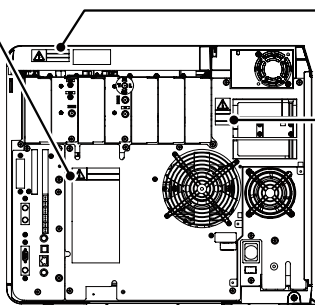


No.	Description
	HIGH TEMPERATURE
①	Do NOT touch injection port, detector and INJ/DET cover during analysis. May cause burn.

■ Rear

① P/N: S221-81354-01

	水素ガス使用上の注意
	WARNINGS IN USING HYDROGEN
	谨慎使用氢气
<p>水素ガスが大量に漏れた場合、爆発する可能性があります。</p> <ul style="list-style-type: none"> ・配管を間違わないようにして接続してください。 ・使用しない時はガス元栓を閉めてください。 ・使用の都度、ガス漏れがないことを点検してください。 ・換気を十分に行い、不必要に火気を使用しないでください。 ・異常を感じた場合、装置の電源を落として、ガスの元栓を閉めてください。 	
<p>When hydrogen gas is in use, care should be exercised in order to prevent accident.</p> <ul style="list-style-type: none"> • Connect gas lines correctly. • When the device is not in use, the main valve of the hydrogen gas cylinder or generator must be closed. • The flow line for hydrogen gas should be checked for leakage whenever it is used. • The room in which the device is used should be well ventilated. Do not use any spark producing instrument, except for analysis, near the device. • If there is any abnormality, turn off the device and close the main valve of the hydrogen gas cylinder or generator. 	
<p>氢气大量泄漏时，可能引发爆炸。</p> <ul style="list-style-type: none"> • 请正确连接氢气管路。 • 不使用仪器时，请关闭氢气瓶总阀门。 • 每次使用仪器前，请确认氢气是否泄漏。 • 保持实验室通风，禁止使用与分析操作无关的明火。 • 发现仪器有异常时，请立即关闭仪器电源，并关闭氢气瓶总阀门。 	



② P/N: S221-81357

	接続管注意
	ENSURE LEAK FREE CONNECTION
	请确认气路无泄漏

③ P/N: S221-80982

	熱風注意
	HOT AIR EXHAUST
	当心热气

No.	Description
①	<p>WARNINGS IN USING HYDROGEN</p> <p>When hydrogen gas is in use, care should be exercised in order to prevent accident.</p> <ul style="list-style-type: none"> • Connect gas lines correctly. • When the device is not in use, the main valve of the hydrogen gas cylinder or generator must be closed. • The flow line for hydrogen gas should be checked for leakage whenever it is used. • The room in which the device is used should be well ventilated. Do not use any spark producing instrument, except for analysis, near the device. • If there is any abnormality, turn off the device and close the main valve of the hydrogen gas cylinder or generator.
②	<p>ENSURE LEAK FREE CONNECTION</p> <p>Install the piping correctly. Wrong tubing may cause release of large amount of gases. We designed the joint of air inlet to be right-handed screw and the joint of hydrogen inlet to be left-handed screw to prevent incorrect piping.</p>
③	<p>HOT AIR EXHAUST</p> <p>Hot air is exhausted from the openings and the rear. Hot air may cause burn and fire. If hot air blows directly on combustibles, that may cause ignition and fire.</p>

■ Auto Injector

There is a risk of puncturing your finger with the syringe needle.

- When replacing the syringe, use caution to avoid the needle tip.
- Do not open the door while the auto injector is in operation.

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Introduction

Electromagnetic Compatibility

Descriptions in this section apply only to the following models:

- 221-77002-58, 221-85702-58 GC-2030 AF
- 221-77003-58, 221-85703-58 GC-2030 AT
- 221-77004-58, 221-85704-58 GC-2030 ATF
- 221-77005-58, 221-85705-58 GC-2030 N
- 221-85045-58, 221-85707-58 GC-2030 APT

This product complies with European standard EN61326-1, class A for electromagnetic interference (Emissions) and basic electromagnetic environment requirement (Table1) for electromagnetic susceptibility (Immunity).

■ EN61326-1 Emissions (Electromagnetic Interference)

This is a class A product and is not designed for use in a residential environment.

When this product causes an electromagnetic disturbance to devices being used near this product, create an appropriate distance between those devices and this product in order to eliminate the disturbance.

■ EN61326-1 Immunity (Electromagnetic Susceptibility)

Compliance with this standard does not ensure that the product can operate at a level of electromagnetic interference that is stronger than the level tested. Interference stronger than the values specified in the standard may cause the product to malfunction.

When installing or using this product, especially in an industrial location:

Locate the product away from any device emitting strong levels of electromagnetic noise.

Use a power source that is separated from the power source of any device emitting strong levels of electromagnetic noise.

To prevent static electricity:

Prior to touching the product, the operator should be sure to discharge the static electricity stored in their body by first touching a grounded metallic structure.

Do not touch any terminals or connectors that are not connected to cables while the product is turned ON.

Precautions on Handling Gases

The gas cylinders used with this product must conform to the "High Pressure Gas Safety Law". Be sure that the "High Pressure Gas Safety Law" and "Security Regulations for General High-Pressure Gas" are strictly observed. Additionally, be sure that regulations in the "Road Law", "Act on Port Regulations", "Aviation Law", "Ship Safety Law" and "Fire Services Act" as well as SDS (Safety Data Sheet) published by the gas manufacturer are also strictly observed.

▶▶ **Reference:** For kind, purity, and supply pressure of gases used for the product, refer to "8.3.1 Gas type and purity" in GC-2030 Instruction Manual.

■ High Pressure Gas Cylinder Precautions

WARNING



Instructions

General precautions are provided below.

Consult state and local regulations for specific precautions.

- Keep gas cylinders away from the lab, preferably outdoors, but not exposed to direct sunlight. The area must be well-ventilated. Use tubing to bring the gases to the lab.
- Flammable items must be kept at least 2 m from a gas cylinder. Secure gas cylinders with rope etc. to avoid toppling over and drop.
- The temperature of gas cylinders must not exceed 40 °C.
- When using high pressure gases, pay strict attention to ventilation, and perform daily leak checks.
- Check for gas leakage with soapy water etc. during starting inspection.
- When using flammable gases (such as hydrogen), never smoke or allow open flame within 5 m of the equipment.
- Fire extinguishers must be present.
- Use an oil-free pressure reducing valve.
- If the inside of the valve, for example the pipe which comes in contact with high pressure gases, is coated by oil, do NOT use the valve.
- When finished with the gas, tighten the main valve of the cylinder immediately.

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Introduction

■ Precautions on Handling Hydrogen Gas

Read a separate volume, "Gas Chromatograph Hydrogen Gas Safety" and follow the instructions to handle hydrogen correctly.

NOTE

We provide a plate for caution on handling hydrogen gas (Part No.: S221-44025-02) without charge.

⚠ WARNING



Instructions

Close all unused valves for hydrogen pressure control and seal the column fittings.

If hydrogen fills the oven, it may cause explosion.



Instructions

Make sure that the supply pressure to the flow controller does not exceed 300 kPa.

If the flow controller fails with a hydrogen gas supply pressure over 300 kPa, a dangerous situation exists. Large amounts of leaking hydrogen could cause the FID flame to expand out of the detector. Set supply pressure to APC at 300 kPa when the H₂ flow is set at the initial value (32.0 mL/min). It is enough for operation.



Instructions

Pay strict attention to ventilation so that leaking hydrogen is vented out of the room and cannot accumulate.

Hydrogen gas is lighter than air. If it leaks, it can accumulate near the ceiling.

■ Hydrogen Carrier Gas Precautions

⚠ WARNING



Instructions

Install pipings so that the gas exhausted from split vent and purge vent are discharged to open air or a ventilation equipment (such as the draft chamber).

If much hydrogen gas is released into the poorly ventilated room, it may cause the explosion.



Instructions

Install the instrument in the well ventilated area. (Ex. in the draft chamber).

If much hydrogen gas is released into the poorly ventilated room, it may cause the explosion.



Instructions

In order to measure hydrogen gas concentration, equip a hydrogen gas sensor in the room. Keep the hydrogen concentration low.

If much hydrogen gas is released into the poorly ventilated room, it may cause the explosion.

WARNING



Instructions

Ensure that the column is connected correctly.

If the column is not connected correctly, especially when the carrier gas flow is set at a high value, the oven may be filled with hydrogen gas and it may explode.

■ Caution in Gas Plumbing

WARNING



Instructions

Set the gas inlet pressure below the maximum pressure shown in the instruction manual.

If pressure above its specifications is applied, the pressure regulator valve may be damaged and it may result in gas leakage.

▶▶ **Reference:** GC-2030 Instruction Manual, "8.3.2 Gas supply pressure"



Instructions

When the product shares gas supplies with other devices, check all specifications.

Pressure above the specifications may damage the devices. Set supply pressure so that it satisfies specifications for all the devices.

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Precautions on Using CRG

CRG uses liquefied CO₂ or pressurized liquid N₂ as coolant. Prepare siphon type cylinder when using liquid CO₂.

Care should be taken when handling the coolant. When using liquid N, prepare the gas in a low-temperature liquefied gas container regulated to 50 to 200 kPa.

Be sure to follow the instructions below.

■ Precautions for Operation

WARNING



Instructions

Ventilate the room adequately.

The device releases large amount of CO₂ or N₂. Oxygen deficiency may occur in a closed room.



Instructions

Wear safety glasses and leather gloves when handling coolant.

Contact with skin or eye can result in frostbite or blindness. Extreme caution should be paid when handling coolant cylinder.



Prohibitions

Do NOT breathe blowing gases.

May cause burn. Extreme caution should be paid when replacing column and handling coolant cylinder.

CAUTION



Instructions

Set [Valve] to [Off] on [CRG] screen and ensure that the column temperature reaches near room temperature before opening the column oven door.

If the valve is not turned off, gases are released, which may cause oxygen deficiency.

▶▶ Reference: GC-2030 Instruction Manual, "7.7.1 [CRG] Screen"



Instructions

Ensure that wiring of electrical devices are not located around you before you take out coolant from the cylinder.

If frost forms on the upper part of the cylinder and wiring, the frost may melt and drip.



Instructions

After analysis, turn off the GC and shut off the main valve of the cylinder.

In case of gas leakage, oxygen deficiency may occur.

! CAUTION



Fix the liquid N₂ container and liquid CO cylinder to a desk or wall before use.

Instructions

NOTE

- When you perform low-temperature analysis on highly humid day, condensation may occur on the instrument surface or inside the column oven. In this case, set the column oven temperature at about 200 °C and dry out the instrument.

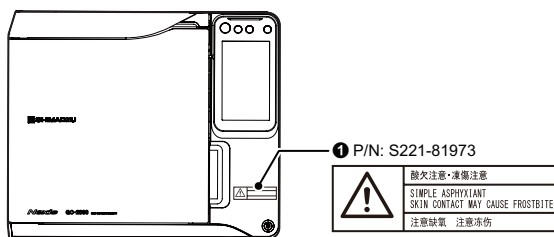
▶▶ **Reference:** GC-2030 Instruction Manual, "8.2 Power Supply and Wiring ■ Drying out of the instrument"

When the humidity is too high in the atmosphere, adjust the humidity using air conditioner etc.

- When moving a liquid N container or a liquid CO cylinder, be careful not to get your feet caught by the container or cylinder.

■ Warning Label

In order to ensure safety use of CRG, warning label is attached in place requiring caution. If a warning label is lost or damaged, obtain a new label through your Shimadzu representative and attach it in the correct position.



No.	Description
①	<p>SIMPLE ASPHYXIANT / SKIN CONTACT MAY CAUSE FROSTBITE</p> <ul style="list-style-type: none"> • Provide sufficient room ventilation. Insufficient room ventilation may cause oxygen deficiency resulting in anoxia (oxygen deficiency). • Wear eye protection and insulated gloves when handling coolant. Direct contact with coolant may cause frostbite. • When setting the oven temperature to -50 °C or lower, maintain a room temperature of at least 10 °C.

Precautions for Use of Electron Capture Detector (ECD)

Important: Legal regulations

- Since a radioisotope is used as the radiation source, check the laws and regulations before installation.
- ECD-2010 Exceed is classified as B646666 / IEC 60405 and ISO/12/C32211 of ISO 2919.
- ECD-2010 Exceed must be checked for radiation leakage periodically depending on your local regulation.

■ Corrosive Gas and Dust

The vital section of the measuring circuit of this detector is shielded in a case. In view of maintaining the service life and accuracy of the detector, avoid installing in a dusty or corrosive environment.

■ Discharge of Carrier Gas

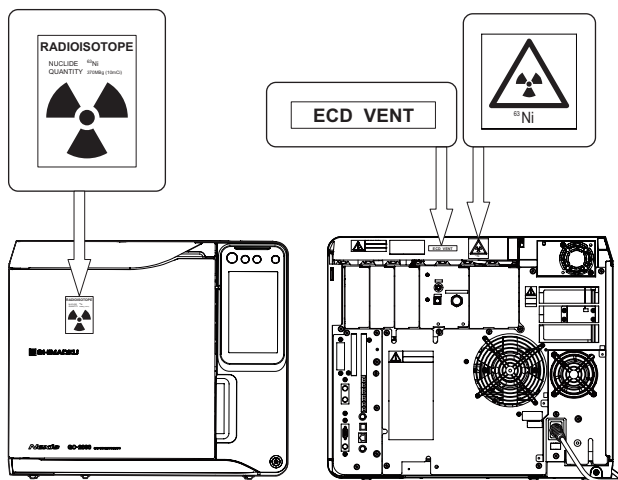
Connect a vinyl or PTFE tube to the exhaust port (VENT) when using the detector, and set the other end of the tube on the roof of the building or other place where no person is likely to come within 1 m from the tube end.

■ Precautions on Unit Removal

Do NOT remove or disassemble the ECD (detector). When it is necessary to remove the ECD, contact your Shimadzu representative.

■ Application Name Plates

Stick the name plates at the position shown below:



■ Actions to Be Taken in Case There Is the Doubt of Break

If there is a doubt of break of the ECD, the measurement with the survey meter must be carried out. If there is any abnormality such as the disuse of the ECD etc.

■ Cautions at Disposal

When disusing the used ECD etc., you must take legal administrative procedures at the same time. Also, in the case of disposing the gas chromatograph equipped with the ECD, be sure to remove the ECD and take the measures mentioned above. When removing the ECD from the gas chromatograph, contact your Shimadzu representative.

Keep the original packing container for future transportation of the ECD unit.

▼ NOTE

When removing the ECD unit, plug the hole with the heat insulating material which was cut off at installation.

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Introduction

Precautions for Use of Sulfur Chemiluminescence Detector (SCD)

When using SCD, be sure to follow the instructions below.

■ Installation Site

! CAUTION



Instructions

Install the product on a flat and stable table or base with the depth of more than 1040 mm which can carry the total weight of the system.

The total weight of GC-2030 and SCD-2030 is about 70.5 kg. If the conditions are not satisfied, that may cause accident due to toppling over or drop.



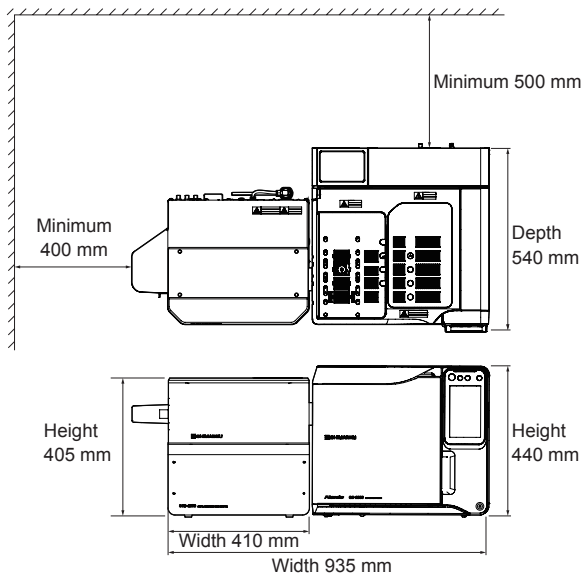
Instructions

Keep the rear of the product more than 500 mm away from the wall.

Keep the left side of the product more than 400 mm away from the wall.

Hot air is discharged from the vent on the rear of the product while cooling the column oven. Comply with the following conditions for installation.

- Do NOT put combustibles near the rear of the product.
- Keep the rear of the product more than 500 mm away from the wall.
The distance from the wall should be more than 250 mm when optional exhaust duct (P/N: S221-80955-41) is installed.
- Leave a space for maintenance and inspection of the rear.



⚠ CAUTION



Instructions

Discharge the gas from the vacuum pump to the outdoor where no flame nor entry is permitted.

Exhaust from the vacuum pump includes flammable hydrogen and toxic nitrogen compounds. If it is not properly discharged to the outdoor, a fire or adverse effect on humans may occur.

■ Installation

⚠ WARNING



Instructions

Use a wall outlet which satisfies the following conditions only for GC-2030.

When using SCD-2030, be sure to ground it and GC-2030 with equal potential grounds and use the same power supply with GC-2030 if you can.

- Rated current for GC-2030

Power voltage	Standard model with FID	The maximum value for models with peripherals
100 V AC	18 A	26 A
115 V AC	15.7 A	22.6 A
230 V AC	11.3 A	14.8 A

- Rated current for SCD-2030

Power voltage	Rated current
100 V AC to 120 V AC	5 A
220 V AC to 240 V AC	2.3 A

- Independent earth leakage breaker (For SCD-2030, you can share it with GC-2030.)
- Three-prong grounded-type



NOTE Earth leakage breaker automatically shuts off the power upon detecting of current leakage from circuits and devices to prevent electric shock and fire.

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Introduction

WARNING



Instructions

Connect the power supply complying with the power-supply voltage shown on the label on the rear of the product.

Otherwise, fire or electric shock could result. Check that the power supply voltage is stable and that its current capacity is sufficient to operate all the components of the system. If not, the instrument will not operate at its rated performance.

Instrument Type	Power Supply Voltage ^{*1} (indicated on the instrument)	Power Consumption	Frequency	Rated Breaking Capacity ^{*2}
GC-2030 main unit	100 V AC (100 V~)	1800 VA	50 Hz/60 Hz	80 A
	115 V AC (115 V~)	1800 VA	50 Hz/60 Hz	80 A
	230 V AC (230 V~)	2600 VA	50 Hz/60 Hz	50 A
SCD-2030	100 V AC to 120 V AC	500 VA	50 Hz/60 Hz	50 A
	220 V AC to 240 V AC	500 VA	50 Hz/60 Hz	50 A

*1 Mains supply voltage fluctuations are not to exceed 10 % of the nominal supply voltage.

*2 Connect the instrument to a power outlet that is equipped with a circuit breaker that shuts off the current at the described value or less.

■ Inspection and Maintenance

CAUTION



Prohibitions

Do NOT remove the covers except the side cover.

May cause electric shock, burn, and injury.

