Control Number: ZAQFMAE-10

INSTRUCTION MANUAL
For
Automatic Quick Furnace
MODEL AQF-100

MITSUBISHI CHEMICAL ANALYTECH

EC DECLARATION OF CONFORMITY

We hereby declare that the following equipment complies with the essential requirements of:

EC Electromagnetic Compatibility Directive: 89/336/EEC
Electrical Equipment Designed for Use within Certain Voltage Limits : 73/23/EEC

Model Name : Automatic Quick Furnace Model AQF-100

Standard to which Conformity is Declared:

EN55011 (1991) Class B

EN50082-1 (1997)

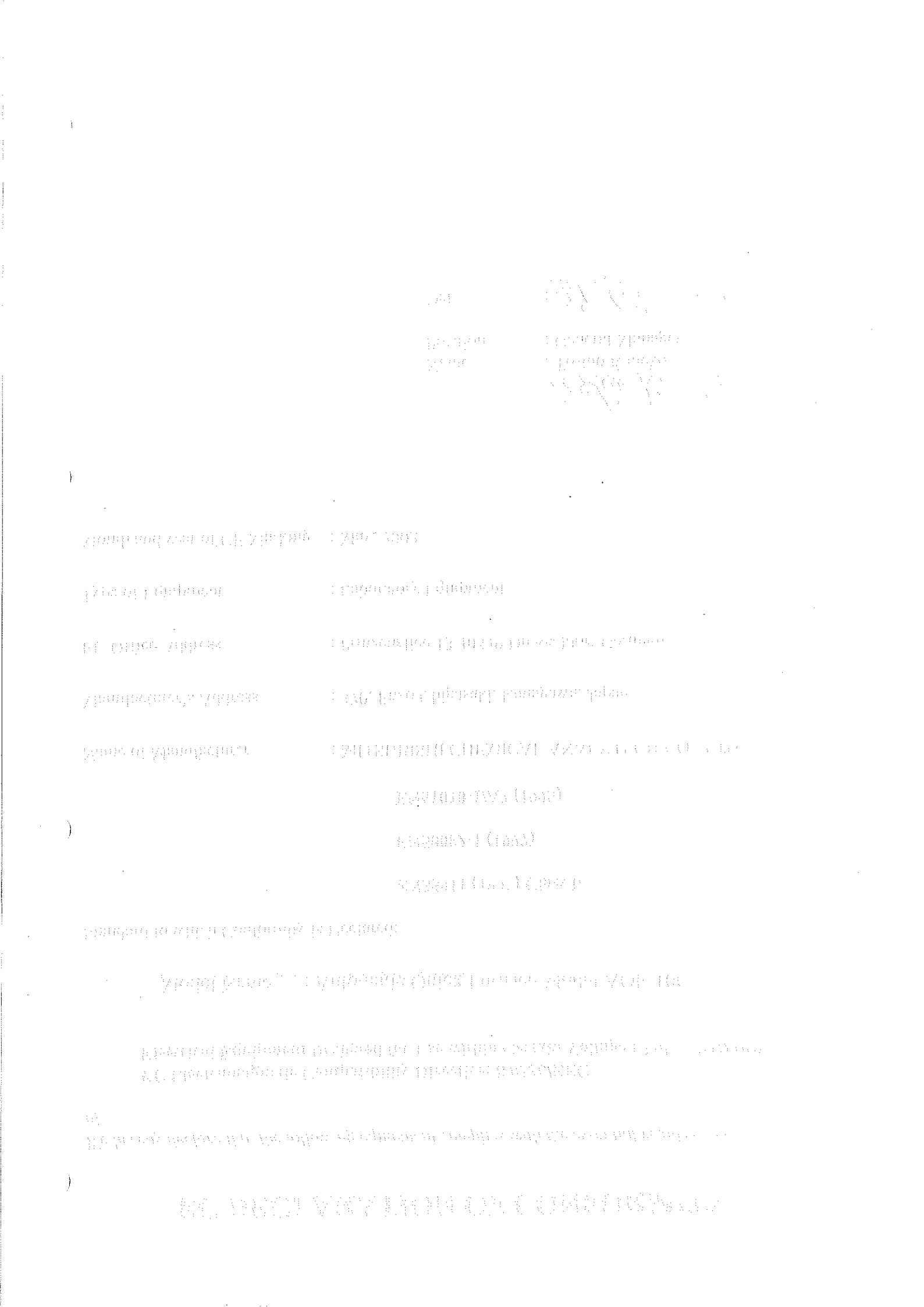
EN61010-1/A2 (1995)

Name of Manufacturer	: MITSUBISHI CHEMICAL ANALYTECH CO., LTD
Manufacturer's Address	: 370, Enzo Chigasaki, Kanagawa, Japan
EU Office Address	: Prinzenallee 13 40549 Duesseldorf Germany
Type of Equipment	: Laboratory Equipment
Month and year of CE Marking	: May, 2002

Toshio Kaneko

Name : Toshio Kaneko
Position : General Manager

Date : 29 Oct. 2008
DD.MMM.YYYY



INTRODUCTION

Thank you for your purchase of our Automatic Quick Furnace Model AQF-100.
This unit has the following features.

- Appropriate for pretreatment of simultaneous analysis of anion such as sulfur and halogen
  By connecting combustion part, automatic absorption part, and a liquid or solid sampler, the pretreatment from combustion to absorption can be run automatically.
  Absorption solvent is automatically injected into an ion chromatography unit and sulfur and halogen can be measured simultaneously.

- Available for pretreatment of dioxin bromide
  Sample is extracted and concentrated with toluene and combusted and absorbed by this unit. It can be measured as total bromine with an ion chromatography unit.

- Whole control by a personal computer
  The personal computer controls combustion part temperature, gas flow, automatic absorption of combustion gas, and a liquid or solid sampler. Therefore operation is easy.
  By combustion and absorption and automatic injection to an ion chromatography unit, measurement can be accurate.

To use Model AQF-100 efficiently and safely, read this manual and understand functions and the operation fully.

NOTICE

(1) Do not reprint this manual wholly or partially without permission.

(2) The contents may be changed without notice.

(3) Though this manual was prepared carefully, contact our local distributors when mistakes, omission, and missing pages are found. But the system program screen in this manual may be different partially every version.

(4) For the influence of used results, we don't take the responsibility regardless of (3).

(5) Decide operators when using this unit.

(6) Follow the contents in this manual. When troubles or damage occur by neglecting the contents in this manual, we do not guarantee the unit even under the guarantee.

IMPORTANT SAFEGUARDS AND PRECAUTIONS

Thank you for purchasing our Automatic Quick Furnace Model AQF-100.
Read this instruction manual with care before the use.
Keep the manual at hand when you are operating the analyzer.
If you operate the analyzer in the way except this manual description, the security can't be assured. If you find questions, errors, and omissions, contact our distributors.

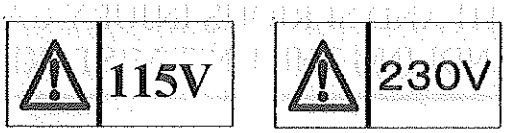
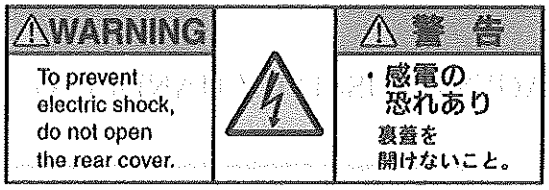
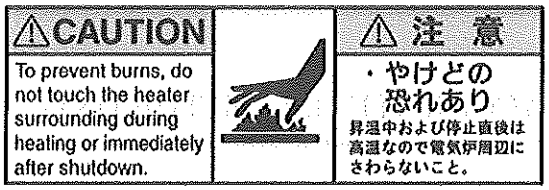
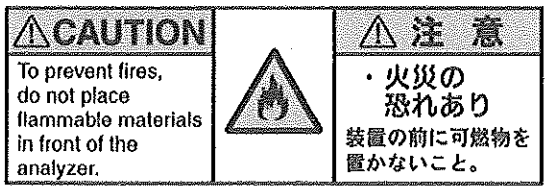
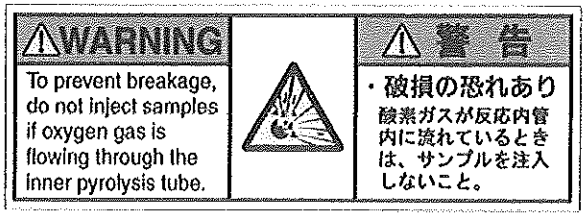
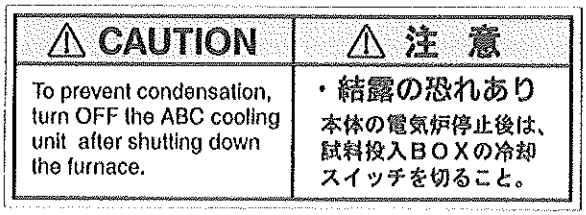
WARNING
"WARNING" SHOWS DANGER OF DEATH AND SERIOUS INJURY CAUSED BY NEGLECTING "WARNING" AND HANDLING THE UNIT MISTAKENLY.

CAUTION
"CAUTION" SHOWS DANGER OF DAMAGES CAUSED BY HANDLING THE UNIT MISTAKENLY.

POINT
IMPORTANT INFORMATION FOR THE ACCURATE USE OF THE UNIT

Labels

The following labels are attached to AQF-100. Follow the instructions in the labels necessarily.

Warning and Caution labels	Attached places
	At the gas connection part of AQF-100 rear
	At power voltage setting box of AQF-100 rear At AC POWER sides of ABC rear and GA-100 rear
	At AQF-100 rear lower side (electric furnace rear side)
	At the right and left sides of AQF-100
	At the bottom of AQF-100 front air inlet
	At ABC safety cover
	At the rear of ABC upper right

At installation

CAUTION
Install the unit at the place where the temperature is 15℃~35℃.
By installing it at immoderate temperature places, a fire is caused and operation is unstable.

CAUTION
Install the unit in the place free from direct sunlight to prevent a fire.

CAUTION
Install the unit in the place free from strong vibration or continuous weak vibration to prevent operation instability.

CAUTION
Install the unit in the place free from strong electromagnetic field to prevent error operation.

CAUTION
Install the unit in the place where humidity is under 80% to prevent a fire and an electric shock.

CAUTION
Install the unit in the place free from corrosive gas not to deteriorate the unit.

CAUTION
Install the unit in the place free from much dust to prevent a fire and an electric shock.

CAUTION
Install the unit in the place where fire is not used to prevent a fire.

CAUTION
Install the unit horizontally.

At the unit use

WARNING

Check gas leak necessarily before using the unit. When organic matter mixes with oxygen or air at high temperature, explosive combustion can occur and glass part such as a pyrolysis tube and a guide tube is damaged.
To prevent explosive combustion, this unit vaporizes slowly a sample in argon gas and mixes it with oxygen or air and combust it. Before the use, check necessarily gas piping looseness, O-ring deterioration, and gas leak by septum removal.

WARNING

Do not expose directly the unit to combustibles and combustible gas.
The unit furnace is high-temperature. Combustible liquid causes a fire and it is very dangerous.

CAUTION

Appoint a person responsible for the operation and operators.

CAUTION

Check gas flow and inject a sample.

CAUTION

Do not touch high temperature part. The electric furnace is heated up to 900℃~1000℃.
Do not open the door and touch it with naked hands.

CAUTION

Do not touch a power plug with wet hands to prevent an electric shock.

CAUTION

Do not remake and break a power cable. Do not load a heavy thing on the cable and heat it.

CAUTION

Do not remove the unit cover except our servicemen. An electric shock and a fire can be caused.

CAUTION

Check that a ground terminal is connected to prevent an electric shock.

CAUTION

When handling chemicals, put on the safety goggles or glasses to protect ears, skin, and eyes. Do not inhale chemicals vapor.

CAUTION

When using ABC, use a safety cover. Without the cover, measurement can't start. When the cover is open, an error message is displayed in a monitor.

Maintenance and inspection

CAUTION

Check the unit every day before the use. If you fail to check it, it doesn't perform properly and a serious accident can be caused.

Table of Contents

Section 1: Names and Functions of AQF-100 System

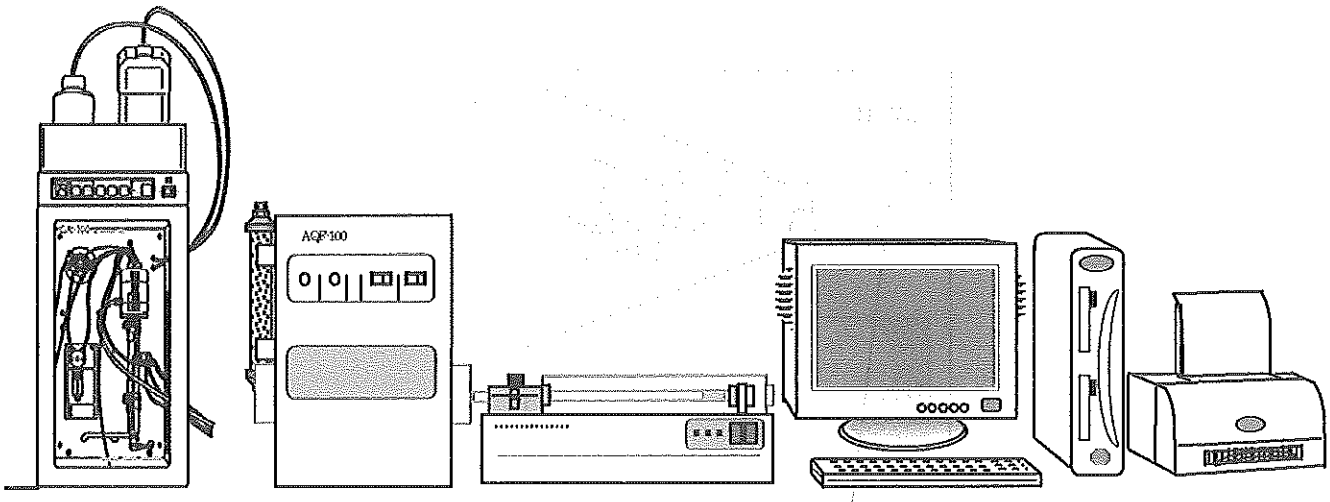
Section 2: Packed Parts Check

Section 3: Installation

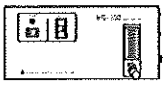
Section 5: Measurement

Section 1: Names and Functions of AQF-100 System

1-1. System Composition



GA-100 **AQF-100** **Automatic boat controller (ABC)** **Personal computer (Supplied by local distributors)** **Printer**



WS-100

Illustration 1-1. AQF-100 system

No.	Unit name	Function
1	AQF-100	Sample heating and decomposition, System control
2	Automatic boat controller (ABC)	Automatic feeding of a sample boat
3	GA-100	Absorption of combustion gas
4	WS-100	Water supply

Table 1-1. AQF-100 system composition

1-2. Names and Functions of System

1-2-1. AQF front side names and functions

Illustration 1-2 and Table 1-2 show AQF front side and the names and functions.

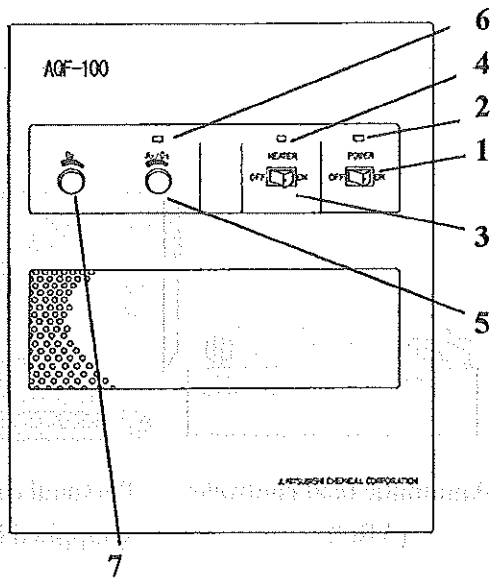


Illustration 1-2. AQF-100 front side

No.	Indication	Name	Function
1	POWER	Power switch	Power is supplied to the unit by turning on this switch.
2		Power switch LED	This LED (green) is ON when the power switch is turned on.
3	HEATER	Heater switch	For an electric furnace To increase the heater temperature, set it at "Heater" of "System". When this switch is off, power is not supplied to the heater.
4		Heater LED	This LED (green) is ON when the electric furnace is under control.
5	Ar/ O_2	Ar/O_2 adjustment knob	Turn it left to increase the flow. Turn it right to decrease the flow. Adjust the flow by checking gas flow in the computer display.
6		O_2 LED	It lights when O_2 flows into an inner pyrolysis tube.
7	O_2	O_2 adjustment knob	Turn it left to increase the flow. Turn it right to decrease the flow. Adjust the flow by checking gas flow in the computer display.

Table 1-2. AQF-100 front side names and functions

1-2-2. AQF rear side names and functions

Illustration 1-3 and Table 1-3 show AQF rear side and the names and functions.

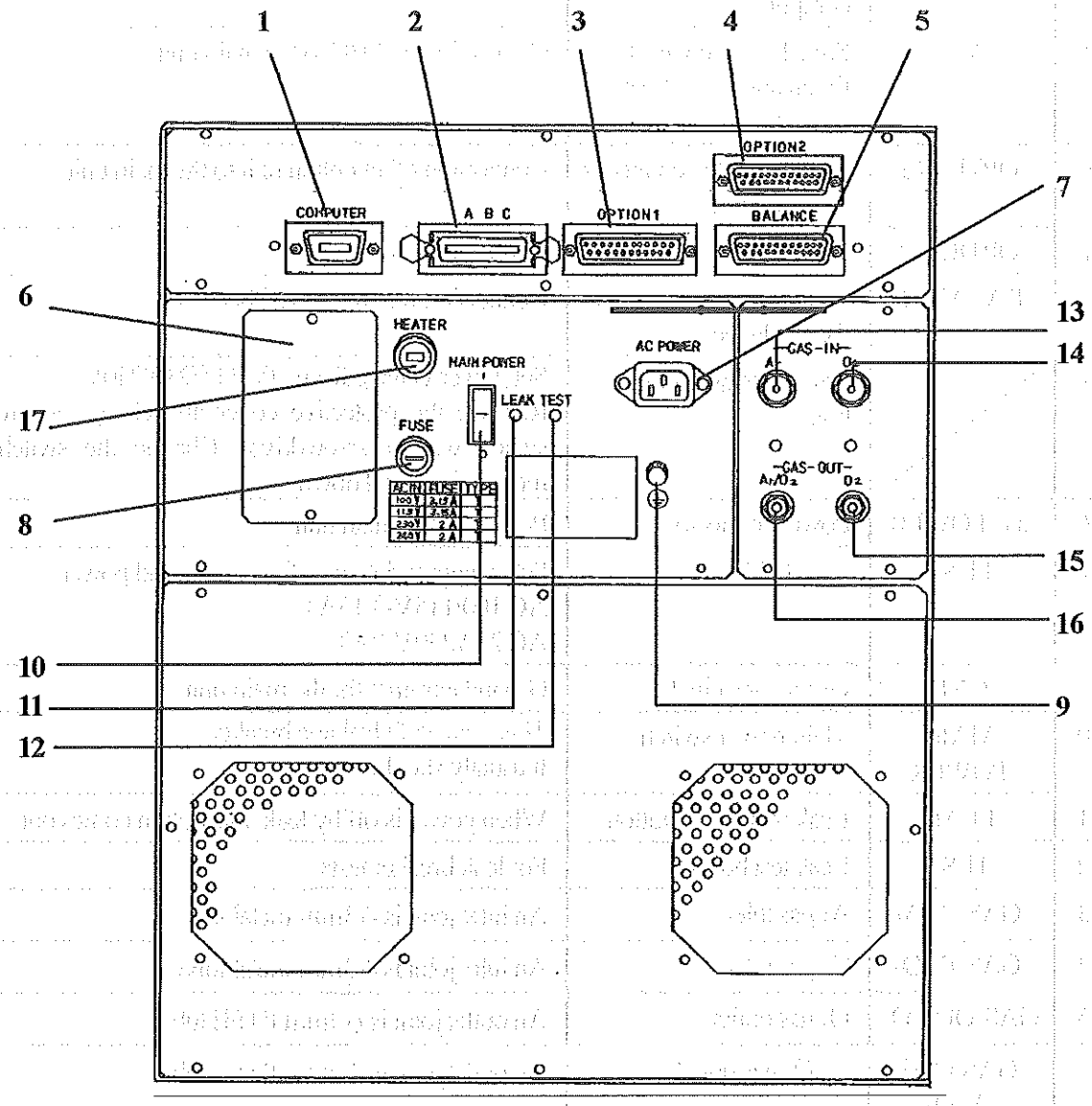


Illustration 1-3. AQF rear side names and functions

No.	Indication	Name	Function
1	COMPUTER	Connector for a personal computer	For a signal cable connecting a personal computer
2	ABC	Signal cable connector for an automatic boat controller	Connection of ABC to the main unit
3	OPTION 1	Signal cable connector for an option	Connection of an option unit to the main unit
4	OPTION 2		This is not used.
5	BALANCE	Signal cable connector for a balance	Connection for an optional balance
6		Power voltage setting box	Set power voltage from 100/115/230/240V. Remove the protective cover and change the rotary switch with a screwdriver. Change the switch by moving it up and down.
7	a.c. POWER	Power connector	Power for the main unit
8	FUSE	Fuse holder	Set an appropriate fuse for voltage and power. AC 100/115V-3.15AT AC 230/240V-2AT
9	GND	Ground terminal	Ground terminal for the main unit
10	MAIN POWER	Main power switch	This is an earth leakage breaker. It usually should be on.
11	LEAK	Leak indication button	When power is off by leak, this button comes out.
12	TEST	Leak test button	For leak breaker tests
13	GAS-IN Ar	Ar gas inlet	An inlet joint is ϕ 3mm metal tube.
14	GAS-IN O_2	O_2 gas inlet	An inlet joint is ϕ 3mm metal tube.
15	GAS-OUT O_2	O_2 gas outlet	An outlet joint is ϕ 4mm PTFE tube.
16	GAS-OUT Ar/O_2	Ar/O_2 gas outlet	An outlet joint is ϕ 4mm PTFE tube.
17	HEATER	Circuit protector for a heater	No fuse breaker for heater circuit protection

Table 1-3. AQF rear side names and functions

1-2-3. AQF-100 left side names and functions

Illustration 1-4 and Table 1-4 show AQF left side and the names and functions.

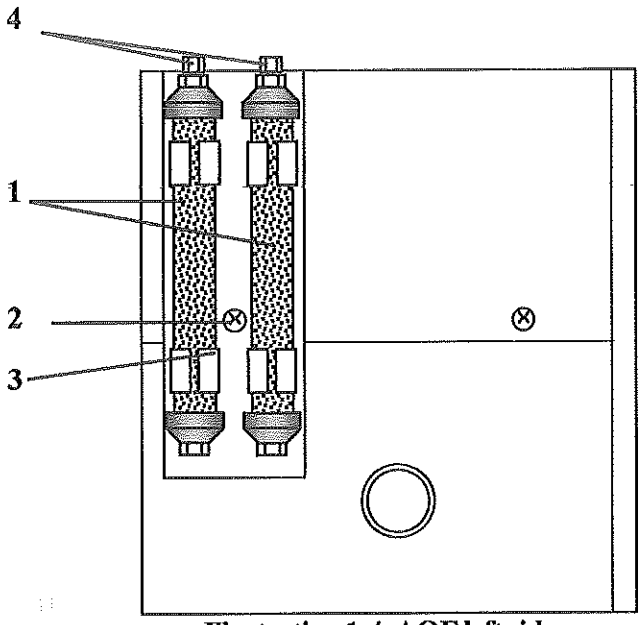


Illustration 1-4. AQF left side

No.	Name	Function
1	Gas purification filter (Hydro-purge II)	Removing impurities in supply gas
2	Screw for a gas purification filter fixing metal	Fixing a gas purification filter fixing metal
3	Gas purification filter fixing metal	Metal for fixing a gas purification filter
4	Reducer	Joint for a gas purification filter and a ϕ4/2 PTFE tube

Table 1-4. AQF left side names and functions

1-2-4. GA-100 front side names and functions

Illustration 1-5 and Table 1-5 show GA-100 front side and the names and functions.

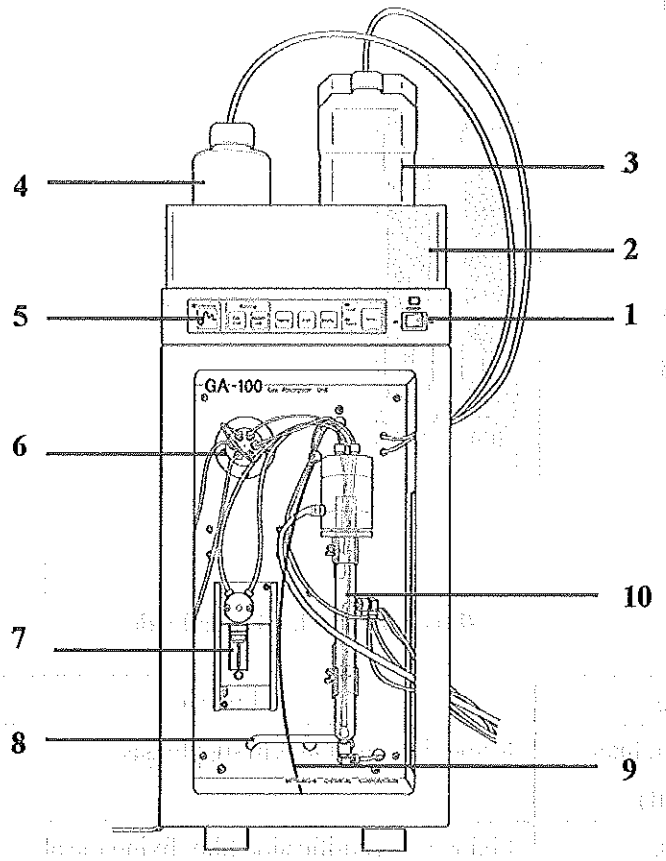


Illustration 1-5. GA-100 front side

No.	Name	Function
1	Power switch	GA-100 power switch
2	Bottle tray	Place an absorption solvent bottle and a washing solution bottle.
3	Washing solution bottle	For washing solution (2 L)
4	Absorption solvent bottle	For absorption solvent (0.5 L)
5	Operation panel	For manual operation of GA-100 Refer to Illustration 1-9. GA-100 operation panel for details.
6	Sample injector	For filing a sample loop with absorption solvent or standard solution and injecting a sample into an ion chromatography unit
7	Syringe	Absorption solvent is injected into an absorption tube.
8	Handle	For pulling GA-100 front forward
9	Standard solution injection tube	For injecting standard solution
10	Absorption tube	Absorption solvent is injected and combustion gas is absorbed.

Table 1-5. GA-100 front side names and functions

1-2-5. GA-100 rear side names and functions

Illustration 1-6 and Table 1-6 show GA-100 rear side and the names and functions.

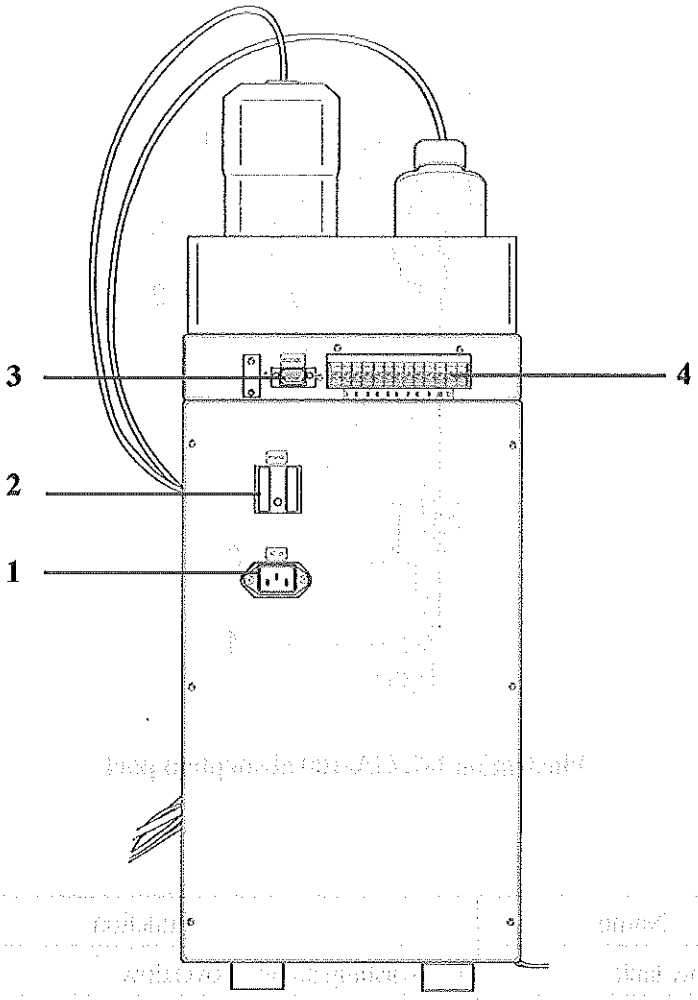


Illustration 1-6. GA-100 rear side

No.	Indication	Name	Function
1	a.c. POWER	Power connector	For GA-100
2	MAIN POWER	Main power switch	This is an earth leakage breaker switch. It should be ON.
3	RS-232C	Connector of a signal cable for a personal computer	Connection of a personal computer to GA-100
4	1~11	Signal terminal for an ion chromatography unit	Connection of an ion chromatography unit and WS-100 to GA-100

Table 1-6. GA-100 rear side names and functions

1-2-6. GA-100 absorption part names and functions

Illustration 1-7 and Table 1-7 show GA-100 absorption part and the names and functions.

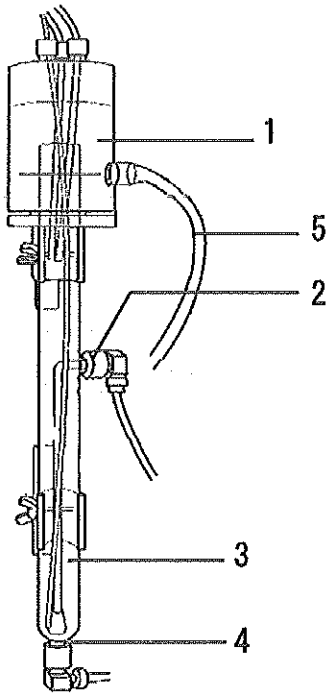


Illustration 1-7. GA-100 absorption part

No.	Name	Function
1	Overflow tank	For washing solution overflow
2	Combustion gas inlet	For combustion gas
3	Absorption tube	Absorption solvent is injected and combustion gas is absorbed.
4	Drain outlet	For absorption solvent and washing solution
5	Vinyl tube	For draining overflowed washing solution

Table 1-7. GA-100 absorption part names and functions

1-2-7. GA-100 absorption part line names and functions

For pump (P) and valve (V) positions, refer to Illustration 8-3. GA-100 line control part and the leakage sensor.

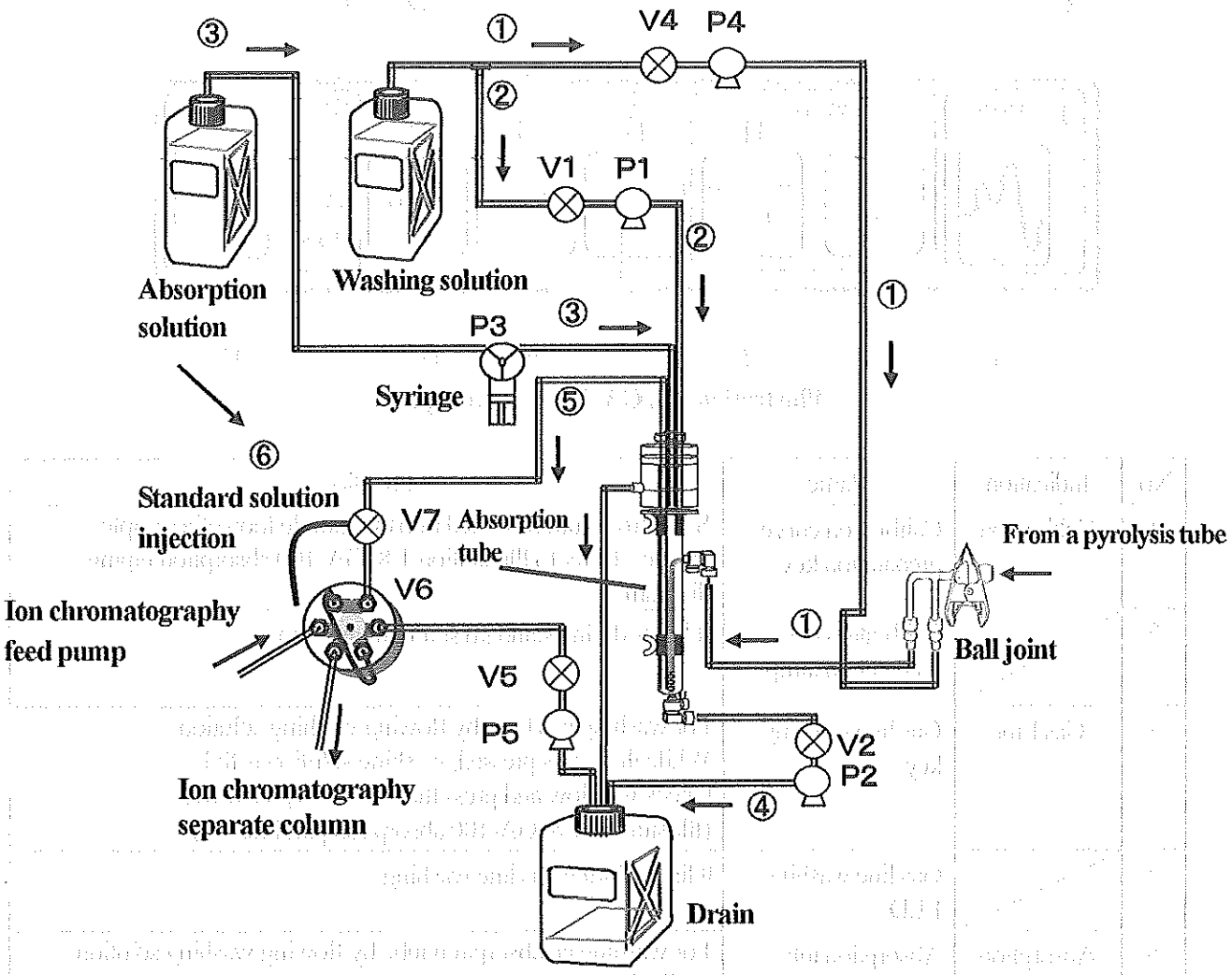


Illustration 1-8. GA-100 absorption part lines

Line No.	Name	Valve No.	Pump No.	Function
①	Gas Line	V4	P4	For washing gas lines
②	Absorption Tube	V1	P1	For washing an absorption tube
③	Dispense		P3	For filling absorption solvent into an absorption tube
④	Drain	V2	P2	For draining absorption solvent from an absorption tube
⑤	Sampling	V5	P5	For sampling absorption solvent of an absorption tube
⑥	Calibration	V5, V7	P5	For injecting directly measurement solution such as standard solution

Table 1-8. GA-100 absorption part line names and functions

1-2-8. GA-100 operation panel names and functions

Illustration 1-9 shows GA-100 operation panel and Table 1-9 shows GA-100 operation panel names and functions.

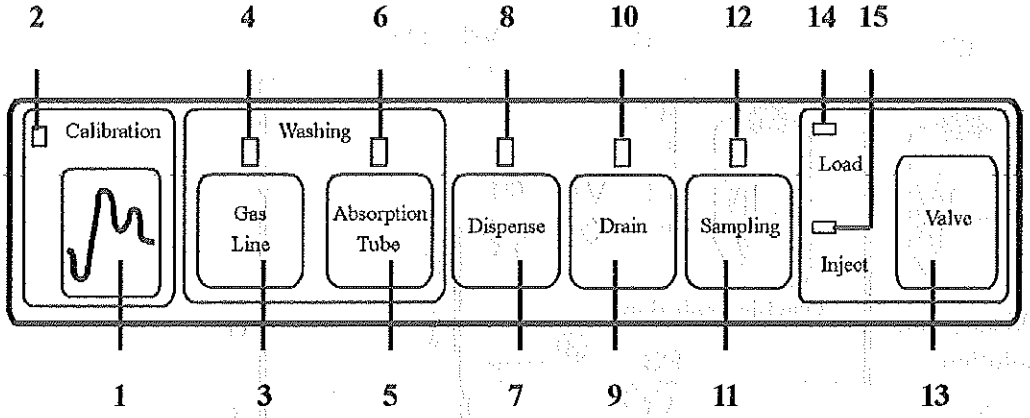


Illustration 1-9. GA-100 operation panel

No.	Indication	Name	Function
1	Calibration	Calibration curve preparation key	Standard solution is filled into the sample loop of a sample injector. Refer to Illustration 1-8. GA-100 absorption piping diagram.
2		Calibration curve preparation lamp	It lights during standard solution injection.
3	Gas Line	Gas line washing key	For washing gas lines by flowing washing solution While the key is pressed, washing solution is fed. Check gas flow and press the key when gas flows. (Illustration 1-8. GA-100 absorption part line ①)
4		Gas line washing LED	It lights during gas line washing.
5	Absorption Tube	Absorption tube washing key	For washing an absorption tube by flowing washing solution While the key is pressed, washing solution is fed. (Illustration 1-8 GA-100 absorption part line ②)
6		Absorption line washing LED	It lights during absorption line washing.
7	Dispense	Absorption solvent injection key	For filling absorption solvent into an absorption tube Once it is pressed, absorption volume is fed. (Illustration 1-8. GA-100 absorption part line ③)
8		Absorption solvent injection LED	It lights during injection.
9	Drain	Drain key	For draining absorption solvent or washing solution from an absorption tube While it is pressed, a drain valve is open. (Illustration 1-8. GA-100 absorption part line ④)
10		Drain LED	It lights during draining.

No.	Indication	Name	Function
11	Sampling	Sampling key	For injecting absorption solvent after absorption into a sample loop of a sample injector Absorption solvent is injected while pressing this key. (Illustration 1-8. GA-100 absorption part line ⑤)
12		Sampling LED	It lights during sampling.
13	Valve	Valve key	It changes a sample injector into the load side or the injection side.
14	Load	Load LED	It lights when a sample injector is in the load side.
15	Inject	Injection LED	It lights when a sample injector is in the injection side.

Table 1-9. GA-100 operation panel names and functions

1-2-9. ABC front side names and functions

Illustration 1-10 and Table 1-10 show ABC front side and the names and functions.

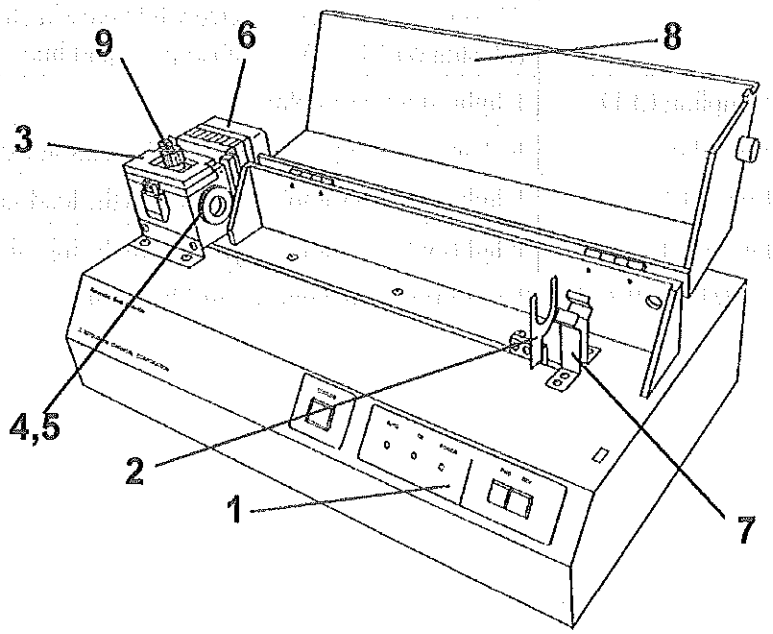


Illustration 1-10. ABC front panel

No.	Name	Function
1	Operation panel	ABC operation panel Refer to 1-2-11. ABC operation panel names and functions for details
2	Arm for magnet	For moving a round magnet
3	Sample introduction box	For putting in and out a sample boat
4	O-ring	For fixing a pyrolysis tube and a guide tube
5	O-ring holder	For holding an O-ring and fixing a pyrolysis tube and a guide tube
6	Cooling unit	For cooling a heated sample introduction box by boat heat
7	Guide tube holder	For supporting a guide tube
8	Safety cover	For the protection from explosion When a safety cover is open, the unit does not operate. By opening the cover during the operation, AQF-100 pretreatment is suspended and the unit stops.
9	Septum holder	Cap for fixing the septum of a sample inlet port

Table 1-10. ABC front panel names and functions

1-2-10. ABC rear side names and functions

Illustration 1-11 and Table 1-11 show ABC rear side and the names and functions.

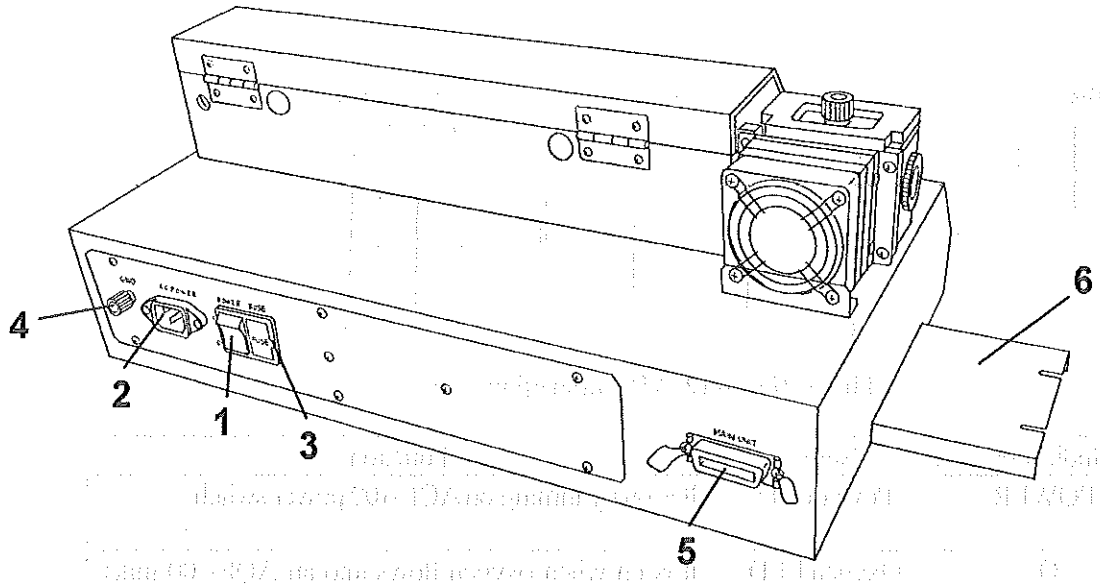


Illustration 1-11. ABC rear panel

No.	Indication	Name	Function
1	POWER	Power switch	For cooling the fan of a sample introduction box
2	a.c. POWER	Power connector	For supplying power to ABC AC100/115/230/240V is available.
3	FUSE 2AT	Fuse	Set a 2A midget fuse.
4	⏚	Ground terminal	Ground terminal for ABC When the power cable can't be grounded, ground an earth line here.
5	MAIN UNIT	ABC signal cable connector	For connecting ABC to AQF-100
6		ABC fixing plate	For fixing ABC to AQF-100

Table 1-11. ABC rear side panel names and functions

1-2-11. ABC operation panel names and functions

Illustration 1-12 and Table 1-12 show ABC operation panel and the names and functions.

