Tissue-Tek® VIP® 6 Vacuum Infiltration Processor

SERVICE MANUAL

Sakura Finetek Japan Co., Ltd.

No. AH9-IF-001-01
June 2009

Information contained in this service manual is designed for use by properly trained service personnel using appropriate tools and test equipment. If you do not possess the proper training or tools, do not attempt to service this instrument.

Manufactured for:
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AH9-IF-001-01

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VIP 6 Service Manual Pending Corrections

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No	Revision	Page	Section	Title	Incorrect	Correction
1	AH9-IF-001	5-7	5-5	Bottle Rack and Base	Part Code for item #35 (Thermistor) is A6-60-3043.	The correct Part Code for item #35 (Thermistor) is A6-60-3046.
2	AH9-IF-001	1-10	1-2-1-3	Port Position	LED ON pattern for Port18 is PC1, PC2, PC3, PC5	LED ON pattern for Port18 is PC1, PC2, PC3, PC4
3	AH9-IF-001	1-11	1-2-1-4	Operation Flowchart	All EC42s and EC40s in the flowchart are incorrect ECs.	EC42 should be EC43. EC40 should be EC42.
4	AH9-IF-001	1-12	1-2-1-4	Operation Flowchart	EC42 described in the first paragraph is not the correct EC.	The correct EC is EC43.
5	AH9-IF-001	1-11	1-2-1-4	Operation Flowchart	"Also, the rotary valve turns by 17.14 degrees from one port to the next port (34.34 degrees between ports 19 and 20)."	"Also, the rotary valve turns by 17.14 degrees from one port to the next port (34.34 degrees between ports 17 and 18)."
6						
7						
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Chapter 1 Operating Principles

1-1 Overview

Tissues (cassettes containing fixed/coverslipped tissues) are placed in stainless tissue baskets and the baskets are placed in the retort. After the baskets have been placed the retort lid is closed. Parameters are entered according to messages, buttons and icons displayed on each screen, after which the user can start auto operation by operating a button or icon.

In the auto operation mode, reagent is supplied to the retort (this action is hereinafter referred to as “pumping in”) or drained from the retort (hereinafter referred to as “pumping out”) from/to the reagent tanks sequentially at the pre-defined intervals to fix, dehydrate and replace tissues. Thereafter, paraffin that has been heated in the paraffin oven is pumped in to the retort to permeate paraffin through the tissues.

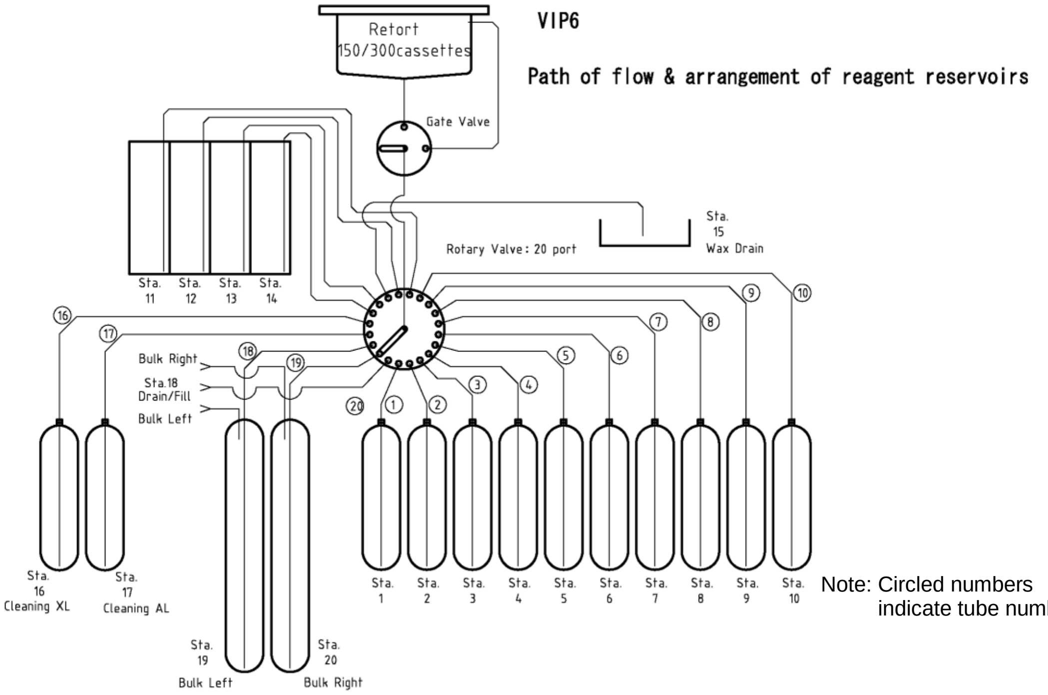
Reagent and paraffin pumped in to the retort are controlled at the pre-defined temperatures, and also a mixing function is provided whereby the P/V cycles for pressurizing/depressurizing the retort are repeated at specified intervals, along with pumping in/out of reagent, to process the tissues more effectively.

In the pumping-in phase, the retort is depressurized and reagent is supplied from the selected reagent tank. In the pumping-out phase, the retort is pressurized and reagent is returned to the selected reagent tank. The retort is pressurized/depressurized by closing the reagent circuit connected to the retort and increasing/decreasing the retort pressure. This is implemented by operating one air pump and multiple solenoid valves in the air circuit, as well as the rotary valve and gate valve in the reagent circuit.

Tissues are taken out from the retort and the remaining paraffin in the retort is drained to the final paraffin tank, after which a series of cleaning/drying steps are performed using xylene and alcohol to wash off paraffin attached to the retort.

To manage reagent, functions are also provided to drain used reagent to an external container, measure the amount of reagent supplied from an external container using the level sensors installed in the retort, and supply reagent to a specified reagent bottle.

1-1-1 Tubing System



Note: Circled numbers indicate tube numbers.

Fig. 1-1-1. Tubing Diagram

Fig. 1-1-1 shows a tubing diagram of the system.

Take note that the reagent tanks, paraffin containers and waste paraffin container that can be selected by the rotary valve, two bulk reservoirs affixed to the system, external drain/fill ports, etc., are referred to as “ports,” where each port is assigned a port number (Pnn) and name. Each port is connected to a tube denoted by the same number. Note that port numbers are different from station numbers shown on the screen.

With this system, process reagent bottles are indicated as P1 to P10 (Station Numbers: Sta. 1 to 10), paraffin containers as P11, P12, P14 and P15 (Station Numbers: Sta. 11 to 14), waste paraffin container as P13 “Wax Drain” (Station Number: Sta. 15), retort cleaning reagent bottles as P16 “Cleaning XL” (Station Number: Sta. 16) and P17 “Cleaning Al” (Station Number: Sta. 17), bulk reservoirs as P18 “Bulk Left” (Station Number: Sta. 19) and P19 “Bulk Right” (Station Number: Sta. 20), and one external drain/fill port as P20 “Drain/Fill” (Station Number: Sta. 18).

For your information, accumulated liquid generated by condensation of air gas in the tubing is drained to the condensate bottle “Condensate” during operation.

The tubing system is divided into the following units:

- Retort — A container used to process tissues.
- Paraffin oven — A unit that stores paraffin containers containing molten paraffin. Two types of paraffin containers are housed in the oven according to the required paraffin replenishment function, where only station 14 (P15) is larger than others.
- Tank rack — A unit that stores the process reagent bottles, retort cleaning reagent bottles, waste paraffin container, and condensate bottle.
- Rotary valve — A valve used to select each port.
- Gate valve — A valve used to connect and disconnect each reagent port to/from the retort.

- Access door When the access door on the left side of the retort at the front is opened, the fume control unit and external drain/fill ports can be accessed.
- Fume control unit
  In this unit, all exhaust gases generating from the air tubes/reagent bottles, as well as exhaust gases in the oven/tank rack, are sucked in at once and passed through the activated carbon filters using air blown by a fan, to cause the exhaust gases to be adsorbed to the filters.
- External drain/fill ports
  A connection port that supplies and drains reagent to/from a reagent bottle through the retort “Drain/Fill” (Station Number: Sta. 18), as well as connection ports that fill reagent to the right and left bulk reservoirs “Bulk Left” (Station Number: Sta. 19) and “Bulk Right” (Station Number: Sta. 20), are available.
- Bulk reservoirs
  Storage containers capable of replenishing retort reagent are provided inside the right and left side panels of the system, where the left bulk reservoir is connected to the connection port for “Bulk Left” (Station Number: Sta. 19), while the right bulk reservoir is connected to the connection port for “Bulk Right” (Station Number: Sta. 20).

Specified reagent, etc., can be pumped in to/out of the retort storing tissues using the gate valve and rotary valve. This is made possible by depressurization and pressurization achieved by the air pump and multiple solenoid valves in the air unit.

The retort has four level sensors to detect the levels at 2.7 liters, 3.5 liters and 4.2 liters from the bottom, as well as the top overflow level. These sensors are used to fill reagent to a specified level so that the tissues are submerged in reagent.

One feature of this system is that a specified amount of reagent can be supplied from an external container to P1 to 10 (Station Numbers: Sta. 1 to 10) and P16 and 17 (Station Numbers: Sta. 16, 17) through the external drain/fill port P20 (Drain/Fill) (Station Number Sta. 18), and used reagent can also be drained to an external container.

If the specified level in the retort is not reached during the process, reagent can be replenished to the retort from a specified bulk reservoir. In the system preparation steps, an external tube is connected to the left bulk reservoir via the connection port for “Bulk Left” (Station Number Sta. 19), and to the right bulk reservoir via the connection port for “Bulk Right” (Station Number Sta. 20), to allow for reagent supply from an external container.

This system consists of pressurized tubing circuits and uses large amounts of reagents having very adverse effects on the human body, etc. Accordingly, air generated by depressurization, pressurization, etc., is converted into reagent mist by the condenser and tentatively accumulated in the trap bottle, and the air accumulated in the trap bottle is discharged to the condensate bottle during operation. The condensed exhaust gases, gases in the reagent bottles, gases generated in the oven and odorous gases in the tank rack are guided by the intake fan of the fume control unit and cleaned by the activated carbon filters, and then released to atmosphere. For your information, these exhaust gases can be discharged through a duct, etc., by installing an optional duct connection adapter (used for both ∅38-mm and 75-mm ducts).

1-1-2 Electrical System

Fig. 1-1-2-1 shows an electrical diagram.

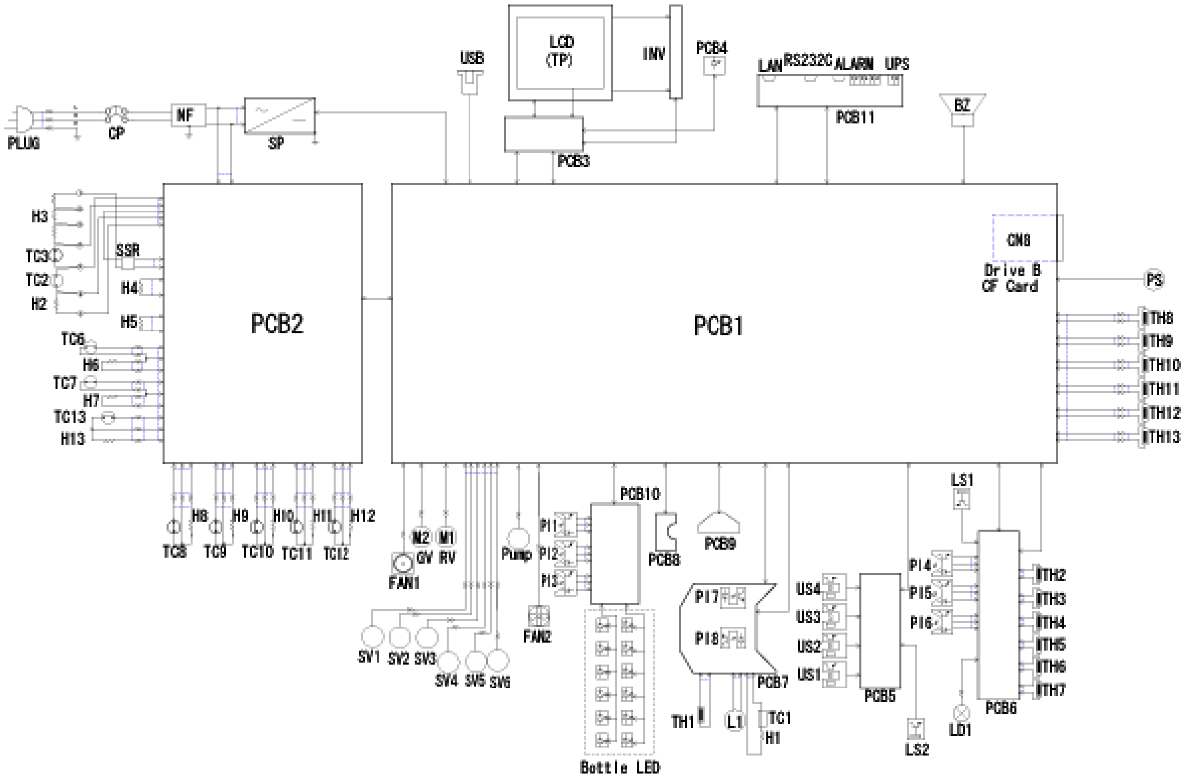


Fig. 1-1-2-1 Electrical Diagram

Table 1-1-2-1 List of Printed Circuit Boards

Symbol	Name	Function
PCB1	CPU board	A printed circuit board mainly consisting of a CPU, used to control the system by means of software.
PCB2	Heater driver board	A printed circuit board used to control the heaters.
PCB3	LCD relay board	A printed circuit board used to control the display through the LCD and touch-panel controller.
PCB4	Power indicator board	A printed circuit board equipped with power indicators.
PCB5	Ultrasonic sensor board	A printed circuit board used to relay inputs from the four ultrasonic sensors in the retort.
PCB6	Relay board (right)	A printed circuit board used to relay signals from the bulk reservoir level sensors, temperature sensors, etc.
PCB7	Lid sensor board	A printed circuit board on which the relays for wires connected to the retort lid heater and lock, as well as the lid sensor, are mounted.
PCB8	GV positioning board	A printed circuit board equipped with the four photo-sensors that determine gate valve positions.
PCB9	RV positioning board	A printed circuit board equipped with the six photo-sensors that determine rotary valve positions.
PCB10	Relay board (left)	A printed circuit board used to relay signals from the bulk reservoir level sensors, bottle LEDs, etc.
PCB11	Interface board	A printed circuit board equipped with the connectors for external alarm output, LAN, serial communication and UPS.

Table 1-1-2-2 Electrical Units

Symbol	Name	Function
PLUG	Power Cord	This cable receives the power from the commercial power source. Since the power-supply voltage and applicable safety standards vary from one country to another, a different cable is used in each country.
CP	Circuit protector	This protector serves as a main power switch, and also has a function to cut off the power upon occurrence of short-circuit, etc.
NF	Noise filter	This filter eliminates noise between the system and commercial power source.
SP	Switching power supply	This power supply converts the AC power-supply voltage to DC power-supply voltages of 24 VDC and 5 VDC. It also insulates the system from the commercial power source.
USB	USB connector	An interface that connects a USB memory device to the system.
LCD(TP)	LCD module with touch panel	This module provides a 10.4” color LCD and resistance-membrane touch panel.
INV	Inverter	A DC-AC converter for turning on the cold cathode tube in the 10.4” color LCD.
LAN	LAN interface connector	A RJ45 LAN connector.
RS232C	RS232C interface connector	A connector for establishing serial communication.
ALARM	Alarm output connector, terminal block	A connector and terminal block for outputting alarms indicating power failure and various errors to an external device.
UPS	Terminal block for power-failure signal input	A terminal block for notifying the system of power failure when an uninterruptible power supply (UPS) is used externally to the system.
BZ	Speaker	A speaker for generating an alarm sound, key click sound, etc.
CN8	CF card slot	A connector that houses a CF card in which the system software, etc., is stored.
PS	Pressure sensor	This sensor measures the retort pressure.
LS1	Waste paraffin container sensor	A proximity sensor that detects whether or not a waste paraffin container is set.
LS2	Oven door sensor	A proximity sensor that detects opening of the oven door.
LD1	Waste paraffin container indicator	A red indicator indicating that paraffin has been drained.
US1	2.7l ultrasonic sensor	An ultrasonic sensor that detects the 2.7-L level.
US2	2.5l ultrasonic sensor	An ultrasonic sensor that detects the 3.5-L level.
US3	4.2l ultrasonic sensor	An ultrasonic sensor that detects the 4.2-L level.
US4	Ultrasonic sensor for overflow position	An ultrasonic sensor that detects the 4.5-L level.
PI1	Overflow sensor for left bulk reservoir	An optical level sensor located at the overflow position in the left bulk reservoir.
PI2	High level sensor for left bulk reservoir	An optical level sensor located at the high level position in the left bulk reservoir.
PI3	Low level sensor for left bulk reservoir	An optical level sensor located at the low level position in the left bulk reservoir.
PI4	Overflow sensor for right bulk reservoir	An optical level sensor located at the overflow position in the right bulk reservoir.
PI5	High level sensor for right bulk reservoir	An optical level sensor located at the high level position in right left bulk reservoir.
PI6	Low level sensor for right bulk reservoir	An optical level sensor located at the low level position in right left bulk reservoir.
PI7	Lid closed positioning sensor for retort	An optical sensor that detects that the retort lid lever is at the closed position.
PI8	Locked positioning sensor for retort	An optical sensor that detects that the retort lock lever is at the locked position.
L1	Lid solenoid	A self-holding solenoid for locking/unlocking the lid.
Pump	Air pump	An air pump for pressurizing/depressurizing the retort.
SV1	Solenoid valve for pressurization	A solenoid valve positioned on the discharge side of the air pump and switched when pressurizing the line.
SV2	Solenoid valve for depressurization	A solenoid valve positioned on the suction side of the air pump and switched when depressurizing the line.
SV3	Solenoid valve for opening line to atmosphere	A solenoid valve positioned on the valve manifold to open and close the air circuit to/from atmosphere.
SV4	Solenoid valve for filling left reservoir	A solenoid valve switched when depressurizing/supplying from the left bulk reservoir.
SV5	Solenoid valve draining right reservoir	A solenoid valve switched when depressurizing/supplying from the right bulk reservoir.
SV6	Solenoid valve for draining condensate	A solenoid valve switched when discharging condensate in the condensate bottle to the condensate bottle.
M1	Rotary valve motor	A 2-phase stepping motor with reducing gears. This motor is used to turn the rotary disk.
M2	Gate valve motor	A 2-phase stepping motor with reducing gears. This motor is used to turn the rotary disk.
FAN1	Cooling fan	A fan that cools the interior of the control box.
FAN2	Fume fan	A fan in the fume control unit, used to forcibly discharge odorous gases from the system.
SSR	Solid state relay	A solid-state relay used in the heating control of retort heaters.
Bottle LED	Bottle led unit	A unit that illuminates the reagent bottle to facilitate checking of reagent level from the back of the bottle.

Table 1-1-2-3 Temperature Control Units

Heater symbol	Thermostat symbol	Temperature sensor symbol	Temperature-controlled location	Description
TH1	TC1	TH1	Retort lid heater	A heater for preventing bedewing on the retort lid. Only this heater is driven by 24 VDC.
TH2	TC2	TH2	Retort front heater	A heater provided on the front side of the retort. It also heats the level sensors.
TH3	TC3	TH3	Retort heater, other	A heater not located on the front side of the retort.
TH4	None	TH4	Fill tube heater	A tube heater provided between the side face at the top of the retort and the gate valve.
TH5	None	TH5	Drain tube heater	A tube heater provided between the side face at the bottom of the retort and the gate valve.
TH6	TC6	TH6	Gate valve hater	A heater that heats the GV housing.
TH7	TC7	TH7	Rotary valve heater	A heater that heats the RV housing.
TH8	TC8	TH8	Paraffin station 11 heater	A heater positioned at the bottom of oven station 11.
TH9	TC9	TH9	Paraffin station 12 heater	A heater positioned at the bottom of oven station 12.
TH10	TC10	TH10	Paraffin station 13 heater	A heater positioned at the bottom of oven station 13.
TH11	TC11	TH11	Paraffin station 14 heater	A heater positioned at the bottom of oven station 14.
TH12	TC12	TH12	Oven top board heater	A heater for the tube holding block at the oven top board
TH13	TC13	TH13	Xylene heater	A heater positioned at the bottom of the xylene station.

1-1-2-1 Explanation of Electrical System

This system is available in three models, each corresponding to one of three power-supply voltage specifications.

Table 1-1-2-4 Power-supply Voltage Specifications

Model	Power-supply voltage	Rated input
VIP6-J0	AC 100V 50/60 Hz	12 A
VIP6-A1	AC 115V 50/60 Hz	12 A
VIP6-E2	AC 230V 50/60 Hz	6 A

The system supplies the power using the power cable connected through the inlet at the back of the system. The power switch located on the right side face of the control box can be used to supply and cut off power to/from the system. The power-supply voltage supplied to the system is directed via the noise filter to the switching power supply that generates safe, low voltages and also to the heater driver board. The switching power supply generates 24-VDC power to drive devices and 5-VDC power used for control. These voltages output from the switching power supply are supplied to the CPU board first, and then to the various devices according to the software.

On the CPU board, the microcontroller loads the software from the CF card set in the CF card slot on the CPU board, and then starts the software. Inputs and outputs to/from the LCD, touch panel, etc., are implemented via the LCD relay board, while each heater is temperature-controlled via the heater driver board.

Except for the heaters, all devices are driven by the power output from the switching power supply. Among the heaters, the lid heaters are driven by 24 VDC, while all other heaters are driven by the AC power-supply voltage.

1-2 Operation of Each Part

1-2-1 Rotary Valve

1-2-1-1 Overview

The purpose of the rotary valve is to provide a reagent passage between a specific station and the retort. The rotary valve has positions corresponding to respective stations, to provide a reagent circuit connecting the gate valve to each station. A total of 20 stations are available. For your information, the station numbers shown and manipulated on the software screen are called “stations,” while the tube numbers assigned mechanically to the rotary valve are called “ports.” Note that numbers do not always match between “stations” and “ports.”

Table 1-2-1-1 Rotary Valve Station Numbers

Station	Port	Connected to	Application
Sta.1	P1	Reagent bottle at the far left on the upper level	For process reagent
Sta.2	P2	Reagent bottle second from the left on the upper level	For process reagent
Sta.3	P3	Reagent bottle third from the left on the upper level	For process reagent
Sta.4	P4	Reagent bottle fourth from the left on the upper level	For process reagent
Sta.5	P5	Reagent bottle fifth from the left on the upper level	For process reagent
Sta.6	P6	Reagent bottle at the far left on the lower level	For process reagent
Sta.7	P7	Reagent bottle second from the left on the lower level	For process reagent
Sta.8	P8	Reagent bottle third from the left on the lower level	For process reagent
Sta.9	P9	Reagent bottle fourth from the left on the lower level	For process reagent
Sta.10	P10	Reagent bottle fifth from the left on the lower level	For process reagent
Sta.11	P11	Oven at the far left	For paraffin
Sta.12	P12	Oven second from the left	For paraffin
Sta.13	P14	Oven third from the left	For paraffin
Sta.14	P15	Oven fourth from the left	For paraffin
Sta.15	P13 (Wax Drain)	Reagent bottle sixth from the left on the upper level	Waste paraffin container
Sta.16	P16 (Cleaning XL)	Reagent bottle at the far right on the upper level	Xylene for cleaning
Sta.17	P17(Cleaning AL)	Reagent bottle at the far right on the bottom level	Alcohol for cleaning
Sta.18	P20 (Drain/Fill)	External drain/fill port (center)	External drain/fill
Sta.19	P18 *Bulk Left)	Left bulk reservoir	For storing new reagent (for filling purposes only)
Sta.20	P19 (Bulk Right)	Right bulk reservoir	For storing new reagent (for filling purposes only)

The rotary valve allows for direct access to a given station by specifying the applicable station. When accessing a station, stations 19 and 20 are not passed, except when station 19 or 20 is directly specified, in order to prevent reagent from mixing into stations 19 and 20 that are bulk reservoirs.
When accessing station 1 from station 17 (containing alcohol for cleaning), for example, the motor is operated in the reverse direction (= turned in the direction of decreasing port numbers) until station 1 is accessed.

1-2-1-2 Components

The rotary valve mainly consists of the component units listed below.

Table 1-2-1-2 Rotary Valve Components

No.	Name	Function
1	RV housing	This housing connects the reagent circuit to the reagent tank, gate valve, etc. The RV housing has a temperature control function.
2	RV fixed disk	This disk is made of ceramics, and has ports arranged in a circle concentric to the common port at the center.
3	RV rotary disk	A disk made of ceramics, connecting a given port on the fixed disk to the common port at the center. The RV rotary disk is turned by a drive motor and stopped at a specified port position.
4	RV positioning disk	A disk with grooves used to indicate the current position of the rotary disk. It has a concentric double structure, where the inner circle defines the port number, while the outer circle defines the stopped position.
5	RV positioning board	A printed circuit board on which six photo-sensors are mounted. The port position is detected by this board in combination with RV positioning disk 5.
6	Stepping motor	A stepping motor with rotary gears, having a resolution of 7,200 steps. This motor is used to move the RV rotary disk at a specified position.

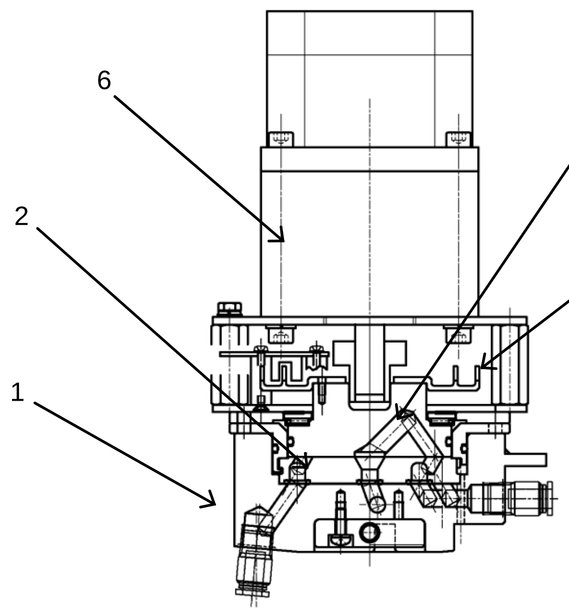
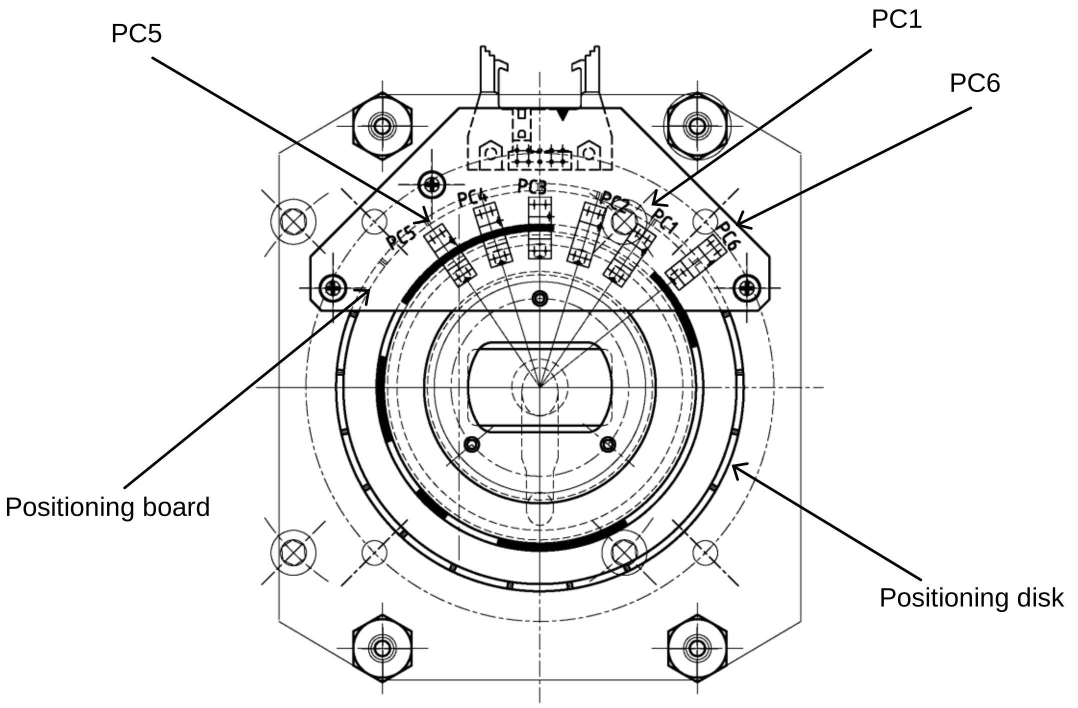


Fig. 1-2-1-1 Rotary Valve

1-2-1-3 Port Position

The port position is determined by the six photo-sensors detecting different positions on the grooves provided in RV positioning disk 6. RV positioning disk 6 has the inner groove and outer groove as shown in the figure below. The RV positioning board is shown below.



* When viewed from the motor

Fig. 1-2-1-2 RV Valve Positioning

Table 1-2-1-3 Port Positions and Photo-sensor Illumination Conditions

Port position	Illumination conditions of LEDs on CPU board					
	R:PC1	R:PC2	R:PC3	R:PC4	R:PC5	R:PC6
1	OFF	OFF	OFF	ON	ON	OFF
2	ON	OFF	OFF	OFF	ON	OFF
3	OFF	ON	OFF	OFF	OFF	OFF
4	ON	OFF	ON	OFF	OFF	OFF
5	OFF	ON	OFF	ON	OFF	OFF
6	OFF	OFF	ON	OFF	ON	OFF
7	ON	OFF	OFF	ON	OFF	OFF
8	OFF	ON	OFF	OFF	ON	OFF
9	OFF	OFF	ON	OFF	OFF	OFF
10	OFF	OFF	OFF	ON	OFF	OFF
11	OFF	OFF	OFF	OFF	ON	OFF
12	ON	OFF	OFF	OFF	OFF	OFF
13	ON	ON	OFF	OFF	OFF	OFF
14	OFF	ON	ON	OFF	OFF	OFF
15	OFF	OFF	ON	ON	OFF	OFF
16	ON	OFF	OFF	ON	ON	OFF
17	ON	ON	OFF	OFF	ON	OFF
18	ON	ON	ON	OFF	ON	OFF
19	OFF	ON	ON	ON	ON	OFF
20	OFF	OFF	ON	ON	ON	OFF

* Note that when each LED is illuminating, it means that the corresponding sensor is sensing light. The above patterns are feasible only when “R: PC6” is OFF (= PC6 is sensing light).

1-2-1-4 Operation Flowchart

Fig. 1-2-1-3 shows an operation flow of the rotary valve.

Fig. 1-2-1-3 Rotary Valve Operation Flow

The software can only access stations 11 to 15 when the retort contains paraffin. Also, the system is designed in such a way that stations 19 and 20, which are bulk reservoirs, are not passed. However, take note that the rotary valve can be turned in the forward/reverse directions manually by the service personnel after logging on using a dedicated password, in which case the above limitations are invalid.

When positioning sensor PC6 is outputting a detection signal but no input is received from the anticipated port through photo-sensors PC1 to PC5, a rotary valve positioning sensor error generates. Also, the rotary valve turns by 17.14 degrees from one port to the next port (34.34 degrees between ports 19 and 20). In addition, a maximum play of 5.24 degrees is considered for the coupling between the motor shaft and rotary disk, and if the photo-sensor input condition does not change after the rotary disk has turned by a specified angle or more, a rotary valve malfunction error is output. For your information, the axial torque can be changed by greater margins by changing the speed of the stepping motor. During normal operation, the speed of the stepping motor is 59 seconds per revolution. If valve malfunction error 42 is issued, the speed is reduced to a half, and the temperature condition of the valve housing is also changed, to increase the rotating torque. If the situation does not improve after increasing the rotating torque, valve malfunction error 41 is issued.

1-2-1-5 Temperature Control

The rotary valve temperature can be controlled at different levels including “Not Heated” (default), “40°C” and “70°C.” Since the valve itself has a large shape, its temperature is raised to 70°C from room temperature 30 minutes before paraffin is input.
The RV over-temperature protector uses an energized non-reset thermostat. If this thermostat is actuated due to a problem, the power is cut off. When the thermostat temperature drops to approx. 40°C thereafter, the thermostat will be reset. If the thermostat has actuated, the system must have experienced some problem that triggered the thermostat. Accordingly, be sure to remove the cause of the problem.

1-2-2 Gate Valve

1-2-2-1 Overview

The purpose of the gate valve is to open and cut off the reagent circuit connecting to the retort container. The gate valve has positions to close the fill port of the retort for supplying reagent and open the drain port of the retort for draining reagent, as well as positions to close these ports to pressurize/depressurize the retort. Also, the gate valve has a temperature control function and controls temperature by operating together with the rotary valve.

This gate valve allows the rotary valve port to be switched while reagent is still inside the retort, and this feature allows various functions to be achieved, such as automatically changing reagent and checking tank connection.

1-2-2-2 Components

The gate valve mainly consists of the component units listed below.

Table. 1-2-2-1 Gate Valve Components

No.	Name	Function
1	GV valve housing	Installed on the rotary valve, this housing connects to the fill port and drain port of the retort as well as the common channel of the rotary valve. It has a temperature control function.
2	GV fixed disk	This disk is made of ceramics and has a retort fill port and drain port arranged in a circle concentric to the common port at the center that connects to the rotary valve.
3	GV rotary disk	Made of ceramics, this disk connects the common port at the center, a given port on the fixed disk, and the reagent circuit. It is turned by a stepping motor to stop, with every 90 degrees of rotation, at one of four positions including the retort fill port position, drain port position and two positions to close the channel.
4	GV positioning disk 6	A disk with grooves used to indicate the current position of the rotary disk. It has a concentric double structure, where the inner circle defines the valve position, while the outer circle defines the stopped position.
5	GV positioning board	A printed circuit board on which four photo-sensors are mounted. The port position is detected by this board in combination with GV positioning disk 6.
6	Stepping motor	A stepping motor with rotary gears, having a resolution of 7,200 steps. This motor is used to move the GV rotary disk at a specified position.

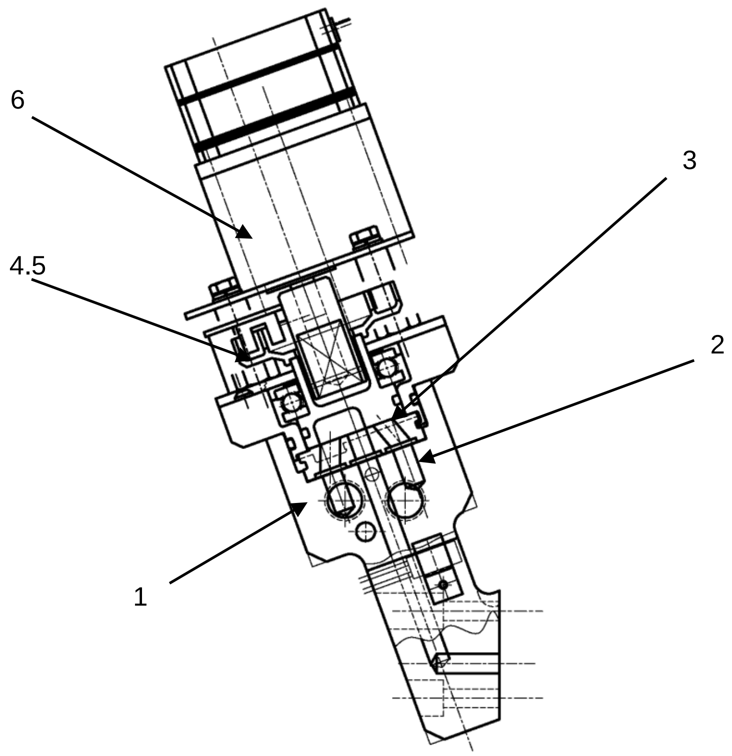


Fig. 1-2-2-1 Gate Valve Structure

1-2-2-3 Valve Positions

The valve position is determined by the three photo-sensors detecting different positions on the grooves provided in GV positioning disk 6. GV positioning disk 6 has the inner groove and outer groove as shown in the figure below.

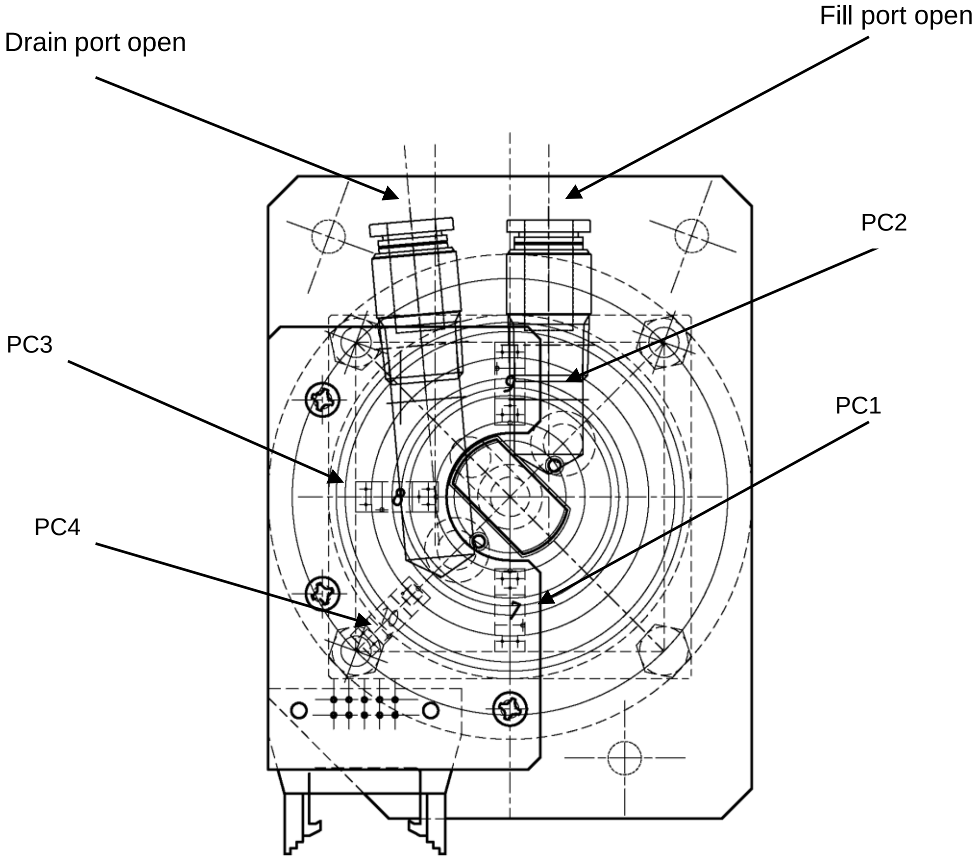


Fig. 1-2-2-2 Determination of Gate Valve Position

The drain port open position and closed position, as well as fill port open position and closed position, are determined by a combination of photo-sensors PC1 to PC3. Photo-sensor PC4 ensures accurate determination of positions.

Table. 1-2-2-2 Photo-sensor State Indications

GV position	Illumination conditions of LEDs on CPU board			
	G:CP4	G:PC3	G:PC2	G:PC1
Fill port open	OFF	OFF	OFF	ON
Closed position	OFF	ON	OFF	OFF
Drain port open	OFF	OFF	ON	OFF
Closed position	OFF	OFF	OFF	OFF

* Note that when each LED is illuminating, it means that the corresponding sensor is sensing light.

1-2-2-4 Operation Flowchart

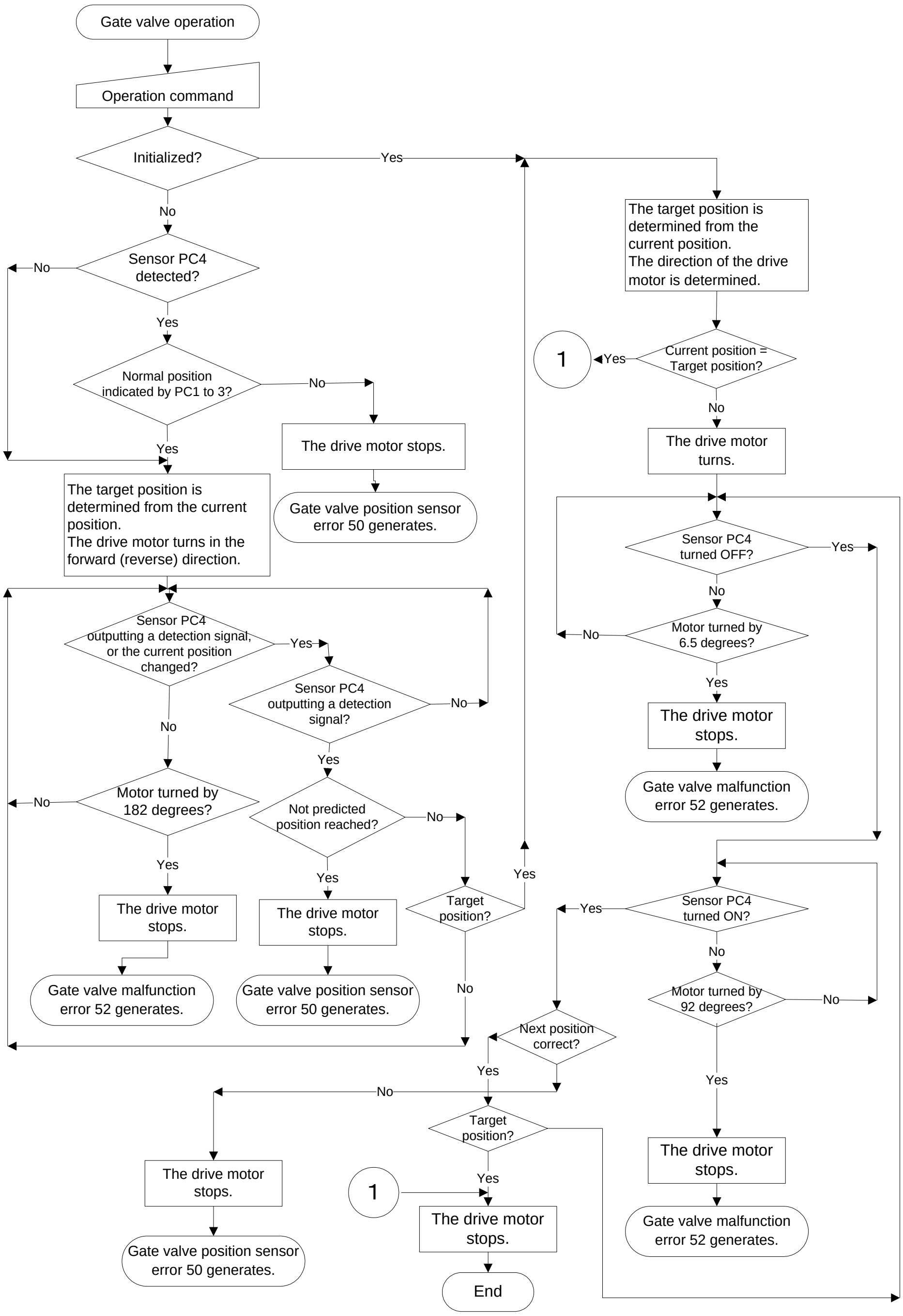


Fig. 1-2-2-3 Gate Valve Operation Flow

While paraffin is in the retort, the software can only run when the gate valve, rotary valve and retort temperatures are all at raised levels and the stations to be filled/drained also contain molten paraffin. However, take note that the gate valve alone can be operated manually by the service personnel after logging on using a dedicated password, in which case the above limitation is invalid.

As for errors, when positioning sensor PC4 is outputting a detection signal but no input is received from the anticipated position through photo-sensors PC1 to PC3, a gate valve positioning sensor error is issued. Also, the gate valve turns by 90 degrees from one position to the next position. In addition, a maximum play of 1.78 degrees is considered for the coupling between the motor shaft and rotary disk, and if the photo-sensor input condition does not change after the rotary disk has turned by a specified angle or more, a gate valve malfunction error is output. For your information, the axial torque can be changed by greater margins by changing the speed of the stepping motor. During normal operation, the speed of the stepping motor is 7.7 seconds to the next position. If valve malfunction error 52 is issued, the speed is reduced to a half, and the temperature condition of the valve housing is also changed, to try to rotate via large torque. If the situation does not improve after rotating via large torque, valve malfunction error 51 is issued.

1-2-2-5 Temperature Control

The gate valve temperature can be controlled at different levels including “Not Heated” (default), “40°C” and “70°C.” Since the valve itself has a large shape, its temperature is raised to 70°C from room temperature 30 minutes before paraffin is input (this temperature control is coordinated with the rotary valve).

The GV over-temperature protector uses an energized non-reset thermostat. If this thermostat is actuated due to a problem, the power is cut off. When the thermostat temperature drops to approx. 40°C thereafter, the thermostat will be reset. If the thermostat has actuated, the system must have experienced some problem that triggered the thermostat. Accordingly, be sure to remove the cause of the problem.

1-2-3 Air Unit

1-2-3-1 Overview

The air unit consists of six solenoid valves, pressure regulator, air pump, trap bottle, condenser coil and pressure sensor.
The pressure regulator is a safety valve that prevents the retort pressure from rising should the pressure control function fail. The air pump, pressure sensor and three solenoid valves from SV1 to SV3 are used to control the retort pressure. Solenoid valves SV4 and SV5 are used to depressurize the bulk reservoirs when supplying reagent from the bulk reservoirs. Solenoid valve SV6 is operated when draining the condensate accumulated in the trap bottle to the condensate bottle.
While the line is depressurized, reagent is output to the air unit as vapor, and this reagent vapor is liquefied by the condenser coil, with the liquefied reagent accumulated in the trap bottle, and dry air is sent to the air unit.

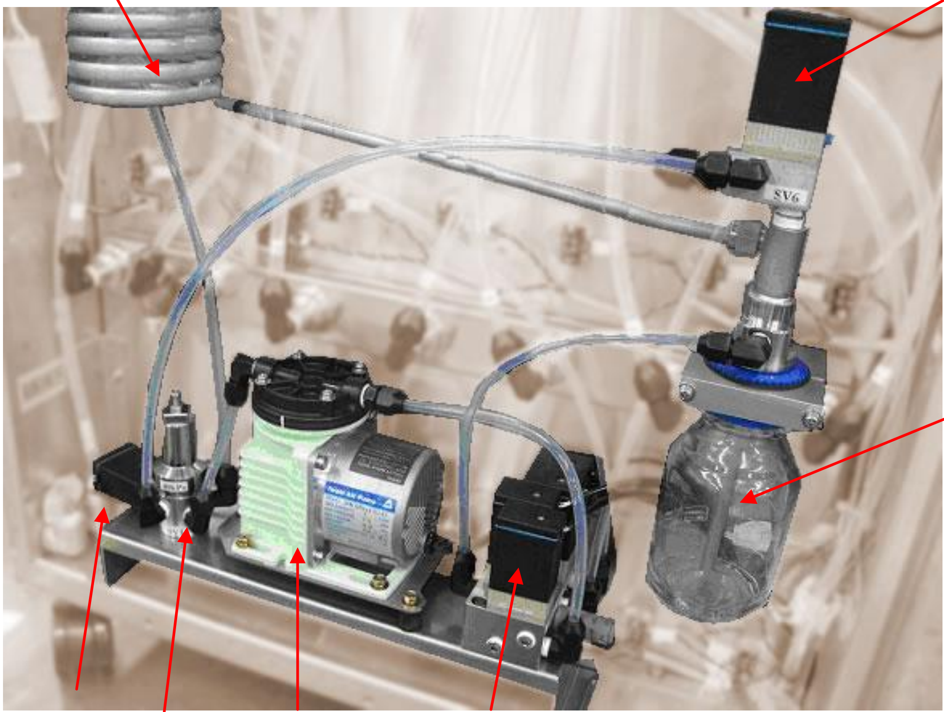
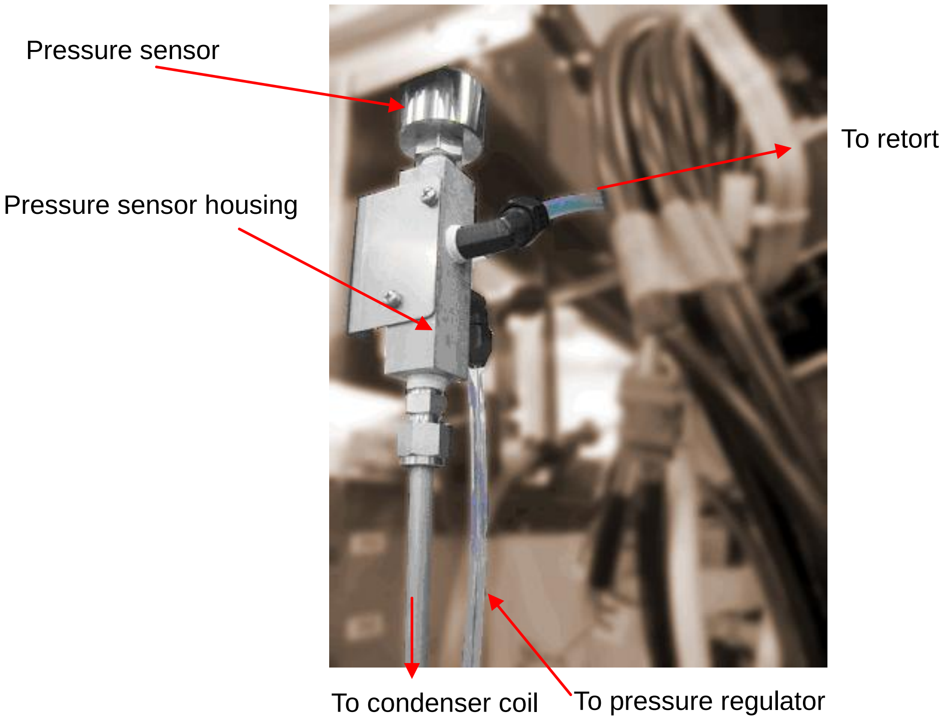


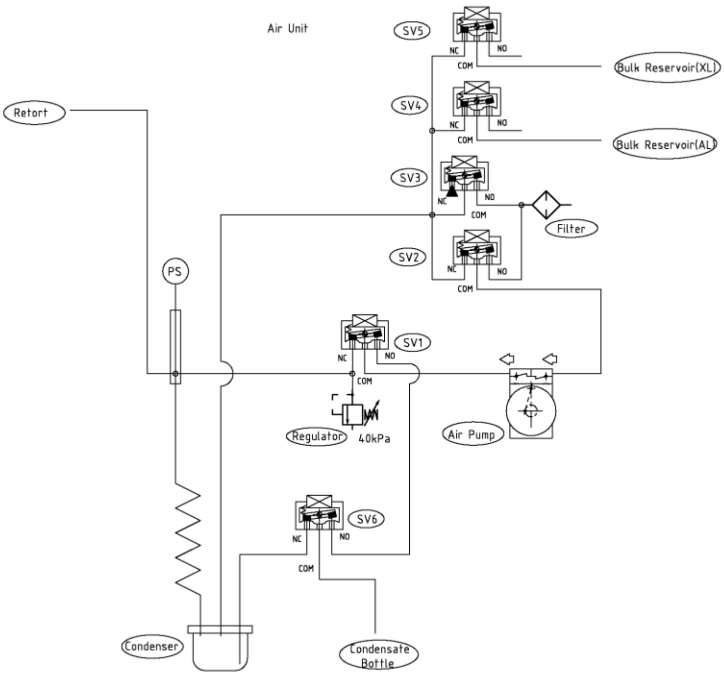
Fig. 1-2-3-1 Air Unit (1)

As shown in the figure above, all components of the air unit are concentrated in one location, except for the pressure sensor. Solenoid valves SV1 to SV6 use the same valve to facilitate management of service parts.



<u>Fig. 1-2-3-2 Air Unit (2)</u>

The pressure sensor is provided at the pressure sensor housing and measures the retort pressure.



<u>Fig. 1-2-3-3 Air circuit</u>

1-2-3-2 Pressurization Control

Pressurization control by the air pump is based on the procedure shown in Table 1-2-3-1. The air pump uses a single-head diaphragm pump driven by a DC brushless motor, where the motor speed can be controlled according to the voltage output (1 to 3 V). The air-pump motor rotation signal is also acquired at the same time to determine the starting state of the air pump as well as information regarding its rotation.
Under pressurization control, a cycle is operated according to the combination of solenoid valves whereby the condensate accumulated in the condensate pipe is recovered to the trap bottle when the pump is started and stopped. Pressure control uses an irregular PID control algorithm based on a sliding mode where the control state is switched depending on the situation. When the pressure-controlled state is switched from a constant pressure to atmospheric pressure, the air-pump motor is prevented from increasing its revolutions abruptly due to an abrupt change in the load, so that bubbling can be reduced.

Table 1-2-3-1 Pressurization Control

NO.	State	Operation	Solenoid valve state			Pump control
			SV1	SV2	SV3	
1	Stopped	Stopped	OFF	OFF	OFF	OFF
2	Starting pressurization	The pump is started. The starting state of the air pump is checked for 2 seconds.	OFF	OFF	OFF	The pump is started.
3	Draining condensate	Only solenoid valve SV1 is opened and condensate is drained for 1 second.	ON	OFF	OFF	Pressure feedback control is performed.
4	Performing pressurization control	The air-pump output is controlled to maintain a constant pressure.	ON	OFF	ON	Pressure feedback control is performed.
5	Retaining pressurized state	The air pump is stopped and the pressurized state is retained. (This operation is performed as part of the P cycle.)	OFF	OFF	ON	OFF
6	Ending pressurization	Only solenoid valve SV1 is opened for one second immediately before the pressurization ends, and the air tubing is cleaned.	ON	OFF	OFF	OFF
7	Stopped	Stopped	OFF	OFF	OFF	OFF

1-2-3-3 Depressurization Control

Depressurization control by the air pump is based on the procedure shown in Table 1-2-3-2. The air pump uses a single-head diaphragm pump driven by a DC brushless motor, where the motor speed can be controlled according to the voltage output (1 to 3 V). The air-pump motor rotation signal is also acquired at the same time to determine the starting state of the air pump as well as information regarding its rotation.
Pressure control uses an irregular PID control algorithm based on a sliding mode where the control state is switched depending on the situation. When the pressure-controlled state is switched from a constant pressure to atmospheric pressure, the air-pump motor is prevented from increasing its revolutions abruptly due to an abrupt change in the load, so that bubbling can be reduced. In the P/V cycles where the pressure is reduced to -40 kPa or below, constant-pressure control is not possible to prevent problems associated with the air-pump load. In this case, the control is switched to one where the vacuum level is increased to the limit while maintaining a constant output.

Table 1-2-3-2 Depressurization Control

NO.	State	Operation	Solenoid valve state			Pump control
			SV1	SV2	SV3	
1	Stopped	Stopped	OFF	OFF	OFF	OFF
2	Starting depressurization	The pump is started. The starting state of the air pump is checked for 2 seconds.	OFF	OFF	OFF	The pump is started.
3	Performing depressurization control	The air-pump output is controlled to maintain a constant pressure.	OFF	ON	ON	Pressure feedback control is performed.
4	Depressurizing	If the pressure drops to -40 kPa or below, the air pump is driven at a constant output.	OFF	ON	ON	Constant output is maintained.
5	Stopped	Stopped	OFF	OFF	OFF	OFF

1-2-3-4 Occurrence of Pump Abnormality

When the pressure is controlled using the air pump, occurrence of a motor lock caused by load fluctuation is always of concern. Accordingly, a locked air pump is detected, and an error is issued when the air pump enters an overcurrent state. When the lock is detected the air pump drive is stopped while keeping the pressure, and restart is performed. Starting of the pump is checked by detecting the rotation pulse signals generated by the pump motor. If the motor locks frequently, overcurrent is detected, or the pump cannot be started, the system outputs an error.

1-2-3-5 Pressure Regulator

A pressure regulator is provided so that the air circuit will not reach a specified pressure or above even when the pressure control by the air pump is disabled. This pressure regulator has a direct-acting valve and is structured in such a way that when the screw at the top is tightened, the force of the inner spring increases and the regulator will actuate once the spring force exceeds a specified pressure. The operating pressure of the pressure regulator is set to 40 $\pm$ 2 kPa.

1-2-3-6 Solenoid Valves SV4, SV5

Solenoid valves SV4 and SV5 are provided to supply reagent to the bulk reservoirs from outside. When supplying reagent to each bulk reservoir, the applicable solenoid valve is opened to depressurize the air circuit so that reagent can be filled to the reservoir. Since the air circuit connects to the retort, the retort pressure must also be reduced at the same time. The bulk reservoirs must not be pressurized through these solenoid valves.

1-2-3-7 Solenoid Valve SV6

Solenoid valve SV6 is a special solenoid valve in the air circuit. Normally, condensate is drained to the condensate bottle through this solenoid valve from the line on the secondary side of the pressure regulator. When this solenoid valve is switched, the condensate bottle connects to the trap bottle so that the reagent in the trap bottle can be drained to the condensate bottle by the pressure in the air circuit.

1-2-3-8 Pressure Control Conditions

In the respective pressure control operations, control pressures are set shown below.

Table 1-2-3-3 Pressure Control Conditions

State	Condition	Control pressure
P cycle	The P cycle in the P/V cycles is performed.	34 kPa (retained)
Pumping out	Pump-out operation is performed.	34 kPa
Checking for bottle connection	The connection state of the TN tank coupler is checked.	10 kPa
Draining the common pipe	Reagent is drained from the line up to the reagent bottle from the retort fill port through the gate valve and rotary valve.	10 kPa
Pumping in	Pump-in operation is performed.	-27 kPa
V cycle (intermediate)	The V cycle is performed based on the intermediate setting.	-37 kPa
V cycle (standard)	The V cycle is performed based on the standard setting.	Varies depending on the pump performance.

1-2-4 Exhaust Manifolds and Coupler

1-2-4-1 Overview

The exhaust manifolds constitute the housing for installing the TN tank coupler sockets connected to the plugs of reagent bottles, where the housing, which has a square pipe shape, connects to the gas line of each station. The exhaust manifolds not only connect the reagent channel to each reagent bottle, but it also causes the reagent gas generated by pumping-out to the fume control unit and also guides to the condensate bottle “Condensate” the reagent mist generating in the exhaust manifolds or reagent overflowing due to malfunction.

The exhaust manifolds consist of the top exhaust manifold and bottom exhaust manifold, just like the two-level tank rack storing reagent bottles, and the top and bottom exhaust manifolds are connected with each other by a pipe. Also, a pipe links the fume control unit to the top of each container connected to the top/bottom manifold. The condensate accumulated in the top/bottom exhaust manifolds is collected in the bottom exhaust manifold and guided/drained to the condensate bottle “Condensate.” A drain plug is screwed in below the bottom exhaust manifold to allow the reagent remaining in the exhaust manifold to be drained.

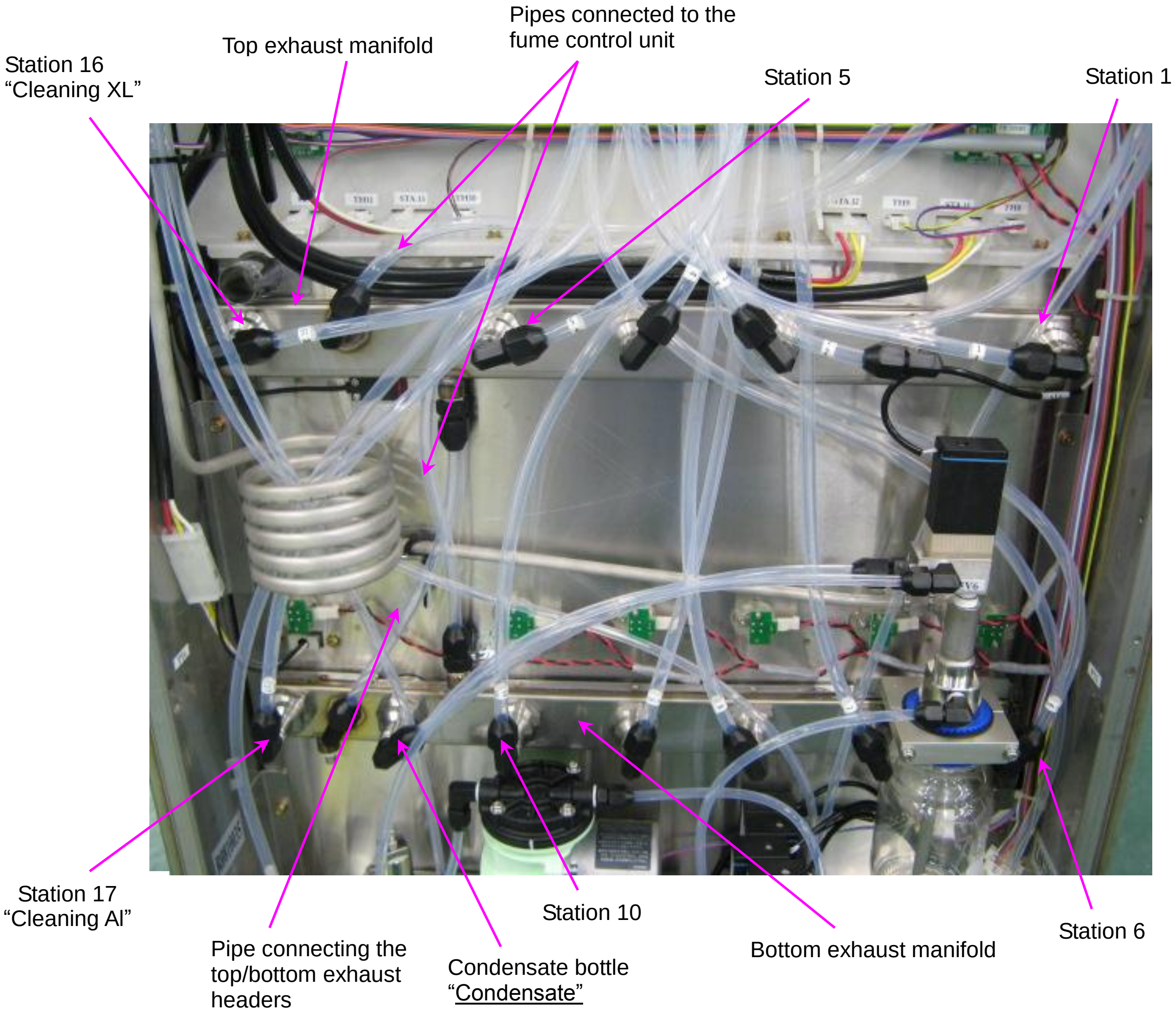


Fig. 1-2-15 Rear View of Tank Rack

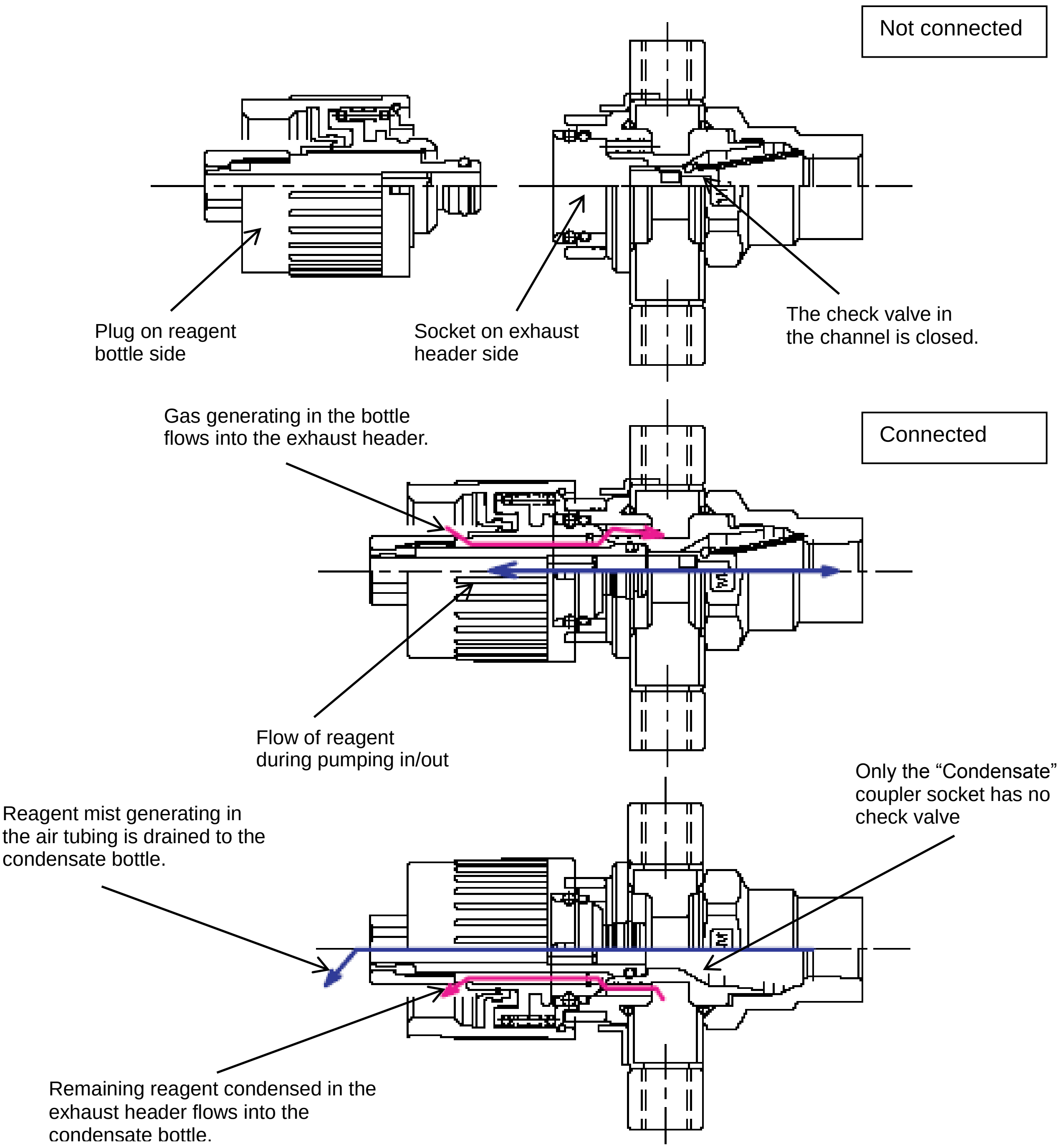


Fig. 1-2-16 TN Tank Coupler and Exhaust Manifolds

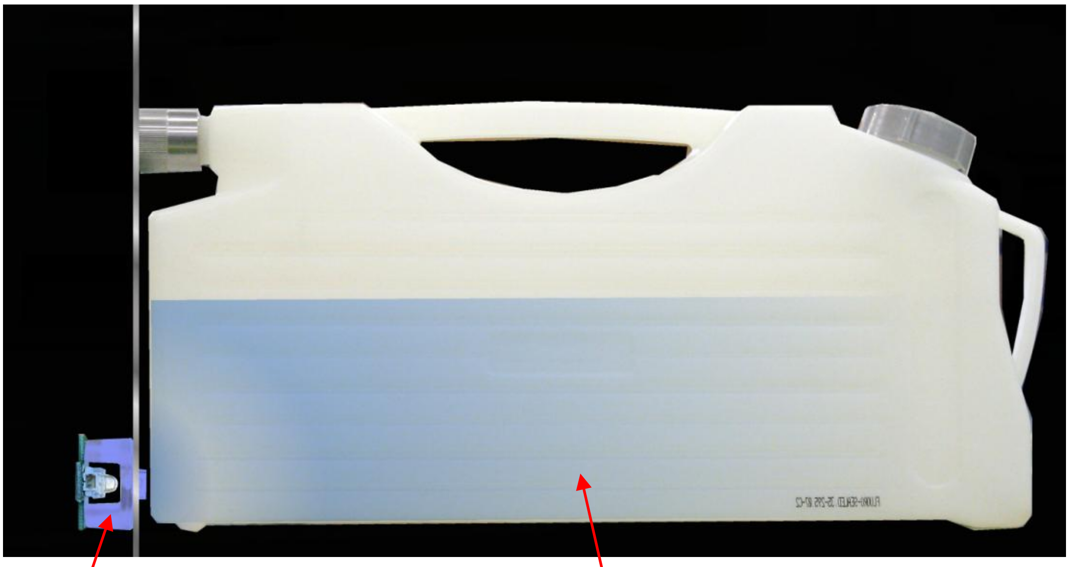
As shown in Fig. 1-2-16, the TN tank coupler sockets are incorporated into the top exhaust manifold/bottom exhaust manifold. Only the “Condensate” coupler socket on the bottom exhaust manifold has a 180° mounting angle and no check valve.

When the plug on reagent bottle side is connected to the corresponding socket, a reagent channel route and exhaust gas route are formed. Also, the check valve that opens/closes the reagent channel port on socket side opens at the tip of the reagent bottle plug.

1-2-5 Bottle Illumination

1-2-5-1 Overview

Reagent bottles are made of thick high-density polyethylene to accommodate various types of reagents. Accordingly, when reagent is filled in these reagent bottles, the reagent levels cannot be clearly identified. Bottle illumination refers to the blue LEDs illuminating the reagent bottles from the back so that reagent inside the bottles can be clearly identified. As shown below, each reagent bottle, except for the condensate bottle, is illuminated through a resin lens designed to provide sufficient chemical resistance.



Bottle LED unit   Reagent bottle

Fig. 1-2-5-1 Bottle Illumination Structure

The bottle LED unit has a LED emitting blue light (wavelength: approx. 465 nm), which is transmitted through a TPX (polymethyl pentene polymer) lens to illuminate the interior of the bottle. If the bottle contains liquid, the light undergoes irregular reflection inside the bottle and the bright liquid becomes visible from outside the system.
5-V power-supply voltage is supplied to each bottle LED unit. Also, a protective device is provided so that if an overload condition occurs due to short-circuiting, etc., the power supply to each illumination unit is stopped. Each bottle LED unit is connected to the left relay board through one of two lines, each connecting the upper-level bottles or lower-level bottles.

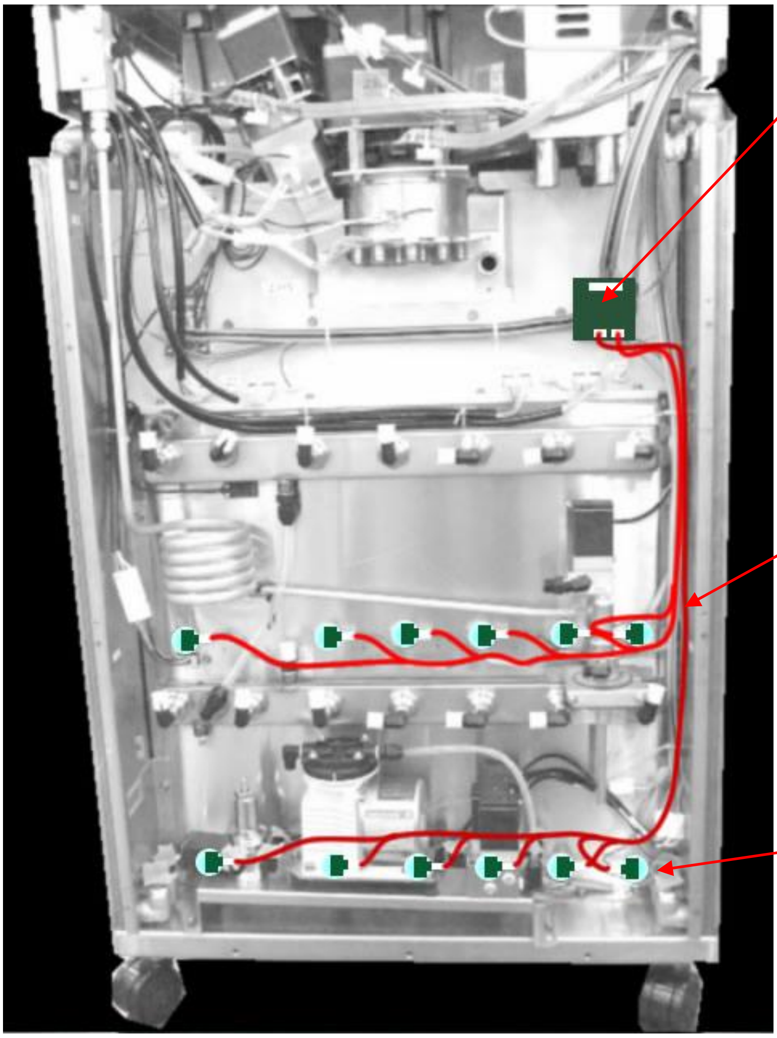


Fig. 1-2-5-2 Illumination Wiring Circuit

The bottle LED units are wired using dedicated cables. Only the bottle LED unit at the far left as viewed from the rear is wired in reverse.

1-2-6 Retort Lid Heater

1-2-6-1 Overview

Water droplets may form on the inside of the retort lid due to condensation. In particular, condensation occurs more quickly when reagent in the retort is heated and the retort is depressurized. If water droplets form and drop during the paraffin process, tissue processing results may be affected. Accordingly, a lid heater is provided for the retort to prevent condensation.

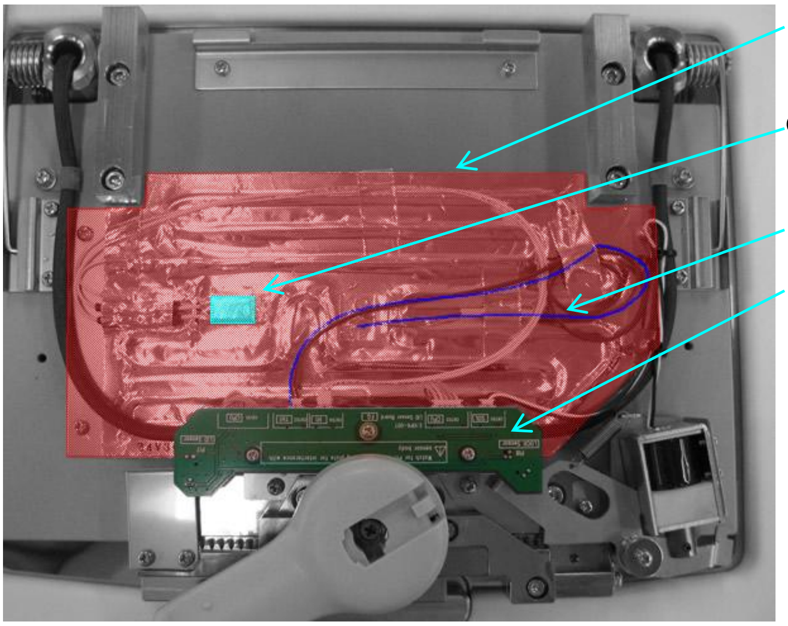


Fig. 1-2-6-1 Heater Unit on Top of Retort Lid

The table below lists the components of the heater unit. Electrical signals from the CPU board are connected to the lid sensor board via robot cables that are wired through the center of the retort lid column. The retort lid heater H1 and temperature sensor TH1 are connected to the lid sensor board. The retort lid heater can be set in two temperature control modes: one where the temperature is always controlled at 60°C and the other where the temperature is not controlled. While temperature control is active, the power is supplied to the heater so that the temperature detected by the temperature sensor TH1 becomes the setpoint temperature.

Table 1-2-6-1 Heater Unit on Top of Lid

No.	Name	Function
H1	Retort lid heartier	A 24-V, 30-W aluminum foil heater using safe voltage.
TC1	Over temperature protector	A non-reset thermostat actuated at 100°C, incorporated in the heater circuit.
TH1	Temperature sensor	A thermistor temperature sensor. This sensor is affixed with aluminum tape in a location at the center of the retort lid heater where no heater element is present.
PCB7	Lid sensor board	A printed circuit board that relays electrical signals relating to the retort lid.

1-2-6-2 Current Detection Part

If the over-temperature protector actuates or the retort lid heater circuit becomes open, current will not flow through the heater even when the heater is turned on. Accordingly, an error will generate upon actuation of the over-temperature protector or opening of the retort lid heater circuit.
This function monitors current on the CPU board using the following circuit, and issues the above error if no current is detected while the heater is energized. The detection program can also measure the heater current.

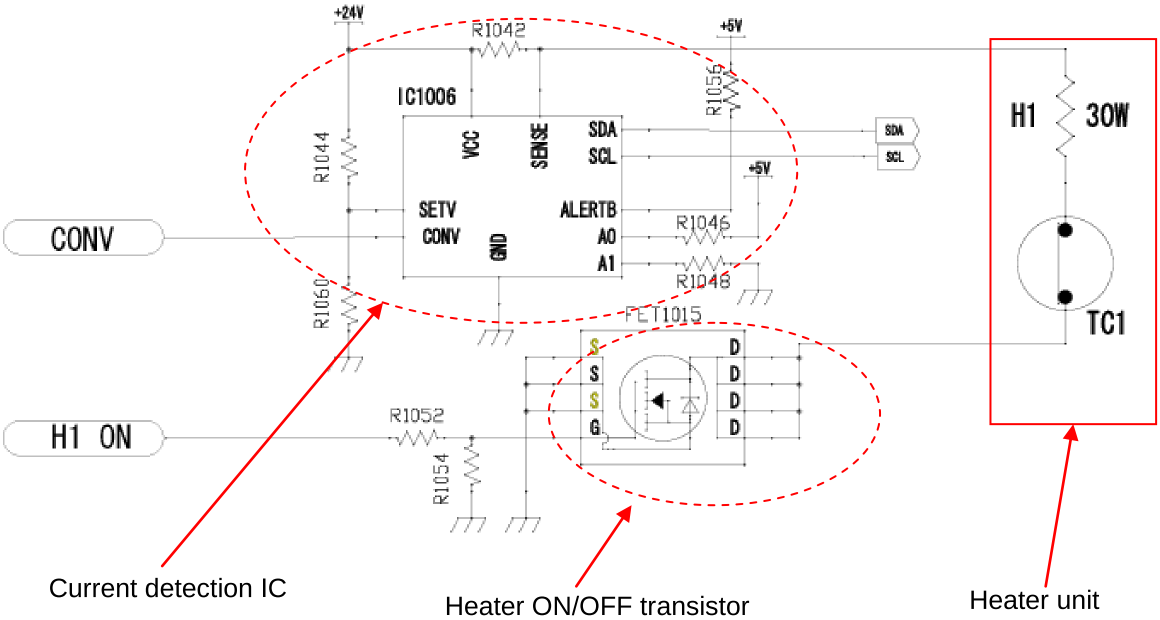


Fig. 1-2-6-2 Retort Lid Heater Drive Circuit

When the heater H1 is turned on, the current is measured by the IC1006 current detection IC. If the over-temperature protector TC1 or heater circuit itself is disconnected, the current detected by the current detection IC becomes small, upon which an open-circuit is recognized.

1-2-6-3 Temperature Sensor Detection Part

The heater surface temperature is detected and controlled at a constant level. Temperature measurement uses a thermister having constant resistance against temperature. When current flows through this thermister, unique voltage generates according to the resistance, and this voltage is measured. Although the temperature sensors used by this system each have a different shape at the tip, all use a thermister of the same characteristics and thus conform to the temperature vs. resistance characteristics shown in the table below.

Table 1-2-6-2 Thermister Temperature Characteristics

Temperature	Resistance	Temperature	Resistance	Temperature	Resistance	Temperature	Resistance
-20	38480	20	6517	60	1593	100	508.3
-19	36000	21	6266	61	1544	101	495.3
-18	34830	22	6027	62	1496	102	482.8
-17	33150	23	5798	63	1450	103	470.6
-16	31570	24	5579	64	1406	104	458.8
-15	30060	25	5369	65	1363	105	447.3
-14	28640	26	5169	66	1322	106	436.2
-13	27300	27	4977	67	1283	107	424.5
-12	26020	28	4793	68	1244	108	414.9
-11	24820	29	4617	69	1207	109	404.8
-10	23670	30	4448	70	1171	110	394.9
-9	22590	31	4287	71	1137	111	385.3
-8	21560	32	4132	72	1104	112	376
-7	20580	33	3983	73	1071	113	366.9
-6	19660	34	3841	74	1040	114	358.2
-5	18780	35	3704	75	1010	115	349.6
-4	17940	36	3573	76	981.3	116	341.3
-3	17150	37	3448	77	953.3	117	333.3
-2	16400	38	3327	78	926.1	118	325.4
-1	15680	39	3211	79	899.9	119	317.8
0	15000	40	3100	80	874.6		
1	14350	41	2994	81	850.1		
2	13740	42	2891	82	826.4		
3	13150	43	2793	83	803.4		
4	12590	44	2698	84	781.3		
5	12060	45	2607	85	759.8		
6	11560	46	2520	86	739		
7	11080	47	2436	87	718.9		
8	10620	48	2355	88	699.4		
9	10180	49	2278	89	680.6		
10	9765	50	2203	90	662.3		
11	9368	51	2131	91	644.6		
12	8989	52	2062	92	627.5		
13	8628	53	1995	93	610.9		
14	8283	54	1931	94	594.8		
15	7954	55	1869	95	579.3		
16	7639	56	1810	96	564.2		
17	7339	57	1753	97	549.5		
18	7052	58	1698	98	535.4		
19	6778	59	1644	99	521.6		

For your information, a temperature sensor error occurs when the temperature drops to below -20°C or rises above 110°C according to this table.

1-2-7 Retort Heater

1-2-7-1 Overview

The retort is where reagent or paraffin is actually filled to process tissues placed inside the retort. The retort temperature rises quickly after it has been filled with reagent/paraffin, where the temperature rise is particularly quick in the paraffin fill stage. Accordingly, a heat output of up to 650 W can be supplied by the retort alone. A total of four retort heaters are attached on the bottom and side faces using silicone rubber adhesive. Also, these heaters are classified into two types according to their temperature adjustment function.

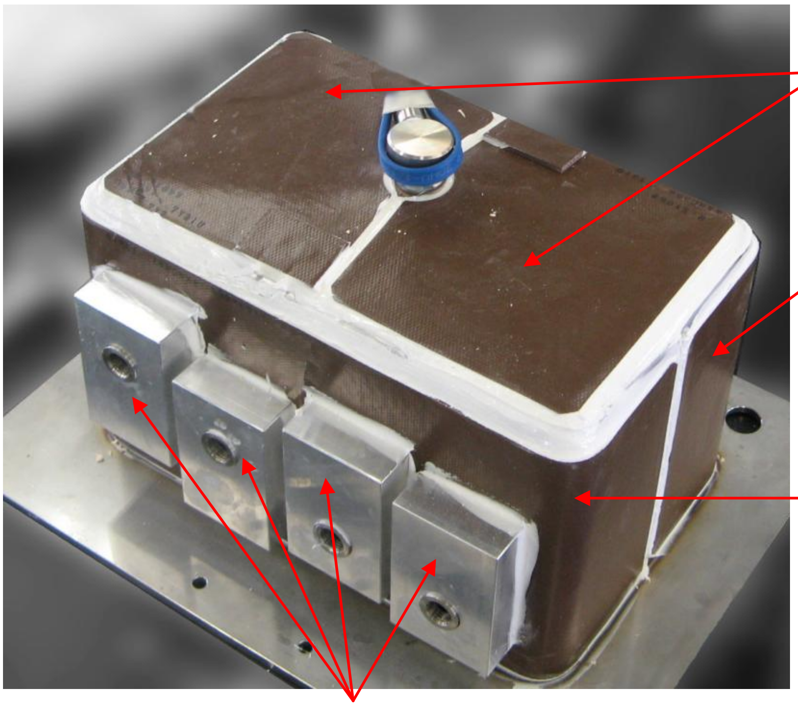


Fig. 1-2-7-1 Retort Heater Units

The above photograph shows the physical configuration of retort heaters. The heater attached on the front side in the photograph, or the side where the level sensor heat block is provided, is the “retort front heater” that performs temperature control independently of other heaters. On the other hand, a total of three remaining heaters including the two retort bottom heaters and one retort back heater are the “other heaters” that perform temperature control separately from the front heater. The three other retort heaters are wired in series, so that abnormal heat generation will not occur even when any of the heaters experiences an open-circuit, etc.
Temperature control is performed separately by the retort front heater and other retort heaters, because the level sensors must be heated. The retort front heater incorporates four level sensors, and a level sensor heat block is attached above the heater to prevent hardening of paraffin attached to the sensor detection part. Accordingly, the retort front heater adopts a temperature control method different from the one used by the other heaters. The table below lists the characteristics of individual heaters. Take note that the voltage specification in this area conforms to the 115-V heater configuration for the VIP6-J0 and VIP6-A1 models, or the 230-V heater configuration for the VIP6-E2 model of 230-V voltage specification.

Table 1-2-7-1 Ratings of Each Heater

No.	Name	115-V specification			230-V specification		
		Ratings	Resistance	Total resistance	Ratings	Resistance	Total resistance
H2	Retort front heater	115 V 260 W	50.9 Ω	50.9 Ω	230 V 260 W	203.5 Ω	50.9 Ω
H3-1	Retort back heater	76.7 V 260 W	22.6 Ω	33.9 Ω	153.3 V 260 W	90.4 Ω	135.6 Ω
H3-2	Retort bottom heater right	19.2 V 65 W	5.7 Ω		38.5 V 65 W	22.6 Ω	
H3-3	Retort bottom heater left	19.2 V 65 W	5.7 Ω		38.5 65 W	22.6 Ω	

The components of the heater unit are listed in the table below. Heater control signals from the CPU board are transmitted to the heater driver board via the CN26 connector. On the heater driver board, the retort front heater is turned ON/OFF via the semiconductor relay SSR1. The other retort heaters are turned ON/OFF via external large-capacity semiconductor relays via the CN211 on the heater driver board. On the other hand, over-temperature protectors are connected in series with the heaters to cut off each heater circuit if an abnormal rise in heater temperature is detected. If the contacts of each over-temperature protector became open due to rising temperature, this contact input state is detected to notify that the over-temperature protector has actuated. Also, the temperature sensors installed on the sides at the bottom of the retort are used to control ON/OFF of the applicable heaters so as to achieve the target temperature.

Table 1-2-7-2 Retort Heater Components

No.	Name	Function
TC2	Over temperature protector (front)	A self-holding thermal protector that opens the circuit by means of bimetal when the temperature reaches 100°C. The built-in PTC heater maintains the bimetal state and the protector will not be reset unless the power supply is cut off and the temperature drops to a certain level.
TC3	Over-temperature protector (other)	A self-holding thermal protector that opens the circuit by means of bimetal when the temperature reaches 100°C. The built-in PTC heater maintains the bimetal state and the protector will not be reset unless the power supply is cut off and the temperature drops to a certain level.
TH2	Retort front temperature sensor	A thermistor temperature sensor affixed by an aluminum plate on the front side at the bottom of the retort.
TH3	Other retort temperature sensor	A thermistor temperature sensor affixed by an aluminum plate on the back side at the bottom of the retort.
PCB2	Heater driver board	A board used to control each heater.
SSR	Semiconductor relay	A semiconductor relay capable of turning the other large-capacity heaters ON/OFF.

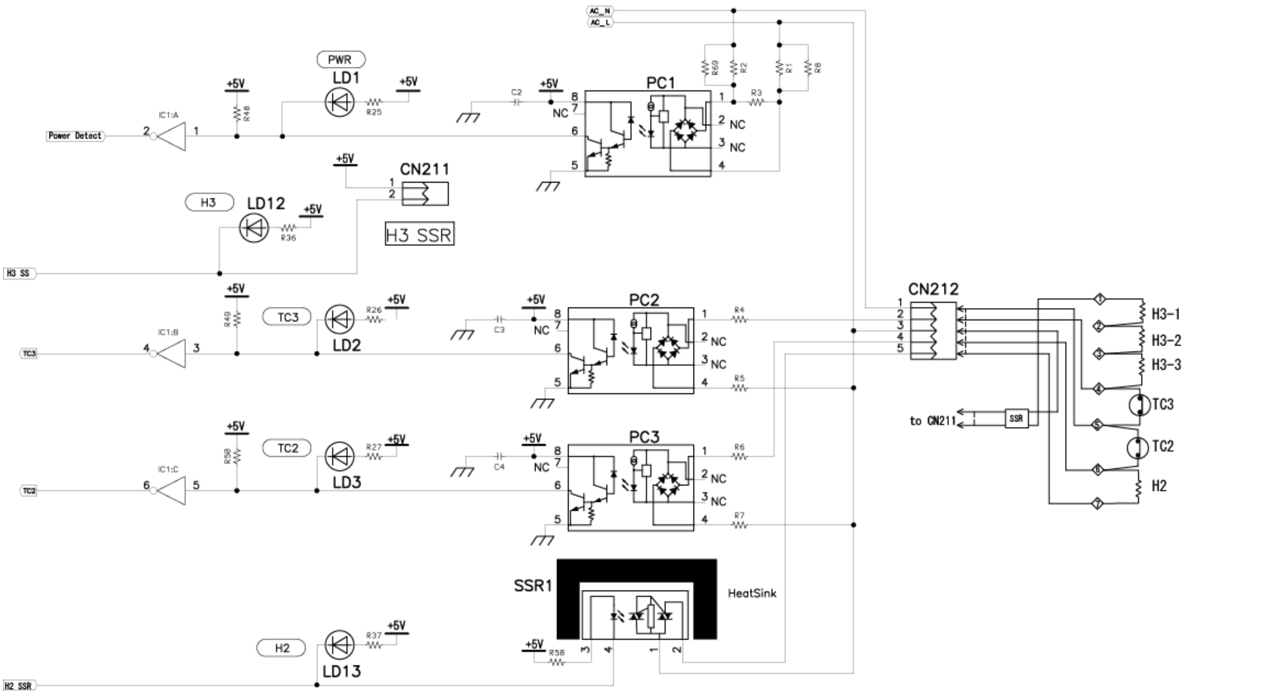


Fig. 1-2-7-2 Retort Heater Drive Circuit

1-2-7-2 Over-Temperature Protector

The retort temperature can be controlled at a setpoint temperature of 35 to 70°C, and an over-temperature level will not be reached even when nothing is in the retort (however, exercise due caution because if the retort has no reagent inside, the retort surface temperature may exceed 100°C in some locations). If the semiconductor relay circuit that turns ON/OFF the heater power fails or any temperature sensor comes off, the retort can no longer be controlled at the setpoint temperature, in which case an applicable over-temperature protector may be actuated. Each over-temperature protector consists of bimetal and RTC, as shown below, and once actuated the over-temperature protector will not turn ON again due to heat generated from the RTC. The over-temperature protector will be reset when it has cooled sufficiently and the current flowing through the over-temperature protector is cut off (= the system power is turned off).

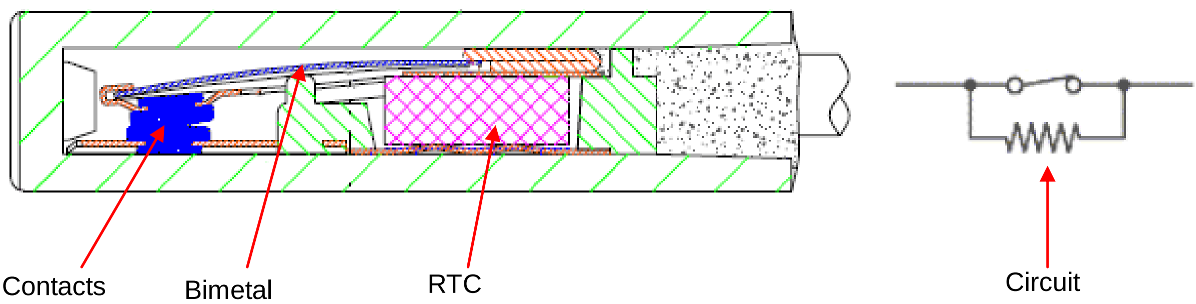


Fig. 1-2-7-3 Over-Temperature Protector

The over-temperature protectors and temperature sensors are installed by retort temperature sensor mounting plates on the side faces of the retort at the bottom.

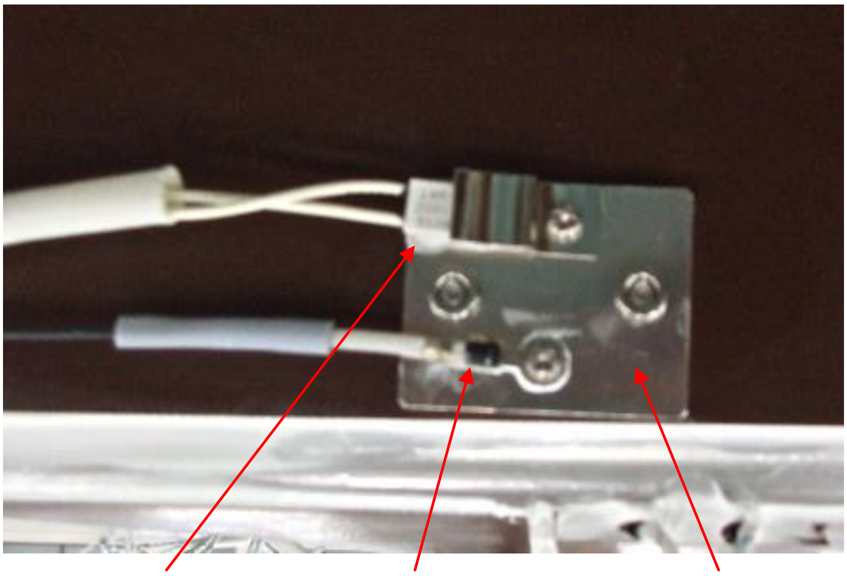


Fig. 1-2-7-4 Retort Temperature Sensor Mounting Plate

1-2-7-3 Temperature Sensor Detection Part

Two temperature sensors are installed on the retort. One temperature sensor is TH2 that controls the retort front heater, while the other temperature sensor is TH3 that controls the other heaters. Both temperature sensors have the same characteristics as the retort lid temperature sensor. For details, refer to 1-2-6-3, “Temperature Sensor Detection Part.”

1-2-7-4 Temperature Control Method

Temperature control is implemented by means of controlling the front and other heaters separately and then harmonizing the overall temperature, in order to determine the temperature of one whole retort. The front heater has a level sensor heat block used to heat the four ultrasonic sensors, and therefore its control temperature must be higher than that of the other heaters. On the other hand, only one actual temperature compensation point is provided for the retort, which means that only one temperature compensation value is provided as the reference setpoint temperature based on which to change the actual control temperatures of the retort front heater and other retort heaters. Specifically, the following formulas are used:

Control temperature of retort front heater = Setpoint temperature + Temperature compensation value + 2.5°C

Control temperature of other retort heaters = Setpoint temperature + Temperature compensation value - 2.5°C

As shown above, there is actually a difference of 5°C between the front heater and the other heaters. In fact, this temperature difference becomes more pronounced when the retort is empty. Accordingly, the control temperature of other retort heaters is raised once the tissue processing has ended and paraffin has been drained, so as to prevent hardening of paraffin at the bottom of the retort.