For maintenance and replacement other than the inner pyrotube and outer pyrotube in the side cover, contact your Shimadzu sales/service representative.

■ Ozone Generator and Toxicity of Ozone

Ozone is toxic for human bodies, therefore, the ozone scrubber decomposes and then discharges it.

When the filling materials in the ozone scrubber become degraded, exhaust from the vacuum pump may include ozone. For safety, replace the ozone scrubber periodically. We recommend to replace the ozone scrubber once a year.

▶▶ Reference: "6.3 Recommended Inspection Cycle" P. 62

Warning Labels and Residual Risk Information

In order to ensure safety, warning labels are attached in places requiring caution. If a warning label is lost or damaged, obtain a new label through your Shimadzu representative and attach it in the correct position.

A residual risk indicates a risk that could not be reduced or eliminated in the process of design and manufacture. Read and understand "Description" before use.

Left Side / Top Face

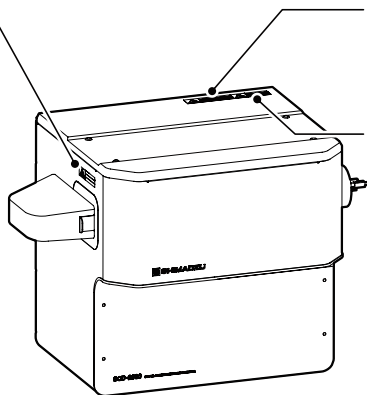
① P/N: S221-80981



② P/N: S221-81353

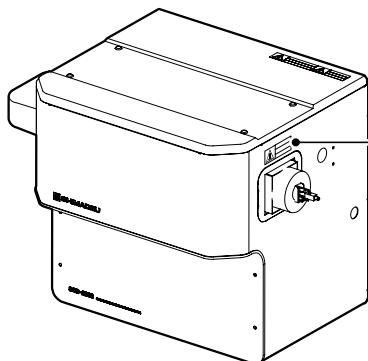


③ P/N: S221-81352

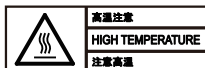


No.	Description
①	<p>HIGH TEMPERATURE Do NOT open the side cover during analysis. May cause burn. While the SCD runs, the oxidation/reduction furnace on which the pyrotube is installed becomes very hot (about 1000 °C). Stop the GC and SCD and wait until the oxidation/reduction furnace cools down before you open the side cover.</p>
②	<p>WARNING WHEN USING HYDROGEN Close all unused valves for hydrogen pressure control and seal the column fittings. If hydrogen fills the oven, it may cause explosion.</p>
③	<p>CAUTION FLAME PRESENT Do NOT put objects on the top cover. May cause fire.</p>

Right Side

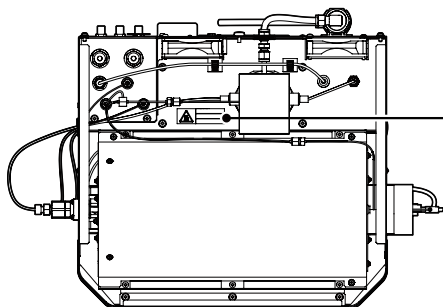


① P/N: S221-80981

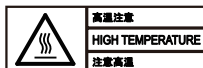


No.	Description
①	HIGH TEMPERATURE Do NOT touch the interface of the instrument during analysis. May cause burn.

Inside of the Instrument




① P/N: S221-80981

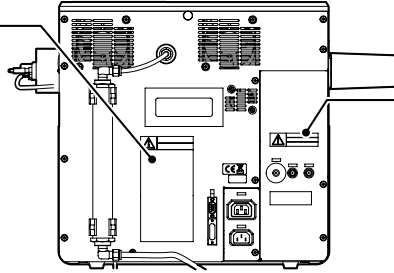


No.	Description
①	HIGH TEMPERATURE Do NOT touch the inside of the instrument during analysis. May cause burn. While the SCD runs, the oxidation/reduction furnace becomes very hot (about 1000 °C). Normally, you do not need to open the top cover for operation of the inside of the instrument.

Rear

① P/N: S221-81354-01

	水素ガス使用上の注意
	WARNINGS IN USING HYDROGEN
	谨慎使用氢气
	水素ガスが大気に漏れた場合、爆発する可能性があります。 ・ 異常を指摘されないようにして稼働してください。 ・ 使用しない時はガスの元栓を閉じてください。 ・ 使用の前後、ガス漏れがないことを直検してください。 ・ 換気を十分に行い、不必要に火気を使用しないでください。 ・ 異常を感じた場合、装置の電源を落として、ガスの元栓を閉めてください。
	When hydrogen gas is in use, care should be exercised in order to prevent accident. ・ Connect gas lines correctly. ・ When the device is not in use, the main valve of the hydrogen gas cylinder or generator must be closed. ・ The flow line for hydrogen gas should be checked for leakage whenever it is used. ・ The room in which the device is used should be well ventilated. Do not use any spark producing instrument, except for analysis, near the device. ・ If there is any abnormality, turn off the device and close the main valve of the hydrogen gas cylinder or generator.
	氢气大量泄漏时，可能引发爆炸。 ・ 请正确连接氢气管路。 ・ 不使用仪器时，请关闭氢气瓶总阀门。 ・ 每次使用仪器前，请确认氢气是否泄漏。 ・ 保持实验室通风，禁止使用与分析操作无关的明火。 ・ 发现仪器有异常时，请立即关闭仪器电源，并关闭氢气瓶总阀门。



② P/N: S221-81357

	配管注意
	ENSURE LEAK FREE CONNECTION
	请确认气路无泄漏

No.	Description
①	<p>WARNINGS IN USING HYDROGEN</p> <p>When hydrogen gas is in use, care should be exercised in order to prevent accident.</p> <ul style="list-style-type: none"> • Connect gas lines correctly. • When the device is not in use, the main valve of the hydrogen gas cylinder or generator must be closed. • The flow line for hydrogen gas should be checked for leakage whenever it is used. • The room in which the device is used should be well ventilated. Do not use any spark producing instrument, except for analysis, near the device. • If there is any abnormality, turn off the device and close the main valve of the hydrogen gas cylinder or generator.
②	<p>ENSURE LEAK FREE CONNECTION</p> <p>Install the piping correctly. Wrong tubing may cause release of large amount of gases. We designed the joint of air inlet to be right-handed screw and the joint of hydrogen inlet to be left-handed screw to prevent incorrect piping.</p>

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Introduction

Warranty

Shimadzu provides the following warranty for this product.

1. Period:

Please contact your Shimadzu representative for information about the period of this warranty.

2. Description:

If a product/part failure occurs for reasons attributable to Shimadzu during the warranty period, Shimadzu will repair or replace the product/part free of charge. However, in the case of products which are usually available on the market only for a short time, such as personal computers and their peripherals/parts, Shimadzu may not be able to provide identical replacement products.

3. Limitation of Liability:

- (1) In no event will Shimadzu be liable for any lost revenue, profit or data, or for special, indirect, consequential, incidental or punitive damages, however caused regardless of the theory of liability, arising out of or related to the use of or inability to use the product, even if Shimadzu has been advised of the possibility of such damage.
- (2) In no event will Shimadzu's liability to you, whether in contract, tort (including negligence), or otherwise, exceed the amount you paid for the product.

4. Exceptions:

Failures caused by the following are excluded from the warranty, even if they occur during the warranty period.

- (1) Improper product handling
- (2) Repairs or modifications performed by parties other than Shimadzu or Shimadzu designated companies
- (3) Product use in combination with hardware or software other than that designated by Shimadzu
- (4) Computer viruses leading to device failures and damage to data and software, including the product's basic software
- (5) Power failures, including power outages and sudden voltage drops, leading to device failures and damage to data and software, including the product's basic software
- (6) Turning OFF the product without following the proper shutdown procedure leading to device failures and damage to data and software, including the product's basic software
- (7) Reasons unrelated to the product itself
- (8) Product use in harsh environments, such as those subject to high temperatures or humidity levels, corrosive gases, or strong vibrations
- (9) Fires, earthquakes, or any other act of nature, contamination by radioactive or hazardous substances, or any other force majeure event, including wars, riots, and crimes

(10) Product movement or transportation after installation

(11) Consumable items

Recording media such as CD-ROMs are considered consumable items.

- * If there is a document such as a warranty provided with the product, or there is a separate contract agreed upon that includes warranty conditions, the provisions of those documents shall apply.

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Introduction

After-Sales Service and Availability of Replacement Parts

■ After-Sales Service

If any problem occurs with this product, perform an inspection and take appropriate corrective action as described in the troubleshooting section of this manual or GC-2030 Instruction Manual, "5 Troubleshooting".

If the problem persists, or the symptoms are not covered in the troubleshooting section, contact your Shimadzu representative.

■ Replacement Parts Availability

Replacement parts for this product will be available for a period of seven (7) years after the product is discontinued. Thereafter, such parts may cease to be available.

If Shimadzu receives notice of the discontinuation of units or parts, the necessary quantity for the above period is immediately calculated and secured. However, such units or parts may cease to be available within seven years after the discontinuation of the product, depending on the conditions of individual manufacturers and on changes in the quantity required.

Maintenance, Inspections, and Adjustment

In order to maintain the instrument's performance and obtain accurate measurement data, daily inspection and periodic inspection are necessary.

- For daily maintenance, inspection, and replacement parts, see "6 Maintenance" P. 60 of this manual.
- Periodic inspection should be requested to your Shimadzu representative.
- Replacement cycles described for periodic replacement parts are a rough estimate.
- Replacement may be required earlier than the described replacement cycles depending on usage environment and frequency.

Disposal Precautions

Dispose of the GC unit using a qualified industrial waste management company, in compliance with the applicable laws in the country where it is used.

Note also that the GC unit contains batteries (location: PCBs). Dispose of the unit appropriately and in accordance with the laws and regulations of the country or region.

■ Disposal of Electron Capture Detector (ECD)

An instrument equipped with the ECD cannot be disposed as normal waste.

Do NOT remove or disassemble the ECD (detector).

When it is necessary to remove the ECD, contact your Shimadzu representative.

The ECD contains a radioisotope, ^{63}Ni . When removing the ECD (detector) for cleaning or disposing as waste, contact your Shimadzu representative.

■ For California, USA Only

CAUTION



Instructions

This product contains a battery that contains perchlorate material.

Perchlorate Material - special handling may apply.
See www.dtsc.ca.gov/hazardouswaste/perchlorate

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1 Overview

1.1 Overview

Shimadzu GC-2030 is a high-end gas chromatograph which achieves the highest level of sensitivity and repeatability in the world.

GC-2030 provides "high throughput", which enables high-speed microanalysis, and "excellent usability", which enables intuitive operations.

1.2 Features

■ Basic features

Improved sensitivity of detectors

GC-2030 achieves the highest level of sensitivity and repeatability in the world. (As of May 2017, our investigation)

New flow controller

New flow controller (AFC/APC) equipped with CPU enables various carrier gas control modes including constant velocity/flow/pressure, and achieves high-speed and high-precision control and excellent repeatability.

Advanced Flow Technology (AFT)

The performances of back flush system and detector splitting system are improved. GC-2030 supports various carrier gas control modes (constant velocity/flow/pressure) and migration from the previous analytical settings is easy.

■ Better usability

Touch operation

Touch panel is adopted for the interface. You can check the device status and settings intuitively.

Enhanced hardware

You can open/close the inlet, replace the glass insert, and the split filter without tools. You can check the dirt on the split filter with your eyes. We also provide an optional device which enables you to install column without tools.

■ Environmentally friendly

Options for cooling rate of column oven temperature

You can select cooling rate of column oven temperature from 3 options (Fast, Mid, Slow) or customize the rate. It may help to reduce cooling time and damages of the liquid phase of the column during cooling.

Control range of column oven temperature becomes wider (from a temperature 2 °C higher than room temperature)

The control range of previous model is from 4 °C higher than room temperature. GC-2030 can control the column oven temperature from 2 °C higher than room temperature. GC-2030 can perform the same analysis as the previous models even if the analysis room temperature is controlled within the range of ± 2 °C. Thus, the power consumption in the analysis room can be reduced.

Auto start/Auto stop function

Auto start/Auto stop function can save the running cost.

Sleep mode

The instrument includes sleep mode to wait with a minimum power consumption when the main power is turned on.

Carrier gas saver

In split/splitless sample injection mode, this function reduces split ratio after sample injection to reduce split flow, which saves carrier gas consumption.

Monitoring function

You can check the power consumption in real time.

■ Expandability

Up to three injection units and four detectors can be controlled simultaneously.

You can choose from 5 kinds of injection units and 8 kinds of detectors (Maximum installation: 3 for injection units and 4 for detectors).

Using LabSolutions, you can control 4 detectors simultaneously to collect data.

2 Standard Accessories

Standard accessories are shown below. Check the contents and their number.

Type	Name	Part number	Qty		
			Capillary model	Packed model	
Manuals	Operation Guide	S221-79201	1	1	
	Instruction Manual (DVD-ROM)	S221-79206-41	1	1	
Parts	Branch tube	S221-72658-91	1	1	
	Column nut (without split)	S221-16325-01	1	-	
	Column nut (with split)	S221-32705	1	-	
	Graphite jig, SPL (SPL/PTV Column insertion jig)	S221-41532-91	1	-	
	Column hanger ¹	S221-47159	1	-	
	Radiating fin cover ²	S221-43597-02	1	1	
	Cable tie (red) ³	S072-60606-01	2	-	
	Touch pen	S228-58619-41	1	1	
	Standard Accessory Kit for GC-2030	S227-35003-01	1	-	
Consumables ⁴	Contents	Premium Green Septa ⁵	-	2	-
		Deactivated Insert with wool for Split	-	1	-
		Deactivated Insert with wool for Splitless	-	1	-
		O-ring for Insert	-	2	-
		Graphite Ferrule 0.5 (fired)	-	4	-
	Standard Accessory for GC-2030 Packed		-	-	-
	Contents	Glass insert for packed column	S221-80902	-	1
		SUS column adapter, for INJ	S221-14087-92	-	1
		SUS column adapter, for DET	S221-43143-92	-	1
Glass column joint		S221-15561-91	-	2	
Other	Declaration of conformity	S221-30991-71	1	1	
	Declaration of conformity: Descriptions	S228-30164	1	1	

¹ Installed in the inside of the column oven.

² Attach it to INJ/DET cover in the case of manual injection.

³ Attach the cable ties to the hydrogen gas line for making a distinction from other gas lines.

Supplied only with FID-equipped models.

⁴ We also provide Consumable Set for repeat orders.

Name	Part number
Premium Green Septa (50 pcs.)	S227-35004-01
Deactivated Insert with wool for Split (5 pcs.)	S227-35007-01
Deactivated Insert with wool for Splitless (5 pcs.)	S227-35008-01
O-ring for Insert (10 pcs.)	S227-35005-01
Graphite Ferrule 0.5 (10 pcs.)	S227-35006-01
Graphite Ferrule 0.8 (10 pcs.)	S227-35009-01
Glass insert for packed column (5 pcs.)	S221-80902-84

⁵ Max temperature of premium green septa is 350 °C.

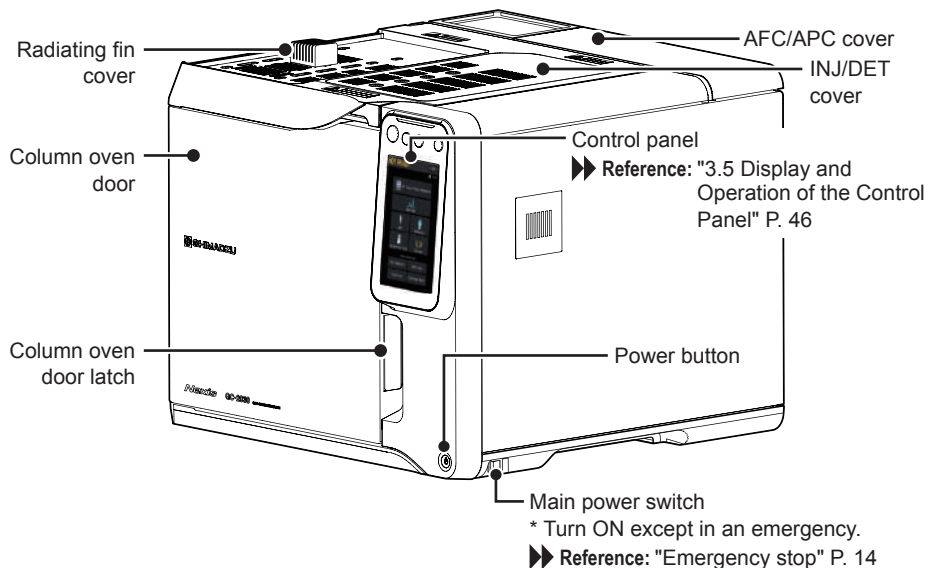
■ Detector accessories

Type	Name	Part number	Qty
FID	Graphite jig, FID (FID Column insertion jig)	S221-41532-04	1
	Column nut (with split)	S221-32705	1
TCD	Graphite jig, TCD (TCD Column insertion jig)	S221-48610-01	1
	CAUTION label TCD-2030	S221-42741	1
	Card case, A6	S038-03069-11	1
	Column nut (with split)	S221-32705	1
FTD	Graphite jig, FTD (FTD Column insertion jig)	S221-41532-92	1
	Column nut (with split)	S221-32705	1
FPD	Graphite jig, FPD (FPD Column insertion jig)	S221-48610-02	1
	Column nut (with split)	S221-32705	1
ECD	Graphite jig, ECD (ECD Column insertion jig)	S221-48610-07	1
	Column nut (with split)	S221-32705	1
BID	Graphite jig, BID (BID Column insertion jig)	S221-41532-02	1
	Column nut (with split)	S221-32705	1
SCD	Instruction Manual (DVD-ROM)	S221-79206-41	1
	Graphite Vespel [®] jig, SCD (SCD Column insertion jig)	S221-83764-01 ¹¹	1
	Graphite Vespel [®] ferrule, GVF16-004	S670-15003-03	1 (10 pcs.)
	Spanner, SCD	S221-83722	1
	Column nut (for SCD)	S670-11009	1 (5 pcs.)
	Spanner for column nut, 3/16 × 1/4	S225-20801-01	1
	Spanner, SCD, maintenance	S221-84181	1
	Flow inspection connector, SCD	S221-84174-41	1
	Inner pyrotube	S221-84502-41	1 (3 pcs.)
	PTFE ferrule	S228-16007	3
Outer pyrotube	S221-84502-42	1	

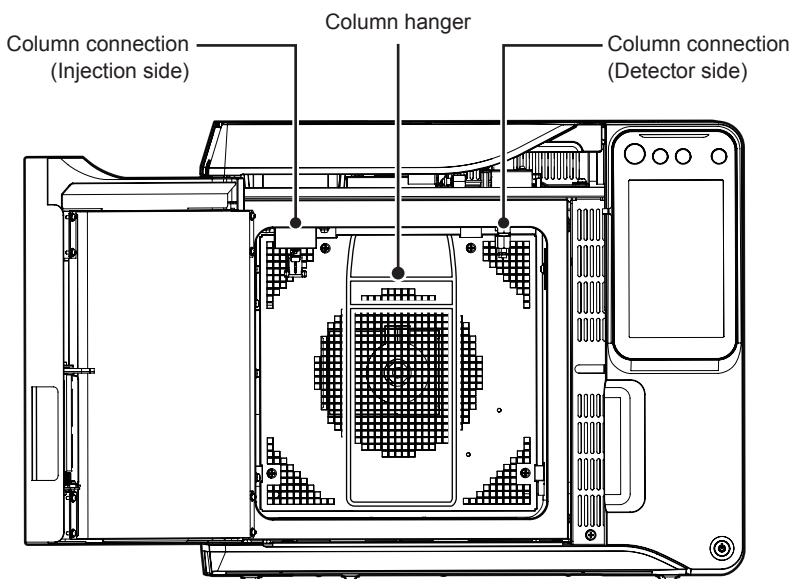
¹¹ "S221-83764" for the right installation model.