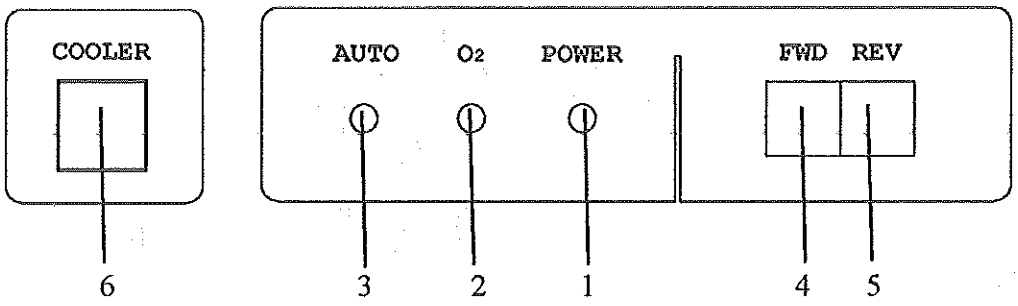


Illustration 1-12. ABC operation panel

No.	Indication	Name	Function
1	POWER	Power LED	It is on by turning on AQF-100 power switch.
2	O_2	Oxygen LED	It is on when oxygen flows into an AQF-100 inner pyrolysis tube. When this lamp is on during sequence operation (when the sample boat moves forward), an error message is displayed in a monitor, a buzzer sounds (long), operation is stopped, and measurement is suspended. **CAUTION:** **At the manual mode, never move a sample boat forward when this lamp is on.** **Sample combusts explosively and glass breaks and scatters.**
3	AUTO	Automatic operation LED	It is on when AQF-100 communicates with a personal computer.
4	FWD	Forward button	By pressing the button during manual operation, the boat moves forward. By releasing the button, the boat stops. By pressing the button again, the boat moves.
5	REV	Reverse button	By pressing the button during manual operation, the boat moves backward. By releasing the button, the boat stops. By pressing the button again, the boat moves.
6	COOLER	Cooler switch	For the cooling fan of a sample introduction box It is on during cooling fan operation. It is unavailable when the power switch of the unit rear is off.

Table 1-12. ABC operation panel names and functions

1-2-12. WS-100 front panel names and functions

Illustration 1-13 and table 1-13 show WS-100 front panel and the names and functions.

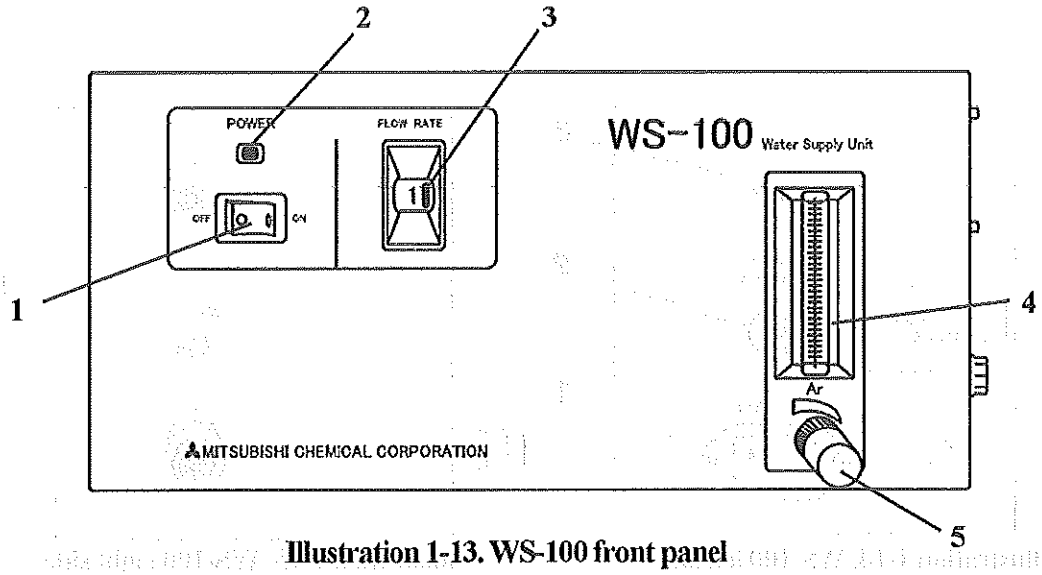


Illustration 1-13. WS-100 front panel

No.	Display	Name	Function
1		Power switch	Power switch of WS-100
2	POWER	Power indicator	It lights when the power switch is ON.
3	FLOW RATE	Water supply dial	Supply volume can be changed by 10 steps of 0~9.
4		Flow meter	For displaying argon gas flow
5		Flow adjustment knob	Turn it left to increase argon gas flow. Turn it right to decrease argon gas flow. Adjust the flow by checking a flow meter.

Table 1-13. WS-100 front panel names and functions

1-2-13. WS-100 left side and right side names and functions

Illustration 1-14 and 15 show WS-100 left side and right side. Table 1-14 shows the names and functions.

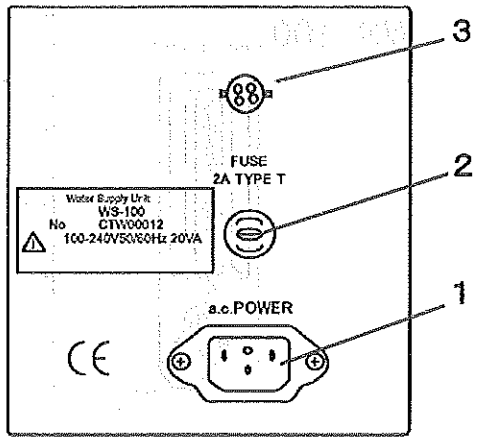


Illustration 1-14. WS-100 left side

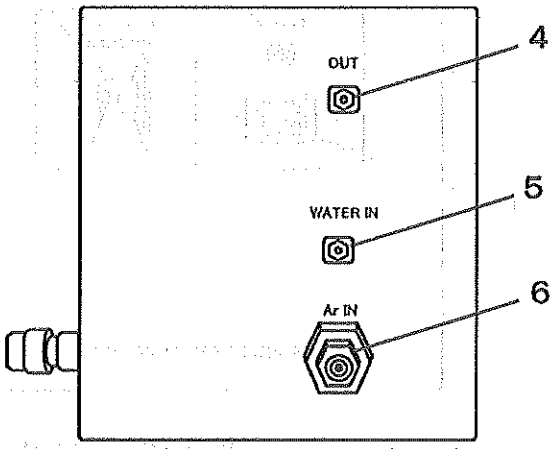


Illustration 1-15. WS-100 right side

No.	Display	Name	Function
1	a.c.POWER	Power connector	WS-100 power connector
2	FUSE 2A TYPE T	Fuse	Set a 2A midget fuse.
3		Signal connector	Connect the signal cable of GA-100.
4	OUT	Argon outlet	Outlet for argon including ultrapure water
5	WATER IN	Water inlet	Water inlet
6	Ar IN	Argon inlet	Argon inlet

Table 1-14. WS-100 left and right sides names and functions

Section 2: Packed Parts Check

2-1. AQF-100 Main Unit Parts

No.	Part name	Quantity	Check		Remarks
1	AQF-100 main unit	1 pc			
2	Thermal insulator (right)	1 set			With a fixing metal and knurled screws (2 pcs)
3	Thermal insulator (left)	1 set			With a knurled screw
4	Clip, P18	1 pc			
5	Gastight microsyringe 50 μ l	1 pc			
6	Flow meter for gas leak check (1L/min)	1 pc			
7	ϕ6/4 L-type joint (30-6RUE4-S)	2 pcs			
8	ϕ 4/2 PTFE tube 1.2m	1 pc			For Ar
9	ϕ 4/2 PTFE tube 0.7m	1 pc			For O_2
10	ϕ 3 Nut (with a ferrule)	2 sets			
11	ϕ 4 Nut (with a ferrule)	2 sets			
12	Quartz wool 5g	1 pc			
13	Quartz wool poker	1 pc			It is not used for XS-100 series.
14	O-ring, P-16	5 pcs/set			For ABC
15	Tweezers (L=150mm)	1 pc			
16	Spanner, 10×12mm	2 pcs/set			
17	Plus and minus screwdriver	1 pc			
18	RS-232C cable 9-pin cross type	1 pc			For a personal computer
19	Fuse, 3.15A or 2A	2 pcs/set			
20	Thermal fuse (93℃)	1 pc			
21	Power cable (AC 100/115V or 230/240V, 2.5m)	1 pc			
22	2P-3P converting plug	1 pc			115V only
23	AQF-100 system program	1 pc			CD-ROM
24	AQF instruction manual	1 pc			
25	AQF digest manual	1 pc			

Table 2-1. AQF-100 parts

2-2. GA-100 Parts

No.	Part name	Quantity	Check		Remarks
1	GA-100 main unit	1 pc			
2	Syringe 5ml (Cavro)	1 pc			
3	Ball joint with branch tubes (Quartz)	1 pc			
4	Inline filter	1 pc			
5	Connector EASYFITT ϕ 12	2 pcs/set			For an inline filter (beige)
6	ϕ 1/6" Union	6 pcs/set			For a sample injector (black, 2pcs spares)
7	ϕ 1/16" connector (#9005)	1 pc			
8	ϕ 6/3 Connector (30-6RU3-S)	2 pcs/set			For the connection of a ball joint, straight
9	ϕ 6/3 Gas inlet connector (30-6RUE3-S)	2 pcs/set			For the connection of an absorption tube, elbow
10	Vinyl tube 1.6m	1 pc			For drain
11	PEEK tube (Blue) ϕ 1/16"×0.01" 3m	1 pc			For the connection of a sample injector and an ion chromatography unit
12	PTFE tube ϕ 3/2 0.5m	1 pc			For the connection of an absorption tube and a pyrolysis tube
13	PTFE tube ϕ 4/2 0.7m	2 pcs/set			For the connection of a gas purification filter and AQF-100
14	Polyethylene tank 4L	1 pc			For drain
15	Polyethylene tank 2L	1 pc			For washing solution, with 2 holes in a cap
16	Polyethylene tank 0.5L	1 pc			For absorption solvent, with 2 holes in a cap
17	Tube holder (resin)	1 pc			
18	Double-ended spanner, 6×8mm	1 pc			
19	Double-ended spanner, 8×10mm	1 pc			
20	Double-ended spanner 3/8" × 7/16"	1 pc			
21	Double-ended spanner 1/2"×9/16"	1 pc			
22	Hexagonal wrench	1 pc			
23	Tube cutter	1 pc			

No.	Part name	Quantity	Check		Remarks
24	Gas purification filter (HYDRO-PURGE Ⅱ)	2 pcs			
25	Gas purification filter fixing board	1 pc			
26	Gas purification filter fixing metal	4 pcs/set			With a magnet rubber
27	Screw M3 × 8mm	8 pcs/set			
28	Insert	6 pcs/set			
29	Reducer	4 pcs/set			
30	Signal cable	1 pc			
31	RS-232C cable 9-pin cross type	1 pc			
32	Power cable (AC 100/115V or 230/240V, 2 m)	1 pc			
33	2P-3P converting plug	1 pc			

Table 2-2. GA-100 parts

2-3. Automatic Boat Controller (ABC) Parts

No.	Part name	Quantity	Check		Remarks
1	ABC unit	1 pc			
2	Outer pyrolysis tube	1 pc			
3	Inner pyrolysis tube	1 pc			
4	Spring for a pyrolysis tube	2 pcs/set			
5	Fixing plate	1 pc			
6	Signal cable	1 pc			
7	Guide tube	1 pc			
8	Ladle	1 pc			
9	Magnet	1 pc			
10	Sample boat (Quartz)	2 pcs/set			
11	Glass petri dish	1 pc			
12	Septum holder	1 pc			They are already set to a sample injection port on delivery.
13	Septum for a sample injection port	100 pcs/set			
14	Sample introduction port packing	1 pc			
15	Power cable (AC 100/115V/230/240V, 2 m)	1 pc			
16	2P-3P converting plug	1 pc			115V only
17	Fuse 2A	2 pcs/set			

Table 2-3. ABC parts

2-4. WS-100 Parts

No.	Name	Quantity	Check	Remarks
1	WS-100 unit	1 pc		
2	ϕ6/3 Gas inlet connector (30-6RUE3-S)	1 pc		Connect it to the branch tube of an inner pyrolysis tube.
3	T-type joint (4TTT-B)	1 pc		With a copper tube
4	ϕ3/2 PTFE tube 2.0m	1 pc		
5	ϕ4/2 PTFE tube 2.0m (blue)	1 pc		
6	Insert	2 pcs/set		
7	Fuse 2A	1 pc		
8	Plastic tank 250ml	1 pc		With 2 holes in a cap
9	Syringe for evacuation	1 pc		
10	Signal cable	1 pc		
11	L-type power cable (AC100/115V or 230/240V 2m)	1 pc		
12	2P-3P converting plug	1 pc		115V only
13	ϕ4 Nut (with a ferrule)	1 pc		

Table 2-4. WS-100 parts

2-5. AQF-100 Parts

No.	Name	Quantity	Check		Remarks
1	Absorption tube 10ml	1 pc			Only for impurities analysis system
2	Absorption tube 20ml	1 pc			Only for high concentration system
3	Sample loop 5 μl	1 pc			
4	Sample loop 20 μl	1 pc			
5	Trap column	1 pc			

Table 2-5. AQF-100 parts

Section 3: Installation

3-1. Installation

Install the unit as the following conditions for the long-term stable use.
Refer to Important safeguards and precautions for the details.

- Room temperature is 15~35℃.
- Free from direct sunlight
- No strong vibration and continuous weak vibration
- No strong electromagnetic field
- The humidity is under 80%.
- No corrosive gas
- Free from much dust
- Fire must not be used.
- No flammable materials
- The horizontal surface for installation

Even within the guarantee term, we can't compensate the troubles or damages caused by neglecting the above conditions.

3-2. Installation Space

AQF-100 system size is as follows.

- Table size : (Width 2250mm + ion chromatography unit width)×Depth 650mm
- Table load capacity : About 100kg
- Do not place things at the back of AQF rear side fan for ventilation.
  Prepare more than 150mm space between the unit and the back wall.

Illustration 3-1. shows the space of AQF-100 system.

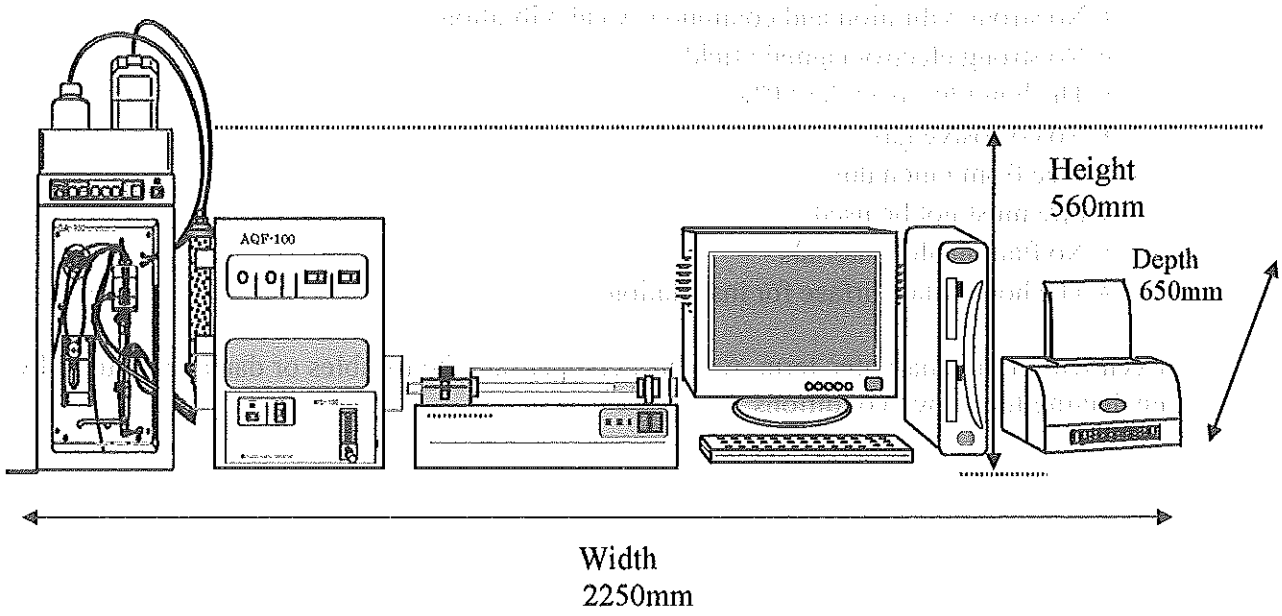


Illustration 3-1. Installation space of AQF-100 system

3-3. Power Preparation

3-3-1. Power

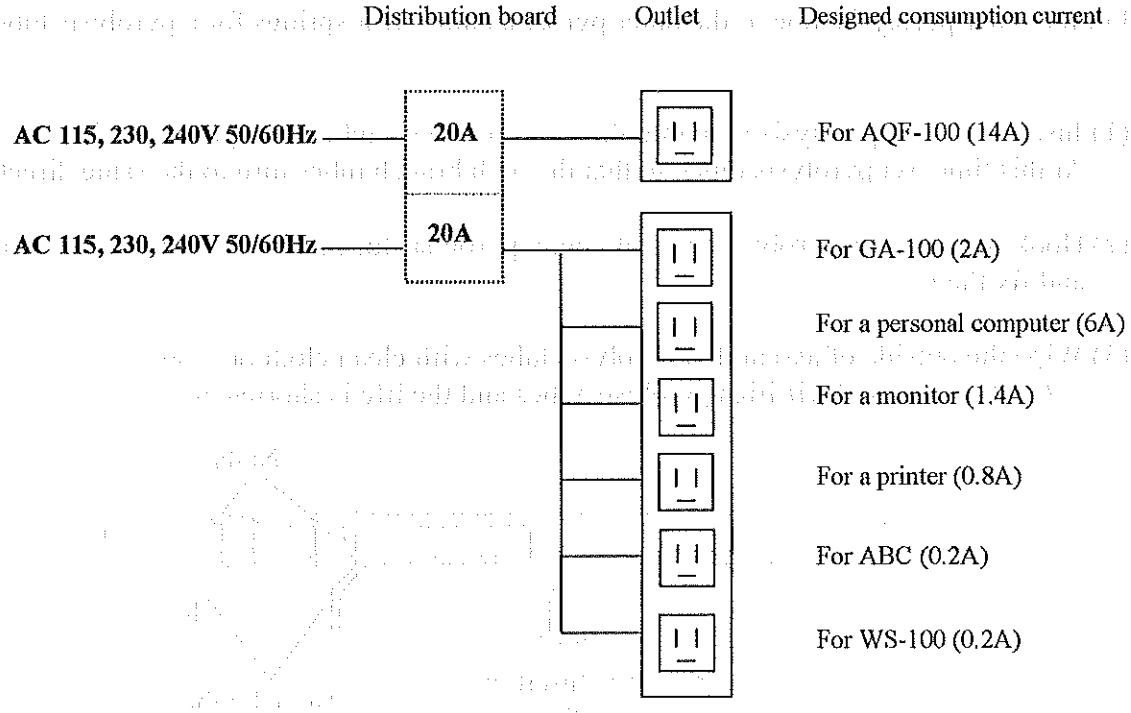
AQF-100 consumption power is 1.4kVA. Consumption power including peripheral equipment such as a personal computer is 1kVA.
Prepare 2 lines of power of over 20A capacity.
Voltage fluctuation range should be within ±10% of incoming electricity.
When voltage fluctuation is over 10%, use a voltage stabilizer.

3-3-2. Grounding

The attached power cable is 3-line type including a grounding line.
Insert a power cord into a 3-line type power outlet and ground it stably.
If the power outlet is 2-line type, ground it necessarily from the earth terminal of a power cable or an unit grounding terminal.

Wiring

The following diagram is a wiring example.
Separate the distribution board for AQF-100 from the one for others.



The following consumption currents are reference values.

- Personal computer (6A)
- Monitor (1.4A)
- Printer (0.8A)

The cable length is as follows.

- Power cable for AQF-100 : 2.5m
- Power cable for GA-100 : 2m
- Power cable for ABC : 2m
- Power cable for WS-100 : 2m

3-4. Preparation for pyrolysis tubes

3-4-1. Filling of quartz wool

Fill about **1g** quartz wool into an outer pyrolysis tube so that the width should be about 40～60mm.

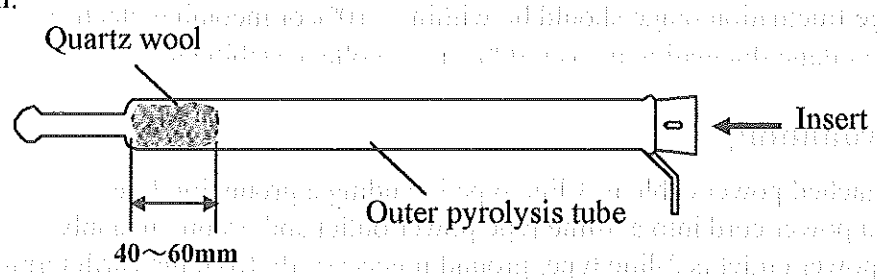


Illustration 3-2. Filling of quartz wool

3-4-2. Assembly of an inner pyrolysis tube

Assemble an outer pyrolysis tube with quartz wool and an inner pyrolysis tube as follows. Fix the inner pyrolysis tube to the outer pyrolysis tube with springs for a pyrolysis tube.

(1) Insert the inner pyrolysis tube into the outer pyrolysis tube with quartz wool.
At this time, set pyrolysis tubes so that the both branch tubes turn to the same direction.

(2) Hook springs for a pyrolysis tube into outer pyrolysis tube and inner pyrolysis tube nails and fix them.

(3) Wipe the outside of assembled pyrolysis tubes with clean cloth or tissue.
* Contamination devitrifies pyrolysis tubes and the life is shortened.

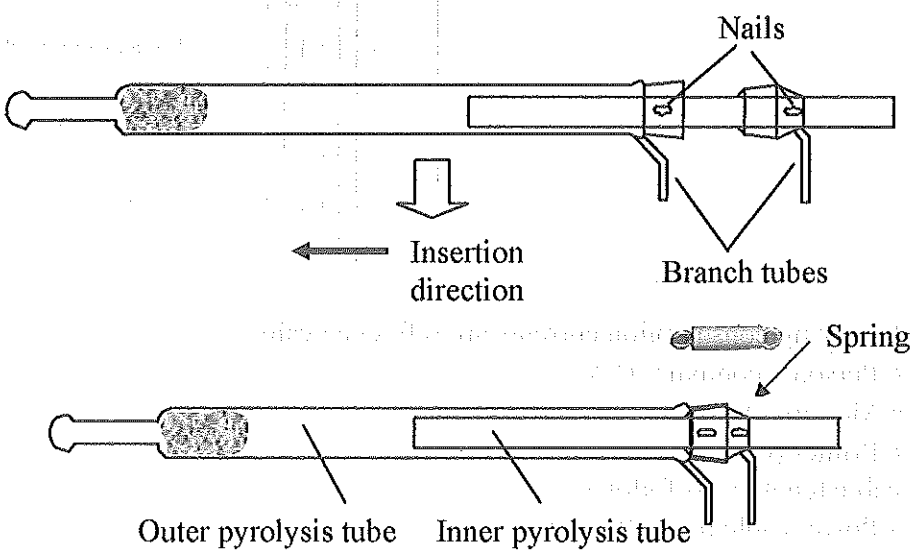


Illustration 3-3. Assembly of pyrolysis tubes

3-5. Gas Line

3-5-1. Preparation for gas lines

Prepare gas lines as follows.

- Prepare O_2 line and Ar line to the center of a table.
- Use outer size ϕ 3 metal line to connect lines to the unit.
- Prepare about 1m space at the end of lines to connect lines to the unit.

POINT

When setting a new line, check contamination and impurities are not in the line.

Set the pressures of O_2 and Ar to the same value.

Setting pressure : 0.4 ± 0.1MPa

Use the following gas purities.

O_2 gas 99.7% or more

Ar gas 99.98% or more

3-5-2. Gas purification filter setting

Set gas purification filters (HYDRO-PURGE Ⅱ) at the left side of AQF-100 as follows.

(1) Remove screws from the left side of AQF-100.

(2) Set the gas purification filter metal plate on the left side of AQF-100 with (1) screws. Refer to Illustration 1-4. AQF left side.

(3) Set 2 gas purification filters on the metal plate.

3-5-3. Connection of supply gas lines

(1) Set O_2 metal line to the bottom of the gas purification filter at the left side of AQF-100.

(2) Set Ar metal line to the bottom of the gas purification filter at the left side of AQF-100.

(3) Put inserts into the both ends of 2 PTFE tubes (ϕ 4/2 0.7m).

(4) Connect the top of an oxygen gas purification filter to GAS IN O_2 of AQF-100 rear with a PTFE tube and a reducer.

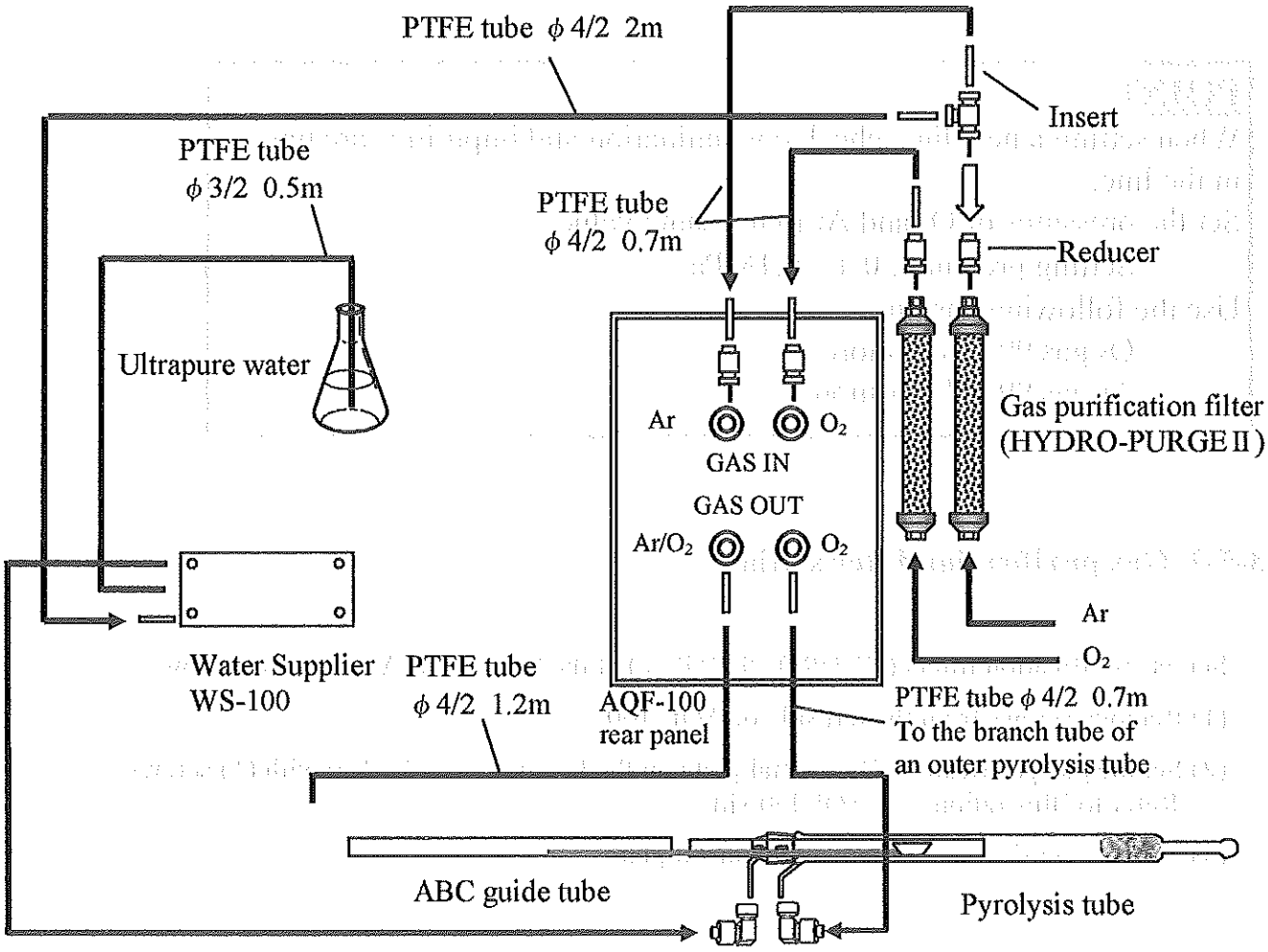


Illustration 3-4. Connection of supply gas lines

(5) Connect a reducer and a joint (T-type) to the top of an argon gas purification filter.

(6) Connect the one side of the joint to GAS IN Ar at the rear panel of AQF-100 with a PTFE tube (ϕ 4/2 0.7m) and a reducer.

(7) Put inserts into the both sides of a PTFE tube (ϕ 4/2 2m) and connect it to the both sides of the joint (T-type).

(8) Connect the one side of a PTFE tube (ϕ 4/2 2m) to GAS-IN of WS-100 right side.

(9) Set a ϕ 6/3 gas inlet connector (30-6RUE3-SP) to the branch tube of the pyrolysis tube.

(10) Connect OUT at the right side of WS-100 and the ϕ 6/3 gas inlet connector (30-6RUE3-SP) to a PTFE tube (ϕ 3/2 0.5m).

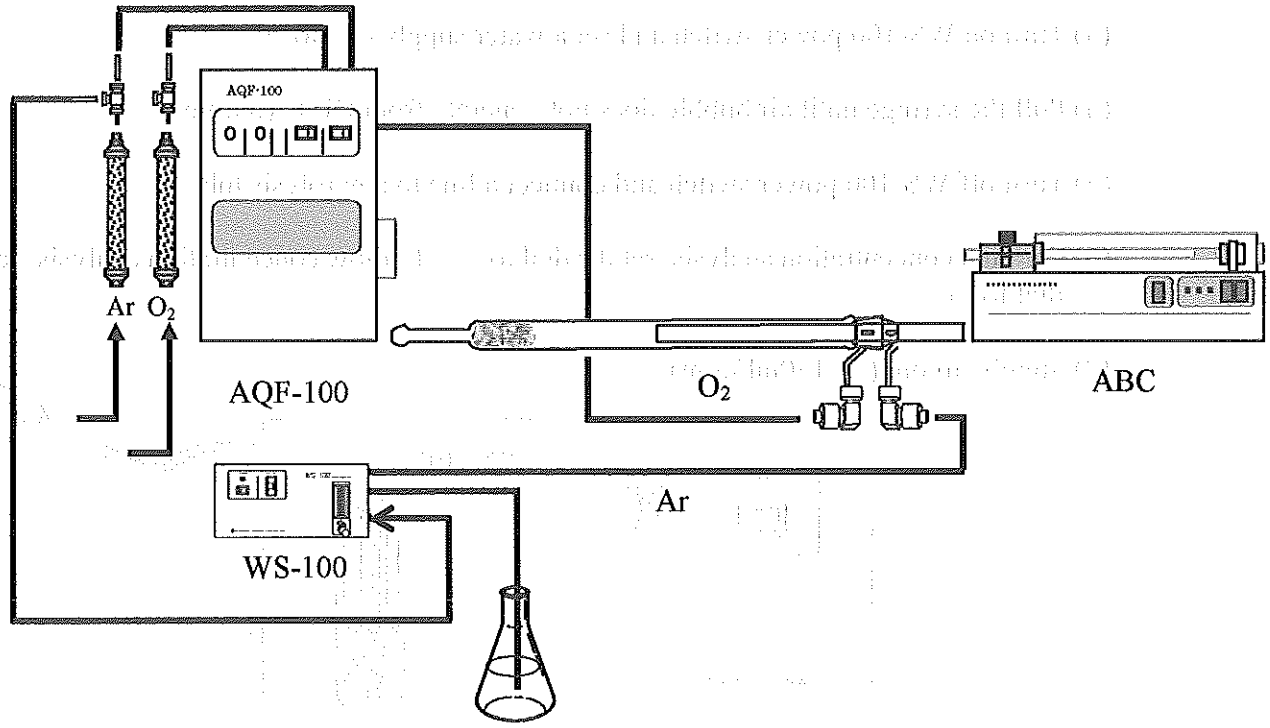


Illustration 3-5. The front of supply gas lines connection

3-5-4. Setting of WS-100

Evacuate pump air and set WS-100. Illustration 3-5 shows the setting of a syringe for evacuation. When supply volume is wrong, take the following steps.

* Set WS-100 when a communication cable is removed.
  About the cable connection position, refer to (5) in 3-12-1. Connection of communication cables.

(1) Turn a flow adjustment knob to set flow to zero.

(2) Remove a line from Ar gas outlet (OUT) and set a syringe with a PTFE tube for evacuation.

(3) Turn on WS-100 power switch and set a water supply dial to "9".

(4) Pull the syringe until air bubble does not generate from OUT. (5 times)

(5) Turn off WS-100 power switch and connect a line to a pyrolysis tube.

(6) For high concentration analysis, set the dial to "4". For low concentration analysis, set the dial to "1".

(7) Supply argon. (Ar 150ml/mim)

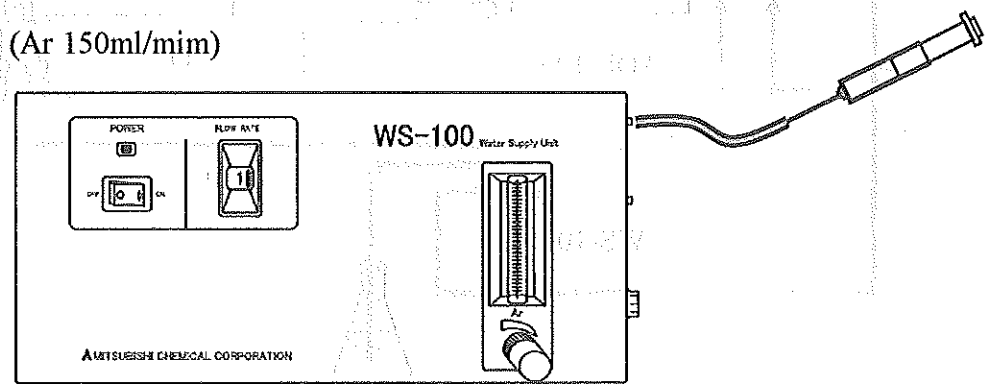


Illustration 3-6. Setting of a syringe for evacuation

3-5-5. Gas exhaust

This unit passes sample gas after combustion through absorption solvent and discharges it from the upper hole of GA-100 overflow tank.
Prepare a ventilating fan and ventilation line from GA-100 to outside.

3-6. Preparation for ABC

3-6-1. Setting of AQF-100 fixing plate

Insert screws into the screw holes of AQF-100 fixing plate and ABC lower part on the left of ABC front and attach the plate.

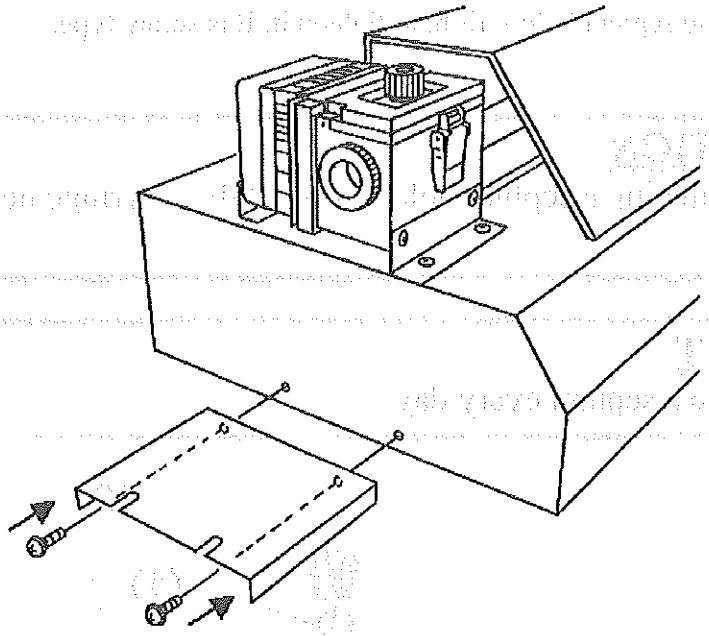


Illustration 3-7. Setting of AQF fixing plate

3-6-2. Setting of a septum and a septum holder

A septum and a septum holder are set to ABC sample injection port on delivery.
When changing a septum, set it as follows.

(1) Place a septum on the upper part of the sample injection port and put a septum holder on it.

(2) Turn the septum holder right to tighten it. It is screw-type.

CAUTION
By tightening a septum holder too tightly, a syringe needle can break.

POINT
Replace a septum every day.

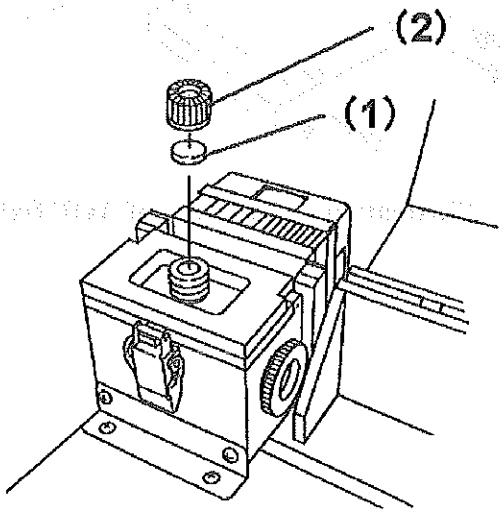


Illustration 3-8. Setting of a septum and a septum holder

3-6-3. Setting of a guide tube

(1) Insert a ladle ② into a guide tube ①.

(2) Insert a magnet ③ to the outside of the guide tube into which the ladle is inserted.

(3) Open ABC safety cover and remove an O-ring holder ④ of the sample introduction box right. Put an O-ring ⑤ and set it loosely with the O-ring holder.

(4) Set the right of the guide tube at which the ladle and the magnet are set to the guide tube holder. Set the magnet set at the guide tube to the left of the arm for a magnet.

(5) Slide slowly the guide tube into the left and insert it into the O-ring holder.
* Open the cover of the sample introduction box and check that the guide tube touches the box right.

(6) Tighten the O-ring holder by hand and fix the guide tube.

CAUTION
Loose tightening of an O-ring holder causes gas leakage and too tight tightening causes guide tube breakage. Take care of the tightening of an O-ring holder.

(7) Move the arm for magnet about 2cm to the left by hand.
(8) Close ABC safety cover.

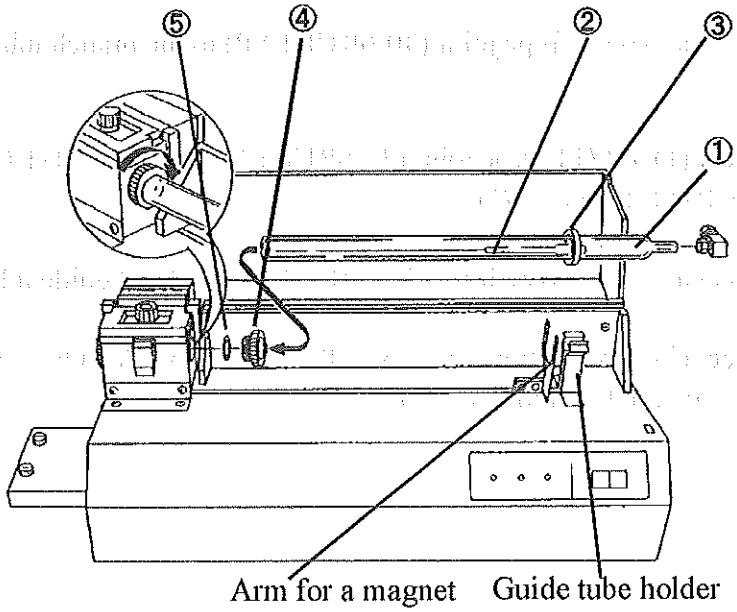


Illustration 3-9. Setting of a guide tube

3-6-4. Insertion of a pyrolysis tube into AQF-100

Insert an assembled pyrolysis tube into AQF-100 electric furnace from the right side (ABC side) of AQF-100 front.

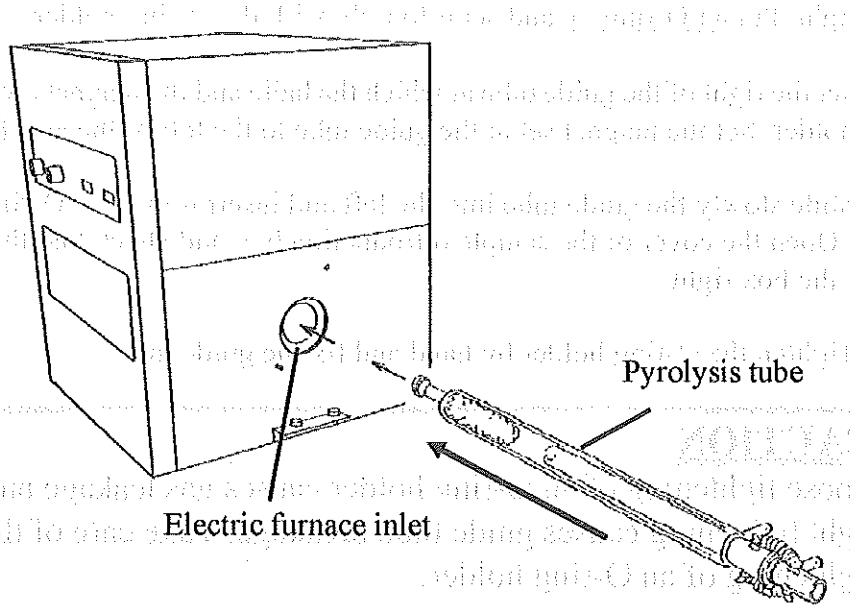


Illustration 3-10. Insertion of a pyrolysis tube

3-6-5. Connection of ABC pyrolysis tube and gas lines

(1) Connect a ϕ 6/4 L-type joint (30-6RUE4-SP) to the branch tube of an outer pyrolysis tube.

(2) Connect (1) ϕ 6/4 L-type joint (30-6RUE4-SP) to GAS-OUT O_2 of AQF-100 rear panel with a PTFE tube (ϕ 4/2).

(3) Connect a ϕ 6/4 L-type joint (30-6RUE4-SP) to ABC guide tube.

(4) Connect (3) ϕ 6/4 L-type joint (30-6RUE4-SP) to GAS-OUT Ar/O_2 of AQF-100 rear panel with a PTFE tube (ϕ 4/2).

3-6-6. Connection of ABC to AQF-100

Connect ABC to AQF-100 as follows.

(1) Insert a pyrolysis tube deeply to the O-ring of the left of the sample introduction box of ABC while rotating it.

(2) Fix ABC to which a fixing plate and a guide tube are set into the locking plate in the right of AQF-100 with screws.

(3) Tighten an O-ring holder and fix the pyrolysis tube.
Set an inner pyrolysis tube so that the branch tube should face downward.