Also, the retort has a large heater capacity as well as a large structural heat capacity, and thus its temperature tends to be over-controlled. In particular, the temperature overshoot is relatively large when the temperature is rising. Accordingly, two-stage controls are implemented based on proportional control. The control method is as follows. When the retort temperature is raised, a proportional constant of 0.07 is used to wait for the temperature to rise sufficiently. Once the retort temperature reaches 3°C below the target temperature, this temperature condition is maintained for 5 minutes and then the proportional constant is switched to 0.5. This way, the overshoot can be minimized to achieve more stable temperature control.

1-2-8 Level Sensor

1-2-8-1 Overview

Four level sensors are installed in the retort to detect the liquid level.

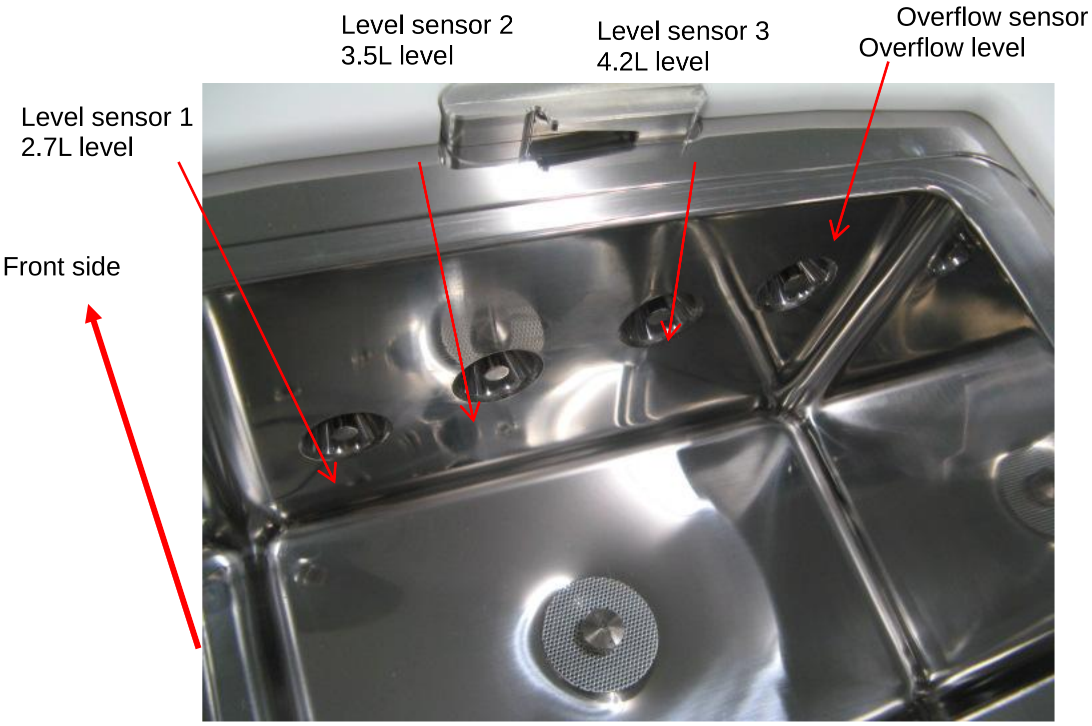


Fig. 1-2-3-1 Level Sensors in Retort

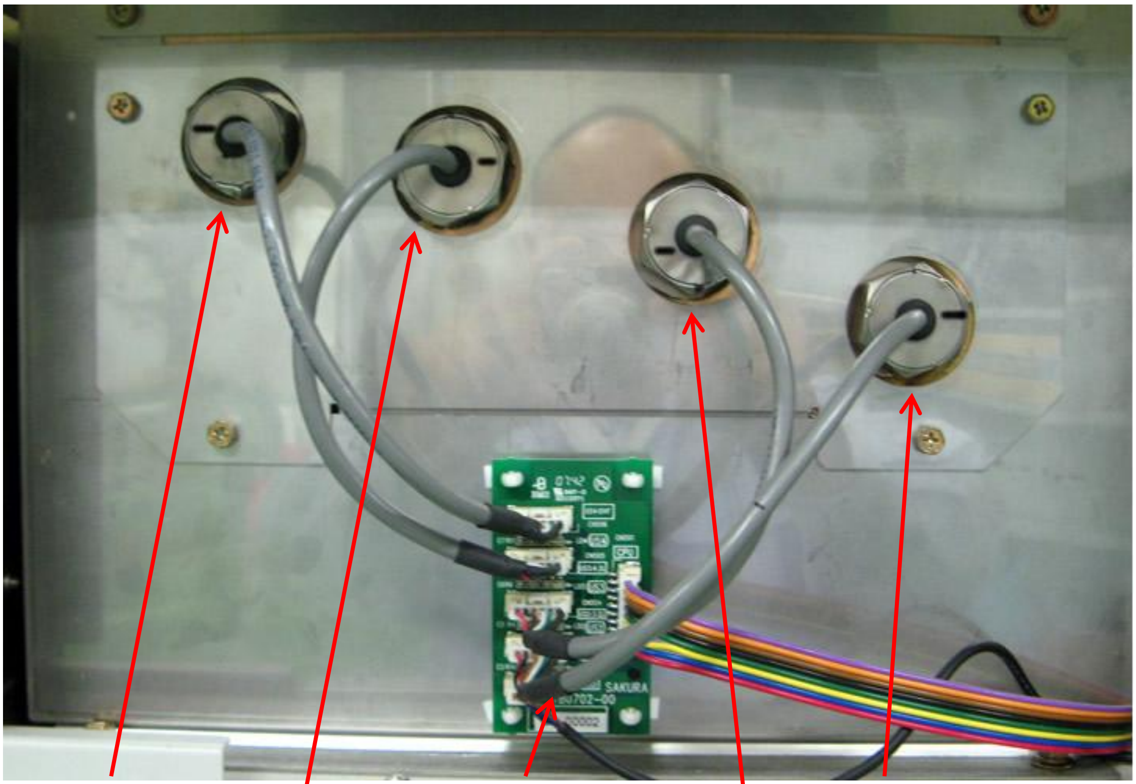
These level sensors provide the function of assuring a specified liquid level during tissue processing and retort cleaning, as well as facilitating mixing operation. When reagent is changed, these sensors are used to measure the amount of reagent.
Baskets can be placed in up to two levels inside the retort to process tissues. The sensors used to assure a given liquid level and detect the fill level vary depending on the basket placement condition.

Table 1-2-3-1 Level Sensor Functions

No.	Name	Level	1 basket level			2 basket level		
			Liquid level assurance	Fill level	Continuous mixing	Liquid level assurance	Fill level	Continuous mixing
US4	Overflow sensor	4.5L						
US3	Level sensor 3	4.2L					○	Upper level
US2	Level sensor 2	3.5L		○	Upper level	○		Lower level
US1	Level sensor 1	2.7L	○		Lower level			

Each level sensor consists of an ultrasonic sensor that detects liquid or lack thereof. These sensors are incorporated in the side plates on the front side of the retort and can be heated by the retort front heater and level sensor heat block to prevent hardening of paraffin attached to the sensor housing.

The photograph below shows the sensor mounting points as viewed from the front side of the retort.

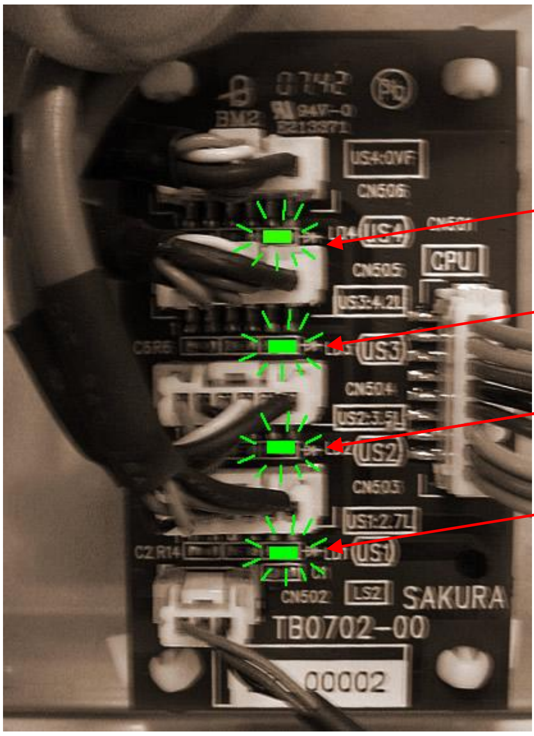


Overflow sensors Level sensor 3 US board Level sensor 1

Level sensor 2

Fig. 1-2-3-2 Level Sensor Mounting Condition

Each sensor is set at a position where the sensor can be easily installed or removed from the front side, and all sensors use the same components. The US board can relay signals from these sensors to display the detection states.



US Board Structure

When a level sensor turns ON, the applicable LED becomes lit, as shown in the photograph.

Overflow sensor indicator

Level sensor 3 indicator

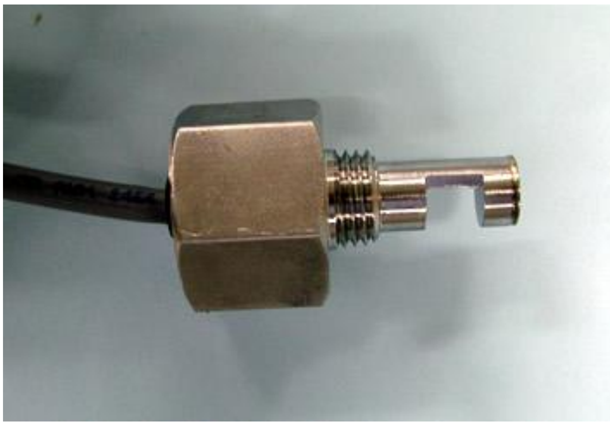
Level sensor 2 indicator

Level sensor 1 indicator

Fig. 1-2-3-3 US Board

1-2-8-2 Ultrasonic Sensor

These ultrasonic sensors are used to detect the liquid level based on transmission of ultrasonic waves in liquid or lack thereof. When liquid is present, high-frequency ultrasonic waves do not transmit easily in air, but they transmit easily in liquid.
The ultrasonic sensor is shown below.



Ultrasonic Sensor 170-00002

Pin number	Wire color	Signal name
1	Red	+12 V
2	Black	GND
3	Brown	N.O
4	White	COM
5	Green	CASE
6	Shield	CASE

Wired Sensor Signals

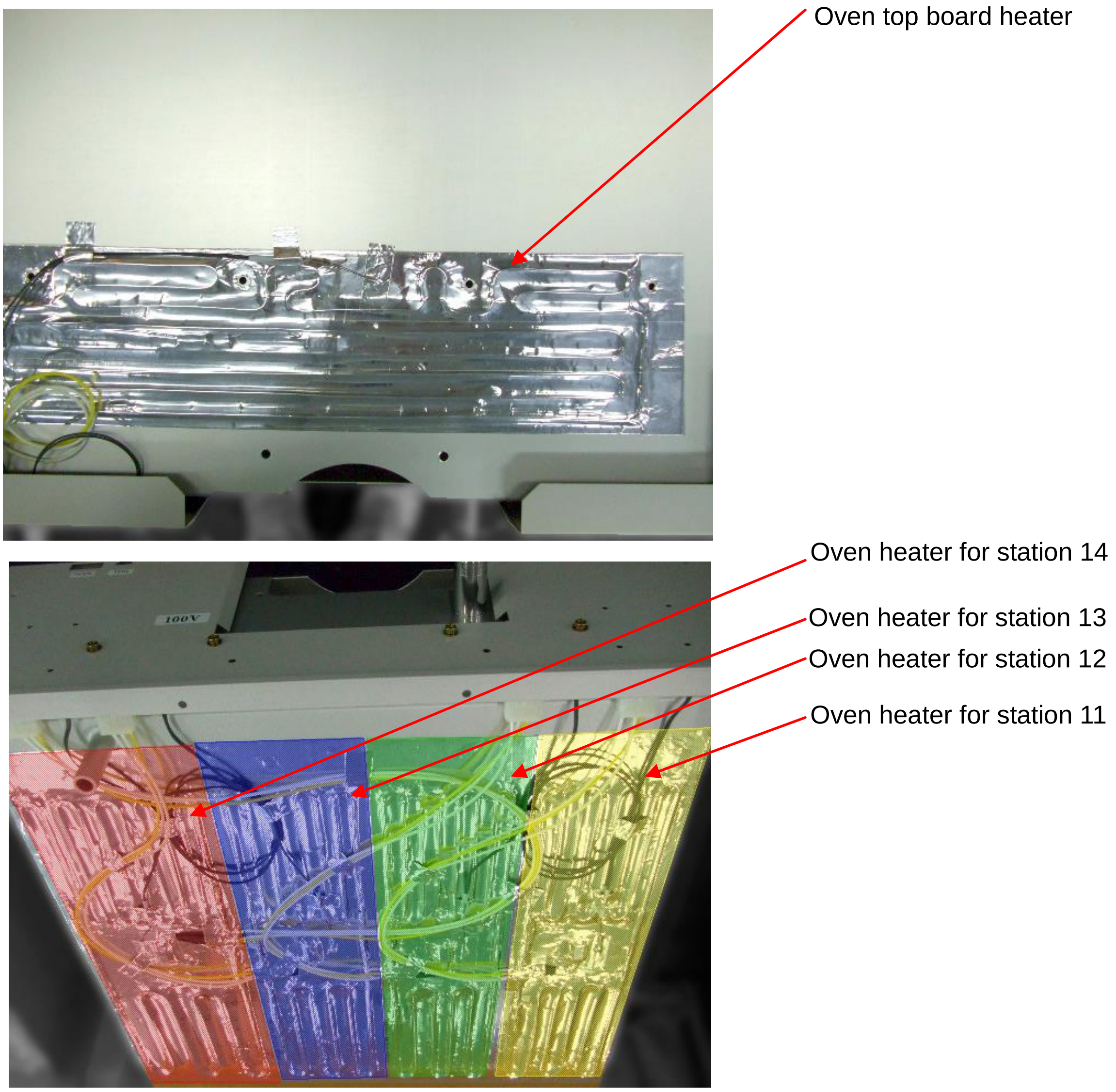
Fig. 1-2-3-4 Ultrasonic Sensor

The cutout part shown in the photograph detects liquid. For the sensor installation, refer to 4-3-1, “Replacing the Ultrasonic Sensor” in Chapter 4, “Disassembly, Repair and Adjustment.”

1-2-9 Oven Heater

1-2-9-1 Overview

The oven is where solid paraffin is melted and molten paraffin is stored. Accordingly, the oven has the function to heat the containers in which paraffin is filled, or specifically the paraffin containers, at temperatures that allow paraffin to melt and remain molten. The VIP6 has four paraffin containers from stations 11 to 14, where station 14 is capable of containing 3.5 liters of paraffin, which is the minimum amount required for processing tissues, when paraffin pellets are directly input and melted and is capable of containing up to 5.6 liters of melted paraffin. Accordingly, this station can be used for additional purposes such as replenishing other paraffin containers when their paraffin level becomes low. The paraffin oven also has the function to heat each station using the aluminum foil heater attached on the bottom aluminum plate at the bottom of the container comprising each station. The oven is also equipped with an oven top board heater that heats the paraffin tube connecting the rotary valve and each paraffin container.



* View of the oven unit from the rear of the system

Fig. 1-2-9-1 Oven Heater Unit

The above photograph shows the physical configuration of oven heaters. All heaters use an aluminum foil heater, and each heater is equipped with an over-temperature protector actuating at 100°C. Each heater unit also has a temperature sensor which is used to temperature-control each heater independently. This way, uneven heating and other unwanted effects can be minimized even when the ambient temperature changes, and any temperature drop occurring upon input of solid paraffin can also be dealt with flexibly.

The table below lists the characteristics of individual heaters. To reduce the fluctuation in the heat output from heaters caused by fluctuation in the power-supply voltage, dedicated heaters are used for the VIP6-J0, VIP6-A1 and VIP6-E2 models.

Table. 1-2-9-1 Ratings of Each Heater

No.	Name	100-V specification		115-V specification		230-V specification	
		Ratings	Resistance	Ratings	Resistance	Ratings	Resistance
H8	Paraffin station 11 heater	100 V 50 W	200 Ω	115 V 50 W	265 Ω	230 V 50 W	1058 Ω
H9	Paraffin station 12 heater	100 V 50 W	200 Ω	115 V 50 W	265 Ω	230 V 50 W	1058 Ω
H10	Paraffin station 13 heater	100 V 50 W	200 Ω	115 V 50 W	265 Ω	230 V 50 W	1058 Ω
H11	Paraffin station 14 heater	100 V 75 W	133 Ω	115 V 75 W	176 Ω	230 V 75 W	705 Ω
H12	Oven top board heater	100 V 50 W	200 Ω	115 V 50 W	265 Ω	230 V 50 W	1058 Ω

The configuration of each heater unit roughly conforms to the table below. Heater control signals from the CPU board are transmitted to the heater driver board via the CN26 connector. The heater driver board turns the heaters ON/OFF using the respective semiconductor relays. Each heater has a built-in over-temperature protector connected in series, so that the heater circuit can be cut off when the heater temperature rises abnormally. If the contacts of a given over-temperature protector open due to rising temperature, this contact input state is detected to inform that the over-temperature protector has actuated. In addition, the temperature sensors installed on the sides at the bottom of the retort are used to control ON/OFF of each heater to achieve the target temperature.

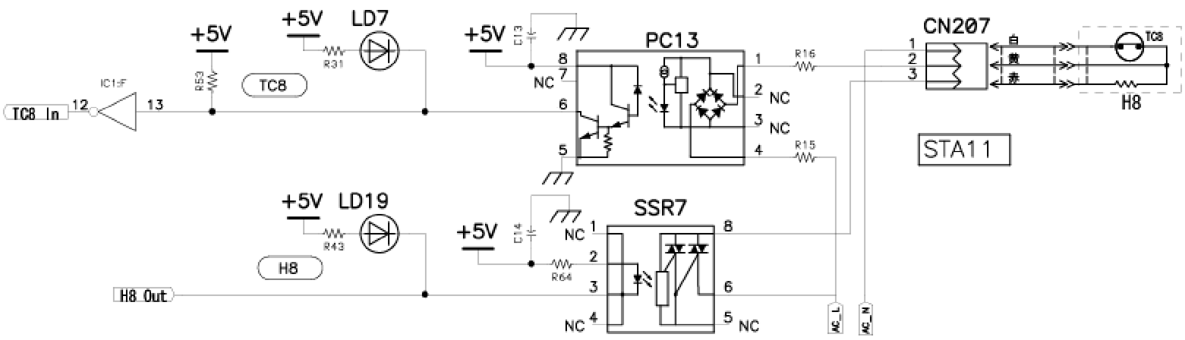


Fig. 1-2-9-2 Example of Oven Heater Drive Circuit

1-2-9-2 Over-temperature Protector

The control temperature of the oven can be set in range of 45 to 70°C, and an over-temperature condition will not occur even when nothing is in the oven. If the semiconductor relay circuit that turns ON/OFF the heater power supply becomes faulty or any temperature sensor detaches, the oven can no longer be controlled at the setpoint temperature and thus the applicable over-temperature protector may actuate. For details on the over-temperature protector, refer to 1-2-7-2, “Over-temperature Protector” in the section explaining the retort heater. To reset the over-temperature protector, the over-temperature protector must cool down sufficiently. Accordingly, remove all paraffin containers in the oven and turn off the system power, cool the center of the applicable station using wet towels, etc., as much as possible (to 40°C or below), and then turn on the power again.

1-2-9-3 Temperature Sensor Detection Part

The oven has a temperature sensor for each heater. The assignment of temperature sensors is shown in the table below. All temperature sensors have the same characteristics as the temperature sensor used on the retort lid, so refer to 1-2-6-3, “Temperature Sensor Detection Part” for details.

Table. 1-2-9-2 Assignment of Temperature Sensors

No.	Temperature sensor name	Applicable heater
TH8	Temperature sensor for paraffin station 11	H8
TH9	Temperature sensor for paraffin station 12	H9
TH10	Temperature sensor for paraffin station 13	H10
TH11	Temperature sensor for paraffin station 14	H11
TH12	Temperature sensor for paraffin top plate	H12

1-2-9-4 Temperature Control Method

Temperature control is performed based on a specific temperature set for each heater. The oven heaters have a relatively small heat output with respect to the heating target and thus their temperature stabilizes easily. Accordingly, these heaters use the ON/OFF control method associated with greater ease of control.

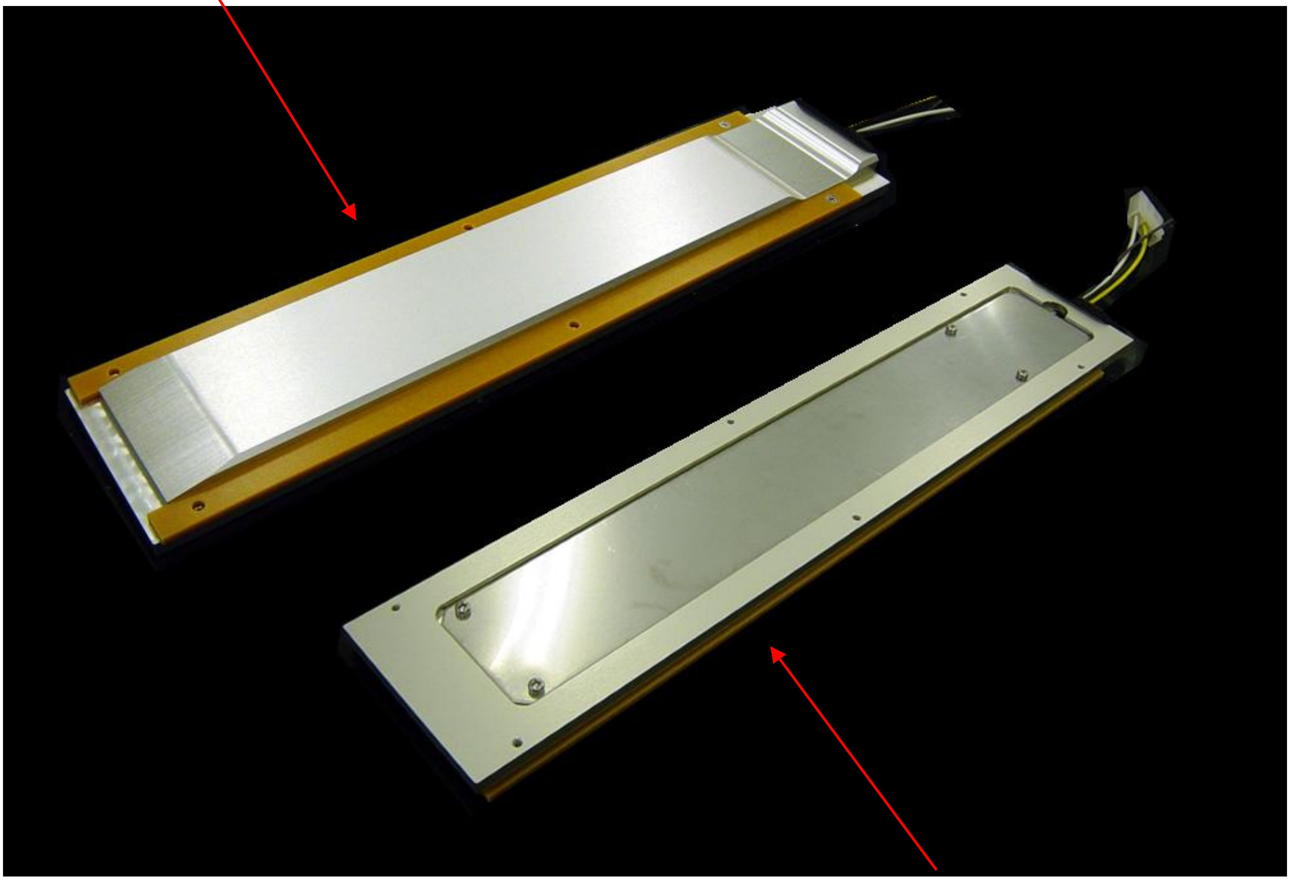
The oven is subject to temperature drop, and consequent solidification of paraffin in paraffin containers, due to power failure, paraffin input and other external factors. Accordingly, the control temperature is constantly checked and if the temperature drops, the detected paraffin melt state may change. If the paraffin melt state changes to “Solid,” the entire oven will be switched to a mode where higher control temperatures are used to melt paraffin.

1-2-10 Cleaning Xylene Heaters

1-2-10-1 Overview

The cleaning process is provided to use xylene to melt solid paraffin in the retort after the paraffin process, thereby restoring a condition where the system can perform a new process. In this process, a cleaning xylene station is provided at station 16 to melt paraffin. The paraffin solubility of cleaning xylene varies according to the paraffin concentration in xylene and the xylene temperature. By raising the xylene temperature beforehand, the paraffin solubility can be improved to shorten the cleaning process time. The cleaning xylene heater is used to constantly heat xylene in the cleaning xylene bottle using the heating part installed at the bottom of the bottle.

Xylene heating unit (Top view)



Xylene heating unit (Back view)

Fig. 1-2-10-1 Xylene Heating Unit

As shown in the photograph above, the bottle heating part consists of an aluminum heating surface and a bottle rack fixing part made of phenol resin. A heater is stored at the back and the unit is structured in such a way that spilled reagent will not flow into the heater unit.

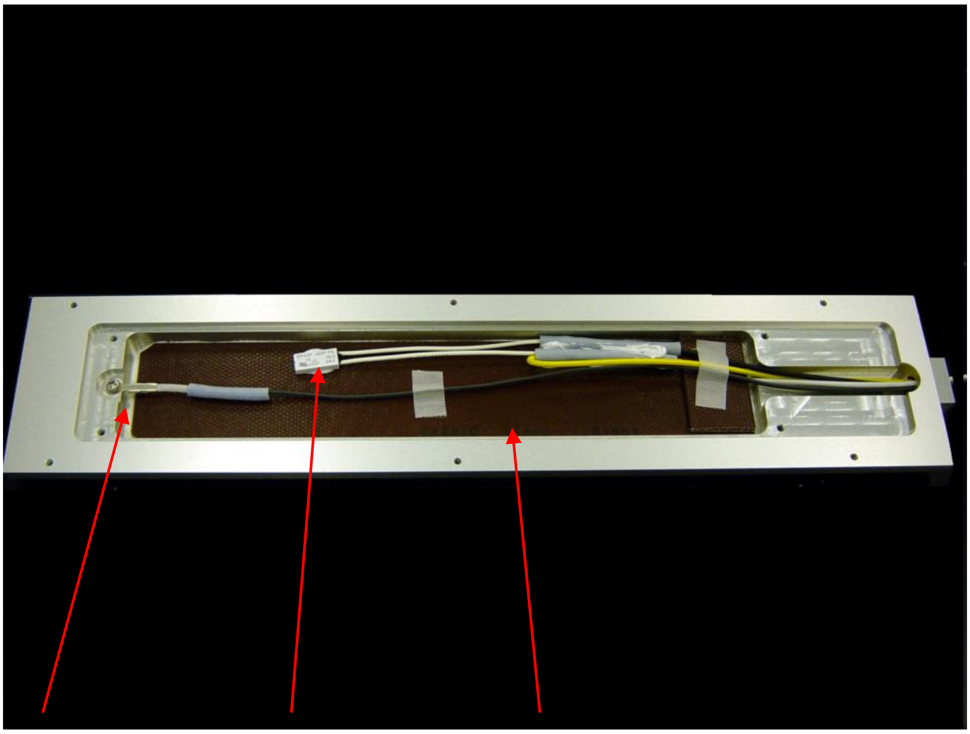


Fig. 1-2-10-2 Xylene Heater

The xylene heater is a silicone rubber heater attached at the back of the heat plate, and an over-temperature protector set to actuate at 90°C is attached using RTV rubber in series with this heater. The temperature sensor measures the heat plate temperature.

As for the characteristics of this heater, a 115-V heater with 60-W ratings is used for the VIP6-J0 and VIP6-A1 models, while a 230-V heater with 60-W ratings is used for the VIP6-E2 model.

The configuration of the heater unit is as follows. Heater control signals from the CPU board are transmitted to the heater driver board via the CN26 connector. The heater driver board turns the heater ON/OFF using each semiconductor relay SSR6. An over-temperature protector TC13 is connected in series with the heater, so that the heater circuit can be cut off when the heater temperature rises abnormally. If the contacts of the over-temperature protector open due to rising temperature, this contact input state is detected to notify that the over-temperature protector has actuated. In addition, the temperature sensor TH13 installed on the side at the bottom of the retort is used to control ON/OFF of the heater to achieve the target temperature. For the driver circuit, refer to Fig. 1-2-9-2, “Example of Oven Heater Drive Circuit.”

1-2-10-2 Over Temperature Protector

The xylene heater is controlled at a control temperature of 40°C. If the semiconductor relay circuit that turns ON/OFF the heater power supply becomes faulty or the temperature sensor detaches, xylene can no longer be controlled at the setpoint temperature and thus the over-temperature protector may actuate. For details on the over-temperature protector, refer to 1-2-7-2, “Over-temperature Protector” in the section explaining the retort heater. To reset the over-temperature protector, wait for the over-temperature protector to cool down sufficiently, and then turn off the system power and turn it back on.

1-2-10-3 Temperature Sensor Detection part

The temperature sensor TH13 at the xylene heater part has the same characteristics as the temperature sensor used on the retort lid. For details, refer to 1-2-6-3, “Temperature Sensor Detection Part.”

1-2-10-4 Temperature Control Method

Xylene temperature is controlled in such a way that the heating mode and OFF mode can be switched at any time. Since the required temperature accuracy is low in this area, simple ON/OFF control is used.

1-2-11 Control Box

1-2-11-1 Overview.

The control box is where the user interfaces with the system via the touch panel or control all functions of the system through the PU board in which the system's software is stored.
The key components of the control box include the CPU board, heater driver board, LCD relay board, LCD unit and switching power supply unit. An overview of each component is explained below.

Table 1-2-11-1 Overviews of Components

No.	Name	Overview explanation
PCB1	CPU board	A unit with a microprocessor, designed to execute the software and generate an output signal according to each input signal.
PCB2	Heater driver board	This board turns ON/OFF the heaters connected to the AC power supply according to instructions received from the CPU board. It also monitors the power-supply voltage and detects the status of each heater over-temperature protector.
PCB3	LCD relay board	This board transmits to the LCD module the LCD display signals generated by the CPU board. It also communicates the position touched on the touch panel to the CPU board via the touch panel controller.
PCB4	Power indicator board	A board with power indicators.
PCB5	US board	A board that relays input signals from ultrasonic sensors.
PCB6	Relay board (right)	A board that relays inputs from the various sensors installed on the right side of the system.
PCB7	Lid sensor board	This board receives inputs from two retort lid sensors and relays the signals to the lead heater, solenoids, etc.
PCB8	GV positioning board	A board that detects the gate valve position.
PCB9	RV positioning board	A board that detects the rotary valve position
PCB10	Relay board (left)	This board relays signals from the sensors installed on the left side of the system, as well as LED signal outputs.
PCB11	Interface board	Positioned at the back of the system, this board relays alarm outputs, serial communication signals and LAN communication signals.
LCD	LCD module	A 10.4” VGA color TFT LCD module.
TP	Touch panel	A 10.4” 4-wire, analog resistance-membrane touch panel.
INV	Inverter	This inverter generates high AC voltage to turn on the cold cathode tubes located at the top and bottom of the LCD module.
CP	Circuit protector	A switching & protective device that cuts off the power when the system experiences overcurrent, short-circuiting, etc.
SP	Switching power supply	This power supply insulates the AC power-supply voltage and then converts it to 24 VDC or 5 VDC.

The flow of power supply is as follows. The control box is affixed on the system's top plate and supplies the external AC power via the power-supply inlet provided at the back of the control box. The external AC power is converted by the switching power supply to a safe, low voltage used for control, and this low voltage is supplied to the CPU board. At the same time, the external AC power is supplied directly to the heater driver board for driving the heaters. On the CPU board, a different level of voltage is also generated and supplied according to the operating voltage of each device. The flow of each power-supply voltage in the system is shown below.

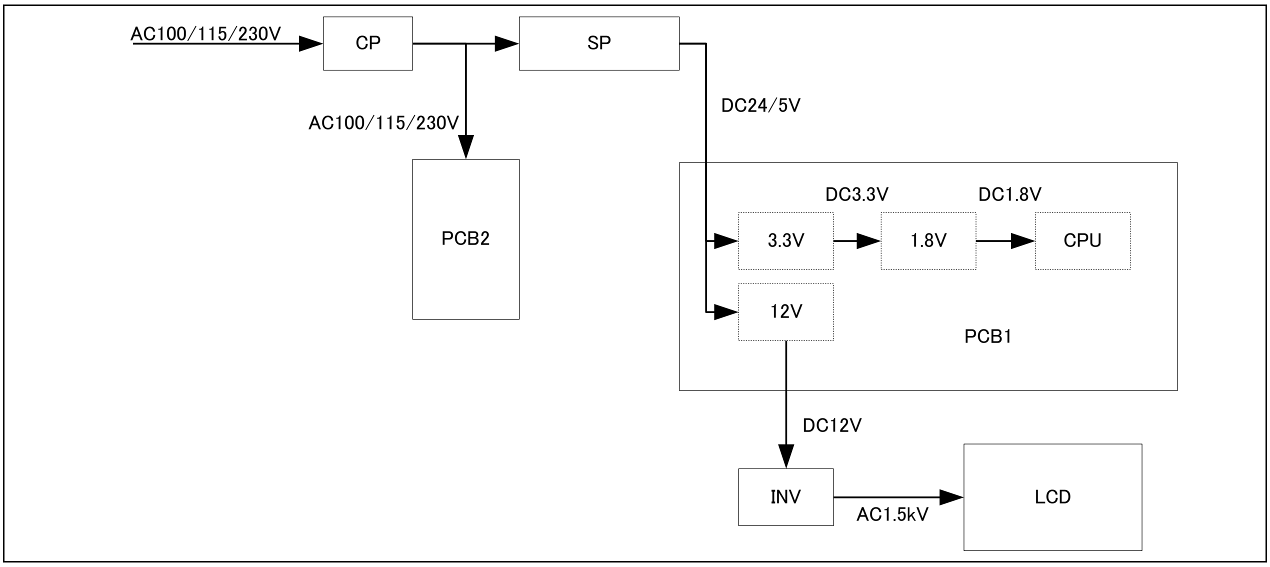


Fig. 1-2-11-1 Paths of Power-supply Voltages

In the above diagram, the power-supply voltages 3.3 V and 1.8 V are terminated within the CPU board. 3.3 V is used for driving the control devices, while 1.8 V is used for driving the CPU. The power-supply voltage delivered to external devices from the CPU board is mainly 5 VDC for inputs and 24 VDC for outputs. 12 VDC is also supplied for operating the fume fan at low speed.

1-2-11-2 CPU Board

One of the most important units comprising the system is this CPU board. The CPU board has a microprocessor at the center, around which memories and I/O devices are arranged. These components are operated individually by the software. Also, a driver device is mounted for driving the 24-VDC output devices so that these devices can be controlled directly. The block diagram below shows a rough configuration of the CPU board.

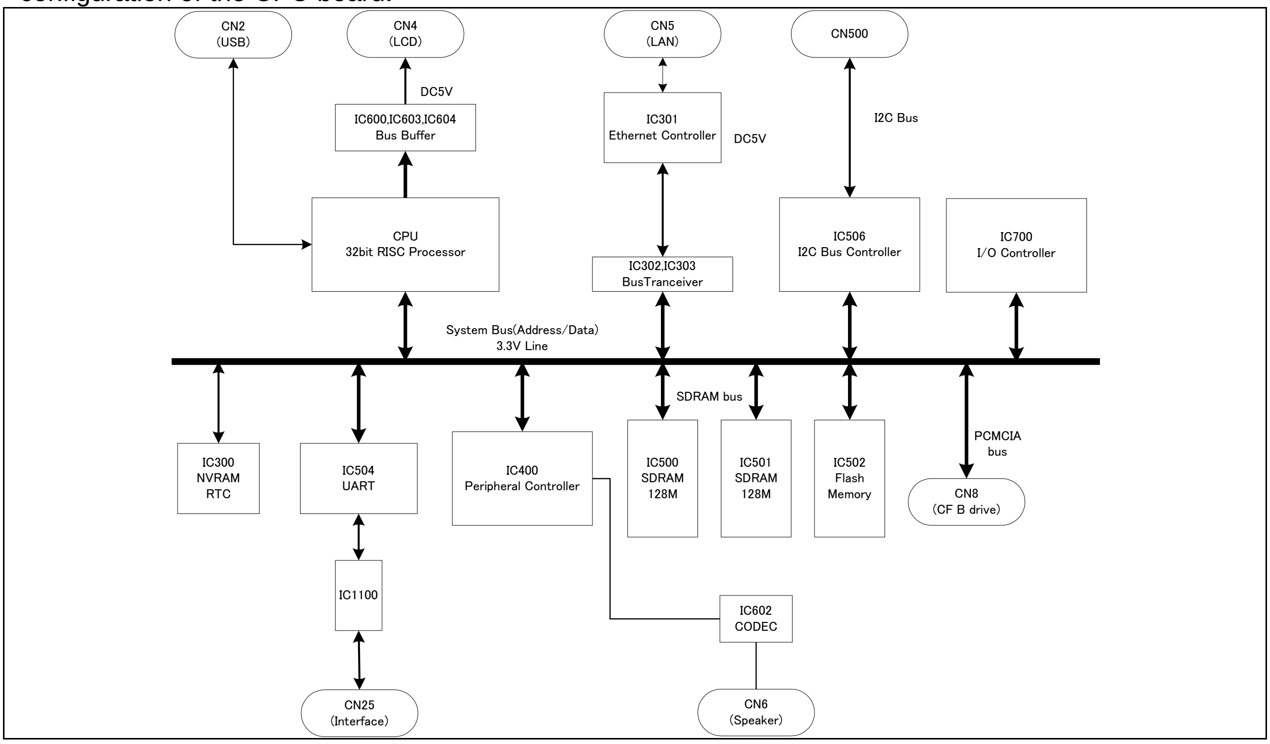


Fig. 1-2-11-2 Block Diagram of CPU Board

The CPU board mainly provides the following functions.

Table 1-2-11-2 Main Functions of CPU Board

Item	Name	Function/ Feature
CPU	Microprocessor	A 32-bit RISC microprocessor is used to perform calculations at a clock speed of 144 MHz. So that calculations are performed reliably at all times, only one CPU is used to control all functions of the system.
Primary memory unit	Flash memory	A 16-Mbit flash memory is installed to start one program that displays the initial screen first, after which another program is loaded from the secondary memory unit.
	SDRAM	This SDRAM provides a 256-Mbit memory space and plays a central role as the source for software and control data and also as the display memory.
	NVRAM	A memory backed up by batteries, where the data written to the memory will be retained even after the power is cut off. To be specific, control information that will become necessary when the power supply is restored is written. The NVRAM also has a clock function to obtain the current time. The NVRAM has an accuracy of ±35 ppm and operating life of 10 years (at 25°C).
Secondary memory unit	CF card slot	This slot is used to read and write a CF card. The system adopts the FAT format to permit sharing of CF card information with a PC. Data in the CF card is read and written via the SDRAM and cannot be read directly from the CPU. The FAT system assigns drive B for the CF card slot. Note that this CF card slot cannot be disabled/enabled by connecting/disconnecting the live wires.
	USB memory	Through its USB interface, this system can access external USB memories conforming to the USB1.1 standard. An interface of mass storage class is provided in the system, and SCSI or ATAP USB-memory commands are supported. USB devices other than memories are not supported. Only one device can be connected at a time. The maximum load current is 500 mA or less.
Interface	Ethernet	One 10BASE-T interface is provided. The MAC address of the system is registered in the CPU board. The IP address and other information are specified in PRODUCT.CSV.
	EIA-232	One EIA-232 serial port is provided for terminal connection.
	I2C	One I2C bus is provided for future expansion of the interface.
Video output	LCD	Display outputs supporting a 256-color, VGA (480 x 640) TFT LCD are provided.
Audio output	CODEC	The system can output 16-bit, 8-KHz monaural PCM data. The maximum playback time per file is 10 seconds.
Touch panel input	Analog resistance type	The system accepts inputs from a 4-wire analog touch panel with a resolution of 1024 x 1024.
Peripheral	Analog inputs	The system supports up to 14 thermistor temperature sensor input points and one pressure sensor input point (1 to 5 V, ±100 kPa).
	Digital inputs	Valve position and sensor information can be obtained.
	Analog outputs	Analog pump outputs (1 to 3 V) are available.
	Digital outputs	Outputs for stepping motors, fans, pumps, etc., are available.

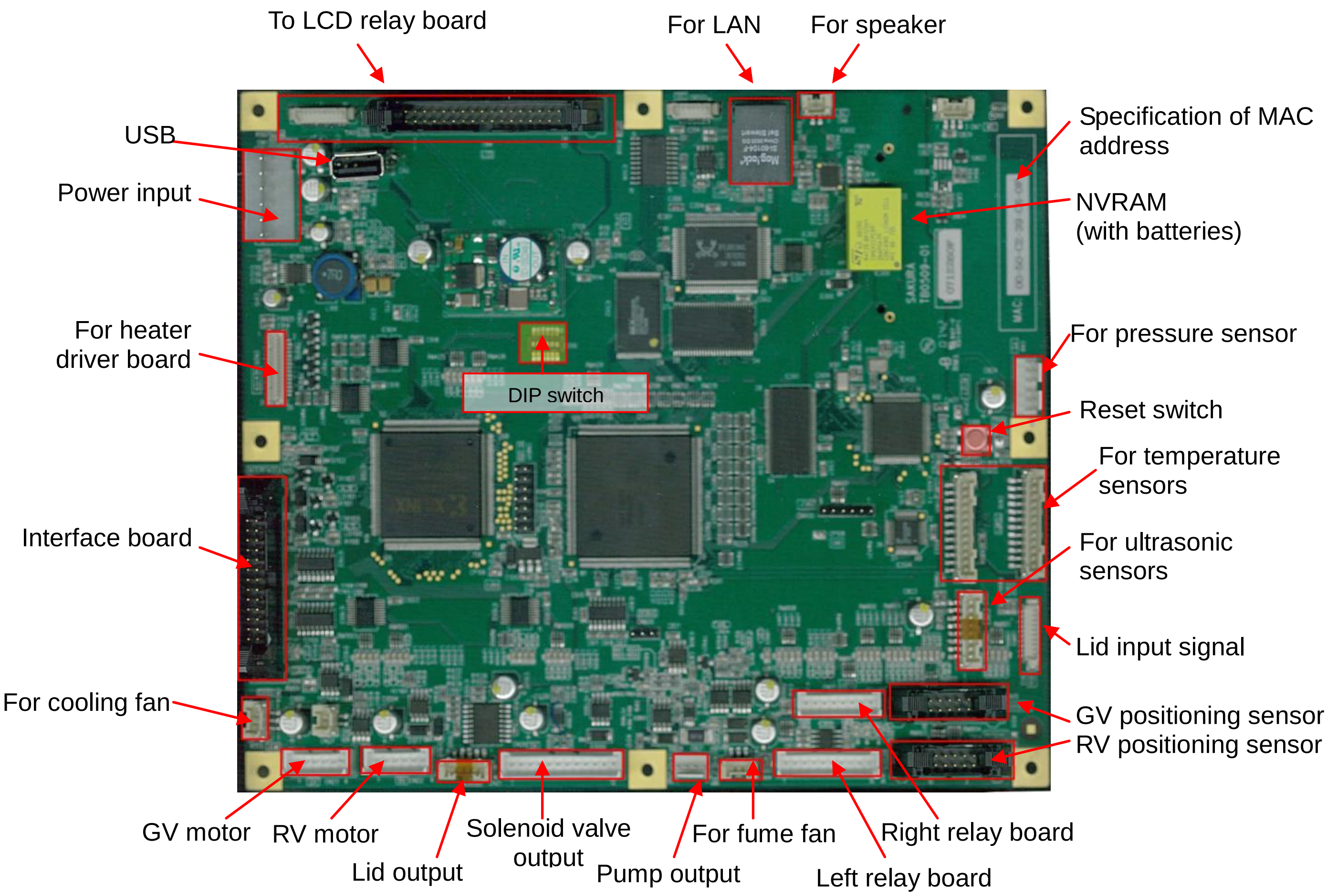


Fig. 1-2-11-3 Overview of CPU Board Layout (Component Side)

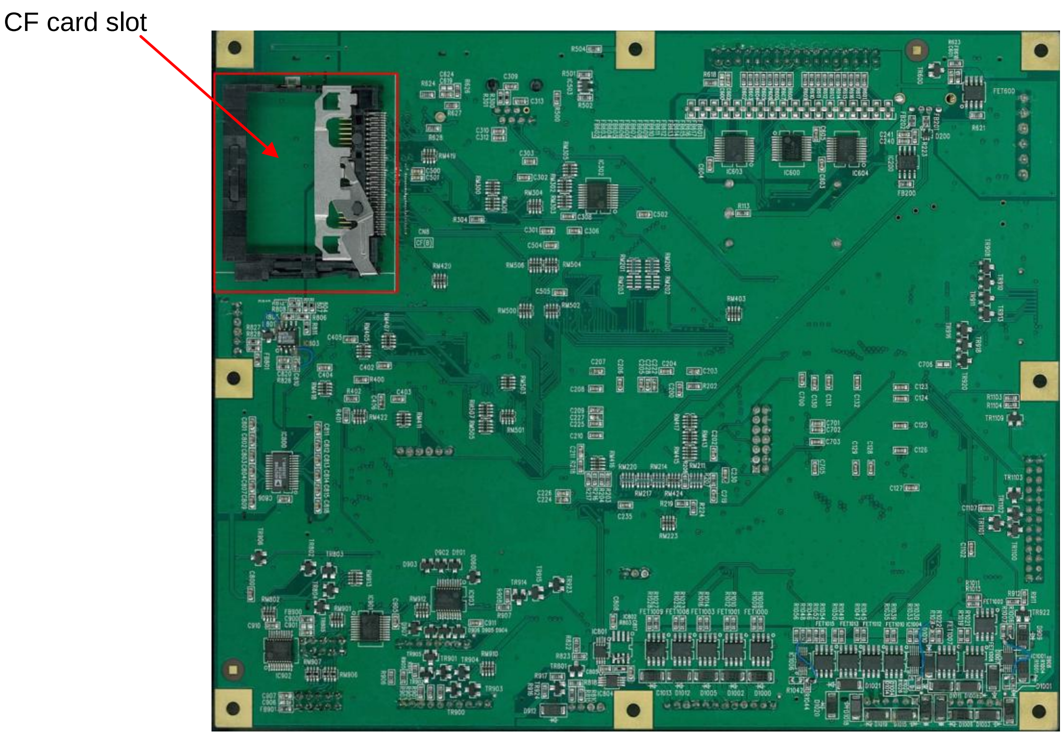


Fig. 1-2-11-4 Overview of CPU Board Layout (Soldered Side)

The CPU board has DIP switches that can be set in different positions to execute various programs other than the software. The conditions under which to search for the program to be started are as follows.

Table 1-2-11-3　DIP Switch Assignments

No.	Priority	File name	Format	DIP switches 6 5 4 3 2 1	Specification
1	1	B:¥MS7727.MOT	S format	-	For development test
2	2	B:¥MS7727.BIN	Binary format	-	For development test
3	3	B:¥SYSTEM¥VIP6KPG.BIN	Binary format	0 0 0 0 0 1	Check program
4	3	B:¥SYSTEM¥VIP6TCG.BIN	Binary format	0 0 0 0 1 0	Screen teaching program
5	3	B:¥SYSTEM¥VIP6IPL.BIN	Binary format	0 0 0 0 1 1	IPL update program
6	3	B:¥SYSTEM¥VIP6LAN.BIN	Binary format	0 0 0 1 0 0	LAN setup program
7	3	B:¥SYSTEM¥VIP6UPS.BIN	Binary format	0 0 0 1 0 1	External UPS setup program
8	3	B:¥SYSTEM¥VIP6PCB.BIN	Binary format	0 0 0 1 1 0	Printed circuit board check program
9	3	B:¥SYSTEM¥VIP6TLN.BIN	Binary format	0 0 0 1 1 1	Telnet communication program
10	3	B:¥SYSTEM¥VIP6000.BIN	Binary format	0 0 1 0 0 0	Reserved
11	3	B:¥SYSTEM¥VIP6001.BIN	Binary format	0 0 1 0 0 1	Reserved
12	3	B:¥SYSTEM¥VIP6002.BIN	Binary format	0 0 1 0 1 0	Reserved
13	3	B:¥SYSTEM¥VIP6003.BIN	Binary format	0 0 1 0 1 1	Reserved
14	3	B:¥SYSTEM¥VIP6004.BIN	Binary format	0 0 1 1 0 0	Reserved
15	3	B:¥SYSTEM¥VIP6005.BIN	Binary format	0 0 1 1 0 1	Reserved
16	3	B:¥SYSTEM¥VIP6006.BIN	Binary format	0 0 1 1 1 0	Reserved
17	3	The monitor screen(1) is displayed		0 0 1 1 1 1	The application program is not started.
18	4	B:¥VIP6GUT.BIK(2)	Binary format	0 0 0 0 0 0	Backup program
19	5	B:¥VIP6GUT.BIN	Binary format	0 0 0 0 0 0	Software

*　The DIP switch status is ON if 1, and OFF if 0.

Note (1)　The monitor screen refers to one showing a box at the center of the screen whose color changes differently when a CF card is not yet inserted or the applicable program cannot be found.

Note (2)　VIP6GUT.BIK is the old, backed-up version of software which may be used when the software is updated. Should a power failure or error occur while the software is being updated, this old version of software will be started. In this case, you must try updating the software again.

Note (3)　As for DIP switches 5 and 6, DIP switch 5 is not connected and must therefore be set to the OFF position at all times. DIP switch 6 is used for factory adjustment and must also be set to the OFF position at all times. If switch 6 is in the ON position, the programs may not operate.

Among the programs listed above, the check program, screen teaching program and software are already released. Also note that the printed circuit board check program is used when inspecting the printed circuit boards with a dedicated inspection jig. Release of other programs is not yet scheduled.

The table below lists the LED indicators on the CPU board. The illumination color is red for output LEDs and green for input LEDs. These LED indicators can be used to check the system condition.

Table 1-2-11-4 Output LEDs

No.	Name	Function
LD100	24V	The input status of 24-VDC power is indicated.
LD101	5V	The input status of 5-VDC power is indicated.
LD102	12V	The output status of 12-VDC power is indicated.
LD103	3.3V	The output status of 3.3-VDC power is indicated.
LD800	PUMP	Output of pump power is indicated.
LD904	SPY1	Reserved indicator output 1
LD905	SPY3	Reserved indicator output 3
LD906	SPY2	Reserved indicator output 2
LD923	LD1	Output of the paraffin container indicator is indicated.
LD924	FANL	12-VDC driving of the fume fan is indicated.
LD926	FANH	24-VDC driving of the fume fan is indicated.
LD1000	SV1	Output to the solenoid valve SV1 is indicated.
LD1001	SV2	Output to the solenoid valve SV2 is indicated.
LD1002	GVA	Excitation of phase A of the gate valve motor is indicated.
LD1003	SV3	Output to the solenoid valve SV3 is indicated.
LD1004	GV-A	Excitation of phase A of the gate valve motor is indicated.
LD1005	SV4	Output to the solenoid valve SV4 is indicated.
LD1006	GVB	Excitation of phase B of the gate valve motor is indicated.
LD1007	GV-B	Excitation of phase B of the gate valve motor is indicated.
LD1008	SV5	Output to the solenoid valve SV5 is indicated.
LD1009	SV6	Output to the solenoid valve SV6 is indicated.
LD1010	H1	Output to the retort lid heater is indicated.
LD1011	FOUT	Reserved output indicator
LD1012	RV-B	Excitation of phase B of the rotary valve motor is indicated.
LD1013	RVB	Excitation of phase B of the rotary valve motor is indicated.
LD1014	RV-A	Excitation of phase A of the rotary valve motor is indicated.
LD1015	RVA	Excitation of phase A of the rotary valve motor is indicated.
LD1016	FOUTX	Reserved output indicator
LD1100	AL1S	Indication of the set signal for system alarm output 1
LD1101	AL1R	Indication of the reset signal for system alarm output 1
LD1102	AL2	Indication of the signal for system alarm output 2

As for the output LEDs, four types of LEDs (phase A, phase –A, phase B and phase –B) appear to become lit simultaneously while the rotary valve is operating because the valve speed is high. The pump power output indicates the condition of supply of 24-VDC drive power to the pump. In reality, however, pump operation depends on the analog output voltage of the pump and if the pump analog output is less than 1 VDC, the pump does not operate. System alarm output 1 represents the signal for the power-failure hold relay, and indicates the system status output. The alarm contacts are explained separately.

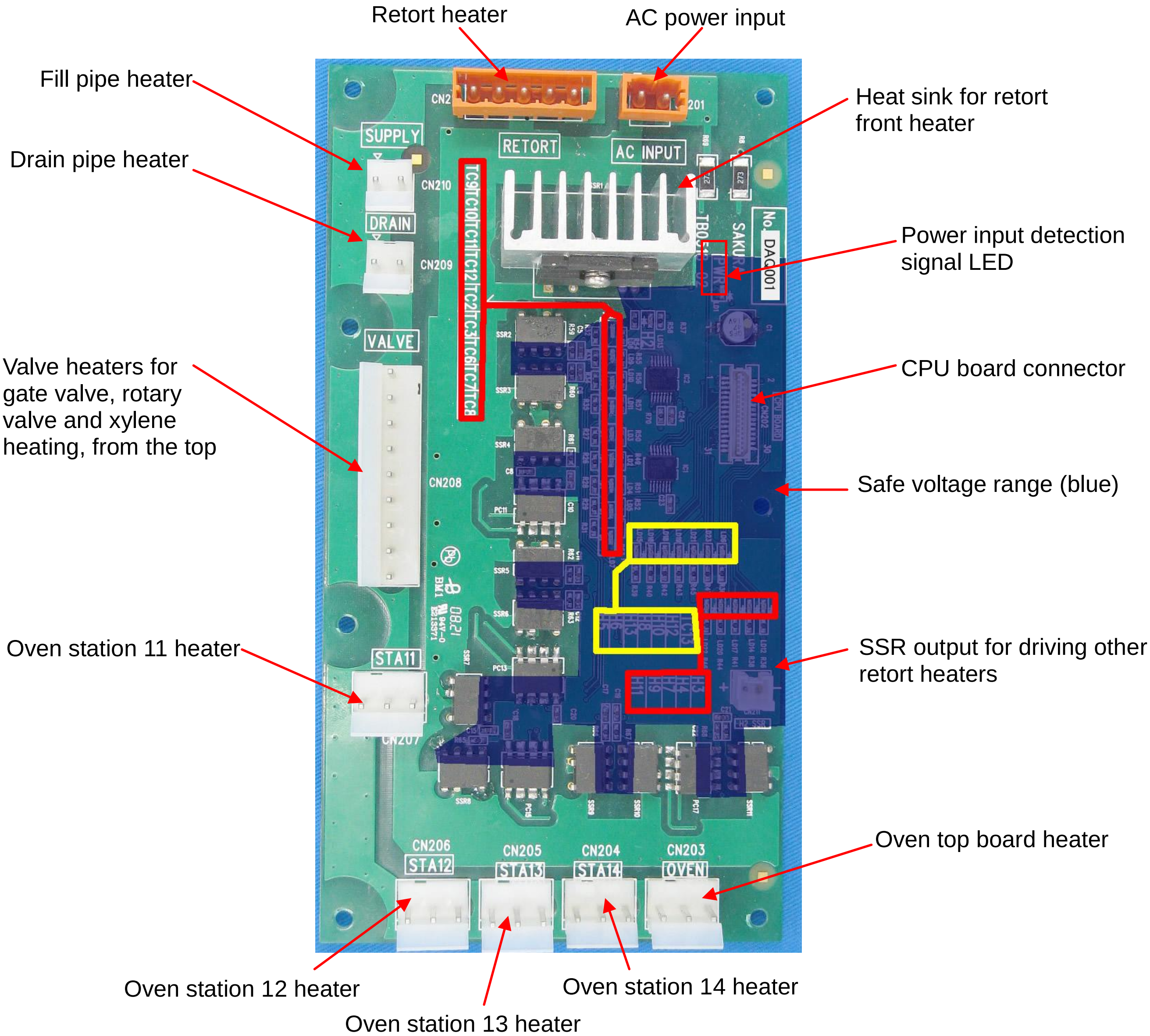
Table 1-2-11-5 Input LEDs

No.	Name	Function
LD400	RX	Detection of signals being received via Ethernet
LD401	TX	Detection of data being sent via Ethernet.
LD402	G	-
LD403	Y	-
LD404	B	Starting of the initialization program
LD405	R	Starting of the initialization program (from the SDRAM)
LD801	PC	Input of pump motor rotation pulses
LD803	US1	Turning ON of the 2.7-L ultrasonic sensor
LD805	US2	Turning ON of the 3.5-L ultrasonic sensor
LD807	US3	Turning ON of the 4.2-L ultrasonic sensor
LD809	US4	Turning ON of the overflow ultrasonic sensor
LD900	G:PC2	Turning OFF of the GV positioning sensor PC2
LD901	G:PC1	Turning OFF of the GV positioning sensor PC1
LD902	G:PC4	Turning OFF of the GV positioning sensor PC4
LD903	G:PC3	Turning OFF of the GV positioning sensor PC3
LD907	R:PC2	Turning OFF of the RV positioning sensor PC2
LD908	R:PC1	Turning OFF of the RV positioning sensor PC1
LD909	R:PC4	Turning OFF of the RV positioning sensor PC4
LD910	R:PC3	Turning OFF of the RV positioning sensor PC3
LD911	PI1	Detection of the HH level in the left bulk reservoir
LD912	PI2	Detection of the H level in the left bulk reservoir
LD913	PI3	Detection of the L level in the left bulk reservoir
LD914	LS1	Detection of the wax drain container
LD915	R:PC6	Turning OFF of the RV positioning sensor PC6
LD916	R:PC5	Turning OFF of the RV positioning sensor PC5
LD917	PI7	Retort lid sensor
LD918	PI8	Retort lid lock sensor
LD919	PI6	Detection of the L level in the right bulk reservoir
LD920	PI5	Detection of the H level in the right bulk reservoir
LD921	PI4	Detection of the HH level in the right bulk reservoir
LD922	LS2	Oven door closed sensor
LD925	FCE	Cooling fan alarm
LD927	FANE	Fume fan alarm
LD1103	UPS	UPS signal input

Among the input LEDs, those for GV and RV position detection sensors become lit when the applicable sensor turns OFF. For details, refer to the detailed explanations of the gate valve and rotary valve.

1-2-11-3 Heater Driver Board

The heater driver board is used to control the AC power supply to control multiple heaters. A large, special copper-foil board consisting of four layers is provided separately from the CPU board, partly to ensure a sufficient heat radiation surface and insulation space to control the high voltage and high current, and partly to accommodate the board within a limited space. Because of its design, this board can be used continuously at AC power-supply voltages of up to 264 VAC and loads of up to 12 A.



The red and yellow frames indicate the locations of LEDs and corresponding symbols, respectively.

Fig. 1-2-11-5 Heater Driver Board

The heater driver not only controls the heaters, but it also monitors the status of AC power-supply voltage. Once the voltage reaches 80 VAC or more, the applicable signal is turned ON. This signal is sent to the peripheral IC (IC400) on the CPU board to detect a power failure condition. The VIP6 is connected to a USB and other devices that require a relatively long time to access files stored inside. Accordingly, a certain file closing time is required following a power failure in order to prevent damage to these files systems. By monitoring the AC voltage, a sufficient file closing time is assured in the form of a delay in voltage drop caused by the remaining capacity of the switching power supply, etc., in the event of an unexpected power failure.
Except for the pipe heaters having a self-temperature control function, all heaters have a built-in over-temperature protector to prevent overheating of the heater due to a faulty SSR or control circuit. When a given over-temperature protector actuates, the applicable circuit turns OFF. The status of each

over-temperature protector can be detected when the heater is ON.

The LED indicators on the heater driver board are shown below. The input LEDs illuminate in green, while the output LEDs illuminate in red.

Table 1-2-11-6 Input LEDs

No.	Name	Function
LD1	PWR	Detection of AC power input
LD2	TC3	Over-temperature protector for other retort heaters
LD3	TC2	Over-temperature protector for retort front heater
LD4	TC6	Over-temperature protector for GV heater
LD5	TC7	Over-temperature protector for RV heater
LD6	TC13	Over-temperature protector for xylene heater
LD7	TC8	Over-temperature protector for oven station 11 heater
LD8	TC9	Over-temperature protector for oven station 12 heater
LD9	TC10	Over-temperature protector for oven station 13 heater
LD10	TC11	Over-temperature protector for oven station 14 heater
LD11	TC12	Over-temperature protector for oven top board heater

Table 1-2-11-7 Output LEDs

No.	Name	Function
LD12	H3	Output for other retort heaters
LD13	H2	Output for retort front heater
LD14	H4	Output for supply pipe heater
LD15	H5	Output for drain pipe heater
LD16	H6	Output for GV heater
LD17	H7	Output for RV heater
LD18	H13	Output for xylene heater
LD19	H8	Output for oven station 11 heater
LD20	H9	Output for oven station 12 heater
LD21	H10	Output for oven station 13 heater
LD22	H11	Output for oven station 14 heater
LD23	H12	Output for oven top board heater

1-2-11-4 LCD Unit

The LCD unit is a 10.4" VGA (640 x 480) TFT liquid crystal display. The figure below illustrates an overview of the LCD unit.

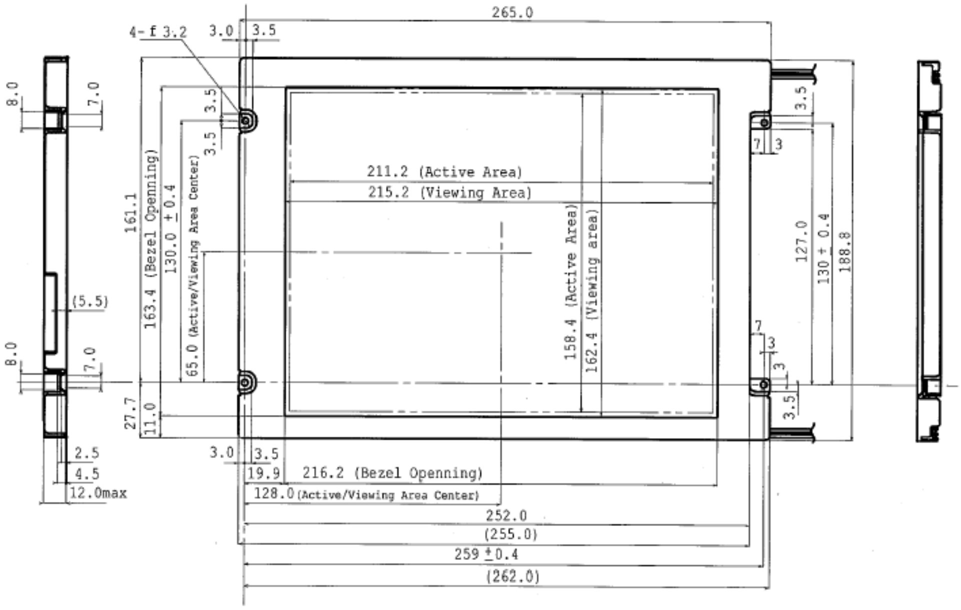


Fig. 1-2-11-5 LCD Unit

The TFT display itself supports 260,000 colors, but the number of colors is limited to 256 by the CPU board in light of the draw speed and the required memory space. Images are actually drawn in cycles of approx. 16 msec based on eight bytes of color information amounting to a total of 307,200 pixels. The actual video RAM is installed on the CPU board.

ON/OFF control of the LCD uses a dedicated 5-VDC LCD power and is synchronized with control signals. Cold cathode tubes are provided at the top and bottom and illuminated by an inverter. These cold cathode tubes have a service life (half life) of approx. 5 years. Take note that the LCD may appear slightly dark immediately after the tubes are turned on.

The inverter unit is a step-up inverter used for turning on the two cold cathode tubes mentioned above, and converts the 12-VDC input voltage to 1500 VAC of 30 kHz. Do not tough this inverter unit while the power is supplied, because it generates high voltage. The inverter turns ON when the system power is turned ON and remains ON while the system is operating.

1-2-11-5 Touch Panel Unit

The touch panel is secured by double-sided adhesive tape in the specified position on the LCD.
The touch panel is of the analog resistance-membrane type, where touching and releasing actions as well as applicable positions are read.
This analog resistance-membrane touch panel is constituted by two surfaces each coated with resistive films extending uniformly in the horizontal direction (X) and the vertical direction (Y), where the two surfaces are stacked on top of each other, as shown below. The two surfaces are not normally contacting each other, and make contact only when a film pressure is applied from above. An example of detecting a horizontal position is shown below. The input voltage changes when the panel is touched, and the applicable voltage is measured to calculate position x1. The same principle applies when detecting a vertical position. Although this function allows for detection of a single point on the touch panel, the detected position information becomes inaccurate when the two surfaces make contact at multiple points at the same time.

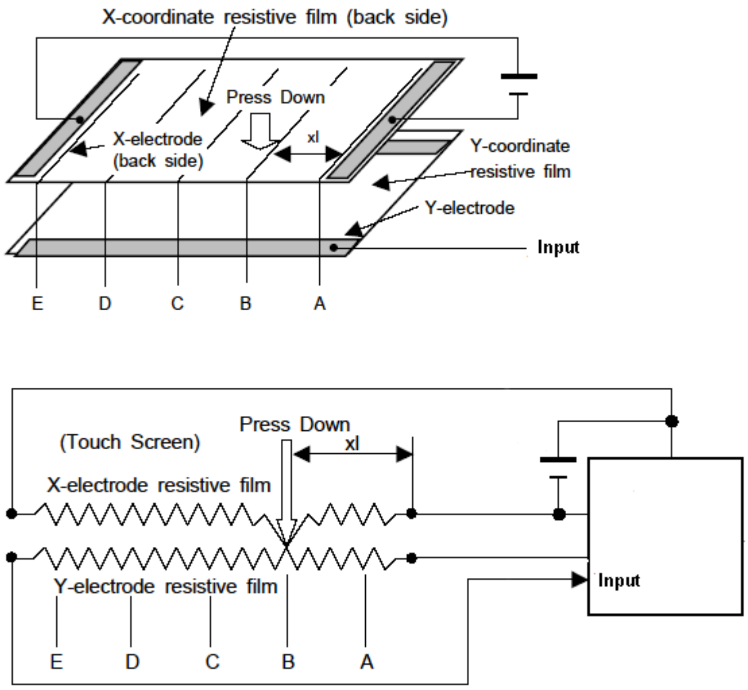
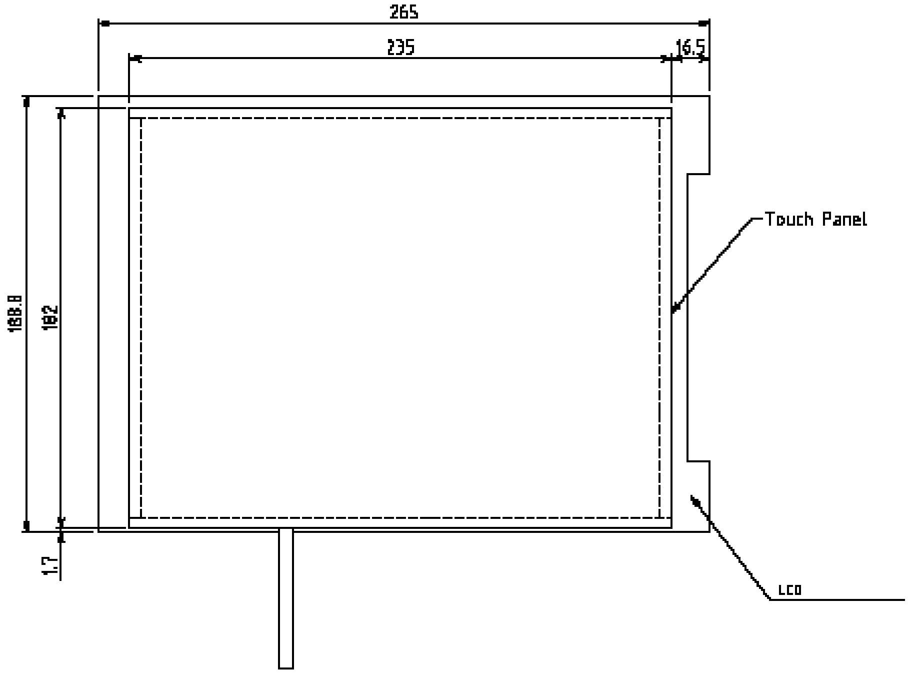


Fig. 1-2-11-7 Touch Panel

The touch panel consists of a bottom face made of glass and a top face made of PET film. The panel may become cloudy due to attachment of reagent, etc., over time or may get scratched by sharp objects, etc. To prevent soiling and scratching, a LCD protection sheet that can be attached on the surface is available. If the surface is soiled or scratched, clean or replace this sheet. The LCD protection sheet consists of two layers including a silicon rubber layer on the attaching side and a PET film layer on the touching side. The silicon rubber side sticks by itself. If the sheet has become fairly dirty, peel the sheet, wash it with water and dry thoroughly, and then reattach the sheet.
Replace the protection sheet if it has become very dirty or scratched.

With the touch panel unit, its position relationship with the LCD is very important. This system is designed so that the touch panel unit is arranged in the position shown below.



The PET-sheet side of the touch panel should face up.

Fig. 1-2-11-8 Exterior View of Touch Panel

Even when the touch panel is positioned accurately, slight misalignment still occurs depending on the condition. Accordingly, a teaching program is provided to correct such misalignment. The learned data for correcting misalignment is stored in the flash memory on the CPU board.

1-2-11-6 LCD Relay Board

The LCD relay board is a printed circuit board that relays signals between the LCD unit, touch panel and inverter, and the CPU board.

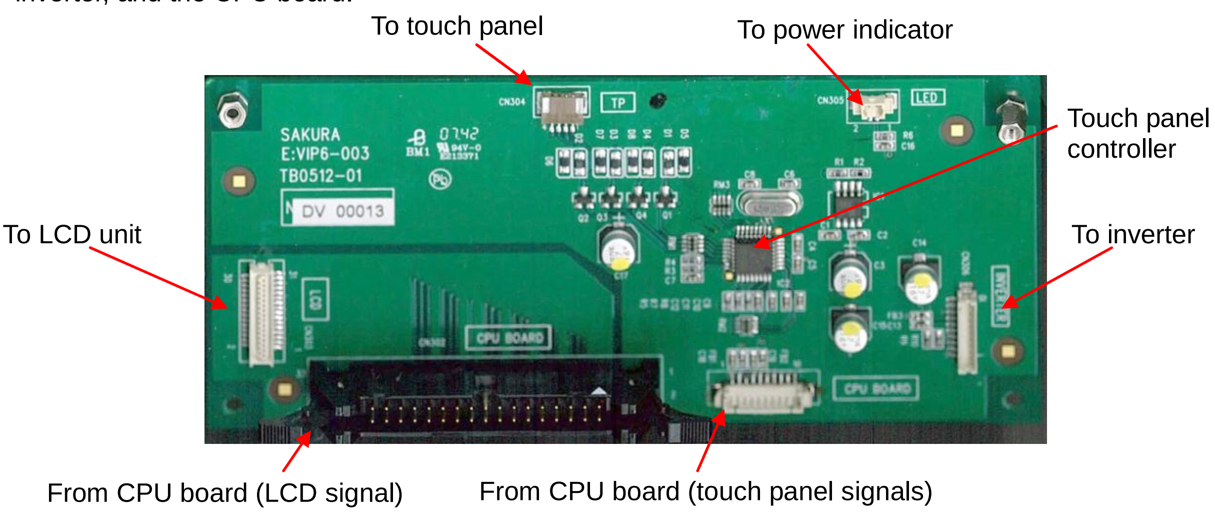
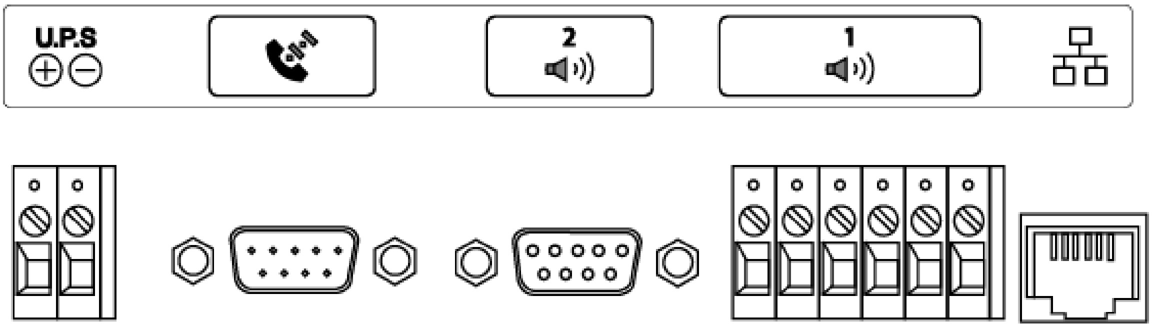


Fig. 1-2-11-9 LCD Relay Board

In reality, LCD display signals generated by the CPU board are directly relayed to the LCD unit without being converted. On the other hand, touch panel signals are connected to the CPU board after being converted by the touch panel controller into information indicating that the touch panel has been operated. The touch panel controller is synchronized with the LCD power control and once the CPU board is reset, the power supply to the touch panel controller will be cut off and the controller will be reset. Accordingly, if a poor connection or other problem occurs between the CPU board and LCD relay board, information may no longer become available from the touch panel unless the CPU board is reset to initialize the controller.

1-2-11-7 Interface Board

The interface board is provided at the back of the system, and used to connect to external units so as to expand the system functions.
The interface consists of the following.



UPS (uninterruptible power supply) Power-failure contact input	EIA-574 serial communication port	External signal output Transistor outputs	External alarm Contact outputs	Ethernet port

Fig. 1-2-11-10 Interface Board

The interface specifications for respective connectors are as follows.

Table 1-2-11-8 Interface Specifications

Connector No.	Name	Application	Specification
CN1103	LAN	Ethernet	This connector can be connected to an Ethernet port. It conforms to the 10BASE-T standard and accepts a LAN cable fitted with a RJ45 plug. Note, however, that a system network must be set up before this connector can be used The default IP address is “192.168.1.1,” while the default subnet mask is “255.255.255.0.”
CN1104	MODEM	Serial port	A serial port conforming to the EIA-574 standard.
CN1105	ALARM	External output	This connector can output signals to external devices according to the items set by the software. For example, you can provide an external alarm device to notify the user that “tissue processing has ended.” This connector is not set by default.
TB1	ALARM	External alarm	This connector is used to notify the user of emergency situations (where continuous processing is disabled due to a power failure, error, etc.) encountered by the system. Six contacts are available so that whether tissue processing is currently in progress or not can be identified.
TB2	UPS	UPS input	If the UPS unit of Sanken Electric (SMU-EA152) or an equivalent product is used, the system continues operating even during power outage until it detects the low battery event output from the UPS. As soon as the system receives this output signal, it begins the specimen protection operation. For other UPS units, the power outage signal output from the UPS is utilized. In this case, the specimen protection operation is immediately started when a power outage occurs.

* The IP address and subnet mask of the system are stored in the PRODUCT.CSV file, and the software uses the values written in this file.
* The events associated with external outputs and external alarms can be changed using the software. For example, error messages can be output by external outputs, or processing conditions can be output by external alarms. However, it is recommended that you register events that disable continuous processing, such as power failure, for external alarms.

Connection examples and electrical characteristics are explained below for respective interfaces.

1-2-11-7-1 Ethernet (LAN)

By using software incorporating network applications, etc., the system can connect to an external network device. To check network connection, follow the procedure below:

(1) Have the Administrator of the applicable local network area issue you a dedicated IP address.
(2) Change the IP address of the system (such as from “192.168.1.1” to “192.168.10.100”).
(3) Modify the subnet mask of the system.
(4) If a gateway must be used, also set the default gateway value.
(5) Perform a connection test. Issue a Ping command from a terminal connected to the same network to check if the connection is valid.

The CAT.5 UTP RJ-45 cable is recommended as the connection cable. The pin layout of the RJ-45 connector is shown below.

Table 1-2-11-9 RJ-45 Pin Assignments

Pin No.	Signal name	Description
1	TX+	Twisted-pair wire differential signal, send+
2	TX-	Twisted-pair wire differential signal, send-
3	RX+	Twisted-pair wire differential signal, receive+
6	RX-	Twisted-pair wire differential signal, receive-

Note) Take note that Ethernet connection should be established only when software incorporating network applications, etc., is available.

1-2-11-7-2 Serial Port

By using software incorporating serial communication applications, etc., the system can connect to an external terminal.

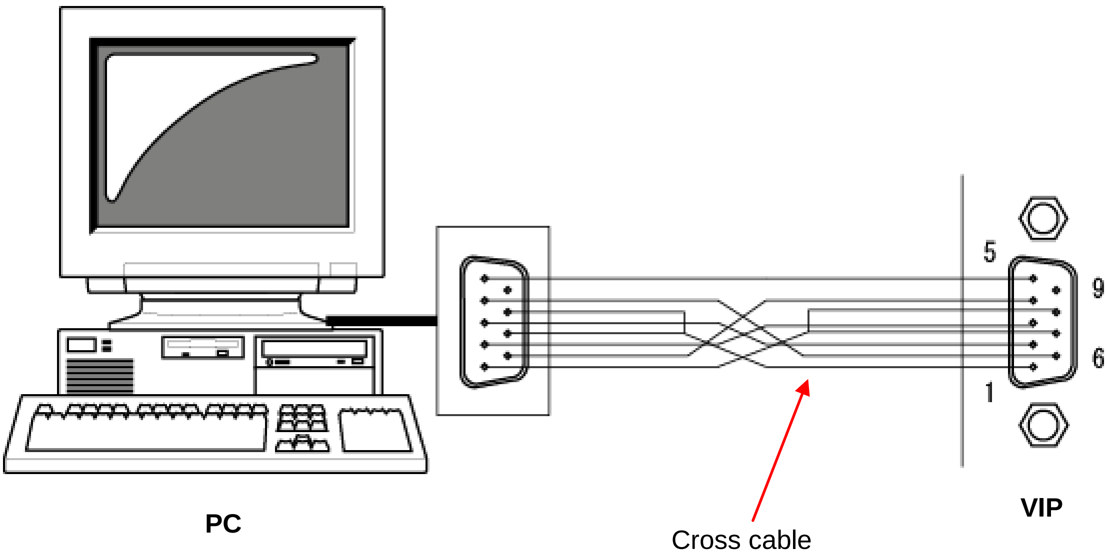


Fig. 1-2-11-11 Example of Connection with PC

The table below lists the connector pin assignments.

Table 1-2-11-10 Serial Port Pin Assignments

PIN No.	Signal name	Description
1	DCD	Carrier detection
2	RXD	Receive data
3	TXD	Send data
4	DTR	Data terminal ready
5	GND	Signal ground
6	DSR	Data set ready
7	RTS	Send request
8	CTS	Receive request
9	N.C	Not connected

The characteristics of each signal conform to EIA-574, and these signals can be connected to a standard serial port on a PC or modem.

Note) Take note that serial port connection should be established only when software incorporating serial port applications, etc., is available.

1-2-11-7-3 External Output/Alarm

By using the setup screen of the software, signals can be output to an external alarm device, etc., upon occurrence of events. All of the following events can be monitored. Note, however, that if a given event is already set for an external output or external alarm, the event can no longer be assigned to other output/alarm. Also note that external alarms cannot be assigned to events indicating the system conditions corresponding to EVNT1 to 11.

Table 1-2-11-11 List of Events

ID	Event
ER_EVNT1	Power outage
ER_EVNT2	UPS battery voltage has dropped during tissue processing backed up by UPS.
ER_EVNT3	An error occurred during tissue processing. Tissue processing was aborted by the system.
ER_EVNT4	Unit was paused during tissue processing. User interaction is necessary to continue.
ER_EVNT5	UPS battery voltage has dropped during retort cleaning backed up by UPS.
ER_EVNT6	An error occurred during the retort clean. The retort clean was aborted by the system.
ER_EVNT7	Unit was paused during the retort clean. User interaction is necessary to continue.
ER_EVNT8	UPS battery voltage has dropped during warm water flush backed up by UPS.
ER_EVNT9	An error occurred during the warm water flush. The warm water flush was aborted by the system.
ER_EVNT10	Unit was paused during the warm water flush. User interaction is necessary to continue.
ER_EVNT11	UPS battery voltage has dropped during rinse cycle backed up by UPS.
ER_EVNT12	An error occurred during the rinse cycle. The rinse cycle was aborted by the system.
ER_EVNT13	Unit was paused during the rinse cycle. User interaction is necessary to continue.
ER_EVNT14	UPS battery voltage has dropped during solution exchange backed up by UPS.
ER_EVNT15	An error occurred during the solution exchange. The solution exchange was aborted by the system.
ER_EVNT16	Unit was paused during the solution exchange. User interaction is necessary to continue.
ER_EVNT17	The power has been restored and the UPS battery was recharged.
ER_EVNT18	A critical error occurred during screen operation.
WR_EVNT1	Unit was paused during tissue processing.
WR_EVNT2	Unit was paused during tissue processing and the retort lid was kept open for 5 minutes.
WR_EVNT3	Tissue processing was aborted by the user.
WR_EVNT4	A Solution Manager refill action occurred during tissue processing.

WR_EVNT5	A Solution Manager station substitute was performed during tissue processing.
WR_EVNT6	The left bulk reservoir (Sta. 19) was emptied during tissue processing.
WR_EVNT7	The right bulk reservoir (Sta. 20) was emptied during tissue processing.
WR_EVNT8	Unable to use the wax drain container during tissue processing.
WR_EVNT9	Unit was paused during the retort clean.
WR_EVNT10	The retort clean was aborted by the user.
WR_EVNT11	A Solution Manager refill action occurred during the retort clean.
WR_EVNT12	The left bulk reservoir (Sta. 19) was emptied during the retort clean.
WR_EVNT13	The right bulk reservoir (Sta. 20) was emptied during the retort clean.
WR_EVNT14	Unit was paused during the warm water flush.
WR_EVNT15	The warm water flush was aborted by the user.
WR_EVNT16	Unit was paused during the rinse cycle.
WR_EVNT17	The rinse cycle was aborted by the user.
WR_EVNT18	Unit was paused during the solution exchange.
WR_EVNT19	The solution exchange was aborted by the user.
WR_EVNT20	The left bulk reservoir (Sta. 19) was emptied during the solution exchange.
WR_EVNT21	The right bulk reservoir (Sta. 20) was emptied during the solution exchange.
WR_EVNT22	Unable to use the wax drain container during the solution exchange
EVNT1	Tissue processing was started in the delayed start mode.
EVNT2	Tissue processing was started in the immediate start mode.
EVNT3	The first step of the program was started in the delayed start mode.
EVNT4	Tissue processing was completed.
EVNT5	Power was restored and tissue processing was restarted.
EVNT6	The retort clean was completed.
EVNT7	The warm water flush was completed.
EVNT8	The rinse cycle was completed.
EVNT9	The solution exchange was completed.
EVNT10	Replacement request was given for the fume filter or solutions.
EVNT11	The melting process was started because the paraffin was solidified.

A wiring example for external signal outputs is shown below.

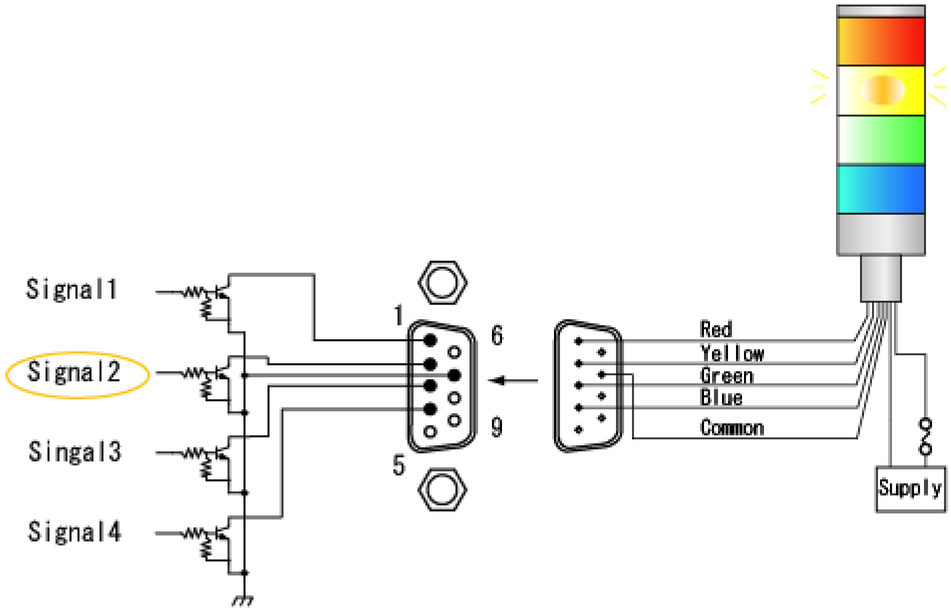


Fig. 1-2-11-12 Example of Connection with Indicators

Take note that the maximum load for each output is 30 VDC, 50 mA. If the load exceeds 30 VDC or 50 mA, use a relay to connect the output.

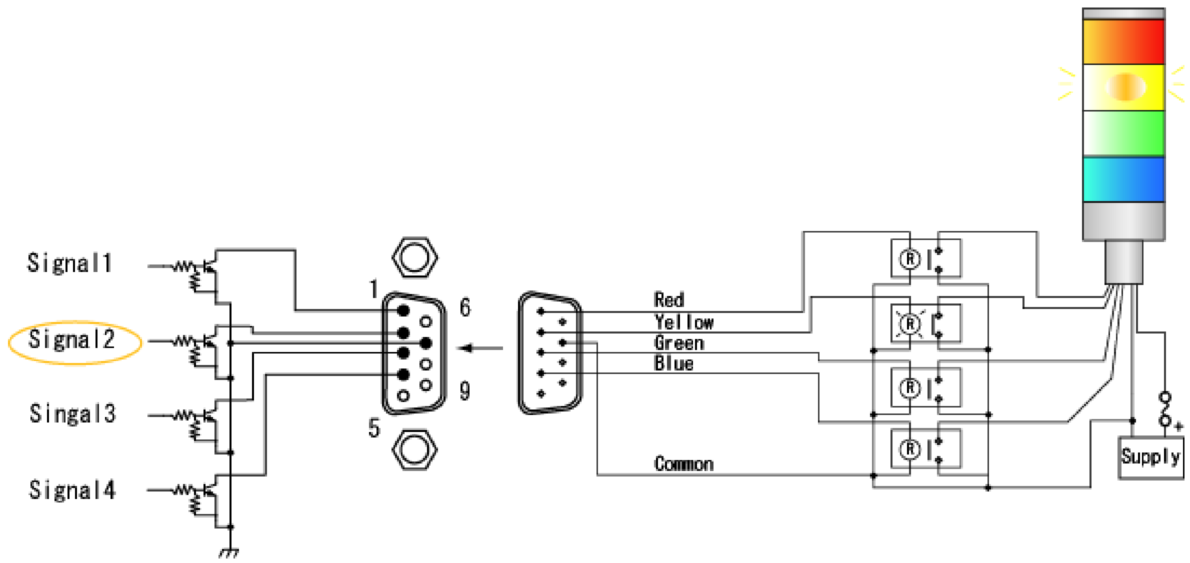


Fig. 1-2-11-13 Example of Connection with Indicators (Using Relay)

Large loads equal to or exceeding the load rating can be applied if a relay is used. Without a relay, however, the loads must not exceed 30 VDC, 50 mA. As shown in this example, the user can be notified of event statuses visually. For example, you can assign red for an error, yellow for end of tissue processing, green for start of tissue processing, and blue for end of reagent exchange, to allow the user to check each status of the system remotely. Note that a detected event is cleared when the LCD of the system is touched.
On the other hand, external alarms are used to notify the user of emergency situations, such as power failure, when the user is away from the system.

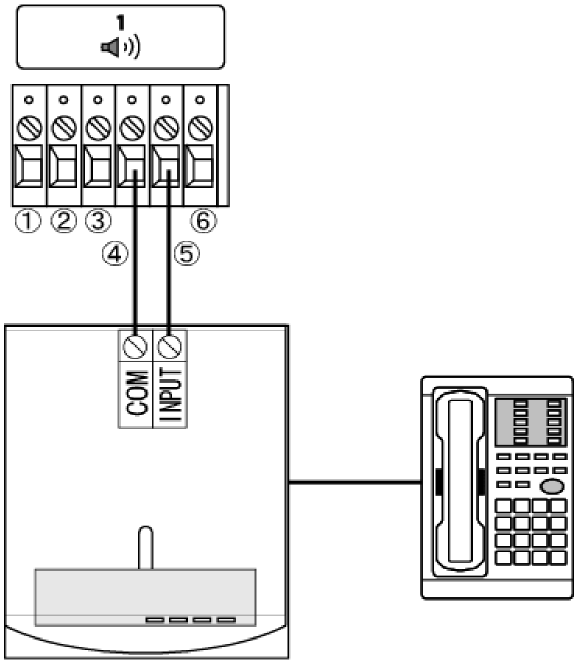


Fig. 1-2-11-14 Example of Connection for Sending Error Signals to Notification Device

Error signals can be sent to a notification device as shown in the figure above. For example, you can set contacts 4 and 5 to connect in the event of a power failure so that the user will be notified by the notification device. Note, however, that in this case an error signal will be issued even when tissue processing is not performed.

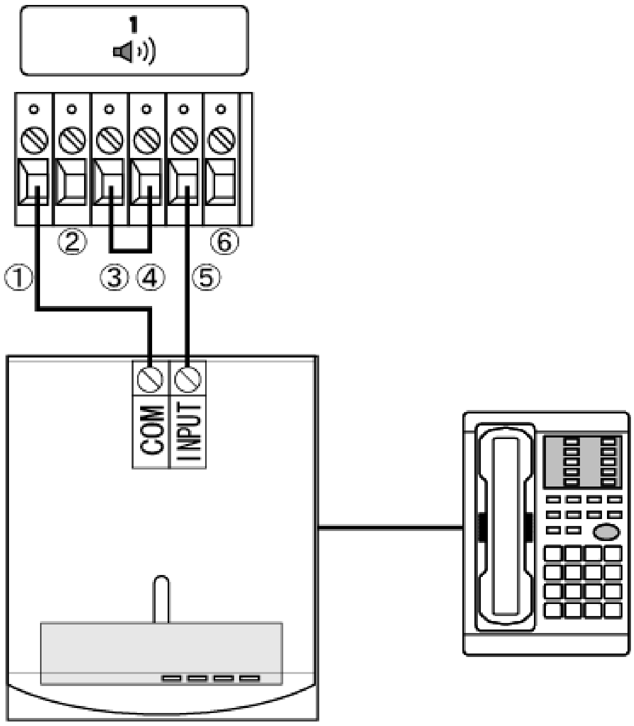


Fig. 1-2-11-15 Example of Connection for Sending Error Signals to Notification Device (Only during Tissue Processing)

Among contacts 1 to 3, only contacts 1 and 3 are connected during tissue processing. These contacts maintain their status even during a power failure, so errors including power failure can be issued only during tissue processing.

The status of each pair of contacts is shown below. Note that terminals 1 and 4 are a common terminal.

Table 1-2-11-11 Alarm Contact Statuses

No.	Status		Tissue processing			
	Tissue processing	Alarm	Contacts 1 and 2	Contacts 1 and 3	Contacts 4 and 5	Contacts 4 and 5
1	Currently processing	Not issued	OFF	ON	OFF	ON
2	Currently processing	Issued	OFF	ON	ON	OFF
3	None	Not issued	ON	OFF	OFF	ON
4	None	Issued	ON	OFF	ON	OFF
5	Currently processing	Power failure occurred	OFF	ON	ON	OFF
6	Not issued	Power failure occurred	ON	OFF	ON	OFF

Take note that the maximum load for alarm contacts is 30 VDC, 1 A. The contacts have no voltage.

1-2-11-7-4 UPS Input

With the UPS input signal, the system judges it impossible to continue an operation backed up by the UPS when the terminals are conducted. If this signal is detected during tissue processing, the system will immediately perform the specimen protection operation (pumping-in, followed by standing-by). Once the specimen protection operation has been performed due to this signal, the UPS battery is recharged for 10 minutes after power restoration in order to prepare for a next power outage. The recommendable UPS unit is Sanken Electric's SMU-EA152 or a product having similar specifications. If Sanken's UPS is used, the low battery signal output terminal of the UPS can be connected to the UPS input terminal on the system side, and also the system can continue operation by using the backup capability of the UPS even after power outage occurs. If one of other UPS's is used, connect a power outage output signal terminal of the UPS to the system. In this case, the specimen protection operation is started as soon as power outage occurs.