3 Names and Functions of Parts

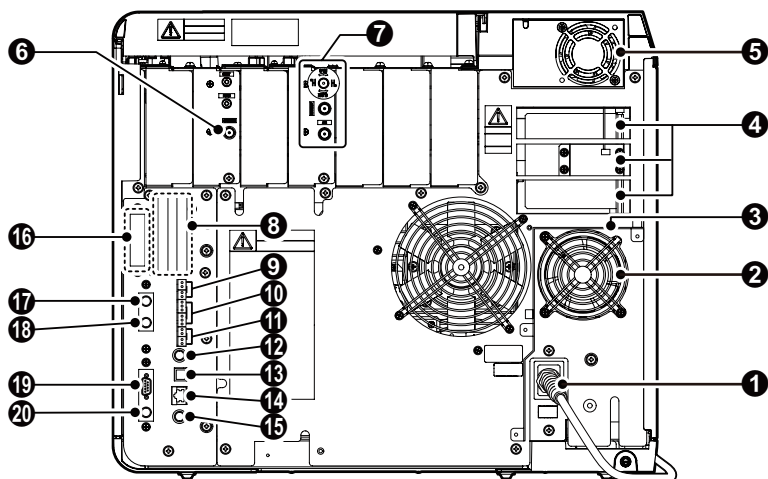
3.1 General View



3.2 Inside of the Column Oven



3.3 Rear

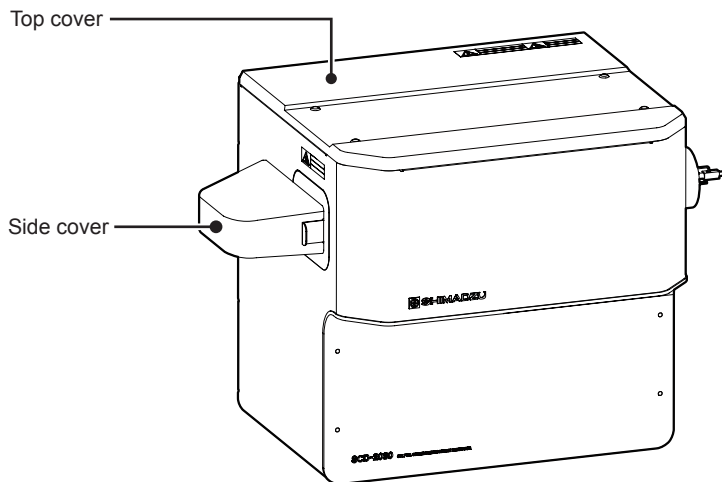


No.	Name	No.	Name
①	Power cable	⑪	Relay input connector
②	Air inlet fan	⑫	INJECTOR1 connector
③	Partition plate	⑬	USB connector
④	Exhaust vent	⑭	Ethernet connector
⑤	INJ / DET fan	⑮	Detector signal output terminal for Ch1 (analog)
⑥	Carrier gas inlet	⑯	External input connector for A/D board *1
⑦	Detector gas inlet	⑰	SAMPLER connector *1
⑧	PRG connector *1	⑱	INJECTOR2 connector *1
⑨	Relay output connector (1 relay)	⑲	RS-232C connector *1
⑩	Relay output connector (2 relay)	⑳	Detector signal output terminal for Ch2 (analog) *1

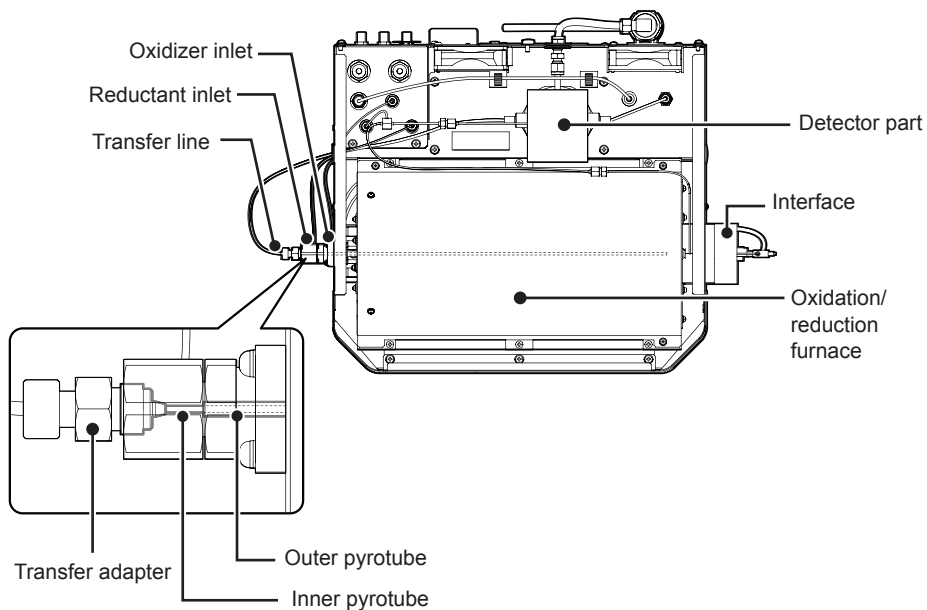
*1 Connectors to connect optional devices. Normally they are covered with a plate.

3.4 SCD-2030

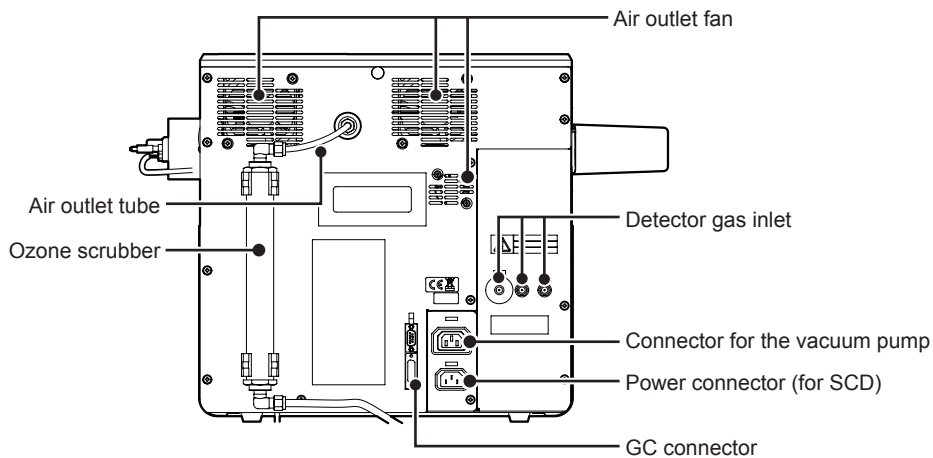
■ General View



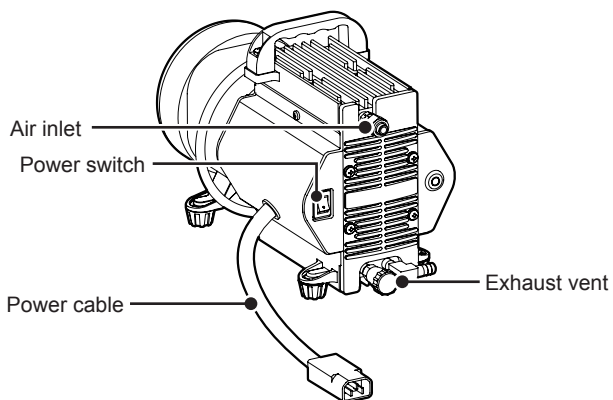
■ Inside of the Instrument



■ Rear



■ Vacuum Pump



3.5 Display and Operation of the Control Panel

Control panel is comprised of "status light", "operation buttons", and "touch panel". Use control panel to set various conditions, check instrument status, and perform analysis.



■ Status light

Indicates the instrument status by the color of the light.

Colors	Description
Not Illuminating	Indicates the following instrument status. <ul style="list-style-type: none"> • The instrument is turned off. • The instrument is waiting in sleep mode. • The instrument is turned on, however the GC has not started yet.
Yellow	The GC started and the instrument is getting ready.
Green	The GC started and the instrument is ready.
Blue	During analysis or diagnosis.
Red	An error occurs.

■ Operation buttons

Use to start/stop analysis or analytical programs and display HOME screen.

Icons	Name	Function
	START	Analysis will start. Use for manual sample injection. When pre-run program is set, pre-run program will start.
	PREP RUN	Use it while PREP RUN function is active (the instrument status on the touch panel flashes). The instrument enters the status where the instrument can start analysis. ▶▶ Reference: GC-2030 Instruction Manual, "7.9.10 [PREP RUN] Screen"
	STOP	Stops analysis or analytical programs.
	HOME	Displays HOME screen.

■ Touch panel

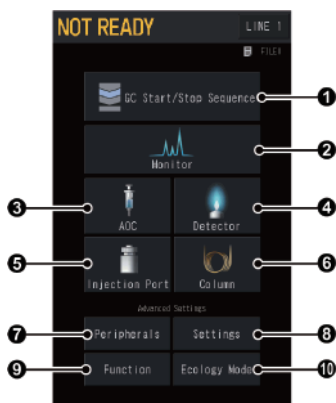
▶▶ **Reference:** For details about setting items of the touch panel, refer to the GC-2030 Instruction Manual.

HOME screen is displayed when you turned on the instrument.

NOTE

Do not turn off the main power for 10 seconds after you change the setting. If you turn off the main power within 10 seconds, the changed setting may not be reflected.

HOME



No.	Item	Description
①	GC Start/Stop Sequence	Sets parameters related to the GC start and stop.
②	Monitor	You can check conditions of injection ports, columns, and detectors and the baseline.
③	AOC	Sets AOC.
④	Detector	Sets detector temperature, conditions for the detector gas, and signal output.
⑤	Injection Port	Sets inlets temperature and various conditions for the carrier gas.
⑥	Column	Sets column temperature, column information (inner diameter, length, etc.), and temperature program.
⑦	Peripherals	Sets optional devices (CRG, AUX-APC, etc.).
⑧	Settings	Sets line settings and frequently changed conditions (various temperatures, the carrier gas, detectors, etc.) by batch.
⑨	Function	Sets configuration and time program.
⑩	Ecology Mode	Sets carrier gas saver and auto stop/start of the instrument.

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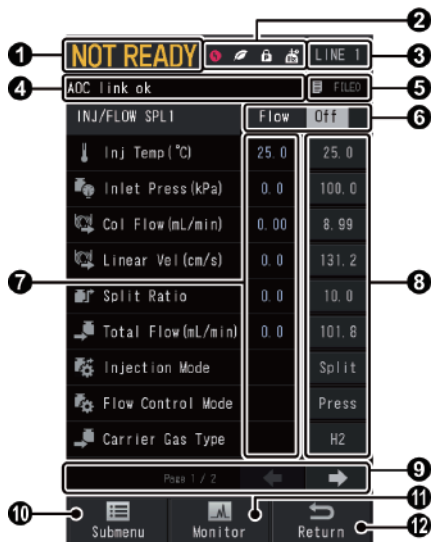
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Displayed items on the touch panel



No.	Item	Description
1	Instrument Status	Displays the current status of the instrument.
	Norm	The text changes depending on GC status. <ul style="list-style-type: none"> • NOT READY : GC is in preparation • READY : GC is ready • RUN : Analyzing • PRERUN : Pre-Run Program is running • DIAGNOSIS : Self-Diagnosis is running • CLEANUP : Clean up is running • PREP RUN : Analysis is in standby state (PREP RUN is active) • PREPARING: Analysis is in preparation
	Highlight	The background of the instrument status is highlighted while the instrument is working.
	Flashing	The instrument status on the touch panel will flash when the instrument is set in waiting state by PREP RUN function. When PREP RUN function is active, the instrument is in waiting status for analysis and cannot perform analysis. Press  (PREP RUN) on the control panel to change the instrument from waiting status for analysis to the status which enables analysis (READY).

Display and Operation of the Control Panel


No.	Item	Description
②	Status Icons	Displays icons depending on the instrument status.
	 (Error)	Displayed when an error occurs. Press the icon to check the current error.
	 (Eco)	Displayed when [Carrier Gas Saver] are set at [On] on [Eco Setting] screen. If several injection ports are configured in the analytical line, it is displayed when [Carrier Gas Saver] are set at [On] for all injection ports.
	 (Screen Lock)	Displayed when Screen Lock function is active.
	 (Parameter Lock)	Displayed when Parameter Lock function is active.
	 (Hydrogen is used)	Displayed when the carrier gas is hydrogen.
	 (Hydrogen Leak Check)	Displayed when optional Hydrogen Leak Check function is active.
③	LINE	Displays the analytical line number. When several analytical line are configured, switch the line number to set parameters for each line.
④	Message Display	Displays messages depending on the instrument status.
⑤	Used File	Displays the name of the loaded file.
⑥	Control Status	Displays the current control status. Press [Off] or [On] to switch the control status.
⑦	Value	Displays the actual values in blue text.
⑧	Setup Button	Press the button to change the settings.
⑨	Page Switching	Displayed when items are continued to the next page. Switch pages to set items.
⑩	Submenu	Press to display Submenu for each screen.
⑪	Monitor	Press to display the monitor screen.
⑫	Return	Press to display the previous screen.

3.6 Line Configuration

Line configuration is a function to configure a combination of units for analysis. The instrument can control each combination configured in analytical lines separately.

NOTE When using Heart-Cut or Detector Switching of AFT, set it at "LINE1".

■ Switching active views button

Press  (HOME) - [Settings] - [Submenu] - [Line Configuration] to display [Line Configuration] screen.

[Line Configuration] screen shows all units installed on the instrument. Configure a combination of injection port, detector, option, and AFT in analytical lines. When using optional AOC or AFT, configure them in the analytical line same as injection port and detector.

Up to four detectors, one injection port, one option, and one AFT can be configured in one analytical line.

■ Operations after GC start

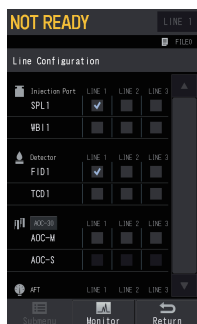
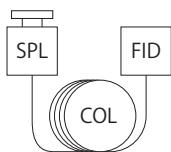
After the GC starts, the instrument starts to control temperature of injection port and detector configured in analytical lines. If AFC or APC is installed, the carrier gas is supplied to the injection port and the detector gas is supplied to the detector. Temperature and gas supply of units which are not configured in analytical lines will not be controlled.

■ Example 1 for line configuration

When the instrument equipped with SPL and WBI for injection port, and FID and TCD for detector

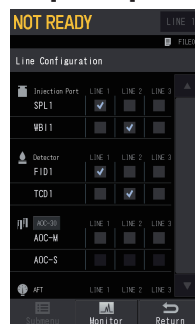
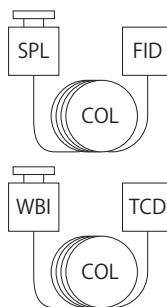
• When using SPL and FID

Configure SPL and FID in [LINE 1].



• When using two combinations; SPL and FID, WBI and TCD

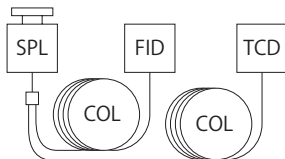
Configure SPL and FID in [LINE 1], and WBI and TCD in [LINE 2].



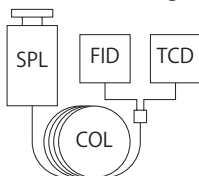
• **When using SPL, FID, and TCD**

Configure both detectors in [LINE 1].

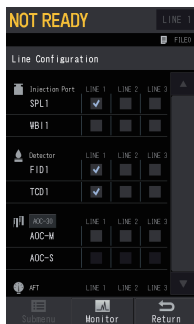
- (1) When branching the column inlet to connect two columns



- (2) When branching the column outlet



NOTE
Only one column information (inner diameter, length, film thickness, max temperature) can be set. When using columns with different column dimensions, calculations of column flow and velocity are not correct.

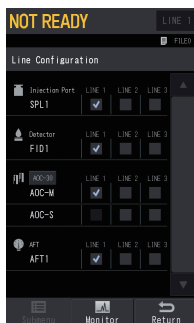
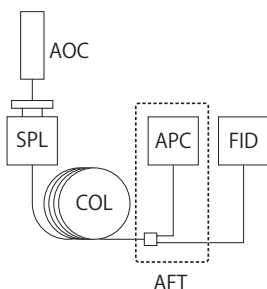


■ **Example 2 for line configuration**

When the instrument equipped with SPL for injection port, and FID for detector

• **When using SPL, FID, AOC, and AFT**

Configure SPL, FID, AOC, and AFT in [LINE 1].



Hint

- Combination of injection port, column, and detector used for analysis is saved as Line in data file.
- The instrument does not control gases of the injection port and the detector which are not configured in the line, therefore you can avoid unnecessary gas/power consumption and malfunctions.