CAUTION
Loose an O-ring holder causes gas leakage and too tight tightening causes pyrolysis tube breakage. Tighten the O-ring holder carefully.

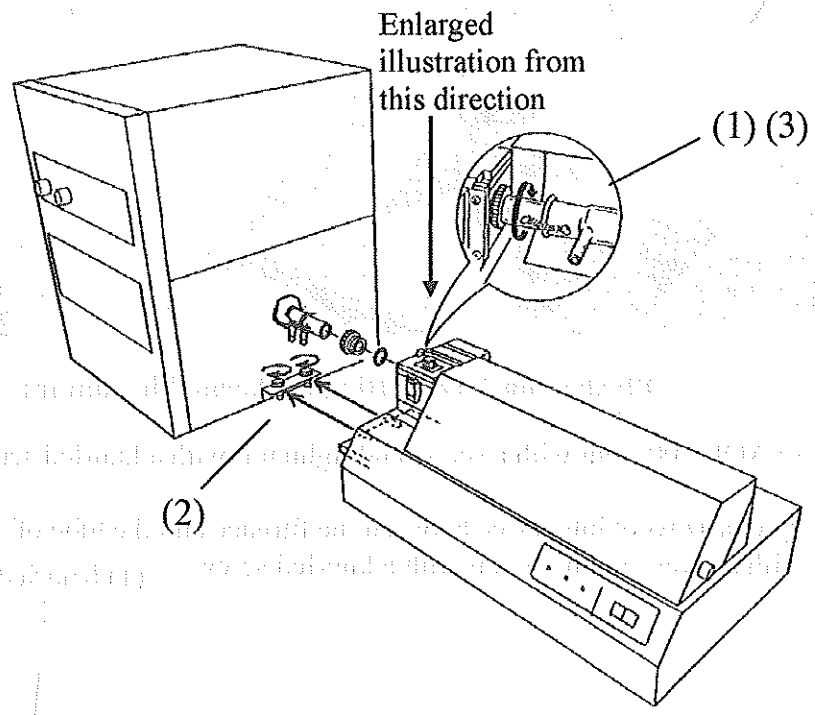


Illustration 3-11. Connection of ABC to AQF-100

3-6-7. Setting of thermal insulators

Set thermal insulators to the both sides of AQF-100.

CAUTION

Set a thermal insulator while the electric furnace temperature is cool fully. The electric furnace is heated up to 900℃ to 1000℃. Pyrolysis tube both ends, pyrolysis side, a thermal insulator are hot. Therefore, never touch them with naked hands.

(1) To keep heat, put about 0.5g quartz wool into space between the furnace inlet and the pyrolysis tube of AQF-100 right.

(2) Extend quartz wool so that the width and the length are about 3 to 4cm and 13cm.

(3) Wind extended quartz wool around the electric furnace and the branch tube.

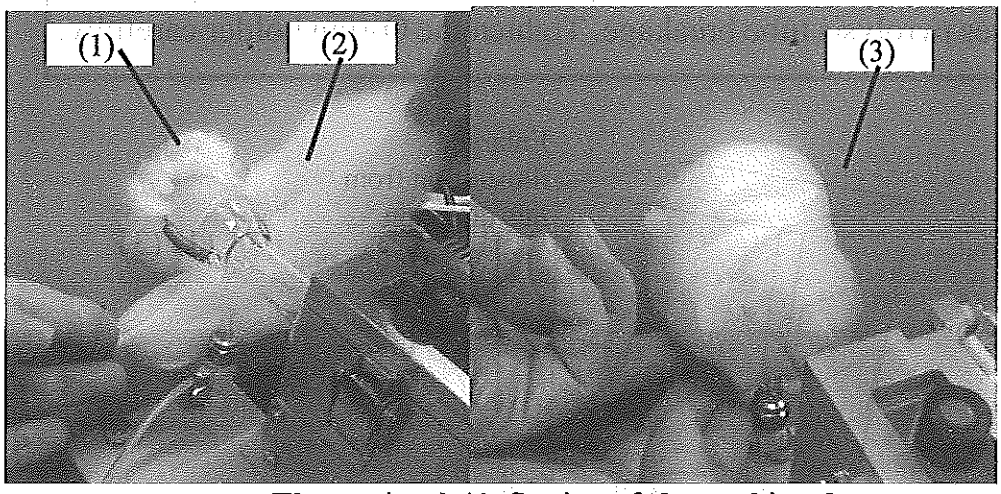
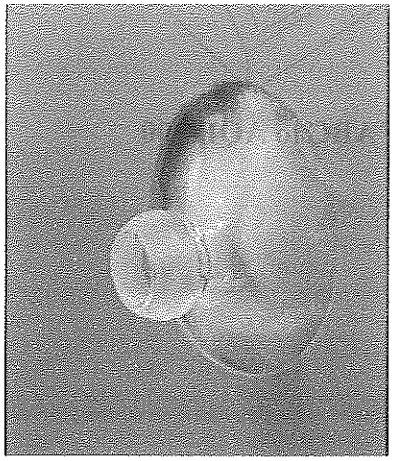


Illustration 3-12. Setting of thermal insulators

(4) Fix it to AQF-100 right with a screw and tighten it with a knurled screw.

(5) Put 0.2g quartz wool into space between the furnace and the tube of AQF-100 left. Fix it with a screw and tighten it with a knurled screw.



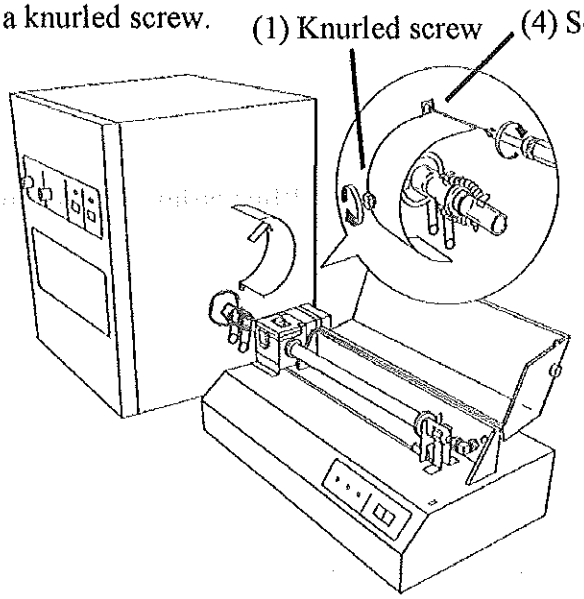


Illustration 3-12. Thermal insulator setting

3-7. Assembly of a pyrolysis tube outlet

(1) Connect a PTFE tube and the ball joint main tube (away from the fitting part) with branch tubes to the combustion gas inlet of an absorption tube with a ϕ6/3 connector (30-6RU3-S).

(2) Connect a PTFE tube with WASH.G tag and the branch tube (near the fitting part) of a ball joint with a ϕ6/3 connector joint (30-6RU3-S).

(3) Connect the ball joint with branch tubes to a pyrolysis tube outlet with a clamp for a ball joint and clamp it.

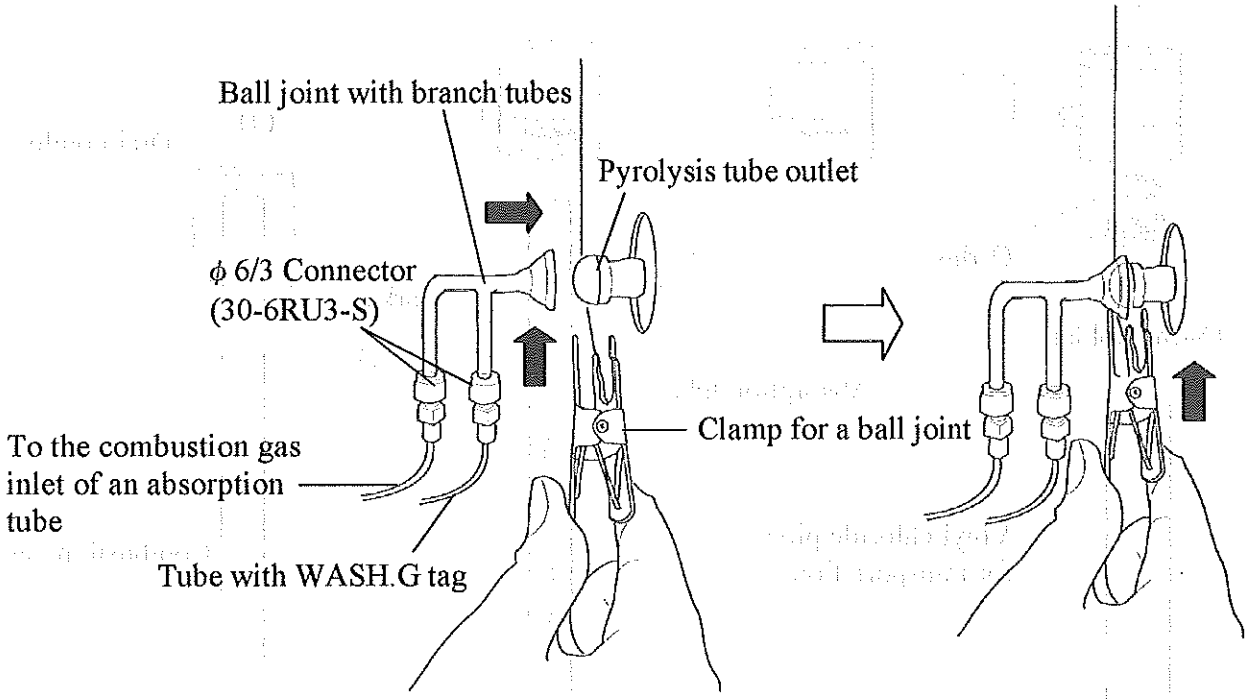


Illustration 3-13. Assembly of a pyrolysis tube outlet

3-8. Assembly of GA-100 absorption part

Set an overflow tank to an absorption tube, attach it to GA-100, and set a line.

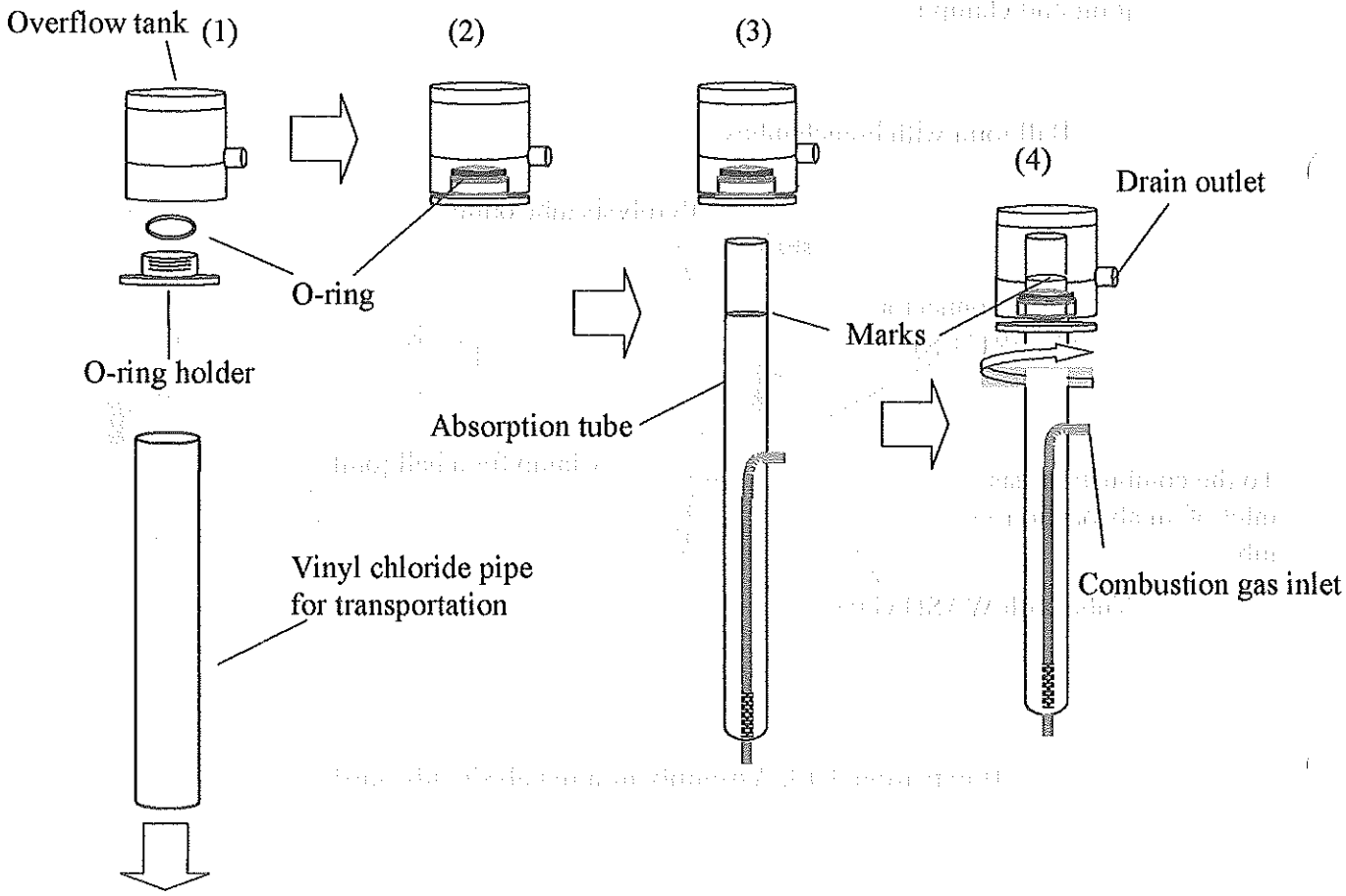
(1) Remove a vinyl chloride pipe for transportation from an overflow tank.

(2) Put an O-ring to the overflow tank from the bottom and screw an O-ring holder lightly.

(3) Insert an absorption tube into the overflow tank.

Put together an absorption tube marker and the overflow tank bottom.

(4) Turn the overflow tank drain outlet into the left and the combustion gas inlet into the right.



Screw the O-ring holder and tighten it.

Illustration 3-14-1. Assembly of GA-100 absorption part

(5) Put three lines with caps into the absorption tube.

(6) Fix the absorption tube to a GA-100 holder with thumbscrews.

(7) Adjust the tip length of an absorption soltuion absorption tube (green) by moving the green tube to touch the bottom of the absorption tube.

(8) Connect another side of the PTFE tube connected to a ball joint main tube (away from the fitting part) to combustion gas inlet with a ϕ6/3 gas inlet connector (30-6RUE3-S) from the outlet of GA-100 right tube.

(9) Connect a PTFE tube for drain to the absorption tube drain outlet with the ϕ6/3 gas inlet connector (30-6RUE3-S).

(10) Connect the vinyl tube to the overflow tank from the outlet of GA-100 right tube.

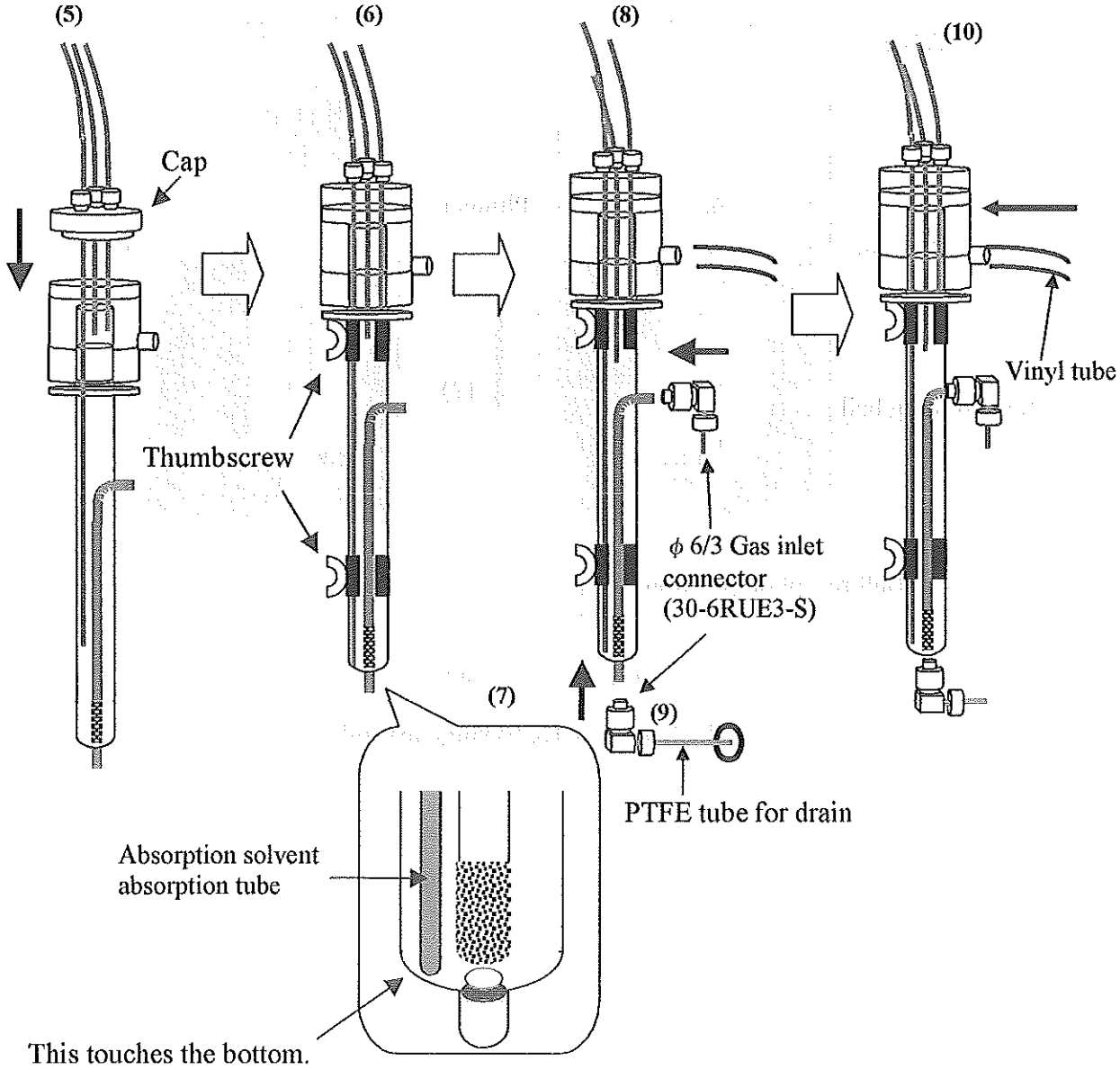


Illustration 3-14-2. Assembly of GA-100 absorption part

3-9. Syringe setting

Set a syringe to a plunger drive.

(1) Turn off GA-100 power switch.

(2) Lower a carriage assembly to the lowest part by hand.

(3) When a plunger is pushed, place a self aligning ball to the reception position.

(4) Raise the syringe and screw it to a valve. Turn it by a quarter to fix.

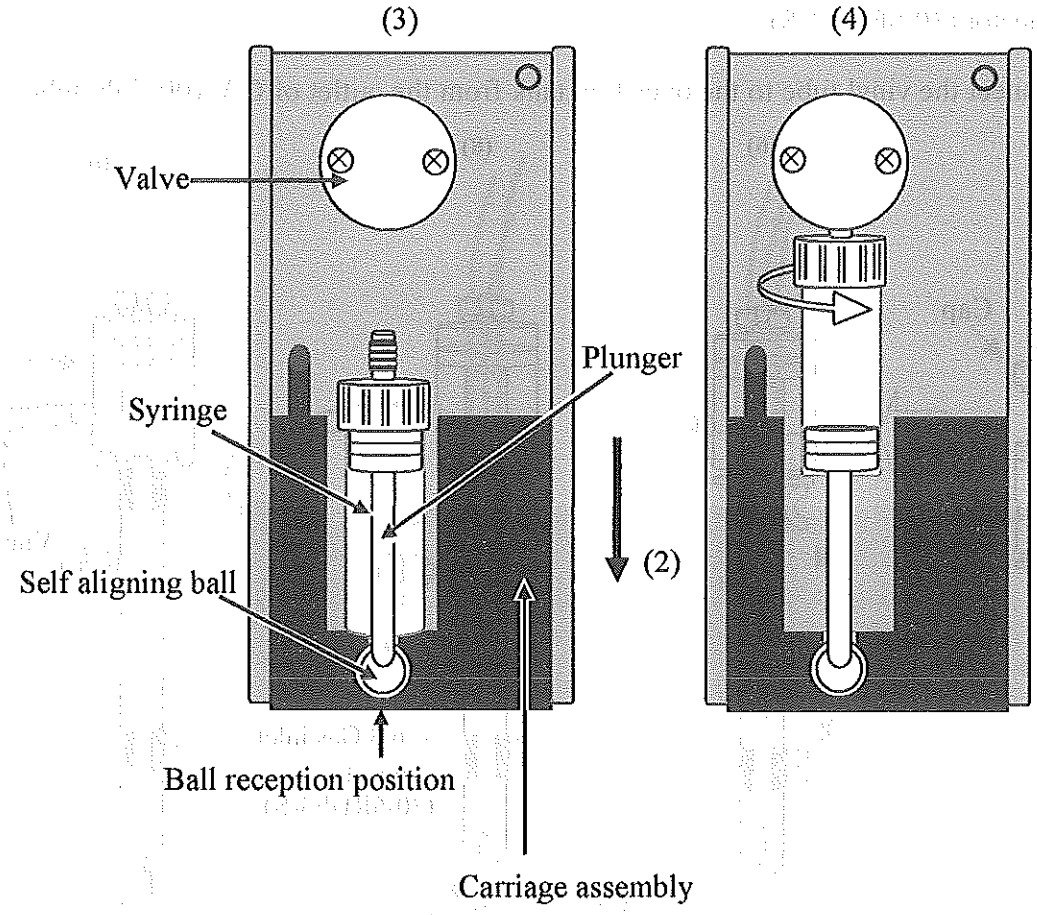


Illustration 3-15. Syringe assembly

3-10. GA-100 Line Connection

Connect GA-100 lines. See illustration 3-15. GA-100 line connection.

(1) Put a PTFE tube with "WATER" tag into a polyethylene tank for washing solution (2L). Put a PTFE tube with "ABS." tag into a polyethylene tank for absorption solvent (0.5L). Pass PTFE tubes through caps with holes and fix them not to come out of polyethylene tanks.

(2) Fix PTFE tubes with a tube holder (magnet).

(3) Connect a PTFE tube with "WASH.G" tag to the branch tube (near the fitting part) of the ball joint connected to a pyrolysis tube outlet.

(4) Put out 2 PTFE tubes with "DRAIN" tags from the right bottom of GA-100 and a vinyl tube for drain from the right tube outlet of an absorption tube. Put them into the drain tank. Put the vinyl tube for drain not to contact the solution level in the drain tube. Put and fix it.

CAUTION
Drain free-falls from an overflow tank. When the tip of a vinyl tube is in drain, solution can't be drained and overflows from the tank. As a result, you can get an electric shock. Place the vinyl tube so that the tip should be higher than solution level.

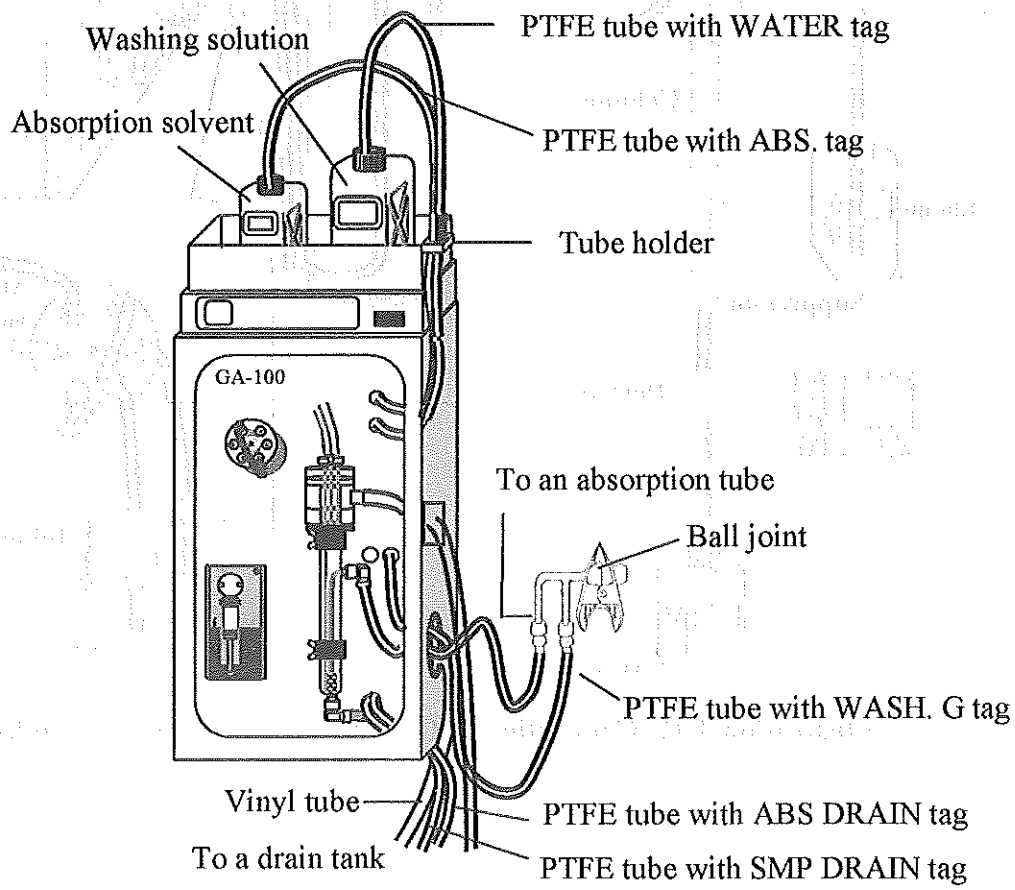


Illustration 3-16. GA-100 line connection

3-11. Connection of GA-100 and ion chromatography unit lines

Connect GA–100 sample injector lines to ion chromatography unit lines.
Cut tubes with a tube cutter.

(1) Connect the tube from the ion chromatography unit pump and ϕ 1/16" Union.
Connect ϕ 1/16" Union and GA-100 sample injector with an attached PEEK tube (blue).

(2) Connect the GA-100 sample injector to an inline filter with an attached PEEK tube (blue).

(3) Connect the inline filter to the sample injector of the ion chromatography unit with an attached PEEK tube (blue).

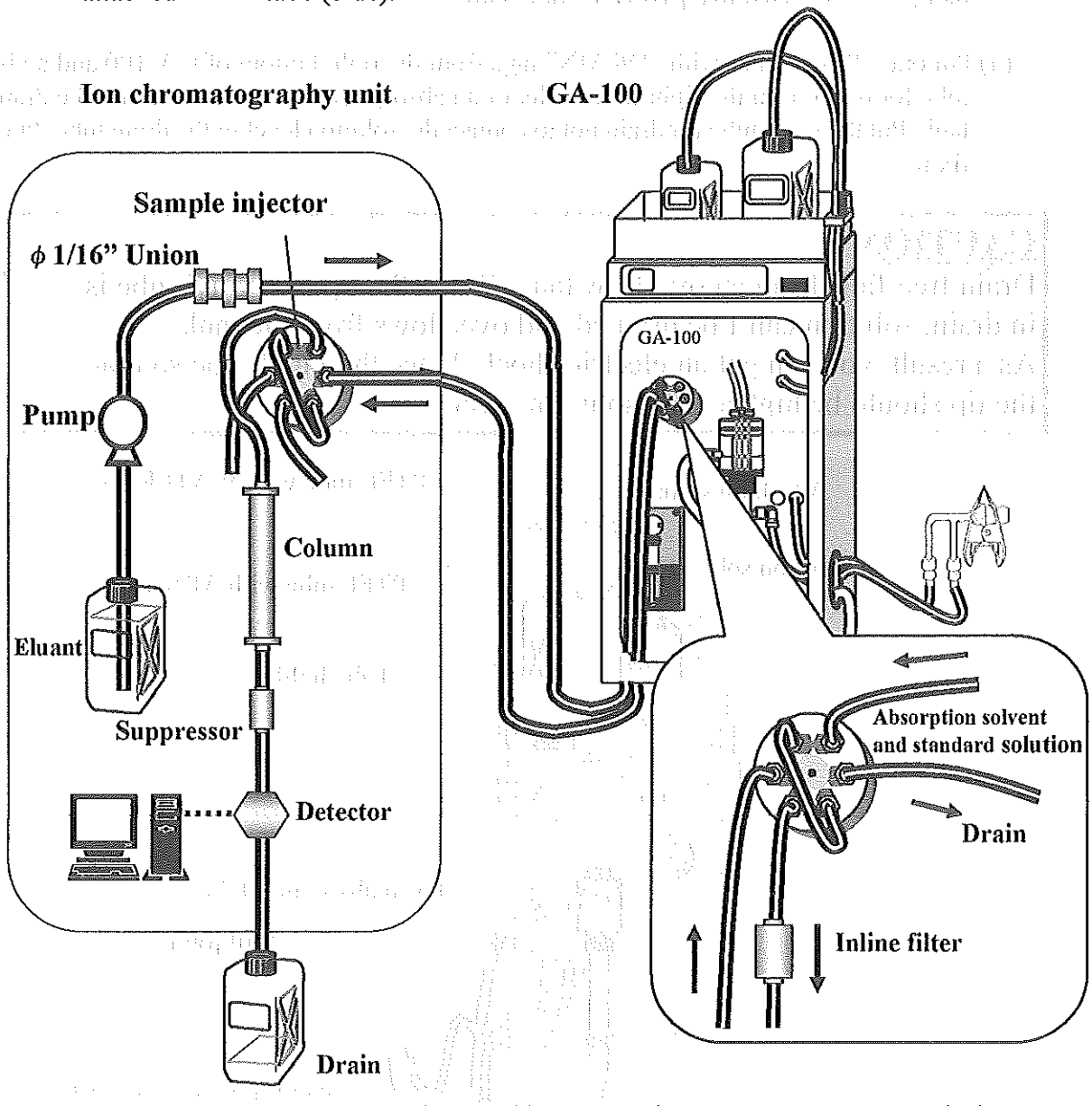


Illustration 3-17. Connection of GA-100 and ion chromatography unit lines

3-12. Cable Connection

3-12-1. Connection of communication cables

Connect AQF-100, GA-100, ABC, and a personal computer with communication cables.

(1) Connect ABC connector of AQF-100 rear to MAIN UNIT connector of ABC rear panel with an ABC signal cable.

(2) Connect COMPUTER connector of AQF-100 rear to COM1 port of the personal computer with a RS-232C cable (9 pin cross).

(3) Connect the RS-232C connector of GA-100 rear to COM2 port of the personal computer with a RS-232C cable (9 pin cross).

(4) Connect the start terminal of an ion chromatography unit to the signal terminal outside contact point of GA-100 rear with a signal cable.
For contact point operation timing, refer to 4-5-2-3. "Absorption solvent sampling" flow and 4-5-2-4. "Calibration" flow.
For ion chromatography unit terminals, refer to the instruction manual.

(5) Connect 8 and 9 of the signal terminal outside contact of GA-100 rear panel and WS-100 signal connector with a signal cable.
* The connection to COM2 is sometimes different by the system structure.

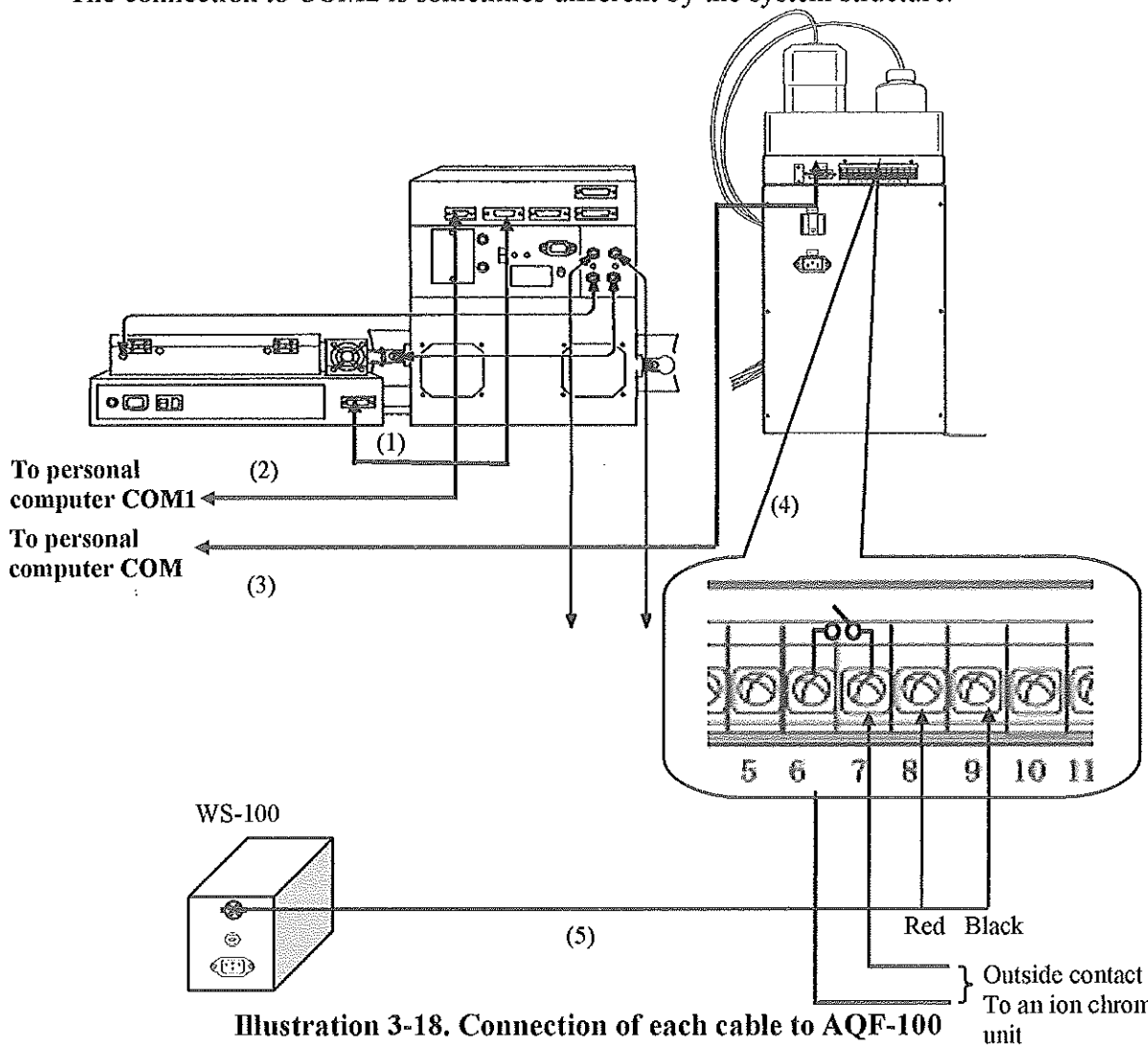


Illustration 3-18. Connection of each cable to AQF-100

3-12-2. Connection of power cables

Connect power cables of AQF-100, GA-100, and ABC.
* For the connection of power cables of a personal computer, a monitor, and a printer, refer to each instruction manual.

(1) Connect the power cable for AQF-100 to a.c. POWER connector of AQF-100 rear panel.

(2) Connect the power cable for ABC to a.c. POWER connector of ABC rear panel.
Turn on the power switch of ABC rear cooling unit.

(3) Connect the power cable for GA-100 to a.c. POWER connector of GA-100 rear panel.

3-13. WS-100 Connection

By using WS-100, the recovery is up and the unit is useful for fluorine measurement.
For gas line and water line connection, refer to 3-5-3. Connection of supply gas lines.

3-13-1. Gas line connection

Connect AQF-100 to WS-100 Ar IN with a ϕ 4/2 PTFE tube.

3-13-2. Power cable connection

Connect a power cable to a WS-100 power connector (a.c. POWER).

3-13-3. Water line cable connection

Connect a water line to supply argon gas including ultrapure water to a pyrolysis tube.
Connect the water container to WS-100 WATER IN with a ϕ 3/2 PTFE tube.
Next, connect an inner pyrolysis tube to WS-100 OUT with a ϕ 3/2 PTFE tube.

3-14. The connection of a kit for high concentration

When sample elements are more than 1000ppm, use a kit for high concentration (an absorption tube 20ml, a sample loop 20 μ l, a trap column) to measure accurately.

3-14-1. Absorption tube connection

Assemble 20ml absorption tube by referring to 3-8. Assembly of GA-100 absorption part and connect it.

3-14-2. Sample loop connection

(1) Press Absorption Tube key of GA-100 and pour 10ml water into an absorption tube.

(2) Press Valve key to switch the valve into Load side.

(3) Change a sample loop.

(4) Press Sampling key to absorb water in the absorption tube.
Check that water flows into a PTFE tube with DRAIN tag.

(5) Press Valve key to switch the valve into Inject side.

(6) Check a water dip peak with the ion chromatography unit and measure a sample.

3-14-3. Trap column connection

Change a PTFE tube used at (1) in 3-7. Assembly of a pyrolysis tube outlet and (8) in 3-8. Assembly of GA-100 absorption part with one with a trap column.
Connect it.

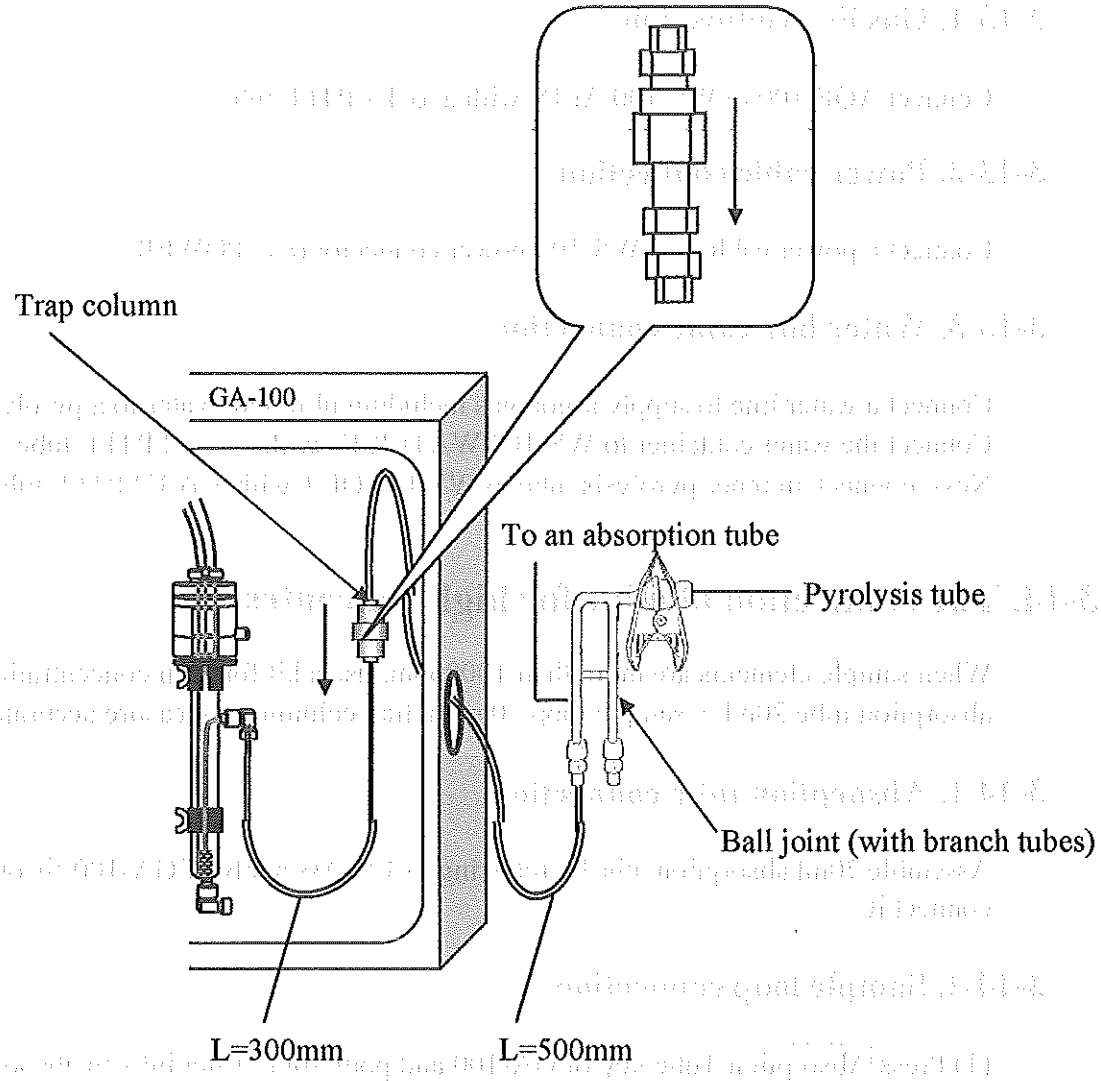


Illustration 3-19. Connection of a PTFE tube with a trap column

3-15. ASC-150L (Option) Connection

By using ASC-150L, up to 50 liquid samples can be measured automatically.
For ASC-150L assembly, installation, and operation, refer to ASC-150L instruction manual.

3-15-1. Connection of AQF-100/ABC and ASC-150L

Refer to ASC-150L instruction manual.

3-15-2. Connection of a communication cable

Connect AQF-100 communication connector (OPTION 1) to ASC-150L connector (MAIN UNIT) with a RS-232C cable.

3-15-3. Connection of a power cable

Connect a power cable to ASC-150L power connector (a.c. POWER).

3-16. ASC-120S (Option) Connection

By using ASC-120S (option), up to 20 solid samples can be measured automatically.
For ASC-120S assembly, installation, and operation, refer to ASC-120S instruction manual.

3-16-1. Connection of AQF-100 and ASC-120S

Refer to ASC-120S instruction manual.

3-16-2. Connection of a communication cable

Connect AQF-100 communication connector (OPTION 1) to ASC-120S connector (MAIN UNIT) with a RS-232C cable.

3-16-3. Connection of a power cable

Connect a power cable to ASC-120S power connector (a.c. POWER).

Section 4: AQF-100 System Program

4-1. AQF-100 System Program Start and Shutdown

4-1-1. Start

Before starting AQF-100 system program, turn on the following switches.

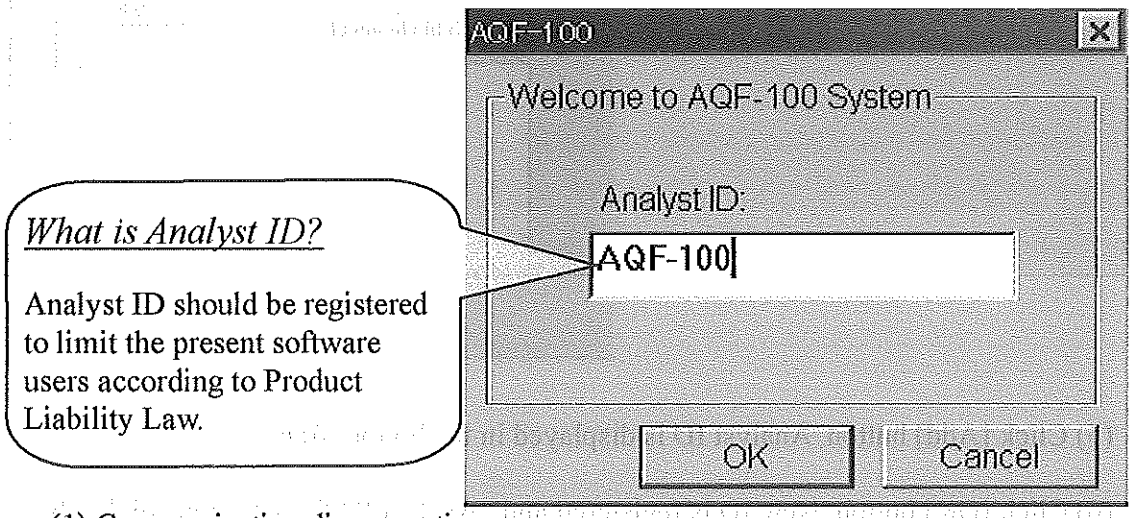
- Power and heater switches of AQF-100 front
- Power switch of GA-100 front
- Power switch of ABC rear
- Cooler switch of ABC front
- Power switch of options

(1) Click "Programs", "AQF-100 System", and "AQF-100 System".
After "AQF-100 System Program" is displayed, "AQF-100" dialog box is displayed.