UPS (SMU-EA152, Sanken Electric Co., Ltd.) UPS terminal on the back side of the VIP6

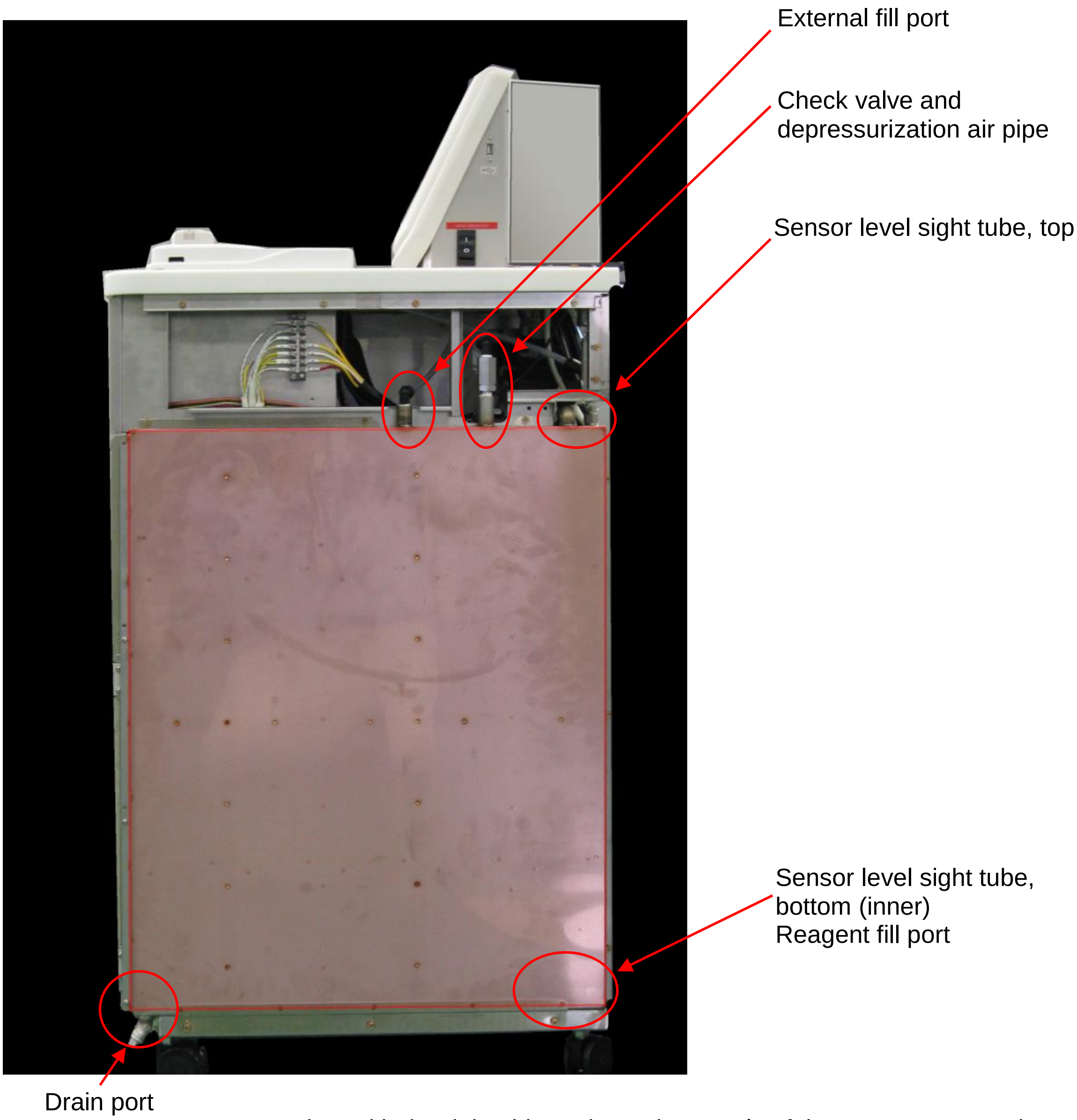
Fig. 1-2-11-16 Example of Connection with UPS

For details on installation, refer to 4-13-10, "Installation of uninterruptible power supply system".

1-2-12 Bulk Reservoir

1-2-12-1 Overview

Bulk reservoirs are stainless steel tanks for storing new reagent, installed on both sides of the system. Each bulk reservoir has the maximum capacity of approx. 11 liters and can be filled with reagent supplied from an external reagent bottle via the external drain/fill port provided in the top left of the system at the front. The bulk reservoirs are structured to withstand depressurization up to -100 kPa, but they cannot be pressurized. Accordingly, a check valve is provided at the top of each bulk reservoir to prevent the reservoir pressure from rising. The external fill port at the top of each reservoir is connected to the external drain/fill port at the front of the system, and the check valve in the connection coupler can be used to depressurize the reservoir when no connection hose is connected.



* View with the right side and exterior panels of the system removed

Fig. 1-2-12-1 Bulk Reservoir Unit

When filling reagent, the reservoir is depressurized via the tubing connected to the air unit located directly below the check valve at the top, so that reagent will be supplied. A sensor level sight tube is provided at the rearmost point of the reservoir to allow for checking of the reagent level in the reservoir.

A drain port is provided at the front bottom of the reservoir, and this port is plugged with a hexagonal plug. If this hexagonal plug is removed when reagent is still in the reservoir, all reagent will gush out from the drain port. Accordingly, be sure to drain reagent from the reservoir through the retort before removing the hexagonal plug. Take note, however, that approx. 400 cc of reagent will still remain in the reservoir after fully draining reagent from the reservoir through the retort, and thus a tray must always be placed below the plug. The reagent fill port is directly connected to the rotary valve, so reagent can be supplied to the retort from the reservoir through the rotary valve. Because the rotary valve is positioned lower than the level of reagent stored in the bulk reservoir, disconnecting the tubing at a point below the rotary valve may cause reagent to flow back. Accordingly, pay due attention to the reagent levels in both bulk reservoirs when disassembling the rotary valve or gate valve.

Rear view

Level sight tube for right bulk reservoir reservoir

Level sight tube for left bulk

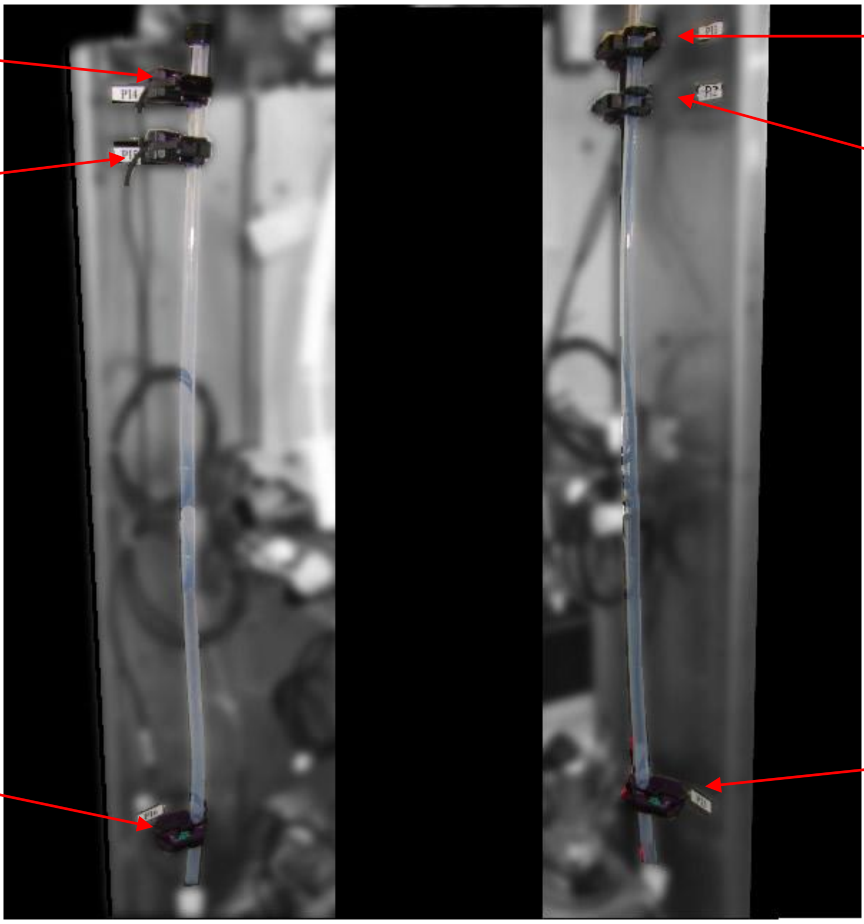


Fig. 1-2-12-2 Bulk Reservoir Level Sensors

The amount of reagent measured by these level sensors is approx. 5 liters for the low level sensor, approx. 10 liters for the high level sensor, and approx. 11 liters for the overflow sensor. When the low level sensor is detecting reagent, the bulk reservoir contains an enough amount to change reagent for one reagent bottle.

These level sensors are optical sensors that optically detect fluid, or lack thereof, based on the difference between the refractive index of fluid and that of gas. Accordingly, these sensors must be installed correctly to ensure accurate detection. If sensor installation is required, refer to 4-9-2, “Replacement of Level Sensor.”

1-2-13 Retort Lid Interlock

1-2-13-1 Overview

The retort lid can be tightened based on quick operation using a rack & pinion mechanism. The retort may be pressurized or depressurized at a given point in time, and if the user tries to open the retort lid while the retort is pressurized, the user may sustain injury or the tissues may be damaged. To prevent these unwanted outcomes, an interlock mechanism is provided based on a self-holding solenoid.

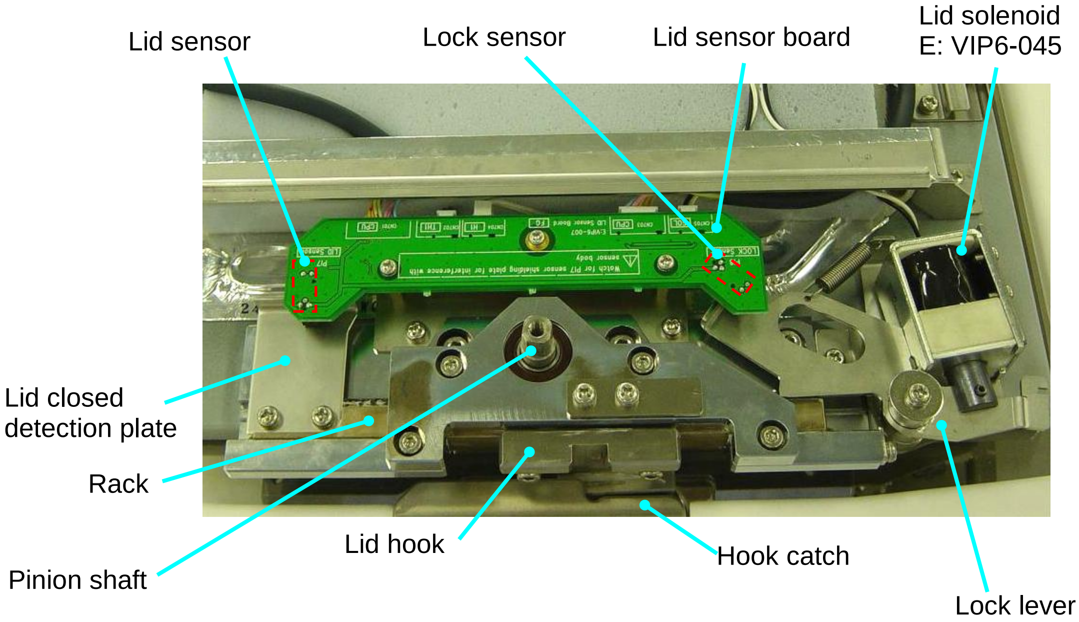


Fig. 1-2-13-1 Retort Lid Mechanism

Table. 1-2-13-1 Lid Interlock Inputs/Outputs

No.	Name	Function
PCB7	Lid sensor board	A printed circuit board that relays electrical signals relating to the retort lid.
SOL	Lid solenoid	A 24-V self-holding solenoid with a built-in thermal fuse (operating temperature: 110°C).
LID Sensor (PI7)	Lid sensor	A photo-interrupter that detects secure tightening of the retort lid.
LOCK Sensor (PI8)	Lock sensor	A photo-interrupter that detects operation of the lock lever.

The table above lists the components of the interlock. Electrical signals from the CPU board are connected to the lid sensor board by a robot cable wire through the center of the retort lid column. These signals are then connected to the lid solenoid SOL from the lid sensor board. The lid solenoid is connected to the lock lever.

The moment the retort is pressurized at the start of auto operation (tissue processing, cleaning or reagent exchange), manual operation, etc., the lid solenoid is energized and locked. If both the lid sensor and lock sensor are not ON at this time, an error is output. The lid solenoid is of the self-holding type, meaning that it will remain locked even when the power is cut off. While the power is cut off, the solenoid must be unlocked manually.

1-3 Each Function Operation Explanation

1-3-1 Pumping-in

1-3-1-1 Overview

Pumping-in refers to supplying reagent from a reagent bottle (may be a paraffin container, attached bulk reservoir, or external bulk reservoir connected via the external drain/fill port) to the retort. This system uses level sensors to determine that reagent has been supplied to the retort and stops pumping-in. Note that although the conditions in which reagent supply is checked using the level sensors and pumping-in is stopped vary depending on each auto operation (tissue processing, cleaning, reagent exchange), the system will stop pumping-in unconditionally if the overflow sensor in the retort detects reagent.

(1) Pumping-in during tissue processing
If the system is set to process 150 cassettes, pumping-in will stop when the reagent level in the retort reaches level sensor 2 (3.5-liter level). While reagent remains below level sensor 2 (3.5-liter level), pumping-in will stop when recovery of the retort pressure to atmospheric pressure is detected by the pressure sensor.
If the system is set to process 300 cassettes, pumping-in will stop when the reagent level in the retort reaches level sensor 3 (4.2-liter level). While reagent remains below level sensor 3 (4.2-liter level), pumping-in will stop when recovery of the retort pressure to atmospheric pressure is detected by the pressure sensor.

(2) Pumping-in during retort cleaning

When reagent reaches level sensor 3 (4.2-liter level), pumping-in will continue for another 5 seconds and then pumping-in will stop. After reagent has reached level sensor 3 (4.2-liter level), pumping-in will stop when recovery of the retort pressure to atmospheric pressure is detected by the pressure sensor.

(3) Pumping-in during warm-water cleaning
Warm-water cleaning will stop when the reagent level in the retort reaches level sensor 1 (2.7-liter level). While reagent remains below level sensor 1 (2.7-liter level), pumping-in will stop when recovery of the retort pressure to atmospheric pressure is detected by the pressure sensor.

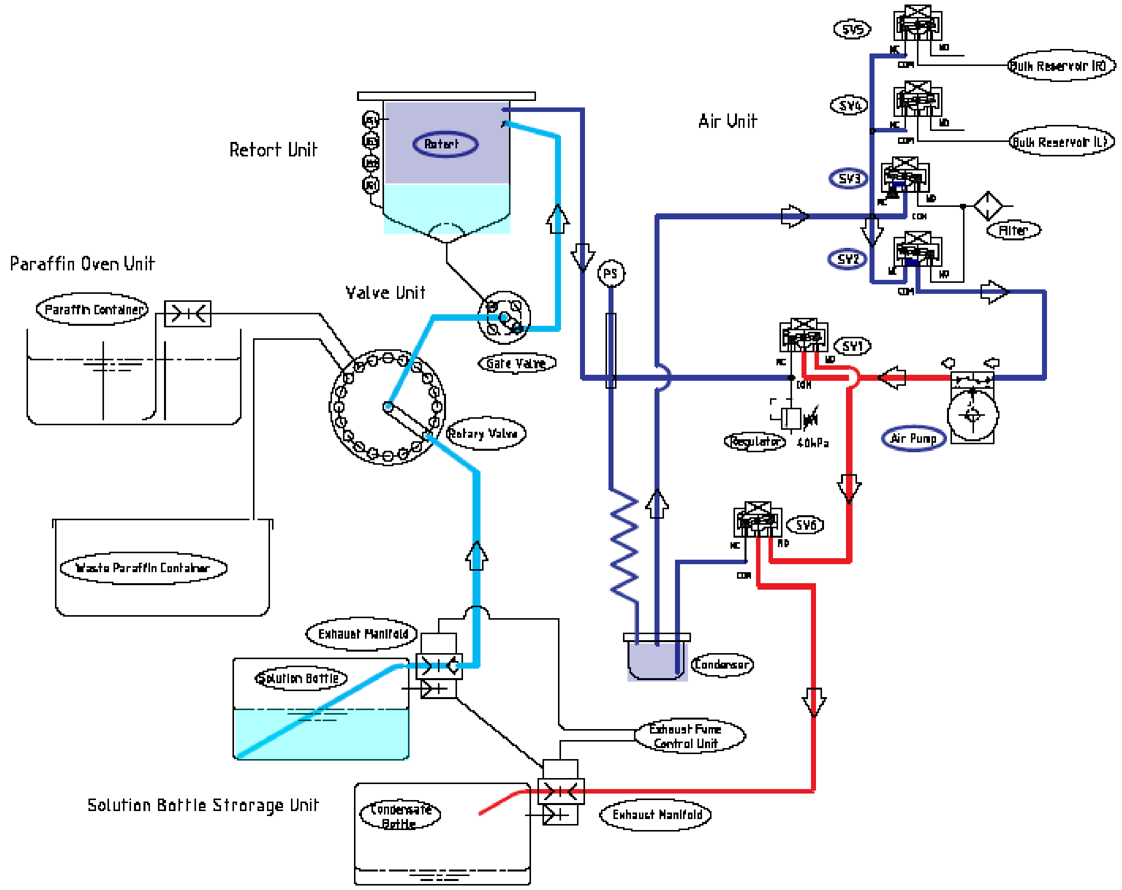
(4) Pumping-in during rinsing
When the reagent level in the retort reaches level sensor 3 (4.2-liter level) pumping-in during cleaning will stop. While reagent remains below level sensor 3 (4.2-liter level), pumping-in will stop when recovery of the retort pressure to atmospheric pressure is detected by the pressure sensor.

(5) Pumping-in for filling during reagent exchange
In reagent exchange, the fill level can be selected from three levels including 2.7 liters, 3.5 liters and 4.2 liters. If the fill level is set to 2.7 liters, pumping-in will stop when the reagent level in the retort reaches level sensor 1 (2.7-liter level). If the fill level is set to 3.5 liters, pumping-in will stop when the reagent level in the retort reaches level sensor 2 (3.5-liter level). If the fill level is set to 4.2 liters, pumping-in will stop when the reagent level in the retort reaches level sensor 3 (4.2-liter level). While reagent remains below the level sensor at which to stop filling, pumping-in will stop when recovery of the retort pressure to atmospheric pressure is detected by the pressure sensor.

(6) Pumping-in during manual operation
When the reagent level in the retort reaches level sensor 3 (4.2-liter level) pumping-in manual operation will stop. While reagent remains below level sensor 3 (4.2-liter level), pumping-in will stop when recovery of the retort pressure to atmospheric pressure is detected by the pressure sensor.

1-3-1-2 Operation

Pumping-in operations are largely classified into the two types: standard pumping-in in which reagent is supplied from the reagent bottle to the retort, and pumping-in for short mixing intended to mix reagent between level sensors.
For details on pumping-in operations, refer to 1-4, "Flowchart."



(1) Standard pumping-in operation

[1] The fill position of the gate valve is opened.

[2] The air pump is started and the solenoid valves SV2 and SV3 are turned ON to depressurize the retort. The minimum pressure to be achieved by depressurization is set to -27 kPa. The system confirms that the retort is depressurized (its pressure reaches -13 kPa or below) within 30 seconds. If the pressure is still in a range of -5 kPa to -12 kPa after 30 seconds, the depressurization control is continued for additional 30 seconds (for a total time of 1 minute).

[3] If depressurization can be maintained, it is maintained for up to 6 minutes until one of the following conditions is achieved:
Condition 1) Reagent reached the upper level sensor.
Condition 2) Reagent reached the level sensor above the upper level sensor.
Condition 3) Reagent reached the overflow sensor.
Condition 4) The retort pressure became equivalent to atmospheric pressure.
If any of conditions 1 to 4 is satisfied, depressurization stops.

[4] If the overflow sensor turned ON in [3], it is registered as error information ("Error 10: Pumping-in was stopped because reagent was detected by the overflow sensor during pumping-in"). However, the system determines that pumping-in has completed successfully.

[5] The gate valve is closed to end pumping-in.

[6] If the retort could not be depressurized after 60 seconds in [2], the gate valve is closed and the operation in [2] is repeated. If the retort could not be depressurized after 30 seconds in the second attempt, the system recognizes an error in the air circuit and stops the pressure control, and then aborts pumping-in with an error generated ("Error 13: The setpoint pressure

is not reached after 1 minute of depressurization"). If the retort could be depressurized, the system determines that no reagent is present in the reagent bottle or paraffin container and aborts pumping-in ("Error 14: Insufficient (no) reagent was detected during pumping-in").

[7] When the retort remains depressurized after 6 minutes in [3], an error ("Error 11: Pumping-in does not stop after 6 minutes") is registered if none of the level sensors is detecting reagent, and depressurization stops. Next, the gate valve is closed and the retort is pressurized. If the retort could be pressurized, the fill position of the gate valve is opened, after which if the retort still remains pressurized for 1 minute, the system determines that the tubing is clogged or the tank is detached and aborts pumping-in with an error generated ("Error 213: No bottle is connected or the tubing is clogged").
If the retort returns to atmospheric pressure within 1 minute, reagent in the retort is drained to the reagent bottle. When draining is complete, steps [1] to [3] are repeated. If the retort still remains depressurized after 6 minutes even though draining and steps [1] to [3] have been repeated twice, the system determines that pumping-in is not possible and aborts pumping-in with an error generated ("Error 12: Pumping-in does not end after three attempts"). Note, however, that if the level sensor at the safeguarded level is detecting reagent, an error ("Error 210: Pumping-in does not end in time, but the level sensor at the safeguarded level is detecting reagent") is registered and pumping-in ends. In this case, the system determines that pumping-in has completed successfully despite the registration of an error.

[8] If the retort lid opens during pumping-in, pumping-in is aborted immediately with an error generated ("Error: 341: The retort lid sensor generated an error").

[9] If the retort lid cannot be locked during pumping-in, pumping-in is aborted immediately with an error generated ("Error: 342: The retort lid lock sensor generated an error").

[10] If an error occurred while the gate valve is moving, a gave-valve recovery operation is performed. If the gave-valve recovery operation has been successful, pumping-in is continued. If the gave-valve recovery operation has failed, pumping-in is aborted with an error generated.

[11] If an air pump error was detected during depressurization, an error ("Error 70: The air pump generated an error") is registered and pumping-in is aborted with an error generated. If the gate valve is at a position other than the closed position, the gate valve moves to the closed position.

(2) Pumping-in operation for short mixing
Pumping-in for short mixing is a type of control to fill reagent to the upper level sensor when the retort is containing reagent. Pumping-in for short mixing is used in combination with pumping-out for short mixing, which is explained later, in order to achieve the short mixing function and continuous mixing function during tissue processing.
Note that short mixing is a function to drain/fill reagent at a specified interval (3 to 10 minutes) between the level sensor at the safeguarded level and the upper level sensor. Continuous mixing is a function to drain/fill reagent for 10 minutes between the level sensor at the safeguarded level and the upper level sensor.
The control procedure for this pumping-in operation is explained below.

[1] The fill position of the gate valve is opened.

[2] The air pump is started and the solenoid valves SV2 and SV3 are turned ON to depressurize the retort. If the short mixing function is used, the minimum pressure is set to -27 kPa. If the continuous mixing function is used, the minimum pressure is set to -70 kPa. The system confirms that the retort is depressurized (its pressure reaches -13 kPa or below) within 30 seconds. If the pressure is still in a range of -5 kPa to -12 kPa after 30 seconds, the depressurization control is continued for additional 30 seconds (for a total time of 1 minute).

[3] If depressurization can be maintained, it is maintained for up to 2 minutes until one of the following conditions is achieved:
Condition 1) Reagent reached the upper level sensor.
Condition 2) Reagent reached the level sensor above the upper level sensor.
Condition 3) Reagent reached the overflow sensor.
Condition 4) The retort pressure became equivalent to atmospheric pressure.
If any of conditions is satisfied, depressurization stops.

[4] If the overflow sensor turned ON in [3], it is registered as error information ("Error 10:

Pumping-in was stopped because reagent was detected by the overflow sensor during pumping-in”). However, the system determines that pumping-in has completed successfully.

[5] The gate valve is closed to end pumping-in.

[6] If the retort could not be depressurized after 60 seconds in [2], the gate valve is closed and the operation in [2] is repeated. If the retort could not be depressurized after 30 seconds in the second attempt, the system recognizes an error in the air circuit and stops the pressure control, and then aborts pumping-in with an error generated (“Error 13: The setpoint pressure is not reached after 1 minute of depressurization”).If the retort could be depressurized, the system determines that all reagent in the reagent bottle or paraffin container has been filled and ends pumping-in.

[7] If the retort could maintain depressurization after 2 minutes, the system aborts pump-in with an error generated (“Error 13: Pump-in operation for short mixing does not end after 2 minutes").

[8] If the retort lid opens during pumping-in, pumping-in is aborted immediately (“Error: 341: The retort lid sensor generated an error”).

[9] If the retort lid cannot be locked during pumping-in, pumping-in is aborted immediately with an error generated (“Error: 342: The retort lid lock sensor generated an error”).

[10] If an error occurred while the gate valve is moving, a gave-valve recovery operation is performed. If the gave-valve recovery operation has been successful, pumping-in is continued. If the gave-valve recovery operation has failed, pumping-in is aborted with an error generated.

[11] If an air pump error was detected during depressurization, an error (“Error 70: The air pump generated an error”) is registered and pumping-in is aborted with an error generated. If the gate valve is at a position other than the closed position, the gate valve moves to the closed position.

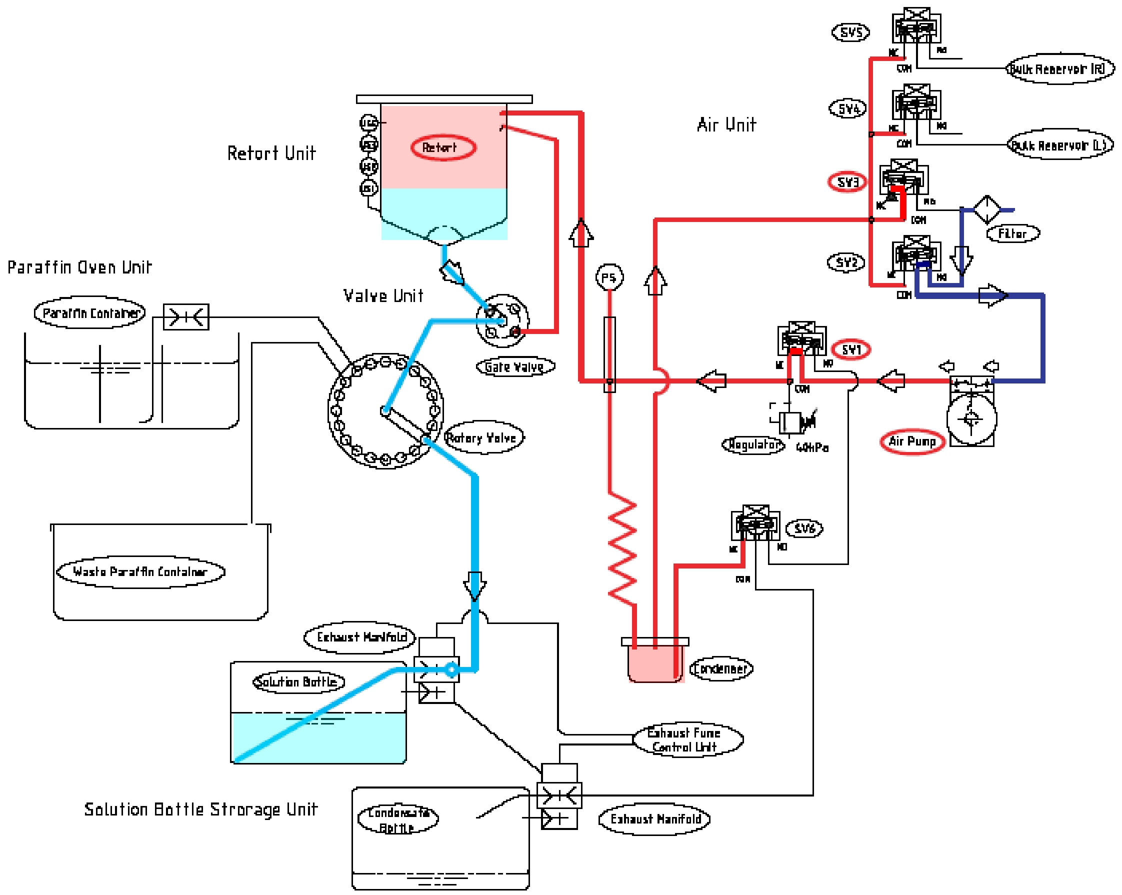
1-3-2 Pumping-out

1-3-2-1 Overview

Pumping-out refers to draining reagent from the retort to a reagent bottle (may be a paraffin container, attached bulk reservoir, or external bulk reservoir connected via the external drain/fill port).
For pumping-out to the wax drain container, refer to 1-3-13, “Paraffin Drained to Wax Drain Container.”

1-3-2-2 Operation

Pumping-out operations are largely classified into the two types: standard pumping-out in which all reagent in the retort is drained to the reagent bottle, and pumping-out for short mixing intended to mix reagent between level sensors.
For details on pumping-out operations, refer to 1-4, “Flowchart.”



(1) Standard pumping-in operation

[1] The gate valve is closed.

[2] The air pump is started and the solenoid valves SV1 and SV3 are turned ON to pressurize the retort. At this time, the pressure to be achieved by pressurization is set to 34 kPa. The system confirms that the retort is pressurized (its pressure reaches 13 kPa or above) within 1 minute.

[3] If the retort could be pressurized, the drain position of the gate valve is opened.

[4] Pressurization is maintained for up to 6 minutes until the retort pressure drops. Once the retort pressure has dropped to atmospheric pressure, the air pump is stopped and all solenoid valves are turned OFF.

[5] During pumping-out in the auto operation mode, the gate valve does not close when pumping-out ends. During pumping-out in the manual operation mode, the gate valve is closed when pumping-out ends.

[6] If the retort could not be pressurized after 1 minute in [2], the pressure control is stopped. An

error ("Error 20: The setpoint pressure is not reached after 1 minute of pressurization with the gate valve closed") is registered and the operation in [2] is repeated for up to three times (once in a normal condition + two retries). If the retort could not be pressurized after two retries, the system determines that air is leaking and aborts pumping-out with an error generated ("Error 21: The setpoint pressure is not reached after repeating a 1-minute pressurization three times with the gate valve closed").

[7] If the retort remains pressurized after 6 minutes in [4], the pressure control is stopped. An error ("Error 22: Pumping-out does not end after 6 minutes") is registered and steps [1] to [4] are repeated. If the retort still remains pressurized, the system determines that the tubing is clogged or reagent bottle is detached and aborts pumping-out with an error generated ("Error 23: Pumping-out does not end after two attempts").
Take note that when this error is detected, it may simply be that draining is taking a longer time due to clogged tubing. If this error is detected, therefore, check the level sensors. If the safeguarded level is not detected, fill reagent to the safeguarded level.

[8] If any level sensor is detecting reagent even when the controls in steps [1] to [4] have been successful (= pumping-out has completed successfully), the system recognizes a false detection by the level sensor and registers an error for the level sensor detecting reagent.
When the overflow sensor is ON: Error 311: Overflow sensor error
When level sensor 1 is ON: Error 312: Level sensor 1 (2.7L) error
When level sensor 2 is ON: Error 313: Level sensor 2 (3.5L) error
When level sensor 3 is ON: Error 314: Level sensor 3 (4.2L) error

[9] If the oven door opened while the retort was being pressurized, pumping-out is canceled when the draining destination is a paraffin station (one of stations 11 to 15) ("Error 919: The paraffin open door was opened while draining to a paraffin station").

[10] If the retort lid opened during pumping-out, pumping-out is aborted immediately with an error generated ("Error 341: The retort lid sensor generated an error").

[11] If the retort lid cannot be locked during pumping-out, pumping-out is aborted immediately ("Error: 342: The retort lid lock sensor generated an error").

[12] If an air pump error was detected during pressurization, an error ("Error 70: The air pump generated an error") is registered and pumping-out is aborted with an error generated. If the gate valve is at a position other than the closed position, the gate valve moves to the closed position.

(2) Pumping-out operation for short mixing

[1] The system confirms that the level sensor at the target level is detecting reagent. If the level sensor is not detecting reagent, the system ends pumping-out without doing anything.

[2] The gate valve is closed.

[3] The air pump is started and the solenoid valves SV1 and SV3 are turned ON to pressurize the retort. At this time, the pressure to be achieved by pressurization is set to 34 kPa. The system confirms that the retort is pressurized (its pressure reaches 13 kPa or above) within 1 minute.

[4] If the retort could be pressurized, the drain position of the gate valve is opened.

[5] Pressurization is maintained for up to 2 minutes until one of the following conditions is achieved:
Condition 1) Reagent dropped to level sensor 2 when the upper level sensor is level sensor 3.
Condition 2) Reagent dropped to level sensor 1 when the upper level sensor is level sensor 2.
Condition 3) The retort pressure dropped and became equivalent to atmospheric pressure.
Condition 4) 2 minutes have elapsed.

[6] The gate valve is closed to end pumping-out.

[7] If the retort could not be pressurized after 1 minute in [2], the pressure control is stopped and the gate valve is closed. An error ("Error 20: The setpoint pressure is not reached after 1 minute of pressurization with the gate valve closed") is registered and the operation in [2] is repeated. If the retort could not be pressurized after 1 minute, the system determines that air is leaking and aborts pumping-out with an error generated ("Error 21: The setpoint pressure is not reached after repeating a 1-minute pressurization three times with the gate valve closed").

[8] If the oven door opened while the retort was being pressurized, pumping-out is canceled when the draining destination is a paraffin station (one of stations 11 to 15) ("Error 919: The paraffin open door was opened while draining to a paraffin station").

[9] If the retort lid opened during pumping-out, pumping-out is aborted immediately with an error generated (“Error 341: The retort lid sensor generated an error”).

[10] If the retort lid cannot be locked during pumping-out, pumping-out is aborted immediately with an error generated (“Error: 342: The retort lid lock sensor generated an error”).

[11] If an air pump error was detected during pressurization, an error (“Error 70: The air pump generated an error”) is registered and pumping-out is aborted with an error generated. If the gate valve is at a position other than the closed position, the gate valve moves to the closed position.

1-3-3 Bottle Check

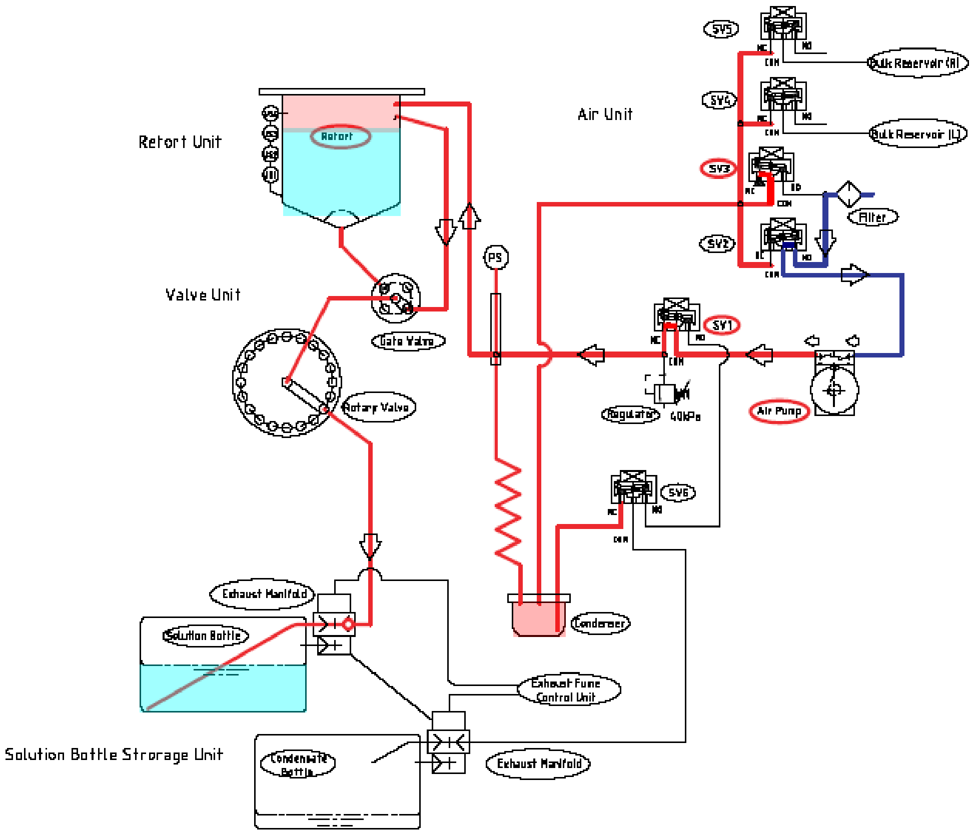
1-3-3-1 Overview

The reagent bottle coupler houses a valve that opens/closes the flow channel when a reagent bottle is set/removed. If no reagent bottle is connected or when a reagent bottle is not connected properly, this valve is closed. The system also has a gate valve and when this gate valve is at the fill position, an opening is created above the reagent level in the retort. These functions can be used to check the condition of reagent bottle connection at the start of tissue processing.

The targets of bottle check include stations 1 to 10 whose processing time is not “00:00.” The user can select whether or not to use the bottle check function on the tissue processing start screen.

While a bottle check is in progress, the screen title changes to “Checking Bottle…” If any station is found for which a reagent bottle is not connected properly, a  icon appears on the screen above the button corresponding to the applicable station. Once all stations have been checked and any station with improper bottle connection has been found, the “Bottle Check” window appears and the system enters the standby mode. When the **Resume** key is pressed, a bottle check will be performed again.

Since this check function determines whether the gate valve is open or closed based on pressure, a bottle may be detected as “connected” when the bottle is actually only half connected. Also note that, in a condition where a reagent bottle is connected but the applicable station is determined to have no bottle connected, it is likely that clogging has occurred at a point between the rotary valve and the reagent bottle coupler.



1-3-3-2 Operation

The operation of bottle check for a single station is explained below. If there are multiple stations for which a bottle check must be performed, the following process is performed for each station.

[1] The station for which a bottle check will be performed is accessed.

[2] The gate valve is closed.

[3] The air pump is started and the solenoid valves SV1 and SV3 are turned ON to pressurize the retort. At this time, the pressure to be achieved by pressurization is set to 10 kPa. The system confirms that the retort is pressurized (its pressure reaches 9 kPa or above) within 1 minute.

[4] The fill position of the gate valve is opened.

[5] If the retort has returned to atmospheric pressure within 5 seconds, the system determines that a reagent bottle is connected properly.
If the retort does not return to a positive pressure within 5 seconds, the system determines that no reagent bottle is connected.

[6] If the retort could not be pressurized after 1 minute in [3], the pressure control is stopped and the reagent bottle check operation is aborted with an error generated (“Error 236: The setpoint pressure it not achieved during bottle check after 1 minute of pressurization with the gate valve is closed”).

[7] If the retort lid opened during bottle check, bottle check is aborted immediately with an error generated (“Error 341: The retort lid sensor generated an error”).

[8] If the retort lid cannot be locked during bottle check, bottle check is aborted immediately with an error generated (“Error: 342: The retort lid lock sensor generated an error”).

[9] If an air pump error was detected during pressurization, an error (“Error 70: The air pump generated an error”) is registered and pumping-out is aborted with an error generated. If the gate valve is at a position other than the closed position, the gate valve moves to the closed position.

For details on the bottle check operation, refer to 1-4, “Flowchart.”

1-3-4 Fume Control

1-3-4-1 Overview

Vapor gases of xylene and other intermediate agents that are dissolved in paraffin in the paraffin oven, odorous gases generating from the tank racks around the wax drain container, and exhaust gases from the top and bottom exhaust headers connected to reagent bottles, are all collected into and controlled by the fume control unit. In the fume control unit, a fume fan is always operating to forcibly collect exhaust gases into this unit, and collected gases are passed through activated carbon filters to adsorb harmful gas constituents, in order to discharge gases containing less harmful constituents from the system. The forced exhaust by the fume fan creates airflows inside the system to prevent leakage of odor from areas where reagent is stored or exposed to atmosphere.
The airflow rate of the fume fan can be changed to one of two levels. In the case of the paraffin oven where a lot of intermediate agent vapor generates and the user can easily get exposed to such vapor directly, the fume fan is set to rotate at a high speed when the oven door is opened, in order to minimize vapor exposure of the user.
Two activated filters are housed in the filter case on the inner side of the access door at the front of the system. There are limits to how much the activated carbon filters can adsorb, and thus these filters must be replaced according to the condition of use.

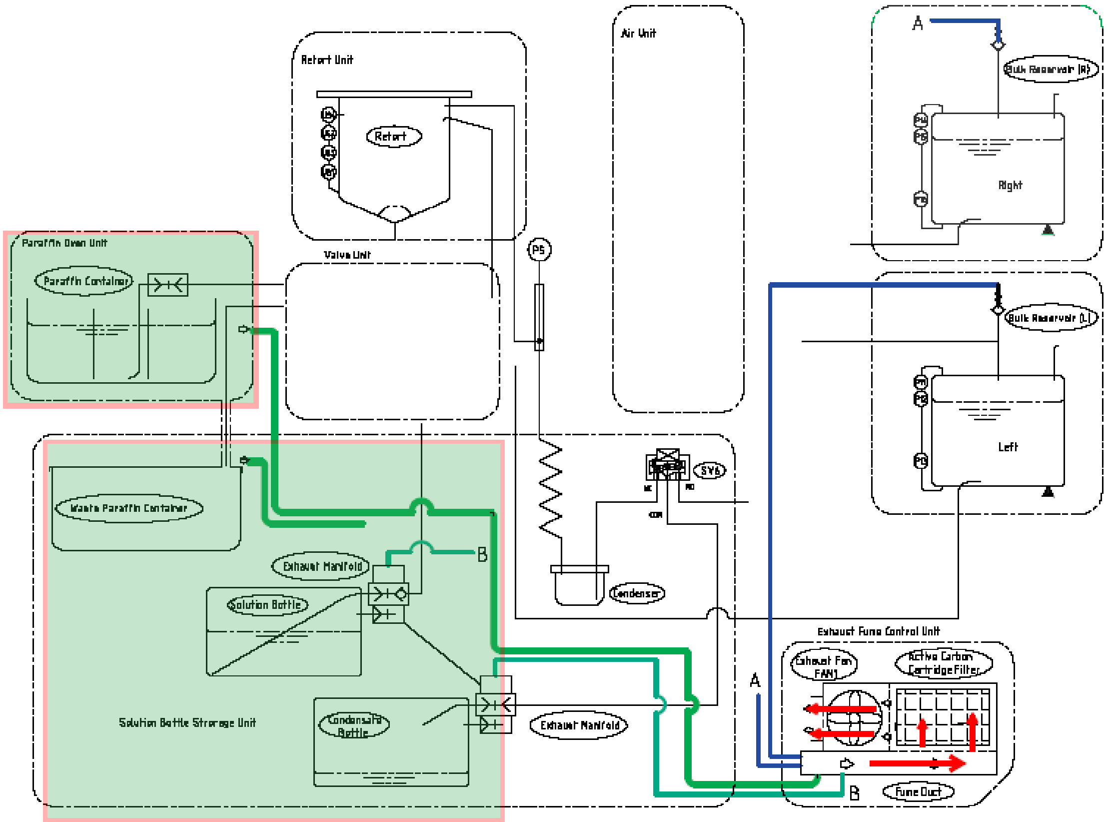


Fig. 1-2-11-1 Fume Circuit

1-3-4-2 Configuration

Fig. 1-3-4-1 shows the fume circuit. Also, a view of the fume control unit from the back of the system is shown below.

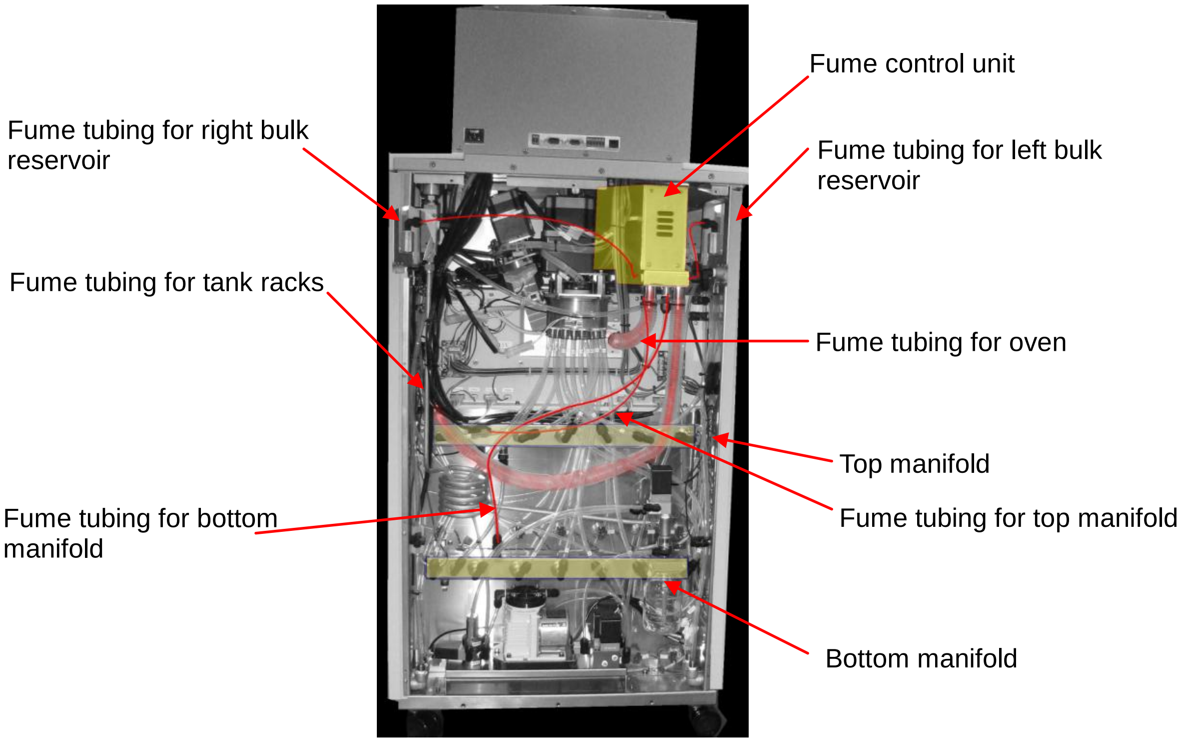


Fig. 1-2-11-1 Configuration of Fume Control Unit

To achieve a sufficient airflow rate, the fume tubing for oven and tank rack uses thick tubes (flexible hoses) subject to small pressure losses. Use of these tubes ensures a sufficient airflow rate, thereby maintaining a proper balance with the need to prevent odor leakage from the system. As for the oven, the oven door has sufficient sealing property so that when the oven door is closed, air does not flow through the fume tubing for oven. If the sealing performance of the oven door gasket drops, however, air will flow out through the fume tubing for oven and cold outside air will enter the oven. As a result, the paraffin temperature in the oven may be affected. With respect to the tank racks, they are positioned above the wax drain container to prevent leakage of odor from the tank racks as a whole, and also to allow leaking odors of intermediate agents to be removed centrally when paraffin containing intermediate agents is drained.

The reagent bottle manifolds are connected to the fume control unit via thin tubes. These tubes are mainly used to control two types of exhaust gases, including exhaust gas discharged from the reagent bottle when the system pumps out reagent into the reagent bottle, and gas discharged into the manifolds through the condensate bottle when air is discharged by the air pump while the retort is depressurized. These manifold tubes are connected to the fume control unit.

Fume tubing is also provided above the check valve for each bulk reservoir. The bulk reservoirs must not be pressurized to levels above atmospheric pressure, and thus any vapor generating from reagent in each bulk reservoir due to temperature, etc., is sent to the fume control unit through the check valve.

Take note that a clearance of at least 10 cm must be provided between the rear of the fume control unit and any obstruction such as a wall, because the air collected by means of the fume fan is discharged from the rear of the unit.

If a central fume control unit, etc., is available in the environment where the system is installed and this unit is connected directly to the system, an optional mounting plate for exhaust duct can be connected to the rear of the fume control unit so that a duct hose of ∅38 mm or ∅75 mm in size can be connected.

1-3-5 P/V Cycle

1-3-5-1 Overview

The P/V cycle implements operations where the retort is pressurized and depressurized alternately for the purpose, among others, of removing air bubbles in tissues taken from the lung, etc. In the P/V cycle, the following four operations are repeated:

[1] Pressurization (90 seconds)
[2] Maintenance at atmospheric pressure (30 seconds)
[3] Depressurization (90 seconds)
[4] Maintenance at atmospheric pressure (30 seconds)

The periods specified for [1] to [4] are the defaults. These periods can be changed within a range of 30 to 180 seconds when the tissue processing program is edited. In addition, the depressurization level can also be changed to one of three levels, including "Standard (pump capacity: approx. -70 kPa)," "Intermediate (-37 kPa)" and "Pumping-in (-27 kPa)" when the tissue processing program is edited.
This chapter explains the specific operations based on the periods specified for [1] to [4] above and also by assuming the standard depressurization level.
Take note that this system also performs V-cycle operations where the two operations in the P/V cycle, namely [3] and [4], are repeated.

1-3-5-2 Operation

(1) P/V cycle operations

[1] The P-cycle timer is set (default: 90 seconds), the air pump is started, and the solenoid valves SV1 and SV3 are turned ON to pressurize the retort. Here, the pressure to be achieved by pressurization is set to 34 kPa.

[2] If the retort pressure has become positive (13 kPa or above) within 10 seconds, pressurization is maintained until the P-cycle timer elapses.

[3] Upon elapse of 90 seconds from the start of pressurization, pressurization is stopped and the retort is returned to atmospheric pressure.

[4] The retort is kept at atmospheric pressure for 30 seconds.

[5] The V-cycle timer (default: 90 seconds) is set. The air pump is started and the solenoid valves SV2 and SV3 are turned ON to depressurize the retort. The pressure to be achieved by depressurization is set to -70 kPa.

[6] Depressurization continues until the V-cycle timer elapses. If the overflow sensor detected reagent during depressurization, the V cycle operation is canceled.

[7] Upon elapse of 90 seconds from the start of depressurization, depressurization is stopped and the retort is returned to atmospheric pressure.

[8] The retort is kept at atmospheric pressure for 30 seconds. After 30 seconds, the P/V cycle ends.

[9] If the retort lid opened during the P/V cycle, the P/V cycle is aborted immediately with an error generated ("Error: 341: The retort lid sensor generated an error").

[10] If the retort lid cannot be locked during the P/V cycle, the P/V cycle is aborted immediately ("Error: 342: The retort lid lock sensor generated an error").

[11] If an air pump error was detected during any of the cycle operations, an error ("Error 70: The air pump generated an error") is registered and the P/V cycle is aborted with an error generated. If the gate valve is at a position other than the closed position, the gate valve moves to the closed position.

(2) V-cycle operations

[1] The V-cycle timer (default: 90 seconds) is set. The air pump is started and the solenoid valves SV2 and SV3 are turned ON to depressurize the retort. The pressure to be achieved by depressurization is set to -70 kPa.

[2] Depressurization continues until the V-cycle timer elapses. If the overflow sensor detected reagent during depressurization, the V cycle operation is canceled.

[3] Upon elapse of 90 seconds from the start of depressurization, depressurization is stopped and

the retort is returned to atmospheric pressure.

[4] The retort is kept at atmospheric pressure for 30 seconds. After 30 seconds, the V cycle ends.

[5] If an air pump error was detected during any of the cycle operations, an error (“Error 70: The air pump generated an error”) is registered and the V cycle is aborted with an error generated. If the gate valve is at a position other than the closed position, the gate valve moves to the closed position.

For details on the P/V cycle operations, refer to 1-4, “Flowchart.”

1-3-6 Mixing

1-3-6-1 Overview

Mixing has the effect of increasing the slope of reagent concentration at the tissue surface and thereby promoting the permeation of reagent. To achieve these mixing effects, this system performs various mixing operations that are largely classified into the following three types:

[1] Mixing by means of periodic pumping-out/pumping-in (full mixing)
[2] Mixing by means of continuous pumping-out/pumping-in of reagent within a specified range (continuous mixing)
[3] Mixing by means of periodic pumping-out/pumping-in of reagent within a specified range (short mixing)

(1) Mixing by means of periodic pumping-out/pumping-in (full mixing)
This is a function to pump out and pump in reagent in the retort at specified intervals after the start of processing at the applicable station. This type of mixing is suitable in situations where the processing time per station is long, such as when processing continues for 24 hours, because a desired reagent condition at the tissue surface can be restored. This mixing can be performed in one of two modes, each associated with a different interval:

[1] Fast mode: Reagent is mixed at 12-minute intervals.
[2] Slow mode: Reagent is mixed at 20-minute intervals.

Note, however, that a minimum processing time is specified to perform mixing at least once, where the specific minimum processing time is 2 minutes in the Fast mode and 30 minutes in the Slow mode. Also note that even when the mixing time arrives during processing, mixing will not be performed if the remaining processing time is less than 10 minutes.

(2) Mixing by means of continuous pumping-out/pumping-in of reagent within a specified range (continuous mixing)
This mixing mode (continuous mode) is effective in brief tissue processing where the processing time per station is only several minutes or so. In this type of mixing, the level of reagent is changed continuously between the upper level sensor and safeguarded level sensor installed in the retort, for 10 minutes after the start of processing at the applicable station. If the remaining time is at least 10 minutes at the time of elapse of 12 minutes from the start of processing, full mixing is performed and then the mixing operation changes to one similar to the Fast mode.
If the system is set to process 150 cassettes, the upper level sensor corresponds to the 3.5-liter level sensor, while the safeguarded level sensor corresponds to the 2.7-liter level sensor. If the system is set to process 300 cassettes, on the other hand, the upper level sensor corresponds to the 4.2-liter level sensor, while the safeguarded level sensor corresponds to the 3.5-liter level sensor.

(3) Mixing by means of periodic pumping-out/pumping-in of reagent within a specified range (short mixing)
This mixing mode (short mode) is effective in brief tissue processing where the processing time per station is less than 30 minutes and where periodic mixing cannot be performed. In this type of mixing, the level of reagent is changed continuously between the upper level sensor and safeguarded level sensor installed in the retort, after the start of processing at the applicable station, according to the time interval (3 to 10 minutes) set when the tissue processing program was edited. Short mixing is performed for up to 20 cycles per station. If the remaining time at the station is at least 22 minutes after 20 cycles of short mixing, the mixing operation changes to one similar to the Fast mode. If the system is set to process 150 cassettes, the upper level sensor corresponds to the 3.5-liter level sensor, while the safeguarded level sensor corresponds to the 2.7-liter level sensor. If the system is set to process 300 cassettes, on the other hand, the upper level sensor corresponds to the 4.2-liter level sensor, while the safeguarded level sensor corresponds to the 3.5-liter level sensor.

1-3-6-2 Operation

(1) Mixing by means of periodic pumping-out/pumping-in (full mixing)

[1] If the remaining time at the station is at least 10 minutes at the time of elapse of 12 minutes (20 minutes) from the start of processing at the station, pumping-out is performed in the full mixing mode.
[2] When pumping-out in the full mixing mode is complete, pumping-in in the full mixing mode is started.
[3] When pumping-in in the full mixing mode is complete, the system stands by for 12 minutes (20 minutes) again.
[4] Steps [1] to [3] are repeated as long as enough processing time is remaining to perform full mixing.
[5] If the station at which full mixing is performed is specified for automatic transfer, the last pumping-out cycle in the full mixing mode is performed at the station to which reagent is automatically transferred. On the other hand, the target of pumping-in in the full mixing mode is the station from which reagent is automatically transferred. Take note that if the station specified for automatic transfer is the paraffin loading station (normally station 11) or final paraffin station (normally station 14), automatic transfer operation is not performed.

(2) Mixing by means of continuous pumping-out/pumping-in of reagent within a specified range
Mixing is performed between the upper level sensor and safeguarded level sensor. In the V cycle, the air pump is operated at its maximum capacity to depressurize the retort (refer to the section on the P/V cycle).
After processing is started at the station, pumping out/pumping-in is performed in the initial 10 minutes to maintain the reagent level between the two level sensors. This way, the tissues to be processed can be always kept submerged in reagent during mixing. Also during mixing, pumping-in is performed in the form of reagent supply from the fill side (top of the retort), while pumping-out is performed in the form of reagent drain from the drain side (bottom of the retort), and these operations are repeated alternately. As a result, a reagent flow from top to bottom generates. The continuous mixing operation varies depending on whether the P/V cycle is turned ON or OFF, as shown in the table below.

Table 1-3-1. Differences in Continuous Mixing Operation

Condition	P/V cycle ON	P/V cycle OFF
Mixing operation per cycle	[1] V-cycle (40 seconds) [2] Pumping-out until the lower level sensor [3] Pumping-in until the upper level sensor	[1] Pumping-out until the lower level sensor [2] Pumping-in until the upper level sensor

If the reagent level does not reach the upper level sensor during pumping-in, the system continues pumping-in and then repeats pumping-in and pumping-out to keep the reagent level between what would be achieved if the entire amount of reagent in the reagent tank is pumped in, and the reagent level at the lower level sensor.

* Notes on Continuous Mixing
Points to note regarding the continuous mixing operation are listed below.
- Fill as much reagent as possible beforehand. The recommended amount of reagent to make sure mixing is performed without fail is 3.5 liters or more when the system is set to process 150 cassettes or 4.2 liters when the system is set to process 300 cassettes.
- Continuous mixing may cause significant deterioration in the performance of activated carbon filters due to longer operating times of the air pump, gate valve and solenoid valves.

Provide a sufficient clearance between adjacent cassettes to ensure efficient mixing.

1-3-7 Solution Manager

1-3-7-1 Overview

Solution Manager is a function that completes each applicable process, without stopping the tissue processing, in certain situations when the reagent volume is found inappropriate for tissue processing, pumping-in has failed, or paraffin is still not melted when processing is performed at a paraffin station.
For tissue processing, Solution Manager is set to “SM1,” “SM2” or “OFF” in the program editing stage.
If Solution Manager is set to “OFF,” the system will pump in reagent from a station that has already completed its processing and then enter the standby mode if “Fluid low” is detected, etc. If no station is available that can be used as a substitute, the system will perform the same avoidance operation as if Solution Manager were set to “OFF.”
For retort cleaning, Solution Manager is set to “ON” or “OFF at the start of retort cleaning.
Although the system has a function to assure the reagent level in the retort using level sensors, Solution Manager is an effective function to prevent a “Fluid low” error caused by transferred paraffin residue or evaporation of reagent, etc.
If “Fluid empty” or “Fluid low” (pumping-in was successful, but reagent is still not at the safeguarded level) is detected during pumping-in for tissue processing, or if unmelted paraffin or any temperature control error is detected at a paraffin station before pumping-in to the paraffin station, Solution Manager will be actuated so as not to stop tissue processing. Solution Manager used for tissue processing is available in two types including “Refill” and “Substitution.” The “Refill” Solution Manager is further divided into two types including “Next Station Refill” where reagent is refilled from the next station in the solution group using the same reagent type, and “Bulk Reservoir Refill” where reagent is refilled from a bulk reservoir storing the same reagent type. Note that the type of Solution Manager to be actuated is specified in the table below to minimize generation of a new error (“Fluid low”) due to actuation of Solution Manager.

Type of error / Operation	Next Station Refill	Bulk Reservoir Refill	Substitution
Fluid empty	--	--	○
Clogged tubing/bottle not connected	--	--	○
Fluid low	○	○	○
Paraffin unmelted/paraffin station temperature control error	--	--	○

For your information, a “Fluid low” error occurs only when the solution level is safeguarded, meaning that Solution Manager will be actuated only when the “Solution level safeguarded” option is set on the system setup screen (whether or not to use “Next Station Refill” or “Bulk Reservoir Refill” can be set by the user). As for “Bulk Reservoir Refill,” this Solution Manager can be actuated only when a bulk reservoir storing reagent of the same type as the process reagent is available.

If a pumping-in error occurs during tissue processing, the user specifies to the tissue processing program which type of Solution Manager is to be actuated. The selectable types are specified below.

SM1:	Solution station	Solution Managers are actuated in the sequence of: Next Station Refill → Bulk Reservoir Refill → Substitution
	Paraffin station	Solution Managers are actuated in the sequence of: Next Station Refill → Substitution

SM2:	Solution station	Solution Managers are actuated in the sequence of: Refill Bulk Reservoir Refill → Next Station Refill → Substitution
	Paraffin station	Solution Managers are actuated in the sequence of: Next Station Refill → Substitution
OFF:	No Solution Manager is actuated. If a “Fluid low” is detected during retort cleaning, Solution Manager is actuated to refill reagent from a bulk reservoir. If the solution station used for cleaning (station 16 or 17) is not linked to a bulk reservoir, Refill is not performed.	

1-3-6-2 Operation

(1) Solution Manager for next station refill
Solution Manager that performs “Next Station Refill” is explained below. To be specific, an example where “Fluid low” occurs at station A2 in solution group A consisting of stations A1, A2 and A3 is explained.

[1] Reagent did not reach the safeguarded level after pumping in all reagent from the reagent bottle for station A2 in the pumping-in from station A2 (“Fluid low” occurred).
[2] The current station switches to station A3, which is the next process station in the same solution group.
[3] After the station has been switched, pumping-in is performed to refill reagent from the reagent bottle for station A3. Note that in the case of pumping-in for refill, the level to refill reagent to varies depending on the mixing setting for the station where tissues are currently processed.

Mix=OFF/Fast/Slow	Refill to the safeguarded level
Mix=Cont/Short 1/Short 2/Short3	Refill to the upper level

[4] Upon completion of pumping-in, the current station switches to station A2.
[5] After the station has been switched, “Station Process” at station A2 that has been set in the tissue processing program is executed.
[6] Upon completion of “Station Process,” pumping-out is performed to the reagent bottle for station A2.
[7] Upon completion of pumping-out, the current station switches to station A3.
[8] After the station has been switched, pumping-in is performed from station A3. In the case of “Fluid low” occurring at station A3, the current station switches to the bulk reservoir linked to solution group A, if “SM1” is set, because station A3 is the final station in the solution group. If “SM2” is set, Solution Manager that performs “Substitution” is actuated at the preceding station.
[9] After the station has been switched, pumping-in is performed to refill from the bulk reservoir.
[10] Upon completion of pumping-in, the current station switches to station A3.
[11] After the station has been switched, “Station Process” at station A3 that has been set in the tissue processing program is executed.
[12] Upon completion of “Station Process,” pumping-out is performed to the reagent bottle for station A3.
[13] In the case of “Fluid low,” it is highly like that the amount of insufficiency is small. Accordingly, the solution usage information is not updated.
[14] If no bulk reservoir is available that stores the same reagent or the applicable bulk reservoir does not contain enough reagent to resolve “Fluid low” in [8], Solution Manager that performs “Substitution” is actuated at the preceding station.

(2) Solution Manager for bulk reservoir refill
Solution Manager that performs “Bulk Reservoir Refill” is explained below. To be specific, an example where “Fluid low” occurs at station A2 in solution group A consisting of stations A1, A2 and A3 is explained.

[1] Reagent did not reach the safeguarded level after pumping in all reagent from the reagent bottle for station A2 in the pumping-in from station A2 (“Fluid low” occurred).
[2] The current station switches to the bulk reservoir linked to solution group A.
[3] After the station has been switched, pumping-in is performed to refill from the bulk reservoir.
[4] Upon completion of pumping-in, the current station switches to station A3.
[5] After the station has been switched, “Station Process” at station A3 that has been set in the tissue processing program is executed.
[6] In the case of “Fluid low,” it is highly like that the amount of insufficiency is small. Accordingly, the solution usage information is not updated.
[7] If no bulk reservoir is available that stores the same reagent or the applicable bulk reservoir does not contain enough reagent to resolve “Fluid low” in [2], Solution Manager that performs “Substitution” is actuated at the preceding station, if “SM1” is set. If “SM2” is set, Solution Manager that performs “Next Station Refill” is actuated.

(3) Solution Manager for substitution
Solution Manager that performs “Substitution” is explained below. To be specific, an example where “Fluid empty” occurs at station A2 in solution group A consisting of stations A1, A2 and A3 is explained.

[1] A “Fluid empty” error was detected during pumping-in from the reagent bottle for station A2 during pumping-in from station A2.
[2] The current station switches to station A1, which is the preceding station in the same solution group.
[3] After the station has been switched, the current station switches to station A1.
[4] Upon completion of pumping-in, “Station Process” at station A2 that has been set in the tissue processing program is executed (substitution by station A1).
Take note that even when “Fluid low” occurs during pumping-in from the “Substitution” station, the condition will be ignored and substitution will be performed. However, “Fluid low” will be registered in the solution usage information (same with the VIP5).
[5] Upon completion of “Station Process,” pumping-out is performed to station A1.
[6] Upon completion of pumping-out, the current station switches to station A3, which is the next process station.
[7] If Solution Manager that performs “Substitution” has actuated, the solution usage information of the substituted solution (station A1 in this example) is updated.
[8] If substitution becomes necessary at station 1 in the solution group (station A1 in this example), substitution is performed at the next or subsequent process station in the solution group (station A2, or station A3 if substitution by station A2 is not possible, in this example) (same with the VIP5).
[9] If the reagent bottle for the preceding station in the same solution group is empty as a result of automatic transfer during tissue processing, substitution is performed at the two stations before in the same solution group (same with the VIP5).
[10] If no substitutable station is available in the same solution group (this occurs when automatic transfer is performed during tissue processing in the solution group consisting of two stations), pumping-in is performed from the final process solution in the preceding solution group, after which the system enters the standby mode and waits for action by the user.

(4) Solution Manager to be actuated upon detection of unmelted paraffin/temperature control error at a paraffin station
If unmelted paraffin or any temperature control error is detected at a paraffin station before pumping-in to the paraffin station, “Substitution” is performed at the station preceding the one that generated the error. If the error occurs at the paraffin loading station, “Substitution” is performed at the station next to the one that generated the error. Take note that if a temperature control error is detected at a paraffin station, substitution will be performed even when Solution Manager is set to “OFF.” This is because the user cannot handle this error even if the system stands by while protecting the tissues.

(5) Tissue protection operation during tissue processing
If Solution Manager is set to “OFF” or cannot be actuated, the system protects the tissues and then stops the processing and waits for action by the user. If tissue protection is performed at a station other than process stations (stations 1 to 14), tissue processing will be aborted. The basic tissue protection operation is to supply reagent from the process station preceding the one that required tissue protection operation. If there is no preceding station, reagent is supplied from the next process station, after which the system stands by. If there is no next station, either, then the system follows the sequence specified below to find the station where the tissues can be protected.

Sequence: Solution groups
The system stands by at the preceding solution group
If this not possible, the system stands by at the next solution group.

If the above is not possible, the system protects the tissues at the cleaning alcohol station and stops the tissue processing.

If the above is not possible, the system protects the tissues at the cleaning xylene station and stops the tissue processing (by turning off the retort, retort lid, valve and fill/drain pipe heaters).

If the above is not possible, the system protects the tissues at the paraffin station and stops the tissue processing (by turning off the retort, retort lid, valve and fill/drain pipe heaters).

If the above is not possible, the system turns off the retort, retort lid, valve and fill/drain pipe heaters and stops the tissue processing.

Sequence: Paraffin stations

If the above is not possible, the system switches the current station from station 10 to station 1 and stands by.

If the above is not possible, the system protects the tissues at the cleaning alcohol station and stops the tissue processing.

If the above is not possible, the system protects the tissues at the cleaning xylene station and stops the tissue processing (by turning off the retort, retort lid, valve and fill/drain pipe heaters).

If the above is not possible, the system turns off the retort, retort lid, valve and fill/drain pipe heaters and stops the tissue processing.

(6) Solution Manager for retort cleaning
Solution Manager used for retort cleaning is explained below. To be specific, an example where "Fluid low" occurs at the cleaning xylene station (station 16) is explained.

[1] Reagent did not reach the safeguarded level after pumping in all reagent from the reagent bottle for the cleaning xylene station in the pumping-in from the cleaning xylene station ("Fluid low" occurred).
[2] The current station switches to the bulk reservoir linked to the cleaning xylene station.
[3] After the station has been switched, pumping-in is performed to refill from the bulk reservoir.
[4] After completion of pumping-in, the current station switches to the cleaning xylene station.
[5] After the station has been switched, cleaning is continued.
[6] In the case of "Fluid low," it is highly like that the amount of insufficiency is small. Accordingly, the solution usage information is not updated.
[7] If no bulk reservoir is available that stores the same reagent or the applicable bulk reservoir does not contain enough reagent to resolve "Fluid low" in [2], "Fluid low" information is registered at the end of retort cleaning.

1-3-8 Paraffin Melt Check

1-3-8-1 Melting of Paraffin

If a new system is installed or an existing system is powered up after a long period of shutdown, the paraffin oven is not sufficiently warm. Accordingly, installing a paraffin container storing molten paraffin in the paraffin oven may still result in paraffin solidifying in the paraffin oven. It is desirable that the paraffin container storing molten paraffin be set in a thermally stable condition after the paraffin oven has reached the control temperature (preset paraffin oven temperature + 2°C). Take note that although this system can melt solid paraffin in the paraffin container, it cannot determine adding of solid paraffin based on temperature change in the paraffin oven. Accordingly, the user must notify the system that solid paraffin has been added.

1-3-8-2 Standby Mode upon Paraffin Solidification after Recovery of Power Following Power Failure

If a power failure occurs while the system is in use, paraffin solidifies due to drop in paraffin oven temperature. If paraffin is supplied from the paraffin station in this condition, clogged tubing will occur due to paraffin. To prevent this problem, the system will stand by for a specified period after recovery of power following a power failure and then resume operation once paraffin has melted. The standby times are shown in Table 1-3-8-1 and Table 1-3-8-2. The specific standby time during which the system stands by until the paraffin oven temperature recovers and supply of paraffin becomes possible (time to wait for paraffin to melt) varies depending on the duration of power outage and the degree of drop in paraffin oven temperature from the preset temperature. The system will stand by for the standby time required by the duration of power outage or for the standby time required by the drop in oven temperature, whichever is longer. During the time to wait for paraffin to melt, the system may continue to stand by, even when paraffin has melted sufficiently, depending on the type of paraffin used, ambient temperature and power-supply voltage, etc. Once the paraffin oven reaches the control temperature and becomes thermally stable while the system is standing by, the system enters a mode where melting of paraffin can be checked by the user. Once the system enters this paraffin melt check mode, the user visually checks the melting condition of paraffin in the paraffin oven and if paraffin is found melted, notifies the system that “paraffin is melted” (paraffin melt check operation). After receiving an input indicating that “paraffin is melted,” the system determines that paraffin can now be supplied/drained.
To accelerate the melting of paraffin, the paraffin oven is heated at 70°C during the paraffin melting. The paraffin oven starts being controlled at the “preset oven temperature + 2°C” two hours before completion of the standby. If the standby time is shorter than two hours, the heating at 70°C is not performed.

Table 1-3-8-1 Standby Times after Drop in paraffin Oven Temperature

Paraffin oven temperature	Standby time
Drop by no more than 10°C from the preset temperature	00 minutes
Drop by no more than 12°C from the preset temperature	1 hour 00 minutes
Drop by no more than 14°C from the preset temperature	3 hours 30 minutes
Drop by no more than 16°C from the preset temperature	6 hour 00 minutes
Drop by no more than 18°C from the preset temperature	7 hour 00 minutes
Drop by no more than 19°C from the preset temperature	24 hour 00 minutes

Table 1-3-8-2 Standby Times required by Duration of Power Outage

Duration of Power Outage	Standby time
Less than 1 hour	00 minutes
Less than 1 hour and a half	1 hour 00 minutes
Less than 3 hours	2 hours 00 minutes
Less than 5 hours	4 hour 00 minutes
Over 5 hours	24 hour 00 minutes

If a power failure occurs while paraffin is supplied to the retort, the drop in retort temperature also affects the standby time. This is because paraffin is present not only in the paraffin oven, but also in the retort. Table 1-3-8-3 shows the standby times relative to retort temperatures.

Table 1-3-8-3 Standby Times after Drop in Retort Temperature

Retort temperature	Standby time
Drop by no more than 4°C from the preset temperature	15 minutes
Drop by no more than 6°C from the preset temperature	25 minutes
Drop by no more than 8°C from the preset temperature	40 minutes
Drop by no more than 10°C from the preset temperature	1 hour 00 minutes
Drop by no more than 12°C from the preset temperature	2 hour 10 minutes
Drop by no more than 14°C from the preset temperature	4 hours 00 minutes
Drop by no more than 16°C from the preset temperature	5 hour 30 minutes
Drop by no more than 18°C from the preset temperature	7 hour 00 minutes
Drop by no more than 19°C from the preset temperature	24 hour 00 minutes

If the retort contains paraffin, the system will stand by for the standby time corresponding to the duration of power outage, or the standby time corresponding to the drop in paraffin oven temperature, or the standby time corresponding to the drop in retort temperature, whichever is longer. The operation performed during standby is the same as when the system stands by only due to drop in paraffin oven temperature. Take note, however, that if a paraffin melt check operation is performed, paraffin is checked in both the retort and paraffin oven.

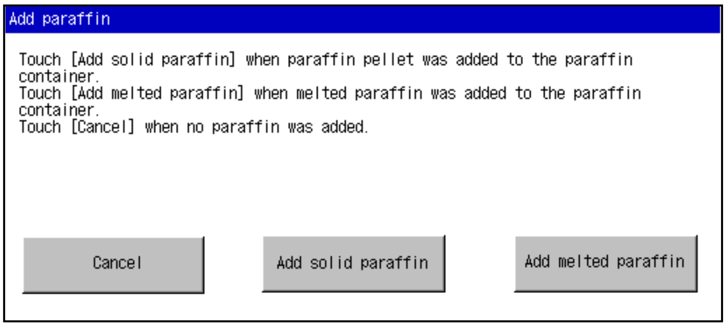
1-3-8-3 Adding Paraffin and Paraffin Melt Check Operation

The procedures to add paraffin and perform paraffin melt check operation while the system power is supplied are specified below.

(1) Adding paraffin

When the paraffin oven door is closed after opened for more than 5 seconds while paraffin is melted, the “Add paraffin” window will appear with a message asking if paraffin was added. As either of solid paraffin or molten paraffin can be added, touch an appropriate button for the type of paraffin added. This window may also appear even when paraffin has not been added. In this case, touch the **Cancel** button.

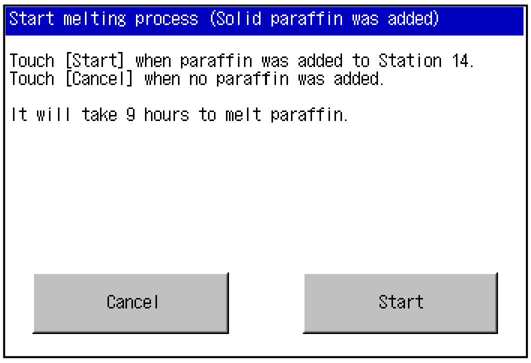
Take note that the “Add paraffin” window can also be accessed by touching the “Start Paraffin Melt” icon on the Process Menu screen.



Screen 1-3-8-1 “Add paraffin” window

1. Adding solid paraffin

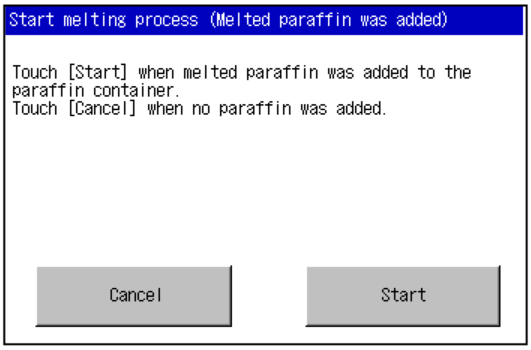
   When solid paraffin is added to Station 14 (a larger paraffin container) in the paraffin oven, touch the **Add solid paraffin** in the “Add paraffin” window. The “Start melting process (solid paraffin was added)” window appears. Touch the **Start** button. The standby time is 9 hours until solid paraffin is molten. If this window is displayed by mistake, touch the **Cancel** button.



Screen 1-3-8-2 “Start melting process (solid paraffin)” window

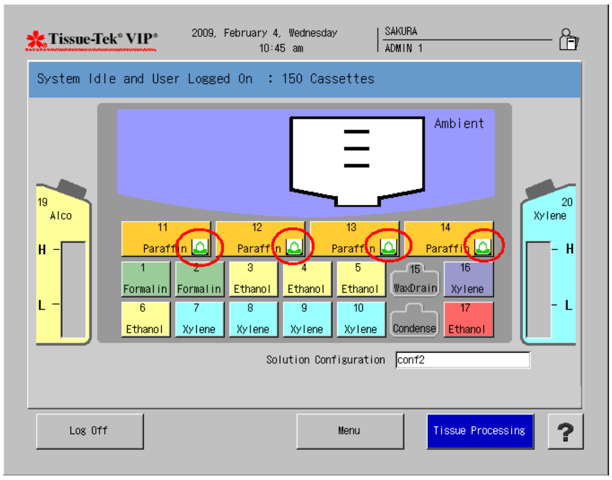
2. Adding molten paraffin

   When molten paraffin is added to any paraffin container in the paraffin oven, touch the **Add melted paraffin** in the “Add paraffin” window. The “Start melting process (Melted paraffin was added)” window appears. Touch the **Start** button. When molten paraffin was added, the system does not stand by for the paraffin melting. However, if a drop in the oven temperature occurs due to addition of molten paraffin, the system will stand by, depending on the degree of temperature drop. Table 1-3-8-1 indicates the standby time. If this window is displayed by mistake, touch the **Cancel** button.



Screen 1-3-8-3 “Start melting process (molten paraffin)” window

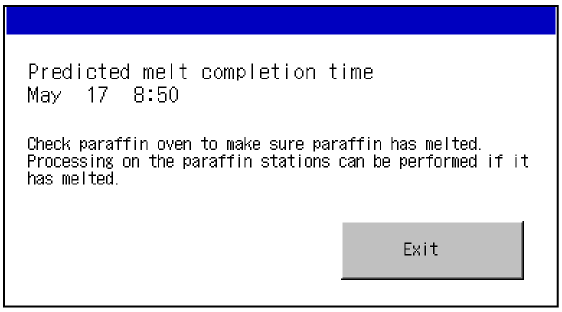
When solid paraffin was added or when the system recognizes that paraffin has not melted due to the drop in the oven temperature, a small icon with the same design as the “Start Paraffin Melt” icon is displayed on each paraffin station button on the System Idle and User Logged On screen.　The small icon disappears when the paraffin melting standby time was up or when the user took the paraffin melting check action.



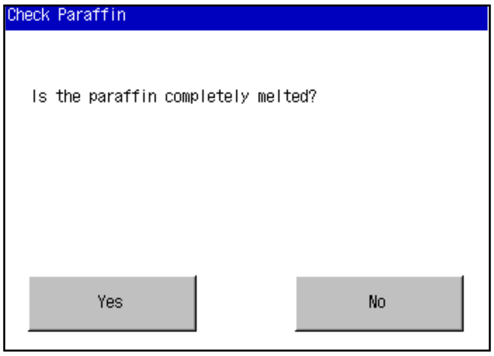
Screen.1-3-8-4 System idle screen displayed when paraffin has not melted

(2) Paraffin melt check operation

Once paraffin melt check becomes possible, the system displays a window notifying that the paraffin melt check can be made on the screen.　Also displayed in this notice window is the predicted date and time when paraffin is completely melted without making the paraffin melt check by the user.　Once this notice window appears, you can check whether paraffin has melted in the paraffin container in the paraffin oven at any time. The user opens the paraffin oven door, draws out the paraffin container to which solid paraffin has been added, and confirms that paraffin is melted. After the confirmation, the user closes the paraffin oven door, upon which the “Check Paraffin” window appears and asks if paraffin is melted. If paraffin is melted, touch the **Yes** button. If paraffin is not melted, touch the **No** button.



Screen 8-3-8-5 “Paraffin Melt Check Notice” window



Screen 1-3-8-6 “Paraffin Check” Window

1-3-8-4 Operation upon Adding Solid Paraffin with System Power Supplied

If solid paraffin has been added to the paraffin container at Station 14 and a paraffin adding operation is performed while the system power is supplied, the system will melt paraffin for 9 hours after the receipt of an "Addition" signal because it cannot determine the standby time need for paraffin to melt based on temperature change in the paraffin oven. During this time, the system heats the oven at 70°C for 7 hours. For the remaining 2 hours, the system reheats the oven at "oven temperature set in the system + 2°C" in order to lower the paraffin temperature to near the preset temperature. Once the paraffin oven reaches the control temperature and becomes thermally stable while paraffin is melting, the system enters a mode where melting of paraffin can be checked by the user. Once the system enters this paraffin melt check mode, the user checks the melting condition of paraffin in the paraffin oven and if paraffin is found melted, performs a paraffin melt check operation. After receiving an input indicating that "paraffin is melted," the system determines that paraffin can now be supplied/drained. Even when the user does not perform a paraffin melt check operation, the system will determine that paraffin can be supplied/drained upon elapse of 9 hours after the paraffin adding operation.

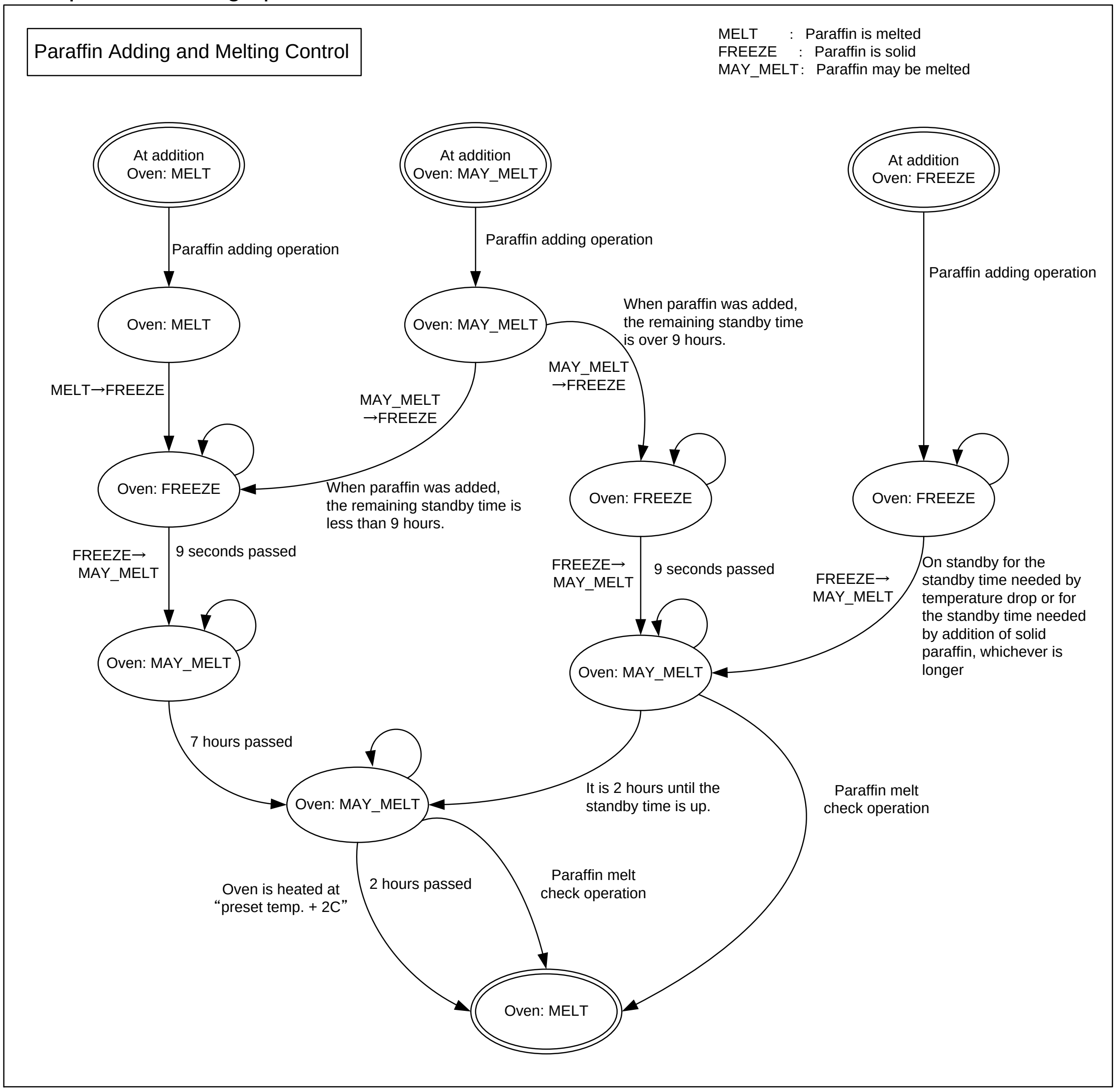


Fig. 1-3-8-1 Paraffin Adding and Melting Controls

Solid paraffin can be added even during the paraffin melting in progress. However, you may not need to wait for 9 hours because the system is already working on the paraffin melting. In this case, the system will stand by for the longer standby time after comparing 9 hours with the standby time remaining when solid paraffin was added.

1-3-8-5 Automatic Operation While Waiting for Paraffin to Melt

If a power failure occurs during tissue processing or an attempt is made to process tissues, drain paraffin as part of solution exchange or implement automatic transfer among paraffin stations while the system is waiting for paraffin to melt, the system will perform the operations explained below.

(1) Recovery of power after a power failure during tissue processing
If the paraffin oven temperature has dropped due to a power failure, etc., the system operates as follows:

[1] After the recovery of power following the power failure, the system measures both the duration of power outage and the minimum paraffin oven temperature and determines the standby time according to Table 1-3-8-1 and Table 1-3-8-2.
[2] The processing at stations 1 to 10 before the paraffin process is continued.
[3] Once the paraffin oven temperature recovers to the control temperature, the system starts measuring the standby time.
[4] Once the paraffin oven reaches the control temperature and becomes thermally stable, the system permits the user to check melting of paraffin. If the user subsequently performs a paraffin melt check operation during the process at each solution group, the system permits supply/drain to/from the paraffin station and then performs the same operations normally performed during tissue processing.
[5] If the standby time for the paraffin melting is not yet elapsed at the end of the process immediately before the paraffin process, the process is continued up to the paraffin station where paraffin is already melted. If paraffin is not yet melted in the first station of the paraffin process (normally, Station 11), the system stands by while retaining reagent of the final solution station (normally station 10) in the retort.
[6] Once the standby time elapses after recovery of paraffin oven temperature or the user performs a paraffin melt check operation, the system pumps out reagent from the final solution station and proceeds to the paraffin process.

(2) Adding solid paraffin while the system power is supplied: Tissue processing
If tissue processing is performed after solid paraffin has been added to Station 14 while the system power is supplied, the system operates as follows:

[1] After receiving an input indicating that “paraffin has been added,” the paraffin melting for Station 14 starts.
[2] Once the paraffin oven reaches the control temperature and becomes thermally stable, the system starts measuring the standby time of 9 hours and permits the user to check melting of paraffin.
[3] The processing at stations 1 to 13 is continued.
[4] Upon elapse of 9 hours before the paraffin process or when the user performs a paraffin melt check operation, the system permits supply/drain to/from Station 14 and then performs normal operations.
[5] If supply/drain to/from Station 14 is not permitted at the end of the process immediately before Station 14, the system stands by while retaining paraffin of the previous station (normally station 13) in the retort.
[6] Upon elapse of 9 hours after adding paraffin or when the user performs a paraffin melt check operation, the system pumps out paraffin to the previous station (normally Station 13) and proceeds to the process for Station 14.

(3) Adding solid paraffin while the system power is supplied: Solution exchange
If paraffin drain for Station 14 as part of solution exchange or automatic transfer among paraffin stations is performed after solid paraffin has been added to Station 14 while the system power is supplied, the system operates as follows:

[1] After receiving an input indicating that “paraffin has been added,” the system starts measuring the standby time of 9 hours.
[2] The system holds supply from Station 14 until 9 hours elapse after the addition of paraffin or the user performs a paraffin melt check operation.
[3] Once the paraffin oven reaches the control temperature and becomes thermally stable,

the system permits the user to check melting of paraffin.

[4] Upon elapse of 9 hours before the paraffin process or when the user performs a paraffin melt check operation, the system permits supply/drain to/from Station 14 and then starts pumping-in.

[5] Hereafter, the system performs paraffin drain for Station 14 or automatic transfer among paraffin stations.

1-3-9 Cleaning

This system provides the following three types of cleaning functions:

[1] Retort cleaning where the interior of the retort and tubing are cleaned with cleaning xylene and cleaning alcohol to clear attached paraffin.
[2] Warm water flush where precipitates generated on the interior of tubing due to buffer agent for fixing solution is flushed using warm water.
[3] Rinsing where the retort is cleaned using cleaning alcohol. Also, cleaning alcohol supplied from the external drain/fill port to an external container is used to clean the tubing from the external drain/fill port to the retort.

1-3-9-1 Retort Cleaning

(1) Overview

Retort cleaning is implemented in three processes of pumping-in/out of cleaning xylene (station 16), pumping-in/out of cleaning alcohol (station 17), and retort drying. In the processes involving cleaning xylene and cleaning alcohol, pumping-in and pumping-out to/from the retort are repeated. Whether or not cleaning is complete is determined by the condition of what has been cleaned, number of times cleaning xylene and cleaning alcohol have been used, and number of times pumping-in/out has been repeated.
The key objective of each process is as follows:

[1] Xylene: Melt paraffin and thereby remove paraffin from the retort and tubing.
[2] Alcohol: Remove cleaning xylene from the retort and tubing.
[3] Drying: Remove alcohol smell from the retort.

The user can edit the number of repetitions of pumping-in/out (1 to 15 times), supply/drain interval for cleaning xylene (0 to 5 minutes) and retort temperature in the cleaning xylene process (45 to 60°C) in the cleaning program. The user can also specify at the start of retort cleaning whether or not to perform the drying process.

(2) Operation

[1] If the retort is dirty with paraffin but the current station is not a paraffin station when retort cleaning is started, the system switches the station to the final paraffin station used in the most recent tissue processing run (normally station 14).
[2] If the retort is dirty with paraffin when retort cleaning is started, the system warms up the retort to melt paraffin attached to the retort walls. The retort warm-up time is specified at the start of retort cleaning (it can also be specified to "0" minute). The retort temperature is 70°C during warm-up. While the retort is warmed up, the fill pipe, drain pipe, rotary valve and gate valve are also heated.
[3] Upon completion of warm-up, paraffin collected at the bottom of the retort is slowly pumped out at 15 kPa, which is lower than the normal pumping-out pressure.
[4] The current station switches to the cleaning xylene station (station 16).
[5] After the station has been switched, the cleaning xylem station is heated at the temperature (45 to 60°C) specified in the retort cleaning program. At the same time, the retort lid, fill pipe, drain pipe, rotary valve and gate valve are also heated.
[6] After the station has been switched, pumping-in from the cleaning xylene station is performed until reagent reaches slightly above the 4.2-liter level. "Slightly above" indicates the level achieved when pumping-in is continued for 5 seconds after the upper level is reached.
[7] Upon completion of pumping-in, the system stands by for a specified time (0 to 5 minutes, changeable by the user) to provide enough time for the cleaning xylene temperature to rise and paraffin to melt.
[8] After elapse of the specified time, pumping-out to the cleaning xylene station is performed.
[9] Steps [6] to [8] are repeated for the number of times specified in the retort cleaning program.
[10] The current station switches to the cleaning alcohol station (station 17).
[11] After the station has been switched, pumping-in from the cleaning alcohol station is performed until reagent reaches slightly above the 4.2-liter level. "Slightly above" indicates the level achieved when pumping-in is continued for 5 seconds after the upper level is reached.

[12] After the first pumping-in from the cleaning alcohol station, the condenser is drained.
[13] Upon completion of pumping-in, pumping-out to the cleaning alcohol station is performed. Pumping-in and pumping-out from/to the cleaning alcohol station are repeated for the number of times specified in the retort cleaning program.
[14] The drying process is performed. The following processing steps are performed one by one during the drying process:
- The retort temperature is raised to 50°C.
- Pumping-out is performed eight times consecutively.
- Depressurization is performed to maintain negative pressure for 90 seconds and then atmospheric pressure is restored and maintained for 30 seconds, and this is repeated three times consecutively.
- Pumping-out is performed.

[15] Upon completion of drying, retort cleaning ends and a retort cleaning history file is output.

(3) Notes
In retort cleaning, cleaning xylene deteriorates faster due to dissolved paraffin. Since deterioration of cleaning xylene causes paraffin to solidify in tubing and consequently leads to a system failure, it is recommended that the number of times reagent is used be minimized and reagent be changed as soon as possible.
Although the cleaning xylene station has a heating function using a xylem heater, this function does not reduce the degree of drop in cleaning performance due to dissolved paraffin compared to previous models, although the cleaning time is shorter. Accordingly, it is recommended to change cleaning xylene as soon as possible.

1-3-9-2 Warm Water Flush

(1) Overview
If fixing solution is used, buffer agent dissolved in fixing solution cannot dissolve in degreasing agent in the next step and consequently precipitates in tubing. As for the common tubing between the retort and rotary valve, the tubing is exposed to different reagent every time and thus rarely affected by precipitated buffer agent. As for the tubing line between the rotary valve and reagent bottle, however, precipitated buffer agent may remain and accumulate after several processing runs, consequently clogging the tubing.
Warm water flush is a function to remove these precipitates in tubing, representative of which is buffer agent, using warm water. In warm water flush, desired stations among stations 1 to 5 are cleaned with warm water. Since precipitation occurs easily at the first station that performs dewatering, it is recommended that the applicable station be cleaned with warm water periodically.
The user can specify at the start of warm water flush which station to be cleaned with warm water. The user can also specify at the start of warm water flush whether or not to perform the drying process.

(2) Operation
[1] Pumping-in is performed from the station to be cleaned with warm water.
[2] Upon completion of pumping-in, pumping-out is performed.
[3] If multiple stations are to be cleaned with warm water, the current station switches to the next one and steps [1] and [2] are performed.
[4] The drying process is performed. This process can be skipped.
[5] Upon completion of the drying process, warm water flush ends and a warm water flush history file is output.

1-3-9-3 Rinsing

After solution exchange, reagent remains attached to the retort and tubing. If mixing of intermediate solutions, etc., with fixing solution may present a problem, the applicable areas can be rinsed with cleaning alcohol (station 17). Also, the tubing system between the external drain/fill port (station 18) and retort, including the solution exchange hose, can be rinsed using alcohol supplied from an external container.
The operation of rinsing with cleaning alcohol (station 17) is simply referred to as “Rinsing.” Rinsing of the tubing between the external drain/fill port (station 18) and retort is referred to as “External Drain/fill Port Rinsing.”
The user can specify at the start of rinsing which of “Rinsing” and “External Drain/fill Port Rinsing” is to be performed. The user can also specify at the start of rinsing whether or not to perform the drying process.
Take note that if external drain/fill port rinsing is performed, the user must connect an external container storing cleaning alcohol (approx. 1 liter of alcohol is enough because only the tubing line is rinsed) to the external drain/fill port using a solution exchange hose before commencement of external drain/fill port rinsing.