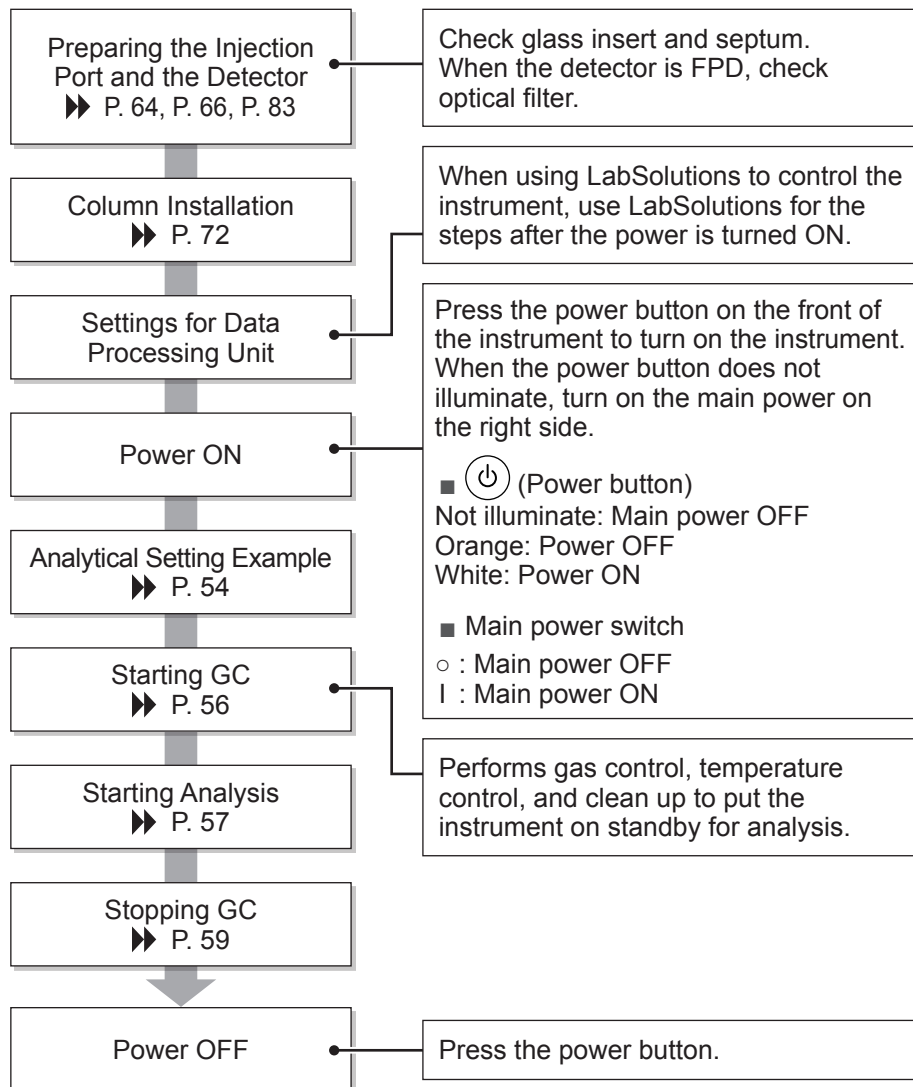
4 Operation Flow

Analysis procedure is different depending on the detector and your purpose of the analysis.

This chapter describes general procedure for analysis.

▶▶ **Reference:**

- For the installation of the parts, see "6 Maintenance" P. 60 or refer to the "Maintenance Help".
- For details of the operation, refer to the GC-2030 Instruction Manual.



NOTE

- You do not need to use the main power switch. Normally, the main power switch is turned on.
- The cycle of replacement of the septum/glass insert is different depending on usage conditions and frequency.

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Operation Flow

■ Instrument temperature

Ensure that temperature drops adequately before operation.

WARNING



Instructions

Ensure that the column oven temperature drops below 40 °C on [Temp Monitor] screen. Ensure that the temperatures of the injection port and the detector drop below 50 °C on [Temp Monitor] screen.

- Temperatures of parts may be high immediately after the GC stops. Operate them after temperatures of parts drops to a temperature where you can perform maintenance.
- Operation at a high temperature may cause burns. Tightening the nut or ClickTek Connector (Option) at a high temperature may cause the seizing (galling) of the sliding part.

[Temp Monitor] Screen

(HOME) - [Monitor] - [Temp Monitor]

Temp Monitor		LINE 1
Column (°C)	25.0	70.0
SPL1 (°C)	25.0	25.0
FID1 (°C)	25.0	25.0
SPL2 (°C)	25.0	25.0
TCD1 (°C)	25.0	25.0
PRETCD1 (°C)	25.0	25.0
WB11 (°C)	25.0	25.0

■ [Analysis Settings] screen

On [Analysis Settings] screen, you can set frequently changed conditions including various temperatures and conditions for carrier gas and detector by batch for parts configured in analytical lines on [Line Configuration] screen.

▶▶ Reference: "3.6 Line Configuration" P. 50

5 To Analyze

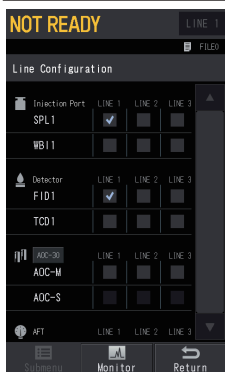
5.1 Analytical Setting Example

As an example, this section describes the analysis using SPL, FID, and column (Rtx-1, an inner diameter of 0.32 mm, a length of 30 m, a film thickness of 0.25 μm , the max temperature 350.0 $^{\circ}\text{C}$) under the following conditions.

- Column temperature: 170.0 $^{\circ}\text{C}$ (10 minutes)
- Injection Mode: Split
- H_2 : 32.0 mL/min
- Injection port temperature: 250.0 $^{\circ}\text{C}$
- Carrier Gas: He
- Air: 200.0 mL/min
- Linear velocity: 30.0 cm/sec
- Detector Temperature: 250.0 $^{\circ}\text{C}$
- Split Ratio: 1:30
- Makeup Gas: N_2 , 24.0 mL/min

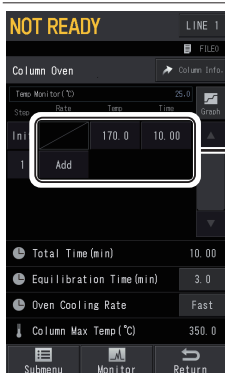
1 Configure units to be used in analytical lines.

(HOME) - [Settings] - [Submenu] - [Line Configuration]



2 Set the column oven temperature.

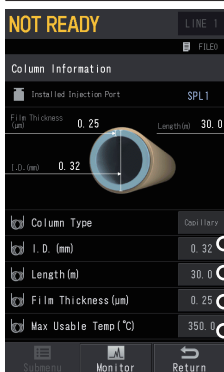
(HOME) - [Column]



Set at 10 min at 170.0 $^{\circ}\text{C}$

3 Set the column information.

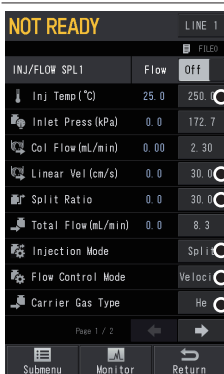
[Column Info.] on [Column Oven] screen



- Set at 0.32
- Set at 30.0
- Set at 0.25
- Set at 350.0

4 Set various conditions for the injection port.

(HOME) - [Injection Port]



- Set at 250.0
- Set at 30.0
- Set at 30.0
- Set at Split
- Set at Velocity
- Set at He

5 Set various conditions for the detector.

(HOME) - [Detector]



Hint

Sets detector temperature higher than column temperature to prevent components eluted from the column from remaining in the detector.

6 Set up the detector signal.

[Submenu] - [Signal Settings]
on [Detector] screen.



Hint

When using LabSolutions, detector signal setting is not required. When using Chromatopac, the setting is required.

7 Perform quick leak check for the connector using Carrier Gas Leak Check function.

(HOME) - [Function] - [Diagnosis] -
[Carrier Gas Leak Check]

After confirming that each item of [Column Information] is correctly set, press [Start].

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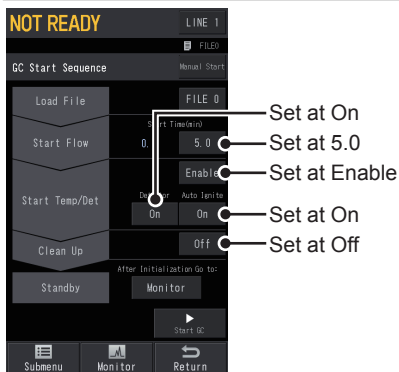
To Analyze

5.2 Starting GC

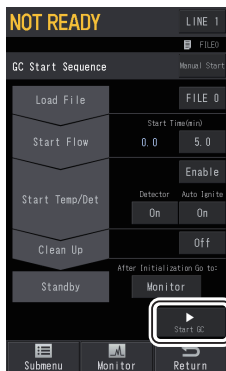
Sets start sequence and starts GC.

1 Set GC start sequence.

(HOME) - [GC Start/Stop Sequence]

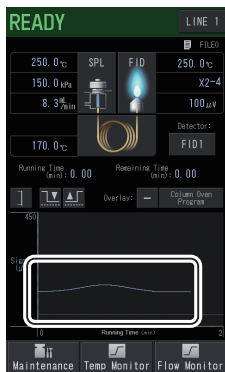


2 Press [Start GC].

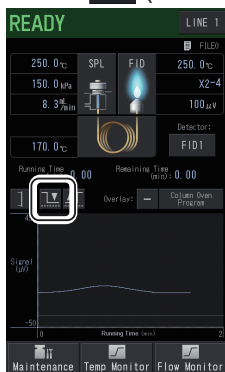


GC starts working. After the GC startup is completed, the status light (▶▶ Reference: P. 46) illuminates in green and Monitor screen is displayed.

3 Ensure that the baseline is stable at the desired sensitivity.



4 Press (Auto Zero).



The detector output is adjusted to 0 μV.

Hint

To automatically start auto zero, press (HOME) - [Function] - [Configuration] - [Other Configurations], and set [Auto Zero After Ready] at [On].

5.3 Starting Analysis

After GC starts, inject the sample and start the analysis.

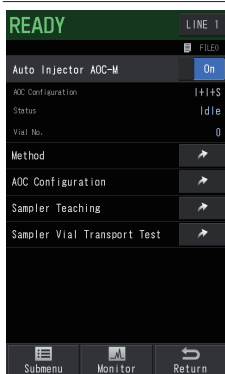
There are two methods of sample injection: auto injection using AOC and manual injection.

▶▶ **Reference:** For details about AOC, refer to the AOC Instruction Manual.

■ When using AOC

- 1 Configure AOC in the analytical line.
- 2 Check the syringe, etc. of AOC and set the sample.
- 3 Set parameters related to AOC.

(HOME) - [AOC]



- 4 If you are using AOC-20i, press [Start AOC].
If you are using AOC-30i, press the [START] button on the auto injector.

AOC starts and the instrument performs the analysis according to the set analysis conditions.

■ For manual injection

Safety glasses are required for manual sample injection.

- 1 Charge the syringe with the sample.
- 2 Inject the sample.

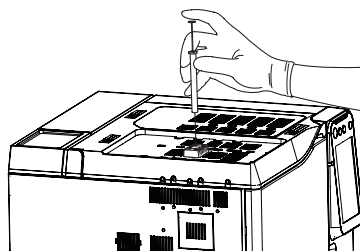
! CAUTION



Instructions

Wear safety glasses during sample injection.

The sample may squirt and be got in your eyes causing damage of your eyes.



- 3 Press **START** (START).



The instrument performs the analysis according to the set analysis conditions.

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To Analyze

5.4 Operations During Analysis

After a sequence of the analysis is completed, the instrument automatically goes into waiting mode. However, operate the instrument manually in the following cases.

■ To stop analysis

Press **STOP** (STOP) on the control panel. The current analysis is terminated forcibly.

Press **START** (START) after the instrument status changed from "NOT READY" to "READY" to start the analysis from the beginning.



■ When the instrument status flashes

The instrument status on the touch panel will flash when the instrument is set in waiting state by PREP RUN function.

When PREP RUN function is active, the instrument is in waiting status for analysis and cannot perform analysis.

Press **PREP RUN** (PREP RUN) on the control panel to change the instrument from waiting status for analysis to the status which enables analysis (READY).

▶▶ Reference: GC-2030 Instruction Manual, "7.9.10 [PREP RUN] Screen"

When instrument status flashes



5.5 Stopping GC

Set stop sequence and stop GC safely.

If the instrument is turned off without performing stop sequence, carrier gas supply is shut off and it may cause malfunctions such as column degradation.

1 Set GC stop sequence.

(HOME) - [GC Start/Stop Sequence]



2 Press [Stop GC].



The GC stops according to [GC Stop Sequence] screen settings.



Examples for the GC stop (1)

Turn off heater switch immediately and stop the carrier gas after 20 minutes.

- Stop Time: 0 min
- Flow Control: Off
- Flow Off Time: 20 min

NOTE

If the carrier gas stops while the column oven temperature is high, the liquid phase of the column may be degraded. The flow off time should be set at a value where the column oven temperature drops adequately.

Examples for the GC stop (2)

Turn off heater switch 10 minutes after [Stop GC] is pressed, keep the carrier gas flow, and restart the instrument after 20 hours (1200 minutes).

- Stop Time: 10 min
- Flow Control: Off
- Flow Off Time: 1200 min (20 hours)
- Sleep: Disable
- Restart: Enable
- Restart Time: 1200 min (20 hours)

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To Analyze

6 Maintenance

Periodic inspection and replacement are required to maintain the instrument performance for a long time and obtain correct analytical data.

This chapter describes maintenance of SPL and FID.

▶▶ **Reference:** For maintenance of parts other than SPL and FID, refer to "Maintenance Help". If any abnormality of the instrument are found, contact your Shimadzu sales/service representative.

6.1 Precautions on Maintenance

WARNING



Instructions

Ensure that the column oven temperature drops below 40 °C on [Temp Monitor] screen. Ensure that the temperatures of the injection port and the detector drop below 50 °C on [Temp Monitor] screen.

- Temperatures of parts may be high immediately after the GC stops. Operate them after temperatures of parts drops to a temperature where you can perform maintenance.
- Operation at a high temperature may cause burns. Tightening the nut or ClickTek connector (optional) at a high temperature may cause the seizing (galling) of the sliding part.



Instructions

For parts replacement, use items listed in "2 Standard Accessories" P. 40 , "Gas Chromatograph Accessories and Supplies", and "Maintenance Help".

When you use items not on the lists, the part may be damaged and may not operate properly. It may also cause malfunction or injury.

▶▶ **Reference:** "6.10 Consumables" P. 87

CAUTION



Instructions

Wear gloves and use proper tools.

- If you directly touch parts, the parts may be contaminated affecting the analytical data.
- Remove dirt of tools with a gauze, etc. moistened with acetone before use.



Instructions

Place removed parts on a clear tray or sheet.

Pay attention not to lose or contaminate them.



Prohibitions

Do NOT perform maintenance or inspection while the inlet pressure is high.

Septum and O-ring may project. And, rapid change of the inlet pressure may cause misalignment of the silica wool. This may cause incorrect analytical result.

6.2 [Inj Maintenance] Screen

To replace septum or glass insert while GC is working (instrument status is highlighted), perform the following procedure. The instrument can enter a state where maintenance can be performed without changing conditions, and return to the original state after the maintenance.

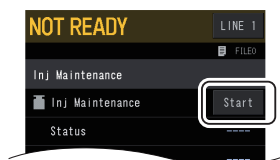
■ Before maintenance

1 Displays [Inj Maintenance] screen.

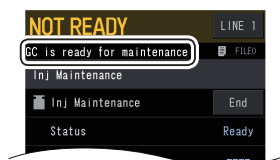
(HOME) - [Monitor] - [Inj Maintenance]



2 Press [Start].



When the instrument is ready for maintenance, [GC is ready for maintenance] appears in the message display.



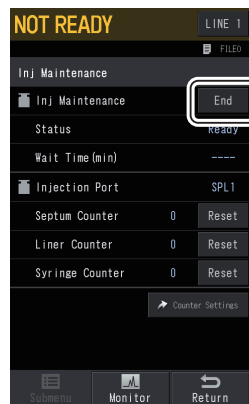
Perform maintenance.

■ After maintenance

1 When you replaced any parts, press [Reset] for the replaced part.



2 Press [End].



Automatically supplies carrier gas, and starts temperature control of the inlet and the column oven.

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Maintenance

6.3 Recommended Inspection Cycle

Inspect the parts based on the recommended inspection/replacement cycle.

Inspection items	Inspection/ replacement cycle						Corrective action
	1 mo.	3 mos.	6 mos.	1 yr	2 yrs	Other	
Septum						✓	When using syringe for AOC, replace it after approx. 100 analyses. When using gastight syringe with thick needle tip, replace it after approx. 50 analyses.
Glass insert						✓	Inspect or replace it after approx. 100 analyses. If the position of the silica wool is correct and glass insert/wool is not contaminated, they can be used again.
Insert O-ring						✓	Replace it when you replace the glass insert. Not reusable.
Syringe						✓	Clean it after approx. 500 analyses. Check that there is no problem with the following 2 points after the cleaning. <ul style="list-style-type: none"> • The plunger moves smoothly. • The sample is ejected straight from the needle end.
Split filter	✓		✓				Inspect it once a month and replace it every about 6 months.
Capillary column						✓	Perform conditioning when you install the column.
SUS column						✓	Perform conditioning when you install the column.
Glass column						✓	Perform conditioning when you install the column.
Graphite ferrule						✓	Check it when you install the column. Replace it if there is no space between the back ring and side ring.
ClickTek ferrule						✓	Check it for dust and damage when you install the column. Replace it after approx. 5 attaching/detaching. Up to 10 attaching/detaching is allowable.
ClickTek adapter						✓	Replace it every 3 years.
ClickTek connector						✓	Replace it every 3 years.
FID igniter				✓			Replace it once a year.
FID collector				✓			Replace it once a year. Replace it if noise becomes large.
FID jet				✓			Replace it once a year. Replace it if noise becomes large.
FTD collector						✓	Recondition or replace the alkaline source if the desired sensitivity cannot be achieved or there is spike noise on the minus side on standby.

Inspection items	Inspection/ replacement cycle						Corrective action
	1 mo.	3 mos.	6 mos.	1 yr	2 yrs	Other	
FTD jet				✓			Replace it once a year. Replace it if noise becomes large.
FPD interference filter			✓			✓	Inspect it once every 6 months. Clean or replace it if it is contaminated.
FPD photomultiplier					✓		Replace it every 2 years.
FPD igniter				✓			Replace it once a year.
FPD quartz cylinder			✓		✓		Inspect it once every 6 months and replace it every about 2 years.
FPD lens			✓			✓	Inspect it once every 6 months or when you replace the interference filter. Clean or replace it if it is contaminated.
O-ring inside the FPD filter			✓			✓	Inspect it once every 6 months or when you replace the interference filter. Clean or replace it if it degenerates.
SCD inner pyrotube						✓	Replace it once every 1000 hours. Replace it when desired sensitivity cannot be obtained.
SCD outer pyrotube						✓	Replace it once every 1000 hours.
SCD ozone scrubber				✓			Replace it once a year. You can replace only the filler, but we recommend to replace the ozone scrubber itself.
SCD vacuum pump				✓			Maintain it once a year. Contact your Shimadzu sales/service representative.
Gas filter				✓			Replace it once a year.
PTV liner						✓	Inspect or replace it after approx. 100 analyses. If the position of the silica wool is correct and glass insert/wool is not contaminated, they can be used again.
OCI liner						✓	Inspect or replace it after approx. 100 analyses.
OCI grass liner						✓	Inspect or replace it after approx. 100 analyses.
OCI-2030 NX liner						✓	Inspect or replace it after approx. 100 analyses.

NOTE

- Recommended number of analysis and inspection cycles should be used for reference only. They are not warranty period.
- Inspection cycle is different depending on the instrument usage and the samples to be analyzed. Inspect the instrument according to the situation.

6.4 Inspection and Replacement of Septum

Replace the septum.