(2) Input AQF-100 into Analyst ID and click [OK] button. AQF-100 system main window is displayed.

4-1-2. Shutdown

After measurement, shut down AQF-100 system program as follows.



(1) Communication disconnection
Click "System", "System Setup", and [Disconnect] button.
→Heater switch is off and communication to AQF-100 is disconnected.

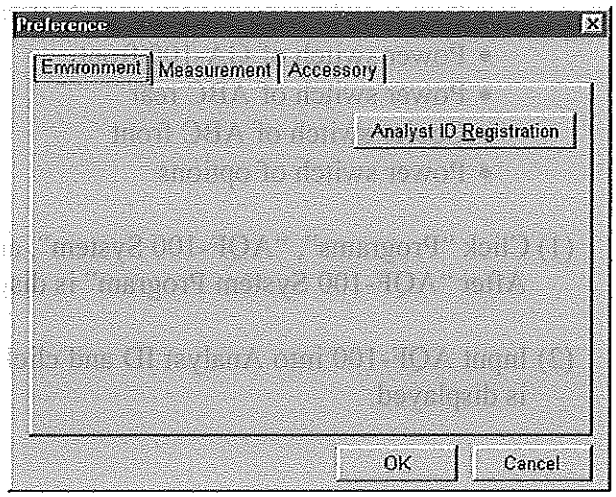
(2) AQF-100 system program exit
Click "×" of the right top of the main window or click "File" and "Exit".
→AQF-100 system program is exited.

4-2. Registration and Deletion of Analyst ID

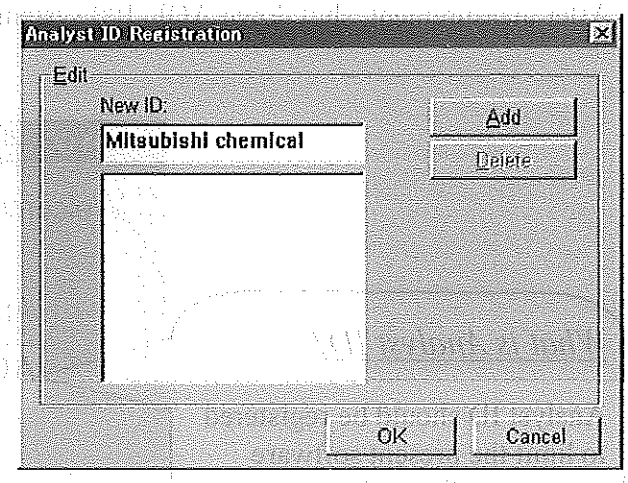
To use AQF-100 system program, Analyst ID is required.
An initial Analyst ID for AQF-100 system is "AQF-100". By using "AQF-100" as Analyst ID, anyone can use this software.
To limit the software user for Product Liability Law, a different ID can be registered.

4-2-1. Analyst ID registration

(1) Click "Preference" in "System" menu of AQF-100 measurement program. "Preference" dialog box is indicated.
(2) Click [Analyst ID Registration] button. "Analyst ID Registration" dialog box is indicated.
(3) Input an analyst ID into "New ID".



(4) Press <Enter> key. New ID is highlighted and [Add] button is available.



(5) Click [Add] button. Analyst ID is displayed in the bottom frame.

(6) Click [OK] button. New ID is registered and "Analyst ID Registration" dialog box is closed and "Preference" returns.

* By clicking [Cancel] button, "New ID" is not registered.

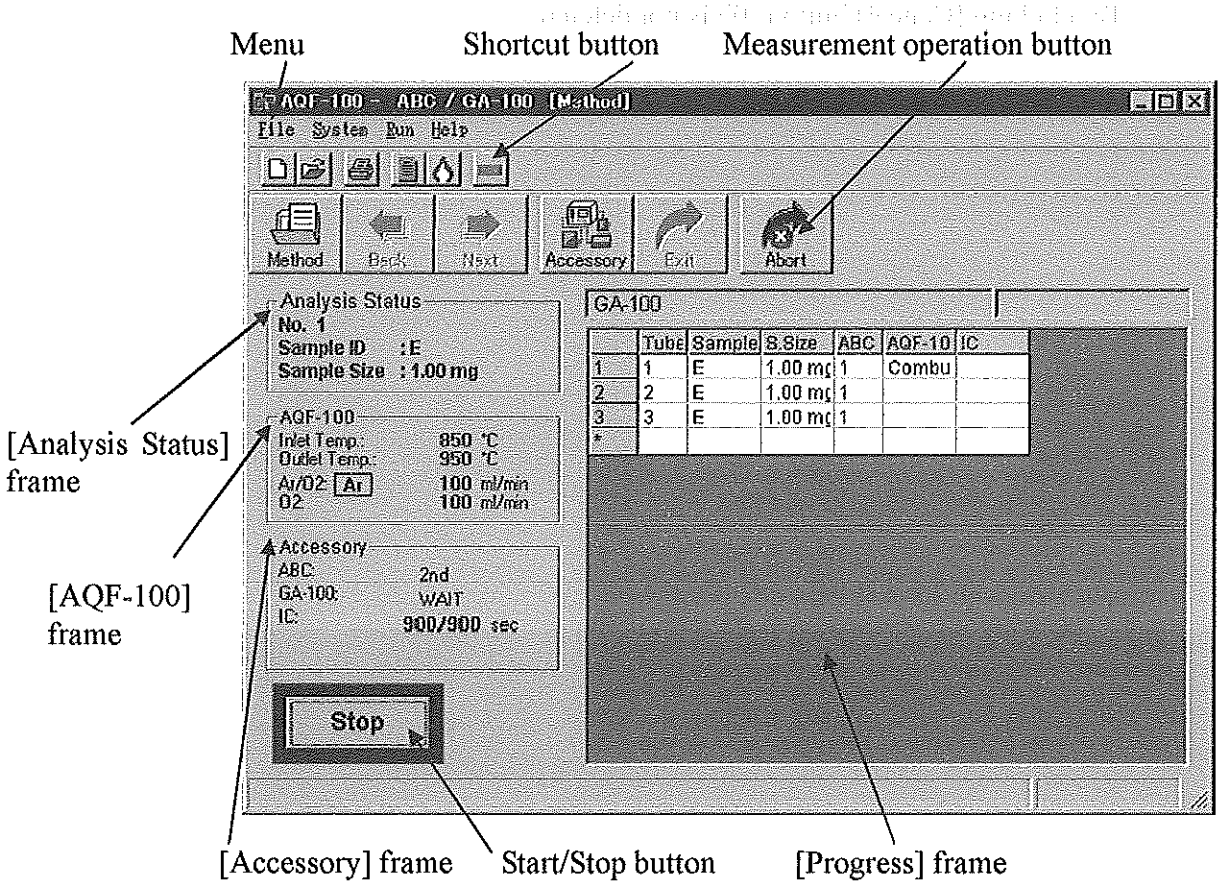
4-2-2. Analyst ID deletion

(1) Click "Preference" in "System". "Preference" dialog box is indicated.
(2) Click [Analyst ID Registration] button. "Analyst ID Registration" dialog box is indicated.
(3) Click ID to select it.
(4) Click [Delete] button. ID is deleted.
(5) Click [OK] button.
* By clicking [Cancel] button, ID is not deleted.

4-3. Main Window Function

4-3-1. Description of main window items

AQF-100 system program main window is as follows.



[Analysis Status] frame

When measurement starts, the following contents are displayed in "Analysis Status".

Display	Contents
No.	Current measurement number
Sample ID	Sample name
Sample Size	Sample volume

Table 4-1. Display contents in "Analysis Status" frame

[AQF-100] frame

When measurement starts, the following contents are displayed in "AQF-100" frame.

Display	Contents
Inlet Temp	The temperature of an electric furnace inlet
Outer Temp	The temperature of an electric furnace outlet
Ar/O_2	Flowing gas type (Ar/O_2) and the flow
O_2	O_2 flow

Table 4-2. Display contents in "AQF-100" frame

[Accessory] frame

When measurement starts, the following contents are displayed in "Accessory" frame. Display contents are different by the accessory connected at "System Setup".

Display	Contents
ABC	ABC condition
GA-100	GA-100 condition
IC	IC Measurement Time and the passing time

Table 4-3. Display contents in "Accessory" frame

[Progress] frame

When measurement starts, the following contents are displayed in "Progress" frame.

Display	Contents
No.	Serial number of sample
Tube	Absorption solvent is measured in tube number order. For repetitive measurement, after the sample of the same tube number is combusted and absorbed, the solvent is measured.
Sample ID	Sample name
S. Size	Sample size
ABC	ABC program number
AQF-100	AQF-100 condition Combustion : During combustion Absorption : During combustion gas absorption Finished : Combustion end
IC	Ion Chromatography unit condition Measurement : During measurement Finished : Measurement end

Table 4-4. Display contents in "Progress" frame

4-3-2. Menu and function list

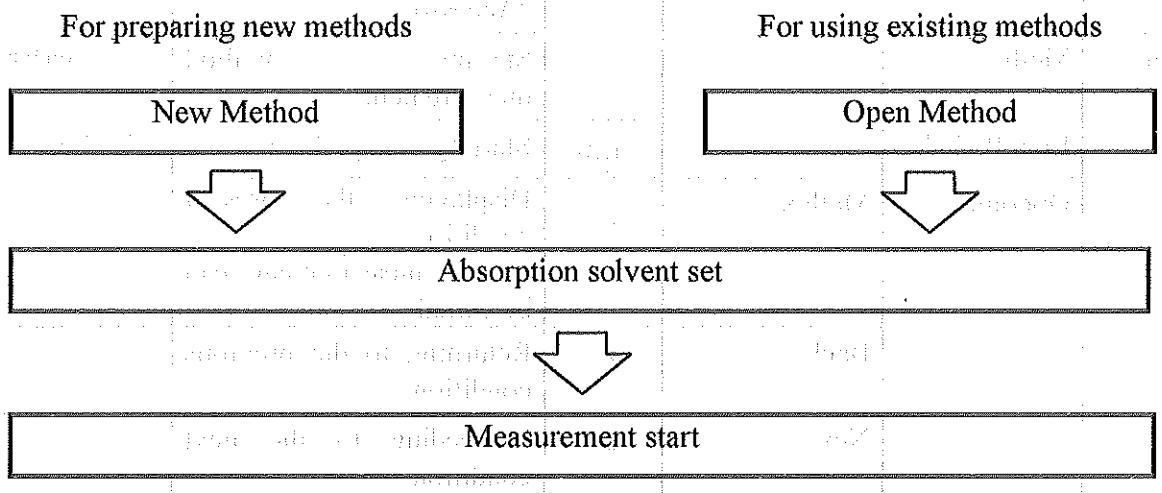
Menu	Sub menu		Button	Contents	Reference
File	New Method			Preparing new methods	4-4-1. New Method
	Open Method			Opening existing methods	4-4-2. Open Method
	Printer Setup			Printer setting	4-6-1. Printer setting
	Print	Print Method		Printing methods during measurement	4-6-2. Print type
		Print Parameters		Printing parameters during measurement	
		Print All ABC Programs Lists		Printing all ABC program lists	
		Print Preference		Printing set preference	
		Print ASC-150L Parameters		Printing ASC-150L parameters	
		Print GA-100 Parameters		Printing GA-100 parameters	
	Exit			Shutting down AQF-100 system program	4-1-2. Shutdown
System	System Setup			Setting an option and starting the communication to AQF-100	5-4-3-1 System Setup
	Heater			Turning on and off the heater switch and setting the temperature	5-4-5. Heater On
	Ar/O2 Gas			Changing Ar/O_2 Gas manually	
	Analysis Parameters			Setting absorption time and ion chromatography time	5-4-3-2. Analysis Parameters
	Accessory			Displaying accessory operation	4-5-1. Accessory (ABC) setting
	GA-100			Setting GA-100 parameters "Wash All", "Solvent Set", and "Solvent Sampling" are available. Displaying GA-100 conditions	4-5-2. GA-100 parameter

Menu	Sub menu		Button	Contents	Reference
	Computer I/F			Setting and checking communication for a computer	4-5-3. Computer I/F
	Preference			Setting "Environment", "Measurement", and "Accessory"	4-5-4. Preference
Run	Method			Starting method measurement	5-7-5. Combustion
	Boat Prebake			Starting boat prebaking	5-4-7. Boat Prebake
	Operation	Method		Displaying the present condition Added measurement can be edited.	
		Back		Returning to the previous condition	
		Next		Proceeding to the next condition	
		Exit Run		Shutting down method measurement	
	Start			Starting measurement	
	Stop			Stopping measurement	
	Abort			Interrupting all power and stopping the unit urgently	
	GA-100 Start			Starting setting GA-100 absorption solvent	
	ABC Manual			Setting ABC program by manual operation	5-6-3. Combustion by ABC manual operation
Help	About System			Displaying AQF-100 system program version information	

Table 4-5. Menu and function list

4-4. Method

To run measurement, "Method" of file for setting measurement conditions is required.
At this system, sample is measured by methods.
At methods, set accessory (Standard composition: ABC), measurement order, and times by samples. Set measurement conditions as follows.



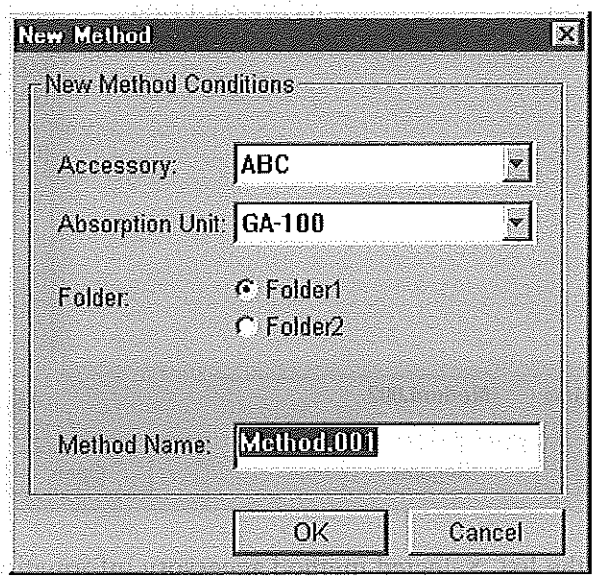
POINT
Any methods can be prepared. When running almost the same measurement, open existing methods and edit them.

4-4-1. New Method

Set a folder to store an accessory, a measurement mode, a method name, and a method.
* Measurement conditions are different by a combination of an accessory and a mode.

(1) Click  or click "File" and "New Method".
"New Method" dialog box is displayed.

(2) Click ▼ of Accessory to select it. For standard composition, select "ABC".



Accessory name	Description
ABC	Automatic Boat Controller ABC
ASC-150L+ABC	Automatic Sample Changer ASC-150L and ABC
ASC-120S	Automatic Sample Changer ASC-120S

(3) Click ▼ of "Absorption Unit" to select a unit.

Absorption Unit name	Description
(NOT USED)	GA-100 is not used.
Gilson	Gilson sampler
GA-100	Gas Absorption Unit GA-100

(4) Click Folder 1 or Folder 2 to save a method file.

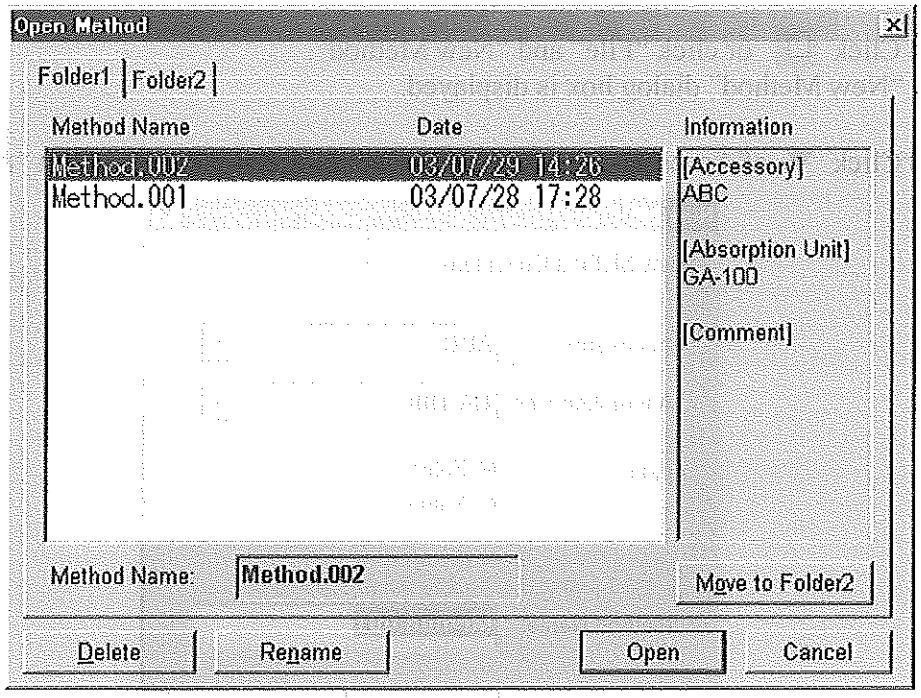
* For example, like folder 1 can be used for calibration curve and Folder 2 can be used for sample, folders can be separated.

(5) Input a method name into "Method Name".

(6) Click [OK] button. "New Method" dialog box is displayed. Refer to 4-4-3. Method edit.

4-4-2. Open Method

(1) Click  or click "File" and "Open Method". "Open Method" dialog box is displayed.



(2) Click methods in the list. Selected method accessory information is displayed in "Information".

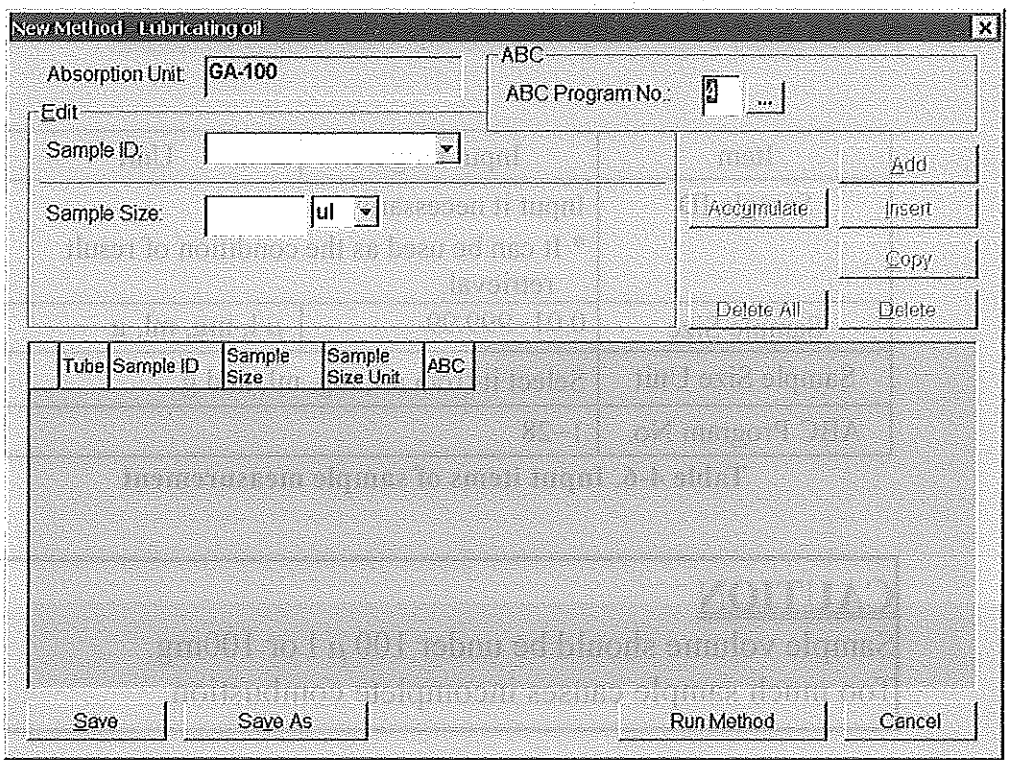
(3) Click [Open] button. The method edit dialog box is displayed.
Refer to 4-4-3. Method edit.

4-4-3. Method edit

Edit a method and set measurement conditions.

4-4-3-1. Edit flow

(1) Prepare a new method or open an existing method. (Refer to 4-4-1. New Method or 4-4-2. Open Method.) The method edit dialog box is displayed.

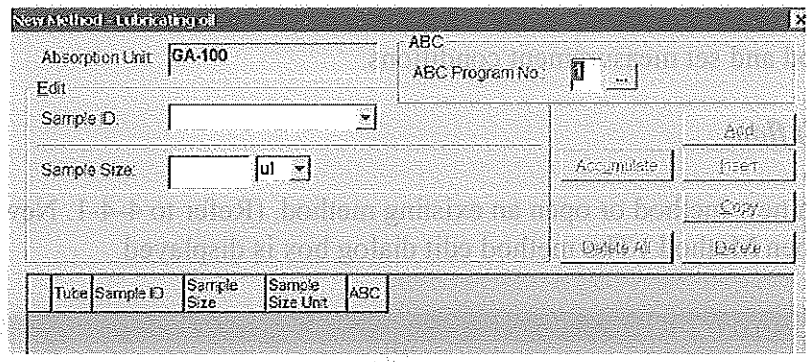


* "New Method" contents are partly different from "Open Method" contents. The above dialog box is "New Method".

* The title of "New Method" edit dialog box is different from one of "Open Method". But their contents are same.

For preparing a new method	[New Method (Method Name)]
For using an existing method	[Open Method (Method Name)]

(2) Input items of sample measurement



Item	Input range	Unit
Sample ID	Input it necessarily. * It can be used as the condition of result retrieval.	
Sample Size	0.01~999.99	μ l, mg, ml, g
Sample Size Unit	Select it from μ l, mg, ml, and g.	
ABC Program No.	1~28	

Table 4-6. Input items of sample measurement

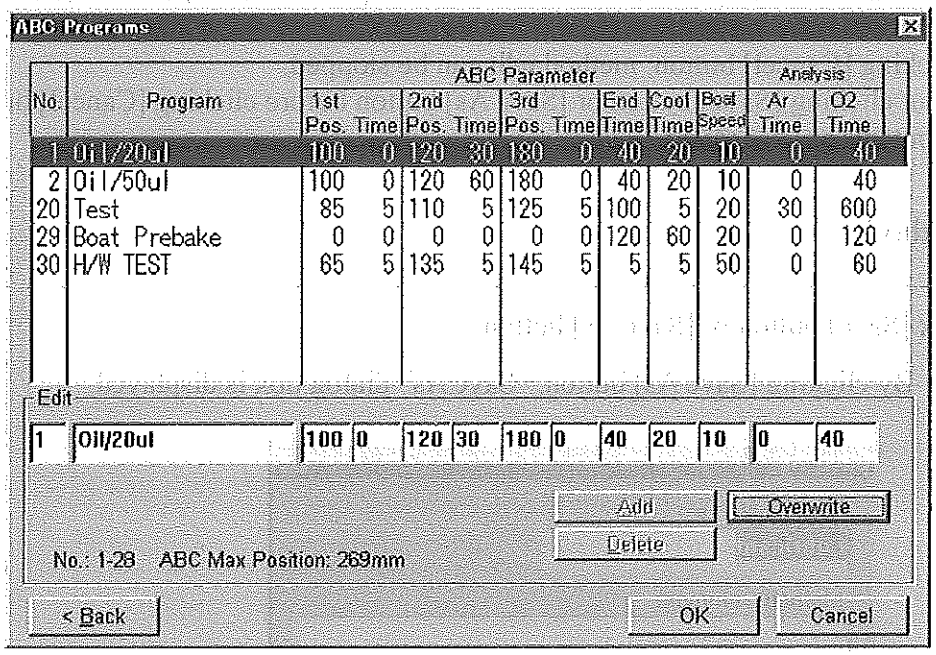
CAUTION
Sample volume should be under 100 μ l or 100mg.
Too much sample causes incomplete combustion.

(3) Click ... button of "ABC Program No." right.

"ABC Programs" dialog box is displayed.

* When a program No. is known, input it directly to "ABC Program No." and proceed to (5).

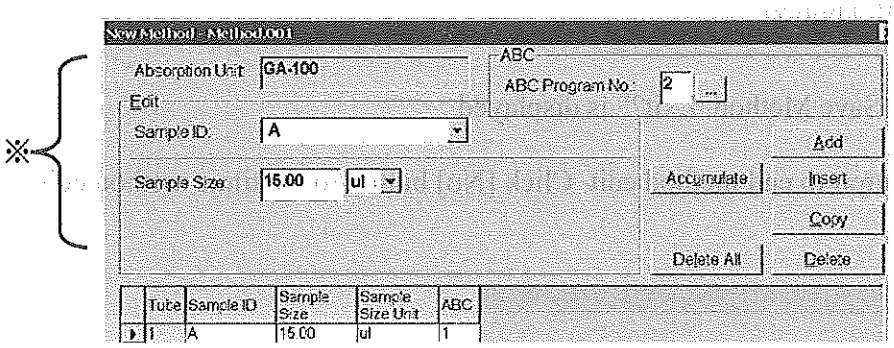
(4) Click a program (Example : No.1) and click [OK] button.



The method edit dialog box returns. Selected ABC program No. is displayed in "ABC Program No.".

(5) Click [Add] button. "ABC Program No." program is added into a dialog box bottom list.

* Added parts are ※ contents and ABC Program No.



(6) Add programs after the second into the list by (3)~(6) in the same way.

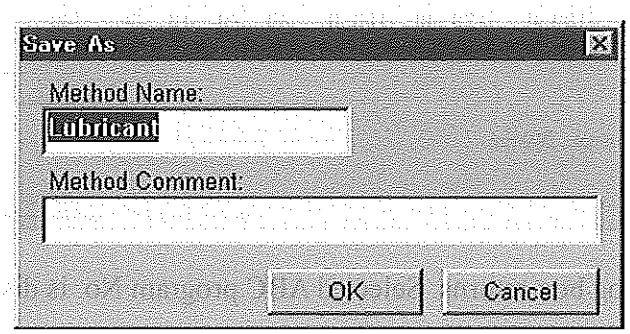
	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	A	15.00	ul	1
	2	A	15.00	ul	1
	3	B	20.00	ul	2
▶	4	B	20.00	ul	2

This is the completion of method edit.
To start measurement by the edited method, click [Run Method] button. (Refer to 4-4-4. Run.)
* By clicking [Cancel] button, method edit can be stopped.
Without clicking [Save] button or [Save As] button before clicking [Cancel] button, edit contents are not saved.

For saving methods

(1) Click [Save] button or [Save As] button.

① By clicking [Save As] button, "Save As" dialog box is displayed.



② Input method name into "Method Name".

Up to 40 characters can be inputted into "Method Comment".

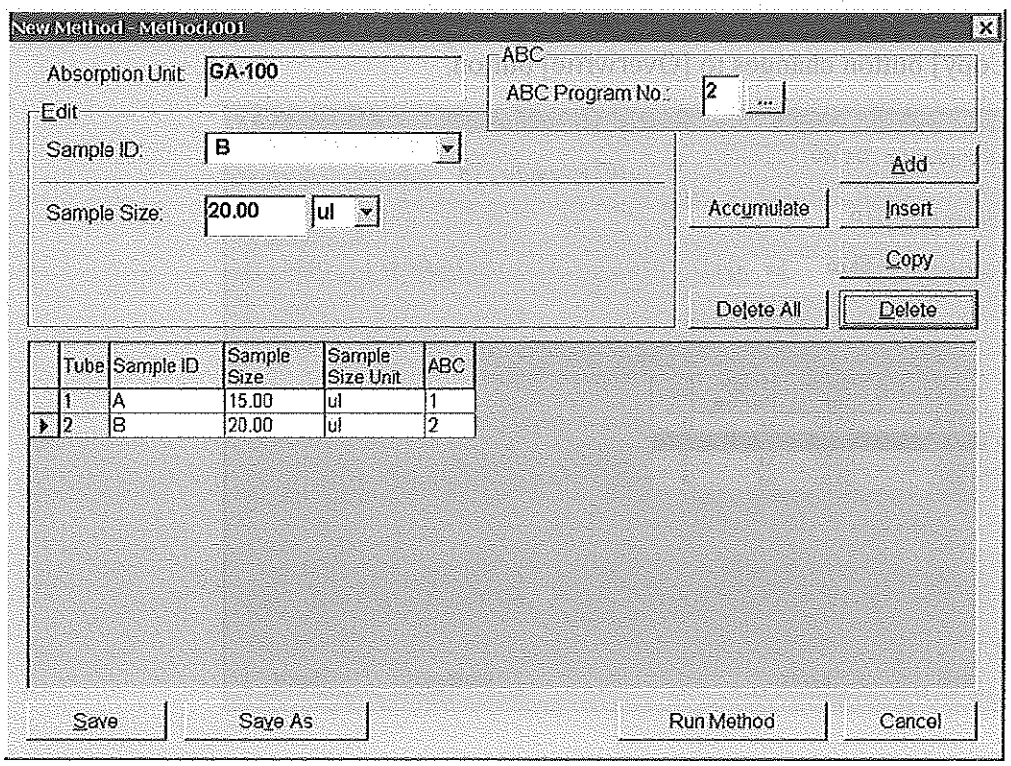
③ Click [OK] button.

(2) After saving, "Save Method. Exit?" is displayed.

(3) Click [Yes] button to end method edit. Click [No] button to continue method edit.

4-4-3-2. Measurement addition and deletion

By using [Add], [Insert], [Copy (Overwrite)], [Accumulate], and [Delete], and [Delete All] buttons, the following edit operations can be run.



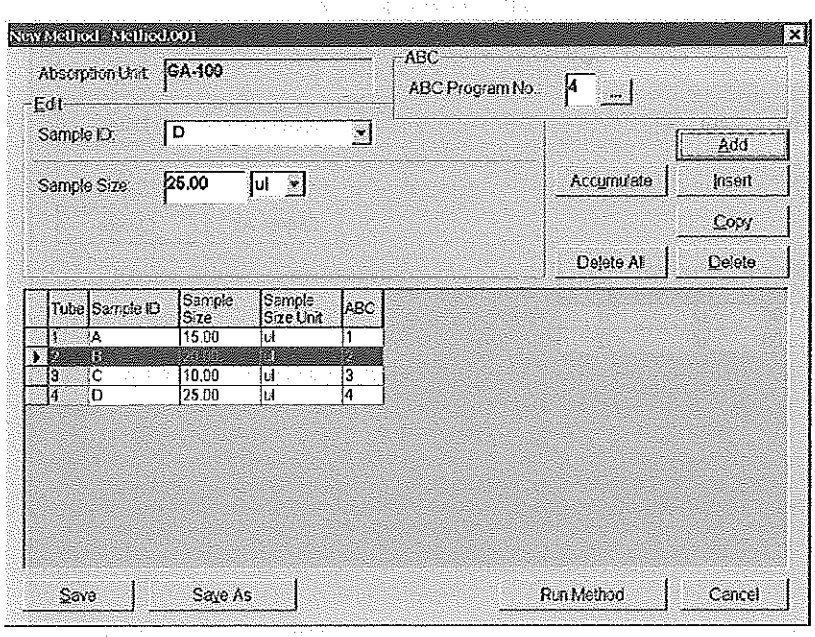
- Measurement copy
- Measurement addition
- Measurement insertion
- Measurement overwrite
- Measurement deletion
- Measurement accumulation
- All measurements deletion

Refer to the next page and after for operation.

Measurement copy

To add and insert set contents, copy the line.

(1) Click the line (Example : the second line) to highlight it.
(2) Click [Copy] button. The line contents are copied to edit part and ABC Program No. [Copy] button changes to [Overwrite] button.



Measurement insertion

New measurement can be inserted among set measurements.

(1) Copy measurement or input edit part and ABC program No.

(2) Click a line (Example : the fourth line) to highlight it. A new line is inserted into the above of a selected line.

	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	A	15.00	ul	1
	2	B	20.00	ul	2
	3	C	10.00	ul	3
▶	4	D	25.00	ul	4

(3) Click [Insert] button. A new line is inserted.

	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	A	15.00	ul	1
	2	B	20.00	ul	2
	3	C	10.00	ul	3
▶	4	B	20.00	ul	2
	5	D	25.00	ul	4

(4) By clicking [Insert] button repeatedly, new lines are inserted.

Measurement addition

Lines can be added to the bottom of existing measurement lines.

(1) Copy measurement contents or input edit parts and ABC program No.

(2) Click [Add] button. One line is added to the bottom line.

	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	A	15.00	ul	1
	2	B	20.00	ul	2
	3	C	10.00	ul	3
	4	B	20.00	ul	2
	5	D	25.00	ul	4
▶	6	B	20.00	ul	2

(3) By clicking [Add] button repeatedly, new lines are added.

[Overwrite] button

Unnecessary lines can be overwritten by copy and changed into new contents.

(1) Copy an existing measurement line (Example: the second line).

	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	A	15.00	ul	1
▶	2	B	20.00	ul	2
	3	C	10.00	ul	3
	4	B	20.00	ul	2
	5	D	25.00	ul	4
	6	B	20.00	ul	2

(2) Click an unnecessary line (Example : the third line) to highlight it.

	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	A	15.00	ul	1
	2	B	20.00	ul	2
▶	3	C	10.00	ul	3
	4	B	20.00	ul	2
	5	D	25.00	ul	4
	6	B	20.00	ul	2

(3) Click [Overwrite] button. The line is overwritten and new contents are displayed.

	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	A	15.00	ul	1
	2	B	20.00	ul	2
▶	3	B	20.00	ul	2
	4	B	20.00	ul	2
	5	D	25.00	ul	4
	6	B	20.00	ul	2

Measurement deletion

Unnecessary lines can be deleted.

(1) Click an unnecessary line (Example : the sixth line) to highlight it.

	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	A	15.00	ul	1
	2	B	20.00	ul	2
	3	B	20.00	ul	2
	4	B	20.00	ul	2
	5	D	25.00	ul	4
▶	6	B	20.00	ul	2

(2) Click [Delete] button. The line is deleted.

	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	A	15.00	ul	1
	2	B	20.00	ul	2
	3	B	20.00	ul	2
	4	B	20.00	ul	2
▶	5	D	25.00	ul	4

- By clicking [Delete All] button, all measurements can be deleted. With lines of ended measurement, this button can't be clicked.

Measurement accumulation

Different samples in the same tube (absorption solvent) can be measured continuously.

(1) Input edit part and ABC Program No.

(2) Click a line position (Example: the fifth line) to highlight it.
A new line is inserted below selected line.

	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	A	15.00	ul	1
	2	B	20.00	ul	2
	3	B	20.00	ul	2
	4	B	20.00	ul	2
▶	5	D	25.00	ul	4

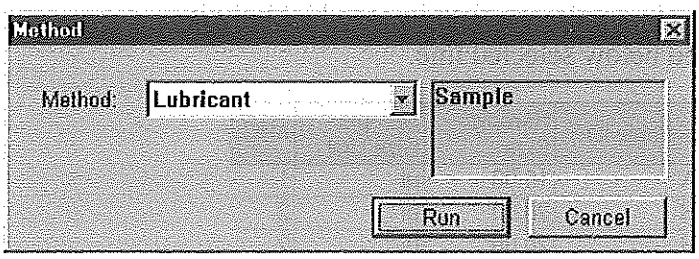
(3) Click [Accumulate] button. A new line is inserted.

	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	A	15.00	ul	1
	2	B	20.00	ul	2
	3	B	20.00	ul	2
	4	B	20.00	ul	2
	5	D	25.00	ul	4
	5	E	25.00	ul	4
▶	5	F	25.00	ul	4

(4) By clicking [Accumulate] button repetitively, new lines are inserted.
The "Tube" numbers of inserted lines are same.

4-4-4. Run

(1) Click [Run Method] button in the method edit dialog box. [Method] dialog box is displayed.
* By selecting "Run" and "Method", [Method] dialog box is displayed. But, click ▼ of "Method" to select methods.



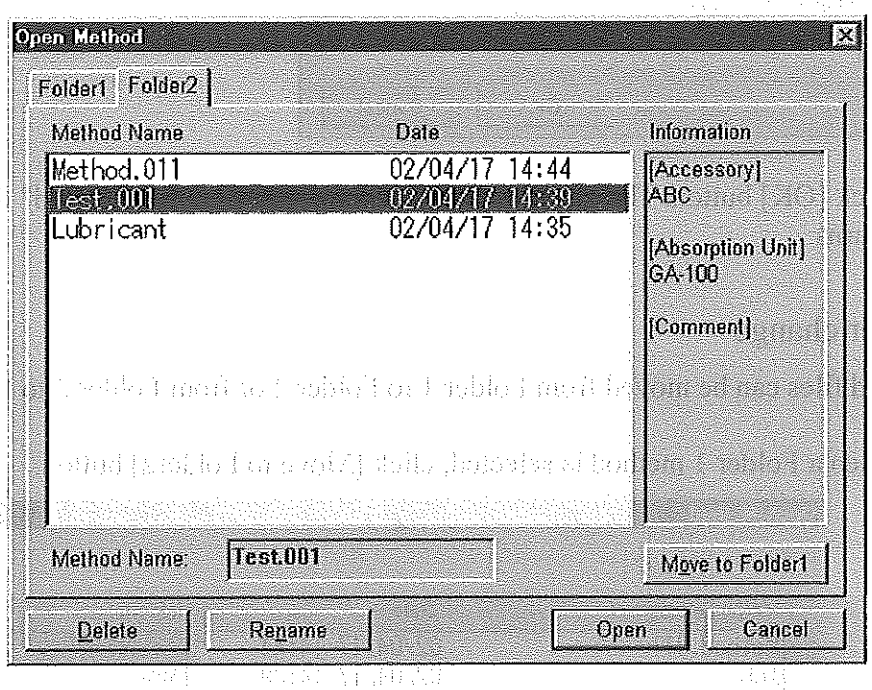
(2) Click [Run] button. The main window returns and "ABC Home Moving" is displayed. After a while, measurement is ready.

4-4-5. Method management

Existing method names and saving positions can be changed.
In addition, unnecessary methods can be deleted.

(1) Click  or click "File" and "Open Method". "Open Method" dialog box is displayed.

(2) Select a method from a list.

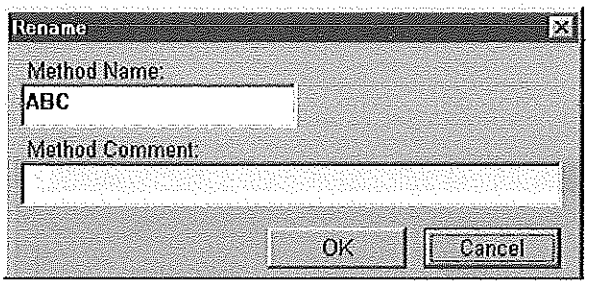


Selected method information is displayed in "Information".
The selected method name and the folder can be changed and deleted.

Rename

(1) Click [Rename] button of "Open Method" dialog box when a method is selected. "Rename" dialog box is displayed.

(2) Input a name into "Method Name".

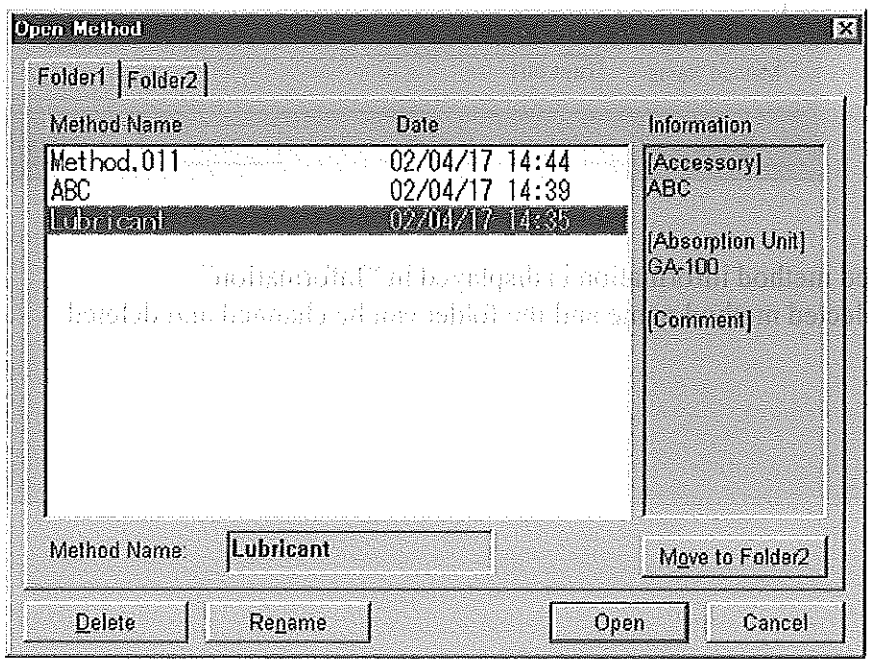


(3) Click [OK] button. The method name is changed and "Open Method" dialog box returns.

Method folder change

Method files can be moved from Folder 1 to Folder 2 or from Folder 2 to Folder 1.

(1) When a Folder 1 method is selected, click [Move to Folder2] button.



The method moves to Folder 2.

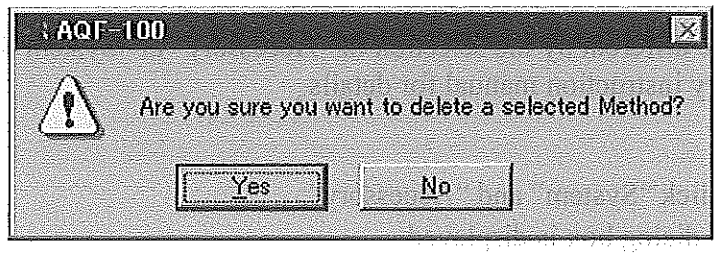
* In the opposite case, click [Move to Folder1] button when a Folder 2 method is selected.

Method deletion

Unnecessary methods can be deleted.

POINT
Deleted methods can't be undone.

(1) Click [Delete] button when methods are selected.
The following dialog box is displayed.



(2) Click [Yes] button. They are deleted.

4-5. Setting

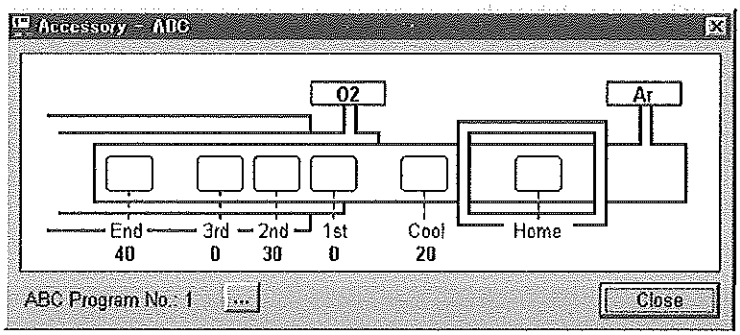
POINT

Once the condition is set on the same measurement condition, the change is not required. Change it if necessary.