(2) Rinsing operation
- [1] The current station switches to the cleaning alcohol station (station 17).
- [2] Alcohol is pumped in to slightly above the upper level. “Slightly above” indicates the level achieved when pumping-in is continued for 10 seconds after the upper level is reached.
- [3] Upon completion of pumping-in, pumping-out is performed
- [4] The drying process is performed. This process can be skipped.
- [5] Upon completion of the drying process, rinsing ends.

(3) External drain/fill port rinsing operation
- [1] The current station switches to the external drain/fill port (station 18).
- [2] Pumping-in is performed from the external container.
- [3] Upon completion of pumping-in, pumping-out is performed
- [4] The current station switches to the cleaning alcohol station (station 17).
- [5] The drying process is performed. This process can be skipped.
- [6] Upon completion of the drying process, external drain/fill port rinsing ends.

1-3-10 Solution Exchange

Solution exchange allows each reagent excluding paraffin to be supplied and drained from/to the external drain/fill port (station 18); reagent to be supplied to a reagent bottle from a bulk reservoir linked to each station or supplied to a bulk reservoir; paraffin to be drained to a wax drain container; or reagent or paraffin to be automatically transferred within a solution group. The retort has level sensors that can measure reagent level, so that reagent can be exchanged and transferred without having to directly access reagent bottles in the tank rack.
Solution exchange functions are largely classified into seven functions including: “External Drain” (draining to outside the system), “External Fill” (filling from outside the system), “Fill from Bulk Reservoir” (filling from a bulk reservoir), “Drain & Fill from Bulk Reservoir” (draining to outside the system & filling from a bulk reservoir), “Automatic Transfer,” “Paraffin Drain” and “Reservoir Fill.” “External Drain,” “External Fill,” “Fill from Bulk Reservoir” and “Drain & Fill from Bulk Reservoir” can be implemented for each solution group or each station. In “Automatic Transfer,” transfer among multiple solution groups and paraffin stations can be implemented in a single operation.

1-3-10-1 External Drain

(1) Overview
External drain is a function to drain old reagent in the reagent bottles for stations 1 to 10, 16 and 17 to an external drain container. External drain can be performed per group or station. In the case of external drain from a solution group, drain operation is performed from the reagent bottles for all stations comprising the solution group selected by the user. In the case of external drain from each station, drain operation is performed from the reagent bottle for the station selected by the user.
Take note that if external drain is to be performed, the user must connect an external drain container large enough to accommodate drained reagent, to the external drain/fill port (station 18) using a solution exchange hose before commencement of external drain.

(2) Operation

[1] In the case of external drain from each solution group, the current station switches to the loading station in the solution group to be drained. In the case of external drain from each station, the current station switches to the solution station to be drained.
[2] Pumping-in from the solution station to be drained is performed. At this time, an error will not generate even when the reagent bottle is empty. If the reagent bottle is found empty at the time of pumping-in, the current station switches to the next station (the system proceeds to step [5]) in the case of external drain from each solution group. In the case of external drain from each station, external drain ends.
[3] Upon completion of pumping-in, the current station switches to the external drain/fill port.
[4] Pumping-out to the external drain container is performed.
[5] In the case of external drain from each solution group, the current station switches to the next station in the solution group. In the case of external drain from each station, external drain ends.
[6] Steps [2] to [5] are performed for all stations in the solution group.
[7] When all solution at the final station in the solution group has been pumped out to the external drain container, external drain from the solution group ends.

1-3-10-2 External Fill

(1) Overview

External fill is a function to fill reagent from an external bulk reservoir to the reagent bottles for stations 1 to 10, 16 and 17. External fill can be implemented for each solution group or each station. The amount of reagent to be filled is selected by the user from among “2.7 L,” “3.5 L” and 4.2 L.” The system fills the specified amount of reagent using the three level sensors provided in the retort.

External fill is implemented in the form of refill of reagent from an external bulk reservoir when the specified amount of reagent is still not available after reagent has been pumped in from the reagent bottle for the station to be filled. Accordingly, the system does not fill from an external bulk reservoir if the amount of reagent in the reagent bottle for the station to be filled exceeds the desired amount of reagent.

In the case of external fill to a solution group, fill operation is performed from the reagent bottles for all stations comprising the solution group selected by the user. In the case of external fill to each station, fill operation is performed to the reagent bottle for the station selected by the user.

Take note that if external fill is to be performed, the user must connect an external bulk reservoir containing new reagent by the amount to be filled, to the external drain/fill port (station 18) using a solution exchange hose before commencement of external fill.

(2) Operation

[1] In the case of external fill to each solution group, the current station switches to the loading station in the solution group to be filled. In the case of external fill to each station, the current station switches to the solution station to be filled.
[2] Pumping-in from the solution station to be filled is performed. At this time, an error will not generate even when the reagent bottle is empty. If the specified level is reached after pumping-in, new reagent is not refilled from the external bulk reservoir. In this case, pumping-out is performed in the case of external fill to each solution group, after which the current station switches to the next station (the system proceeds to step [6] and then switches to the next station without refilling). In the case of external fill to each station, external fill ends.
[3] Upon completion of pumping-in, the current station switches to the external drain/fill port.
[4] The specified amount of reagent is pumped in from the external bulk reservoir.
[5] Upon completion of pumping-in for refill, the current station switches to the station to be filled.
[6] After the station has been switched, pumping-out is performed.
[7] Upon completion of pumping-out, the current station switches to the next station in the solution group in the case of external fill to each solution group. In the case of external fill to each station, external fill ends.
[8] Steps [2] to [7] are performed for all stations in the solution group.
[9] After pumping-out to the final station in the solution group is complete, external fill to the solution group ends.

1-3-10-3 Fill from Bulk Reservoir

(1) Overview

Fill from bulk reservoir is a function to fill reagent to the reagent bottles for stations 1 to 10, 16 and 17 from the bulk reservoir linked to each applicable station. Fill from bulk reservoir cannot be implemented for solution groups and solution stations not linked to a bulk reservoir.

The amount of reagent to be filled is selected by the user from among “2.7 L,” “3.5 L” and 4.2 L.” The system fills the specified amount of reagent using the three level sensors provided in the retort.

Fill from bulk reservoir is implemented in the form of refill of reagent from a bulk reservoir when the specified amount of reagent is still not available after reagent has been pumped in from the reagent bottle for the station to be filled. Accordingly, the system does not fill from a bulk reservoir if the amount of reagent in the reagent bottle for the station to be filled exceeds the desired amount of reagent.

In the case of fill from bulk reservoir to a solution group, fill operation is performed from the reagent bottles for all stations comprising the solution group selected by the user. In the case of fill from bulk reservoir to each station, fill operation is performed to the reagent bottle for the station selected by the user.

(2) Operation

[1] In the case of fill from bulk reservoir to each solution group, the current station switches to the loading station in the solution group to be filled. In the case of external fill to each station, the current station switches to the solution station to be filled.

[2] After the station has been switched, pumping-in is performed. At this time, an error will not generate even when the reagent bottle is empty. If the specified level is reached after pumping-in, new reagent is not refilled from the bulk reservoir. In this case, pumping-out is performed in the case of fill from bulk reservoir to each solution group, after which the current station switches to the next station (the system proceeds to step [6] and then switches to the next station without refilling). In the case of fill from bulk reservoir to each station, fill from bulk reservoir ends.

[3] Upon completion of pumping-in, the current station switches to the linked bulk reservoir.

[4] The specified amount of reagent is pumped in from the bulk reservoir.

[5] Upon completion of pumping-in for refill, the current station switches to the station to be filled.

[6] Pumping-out to the station to be filled is performed.

[7] Upon completion of pumping-out, the current station switches to the next station in the solution group in the case of fill from bulk reservoir to each solution group. In the case of fill from bulk reservoir to each station, fill from bulk reservoir ends.

[8] Steps [2] to [7] are performed for all stations in the solution group.

[9] After pumping-out to the final station in the solution group is complete, fill from bulk reservoir to the solution group ends.

1-3-10-4 Drain & Fill from Bulk Reservoir

(1) Overview

Drain & fill from bulk reservoir is a function to drain old reagent in the reagent bottles for stations 1 to 10, 16 and 17 to an external drain container and then fill reagent from a linked bulk reservoir. Drain & fill from bulk reservoir cannot be used for solution groups and solution stations not linked to a bulk reservoir.

In the case of drain & fill from bulk reservoir from/to a solution group, external drain operation is performed from the reagent bottles for all stations comprising the solution station selected by the user, after which reagent is refilled from the bulk reservoir. In the case of drain & fill from bulk reservoir from/to each station, external drain operation is performed from the reagent bottle for the station selected by the user, after which reagent is refilled from the bulk reservoir. The amount of reagent to be filled is selected by the user from among “2.7 L,” “3.5 L” and 4.2 L.” The system fills the specified amount of reagent using the three level sensors provided in the retort.

Take note that if drain & fill from bulk reservoir is to be performed, the user must connect an external drain container large enough to accommodate drained reagent, to the external drain/fill port (station 18) using a solution exchange hose before commencement of drain & fill from bulk reservoir.

(2) Operation

[1] In the case of drain & fill from bulk reservoir to/from each solution group, the current station switches to the loading station in the solution group to be drained. In the case of drain & fill from bulk reservoir to/from each station, the current station switches to the solution station to be drained.

[2] After the station has been switched, pumping-in is performed. At this time, an error will not generate even when the reagent bottle is empty. If the reagent bottle is found empty at the time of pumping-in, the current station switches to the ext station (the system proceeds to step [5]) in the case of drain & fill from bulk reservoir to/from each solution group. In the case of drain & fill from bulk reservoir to/from each station, refill from the bulk reservoir is performed (the system proceeds to step [8]).

[3] Upon completion of pumping-in, the current station switches to the external drain/fill port.

[4] Pumping-out to the external drain container is performed.

[5] In the case of drain & fill from bulk reservoir to/from each solution group, the current station switches to the next station in the solution group. In the case of drain & fill from bulk reservoir to/from each station, refill from the bulk reservoir is performed (the system proceeds to step [8]).

[6] Steps [2] to [5] are performed for all stations in the solution group.

[7] After reagent at the final station in the solution group has been pumped out to the external drain container, refill from the bulk reservoir is performed (the system proceeds to step [8]).

[8] The current station switches to the linked bulk reservoir.

[9] The specified amount of reagent is pumped in from the bulk reservoir.

[10] Upon completion of pumping-in for refill, the current station switches to the station to be filled.

[11] After the station has been switched, pumping-out is performed.

[12] Upon completion of pumping-out, steps [8] to [11] are performed for all stations in the solution group in the case of drain & fill from bulk reservoir to/from each solution group. In the case of drain & fill from bulk reservoir to/from each station, drain & fill from bulk reservoir ends.

1-3-10-5 Automatic Transfer

(1) Overview

This function performs automatic transfer within a solution group consisting of stations 1 to 14 during solution exchange.
An empty reagent bottle must be set for the loading station in the solution group before automatic transfer is implemented for any solution group consisting of stations 1 to 10. The reagent bottle for the final station in the solution group is filled from a bulk reservoir. If the solution group is not linked to a bulk reservoir, the final station in the solution group is empty and thus automatic transfer ends. The amount of reagent to be filled is selected by the user from among “2.7 L,” “3.5 L” and 4.2 L.”
If automatic transfer among paraffin stations corresponding to stations 11 to 14 is to be performed, the user must prepare a wax drain container (by emptying the container and setting a waste bag) and set it in the system beforehand. Since the paraffin container at station 14 is excluded from the scope of automatic transfer, molten paraffin or solid paraffin must be refilled to this station after automatic transfer ends.
The system fills the specified amount of reagent using the three level sensors provided in the retort. If the specified amount of reagent is not available after automatically transferring all reagents from the source station to the destination station, reagent is refilled from the solution station next to the source station, or from the linked bulk reservoir, to achieve the specified amount of reagent. If reagent in the source station exceeds the specified amount, only the specified amount of reagent is transferred to the destination station. The same applies to automatic transfer among paraffin stations.

(2) Automatic transfer operation within a solution group

[1] The current station switches to the loading station in the solution group.
[2] After the station has been switched, pumping-in is performed from the loading station in the solution group to confirm that the loading station in the solution group is empty.
[3] The current station switches to the second station in the solution group.
[4] After the station has been switched, the specified amount of reagent is pumped in from the second station in the solution group.
[5] The current station switches to the loading station in the solution group, and pumping-out is performed.
[6] Upon completion of pumping-out, the second station in the solution group is designated as the destination station, while the third station in the solution group is designated as the source station. If there is no third station in the solution group, the linked bulk reservoir is designated as the source station. If the solution group has no bulk reservoir, automatic transfer ends.
[7] If the destination station is not empty, the current station switches to the source station. If the destination station is empty, the current station switches to the source station (the system proceeds to step [9]).
[8] After the station has been switched, pumping-in is performed from the destination station.
[9] The current station switches to the source station.
[10] The specified amount of reagent is pumped in from the source station.
[11] The current station switches to the destination station, and pumping-out is performed.
[12] If the destination station is the final station in the solution group, automatic transfer ends. If the destination station is not the final station in the solution group, the current source station is designated as the destination station, and the next station is designated as the source station. If there is no next station, the linked bulk reservoir is designated as the source station. If the solution group has no bulk reservoir, automatic transfer ends.
[13] Steps [7] to [12] are repeated until automatic transfer ends at the final station in the solution group.
[14] If pumping-in ends before the specified amount of reagent is reached in [4], the current station switches to the third station in the solution group and reagent is refilled by the amount of shortage. If the second station in the solution group is the final station in the solution group, the current station switches to the linked bulk reservoir and reagent is refilled by the amount of shortage. If the solution group has no bulk reservoir, nothing is performed.
[15] If the specified amount of reagent is exceeded through pumping-in in [8], transfer to the application station is skipped (the system proceeds to step [11]).

[16] If pumping-in ends before the specified amount of reagent is reached in [10], the current station switches to the station next to the source station and reagent is refilled by the amount of shortage. If the source station is the final station in the solution group, the current station switches to the linked bulk reservoir and reagent is refilled by the amount of shortage. If the solution group has no bulk reservoir, nothing is performed.

(3) Automatic transfer operation among paraffin stations

[1] Temperature control is performed for the retort, rotary valve, gate valve, fill pipe and drain pipe. At this time, the retort control temperature corresponds to “preset paraffin oven temperature + 2°C” and if this temperature exceeds 70°C, the control temperature is set to 70°C.
[2] The current station switches to station 11.
[3] After the station has been switched, the entire amount is pumped in from station 11.
[4] The current station switches to the wax drain container.
[5] Pumping-out is performed to the wax drain container.
[6] The current station switches to station 12.
[7] The specified amount of reagent is pumped in from station 12.
[8] The current station switches to station 11 and pumping-out is performed to station 11.
[9] If station 12 is not empty, the current station switches to station 12. If station 12 is empty, the current station switches to station 13 (the system proceeds to step [11]).
[10] The entire amount is pumped in from station 12.
[11] The current station switches to station 13.
[12] The specified amount of reagent is pumped in from station 13.
[13] The current station switches to station 12 and pumping-out is performed to station 12.
[14] If station 13 is not empty, the current station switches to station 13. If station 13 is empty, the current station switches to station 14 (the system proceeds to step [16]).
[15] The entire amount is pumped in from station 13.
[16] The current station switches to station 14.
[17] The specified amount of reagent is pumped in from station 14.
[18] The current station switches to station 13 and pumping-out is performed to station 13.
[19] Upon completion of pumping-out, automatic transfer ends.

1-3-10-6 Paraffin Drain

(1) Overview

This function drains paraffin from paraffin stations (stations 11 to 14) to a wax drain container during solution exchange. Take note that the drainable amount is 4.2 liters for station 14, because the capacity of this station is larger than that of the wax container.
If paraffin drain is to be performed, the user must prepare a wax drain container (by emptying the container and setting a waste bag) and set it in the system beforehand.

(2) Operation

[1] Temperature control is performed for the retort, rotary valve, gate valve, fill pipe and drain pipe. At this time, the retort control temperature corresponds to “preset paraffin oven temperature + 2°C” and if this temperature exceeds 70°C, the control temperature is set to 70°C.
[2] The current station switches to the paraffin station specified for draining.
[3] Pumping-in is performed from the paraffin station specified for draining. If the specified paraffin station is one of stations 11 to 13, the entire amount is pumped in. If it is station 14, pumping-in is performed until level sensor 3 in the retort turns ON (4.2-liter level).
[4] Upon completion of pumping-in, the current station switches to the wax drain container.
[5] Pumping-out is performed to the wax drain container.
[6] Upon completion of pumping-out, paraffin drain ends.

1-3-10-7 Bulk Reservoir Fill

(1) Overview

This function fills reagent to the bulk reservoirs installed in the system on the left and right (station 19 being the left bulk reservoir, and station 20 being the right bulk reservoir) during solution exchange. When filling each bulk reservoir, the bulk reservoir is filled directly from the external fill port for reservoir fill, without going through the retort.

If reservoir fill is to be used, the user must connect an external bulk reservoir containing new reagent, to the external fill port (top for the left bulk reservoir or bottom for the right bulk reservoir) using a solution exchange hose before commencement of reservoir fill.

(2) Operation

[1] Fill operation is performed to the specified bulk reservoir. For details on reservoir fill operation, refer to 1-3-11, “Bulk Reservoir Fill.”

[2] The bulk reservoir is filled until the upper level sensor in the bulk reservoir detects reagent, or there is no more reagent left in the external bulk reservoir.

[3] Upon completion of filling to the bulk reservoir, bulk reservoir fill ends.

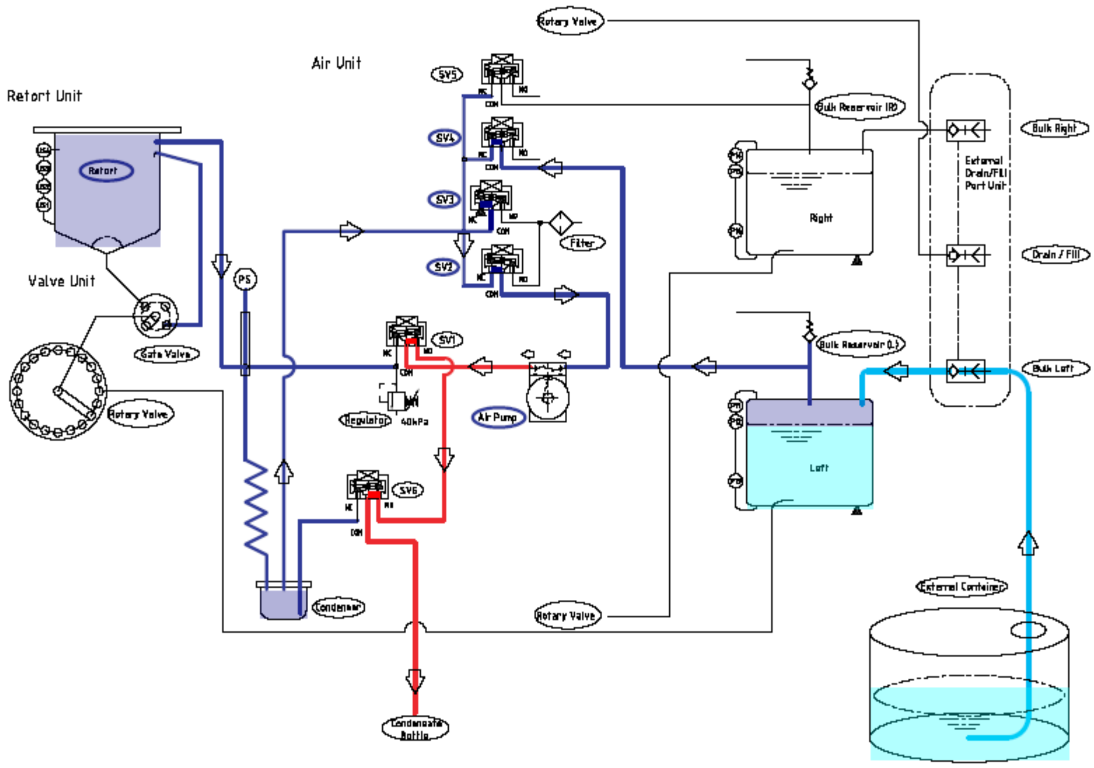
1-3-11 Bulk Reservoir Fill

1-3-11-1 Overview

There are two types of bulk reservoirs including the “Left Bulk Reservoir” (station 19) positioned on the left side of the system as viewed from the front, and the “Right Bulk Reservoir” (station 20) positioned on the right side of the system. The bulk reservoirs are used for the following purposes:

[1] Refill a station linked to a bulk reservoir when the reagent level in the station becomes low during tissue processing or retort cleaning.
[2] Refill reagent to the final station in a solution group when the station becomes empty after automatic transfer during tissue processing.
[3] Refill reagent to a station linked to a bulk reservoir during solution exchange.

Bulk reservoirs are filled using the “Bulk Reservoir Fill” function relating to solution exchange. When a bulk reservoir is filled, the retort lid must be closed although the retort is not filled. This is because the air circuit is also used during retort fill. In addition, three level sensors are installed in each bulk reservoir (HH level for overflow detection, H level indicating the full level, and L level indicating the lower level, from the top). When a bulk reservoir is filled, reagent is supplied to the H level.
Bulk reservoirs are filled from an external bulk reservoir connected to the dedicated external fill port for each bulk reservoir.
Since bulk reservoirs are not pressure containers, they must not be drained of reagent or pressurized.



1-3-11-2 Operation

[1] The gate valve is closed.
[2] The air pump is started and the solenoid valves SV2 and SV3 are turned ON to depressurize the retort. The minimum pressure to be achieved by depressurization is set to -27 kPa. The system confirms that the retort is depressurized within 1 minute.
[3] If depressurization could be maintained, the solenoid valve SV4 is turned ON if the “Left Bulk Reservoir” is filled. The solenoid valve SV5 is turned ON if the “Right Bulk Reservoir” is filled.
[4] When the solenoid valve SV4 or SV5 is turned ON, the retort pressure may sometimes rise temporarily. Accordingly, the system confirms that the retort is depressurized within 6 seconds to 1 minute (air is bled from the bulk reservoir in the first 5 seconds).
[5] If the retort could be depressurized after the solenoid valve SV4 or SV5 was turned ON, depressurization is maintained for up to 6 minutes until one of the following conditions is satisfied:
Condition 1) Reagent reached the H level sensor.
Condition 2) The retort returned to atmospheric pressure (= the external fill container became empty).
Condition 3) Reagent reached the HH level sensor (overflow).
If any of the above conditions is satisfied, pressure control is stopped immediately and the solenoid valve SV4 or SV5 is turned OFF.
[6] Filling of the bulk reservoir ends.
[7] If the retort could not be depressurized after 30 seconds in [2], the system determines that the air circuit is abnormal and aborts the fill operation to the bulk reservoir with an error generated (by registering “Error 242: The preset temperature is not achieved after 1 minute of depressurization when filling the left bulk reservoir (station 19)” in the case of the “Left Bulk Reservoir,” or “Error 252: The preset temperature is not achieved after 1 minute of depressurization when filling the right bulk reservoir (station 20)” in the case of the “Right Bulk Reservoir”).
[8] If the retort could not be depressurized after 1 minute in [4], the system determines that the external bulk reservoir is empty and aborts the fill operation to the bulk reservoir with an error generated (by registering “Error 243: The external bulk reservoir was empty when filling the left bulk reservoir (station 19)” in the case of the “Left Bulk Reservoir” or “Error 253: The external bulk reservoir was empty when filling the right bulk reservoir (station 20)” in the case of the “Right Bulk Reservoir”).
[9] If the HH level sensor turned ON in [5], pressure control is stopped immediately and the solenoid valve SV4 or SV5 is turned OFF. The system determines that the bulk reservoir overflowed and registers an error (“Error 240: An overflow occurred while filling the left bulk reservoir (station 19)” in the case of the “Left Bulk Reservoir” or “Error 250: An overflow occurred while filling the right bulk reservoir (station 20)” in the case of the “Right Bulk Reservoir”).
[10] If the retort still remains depressurized after 6 minutes in [5], pressure control is stopped and the solenoid valve SV4 or SV5 is turned OFF. The system determines that a fill error occurred in the bulk reservoir and aborts the fill operation to the bulk reservoir with an error generated (by registering “Error 241: Filling of the left bulk reservoir (station 19) does not end after 6 minutes” in the case of the “Left Bulk Reservoir” or “Error 251: Filling of the right bulk reservoir (station 20) does not end after 6 minutes” in the case of the “Right Bulk Reservoir”).
[11] If the retort returned to atmospheric pressure in [5], pressure control is stopped and the solenoid valve SV4 or SV5 is turned OFF. The system determines that the external bulk reservoir from which the bulk reservoir is filled became empty and aborts the fill operation to the bulk reservoir with an error generated (by registering “Error 244: Insufficient reagent in the external bulk reservoir when filling the left bulk reservoir (station 19)” in the case of the “Left Bulk Reservoir” or “Error 254: Insufficient reagent in the external bulk reservoir when filling the right bulk reservoir (station 20)” in the case of the “Right Bulk Reservoir”).
[12] If an error occurred while the gate valve was moving in [1], a gate valve recovery operation is performed. If the gate valve recovery operation was successful, the fill operation to the bulk reservoir is continued. If the gate valve recovery operation failed, the fill operation to the bulk reservoir is aborted with an error generated.

For details on the reservoir fill operation, refer to 1-4, “Flowchart.”

1-3-12 Drain from Condenser to Condensate Bottle

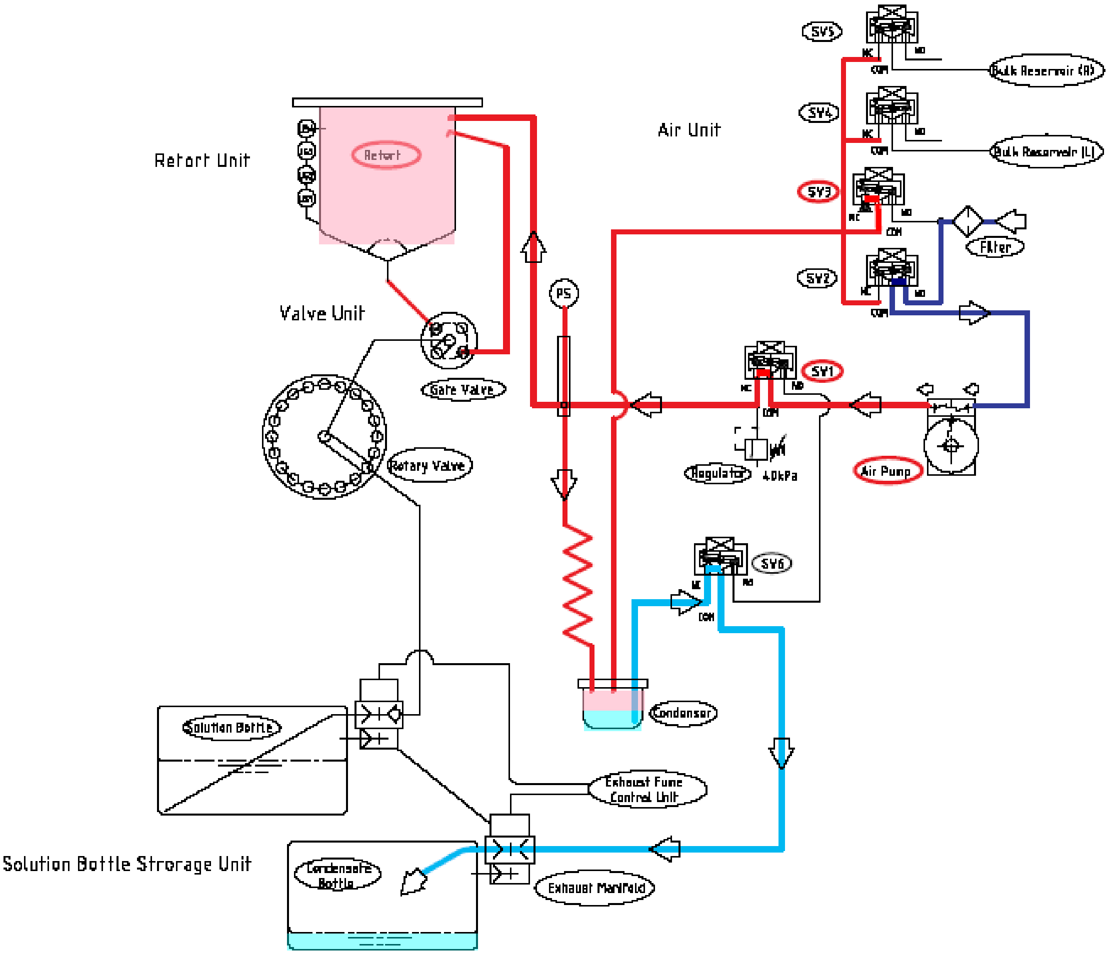
1-3-12-1 Overview

The operation to drain fluid collected in the condenser to the condensate bottle is called “Drain from Condenser to Condensate Bottle.” The “Drain from Condenser to Condensate Bottle” operation is performed automatically at the timings specified below. It can also be performed manually by service personnel:

[1] If the P/V cycle is implemented while the retort or valve is heated as part of processing at a solution station (any one of stations 1 to 10) during tissue processing, the condenser will be drained when the processing at the station ends.

[2] If continuous mixing is performed for 10 minutes or longer while the retort or valve is heated as part of processing at a solution station (any one of stations 1 to 10), without implementing the P/V cycle, the condenser will be drained when the processing at the station ends.

[3] The condenser will be drained upon completion of the first pumping-in of cleaning alcohol for retort cleaning.



1-3-11-2 Operation

[1] The gate valve is closed.
[2] The air pump is started and the solenoid valves SV1 and SV3 are turned ON to pressurize the retort. The pressure to be achieved by pressurization is set to 34 kPa. The system confirms that the retort pressure becomes positive (to 13 kPa or above) within 1 minute.
[3] The SV6 is turned ON and waste fluid in the condenser is drained to the condensate bottle.
[4] Upon detection of atmospheric pressure in the retort or elapse of 1 minute, pressure control is stopped and the SV6 is turned OFF, thereby ending the “Drain from Condenser to Condensate Bottle” operation.
[5] If the retort could not be pressurized after 1 minute in [2], the system stops pressure control and aborts the drain operation from the condenser with an error generated (by registering “Error 230: The preset pressure is not reached after 1 minute of pressurization with the gate valve closed during condenser drain”).
[6] If the retort did not return to atmospheric pressure after 1 minute in [4], the system stops pressure control and aborts the drain operation from the condenser with an error generated (by registering “Error 231: Draining does not end after 1 minute of pressurization during condenser drain”).
[7] If the retort lid opened during pressurization, the system immediately aborts the “Drain from Condenser to Condensate Bottle” operation with an error generated (by registering “Error 341: The retort lid sensor generated an error”).
[8] If the retort lid cannot be locked during pressurization, the system immediately aborts the “Drain from Condenser to Condensate Bottle” operation with an error generated (by registering “Error 342: The retort lid lock sensor generated an error”).
[9] If an error occurred while the gate valve was moving in [1], a gate valve recovery operation is performed. If the gate valve recovery operation was successful, the drain operation from the condenser is continued. If the gate valve recovery operation failed, the drain operation from the condenser is aborted.
[10] If an air pump error occurred during operation, the system registers an error (Error 70: The air pump generated an error”) and aborts the “Drain from Condenser to Condensate Bottle” operation with an error generated. If the gate valve is at a position other than the closed position, the gate valve moves to the closed position.

For details on the “Drain from Condenser to Condensate Bottle” operation, refer to 1-4, “Flowchart.”

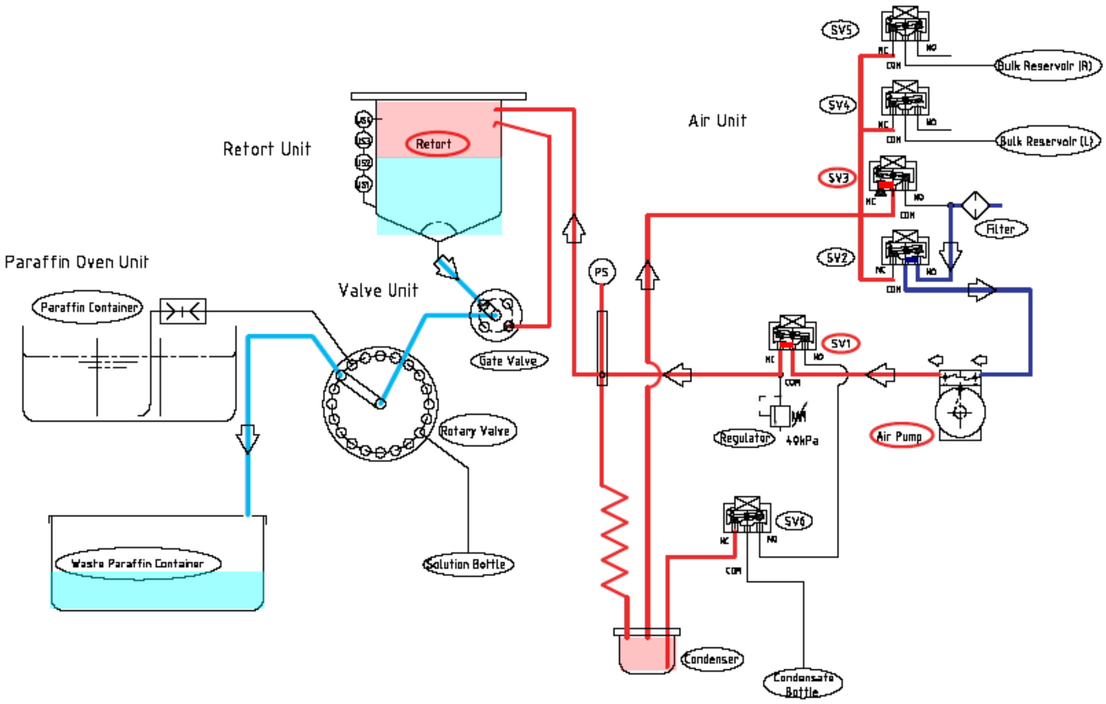
1-3-13 Paraffin Drain to Wax Drain Container

1-3-13-1 Overview

The wax drain container is the stainless container positioned second from the right in the top level of the tank rack. The wax drain container is used for the following purposes:

[1] Used as a destination to drain paraffin to from station 11 at the time of “automatic transfer” of paraffin during tissue processing or solution exchange.
[2] Used as a destination to drain a desired paraffin station to during “paraffin drain” performed as part of solution exchange.

The wax drain container is handled as a paraffin station for the purpose of control. Accordingly, the retort and valve must be heated to the preset temperatures when draining to the wax drain container. Take note that no fill mechanism is available for the wax drain container, meaning that any attempt of manual pumping-in will generate an error (Error 14: Insufficient (empty) reagent was detected during pumping-in”) and pumping-in will be aborted with an error generated.
If the wax drain container is not set in the system correctly and thus the sensor LS1 is not detecting the wax drain container, draining to the wax drain container is prohibited.



1-3-13-2 Operation

[1] The current station switches to the wax drain container.
[2] The gate valve is closed.
[3] The air pump is started and the solenoid valves SV1 and SV3 are turned ON to pressurize the retort. The pressure to be achieved by pressurization is set to 34 kPa. The system confirms that the retort is pressurized (to 13 kPa or above) within 1 minute.
[4] If the retort could be pressurized, the gate valve on the drain side is opened.
[5] Pressurization is maintained for up to 6 minutes until the retort pressure drops. Once the retort pressure drops to atmospheric pressure, the air pump is stopped and all solenoid valves are turned OFF.
[6] The gate valve is closed to end the “Paraffin Drain to Wax Drain Container” operation.
[7] If the system determines in [1] that no wax paraffin container is set in the system (because the sensor LS1 is not ON), it aborts the “Paraffin Drain to Wax Drain Container” operation with an error generated (by registering “Error 350: No wax drain container is set at the time of paraffin drain or automatic paraffin transfer”).
[8] If the retort could not be pressurized after 1 minute in [3], pressure control is stopped temporarily. The system registers an error (“Error 20: The preset pressure is not reached after 1 minute of pressurization with the gate valve closed”) and then attempts the operation in step [3] for up to three times (one normal operation + two retries). If the retort could not be pressured after two retries, the system determines that air is leaking and aborts the “Paraffin Drain to Wax Drain Container” operation with an error generated (by registering “Error 21: The preset pressure is not reached after repeating a 1-minute pressurization three times with the gate valve closed”).
[9] If the system determines in [5] that no wax paraffin container is set in the system (because the sensor LS1 is not ON), it aborts the “Paraffin Drain to Wax Drain Container” operation with an error generated (by registering “Error 350: No wax drain container is set at the time of paraffin drain or automatic paraffin transfer”).
[10] If the retort remains pressurized after 6 minutes in [5], pressure control is stopped temporarily. The system registers an error (“Error 22: Pumping-out operation does not end after 6 minutes”) and then repeats steps [2] to [5]. If the retort still remains pressurized, the system determines that the tubing is clogged or reagent bottle has detached and aborts the “Paraffin Drain to Wax Drain Container” operation with an error generated (by registering “Error 23: Pumping-out operation does not end after two attempts”).
Take note that if this error is detected, it may simply be that draining is taking a longer time due to clogged tubing. If this error was detected during tissue processing, therefore, check the level sensors. If the safeguarded level is not detected, fill to the safeguarded level.
[11] If a level sensor turns ON although the controls in steps [2] to [5] have been successful, the system recognizes a false detection by the level sensor and registers an error in the level sensor detecting fluid.

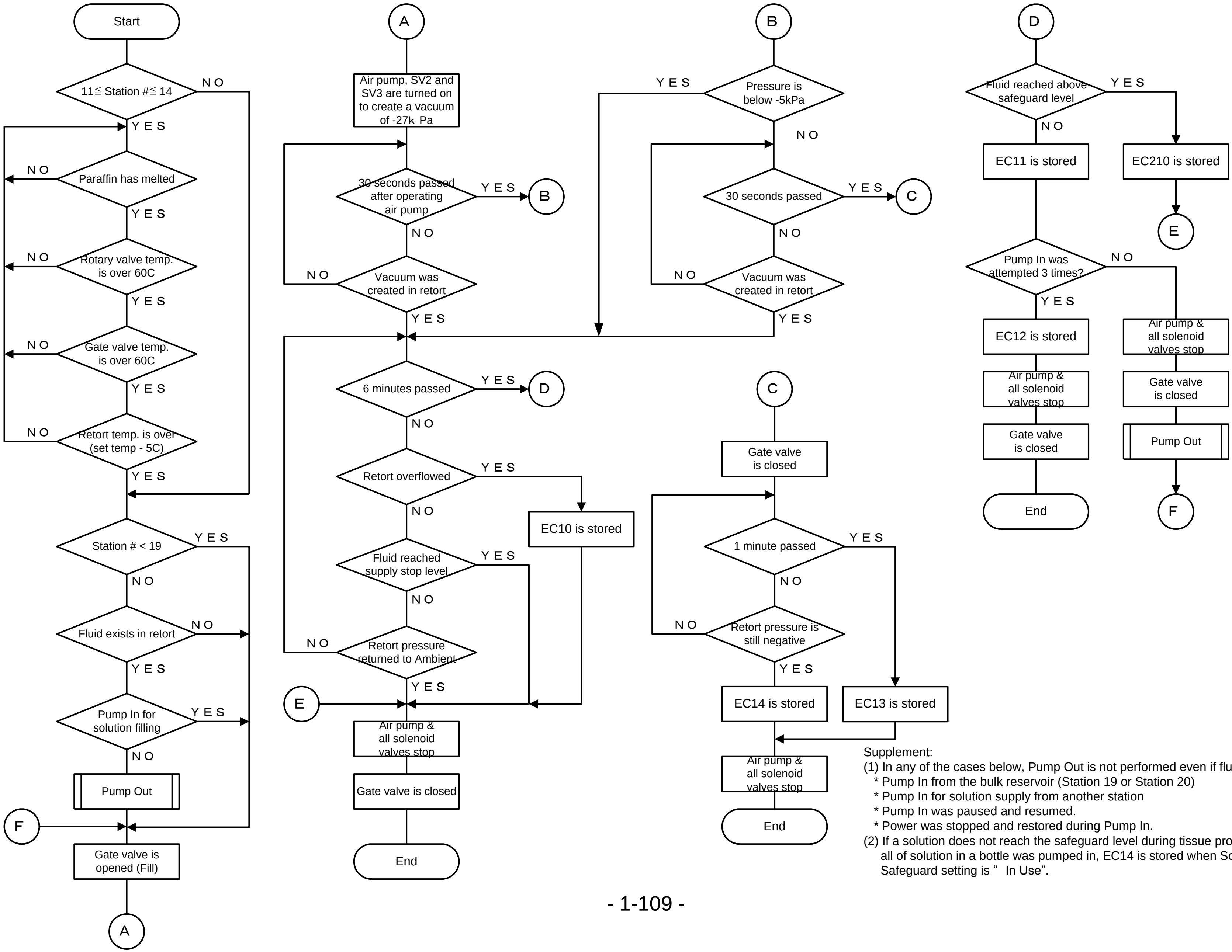
When the overflow sensor turned ON:	Error 311: Overflow sensor error
When level sensor 1 turned ON:	Error 312: Level sensor 1 (2.7 L) error
When level sensor 2 turned ON:	Error 313: Level sensor 1 (3.5 L) error
When level sensor 3 turned ON:	Error 314: Level sensor 1 (4.2 L) error

[12] If the oven door was opened while the retort was pressurized and if the drain destination is a paraffin station (any one of stations 11 to 15), the system cancels the “Paraffin Drain to Wax Drain Container” operation (by registering “Error 919: The paraffin oven door was opened while draining to a paraffin station”).
[13] If the retort lid opened during the “Paraffin Drain to Wax Drain Container” operation, the system immediately aborts the “Paraffin Drain to Wax Drain Container” operation with an error generated (by registering “Error 341: The retort lid sensor generated an error”).
[14] If the retort lid cannot be locked during the “Paraffin Drain to Wax Drain Container” operation, the system immediately aborts the “Paraffin Drain to Wax Drain Container” operation with an error generated (by registering “Error 342: The retort lid lock sensor generated an error”).
[15] If an air pump error occurred during pressurization, the system registers an error (Error 70: The air pump generated an error”) and aborts the “Paraffin Drain to Wax Drain Container” operation with an error generated. If the gate valve is at a position other than the closed position, the gate valve moves to the closed position.

For details on the “Paraffin Drain to Wax Drain Container” operation, refer to 1-4, “Flowchart.”

1-4 Flowchart

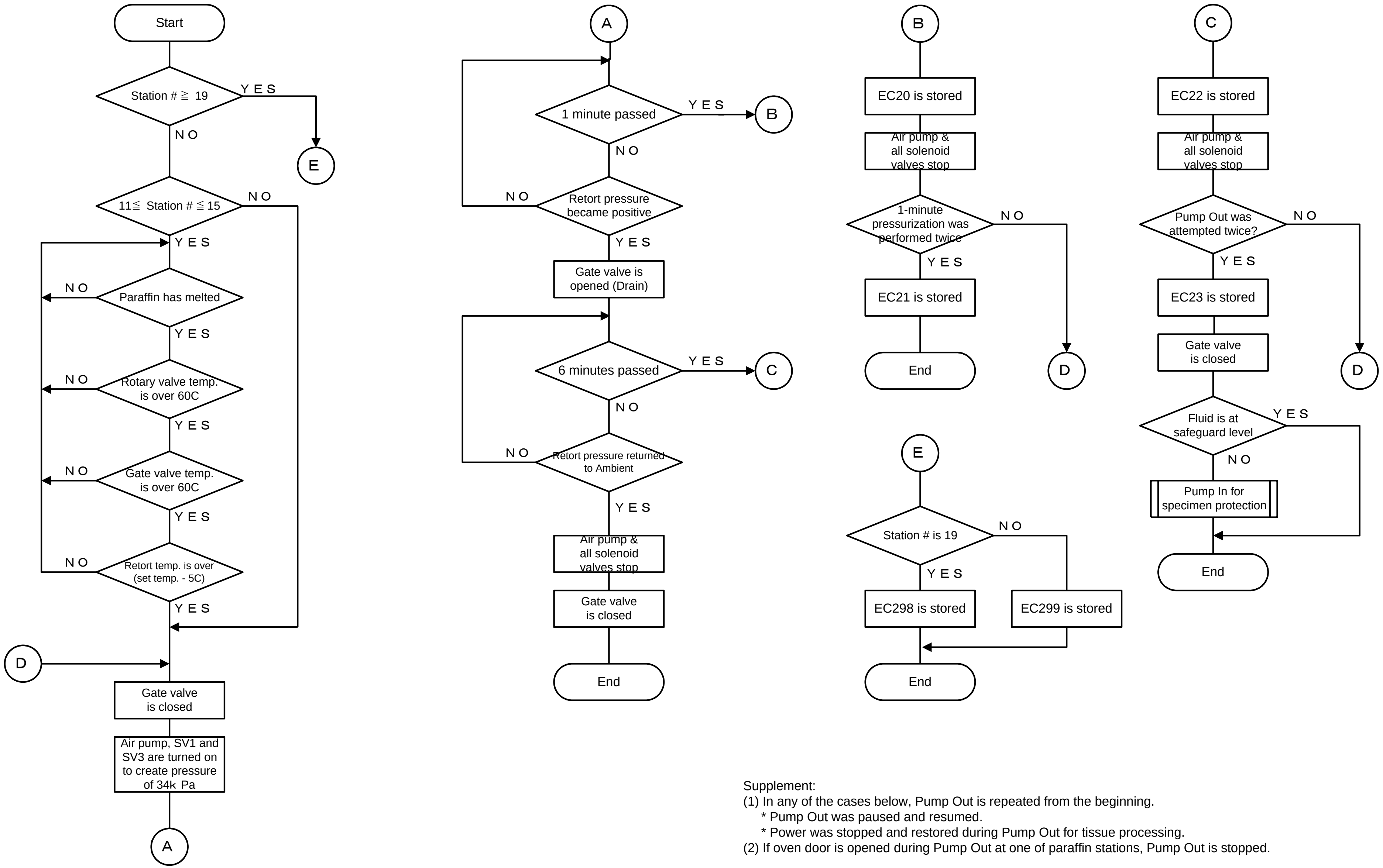
Pump In



Supplement:
(1) In any of the cases below, Pump Out is not performed even if fluid is in retort.
- Pump In from the bulk reservoir (Station 19 or Station 20)
- Pump In for solution supply from another station
- Pump In was paused and resumed.
- Power was stopped and restored during Pump In.

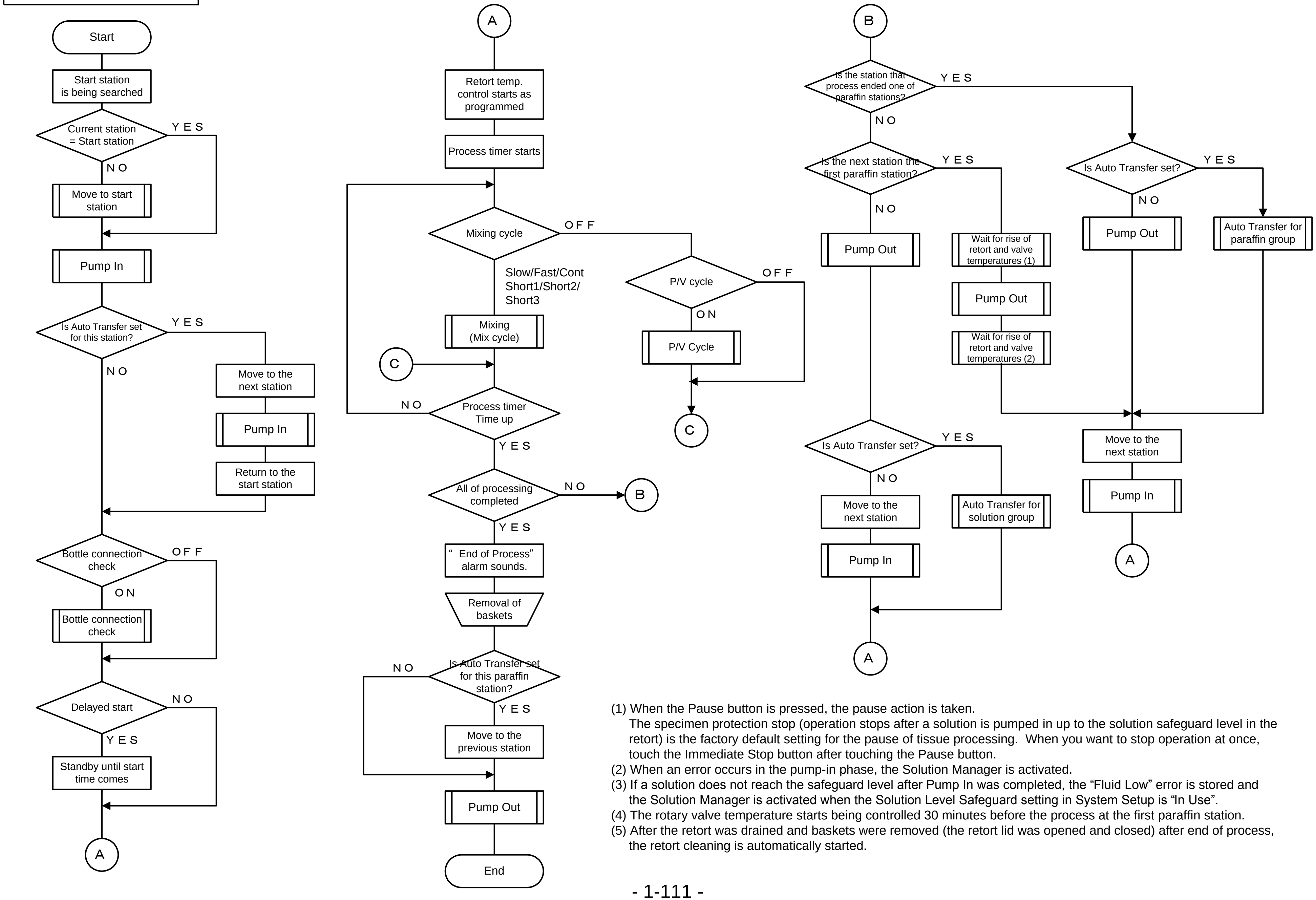
(2) If a solution does not reach the safeguard level during tissue processing after all of solution in a bottle was pumped in, EC14 is stored when Solution Level Safeguard setting is " In Use".

Pump Out



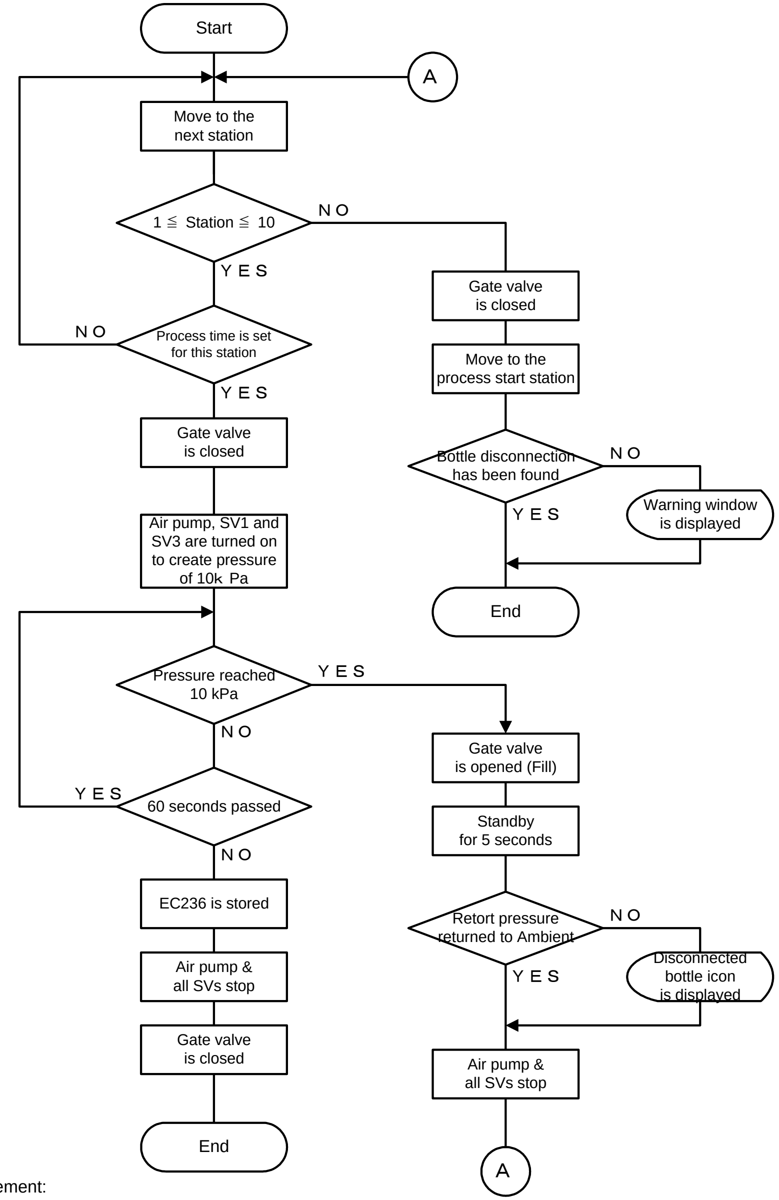
Supplement:
(1) In any of the cases below, Pump Out is repeated from the beginning.
* Pump Out was paused and resumed.
* Power was stopped and restored during Pump Out for tissue processing.
(2) If oven door is opened during Pump Out at one of paraffin stations, Pump Out is stopped.

Tissue Processing



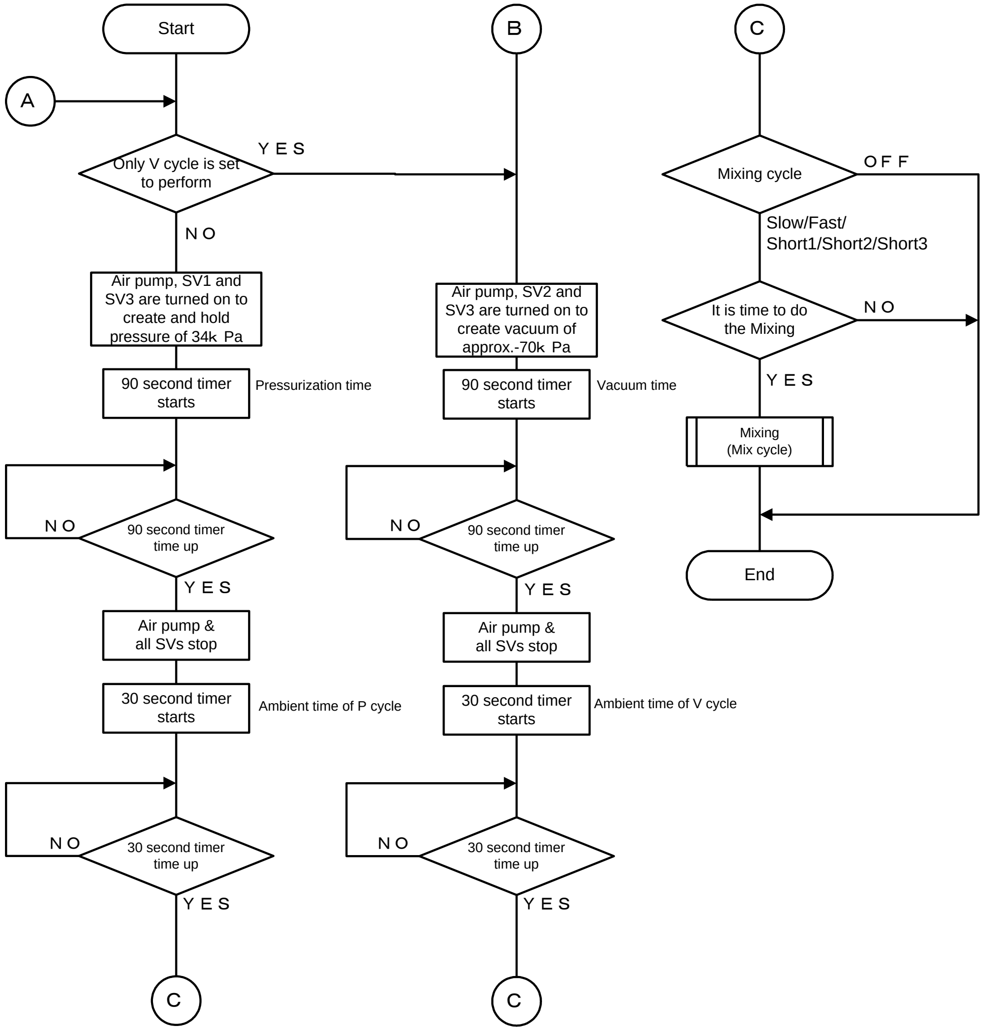
(1) When the Pause button is pressed, the pause action is taken.
The specimen protection stop (operation stops after a solution is pumped in up to the solution safeguard level in the retort) is the factory default setting for the pause of tissue processing. When you want to stop operation at once, touch the Immediate Stop button after touching the Pause button.
(2) When an error occurs in the pump-in phase, the Solution Manager is activated.
(3) If a solution does not reach the safeguard level after Pump In was completed, the "Fluid Low" error is stored and the Solution Manager is activated when the Solution Level Safeguard setting in System Setup is "In Use".
(4) The rotary valve temperature starts being controlled 30 minutes before the process at the first paraffin station.
(5) After the retort was drained and baskets were removed (the retort lid was opened and closed) after end of process, the retort cleaning is automatically started.

Bottle Connection Check



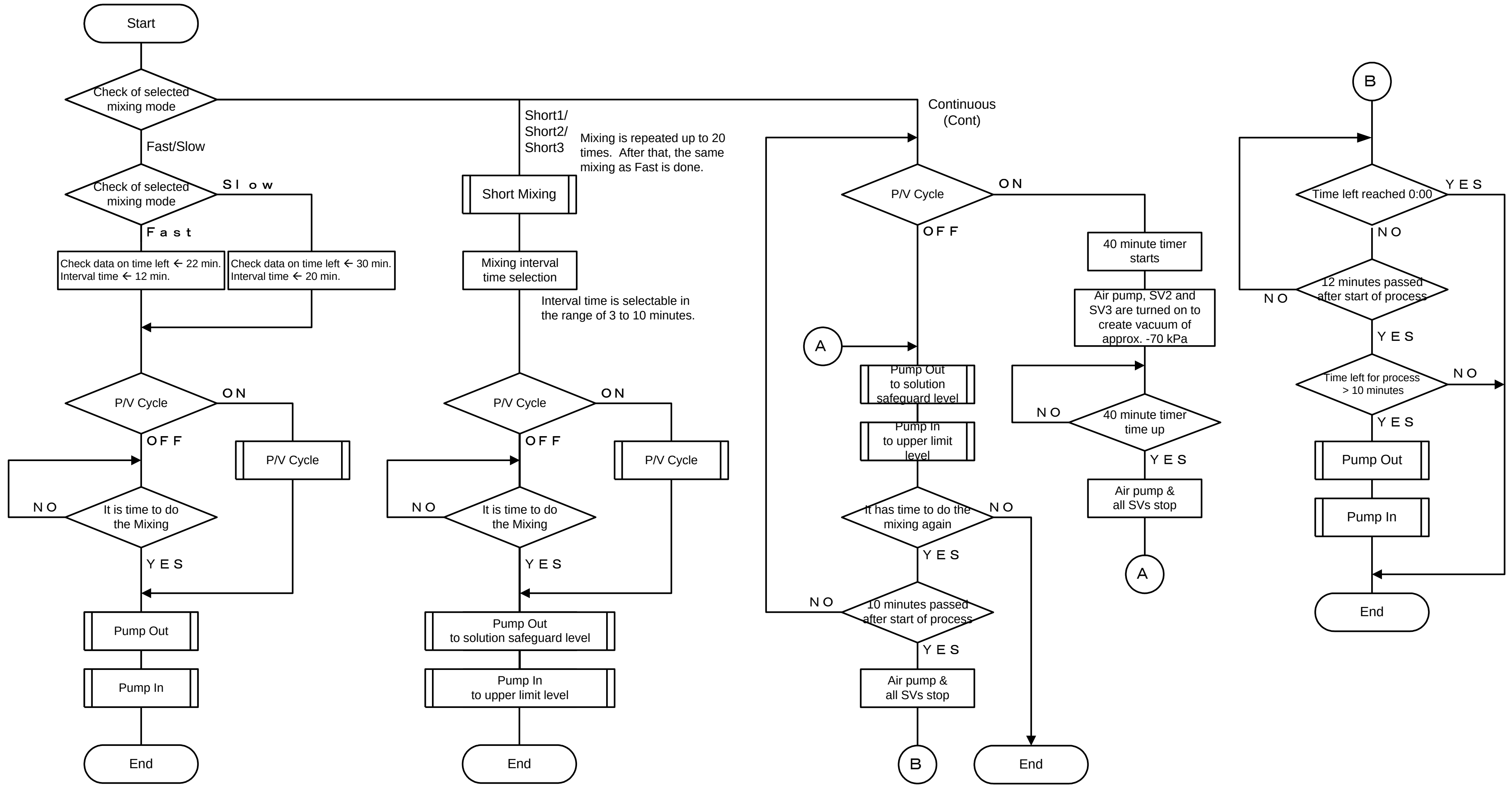
Supplement:
(1) When a solution bottle is found disconnected, the “disconnected bottle” icon is displayed on the appropriate station button on the screen. After all solution bottles are checked, the warning window is displayed and the system is put into standby. By pressing the Resume button in the window, the connection check is again performed on all bottles

P/V Cycle

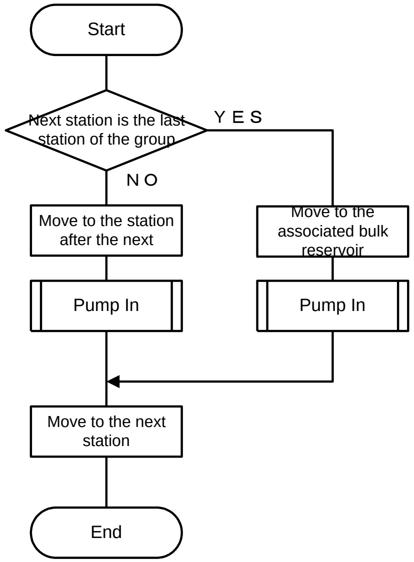


Supplement:
(1) When one of P/V 1 - P/V3 is selected, the pressure time of P cycle and ambient time are user-selectable in the range of 30 seconds to 180 seconds.
(2) When one of P/V 1 - P/V 3 or V1 - V3 is selected, the vacuum of V cycle is user-selectable from -27 kPa, -37 kPa and -70 kPa. Vacuum is performed at the selected pressure value.
(3) When one of P/V 1 - P/V 3 or V1 - V3 is selected, the vacuum time of V cycle and ambient time are user-selectable in the range of 30 seconds to 180 seconds.

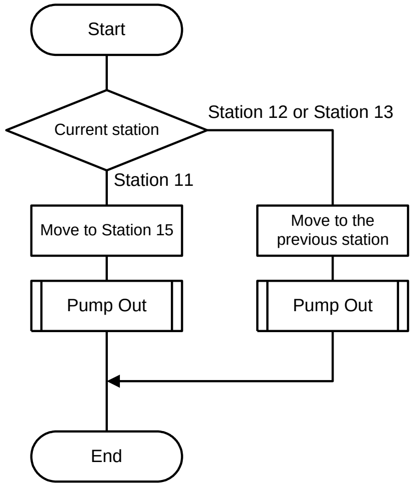
Mixing (Mix Cycle)



Auto Transfer of solution group during processing

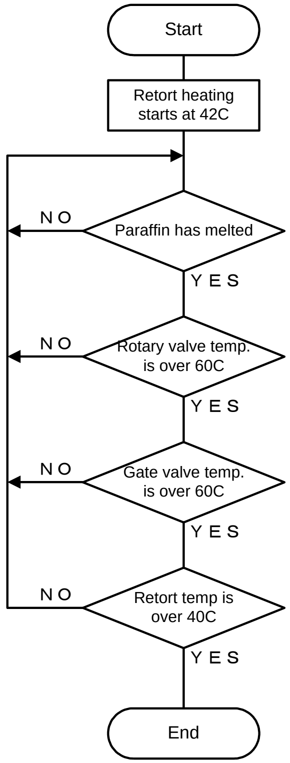


Auto Transfer of paraffin group during processing



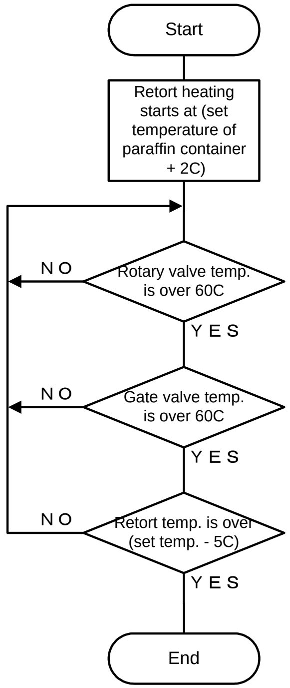
Supplement:
(1) Paraffin in Station 14 is rotated at drain of the retort after end of process.

Standby for temperature rise of retort and valves (1)

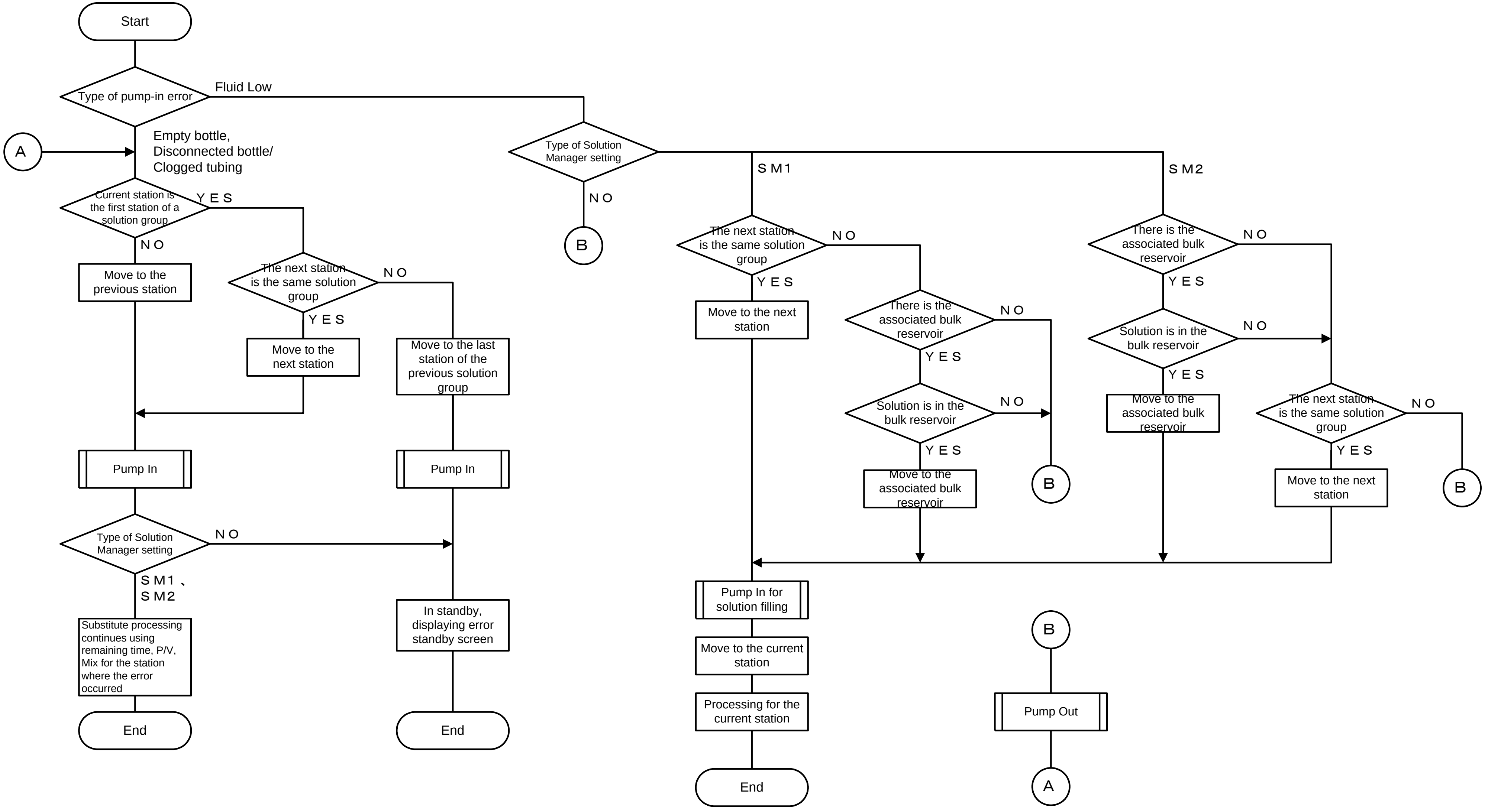


Supplement:
(1) The gate valve and rotary valve start being heated at 70C 30 minutes before.
(2) The front retort heater starts working at 40C 20 minutes before to heat retort level sensors.
(3) The fill/drain pipe starts being heated at 70C 15 minutes before.

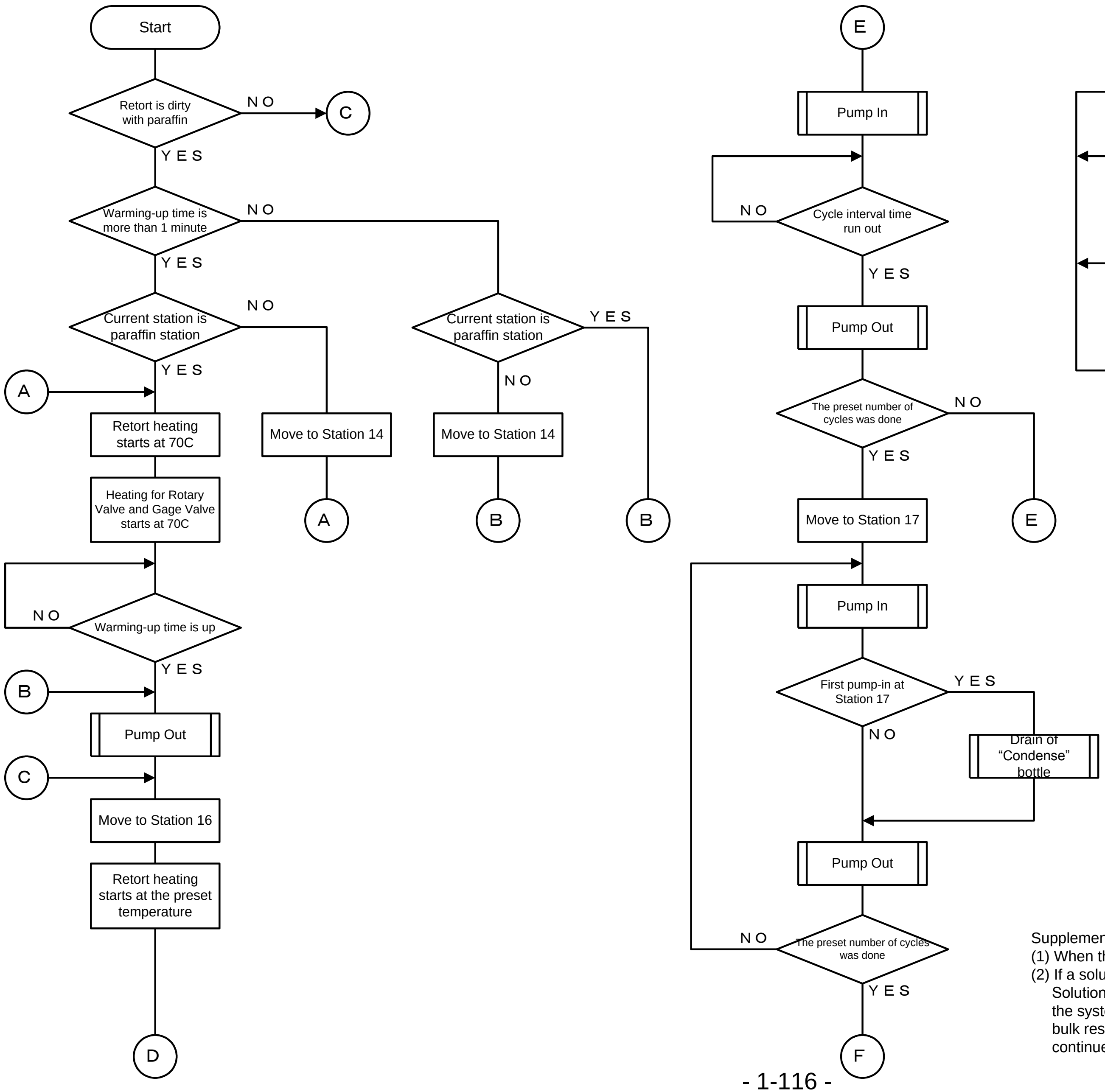
Standby for temperature rise of retort and valves (2)

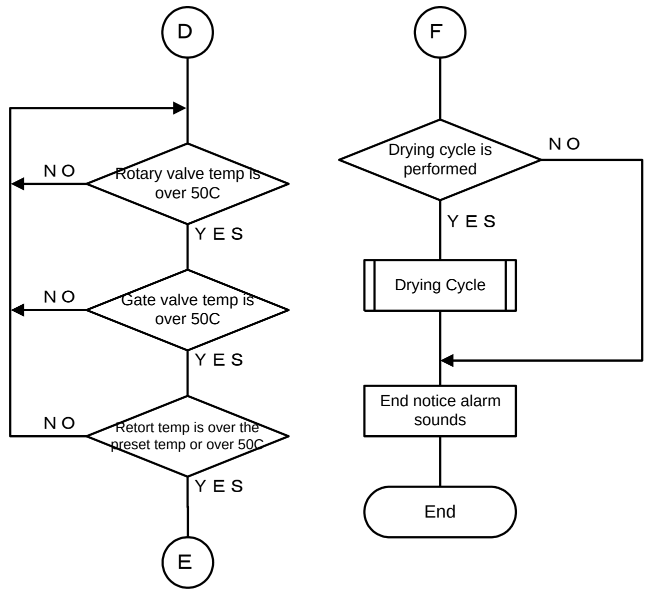


Solution Manager



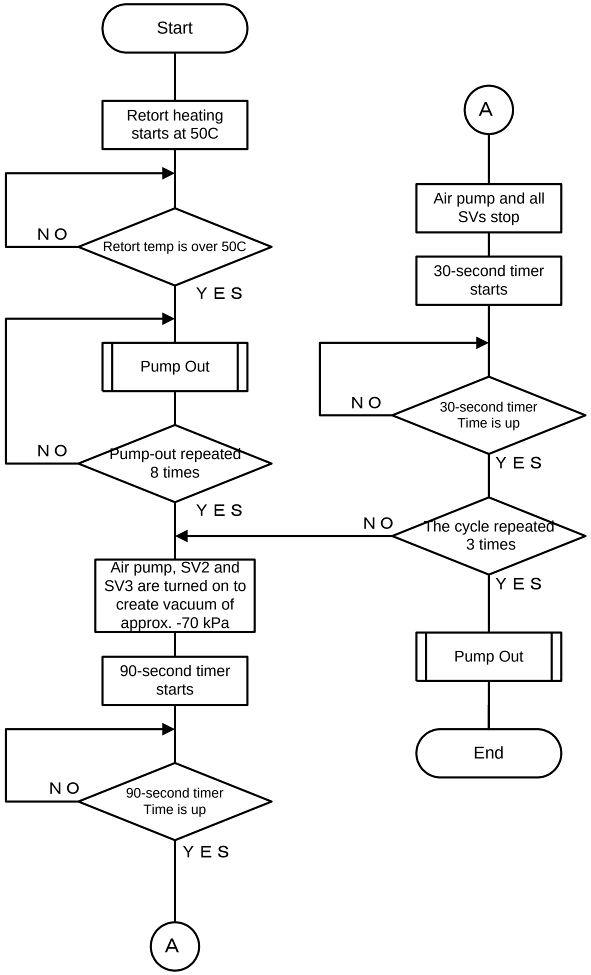
Retort Cleaning



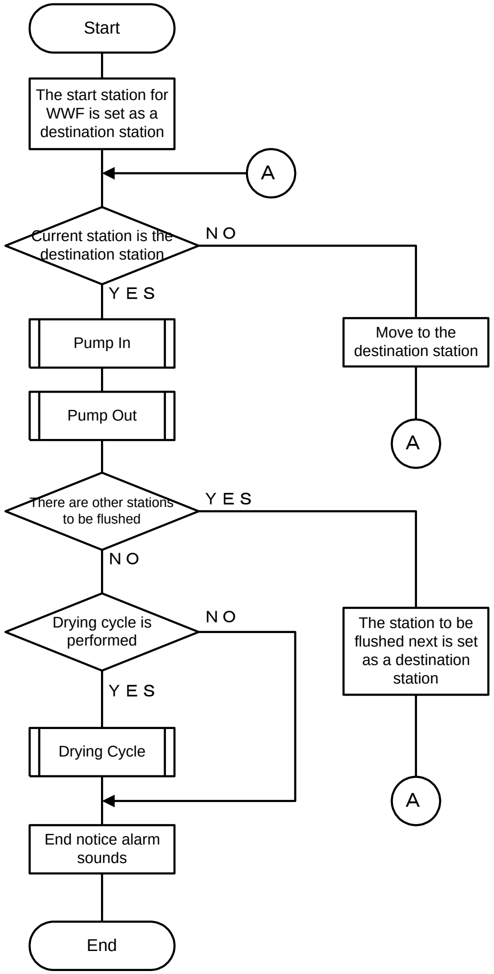


Supplement:
(1) When the Pause button is pressed during warming-up, the warming-up continues.
(2) If a solution does not reach the safeguard level at end of pump-in when the Solution Level Safeguard setting is “In Use” and the Solution Manager is “ON”, the system judges a solution is low, and a solution is supplied from the associated bulk reservoir. If there is not the associated bulk reservoir, the retort cleaning continues as it is.

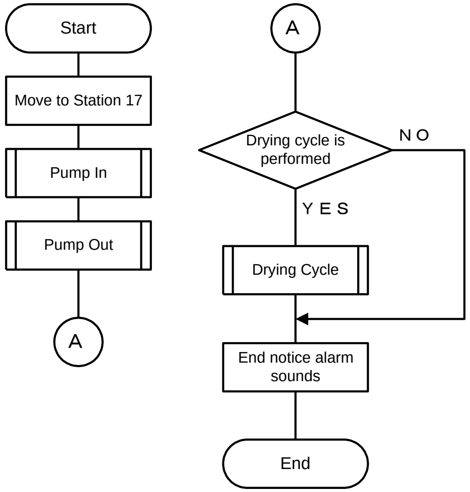
Drying Cycle



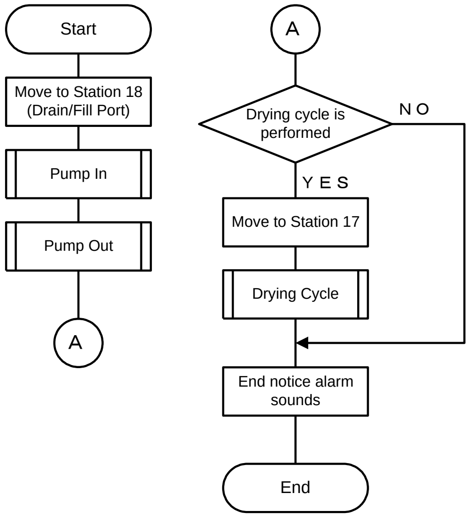
Warm Water Flush



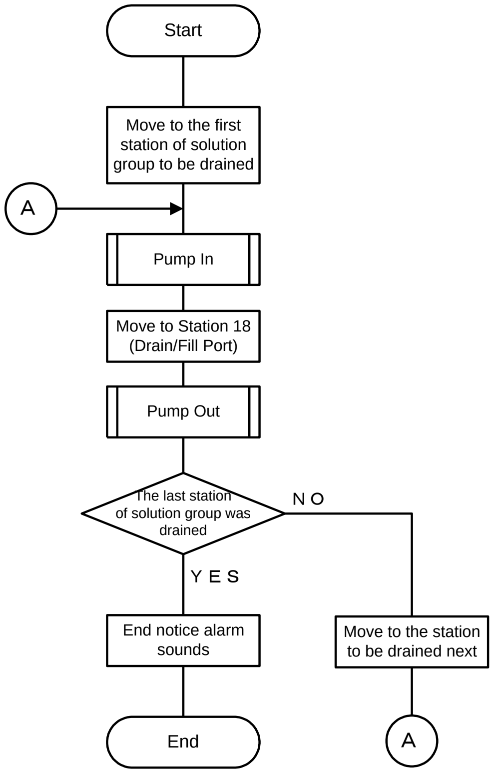
Rinse



Drain/Fill Port Rinse

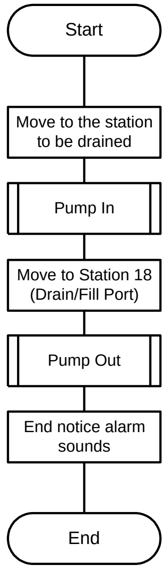


External Drain of Solution Group



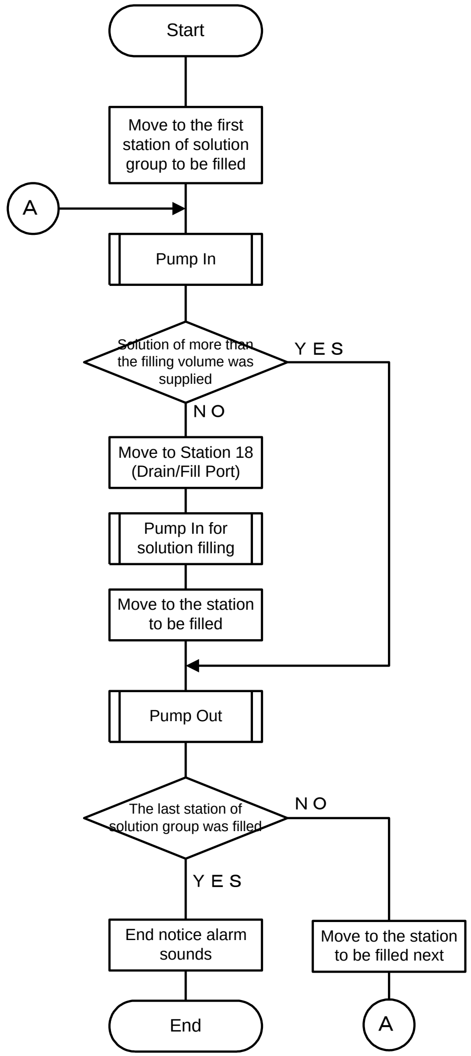
Supplement:
(1) When the Rinse has been selected to perform after completion of external drain, the Rinse is automatically started 30 seconds after completion of the process.

External Drain of Single Solution Station



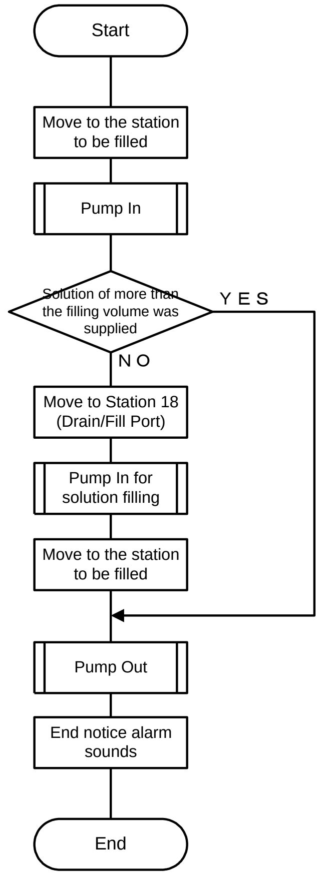
Supplement:
(1) When the clean xylene station (Sta. 16) is drained, the retort is heated at the preset temp. for the oven and the gate valve and rotary valve are heated at 70C. However, the process does not wait for temperature rise.
(2) When the Rinse has been selected to perform after completion of external drain, the Rinse is automatically started 30 seconds after completion of the process.

External Fill of Solution Group



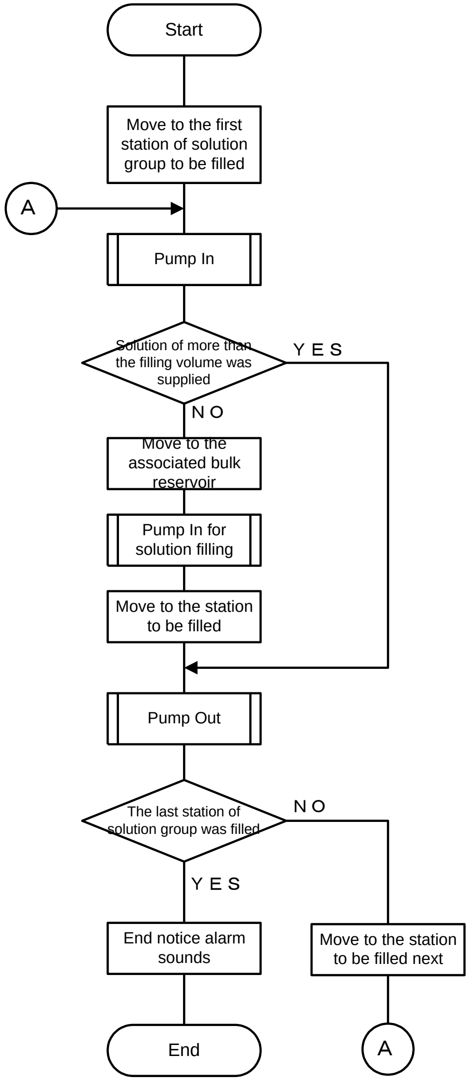
Supplement:
(1) When the Rinse has been selected to perform after completion of external fill, the Rinse is automatically started 30 seconds after completion of the process.

External Fill of Single Solution Station



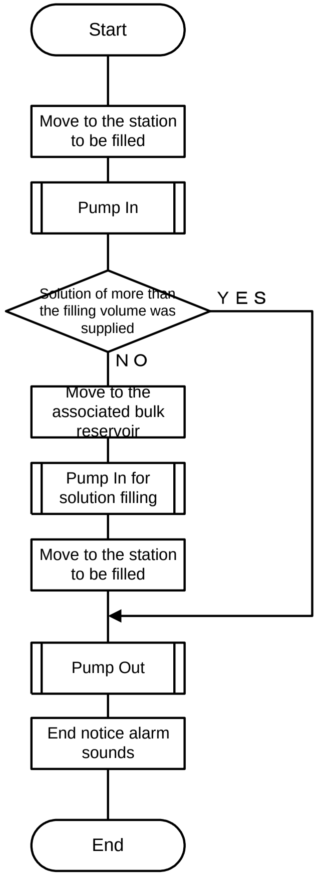
Supplement:
(1) When the clean xylene station (Sta. 16) is filled, the retort is heated at the preset temp. for the oven and the gate valve and rotary valve are heated at 70C. However, the process does not wait for temperature rise.
(2) When the Rinse has been selected to perform after completion of external fill, the Rinse is automatically started 30 seconds after completion of the process.

Fill from Bulk Reservoir to Solution Group



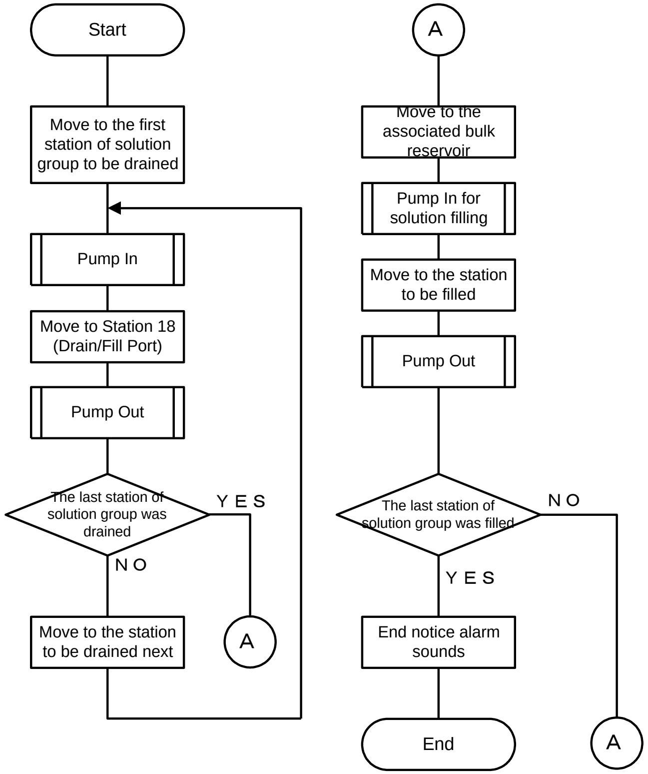
Supplement:
(1) When the Rinse has been selected to perform after completion of fill from bulk reservoir, the Rinse is automatically started 30 seconds after completion of the process.

Fill from Bulk Reservoir to Single Solution Station



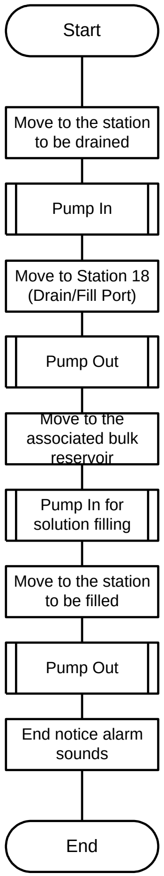
Supplement:
(1) When the clean xylene station (Sta. 16) is filled, the retort is heated at the preset temp. for the oven and the gate valve and rotary valve are heated at 70C. However, the process does not wait for temperature rise.
(2) When the Rinse has been selected to perform after completion of fill from bulk reservoir, the Rinse is automatically started 30 seconds after completion of the process.

Drain & Fill from Bulk Reservoir to Solution Group



Supplement:
(1) When the Rinse has been selected to perform after completion of drain & fill from bulk reservoir, the Rinse is automatically started 30 seconds after completion of the process.。

Drain & Fill from Bulk Reservoir to Single Solution Station

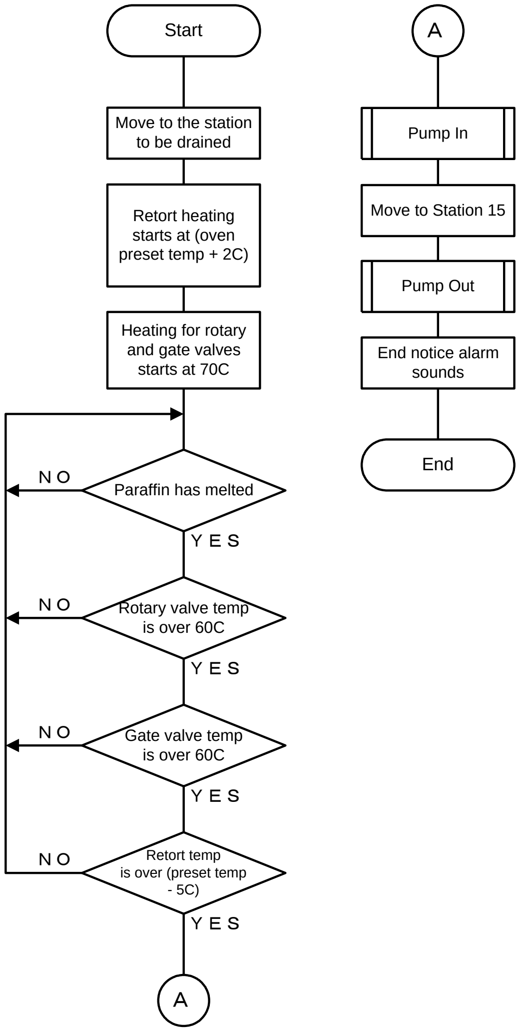


Supplement:

(1) When the clean xylene station (Sta. 16) is drained and filled, the retort is heated at the preset temp. for the oven and the gate valve and rotary valve are heated at 70C. However, the process does not wait for temperature rise.

(2) When the Rinse has been selected to perform after completion of drain & fill from bulk reservoir, the Rinse is automatically started 30 seconds after completion of the process.

Paraffin Drain



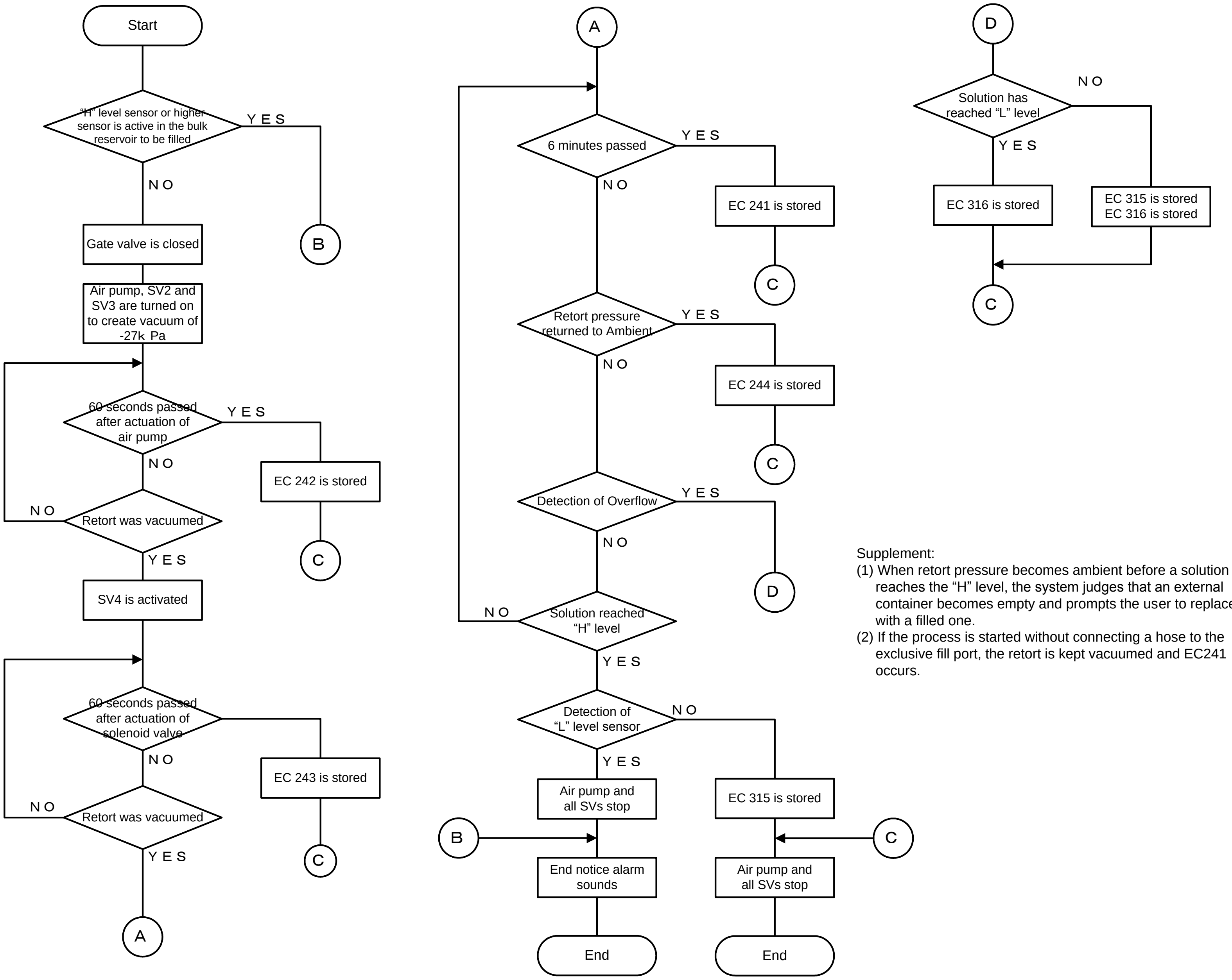
Supplement:

(1) A maximum volume of paraffin to be drained from Station 14 is 4.2 liters.