Type of bleeding depends on the septum. Select a septum according to the purpose of analysis. For high-sensitivity analysis, use a septum of which bleeding does not appear in positions that interfere with the peaks of the target compounds.

▶▶ **Reference:** Maintenance Help

Required devices

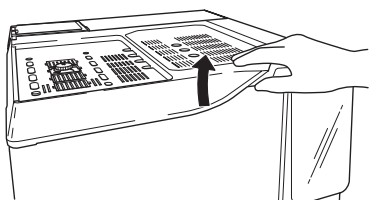
Parts name	Qty
Tweezers	1
Septum	1

1 Prepare for maintenance.

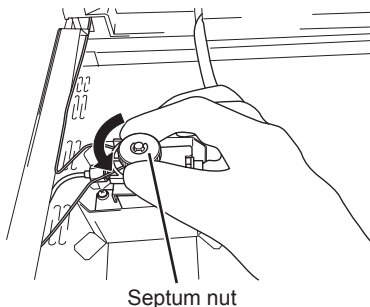
▶▶ **Reference:**

- "6.1 Precautions on Maintenance"
P. 60
- "6.2 [Inj Maintenance] Screen"
P. 61

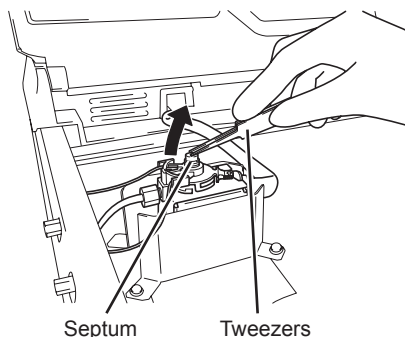
2 Open INJ/DET cover.



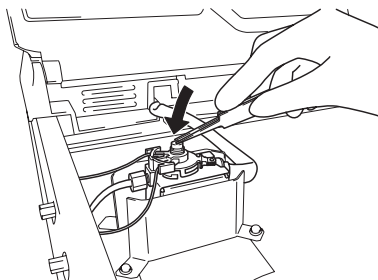
3 Turn the septum nut counterclockwise to remove it.



4 Remove old septum with tweezers.



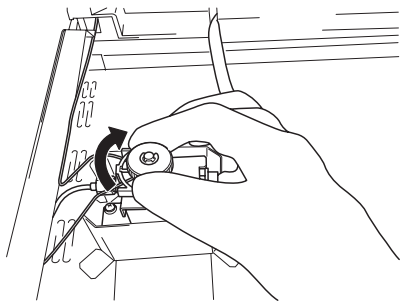
5 Install a new septum.



Hint

Hold down the septum with flat surface of tweezers for easier installation.

- 6** Turn the septum nut clockwise, fully tighten it, and return it halfway.

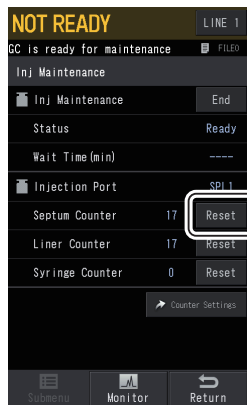


Hint

- If it is not returned halfway, the septum may become hard and the needle of the syringe may bend when the syringe is inserted.
- Returning halfway after fixing prevents the septum from excessive compression, which makes it difficult to insert the syringe.

- 7** Close INJ/DET cover.

- 8** Press [Reset] on [Septum Counter].



- 9** Press [End].



Automatically supplies carrier gas, and starts temperature control of the inlet and the column oven.

6.5 Inspection and Replacement of Glass Insert and O-ring

Replace the glass insert and O-ring.

In the glass insert included in the standard accessories, silica wool is packed at proper position in advance. Pack the proper amount of silica wool in the glass insert at proper position in advance.

▶▶ **Reference:** "6.5.1 Packing Silica Wool" P. 69

Required devices

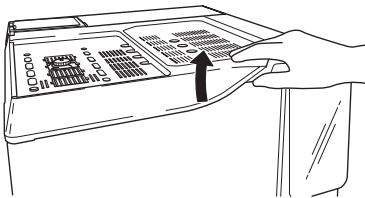
Parts name	Qty
Tweezers	1
Glass insert	1
O-ring	1

1 Prepare for maintenance.

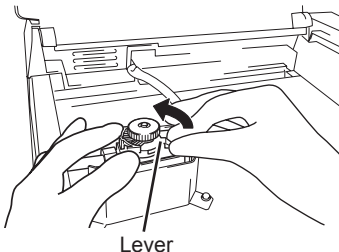
▶▶ **Reference:**

- "6.1 Precautions on Maintenance" P. 60
- "6.2 [Inj Maintenance] Screen" P. 61

2 Open INJ/DET cover.



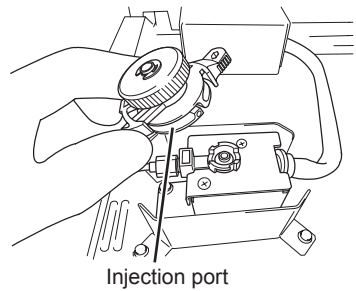
3 Turn the lever counterclockwise while holding the injection port.



4 Raise the injection port slowly.

NOTE

Raise the injection port slowly by left hand to prevent damage of glass insert.



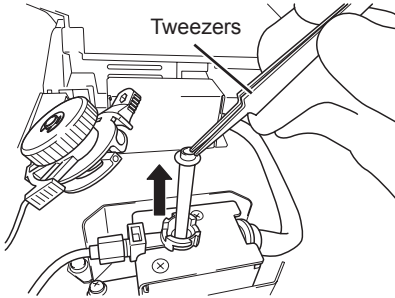
Hint

When O-ring is adhered to the injection port, remove O-ring with tweezers before raising the injection port to prevent damage of glass insert.

5 Pull out old glass insert with tweezers.

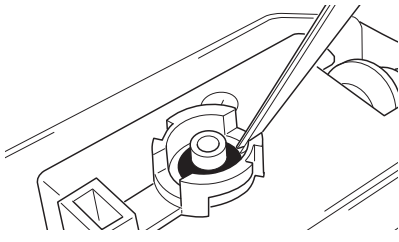
NOTE

Pay attention not to damage the installation surface of O-ring on the injection inlet.

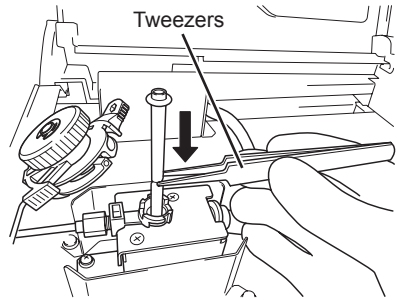


Hint

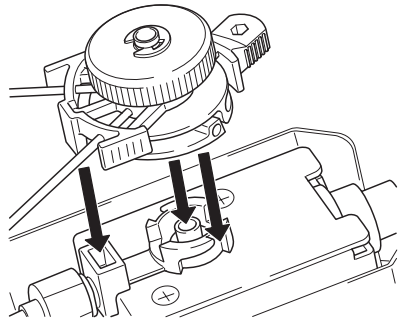
When O-ring is adhered by heat, remove the connection between O-ring and the body by inserting tweezers in 2 slits on the both side.



6 Install a new glass insert equipped with O-ring.



7 Install the injection port fitting into the groove.



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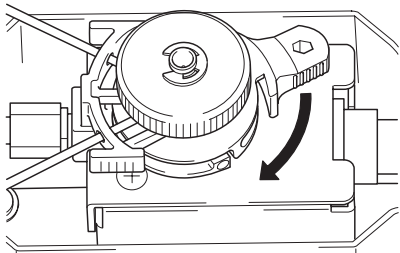
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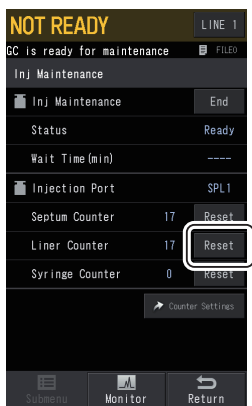
Maintenance

- 8** Turn the lever clockwise while holding the injection port.

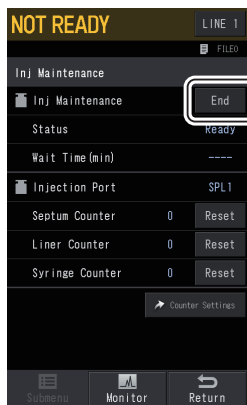


- 9** Close INJ/DET cover.

- 10** Press [Reset] on [Liner Counter].



- 11** Press [End].



Automatically supplies carrier gas, and starts temperature control of the inlet and the column oven.

6.5.1 Packing Silica Wool

In the glass insert included in the standard accessories, silica wool is packed at proper position in advance.

When using a glass insert in which silica wool is not packed, pack silica wool according to the following.

■ The amount of the silica wool

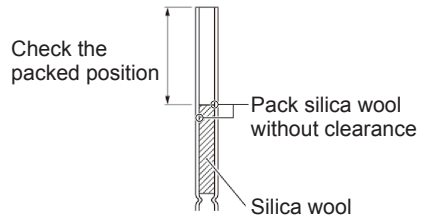
For split: about 10 mg

For splitless/WBI: about 4 mg

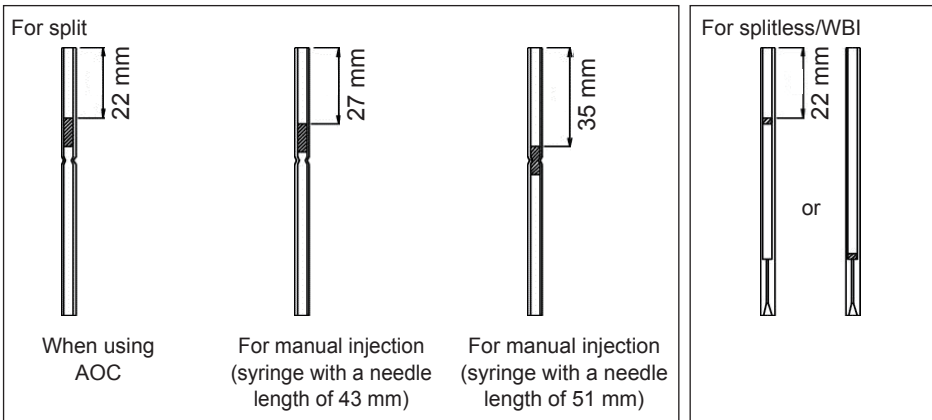
NOTE

Normally, you do not need to pack silica wool in full injection mode using wide bore column for splitless/WBI. However, pack small amount (about 2 mg) of silica wool when analyzing samples including non-volatile components to prevent contamination of the column.

■ Method of packing silica wool



■ Recommended position of silica wool



NOTE

- Packing position and the amount are general guidelines.
- The optimal values may be different depending on analytical conditions and samples.
- It is recommended to use inactivated glass inserts and silica wool to prevent absorption and decomposition in the injection inlet.

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Maintenance

6.6 Inspection and Replacement of Split Filter

Replace the split filter.

Split filter is installed to protect split vent in the downstream. Split filter can effectively remove components which cause malfunctions of split vent.

Standard cycle of replacement is 6 months, however, it becomes shorter than 6 months when analyzing components which dissolve rubber such as THF and DMF.

Before installation of new split filter, check the following points.

- Two O-rings are installed.
- There is no dust on the sealing surface of O-ring and filter fixing block.

Required devices

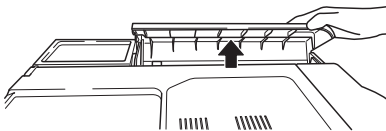
Parts name	Qty
Split filter	1

1 Prepare for maintenance.

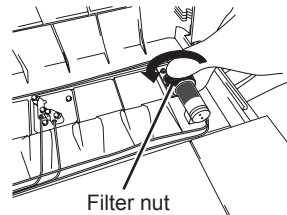
▶▶ Reference:

- "6.1 Precautions on Maintenance"
P. 60
- "6.2 [Inj Maintenance] Screen"
P. 61

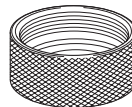
2 Open AFC/APC cover.



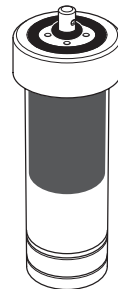
3 Turn the filter nut counterclockwise to remove old split filter.



It can be split into the split filter and the filter nut.

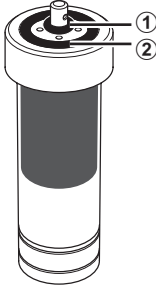


Filter nut



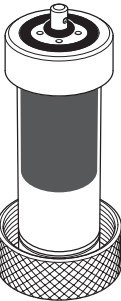
Split filter

- 4** Check that there are 2 pcs of O-rings on a new split filter.

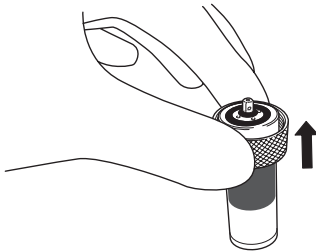


- 5** Install a filter nut on a new split filter.

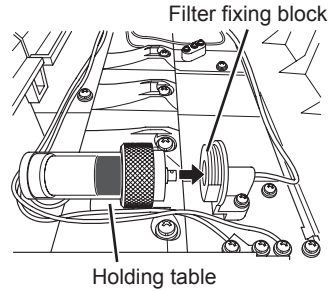
1. Draw the split filter through the filter nut.



2. Raise the filter nut.



- 6** Put the split filter on the holding table, draw the center axis of the split filter through the hole of the filter fixing block, and insert it toward the back.



- 7** Turn the filter nut clockwise to fix the split filter.



- 8** Close AFC/APC cover.

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Maintenance

6.7 Inspection and Replacement of Capillary Column

Replace the capillary column.

Methods for installing the column depend on used ferrule (graphite ferrule or ClickTek ferrule).

Install the column correctly depending on the used ferrule.

► **Reference:**

- "6.7.1 Graphite Ferrule" P. 73
- "6.7.2 ClickTek Ferrule (Option)" P. 76




■ Points for column installation

- Avoid applying excessive force to the column.
When the column does not reach the injection port or the detector, unwind the column about one turn and install it.
- Keep the column from contact with the inner wall of the oven.
- To install the column hanger, reduce the width of the upper part of the column hanger and insert it into the mounting hole.
Normally, install it into the back hole. To install two columns, purchase column hanger for the front one.

■ Ferrule type

Use the correct ferrule according to the system configuration and the purpose.

For analysis

I.D. of column	Graphite ferrule	ClickTek ferrule	
0.18 mm	G0.5	ClickTek Ferrule for Narrow Bore, 0.43 Two marking-off line.	
0.25 mm			
0.32 mm		ClickTek Ferrule for Middle Bore, 0.5 One marking-off line.	
0.53 mm	G0.8	ClickTek Ferrule for Wide Bore, 0.73 No marking-off line.	

For sealing

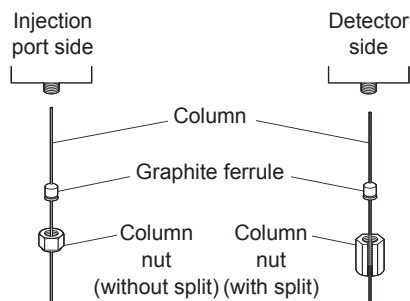
Graphite ferrule	ClickTek ferrule
G0.5 or G0.8 (with wire)	ClickTek Ferrule Blind

6.7.1 Graphite Ferrule

Required devices

Parts name	Qty
10 × 12 spanner	1
6 × 8 spanner	2
Tweezers	1
Capillary cutter	1
Column nut (without split)	1
Column nut (with split)	1
Graphite ferrule	2
Graphite jig (for injection port)	1
Graphite jig (for detector)	1

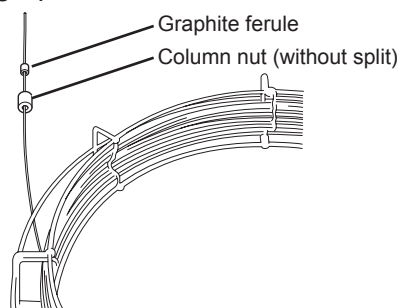
Magnified view of column



- 1 Stop GC and check that gas supply is stopped and there is no residual pressure.

▶▶ Reference:
"6.1 Precautions on Maintenance"
P. 60

- 2 Slide the injection port side of the column through the column nut (without split), and then graphite ferrule.



Hint

Organic matter easily adheres to graphite. If you directly touch graphite, it may affect the analytical data.

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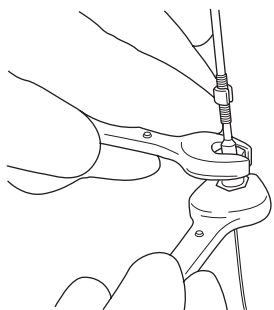
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Maintenance

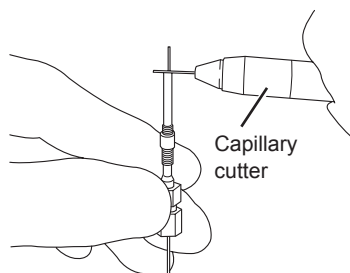
3 Fix the graphite ferrule temporarily with the Graphite jig and a 6 × 8 spanner.

In this case, push out capillary column about 10 mm from the Graphite jig.



When using Graphite jig for SPL/PTV, the sealed end of the graphite ferrule is fixed at 34 mm from the column end.

4 Cut the end of column with capillary cutter etc.



5 Prepare the detector side of the column in the same way.

Normally, a nut with split is used on the detector side, fix only the graphite ferrule with Graphite jig.



The position where the graphite ferrule is fixed depends on the detector to be used.

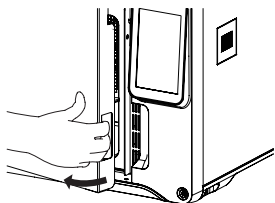
- FID: 72 mm^{*1}
- TCD: 50 mm
- FPD: 82 mm
- FTD: 69 mm
- BID: 74 mm
- ECD^{*2}: 43 mm
(Column flow rate is less than 2 mL/min)
- ECD^{*2}: 38 mm
(Column flow rate is more than 10 mL/min)

^{*1} When using metal capillary, 7 to 8 mm shorter.

^{*2} When the column flow rate is 2 mL/min or more, make the length of the inserted column shorter than 43 mm to improve the durability of ECD cell (Example: when the column flow rate is 2 to 10 mL/min, 41 mm). Adjust the length of the inserted column because optimal length depends on analytical settings and the sample.

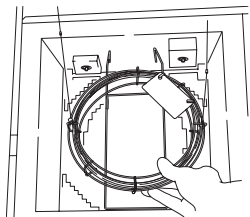
Inspection and Replacement of Capillary Column

- 6** Open the column oven door.

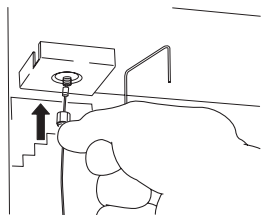


Pull the column oven door latch toward you.