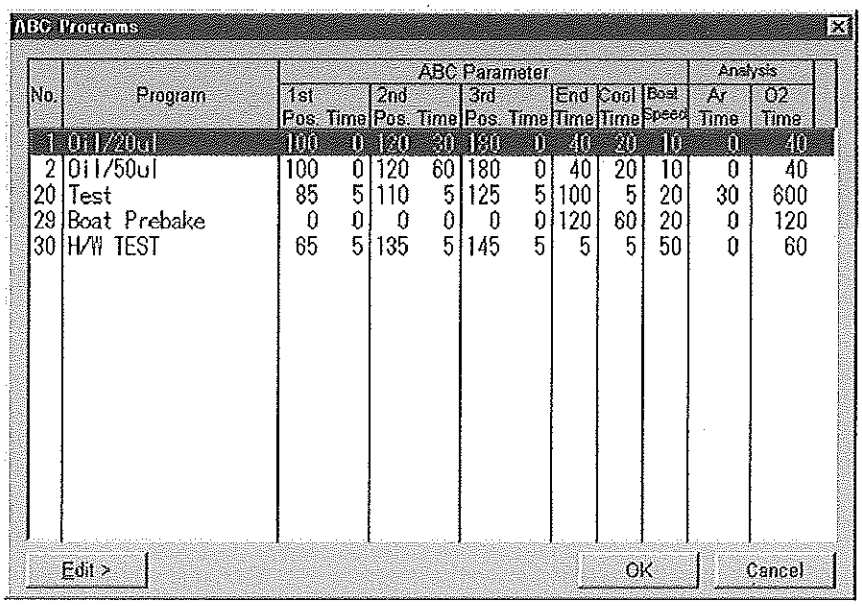
4-5-1. Accessory (ABC) setting

Set ABC program.
Accessory contents are different by the selection of "Accessory" at "System Setup".
Refer to each accessory instruction manual for details.

(1) Click  or click "System" and "Accessory".
"Accessory-ABC" dialog box is displayed.

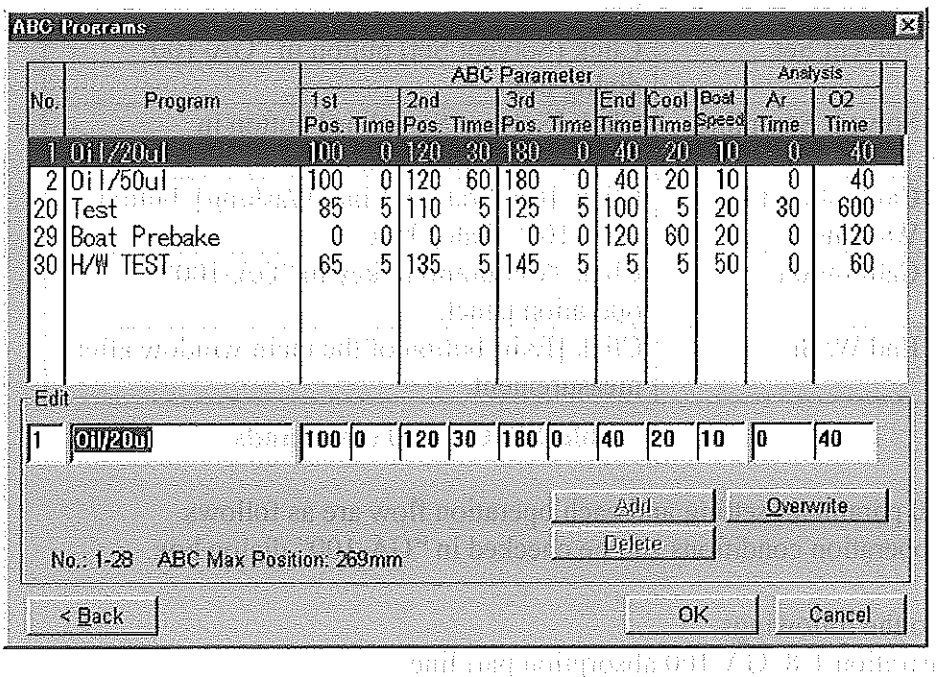


(2) Click  button to display "ABC Programs" dialog box.



(3) Click [Edit] button to move to the edit mode.

(4) Move a cursor to each item of "ABC Parameter" and "Analysis" to correct it.
Click [Add] button to add the program.
Click [Overwrite] button to overwrite the program.
Click [Delete] button to delete the whole of Program No.



(5) Click [OK] button. ABC program setting is saved and "ABC Programs" dialog box is closed.

4-5-2. GA-100 parameter

Absorption unit has the following five commands.

Command	Operation method
Wash All	Click [Wash All] button in "GA-100" dialog box.
Solvent Set	Click [Solvent Set] button in "GA-100" dialog box.
Solvent Sampling	Click [Solvent Sampling] button in "GA-100" dialog box.
Calibration Line Washing	Click [Calibration Line Washing] button in "GA-100" dialog box.
Calibration	Click <Calibration> key in "GA-100" operation panel.
End Wash	Click [Exit] button of the main window after measurement.

Table 4-7. GA-100 commands

GA-100 parameter setting and each operation flow are as follows.
These operation conditions can be checked in "GA-100" dialog box.

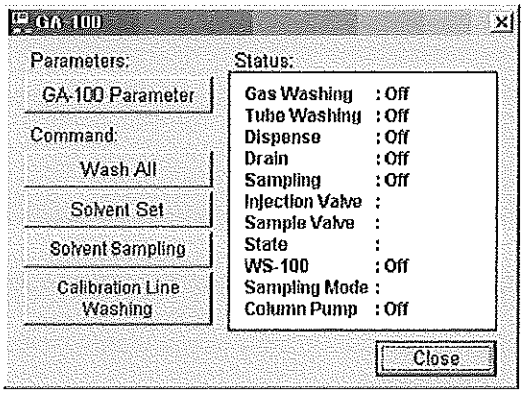
Refer to the followings.
Illustration 1-8. GA-100 absorption part line
Table 1-8. GA-100 absorption part line names and functions
Illustration 1-9. GA-100 operation panel
Table 1-9. GA-100 operation panel names and functions

POINT

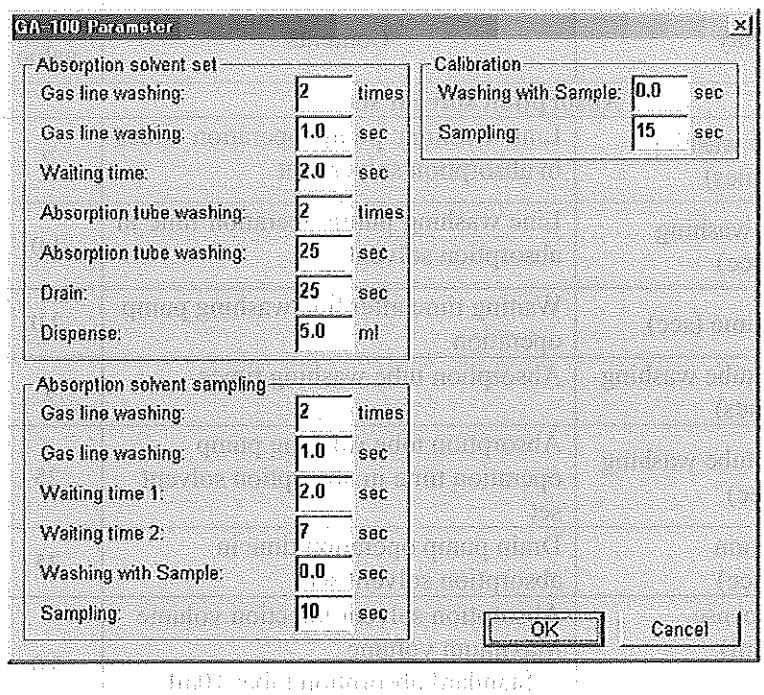
Set "GA-100 Parameter" while checking each operation.
Once it is set, setting is not changed so often.
Change it if necessary.
Adjust the gas flow same as measurement condition when setting parameters. Without the same amount of gas flow, setting parameter errors might occur.
Without flowing gas at the setting, washing solution flows back into a pyrolysis tube during line washing.

4-5-2-1. GA-100 parameter setting

(1) Click "System" and "GA-100". "GA-100" dialog box is displayed.



(2) Click [GA-100 Parameter] button. "GA-100 Parameter" dialog box is displayed.



(3) By absorption tube capacity, initial values should be as Table 4-8.
Measure them with a stopwatch and set appropriate values.

Parameters	Absorption tube 10ml	Absorption tube 20ml
Absorption tube washing	20 sec	30 sec
Drain	15 sec	30 sec

Table 4-8. Initial values

(4) Input each item. Table 4-9 shows GA-100 parameter setting input items.

(5) Click [OK] button. GA-100 Parameter setting is saved and "GA-100 Parameter" dialog box is closed.

(6) Check "Wash All", "Solvent Set", "Solvent Sampling", and "Calibration Line Washing" movements with each button of "GA-100" dialog box.
Check "Calibration" movement with <Calibration> key of GA-100 operation panel.

POINT
Once measurement starts, parameters can't be changed.

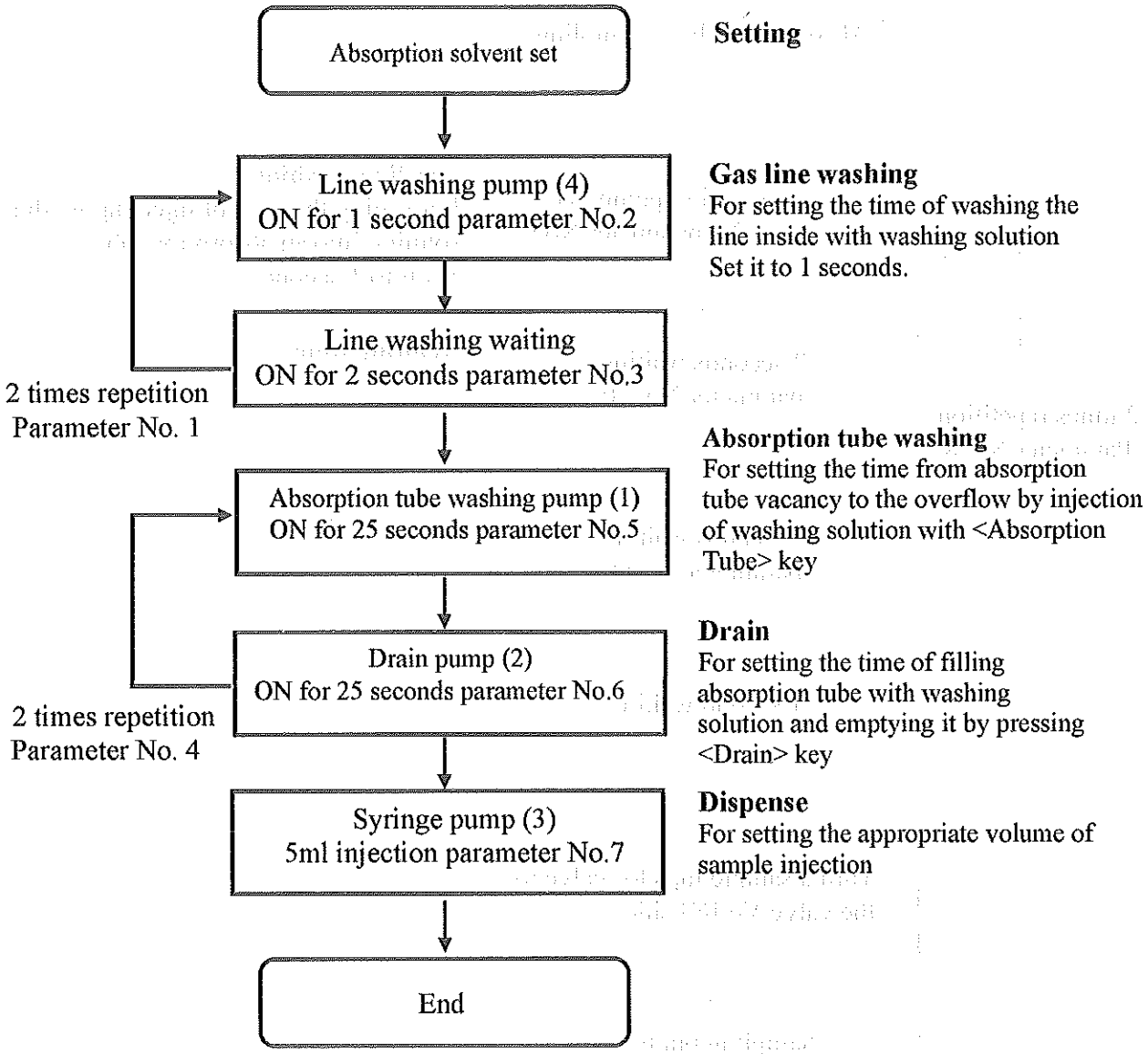
CAUTION
Conduct movement command when the cover of ABC sample box is closed. For command except "Calibration", operation is wrong and washing solution runs into a pyrolysis tube.

Parameter No.	Display	Contents	Initial value	Setting range
Absorption solvent set				
1	Gas line washing (times)	Line washing pump operation times in absorption solvent set	2	0~99
2	Gas line washing (sec)	Line washing pump operation time in absorption solvent set	1.0	0.1~2.0
3	Waiting time (sec)	Waiting time after line washing pump operation	2.0	0~99.0
4	Absorption tube washing (times)	Absorption tube washing times	2	1~99
5	Absorption tube washing (sec)	Absorption tube washing pump operation time in absorption solvent set	25	0~99
6	Drain (sec)	Drain pump operation time in absorption solvent set	25	0~99
7	Dispense (ml)	Absorption solvent injection volume Maximum volume Standard absorption tube: 10ml Optional absorption tube: 20ml	5.0	0.1~30
Absorption solvent sampling				
8	Gas line washing (times)	Line washing pump operation times in absorption solvent sampling	2	0~99.0
9	Gas line washing (sec)	Line washing pump operation time in absorption solvent sampling	1.0	0.1~2.0
10	Waiting time 1 (sec)	Line washing pump operation interval in absorption solvent sampling	2.0	0.1~ 10.0
11	Waiting time 2 (sec)	Waiting time until absorption solvent sampling after line washing	7	0~99
12	Washing with Sample (sec)	Time of washing with a sample from an absorption solvent tube to a sample injector Recommended conditions by sample loops 100 μl: 0.0, 20 μl: 20	0.0	0.0~ 99.9
13	Sampling (sec)	Sampling time of absorption solvent	10	0~99
Calibration				
14	Washing with Sample (sec)	Time of washing with a sample from a standard solution tube to a sample injector Recommended conditions by sample loops 100 μl: 0.0, 20 μl: 10	0.0	0.0~ 99.9
15	Sampling (sec)	Sampling time of standard solution	15	0~99

Table 4-9. GA-100 parameter setting input items

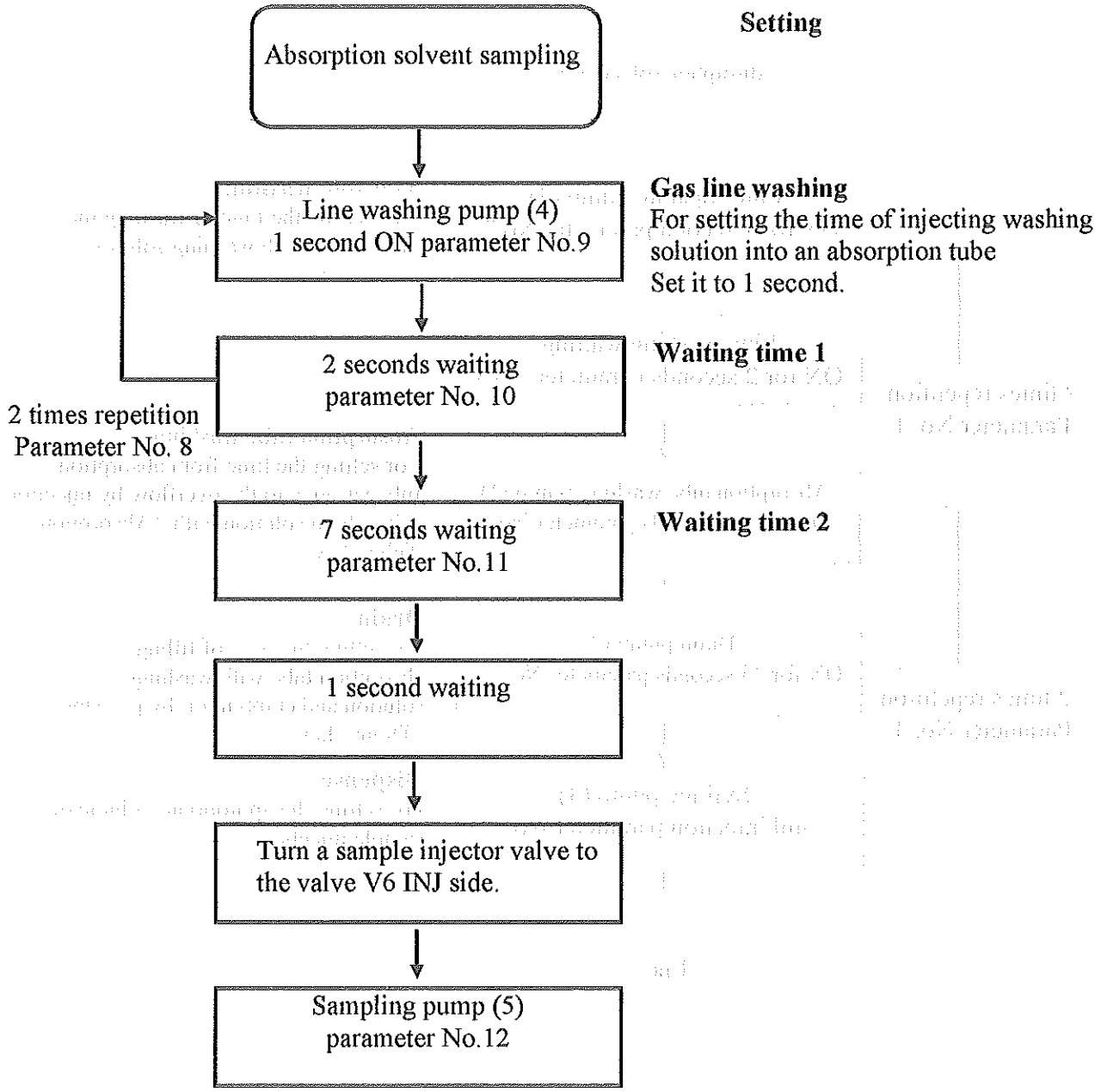
4-5-2-2. "Absorption solvent set" flow

"Absorption solvent set" is operation for injecting absorption solvent into an absorption tube. The following flow parameter values are indicated by initial values.

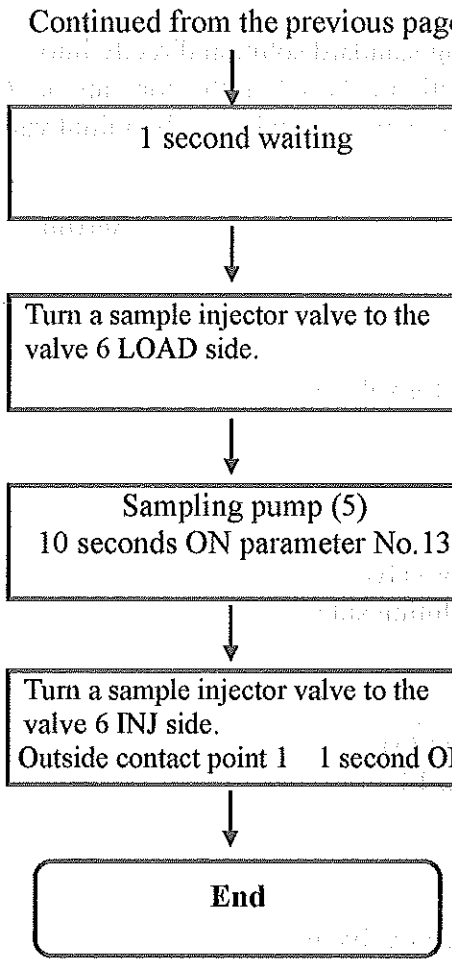


4-5-2-3. "Absorption solvent sampling" flow

"Absorption solvent sampling" is operation for injecting absorption solvent into a sample loop. The following flow parameter values are indicated by initial values.



Continued on the next page



Sampling
For setting the time of absorption solvent flowing into a drain line by pressing <Sampling> key Refer to POINT.

POINT

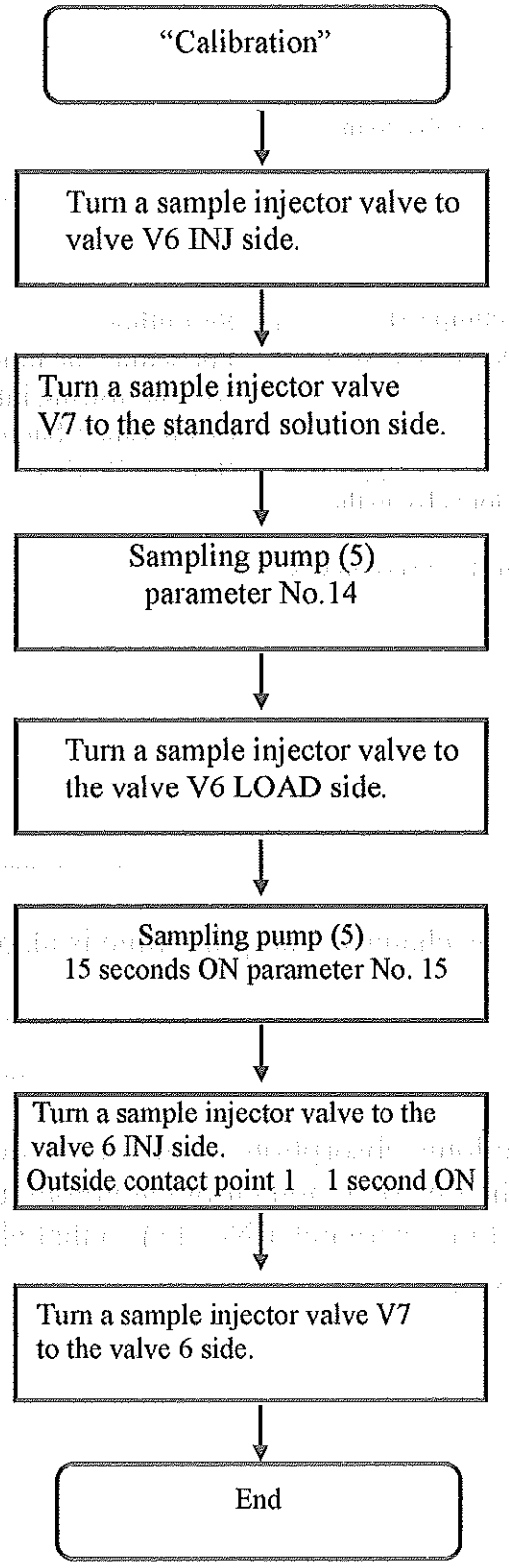
If sample loop volume is changed, sampling time is also different.

CAUTION

If sampling time is too long, absorption solution becomes empty. Air goes into the line of an ion chromatography unit and column. Set sampling time (parameter No. 13) so that absorption solvent should not be empty.

4-5-2-4. "Calibration" flow

"Calibration" is operation for injecting standard solution directly into a sample loop from a tube. The operation is based on the contents of "GA-100 Parameter" setting. The following flow parameter values are indicated by initial values.



Setting

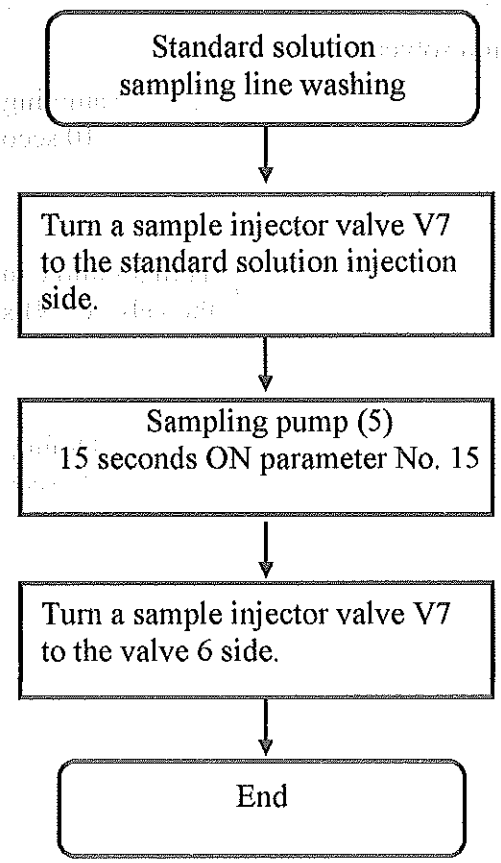
Sampling
For setting the time of standard solution flowing into a drain line by pressing <Calibration> key Refer to POINT.

POINT
If sample loop volume is changed, sampling time is also different.

CAUTION
If sampling time is too long, absorption solution becomes empty. Air goes into the line of an ion chromatography unit and column. Set sampling time (parameter No. 15) so that absorption solvent should not be empty.

4-5-2-5. "Calibration Line Washing" flow

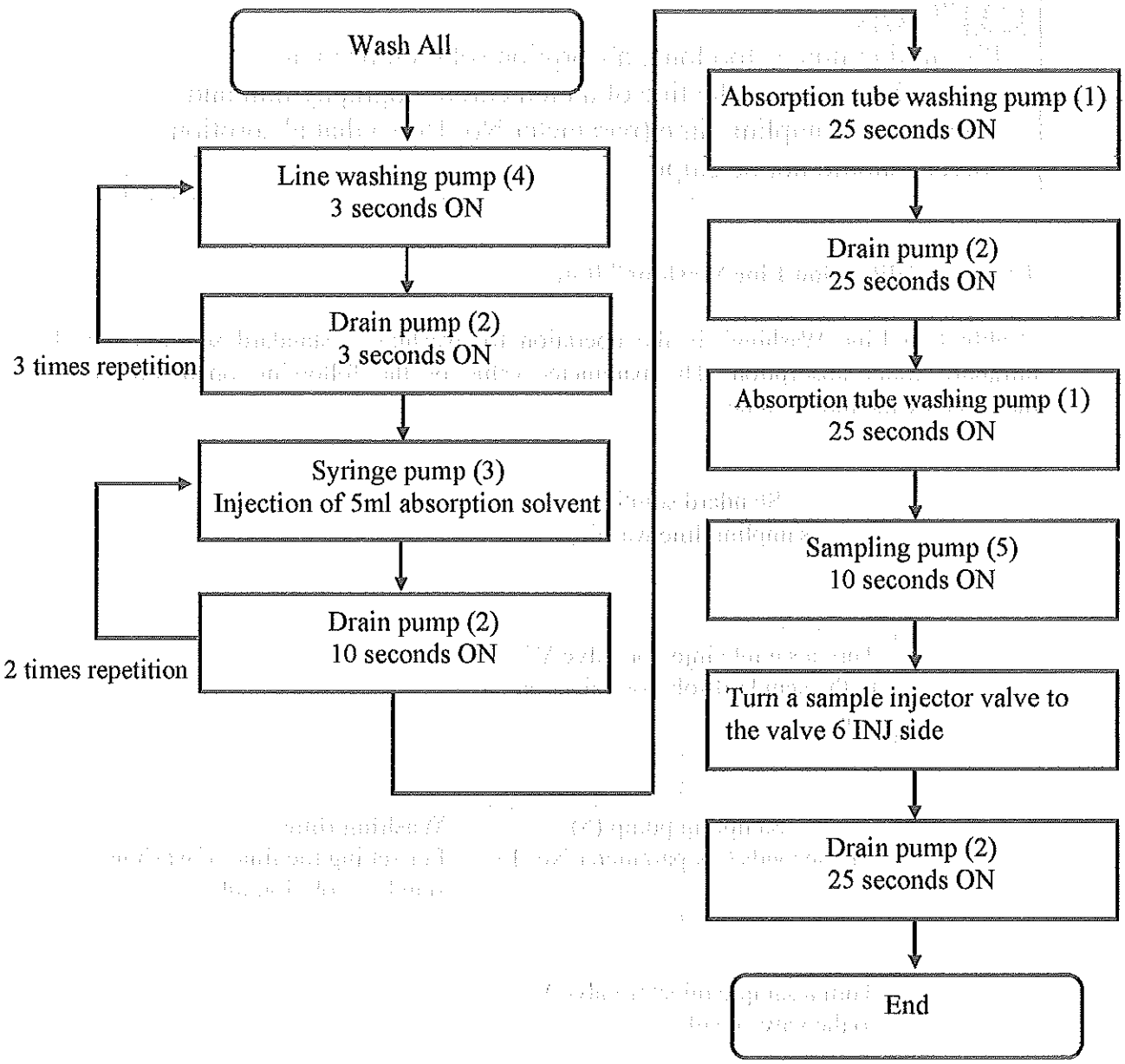
"Calibration Line Washing" is the operation for washing a standard solution tube by ultrapure water absorption. The parameter value of the following operation flow is indicated by the initial value.



Washing time
For setting the time of washing a standard solution tube

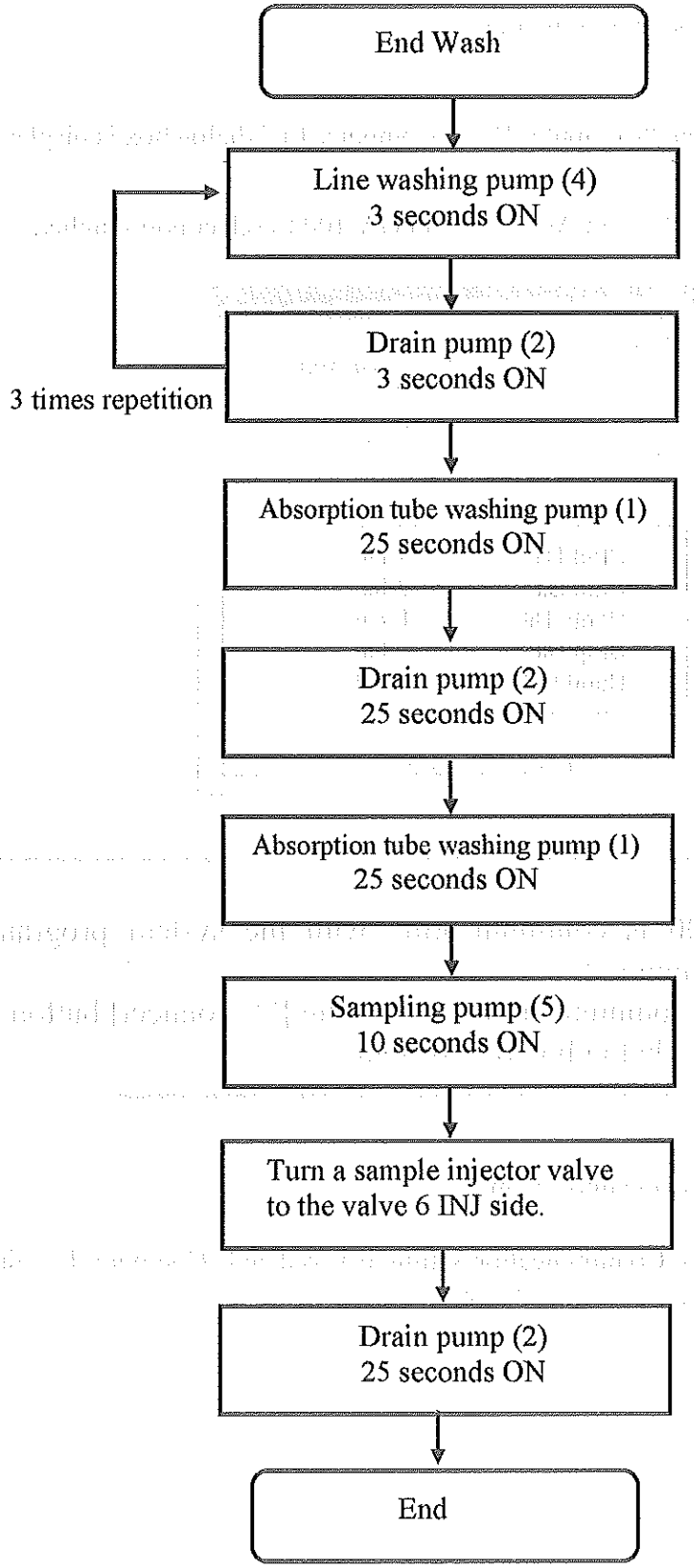
4-5-2-6. "Wash All" flow

Run "Wash All " before measurement start. GA-100 runs by the following flow chart.



4-5-2-7. End Wash flow

Run "End Wash" at measurement end. GA-100 runs by the following flow chart.

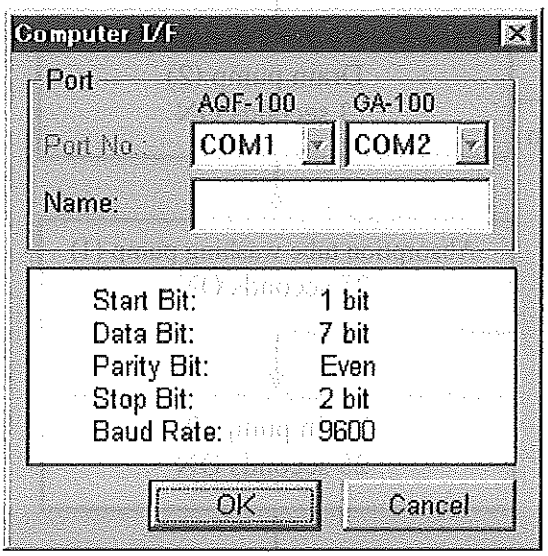


4-5-3. Computer I/F

In "Computer I/F" dialog box, set "Port No." and input a unit name.
Communication conditions are displayed. By inputting a name into "Name", print result can be separated in common printer use.

(1) Click "System" and "Computer I/F". "Computer I/F" dialog box is displayed.

(2) Click ▼ of "Port No." of AQF-100 and GA-100 to select port numbers.



POINT

When AQF-100 is communicating with the system program, a name can't be inputted.
Disconnect the communication by clicking [Disconnect] button of "System Setup" dialog box of "System".

(3) Input an optional name into "Name".

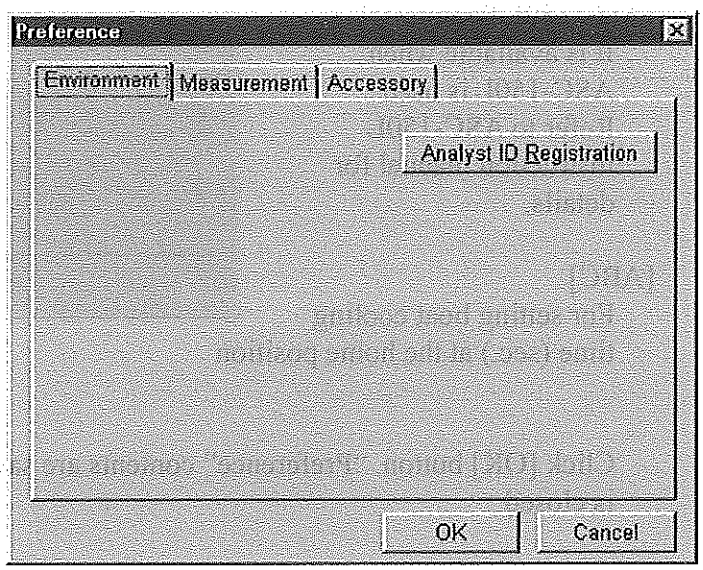
(4) Click [OK] button. Communication setting is saved and "Computer I/F" dialog box is closed. Optional name is printed to print result.

4-5-4. Preference

Set and change basic system environment here.
Click "System" and "Preference". "Preference" dialog box is displayed.

Environment

[Analyst ID Registration]
Refer to 4-2. Registration and Deletion of Analyst ID.

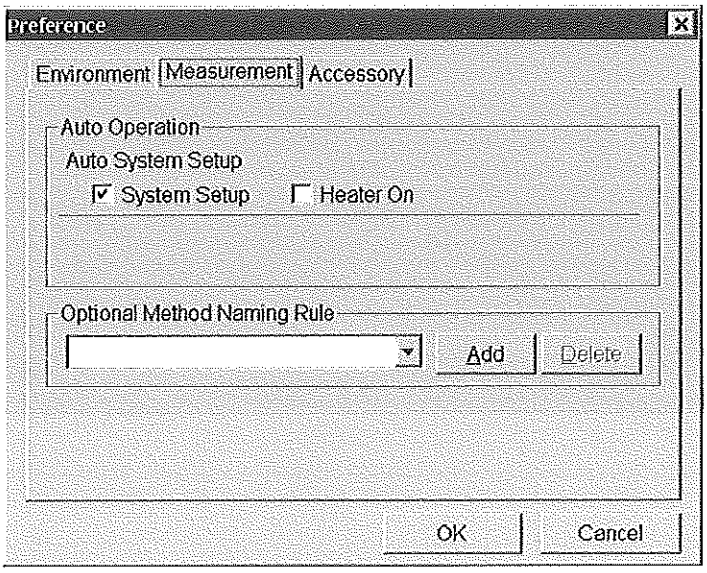


Measurement

[Auto System Setup]
After starting the system program, set automatic operation.
Click the item check box.

- System Setup
- Heater On

("Heater On" is effective by checking "System Setup".)

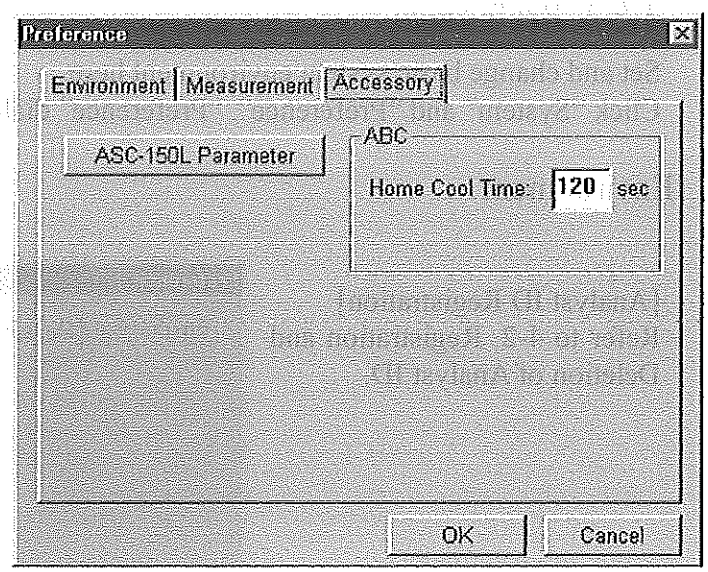


[ASC-When all measurement is finished.]

Setting for ASC-150L or ASC-120S use
(Without the use, the setting is invalid.)

Refer to ASC-150L or ASC-120S instruction manual for details.

Accessory



For setting the use environment and operation when an accessory is connected

[ASC-150L Parameter]
It is available when ASC-150L is used. Refer to ASC-150L instruction manual for details.

[ABC]
For setting boat cooling time (sec.) at the home position

Click [OK] button. "Preference" contents are saved and "Preference" dialog box is closed.

4-6. Print Function

4-6-1. Printer setting

(1) Click "File" and "Printer Setup". "Printer Setup" window is displayed.

(2) When some printers are connected, click ▼ of "Name" to select a printer.

(3) Click [Property] button to set printer details. Refer to a printer instruction manual.

(4) Click ▼ of "Size" to select a paper size. (Default: A4)

(5) Click a print direction. (Default: Vertical direction)

(6) Click [OK] button. The setting is saved.

4-6-2. Print type

For AQF-100 system program, some types of print are available.
The following items can be selected by clicking "File" and "Print".

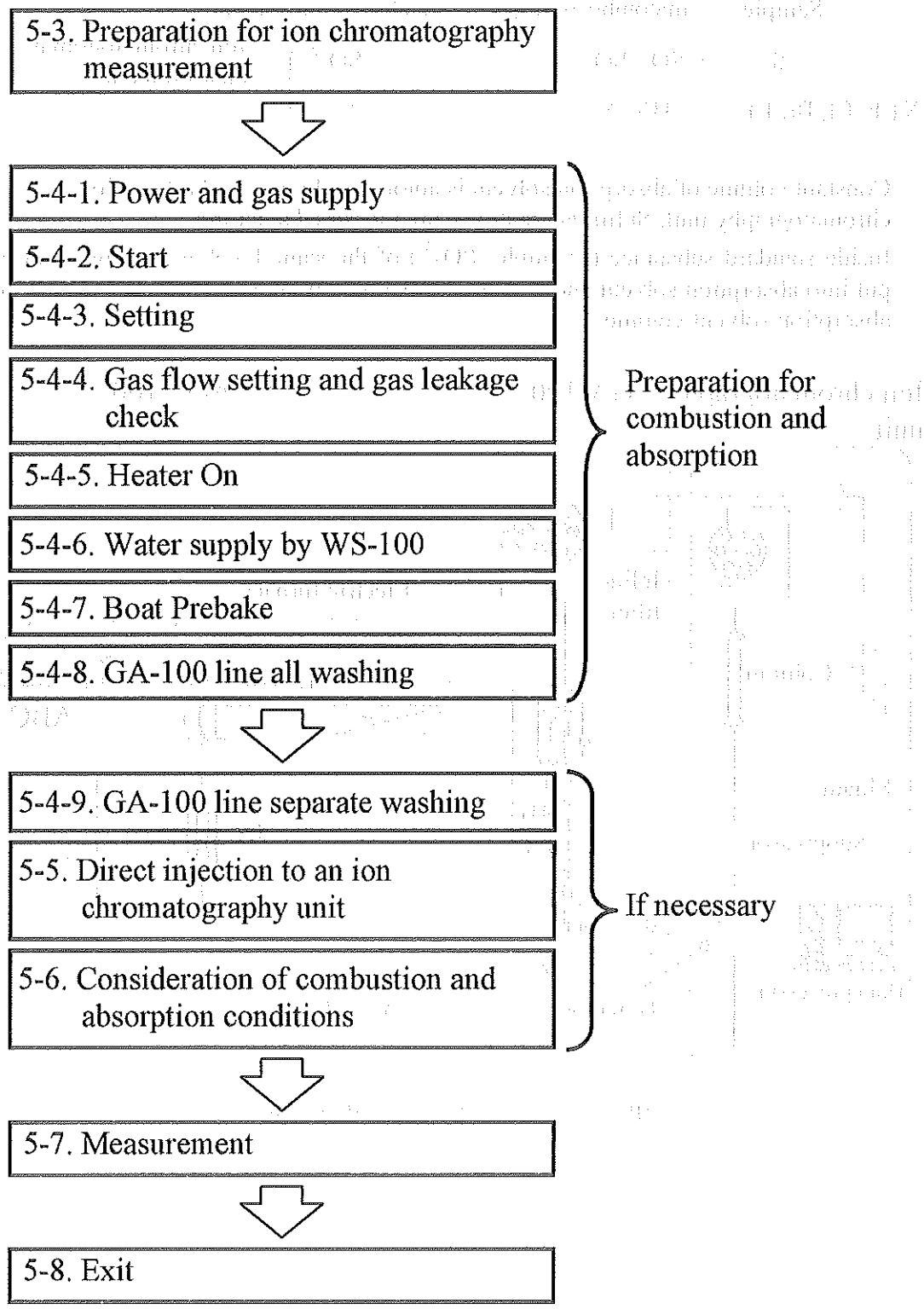
- Print Method
- Print Parameters
- Print All ABC Programs Lists
- Print Preference
- Print ASC-150L Parameters
- Print GA-100 Parameters

Section 5: Measurement

This section describes the details of combustion and absorption and ion chromatography. For ion chromatography contents, refer to the unit instruction manual.