(2) When paraffin is drained to the wax drain container (Station 15), the red LED is lit to inform that paraffin is present in the wax drain container.

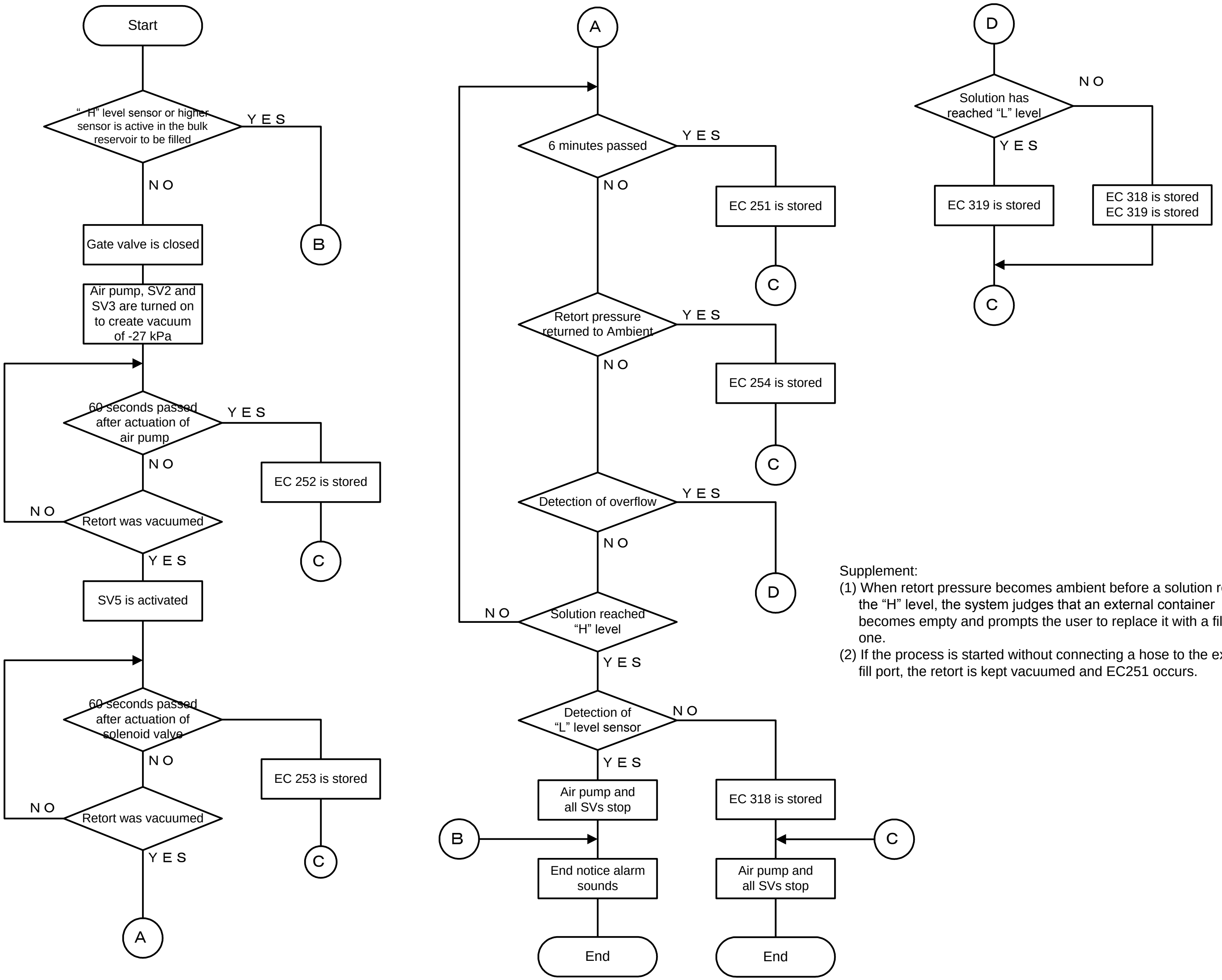
(3) When the Clean Retort process has been selected to perform after completion of paraffin drain, the Clean Retort process is automatically started 30 seconds after completion of the process.

Tank Fill to Left Bulk Reservoir (Station 19)



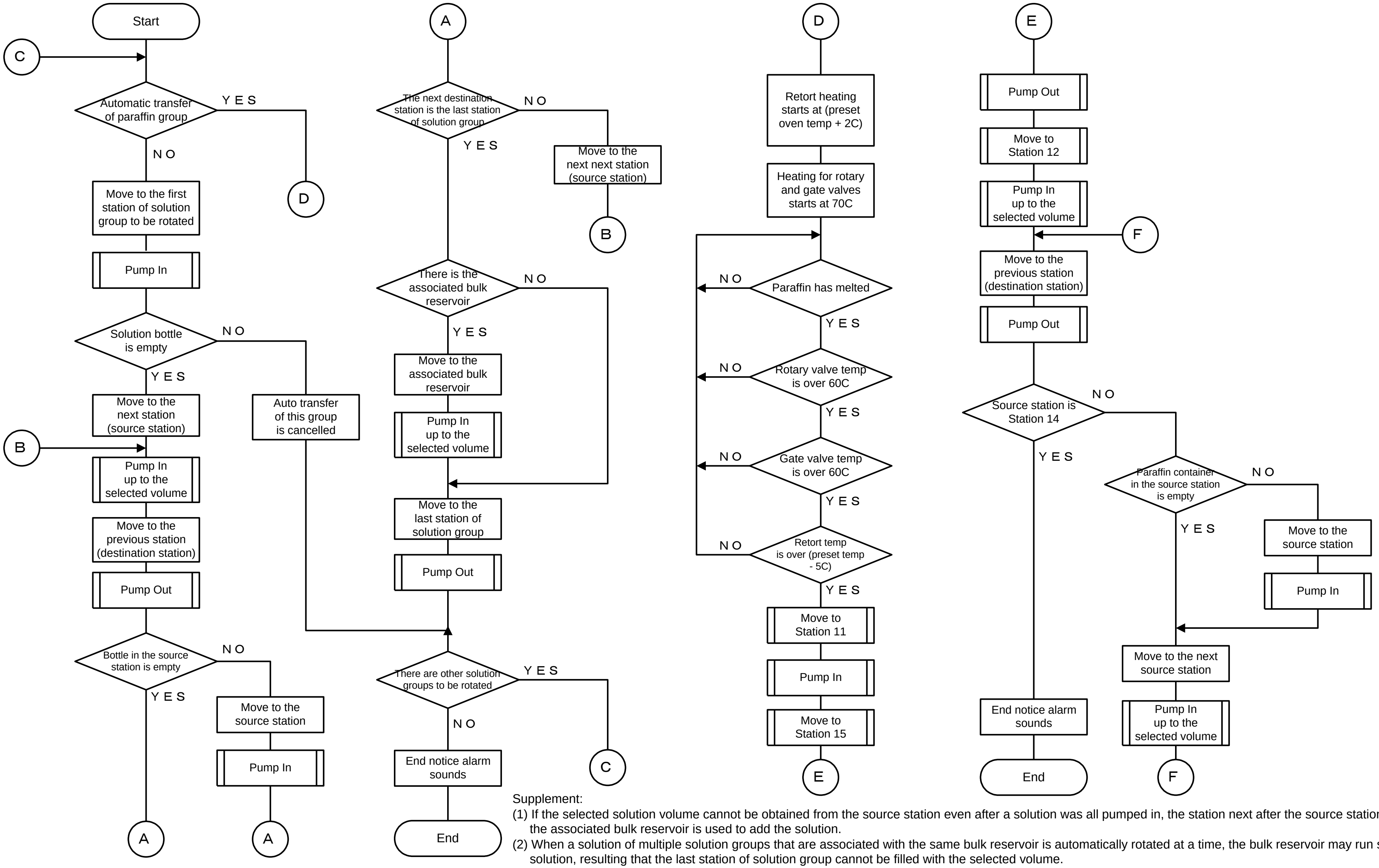
Supplement:
(1) When retort pressure becomes ambient before a solution reaches the "H" level, the system judges that an external container becomes empty and prompts the user to replace it with a filled one.
(2) If the process is started without connecting a hose to the exclusive fill port, the retort is kept vacuumed and EC241 occurs.

Tank Fill to Right Bulk Reservoir (Station 20)



Supplement:
(1) When retort pressure becomes ambient before a solution reaches the "H" level, the system judges that an external container becomes empty and prompts the user to replace it with a filled one.
(2) If the process is started without connecting a hose to the exclusive fill port, the retort is kept vacuumed and EC251 occurs.

Automatic Solution Transfer under Solution Exchange



Supplement:
(1) If the selected solution volume cannot be obtained from the source station even after a solution was all pumped in, the station next after the source station or the associated bulk reservoir is used to add the solution.
(2) When a solution of multiple solution groups that are associated with the same bulk reservoir is automatically rotated at a time, the bulk reservoir may run short of solution, resulting that the last station of solution group cannot be filled with the selected volume.
(3) When paraffin is drained to the wax drain container (Station 15), the red LED is lit to inform that paraffin is present in the wax drain container.
(4) When the Rinse has been selected to perform after completion of automatic transfer of solution, the Rinse is automatically started 30 seconds after completion of the process.
(5) When the Clean Retort process has been selected to perform after completion of automatic transfer of solution, the Clean Retort process is automatically started 30 seconds after completion of the process.

Chapter 2 Service Operations

2-1 Software/Data Update

Explain the software update, data backup and update operating methods.

2-1-1 Software Update

Perform based on the following procedures for software update.

(1) Preparation

1) Copy the software to be updated（VIP6GUT.BIN）to the root directory of USB flush memory attached to the instrument.

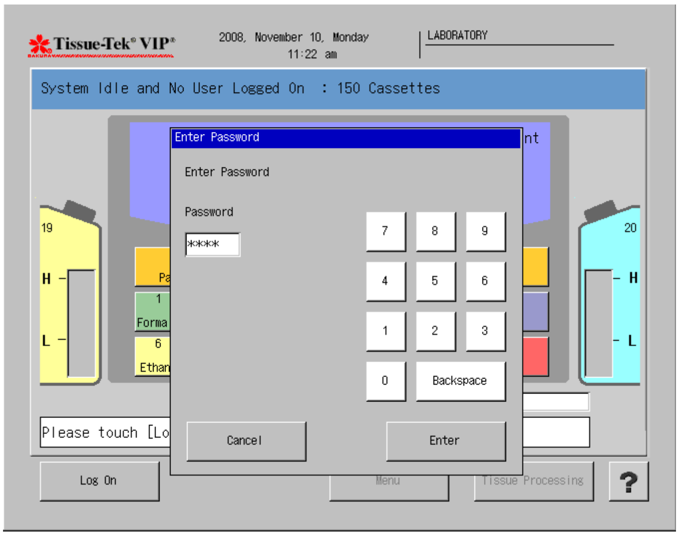
When software to be updated is compressed（File of ***.ZIP type）, copy to the root directory of USB flush memory after being unpacked.

(2) Software update operation procedure

1) After completing all works performed in the instrument, return to the 「System Idle and User Logged On」 screen, press the **Log Off** button to log off. Log off will display「System Idle and No User Logged On」 screen.

2) Press the **Log On** button of「System Idle and No User Logged On」screen to let the 「Enter Password」 window display.

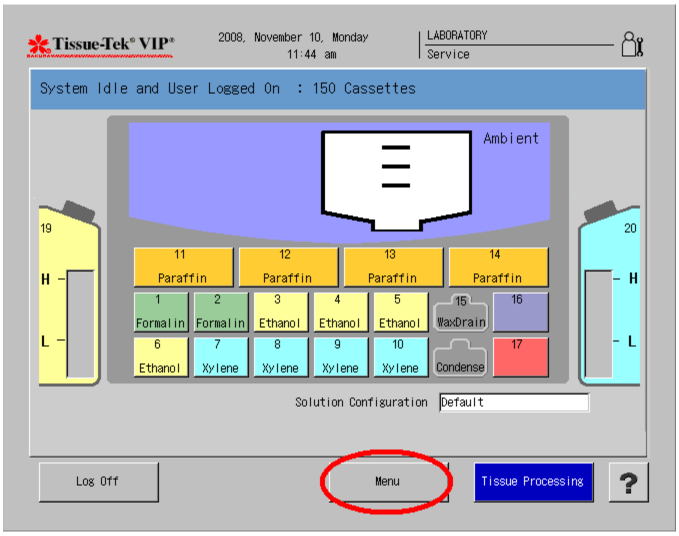
3) Enter password 「3141」 for service on the「Enter Password」 window to log on.



Screen2-1-1 Enter Password window

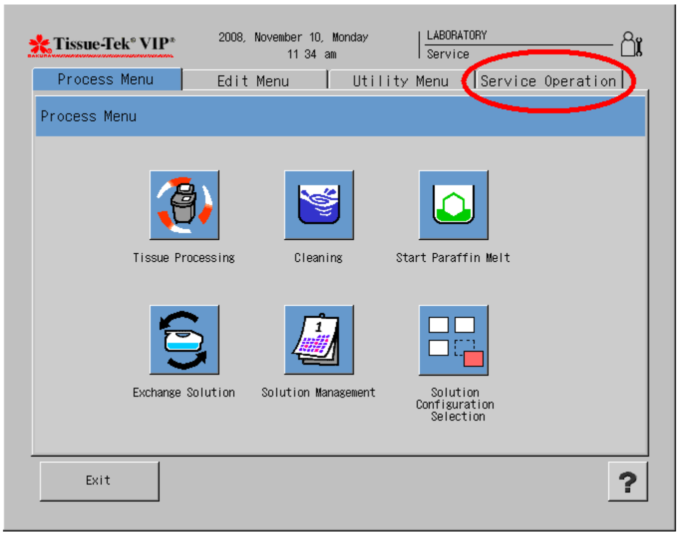
4) Log on will display the「System Idle and User Logged On」screen.

5) Press the **Menu** button of「System Idle and User Logged On」screen to let the「Process Menu」screen display.



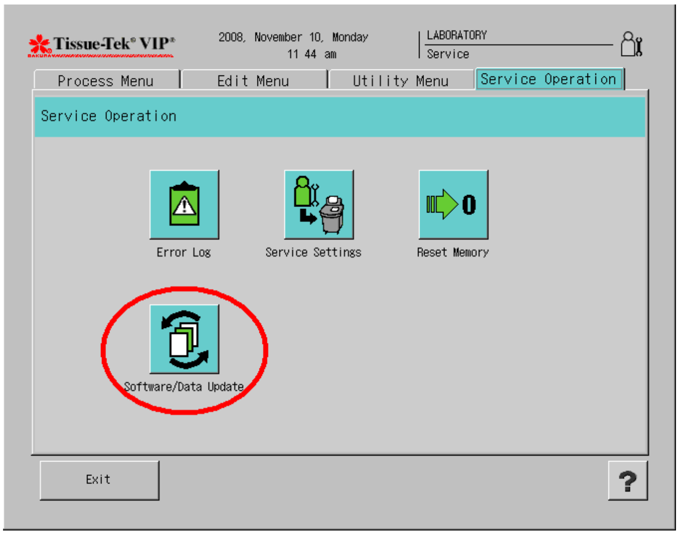
Screen2-1-2 System Idle and User Logged On screen 1)

6) Press「Service Operation」tub of「Process Menu」screen to switch to the「Service Menu」screen.

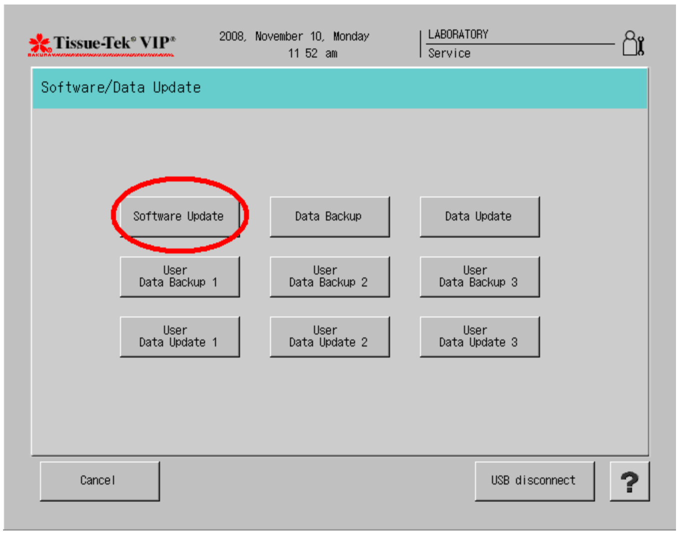


Screen2-1-3 Process Menu screen 1)

7) Press the 「Software／Data Update」 icon of 「Service Operations」 screen to display the「Software/Data Update」 screen



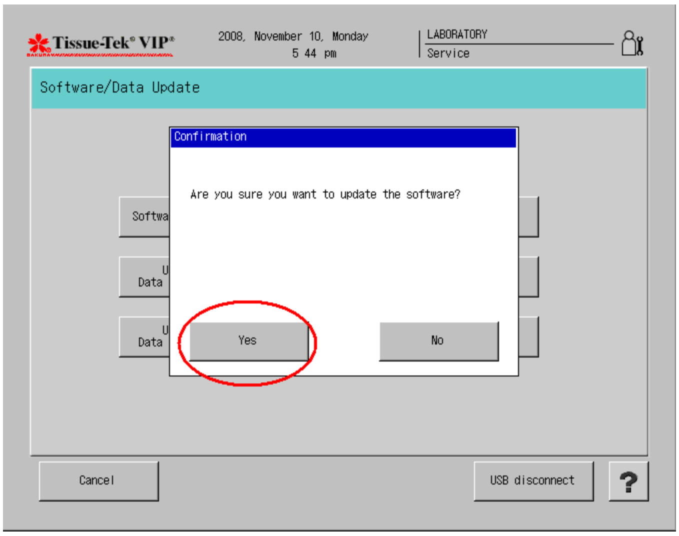
Screen2-1-4 Service Operations screen 1)



Screen2-1-5 Software/Data Update screen 1)

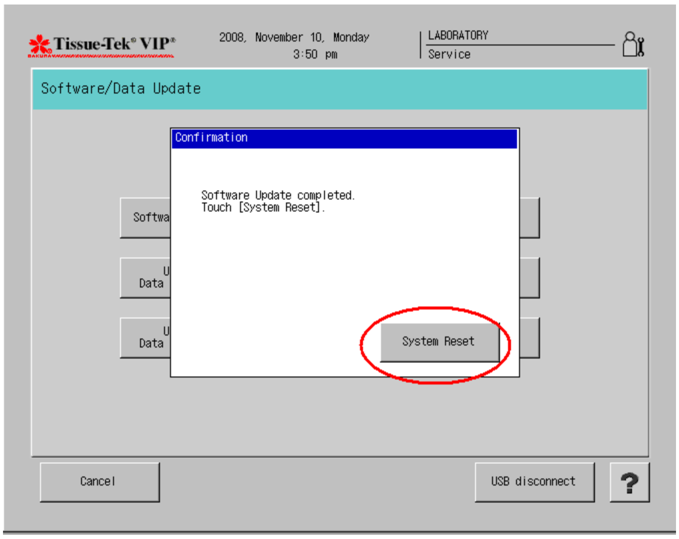
8) If 「Software/Data Update」 screen was displayed, insert the USB flush memory installing with software to be updated into the USB port on the right side of operating box of the system

9) Press the **Software Update** button of「Software/Data Update」screen to start the update of software. As execution confirmation window of Software/Data Update will be displayed prior to start, press the **Yes** button to start execution. When software update starts, window showing update in-process will be displayed.



Screen2-1-6 Execution Confirmation window 1)

10) When software update is completed, window to facilitate system reset will be displayed, press the **System Reset** button to reset the system. About 10 seconds after the window is displayed, system is reset automatically, and software will be loaded again.



Screen2-1-7 System Reset window

11) System will start up with updated software.

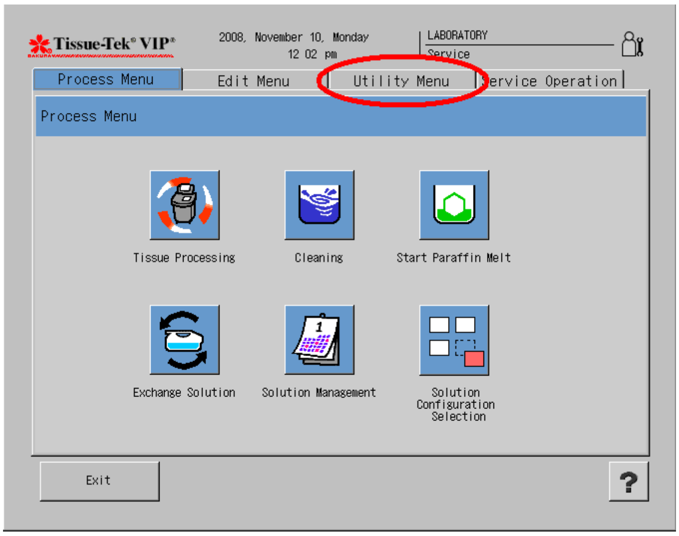
(3) Confirmation of Software Update

1) As system startup will display「System Idle and No User Logged On」screen, log on the system.

Logging on the system will display「System Idle and User Logged On」screen

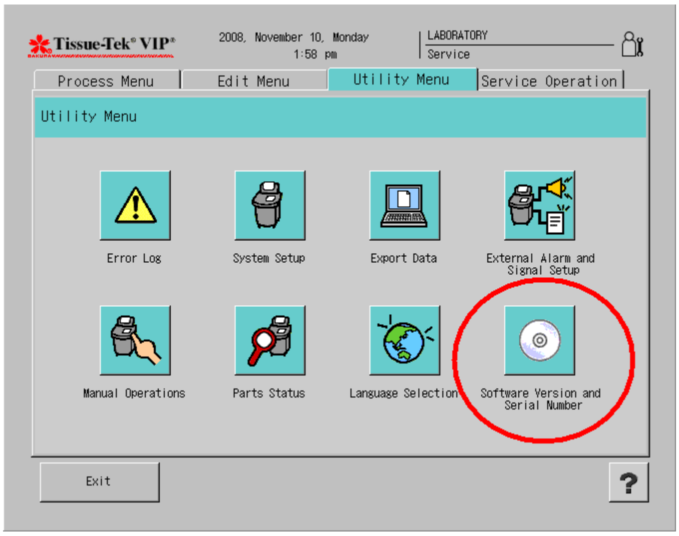
2)Press the **Menu** button of the「System Idle and User Logged On」screen to let the「Process Menu」screen display.

3) Press 「Utility Menu」tab of 「Process Menu」screen to switch to the「Utility Menu」screen.



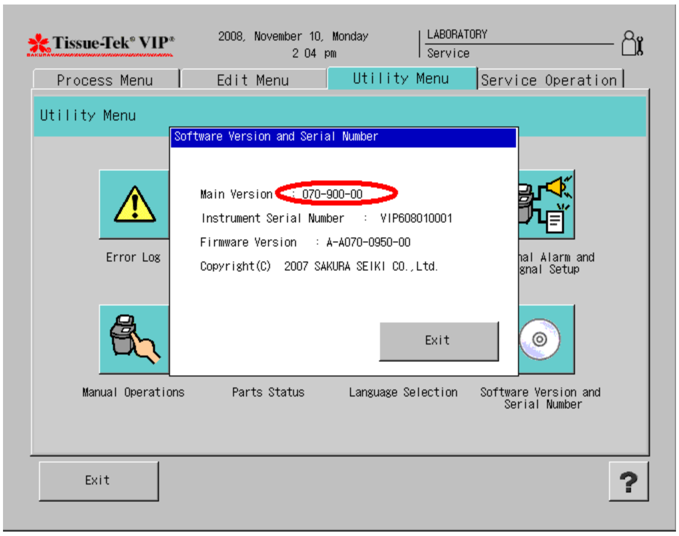
Screen2-1-8 Process Menu screen 2)

4) Press「Software Version and Serial Number」icon of「Utility Menu」screen to display「Software Version and Serial Number」window.



Screen2-1-9 Utility Menu screen

5) Confirm that software version is displayed on the「Software Version and Serial Number」window . Software version is displayed with「O70-900-**」form.



Screen2-1-10「Software Version and Serial Number」window

2-1-2 Data Backup

Follow the following procedures to perform the data (System Data) backup.

(1) Preparation

1) When BACKUP folder is on the root directory of USB flush memory, delete the folder.

(2) Data Backup Operation Procedures

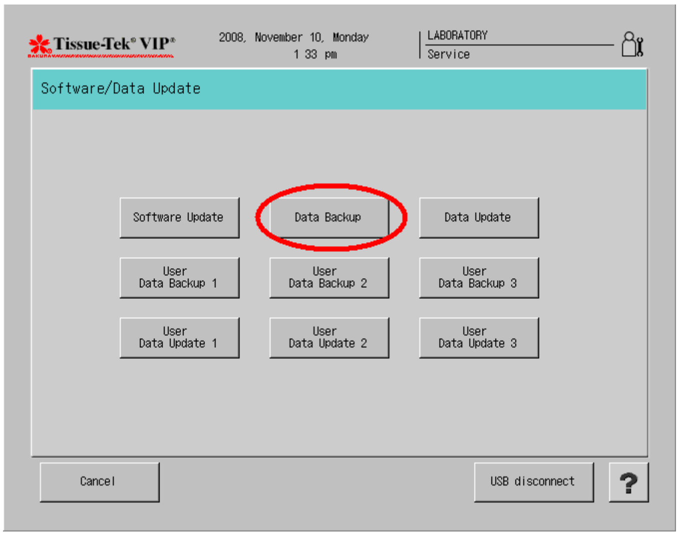
1) As system startup will display「System Idle and No User Logged On」screen, perform log on.

When logging on,「System Idle and User Logged On」 screen will be displayed.

2) Press the **Menu** button of「System Idle and User Logged On」screen to let「Process Menu」 display.

3) Press 「Service Operation」tab of 「Process Menu」screen to switch to 「Service Menu」 screen.

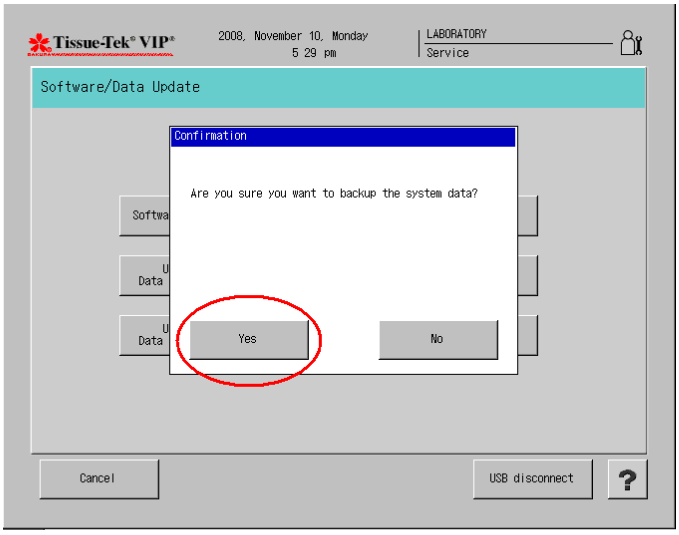
4) Press 「Software／Data Update」 icon of 「Service Operations」 screen to let「Software/Data Update」 screen display.



Screen2-1-11 Software/Data Update screen 2)

5)If「Software/Data Update」 screen was displayed, insert the USB flush memory installing with completed backup data into the USB port on the right side of operating box of the instrument. Completed backup data is stored in the BACKUP folder of root directory of USB flush memory.

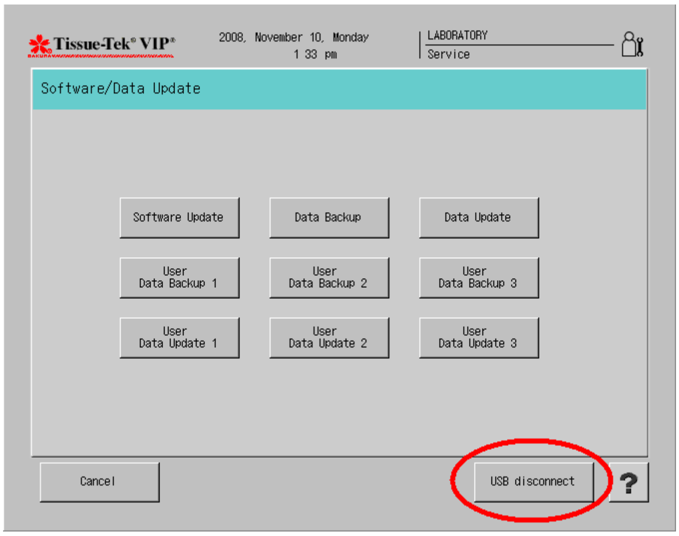
6) Press the **Data Backup** button of「Software/Data Update」screen to start the data backup. As execution confirmation window of Data Backup will be displayed prior to start, press the **Yes** button to start execution. When data backup starts, window showing backup in-process will be displayed.



Screen2-1-12 Execution Confirmation window 2)

7) When data backup is completed, window showing Completed will be displayed, press the **Exit** button to start execution.

8)Press the **USB disconnect** button of「Software/Data Update」screen in order to remove the USB flush memory from the system. After this, USB flush memory can be removed anytime.



Screen2-1-13 Software／Data update screen 3)

2-1-3 Data Update

Follow the following procedures for data update.

(1) Preparation

1) Prepare UPDATE folder of the root directory of USB flush memory. To update all completed backup data, change the name from BACKUP folder to UPDATE folder.

2) Store the update data in the UPDATE folder.

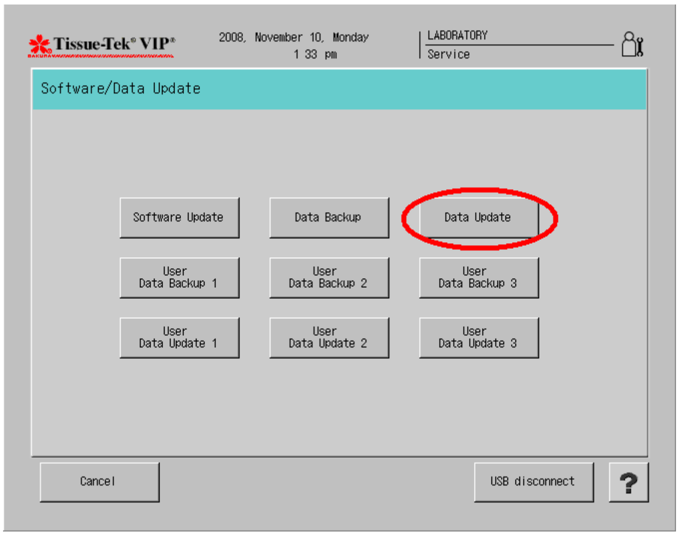
- To update the system setup file (INSTRMNT.CSV), store the update file in the ¥UPDATE¥SYSDEF folder
- To update the password file (PASSWORD.CSV), store the update file in the ¥UPDATE¥SYSDEF folder
- To update the password file (PASSWORD.CSV), store the update file in the ¥UPDATE¥SYSDEF folder
- To update the solution information file (PASSWORD.CSV), store the update file in the ¥UPDATE¥SYSDEF folder
- To update the external alarm file (EXTALARM.CSV), store the update file in the ¥UPDATE¥SYSDEF folder
- To update display language file(SYSDISP.CSV), store the update file in the ¥UPDATE¥SYSDEF folder
- To update alarm sound control information file(SYSWAV.CSV), store the update file in the ¥UPDATE¥SYSDEF folder
- To update solution configuration information file(CONFIG1.CSV ～ CONFIG5.CSV), store the update file in the ¥UPDATE¥CONFIG folder.
- To update tissue processing information file(PROG01.CSV～PROG50.CSV), store the update file in the ¥UPDATE¥PROGRAM folder.
- To update clean program information file(CLEAN.CSV), store the update file in the ¥UPDATE¥PROGRAM folder.
- To update language data file(MAIN001.VIP～MAIN016.VIP), store the update file in the ¥UPDATE¥LANGUAGE folder.
- To update alarm sound data file (SOUND01.WAV～SOUND10.WAV), store the update file in the ¥UPDATE¥LANGUAGE folder.
- To update Solution name information file (PRISNAME.CSV) of factory setup, store the update file in the ¥UPDATE¥PRESET folder.
- To update External alarm file of factory setup (PREXALRM.CSV), store the update file in the ¥UPDATE¥ PRESET folder.
- To update external alarm file of solution configuration information file (PRICNFG.CSV), store the update file in the ¥UPDATE¥ PRESET folder.
- To update tissue processing information file (PRPROG1.CSV) of factory setup,

store the update file in the ¥UPDATE¥ PRESET folder.

- To update clean program information file (PRCLEAN.CSV) of factory setup, store the update file in the ¥UPDATE¥ PRESET folder.
- To return log information of completed backup to the system, copy all files of ¥BACKUP¥HISTORY to ¥UPDATE¥ HISTORY folder.
- To return log information of completed backup to the system, copy all files of ¥BACKUP¥LOGDATA to ¥UPDATE¥ LOGDATA folder.

(2) Data Update operation procedures

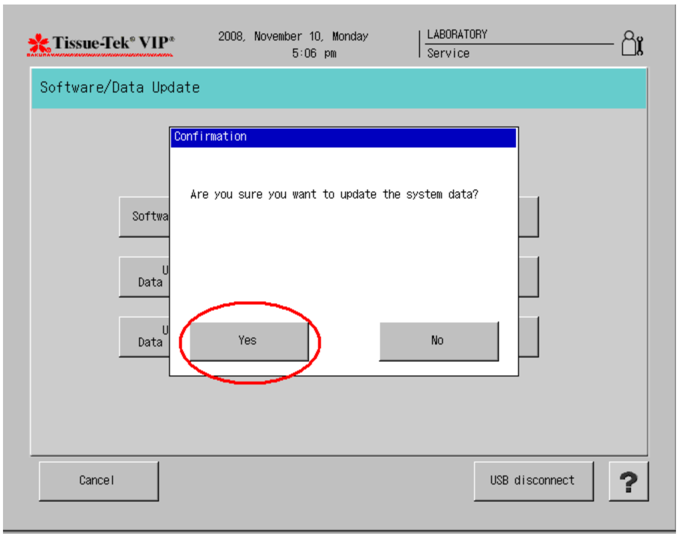
1) As system startup will display「System Idle and No User Logged On」screen, log on the system.
Logging on the system will display「System Idle and User Logged On」 screen
2) Press the **Menu** button of the「System Idle and User Logged On」 screen to let the「Process Menu」 screen display.
3) Press「Service Operation」tab of「Process Menu」screen to switch to the「Service Menu」 screen.
4) Press「Software／Data Update」 icon of「Service Operations」 screen to display「Software/Data Update」 screen.



Screen2-1-14 Software/Data Update screen 4)

5) If「Software/Data Update」screen was displayed, insert the USB flush memory installing with data file of update into the USB port on the right side of operating box of the system

6) Press the **Software Update** button of「Software/Data Update」screen to start the update of data. As execution confirmation window of Software/Data Update will be displayed prior to start, press the **Yes** button to start execution. When software update starts, window showing update in-process will be displayed.



Screen2-1-15 Execution Confirmation window 3)

7) When data update is completed, window to facilitate system reset will be displayed, so press **System Reset** button to reset the system. About 10 seconds after the window is displayed, system is reset automatically, and software will be loaded again.

8) System will start up with updated data.

2-1-4 Data Exchange between Systems

This system allows data exchange of following data between systems.

- Solution name information
- Solution configuration information
- Tissue processing program/Clean program information
- System setting information
- Password information

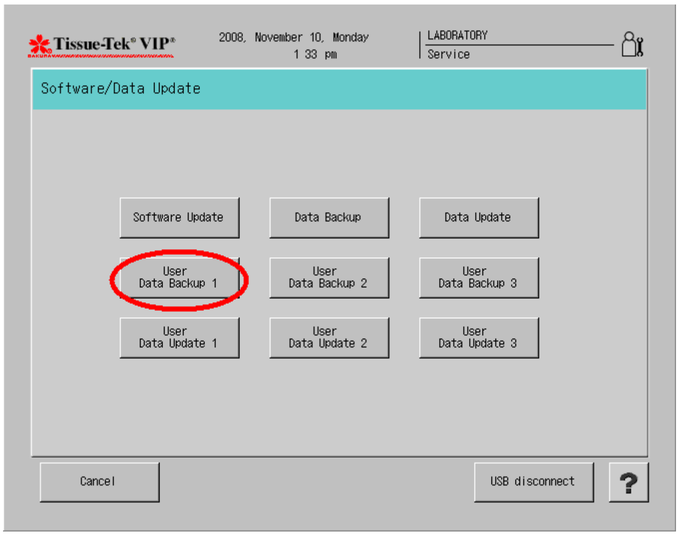
(1) Preparation

1) If UBACKUP1 folder, UBACKUP2 folder, or UBACKUP３ folder are in the root directory of USB flush memory, delete all of these folders.

(2) Exchange operation procedures for Solution name information, Solution configuration information /Tissue processing program/Clean program information

1) Display the「Service Operations」screen in the system with the data to be exchanged.

2) Press「Software／Data Update」icon of「Service Operations」screen to let the「Software/Data Update」screen display.



Screen2-1-16 Software/Data Update screen 5)

3) If「Software/Data Update」screen was displayed, insert the USB flush memory installing with data of completed backup into the USB port on the right side of operating box of the system. The data of completed backup will be stored in the UBACKUP1 folder of root directory of USB flush memory.

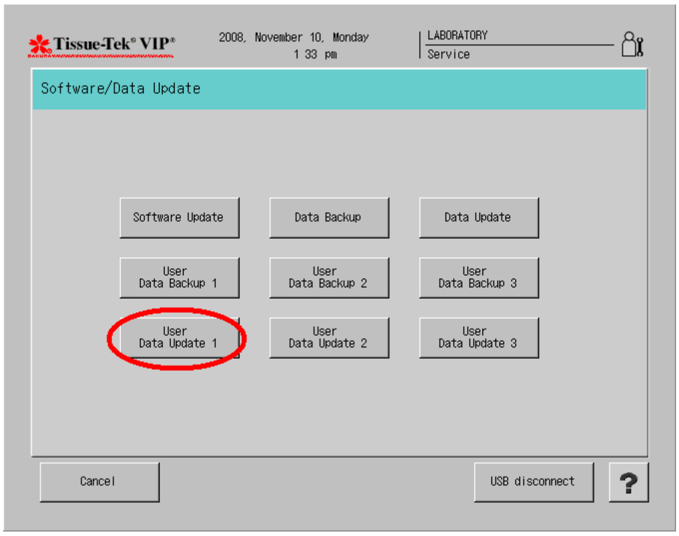
4) Press **User Data Backup 1** button of「Software/Data Update」screen to start the backup of Solution name information, Solution configuration information /Tissue processing program/Clean program information. As execution confirmation window of Data Backup will be displayed prior to start, press the **Yes** button to start execution. When Data Backup starts, window showing backup in-process will be displayed.

5) When backups of Solution name information, Solution configuration information /Tissue processing program/Clean program information are completed, window showing Completed is displayed, press the **Exit** button to start execution.

6) Remove USB flush memory from the system after pressing the **USB disconnect** button of「Software/Data Update」screen.

7) Display「Service Operations」screen in the system that data is to be exchanged.

8) Press the 「Software／Data Update」icon of 「Service Operations」screen to display the「Software/Data Update」screen



Screen2-1-17 Software/Data Update screen 6)

9) If「Software/Data Update」screen was displayed, insert the USB flush memory removed from the system that the data is to be exchanged in 6) into the USB port on the right side of operating box of the system

10) Press the **User Data Update 1** button of「Software/Data Update」screen to start the update of Solution name information, Solution configuration information /Tissue processing program/Clean program information. As execution confirmation window of Data Update will be displayed prior to start, press the **Yes** button to start execution. When data update starts, window showing update in-process will be displayed.

11) When update of Solution name information, Solution configuration information

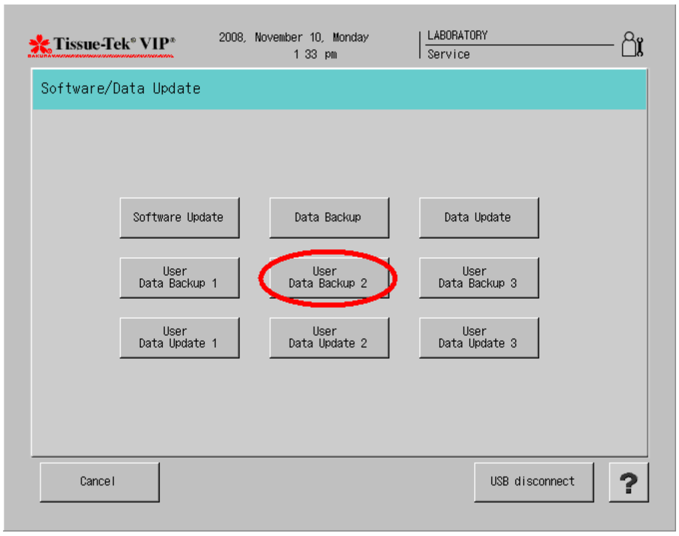
/Tissue processing program/Clean program information is completed, window to facilitate system reset will be displayed, press the **System Reset** button to reset the system. About 10 seconds after the window is displayed, system is reset automatically, and software will be loaded again.

12) System that data was exchanged will start up with Solution name information, Solution configuration information /Tissue processing program/Clean program information after exchange.

(3) Exchange operation procedures for System setup information and Password information

1) Display the「Service Operations」screen in the system with the data to be exchanged.

2) Press「Software／Data Update」icon of「Service Operations」screen to let the「Software/Data Update」screen display.



Screen2-1-18 Software/Data Update screen 7)

3) If 「Software/Data Update」screen was displayed, insert the USB flush memory installing with data of completed backup into the USB port on the right side of operating box of the system. The data of completed backup will be stored in the UBACKUP2 folder of root directory of USB flush memory.

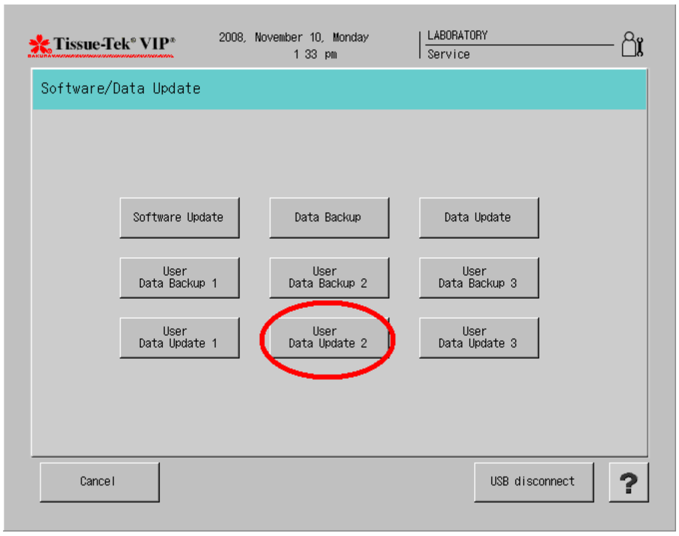
4) Press the **User Data Backup 2** button of「Software/Data Update」screen to start the backup of System setup information and Password information. As execution confirmation window of Data Backup will be displayed prior to start, press the **Yes** button to start execution. When Data Backup starts, window showing backup in-process will be displayed.

5) When backups of system setup information and password information are completed, window showing Completed is displayed, press **Exit** button to start execution.

6) Remove USB flush memory from the system after pressing the **USB disconnect** button of「Software/Data Update」screen.

7) Display「Service Operations」screen in the system that data is to be exchanged.

8) Press the 「Software／Data Update」icon of 「Service Operations」screen to display the「Software/Data Update」screen.



Screen2-1-19 Software/Data Update screen 8)

9) If 「Software/Data Update」screen was displayed, insert the USB flush memory removed from the system that the data is to be exchanged in (6) into the USB port on the right side of operating box of the system

10) Press the **User Data Update 2** button of「Software/Data Update」screen to start the update of System setup information and Password information. As execution confirmation window of Data Update will be displayed prior to start, press the **Yes** button to start execution. When data update starts, window showing update in-process will be displayed.

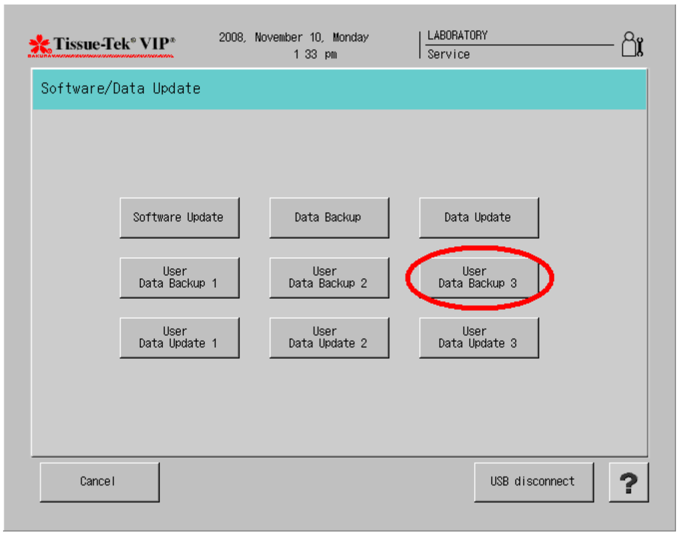
11) When update of System setup information and Password information is completed, window to facilitate system reset will be displayed, press the **System Reset** button to reset the system. About 10 seconds after the window is displayed, system is reset automatically, and software will be loaded again.

12) System that data was exchanged will start up with System setup information and Password information after exchange.

(4) Exchange operation procedures for Solution name information, Solution configuration information /Tissue processing program/Clean program information, System setup information and Password information

1) Display the「Service Operations」screen in the system with the data to be exchanged.

2) Press「Software／Data Update」icon of「Service Operations」screen to let the「Software/Data Update」screen display.



Screen2-1-20 Software/Data Update screen 9)

3) If「Software/Data Update」screen was displayed, insert the USB flush memory installing with data of completed backup into the USB port on the right side of operating box of the system. The data of completed backup will be stored in the UBACKUP3 folder of root directory of USB flush memory.

4) Press the **User Data Backup 3** button of「Software/Data Update」screen to start the backup of Solution name information, Solution configuration information /Tissue processing program/Clean program information, System setup information and Password information. As execution confirmation window of Data Backup will be displayed prior to start, press the **Yes** button to start execution. When Data Backup starts, window showing backup in-process will be displayed.

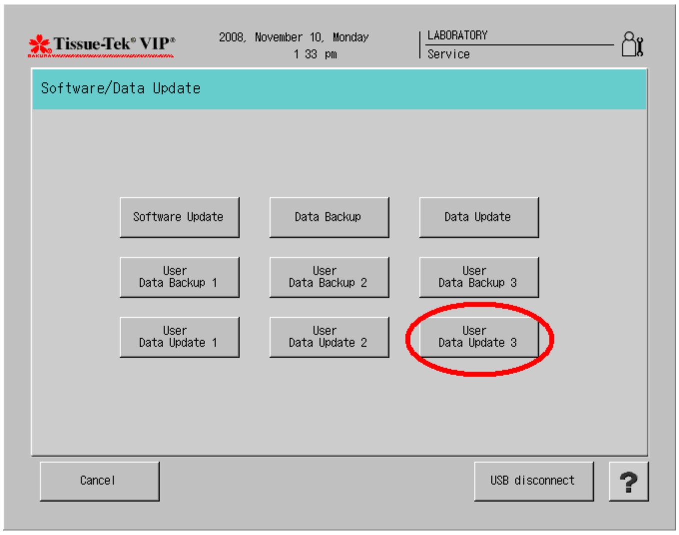
5) When backups of Solution name information, Solution configuration information /Tissue processing program/Clean program information, System setup information and Password information are completed, window showing Completed is displayed, press the **Exit** button to start execution.

6) Remove USB flush memory from the system, after pressing the **USB disconnect** button of「Software/Data Update」screen.

7) Display「Service Operations」screen in the system that data is to be exchanged.

8) Press the「Software／Data Update」icon of「Service Operations」screen to

display the「Software/Data Update」screen.



Screen2-1-21 Software/Data Update screen 10)

9) If「Software/Data Update」screen was displayed, insert the USB flush memory removed from the system that the data is to be exchanged in 6) into the USB port on the right side of operating box of the system

10) Press the **User Data Update 3** button of「Software/Data Update」screen to start the update of Solution name information, Solution configuration information /Tissue processing program/Clean program information, System setup information and Password information. As execution confirmation window of Data Update will be displayed prior to start, press the **Yes** button to start execution. When data update starts, window showing update in-process will be displayed.

11) When update of System setup information and Password information is completed, window to facilitate system reset will be displayed, press the **System Reset** button to reset the system. About 10 seconds after the window is displayed, system is reset automatically, and software will be loaded again.

12) System that data was exchanged will start up with System setup information and Password information after exchange.

2-2 Service Settings

Explain the service settings operation when operating system with limitation.

Four kinds of service settings as follows:

- Disabling and enabling “Ignore Level Sensor”
- Clearing level sensor error
- Resetting retort paraffin dirty information
- Resetting retort reagent information

2-2-1 Disabling and Enabling “Ignore Level Sensor”

Ignore Level Sensor is a function to perform the tissue processing and retort clean without using level sensor as a temporary action such as during level sensor error.

While using this function, other automatic processes (warm water clean, rinse and solution exchange) are not allowed. Moreover, use of bulk reservoir is also prohibited.

(1) Note

1) When reagent bottles or paraffin container are full of reagent, retort may be overflow depending on the volume of tissue. To avoid this, the reagent volume of reagent bottle or paraffin container is maximum 3.5 L. Especially need to note that paraffin container of 14th station is more than 5L.

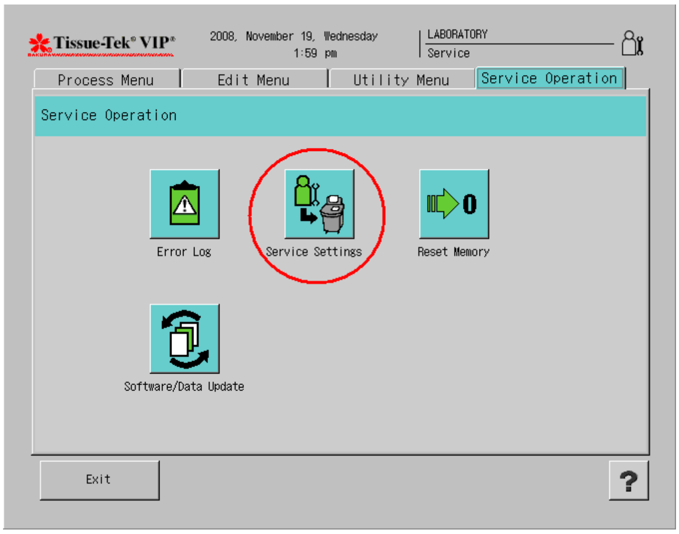
(2) Limitations

1) Retort level of monitor with reagent on the retort is 2.7L at the time of 150-cassette processing. Keep 3.5L all the time for 300-cassette processing
2) Level guarantee is unavailable. Become「No level guarantee」mode during Ignore Level Sensor
3) Solution manager will function instead.
4) Automatic transfer is not available during tissue processing. When avoidance action functioned during processing of automatic transfer on the stations of solution group, automatic transfer will stop.
5) Continuous mixing and short mixing of tissue processing are not available.
Replace with mixing (Mix=Fast) every 12-minute.
6) During tissue processing, since retort overflow is likely to occur in case of pump-in for all volume at the time of tissue processing, when reaching fill time up to certain level sensor 2 (3.5L) by measuring it in advance, the pump-in will stop.
7) Pump-in of bulk reservoir is unavailable. Manual pump-in from bulk reservoir will cause error of “bulk reservoir is empty”.

8) Pump-in of external container from external drain/fill port is not available.
Manual pump-in from external drain/fill port will cause the error of “external container is empty”.

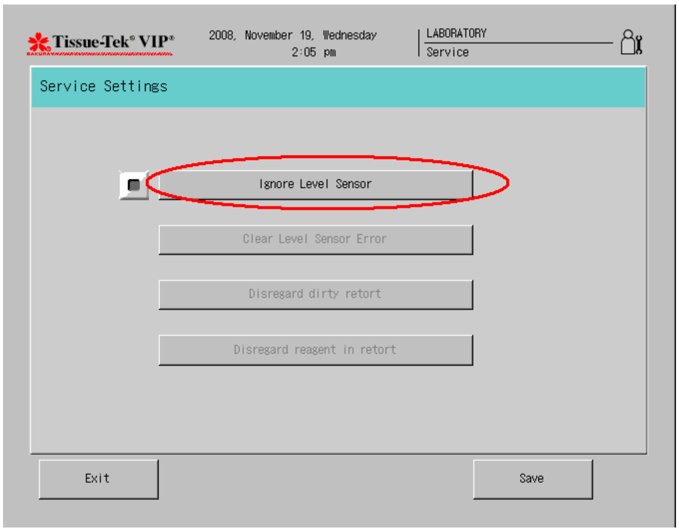
(3) Enabling the Ignore Level Sensor

1) Since system startup will display「System Idle and No User Logged On」screen, enter service password「3141」to log on. 「System Idle and User Logged On」will be displayed after log on.
2) Press the **Menu** button of 「System Idle and User Logged On」screen to display「Process Menu」screen.
3) Press「Service Operation」tab of「Process Menu」screen to switch to「Service Menu」screen.
4) Press「Service Settings」icon of「Service Menu」screen to display「Service Settings」screen.



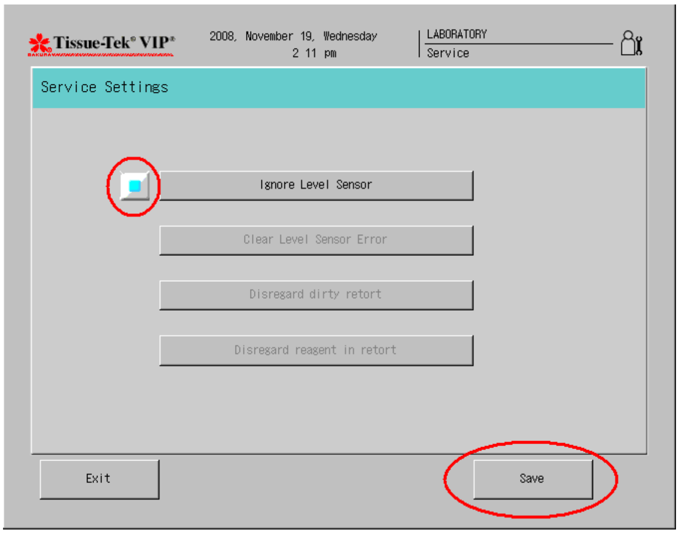
Screen2-2-1 Service operation menu screen 2)

5) Press the **Ignore Level Sensor** button of「Service Settings」 screen to perform the setting operation of Ignore Level Sensor.



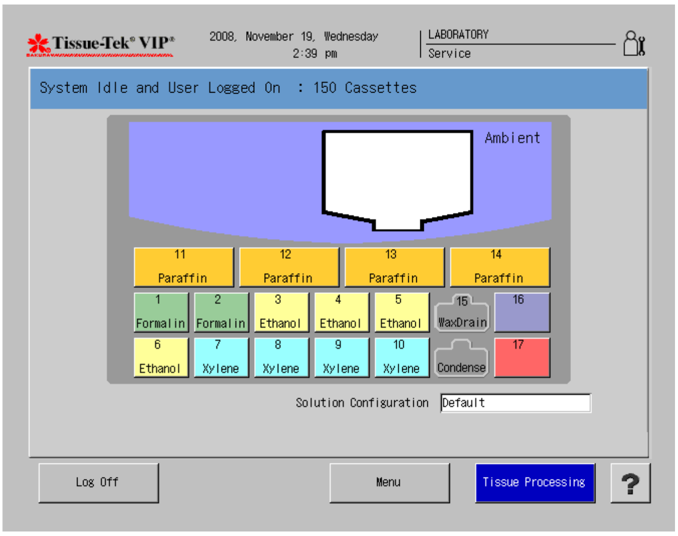
Screen2-2-2 Service setting screen 1)

6) When pressing the **Ignore Level Sensor** button, lamp icon of right side of button will be on. The setting of Ignore Level Sensor is completed by confirming this light and pressing the **Save** button.



Screen2-2-3 Service setting screen 2)

7) Setting the Ignore Level Sensor will display the following「System Idle and User Logged On」screen.

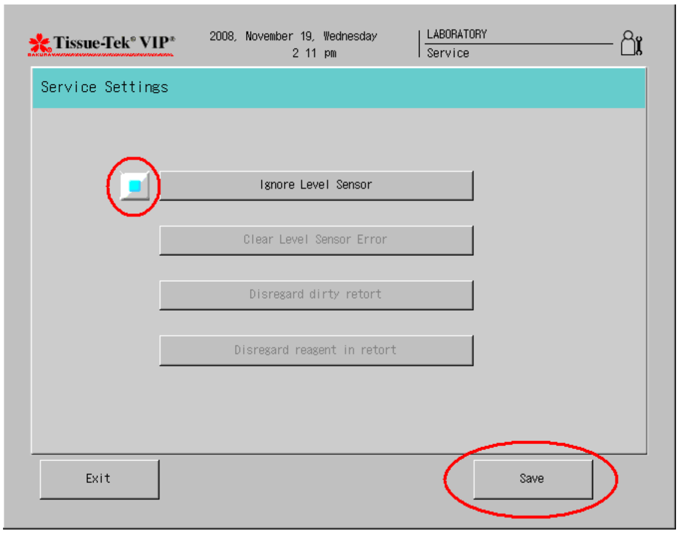


Screen2-2-4「System Idle and User Logged On」screen2)

(4) Disabling the Ignore Level Sensor

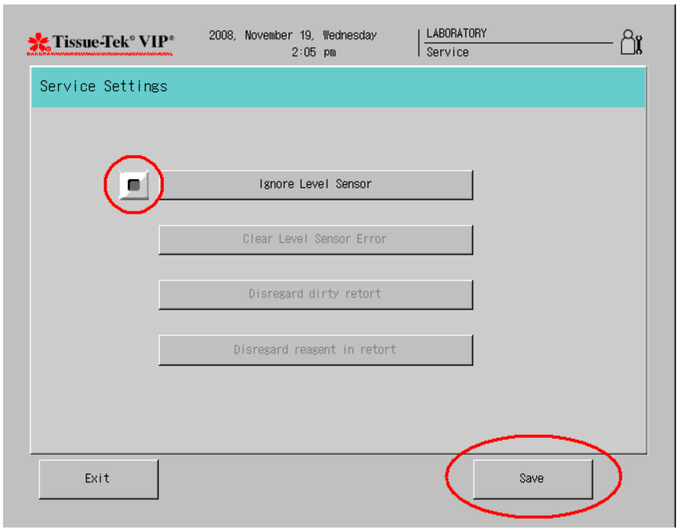
1) Display 「Service Settings」screen.

2) Confirm the lamp icon of right side of the **Ignore Level Sensor** button is on and then press the **Ignore Level Sensor** button.



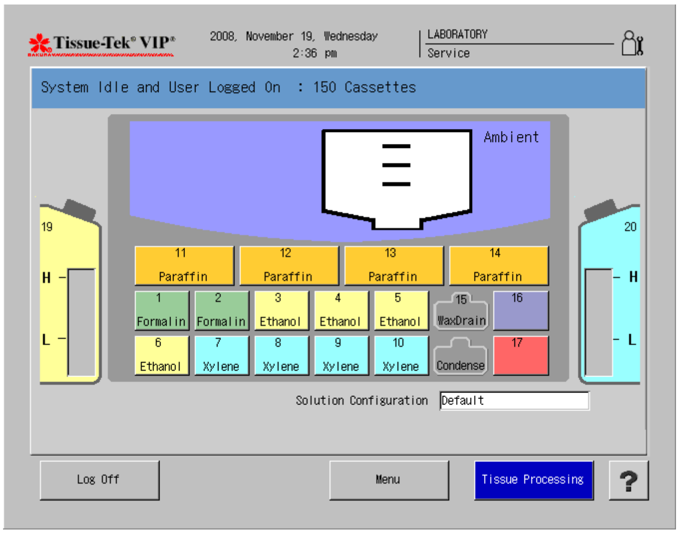
Screen2-2-5 Service Settings screen 3)

3) When pressing the **Ignore Level Sensor** button, lamp icon of right side of button will be off. The clear of Ignore Level Sensor is completed by confirming the light-off and pressing the **Save** button.



Screen2-2-6　Service Settings screen　4)

4) Clearing the Ignore Level Sensor will display the following「System Idle and User Logged On」screen.



Screen2-2-7　System Idle and User Logged On」screen 3)

2-2-2 Clearing Level Sensor Error

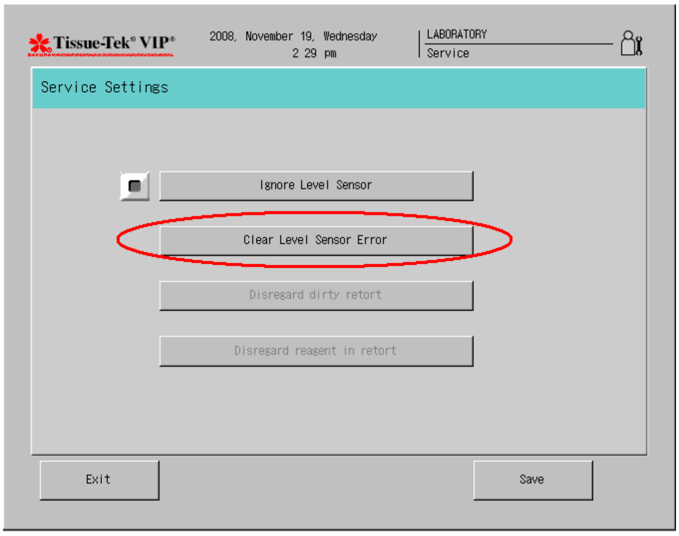
System might judge that the level sensor made false detection as level sensor detected the reagent when adding the reagent into the empty retort directly during operation. If system judged that level sensor made false detection, level sensor detection will be stopped temporarily. In such case, the operation to let level sensor return to the use situation is 「Clearing Level Sensor Error」 operation.

(1) Operation procedures of Clear Level Sensor Error

1) Display 「Service Menu」 screen

2) Press 「Service Settings」icon of 「Service Menu」screen to display「Service Settings」 screen.

3) Press the **Clear Level Sensor Error** button of 「Service Settings」 screen to perform the setting operation of Ignore Level Sensor. The **Clear Level Sensor Error** button can be pressed when error occurred in level sensor and became unfunctional.



Screen2-2-8 Service Settings Screen 4)

4) Pressing the **Clear Level Sensor Error** button will clear all Level Sensor Error. When error is cleared, the **Clear Level Sensor Error** button can not be pressed any more.

2-2-3 Resetting Information on Dirty Retort with Paraffin

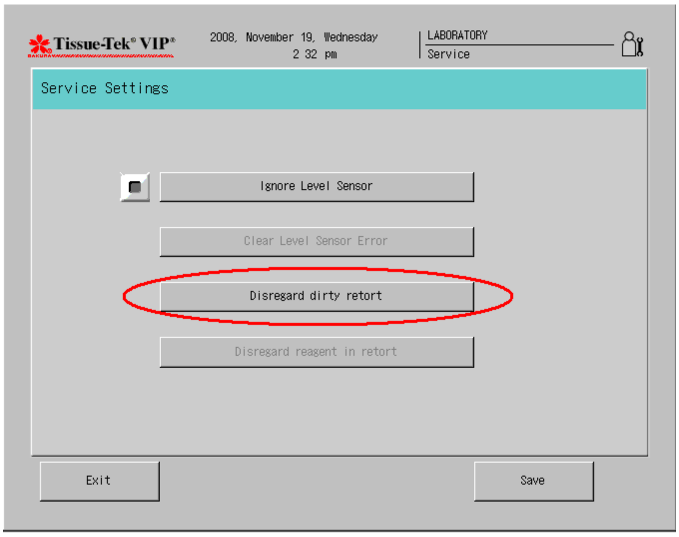
When performed pump-in of paraffin station during confirmation action after disassembly and assembly, although paraffin is not really filled into retort, system will judge that retort is dirty due to paraffin. In general, if retort is dirty due to paraffin, retort cleaning is required. In such case, reset the information on retort is dirty due to paraffin, the operation to the situation that retort is not dirty due to paraffin is the 「resetting information on dirty retort with paraffin」 operation.

(1) Resetting procedures for dirty retort information

1) Display「Service Settings」 screen

2) Press **Disregard dirty retort** button of 「Service Settings」 screen to operate reset of information on retort is dirty due to paraffin.

The **Disregard dirty retort** button can be pressed when it is judged that retort is dirty due to paraffin.



Screen2-2-9 Service Settings Screen 5)

3) System will judge that retort is not dirty due to paraffin by pressing **Disregard dirty retort** button. When retort is not dirty due to paraffin, the **Disregard dirty retort** button can not be pressed any more.

2-2-4 Resetting Information on Reagent in Retort

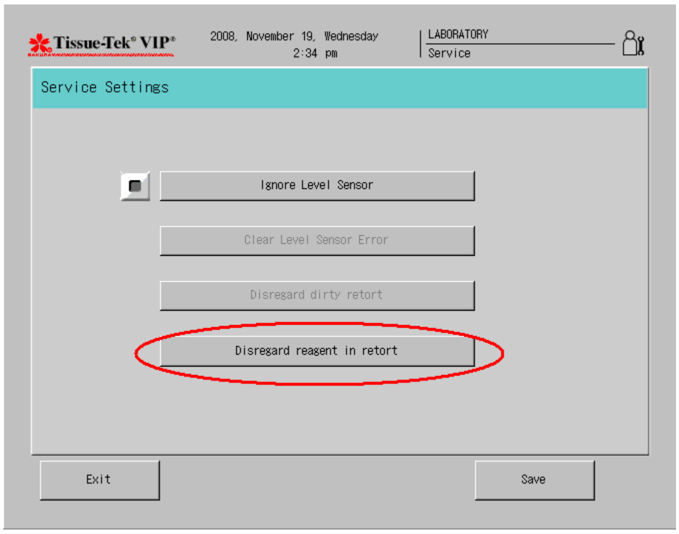
When performed pump-in of reagent during confirmation action after disassembly and assembly, although reagent is not really filled into retort, system will judge that reagent is in retort. In general, if reagent is in retort, pump-out is required. In such case, reset the information on reagent is in retort, the operation to the situation that “reagent is not in the retort” is the「Resetting information on reagent in retort 」operation.

(1) Operation Procedures for clear of level sensor error

1) Display「Service Settings」screen

2) Press the **Disregard reagent in retort** button of 「Service Settings」screen to operate setting operation of Ignore Level Sensor.

The **Disregard reagent in retort** button can be pressed when it was judged that reagent is in the retort.



Screen2-2-10 Service Settings Screen 6)

3) System will judge that reagent is not in the retort when pressing **Disregard reagent in retort** button. When reagent is not in the retort, the **Disregard reagent in retort** button can not be pressed any more.

2-3 Reset Memory

Interpret the「Reset Memory」operation returning to the factory situation for system.

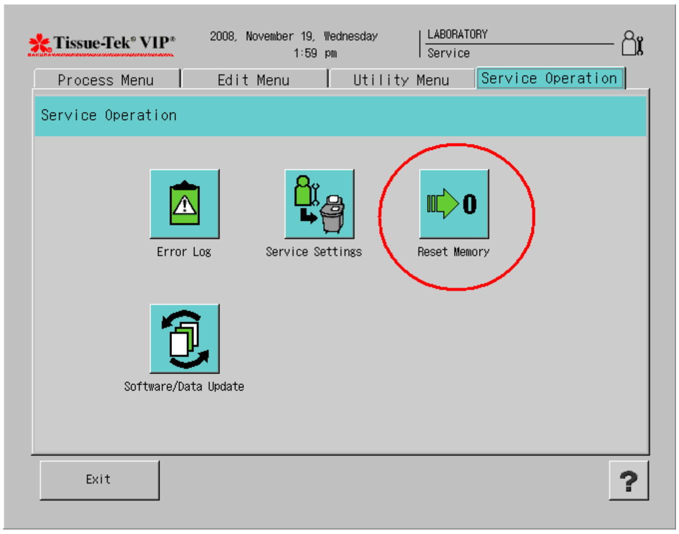
(1) Operation procedures of Reset Memory

1) Since system startup will display「System Idle and No User Logged On」screen, perform log on. Log on will display「System Idle and User Logged On」screen

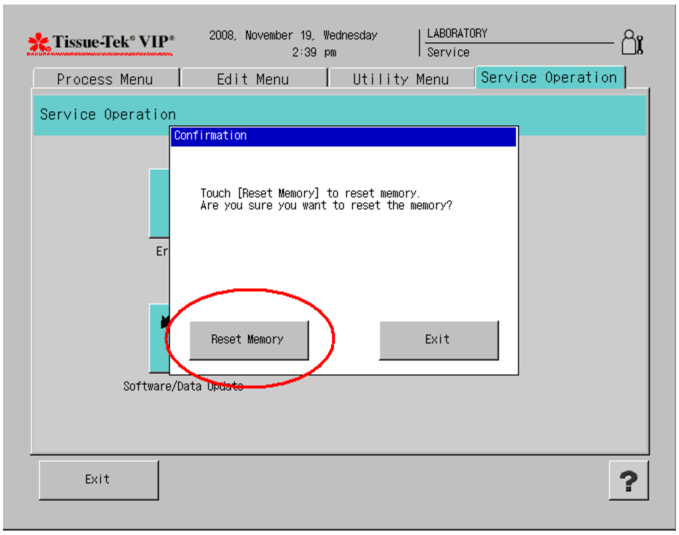
2) Press the **Menu** button of「System Idle and User Logged On」screen to display「Process Menu」screen.

3) Press「Service Operation」tab of「Process Menu」screen to switch to「Service Menu」screen.

4) Pressing「Reset Memory」icon of「Service Menu」screen will display「Reset Memory Confirmation」window.

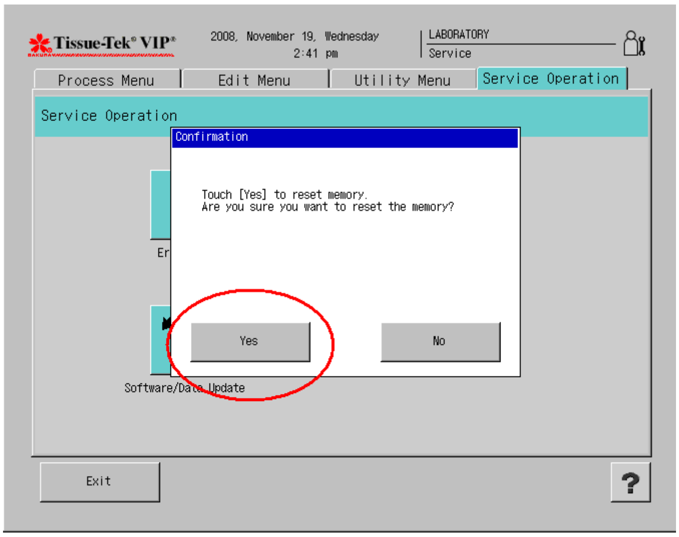


Screen2-3-1 Service settings screen 3)



Screen2-3-2 Reset Memory Confirmation window 1)

5) When pressed the **Reset Memory** button on 「Reset Memory Confirmation」window, window confirming Reset Memory execution will be displayed again. Pressing the 「Yes」 button will execute the Reset Memory on this window.



Screen2-3-3 Reset Memory Confirmation window 2)

6) When Reset Memory is completed, window to facilitate system reset will be displayed, press **System Reset** button to reset the system. About 10 seconds after the window is displayed, system is reset automatically, and software will be loaded again.

7) System will start up with the situation of factory.

(2) Note

1) After the Reset Memory is completed, the information registered in the file also returns to the factory setup.

2-4 Manual Operations

2-4-1 User Manual Operations

(1) Note

1) Change Station, Fill Retort are the functions only can be used during log on by manager password.
2) When current station is in the reagent station and will change to paraffin station, pressing **Change Station** button will warm up retort, rotary valve and gate valve after completing station change. At this time, waiting for temperature rise of retort, rotary valve and gate valve will be performed.
3) When trying to pump in immediately after moving from reagent station to paraffin station, as retort and level sensor are cold, level sensor needs to be heated to avoid paraffin filled becoming solid in the retort. Heating time is about 25 minutes.
4) The pump-in station and pump-out station may be different such as fill from bulk reservoir to reagent station in the reagent exchange. In such cases, stop during pump-in will cause drain fault in filled station. In the case of different pump-in station and pump-out station, changing to the station to be drained into is allowed even in the situation that reagent is in the retort.

Table2-4-1 Allow station change or not

Conditions								"Station change" button
Filled station	Reagent in retort	Save of drain station Note1)	Retort is dirty due to paraffin	Current staion				
				Filled station	Drain station	Stations other than fill/drain	Paraffin station (Sta.11-15)	
Sta. 1-18	Yes	Yes	--	○			--	Can be pushed Note2)
Sta. 1-18	Yes	Yes	--		○		--	Can be pushed Note2)
Sta. 1-18	Yes	Yes	--			○	--	Can be pushed Note2)
Sta. 1-18	Yes	None	--	○			--	Can not be pushed
Sta. 1-18	Yes	None	--			○	--	Can be pushed Note3)
Sta. 19-20	Yes	Yes	--	○			--	Can be pushed Note4)
Sta. 19-20	Yes	Yes	--		○		--	Can not be pushed
Sta. 19-20	Yes	Yes	--			○	--	Can be pushed Note4)
Sta. 19-20	Yes	None	--	○			--	Can be pushed Note5)
Sta. 19-20	Yes	None	--			○	--	Can be pushed Note5)
--	None	--	No	Any staions				Can be pushed
--	None	--	Yes	--	--	--	○	Can be pushed Note6)
--	None	--	Yes	--	--	--	×	Can be pushed Note6)

Note 1: When the filled station and drain station are different during reagent fill and automatic transfer etc, the station to be drained is saved.

Note 2: Changeable stations are both of filled station and drain station.

Note 3: Changeable station is only the filled station.

Note 4: Changeable station is only the drain station.

Note 5: Changeable station is only the outside fill/drain port (Sta. 18).

Note 6: Changeable stations are Sta. 11-14, wax drain container (Sta.15) and clean xylene station (Sta.16)

(2) Limitations

1) Pump-out to bulk reservoir is not permitted

2) Pump-in to wax drain container is not permitted.

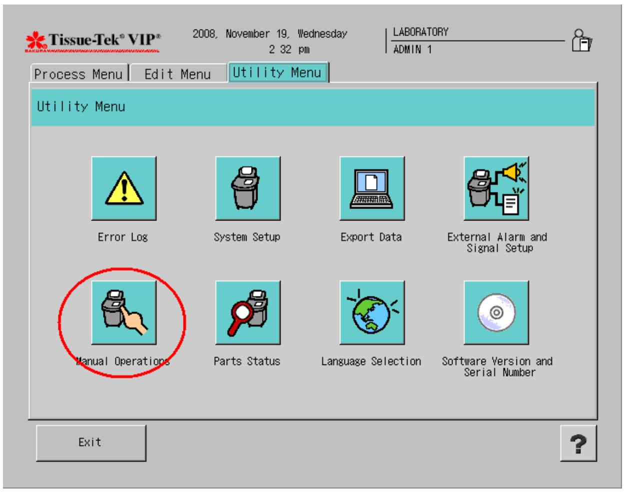
(3) Display procedures of Manual Operations screen

1) As system startup will display「System Idle and No User Logged On」screen, log on by entering manager password. 「System Idle and User Logged On」screen will be displayed after log on.

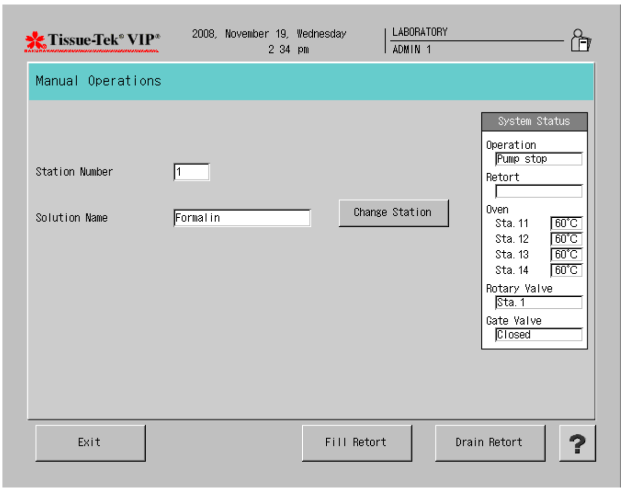
2) Press the **Menu** button of「System Idle and User Logged On」screen to display「Process Menu」screen.

3) Press the「Utility Menu」tab of 「Process Menu」screen to switch to「Utility Menu」screen.

4) Pressing 「Manual Operations」icon of「Utility Menu」screen will display 「Manual Operations」 screen for user.

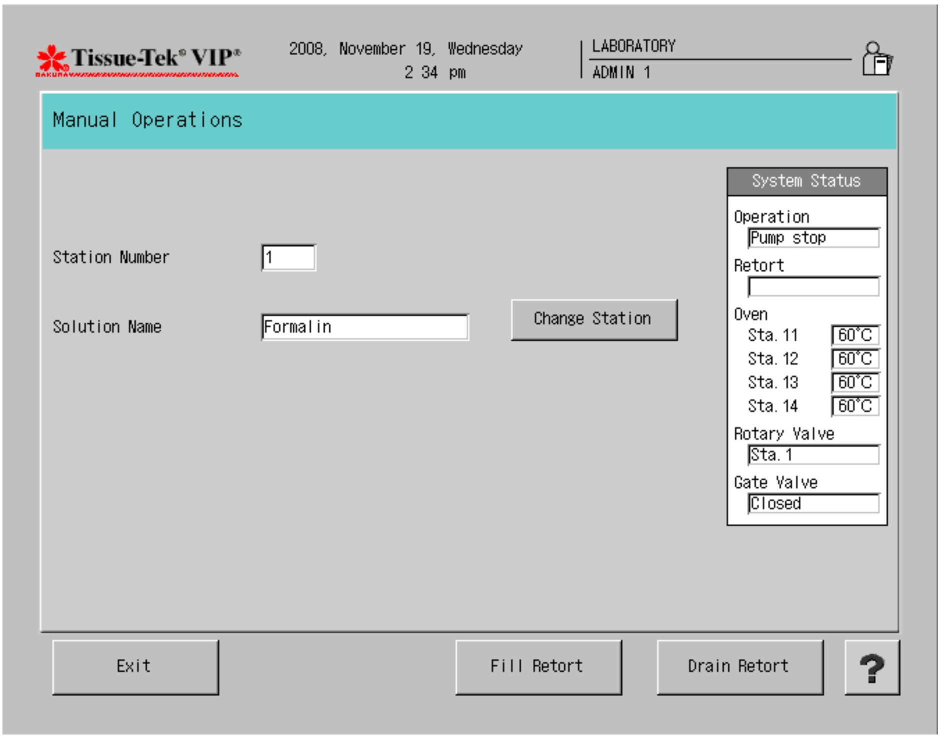


Screen2-4-1 Utility Menu Screen 1)



Screen2-4-2 User manual operations screen 1)

(4) Outline of Manual Operations screen



Change Station: Button to be pushed when changing station.

Drain Retort: Drain to the station displaying current station No.

Fill Retort: Fill reagent to the station displaying current station No.

Column displaying system conditions: Current system conditions are displayed

- Operation: Pump out/Pump In/Pump stop/Retort heating/Air pump ON
- Retort: Pressure/Ambient/Vacuum、Current temperature
- Oven: Current temperature from Sta.11 – Sta.14
- Rotary Valve: Current station No.:1 - 20, Current temperature
- Gate Valve: Current position（Fill/Drain/Closed）, Current temperature

2-4-2 Service Manual Operations

(1) Notes

1) Automatic stop when completed for the following operations
   - Pump in
   - Pump out
   - Change station
   - Clockwise/Counterclockwise rotations of rotary valve
   - Change of gate valve position
   - Condenser waste

2) During change station, when the **Stop** button is pressed, station will not stop until arriving in the position allowing safe stop.

3) When station is changed to the paraffin station (Sta.11 station to Sta.14) or clean xylene station (Sta.16), retort will be heated with setting temperature of paraffin oven.

4) When current station is paraffin station or clean xylene station, in the case of manual heating of retort, after manual heating of retort stops, it will return to the control of heating retort with setting temperature of paraffin oven.

5) When station is paraffin station or clean xylene station, if performing pump in/pump out, the operations will not start until the temperatures of retort, rotary valve, gate valve and paraffin oven reach the setting temperature.

6) When retort is dirty due to paraffin, the operations of pump in and pump out can not be performed unless the current stations are Sta. 11 - Sta.16.

7) When changing from reagent bottle to paraffin station, after changing, retort, rotary valve and gate valve will be heated with setting temperature. Paraffin station processing such as pump-in can not be executed until temperatures of retort, rotary valve and gate valve reach setting temperature.

8) When trying to perform pump in immediately after moving to the paraffin station from reagent bottle, as retort and level sensor got cold, heating level sensor is required to avoid the paraffin filled to the retort becoming solid. The heating time is 25 minutes.

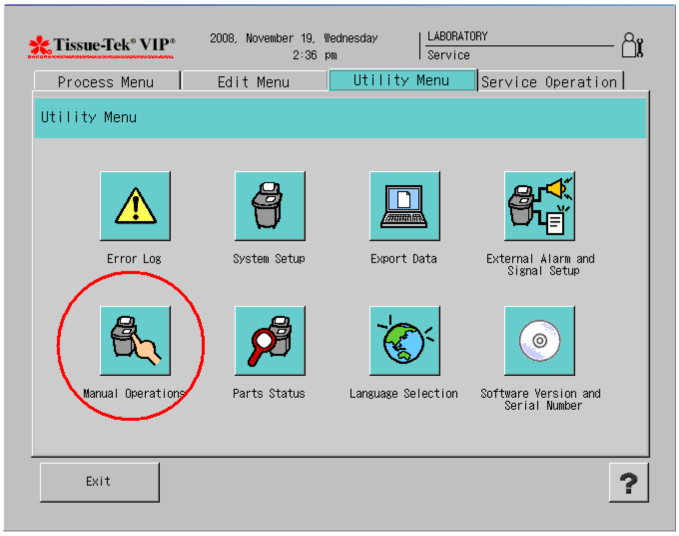
(2) Limitations

1) Pump out to bulk reservoir is not permitted

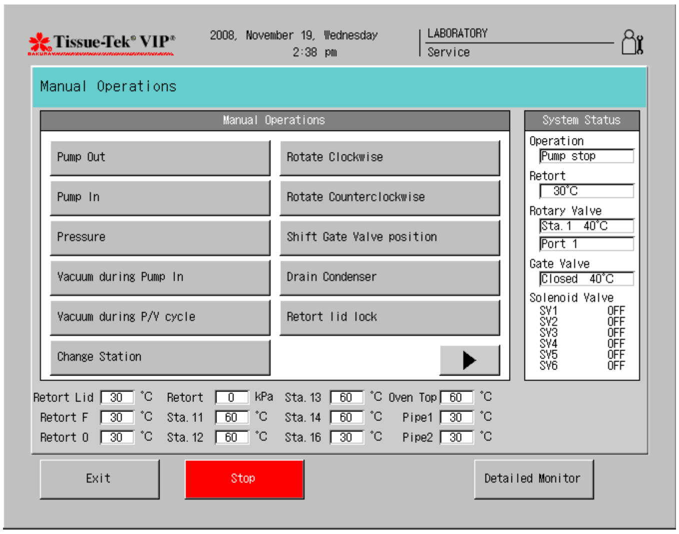
2) Pump in to wax drain container is not permitted.

(3) Display procedures of Manual Operations screen

1) As system startup will display「System Idle and No User Logged On」screen, log on by entering service password 「3141」. 「System Idle and User Logged On」screen will be displayed after log on.
2) Press the **Menu** button of 「System Idle and User Logged On」 screen to display 「Process Menu」 screen.
3) Press the「Utility Menu」tab of 「Process Menu」screen to switch to「Utility Menu」screen.
4) Pressing 「Manual Operations」icon of「Utility Menu」screen will display「Manual Operations」 screen for service.

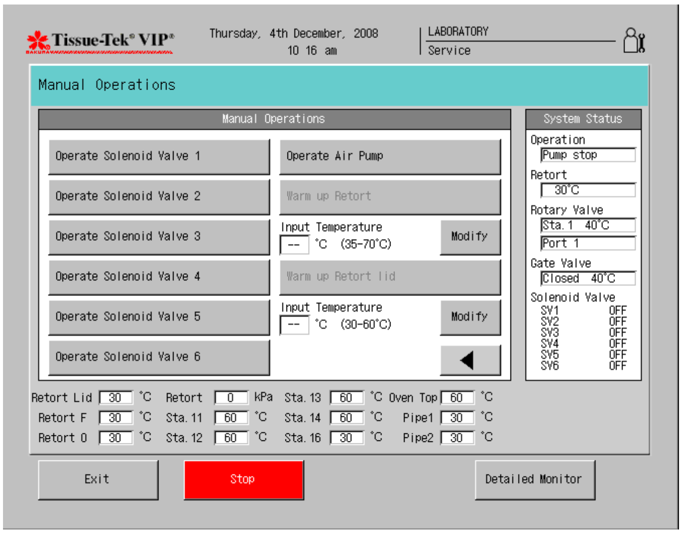


Screen2-4-3 Utility Menu screen



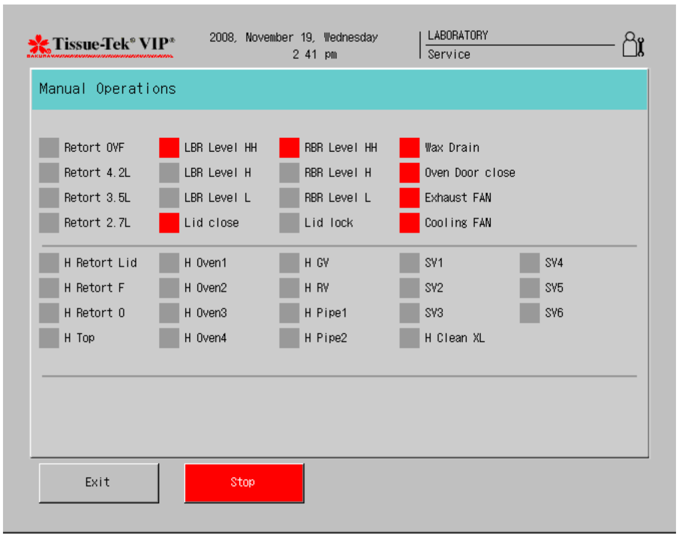
Screen2-4-4 Service Manual Operations screen 1)

5) 「Manual Operations」 screen for service operations is comprised of three screens. Pressing of「Manual Operations」screen will display the following 「Manual Operations」 screen.



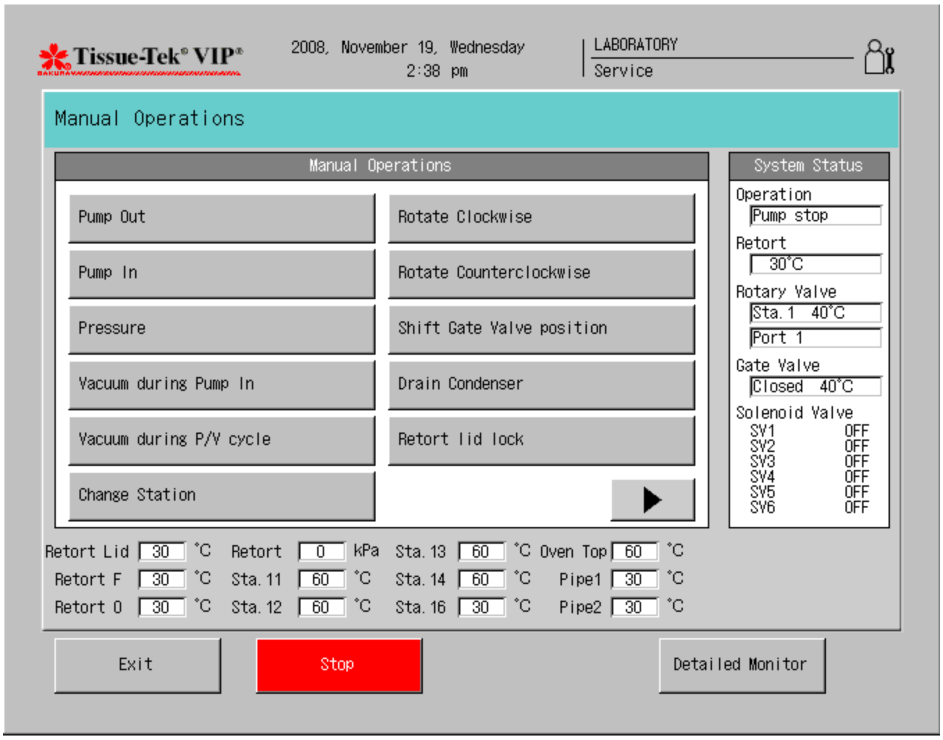
Screen2-4-5 Service Manual Operations screen 2)

6) When pressing the **Detail Monitor** button of「Manual Operations」screen, 「Detail Monitor」 screen will be displayed.



Screen2-4-6 Detail Monitor screen

(4) Outline of service manual operations screen

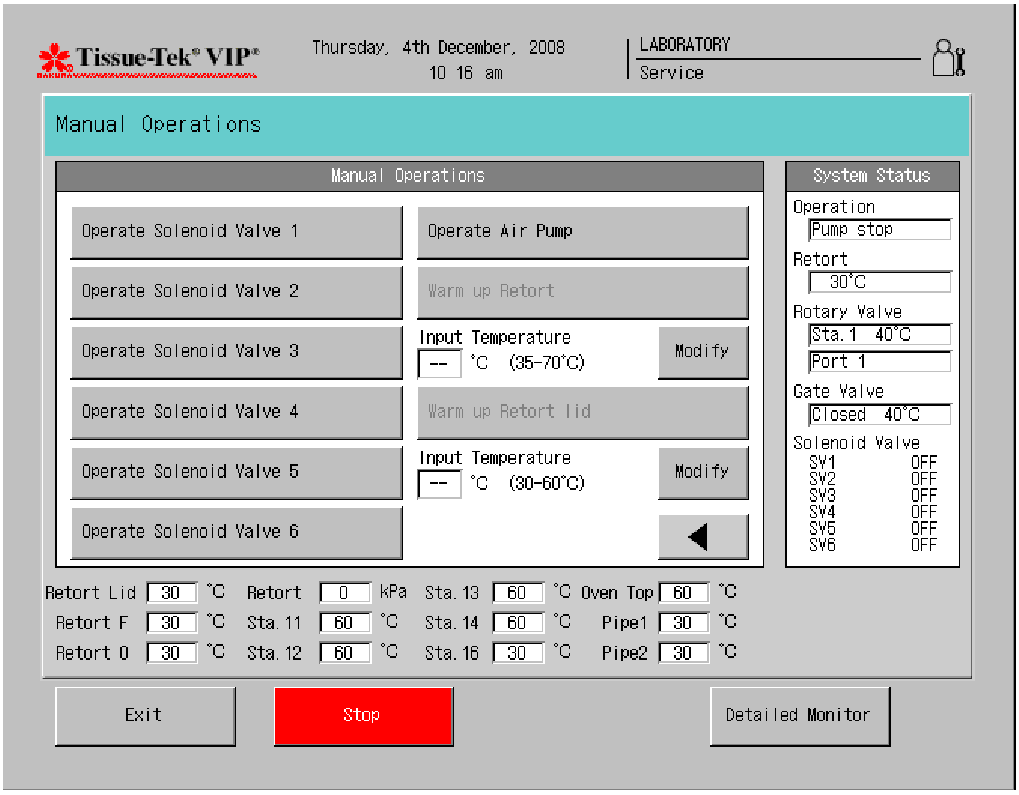


Pump In	: Fill to retort
Pump Out	: Drain from retort
Pressure	: Pressurize retort at 34kPa
Vacuum during Pump In	: Decompress retort at -27kPa
Vacuum during P/V cycle	: Decompress retort at -70kPa
Change Station	: Change to designated station
Rotate Clockwise	: Rotate port of rotary valve from current position clockwise, change one position
Rotate Counterclockwise	: Rotate port of rotary valve from current position counterclockwise, change one position
Shift Gate Valve position	: Change gate valve position
Drain Condenser	: Drain reagent stored in trap bottle to condenser bottle
Retort lid lock	: Open/close lock of retort lid

「Retort Lid °C」	: Display temperature of retort lid [TH1]
「Retort F °C」	: Display the temperature of retort front heater [TH2]
「Retort O °C」	: Display the temperature other than retort front heater [TH3]
「Sta. 11 - 14 °C」	: Display the temperature of paraffin station (Sta.11 – Sta.14) [TH8-11]
「Sta. 16 °C」	: Display the temperature of clean xylene station [TH13]
「Oven Top °C」	: Display temperature of oven top plate [TH12]
「Pipe1 – 2 °C」	: Display temperature of common tubing.