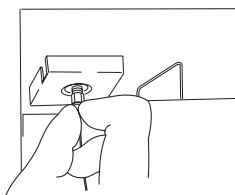
- 7** Hang the column on the column hanger.



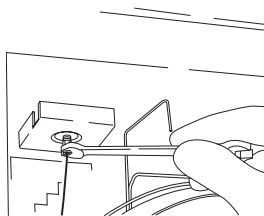
- 8** Insert the column into the injection inlet.



- 9** Turn the nut clockwise by hand to tighten it.



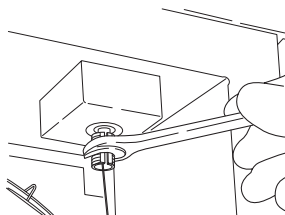
- 10** Tighten it about 1/2 turn with a 6 × 8 spanner.



- 11** Insert the column also on the detector side.

- 12** Thread a column nut (with split), and turn the nut clockwise by hand to tighten it.

- 13** Tighten it about 1/2 turn with a 10 × 12 spanner.



- 14** Close the column oven door.

- 15** Start the GC.

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Maintenance

6.7.2 ClickTek Ferrule (Option)

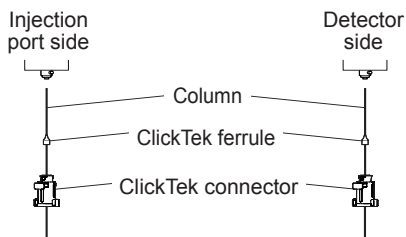
NOTE

- ClickTek ferrules are not compatible with metal columns.
- OCI/PTV is not compatible with ClickTek ferrules.

Required devices

Parts name	Qty
Tweezers	1
Capillary cutter	1
ClickTek connector	2
ClickTek ferrule	2
Pre-Fix Tool	1

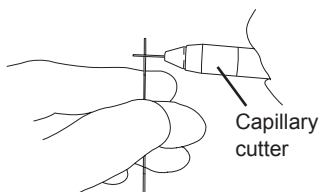
Magnified view of column



- 1 Stop GC and check that gas supply is stopped and there is no residual pressure.

▶▶ Reference:
"6.1 Precautions on Maintenance"
P. 60

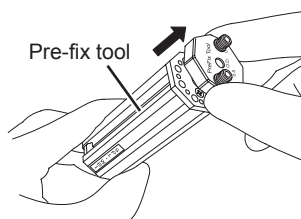
- 2 Cut the end of column with capillary cutter etc.



- 3 Install ClickTek ferrule on the column with Pre-fix tool.

For example, installation on SPL side for Split analysis is described here.

1. Raise rotating part of Pre-fix tool and set the inlet at "SPL • WBI". For ClickTek ferrule for narrow/middle bore, set the inlet of "0.43/0.5". For ClickTek ferrule for wide bore, set the inlet of "0.73".



Hint

- Select inlet of Pre-fix tool depending on the type of injection inlet and detector.

For ClickTek Ver.1

Item	The length of the inserted column
SPL • WBI	Split/Splitless 33 mm
15 mm	Splitless 15 mm (When performing splitless analysis by wide bore column with inner diameter of 0.53 mm)
FID	71 mm
TCD	49 mm
BID	73 mm
FTD	68 mm
ECD-Exceed	42 mm
FPD	81 mm

 **Hint**

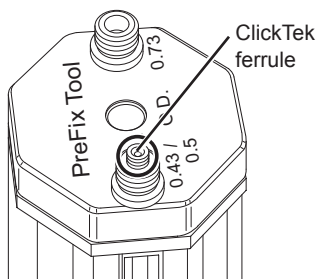
ClickTek Ver.2

Item	The length of the inserted column
SPL • WBI	Split/Splitless 33 mm
15 mm	Splitless 15 mm (When performing splitless analysis by wide bore column with inner diameter of 0.53 mm)
DET	71 mm (For FID, TCD, BID, FTD and ECD-Exceed)
FPD	81 mm

- * For the injection port, FID, and FPD, you do not need to change the length of the inserted column and ClickTek ferrule. They can be used for any version of ClickTek.
- For ClickTek ferrule, the length of the inserted column is about 1 mm shorter than the graphite ferrule. See the above table when installing ClickTek ferrule without Pre-fix tool.
- To use the Pre-fix tool Ver.1 for ClickTek Ver.2, select "FID" when the detector is FID, TCD, BID, FTD or ECD-Exceed.
- If the length of the inserted column is wrong, the sensitivity may significantly deviate. Set the length of the inserted column depending on the used version of ClickTek.

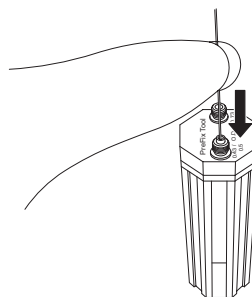
▶▶ Reference:
For the way to differentiate between Ver.1 and Ver.2 of ClickTek, see the hint in step 9.

2. Fix ClickTek ferrule on Pre-fix tool.

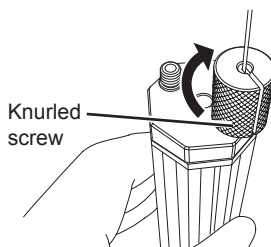


▶▶ Reference:
"Ferrule type" P. 72

3. Insert the column in Pre-fix tool and put it as far as it will go.



4. Draw the column through the knurled screw and turn it clockwise.



 **Hint**

Turn it until the knurled screw reaches the ferrule.

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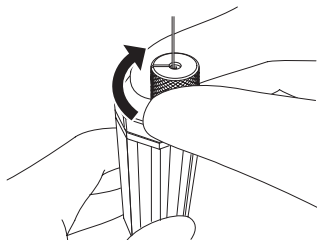
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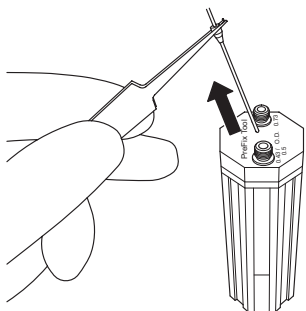
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Maintenance

5. Ensure that the column is inserted in Pre-fix tool as far as it will go.
6. Turn the knurled screw 90 degrees clockwise while supporting the column to prevent it from coming out.



7. Remove the knurled screw and pick up the ferrule with tweezers to remove the column.



NOTE

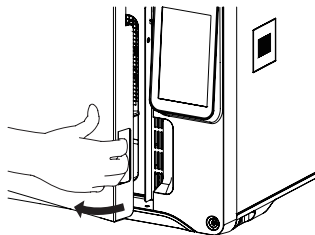
Be sure to pick up the ferrule with tweezers to remove the column. If the column is pulled, it may damage the column.

8. Ensure that the ferrule is installed securely.

NOTE

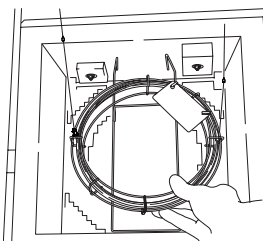
If the ferrule is not installed securely, additionally tighten it 45 degree angle.

- 4 Prepare the detector side of the column in the same way as step 2 to 3.
- 5 Open the column oven door.



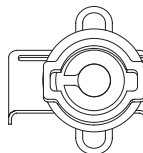
Pull the column oven door latch toward you.

- 6 Hang the column on the column hanger.

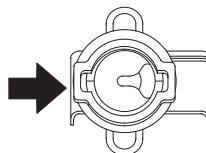


- 7 Draw the column on the injection port side through ClickTek connector.

Draw the column as shown below.



- 8 Slide the hardware on the side until it clicks to lock it.

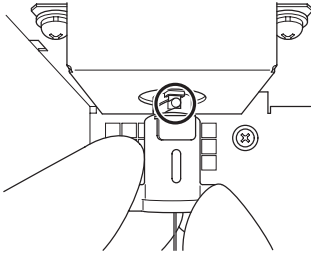


9 Insert the column into the injection inlet.

NOTE

Check that there is no dust, etc. on ClickTek ferrule. When there is dust, wipe it softly with a clean cloth moistened with organic solvent (acetone, hexane, etc.).

Insert the projection of the adapter into the slit of ClickTek connector.



Hint

- The length of the inserted column varies depending on the version of ClickTek.

▶▶ Reference:

For details, see the hint in step 3.

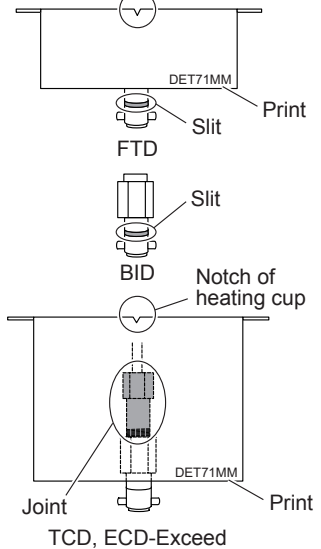
- The shapes of TCD, BID, FTD, and ECD-Exceed vary depending on the version of ClickTek.

For the Ver.2, the following features are found.

- The heating cup has a notch and the print of "DET71MM" (TCD, FTD, and ECD-Exceed)
- The adapter has a slit (BID, FTD)
- The adapter has a joint (TCD, ECD-Exceed)

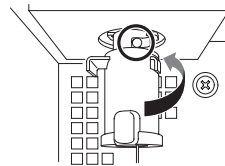
Hint

Notch of heating cup



- The injection port, FID, and FPD are the same for all versions of ClickTek.

10 Turn ClickTek connector clockwise to tighten it until you feel a click.



11 Also on the detector side, fix the column in the same way as step 7 to 10.

12 Close the column oven door.

13 Start the GC.

Inspection and Replacement of Capillary Column

■ Installation of ClickTek Adapter

▶▶ Reference:

For the way to differentiate between Ver.1 and Ver.2 of ClickTek, see the hint in step 9 of "6.7.2 ClickTek Ferrule (Option)" P. 76.

To use ClickTek connector for the column connection, install ClickTek adapter.

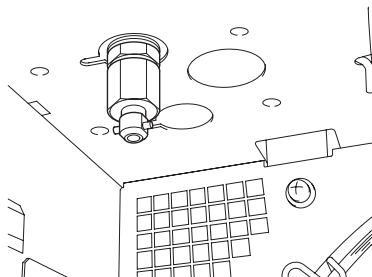
Required devices

Parts name	Qty
10 × 12 spanner	1
Screwdriver	1
ClickTek adapter	1
AU Gasket	1
Heating Cup For ClickTek	1

- 1 Place Au packing on ClickTek adapter on the injection port side.

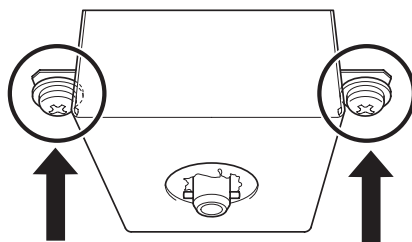


- 2 Install ClickTek adapter on the injection port side.



- 3 Fix ClickTek adapter with 10 x 12 spanner.

- 4 Install heating cup for ClickTek and fix it with 2 screws.



- 5 Install it on the detector side in the same way.

NOTE

The Au packing is not required on the detector side.

6.8 Maintenance of Micro Syringe

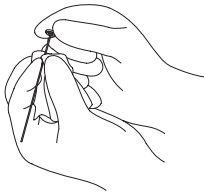
Required devices

Parts name	Qty
Organic solvent (acetone, hexane, etc.)	1
Soft cloth	1
Stylet wire	1

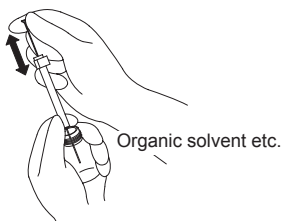
- Aspirate and eject organic solvent etc. with the syringe to clean the inside.
- Ensure that the plunger moves smoothly.

Hint

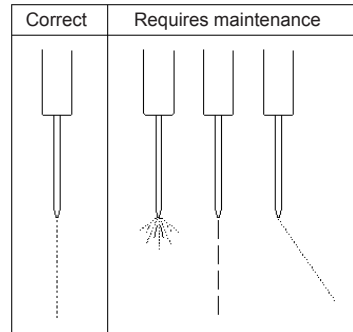
When syringe plunger does not move smoothly, it is effective to pull out the plunger from the barrel and wipe it with a soft cloth moistened with organic solvent etc.



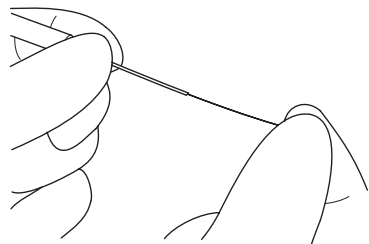
- Repeat pumping using organic solvent etc.
When syringe plunger does not move smoothly after a few times of pumping, clean it again.



- Inspect the condition of sample ejection from the needle tip. If the sample is ejected straight, there is no problem. When the needle tip is clogged, the sample may be ejected in the form of a mist or ejected diagonally or horizontally.



- When the needle tip is clogged, perform maintenance of the needle tip. Remove clogging in the needle tip using stylet wire, etc.



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Maintenance

6.9 Inspection and Replacement of FID

6.9.1 FID Igniter, Igniter Filament

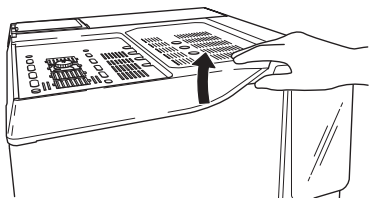
Required devices

Parts name	Qty
FID igniter assy	1
Phillips screwdriver	1

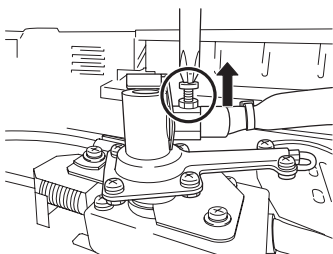
- 1 Ensure that the main power of the instrument is turned off (power button does not illuminate).

▶▶ Reference:
"6.1 Precautions on Maintenance"
P. 60

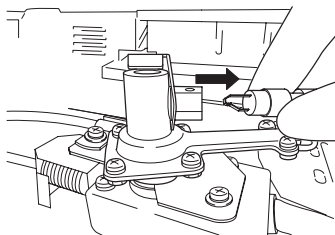
- 2 Open INJ/DET cover.



- 3 Loosen igniter fixing screw with a Phillips screwdriver.

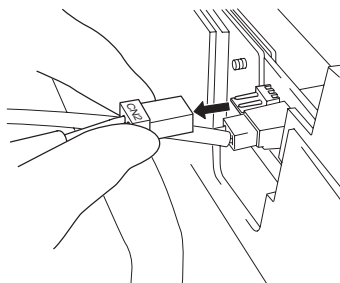


- 4 Pull out the igniter.



Check that the filament is not broken or has no corrosion. If there is a broken wire or corrosion, the igniter should be replaced.

- 5 Remove connector (CN2) of the FID amplifier (black cable).



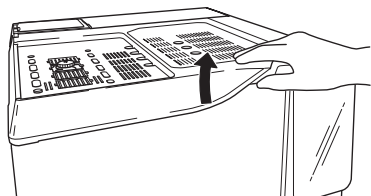
- 6 Install a new igniter.
- 7 After installation of the igniter, install the connector (CN2) on the FID amplifier side.
- 8 Fix the igniter by installing screws.
- 9 Close INJ/DET cover.

6.9.2 FID Collector, FID Jet

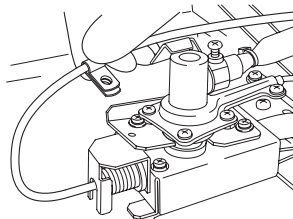
Required devices

Parts name	Qty
Tweezers	1
Hexnut screwdriver	1
FID collector assy	1
High voltage electrode	1
FID jet assy	1
Phillips screwdriver	1
Spanner	1
Stylet wire (0.1 mm×150 mm)	1

- 1 Ensure that the main power of the instrument is turned off (power button does not illuminate).
▶▶ Reference:
"6.1 Precautions on Maintenance"
P. 60
- 2 Remove the column installed on FID.
▶▶ Reference:
"6.7 Inspection and Replacement of Capillary Column" P. 72
- 3 Open INJ/DET cover.



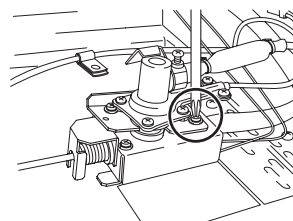
- 4 Remove the screw fixing the clamp for high voltage cable, and remove the clamp.



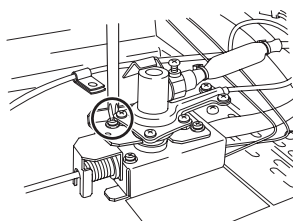
- 5 Loosen the screw on the near side of the collector holding hardware.



You do not need to remove the screws.



- 6 Remove the screw on the far side of the collector holding hardware.



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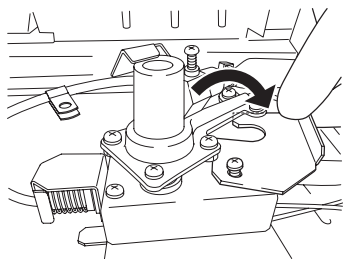
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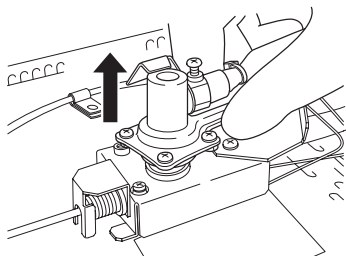
8

Maintenance

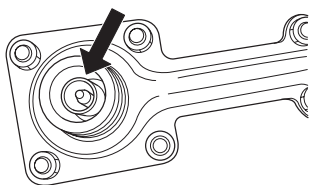
- 7** Slide the collector holding hardware clockwise.



- 8** Raise the collector to remove it.

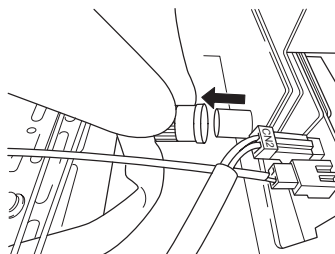


- 9** Turn the collector upside down and inspect the inside.

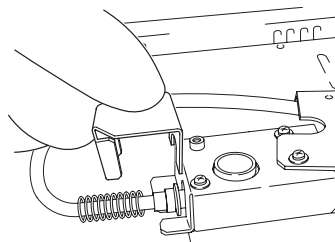


If the inside of the collector is contaminated, clean it. For cleaning, use a cotton swab or a soft brush moistened with organic solvent (acetone, hexane, etc.). Damage on the inside of the collector may cause noise. When there is terrible dirt or rust, replace the collector. Then, proceed to inspection and replacement of the jet.

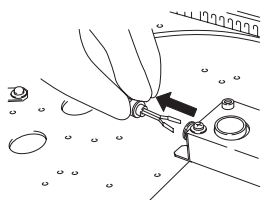
- 10** Remove the connector of the signal code.