5-1. Operation Flow

Basic flow of combustion and absorption and ion chromatography is as follows.



5-2. Combustion and Absorption Flow

5-2-1. Combustion and absorption principle

Sample is injected into a pyrolysis tube where Ar gas flows and temperature is high (800~1100℃).
After sulfur and halogen compound in sample are pyrolyzed, they are combusted and oxidized by O_2 gas as follows and collected to absorption solvent.

Sample	in combustion gas	in absorption solvent	
S	→ SO_2, SO_3	→ SO_4^{2-}	→ Ion chromatography measurement
X (F, Cl, Br, I)	→ HX, X_2	→ X^-	→ Ion chromatography measurement

Constant volume of absorption solvent is automatically injected into an ion chromatography unit. Sulfur and halogen are measured at a time.
Inside standard substance (Example: PO_4^{3-}) of the same level as measurement element is put into absorption solvent and used to correct measurement values by the gain and loss of absorption solvent volume.

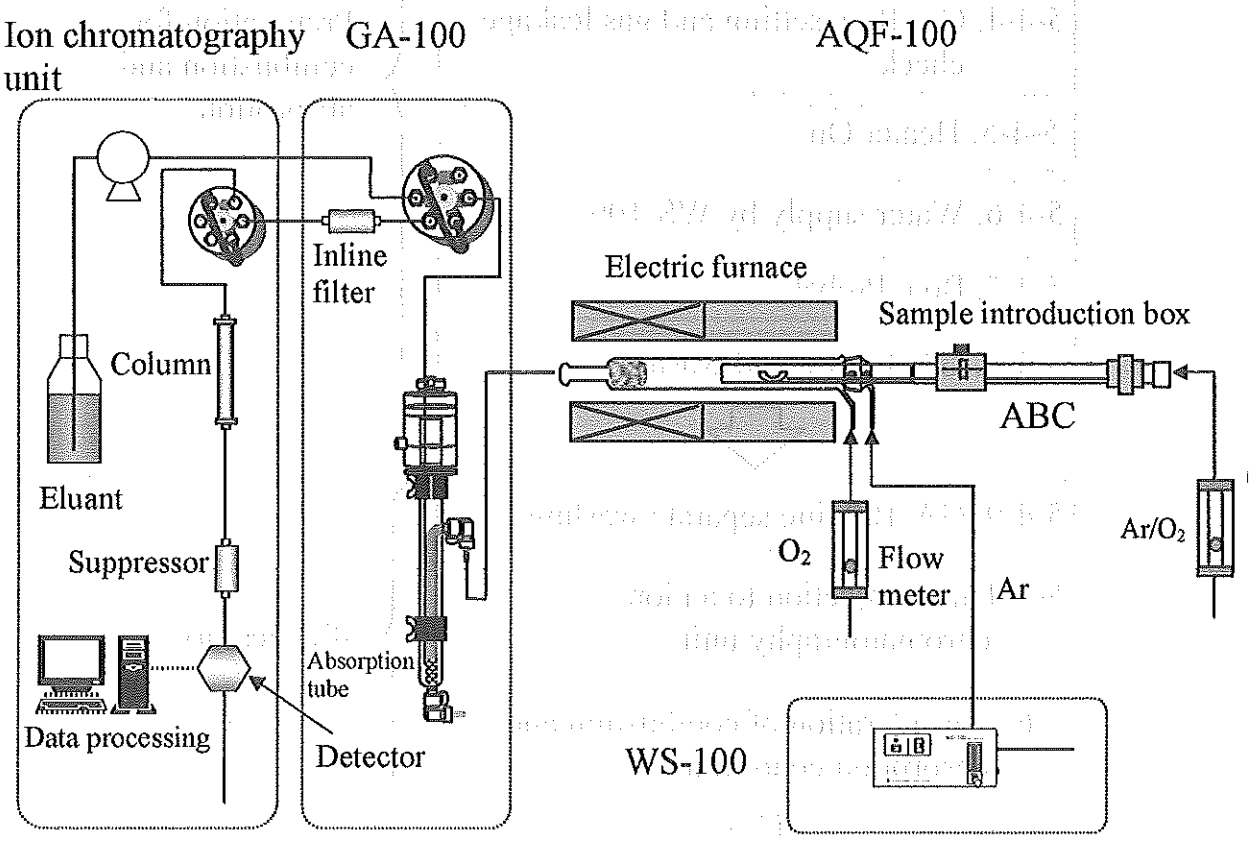


Illustration 5-1. System schematic

5-2-2. Samples combustion and absorption examples

To gain optimum conditions in combustion and absorption process, understand the following points.

1. Sample quality
2. Sample volume
3. Pyrolysis tube temperature
4. Combustion position and time
5. Oxygen/Argon gas flow
6. Absorption solvent quality
7. Absorption solvent concentration and volume

Table 5-1 shows ABC combustion condition data. Consider combustion and absorption conditions.

	1st		2nd		3rd		End	Cool	Boat	Ar	O_2
	Pos mm	Time sec	Pos mm	Time sec	Pos mm	Time sec	Time sec		Speed mm/s	Time sec	
Coal	0	0	0	0	0	0	360	30	10	0	300
Organic/Et 30 μ l	95	90	120	30	150	30	120	30	10	0	300
Toluene 30 μ l	100	120	110	30	180	0	120	30	10	0	300
Gasoline 50 μ l	95	120	110	30	180	0	60	30	10	0	300
Heavy oil 30 μ l	110	30	130	120	150	60	60	30	10	0	300
Gelatin (solid 10mg)	130	180	160	90	180	30	180	30	10	0	300
Kerosene 50 μ l	100	30	120	120	180	0	60	30	10	0	300
Waste oil 30 μ l	100	120	150	30	180	30	60	30	10	0	300

Table 5-1. Sample combustion and absorption condition examples

Common conditions

Heater temperature : Inlet Temp : 800℃ Outlet Temp : 1000℃

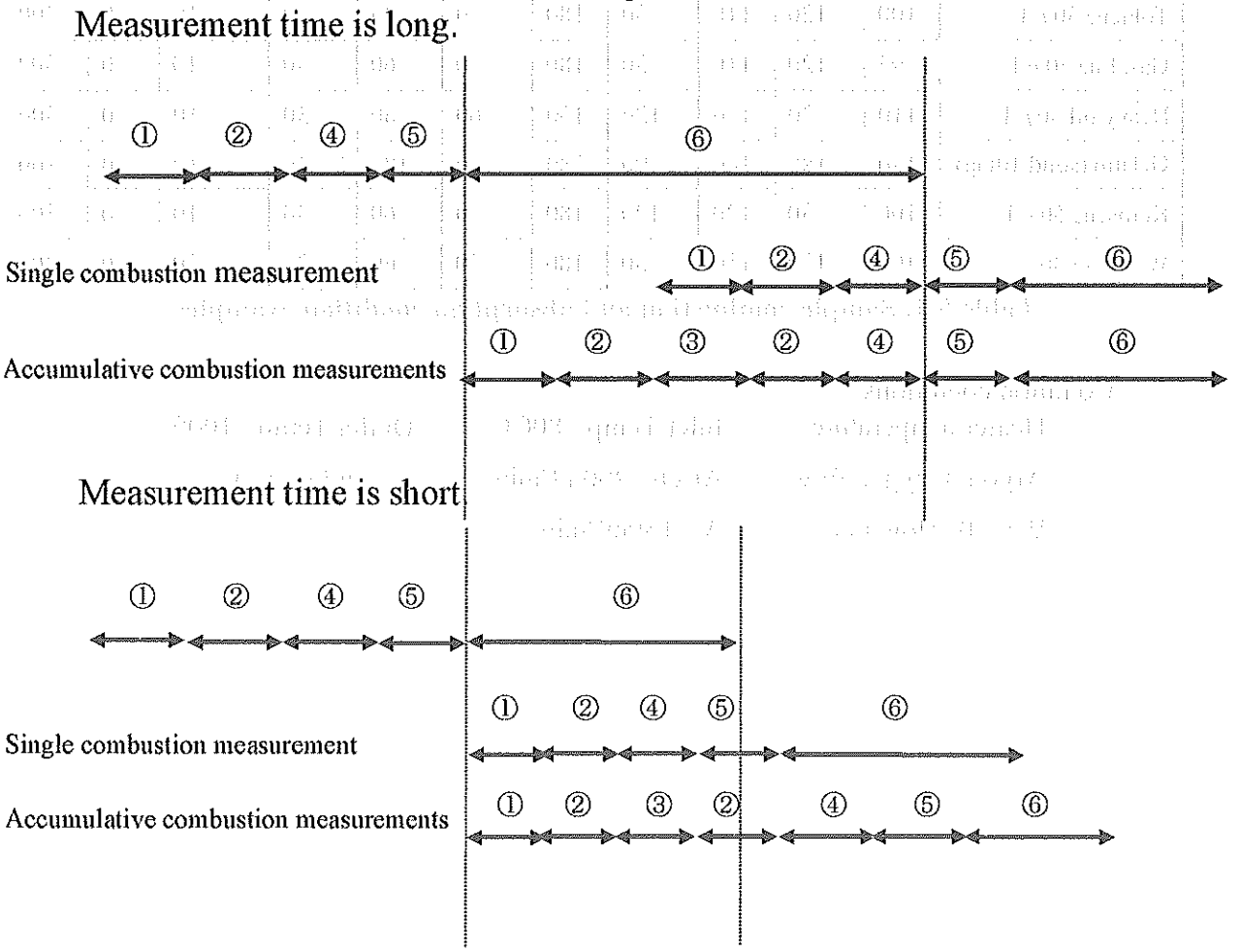
Argon /Oxygen flow : Ar/O_2 : 200ml/min O_2 : 400ml/min

WS-100 flow rate : Ar: 150ml/min

5-2-3. Analysis schedule

For efficient ion chromatography measurement, combust and absorb the next sample during measurement. After absorption, absorption solvent sampling starts without waiting time.
The following chart shows two types of time of ion chromatography measurement.
The first is the case where ion chromatography measurement is longer than total time of absorption solvent setting, combustion and absorption, and absorption time.
The second is the case where ion chromatography measurement is shorter than total time of absorption solvent setting, combustion and absorption, and absorption time.

① Absorption solvent set : Time for injecting absorption solvent into an absorption tube
(Refer to 4-5-2-2. "Absorption solvent set" flow.)
② Combustion and absorption : Time required for combustion and absorption
③ ABC H.C.T. : ABC HOME COOL TIME
(Boat cooling time at ABC home position)
④ Absorption time : Combustion gas absorption time after a sample boat returns to ABC home position
⑤ Absorption solvent sampling : Absorption solvent sampling time
(Refer to 4-5-2-3. "Absorption solvent sampling" flow.)
⑥ Ion chromatography measurement : Time from ion chromatography measurement to measurement and data processing ends and the reception



5-3. Preparation for ion chromatography measurement

(1) Prepare for ion chromatography measurement by the instruction manual.

(2) Check that a detector base line is stable.

(3) The start signal from GA-100 is waited.

5-4. Preparation for combustion and absorption

5-4-1. Power and gas supply

(1) Open main valves of O_2 gas and Ar gas cylinders.

(2) Adjust the second pressures of a cylinder and a STOP valve to 0.4±0.1MPa with a reducing valve.

(3) Supply power to the outlet on the table.

5-4-2. Start

(1) Turn on the following power switches.

① AQF-100 power switch and heater switch (Front panel)
The power switch of an automatic boat controller (ABC) is turned on automatically.

② Cooling the unit power switch of ABC rear

③ Cooler switch of ABC front

④ GA-100 power switch (Front panel)

(2) When using ASC-150L, turn on the power switch.

(3) When using ASC-120S, turn on the power switch.

(4) Turn on the power switches of a personal computer, a monitor, and a printer.

(5) Start AQF-100 system program. (Refer to 4-1-1. Start.)

POINT
When measuring fluorine, use Water Supplier Model WS-100. Absorption rate is better with WS-100.

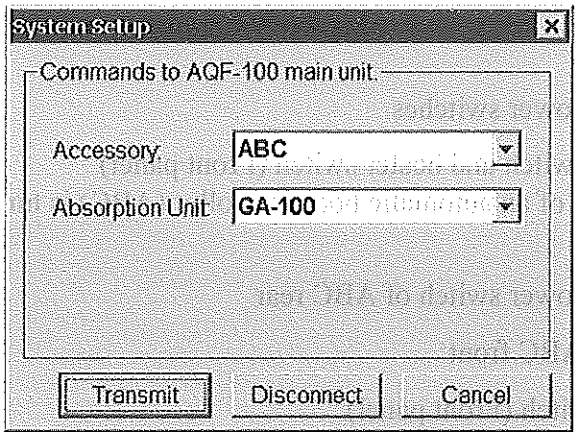
5-4-3. Setting

5-4-3-1. System Setup

Select an accessory and GA-100 in "System Setup" dialog box and start the communication to the main unit.

POINT
Before measurement, run "System Setup" if necessary.
After "System Setup", AQF communication to the system program starts. "Analysis Parameters", "Heater", and "Boat Prebake" are effective and their operations can be run.

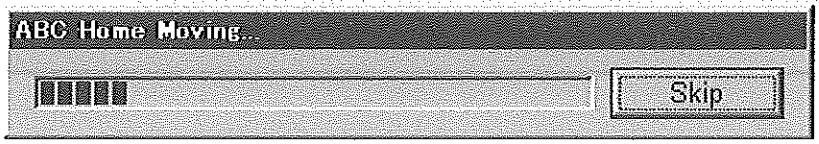
(1) Press <F5> key or click "System" and "System Setup".
"System Setup" dialog box is displayed.



(2) Click ▼ of "Accessory" to select it. For standard composition, select "ABC".

(3) Select "Absorption Unit". For standard composition, select "GA-100".

(4) Click [Transmit] button.

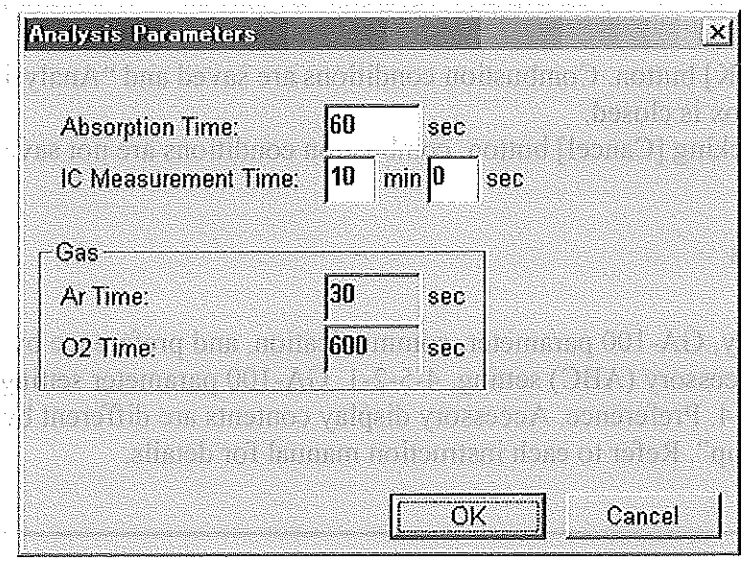


"ABC Home Moving" is displayed. It indicates the time of initializing ABC.
"System Setup" contents are saved and "System Setup" dialog box is closed.
AQF communication to the system program starts.

5-4-3-2. Analysis Parameters

(1) Click  or click "System" and "Analysis Parameters".
"Analysis Parameters" dialog box is displayed.

(2) Set each item. (Refer to Table 5-2. Analysis Parameters setting item.)



Item	Setting contents
Absorption Time	Time of combustion gas absorption after ABC boat return to the home position (0～9999 sec)
IC Measurement Time	Measure previously time from ion chromatography measurement start time to data processing and input it. (99min, 0～59sec)
Ar Time	Time for flowing argon gas into Ar/ O_2 line (an inner pyrolysis tube) (0～999 sec) * Set it by ABC program.
O2 Time	Time for flowing oxygen gas into Ar/ O_2 line (an inner pyrolysis tube) (0～999 sec) * Set it by ABC program.

Table 5-2. Analysis Parameters setting item

POINT
If ion chromatography measurement time is too short, next measurement can't be run.
If setting time is too long, ion chromatography unit waiting is long and total time is long.

(3) Click [OK] button. Combustion conditions are saved and "Analysis Parameters" dialog box is closed.
* By clicking [Cancel] button, combustion conditions are not saved.

5-4-3-3. Settings

Set accessory, GA-100 parameter, communication, and preference by referring to 4-5-1. Accessory (ABC) setting, 4-5-2-1. GA-100 parameter setting, 4-5-3. Computer I/F, and 4-5-4. Preference. Accessory display contents are different by the selection at "System Setup". Refer to each instruction manual for details.

POINT
Even when each setting is not changed, check the contents.

5-4-4. Gas flow setting and gas leakage check

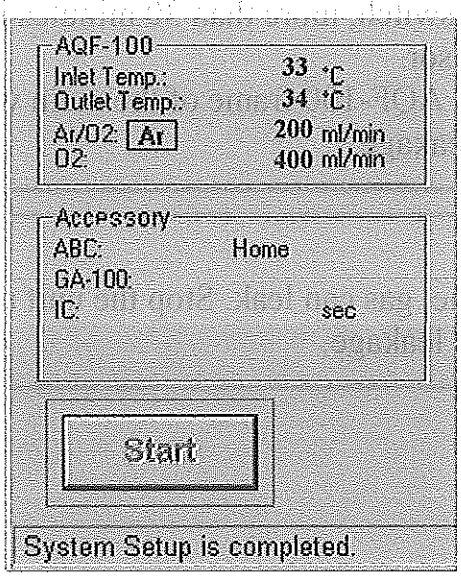
Change gas at the personal computer side, adjust AQF-100 gas flow, and check gas leakage.

CAUTION

After turning on the power switch, more than 30 minutes is required to stabilize AQF-100 flow sensor.
The flow can be checked in AQF-100 frame of the main window.
After sufficient time, check gas leakage.

5-4-4-1. Gas flow setting

(1) Gas flow is displayed in AQF-100 frame of the main window.



(2) Turn the knob of AQF-100 front and adjust gas flow. Adjust Ar flow with Ar. Adjust O_2 flow with O_2. Total argon flow of WS-100 and the main window AQF-100 frame flows to a pyrolysis tube.

	ml/min
Ar/ O_2	200
O_2	400

Gas flow setting example

5-4-4-2. Gas leakage check

CAUTION
Check gas leakage when the heater switch is off. By checking gas leakage when the switch is on, you can get burned.
When setting a gas flow meter for gas leakage check, a pyrolysis tube already can be hot. Take care not to get yourself.

CAUTION
Do not clog the outlet of a pyrolysis tube. The pyrolysis tube breaks and you can get hurt.

CAUTION
After turning on the power switch, more than 30 minutes is required to stabilize AQF-100 flow sensor.
The flow can be checked in AQF-100 frame of the main window.
After full time, check gas leakage.

CAUTION
If flow is under the set value, gas can leak. Stop the unit use immediately and check gas leakage.

(1) Replace a ball joint (with branch tubes) of a pyrolysis tube outlet with one of a flow meter for gas leakage check.

(2) Check that the flow meter value is within 750±75ml/min of O_2 scale.
(When Ar is 350ml/min (including WS-100 flow 150ml/min) and O_2 is 400ml/min, total flow is 750ml/min.)

(3) If the value is under the set flow, refer to Illustration 5-2 and check gas leakage.

(4) Recover gas leakage points and run (2) again.

(5) Change the ball joint of the flow meter for gas leakage check with one with branch tubes.

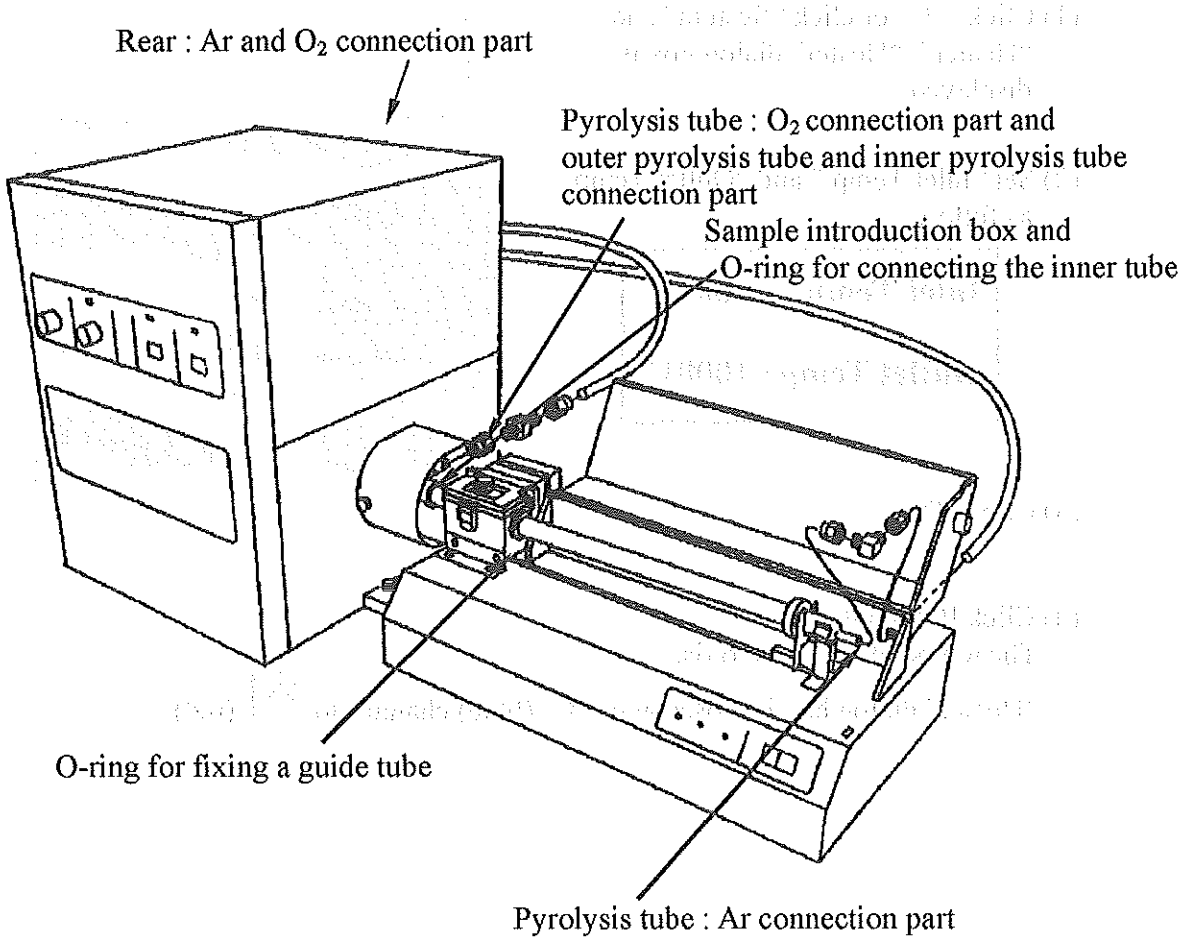


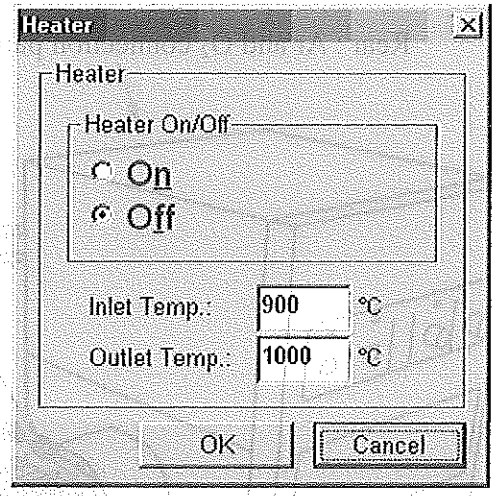
Illustration 5-2. Gas leakage check position

5-4-5. Heater On

POINT

Turn on AQF-100 heater switch and click "On" and [OK] button in "Heater" dialog box. Without the setting in "Heater" dialog box, the temperature does not start to rise.
Before the temperature reaches the set temperature and is stable, more than 60 minutes is required.

(1) Click  or click "System" and "Heater". "Heater" dialog box is displayed.



(2) Set "Inlet Temp." and "Outlet Temp" as follows.

Inlet Temp : 900℃

Outlet Temp : 1000℃

(3) Click "On".

(4) Click [OK] button.
The temperature starts to rise.
"Heater" dialog box is closed and  (blue) changes to  (red).

5-4-6. Water supply by WS-100

Argon gas including ultrapure water is supplied to a pyrolysis tube with WS-100.

POINT

By supplying argon gas including ultrapure water, component recovery is up. When contamination is in WS-100 line, operate it fully with ultrapure water and set it to a pyrolysis tube.
By using WS-100, water is supplied to an absorption tube between absorption solvent set and sampling and the solvent volume increases. Consider increasing amount and set GA-100 parameter absorption solvent volume.

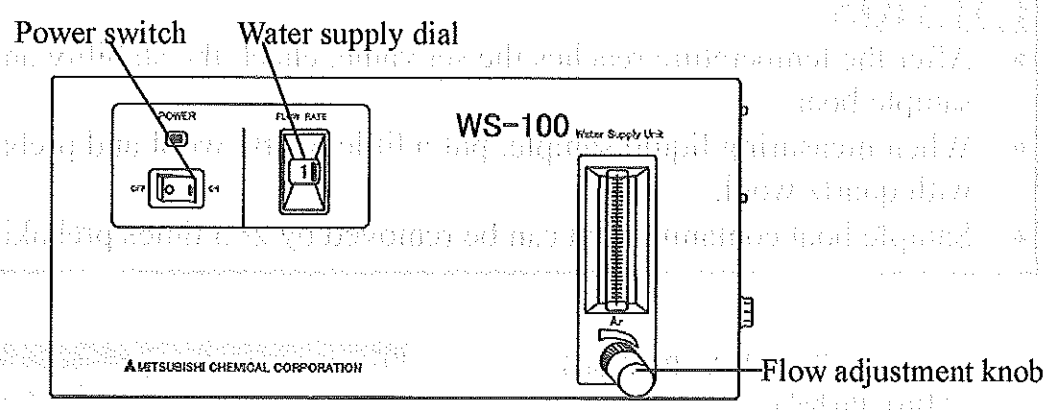


Illustration 5-3. WS-100 front panel

(1) Turn a flow adjustment knob to set argon gas flow to 150ml.
Total argon gas flow of WS-100 and the main window AQF-100 frame goes into a pyrolysis tube.

(2) Adjust "FLOW RATE" of a water supply dial. For high concentration analysis, set the dial to "4". For low concentration analysis, set the dial to "1".
* The indication of water supply volume is a dial gauge × 0.05 (ml/min).
Water supply volume is ±30% of setting values.

(3) After the temperature reaches the preset value, the dialog box is displayed.
Turn on WS-100 power switch and click [OK] button. Water supply starts.

CAUTION

When the temperature does not reach the preset value, water is not supplied even by turning on WS-100 power switch.

5-4-7. Boat Prebake

Prebake a boat to remove the contamination.
Before prebaking, remove a clamp for a ball joint and a ball joint (with branch tubes) from a pyrolysis tube outlet.

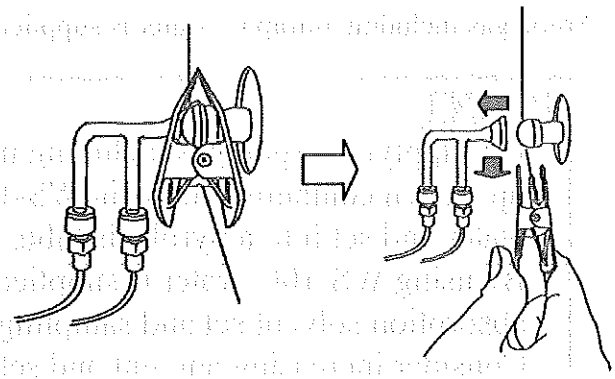
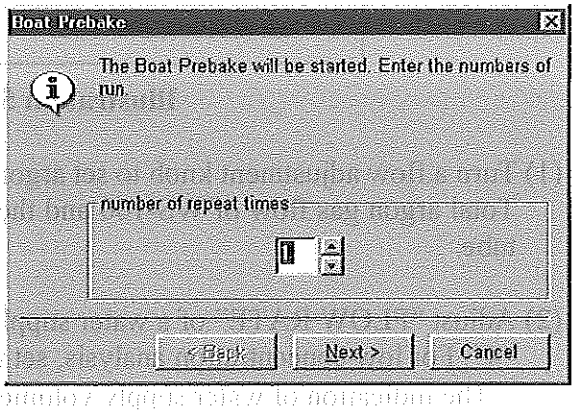


Illustration 5-4. Pyrolysis tube outlet removal

CAUTION

- After the temperature reaches the set value, check the stability and prebake a sample boat.
- When measuring liquid sample, put a little quartz wool and prebake the boat with quartz wool.
- Sample boat contamination can be removed by 2~5 times prebaking.

(1) Click  or click "Run" and "Boat Prebake".
"Boat Prebake" dialog box is displayed.



(2) Input "number of repeat times". (Usually 2~5 times)

Setting of a sample boat

a. Open the cover of a sample introduction box.

b. Put a sample boat into the sample introduction box and set it to a ladle. For liquid samples, put 0.02~0.03g quartz wool without running over from the boat and flatten it fully.

c. Close the cover of the sample introduction box and lock it.

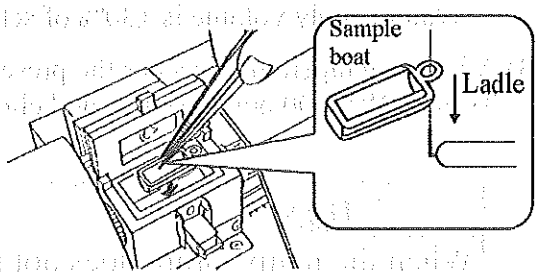


Illustration 5-5. Sample boat setting

(3) Click [Next] button.
The following dialog box is displayed.
* By clicking [ABC Programs] button, ABC program can be checked.

(4) Click [OK] button. "Boat Prebake" dialog box is closed.

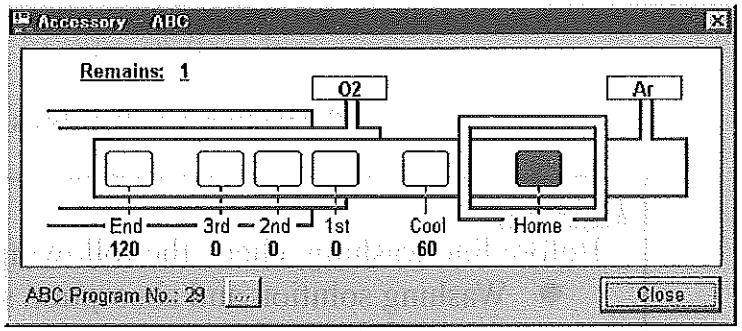
(5) When [Start] button flickers, set a sample boat to ABC sample introdution box.

POINT

When handling a sample boat, use tweezers to prevent contamination. For more than 2 sample boats prebaking, keep sample boats in a glass petri dish until measurement.

(6) Click [Start] or press <Enter> key. Boat prebaking starts.

(7) 1 prebaking requires about 4~5 minutes and prebaking is repeated automatically by the predtermined number.
"Boat Prebake" is indicated in "Analysis Status".



By clicking 

, remaining times is displayed in "Remains" of the upper left.

(8) To prebake another boat, repeat (5)~(7).

(9) To end boat prebaking, click 

. Boat prebaking ends.

5-4-8. GA-100 line all washing

Line washing is required before measurement. Click [Wash All] button of GA-100 dialog box. Refer to 4-5-2-5. "Wash All" flow.
Set a ball joint with branch tubes before "Wash All" and fix it to a pyrlysis tube with a clamp for a ball joint.

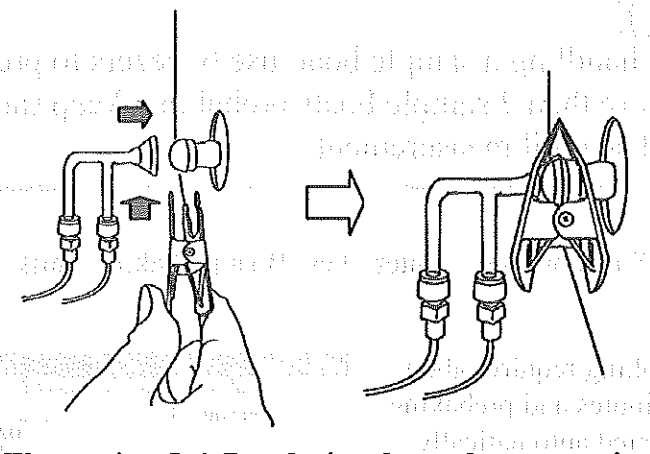


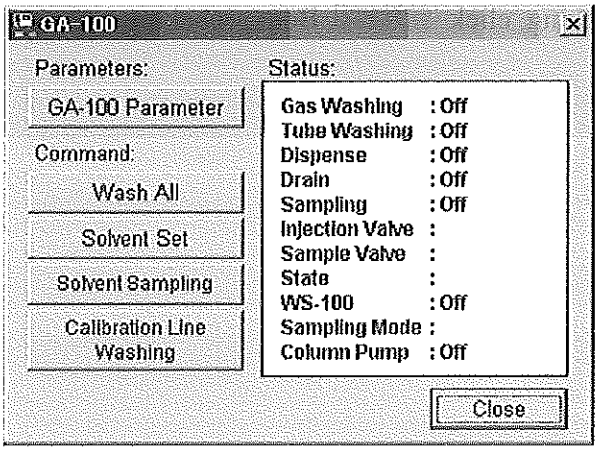
Illustration 5-6. Pyrolysis tube outlet connection

POINT

Before line washing, check the following points.

- Washing solution and absorption solvent are set and lines are connected correctly.
- A ball joint with branch tubes is connected.
- ABC sample introduction box cover is closed.
- Pour washing solution by pressing <Absorption Tube> key and check that gas flows into the solution.

(1) Click "System" and "GA-100". "GA-100" dialog box is displayed.



(2) Click [Wash All] button. Each gas line is washed automatically.

5-4-9. GA-100 line separate washing

Line washing is required in the following cases. When washing is not required, skip it.

① In the first use of the unit, When the line inside is empty, Out of use for long time
② When absorption solvent is prepared again
③ When lines are contaminated

Refer to Illustration 1-8. GA-100 absorption part line, Illustration 1-9. GA-100 operation panel, Table 1-9. GA-100 operation panel names and functions.

POINT

Before line washing, check the following points.

- Washing solution and absorption solvent are set and lines are connected correctly.
- A ball joint with branch tubes is connected.
- ABC sample introduction box cover is closed.
- Pour washing solution by pressing <Absorption Tube> key and check that gas flows into the solution.

5-4-9-1. Gas line washing

(1) Check gas flow and press <Gas Line> key for one second to pour washing solution.
(2) Continue to press <Drain> key to drain washing solution.
(3) Repeat (1) and (2) several times and wash gas lines.

5-4-9-2. Absorption tube washing

(1) Continue to press <Absorption Tube> key and fill washing solution into an absorption tube by overflow. Pour it again for about 5 seconds.
(2) Continue to press <Drain> key to drain washing solution.
(3) Repeat (1) and (2) several times. Wash the absorption tube.

5-4-9-3. Absorption solvent tube washing

(1) Press <Dispense> key and inject the specified volume of absorption solvent into an absorption tube.
(2) Continue to press <Drain> key to drain absorption solvent.
(3) Repeat (1) and (2) 2~3 times and wash the absorption solvent tube.

5-4-9-4. Standard solution tube washing

To wash a standard solution tube, dip the tube in ultrapure water and click "System" and "GA-100" of AQF system program menu and [Calibration Line Washing] button.
Refer to 4-5-2-5. Standard solution sampling line washing flow.

5-5. Direct injection to an ion chromatography unit

Without combustion and absorption, standard solution can be injected directly from GA-100 to an ion chromatography unit. By comparing the case of direct injection of standard solution with the case of injection from absorption solvent by combustion and absorption, the recovery can be obtained. When direct injection is not required, skip this item. Refer to Illustration 1-9. GA-100 operation panel and Table 1-9. GA-100 operation panel names and functions.

(1) Put a standrad solution injection tube into standard solution.
Press <Calibration> key.

(2) Left lamp of <Calibration> key is on and standard solution is injected while the lamp is on.

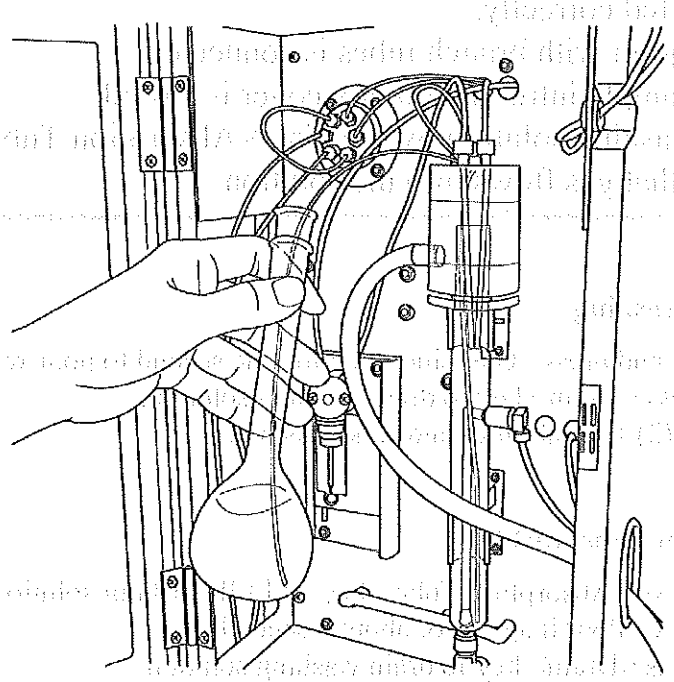


Illustration 5-7. Direct injection to an ion chromatography unit

POINT
When the unit is not used, immerse the tip of a standard solution injection tube in ultrapure water to prevent the tube contamination.

5-6. Consideration of combustion and absorption conditions

When combustion and absorption conditions are known, skip this section.

POINT
Remove the clamp for a ball joint of a pyrolysis tube outlet and remove the pyrolysis tube outlet and the ball joint (with branch tubes). Incomplete combustion when a ball joint is connected contaminates the pyrolysis tube and gas lines.

5-6-1. Removal of a pyrolysis tube outlet

Remove a clamp for a ball joint and remove a ball joint (with branch tubes) from a pyrolysis tube outlet. Illustration 5-8 shows pyrolysis tube outlet removal.

CAUTION
Do not touch high-temperature part. The temperature of an electric furnace is usually 900~1000℃. Therefore, both ends of a pyrolysis tube, the pyrolysis side, and a thermal insulator are hot. Do not touch them with naked hands.

CAUTION
For samples generating harmful gas, prepare connection lines from a pyrolysis tube outlet and discharge the gas by local exhaust.

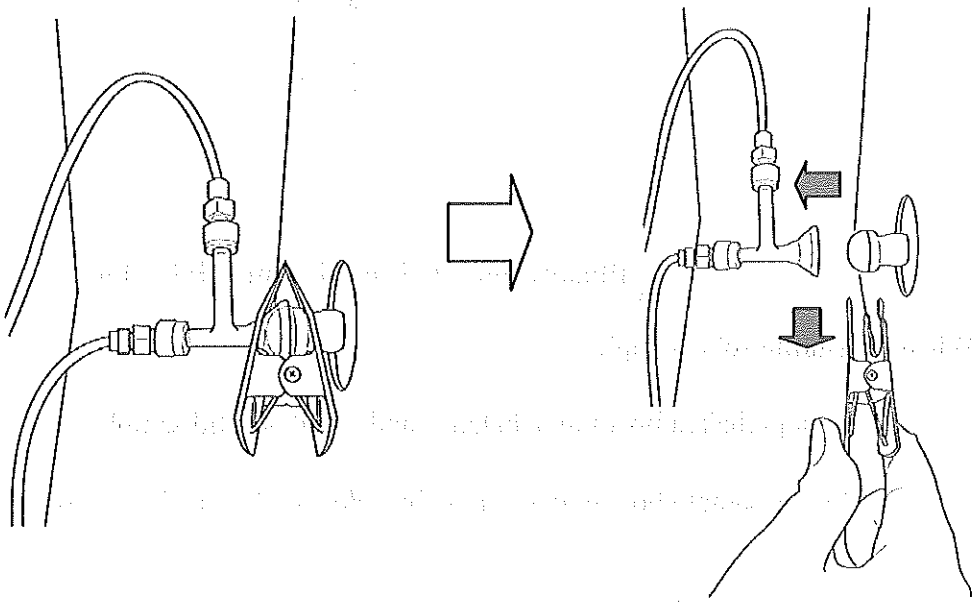


Illustration 5-8. Pyrolysis tube outlet removal

5-6-2. Sample injection

Weigh solid samples before 5-6-3. Combustion by ABC manual operation.
For solid samples and liquid samples, when the message of sample boat setting is displayed at (2) of 5-6-3. Combustion by ABC manual operation, inject sample.

CAUTION
Sample volume should be under 100 μ l or 100mg.
Some samples can cause incomplete combustion.
In that case, reduce the sample volume and consider combustion conditions. Incomplete combustion when a ball joint is connected causes the contamination of a pyrolysis tube and a PTFE tube with "WASH. G".

When measuring liquid samples

① Set the boat which is prebaked with 0.02～0.03g quartz wool to a sample introduction box. (After the second time, use the previous boat.)

② Take a sample into a microsyringe. Inject it into the sample boat.
(Refer to Illustration 5-9 Liquid sample injection.)

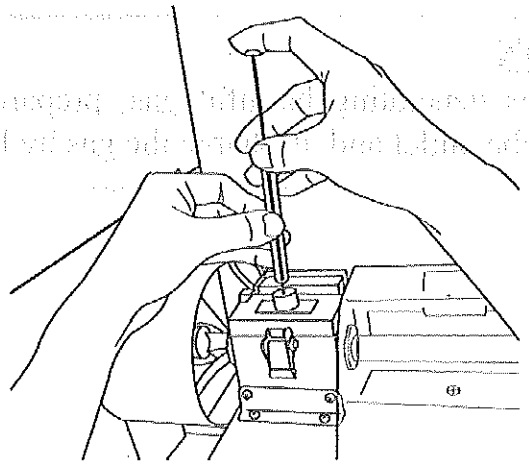


Illustration 5-9. Liquid sample injection

When measuring solid samples

① Put a prebaked boat into a balance and weigh a solid sample.

② Put the sample boat into a sample introduction box and set it to a ladle.

③ Close a sample introduction box cover and lock it.