Pipe1: fill [TH4], Pipe2: drain [TH5]

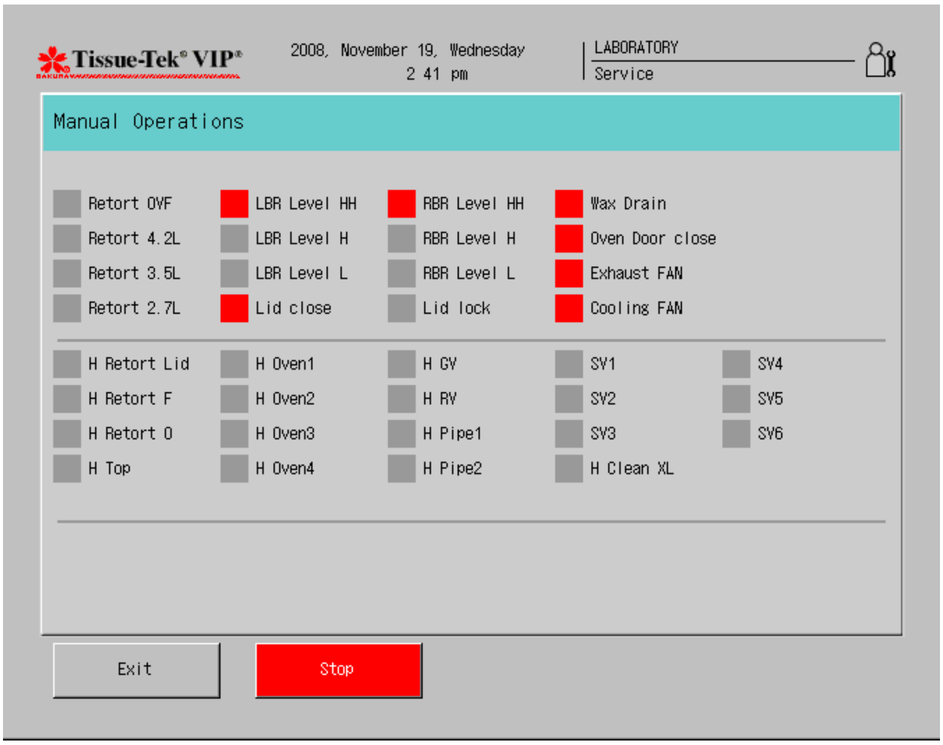
「Retort kPa」 : Display pressure valve of retort



Operate Solenoid Valve 1	: Operate ON/OFF of Solenoid Valve 1
Operate Solenoid Valve 2	: Operate ON/OFF of Solenoid Valve 2
Operate Solenoid Valve 3	: Operate ON/OFF of Solenoid Valve 3
Operate Solenoid Valve 4	: Operate ON/OFF of Solenoid Valve 4
Operate Solenoid Valve 5	: Operate ON/OFF of Solenoid Valve 5
Operate Solenoid Valve 6	: Operate ON/OFF of Solenoid Valve 6
Operate Air Pump	: Operate start/stop of air pump
Warm up Retort	: Warm up retort at designated temperature
Warm up Retort lid	: Warm up retort lid at designated temperature

System Status: Current system condition is displayed

- Operation: Pump out/Pump In/Pump stop/Retort heating/Air pump ON
- Retort: Pressure/Ambient/Vacuum
- Rotary Valve: Current station No. : 1 to 20
  Port No.: 1 to 14, Wax Drain, Cleaning XL, Cleaning AL, Drain/Fill, Left Bulk, Right Bulk
- Gate Valve: Current position (Fill/Drain/Closed)
- Solenoid Valve 1 - 6: ON/OFF



Retort OVF : ON/OFF of overflow sensor US4 of retort. ON when red is displayed

Retort 4.2L : ON/OFF of level sensor US3 (4.2L) of retort. ON when red is displayed

Retort 3.5L : ON/OFF of level sensor US2 (3.5L) of retort. ON when red is displayed

Retort 2.7L : ON/OFF of level sensor US1 (2.7L) of retort. ON when red is displayed

LBR Level HH : ON/OFF of overflow sensor PI1 of left bulk reservoir. ON when red is displayed

LBR Level H : ON/OFF of high level sensor PI2 of left bulk reservoir. ON when red is displayed

LBR Level L : ON/OFF of low level sensor PI3 of left bulk reservoir. ON when red is displayed

RBR Level HH : ON/OFF of overflow sensor PI4 of right bulk reservoir. ON when red is displayed

RBR Level H : ON/OFF of high level sensor PI5 of right bulk reservoir. ON when red is displayed

RBR Level L : ON/OFF of low level sensor PI6 of right bulk reservoir. ON when red is displayed

Lid close : Open/close signal of retort lid ON/OFF sensor PI7. OFF when

		red is displayed
Lid lock	:	Lock/Unlock of retort lid lock sensor PI8. Lock when red is displayed.
Wax Drain	:	ON/OFF of wax drain container detection sensor LS1. ON when red is displayed (Container detected)
Oven Door close	:	Open/Close of oven door sensor LS2. Close when red is displayed
Exhaust FAN	:	Operation situation of exhaust fan. Under rotation when red is displayed
Cooling FAN	:	Operation situation of cooling fan. ON when red is displayed
H Retort Lid	:	ON/OFF of retort lid heater H1. ON when red is displayed
H Retort F	:	ON/OFF of retort front heater H2. ON when red is displayed
H Retort O	:	ON/OFF of other than retort front heater H3. ON when red is displayed
H Top	:	ON/OFF of oven top plate heater H12. ON when red is displayed
H Oven1	:	ON/OFF of station 11 heater H8. ON when red is displayed
H Oven2	:	ON/OFF of station 12 heater H9. ON when red is displayed
H Oven3	:	ON/OFF of station 13 heater H10. ON when red is displayed
H Oven4	:	ON/OFF of station 14 heater H11. ON when red is displayed
H GV	:	ON/OFF of gate valve heater H6. ON when red is displayed
H RV	:	ON/OFF of rotary valve heater H7. ON when red is displayed
H Pipe1	:	ON/OFF of fill pipe heater H4. ON when red is displayed
H Pipe2	:	ON/OFF of drain pipe heater H5. ON when red is displayed
SV1	:	ON/OFF of Solenoid valve SV1. ON when red is displayed
SV2	:	ON/OFF of Solenoid valve SV2. ON when red is displayed
SV3	:	ON/OFF of Solenoid valve SV3. ON when red is displayed
SV4	:	ON/OFF of Solenoid valve SV4. ON when red is displayed
SV5	:	ON/OFF of Solenoid valve SV5. ON when red is displayed
SV6	:	ON/OFF of Solenoid valve SV6. ON when red is displayed
H Clean XL	:	ON/OFF of clean xylene station heater H13. ON when red is displayed

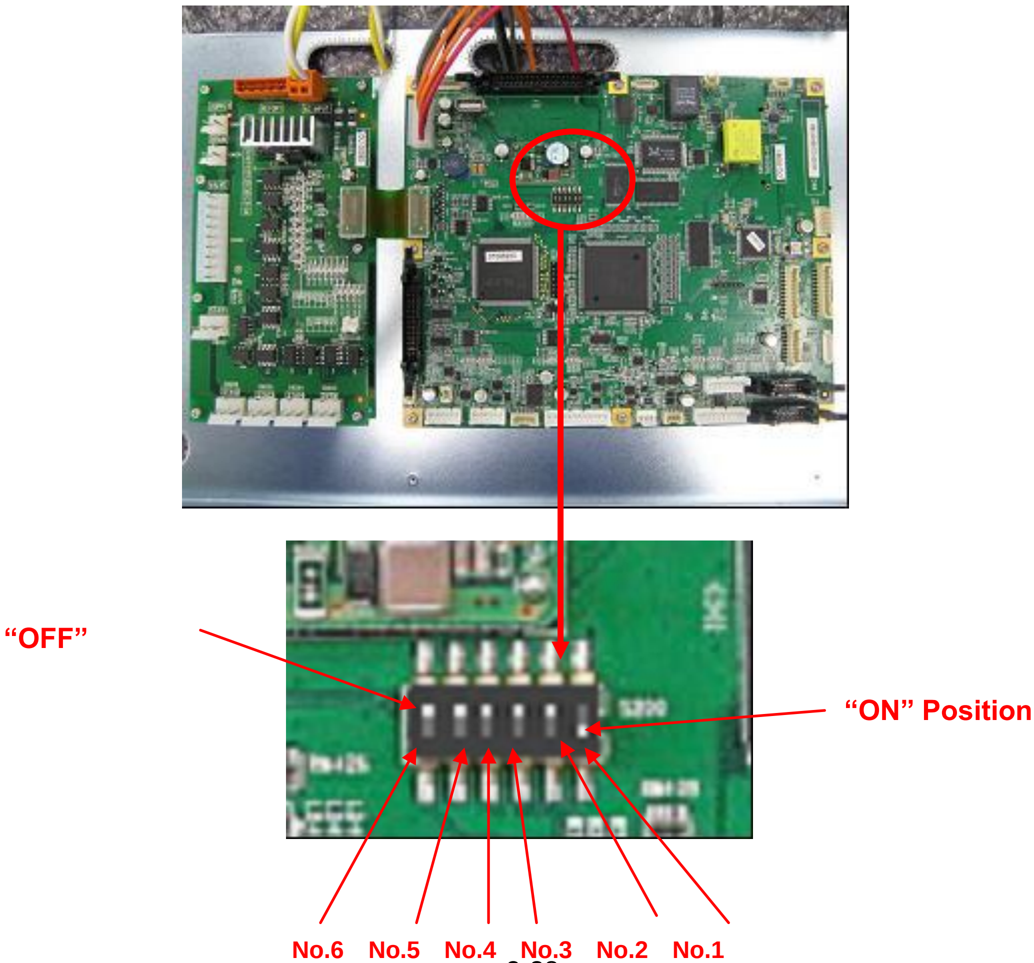
2-5 Check Program

Check program is used to confirm the basic function of the setup, condition check and adjustment e.g. Main function of check program is as follows:

· Date setup	Set the clock of system
· Measurement of maximum current consumption	Use electrical safety test
· Check and setup of serial number	Allow save of serial number for system
· Update of program	Allow program update
· Backup of data	Provide backup of setup information and data etc. for system
· Input check	Allow to check input situation of sensor etc.
· Tubing check	Allow to check and test the tubing system
· NVRAM clear	Allow to clear the NVRAM.

2-5-1 Startup Method of Check Program

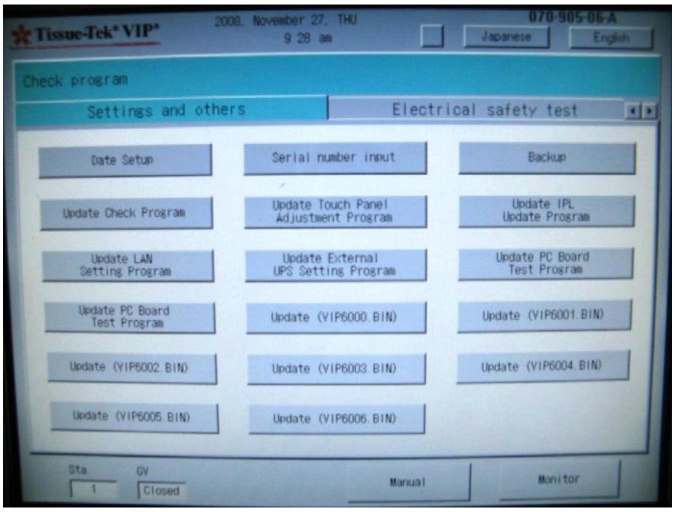
Turn “**ON**” No.1 of DIP switch on the CPU board (Others “**OFF**”) to turn on the power.
Check program is VIP6KPG.BIN



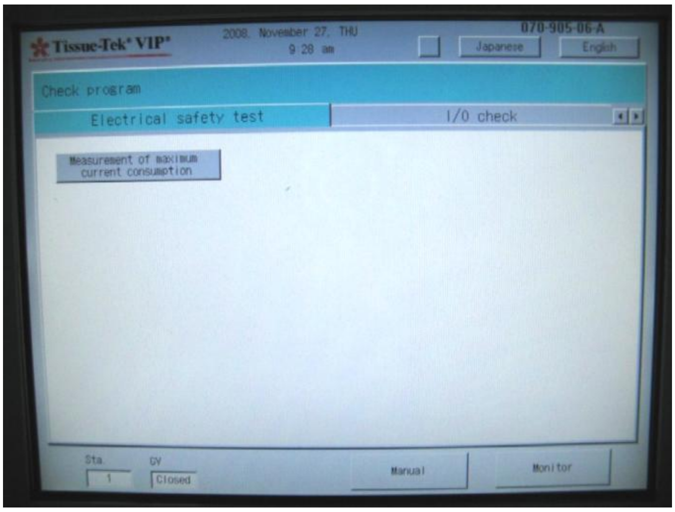
To stop check program and start up system with normal mode, once turn off the power, turn “**OFF**” DIP switch No.1 on CPU board (Others “**OFF**”) and then turn on the power.

2-5-2 Screen Configuration

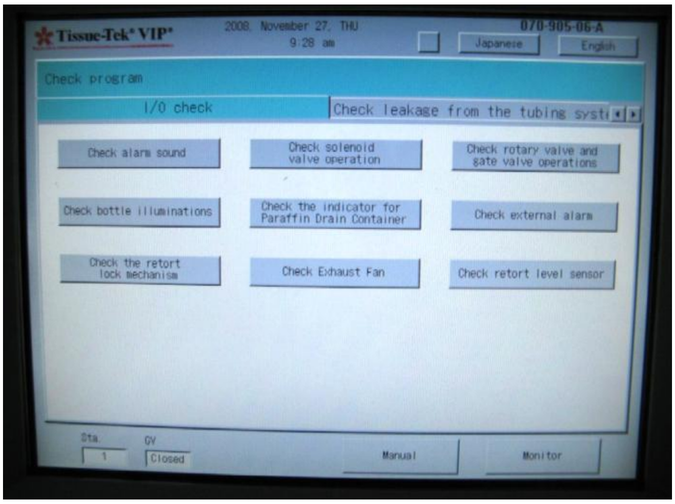
1) Starting up the check program will display check program, screen is separated by tab according to the purpose.



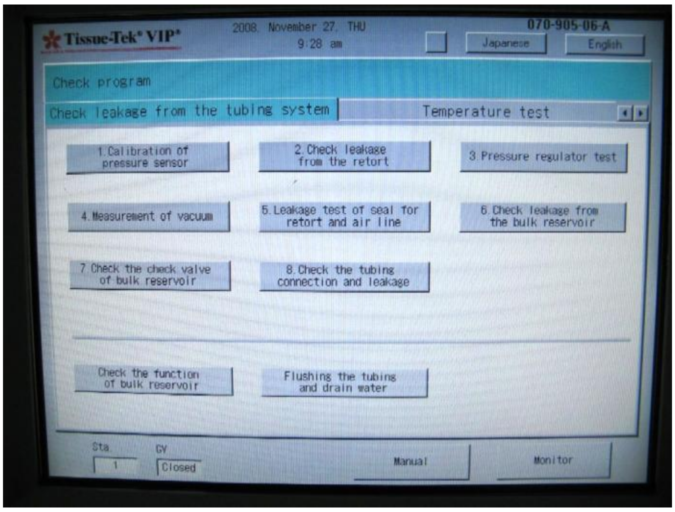
Screen.2-5-2-1 Settings ＆ other screen



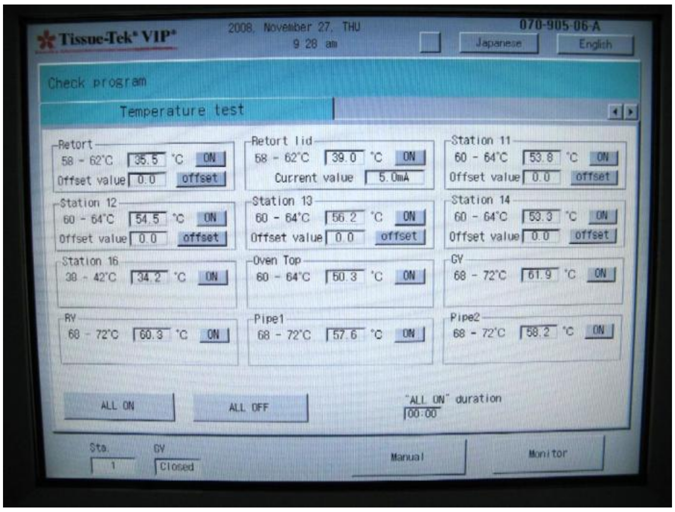
Screen.2-5-2-2 Electrical safety test screen



Screen.2-5-2-3 I/O check screen



Screen.2-5-2-4 Tubing system check screen



Screen.2-5-2-5 Temperature test screen

2) Start by pressing button of check program screen for selection of check contents. All check items except key input check can be stopped by pressing Exit button.
3) Pressing Japanese button of upper right on the screen will switch to Japanese language display and pressing English button will switch to English display.

Table.2-5-1 Language list

English
Settings & Others
Electrical safety test
I/O check
Check leakage from the tubing system
Measurement of maximum current consumption
Check main power indicator
Check screen
Check alarm sound
Date Setup
Serial number input
Check solenoid valve operations
Check rotary valve and gate valve operations
Check bottle illumination
Check the indicator for Paraffin Drain Container
Check the sensor for Paraffin Drain Container
Check the sensor for Oven Access Door
Check the retort lock mechanism
Check Exhaust Fan
Check Cooling Fan
Check level sensor for bulk reservoir
Check detection of power failure signal
Check communication function (LAN)
Check external alarm
Calibration of pressure sensor
Retort level sensor test
Check leakage from the retort
Pressure regulator test
Measurement of vacuum
Leakage test of seal for retort and air line
Check leakage from the bulk reservoir
Check the check valve of bulk reservoir
Check the tubing connection and leakage
Tubing Air Check
Check bottle connection
Tubing leakage Check
Temperature test
Check retort level sensor
Check the function of bulk reservoir
Manual
Monitor
Flushing the tubing and drain water
Alcohol Rinsing
Move to Water Drain Position
Start Water Drain
Backup of the instrument information
Update

Exit
Key buzzer Check
Alarm Check
Modify
Save
Input
Start
Stop
Lock
Unlock
Open
Closed
Fill
Drain
Output
Start Continuous Check
Immediate Start
Delayed Start
Start(Wet)
Start(Dry)
Pump in
Pump out
Pressure
Vacuum during Pump In
Vacuum during P/V cycle
Change Station
Rotate Clockwise
Shift Gate Valve position
Operate Air Pump
Drain Condenser
Backup
Execution
Unmount
GV Slack Check
Software Update
Control Data Update
NVRAM Clear

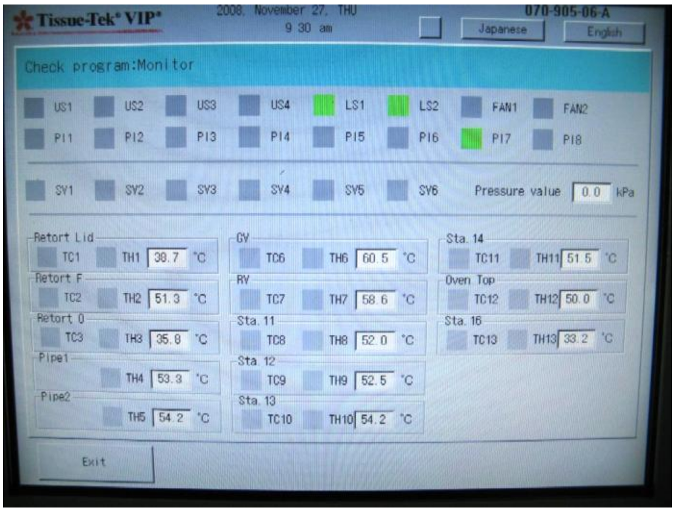
4) Backlight will be off by pressing [ ] on the left of [Japanese] button. Backlight will be on by pressing screen (Display field).

2-5-3 Check Program Function

(1) Detail monitor

1) Press the Monitor button

2) Detail monitor window will be displayed.



Screen.2-5-3-1 Detail monitor window

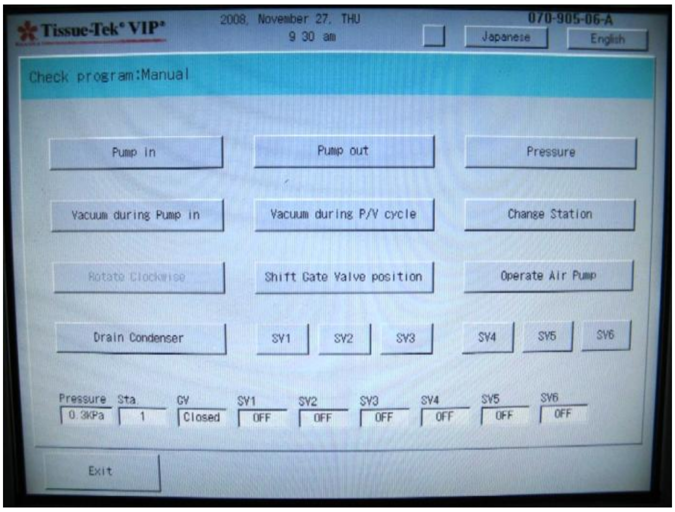
3) Mark and Name

Table 2-5-2 Mark and Name

Mark	Name	Mark	Name
US1	Ultrasonic sensor 2.7 L position	TC2	Retort front over temp. protector
US2	Ultrasonic sensor 3.5 L position	TC3	Retort other over temp. protectors
US3	Ultrasonic sensor 4.2 L position	TC6	Gate valve over temp. protector
US4	Ultrasonic sensor overflow position	TC7	Rotary valve over temp. protector
LS1	Wax drain container sensor	TC8	Paraffin 11 over temp. protector
LS2	Oven door sensor	TC9	Paraffin 12 over temp. protector
FAN1	Cooling fan	TC10	Paraffin 13 over temp. protector
FAN2	Exhaust fan	TC11	Paraffin 14 over temp. protector
PI1	Bulk tank level sensor (Sta.19) HH	TC12	Oven top plate over temp. protector
PI2	Bulk tank level sensor (Sta.19) H	TC13	Xylene warm up over temp. protector
PI3	Bulk tank level sensor (Sta.19) L	TH1	Retort lid heater
PI4	Bulk tank level sensor (Sta.20) H	TH2	Retort front heater
PI5	Bulk tank level sensor (Sta.20) HH	TH3	Retort other heaters
PI6	Bulk tank level sensor (Sta.20) L	TH4	Fill tube heater
PI7	Retort lid open/close sensor	TH5	Drain tube heater
PI8	Retort lid lock sensor	TH6	Gate valve heater
UPS	Power outage signal	TH7	Rotary valve heater
SV1	Solenoid valve 1	TH8	Paraffin station 11heater
SV2	Solenoid valve 2	TH9	Paraffin station 12 heater
SV3	Solenoid valve 3	TH10	Paraffin station 13 heater
SV4	Solenoid valve 4	TH11	Paraffin station 14 heater
SV5	Solenoid valve 5	TH12	Oven top plate heater
SV6	Solenoid valve 6	TH13	Xylene warm up heater
TC1	Retort lid over temperature protector		

(2) Manual operation

1) Press the Manual button.
2) Manual operation window will be displayed.



Screen.2-5-3-2 Manual operation window

3) Press operation items button to operate

Explanation of Items

1. Pump in

   Perform pump in operation

   Pump in button will become blue and start pump in by pressing Pump in button. Either when retort becomes air pressure or by repressing Pump in button, pump in will stop. Pump in button returns to grey.

2. Pump out

   Perform pump out operation

   Pump out button will become blue and start pump out by pressing Pump out button. Either when retort becomes air pressure or by repressing Pump out button, pump out will stop. Pump out button returns to grey.

3. Pressure operation

   Perform pressure operation at 34kPa setup pressure

   Pressure button will become blue and start pressure operation by pressing Pressure button. Repress Pressure button to stop pressure. Pressure button returns to grey.

4. Decompression operation of setup pressure of pump in

   Decompress with setup of vacuum reach pressure (-27kPa) of pump in. The Vacuum during Pump in button will switch to blue and start decompression operation by pressing Vacuum during Pump in button. Repress Vacuum during Pump in button to stop operation. Vacuum during Pump in button returns to grey.

5. Decompression operation of setup pressure of P/V cycle

   Decompress with setup of vacuum reach pressure (-70kPa) of P/V cycle. Vacuum during P/V cycle button will switch to blue and start decompression operation by pressing Vacuum during P/V cycle button. Repress Vacuum during P/V cycle button to stop operation. Vacuum during P/V cycle button returns to grey.

6. Change station

   Change to the target station

   Pressing Change Station button will display change station window. Pressing station number button of target station will change to target station on change station window. No button can be pressed during move. By pressing Exit button will return to manual operation window.

7. Rotary valve clockwise (Ignore situation)

   Let rotary valve turn clockwise

   Rotate Clockwise button will turn to blue and rotary valve will turn clockwise and then change to the next station by pressing Rotate Clockwise button. Rotate Clockwise button will return to grey after change station.

8. Gate valve position switch

   Switch gate valve position

   Shift Gate Valve position will become blue and switch gate valve position by pressing Shift Gate Valve position button. Shift Gate Valve position button returns to grey after gate valve switch,

9. Pump operation

   Let pump operate

   Operate Air Pump button will become blue and start pump by pressing Operate Air Pump button. Pump stops and Operate Air Pump button returns to grey by repressing Operate Air Pump button.

10. Condenser drain

   Perform drain operation of condenser

   Drain condenser button will become blue and start drain operation of condenser by pressing Drain condenser button (Turn on pressure and solenoid valve SV6). Operation stops and Drain condenser button returns to grey by repressing Drain condenser button.

11. Solenoid valve operation

   Turn solenoid valve SV1- SV6 on and off respectively.

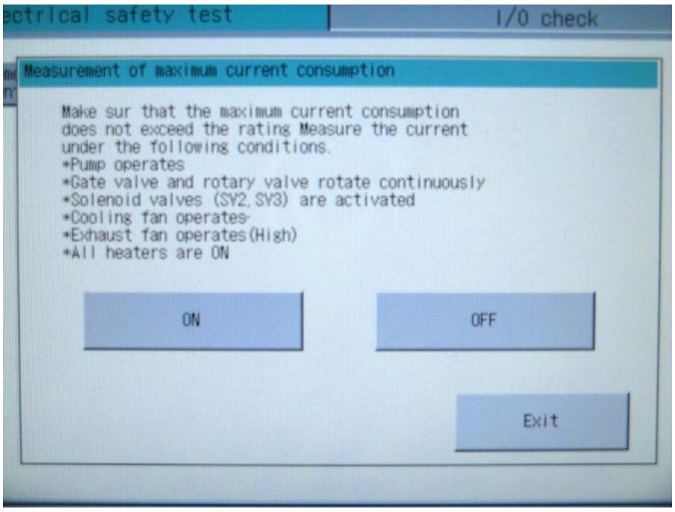
   ON and OFF will switch when pressing each button of SV1 - SV6 every time.

(3) Measurement of maximum current consumption

1) Press Electrical safety test tab

2) Press Measurement of maximum current consumption button

3) Measurement of maximum current consumption window is displayed



Screen 2-5-3-3 Measurement of maximum current consumption window

4) Press ON button to make the maximum current condition

Turn to the following output condition:

- Pump operation
- Continuous operation of gate valve and rotary valve
- Activate solenoid valves (SV2, SV3)
- Cooling fan operation
- Exhaust fan operation
- Temperature control for all heaters
- Bottle illumination ON

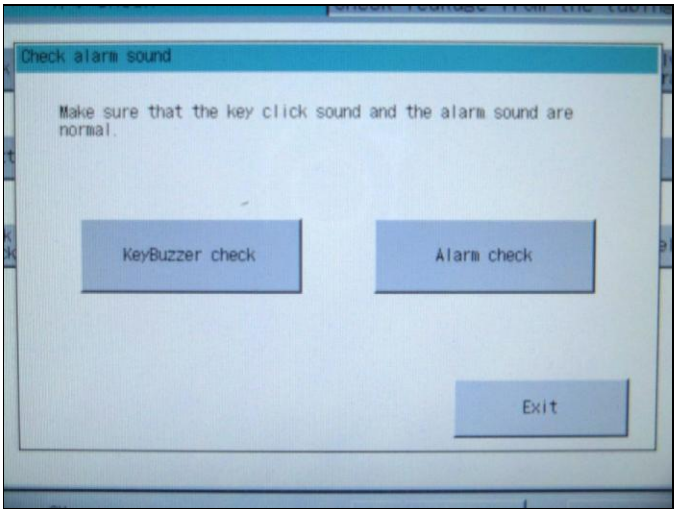
5) Pressing OFF button will clear the maximum current condition

(4) Check alarm sound

1) Press I/O check tab

2) Press Check alarm sound button

3) Check alarm sound window will be displayed



Screen.2-5-3-4 Check alarm sound window

4) When pressing Keybuzzer Check button, make sure that key sound is given

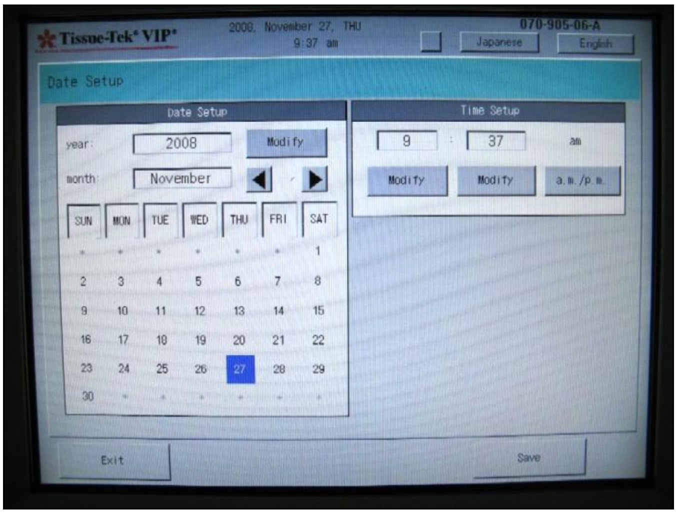
5) When pressing Alarm Check button, confirm that alarm sound is given (Sound twice then stop)

(5) Date setup

1) Press Settings & Others tab

2) Press Date Setup button

3) Date setup window is displayed.



Screen.2-5-3-5 Date setup window

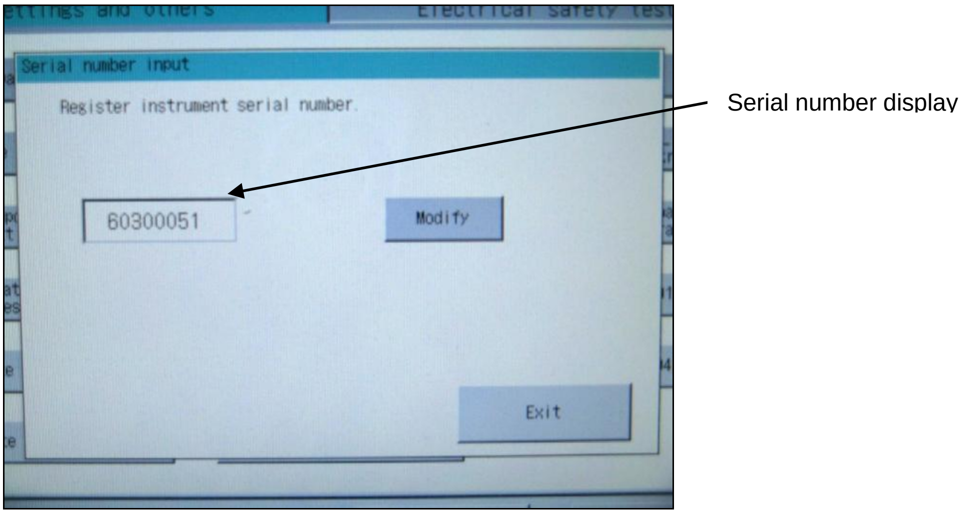
4) Press Modify button or date to adjust year, month, day, hour and minute of current date and save with Save button

5) Check if the time set is saved at the time of software startup after setup completed.

(6) Input serial number

1) Press Settings & Others tab
2) Press Serial number input button
3) Serial number input window will be displayed

When moved to this window, if serial number has been saved, the number will be displayed.



Screen.2-5-3-6 Serial number input window

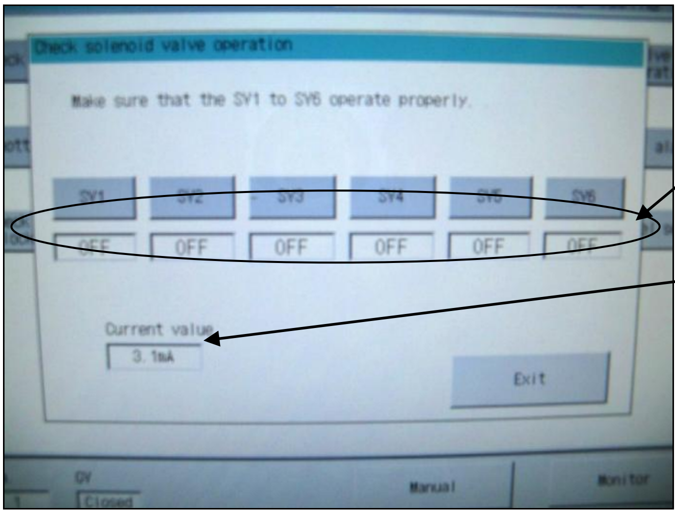
4) Press Modify button, input the specific serial number through 0 - 9 number key, then touch Input button to save after confirmation.

(7) Check solenoid valve operation

1) Press I/O check tab

2) Press Check solenoid valve operations button

3) Check solenoid valve operation window will be displayed.



Display solenoid valve condition

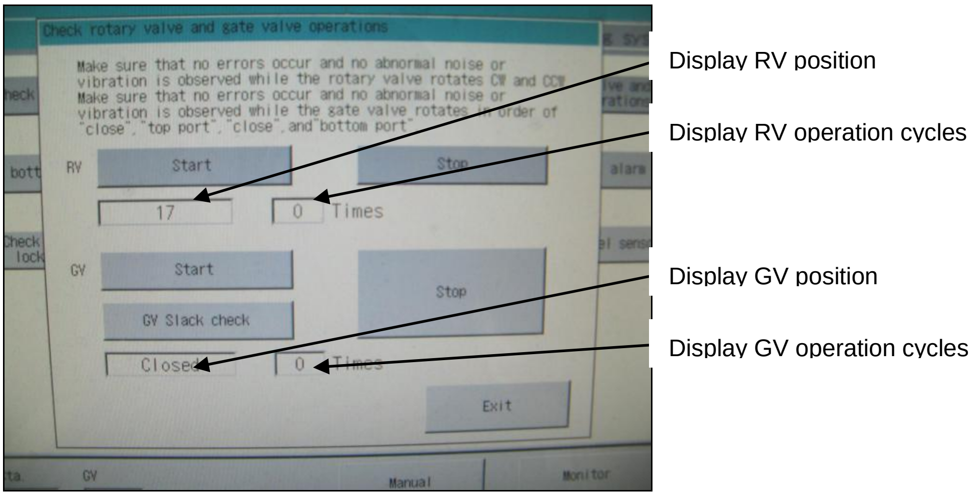
Display current of solenoid valve

Screen.2-5-3-7 Check solenoid valve operation window

4) If pressing each ON button of solenoid valve from SV1 to SV6, applicable condition display of solenoid valve will switch to "**ON**" or pressing OFF button will switch to "**OFF**" display. Total output current of solenoid valve is displayed on the lower left. Each current value is approx. 220mA.

(8) Check rotary valve and gate valve operations

1) Press I/O check tab
2) Press Check rotary valve and gate valve operations button
3) Check rotary valve and gate valve operations window will be displayed



Screen.2-5-3-8 Check rotary valve and gate valve operations window

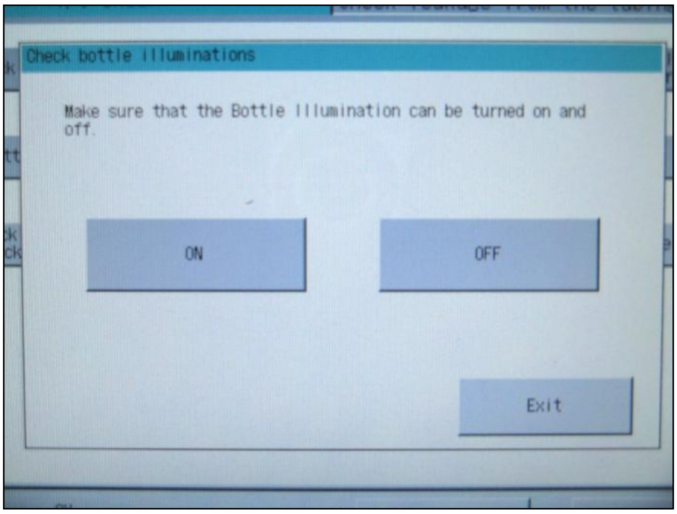
4) When RV Start key is pressed, while displaying current station number, rotary valve rotates one circle clockwise and one cycle counterclockwise. Make sure that no abnormal noise and vibration is observed and rotation is completed normally during rotation.
5) When GV Start key is pressed, while displaying current position, gate valve rotates "**Closed**" → "**Fill**" → "**Closed**" → "**Drain**" → "**Closed**" in order. Make sure that no abnormal noise and vibration is observed during rotation and rotation is completed normally.
6) When GV Slack check key is pressed, while displaying current position, gate valve rotates "**Closed**" → "**Fill**" → "**Closed**" → "**Fill**" → "**Closed**" → "**Drain**" → "**Closed**" → "**Drain**" → "**Closed**" in order. Make sure that no abnormal noise and vibration are observed during rotation and rotation is completed normally.
7) When one circle clockwise and one circle counterclockwise are completed, or Stop button is pressed, rotary valve will stop. Gate valve stops when one circle is rotated or Stop button is pressed.

(9) Check bottle illumination

1) Press I/O check tab

2) Press Check bottle illumination button

3) Check bottle illumination window will be displayed



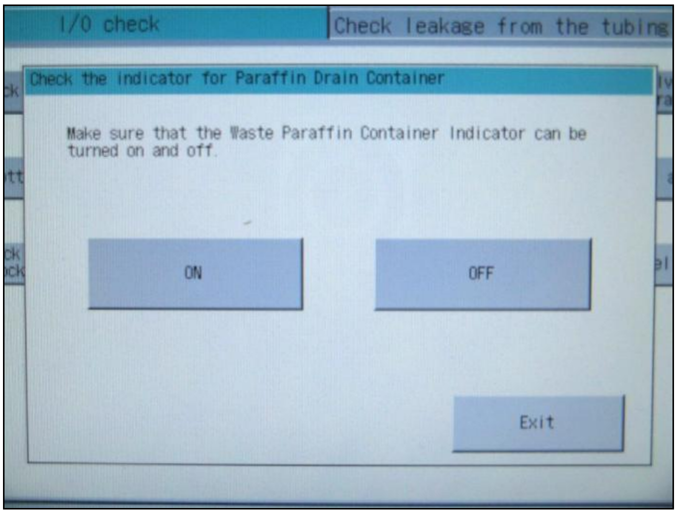
Screen.2-5-3-9 Check bottle illumination window

8) Press ON button to check bottle illumination is on.

9) Press OFF button to check bottle illumination is off.

(10) Check the indicator of paraffin drain container

1) Press I/O check tab
2) Press Check the indicator for Paraffin Drain Container button
3) Check the indicator of paraffin drain container window will be displayed

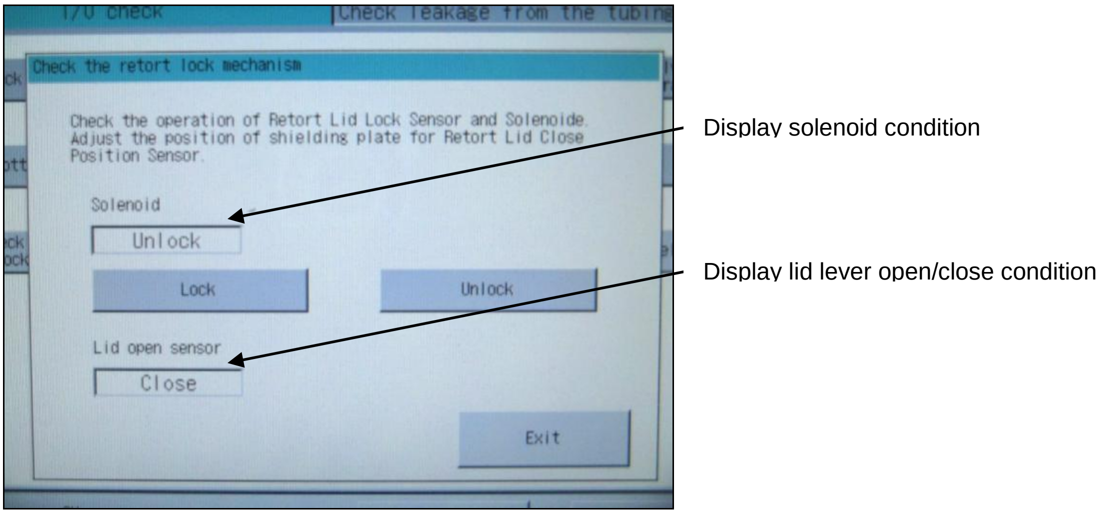


Screen.2-5-3-10 Check the indicator of paraffin drain container window

4) Press ON button to check the indicator of paraffin drain container is on.
5) Press OFF button to check the indicator of paraffin drain container is off.

(11) Check the retort lock mechanism

1) Press I/O check tab
2) Press Check the retort lock mechanism button
3) Check the retort lock mechanism window will be displayed



Screen.2-5-3-11 Check the retort lock mechanism window

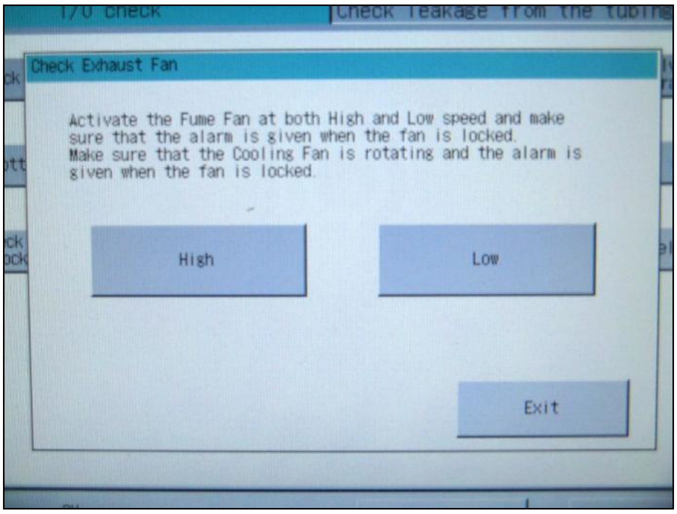
4) Close retort handle and press solenoid Lock button to check「**Lock**」is displayed on solenoid display column. Also make sure that handle is locked.
5) Press Unlock button to check「**Unlock**」is displayed on solenoid display column. Also make sure that handle is unlocked.
6) when handle of retort is on open position, make sure that 「**Open**」is displayed on lid open sensor display column.
7) Close retort handle and make sure that check「**Close**」is displayed on lid open sensor display column.
8) Make solenoid of retort lid become「**Lock**」condition, when rotated retort handle to open direction, make sure that it is not in「**Open**」condition.

(12) Check exhaust fan

1) Press I/O check tab

2) Press Check Exhaust Fan button

3) Check exhaust fan window will be displayed.



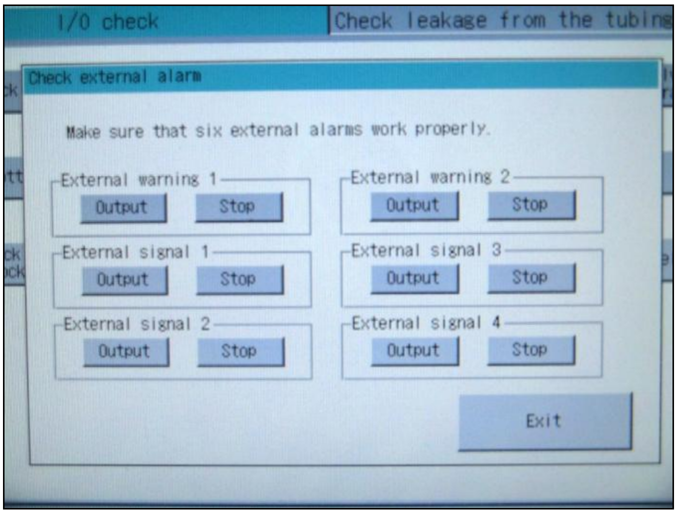
Screen.2-5-3-12 Check exhaust fan window

4) Press Low button to check exhaust fan rotates at low speed.

5) Press High button to check exhaust fan rotates at high speed.

(13) Check external alarm

1) Press I/O check tab
2) Press Check external alarm button
3) Check external alarm window is displayed.



Screen.2-5-3-13 Check external alarm window

4) Pressing Output button of external alarm 1 will display external alarm 1. When Stop button is pressed, output of external alarm 1 will stop.
5) Pressing Output button of external alarm 2 will display external alarm 2. When Stop button is pressed, output of external alarm 2 will stop.
6) Pressing Output button of external signal 1 will display external signal 1. When Stop button is pressed, output of external signal 1 will stop.

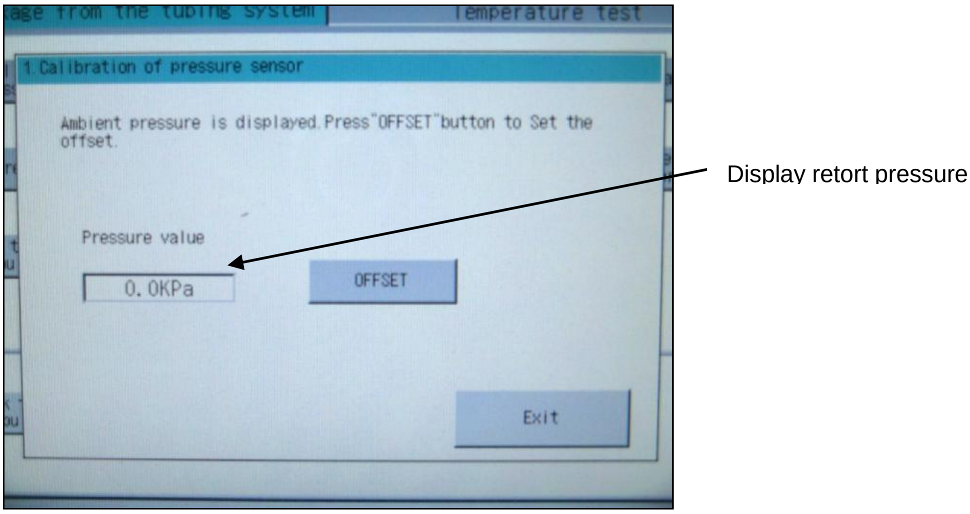
7) Pressing Output button of external signal 2 will display external signal 2. When Stop button is pressed, output of external signal 2 will stop.
8) Pressing Output button of external signal 3 will display external signal 3. When Stop button is pressed, output of external signal 3 will stop.
9) Pressing Output button of external signal 4 will display external signal 4. When Stop button is pressed, output of external signal 4 will stop.

(14) Calibration of pressure sensor

1) Press Check leakage from the tubing system tab

2) Press Calibration of pressure sensor button

3) Calibration of pressure sensor window will be displayed.



Screen.2-5-3-14 Calibration of pressure sensor window

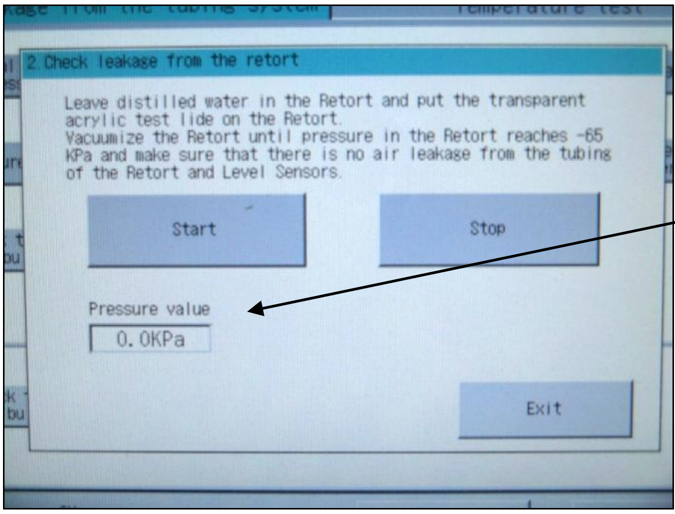
4) Press OFFSET button with retort lid opened. Calibration of pressure sensor will be performed accordingly.

(15) Check leakage from the retort (Check item only for factory shipment inspection)

1) Press Check leakage from the tubing system tab

2) Press Check leakage from the retort button

3) Check leakage from the retort window will be displayed.



Display retort pressure

Screen.2-5-3-15 Check leakage from the retort window

4) Put distilled water into the retort up to upper port of retort and close the lid

5) Press Start button

6) Check leakage from the fill/drain tubing and each level sensor toward retort.

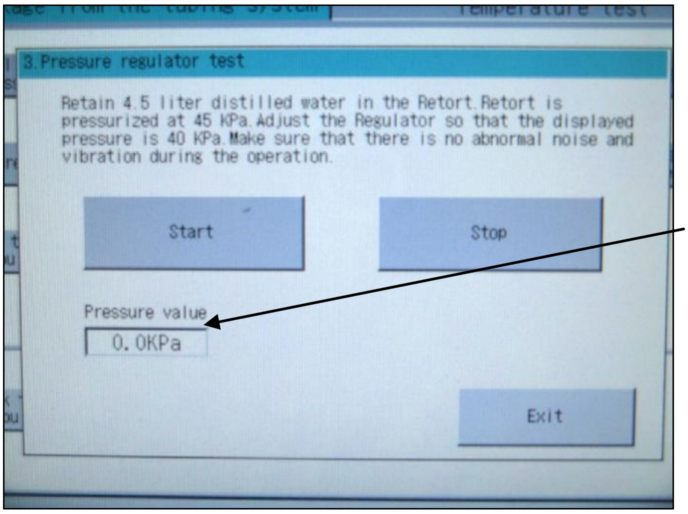
7) Press stop button to stop.

(16) Pressure regulator test

1) Press Check leakage from the tubing system tab

2) Press Pressure regulator test button

3) Pressure regulator test window will be displayed.



Display retort pressure

Screen.2-5-3-16 Pressure regulator test window

4) Press Start button

*If pressure regulator is unadjusted, loosen regulator top's adjustment screw in advance to avoid pressure increase before start.

5) While displaying pressure value, pressurize retort at 45kPa setup pressure. Turn adjustment screw of regulator slowly to get into the range of 38 - 42 kPa for pressure value. Tighten and secure adjustment nut during the said range. (Alarm sound will be given within pressure value of 38 - 42 kPa range)

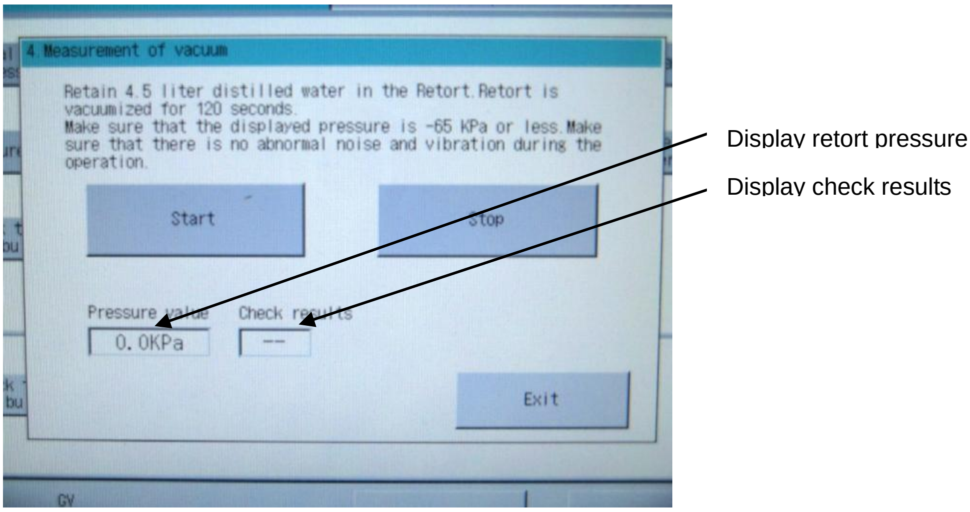
6) Press Stop button to stop.

(17) Measurement of vacuum

1) Press Check leakage from the tubing system tab

2) Press Measurement of vacuum button

3) Measurement of vacuum window will be displayed.



Screen.2-5-3-17 Measurement of vacuum window

4) Put distilled water and formalin water etc. of 4.5L into the retort in advance, close retort lid and press Start button.

5) When decompressing retort, measurement will start in 90 seconds, Measurement pressure value will be displayed. If pressure value is Below -65 kPa, display of check results will display “**OK**”. Make sure that there is no abnormal noise and vibration during decompression operation. (“**NG**” if it did not reach -65 kPa in 90 seconds)

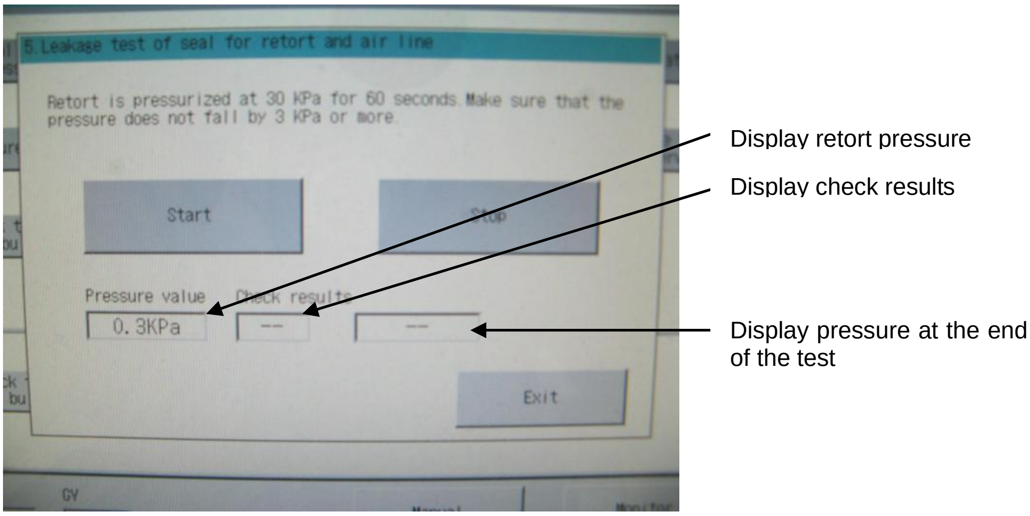
6) This test can be aborted by pressing Stop button.

(18) Leakage test of seal for retort and air line.

1) Press Check leakage from the tubing system tab

2) Press Leakage test of seal for retort and air line button

3) Leakage test of seal for retort and air line window will be displayed



Screen.2-5-3-18 Leakage test of seal for retort and air line window

4) Put distilled water and formalin water etc. of 4.5L into the retort in advance, close retort lid and press Start button.

5) Retort is pressurized at 30 kPa and, if reaching pressure, maintains pressure only by a solenoid valve within 60 seconds. If pressure falls by 3kPa or more, as there is leakage from air line, the result is "**NG**". Make sure that the test result is "**OK**".

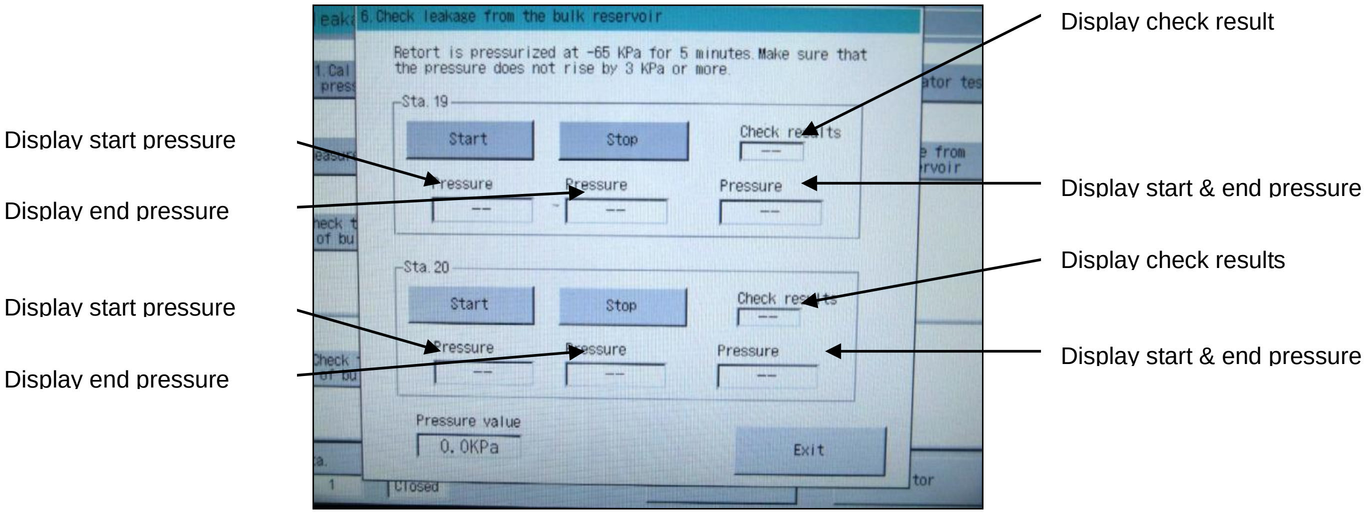
6) This test can be aborted by pressing Stop button.

(19) Check leakage from the bulk reservoir

1) Press Check leakage from the tubing system tab

2) Press Check leakage from the bulk reservoir button

3) Check leakage from the bulk reservoir window will be displayed.



Screen.2-5-3-19 Check leakage from the bulk reservoir window

4) Put distilled water and formalin water etc. of 4.5L into the retort in advance, close retort lid and press Start button of bulk reservoir to be checked.

5) Air line including bulk reservoir is decompressed up to -65kPa for system and maintain pressure for 5 minutes. During the period of time, if the pressure is recovered by 3 kPa or more, as there is leakage from the bulk reservoir, the result is “**NG**”. Make sure that the test result is “**OK”**.

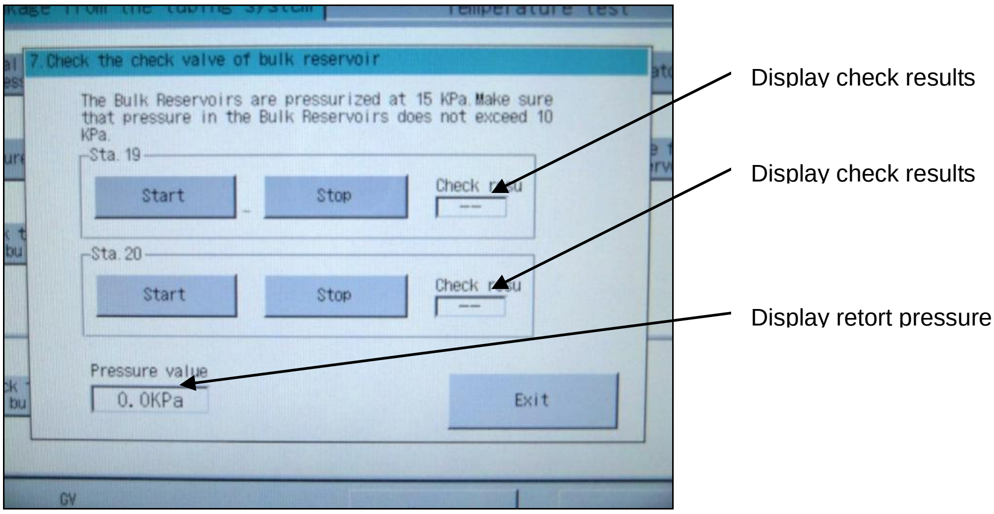
6) This test can be aborted by pressing Stop button.

(20) Check the check valve of bulk reservoir

1) Press Check leakage from the tubing system tab

2) Press Check the check valve of bulk reservoir button

3) Check the check valve of bulk reservoir window is displayed.



Screen.2-5-3-20 Check the check valve of bulk reservoir window

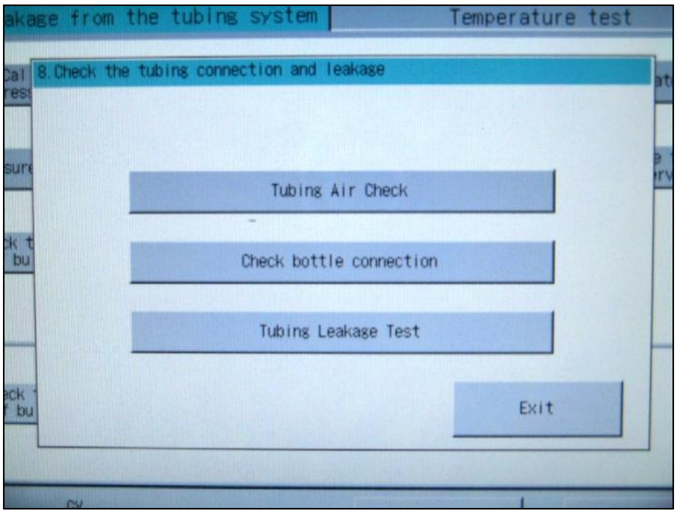
4) Close retort lid, press Start button of bulk reservoir to be checked.

5) The bulk reservoir is pressurized at 15kPa of setup pressure for the system. Make sure that the air pressure does not exceed 10 kPa through check valve. The result ("**OK**" or "**NG**") will be displayed after test, make sure "**OK**" is displayed.

6) This test can be aborted by pressing Stop button.

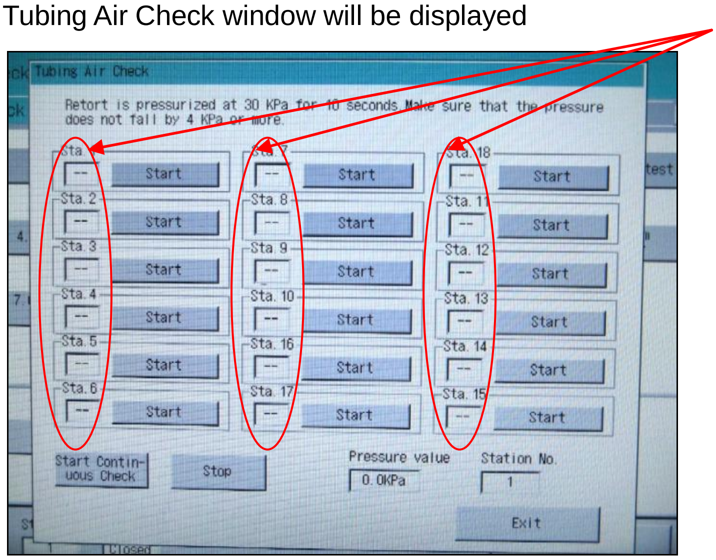
(21) Tubing Air Check **(Only in the factory shipment inspection**)

1) Press Check leakage from the tubing system tab
2) Press Check the tubing connection and leakage button
3) Check the tubing connection and leakage window will be displayed



Screen.2-5-3-21 Check the tubing connection and leakage window

4) Press Tubing Air Check button.
5) Tubing Air Check window will be displayed



Screen.2-5-3-22 Tubing Air Check window

6) Press Start Continuous Check button
7) Confirm that Sta.1 to Sta.10 and Sta.16 to Sta.18 are pressurized up to 30KPa continuously. Make sure that "**OK**" is displayed as result ("**OK** "or "**NG**") will be displayed after test.
8) Press Start button of Sta.11 to Sta.15.
9) Hold the tank connection port manually and make sure it is pressurized up to 30 KPa. The result ("**OK** "or "**NG**") will be displayed after test, make sure "**OK** "is displayed.

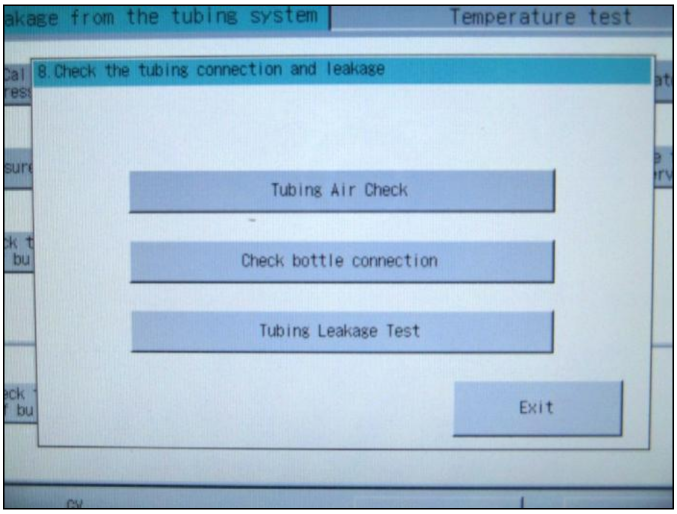
10) Tubing Air Check can be aborted by pressing Stop button.

* Continuous checks are performed for the stations other than Sta. 11 to Sta. 15. Stations from Sta.11 to Sta.15 are checked respectively.

In the case of respective check, press the Start button of the station to be checked.

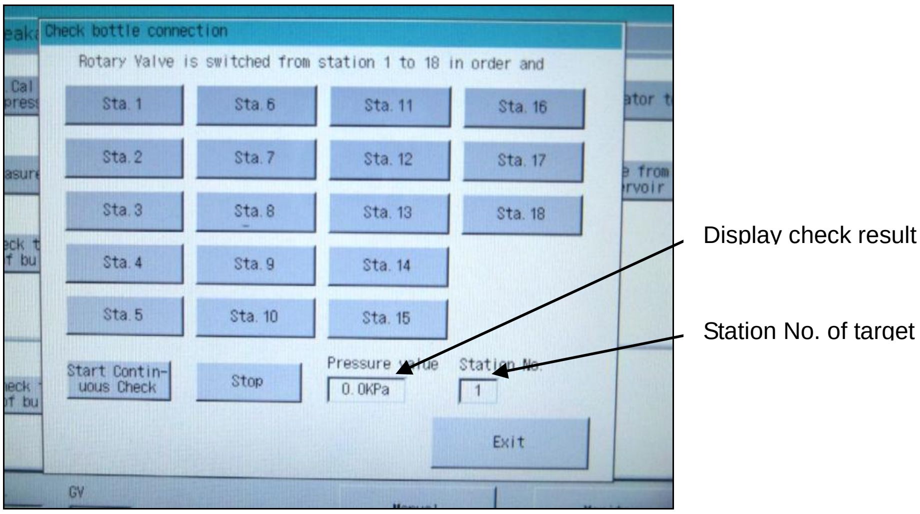
(22) Check bottle connection（**Only in the factory shipment inspection**)

1) Press Check leakage from the tubing system tab
2) Press Check the tubing connection and leakage button
3) Check the tubing connection and leakage window will be displayed



Screen.2-5-3-23 Check the tubing connection and leakage window

4) Press Check bottle connection button
5) Check bottle connection window will be displayed.



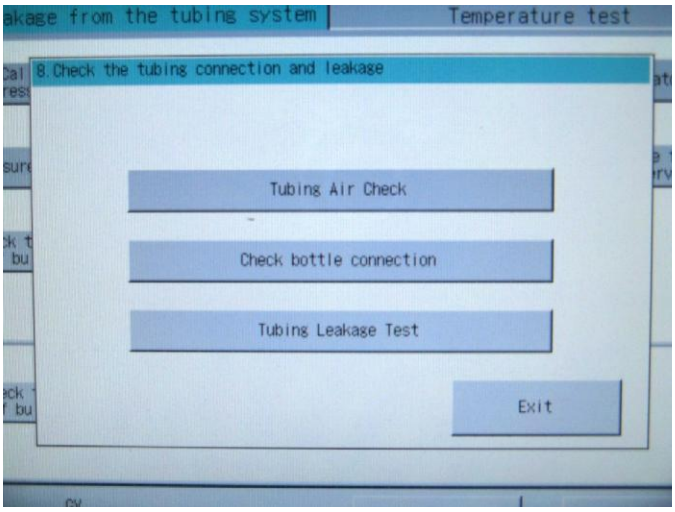
Screen.2-5-3-24 Check bottle connection window

6) Press Start Continuous Check button
7) Sta.1 to Sta.18 are pressurized at 15KPa continuously, alarm will be given when pressure exceeds 10KPa. If alarm occurred, connect reagent tank to connection port, make sure it reaches barometric pressure (alarm stop) Sta. 11 to Sta. 15 will be checked by holding the tank connection port manually in the pressurized condition.
8) Check bottle connection is completed automatically or stopped by touching Stop button.

* To perform respective check, press Sta. No button to be checked.

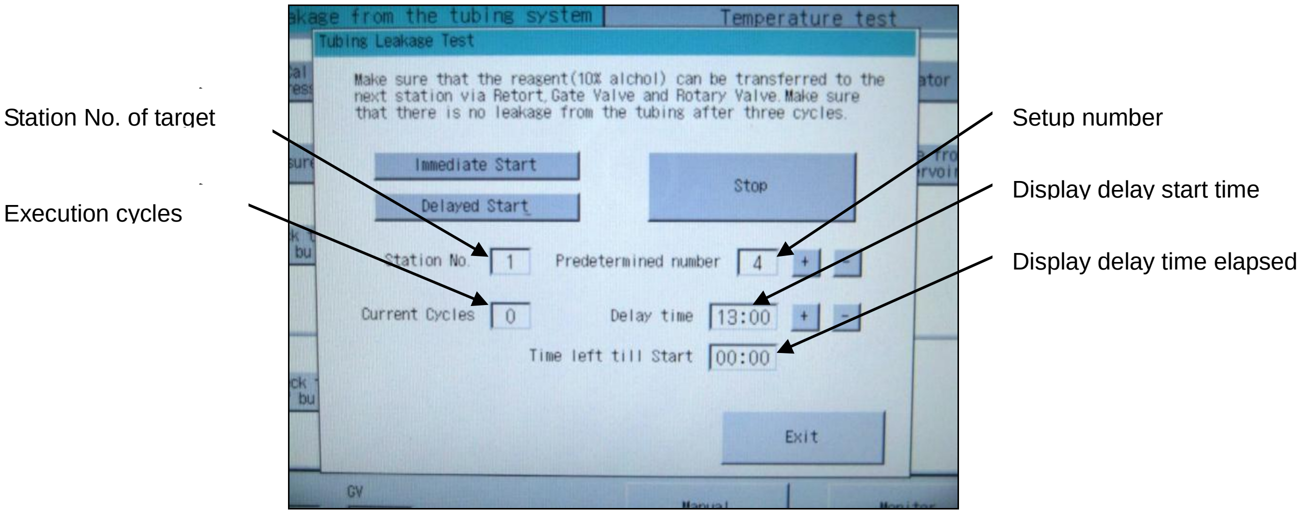
(23) Check the tubing connection and leakage（**Only in the factory shipment inspection**）

1) Press Check leakage from the tubing system tab
2) Press Check the tubing connection and leakage button
3) Check the tubing connection and leakage window will be displayed



Screen.2-5-3-25 Check the tubing connection and leakage window

4) Press Tubing leakage Check button.（No execution without setting paraffin drain container. When pressing Tubing leakage Check button, note window will be displayed to tell you to setup the paraffin drain container）
5) Tubing leakage window will be displayed



Screen.2-5-3-26 tubing leakage test window

6) Connect bottle to Sta. 1 – Sta. 18. Test solution (10% Drysole)
7) To perform delayed start, set with + button and – button for the time before start and touch Delayed Start button. For prompt start, press Immediate Start button.
8) Continuous operations : ”fill” → “drain” → “change to next station” → “fill”---- from Sta. 1 to Sta.18 if started.
9) Confirm that no leakage form tubing after repeating 3 cycles or more
10) Sta15 is filled again from sta. 18 after drain of sta18 of final setting cycle is completed and drain to paraffin drain container after rotary valve changed to sta. 15 to complete the continuous operation.
11) Tubing leakage test is completed automatically or stopped by pressing Stop button.

∗ Delay time will switch to +30-minute every time when pressing + button and switch to -30-minute when pressing – button.
Delay setup time can be set up to 99 hours 30 minutes.
Initial setting is setting cycles: 4, Delay time: 13 : 00
When paraffin drain container is not in the connection condition, note window will be displayed to tell you to connect paraffin drain container.

(24)Temperature test

1) Press Temperature test tab

2) Temperature test screen will be displayed. （See screen2-5-2-5）

3) Put distilled water into retort and paraffin into oven.

4) Press ALL ON button

5) All temperature control of heater will be started.

Retort: 60°C, Oven: 62°C, Xylene heating assembly: 40°C, Others: 70°C

- Retort
- Paraffin Sta. 11
- Paraffin Sta. 12
- Paraffin Sta. 13
- Paraffin Sta. 14
- Retort lid
- Fill tubing
- Drain tubing
- Oven top plate
- Gate valve
- Rotary valve
- Clean xylene station

6) Measure after 4 hours elapsed following temperature control for temperature stability. ALL ON elapsed time will be counted after ALL ON starts.

7) Confirm that temperature is within ±2°C of set temperature and, when retort, paraffin Sta.11, 12, 13, 14 and oven top plate are outside temperature range, touch Offset button to display the input window. Enter offset value for adjustment.

Enter [temperature x 10] for offset value.

For example, enter “10” on input window to set offset value to 1°C.

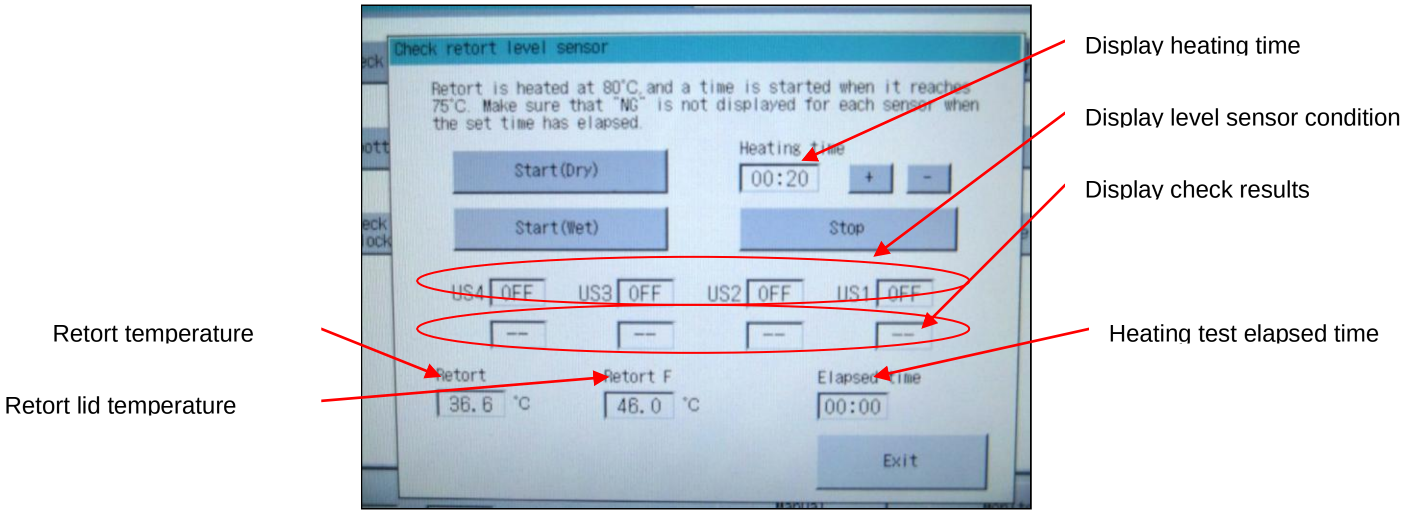
8) To stop heater temperature control, press ALL OFF button.

9) When start/stop heater temperature control respectively, press ON, OFF button (toggle button) of each display parts.

* Although other tests are being performed, temperature control will not stop without stopping temperature control.

(25) Level sensor temperature test （**Only in factory shipment inspection**）

1) Press I/O check tab
2) Press Check retort level sensor button
3) Level sensor temperature test window will be displayed.



Screen.2-5-3-27 level sensor temperature test window

4) Input test time with +, - button
5) To check when reagent is in the retort, press Start (Wet) button
6) To check when reagent is not in the retort, press Start (Dry) button
7) Start temperature control at 80°C for retort and 60°C for retort lid, when retort front heater reaches 75°C, the count of elapsed time will start.
8) Make sure that “**OK**” is displayed when level sensor is not turned counterclockwise after test time elapsed (if starting with reagent: “ **NG**” by OFF, if starting without reagent: “**NG**” by ON)
9) Stop when test time elapsed or by pressing Stop button.

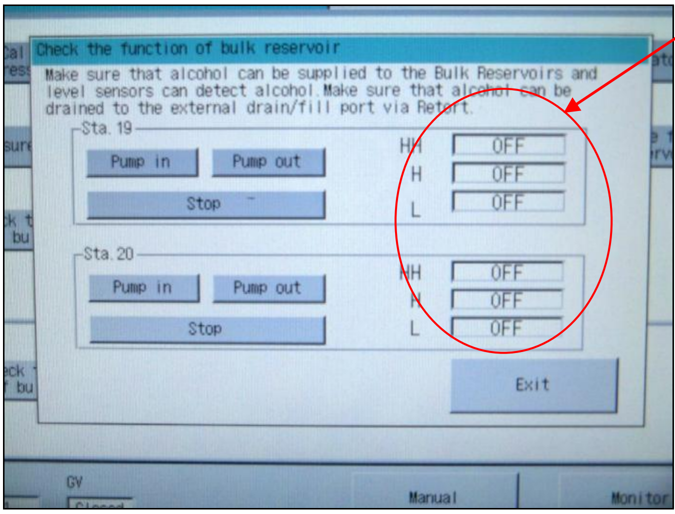
* Although retort front heater has not reached 75°C, the counterclockwise check of level sensor will be performed once Start button is pressed.

(26) Check the function of bulk reservoir

1) Press Check leakage from the tubing system tab

2) Press Check the function of bulk reservoir button

3) Check the function of bulk reservoir window will be displayed



Display level sensor condition

Screen.2-5-3-28 Check the function of bulk reservoir window

4) To perform pump-in of Sta19 and Sta.20, connect hose to external fill port performing pump-in (Sta.19 or 20) and press Pump in button to start pump in.

5) To perform pump-out of Sta.19 and Sta.20, connect hose to external fill port (Sta18) and press Pump out button to start pump out.

6) Press Stop button to stop pump in and pump out.

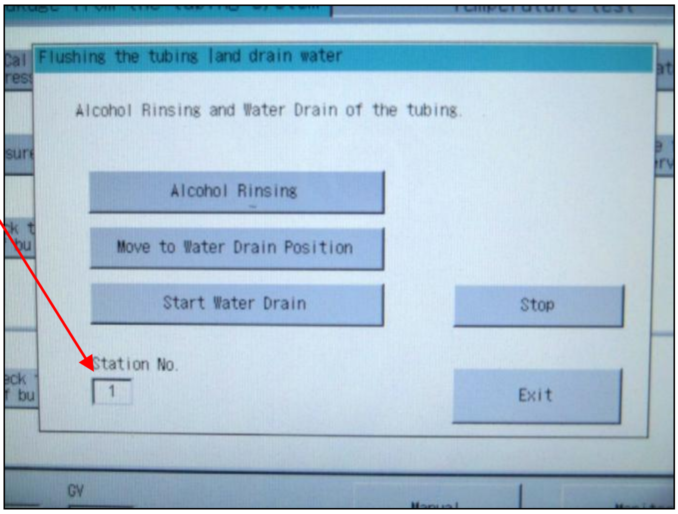
∗ Pump in will also stop when retort pressure became barometric pressure or level sensor of bulk reservoir detected (Sta.19:PI1, Sta.20: PI4).

Pump out will be repeated until reagent of bulk reservoir runs out.

(27) Flushing the tubing and drain water (**Only in factory shipment inspection**)

1) Press Flushing the tubing and drain water button.

2) Flushing the tubing and drain water button will be displayed.



Screen.2-5-3-29 Flushing the tubing and drain water window

3) Prepare the bottle with alcohol of approx. 1L, then set in the Sta.1- Sta.18. After that, press Alcohol Rinsing button. The rinsing of tube will start through alcohol (Ethanol or Methanol). As no fill will be performed for Sta.15, fill from Sta18 again and drain to Sta.15 after Sta.18 drain completed,

* No execution is allowed if paraffin drain container is not set. Pressing Alcohol Rinsing button will display note window to tell you to set the paraffin drain container.

4) When pressing Move to Water Drain Position button, rotary valve moves to Sta.1 and open top opening. Send air to top opening by air gun etc. to drain water of top opening. Make sure that air pressure of air gun is less than 200kPa. Do not put tank cap or loosen it to avoid the air pressure in the tank.

5) If Start Water Drain button is pressed, rotary valve will move to Sta.1.

Perform water drain of Sta. 1 – Sta. 18 through air in the lower opening of retort bottom

* The move interval for rotary valve to the next station is 15 seconds. The drain is completed in 60 seconds after the move to Station 18.

6) Remove all tanks and wipe off droplet of tank connection part, oven and tank rack.

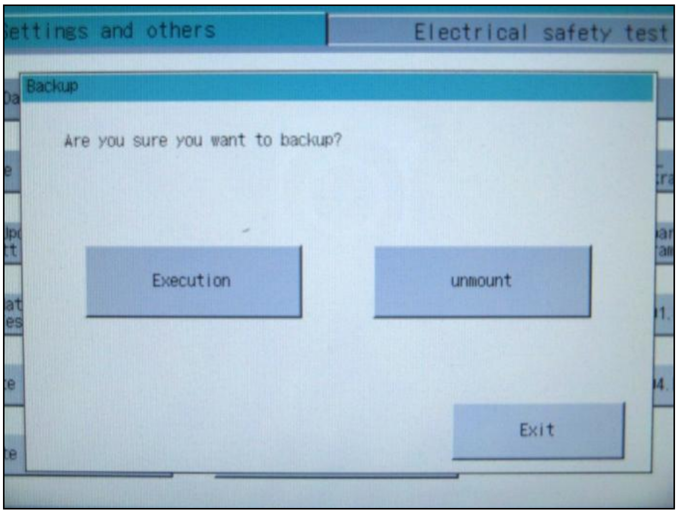
(28) Backup of system information (**Only in factory shipment inspection**)

1) Press Settings & Others tab

2) Press Backup button

3) Insert USB storing with system information into connection port

4) Backup window of system information will be displayed.



Screen.2-5-3-30 Backup window of system information window

5) Press Execution button

6) Folder equating to serial No. of system will be created in the USB of A driver, to which setup information of system will be filed.

7) If normal completion is displayed in the message column, as pressing Unmount button will allow USB separation, remove USB to finish.

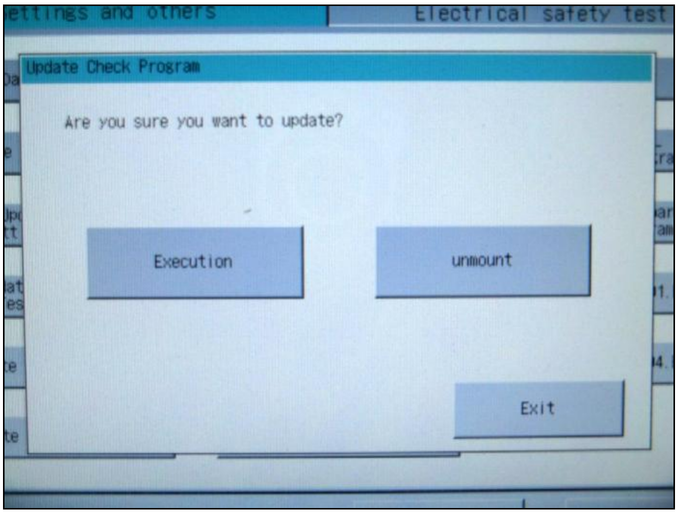
(29) Update of programs

Programs allowed to be updated are as follows:

- Check program（VIP6KPG.BIN）
- Screen teaching program(VIP6TCG.BIN）
- Control program (VIP6GUT.BIN)
- Control data

Update procedures:

1) Press Settings & Others tab.
2) Settings & Others screens are displayed. (Refer to Screen2-5-2-1).
3) To update check program, press Update Check Program button. To update screen teaching program, press Update Touch Panel Adjustment Program button.
   To update control program, press Software Update button.
   To update control data, press Control data update button.
4) Update window will be displayed.

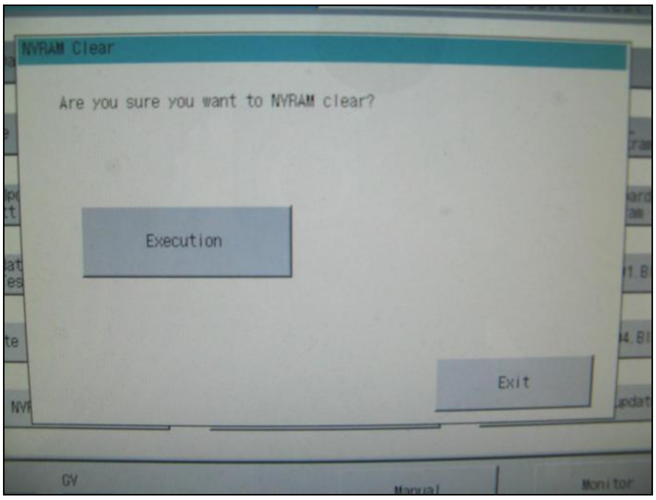


Screen.2-5-3-31 Update window

5) Store program performing update in root directory of USB flush memory, insert to USB connection port.
   To update control data, store control data in an UPDATE folder of USB flush memory, and insert USB flush memory into USB connection port.
6) Press Execution button.
7) “Normal termination” will be displayed in the message column, update in SYSTEM folder of CF of B driver.
8) As pressing Unmount button will allow USB separation, remove USB to finish.

(30) NVRAM Clear

1) Press Settings & Others tab.
2) Settings & Others screens are displayed. (Refer to Screen2-5-2-1).
3) Press NVRAM Clear button.
4) NVRAM Clear window will be displayed.



Screen.2-5-3-32 NVRAM Clear window

5) Press Execution button.
6) “Normal termination” is displayed in the message column, and NVRAM is cleared.
7) Start control program.
8) Clear the usage status of parts. (Refer to 3-4-8 Parts Status Screen.)

2-5-4 Error List

Table.2-5-3 Error List

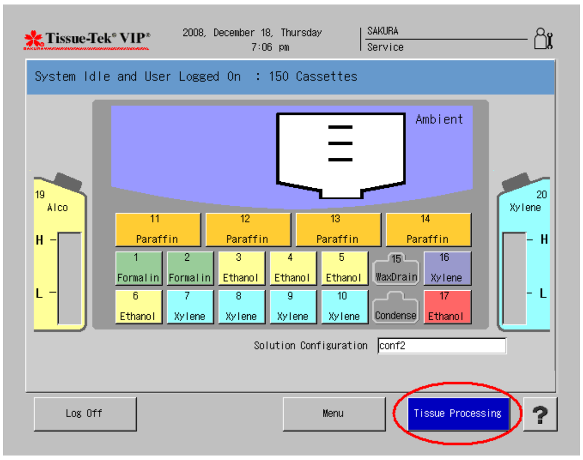
Fume fan error occurred	
Cooling fan error occurred	
Retort(front)	heater burnout
Retort (front)	temperature sensor abnormal
Retort (others)	heater burnout
Retort (others)	temperature sensor abnormal
Retort lid	heater burnout
Retort lid	temperature sensor abnormal
Rotary valve	heater burnout
Rotary valve	temperature sensor abnormal
Gate valve	heater burnout
Gate valve	temperature sensor abnormal
Paraffin Sta.11	heater burnout
Paraffin Sta.11	temperature sensor abnormal
Paraffin Sta.12	heater burnout
Paraffin Sta.12	temperature sensor abnormal
Paraffin Sta.13	heater burnout
Paraffin Sta.13	temperature sensor abnormal
Paraffin Sta.14	heater burnout
Paraffin Sta.14	temperature sensor abnormal
Oven top plate	heater burnout
Oven top plate	temperature sensor abnormal
Fill tube	heater burnout
Fill tube	temperature sensor abnormal
Drain tube	heater burnout
Drain tube	temperature sensor abnormal
Clean xylene	heater burnout
Clean xylene	temperature sensor abnormal
Rotary valve malfunction during clockwise	
Rotary valve position sensor abnormal	
Gate valve malfunction during clockwise	
Gate valve position sensor abnormal	
Pressure control	start-up error
Pressure control	overload error
Pressure control	pressure control unfunctional error
Pressure control	setup error
File not found in the USB flash memory.	

2-6 Check on External Alarm/External Signal Output

Explain the output check operation of the external alarm/external signal when connected alarm device to the system. Regarding external alarm, explain the check method of switch of “in-process” / ”None” for “tissue processing”, and check method of switch of “Available” / ”None” for “ external alarm ” . Regarding external signal, explain check method of switch of ON (“with” output condition) / OFF (“without” output condition) of external signal 1-4. For the connection of system and alarm device, see “1-2-11-7-3 External output/alarm”

(1) Output check operation during tissue processing (Point 1-2, point 1-3 of external alarm)

1) As system starts-up will display「System Idle and No User Logged On」screen , enter password “3141” to log on.「System Idle and User Logged On」screen will be displayed after log-on.
2) External alarm became「”Without” tissue processing」(Point 1-2 ON, point 1-3 OFF) when system started up
3) Press the **Tissue Processing** button of 「System Idle and User Logged On」 screen to display「Start Tissue Processing」 screen.



Screen.2-6-1 System Idle and User Logged On screen

4) When 「Start Tissue Processing」 screen is displayed, external alarm will switch to [tissue processing “ in-process” condition] (Point 1-2 OFF, point 1-3 ON)
5) Press the **Exit** button of 「Start Tissue Processing」screen to return to「System Idle and User Logged On」 screen
6) When 「System Idle and User Logged On」 screen is displayed, external alarm will switch to [“without” tissue processing condition] (Point 1-2 ON, point 1-3 OFF)

(2) Output check operation of external alarm (Point 4-5, point 4-6 of external alarm)

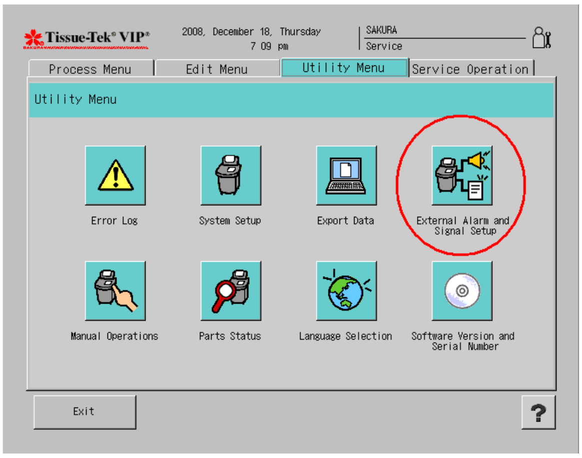
1) As system starts-up will display「System Idle and No User Logged On」screen , enter password “3141” to log on.「System Idle and User Logged On」screen will be displayed after log-on.

2) External alarm became「”Without” external alarm condition」(Point 4-5 OFF, point 4-6 ON) when system started up

3) Press the **Menu** button of 「System Idle and User Logged On screen」 to display 「Process Menu」 screen.

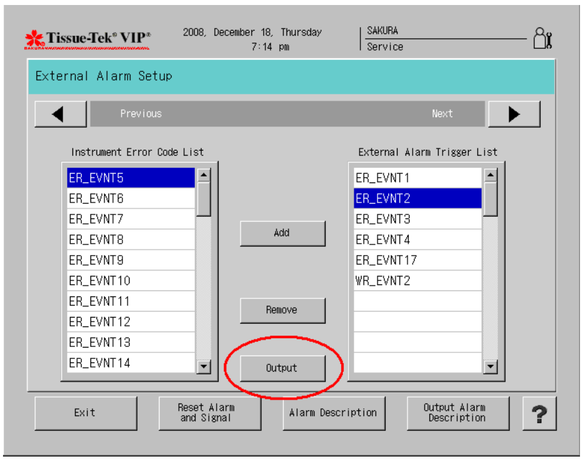
4) Press the「Utility Menu」tab of「Process Menu」screen to switch to 「Utility Menu」 screen.

5) When pressing「External Alarm and Signal Setup」 icon of「Utility Menu」 screen, 「External Alarm Setup」 screen will be displayed.



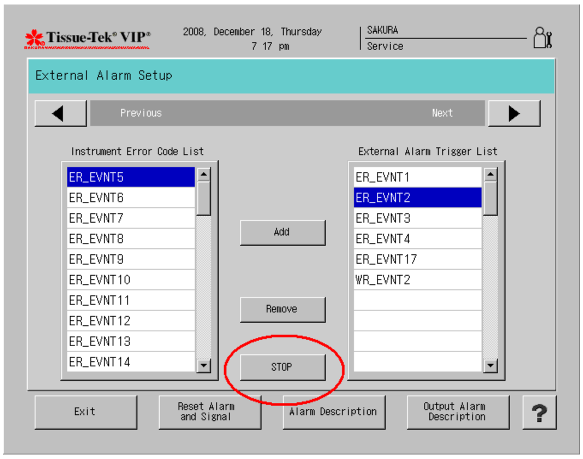
Screen.2-6-2 Utility Menu screen

6) External alarm switches to 「“With” external alarm 」 (Point 4-5 ON, Point 4-6 OFF) when pressing the **Output** button of「External Alarm Setup」 screen.