- 11** Raise the sheet metal fixing the high voltage electrode to remove it.



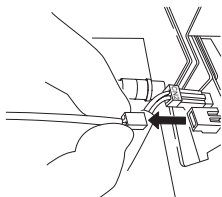
12 Pull out the high voltage electrode.



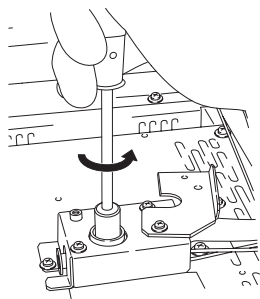
If the high voltage electrode is contaminated, clean it. For cleaning, use a cotton swab or a soft brush moistened with organic solvent (acetone, hexane, etc.). When there is terrible dirt or rust, replace the high voltage electrode.

NOTE

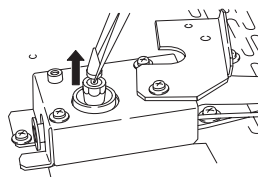
To replace the high voltage electrode, remove the connector (on the front of the instrument) of the high voltage cable (white).



13 Loosen FID jet with a hexnut screwdriver.



14 Remove FID jet with a tweezer.



CAUTION

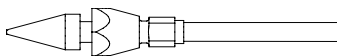


Prohibitions

Avoid applying an impact to the jet.

This may damage the quartz part.

15 Inspect the jet on the tip of FID jet.



- If the jet is contaminated, clean it. For cleaning, use a cotton swab or a soft brush moistened with organic solvent (acetone, hexane, etc.).
- When the jet is clogged, remove clogging in the jet tip using stylet wire.
- When it is terribly contaminated by the sample or the clogging cannot be removed, replace the jet.

Hint

In the following cases, use a jet with an inner diameter of 0.8 mm.

- When analyzing aqueous sample
- When a standard jet (0.3 mm) becomes clogged during analysis of high-boiling components

16 Install FID jet.

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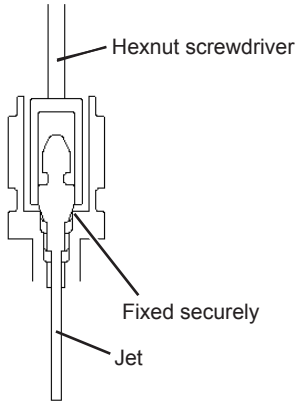
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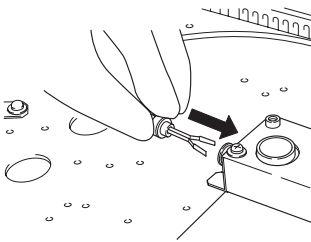
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Maintenance

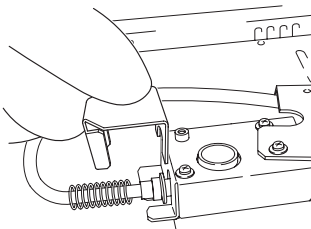
- 17** Tighten it until it is fixed securely with a hexnut screwdriver.



- 18** Install the high voltage electrode.



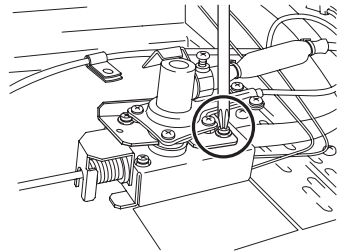
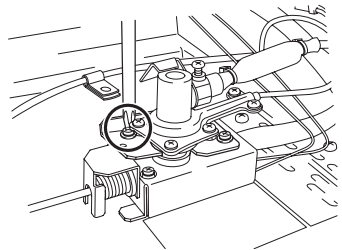
- 19** Install the sheet metal fixing the high voltage electrode.
Hook the sheet metal on the end of the spring, and push it for installation.



- 20** Install the connector of the signal code.

- 21** Install the collector.

- 22** Return the collector holding hardware to the original position and install 2 screws.



- 23** Install the clamp for high voltage cable, and fix the high voltage cable.

- 24** Close INJ/DET cover.

6.10 Consumables

For consumables, see the standard accessory list of the instrument.

▶▶ **Reference:** "2 Standard Accessories" P. 40

Shimadzu provides various parts other than the standard accessories.

The parts required for analysis are listed in "Gas Chromatograph Accessories and Supplies" or "Maintenance Help".

You can download "Gas Chromatograph Accessories and Supplies" the latest version at the following site.

https://www.shimadzu.com/an/gc/column_consumable/index.html

Contact Shimadzu representative to purchase consumables or maintenance parts.

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Maintenance

7 Troubleshooting

When the result of analysis is not good, check first the following points.

- Whether the glass insert and the silica wool are not contaminated
- Whether the O-ring of the glass insert does not degrade
- Whether the septum has no leak
- Whether the length of the inserted column is correct
- Whether the graphite ferrule is fixed
- Whether the connections of gas lines have no leak
- Whether the supplied gas pressure is proper

▶▶ **Reference:** "6.3 Recommended Inspection Cycle" P. 62

▶▶ **Reference:** Maintenance Help

This chapter describes possible problems when using SPL/FID and their causes and solutions.

If the problem is not solved by the recommended solutions, or if problems other than those shown in GC-2030 Instruction Manual, "5 Troubleshooting" occur, contact your Shimadzu sales/service representative.

▶▶ **Reference:** GC-2030 Instruction Manual, "5 Troubleshooting"

7.1 Presence of Ghost Peaks

Cause	Solution
Components which did not elute during previous analysis is detected.	Increase column oven temperature and column flow to eliminate sample remaining inside column.
Micro syringe is dirty.	Clean or replace micro syringe. ▶▶ Reference: "6.8 Maintenance of Micro Syringe" P. 81
Septum, glass insert, or column is contaminated.	Replace septum or glass insert. When the column is contaminated, perform maintenance such as aging or replace it. ▶▶ Reference: "6.4 Inspection and Replacement of Septum" P. 64 ▶▶ Reference: Maintenance Help

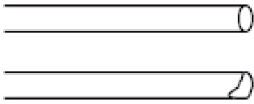
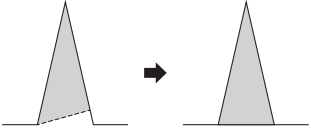
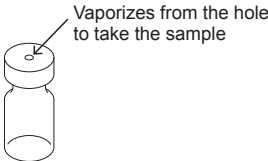
7.2 Abnormal Peak Shape

Cause	Solution
Tailing.	Parts such as septum, glass insert, and column may be contaminated. Clean the parts or replace it.
Column is overloaded.	Perform the following procedure. <ul style="list-style-type: none"> • Decrease injection volume. • Dilute sample. • Increase split ratio. (For split analysis) • Use a column with a greater film thickness.
Temperature of the injection port or the column is low.	Increase temperature of the injection port and the column.
Several peaks are not separated and appear as one peak.	Change conditions or change the column to improve separation.

7.3 Poor Repeatability

Cause	Solution
Carrier gas leaks from septum.	Replace it with a new septum. ▶▶ Reference: "6.3 Recommended Inspection Cycle" P. 62 ▶▶ Reference: "6.4 Inspection and Replacement of Septum" P. 64
Carrier gas leaks from the degraded graphite ferrule. Graphite ferrule cannot be deformed with the increased use, and the sealing performance decreases.	Replace it with a new graphite ferrule. ▶▶ Reference: "6.3 Recommended Inspection Cycle" P. 62 ▶▶ Reference: "6.7 Inspection and Replacement of Capillary Column" P. 72
Syringe has a leak or clogging and the amount of injection (aspiration) is not constant.	Clean or replace syringe.
When using AOC, syringe is not installed correctly.	Check the installation of the plunger. ▶▶ Reference: AOC Instruction Manual

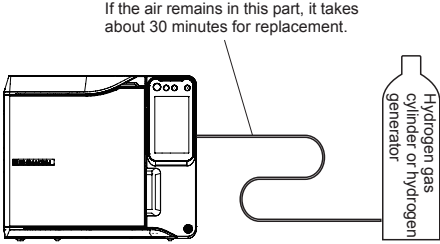
Cause	Solution
<p>Glass insert or silica wool is contaminated.</p>	<p>Replace glass insert or silica wool. ►► Reference: "6.5 Inspection and Replacement of Glass Insert and O-ring" P. 66</p>
<p>Silica wool inside glass insert is packed incorrectly. In split analysis, silica wool must be packed to achieve good repeatability.</p>	<p>Pack silica wool at proper position. Adequate amount of silica wool should be packed to avoid clearance.</p> <div data-bbox="543 459 952 678" data-label="Diagram"> </div> <div data-bbox="492 699 1022 922" data-label="Hint"> <p>Hint</p> <p>Inactivated glass insert and silica wool are effective when analyzing decomposable or adsorbable sample. There are many kinds of inactivation methods. Their effects depend on the target component.</p> </div> <p>►► Reference: Maintenance Help</p>
<p>Carrier gas leaks from the split filter.</p>	<p>Ensure that the split filter is installed correctly. ►► Reference: "6.6 Inspection and Replacement of Split Filter" P. 70</p>
<p>Position of graphite ferule is wrong.</p>	<p>Install graphite ferrule at the correct position. ►► Reference: "6.7 Inspection and Replacement of Capillary Column" P. 72</p>

Cause	Solution
<p>The shape of the column end is not proper, and sample injection is not smooth.</p>	<p>Cut the end of the column flatly with a dedicated capillary cutter.</p> <div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 20px;"> <p>OK</p> <p>NG</p> </div> </div>
<p>Syringe plunger does not move smoothly.</p>	<p>Clean or replace syringe. ▶▶ Reference: "6.4 Inspection and Replacement of Septum" P. 64 ▶▶ Reference: Maintenance Help</p>
<p>Wave shape processing is not optimal.</p>	<p>Change parameters for wave shape processing to optimize wave shape processing.</p> <div style="text-align: center;">  </div> <p>▶▶ Reference: LabSolutions Instruction Manual</p>
<p>Sample solvent or target component is highly volatile.</p>	<p>When analyzing volatile sample with AOC, repeatability may be poor. If you take several samples from one vial. To check repeatability of analysis for volatile sample, take a sample from a vial only once and use several vials. It may provide good repeatability.</p> <div style="text-align: center;">  </div>

7.4 Noise Is High

Cause	Solution
<p>Gases include large amounts of organic components.</p>	<p>Perform the following procedure.</p> <ul style="list-style-type: none"> • Check purity of each gas and the pressure regulator. • Connect molecular sieve filter (Super-Clean gas filter) in gas lines. • Perform maintenance for molecular sieve filter. • Change pressure regulator or tubing. <p>To change pressure regulator or tubing, contact your Shimadzu sales/service representative.</p>
<p>Compressed air is contaminated. When the baseline moves up and down having a period of 15 to 30 minutes, it may synchronizes with the compressor operation.</p>	<p>Perform the following procedure.</p> <ul style="list-style-type: none"> • Install a silica gel trap on both ends of the pressure regulator. • Use air from a gas cylinder instead. • Use AGE-1000.
<p>Septum, glass insert, or column is contaminated.</p>	<p>Replace septum or glass insert. When the column is contaminated, perform maintenance such as aging or replace it.</p> <p>▶▶ Reference: "6.4 Inspection and Replacement of Septum" P. 64</p> <p>▶▶ Reference: Maintenance Help</p>
<p>The FID collector or the FID jet is contaminated.</p>	<p>Perform maintenance for the collector and the jet or replace them.</p> <p>▶▶ Reference: "6.9.2 FID Collector, FID Jet" P. 83</p>
<p>FID jet is damaged.</p>	<p>Replace the jet.</p> <p>▶▶ Reference: "6.9.2 FID Collector, FID Jet" P. 83</p>
<p>Position of graphite ferule is wrong.</p>	<p>Install graphite ferrule at the correct position.</p> <p>▶▶ Reference: "6.7 Inspection and Replacement of Capillary Column" P. 72</p>
<p>Liquid phase of the column volatilizes.</p>	<p>If using the column at temperatures near the maximum temperature, noise may increase due to volatilization of liquid phase. When noise affects the result of analysis, change the column type.</p>

7.5 Cannot Ignite FID

Cause	Solution
<p>There is a leak at the connection of the column on the detector side.</p>	<p>Check the column connections. Replace the ferrule as needed. ▶▶ Reference: "6.7 Inspection and Replacement of Capillary Column" P. 72</p>
<p>Jet is clogged.</p>	<p>Perform maintenance for the jet or replace it. ▶▶ Reference: "6.9.2 FID Collector, FID Jet" P. 83</p>
<p>Igniter filament is broken.</p>	<p>Replace the igniter. ▶▶ Reference: "6.9.1 FID Igniter, Igniter Filament" P. 82</p>
<p>Hydrogen, air, or detector gas is not supplied or their flow are not correct.</p>	<p>Supply them and set the flows at proper values.</p>
<p>Detector temperature is low.</p>	<p>Set the detector temperature at a higher temperature than 150 °C.</p>
<p>The air in the tubing is not adequately replaced with hydrogen gas.</p>	<p>Repeat ignition sequence several times to replace the air completely.</p> <p>If the air remains in this part, it takes about 30 minutes for replacement.</p>  <p>The diagram shows a side view of the detector on the left and a hydrogen gas cylinder on the right. A tube connects them. A callout line points to a specific section of the tube, indicating that if air remains there, it will take about 30 minutes to be replaced.</p>
<p>Position of graphite ferrule is wrong.</p>	<p>Install graphite ferrule at the correct position. ▶▶ Reference: "6.7 Inspection and Replacement of Capillary Column" P. 72</p>

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Trouble Shooting

8 Specifications

■ The main body of the GC

Dimensions	515 mm (W) × 440 mm (H) × 540 mm (D) (excluding projections) ^{*1 *2}
Mass	about 43.5 kg ^{*1}
Power requirements	AC100 V : 1800 VA ^{*1} , 50/60 Hz AC115 V : 1800 VA ^{*1} , 50/60 Hz AC230 V : 2600 VA ^{*1} , 50/60 Hz

*1 For SPL/FID model

*2 For the SINJ/PTCD model, the height is 500 mm.

■ Column oven

Range of temperature	Room temperature +2 °C to 450 °C	
	When using liquid CO ₂ ^{*1}	-50 °C to 450 °C
	When using liquid N ₂ ^{*1}	-99 °C to 450 °C
Dimensions	280 mm (W) × 280 mm (H) × 175 mm (D)	
Volume	13.7 L	
Accuracy of temperature	Set value ±1% (K) (Calibrated at 0.01 °C)	
Deviation of temperature	within 2 °C (on a circle which has a diameter of 200 mm, and is centered at 30 mm from the rear)	
Temperature dependence	0.01 °C/°C	
Program ramps	32 ramps possible (cooling available)	
Program rate	-250 °C to 250 °C/min ^{*2}	
Total time of total program	9999.99 minutes max	
Cooling rate	Within 3.4 minutes cooling from 450 °C to 50 °C (Ambient temperature : 22 °C)	
Oven Light	Available	
Hydrogen Sensor	Available (option)	

*1 Optional parts are required to use liquid CO₂ or liquid N₂.

*2 For controllable ranges of temperature program rates of column oven, refer to "Controllable ranges of temperature program rates" of "7.6.1 [Column Oven] Screen" in GC-2030 Instruction Manual.

■ Injection unit

Maximum installation	Up to 3
Type	5 types (SPL unit, WBI unit, OCl unit, PTV unit, SINJ unit)
Range of temperature	450 °C max

■ Carrier gas flow controller

Maximum installation	Up to 3
----------------------	---------

■ Advanced Flow Controller (AFC)

Injection Mode	Split/Splitless mode, direct (full) mode
Range of pressure	0 to 1035 kPa ("psi" or "bar" can also be used.)
Program ramps	7 ramps possible (step-down program available)
Program rate	-400 to 400 kPa/min
Range of split ratio	0 to 9999.9
Range of total flow	He, H ₂ : 0 to 1300 mL/min N ₂ : 0 to 600 mL/min <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>▼ NOTE The setting range of the flow is specified considering controllable range.</p> </div>
Flow Control Mode	Constant Velocity Mode, Constant Pressure Mode, Constant Flow Mode
Function to keep the average of the column linear velocity during heating	Available
Settable pressure unit	0.001 psi, 0.001 bar, 0.1 kPa

■ Detector

Hydrogen flame ionization detector (FID)

Range of temperature	450 °C max
Minimum detection	1.2 pgC/s (dodecane): Capillary analysis 2.5 pgC/s (dodecane): Packed analysis
Dynamic range	10^7

Thermal conductivity detector (TCD)

Range of temperature	400 °C max
Sensitivity	20000 mV × mL/mg (decane)
Dynamic range	10^5

Thermal conductivity detector (PTCD)

Range of temperature	350 °C max
Sensitivity	40000 mV × mL/mg (decane)
Dynamic range	10^5

Electron capture detector (ECD)

Range of temperature	400 °C max
Minimum detection	4 fg/s (γ -BHC)
Dynamic range	10^5

Flame photometric detector (FPD)

Range of temperature	450 °C max
Minimum detection	P : 0.045 pgP/s (45 fgP/s) (tributyl phosphate) S : 2 pgS/s (dodecanethiol)
Dynamic range	P : 10^4 , S : 10^3

Flame thermionic detector/Nitrogen phosphorous detector (FTD/NPD)

Range of temperature	450 °C max
Minimum detection	N : 0.1 pgN/s (azobenzene), P : 0.01 pgP/s (malathion)
Dynamic range	N, P : 10^3

Barrier discharge ionization detector (BID)

Range of temperature	350 °C max
Minimum detection	0.8 pgC/s (dodecane)
Dynamic range	10^5

Sulfur chemiluminescence detector (SCD)

Range of temperature	Interface part : 300 °C max Furnace: 900 °C max
Minimum detection	0.3 pgS/s
Dynamic range	10 ⁴
Dimensions	410 mm (W) × 405 mm (H) × 360 mm (D) (excluding projections)
Mass	27 kg
Power requirements	100 V AC to 120 V AC: 500 VA, 50 Hz/60 Hz 220 V AC to 240 V AC: 500 VA, 50 Hz/60 Hz

■ Other

Repeatability	Peak area	0.5 % ^{*1}
	Retention time	< 0.008 % or < 0.0008 min
Energy conservation	Power consumption during standby mode is reduced by 60 %.	
Language	English, Chinese	
Data communication	Ethernet and USB	
Display	<ul style="list-style-type: none">• Pixels: width 480 × height 800^{*2}• Method: pressure sensitive• Color depth: 24-bit color touch panel	
Cooling rate of column oven temperature	Three steps (Fast, Mid, Slow), or Custom setting	

*1 Auto Injector AOC-30i, FID as the detector.

Tetradecane (2.5 ng to the column) split injection.

Results may vary depending on the sample and the analytical conditions.

*2 The percentage of the effective pixels of the LCD panel is 99.99 % or more.