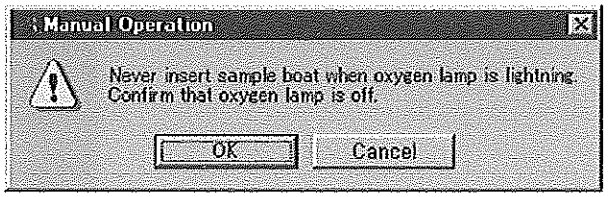
5-6-3. Combustion by ABC manual operation

Operate ABC manually and check appropriate combustion conditions for samples.

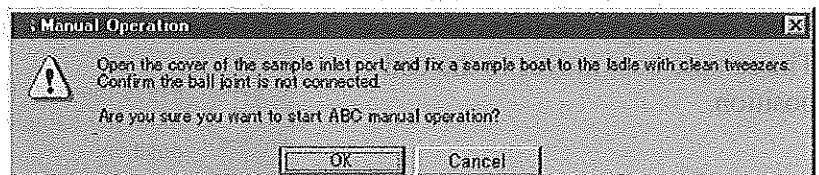
POINT

- Combustion conditions are different by sample quality and volume. By setting it so that the combustion should be peak at the second stop position, the gain of optimum conditions is easier. Optimum conditions are the recovery maximum value by complete combustion.
- Remove a clamp for a ball joint of a pyrolysis tube outlet and check that the pyrolysis tube outlet and a ball joint (with branch tubes) are removed. Incomplete combustion when a ball joint is connected contaminates a pyrolysis tube and gas lines.

(1) Click "Run" and "ABC Manual". "ABC Programs" dialog box and "Manual Operation" dialog box for caution are displayed.



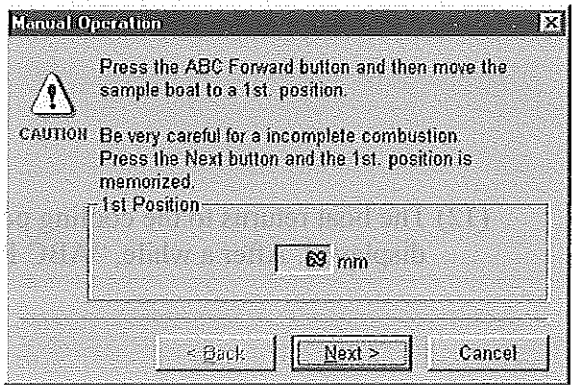
(2) Click [OK] button. "Manual Operation" dialog box is displayed to check accessory manual operation start.



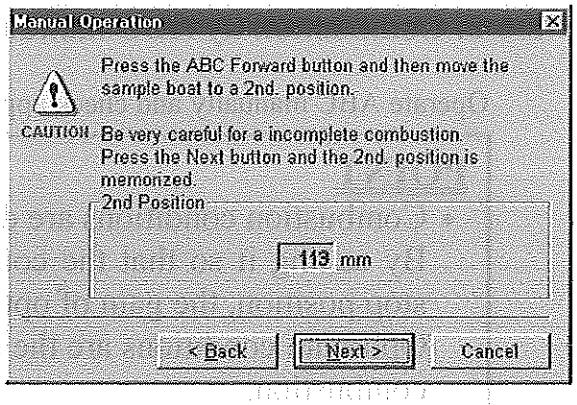
(3) Set sample in a sample boat by referring to 5-6-2. Sample injection. Click [OK] button. ABC AUTO lamp is off and "Manual Operation" dialog box is displayed to check the first stop position of a sample boat.

(4) Adjust the first stop position of the sample boat with <FWD> or <REV> button of ABC. The set first stop position is displayed in the dialog box.

(5) When the first stop position and time are determined, click [NEXT] button. "Manual Operation" dialog box is displayed to check the second stop position of the sample boat.



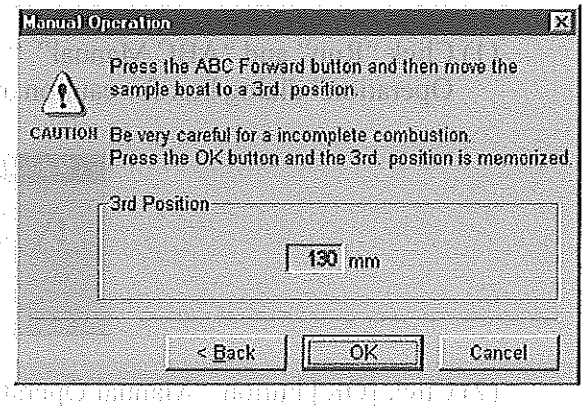
(6) Adjust the second stop position of the sample boat with <FWD> or <REV> button of ABC. The set second stop position is displayed in the dialog box.



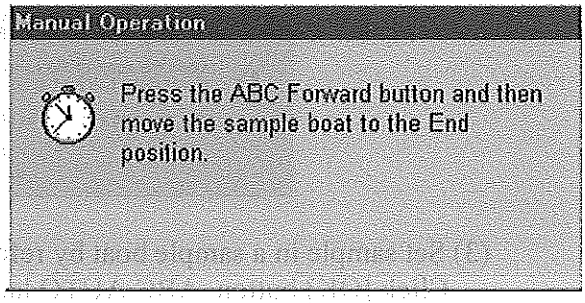
(7) When the second stop position and time are determined, click [NEXT] button. "Manual Operation" dialog box is displayed to check the third stop position of the sample boat.

(8) Adjust the third stop position of the sample boat with <FWD> or <REV> button of ABC. The set third stop position is displayed in the dialog box.

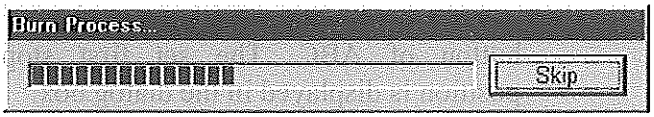
(9) When the third stop position and time are determined, click [OK] button.



(10) Continue to press <FWD> button of ABC according to the right message. The sample boat moves to the end position.



(11) "Burns Process" is displayed.

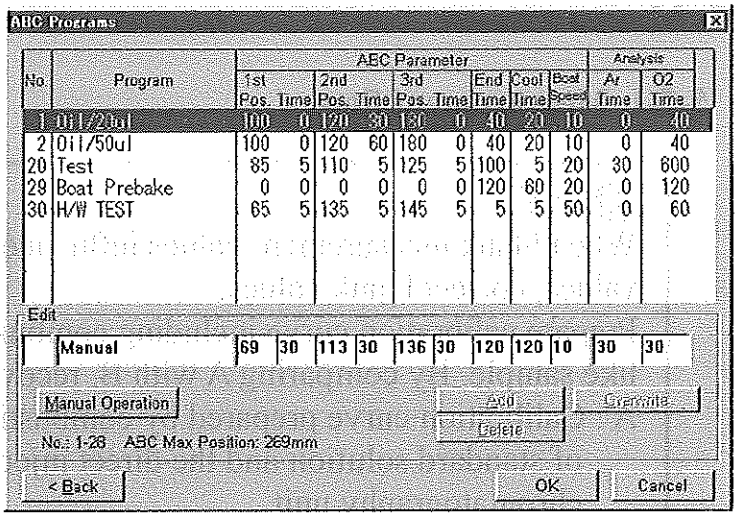


(12) The boat returns to the cooling position after combustion. "O2 Off Process Waiting" is displayed. After a while, "ABC Programs" dialog box returns.

(13) The result of manual operation is inputted into "Edit" frame as program name of "Manual".

Program name can be inputted directly and changed.

Input Program No. (1~28) which is not in the list and press <Enter> key. [Add] button is effective.



(14) When transferring manual operation result into ABC program, click [Add] button. The result is added to the list as new ABC program.

(15) Click [OK] button. The changed contents of ABC program list are saved and the main window returns.

* Click [Cancel] button to return to the main window without saving changed contents.

* Click [Manual Operation] button to run accessory manual operation again. By repeating the consideration of combustion conditions by necessary times, obtain optimum conditions. Run (4)~(15) again.

(16) After the consideration of combustion conditions by ABC manual operation, set a clamp for a ball joint of a pyrolysis tube outlet, connect gas lines, and prepare combustion and absorption ion chromatography measurement.
When connecting a pyrolysis tube outlet, refer to 5-7-4. Connection of a pyrolysis tube outlet.

POINT

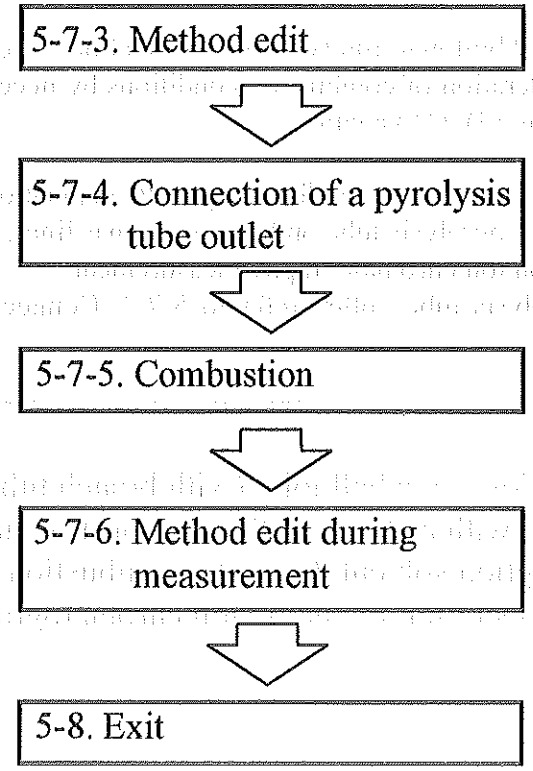
After the consideration, set a ball joint (with branch tubes) to a pyrolysis tube outlet with a clamp so that combustion gas should be absorbed into absorption solvent. Consider combustion and absorption conditions by total operation including ion chromatography measurement.

5-7. Measurement

5-7-1. Measurement flow

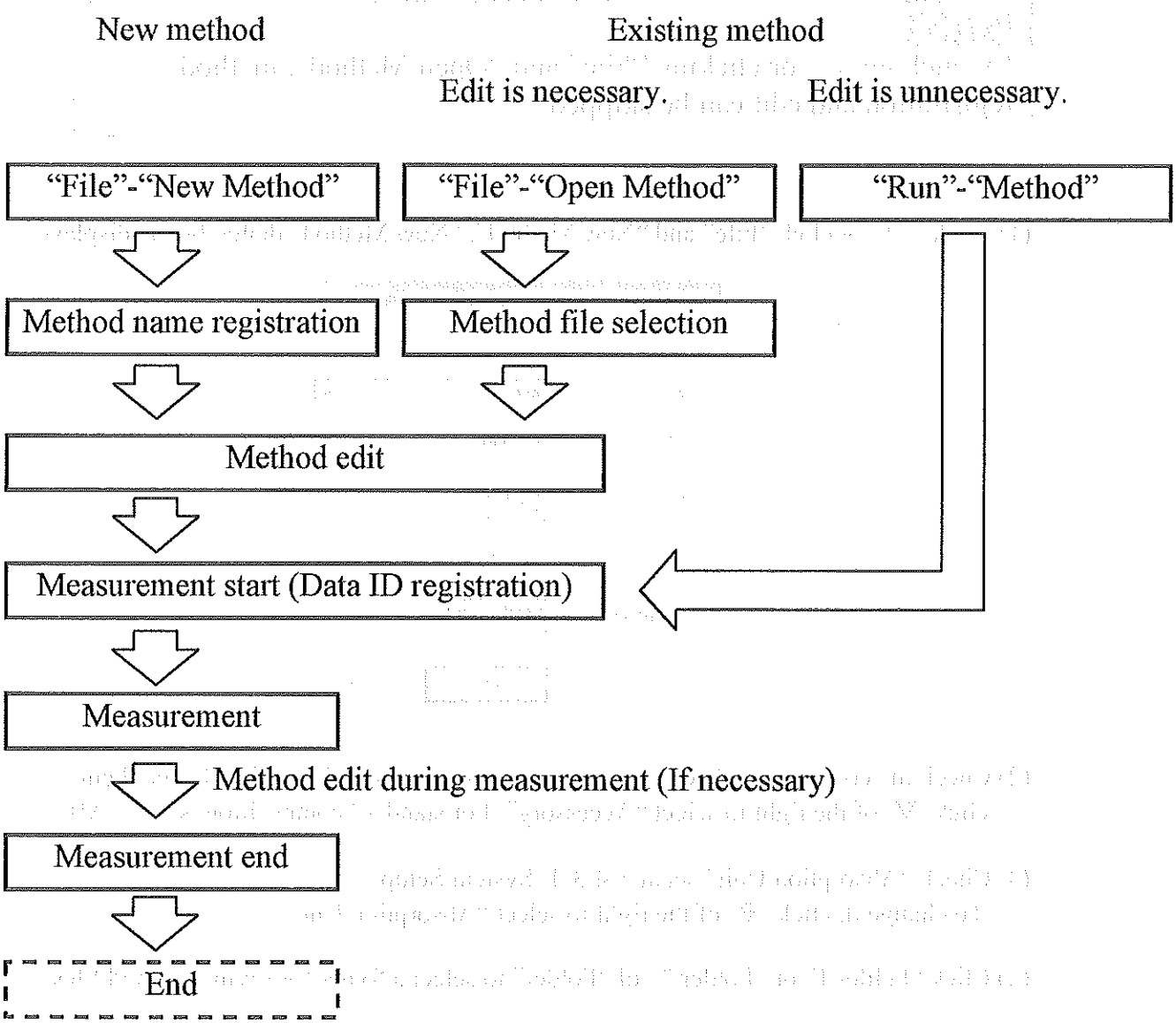
POINT

When blank measurement values influence sample measurement values, correct blank values.
Prepare calibration curve including combustion and absorption like sample. By comparing A with B, recovery can be obtained.
A : Calibration curve prepared by combustion and absorption of standard solution and the direct injection into an ion chromatography unit
B : Calibration curve prepared by direct injection of standard solution into an ion chromatography unit
When recovery is known, calibration curve directly injected into an ion chromatography unit is available.



5-7-2. Method setting

Basic method setting is as follows.

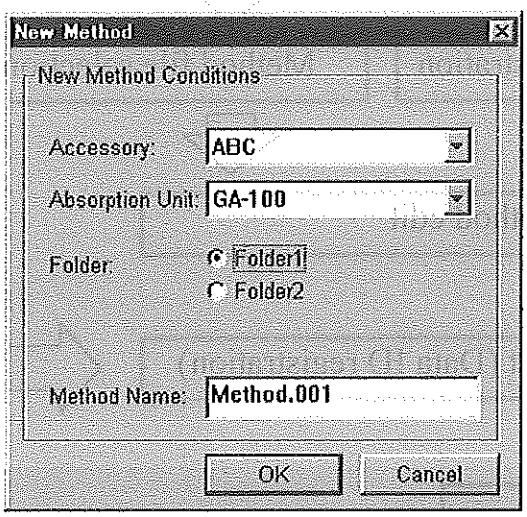


5-7-3. Method edit

Edit a measurement method. The procedure for preparing and editing a new method is described here.

POINT
By clicking or clicking "File" and "Open Method", method registration and edit can be skipped.

(1) Click or click "File" and "New Method". "New Method" dialog box is displayed.



(2) Check the contents of "Accessory" set at 5-4-3-1. System Setup. To change them, click ▼ of the right to select "Accessory". For standard composition, select "ABC".

(3) Check "Absorption Unit" set at 5-4-3-1. System Setup.
To change it, click ▼ of the right to select "Absorption Unit".

(4) Click "Folder 1" or "Folder 2" of "Folder" to select a folder for saving method files.

(5) Input a method name into "Method Name". (Up to 20 characters)
* By clicking "System", "Preference", and "Measurement" tab, setting "Optional Method Naming Rule", and clicking [OK] button, the set name is displayed in "Method Name" of "New Method" dialog box.

(6) Click [OK] button. Method edit dialog box is displayed.

When "ASC-150L+ABC" is selected, the above dialog box is displayed.
The dialog box has ASC-150L frame with "Btl No.", "150L", and "ABC",
but, for standard composition (when selecting ABC as an accessory), "Btl No." and "150L" are not displayed.

(7) Set the following contents.

Item	Contents	Input range
Sample ID	Sample name	Input it necessarily.
Sample Size	Sample volume	0.01~9999.99
Sample Size Unit	Sample volume unit	Select it from μl, mg, ml, or g.
ABC Program No.	ABC Program No.	1~28

Table 5-3. Sample measurement input item

CAUTION

Sample volume should be under 100 μl or 100mg.
Some samples can cause incomplete combustion.
In that case, reduce sample and consider combustion conditions.
Incomplete combustion when a ball joint is connected contaminates a pyrolysis tube and a PTFE tube with "WASH. G".

When measuring liquid samples

Input sample volume into "Sample Size" and click ▼ of the right to set the unit to "μ l".

When measuring solid samples

Put a sample into a sample boat and weigh it. Input sample weight into "Sample Size" and click ▼ of the right to set the unit to "mg".

(8) Set ABC Program No. by sample conditions and volume.

Click [...] of ABC Program No. right. "ABC Programs" dialog box is displayed.

* When program No. is known, input it directly into "ABC Program No." Proceed to (11).

ABC Programs

No.	Program	ABC Parameter									Analysis	
		1st		2nd		3rd		End	Cool	Boat	Ar	O2
		Pos.	Time	Pos.	Time	Pos.	Time	Time	Time	Speed	Time	Time
1	Oil/20ul	100	0	120	30	180	0	40	20	10	0	40
2	Oil/50ul	100	0	120	60	180	0	40	20	10	0	40
20	Test	85	5	110	5	125	5	100	5	20	30	600
29	Boat Prebake	0	0	0	0	0	0	120	60	20	0	120
30	H/W TEST	65	5	135	5	145	5	5	5	50	0	60

(9) Click ABC program to select it.

For preparing a new ABC program, refer to 4-5-1. Accessory (ABC) setting for the details.

① Click [Edit] button.

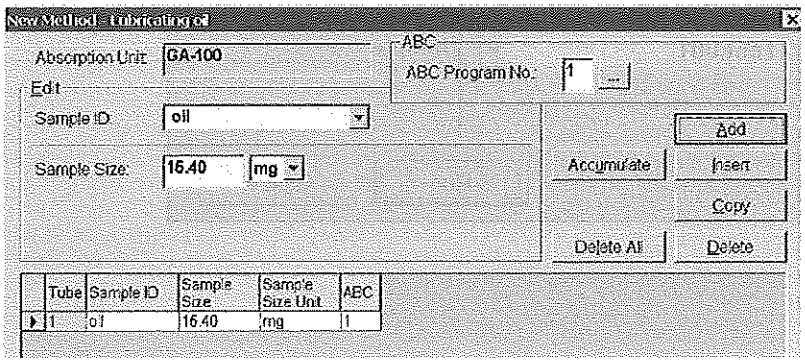
② Input a new number (1~28) into "No.".

③ Input "Program" and "ABC Parameter". Click [Add] button.

④ Click an added Program No.

(10) Click [OK] button. The method edit dialog box is displayed. Selected Program No. is displayed in "ABC Program No.".

(11) Click [Add] button by combustion times. The same setting contents are added into the below list by clicked times.



(12) Like other sample settings, add them into the list by (7)~ (11).
* For each setting addition and deletion, refer to 4-4-3-1. Edit flow.

	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	Oil	15.40	mg	1
	2	Oil	15.70	mg	1
	3	Pellet	20.20	mg	2
▶	4	Pellet	19.80	mg	2

(13) By clicking [Accumulate] button, combusted sample gas is absorbed into the same tube as the cursor position number. After the last combusted sample gas is absorbed into the same number tube, absorption solvent is injected into an ion chromatography unit.

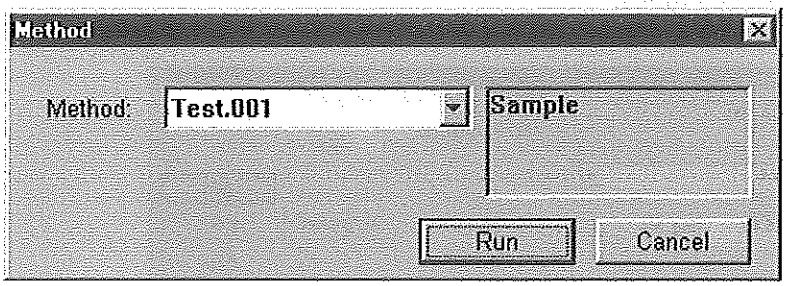
	Tube	Sample ID	Sample Size	Sample Size Unit	ABC
	1	Oil	15.40	mg	1
	2	Oil	15.70	mg	1
	3	Pellet	20.20	mg	2
	4	Pellet	19.80	mg	2
	5	Resin	18.00	mg	4
	5	Resin	17.60	mg	4
▶	5	Resin	17.90	mg	4

POINT

[Accumulate] button is useful when combusting and absorbing many samples.

(14) To start measurement when method edit is completed, click [Run Method] button. "Method" dialog box is displayed.

(15) Click [Run] button.



5-7-4. Connection of a pyrolysis tube outlet

Set a ball joint (with branch tubes) to the outlet of a pyrolysis tube and fix it to the pyrolysis tube with a clamp for a ball joint.

CAUTION

Do not touch high-temperature part. The temperature of an electric furnace is usually 900~1000℃. Therefore, both ends of a pyrolysis tube, the pyrolysis side, and a thermal insulator are hot. Do not touch them with naked hands.

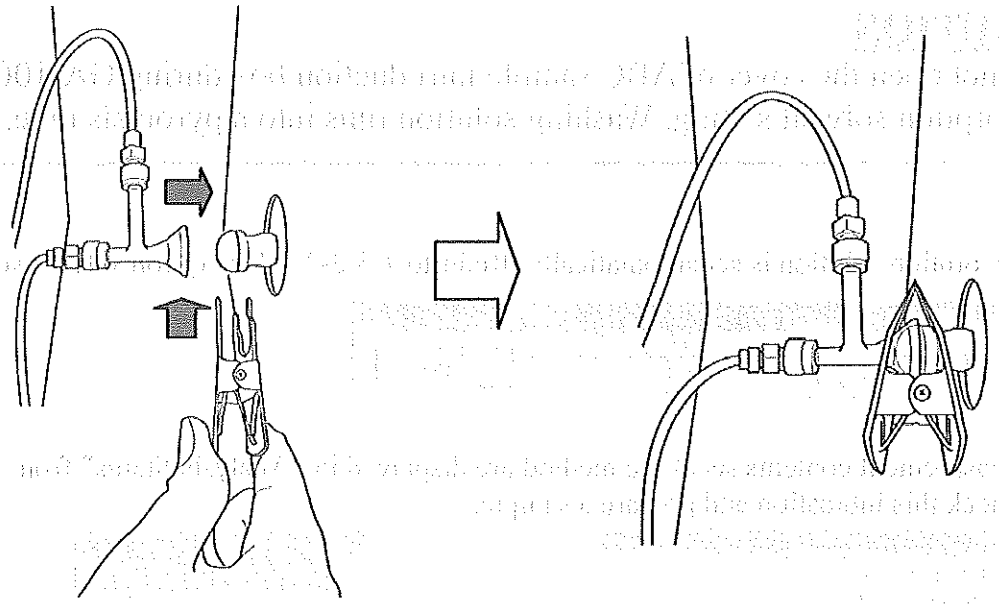
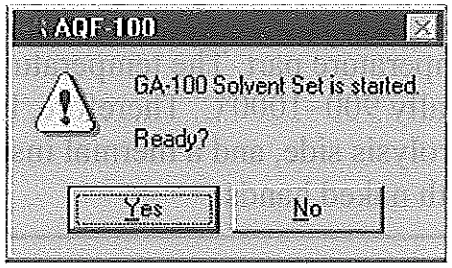


Illustration 5-10. Connection of a pyrolysis tube outlet

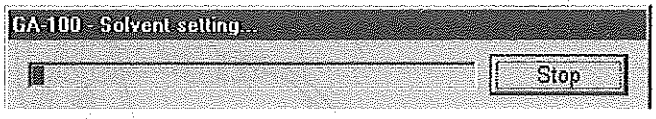
5-7-5. Combustion

(1) Set absorption solvent to an absorption tube. When the following message is displayed, click [Yes] button. To set absorption solvent after a while, click [No] button.
To run combustion again, click "Run" and "GA-100 Start". The following window is displayed.

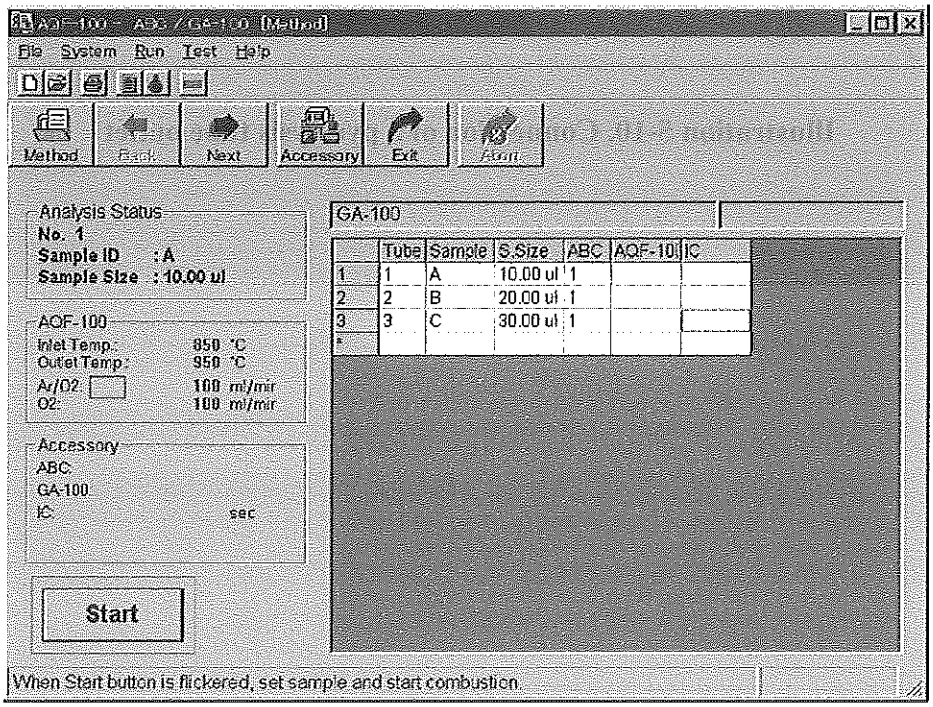


CAUTION
Do not open the cover of ABC sample introduction box during GA-100 absorption solvent setting. Washing solution runs into a pyrolysis tube.

(2) Absorption solution is set automatically. Refer to 4-5-2-2. "Absorption solvent set" flow.



(3) Measurement contents set at the method are displayed in "Analysis Status" from No.1. Check this indication and prepare a sample.



(4) Check that [Start] button flickers and set the sample.

For liquid samples

① Set a prebaked sample boat to a sample introduction box.
(After the second time, use the previous boat.)
② Take a sample into a microsyringe. Inject it into the sample boat.
(Refer to Illustration 5-9. Liquid sample injection.)

For solid samples (Run ① and ② at method edit.)

① Set a prebaked boat on a balance and weigh a sample.
② Input the sample weight into "Sample Size". (Refer to 5-7-3. Method edit.)
③ Put the sample boat into a sample introduction box and set it to a ladle.
④ Close the cover of the sample introduction box and lock it.

(5) After sample setting, click [Start] button or <Enter> key.
Combustion starts by ABC program contents.

(6) The following contents are displayed in "AQF-100" and "IC" of the list in [Progress] frame.

Types and contents in "AQF-100"		Types and contents in "IC"	
Combustion	: During combustion	Measurement	: During measurement
Absorption	: During combustion gas absorption	Finished	: Measurement end
Finished	: Combustion end (Buzzer beeps 5 times.)	Abort	: Measurement stop
Abort	: Combustion stop		

POINT
By clicking 

, ABC conditions can be displayed.
Red part is the position of a sample boat.

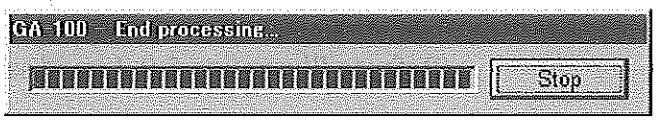
POINT
When incomplete combustion occurs, turn off GA-100 power switch before the absorption solvent is sampled.
When the solvent runs into the separation column of an ion chromatography unit, the column is contaminated and separation power can be bad.

(7) For measurement on and after No.2, repeat (1)~(6).
When ASC-150L or ASC-120S is used, subsequent measurement is run automatically.

(8) After all measurement, "Finished" is displayed in "AQF-100" and "IC" frames.

(9) After method measurement, click 

or click "Run", "Operation", and "Exit Run". "GA-100-End processing" is displayed.



End washing is run automatically. Refer to 4-5-2-6. End Wash flow.

(10) Print methods if necessary. Refer to 4-6-2. Print type.

When troubles occur during combustion.

CAUTION

When troubles occur during combustion, click [Abort] button and suspend combustion. Each unit operates as follows.

GA-100 : Absorption solvent sampling stops.
AQF-100 : Heater is off.
ABC : A sample boat stops at the cool position and returns to the home position.

Take measures against troubles and check that the unit is not wrong.

Combustion can't be continued. Therefore, run combustion again by the same method.

Measurement stop

By clicking 

button during method measurement, the current sample measurement is stopped.

Measurement suspension (displayed when ASC-150L or ASC-120S is used)

Click "Run", "Operation", and "Abort". The automatic start of the next sample measurement is suspended after the current sample measurement.

Remeasurement

During method measurement, by clicking 

or clicking "Run", "Operation", and "Back" before measurement, the previous measurement can be run again.
But the previous result is overwritten and canceled.

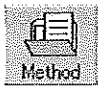
Measurement skip

During method measurement, by clicking 

or clicking "Run", "Operation", and "Next" before measurement, the next measurement can be run.

5-7-6. Method edit during measurement

By editing method during measurement, measurement can be added and deleted.

(1) Click 

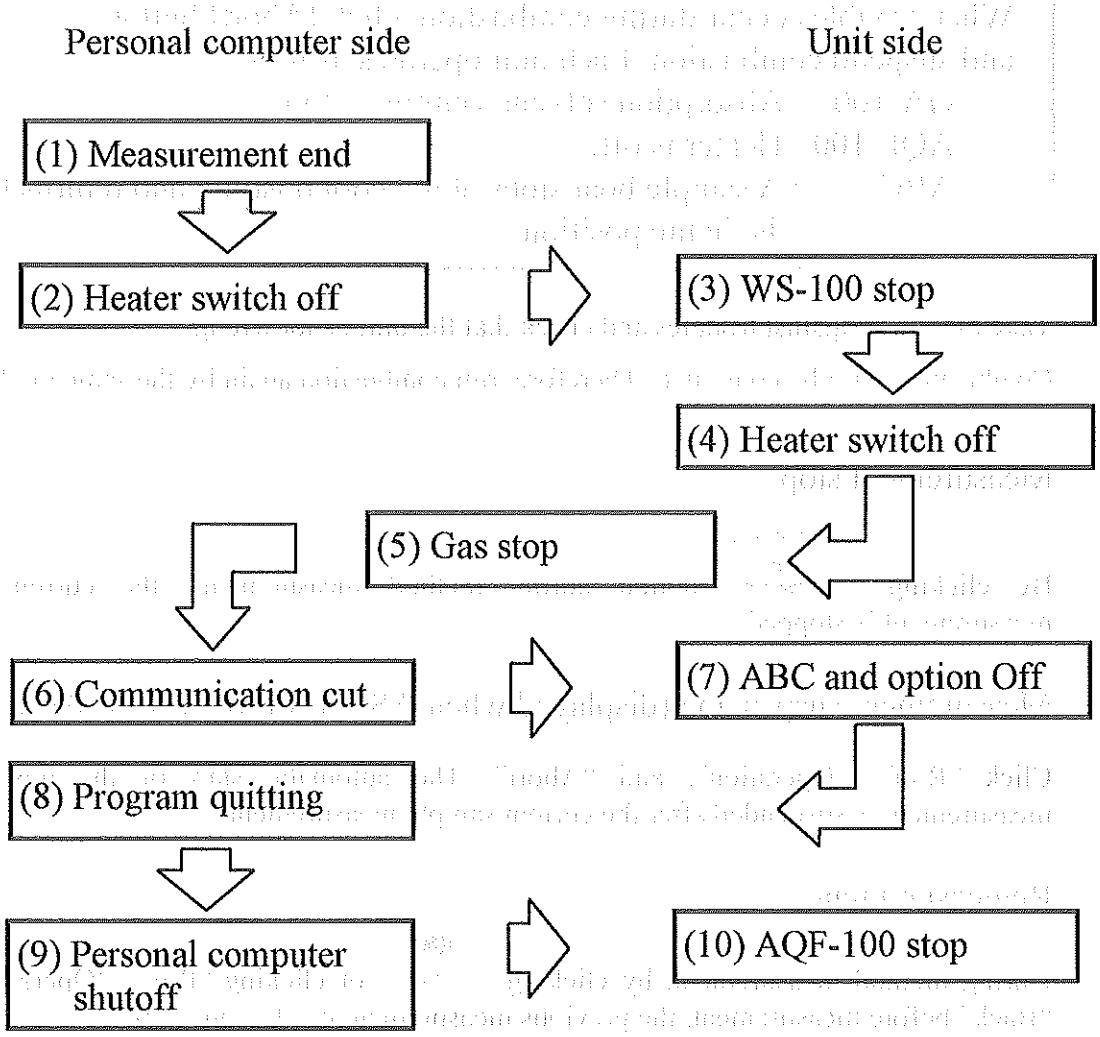
or click "Run", "Operation", and "Method". Method edit dialog box is displayed.

(2) Add or delete a method like method edit.

(3) Click [Run Method] button. The main window returns.

5-8. Exit

After measurement, stop the unit as follows and exit system program.

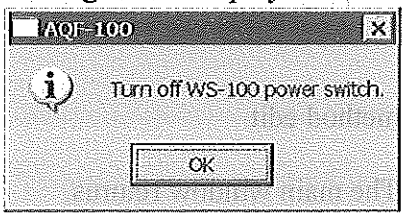


(1) After method measurement, click 

or click "Run", "Operation", and "Exit Run" to end measurement.
* Measurement can be ended halfway.
End Wash is run automatically. Print a method if necessary.

(2) System program heater switch off

① Click  or click "System" and "Heater". "Heater" dialog box is displayed.
② Click "Off".
③ Click [OK] button. "Heater" dialog box is closed and  (red) changed to  (blue). The dialog box is displayed.



④ Click [OK] button. Water supply stops automatically.

(3) WS-100 stop

Turn off the power switch.

* If WS-100 power switch is on when the heater switch is off, the pyrolysis tube is filled with water.

(4) AQF-100 heater switch off

Turn off the front heater switch.
Wait until Inlet Temp. and Outlet Temp. of a pyrolysis tube are under 500℃.

POINT
By closing gas valves before the electric furnace cools, moisture enter the mass flow sensor and the unit breaks. After it cools, proceed to the next procedure.

(5) Gas stop

Close the main valves of O_2 and Ar cylinders.

(6) Communication disconnection

Click "System", and "System Setup", and [Disconnect] button.
Communication to AQF-100 is disconnected.

(7) Unit stop

Turn off the following power switches.

① GA-100 power switch
② Cooler switch of ABC front
③ Option power switch (if connected)

(8) System program quitting

Click " × " of upper right or click "File" and "Exit". AQF-100 system program ends.

(9) Personal computer shutoff

① Click [Start] button of a taskbar.
② Check that "Shut down the computer?" is selected. Click [Yes] button. The computer power is off.
③ Turn off the power switches of a printer and a monitor.

(10) AQF-100 stop

CAUTION
To cool an electric furnace with a cooling fan, stop AQF-100 after the temperature of a pyrolysis tube is under 500℃.

Turn off AQF-100 front power switch. ABC power switch is off automatically.

Section 6: Troubleshooting

Countermeasures against hardware or software troubles when using AQF-100 and system program are described in this section.

CAUTION

Do not take AQF-100 cover except our servicemen.
An electric shock and a fire can be caused.

No power of AQF-100

Point	Countermeasure
Is the main power switch of the rear of AQF-100 ON?	Turn on the power switch.
Is the power connector in the rear of AQF-100 disconnected?	Connect it firmly.
Is the power plug put in the outlet?	Connect it firmly.
Is the power supplied to the outlet?	Connect another electric appliance to the outlet. When it operates normally, AQF-100 can be broken. Contact local distributors.
Is AQF-100 power fuse cut?	(1) Take off the fuse holder of the rear panel with a screwdriver. (2) Check the conduction with a tester. (3) Without conduction, change it for new one.

No power of GA-100

Point	Countermeasure
Is the main power switch of the rear of GA-100 ON?	Turn on the power switch.
Is the power connector in the rear of GA-100 disconnected?	Connect it firmly.
Is the power plug put in the outlet?	Connect it firmly.
Is the power supplied to the outlet?	Connect another electric appliance to the outlet. When it operates normally, GA-100 can be broken. Contact local distributors.
Is GA-100 fuse switch lowered?	(1) Check the cause and take measures against it. (2) Raise the switch.

No gas flow

Point	Countermeasure
Is the gas cylinder valve open?	Open the gas cylinder valve.
Is the quantity of gas in the cylinder sufficient?	If the gas quantity is insufficient, change the cylinder for new one.
Is the room gas supply valve open?	Open it.
Is the line disconnected?	Connect the line.
Is the line clogged?	Change the clogged line.

ABC does not operate.

Point	Countermeasure
Is an error message is displayed?	Check "System Setup" by the following procedure. (1) When the main window of AQF-100 system program is displayed, press <F5> key. "System Setup" dialog box is displayed. (2) Click ▼ of "Accessory" to select "ABC". (3) Click [Transmit] button.
Is the cable to AQF-100 disconnected?	Insert firmly a signal connector of ABC rear. Insert firmly ABC connector of AQF-100 rear.

The temperature of an electric furnace doesn't rise.

Point	Countermeasure
Is an error message indicated in a personal computer display?	Operate the system program according to the error message.
Is the heater switch on the front of AQF-100 ON?	Turn on the heater switch.
Is the heater switch of system program ON?	Turn on heater switch by the following procedure. (1) Click  or "System" and "Heater". (2) Check the heater temperature setting. (3) To change the set contents, input the value directly. (4) Click "On". (5) Click [OK] button.
Is the circuit protector operating?	When the circuit protector button on the rear of AQF-100 stands out, the circuit protector is operating. The heater circuit can be wrong. Contact local distributors.

Peak of ion chromatography is not obtained.

Point	Countermeasure
Is the temperature of an electric furnace up?	Check the following points by AQF-100 system program. (1) Is  (Heater off) changed to  (Heater ON)? When the button does not change, turn on the heater switch. Refer to 5-4-5. Heater On. (2) Are Inlet Temp. and Outlet Temp. indicated? When they are not indicated, check the measurement condition. (3) Is the measurement condition correct? When the condition is not correct, set the appropriate condition. Refer to 5-4-3-2. Analysis Parameters. Without the recovery, contact our distributors. (4) Is sample concentration is low? Increase sampling volume or run accumulative measurement.
Is a clip for a ball joint disconnected?	Fix a ball joint to a pyrolysis tube outlet with the clip.
Is the line to an ion chromatography unit disconnected?	Connect the line firmly.
Is constituent concentration in sample too low?	Add sample or combust it repeatedly.

Dispersion of measurement values

Point	Countermeasure
Are the pressure and flow of oxygen and argon inappropriate?	Set gas pressure as follows. (1) Set the secondary pressure of a cylinder or a stop valve to 0.4±0.1MPa with the reducing valve. (2) Set gas flow to the specified value by the knob.
Is the temperature setting of the electric furnace in combustion part inappropriate?	Set properly the temperature of the electric furnace in combustion part. Refer to 5-4-5. Heater On.
Does the gas leak from the connection part of a pyrolysis tube?	Check the gas leakage. Refer to 5-4-4-2. Gas leakage check.
Is the pyrolysis tube contaminated?	Clean the contaminated pyrolysis tube as follows. · Soak the whole of a pyrolysis tube in washing solution. · Supersonic cleaning with washing solution, etc. In either case, wash the pyrolysis tube with pure water and dry it.
Is the quartz wool of a pyrolysis tube deteriorated?	Change the quartz wool in the pyrolysis tube. Refer to 3-4-1. Filling of quartz wool for the details.

Leakage buzzer sounds.

Point	Countermeasure
Does solution leak?	Check leakage points and take measures. Refer to 8-3. Taking out of GA-100 inside case.

GA-100 stops.

Point	Countermeasure
Does solution flow to a drain tube?	**"Gas Line" When the pump stops** 1. Remove the PTFE tube set to the branch tube (near the ground part) of the ball joint connected to a pyrolysis tube outlet. 2. Set an evacuation syringe of a WS-100 attachment to the tip of the removed PTFE tube. 3. Press Gas Line key while absorbing washing water with the syringe. **"Absorption Tube" When the pump stops** 1. Remove the PTFE tube (not connected to an absorption solution injection pump). 2. Set an evacuation syringe of a WS-100 attachment to the tip of the removed PTFE tube. 3. Press Absorption Tube key while absorbing washing water with the syringe. **"Drain" When the pump stops** 1. Remove the PTFE tube with "ABS DRAIN" tag in a drain tank. 2. Set an evacuation syringe of a WS-100 attachment to the tip of the removed PTFE tube. 3. Press Absorption Tube key to pour washing water into the absorption tube. 4. Press Drain key while absorbing washing water with the syringe. **"Sampling" When the pump stops** 1. Remove the PTFE tube with "SMP DRAIN" tag in a drain tank. 2. Set an evacuation syringe of a WS-100 attachment to the tip of the removed PTFE tube. 3. Press Absorption Tube key to pour washing water into the absorption tube. 4. Press Sampling key while absorbing washing water with the syringe.

Absorption solution and standard solution are not absorbed and a chromatography peak is not displayed.

Point	Countermeasure
Does solution flow to a drain tube?	**When absorption solution is not absorbed** 1. Remove the ball joint connected to a pyrolysis tube outlet. 2. Press Absorption Tube key to pour washing water into the absorption up to the branch tube height. 3. Remove the PTFE tube with "SMP DRAIN" tag in a drain tank. 4. Set an evacuation syringe of a WS-100 attachment to the tip of the removed PTFE tube. 5. Press Sampling key while absorbing washing water with the syringe. 6. Check that the PTFE tube is filled with washing solution.

Section 7: Error Messages

This section describes warnings and error messages displayed in a monitor when troubles occur.

CAUTION

Danger and Warning displayed in a personal computer monitor show the danger of a serious accident. When this message is displayed, take measures immediately.

ERROR No.	Error messages	Status	Countermeasures
010	WATER LEAKAGE ERROR	Warning	Check leak parts and handle them.
061	THERMOSTAT ON ERROR	Warning	Turn off AQF-100 power switch immediately. Contact our distributors.
062	OVER TEMP. ERROR	System Down	Turn off AQF-100 power switch immediately. Heater errors occurred and system down was run. Check the cause of heater temperature errors.
063	OVER TEMP. 1 ERROR		
064	OVER TEMP. 2 ERROR		
065	UNDER TEMP. 1 ERROR		
066	UNDER TEMP. 2 ERROR		
077	COMMUNICATION ERROR	System Down	Check the cable connecting AQF-100 to a personal computer and restart the system. When error occurs even after the restart, contact our distributors.
082	Ar/O2 GAS FLOW ERROR	System Down	Dander of explosion Keep off the unit more than 5m. Gas flow errors occurred and an option was reset. Therefore system down was run. After the option returns to the home position and 30 minutes passes, check the cause of gas flow decrease.
086	O2 GAS FLOW ERROR		
101	ABC CABLE CONNECTION ERROR	Warning	The cable between AQF and ABC is not connected. Connect the cable and restart the system.
105	COVER OPEN ERROR	Warning	Close ABC safety cover and restart the system.