Screen.2-6-3 External alarm setup screen 1)

7) External alarm switches to 「"Without" external alarm 」(Point 4-5 OFF, Point 4-6 ON) when pressing the **Stop** button of「External Alarm Setup」 screen.



Screen.2-6-4 External alarm setup screen 2)

8) Pressing the **Exit** button of「External Alarm Setup」screen will display 「Utility Menu」 screen.

(3) Output check operation of external alarm of power outage.

1) Turn off the power with「System Idle and User Logged On」 screen displayed.

2) When power off occurred in the condition of 1), external alarm will become 「"Without" tissue processing condition」(Point 1-2 ON, Point 1-3 OFF), 「"With" external alarm condition」(Point 4-5 ON, Point 4-6 OFF)

3) Turn on the power to start up the system. As「System Idle and No User Logged On」 screen will be displayed after system start-up, enter password "3141" to log on. 「System Idle and User Logged On」 screen will be displayed after log-on.

4) When system is started up, external alarm will become 「"Without" tissue processing condition」(Point 1-2 ON, Point 1-3 OFF), 「"Without" external alarm condition」 (Point 4-5 OFF, Point 4-6 ON)

5) Press the **Tissue Processing** button of 「System Idle and User Logged On」screen to display「Start Tissue Processing」 screen.

6) Start any tissue processing from「Start Tissue Processing」screen, turn off the power of system immediately.

7) When power off occurred in the condition of 6), external alarm will become 「tissue processing "in-process" condition」(Point 1-2 OFF, Point 1-3 ON), 「"With" external alarm condition」(Point 4-5 ON, Point 4-6 OFF)

8) Turn on the power to start up the system. Tissue processing will become power outage recovery after system start-up. When tissue processing is power outage recovery, external alarm will become 「tissue processing "in-process" condition」 (Point 1-2 OFF, Point 1-3 ON), 「"With" external alarm condition」(Point 4-5 ON,

Point 4-6 OFF)

9) When touching operation screen, external alarm will switch to「tissue processing “in-process” condition」(Point 1-2 OFF, Point 1-3 ON), 「“Without” external alarm condition」(Point 4-5 ON, Point 4-6 OFF)

10) Discontinue tissue processing of power outage recovery.

(4) Output check operation of external signal

1) As system starts-up will display「System Idle and No User Logged On」screen , enter password “3141” to log on.「System Idle and User Logged On」screen will be displayed after log-on.

2) External signal output will become all OFF (“without” output condition) after system start-up.

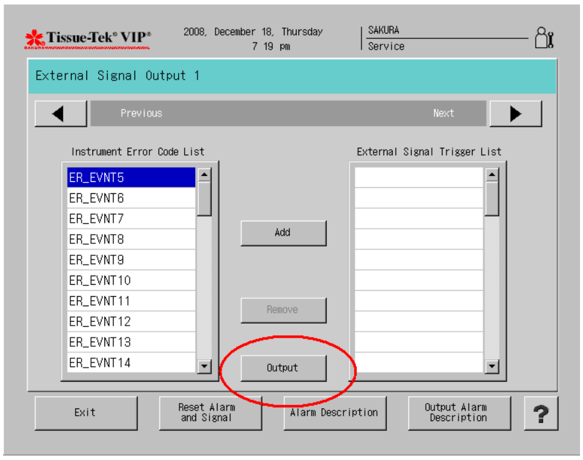
3) Press the **Menu** button of 「System Idle and User Logged On screen」 to display「Process Menu」 screen.

4) Press the「Utility Menu」tab of「Process Menu」screen to switch to 「Utility Menu」 screen.

5) When pressed「External Alarm and Signal Setup」icon of「Utility Menu」screen,「External Alarm Setup」screen will be displayed.

6) 「External Signal Output 1」screen will be displayed when pressed the「▶」 button of「External Alarm Setup」screen.

7) External signal 1 will switch to ON (“with” output condition)when pressed the **Output** button of「External signal Output 1」screen.



Screen.2-6-5 External signal output setup screen

8) Pressing the **Stop** button of「External signal Output 1」, External signal 1 will switch to OFF (“without” output condition)

9) 「External Signal Output 2」screen will be displayed when pressed the ▶ button of「External Signal Output 1」screen.

10) When pressing the **Output** button on「External Signal Output 2」screen, external signal 2 will switch to ON(“with” output condition). When pressing the **Stop** button, external signal 2 will switch to OFF (“without” output condition)

11) Pressing ▶ button of 「External Signal Output 2」screen will display「External Signal Output 3」screen.

12) When pressing the **Output** button on「External Signal Output 3」screen, external signal 3 will switch to ON(“with” output condition). When pressing the **Stop** button, external signal 3 will switch to OFF (“without” output condition)

13) Pressing ▶ button of「External Signal Output 3」screen will display「External Signal Output 4」screen.

14) When pressing the **Output** button on「External Signal Output 4」screen, external signal 4 will switch to ON(“with” output condition). When pressing the **Stop** button, external signal 4 will switch to OFF (“without” output condition)

15) Pressing the **Return** button of「External Signal Output 4」screen will display「Utility Menu」screen.

Chapter 3 System Alarms and Errors

3-1 System Alarms

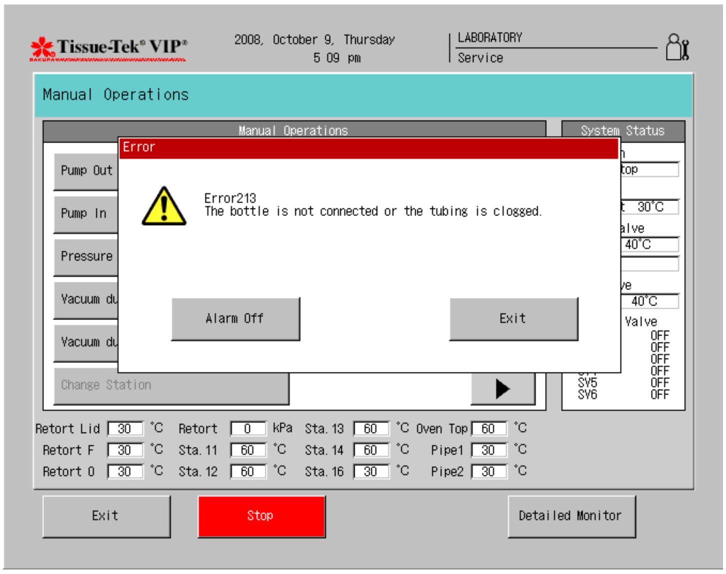
This chapter provides the information on the types and explanations of system alarms and the troubleshooting.

Several alarms are provided with this instrument. The “alarm to inform of error”, “alarm to indicate warning” and “alarm to call operator’s attention” are provided as a system alarm for informing the operator of various operational malfunctions in order to call for operator actions. The alarm to inform of “the status of system that affects instrument operation” is also provided in order to store it in history.

3-1-1 Alarm to inform of error

When a failure that the operator cannot easily solve and/or malfunction that needs repair occurred, the status of such problems is diagnosed by the system and a corresponding error number (error code) is stored in system memory with displaying the error window. In addition, the operator can infer a cause of problem and failure from the error information.

If a fatal error is displayed, the automatic operation (tissue processing, cleaning, solution exchange) is aborted by the system.



Screen 3-1-1 Error Window

(1) Viewing the error log

When automatic operation is in progress, the information on errors occurred can be viewed through the Error Log screen that is displayed by touching the **Error Log** icon on the Process Menu (during processing) screen. Also, touching the **Run History** icon on the Process Menu (during processing) screen allows you to view the information on operator actions as well as errors.

The Error Log screen is also displayed by touching the **Error Log** icon on the Utility Menu screen to view the information on errors occurred.

When the **Error Log** icon is touched in the Service Operations screen, the Error Log screen for service personnel appears, displaying up to 1,000 errors occurred in the past.

For details of the Error Log, see 3-2-1-1. Error log screen

For details of the Run History, see 3-2-1-3. Run history screen.

(2) Viewing description of error codes

By touching the **Error Description** button on the Error Log screen, you can view a brief description about each error code displayed in the Error Log screen.

For details of the Error Description, see 3-2-1-2. Error description screen.

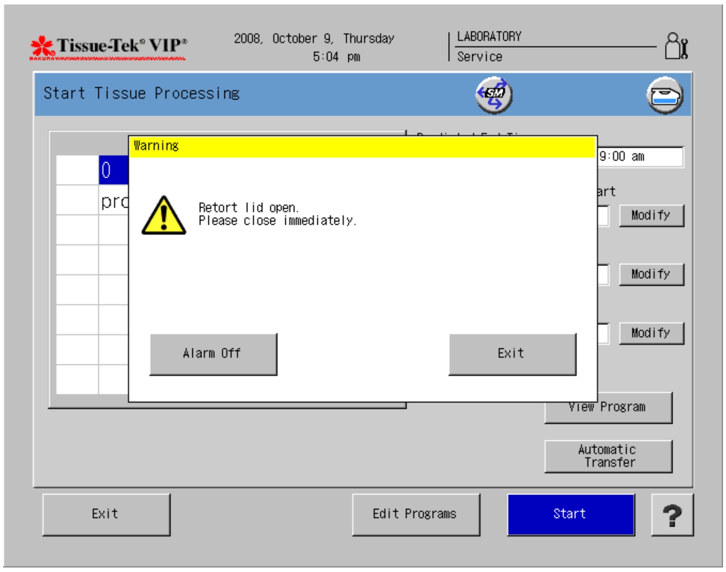
(3) Accessing manual operations

After reading out the error codes displayed, make repairs (see Chapter 4). Instrument behaviors are mainly checked by manual operations during repair.

For details of the manual operations, see Chapter 2 Manual Operations.

3-1-2 Alarm to indicate warning

The warning alarm informs of malfunctions that will not seriously interfere with instrument operation or minor problems that the operation can easily solve to continue operation. When the warning alarm is output, the warning window or screen is displayed with sounding an audible alarm.



Screen 3-1-2 Warning Window

Below are warning messages, probable causes of problems occurred and their remedies.

Message	Retort lid open. Please close immediately.
Probable cause	1. Tissue processing, retort cleaning, warm water flush, rinse or solution exchange cannot start because the retort lid is not closed (the lock lever does not reach the “Lock” position). 2. Due to retort lid sensor malfunction, the system cannot recognize that the retort lid is closed.
Remedy	1. Close the retort lid. 2. See actions for EC 341.

Message	The retort lid was left open for 5 minutes or more. Please close immediately.
Probable cause	1. The retort lid has been open for 5 minutes or more during pause of tissue processing. 2. The system cannot recognize that the retort lid is closed because the lid sensor malfunctioned during pause of tissue processing.
Remedy	1. Close the retort lid. 2. See actions for EC341.

Message	No tissue processing programs are selected to run.
Probable cause	There is no tissue processing program stored in memory.
Remedy	Create a tissue processing program.

Message	Process cannot be completed by the programmed end time. Process is started in the immediate start mode.
Probable cause	Even if a tissue processing run starts now, it cannot be completed by the programmed end time.
Remedy	1. Start the run in the immediate start mode. 2. Modify the end date and time programmed in the tissue processing program you are going to run, and start the program in the delayed start mode again.

Message	An experiment number must be entered.
Probable cause	An experiment number is not entered prior to start of tissue processing although the experiment number entry option is set to “In Use”.
Remedy	Enter an experiment number.

Message	The number of cassettes must be entered.
Probable cause	Although solution stations or paraffin stations to be used by a tissue processing program to run are managed by the number of cassettes processed, the number of cassettes to be processed is not entered.
Remedy	Enter the number of cassettes to be processed.

Message	Retort is dirty. Clean the retort.
Probable cause	The retort cleaning process has not been performed after paraffin was pumped into or out of the retort.
Remedy	Perform the retort cleaning.

Message	Retort is not empty. Drain the retort.
Probable cause	Reagent is left in the retort.
Remedy	Perform the pump-out.

Message	The left bulk reservoir (Sta.19) is empty.
Probable cause	The left bulk reservoir (Sta. 19) is empty. Process can continue, but the automatic supply or transfer of solution cannot be performed for the station(s) associated with this bulk reservoir.

Remedy	Fill the left bulk reservoir (Sta. 19).

Message	The right bulk reservoir (Sta.20) is empty.
Probable cause	The right bulk reservoir (Sta. 20) is empty. Process can continue, but the automatic supply or transfer of solution cannot be performed for the station(s) associated with this bulk reservoir.
Remedy	Fill the right bulk reservoir (Sta. 20).

Message	Abort is not allowed.
Probable cause	A password that is not allowed to take the abort procedure was entered when the password entry is requested to abort the process under the Fill Error screen.
Remedy	Enter an appropriate, authorized password.

Message	The oven door was opened causing the drain to paraffin station to stop. Please close immediately.
Probable cause	The operation has stopped because the oven door was opened during pump-out to one of the paraffin stations (Sta. 11 – Sta. 14).
Remedy	Close the oven door. Once the door is closed, the pump-out resumes.

Message	The oven door is open. Please close the door.
Probable cause	The oven door was opened at the start of or during automatic operation that has the step to drain paraffin to paraffin stations.
Remedy	Close the oven door.

Message	There is no tissue processing program which can be run on the current solution configuration.
Probable cause	A tissue processing program compatible with the solution configuration currently used on the system is not stored in memory.
Remedy	1. Create a tissue processing program associated with the current solution configuration. 2. Replace the current solution configuration with compatible one.

Message	Wax drain container is not ready for use.
Probable cause	The wax drain container (Sta. 15) is not properly set in place or absent at the start of automatic operation including drain of paraffin.
Remedy	Set the wax drain container in place.

Message	The wax drain container was removed causing the processing to stop.
Probable cause	The pump-out was discontinued because the wax drain container (Sta. 15) was removed during pump-out of paraffin to the container. However, the operation continues.
Remedy	None. The drain to the wax drain container is discontinued. If it happens during the automatic transfer in progress, the automatic transfer is cancelled.

Message	Bottle is empty or solution is low.
Probable cause	The bottle at the station displayed in red is empty or the solution is low.
Remedy	Manually fill the bottle and touch the **Resume** button.

Message	Bottle is not connected or tubing is clogged.
Probable cause	The bottle at the station displayed in red is not securely connected or the tubing to that station is clogged.
Remedy	Check connection of the bottle or container and, if it is OK, touch the **Resume** button. If the bottle or container is not connected, properly connect it. If the station displayed in red is the paraffin station (Sta. 11 to Sta. 14) and the container is properly connected, check if paraffin is melted. If the station displayed in red is Station 18, check if the solution exchange hose is bending. If paraffin is melted or the hose is not bent or the station displayed in red is a station except for Sta. 11 to Sta. 14, the tubing may be clogged. Take actions for EC 11 stated in the troubleshooting chart.

Message	Solutions with a check mark have reached or exceeded their pre-defined usage limit. Replace these solutions.
Probable cause	The usage count of the stations that the usage limit has been set exceeded the preset limit.
Remedy	1. Replace the solution with new one. 2. Reset the usage count to zero in the Reset Solution Usage Information screen.

Message	The bulk reservoir is empty.
Probable cause	The left bulk reservoir (Sta. 19) or the right bulk reservoir (Sta. 20) became empty.
Remedy	Fill the empty bulk reservoir.

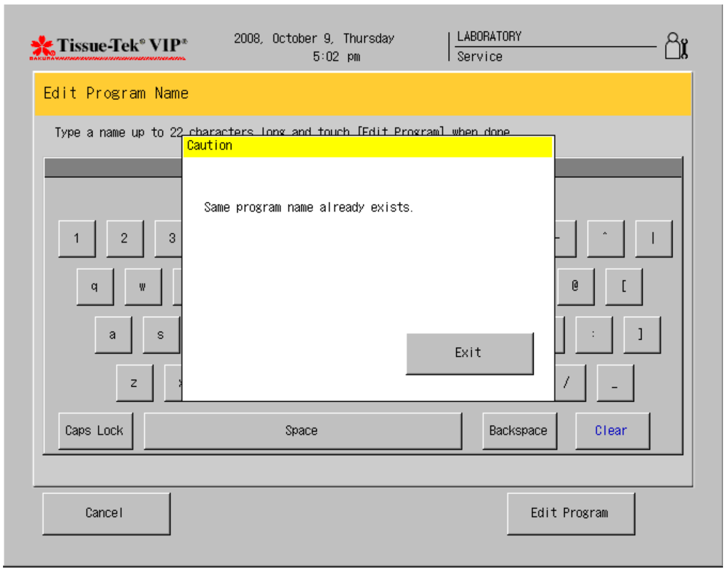
Message	The fume filters with a check mark have reached or exceeded their pre-defined usage limit. Replace the fume filters.
Probable cause	The actual operating time of activated carbon filters exceeded the preset time.
Remedy	Replace activated carbon filters with new ones.

Message	Stations marked with Empty or Low are empty or contain insufficient amount of reagent. Fill these stations.
Probable cause	There are stations that the bottle became empty or that the solution is insufficient to reach the safeguard solution level for tissue processing even after solution is all pumped in.
Remedy	1. Fill the bottles at those stations. 2. Clear the volume check result under the Reset Solution Usage Information screen.

Message	The Solution Manager was active during processing. Fill or replace low bottles.
Probable cause	The Solution Manager started during tissue processing to complete the process by using another station of the same solution group.
Remedy	1. Fill or replace the solution bottles. 2. Clear the volume check result under the Reset Solution Usage Information screen.

3-1-3 Alarm to call operator’s attention

This type of alarm informs of less serious problems than the warning that the operator can easily solve to continue operation or problems that the operator can select actions at his/her own judgment. When the alarm is output, the caution window is displayed with sounding an audible alarm.



Screen 3-1-3 Caution Window

Below are caution messages, probable causes of problems occurred and their remedies.

Message	The number of cassettes processed has reached the set limit.
Probable cause	A tissue processing program to run was changed after the number of cassettes was entered at the start of tissue processing. If you start the new processing program as it is, the cassette count exceeds the number of cassettes preset as a usage limit for solution management.
Remedy	Replace solutions with new ones. If you judge that excessive use of solutions will not pose a problem, you can start the tissue processing.

Message	Some bottles are not connected properly. Verify the bottles are properly connected. To resume processing, touch [Resume].
Probable cause	Disconnected bottle(s) was detected under the Bottle Connection Check prior to the start of tissue processing.
Remedy	Properly connect the bottle(s) and touch the **Resume** button to start the Bottle Connection Check again.

Message	Power outage. Power is being supplied by the UPS.
Probable cause	Process was continued by using the UPS because power outage occurred in laboratory.
Remedy	Wait until the power is restored.

Message	Paraffin has not melted. The process cannot continue.
Probable cause	The Paraffin Drain or Automatic Transfer of the paraffin group was attempted to perform while paraffin has not melted.
Remedy	Wait until paraffin is melted.

Message	The exchange method is incompatible with the selected station. Select a different exchange method or station to exchange.
Probable cause	The selection of station was cleared because the solution exchange method (such as Fill from Reservoir) is incompatible with the selected station under the Single Solution Exchange.
Remedy	Touch the station button for the station compatible with the desired exchange method.

Message	The external solution container is empty. Replace it with a filled container. Touch [Resume] when done. Touch [Stop] to stop the operation at this stage.
Probable cause	The system is waiting for replacement of the external solution container because it became empty during solution exchange.
Remedy	Replace the external solution container with new one and touch the **Resume** button. If it is not possible to replace the external solution container, touch the **Stop** button to supply a solution left in the retort to the target station.

Message	Same solution name already exists.
Probable cause	When a solution name is edited and entered, the same name has already been stored in memory.
Remedy	Enter other unused solution name.

Message	Same abbreviated solution name already exists.
Probable cause	When an abbreviated solution name is edited and entered, the same name has already been stored in memory.
Remedy	Enter other unused abbreviated solution name.

Message	Same Solution Configuration name already exists.
Probable cause	When a solution configuration name is edited and entered, the same name has already been stored in memory.
Remedy	Enter other unused solution configuration name.

Message	Same program name already exists.
Probable cause	When a program name is edited and entered, the same name has already been stored in memory.
Remedy	Enter other unused program name.

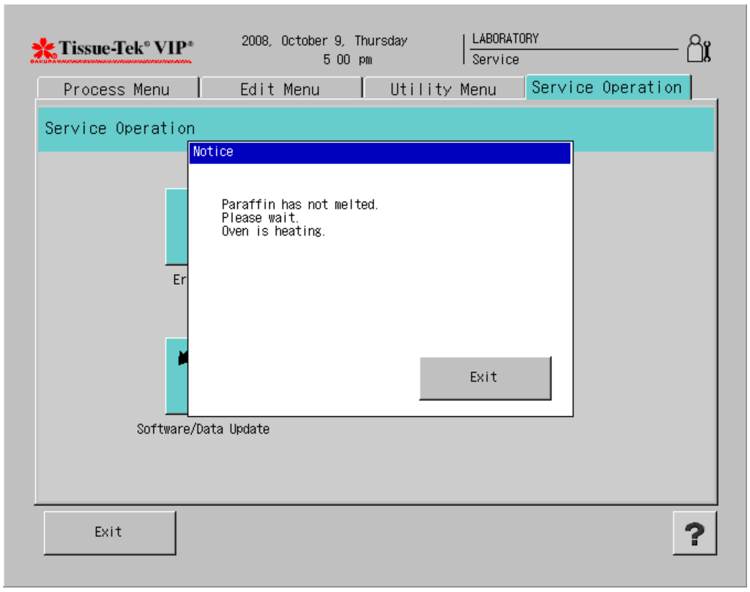
Message	The oven preset temperature is too low and cannot be set.
Probable cause	When editing a tissue processing program, you cannot select a lower temperature than the preset oven temperature as a retort temperature for Stations 11 to 14.
Remedy	Select a retort temperature equal to or higher than the preset oven temperature.

Message	This program cannot be saved. At least one station must have a programmed time different than zero.
Probable cause	When saving a tissue processing program, it was rejected because all stations do not have a processing time.
Remedy	Set a processing time to at least one station before saving the program.

Message	As least one is not registered.
Probable cause	There is no process report to be output under the Export Data.
Remedy	No special action needed.

3-1-4 Notice of the status of system that affects instrument operation

The notice of the status of system indicates that improper conditions that affect instrument operation were created. When this notice is output, the notice window or confirmation window is displayed. An audible alarm does not sound.



Screen 3-1-4 Notice Window

Below are notification messages, probable causes and actions.

Message	Paraffin has not melted.
Probable cause	The oven is being heated to melt paraffin because paraffin is hardened due to temperature decrease of the oven.
Action	No special action needed. Operation can continue, but the process to use paraffin stations cannot be performed.

Message	Paraffin has not melted. Please wait. Retort and Oven are heating.
Probable cause	The retort and oven are being heated to melt paraffin because there is hardened paraffin in the retort when the instrument power was turned on.
Action	No special action needed. Operation can continue, but the process to use paraffin stations cannot be performed.

Message	Paraffin has not melted. Please wait. Oven is heating.
Probable cause	The oven is being heated to melt paraffin after the instrument power was turned on.

Action	No special action needed. Operation can continue, but the process to use paraffin stations cannot be performed.

Message	Melted paraffin condition is confirmed.
Probable cause	The oven temperature has been kept at the preset temperature for a given length of time. The operator can inform the system that paraffin has melted by operating the screen after checking the inside of the oven.
Action	Confirm that paraffin has melted in the paraffin containers in the oven. Once the paraffin oven is opened and closed, the window to ask if paraffin has melted is displayed. Touch the appropriate button.

Message	Please wait. Retort and Valve are heating.
Probable cause	The retort and valves are being heated as paraffin stations are used in automatic operation.
Action	Wait until the retort and valves reach the preset temperature each.

Message	Retort, Level Sensor and Valve are heating. Please wait for about 25 minutes.
Probable cause	If paraffin is attempted to pump in from the paraffin station right after moving from the solution station, the retort level sensors as well as the retort and valves must be heated.
Action	No special action needed. Wait for about 25 minutes.

Message	Please wait. Unit has been placed into standby until the power is restored.
Probable cause	Process was continued for a given length of time by using the UPS, but the system went standby after pumping in a solution to protect specimens because the power was not restored.
Action	Wait until the power is restored.

Message	The power has been restored. Process has been restarted.
Probable cause	The power was restored when the process was being performed by using the UPS.
Action	No special action needed. If power outage has continued long hours, abort the tissue processing and remove specimens from the instrument to store them in an appropriate condition.

Message	Faulty Level Sensor. Operation is continued without using the Sensor.
Probable cause	One of level sensors was found defective during the tissue processing because • Presence of solution is detected although the retort is empty • Presence of solution is not detected although a solution is in the retort. Operation is continued without using the defective level sensor.
Action	The processing run is continued to the end. The operation to be controlled by the defective level sensor (such as the short mixing) is done by using another level sensor. If it is not possible, the control to use level sensors is not performed.

Message	The Solution Manager was active during processing.
Probable cause	1. The Solution Manager was started to supply a solution or use another station of the same solution group because an empty bottle or low solution was detected at the station where specimens are processed. An icon is displayed at the station where the Solution Manager was active. 2. Paraffin in one of paraffin stations (Sta. 11 – 14) where specimens are processed was found unmelted. Another paraffin station containing melted paraffin was used to bring the tissue processing to completion.
Action	1. No action is needed if a solution is only supplied to fill the bottle. If another station is used to complete the processing, fill the bottle at the troubled station with the sufficient amount of solution. 2. No action is needed. Wait until paraffin is melted.

Message	Paraffin drain was discontinued because the wax drain container was not ready for use.
Probable cause	The wax drain container was not detected in place prior to pumping out paraffin to the wax drain container to perform the automatic transfer of paraffin or drain of paraffin for solution exchange. The Automatic Transfer or Paraffin Drain was cancelled.
Action	Set the wax drain container in place and perform the Automatic Transfer for the paraffin group or Paraffin Drain again.

Message	The left bulk reservoir (Sta. 19) may run short of solution during operation.
Probable cause	1. If the tissue processing is started with the left bulk reservoir (Sta. 19) staying as it is, a sufficient amount of solution to reach the solution safeguard level in the retort may not be supplied to the last

	station of a solution group associated with the left bulk reservoir when the automatic solution transfer for the solution group is performed during tissue processing. 2. If the solution exchange for a solution group or a single solution station associated with the left bulk reservoir is started with the left bulk reservoir staying as it is, the selected amount of solution may not be supplied to the target station(s). 3. If the automatic transfer for a solution group associated with the left bulk reservoir is started with the left bulk reservoir staying as it is, the selected amount of solution may not be supplied to the last station of the solution group.
Action	Fill the left bulk reservoir (Sta. 19). If you do not think that it poses a problem with the process, you can start the tissue processing or solution exchange.

Message	The right bulk reservoir (Sta. 20) may run short of solution during operation.
Probable cause	1. If the tissue processing is started with the right bulk reservoir (Sta. 20) staying as it is, a sufficient amount of solution to reach the solution safeguard level in the retort may not be supplied to the last station of a solution group associated with the right bulk reservoir when the automatic solution transfer for the solution group is performed during tissue processing. 2. If the solution exchange for a solution group or a single solution station associated with the right bulk reservoir is started with the right bulk reservoir staying as it is, the selected amount of solution may not be supplied to the target station(s). 3. If the automatic transfer for a solution group associated with the right bulk reservoir is started with the right bulk reservoir staying as it is, the selected amount of solution may not be supplied to the last station of the solution group.
Action	Fill the right bulk reservoir (Sta. 20). If you do not think that it poses a problem with the process, you can start the tissue processing or solution exchange.

Message	Add paraffin in Station 14.
Probable cause	Paraffin is low in Station 14 because the automatic transfer of the paraffin group was done during the tissue processing.
Action	Add paraffin in Station 14.

Message	Used by Solution Configurations. Touch [Yes] to edit.
Probable cause	When an existing solution name is attempted to edit, this message is displayed to ask if you want to edit the solution name or not because it has been used in solution configurations.
Action	Touch the **Yes** button to edit the solution name. The edited solution name will be reflected in solution configurations. Touch the **No** button to cancel the edit procedure.

Message	The solution name is changed and no longer matches the Bulk Reservoir Supply.
Probable cause	When the bulk reservoir is reassigned a solution name that is different from the current solution name, the Bulk Reservoir Supply setting for the stations being associated with that bulk reservoir is all cancelled because a solution may be actually replaced with a different one.
Action	If required, configure the Bulk Reservoir Supply setting again, using the new solution name.

Message	UPS battery voltage has dropped during the operation backed up by UPS. After completion of specimen protection, unit will be placed into standby until UPS battery is recharged.
Probable cause	Since power outage occurred during the tissue processing, the UPS started operating to continue the process. However, the UPS battery run out before power restoration.
Action	Wait until the power is restored and the UPS battery is recharged.

Message	UPS battery voltage has dropped during the operation backed up by UPS.
Probable cause	Since power outage occurred during the process except for the tissue processing, the UPS started operating to continue the process. However, the UPS battery run out before power restoration.
Action	Wait until the power is restored and the UPS battery is recharged.

Message	Wait until UPS battery is recharged.
Probable cause	Process was continued by the UPS for a given length of time. However, the system was put into pause after performing the specimen protection because the UPS battery run out before power restoration.
Action	Wait until the power is restored and the UPS battery is recharged.

Message	The power has been restored and the UPS battery was recharged. Process has been restarted.
Probable cause	When the UPS was in operation, the power was restored and the UPS battery was recharged.
Action	No special action needed. If power outage has continued long hours, abort the tissue processing and remove specimens from the instrument to store them in an appropriate condition.

3-2 Error Information

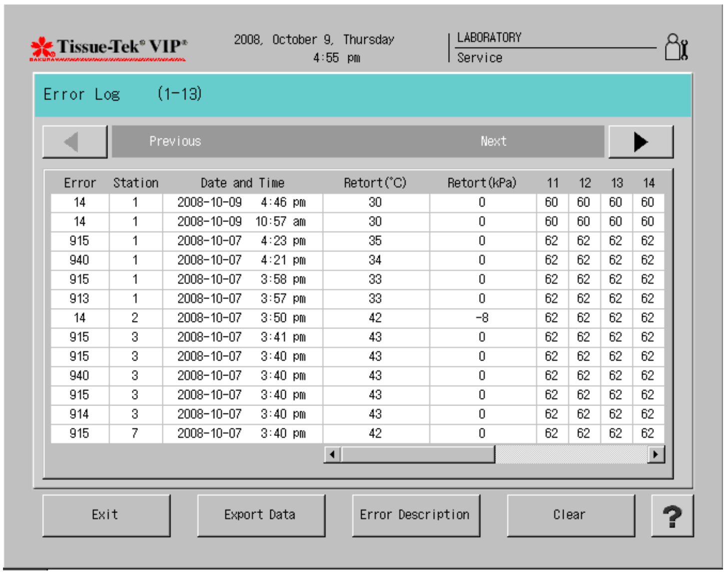
3-2-1 Display of error information

This instrument has two kinds of the error log screen; the user error log screen and the service error log screen. The user error log screen displays up to the latest 100 errors. The service error log screen displays up to the latest 1,000 errors. The error description screen is also available to briefly explain these errors.

Errors that occurred during the tissue processing, cleaning or solution exchange can be viewed on the run history screen. The run history screen displays the information on instrument operations such as pause of process and start of the Solution Manager, except for the error information.

3-2-1-1 Error log screen

The error log screen allows you to view the error number of each error occurred and the status of the system at the time of error occurrence (station number, date and time when the error occurred, retort temperature, retort pressure, temperature of each paraffin station, temperature of the oven top board, rotary valve temperature, gate valve temperature, retort lid temperature, and temperature of the cleaning xylene station).

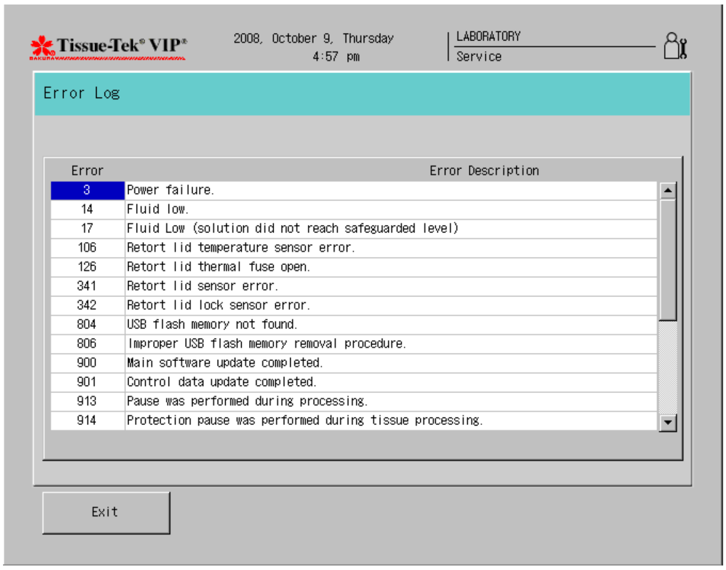


Error	Station	Date and Time	Retort(°C)	Retort(kPa)	11	12	13	14
14	1	2008-10-09 4:46 pm	30	0	60	60	60	60
14	1	2008-10-09 10:57 am	30	0	60	60	60	60
915	1	2008-10-07 4:23 pm	35	0	62	62	62	62
940	1	2008-10-07 4:21 pm	34	0	62	62	62	62
915	1	2008-10-07 3:58 pm	33	0	62	62	62	62
913	1	2008-10-07 3:57 pm	33	0	62	62	62	62
14	2	2008-10-07 3:50 pm	42	-8	62	62	62	62
915	3	2008-10-07 3:41 pm	43	0	62	62	62	62
915	3	2008-10-07 3:40 pm	43	0	62	62	62	62
940	3	2008-10-07 3:40 pm	43	0	62	62	62	62
915	3	2008-10-07 3:40 pm	43	0	62	62	62	62
914	3	2008-10-07 3:40 pm	43	0	62	62	62	62
915	7	2008-10-07 3:40 pm	42	0	62	62	62	62

Screen 3-2-1-1 Error Log screen

3-2-1-2 Error description screen

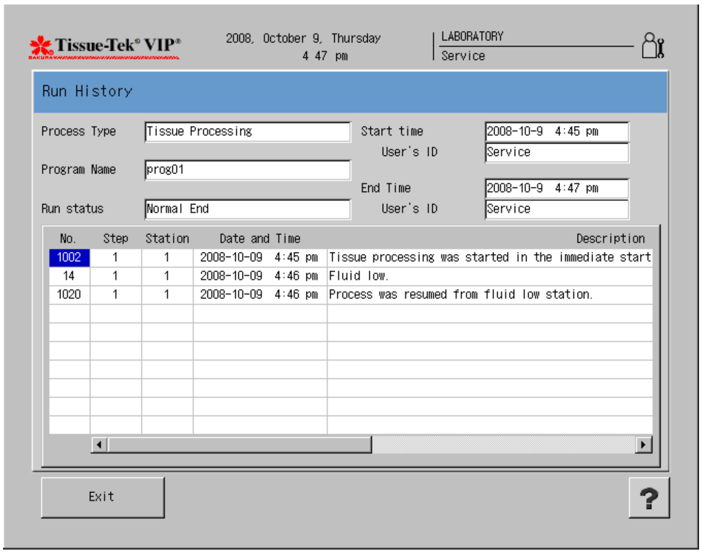
The error description screen displays a brief description of errors being displayed on the error log screen.



Screen 3-2-1-2 Error Description screen

3-2-1-3 Run history screen

The run history screen displays the historical data of automatic operation, for instance, errors that occurred during the tissue processing, cleaning or solution exchange and operations conducted by the system or the operator.



Screen 3-2-1-3 Run History screen

Below is the description of operation numbers. Numbers from 0 to the 900s are the error numbers. Numbers in the 1000s indicate the operations that are conducted by the system or the operator and saved as an operation number.

Table 3-2-1-2 List of Operation Number

Code	Message
1001	Tissue processing was started in the delayed start mode.
1002	Tissue processing was started in the immediate start mode.
1003	The standby for the delayed start ended and the tissue processing started.
1004	The delayed start was overridden by the user pressing the immediate start button.
1005	Bottle connection check was performed.
1006	The cassette count was modified.
1007	The program was temporarily edited during standby.
1008	The program was temporarily edited during tissue processing.
1010	The left bulk reservoir (Sta.19) was used during the automatic transfer.
1011	The right bulk reservoir (Sta.20) was used during the automatic transfer.
1012	Automatic transfer was performed in the paraffin stations.
1013	Solution was supplied from the left bulk reservoir (Sta.19) during tissue processing.
1014	Solution was supplied from the right bulk reservoir (Sta.20) during tissue processing.
1015	Solution was supplied from a station of the same solution group.
1016	Solution was supplied to a station of the same solution group.
1017	Process was completed by using a station of the same solution group.
1018	Process was completed by using another station instead of the error station.
1019	Process was put into standby due to low solution or empty bottle.
1020	Process was resumed from fluid low station.
1021	Process was put into standby due to blocked tube or disconnected bottle.
1022	A blocked tube or disconnected bottle condition was resolved and process was resumed.
1023	An external reservoir low solution condition was resolved and process was resumed.
1024	Process was put into standby due to an external reservoir low solution condition and process was omitted.
1025	Process was resumed by user operation.
1026	Paraffin had melted when confirming it.
1027	Paraffin had not melted when confirming it.
1028	The user logged off during system operation.
1029	The system automatically logged off during system operation.
1030	The user logged on during system operation.
1031	Log on was unsuccessful after three attempts.
1032	The system automatically logged on during system operation.
1033	Automatic Transfer was discontinued because the Solution Manager was started.
1034	Automatic Transfer for the paraffin group was discontinued because the wax drain container was not ready for use.
1035	Automatic Transfer was discontinued because the first station of the selected solution group was not empty.
1036	Automatic Transfer for the paraffin group was discontinued because the paraffin station temperature was too low.
1037	Overflow sensor malfunctioned. The level sensor 3 (4.2L) was operating in place of overflow sensor.
1038	Level sensor 3 (4.2L) malfunctioned. Level sensor 2 (3.5L) was operating in place of level sensor 3.
1039	Level sensor 2 (3.5L) malfunctioned. Level sensor 3 (4.2L) was operating in place of level sensor 2.
1040	Level sensor 1 (2.7L) malfunctioned. Level sensor 2 (3.5L) was operating in place of level sensor 1.
1041	An error occurred during pump out. To protect the specimens, solution was supplied from a bulk reservoir.
1042	Paraffin drain was discontinued because the wax drain container was not ready for use.

3-3 Troubleshooting

3-3-1 List of Malfunction

3-3-1-1 Malfunction with error number

Error Code	Message
3	Power failure
4	Pressure sensor error
7	Power outage
10	The retort overflowed during pump-in.
11	Pump-in was not completed within 6 minutes.
12	Pump-in was not completed after 3 attempts (6 minutes each).
13	Retort pressure could not be decreased.
14	Fluid low
16	Pump-in failure during or after the second pump-in cycle
17	Fluid Low (solution did not reach safeguarded level)
20	Retort pressure did not reach the set value within one minute after the gate valve closed.
21	Retort pressure did not reach the set value after 3 attempts (1 minute each after the gate valve closed).
22	Pump-out was not completed within 6 minutes after the gate valve opened.
23	Pump-out was not completed after 2 attempts (6 minutes each).
30	Gate valve temperature sensor error
32	Rotary valve temperature sensor error
33	Retort front temperature sensor error.
37	Failure of rotary valve temperature control (temperature too low)
39	Failure of retort temperature control (temperature too low)
40	Rotary valve positioning sensor error
41	Rotary valve failed rotating counterclockwise
42	Rotary valve positioning sensor error.　Recovery action was taken.
43	Rotary valve did not operate properly.　Recovery action was taken.
50	Gate valve positioning sensor error
51	The gate valve did not operate properly.
52	Gate valve positioning sensor error.　Recovery action was taken.
53	Gate valve did not operate properly.　Recovery action was taken.
70	Air pump error
81	Rotary valve thermal fuse open
82	Retort front thermal fuse open
83	Gate valve thermal fuse open
85	Failure of gate valve temperature control (temperature too low)
87	Rotary valve temperature exceeded 80°C.
88	Retort temperature exceeded 80°C.
89	Gate valve temperature exceeded 80°C.
91	Exhaust fan alarm

94	Cooling fan alarm
100	Retort temperature sensor error (except for the front temperature sensor)
101	Paraffin station 11 temperature sensor error
102	Paraffin station 12 temperature sensor error
103	Paraffin station 13 temperature sensor error
104	Paraffin station 14 temperature sensor error
105	Oven top board temperature sensor error
106	Retort lid temperature sensor error
107	Cleaning xylene station temperature sensor error
108	Fill line temperature sensor error
109	Drain line temperature sensor error
110	Circumference temperature sensor error
111	Failure of paraffin station 11 temperature control (temperature too low)
112	Failure of paraffin station 12 temperature control (temperature too low)
113	Failure of paraffin station 13 temperature control (temperature too low)
114	Failure of paraffin station 14 temperature control (temperature too low)
117	Failure of cleaning xylene station temperature control (temperature too low)
120	Retort thermal fuse open (except for the front thermal fuse)
121	Paraffin station 11 thermal fuse open
122	Paraffin station 12 thermal fuse open
123	Paraffin station 13 thermal fuse open
124	Paraffin station 14 thermal fuse open
125	Oven top board thermal fuse open
126	Retort lid thermal fuse open
127	Cleaning xylene station thermal fuse open
131	Paraffin station 11 temperature exceeded 80°C.
132	Paraffin station 12 temperature exceeded 80°C.
133	Paraffin station 13 temperature exceeded 80°C.
134	Paraffin station 14 temperature exceeded 80°C.
137	Cleaning xylene station temperature exceeded 80°C.
141	The retort did not reach the preset temperature in time.
142	The rotary valve did not reach the preset temperature in time.
143	The gate valve did not reach the preset temperature in time.
210	Pump-in was not completed in time but solution has reached the safeguarded level.
211	Pump-in was not completed within 2 minutes during short mixing.
212	Retort pressure did not reach the set value within 3 minutes after the gate valve closed.
213	The bottle is not connected or the tubing is clogged.
230	Pressure sensor did not reach the set value within one minute after the gate valve closed for drainage of the condenser.
231	Drainage of the condenser was not completed within 1 minute.
235	Pressure sensor did not reach the set value within one minute after the gate valve closed for drainage of the common line.

236	Pressure sensor did not reach the set value within one minute after the gate valve closed for the bottle connection check.
240	The left bulk reservoir (Sta.19) overflowed during filling.
241	Solution filling to the left bulk reservoir (Sta.19) was not completed within 6 minutes.
242	Retort pressure could not be decreased within 1 minute during solution filling to the left bulk reservoir (Sta.19).
243	External container was empty when starting the solution filling to the left bulk reservoir (Sta.19).
244	Low solution volume in the external container during the solution filling to the left bulk reservoir (Sta.19).
250	The right bulk reservoir (Sta.20) overflowed during filling.
251	Solution filling to the right bulk reservoir (Sta.20) was not completed within 6 minutes.
252	Retort pressure could not be decreased within 1 minute during solution filling to the right bulk reservoir (Sta.20).
253	External container was empty when starting the solution filling to the right bulk reservoir (Sta.20).
254	Low solution volume in the external container during the solution filling to the right bulk reservoir (Sta.20).
298	Drain to the left bulk reservoir (Sta.19) was rejected.
299	Drain to the right bulk reservoir (Sta.20) was rejected.
311	Overflow sensor error
312	Level sensor (2.7 L) error
313	Level sensor (3.5 L) error
314	Level sensor (4.2 L) error
315	Left bulk reservoir (Sta.19) low level sensor error
316	Left bulk reservoir (Sta.19) high level sensor error
318	Right bulk reservoir (Sta.20) low level sensor error
319	Right bulk reservoir (Sta.20) high level sensor error
341	Retort lid sensor error
342	Retort lid lock sensor error
350	Wax drain container is not ready for use.
801	File not found in the USB flash memory
804	USB flash memory not found
805	Excessive current from the connected device
806	Improper USB flash memory removal procedure
807	File system error in Drive A
811	File system error in Drive B
812	File not found in Drive B
814	The WAV file cannot be used for Drive B
900	Main software update completed
901	Control data update completed
910	UPS battery voltage has dropped during the operation backed up by UPS.
911	The power has been restored and the UPS battery was recharged.
913	Pause was performed during processing.

914	Protection pause was performed during tissue processing.
915	The retort lid was opened causing the processing to stop.
916	The retort lid was left open for 5 minutes or more.
917	Solution filling from the left bulk reservoir (Sta.19) could not be performed.
918	Solution filling from the right bulk reservoir (Sta.20) could not be performed.
919	The Oven Door was opened while draining to the paraffin station.
940	Tissue processing was aborted.
960	Clean retort was aborted.
961	Warm water flush was aborted.
962	Rinse cycle was aborted.
963	Drain/Fill port rinse was aborted.
964	Low rinse solution volume
965	Low cleaning xylene volume
966	Low cleaning alcohol volume
980	Exchange solution was aborted.
981	Low solution volume in the external container
982	Low solution volume in the external container during filling of the left bulk reservoir (Sta.19)
983	Low solution volume in the external container during filling of the right bulk reservoir (Sta.20)

(Note) The error numbers of the 900s are for saving the record of disturbances, not errors, in the error log. Therefore, you do not need to take actions for the error numbers of the 900s.

Error No. 003 Power failure

- This error is registered when a power failure occurred or the power switch was turned off during tissue processing or retort cleaning, and then the power was turned on again. The time of this error indicates the time the power was turned on again.

[1] Possible cause
  a. A power failure occurred due to abnormal power supply from the facility.
  b. The power switch was turned off.
  c. The power cable came off from the power outlet.
  d. The power cable or internal wire broke.

[2] Key equipment used for check
- Tester
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Investigate other devices used nearby, because they are likely to have also detected a power failure. Also investigate the power supply on the facility side.

- Checking for possible cause b
  Turn on the power switch. Power failure due to this cause is not a system abnormality.

- Checking for possible cause c
  Check if the system power cable is detached from the power outlet. If the power cable is detached, insert the power cable into the power outlet. Power failure due to this cause is not a system abnormality.

- Checking for possible cause d
  Check if a rated voltage is supplied to the power outlet. If the power cable, etc., are normal, check the power switch, switching power supply, CPU board, etc., for problem.

Error No. 004 Pressure sensor error

- The input voltage of the pressure sensor deviated from the normal voltage range (pressure sensor output = less than 1 V).

[1] Possible cause
  a. The pressure sensor is faulty.
  b. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Bagworm clip wire

[3] Cause identification and remedial action
- Checking for possible cause a
  Unplug the connector CN9 and use a bagworm clip wire to connect pin 2 of the pressure sensor CN9 to the CP104 (3.3-V power supply). Check the displayed pressure. If the displayed pressure is near 0 kPa, the CPU board is normal and accordingly a pressure sensor error is suspected.

- Checking for possible cause b
  If the problem persists even when no problem was found in the check of cause a, the CPU board is likely the cause.

Error No. 007 Power outage

- This error is registered when a power failure occurred or the power switch was turned off during tissue processing or retort cleaning, and then the power was turned on again. The time of this error indicates the time the power failure occurred.

[1] Possible cause

a. A power failure occurred due to abnormal power supply from the facility.
b. The power switch was turned off.
c. The power cable came off from the power outlet.
d. The power cable or internal wire broke.

[2] Key equipment used for check

- Tester
- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Investigate other devices used nearby, because they are likely to have also detected a power failure. Also investigate the power supply on the facility side.

- Checking for possible cause b
  Turn on the power switch. Power failure due to this cause is not a system abnormality.

- Checking for possible cause c
  Check if the system power cable is detached from the power outlet. If the power cable is detached, insert the power cable into the power outlet. Power failure due to this cause is not a system abnormality.

- Checking for possible cause d
  Check if a rated voltage is supplied to the power outlet. If the power cable, etc., are normal, check the power switch, switching power supply, CPU board, etc., for problem.

Error No. 010 The retort overflowed during pump-in.

- The ultrasonic sensor US4 (overflow sensor) at the top of the retort turned ON during pumping-in.

[1] Possible cause

a. The system is not horizontal, but inclined.
b. The ultrasonic sensor US3 (4.2 liters) did not turn ON.
c. The ultrasonic sensor US4 (overflow sensor) malfunctioned.
d. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Check if the system is inclined to the left. Manually fill the retort with 4.2 liters of water. Check the levels at the ultrasonic sensors US3 and US4. If there is no difference between US3 and US4, the system is likely inclined.

- Checking for possible cause b
  Fill water into the retort until the ultrasonic sensor US3 is submerged. Remove the front exterior panel and check if the indicator LD3 on the US board turns on. If the LD3 does not turn on, try swapping with the ultrasonic sensor US2 at the connector. If the LD3 turns on but the LD2 does not turn on after swapping the sensors, the ultrasonic sensor US3 is likely faulty.

- Checking for possible cause c
  While the retort is empty, check if the ultrasonic sensor US4 is operating. Remove the front exterior panel and check if the indicator LD3 on the US board is lit. If the LD3 is lit, unplug the US4 from the connector. If the LD3 turns off, the ultrasonic sensor US4 is likely faulty.

- Checking for possible cause d
  Fill water into the retort until the ultrasonic sensors US1 and US2 turn ON. Check the input state of each ultrasonic sensor using the check program and check if the US4 is ON. If the US4 is ON, unplug the connector CN12 from the CPU board. If the US4 remains ON, the CPU board is faulty. Also confirm that the US1 or US2 is ON, and then try connecting the US1 or US2 to the US3 connector on the front US board. If the LED3 on the US board turns on but the US3 is not ON in the check program, the CPU board is likely faulty.

Error No. 011 Pump-in was not completed within 6 minutes.

- The pressure sensor input does not recover to -10 kPa or above after 6 minutes of pumping-in.

[1] Possible cause
a. The TN bottle coupler is disconnected.
b. The reagent bottle or reagent tubing is clogged by solid matter (paraffin, precipitated salt).
c. The air circuit is clogged.
d. The solenoid valve SV2 is always ON.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
The reagent bottle used in pumping-in is detached. This error occurs when the applicable bottle is disconnected and a bottle connection check is not performed, or when the applicable bottle remains uninstalled after a connection check. As the remedial action, connect the bottle properly and use the bottle connection check function.

- Checking for possible cause b
This error occurs when solid matter generated in the tubing between the reagent bottle and retort and the tubing was clogged. In many cases, this error occurs on the alcohol station immediately after the buffer formalin station, cleaning xylene station containing a lot of dissolved paraffin, or paraffin container where paraffin has not properly melted. If buffer formalin salt is precipitated, the TN bottle coupler clogs easily. Accordingly, disassemble the TN bottle coupler and remove salt thoroughly using water, etc. In this case, ask the customer to perform periodic cleaning using warm water. If the error occurred on the cleaning xylene station, white paraffin solids generate in the tubing. Accordingly, dissolve and remove paraffin solids using xylene, etc. In this case, ask the customer to shorten the reagent change cycle for cleaning xylene. If the error occurred on the paraffin container, ask the customer to melt paraffin fully before commencing the process.

- Checking for possible cause c
This error occurs when solid matter entered in the air circuit, particularly in the tubing between the connection point to the retort container and the pressure sensor. Remove the tubing in the applicable area and flush the tubing with xylene, etc.

- Checking for possible cause d
This error occurs when the solenoid valve SV2 is always ON. Try pressurizing and depressurizing manually using the check program, etc. If the pressure drops but does not rise properly, suspect the SV2. Try turning the SV2 ON/OFF separately to check if the applicable operation is performed.

Error No. 012 Pump-in was not completed after 3 attempts (6 minutes each).

- The pressure sensor input does not recover to -10 kPa or above after three pumping-in operations for 6 minutes each.

[1] Possible cause
  a. The TN bottle coupler is disconnected.
  b. The reagent bottle or reagent tubing is clogged by solid matter (paraffin, precipitated salt).
  c. The air circuit is clogged.
  d. The solenoid valve SV2 is always ON.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  The reagent bottle used in pumping-in is detached. This error occurs when the applicable bottle is disconnected and a bottle connection check is not performed, or when the applicable bottle remains uninstalled after a connection check. As the remedial action, connect the bottle properly and use the bottle connection check function.

- Checking for possible cause b
  This error occurs when solid matter generated in the tubing between the reagent bottle and retort and the tubing was clogged. In many cases, this error occurs on the alcohol station immediately after the buffer formalin station, cleaning xylene station containing a lot of dissolved paraffin, or paraffin container where paraffin has not properly melted. If buffer formalin salt is precipitated, the TN bottle coupler clogs easily. Accordingly, disassemble the TN bottle coupler and remove salt thoroughly using water, etc. In this case, ask the customer to perform periodic cleaning using warm water. If the error occurred on the cleaning xylene station, white paraffin solids generate in the tubing. Accordingly, dissolve and remove paraffin solids using xylene, etc. In this case, ask the customer to shorten the reagent change cycle for cleaning xylene. If the error occurred on the paraffin container, ask the customer to melt paraffin fully before commencing the process.

- Checking for possible cause c
  This error occurs when solid matter entered in the air circuit, particularly in the tubing between the connection point to the retort container and the pressure sensor. Remove the tubing in the applicable area and flush the tubing with xylene, etc.

- Checking for possible cause d
  This error occurs when the solenoid valve SV2 is always ON. Try pressurizing and depressurizing manually using the check program, etc. If the pressure drops but does not rise properly, suspect the SV2. Try turning the SV2 ON/OFF separately to check if the applicable operation is performed.

Error No. 013 Retort pressure could not be decreased.

- The pressure does not drop to -13 kPa or below after 1 minute of pumping-in. The pressure does not drop to -13 kPa or below within 30 seconds of closing the gate valve.

[1] Possible cause

a. The retort lid is open.
b. The trap bottle is detached or loose.
c. The lead valve or diaphragm of the air pump is damaged.
d. The solenoid valve SV3 is faulty.
e. The solenoid valve SV2 is faulty.
f. The solenoid valve SV6 is clogged.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Depressurization is sometimes disabled when the retort lid is open. The retort lock lever can be closed even when the retort lid is not closed. In this case, depressurization is disabled. The same is true when the retort lid gasket is detached or leaking.

- Checking for possible cause b
  Sufficient depressurization cannot be achieved, either, when the trap bottle is detached or loose. Remove the back exterior panel and firmly screw in the bottle.

- Checking for possible cause c
  Depressurization is sometimes disabled when the lead valve or diaphragm of the air pump is damaged. Replace the lead valve or diaphragm of the air pump.

- Checking for possible cause d
  If the solenoid valve SV3 becomes faulty, depressurization is disabled because the air circuit cannot be closed. Turn the solenoid valve SV3 ON/OFF using the check program and check if the SV3 is operating.

- Checking for possible cause e
  If the solenoid valve SV2 becomes faulty, depressurization is disabled because the air circuit cannot be closed. Turn the solenoid valve SV2 ON/OFF using the check program and check if the SV2 is operating.

- Checking for possible cause f
  If the tubing between the solenoid valve SV6 and condensate bottle is clogged by some solid matter, the line through which air escapes from the air pump is closed and consequently depressurization becomes disabled. In this case, disassemble the SV6 and clean the disassembled parts, and also remove the tubing and remove solid matter.

Error No. 014　Fluid low

- The pressure does not drop to -13 kPa or below after 1 minute of pumping-in. The pressure dropped to -13 kPa or below within 30 seconds of closing the gate valve.

[1] Possible cause

a. Reagent in the applicable reagent bottle, or paraffin in the paraffin container, is insufficient.
b. The condensate bottle coupler was used for the reagent bottle.
c. The pipe in the reagent bottle is not set properly.
d. The tubing leaked.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Reagent in the reagent bottle used for pumping-in, or paraffin in the paraffin container, is insufficient. Add an appropriate amount of reagent.

- Checking for possible cause b
  The condensate bottle coupler has a short, red pipe set inside. If this coupler is used for normal reagent by mistake, reagent cannot be supplied and a condition of insufficient fluid occurs.

- Checking for possible cause c
  If the pipe for the reagent bottle coupler is set in such a way that its tip is not contacting the bottom inside the reagent bottle, reagent cannot be supplied and a condition of insufficient fluid occurs.

- Checking for possible cause d
  Depressurization is sometimes disabled when leakage occurs from the tubing between the applicable reagent bottle and gate valve. This includes leakage from the rotary valve or gate valve itself.

Error No. 016 Pump-in failure during or after the second pump-in cycle

- The initial pumping-in from one station was successful, but a pumping-in error occurred in subsequent pumping-in. For example, an error occurred during pumping-in for mixing, etc.

[1] Possible cause

a. The TN bottle coupler is disconnected.
b. The reagent bottle or reagent tubing is clogged by solid matter (paraffin, precipitated salt).
c. The air circuit is clogged.
d. The solenoid valve SV2, 3 or 6 is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  The reagent bottle used in pumping-in is detached. This error occurs when the applicable bottle is disconnected and a bottle connection check is not performed, or when the applicable bottle remains uninstalled after a connection check. As the remedial action, connect the bottle properly and use the bottle connection check function.

- Checking for possible cause b
  This error occurs when solid matter generated in the tubing between the reagent bottle and retort and the tubing was clogged. In many cases, this error occurs on the alcohol station immediately after the buffer formalin station, cleaning xylene station containing a lot of dissolved paraffin, or paraffin container where paraffin has not properly melted. If buffer formalin salt is precipitated, the TN bottle coupler clogs easily. Accordingly, disassemble the TN bottle coupler and remove salt thoroughly using water, etc. In this case, ask the customer to perform periodic cleaning using warm water. If the error occurred on the cleaning xylene station, white paraffin solids generate in the tubing. Accordingly, dissolve and remove paraffin solids using xylene, etc. In this case, ask the customer to shorten the reagent change cycle for cleaning xylene. If the error occurred on the paraffin container, ask the customer to melt paraffin fully before commencing the process.

- Checking for possible cause c
  This error occurs when solid matter entered in the air circuit, particularly in the tubing between the connection point to the retort container and the pressure sensor. Remove the tubing in the applicable area and flush the tubing with xylene, etc.

- Checking for possible cause d
  This error occurs when the solenoid valve SV2, SV3 or SV6 is faulty. Try turning ON/OFF each solenoid valve using the check program, etc., to check if the applicable operation is performed.

Error No. 017 Fluid Low (solution did not reach safeguarded level)

- When baskets are set in one level, the ultrasonic sensor US1 (2.7-liter position) represents the level assurance position. If baskets are set in two levels, the ultrasonic sensor US2 (3.5-liter position) represents the level assurance position. This error occurs if each sensor did not turn ON after a successful pumping-in.

[1] Possible cause

a. Insufficient fluid (less than the required amount of reagent).

[2] Key equipment used for check

- None

[3] Cause identification and remedial action

- Checking for possible cause a

  Reagent in the reagent bottle used for pumping-in, or paraffin in the paraffin container, is less than the required amount of fluid. Add the applicable reagent.

Error No. 020 Retort pressure did not reach the set value within one minute after the gate valve closed.

- At the start of pumping-out, the pressure sensor input does not reach 13 kPa or above after 1 minute of pressurization with the gate valve closed.

[1] Possible cause

a. The retort lid is open.
b. The trap bottle is detached or loose.
c. The lead valve or diaphragm of the air pump is damaged.
d. The solenoid valve SV3 is faulty.
e. The solenoid valve SV1 is faulty.
f. Leakage from the gate valve
g. The solenoid valve SV4 or SV5 is always ON.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Pressurization is sometimes disabled when the retort lid is open. The retort lock lever can be closed even when the retort lid is not closed, in which case pressurization is disabled. The same is true when the retort lid gasket is detached or leaking.

- Checking for possible cause b
  Sufficient pressurization cannot be achieved, either, when the trap bottle is detached or loose. Remove the back exterior panel and firmly screw in the bottle.

- Checking for possible cause c
  Depressurization is sometimes disabled when the lead valve or diaphragm of the air pump is damaged. Replace the lead valve or diaphragm of the air pump.

- Checking for possible cause d
  If the solenoid valve SV3 becomes faulty, pressurization is disabled because the air circuit cannot be closed. Turn the solenoid valve SV3 ON/OFF using the check program and check if the SV3 is operating.

- Checking for possible cause e
  If the solenoid valve SV1 becomes faulty, the discharge side of the pump cannot be connected to the air circuit and thus pressurization is disabled. Turn the solenoid valve SV1 ON/OFF using the check program and check if the SV2 is operating.

- Checking for possible cause f
  If the O-ring at the bottom of the fixed disk of the gate valve is not securely set, leakage occurs from this position. Disassemble the gate valve and check the setting condition of the O-ring.

- Checking for possible cause g
  Pressurization is disabled if the solenoid valve SV4 or SV5 used to depressurize a bulk reservoir remains ON due to some abnormality. Turn each solenoid valve ON/OFF using the check program to confirm that the applicable solenoid valve is operating.

Error No. 021 Retort pressure did not reach the set value after 3 attempts (1 minute each after the gate valve closed).

- At the start of pumping-out, pressurization was attempted three times with the gate valve closed, but the pressure sensor input did not reach 13 kPa or above after 1 minute in each attempt.

[1] Possible cause

a. The retort lid is open.
b. The trap bottle is detached or loose.
c. The lead valve or diaphragm of the air pump is damaged.
d. The solenoid valve SV3 is faulty.
e. The solenoid valve SV1 is faulty.
f. Leakage from the gate valve
g. The solenoid valve SV4 or SV5 is always ON.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Pressurization is sometimes disabled when the retort lid is open. The retort lock lever can be closed even when the retort lid is not closed, in which case pressurization is disabled. The same is true when the retort lid gasket is detached or leaking.

- Checking for possible cause b
  Sufficient pressurization cannot be achieved, either, when the trap bottle is detached or loose. Remove the back exterior panel and firmly screw in the bottle.

- Checking for possible cause c
  Depressurization is sometimes disabled when the lead valve or diaphragm of the air pump is damaged. Replace the lead valve or diaphragm of the air pump.

- Checking for possible cause d
  If the solenoid valve SV3 becomes faulty, pressurization is disabled because the air circuit cannot be closed. Turn the solenoid valve SV3 ON/OFF using the check program and check if the SV3 is operating.

- Checking for possible cause e
  If the solenoid valve SV1 becomes faulty, the discharge side of the pump cannot be connected to the air circuit and thus pressurization is disabled. Turn the solenoid valve SV1 ON/OFF using the check program and check if the SV2 is operating.

- Checking for possible cause f
  If the O-ring at the bottom of the fixed disk of the gate valve is not securely set, leakage occurs from this position. Disassemble the gate valve and check the setting condition of the O-ring.

- Checking for possible cause g
  Pressurization is disabled if the solenoid valve SV4 or SV5 used to depressurize a bulk reservoir remains ON due to some abnormality. Turn each solenoid valve ON/OFF using the check program to confirm that the applicable solenoid valve is operating.

Error No. 022 Pump-out was not completed within 6 minutes after the gate valve opened.

- The pressure sensor input does not drop to 10 kPa or below after 6 minutes of pumping-out.

[1] Possible cause

a. The TN bottle coupler is disconnected.
b. The reagent bottle or reagent tubing is clogged by solid matter (paraffin, precipitated salt).
c. The air circuit is clogged.
d. The external drain/fill port hose is not connected.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  The reagent bottle used for pumping-out is detached. This error occurs when the applicable bottle detached or was intentionally disconnected after pumping-in. As the remedial action, connect the bottle properly and do not remove it during operation.

- Checking for possible cause b
  This error occurs when solid matter generated in the tubing between the reagent bottle and retort and the tubing was clogged. In many cases, this error occurs on the alcohol station immediately after the buffer formalin station, cleaning xylene station containing a lot of dissolved paraffin, or paraffin container where paraffin has not properly melted. If buffer formalin salt is precipitated, the TN bottle coupler clogs easily. Accordingly, disassemble the TN bottle coupler and remove salt thoroughly using water, etc. In this case, ask the customer to perform periodic cleaning using warm water. If the error occurred on the cleaning xylene station, white paraffin solids generate in the tubing. Accordingly, dissolve and remove paraffin solids using xylene, etc. In this case, ask the customer to shorten the reagent change cycle for cleaning xylene. If the error occurred on the paraffin container, ask the customer to melt paraffin fully before commencing the process.

- Checking for possible cause c
  This error occurs when solid matter entered in the air circuit, particularly in the tubing between the connection point to the retort container and the pressure sensor. Remove the tubing in the applicable area and flush the tubing with xylene, etc.

- Checking for possible cause d
  If the external drain/fill port is used but the drain/fill hose is not set at the drain/fill port, the tubing path is closed by the check valve function of the coupler and thus pumping-out continues indefinitely. Set the drain/fill hose and then perform pumping-out.

Error No. 023 Pump-out was not completed after 2 attempts (6 minutes each).

- Pumping-out was attempted twice, but the pressure sensor input did not drop to 10 kPa or below after 6 minutes in either attempt.

[1] Possible cause

a. The TN bottle coupler is disconnected.
b. The reagent bottle or reagent tubing is clogged by solid matter (paraffin, precipitated salt).
c. The air circuit is clogged.
d. The external drain/fill port hose is not connected.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  The reagent bottle used for pumping-out is detached. This error occurs when the applicable bottle detached or was intentionally disconnected after pumping-in. As the remedial action, connect the bottle properly and do not remove it during operation.

- Checking for possible cause b
  This error occurs when solid matter generated in the tubing between the reagent bottle and retort and the tubing was clogged. In many cases, this error occurs on the alcohol station immediately after the buffer formalin station, cleaning xylene station containing a lot of dissolved paraffin, or paraffin container where paraffin has not properly melted. If buffer formalin salt is precipitated, the TN bottle coupler clogs easily. Accordingly, disassemble the TN bottle coupler and remove salt thoroughly using water, etc. In this case, ask the customer to perform periodic cleaning using warm water. If the error occurred on the cleaning xylene station, white paraffin solids generate in the tubing. Accordingly, dissolve and remove paraffin solids using xylene, etc. In this case, ask the customer to shorten the reagent change cycle for cleaning xylene. If the error occurred on the paraffin container, ask the customer to melt paraffin fully before commencing the process.

- Checking for possible cause c
  This error occurs when solid matter entered in the air circuit, particularly in the tubing between the connection point to the retort container and the pressure sensor. Remove the tubing in the applicable area and flush the tubing with xylene, etc.

- Checking for possible cause d
  If the external drain/fill port is used but the drain/fill hose is not set at the drain/fill port, the tubing path is closed by the check valve function of the coupler and thus pumping-out continues indefinitely. Set the drain/fill hose and then perform pumping-out.

Error No. 030 Gate valve temperature sensor error

- When temperature control of the gate valve was attempted, the temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause

a. Effect of the environment temperature
b. The temperature sensor is faulty.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 032　Rotary valve temperature sensor error

- When temperature control of the rotary valve was attempted, the temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause

a. Effect of the environment temperature
b. The temperature sensor is faulty.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 033 Retort front temperature sensor error

- When temperature control of the retort was attempted, the retort front temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause

a. Effect of the environment temperature
b. The temperature sensor is faulty.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 037 Failure of rotary valve temperature control (temperature too low)

- The rotary valve temperature remained 4°C below the setpoint temperature for 30 minutes. This error occurs only when the rotary valve is selecting the paraffin station or waste paraffin container position.

[1] Possible cause
  a. Effect of the environment temperature
  b. The heater circuit opened.
  c. The heater driver board is faulty.
  d. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  This error sometimes occurs when the system is operated at an extremely low environment temperature because then the temperature does not rise sufficiently. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  The heater circuit opened and heating was disabled. Or, the wiring circuit may have opened at a point before the heater. Measure the heater resistance using a tester. The resistance is approx. 133 Ω for the 100-V specification, approx. 176 Ω for the 115-V specification, and approx. 705 Ω for the 230-V specification.

- Checking for possible cause c
  The heater driver board may be faulty. Perform heater temperature control using the check program, etc., and check if the LED H7 on the heater driver board illuminates in red when a heater output is produced. If not, the CPU board is suspected as the cause. In all other conditions, the heater driver board is the cause.

- Checking for possible cause d
  A faulty CPU board is also suspected. If the LED on the heater driver board does not turn on, the CPU board is suspected as the cause.

Error No. 039 Failure of retort temperature control (temperature too low)

- The retort temperature remained 4°C below the set temperature for 20 minutes.

[1] Possible cause
  a. Effect of the environment temperature
  b. The heater circuit opened.
  c. The heater driver board is faulty.
  d. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  This error sometimes occurs when the system is operated at an extremely low environment temperature because then the temperature does not rise sufficiently. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  The heater circuit opened and heating was disabled. Or, the wiring circuit may have opened at a point before the heater. Measure the heater resistance using a tester. There are two types of retort heaters: front heater and other heaters. The resistance for the front heater (between 6 and 7 on the terminal block TB4) is approx. 51 Ω for the 100-V/115-V specification and approx. 203 Ω for the 230-V specification. For the other heaters (between 1 and 4 on the terminal block TB4), the resistance is approx. 34 Ω for the 100-V/115-V specification and approx. 136 Ω for the 230-V specification.

- Checking for possible cause c
  The heater driver board may be faulty. Perform heater temperature control using the check program, etc., and check if the LEDs H2 and H3 on the heater driver board illuminate in red when a heater output is produced. If not, the CPU board is suspected as the cause. In all other conditions, the heater driver board is the cause.

- Checking for possible cause d
  A faulty CPU board is also suspected. If the LED on the heater driver board does not turn on, the CPU board is suspected as the cause.

Error No. 040 Rotary valve positioning sensor error

- When the rotary valve was switched, an unexpected sensor pattern was selected.

[1] Possible cause
 a. The rotary valve position detection board is faulty.
 b. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
 The six sensors on the rotary valve position detection board are faulty. Or, the cable connecting the position detection board and CPU board broke. Remove the position detection board and shield each photo-sensor at a position where short-circuit does not occur. Confirm that the corresponding LED on the CPU board turns off when each photo-sensor is shielded. If any LED does not turn off, the corresponding sensor is faulty.

- Checking for possible cause b
 If the position detection board was found normal as a result of the above test, the CPU board is likely faulty.

Error No. 041 Rotary valve failed rotating counterclockwise.

- The positioning sensor does not change after the valve has been turned by a certain angle to switch from one station to a different station.

[1] Possible cause

a. The motor mis-stepped due to locking of the rotary disk.
b. The motor circuit became open.
c. The rotary valve position detection board is faulty.
d. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  Turn the rotary valve in forward and reverse directions to check if the motor shaft turns within the range of play. If the motor shaft moves but the rotary disk does not, the disk may be locked. Disassemble the rotary valve and soak the ceramic disk in hot water, and separate the rotary disk from the fixed disk. Grease and then assemble each part.

- Checking for possible cause b
  If the motor shaft did not turn normally in the above test, the motor is likely faulty.

- Checking for possible cause c
  Among the six sensors on the rotary valve position detection board, the sensor PC6 is faulty. Or, the cable connecting the position detection board and CPU board broke. Remove the position detection board and shield the sensor PC6 at a position where short-circuit does not occur. Confirm that the corresponding LED on the CPU board turns off when each photo-sensor is shielded.

- Checking for possible cause d
  If the position detection board was found normal as a result of the above test, the CPU board is likely faulty.

Error No. 042 Rotary valve positioning sensor error Recovery action was taken.

- When the rotary valve was switched, an unexpected sensor pattern was selected. However, rotary valve operation was attempted again after the error. The system registers the error before Error 040, and attempts a retry.

[1] Possible cause
  a. The rotary valve position detection board is faulty.
  b. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  The six sensors on the rotary valve position detection board are faulty. Or, the cable connecting the position detection board and CPU board broke. Remove the position detection board and shield each photo-sensor at a position where short-circuit does not occur. Confirm that the corresponding LED on the CPU board turns off when each photo-sensor is shielded. If any LED does not turn off, the corresponding sensor is faulty.

- Checking for possible cause b
  If the position detection board was found normal as a result of the above test, the CPU board is likely faulty.

Error No. 043 Rotary valve did not operate properly. Recovery action was taken.

- The position sensor does not change after the valve has been turned by a certain angle to switch from one station to a different station. The system registers the error before Error 041, and attempts a retry.

[1] Possible cause
  a. The motor mis-stepped due to locking of the rotary disk.
  b. The motor circuit became open.
  c. The rotary valve position detection board is faulty.
  d. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  Turn the rotary valve in forward and reverse directions to check if the motor shaft turns within the range of play. If the motor shaft moves but the rotary disk does not, the disk may be locked. Disassemble the rotary valve and soak the ceramic disk in hot water, and separate the rotary disk from the fixed disk. Grease and then assemble each part.

- Checking for possible cause b
  If the motor shaft did not turn normally in the above test, the motor is likely faulty.

- Checking for possible cause c
  Among the six sensors on the rotary valve position detection board, the sensor PC6 is faulty. Or, the cable connecting the position detection board and CPU board broke. Remove the position detection board and shield the sensor PC6 at a position where short-circuit does not occur. Confirm that the corresponding LED on the CPU board turns off when each photo-sensor is shielded.

- Checking for possible cause d
  If the position detection board was found normal as a result of the above test, the CPU board is likely faulty.

Error No. 050 Gate valve positioning sensor error

- When the gate valve was switched, an unexpected sensor pattern was selected.

[1] Possible cause

a. The gate valve position detection board is faulty.
b. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  The four sensors on the gate valve position detection board are faulty. Or, the cable connecting the position detection board and CPU board broke. Remove the position detection board and shield each photo-sensor at a position where short-circuit does not occur. Confirm that the corresponding LED on the CPU board turns off when each photo-sensor is shielded. If any LED does not turn off, the corresponding sensor is faulty.

- Checking for possible cause b
  If the position detection board was found normal as a result of the above test, the CPU board is likely faulty.

Error No. 051 The gate valve did not operate properly.

- The positioning sensor does not change after the valve has been turned by a certain angle to switch from one station to a different station.

[1] Possible cause

a. The motor mis-stepped due to locking of the gate valve disk.
b. The motor circuit became open.
c. The gate valve position detection board is faulty.
d. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  Turn the gate valve in forward and reverse directions to check if the motor shaft turns within the range of play. If the motor shaft moves but the rotary disk does not, the disk may be locked. Disassemble the rotary valve and soak the ceramic disk in hot water, and separate the rotary disk from the fixed disk. Grease and then assemble each part.

- Checking for possible cause b
  If the motor shaft did not turn normally in the above test, the motor is likely faulty.

- Checking for possible cause c
  Among the four sensors on the gate valve position detection board, the sensor PC4 is faulty. Or, the cable connecting the position detection board and CPU board broke. Remove the position detection board and shield the sensor PC4 at a position where short-circuit does not occur. Confirm that the corresponding LED on the CPU board turns off when each photo-sensor is shielded.

- Checking for possible cause d
  If the position detection board was found normal as a result of the above test, the CPU board is likely faulty.

Error No. 052 Gate valve positioning sensor error Recovery action was taken.

- When the gate valve was switched, an unexpected sensor pattern was selected. However, gate valve operation was attempted again after the error. The system registers the error before Error 050, and attempts a retry.

[1] Possible cause

a. The gate valve position detection board is faulty.
b. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  The four sensors on the gate valve position detection board are faulty. Or, the cable connecting the position detection board and CPU board broke. Remove the position detection board and shield each photo-sensor at a position where short-circuit does not occur. Confirm that the corresponding LED on the CPU board turns off when each photo-sensor is shielded. If any LED does not turn off, the corresponding sensor is faulty.

- Checking for possible cause b
  If the position detection board was found normal as a result of the above test, the CPU board is likely faulty.

Error No. 053 Gate valve did not operate properly. Recovery Action was taken.

- The positioning sensor does not change after the valve has been turned by a certain angle to switch from one station to a different station. The system registers the error before Error 051, and attempts a retry.

[1] Possible cause

a. The motor mis-stepped due to locking of the gate valve disk.
b. The motor circuit became open.
c. The gate valve position detection board is faulty.
d. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  Turn the gate valve in forward and reverse directions to check if the motor shaft turns within the range of play. If the motor shaft moves but the rotary disk does not, the disk may be locked. Disassemble the rotary valve and soak the ceramic disk in hot water, and separate the rotary disk from the fixed disk. Grease and then assemble each part.

- Checking for possible cause b
  If the motor shaft did not turn normally in the above test, the motor is likely faulty.

- Checking for possible cause c
  Among the four sensors on the gate valve position detection board, the sensor PC4 is faulty. Or, the cable connecting the position detection board and CPU board broke. Remove the position detection board and shield the sensor PC4 at a position where short-circuit does not occur. Confirm that the corresponding LED on the CPU board turns off when each photo-sensor is shielded.

- Checking for possible cause d
  If the position detection board was found normal as a result of the above test, the CPU board is likely faulty.

Error No. 070   Air pump error

- The air pump generated one of three types of errors. An attempt was made to start the air pump but failed, or the air pump became overloaded and stopped because the pressure rose to 50 kPa or above due to air-pump control malfunction.

[1] Possible cause
  a. The air pump is faulty.
  b. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Produce output from the air pump alone using the check program. Confirm that the air pump operates and read off the pump speed. If the speed is other than "0," the air pump is normal. The pump is also normal if the LED LD801 on the CPU board is blinking during pump operation (pump speed input signal). Next, pressurize the retort and confirm that the pressure stabilizes at approx. 34 kPa. Next, perform depressurization in the P/V cycles and check if the pump operation is normal when the pressure drops. If the pump stops and cannot be started in the depressurized state, replace the pump and see if the situation improves.

- Checking for possible cause b
  If the above stopping still occurs or speed cannot be read after replacing the pump, the CPU board is likely faulty.

Error No. 081 Rotary valve thermal fuse open

- The 90°C thermostat on the side face of the valve actuated while the rotary valve was temperature-controlled.

[1] Possible cause
a. Temperature sensor installation position
b. The CPU board is faulty.
c. The heater driver board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  Check the side face of the rotary valve and confirm that the temperature sensor is firmly inserted. The sensor should not be disconnected or have dropped. Note that the thermostat will reset once the power is reconnected when the rotary valve temperature is 40°C or below.

- Checking for possible cause b
  Temperature-control the rotary valve at 70°C using the check program. Once the rotary valve temperature reaches 70°C, check if the LED H7 (LD17) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Note that if the thermostat is OFF, the LED TC7 (LD5) should turn off when the LED H7 (LD17) turns on.

- Checking for possible cause c
  If the temperature rises even when the LED is blinking normally, the heater driver board is likely faulty.

Error No. 082 Retort thermal fuse open

- The 100°C thermostat on the front side of the retort actuated while the retort was temperature-controlled.

[1] Possible cause
a. Temperature sensor installation position
b. The CPU board is faulty.
c. The heater driver board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Thermometer

[3] Cause identification and remedial action
- Checking for possible cause a
  Fill 3.5 liters of water in the retort and try temperature-controlling the retort at 60°C. After the temperature has reached 60°C, keep monitoring for another 10 minutes or so. Specifically, check if the displayed retort temperature continues to rise. Also observe the temperature around the center of the retort using a thermometer and see if the temperature stabilizes around 60°C. If the temperature stabilizes around this level, everything is normal. Note that this thermostat will reset once the temperature is reconnected when the retort temperature is 40°C or below.

- Checking for possible cause b
  When the retort temperature reaches 60°C in the above check, see if each of the two LEDs, namely LD12 and LD13, blinks on the heater driver board. If the LED does not blink and the temperature rises, the CPU board is faulty. Note that if the thermostat is OFF, the LED TC2 (LD3) should turn off when the LED H2 (LD13) turns on.

- Checking for possible cause c
  If the temperature rises even when the LED is blinking normally, the heater driver board is likely faulty.

Error No. 083 Gate valve thermal fuse open

- The 90°C thermostat on the side face of the valve actuated while the gate valve was temperature-controlled.

[1] Possible cause
a. Temperature sensor installation position
b. The CPU board is faulty.
c. The heater driver board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  Check the side face of the gate valve and confirm that the temperature sensor is firmly inserted. The sensor should not be disconnected or have dropped. Note that the thermostat will reset once the power is reconnected when the gate valve temperature is 40°C or below.

- Checking for possible cause b
  Temperature-control the gate valve at 70°C using the check program. Once the gate valve temperature reaches 70°C, check if the LED H6 (LD16) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Note that if the thermostat is OFF, the LED TC6 (LD4) should turn off when the LED H6 (LD16) turns on.

- Checking for possible cause c
  If the temperature rises even when the LED is blinking normally, the heater driver board is likely faulty.

Error No. 085 Failure of gate valve temperature control (temperature too low)

- The gate valve temperature remained 4°C below the setpoint temperature for 30 minutes. This error occurs only when the rotary valve is selecting the paraffin station or waste paraffin container position.

[1] Possible cause

a. Effect of the environment temperature
b. The heater circuit opened.
c. The heater driver board is faulty.
d. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  This error sometimes occurs when the system is operated at an extremely low environment temperature because then the temperature does not rise sufficiently. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  The heater circuit opened and heating was disabled. Or, the wiring circuit may have opened at a point before the heater. Measure the heater resistance using a tester. The resistance is approx. 133 Ω for the 100-V specification, approx. 176 Ω for the 115-V specification, and approx. 705 Ω for the 230-V specification.

- Checking for possible cause c
  The heater driver board may be faulty. Perform heater temperature control using the check program, etc., and check if the LED H6 on the heater driver board illuminates in red when a heater output is produced. If not, the CPU board is suspected as the cause. In all other conditions, the heater driver board is the cause.

- Checking for possible cause d
  A faulty CPU board is also suspected. If the LED on the heater driver board does not turn on, the CPU board is suspected as the cause.

Error No. 087 Retort valve temperature exceeded 80°C.

- Retort valve temperature exceeded 80°C.

[1] Possible cause
a. Hot paraffin was input.
b. The CPU board is faulty.
c. The heater driver board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  This error occurs when fluid of 80°C or above was passed through the rotary valve (such as during warm-water cleaning).

- Checking for possible cause b
  Temperature-control the rotary valve at 70°C using the check program. Once the rotary valve temperature reaches 70°C, check if the LED H7 (LD17) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty.

- Checking for possible cause c
  If the temperature rises even when the LED is blinking normally, the heater driver board is likely faulty.

Error No. 088 Retort front temperature exceeded 80°C.

- The input from the temperature sensor at the front of the retort became 80°C or above.

[1] Possible cause
  a. Hot reagent was input.
  b. The CPU board is faulty.
  c. The heater driver board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Thermometer

[3] Cause identification and remedial action
- Checking for possible cause a
  Reagent (such as warm water used for warm-water cleaning) exceeding 80°C was input to the retort.

- Checking for possible cause b
  When the retort temperature reaches 60°C in the above check, see if each of the two LEDs, namely LD12 and LD13, blinks on the heater driver board. If the LED does not blink and the temperature rises, the CPU board is faulty.

- Checking for possible cause c
  If the temperature rises even when the LED is blinking normally, the heater driver board is likely faulty.

Error No. 089 Gate valve temperature exceeded 80°C.

- Gate valve temperature exceeded 80°C.

[1] Possible cause
a. Hot paraffin was input.
b. The CPU board is faulty.
c. The heater driver board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  This error occurs when fluid of 80°C or above was passed through the gate valve (such as during warm-water cleaning).

- Checking for possible cause b
  Temperature-control the rotary valve at 70°C using the check program. Once the rotary valve temperature reaches 70°C, check if the LED H7 (LD17) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty.

- Checking for possible cause c
  If the temperature rises even when the LED is blinking normally, the heater driver board is likely faulty.

Error No. 091 Exhaust fan alarm

- The fume fan at the back of the activated carbon cartridge stopped operating and an alarm signal generated.

[1] Possible cause
  a. The exhaust fan is faulty.
  b. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Try operating the fume fan. If the fan does not turn even when the LED LD924 or LD926 is lit on the CPU board, the fan is faulty. Replace the fan.

- Checking for possible cause b
  If the fume fan does not operate in either the high-speed mode or low-speed mode, the CPU board is faulty.

Error No. 094 Cooling fan alarm

- The cooling fan on the left side face of the control box stopped and an alarm signal generated.

[1] Possible cause

a. Cooling fan is faulty.
b. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Turn on the power and check if the cooling fan is operating. If the cooling fan is stopped, the cooling fan is faulty.

- Checking for possible cause b
  If the error persists even when the cooling fan is turning, the CPU board is faulty.

Error No. 100 Retort temperature sensor error (except for the front temperature sensor)

- When temperature control of the retort was attempted, temperature sensor input other than the retort front temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause

a. Effect of the environment temperature
b. The temperature sensor is faulty.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 101 Paraffin station 11 temperature sensor error

- When temperature control of paraffin station 11 was attempted, the applicable temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause

a. Effect of the environment temperature
b. The temperature sensor is faulty.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 102 Paraffin station 12 temperature sensor error

- When temperature control of paraffin station 12 was attempted, the applicable temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause
  a. Effect of the environment temperature
  b. The temperature sensor is faulty.
  c. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 103 Paraffin station 13 temperature sensor error

- When temperature control of paraffin station 13 was attempted, the applicable temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause
  a. Effect of the environment temperature
  b. The temperature sensor is faulty.
  c. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 104 Paraffin station 14 temperature sensor error

- When temperature control of paraffin station 14 was attempted, the applicable temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause
  a. Effect of the environment temperature
  b. The temperature sensor is faulty.
  c. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 105 Oven top board temperature sensor error

- When temperature control of the oven top board was attempted, the applicable temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause
  a. Effect of the environment temperature
  b. The temperature sensor is faulty.
  c. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 106 Retort lid temperature sensor error

- When temperature control of the retort lid was attempted, the applicable temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause

a. Effect of the environment temperature
b. The temperature sensor is faulty.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 107 Cleaning xylene station temperature sensor error

- When temperature control of cleaning xylene was attempted, the applicable temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause

a. Effect of the environment temperature
b. The temperature sensor is faulty.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 108 Fill line temperature sensor error

- When temperature control of the fill pipe was attempted, the applicable temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause
  a. Effect of the environment temperature
  b. The temperature sensor is faulty.
  c. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 109 Drain line temperature sensor error

- When temperature control of the drain pipe was attempted, the applicable temperature sensor input became -20°C or below or 110°C or above (or the resistance became 38 kΩ or above or 394 Ω or below).

[1] Possible cause

a. Effect of the environment temperature
b. The temperature sensor is faulty.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor resistance is approx. 5 to 6 kΩ near the normal temperature level of 25°C. Check not only the thermistor, but also the connection condition of the relay connectors and wires connected to the CPU board.

- Checking for possible cause c
  A faulty CPU board is also suspected. If other temperature inputs connected to the CPU board are abnormal, the CPU board is suspected as the cause.

Error No. 110 Circumference temperature sensor error

- The input from the circumference temperature sensor TE800 on the CPU board became -20°C or below or 110°C or above. (or the resistance became 38 kΩ or above or 388 Ω or below).

[1] Possible cause
  a. Effect of the environment temperature
  b. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  If the power is turned on when the environment temperature is extremely low (-20°C or below), this error may occur even when the temperature sensor is normal. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  A thermistor is used for the temperature sensor. This error occurs when the thermistor experienced an open or short-circuit. The thermistor is approx. 5 kΩ near the normal temperature level of 25°C. This sensor is mounted on the CPU board, so if the sensor is faulty the entire CPU board must be replaced.

Error No. 111 Failure of paraffin station 11 temperature control (temperature too low)

- The paraffin station 11 temperature remained 4°C below the setpoint temperature for 20 minutes.

[1] Possible cause

a. Effect of the environment temperature
b. The heater circuit opened.
c. The heater driver board is faulty.
d. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  This error sometimes occurs when the system is operated at an extremely low environment temperature because then the temperature does not rise sufficiently. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  The heater circuit opened and heating was disabled. Or, the wiring circuit may have opened at a point before the heater. Measure the heater resistance using a tester. The resistance of paraffin station 11 is approx. 200 Ω for the 100-V specification, approx. 265 Ω for the 115-V specification, and approx. 1058 Ω for the 230-V specification.

- Checking for possible cause c
  The heater driver board may be faulty. Perform heater temperature control using the check program, etc., and check if the LED H8 (LD19) on the heater driver board illuminate in red when a heater output is produced. If not, the CPU board is suspected as the cause. In all other conditions, the heater driver board is the cause.

- Checking for possible cause d
  A faulty CPU board is also suspected. If the LED on the heater driver board does not turn on, the CPU board is suspected as the cause.

Error No. 112 Failure of paraffin station 12 temperature control (temperature too low)

- The paraffin station 12 temperature remained 4°C below the setpoint temperature for 20 minutes.

[1] Possible cause

a. Effect of the environment temperature
b. The heater circuit opened.
c. The heater driver board is faulty.
d. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  This error sometimes occurs when the system is operated at an extremely low environment temperature because then the temperature does not rise sufficiently. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  The heater circuit opened and heating was disabled. Or, the wiring circuit may have opened at a point before the heater. Measure the heater resistance using a tester. The resistance of paraffin station 12 is approx. 200 Ω for the 100-V specification, approx. 265 Ω for the 115-V specification, and approx. 1058 Ω for the 230-V specification.

- Checking for possible cause c
  The heater driver board may be faulty. Perform heater temperature control using the check program, etc., and check if the LED H9 (LD20) on the heater driver board illuminate in red when a heater output is produced. If not, the CPU board is suspected as the cause. In all other conditions, the heater driver board is the cause.

- Checking for possible cause d
  A faulty CPU board is also suspected. If the LED on the heater driver board does not turn on, the CPU board is suspected as the cause.

Error No. 113 Failure of paraffin station 13 temperature control (temperature too low)

- The paraffin station 13 temperature remained 4°C below the setpoint temperature for 20 minutes.

[1] Possible cause
  a. Effect of the environment temperature
  b. The heater circuit opened.
  c. The heater driver board is faulty.
  d. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  This error sometimes occurs when the system is operated at an extremely low environment temperature because then the temperature does not rise sufficiently. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  The heater circuit opened and heating was disabled. Or, the wiring circuit may have opened at a point before the heater. Measure the heater resistance using a tester. The resistance of paraffin station 13 is approx. 200 Ω for the 100-V specification, approx. 265 Ω for the 115-V specification, and approx. 1058 Ω for the 230-V specification.

- Checking for possible cause c
  The heater driver board may be faulty. Perform heater temperature control using the check program, etc., and check if the LED H10 (LD21) on the heater driver board illuminate in red when a heater output is produced. If not, the CPU board is suspected as the cause. In all other conditions, the heater driver board is the cause.

- Checking for possible cause d
  A faulty CPU board is also suspected. If the LED on the heater driver board does not turn on, the CPU board is suspected as the cause.

Error No. 114 Failure of paraffin station 14 temperature control (temperature too low)

- The paraffin station 14 temperature remained 4°C below the setpoint temperature for 20 minutes.

[1] Possible cause

a. Effect of the environment temperature
b. The heater circuit opened.
c. The heater driver board is faulty.
d. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  This error sometimes occurs when the system is operated at an extremely low environment temperature because then the temperature does not rise sufficiently. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  The heater circuit opened and heating was disabled. Or, the wiring circuit may have opened at a point before the heater. Measure the heater resistance using a tester. The resistance of paraffin station 13 is approx. 133 Ω for the 100-V specification, approx. 176 Ω for the 115-V specification, and approx. 705 Ω for the 230-V specification.

- Checking for possible cause c
  The heater driver board may be faulty. Perform heater temperature control using the check program, etc., and check if the LED H11 (LD22) on the heater driver board illuminates in red when a heater output is produced. If not, the CPU board is suspected as the cause. In all other conditions, the heater driver board is the cause.

- Checking for possible cause d
  A faulty CPU board is also suspected. If the LED on the heater driver board does not turn on, the CPU board is suspected as the cause.

Error No. 117 Failure of cleaning xylene station temperature control (temperature too low)

- The cleaning xylene temperature remained 4°C below the setpoint temperature for 20 minutes.

[1] Possible cause

a. Effect of the environment temperature
b. The heater circuit opened.
c. The heater driver board is faulty.
d. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  This error sometimes occurs when the system is operated at an extremely low environment temperature because then the temperature does not rise sufficiently. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  The heater circuit opened and heating was disabled. Or, the wiring circuit may have opened at a point before the heater. Measure the heater resistance using a tester. The resistance of oven top board heater is approx. 220 Ω for the 100-V/115-V specification, approx. 882 Ω for the 230-V specification.

- Checking for possible cause c
  The heater driver board may be faulty. Perform heater temperature control using the check program, etc., and check if the LED H13 (LD18) on the heater driver board illuminates in red when a heater output is produced. If not, the CPU board is suspected as the cause. In all other conditions, the heater driver board is the cause.

- Checking for possible cause d
  A faulty CPU board is also suspected. If the LED on the heater driver board does not turn on, the CPU board is suspected as the cause.

Error No. 120 Retort thermal fuse open (except for the front thermal fuse)

- The 100°C thermostat on the back side of the retort actuated while the retort was temperature-controlled.

[1] Possible cause
  a. Temperature sensor installation position
  b. The CPU board is faulty.
  c. The heater driver board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Thermometer

[3] Cause identification and remedial action
- Checking for possible cause a
  Fill 3.5 liters of water in the retort and try temperature-controlling the retort at 60°C. After the temperature has reached 60°C, keep monitoring for another 10 minutes or so. Specifically, check if the displayed retort temperature continues to rise. Also observe the temperature around the center of the retort using a thermometer and see if the temperature stabilizes around 60°C. If the temperature stabilizes around this level, everything is normal. Note that this thermostat will reset once the temperature is reconnected when the retort temperature is 40°C or below.

- Checking for possible cause b
  When the retort temperature reaches 60°C in the above check, see if each of the two LEDs, namely LD12 and LD13, blinks on the heater driver board. If the LED does not blink and the temperature rises, the CPU board is faulty. Note that if the thermostat is OFF, the LED TC3 (LD2) should turn off when the LED H3 (LD12) turns on.

- Checking for possible cause c
  If the temperature rises even when the LED is blinking normally, the heater driver board is likely faulty.

Error No. 121 Paraffin station 11 thermal fuse open

- The built-in 100°C thermostat of the heater actuated during temperature control of paraffin station 11.

[1] Possible cause
a. The CPU board is faulty.
b. The heater driver board is faulty.
c. Temperature sensor installation position

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  The thermostat will reset once the system power is turned off after the temperature has dropped to 40°C or below. Temperature-control the paraffin station 11 at 62°C using the check program. Once the detected temperature reaches 62°C, check if the LED H8 (LD19) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Also check if the LED TC8 (LD7) on the heater driver board turns off when the LED H8 (LD19) turns on. If the TC8 turns off, the thermostat circuit is OFF.