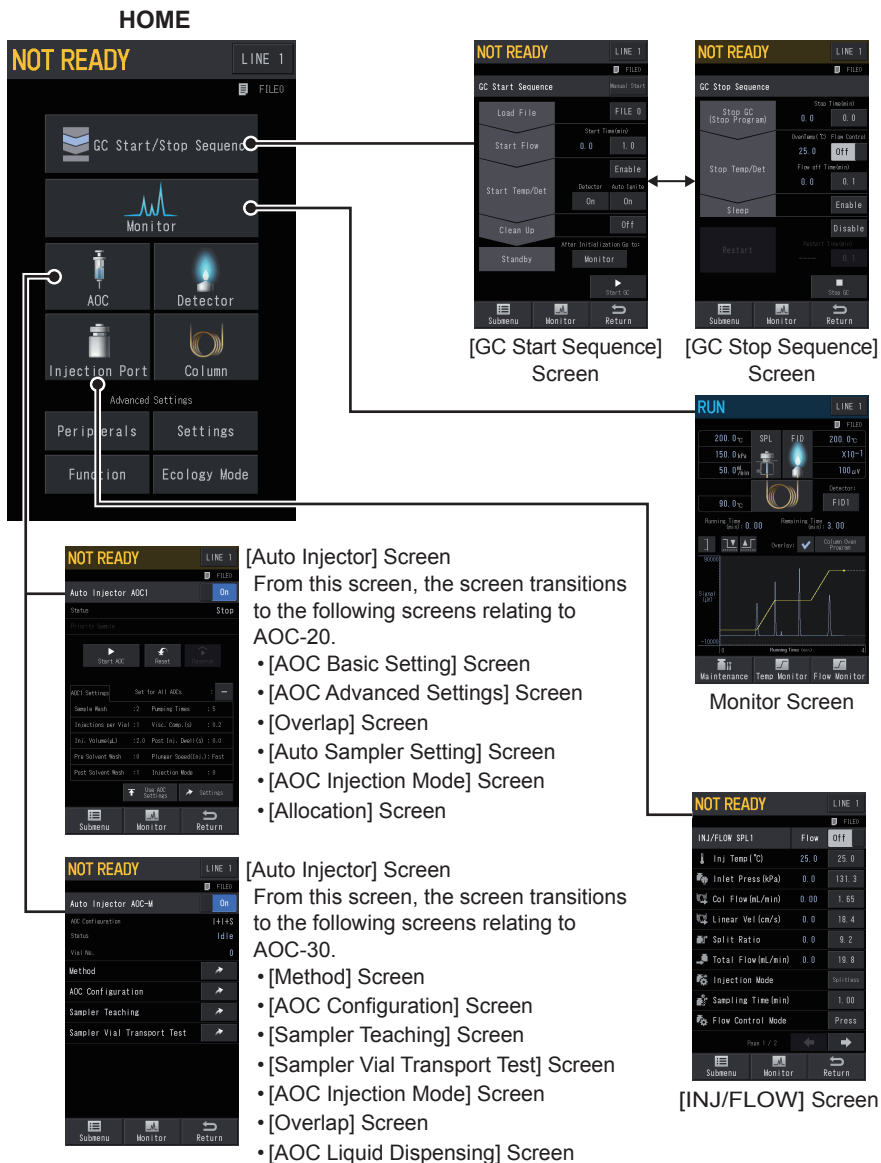
Please note that 0.01 % or less of the pixels may be missing or constantly lit.

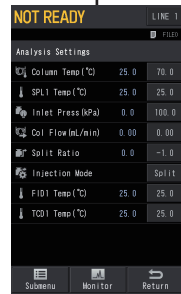
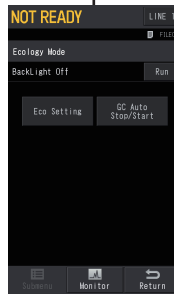
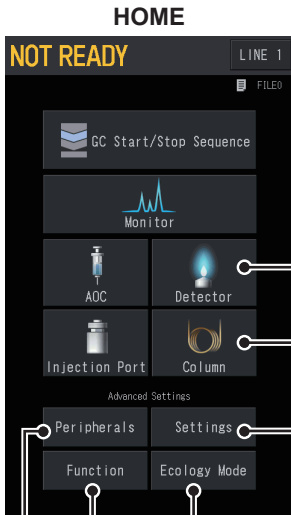
Appendix 1

Display Transition Diagram

Major transition diagrams are shown.

For details about setting items of the touch panel, refer to the GC-2030 Instruction Manual.





[Peripherals] Screen

[Function] Screen

[Ecology Mode] Screen

[Analysis Settings] Screen

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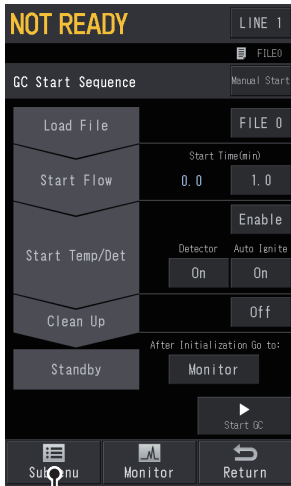
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Appendix 1

[GC Start Sequence] Screen



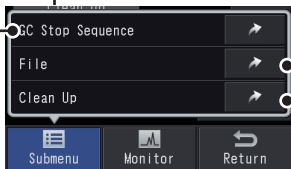
[File Select] Screen



[Clean Up] Screen

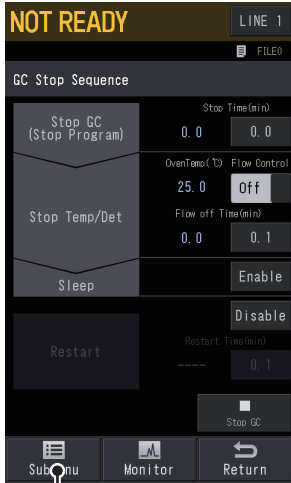
From this screen, the screen transitions to the following screens relating to clean up.

- [Clean Up Temperature Program] Screen
- [Clean Up Pressure Program] Screen
- [Clean Up Column Flow Program] Screen



Displays
 • [GC Stop Sequence] screen on the next page.

[GC Stop Sequence] Screen



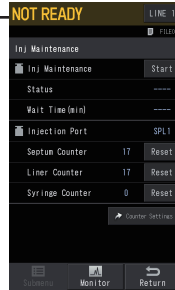
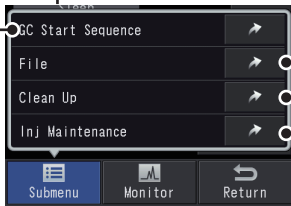
[File Select] Screen



[Clean Up] Screen

From this screen, the screen transitions to the following screens relating to clean up.

- [Clean Up Temperature Program] Screen
- [Clean Up Pressure Program] Screen
- [Clean Up Column Flow Program] Screen



[Inj Maintenance] Screen

Displays

- [GC Start Sequence] screen on the previous page.

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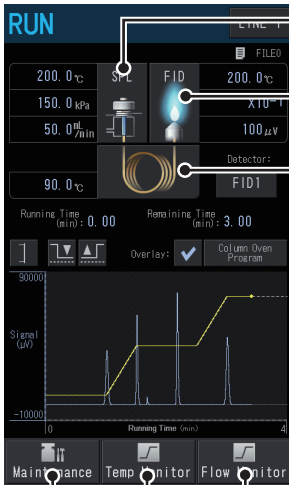
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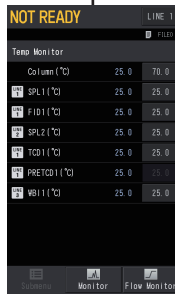
8

Appendix 1

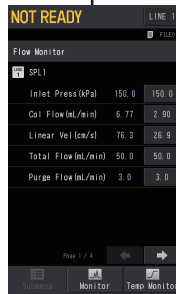
Monitor Screen



[In] Maintenance Screen



[Temp Monitor] Screen



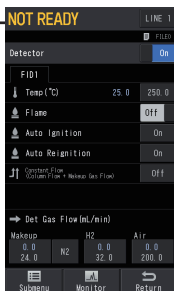
[Flow Monitor] Screen



[INJ/FLOW] Screen

From this screen, the screen transitions to the following screens relating to injection port.

- [Column Inlet Press Program] Screen
- [Linear Vel. Program] Screen
- [Column Flow Program] Screen
- [Inj Temp Program] Screen
- [Back Flush Setting] Screen
- [Column Information] Screen
- [Carrier Gas Saver] Screen
- [Split Ratio Program] Screen
- [Purge Flow Program] Screen
- [High Pressure Injection] Screen
- [Splitter Hold Setting] Screen



[Detector] Screen

From this screen, the screen transitions to the following screens relating to detector.

- [Signal Settings] Screen
- [DET Makeup Program] Screen
- [DET H2 Program] Screen
- [DET Air Program] Screen
- [DET ECD Gas Program] Screen
- [DET DCG Program] Screen
- [Detector Gas Control] Screen
- [Helium Purifier] Screen
- [SCD System Control] Screen
- [SCD Conditioning Mode] Screen
- [SCD Leak Check] Screen
- [SCD Vacuum Log] Screen
- [SCD Parts Counter] Screen



[Column Oven] Screen

From this screen, the screen transitions to the following screen relating to column.

- [Column Information] Screen
- [Column Oven Temp Control Settings] Screen

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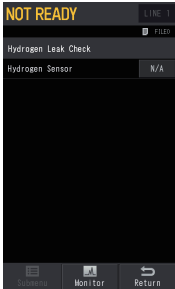
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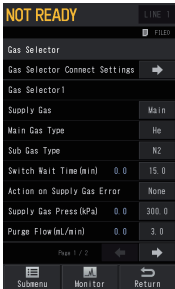
[CRG] Screen



[Hydrogen Leak Check] Screen



[Relay Control] Screen

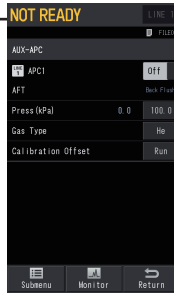
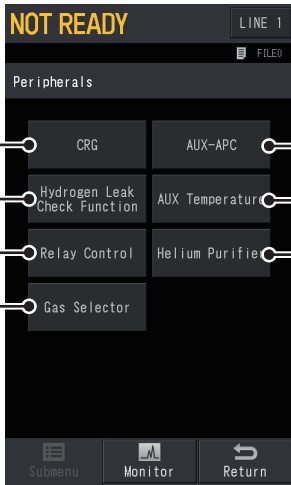


[Gas Selector] Screen

From this screen, the screen transitions to the following screens relating to optional Gas Selector.

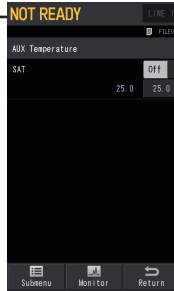
- [Gas Switching Settings] Screen
- [Gas Selector Connect Settings] Screen

[Peripherals] Screen

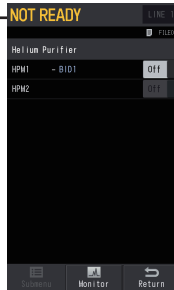


[AUX-APC] Screen
 From this screen, the screen transitions to the following screens relating to optional AUX-APC.

- [Back Flush Setting] Screen
- [AUX-APC Pressure Program] Screen



[AUX Temperature] Screen



[Helium Purifier] Screen

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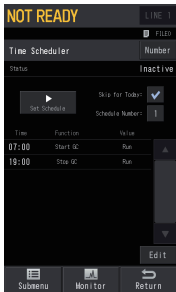
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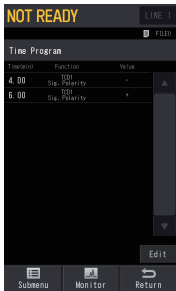
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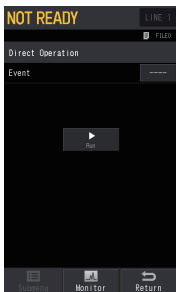
[Function] Screen



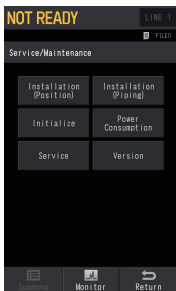
[Time Scheduler] Screen
From this screen, the screen transitions to the following screen relating to split ratio.
• [Event Split Ratio Setting] Screen



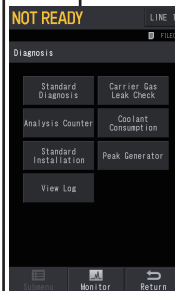
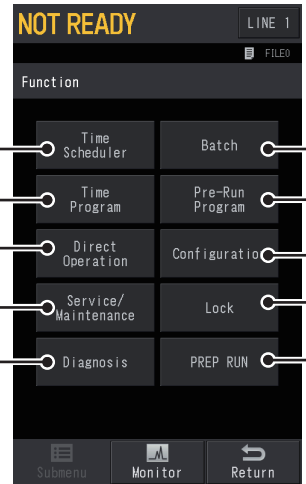
[Time Program] Screen
From this screen, the screen transitions to the following screen relating to split ratio.
• [Event Split Ratio Setting] Screen



[Direct Operation] Screen



[Service/Maintenance] Screen
From this screen, the screen transitions to the following screens relating to check of unit conditions and maintenance.
• [Installation (Position)] Screen
• [Installation (Piping)] Screen
• [Initialize] Screen
• [Power Consumption] Screen
• [ROM Version] Screen



[Diagnosis] Screen
From this screen, the screen transitions to the following screens relating to check of instrument conditions.
• [Standard Diagnosis] Screen
• [Diagnosis Setting] Screen
• [Diagnosis Report] Screen
• [Diagnosis Report (Details)] Screen
• [Carrier Gas Leak Check] Screen
• [Analysis Counter] Screen
• [Coolant Consumption] Screen
• [Standard Installation Test] Screen
• [Peak Generator] Screen
• [Log Reading Menu] Screen

NOTE

[Service] screen is used by Shimadzu service personnel.

Display Transition Diagram

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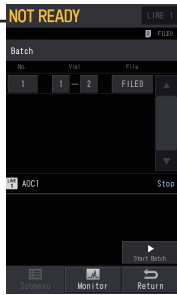
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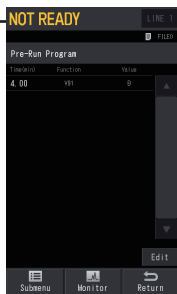
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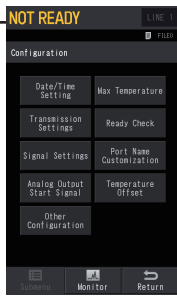


[Batch] Screen



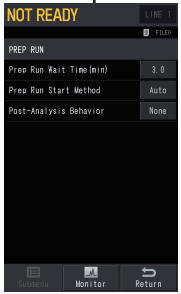
[Pre-Run Program] Screen
From this screen, the screen transitions to the following screen relating to split ratio.

- [Event Split Ratio Setting] Screen

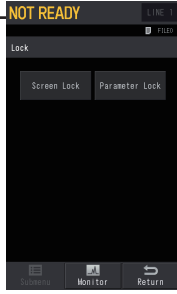


[Configuration] Screen
From this screen, the screen transitions to the following screens relating to instrument usage.

- [Date/Time Setting] Screen
- [Max Temperature] Screen
- [Transmission Settings] Screen
- [Ready Check] Screen
- [Drift] Screen
- [Signal Settings] Screen
- [Port Name Customization] Screen
- [Analog Output Start Signal] Screen
- [Temperature Offset] Screen
- [Other Configurations] Screen



[PREP RUN] Screen



[Lock] Screen
From this screen, the screen transitions to the following screens relating to lock.

- [Screen Lock] Screen
- [Parameter Lock] Screen

[Analysis Settings] Screen

NOT READY LINE 1

FILED

Analysis Settings

Column Temp (°C)	25.0	100.0
SPL1 Temp (°C)	25.0	25.0
Inlet Press (kPa)	0.0	189.0
CoI Flow (mL/min)	0.00	4.62
Split Ratio	0.0	30.0
Injection Mode	Split	
FID1 Temp (°C)	25.0	25.0
TCD1 Temp (°C)	25.0	25.0

Submenu Monitor Return

Display Customization →

Line Configuration →

Submenu Monitor Return

NOT READY LINE 1

FILED

Line Configuration

Injection Port	LINE 1	LINE 2	LINE 3
SPL1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
WS11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Detector	LINE 1	LINE 2	LINE 3
FID1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TCD1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ADC	LINE 1	LINE 2	LINE 3
ADC-M	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ADC-S	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SP1	LINE 1	LINE 2	LINE 3
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Submenu Monitor Return

[Line Configuration] Screen

NOT READY LINE 1

FILED

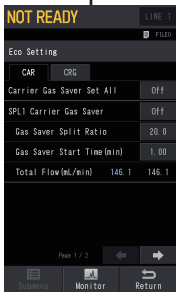
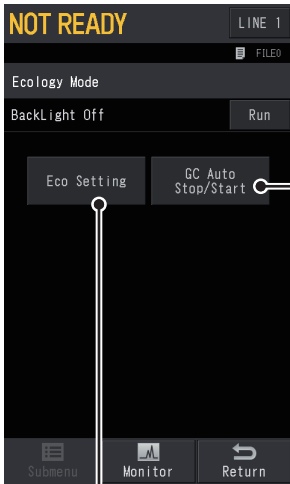
Display Customization

Inlet Press (kPa)	<input checked="" type="checkbox"/>
CoI Flow (mL/min)	<input checked="" type="checkbox"/>
Linear Vel (cm/s)	-
Total Flow (mL/min)	-
Split Ratio	<input checked="" type="checkbox"/>
Purge Flow (mL/min)	-
Sampling Time (min)	<input checked="" type="checkbox"/>
Split Mode	<input checked="" type="checkbox"/>
Control Mode	-

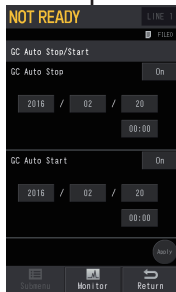
Submenu Monitor Return

[Display Customization] Screen

[Ecology Mode] Screen



[Eco Setting] Screen



[GC Auto Stop/Start] Screen

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Appendix 2

Terms and Definitions

This chapter describes terms and abbreviations used for Shimadzu GC products.

Terms	Description
AFC	An abbreviation of "Advanced Flow Controller". Controls carrier gas.
APC	An abbreviation of "Advanced Pressure Controller". Controls detector gas.
AOC	Auto Injector. Optional device which automatically introduces samples with a syringe into injection port.
INJ	An abbreviation of "Injection Port". Represents the injection port.
DET	An abbreviation of "Detector". Represents the detector.
FID	An abbreviation of "Hydrogen Flame Ionization Detector". It is the most common GC detector which uses ionization by hydrogen flame.
TCD	An abbreviation of "Thermal Conductivity Detector". It detects components using thermal conductivity. After FID, it is the most common detector.
INJ/DET cover	It means top cover of GC-2030.
Time Program	It means various operation programs which start upon sample introduction.
Line	It means unit combinations of "injection port - column - detector" used for analysis. Line configuration helps to correctly save analytical conditions in analysis data.
ClickTek	It means ferrule fixing technology with click feel and maintenance technology for injection port, which are adopted from GC-2030.

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