Table 7-1. Error messages

Section 8: Maintenance and Inspection

8-1. Unit Inspection

8-1-1. Daily inspection

CAUTION

Check the unit every day before the use. If you fail to check it, it doesn't operate properly and a serious accident can occur.

No.	Item	Contents
1	Gas leakage check	Check the leakage of O_2 and Ar gases with a flow meter for gas leakage check.
2	Septum change	Change the septum every day at measurement start.
3	Ball joint contamination check	Check that the ball joint is free from contamination such as soot.
4	Inline filter contamination check	A inline filter is contaminated by incomplete combustion.
5	PTFE tube contamination check	A PTFE tube is contaminated by incomplete combustion.
6	Microsyringe contamination and needlepoint bend checks	Check that a syringe plunger is not contaminated and the needlepoint is not bent.
7	Sample boat contamination check	Check that a sample boat is not contaminated or devitrified.
8	Absorption part contamination check	Check the contamination of absorption part of sample gas.
9	Absorption tube change	Change an absorption tube by sample concentration.

Table 8-1. Items of daily inspection

1. Gas leakage check

Check no leakage of supply gas (O_2 and Ar). Refer to 5-4-4-2. Gas leakage check.

(1) Connect the ball joint of a flow meter for gas leak check to the outlet of a pyrolysis tube.

(2) Check that the set gas flow and the indicated value of the flow meter agree.

2. Septum change

Replace the septum with new one before measurement every day.
Refer to 3-6-2. Setting of a septum and a septum holder.

3. Ball joint contamination check

Check that a ball joint is not contaminated with soot by incomplete combustion.
When the ball joint is contaminated, wash it as follows.

(1) Wipe the ball joint with absorbent cotton immersed in toluene.

(2) Prepare washing water by mixing acetone and distilled water in the ratio of 1 : 10.

(3) Immerse the ball joint in washing water.

(4) Wash it with mild detergent for 5 minutes.

(5) Replace washing solution with distilled water.

(6) Wash it with mild detergent for 5 minutes like (4).

(7) After the washing, dry it fully.

4. Inline filter contamination check

By long-term use and sample incomplete combustion, an inline filter is contaminated.
Column pressure of an ion chromatography unit is up and peak form is wrong.
Replace it with new one.

5. PTFE tube contamination check

By long-term use and sample incomplete combustion, PTFE tubes are contaminated.
Replace them with new ones.

6. Check of microsyringe contamination and needlepoint bend

In the following cases, change a microsyringe.

- A microsyringe plunger doesn't move smoothly.
- PTFE part of the plunger tip is thin and the plunger is loose.
- The microsyringe needlepoint is bent.

7. Sample boat contamination check

When sample boat contamination and devitrification are heavy, replace it with new one.

8. Absorption part contamination check

Absorption part is damaged by washing with a supersonic washing machine or a brush. Therefore wash absorption part as follows.

(1) Prepare cleanser to a beaker. For the preparation and the use, follow the contents described in a cleanser package.

(2) Remove an absorption tube and immerse respective parts in a beaker not to break them. After the immersion, wash them with ultrapure water. Dry and keep them.
If absorption part contamination is difficult to remove by incomplete combustion, wash only an absorption tube with "organic solvent".

CAUTION

Do not flow directly organic solvent such as toluene and acetone into absorption parts. GA-100 inside valve can break.

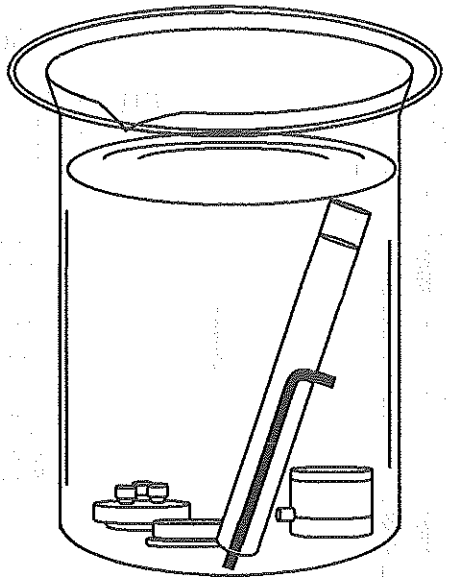


Illustration 8-1. Absorption part washing example

9. Absorption tube change

Illustration 8-2-1. and Illustration 8-2-2. indicate GA-100 absorption part change.

(1) Remove a vinyl tube from an overflow tank.

(2) Remove ϕ6/3 gas inlet connectors (2 pcs) of PTFE tubes of an absorption tube combustion gas inlet and for drain.

(3) Loosen 2 thumbscrews and remove the absorption part.

(4) Remove the overflow tank cap, the overflow tank, and an absorption tube.

(5) Put an O-ring into the overflow tank. Screw in an O-ring holder lightly to fix it.

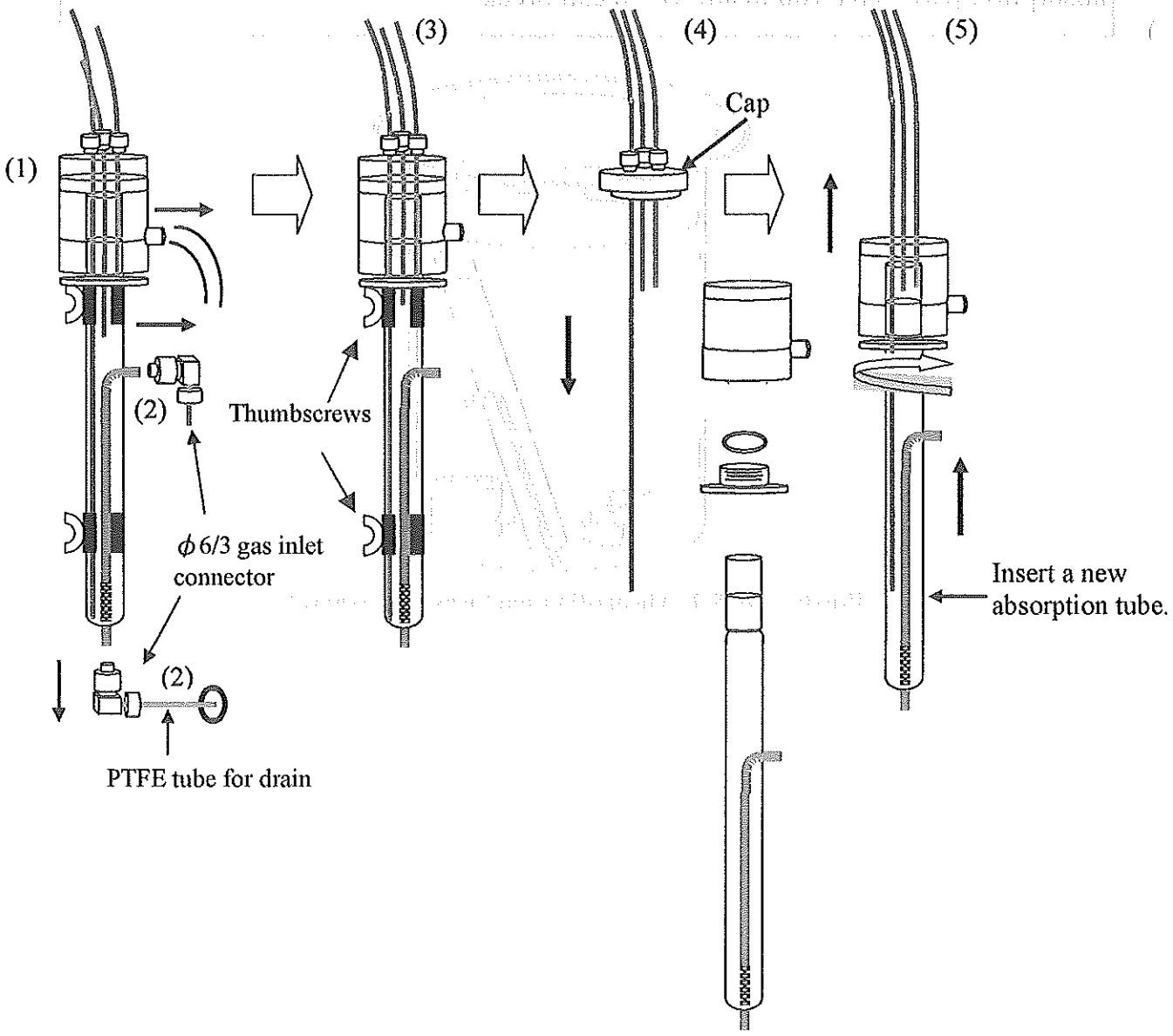


Illustration 8-2-1. GA-100 absorption part change

(6) Put the overflow tank cap to which tubes (3pcs) are set into the tank so that each tube should be put into the absorption tube.

(7) Insert a new absorption tube into GA-100 holder and fix it with thumbscrews.
Adjust the tip length of PEEK tube (green) to touch the bottom of the absorption tube.

(8) Connect ϕ6/3 gas inlet connectors (2 pcs) removed at (2).

(9) Connect the vinyl tube to the overflow tank from GA-100 right side tube outlet.

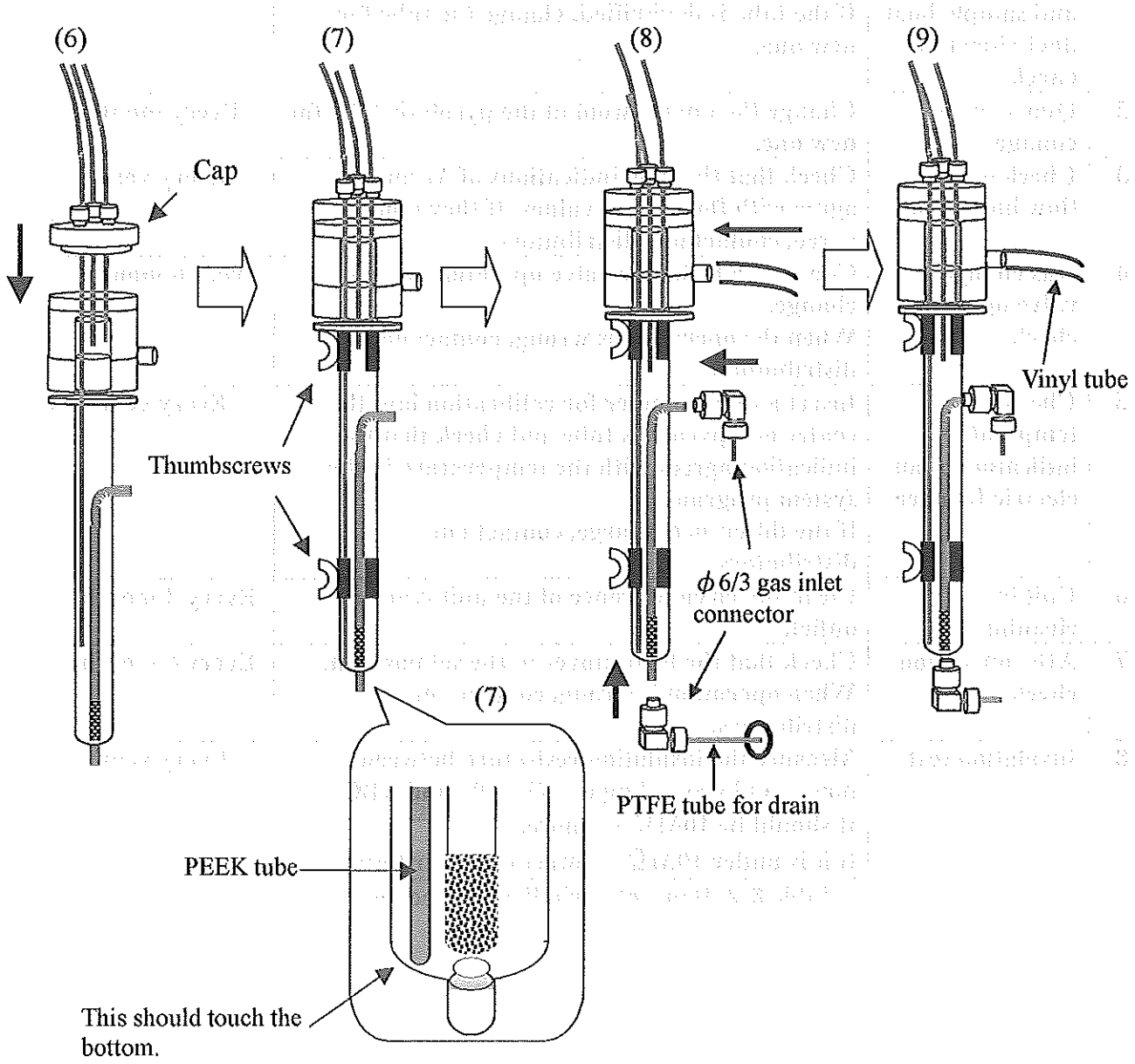


Illustration 8-2-2. GA-100 absorption part change

8-1-2. Periodical maintenance

CAUTION

Maintain the unit necessarily by regular frequency. If you fail to inspect the unit regularly, the unit doesn't perform properly and serious accidents can be caused.

No.	Item	Contents	Frequency
1	Pyrolysis tube and sample boat devitrification check	Check discoloring (whitening). If the tube is devitrified, change the tube for new one.	Every month
2	Quartz wool change	Change the quartz wool in the pyrolysis tube for new one.	Every month
3	Check of gas flow indication	Check that the flow indications of Ar and O_2 agree with flow meter values. If they don't agree, contact our distributors.	Every year
4	Gas change valve operation check	Check Ar/O_2 change valve operation by gas change. When the operation is wrong, contact our distributors.	Every 6 months
5	Check of temperature indication of an electric furnace	Insert a thermometer for calibration into the center of a pyrolysis tube and check that the indication agrees with the temperature in the system program. If the difference is large, contact our distributors.	Every year
6	Unit fan cleaning	Clean the circumference of the unit rear fan outlet.	Every 3 months
7	ABC operation check	Check that the boat moves to the set position. When operation is wrong, contact our distributors.	Every 6 months
8	Insulation test	Measure the insulation resistance between power and grounding of AQF-100 and ABC. It should be 10MΩ or more. If it is under 10MΩ, contact our distributors.	Every year

Table 8-2. Items of periodical inspection

1. Pyrolysis tube and sample boat devitrification check

CAUTION

Pyrolysis tube and sample boat devitrification deteriorate mechanical strength and causes the breakage. White discoloration of a pyrolysis tube is devitrification. When devitrification is heavy and fine cracks are in devitrified parts, mechanical strength is low. Change the tube immediately.

Pyrolysis tube inspection and change

Inspection timing: Every month or after measurement of samples containing much alkali

(1) Check mechanical strength of a pyrolysis tube by checking the devitrified part.
* When fine cracks are in white devitrified parts, mechanical strength is low.

(2) When a pyrolysis tube is devitrified and mechanical strength is low, change the pyrolysis tube immediately. Refer to 3-4. Preparation for pyrolysis tubes.

Sample boat inspection and change

(1) Salt in samples adheres to the sample boat and the boat is whitened. After measuring samples containing much salts and metals, check devitrification.

(2) When devitrification is heavy, replace it with new one.

2. Change of quartz wool in pyrolysis tubes

Salts and metals in samples are accumulated on the quartz wool in the pyrolysis tube.

Inspection timing: Every month or after measurement of sample containing much salts and metals

When the quartz wool is harder than original one or powdery, change it immediately. Read 3-4-1. Filling of quartz wool.

3. Gas flow indication check

Inspection timing: Every year

(1) Connect a calibrated flow meter to GAS-OUT O_2 and GAS-OUT Ar.

(2) After System Setup, check the difference between Ar and O_2 flow displayed in AQF-100 frame and indicated the value of the flow meter.

Ar : 200ml/min
O_2 : 400ml/min

They should be within ± 10%.

4. Ar/O_2 gas change valve operation check

Check Ar/O_2 gas change valve operation by the following procedure.

Inspection timing: Every 6 months

CAUTION

Before this operation, turn off WS-100 power switch and check that there are no waterdrops in an inner pyrolysis tube.
If waterdrops remain, water vapor goes into the flow sensors of the unit inside and the flow sensors can break.

(1) After System Setup, set Ar and O_2 as follows.
Ar: 200ml/mim
O_2: 400ml/mim

(2) Stop oxygen gas supply. (If a stop valve is connected, close it.)

(3) After 10 minutes or more, check that O_2 flow indication is 10ml/min or less. (It can be checked sooner by loosening the middle of an oxygen gas line and discharging oxygen gas.)

(4) Click "System" and "Ar/O2 Gas" of the menu.
Click [Ar/O2] button to change Ar to O_2.

(5) After several minutes, check that Ar/O_2 flow indication is 10ml/min or less.
If it is **not 10ml/min or less**, the change valve can be broken.

(6) Click [Close] button of "Ar/O2 Gas" window to change O_2 to Ar.

(7) Supply oxygen gas and stop argon gas supply.

(8) After more than 15 minutes, check that Ar/O_2 flow indication is 10ml/min or less.
(It can be checked sooner by loosening the middle of an argon gas line and discharging argon gas.)
If it is **not 10ml/min or less**, the change valve can be broken.

(9) Supply argon gas.

5. Check of temperature indication of an electric furnace

Inspection timing: Every year

(1) Insert a calibrated thermometer (R-type thermocouple) into the center of a pyrolysis tube.

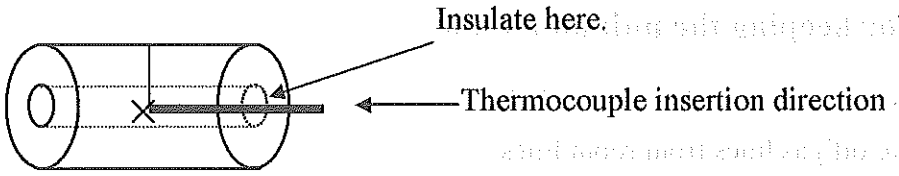
(2) Click  or click "System" and "Heater" in the menu to set the temperature as follows.

Inlet Temp. : 900℃
Outlet Temp. : 900℃

(3) Check the difference between the heater temperature displayed in AQF frame and thermometer one. The temperature in the center of the pyrolysis tube should be 900±50℃.

Take care of the following points.

- Insert the thermometer into the center in the depth direction of the electric furnace and in the radius direction of the pyrolysis tube.



- Insulate a thermometer.
- Use a calibrated thermocouple and an indicator for a thermometer.

6. Unit fan cleaning

Clean the circumference of the unit rear fan with an electric vacuum cleaner.
By using the unit when dust adheres to the circumference, the following phenomena occur.

- Heater cooling time is longer.
- After heater temperature rise, the sensor of temperature control functions and the heater switch is off automatically.

Inspection timing: Every 3 months (For dusty places, increase cleaning times.)

7. ABC operation check

Check that the boat moves to the set position.
Check it by measuring boat movement distance with a ruler.

Inspection timing: Every 6 months

8. Insulation test

Measure the insulation resistance between a power terminal and a protection terminal.

Inspection timing: Every year

Measure the insulation resistance between power terminals of AQF-100, GA-100 and, ABC and a protection ground terminal.
It should be 10MΩ or more at insulation resistance tester (DC 500V).

8-2. Keeping of System

8-2-1. For keeping the unit on a table

1. Take off power cables from outlets.
2. Take off gas lines from room lines.
3. Take off the cable connecting AQF-100 to a personal computer.
4. Put a cover on the whole of the unit.

8-2-2. For keeping the unit in a package

1. Take off power cables from outlets and the unit.
2. Take off gas lines from room lines and the unit.
3. Take off the cable connecting AQF-100 to a personal computer from the unit.
4. Take off ABC from AQF-100 and take off a ladle, a boat, and a guide tube.
5. Pull out a pyrolysis tube from AQF-100.
6. Put AQF-100 and parts in the package as before.
7. No direct sunlight
8. At low temperature and low humidity, no vibration
9. No strong electromagnetic field
10. No corrosive gas
11. No fire
12. Keep the package horizontally.

8-3. Taking out of GA-100 inside case

(1) Turn off the power switch of GA-100. Remove the following lines.
(Refer to Illustration 8-3 and Table 8-3.)

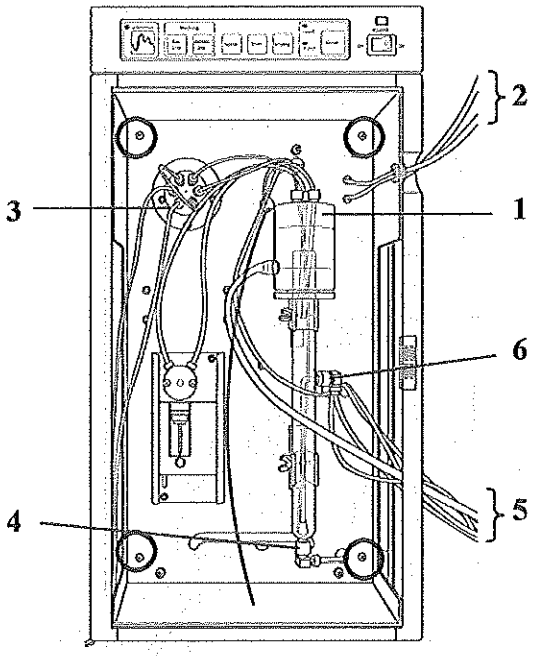


Illustration 8-3. GA-100 lines removal points

No.	Removal items
1	Overflow tank cap (with each line)
2	Absorption solvent and washing solution lines (2pcs) from each container
3	Connectors (2pcs) of an ion chromatography unit
4	Drain line connector
5	Drain lines (2pcs) and a vinyl tube
6	Connector from a pyrolysis tube

Table 8-3. GA-100 lines removal points

(2) Remove 4 screws. Pull a handle and put out the inside case slowly.
(See Illustration 8-3.)

(3) The below illustration shows valve and pump positions. Table 8-4 shows the details.

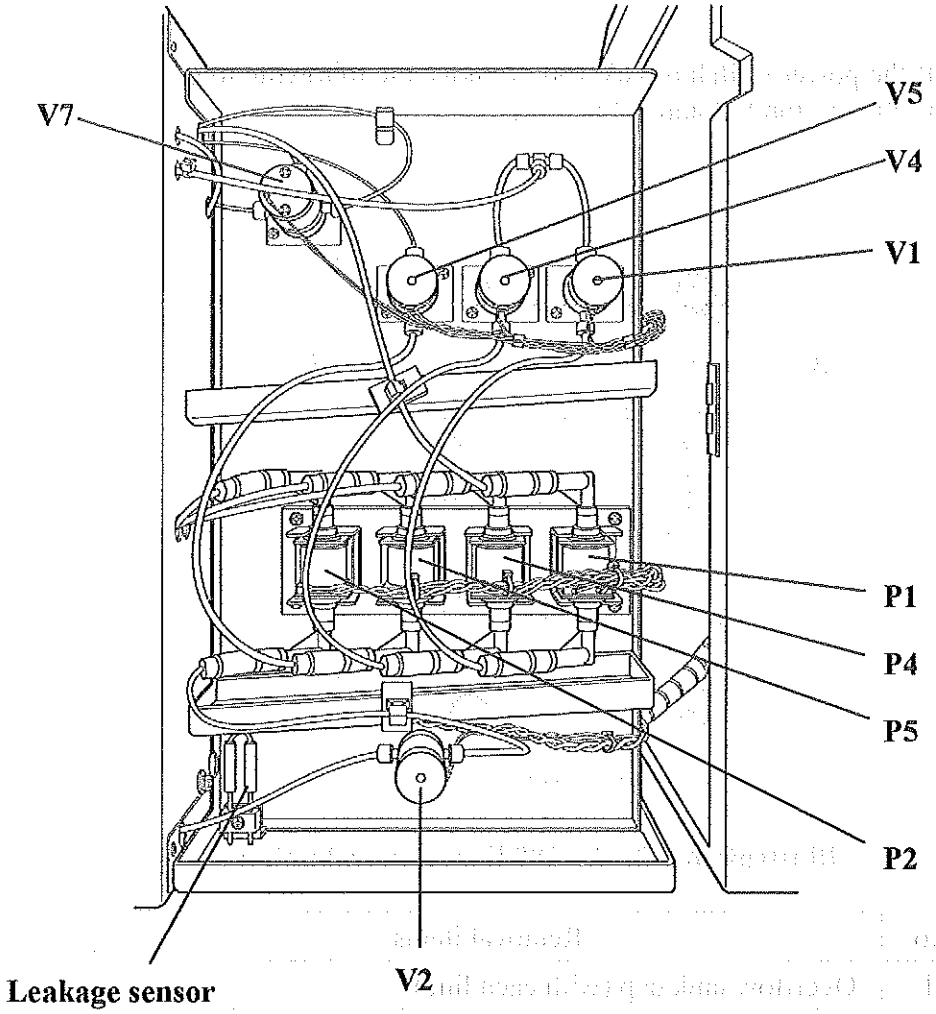


Illustration 8-4. GA-100 line control part and leakage sensor

Name	Mark	Function
Pump 1	P1	For washing an absorption tube
Pump 2	P2	For draining absorption solvent of an absorption tube
Pump 4	P4	For washing a gas line
Pump 5	P5	For sampling absorption solvent of an absorption tube and standard solution from an injection line
Valve 1	V1	Stop valve for washing an absorption tube
Valve 2	V2	Stop valve for draining absorption solvent of an absorption tube
Valve 4	V4	Stop valve for washing a gas line
Valve 5	V5	Stop valve for sampling absorption solvent and standard solution
Valve 7	V7	For changing the line from an absorption tube and a standard solution injection line

Table 8-4. Valve and pump functions

(4) Return the inside case and connect lines again.

Section 9: Specifications

Standard specifications

Measurement sample	Solid samples, nonaqueous liquid samples
Measurement substance	S, F, Cl, Br, I
Analysis method	Oxidative decomposition and gas absorption operation
Sample injection method	Automatic injection by a sample boat (Use ABC.)
Furnace temperature	Max. 1100℃ (It can be set separately at sample injection part and combustion part.)
Sample volume	Solid samples : 1～100mg, liquid samples : 5～100μl
Combustion time	3～10 minutes every sample
Absorption part	Absorption tube : PYREX 20ml Sample injector : Ceramics sample injector Dispenser : Syringe pump, 5ml gastight syringe Drain pump : Diaphragm pump Line : Fluororesin tube, PEEK tube
Balance input	RS-232C
Gas	Oxygen gas (Purity : more than 99.7 %, 0.4±0.1MPa) Argon gas (Purity : more than 99.98%, 0.4±0.1MPa) Standard use amount is as follows. Argon gas : 200ml/min Oxygen gas : 400ml/min Supply gas pressure fluctuation : under ±2% in one day
Power	AQF-100 : AC 100V/115V/230V/240V, 50/60Hz, 1000VA GA-100 : AC 100V/115V/230V/240V, 50/60Hz, 30VA ABC : AC 100V/115V/230V/240V, 50/60Hz, 22VA WS-100 : AC 100V/115V/230V/240V, 50/60Hz, 20VA

Dimension and weight	AQF-100 : Approx. 560(W)×400(D)× 435(H) mm (except a projection), Approx. 17kg GA-100 : Approx. 250(W)×425(D)× 560(H) mm, Approx. 23kg ABC : Approx. 440(W)×250(D)× 180(H) mm, Approx. 11kg WS-100 : Approx. 280(W)×115(D)× 140(H) mm, (except a projection), Approx. 3kg

Section 10: Consumables

10-1. AQF-100 Consumables

No.	Description	Part Number	Quantity	Remarks
1	Outer pyrolysis tube for TSV	TS8QPG	1 pc	
2	Inner pyrolysis tube (with a branch tube) for AQF-100	AQ1QPN	1 pc	
3	Spring for a pyrolysis tube	SX1QSP	4 pcs/set	
4	Quartz wool 10g	TNQWL	1 pc	
5	Gas purification filter (HYDRO-PURGE II)	TS6GPR	1 pc	
6	Clip, P18	TX017	2 pcs/set	
7	Fuse 3.15A	FU31MS	2 pcs/set	For 100/115V
8	Fuse 2A	FU02MS	2 pcs/set	For 230/240V
9	ϕ6/4 L-type joint	GA164E	1 pc	Elbow
10	Thermal fuse 93℃	FU93TR	1 pc	
11	ϕ4/2 Tube 10m	TX3RPP	1 pc	
12	ϕ4/2 Tube 2m	TNFT42	1 pc	
13	Insert	TNIS4	5 pcs	
14	Ferrule	TNFR4	5 pcs	

Table 10-1. AQF-100 consumables

10-2. GA-100 Consumables

No.	Description	Part Number	Quantity	Remarks
1	Absorption tube 10ml	GA1ABT	1 pc	
2	Absorption tube 20ml	GA1AB2	1 pc	
3	Overflow tank (with an O-ring)	GA1OFT	1 pc	
4	O-ring (for a P-18 overflow tank)	TNP18	5 pcs/set	
5	Ball joint with branch tubes (Quartz)	GA1BJQ	1 pc	
6	Syringe 5ml (Cavro)	GA1SB5	1 pc	
7	Nut	GA1NFY	5 pcs/set	Yellow, 1/8", for a selector valve, with a ferrule
8	PEEK tube	GA1PTB	1 pc	Inside diameter 0.25mm, blue 3m, ϕ 1/16"×0.25

No.	Description	Part Number	Quantity	Remarks
9	ϕ6/3 Joint (30-6RU3-S)	TS3JLJ	1 pc	Straight
10	ϕ6/3 Joint (30-6RUE3-S)	GA163E	1 pc	Elbow
11	PTFE tube ϕ 3/2 1m	TN5FTS	1 pc	
12	Inline filter (with a filter)	GA1ILF	1 pc	
13	Filter for an inline filter	GA1IFP	5 pcs/set	
14	Nut (hexagonal)	GA1NHF	10 pcs/set	For a sample injector /an inline filter
15	Nut (with a ferrule) ϕ 3	GA1N03	5 pcs/set	For an overflow tank
16	Nut (#9734), for ϕ 1/16" (with a ferrule #9706)	GA1N16S	5 pcs/set	For an overflow tank

Table 10-2. GA-100 consumables

10-3. ABC Consumables

No.	Description	Part Number	Quantity	Remarks
1	Guide tube	TX3RTG	1 pc	
2	Ladle common use for ABC and ASC	TX3SCR	1 pc	
3	Magnet	TX2RTM	1 pc	
4	Sample boat (Quartz)	TX2SBT	5 pcs/set	
5	Septum holder	TX3SED	10 pcs	
6	Septum for a sample injection port	TN5SIS	100 pcs/set	
7	Packing for a sample inlet port	TXPKG	1 pc	
8	Glass plate for a sample inlet port	TX3BSI	1 pc	
9	Packing for a sample injection port	TN10SP	2 sets	
10	O-ring, P16	TX020	5 pcs/set	
11	O-ring holder	TX0103	1 pc	
12	Fuse 2A	FU02MS	2 pcs/set	
13	ϕ6/4 L-type joint (30-6RUE4-S)	GA164E	1 pc	
14	Ceramic sample boat	SXSMBS	100 pcs/bag	For inorganic measurement

Table 10-3. ABC consumables

10-4. WS-100 Consumables

No.	Description	Part Number	Quantity	Remarks
1	ϕ 6/3 Connector (30-6RUE3-S)	GA163E	1 pc	Connect it to the branch tube of an inner pyrolysis tube.
2	ϕ 3/2 PTFE tube 1m	TN5FTS	1 pc	
3	PTFE tube (blue) for Ar ϕ 4/2 3m	TN5FTA	1 pc	
4	Fuse 2A ϕ 5.2/20 midget-type slow-blow	FU02MS	2 pcs/set	

Table 10-4. WS-100 parts

10-5. Maintenance Consumables

No.	Description	Part Number	Quantity	Remarks
1	Flow meter for gas leak check (1L/min)	TX3FFF	1 pc	
2	Quartz wool poker	TX2RTL	1 pc	

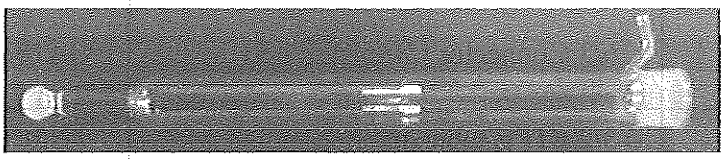
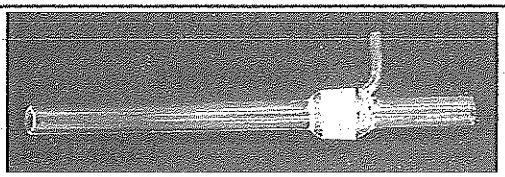
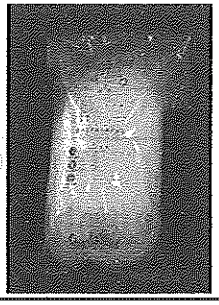
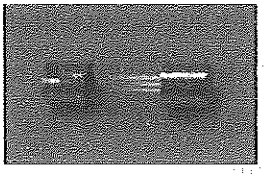
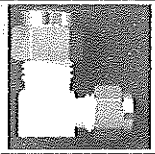
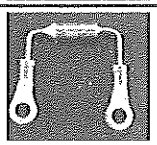
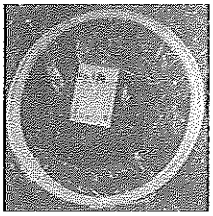
Table 10-5. Maintenance consumables

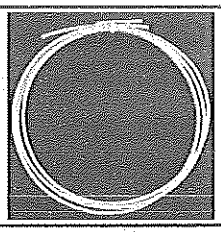
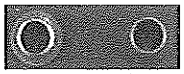
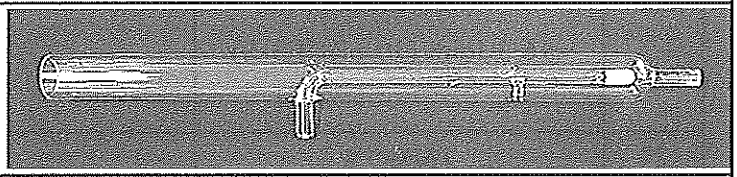
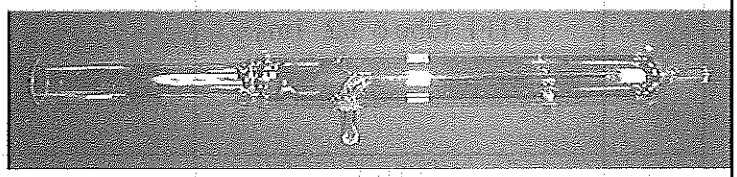
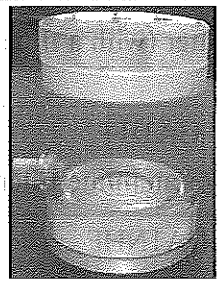
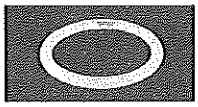
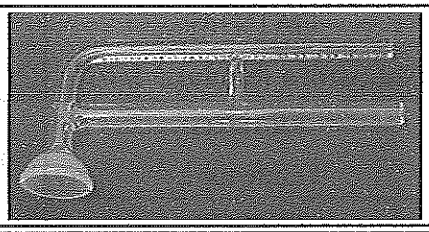
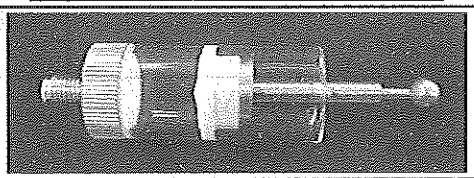
10-6. Option Consumables

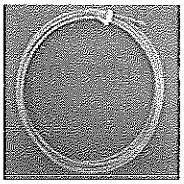
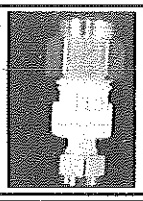
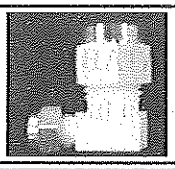
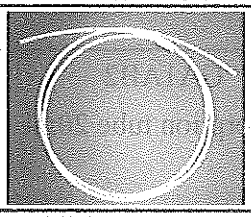
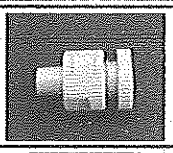
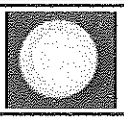
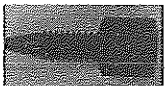
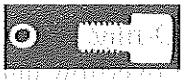
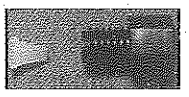
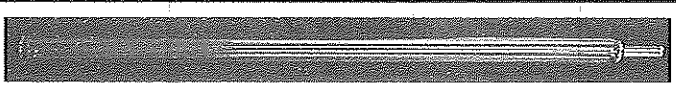
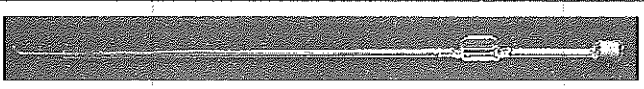
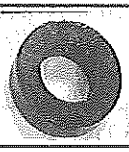
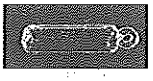
No.	Description	Part Number	Quantity	Remarks
1	Sample loop 5 μ l	GA1L05	1 pc	For a sample injector
2	Sample loop 20 μ l	GA1L20	1 pc	For a sample injector
3	Sample loop 50 μ l	GA1L50	1 pc	For a sample injector
4	Sample loop 100 μ l	GA1L11	1 pc	For a sample injector
5	Sample loop 200 μ l	GA1L21	1 pc	For a sample injector
6	Attachments for high concentration Absorption tube (20ml) Sample loop (20 μ l, 5 μ l) Trap column	AQF1PK	1 set	

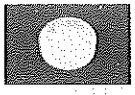
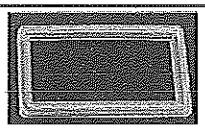
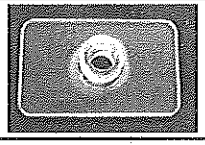
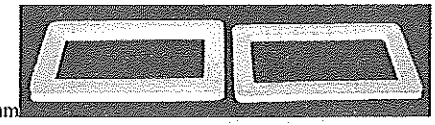
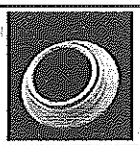
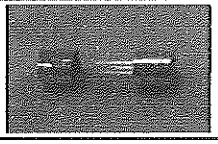
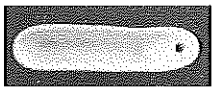
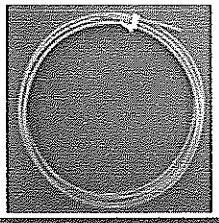
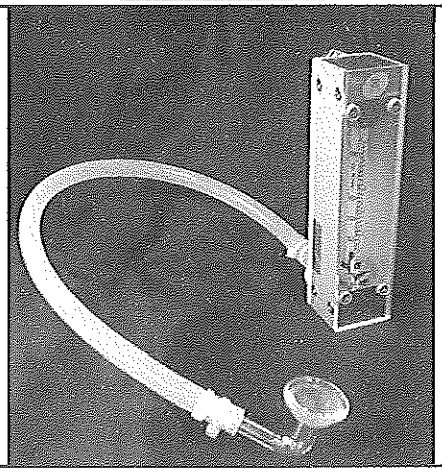
Table 10-6. Option consumables

10-7. Parts Pictures

No.	Part numbers	Pictures
1	TS8QPG Outer pyrolysis tube for TSV	
2	AQ1QPN Inner pyrolysis tube (with a branch tube) for AQF-100	
3	SX1QSP Spring for a pyrolysis tube	
4	TNQWL Quartz wool 10g	
5	TS6GPR Gas purification filter (HYDRO-PURGE II)	
6	TX017 Clip, P18	
7	FU31MS Fuse 3.15A FU02MS Fuse 2A	
8	GA164E ϕ6/4 L-type joint	
9	FU93TR Thermal fuse 93℃	
10	TX3RPP ϕ4/2 Tube 10m	

No.	Part numbers	Pictures
11	TNFT42 ϕ4/2 Tube 2m	
12	TNIS4 Insert	
13	TNFR4 Ferrule	
14	GA1ABT Absorption tube 10ml	
15	GA1AB2 Absorption tube 20ml	
16	GA1OFT Overflow tank (with a O-ring)	
17	TNP18 O-ring (For P-18 overflow tank)	
18	GA1BJQ Ball joint with branch tubes (Quartz)	
19	GA1SB5 Syringe 5ml (Cavro)	
20	GA1NFY Nut yellow 1/8"(for a selector valve) with a ferrule	

No.	Part numbers	Pictures
21	GA1PTB PEEK tube inside diameter 0.25mm blue 3m ϕ 1/16"/0.25	
22	TS3JLJ ϕ 6/3 Joint (30-6RU3-S)	
23	GA163E ϕ 6/3 Joint (30-6RUE3-S)	
24	TN5FTS PTFE tube ϕ 3/2 1m	
25	GA1ILF Inline filter (with a filter)	
26	GA1IFP Filter for an inline filter	
27	GA1NHF Nut (hexagonal)	
28	GA1N03 Nut (with a ferrule) ϕ 3	
29	GA1N16S Nut (with a ferrule) ϕ 1/16"	
30	TX3RTG Guide tube	
31	TX3SCR Ladle	
32	TX2RTM Magnet	
33	TX2SBT Sample boat (Quartz)	
34	TX3SED Septum holder	

No.	Part numbers	Pictures
35	TN5SIS Septum for a sample injection port	
36	TXPKG Packing for a sample inlet port	
37	TX3BSI Glass plate for a sample inlet port	
38	TN10SP Packing for a sample injection port	
39	TX020 O-ring, P16	
40	TX0103 O-ring holder	
41	FU02MS Fuse 2A	
42	SXSMBS Ceramic sample boat	
43	TN5FTA PTFE tube (blue) for Ar ϕ 4/2 3m	
44	TX3FFF Flow meter for gas leak check (1L/min)	

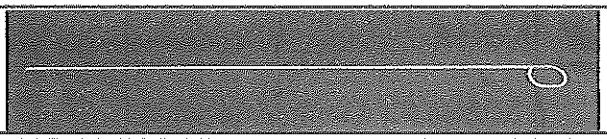
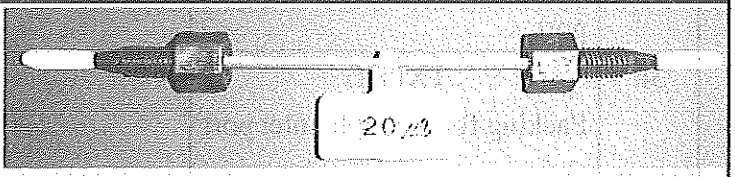
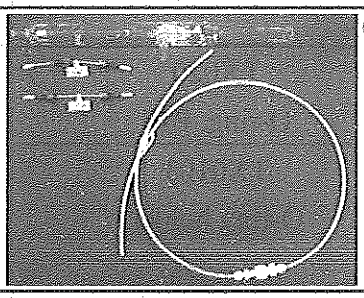
No.	Part numbers	Pictures
45	TX2RTL Quartz wool poker	
46	GA1L05 Sample loop 5 μl	 20 μl sample loop
47	GA1L20 Sample loop 20 μl	
48	GA1L50 Sample loop 50 μl	
49	GA1L11 Sample loop 100 μl	
50	GA1L21 Sample loop 200 μl	
51	AQF1PK Attachments for high concentration Absorption tube (20ml) Sample loop (20 μl) Trap column	

Table 10-7. AQF-100 parts pictures