- Checking for possible cause b
  If the temperature rises and the thermostat blows even when the heater control is stable and the specified temperature is achieved, the heater driver board is faulty.

- Checking for possible cause c
  If the thermostat blows before the temperature rises, the problem is likely in the installation condition of the temperature sensor.

Error No. 122 Paraffin station 12 thermal fuse open

- The built-in 100°C thermostat of the heater actuated during temperature control of paraffin station 12.

[1] Possible cause
a. The CPU board is faulty.
b. The heater driver board is faulty.
c. Temperature sensor installation position

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  The thermostat will reset once the system power is turned off after the temperature has dropped to 40°C or below. Temperature-control paraffin station 12 at 62°C using the check program. Once the detected temperature reaches 62°C, check if the LED H9 (LD20) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Also check if the LED TC9 (LD8) on the heater driver board turns off when the LED H9 (LD20) turns on. If the TC9 turns off, the thermostat circuit is OFF.

- Checking for possible cause b
  If the temperature rises and the thermostat blows even when the heater control is stable and the specified temperature is achieved, the heater driver board is faulty.

- Checking for possible cause c
  If the thermostat blows before the temperature rises, the problem is likely in the installation condition of the temperature sensor.

Error No. 123 Paraffin station 13 thermal fuse open

- The built-in 100°C thermostat of the heater actuated during temperature control of paraffin station 13.

[1] Possible cause
a. The CPU board is faulty.
b. The heater driver board is faulty.
c. Temperature sensor installation position

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  The thermostat will reset once the system power is turned off after the temperature has dropped to 40°C or below. Temperature-control paraffin station 13 at 62°C using the check program. Once the detected temperature reaches 62°C, check if the LED H10 (LD21) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Also check if the LED TC10 (LD9) on the heater driver board turns off when the LED H10 (LD21) turns on. If the TC10 turns off, the thermostat circuit is OFF.

- Checking for possible cause b
  If the temperature rises and the thermostat blows even when the heater control is stable and the specified temperature is achieved, the heater driver board is faulty.

- Checking for possible cause c
  If the thermostat blows before the temperature rises, the problem is likely in the installation condition of the temperature sensor.

Error No. 124 Paraffin station 14 thermal fuse open

- The built-in 100°C thermostat of the heater actuated during temperature control of paraffin station 14.

[1] Possible cause

a. The CPU board is faulty.
b. The heater driver board is faulty.
c. Temperature sensor installation position

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  The thermostat will reset once the system power is turned off after the temperature has dropped to 40°C or below. Temperature-control paraffin station 14 at 62°C using the check program. Once the detected temperature reaches 62°C, check if the LED H11 (LD22) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Also check if the LED TC11 (LD10) on the heater driver board turns off when the LED H11 (LD22) turns on. If the TC11 turns off, the thermostat circuit is OFF.

- Checking for possible cause b
  If the temperature rises and the thermostat blows even when the heater control is stable and the specified temperature is achieved, the heater driver board is faulty.

- Checking for possible cause c
  If the thermostat blows before the temperature rises, the problem is likely in the installation condition of the temperature sensor.

Error No. 125 Oven top board thermal fuse open

- The built-in 100°C thermostat of the heater actuated during temperature control of the oven top board.

[1] Possible cause

a. The CPU board is faulty.
b. The heater driver board is faulty.
c. Temperature sensor installation position

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  The thermostat will reset once the system power is turned off after the temperature has dropped to 40°C or below. Temperature-control the oven top board at 62°C using the check program. Once the detected temperature reaches 62°C, check if the LED H12 (LD23) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Also check if the LED TC12 (LD11) on the heater driver board turns off when the LED H12 (LD23) turns on. If the TC12 turns off, the thermostat circuit is OFF.

- Checking for possible cause b
  If the temperature rises and the thermostat blows even when the heater control is stable and the specified temperature is achieved, the heater driver board is faulty.

- Checking for possible cause c
  If the thermostat blows before the temperature rises, the problem is likely in the installation condition of the temperature sensor.

Error No. 126 Retort lid thermal fuse open

- The built-in 100°C thermostat of the heater actuated during temperature control of the retort lid. Or, the heater circuit is open.

[1] Possible cause
  a. The heater circuit is open.
  b. The CPU board is faulty.
  c. Temperature sensor installation position

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  The thermostat will reset once the system power is turned off after the temperature has dropped to 40°C or below. Temperature-control the retort lid at 60°C using the check program. While a heater signal is output, the LED H1 (LD1010) on the CPU board remains lit. The heater current can be measured using the current read function of the check program. Approx. 1250 mA of current flows while the power is supplied. If the circuit is open, heater current does not flow. In this case, replace the heater.

- Checking for possible cause b
  Once the retort lid temperature reaches 60°C, the LED H1 (LD1010) on the CPU board starts blinking. If the LED does not blink and the temperature rises, the CPU board is faulty.

- Checking for possible cause c
  If the thermostat blows before the temperature rises, the problem is likely in the installation condition of the temperature sensor.

Error No. 127 Cleaning xylene station thermal fuse open

- The built-in 90°C thermostat of the heater actuated during temperature control of cleaning xylene.

[1] Possible cause
  a. The CPU board is faulty.
  b. The heater driver board is faulty.
  c. Temperature sensor installation position

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  The thermostat will reset once the system power is turned off after the temperature has dropped to 40°C or below. Temperature-control the cleaning xylene heater at 40°C using the check program. Once the detected temperature reaches 40°C, check if the LED H13 (LD18) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Also check if the LED TC13 (LD6) on the heater driver board turns off when the LED H13 (LD18) turns on. If the TC13 turns off, the thermostat circuit is OFF.

- Checking for possible cause b
  If the temperature rises and the thermostat blows even when the heater control is stable and the specified temperature is achieved, the heater driver board is faulty.

- Checking for possible cause c
  If the thermostat blows before the temperature rises, the problem is likely in the installation condition of the temperature sensor.

Error No. 131 Paraffin station 11 temperature exceeded 80°C.

- The detected temperature became 80°C or above during temperature control of paraffin station 11.

[1] Possible cause
a. Hot liquid of 80°C or above was input to the paraffin container.
b. The CPU is faulty (if the thermostat also actuates).
c. The heater driver board is faulty (if the thermostat also actuates).
d. Installation position of the temperature sensor (if the thermostat also actuates)

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  This error may occur when hot paraffin is input to the paraffin container.

- Checking for possible cause b
  The thermostat will reset once the system power is turned off after the temperature has dropped to 40°C or below. Temperature-control the paraffin station 11 at 62°C using the check program. Once the detected temperature reaches 62°C, check if the LED H8 (LD19) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Also check if the LED TC8 (LD7) on the heater driver board turns off when the LED H8 (LD19) turns on. If the TC8 turns off, the thermostat circuit is OFF.

- Checking for possible cause c
  If the temperature rises and the thermostat blows even when the heater control is stable and the specified temperature is achieved, the heater driver board is faulty.

- Checking for possible cause d
  If the thermostat blows before the temperature rises, the problem is likely in the installation condition of the temperature sensor.

Error No. 132 Paraffin station 12 temperature exceeded 80°C.

- The detected temperature became 80°C or above during temperature control of paraffin station 12.

[1] Possible cause

a. Hot fluid of 80°C or above was input to the paraffin container.
b. The CPU is faulty (if the thermostat also actuates).
c. The heater driver board is faulty (if the thermostat also actuates).
d. Installation position of the temperature sensor (if the thermostat also actuates)

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  This error may occur when hot paraffin is input to the paraffin container.

- Checking for possible cause b
  The thermostat will reset once the system power is turned off after the temperature has dropped to 40°C or below. Temperature-control paraffin station 12 at 62°C using the check program. Once the detected temperature reaches 62°C, check if the LED H9 (LD20) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Also check if the LED TC9 (LD8) on the heater driver board turns off when the LED H9 (LD20) turns on. If the TC9 turns off, the thermostat circuit is OFF.

- Checking for possible cause c
  If the temperature rises and the thermostat blows even when the heater control is stable and the specified temperature is achieved, the heater driver board is faulty.

- Checking for possible cause d
  If the thermostat blows before the temperature rises, the problem is likely in the installation condition of the temperature sensor.

Error No. 133 Paraffin station 13 temperature exceeded 80°C.

- The detected temperature became 80°C or above during temperature control of paraffin station 13.

[1] Possible cause

a. Hot fluid of 80°C or above was input to the paraffin container.
b. The CPU is faulty (if the thermostat also actuates).
c. The heater driver board is faulty (if the thermostat also actuates).
d. Installation position of the temperature sensor (if the thermostat also actuates)

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  This error may occur when hot paraffin is input to the paraffin container.

- Checking for possible cause b
  The thermostat will reset once the system power is turned off after the temperature has dropped to 40°C or below. Temperature-control paraffin station 13 at 62°C using the check program. Once the detected temperature reaches 62°C, check if the LED H10 (LD21) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Also check if the LED TC10 (LD9) on the heater driver board turns off when the LED H10 (LD21) turns on. If the TC10 turns off, the thermostat circuit is OFF.

- Checking for possible cause c
  If the temperature rises and the thermostat blows even when the heater control is stable and the specified temperature is achieved, the heater driver board is faulty.

- Checking for possible cause d
  If the thermostat blows before the temperature rises, the problem is likely in the installation condition of the temperature sensor.

Error No. 134 Paraffin station 14 temperature exceeded 80°C.

- The detected temperature became 80°C or above during temperature control of paraffin station 14.

[1] Possible cause

a. Hot fluid of 80°C or above was input to the paraffin container.
b. The CPU is faulty (if the thermostat also actuates).
c. The heater driver board is faulty (if the thermostat also actuates).
d. Installation position of the temperature sensor (if the thermostat also actuates)

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  This error may occur when hot paraffin is input to the paraffin container.

- Checking for possible cause b
  The thermostat will reset once the system power is turned off after the temperature has dropped to 40°C or below. Temperature-control paraffin station 14 at 62°C using the check program. Once the detected temperature reaches 62°C, check if the LED H11 (LD22) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Also check if the LED TC11 (LD10) on the heater driver board turns off when the LED H11 (LD22) turns on. If the TC11 turns off, the thermostat circuit is OFF.

- Checking for possible cause c
  If the temperature rises and the thermostat blows even when the heater control is stable and the specified temperature is achieved, the heater driver board is faulty.

- Checking for possible cause d
  If the thermostat blows before the temperature rises, the problem is likely in the installation condition of the temperature sensor.

Error No. 137 Cleaning xylene station temperature exceeded 80°C.

- The detected temperature became 80°C or above during temperature control of cleaning xylene.

[1] Possible cause

a. Hot fluid of 80°C or above was input to the reagent bottle for cleaning xylene.
b. The CPU is faulty (if the thermostat also actuates).
c. The heater driver board is faulty (if the thermostat also actuates).
d. Installation position of the temperature sensor (if the thermostat also actuates)

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  This error may occur when hot reagent is input to the reagent bottle for cleaning xylene.

- Checking for possible cause b
  The thermostat will reset once the system power is turned off after the temperature has dropped to 40°C or below. Temperature-control the cleaning xylene heater at 40°C using the check program. Once the detected temperature reaches 40°C, check if the LED H13 (LD18) on the heater driver board blinks. If the LED does not blink and the temperature rises, the CPU board is faulty. Also check if the LED TC13 (LD6) on the heater driver board turns off when the LED H13 (LD18) turns on. If the TC13 turns off, the thermostat circuit is OFF.

- Checking for possible cause c
  If the temperature rises and the thermostat blows even when the heater control is stable and the specified temperature is achieved, the heater driver board is faulty.

- Checking for possible cause d
  If the thermostat blows before the temperature rises, the problem is likely in the installation condition of the temperature sensor.

Error No. 141 The retort did not reach the preset temperature in time.

- The preset retort temperature is not reached after 20 minutes of retort heating before the paraffin station process during tissue processing.

[1] Possible cause

a. Effect of the environment temperature
b. The heater circuit opened.
c. The heater driver board is faulty.
d. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  This error sometimes occurs when the system is operated at an extremely low environment temperature because then the temperature does not rise sufficiently. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  The heater circuit opened and heating was disabled. Or, the wiring circuit may have opened at a point before the heater. Measure the heater resistance using a tester. There are two types of retort heaters: front heater and other heaters. The resistance for the front heater (between 6 and 7 on the terminal block TB4) is approx. 51 Ω for the 100-V/115-V specification and approx. 203 Ω for the 230-V specification. For the other heaters (between 1 and 4 on the terminal block TB4), the resistance is approx. 34 Ω for the 100-V/115-V specification and approx. 136 Ω for the 230-V specification.

- Checking for possible cause c
  The heater driver board may be faulty. Perform heater temperature control using the check program, etc., and check if the LEDs H2 and H3 on the heater driver board illuminate in red when a heater signal is output. If not, the CPU board is suspected as the cause. In all other conditions, the heater driver board is the cause.

- Checking for possible cause d
  A faulty CPU board is also suspected. If the LED on the heater driver board does not turn on, the CPU board is suspected as the cause.

Error No. 142 The rotary valve did not reach the preset temperature in time.

- The preset rotary valve temperature is not reached after 20 minutes of rotary valve heating before the paraffin station process during tissue processing.

[1] Possible cause

a. Effect of the environment temperature
b. The heater circuit opened.
c. The heater driver board is faulty.
d. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  This error sometimes occurs when the system is operated at an extremely low environment temperature because then the temperature does not rise sufficiently. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  The heater circuit opened and heating was disabled. Or, the wiring circuit may have opened at a point before the heater. Measure the heater resistance using a tester. The resistance is approx. 133 Ω for the 100-V specification, approx. 176 Ω for the 115-V specification, and approx. 705 Ω for the 230-V specification.

- Checking for possible cause c
  The heater driver board may be faulty. Perform heater temperature control using the check program, etc., and check if the LED H7 on the heater driver board illuminates in red when a heater output is produced. If not, the CPU board is suspected as the cause. In all other conditions, the heater driver board is the cause.

- Checking for possible cause d
  A faulty CPU board is also suspected. If the LED on the heater driver board does not turn on, the CPU board is suspected as the cause.

Error No. 143 The gate valve did not reach the preset temperature in time.

- The preset gate valve temperature is not reached after 20 minutes of gate valve heating before the paraffin station process during tissue processing.

[1] Possible cause

a. Effect of the environment temperature
b. The heater circuit opened.
c. The heater driver board is faulty.
d. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  This error sometimes occurs when the system is operated at an extremely low environment temperature because then the temperature does not rise sufficiently. Let the system stand for a while at an operable temperature and then turn on the power.

- Checking for possible cause b
  The heater circuit opened and heating was disabled. Or, the wiring circuit may have opened at a point before the heater. Measure the heater resistance using a tester. The resistance is approx. 133 Ω for the 100-V specification, approx. 176 Ω for the 115-V specification, and approx. 705 Ω for the 230-V specification.

- Checking for possible cause c
  The heater driver board may be faulty. Perform heater temperature control using the check program, etc., and check if the LED H6 on the heater driver board illuminates in red when a heater output is produced. If not, the CPU board is suspected as the cause. In all other conditions, the heater driver board is the cause.

- Checking for possible cause d
  A faulty CPU board is also suspected. If the LED on the heater driver board does not turn on, the CPU board is suspected as the cause.

Error No. 210 Pump-in was not completed in time but solution has reached the safeguarded level.

- The pressure sensor input does not recover to -10 kPa or above after 6 minutes of pumping-in. However, the safeguarded fluid level in the retort was achieved.

[1] Possible cause

a. The reagent bottle or reagent tubing is clogged by solid matter (paraffin, precipitated salt).
b. The air circuit is clogged.
c. The solenoid valve SV2 is always ON.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  This error occurs when solid matter generated in the tubing between the reagent bottle and retort and the tubing was clogged. In many cases, this error occurs on the alcohol station immediately after the buffer formalin station, cleaning xylene station containing a lot of dissolved paraffin, or paraffin container where paraffin has not properly melted. If buffer formalin salt is precipitated, the TN bottle coupler clogs easily. Accordingly, disassemble the TN bottle coupler and remove salt thoroughly using water, etc. In this case, ask the customer to perform periodic cleaning using warm water. If the error occurred on the cleaning xylene station, white paraffin solids generate in the tubing. Accordingly, dissolve and remove paraffin solids using xylene, etc. In this case, ask the customer to shorten the reagent change cycle for cleaning xylene. If the error occurred on the paraffin container, ask the customer to melt paraffin fully before commencing the process.

- Checking for possible cause b
  This error occurs when solid matter entered in the air circuit, particularly in the tubing between the connection point to the retort container and the pressure sensor. Remove the tubing in the applicable area and flush the tubing with xylene, etc.

- Checking for possible cause c
  This error occurs when the solenoid valve SV2 is always ON. Try pressurizing and depressurizing manually using the check program, etc. If the pressure drops but does not rise properly, suspect the SV2. Try turning the SV2 ON/OFF separately to check if the applicable operation is performed.

Error No. 211 Pump-in was not completed within 2 minutes during short mixing.

- The pressure sensor input does not return to -10 kPa or above after 2 minutes of pumping-in for short mixing or continuous mixing.

[1] Possible cause

a. The TN bottle coupler is disconnected.
b. The reagent bottle or reagent tubing is clogged by solid matter (paraffin, precipitated salt).
c. The air circuit is clogged.
d. The solenoid valve SV2 is always ON.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  The target reagent bottle came off or was intentionally detached during processing. As the remedial action, do not remove the reagent bottle during processing and make sure the bottle is pushed all the way in.

- Checking for possible cause b
  This error occurs when solid matter generated in the tubing between the reagent bottle and retort and the tubing was clogged. In many cases, this error occurs on the alcohol station immediately after the buffer formalin station, cleaning xylene station containing a lot of dissolved paraffin, or paraffin container where paraffin has not properly melted. If buffer formalin salt is precipitated, the TN bottle coupler clogs easily. Accordingly, disassemble the TN bottle coupler and remove salt thoroughly using water, etc. In this case, ask the customer to perform periodic cleaning using warm water. If the error occurred on the cleaning xylene station, white paraffin solids generate in the tubing. Accordingly, dissolve and remove paraffin solids using xylene, etc. In this case, ask the customer to shorten the reagent change cycle for cleaning xylene. If the error occurred on the paraffin container, ask the customer to melt paraffin fully before commencing the process.

- Checking for possible cause c
  This error occurs when solid matter entered in the air circuit, particularly in the tubing between the connection point to the retort container and the pressure sensor. Remove the tubing in the applicable area and flush the tubing with xylene, etc.

- Checking for possible cause d
  This error occurs when the solenoid valve SV2 is always ON. Try pressurizing and depressurizing manually using the check program, etc. If the pressure drops but does not rise properly, suspect the SV2. Try turning the SV2 ON/OFF separately to check if the applicable operation is performed.

Error No. 212 Retort pressure did not reach the set value within 3 minutes after the gate valve closed.

- The pressure sensor input does not reach 13 kPa or above after 3 minutes of pressurization with the gate valve closed at the start of preliminary drain before pumping-in from a condition when the retort contained fluid.

[1] Possible cause

a. The retort lid is open.
b. The trap bottle is detached or loose.
c. The lead valve or diaphragm of the air pump is damaged.
d. The solenoid valve SV3 is faulty.
e. The solenoid valve SV1 is faulty.
f. Leakage from the gate valve
g. The solenoid valve SV4 or SV5 is always ON.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Pressurization is sometimes disabled when the retort lid is open. The retort lock lever can be closed even when the retort lid is not closed, in which case pressurization is disabled. The same is true when the retort lid gasket is detached or leaking.

- Checking for possible cause b
  Sufficient pressurization cannot be achieved, either, when the trap bottle is detached or loose. Remove the back exterior panel and firmly screw in the bottle.

- Checking for possible cause c
  Depressurization is sometimes disabled when the lead valve or diaphragm of the air pump is damaged. Replace the lead valve or diaphragm of the air pump.

- Checking for possible cause d
  If the solenoid valve SV3 becomes faulty, pressurization is disabled because the air circuit cannot be closed. Turn the solenoid valve SV3 ON/OFF using the check program and check if the SV3 is operating.

- Checking for possible cause e
  If the solenoid valve SV1 becomes faulty, the discharge side of the pump cannot be connected to the air circuit and thus pressurization is disabled. Turn the solenoid valve SV1 ON/OFF using the check program and check if the SV2 is operating.

- Checking for possible cause f
  If the O-ring at the bottom of the fixed disk of the gate valve is not securely set, leakage occurs from this position. Disassemble the gate valve and check the setting condition of the O-ring.

- Checking for possible cause g
  Pressurization is disabled if the solenoid valve SV4 or SV5 used to depressurize a bulk reservoir remains ON due to some abnormality. Turn each solenoid valve ON/OFF using the check program to confirm that the applicable solenoid valve is operating.

Error No. 213 The bottle is not connected or the tubing is clogged.

- The pressure sensor input does not recover to -10 kPa or above after 6 minutes of pumping-in (error 011). Two consecutive drain operations of 6 minutes each failed.

[1] Possible cause
a. The TN bottle coupler is disconnected.
b. The reagent bottle or reagent tubing is clogged by solid matter (paraffin, precipitated salt).

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  The reagent bottle used in pumping-in is detached. This error occurs when the applicable bottle is disconnected and a bottle connection check is not performed, or when the applicable bottle remains uninstalled after a connection check. As the remedial action, connect the bottle properly and use the bottle connection check function.

- Checking for possible cause b
  This error occurs when solid matter generated in the tubing between the reagent bottle and retort and the tubing was clogged. In many cases, this error occurs on the alcohol station immediately after the buffer formalin station, cleaning xylene station containing a lot of dissolved paraffin, or paraffin container where paraffin has not properly melted. If buffer formalin salt is precipitated, the TN bottle coupler clogs easily. Accordingly, disassemble the TN bottle coupler and remove salt thoroughly using water, etc. In this case, ask the customer to perform periodic cleaning using warm water. If the error occurred on the cleaning xylene station, white paraffin solids generate in the tubing. Accordingly, dissolve and remove paraffin solids using xylene, etc. In this case, ask the customer to shorten the reagent change cycle for cleaning xylene. If the error occurred on the paraffin container, ask the customer to melt paraffin fully before commencing the process.

Error No. 230 Pressure sensor did not reach the set value within one minute after the gate valve closed for drainage of the condenser.

- The pressure sensor input does not reach 13 kPa or above after 1 minute of pressurization with the gate valve closed before draining of the condenser.

[1] Possible cause

a. The retort lid is open.
b. The trap bottle is detached or loose.
c. The lead valve or diaphragm of the air pump is damaged.
d. The solenoid valve SV3 is faulty.
e. The solenoid valve SV1 is faulty.
f. Leakage from the gate valve
g. The solenoid valve SV4 or SV5 is always ON.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Pressurization is sometimes disabled when the retort lid is open. The retort lock lever can be closed even when the retort lid is not closed, in which case pressurization is disabled. The same is true when the retort lid gasket is detached or leaking.

- Checking for possible cause b
  Sufficient pressurization cannot be achieved, either, when the trap bottle is detached or loose. Remove the back exterior panel and firmly screw in the bottle.

- Checking for possible cause c
  Depressurization is sometimes disabled when the lead valve or diaphragm of the air pump is damaged. Replace the lead valve or diaphragm of the air pump.

- Checking for possible cause d
  If the solenoid valve SV3 becomes faulty, pressurization is disabled because the air circuit cannot be closed. Turn the solenoid valve SV3 ON/OFF using the inspection program and check if the SV3 is operating.

- Checking for possible cause e
  If the solenoid valve SV1 becomes faulty, the discharge side of the pump cannot be connected to the air circuit and thus pressurization is disabled. Turn the solenoid valve SV1 ON/OFF using the check program and check if the SV2 is operating.

- Checking for possible cause f
  If the O-ring at the bottom of the fixed disk of the gate valve is not securely set, leakage occurs from this position. Disassemble the gate valve and check the setting condition of the O-ring.

- Checking for possible cause g
  Pressurization is disabled if the solenoid valve SV4 or SV5 used to depressurize a bulk reservoir remains ON due to some abnormality. Turn each solenoid valve ON/OFF using the check program to confirm that the applicable solenoid valve is operating.

Error No. 231 Drainage of the condenser was not completed within 1 minute.

- The pressure does not drop to 10 kPa or below after 1 minute of condenser pressurization in the process of draining reagent from the condenser by switching the solenoid valve SV6.

[1] Possible cause

a. The solenoid valve SV6 is faulty.
b. The CPU board is faulty.
c. The tubing from the condenser to the SV6 is clogged.
d. The tubing from the SV6 to the condensate bottle is clogged.

[2] Key equipment used for check

- Disassembly/assembly tools
- Dedicated solenoid valve driver

[3] Cause identification and remedial action

- Checking for possible cause a
  Perform pressurization using the check program, etc., and try switching the solenoid valve SV6 using the check program first. If atmospheric pressure is not restored, manually press the button for the solenoid valve SV6 to forcibly switch the solenoid valve. If atmospheric pressure is achieved, either the solenoid valve SV6 or CPU board is faulty. Turn only the solenoid valve SV6 ON using the check program to display the total current of solenoid valves. If current is flowing, the solenoid valve SV6 is faulty. If current is not flowing, unplug the solenoid valve SV6 connector and connect the solenoid valve SV2 instead. If the solenoid valve SV2 you have connected switches when the solenoid valve SV6 is turned ON/OFF using the check program, the solenoid valve SV6 is faulty.

- Checking for possible cause b
  If the solenoid valve SV2 you have swapped the wiring with is not switched in the above check, the CPU board is faulty.

- Checking for possible cause c
  If the air circuit remains cut off after forcibly switching the solenoid valve SV6, the tubing including the interior of the solenoid valve SV6 may be clogged. Disconnect the solenoid valve SV6 and apply pressure. If air does not blow out from the tubing port of the solenoid valve, the tubing may be clogged in this area. Disconnect the tubing and clean it with xylene, etc. If air blows out, replace the solenoid valve with a different one. If the pressure drops when the forced switching button on the solenoid valve is pressed, clean or replace the solenoid valve.

- Checking for possible cause d
  If this area is clogged, the retort can no longer be depressurized. First, use the check program to check if the pressure drops to approx. -27 kPa through depressurization by pumping-in. If not, this area may be clogged. If solid matter comes out from the FEP tube, clean the tube with xylene, etc., to remove solid matter.

Error No. 235 Pressure sensor did not reach the set value within one minute after the gate valve closed for drainage of the common line.

- The pressure sensor input does not reach 7 kPa or above after 1 minute of pressurization at 10 kPa with the gate valve closed during draining of the common tubing immediately after pumping-in.

[1] Possible cause

a. The retort lid is open.
b. The trap bottle is detached or loose.
c. The lead valve or diaphragm of the air pump is damaged.
d. The solenoid valve SV3 is faulty.
e. The solenoid valve SV1 is faulty.
f. Leakage from the gate valve
g. The solenoid valve SV4 or SV5 is always ON.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Pressurization is sometimes disabled when the retort lid is open. The retort lock lever can be closed even when the retort lid is not closed, in which case pressurization is disabled. The same is true when the retort lid gasket is detached or leaking.

- Checking for possible cause b
  Sufficient pressurization cannot be achieved, either, when the trap bottle is detached or loose. Remove the back exterior panel and firmly screw in the bottle.

- Checking for possible cause c
  Depressurization is sometimes disabled when the lead valve or diaphragm of the air pump is damaged. Replace the lead valve or diaphragm of the air pump.

- Checking for possible cause d
  If the solenoid valve SV3 becomes faulty, pressurization is disabled because the air circuit cannot be closed. Turn the solenoid valve SV3 ON/OFF using the check program and check if the SV3 is operating.

- Checking for possible cause e
  If the solenoid valve SV1 becomes faulty, the discharge side of the pump cannot be connected to the air circuit and thus pressurization is disabled. Turn the solenoid valve SV1 ON/OFF using the check program and check if the SV2 is operating.

- Checking for possible cause f
  If the O-ring at the bottom of the fixed disk of the gate valve is not securely set, leakage occurs from this position. Disassemble the gate valve and check the setting condition of the O-ring.

- Checking for possible cause g
  Pressurization is disabled if the solenoid valve SV4 or SV5 used to depressurize a bulk reservoir remains ON due to some abnormality. Turn each solenoid valve ON/OFF using the check program to confirm that the applicable solenoid valve is operating.

Error No. 236 Pressure sensor did not reach the set value within one minute after the gate valve closed for the bottle connection check.

- The pressure sensor input does not reach 7 kPa or above after 1 minute of pressurization at 10 kPa with the gate valve closed during bottle check.

[1] Possible cause

a. The retort lid is open.
b. The trap bottle is detached or loose.
c. The lead valve or diaphragm of the air pump is damaged.
d. The solenoid valve SV3 is faulty.
e. The solenoid valve SV1 is faulty.
f. Leakage from the gate valve
g. The solenoid valve SV4 or SV5 is always ON.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Pressurization is sometimes disabled when the retort lid is open. The retort lock lever can be closed even when the retort lid is not closed, in which case pressurization is disabled. The same is true when the retort lid gasket is detached or leaking.

- Checking for possible cause b
  Sufficient pressurization cannot be achieved, either, when the trap bottle is detached or loose. Remove the back exterior panel and firmly screw in the bottle.

- Checking for possible cause c
  Depressurization is sometimes disabled when the lead valve or diaphragm of the air pump is damaged. Replace the lead valve or diaphragm of the air pump.

- Checking for possible cause d
  If the solenoid valve SV3 becomes faulty, pressurization is disabled because the air circuit cannot be closed. Turn the solenoid valve SV3 ON/OFF using the check program and check if the SV3 is operating.

- Checking for possible cause e
  If the solenoid valve SV1 becomes faulty, the discharge side of the pump cannot be connected to the air circuit and thus pressurization is disabled. Turn the solenoid valve SV1 ON/OFF using the check program and check if the SV2 is operating.

- Checking for possible cause f
  If the O-ring at the bottom of the fixed disk of the gate valve is not securely set, leakage occurs from this position. Disassemble the gate valve and check the setting condition of the O-ring.

- Checking for possible cause g
  Pressurization is disabled if the solenoid valve SV4 or SV5 used to depressurize a bulk reservoir remains ON due to some abnormality. Turn each solenoid valve ON/OFF using the check program to confirm that the applicable solenoid valve is operating.

Error No. 240 The left bulk reservoir (Sta. 19) overflowed during filling.

- The level sensor PI1 (overflow) turned ON while the left bulk reservoir (station 19) was filled directly from the external fill port.

[1] Possible cause

a. The high level sensor PI2 of the bulk reservoir is faulty or not installed correctly.
b. The overflow level sensor PI1 of the bulk reservoir is not installed correctly.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Check the condition of the level sensor PI2 using the check program. Turn the switch on the side face of the sensor PI2 to see if the sensor output LED turns on. If the LED does not turn on after turning the switch, the sensor is likely faulty. If the sensor LED turns on, check if the input in the check program is ON.
  Also note that this level sensor may be unable to detect fluid if not connected firmly to the tube. Use the check program to supply to the overflow level the same reagent used in the bulk reservoir. Remove the level sensor PI2 and then install it again.

- Checking for possible cause b
  If the overflow level sensor PI1 is positioned immediately above the high level sensor PI2, malfunction may occur due to overshooting of the fluid level during filling. Check if the level sensor is positioned correctly.

- Checking for possible cause c
  If no input is received from the sensor PI2 in "Checking for possible cause a," swap the PI2 and PI1 connectors on the relay board and see if the PI2 input is received on the CPU board. If not, the CPU board may be faulty.

Error No. 241 Solution filling to the left bulk reservoir (Sta. 19) was not completed within 6 minutes.

- The pressure sensor input does not recover to -10 kPa or above after 6 minutes of filling the left bulk reservoir.

[1] Possible cause

a. The fill hose is detached.
b. The reagent bottle or tubing is clogged by solid matter.
c. The solenoid valve SV2 is always ON.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  The fill hose may be detached from the system or not firmly connected. An open/close valve is housed in the fill hose coupler, so a depressurized condition will remain if no hose if connected.

- Checking for possible cause b
  Foreign matter may have clogged the tubing connected to the bulk reservoir. This condition may occur when foreign matter, etc., has clogged the tubing between the coupler and tank or from the tank to the solenoid valve manifold.

- Checking for possible cause c
  This error occurs when the solenoid valve SV2 is always ON. Try pressurizing and depressurizing manually using the check program, etc. If the pressure drops but does not rise properly, suspect the SV2. Try turning the SV2 ON/OFF separately to check if the applicable operation is performed.

Error No. 242 Retort pressure could not be decreased within 1 minute during solution filling to the left bulk reservoir (Sta. 19).

- The pressure does not drop to -13 kPa or below after 1 minute of depressurization with the gate valve closed.

[1] Possible cause

a. The retort lid is open.
b. The trap bottle is detached or loose.
c. The lead valve or diaphragm of the air pump is damaged.
d. The solenoid valve SV3 is faulty.
e. The solenoid valve SV1 is faulty.
f. Leakage from the gate valve
g. The solenoid valve SV4 or SV5 is always ON.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Pressurization is sometimes disabled when the retort lid is open. The retort lock lever can be closed even when the retort lid is not closed, in which case pressurization is disabled. The same is true when the retort lid gasket is detached or leaking.

- Checking for possible cause b
  Sufficient pressurization cannot be achieved, either, when the trap bottle is detached or loose. Remove the back exterior panel and firmly screw in the bottle.

- Checking for possible cause c
  Depressurization is sometimes disabled when the lead valve or diaphragm of the air pump is damaged. Replace the lead valve or diaphragm of the air pump.

- Checking for possible cause d
  If the solenoid valve SV3 becomes faulty, pressurization is disabled because the air circuit cannot be closed. Turn the solenoid valve SV3 ON/OFF using the check program and check if the SV3 is operating.

- Checking for possible cause e
  If the solenoid valve SV1 becomes faulty, the discharge side of the pump cannot be connected to the air circuit and thus pressurization is disabled. Turn the solenoid valve SV1 ON/OFF using the check program and check if the SV2 is operating.

- Checking for possible cause f
  If the O-ring at the bottom of the fixed disk of the gate valve is not securely set, leakage occurs from this position. Disassemble the gate valve and check the setting condition of the O-ring.

- Checking for possible cause g
  Pressurization is disabled if the solenoid valve SV4 or SV5 used to depressurize a bulk reservoir remains ON due to some abnormality. Turn each solenoid valve ON/OFF using the check program to confirm that the applicable solenoid valve is operating.

Error No. 243 External container was empty when starting the solution filling to the left bulk reservoir (Sta. 19).

- The pressure does not drop to -13 kPa or below after 3 minutes of switching the solenoid valve SV4 following a depressurization check.

[1] Possible cause
a. The bulk reservoir is empty.
b. The fill hose is not submerged in liquid inside the external container.
c. The check valve of the left bulk reservoir is faulty.
d. The left bulk reservoir tubing is leaking.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  This error is issued when the external container is empty and reagent cannot be supplied.

- Checking for possible cause b
  This error is issued when the fill hose is not properly submerged in reagent inside the external container.

- Checking for possible cause c
  If the check valve at the top of the bulk reservoir is faulty and air leaks during depressurization, disassemble the check valve and clean the valve seat and ball. After drying the check valve, install it again and check if depressurization is now possible.

- Checking for possible cause d
  Check for leakage from the tubing, especially the joint, of the bulk reservoir. To do this, pressurize the bulk reservoir at approx. 15 kPa and check the joint using soapy water. (The pressurization level should not exceed 15 kPa.) Also seal the check valve using tape, etc., to prevent leakage from the valve.

Error No. 244 Low solution volume in the external container during the solution filling to the left bulk reservoir (Sta. 19)

- After the start of filling from the external container (the pressure has dropped to -13 kPa or below after switching the solenoid valve SV4 following a depressurization of the air circuit), the original pressure is restored with the low level sensor remaining OFF.

[1] Possible cause

a. The external container has not enough capacity.
b. The fill hose detached during filling from the external container.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  This error is issued when the external reservoir has not enough capacity.

- Checking for possible cause b
  This error occurs when the fill hose detached while reagent was filled from the external container.

Error No. 250 The right bulk reservoir (Sta. 20) overflowed during filling.

- The level sensor PI4 (overflow) turned ON while the left bulk reservoir (station 20) was filled directly from the external drain/fill port.

[1] Possible cause

a. The high level sensor PI5 of the bulk reservoir is faulty or not installed correctly.
b. The overflow level sensor PI4 of the bulk reservoir is not installed correctly.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Check the condition of the level sensor PI5 using the check program. Turn the switch on the side face of the sensor PI4 to see if the sensor output LED turns on. If the LED does not turn on after turning the switch, the sensor is likely faulty. If the sensor LED turns on, check if the input in the check program is ON.
  Also note that this level sensor may be unable to detect liquid if not connected firmly to the tube. Use the check program to supply to the overflow level the same reagent used in the bulk reservoir. Remove the level sensor PI5 and then install it again.

- Checking for possible cause b
  If the overflow level sensor PI4 is positioned immediately above the high level sensor PI5, malfunction may occur due to overshooting of the fluid level during filling. Check if the level sensor is positioned correctly.

- Checking for possible cause c
  If no input is received from the sensor PI5 in "Checking for possible cause a," swap the PI5 and PI4 connectors on the relay board and see if the PI5 input is received on the CPU board. If not, the CPU board may be faulty.

Error No. 251 Solution filling to the right bulk reservoir (Sta. 20) was not completed within 6 minutes.

- The pressure sensor input does not recover to -10 kPa or above after 6 minutes of filling the right bulk reservoir.

[1] Possible cause

a. The fill hose is detached.
b. The reagent bottle or tubing is clogged by solid matter.
c. The solenoid valve SV2 is always ON.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  The fill hose may be detached from the system or not firmly connected. An open/close valve is housed in the fill hose coupler, so a depressurized condition will remain if no hose if connected.

- Checking for possible cause b
  Foreign matter may have clogged the tubing connected to the bulk reservoir. This condition may occur when foreign matter, etc., has clogged the tubing between the coupler and tank or from the tank to the solenoid valve manifold.

- Checking for possible cause c
  This error occurs when the solenoid valve SV2 is always ON. Try pressurizing and depressurizing manually using the check program, etc. If the pressure drops but does not rise properly, suspect the SV2. Try turning the SV2 ON/OFF separately to check if the applicable operation is performed.

Error No. 252 Retort pressure could not be decreased within 1 minute during solution filling to the right bulk reservoir (Sta. 20).

- The pressure does not drop to -13 kPa or below after 1 minute of depressurization with the gate valve closed.

[1] Possible cause

a. The retort lid is open.
b. The trap bottle is detached or loose.
c. The lead valve or diaphragm of the air pump is damaged.
d. The solenoid valve SV3 is faulty.
e. The solenoid valve SV1 is faulty.
f. Leakage from the gate valve
g. The solenoid valve SV4 or SV5 is always ON.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Pressurization is sometimes disabled when the retort lid is open. The retort lock lever can be closed even when the retort lid is not closed, in which case pressurization is disabled. The same is true when the retort lid gasket is detached or leaking.

- Checking for possible cause b
  Sufficient pressurization cannot be achieved, either, when the trap bottle is detached or loose. Remove the back exterior panel and firmly screw in the bottle.

- Checking for possible cause c
  Depressurization is sometimes disabled when the lead valve or diaphragm of the air pump is damaged. Replace the lead valve or diaphragm of the air pump.

- Checking for possible cause d
  If the solenoid valve SV3 becomes faulty, pressurization is disabled because the air circuit cannot be closed. Turn the solenoid valve SV3 ON/OFF using the check program and check if the SV3 is operating.

- Checking for possible cause e
  If the solenoid valve SV1 becomes faulty, the discharge side of the pump cannot be connected to the air circuit and thus pressurization is disabled. Turn the solenoid valve SV1 ON/OFF using the check program and check if the SV2 is operating.

- Checking for possible cause f
  If the O-ring at the bottom of the fixed disk of the gate valve is not securely set, leakage occurs from this position. Disassemble the gate valve and check the setting condition of the O-ring.

- Checking for possible cause g
  Pressurization is disabled if the solenoid valve SV4 or SV5 used to depressurize a bulk reservoir remains ON due to some abnormality. Turn each solenoid valve ON/OFF using the check program to confirm that the applicable solenoid valve is operating.

Error No. 253 External container was empty when starting the solution filling to the right bulk reservoir (Sta. 20).

- The pressure does not drop to -13 kPa or below after 3 minutes of switching the solenoid valve SV5 following a depressurization check.

[1] Possible cause

a. The bulk reservoir is empty.
b. The fill hose is not submerged in liquid inside the external container.
c. The check valve of the right bulk reservoir is faulty.
d. The right bulk reservoir tubing is leaking.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  This error is issued when the external container is empty and reagent cannot be supplied.

- Checking for possible cause b
  This error is issued when the fill hose is not properly submerged in reagent inside the external container.

- Checking for possible cause c
  If the check valve at the top of the bulk reservoir is faulty and air leaks during depressurization, disassemble the check valve and clean the valve seat and ball. After drying the check valve, install it again and check if depressurization is now possible.

- Checking for possible cause d
  Check for leakage from the tubing, especially the joint, of the bulk reservoir. To do this, pressurize the bulk reservoir at approx. 15 kPa and check the joint using soapy water. (The pressurization level should not exceed 15 kPa.) Also seal the check valve using tape, etc., to prevent leakage from the valve.

Error No. 254 Low solution volume in the external container during the solution filling to the right bulk reservoir (Sta. 20)

- After the start of filling from the external container (the pressure has dropped to -13 kPa or below after switching the solenoid valve SV5 following a depressurization of the air circuit), the original pressure is restored with the low level sensor remaining OFF.

[1] Possible cause

a. The external container has not enough capacity.
b. The fill hose detached during filling from the external container.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  This error is issued when the external reservoir has not enough capacity.

- Checking for possible cause b
  This error occurs when the fill hose detached while reagent was filled from the external container.

Error No. 298 Drain to the left bulk reservoir (Sta. 19) was rejected.

- The Pump Out button was touched on the manual operation screen when the rotary valve was at the station 19 position.

[1] Possible cause

a. Misoperation

[2] Key equipment used for check

- None

[3] Cause identification and remedial action

- Checking for possible cause a
  Pumping-out to a bulk reservoir is prohibited.

Error No. 299 Drain to the right bulk reservoir (Sta. 20) was rejected.

- The Pump Out button was touched on the manual operation screen when the rotary valve was at the station 20 position.

[1] Possible cause
  a. Misoperation

[2] Key equipment used for check
- None

[3] Cause identification and remedial action
- Checking for possible cause a
  Pumping-out to a bulk reservoir is prohibited.

Error No. 311 Overflow sensor error

- The overflow sensor US4 detected fluid when the retort was empty.

[1] Possible cause

a. An actual overflow occurred while paraffin was pumped in and paraffin remained at the sensor detection part.
b. Ultrasonic sensor US4 is faulty.
c. CPU board and US board are faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Open the retort and check the interior of the socket of the overflow sensor US4. If paraffin is remaining, remove it from the sensor. To clean the retort, pump in xylene in the cleaning process to fill xylene directly until the overflow sensor turns ON.

- Checking for possible cause b
  While the retort is empty, remove the front external panel and check the status of the ultrasonic sensor US4. Check the US4 input status in the check program. If the US4 is ON in the check program, unplug the connector CN506 to cut off the US4 input. If the corresponding LED on the US board turns off and the input status in the check program also changes to OFF, the ultrasonic sensor US4 is faulty.

- Checking for possible cause c
  If the ultrasonic sensor was not found faulty in the above check process, disconnect the wiring from the CN501 on the US board and check the US4 input status in the check program. If a signal is still input, the CPU board is faulty. If there is no input, the US board is faulty.

Error No. 312 Level sensor (2.7 L) error

- Level sensor 1 (2.7 L) US1 detected fluid when the retort was empty.
- Or, the same condition was achieved during second pumping-in after pumping-out following a turning ON of the high level sensor US2 (3.5 L) when the US1 was OFF.

[1] Possible cause

a. Paraffin was not sufficiently heated during pumping-in and remained at the sensor detection part.
b. Paraffin hardened at the sensor detection part and remained after pumping-out.
c. Ultrasonic sensor US1 is faulty.
d. CPU board and US board are faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Open the retort and check the interior of the socket of the overflow sensor US1. If paraffin is remaining, remove it from the sensor.

- Checking for possible cause b
  Open the retort and check the interior of the socket of the overflow sensor US1. If paraffin is remaining, remove it from the sensor.

- Checking for possible cause c
  While the retort is empty, remove the front external panel and check the status of the ultrasonic sensor US1. Check the US1 input status in the check program. If the US1 is ON in the check program, unplug the connector CN503 to cut off the US1 input. If the corresponding LED on the US board turns off and the input status in the check program also changes to OFF, the ultrasonic sensor US1 is faulty.

- Checking for possible cause d
  If the ultrasonic sensor was not found faulty in the above check process, disconnect the wiring from the CN501 on the US board and check the US1 input status in the check program. If a signal is still input, the CPU board is faulty. If there is no input, the US board is faulty.

Error No. 313 Level sensor (3.5 L) error

- Level sensor 2 (3.5 L) US2 detected fluid when the retort was empty.
- Or, the same condition was achieved during second pumping-in after pumping-out following a turning ON of the high level sensor US3 (4.2 L) when the US2 was OFF.

[1] Possible cause

a. Paraffin was not sufficiently heated during pumping-in and remained at the sensor detection part.
b. Paraffin hardened at the sensor detection part and remained after pumping-out.
c. Ultrasonic sensor US2 is faulty.
d. CPU board and US board are faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Open the retort and check the interior of the socket of the overflow sensor US2. If paraffin is remaining, remove it from the sensor.

- Checking for possible cause b
  Open the retort and check the interior of the socket of the overflow sensor US2. If paraffin is remaining, remove it from the sensor.

- Checking for possible cause c
  While the retort is empty, remove the front external panel and check the status of the ultrasonic sensor US2. Check the US2 input status in the check program. If the US2 is ON in the check program, unplug the connector CN504 to cut off the US2 input. If the corresponding LED on the US board turns off and the input status in the check program also changes to OFF, the ultrasonic sensor US2 is faulty.

- Checking for possible cause d
  If the ultrasonic sensor was not found faulty in the above check process, disconnect the wiring from the CN501 on the US board and check the US2 input status in the check program. If a signal is still input, the CPU board is faulty. If there is no input, the US board is faulty.

Error No. 314 Level sensor (4.2 L) error

- Level sensor 3 (4.2 L) US3 detected fluid when the retort was empty.
- Or, the same condition was achieved during second pumping-in after pumping-out following a turning ON of the high level sensor US4 (overflow sensor) when the US3 was OFF.

[1] Possible cause

a. Paraffin was not sufficiently heated during pumping-in and remained at the sensor detection part.
b. Paraffin hardened at the sensor detection part and remained after pumping-out.
c. Ultrasonic sensor US3 is faulty.
d. CPU board and US board are faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Open the retort and check the interior of the socket of the overflow sensor US3. If paraffin is remaining, remove it from the sensor.

- Checking for possible cause b
  Open the retort and check the interior of the socket of the overflow sensor US3. If paraffin is remaining, remove it from the sensor.

- Checking for possible cause c
  While the retort is empty, remove the front external panel and check the status of the ultrasonic sensor US3. Check the US3 input status in the check program. If the US3 is ON in the check program, unplug the connector CN505 to cut off the US3 input. If the corresponding LED on the US board turns off and the input status in the check program also changes to OFF, the ultrasonic sensor US3 is faulty.

- Checking for possible cause d
  If the ultrasonic sensor was not found faulty in the above check process, disconnect the wiring from the CN501 on the US board and check the US3 input status in the check program. If a signal is still input, the CPU board is faulty. If there is no input, the US board is faulty.

Error No. 315 Left bulk reservoir (Sta. 19) low level sensor error

- The high level sensor PI2 turned ON when the low level sensor PI3 remained OFF while the left bulk reservoir (station 19) was directly filled from the external drain/fill port.

[1] Possible cause

a. The low level sensor PI3 of the bulk reservoir is faulty or not installed correctly.
b. The high level sensor PI2 of the bulk reservoir is not installed correctly.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Check the condition of the level sensor PI3 using the check program. You can use the switch on the side face of the sensor PI3 to turn the sensor output LED on/off. If the applicable LED does not turn on after switching, the sensor is likely faulty. If the sensor LED turns on, check if the PI3 input turns ON in the check program.
  This level sensor may be unable to detect fluid if not connected firmly to the tube. Use the check program to supply to the low level or above the same reagent used in the bulk reservoir. Remove the level sensor PI3 and install it again to make sure reagent is detected, if any.

- Checking for possible cause b
  Check the condition of the level sensor PI2 using the check program. You can use the switch on the side face of the sensor PI2 to turn the sensor output LED on/off. If the applicable LED does not turn on after switching, the sensor is likely faulty. If the sensor LED turns on, check if the PI2 input turns ON in the check program.

- Checking for possible cause c
  If the sensor PI2 or PI3 input was found abnormal in "Checking for possible cause a or b," swap the PI2 and PI3 connectors on the relay board and see if each input is received on the CPU board. If the abnormal condition persists, the CPU board may be faulty.

Error No. 316 Left bulk reservoir (Sta. 19) high level sensor error

- The overflow level sensor PI1 turned ON when the high level sensor PI2 remained OFF while the left bulk reservoir (station 10) was directly filled from the external drain/fill port.

[1] Possible cause

a. The low level sensor PI2 of the bulk reservoir is faulty or not installed correctly.
b. The high level sensor PI1 of the bulk reservoir is not installed correctly.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Check the condition of the level sensor PI2 using the check program. You can use the switch on the side face of the sensor PI2 to turn the sensor output LED on/off. If the applicable LED does not turn on after switching, the sensor is likely faulty. If the sensor LED turns on, check if the PI2 input turns ON in the check program.
  This level sensor may be unable to detect fluid if not connected firmly to the tube. Use the check program to supply to the high level or above the same reagent used in the bulk reservoir. Remove the level sensor PI2 and install it again to make sure reagent is detected, if any.

- Checking for possible cause b
  Check the condition of the level sensor PI1 using the check program. You can use the switch on the side face of the sensor PI1 to turn the sensor output LED on/off. If the applicable LED does not turn on after switching, the sensor is likely faulty. If the sensor LED turns on, check if the PI1 input turns ON in the check program.

- Checking for possible cause c
  If the sensor PI1 or PI2 input was found abnormal in "Checking for possible cause a or b," swap the PI1 and PI2 connectors on the relay board and see if each input is received on the CPU board. If the abnormal condition persists, the CPU board may be faulty.

Error No. 318 Right bulk reservoir (Sta. 20) low level sensor error

- The high level sensor PI5 turned ON when the low level sensor PI6 remained OFF while the right bulk reservoir (station 20) was directly filled from the external drain/fill port.

[1] Possible cause

a. The low level sensor PI6 of the bulk reservoir is faulty or not installed correctly.
b. The high level sensor PI5 of the bulk reservoir is not installed correctly.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Check the condition of the level sensor PI6 using the check program. You can use the switch on the side face of the sensor PI6 to turn the sensor output LED on/off. If the applicable LED does not turn on after switching, the sensor is likely faulty. If the sensor LED turns on, check if the PI6 input turn ON in the check program.
  This level sensor may be unable to detect fluid if not connected firmly to the tube. Use the check program to supply to the low level or above the same reagent used in the bulk reservoir. Remove the level sensor PI6 and install it again to make sure fluid is detected, if any.

- Checking for possible cause b
  Check the condition of the level sensor PI5 using the check program. You can use the switch on the side face of the sensor PI5 to turn the sensor output LED on/off. If the applicable LED does not turn on after switching, the sensor is likely faulty. If the sensor LED turns on, check if the PI5 input turn ON in the check program.

- Checking for possible cause c
  If the sensor PI5 or PI6 input was found abnormal in "Checking for possible cause a or b," swap the PI5 and PI6 connectors on the relay board and see if each input is received on the CPU board. If the abnormal condition persists, the CPU board may be faulty.

Error No. 319 Right bulk reservoir (Sta. 20) high level sensor error

- The overflow level sensor PI4 turned ON when the high level sensor PI5 remained OFF while the right bulk reservoir (station 20) was filled directly from the external drain/fill port.

[1] Possible cause

a. The low level sensor PI5 of the bulk reservoir is faulty or not installed correctly.
b. The high level sensor PI4 of the bulk reservoir is not installed correctly.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Check the condition of the level sensor PI5 using the check program. You can use the switch on the side face of the sensor PI5 to turn the sensor output LED on/off. If the applicable LED does not turn on after switching, the sensor is likely faulty. If the sensor LED turns on, check if the PI5 input turn ON in the check program.
  This level sensor may be unable to detect fluid if not connected firmly to the tube. Use the check program to supply to the high level or above the same reagent used in the bulk reservoir. Remove the level sensor PI5 and install it again to make sure fluid is detected, if any.

- Checking for possible cause b
  Check the condition of the level sensor PI4 using the check program. You can use the switch on the side face of the sensor PI4 to turn the sensor output LED on/off. If the applicable LED does not turn on after switching, the sensor is likely faulty. If the sensor LED turns on, check if the PI4 input turn ON in the check program.

- Checking for possible cause c
  If the sensor PI4 or PI5 input was found abnormal in "Checking for possible cause a or b," swap the PI4 and PI5 connectors on the relay board and see if each input is received on the CPU board. If the abnormal condition persists, the CPU board may be faulty.

Error No. 341 Retort lid sensor error

- The abnormality detection function of the retort lid sensor detected an abnormality.

[1] Possible cause
  a. The retort lid board is faulty.
  b. The cable between the retort lid board and CPU board is broken.
  c. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action
- Checking for possible cause a
  Replace the retort lid board to one which is properly functioning and confirm that no abnormality occurs.

- Checking for possible cause b
  Disconnect the cable and conduct an electrical continuity test of pins 1 to 10 one by one using a tester.

- Checking for possible cause c
  If no problem was found under "Checking for possible causes a and b," the CPU board may be abnormal.

Error No. 342 Retort lid lock sensor error

- The abnormality detection function of the retort lid lock sensor detected an abnormality.

[1] Possible cause

a. The retort lid board is faulty.
b. The cable between the retort lid board and CPU board is broken.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools
- Tester

[3] Cause identification and remedial action

- Checking for possible cause a
  Replace the retort lid board to one which is properly functioning and confirm that no abnormality occurs.

- Checking for possible cause b
  Disconnect the cable and conduct an electrical continuity test of pins 1 to 10 one by one using a tester.

Error No. 350 Wax drain container is not ready for use.

- The wax drain container sensor LS1 turns ON at the start of paraffin drain or automatic paraffin transfer, but the LS1 remained OFF when paraffin was drained.

[1] Possible cause

a. The wax drain container was removed.
b. The sensor LS1 is faulty.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Do not remove the wax paraffin container during paraffin drain or automatic paraffin transfer.

- Checking for possible cause b
  Set a wax drain container and confirm that the sensor LS1 at the back turns ON and the red lamp illuminates. When the red lamp is lit, the LS1 input status in the check program is ON. If these conditions are not satisfied, the sensor may be faulty. Replace the sensor with a new one and check the same items.

- Checking for possible cause c
  If no problem was found under "Checking for possible cause b," the CPU board may be abnormal.

Error No. 801 File not found in the USB flash memory

- This error indicates that the file of the specified name was not found in the USB memory when the file was accessed. This error is issued upon failed opening of a file, etc.

[1] Possible cause

a. The specified file is not found in the USB memory.
b. The USB memory is corrupted or the file format is invalid.
c. A specified USB memory is not used.

[2] Key equipment used for check

- PC or other device capable of reading files in USB memories

[3] Cause identification and remedial action

- Checking for possible cause a
  Output an error history and see if the applicable file is found in the history. Save the file to the specified folder in the USB memory.

- Checking for possible cause b
  The USB memory is physically or logically corrupted. Connect the USB memory to a PC to check whether the memory is normal or not. If the memory is abnormal, reformat the memory.

- Checking for possible cause c
  A device other than the supplied USB memory or USB memories supported by the system is used. Use the supplied USB memory or other USB memory supported by the system.

Error No. 804 USB flash memory not found

- The system cannot recognize the USB memory device to register it in the internal device driver.

[1] Possible cause

a. The USB memory is corrupted or the file format is invalid.
b. A specified USB memory is not used.
c. The CPU board is faulty.

[2] Key equipment used for check

- PC or other device capable of reading files in USB memories

[3] Cause identification and remedial action

- Checking for possible cause a
  The USB memory is physically or logically corrupted. Connect the USB memory to a PC to check whether the memory is normal or not. If the memory is abnormal, reformat the memory.

- Checking for possible cause b
  A device other than the supplied USB memory or USB memories supported by the system is used. Use the supplied USB memory or other USB memory supported by the system.

- Checking for possible cause c
  If a supported USB memory that operates on a PC without problem is still not recognized, the CPU board may be faulty. Also note that if the USB memory was removed while it was being accessed, the memory may not be recognized again depending on the condition. In this case, the system must be restarted.

Error No. 805 Excessive current from the connected device

- The driving current of the connected USB memory device is too large for the system to recognize the device.

[1] Possible cause

a. The USB memory is faulty.
b. A specified USB memory is not used.
c. The CPU board is faulty.

[2] Key equipment used for check

- PC or other device capable of reading files in USB memories

[3] Cause identification and remedial action

- Checking for possible cause a
  The USB memory is physically corrupted. Connect the USB memory to a PC to check whether it is normal or not.

- Checking for possible cause b
  A device other than the supplied USB memory or USB memories supported by the system is used. Use the supplied USB memory or other USB memory supported by the system.

- Checking for possible cause c
  If the same error is issued when a supported USB memory that operates on a PC without problem is used, the CPU board may be faulty.

Error No. 806 Improper USB flash memory removal procedure

- After connecting the USB memory device, the device was pulled out without touching the **USB disconnect** button.

[1] Possible cause
  a. Wrong operating procedure

[2] Key equipment used for check
- PC or other device capable of reading files in USB memories

[3] Cause identification and remedial action
- Checking for possible cause a
  The USB memory device was removed from the system without touching the **USB disconnect** button. In this case, the USB memory file may be corrupted if the device was removed while it was being written, in which case the system may not be able to recognize the USB memory again.

Error No. 807 File system error in Drive A

- A file access error occurred when the USB memory device was accessed.

[1] Possible cause

a. The USB memory has no available space.
b. The specified file in the USB memory is write-protected.
c. The USB memory is corrupted or the file format is invalid.
d. A specified USB memory is not used.

[2] Key equipment used for check

- PC or other device capable of reading files in USB memories

[3] Cause identification and remedial action

- Checking for possible cause a
  Delete unnecessary files in the USB memory.

- Checking for possible cause b
  Disable the write protection of the file in the USB memory you want to output data to. To identify the applicable file, output the error information and identify the file that generated this error.

- Checking for possible cause c
  The USB memory is physically or logically corrupted. Connect the USB memory to a PC to check whether the memory is normal or not. If the memory is abnormal, reformat the memory.

- Checking for possible cause d
  A device other than the supplied USB memory or USB memories supported by the system is used. Use the supplied USB memory or other USB memory supported by the system.

Error No. 811 File system error in Drive B

- A file access error occurred when the CF card on the CPU card was accessed.

[1] Possible cause
  a. The CF card has no available space.
  b. The CF card file is corrupted or the file format is invalid.
  c. A specified CF card is not used.

[2] Key equipment used for check
- PC or other device capable of reading files in USB memories

[3] Cause identification and remedial action
- Checking for possible cause a
  Although normally the CF card should not run out of available space, if this condition occurs some files may be corrupted. If you encountered this error, therefore, refer to "How to Restore the Internal CF Card."

- Checking for possible cause b
  The CF card is physically or logically corrupted. Connect the CF card to a PC to check whether it is normal or not. If the card is abnormal, refer to 3-3 "CF Card Reformatting Procedure" In Appendix 1.

- Checking for possible cause c
  Use an existing CF card.

Error No. 812 File not found in Drive B

- This error indicates that the file of the specified name was not found in the CF card when the file was accessed. This error is issued upon failed opening of a file, etc.

[1] Possible cause

a. The specified file is not found in the CF card.
b. The CF card file is corrupted or the file format is invalid.
c. A specified CF card is not used.

[2] Key equipment used for check

- PC or other device capable of reading files in USB memories

[3] Cause identification and remedial action

- Checking for possible cause a
  Output an error history and see if the applicable file is found in the history. Save the file to the specified folder in the CF card.

- Checking for possible cause b
  The CF card is physically or logically corrupted. Connect the CF card to a PC to check whether it is normal or not. If the card is abnormal, refer to 3-3 "CF Card Reformatting Procedure" In Appendix 1.

- Checking for possible cause c
  Use an existing CF card.

Error No. 814 The WAV file cannot be used for Drive B.

- The specified WAV file in the CF card on the CPU board was using an invalid format when the file was read.

[1] Possible cause
  a. The WAV file format was changed to an invalid one.

[2] Key equipment used for check
- PC or other device capable of reading files in USB memories

[3] Cause identification and remedial action
- Checking for possible cause a
  If you encountered this error, therefore, refer to 3-3 "CF Card Reformatting Procedure"
  In Appendix 1
  The following WAV file format is supported:
  PCM format, monaural 16 bits, 8 kHz, 10 sec max.

3-3-1-2 Malfunction without error number

Group	Area	Symptom	Code
A	Electricity	Power is not supplied to the instrument.	A-1
		Power switch trips.	A-2
		Electric shock occurs.	A-3
B	Control Panel	Display does not come on after power-on.	B-1
		Display remains white after power-on.	B-2
		Control software is not loaded after power-on.	B-3
		Clock stopped.	B-4
		Touch key does not react.	B-5
		Display became darker.	B-6
		Display flickers.	B-7
		Sound is not generated.	B-8
C	Sensors	Paraffin Drain cannot be performed.	C-1
		Tissue processing cannot be started because the oven door is open.	C-2
		Tissue processing cannot be started because the retort lid is open.	C-3
D	Control Program	System setup data was initialized.	D-1
		Password data was initialized.	D-2
		Solution list was initialized.	D-3
		Solution configuration data was initialized.	D-4
		Processing program data was initialized.	D-5
		Cleaning program data was initialized.	D-6
		Error log is not displayed.	D-7
		Past tissue processing reports are not displayed.	D-8
		Past cleaning reports are not displayed.	D-9
		Past solution exchange reports are not displayed.	D-10
		Screens are displayed in the selected language.	D-11
		Selected alarm sounds are not output.	D-12
E	Retort Lid	Lid cannot be opened when power is off.	E-1
		Lid cannot be opened when power is on.	E-2
		Lid lever is loose.	E-3
		Abnormal noise is heard when opening the lid.	E-4
		Odor leaks from the lid.	E-5
F	Solution Bottles	Bottle has swollen and cannot be set in the bottle rack.	F-1
		Reagent leaks from the bottle.	F-2

Group	Area	Symptom	Code
G	Fume Control	Odor leaks from the system in operation.	G-1
		Odor leaks from the system when not in use.	G-2
H	Paraffin Oven	Paraffin overflowed.	H-1
		Paraffin hardened in the oven.	H-2
		The front side gets dirty with paraffin.	H-3
I	Doors	Door does not easily move or close.	I-1
		Door cannot be opened and/or closed.	I-2
J	External Output	External alarms are not output.	J-1
	Interior	Rust was caused.	J-2
	Noise	Noises from the system became louder.	J-3
	Hoses	Hose cannot be connected.	J-4
	Smoke	Smoke came from the system.	J-5
	Spillage	Reagent or water was spilled inside the system.	J-6

A-1 Power is not supplied to the instrument.

- The power is not input even when the power switch is turned on.
- The power indicator on the display does not illuminate.

[1] Possible cause
a. The facility's power supply is abnormal.
b. The power cable is abnormal.
c. The power input part is abnormal.
d. The switching power supply, CPU board or peripheral wiring is abnormal.
e. The LED board is faulty.

[2] Key equipment used for check
- The power indicator on the display does not illuminate.
- Tester
- Control panel LED board which is functioning normally
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Check if the condition of the facility's power supply is normal.

- Checking for possible cause b
  Check the power cable for abnormality (wire breakage, poor connection).
  If poor connection was the case, connect the cable firmly.
  Checking for possible cause c
  Check the voltage of the power input part between L and N at the power inlet using a tester. If the voltage is abnormal, the problem in question is due to possible cause c. Check for wire breakage or poor connection and, if any abnormality is found, replace the applicable part.

- Checking for possible cause d
  Confirm that the LD100 and LD101 are illuminating in red on the CPU board.
  If the voltage is abnormal, the problem in question is due to possible cause d. Replace the switching power supply. However, a faulty CPU board may also be the cause.
  Unplug the connector CN1 and confirm that 24 V is output between the orange and gray wires, and 5 V is output between the red and black wires, at the connector. Also confirm that the connector CN3 is connected to the LCD relay board and that the LD102 is illuminating in red.

- Checking for possible cause e
  If the display turns on but the power indicator (on the LED board) remains unlit, the LED board is faulty. Remove the back of the control panel and install a LED board which is functioning normally to check for illumination. Next, remove and replace the front cover.

A-2 Power switch trips.

- After the power switch is turned on, the switch (circuit protector) trips.

[1] Possible cause

a. The trip current of the power switch (circuit protector) does not match.
b. The power input part is shorted.
c. The switching power supply is shorted to its connection destination.
d. The heater driver board and heater are shorted.

[2] Key equipment used for check

- Tester
- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Check the rated voltage of the system and power-supply voltage of the facility. Check the rated current of the power switch from the marking on the power switch. The 100/115-V specification uses a switch of 15-A rating, while the 230-V specification uses a switch of 10-A rating.

- Checking for possible cause b
  Check the condition of connections and wirings at the power input terminal block in the control box. If shorting due to foreign matter, pinching, etc., was found, the problem in question is due to possible cause b. Remove the cause and restore a normal condition.

- Checking for possible cause c
  Unplug the input connector of the switching power supply and input the power. If the power switch trips, the problem lies in a location before the switching power supply. Next, plug in the input connector again and unplug the output connector of the power switch. If the switch trips when the power is input, the switching power supply is abnormal. If the switch does not trip, the CPU board is abnormal.

- Checking for possible cause d
  If the power switch still trips after taking the above actions, the heater driver board and heaters connected to the board are likely faulty. First, unplug the connector CN201 on the heater driver board to check if the power switch trips. If the power switch does not trip, unplug all connectors other than the CN201, CN202 and CN211 (all locations connected to heaters). Then, plug in the connectors one by one to identify the cause of trip. Once the cause of trip is identified, check the wiring condition and insulation with the enclosure in the applicable location and also check whether or not short-circuiting has occurred.

A-3 Electric shock occurs.

- When a metal part of the system is touched, tingling sensation is felt.

[1] Possible cause

a. The power input ground is not connected.
b. Current is leaking from the power input part.
c. Current is leaking from the heater driver board or each heater unit.

[2] Key equipment used for check

- 500-VDC insulation tester (Megger)
- Tester
- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a

  Check if the grounding wire of the grounding adapter is connected. If not, the problem in question is due to possible cause a. Connect the grounding wire to ground without fail. To doubly sure, unplug the power cable from the outlet and check the insulation resistance between the grounding terminal lug and power terminal lug on the power plug to confirm that the measured resistance is 10 MΩ or more.

- Checking for possible cause b

  Remove the back panel of the control box and LCD unit at the front, and check the wirings from the power inlet in the control box to the switching power supply and also to the heater driver board.
  If the power line and enclosure are contacting each other due to foreign matter or whiskers of electrical wires, the problem in question is due to possible cause b.
  Remove foreign matter and whiskers.

- Checking for possible cause c

  Access the back of the instrument to measure insulation resistance between the two pins at the CN201 on the heater driver board and the instrument chassis. If the measured voltage is 10 MΩ or less, the problem in question is due to possible cause c. Unplug the heater connectors one by one to identify the problem location. Disassemble the parts in the problem location and replace faulty parts.

B-1 Display does not come on after power-on.

- The screen remains dark after the power is turned on. This is caused by non-illumination of the cold cathode tubes located above and below the LCD.

[1] Possible cause
a. Power is not supplied to the LCD. The LCD relay board is faulty.
b. The CPU board is faulty.
c. The LCD relay cable is faulty.
d. The LCD relay board is faulty.
e. The INV cable is faulty.
f. The inverter is faulty.

[2] Key equipment used for check
- Tester
- Harness with clip
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Check if the power indicator on the system is lit.
  If not, remove the back panel of the control box and turn on the power to confirm that the LEDs LD402 and D403 on the CPU board become lit.
  If both LEDs remain unlit on the CPU board, refer to "The power cannot be turned on" in "Troubleshooting."

- Checking for possible cause b
  Use a tester to check the voltage between the check pin GND and pin 3 of the CN3 (LCD) on the CPU board when the power is turned on. If the measured voltage is around 12 V, no signal is output from the CPU board.
  Next, short the check pin GND and pin 3 of the CN3 (LCD) on the CPU board. If the LCD turns on when the pins are shorted, the CPU board is faulty.

- Checking for possible cause c
  If the LCD does not turn on in "Checking for possible cause b," replace the LCD relay cable. If the LCD turns on after the LCD relay cable was replaced, the LCD relay cable is faulty.

- Checking for possible cause d
  If the LCD does not turn on in "Checking for possible cause c," replace the LCD relay board. If the LCD turns on after the LCD relay board was replaced, the LCD relay board is faulty.

- Checking for possible cause e
  If the LCD does not turn on in "Checking for possible cause d," replace the INV cable. If the LCD turns on after the INV cable was replaced, the INV cable is faulty.

- Checking for possible cause f
  Use a tester to measure the voltage between the check pin GND and pin 3 of the CN3 (LCD) on the CPU board when the power is turned on. Confirm that the measured voltage is around 0 V.
  Next, measure the voltage between pins 2 and 10 of the CN306 (INVERTER) on the LCD relay board. If the measured voltage remains 12 V, the inverter is faulty.

B-2 Display remains white after power-on.

- When the power is turned on, the LCD turns on but the screen remains white. This indicates that the power-supply voltage is not supplied to the LCD and thus nothing is displayed.

[1] Possible cause

a. The FPC cable may not be connected properly or the FPC cable is broken.
b. LCD relay cable 2 (34-pin cable) is broken.
c. The CPU board is faulty.
d. The LCD is faulty.

[2] Key equipment used for check

- Tester
- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  Confirm that the FPC cable connecting the LCD relay board and LCD is inserted firmly. If the FPC cable is firmly inserted and connected, remove the FPC and check for electrical continuity between the connector pins on both ends using a tester.

- Checking for possible cause b
  Perform an electrical continuity check using a tester to check for breakage of LCD relay cable 2 (34-pin flat cable) connecting the CPU board and LCD relay board.

- Checking for possible cause c
  First, disconnect LCD relay cable 2 from the CPU board.
  Turn on the system power and measure the voltage between the check pin GND and pin 31 of the CN4 (LCD) on the CPU board using a tester. If 5 V is not supplied, the CPU board is faulty.

- Checking for possible cause d
  If no problem was found due to the above possible causes, the LCD itself is likely faulty. Replace the LCD.

B-3 Control software is not loaded after power-on.

The software is not loaded after the power is turned on.

[1] Possible cause
a. The software file is corrupted.
b. The CPU board is faulty.

[2] Key equipment used for check
- Compact flash card storing the check program "VIP6KPG.BIN" in the SYSTEM folder
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Open the back of the control panel, remove the compact flash card from drive B inside the panel, and set a compact flash card storing the check program. Set the DIP switch S200-1 on the CPU board to ON, and turn on the power.
  If the check program starts properly, the software file is corrupted.
  Once the software file became corrupted, the file in drive B must be registered again.

- Checking for possible cause b
  If the check program could not be started properly in "Checking for possible cause a," the CPU board is likely faulty. All positions of the DIP switch S200 must be set to OFF.

B-4 Clock stopped.

- The clock at the top of the screen no longer shows the correct time.

[1] Possible cause
  a. The battery unit is faulty.
  b. The CPU board is faulty.

[2] Key equipment used for check
- Battery unit functioning normally
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Open the back panel of the control box and gently remove the battery unit (M4T32-BR12SH) from the CPU board. Next, set a battery unit functioning normally. Turn on the power and adjust the time. Turn off and then on the power and confirm that the clock is showing the correct time.

- Checking for possible cause b
  If the time was not correct in "Checking for possible cause a," the CPU board is likely faulty.

B-5 Touch key does not react.

- When an effective button is touched on the displayed screen, the button is not input. Or, the input position is significantly off.

[1] Possible cause

a. Touch panel detection positions are not calibrated correctly.
b. The CPU board is faulty.
c. LCD relay board
d. The touch panel is faulty.

[2] Key equipment used for check

- Bar with soft, rounded tip (tip: approx. 1 mm)
- CPU board functioning normally

[3] Cause identification and remedial action

- Checking for possible cause a
  Remove the back of the control panel and set the DIP switch S200-2 to ON. When the power is turned on, the system enters the touch panel teaching mode. Teach the positions one by one. Turn off the power, set all DIP switch positions to OFF, and then turn the power back on.

- Checking for possible cause b
  Swap the CPU board with one functioning normally and calibrate the touch panel detection positions. If the touch panel functions normally, the CPU board is faulty.

- Checking for possible cause c
  Swap the LCD relay board with one functioning normally and calibrate the touch panel detection positions. If the touch panel functions normally, the LCD relay board is faulty.

- Checking for possible cause d
  If none of the remedial actions for possible causes a, b and c does no work, the touch panel is likely faulty.

B-6 Display became darker.

- The LCD became significantly darker than before.

[1] Possible cause

a. Effect of the ambient temperature when the power is turned on
b. The cold cathode tube(s) is/are faulty.
c. The inverter is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a

  Due to the characteristics of its cold cathode tubes, the LCD sometimes remains dark immediately after the power is turned on. Wait for a while, and the cold cathode tubes of the LCD should warm up and become brighter.
  This is not a system error.

- Checking for possible cause b

  The LCD has two cold cathode tubes, one above and one below the LCD. If the LCD appears dark, one cold cathode tube may have blown. Remove the back of the control panel and unplug the connector for LCD cold cathode tube connected to one inserter. Turn on the power to check the screen condition.
  If the screen remains dark, turn off the power, remove the inverter, and plug the connector of the non-functioning cold cathode tube into the cold cathode tube output connector on the other inverter. Turn on the power and check if the LCD turns on. (Exercise caution when handling the inverter because it is carrying high voltage.) If the LCD does not turn on, replace the applicable cold cathode tube.
  Since the cold cathode tubes have a service life, replace both cold cathode tubes if they have been in use for a long period.

- Checking for possible cause c

  If no problem was found due to possible cause b, the inverter itself is likely faulty.

B-7 Display flickers.

- The LCD is suddenly disturbed or colors become misaligned. This does not include a momentary freezing of the display when the screen is switched during a process.

[1] Possible cause
a. Poor contact of the FPC cable.
b. The CPU board is faulty.
c. The LCD is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Remove the back of the control panel and push the connector of the FPC cable connecting the CPU board and the LCD to secure the connection. If this didn't work, replace the FPC cable.

- Checking for possible cause b
  Swap the CPU board with one functioning normally and check if the situation improves.

- Checking for possible cause c
  If no problem was found due to possible cause a or b, the LCD itself is likely faulty.

B-8 Sound is not generated.

- Sound is not output from the left side of the control box.

[1] Possible cause
  a. Program setting
  b. The speaker is faulty.
  c. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  The key input sound is set to "OFF" on the system setup screen. In this case, alarm sound, end-of-process sound, etc., are still output. If no sound is output when a key is input, change this setting to "ON."

- Checking for possible cause b
  The speaker is faulty. Replace it with a normal speaker to see if sound is output.

- Checking for possible cause c
  If no problem was found due to possible cause a or b, the CPU board is likely faulty.

C-1 Paraffin Drain cannot be performed.

- When trying to perform paraffin drain or automatic transfer of paraffin, the message "Wax drain container is not ready for use" appears repeatedly.

[1] Possible cause

a. No wax drain container is set.
b. The sensor LS1 is faulty.
c. The CPU board is faulty.

[2] Key equipment used for check

- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a

  Before performing paraffin drain or automatic paraffin transfer, set a wax drain container properly by inserting it all the way into the bottle rack.

- Checking for possible cause b

  Set a wax drain container and confirm that the sensor LS1 at the back turns ON and the red lamp illuminates. When the red lamp is lit, the LS1 input status in the check program is ON. If these conditions are not satisfied, the sensor may be faulty. Replace the sensor with a new one and check the same items.

- Checking for possible cause c

  If no problem was found under "Checking for possible cause b," the CPU board may be abnormal.

C-2 Tissue Processing cannot be started because the oven door is open.

- The message "The oven door is open" appears and tissue processing cannot be started.

[1] Possible cause
a. The paraffin oven door remains open.
b. The paraffin oven door sensor LS2 is not installed correctly.
c. The sensor LS2 is faulty.
d. The CPU board is faulty.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Close the paraffin oven door before starting tissue processing.

- Checking for possible cause b
  Even when the paraffin oven door is closed, the oven door sensor LS2 may still fail to turn ON. Remove the front panel and check the door sensor LS2. If the red LED on the sensor LS2 is not lit when the oven door is closed, loosen the sensor fixing screw and move the sensor downward. Affix the sensor at a position where the red LED becomes lit. Confirm that the sensor does not contact the oven door when the door is opened and/or closed.

- Checking for possible cause c
  If the sensor remained unlit in "Checking for possible cause a," the sensor is likely faulty. Replace the sensor with a new one and check the same items.

- Checking for possible cause d
  If no problem was found under "Checking for possible causes d," the CPU board may be abnormal.

C-3 Tissue Processing cannot be started because the retort lid is open.

- The message "Retort lid open" appears at the start or resumption of tissue processing and tissue processing cannot be started.

[1] Possible cause

a. The retort handle cannot be moved to the lock position.
b. The lid sensor cannot detect the lock position.

[2] Key equipment used for check

- Disassembly/adjustment tool

[3] Cause identification and remedial action

- Checking for possible cause a

  The retort handle is not in the lock position. Turn the handle to the lock position.

- Checking for possible cause b

  The retort lid sensor is shielded by the lid close position plate at the lock position. Loosen the screws affixing the lid close position plate and readjust the detection position.

D-1 System setup data was initialized.

[1] Possible cause

a. The control file INSTRMNT.CSV storing the system settings was lost.
b. The control file INSTRMNT.CSV storing the system settings is corrupted.
c. The CF card in the system is corrupted.

[2] Key equipment used for check

- None

[3] Cause identification and remedial action

- Checking for possible cause a
  Check if Error No. 812 was displayed when the system was started.
  Enter the system settings again. If you have a backup of the system data files, update the control file INSTRMNT.CSV using the program/data update function.

- Checking for possible cause b
  Check if Error No. 811 was displayed when the system was started.
  Enter the system settings again. If you have a backup of the system data files, update the control file INSTRMNT.CSV using the program/data update function.

- Checking for possible cause c
  Check if Error No. 811 or 812 was displayed when the system was started. First, take remedial actions for possible causes a and b. If an error still occurs frequently after taking the remedial actions for possible causes a and b, the CF card in the system may be abnormal. Recreate the CF card. For information on recreating the CF card, refer to Appendix 1, "Control Files."

D-2 Password data was initialized.

[1] Possible cause

a. The control file PASSWORD.CSV storing the password settings was lost.
b. The control file PASSWORD.CSV storing the password settings is corrupted.
c. The CF card in the system is corrupted.

[2] Key equipment used for check

- None

[3] Cause identification and remedial action

- Checking for possible cause a
  Check if Error No. 812 was displayed when the system was started.
  Enter the passwords again. If you have a backup of the system data files, update the control file PASSWORD.CSV using the program/data update function.

- Checking for possible cause b
  Check if Error No. 811 was displayed when the system was started.
  Enter the passwords again. If you have a backup of the system data files, update the control file PASSWORD.CSV using the program/data update function.

- Checking for possible cause c
  Check if Error No. 811 or 812 was displayed when the system was started. First, take remedial actions for possible causes a and b. If an error still occurs frequently after taking the remedial actions for possible causes a and b, the CF card in the system may be abnormal. Recreate the CF card. For information on recreating the CF card, refer to Appendix 1, "Control Files."

D-3 Solution list was initialized.

[1] Possible cause

a. The control file SOLUTION.CSV storing the solution names was lost.
b. The control file SOLUTION.CSV storing the solution names is corrupted.
c. The CF card in the system is corrupted.

[2] Key equipment used for check

- None

[3] Cause identification and remedial action

- Checking for possible cause a
  Check if Error No. 812 was displayed when the system was started.
  Enter the solution names again. If you have a backup of the system data files, update the control file SOLUTION.CSV using the program/data update function.

- Checking for possible cause b
  Check if Error No. 811 was displayed when the system was started.
  Enter the solution names again. If you have a backup of the system data files, update the control file SOLUTION.CSV using the program/data update function.

- Checking for possible cause c
  Check if Error No. 811 or 812 was displayed when the system was started. First, take remedial actions for possible causes a and b. If an error still occurs frequently after taking the remedial actions for possible causes a and b, the CF card in the system may be abnormal. Reformat the CF card. For information on recreating the CF card, refer to Appendix 1, "Control Files."

D-4 Solution configuration data was initialized.

[1] Possible cause

a. The control file CONFIG*.CSV storing the solution configurations was lost.
b. The control file CONFIG*.CSV storing the solution configurations is corrupted.
c. The CF card in the system is corrupted.

[2] Key equipment used for check

None

[3] Cause identification and remedial action

- Checking for possible cause a

  Check if Error No. 812 was displayed when the system was started.
  Enter the solution configurations again. If you have a backup of the system data files, update the control file CONFIG*.CSV (* indicates a number from 1 to 5) using the program/data update function.

- Checking for possible cause b

  Check if Error No. 811 was displayed when the system was started.
  Enter the solution configurations again. If you have a backup of the system data files, update the control file CONFIG*.CSV (* indicates a number from 1 to 5) using the program/data update function.

- Checking for possible cause c

  Check if Error No. 811 or 812 was displayed when the system was started. First, take remedial actions for possible causes a and b. If an error still occurs frequently after taking the remedial actions for possible causes a and b, the CF card in the system may be abnormal. Recreate the CF card. For information on recreating the CF card, refer to Appendix 1, "Control Files."

D-5 Processing program data was initialized.

[1] Possible cause

a. The control file PROG**.CSV storing the tissue processing programs was lost.
b. The control file PROG**.CSV storing the tissue processing programs is corrupted.
c. The CF card in the system is corrupted.

[2] Key equipment used for check

None

[3] Cause identification and remedial action

- Checking for possible cause a

  Check if Error No. 812 was displayed when the system was started.
  Enter the tissue processing programs again. If you have a backup of the system data files, update the control file PROG**.CSV (** indicates a number from 01 to 50) using the program/data update function.

- Checking for possible cause b

  Check if Error No. 811 was displayed when the system was started.
  Enter the tissue processing programs again. If you have a backup of the system data files, update the control file PROG**.CSV (** indicates a number from 01 to 50) using the program/data update function.

- Checking for possible cause c

  Check if Error No. 811 or 812 was displayed when the system was started. First, take remedial actions for possible causes a and b. If an error still occurs frequently after taking the remedial actions for possible causes a and b, the CF card in the system may be abnormal. Recreate the CF card. For information on recreating the CF card, refer to Appendix 1, "Control Files."

D-6 Cleaning program data was initialized.

[1] Possible cause

a. The control file CLEAN.CSV storing the cleaning programs was lost.
b. The control file CELAN.CSV storing the cleaning programs is corrupted.
c. The CF card in the system is corrupted.

[2] Key equipment used for check

None

[3] Cause identification and remedial action

- Checking for possible cause a

  Check if Error No. 812 was displayed when the system was started.
  Enter the cleaning programs again. If you have a backup of the system data files, update the control file CLEAN.CSV using the program/data update function.

- Checking for possible cause b

  Check if Error No. 811 was displayed when the system was started.
  Enter the cleaning programs again. If you have a backup of the system data files, update the control file CLEAN.CSV using the program/data update function.

- Checking for possible cause c

  Check if Error No. 811 or 812 was displayed when the system was started. First, take remedial actions for possible causes a and b. If an error still occurs frequently after taking the remedial actions for possible causes a and b, the CF card in the system may be abnormal. Recreate the CF card. For information on recreating the CF card, refer to Appendix 1, "Control Files."

D-7 Error log is not displayed.

[1] Possible cause

a. The history file ERRHSTRY.VIP storing the error history was lost.
b. The history file ERRHSTRY.VIP storing the error history is corrupted.
c. The CF card in the system is corrupted.

[2] Key equipment used for check

None

[3] Cause identification and remedial action

- Checking for possible cause a

  Check if Error No. 812 was displayed when the system was started.
  Output an error history report and check if an error occurred in ERRHSTRY.VIP.
  ERRHSTRY.VIP cannot be restored. If an error occurred in this file, the system will automatically recreate the file.

- Checking for possible cause b

  Check if Error No. 811 was displayed when the system was started.
  Output an error history report and check if an error occurred in ERRHSTRY.VIP.
  ERRHSTRY.VIP cannot be restored. If an error occurred in this file, the system will automatically recreate the file.

- Checking for possible cause c

  Check if Error No. 811 or 812 was displayed when the system was started. First, take remedial actions for possible causes a and b. If an error still occurs frequently after taking the remedial actions for possible causes a and b, the CF card in the system may be abnormal. Recreate the CF card. For information on recreating the CF card, refer to Appendix 1, "Control Files."

D-8 Past tissue processing reports are not displayed.

[1] Possible cause

a. The history file REPORT1.VIP storing the tissue processing history was lost.
b. The history file REPORT1.VIP storing the tissue processing history is corrupted.
c. The CF card in the system is corrupted.

[2] Key equipment used for check

None

[3] Cause identification and remedial action

- Checking for possible cause a

  Check if Error No. 812 was displayed when the system was started.
  Output an error history report and check if an error occurred in REPORT1.VIP.
  REPORT1.VIP cannot be restored. If an error occurred in this file, the system will automatically recreate the file.

- Checking for possible cause b

  Check if Error No. 811 was displayed when the system was started.
  Output an error history report and check if an error occurred in REPORT1.VIP.
  REPORT1.VIP cannot be restored. If an error occurred in this file, the system will automatically recreate the file.

- Checking for possible cause c

  Check if Error No. 811 or 812 was displayed when the system was started. First, take remedial actions for possible causes a and b. If an error still occurs frequently after taking the remedial actions for possible causes a and b, the CF card in the system may be abnormal. Recreate the CF card. For information on recreating the CF card, refer to Appendix 1, "Control Files."

D-9 Past cleaning reports are not displayed.

[1] Possible cause

a. The history file REPORT2.VIP storing the cleaning history was lost.
b. The history file REPORT2.VIP storing the cleaning history is corrupted.
c. The CF card in the system is corrupted.

[2] Key equipment used for check

None

[3] Cause identification and remedial action

- Checking for possible cause a
  Check if Error No. 812 was displayed when the system was started.
  Output an error history report and check if an error occurred in REPORT2.VIP.
  REPORT2.VIP cannot be restored. If an error occurred in this file, the system will automatically recreate the file.

- Checking for possible cause b
  Check if Error No. 811 was displayed when the system was started.
  Output an error history report and check if an error occurred in REPORT2.VIP.
  REPORT2.VIP cannot be restored. If an error occurred in this file, the system will automatically recreate the file.

- Checking for possible cause c
  Check if Error No. 811 or 812 was displayed when the system was started. First, take remedial actions for possible causes a and b. If an error still occurs frequently after taking the remedial actions for possible causes a and b, the CF card in the system may be abnormal. Recreate the CF card. For information on recreating the CF card, refer to Appendix 1, "Control Files."

D-10 Past solution exchange report are not displayed.

[1] Possible cause

a. The history file REPORT3.VIP storing the solution exchange history was lost.
b. The history file REPORT3.VIP storing the solution exchange history is corrupted.
c. The CF card in the system is corrupted.

[2] Key equipment used for check

None

[3] Cause identification and remedial action

- Checking for possible cause a

  Check if Error No. 812 was displayed when the system was started.
  Output an error history report and check if an error occurred in REPORT3.VIP.
  REPORT3.VIP cannot be restored. If an error occurred in this file, the system will automatically recreate the file.

- Checking for possible cause b

  Check if Error No. 811 was displayed when the system was started.
  Output an error history report and check if an error occurred in REPORT3.VIP.
  REPORT3.VIP cannot be restored. If an error occurred in this file, the system will automatically recreate the file.

- Checking for possible cause c

  Check if Error No. 811 or 812 was displayed when the system was started. First, take remedial actions for possible causes a and b. If an error still occurs frequently after taking the remedial actions for possible causes a and b, the CF card in the system may be abnormal. Recreate the CF card. For information on recreating the CF card, refer to Appendix 1, "Control Files."

D-11 Screens are not displayed in the selected language.

[1] Possible cause

a. The file MAIN***.VIP storing the display language data was lost.
b. The file MAIN***.VIP storing the display language data is corrupted.
c. The CF card in the system is corrupted.

[2] Key equipment used for check

None

[3] Cause identification and remedial action

- Checking for possible cause a

  Check if Error No. 812 was displayed when the system was started.
  Output an error history report and confirm that an error occurred in MAIN***.VIP (*** indicates a number from 001 to 016).MAIN***.VIP cannot be restored. If an error occurred in this file, the system will display screens in English.

- Checking for possible cause b

  Check if Error No. 811 was displayed when the system was started.
  Output an error history report and check if an error occurred in MAIN***.VIP.
  MAIN***.VIP cannot be restored. If an error occurred in this file, the system will display screens in English.

- Checking for possible cause c

  Check if Error No. 811 or 812 was displayed when the system was started. First, take remedial actions for possible causes a and b. If an error still occurs frequently after taking the remedial actions for possible causes a and b, the CF card in the system may be abnormal. Recreate the CF card. For information on recreating the CF card, refer to 3-3, "CF Card Reformatting Procedure" in Appendix 1.

D-12 Selected alarm sound are not output.

[1] Possible cause

a. The file SOUND**.VIP storing the alarm sound data was lost.
b. The file SOUND***.VIP storing the alarm sound data is corrupted.
c. The CF card in the system is corrupted.

[2] Key equipment used for check

None

[3] Cause identification and remedial action

- Checking for possible cause a

  Check if Error No. 812 was displayed when the system was started.
  Output an error history report and confirm that an error occurred in SOUND**.VIP (** indicates a number from 01 to 10). SOUND**.VIP cannot be restored. If an error occurred in this file, the system will sound a key entry error buzzer three times instead.

- Checking for possible cause b

  Check if Error No. 811 was displayed when the system was started.
  Output an error history report and check if an error occurred in SOUND**.VIP. SOUND**.VIP cannot be restored. If an error occurred in this file, the system will sound a key entry error buzzer three times instead.

- Checking for possible cause c

  Check if Error No. 811 or 812 was displayed when the system was started. First, take remedial actions for possible causes a and b. If an error still occurs frequently after taking the remedial actions for possible causes a and b, the CF card in the system may be abnormal. Recreate the CF card. For information on recreating the CF card, refer to 3-3, "CF Card Recreating Procedure" in Appendix 1.

E-1 Lid cannot be opened when power is off.

- The retort lid can no longer be opened during tissue processing after a power failure or turning off the power switch.

[1] Possible cause

a. The lid hook was locked by the retort lock lever.
b. The retort lock mechanism or lid rack mechanism was damaged.

[2] Key equipment used for check

Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a

  You can release the retort lock lever by accessing from the hole located on the front right of the retort lid. Insert a screwdriver into this hole and push the lever toward you to release the locked retort lock lever.

- Checking for possible cause b

  To remove the retort lid cover, remove the front panel and take out the hook catch in front of the retort flange first. The retort lid can now opened. Remove the retort lid cover and readjust, replace or otherwise maintain the mechanism that generated the problem.

E-2 Lid cannot be opened when power is on.

- The retort lid can no longer be opened when the power switch is on.

[1] Possible cause

a. The lid hook is locked by the retort lock lever during operation.
b. The retort lid lever is pressing the retort lock lever hard, so the retort lock lever cannot be released.
c. The retort lock mechanism or lid rack mechanism was damaged.

[2] Key equipment used for check

Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a

  The retort lock lever is locked during operation (tissue processing, retort cleaning, automatic solution exchange, etc.) to prevent danger. To open the retort lid, the operation must be paused or stopped to release the retort lock lever.

- Checking for possible cause b

  If the retort lid lever is locked, or being pressed hard toward the release side, sometimes the lock lever cannot be released (error 342 occurs). In this case, turn off the system power and operate the retort lid lever to the lock side, and then insert a screwdriver into the hole provided on the front right of the retort lid and pull the retort lock lever toward you to release the lever. Or, log on in the service mode and touch the **Retort lid lock** button on the service manual operation screen.

- Checking for possible cause c

  To remove the retort lid cover, remove the front panel and take out the hook catch in front of the retort flange first. The retort lid can now opened. Remove the retort lid cover and readjust, replace or otherwise maintain the mechanism that generated the problem.

E-3 Lid lever is loose.

- The retort lid lever is felt loose when locking/unlocking.

[1] Possible cause

a. Looseness is caused by a play at the rack & pinion gear for the lid.
b. The fixing screw affixing the retort lid lever to the pinion shaft is loose.
c. The 3 screws fastening the retort lid lever and retort lever mounting bracket became loose.
d. The latch collar at the lid lever latch became worn.
e. The rack cap and rack base became worn.

[2] Key equipment used for check

Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a
  A rack & pinion gear is used to move to the left/right the hook for opening/closing the retort lid according to the movement of the retort lid lever. A slight play is provided to operate this gear smoothly, so this is not a problem.

- Checking for possible cause b
  If the retort lid lever is felt loose when it is turned, the screw fastening the lid lever to the pinion shaft may be loose. In this case, use a screwdriver, etc., to remove the retort lid lever cap at the top of the retort lid lever and tighten the screw inside the top hole first.

- Checking for possible cause c
  On the retort lid lever, the retort lever mounting bracket is fastened to the bottom of the lever using 3 screws. If these screws are loose, the lever also becomes loose. Remove the screw fastening the lid lever to the pinion shaft, take out the retort lid lever, and tighten the 3 screws at the bottom.

- Checking for possible cause d
  If the retort lid lever is felt loose at the lock position, the lid lever latch provided to give a click feel upon lid lever operation may have been mechanically worn. In this case, remove the lid cover, take out the lid latch plate spring, and replace the latch collar fitted in the hole.

- Checking for possible cause e
  If the lid hook moves back and forth significantly, the rack cap or rack base may not be fastened firmly or the rack cap or rack base itself may have worn. In this case, both the rack cap and rack base must be replaced.

E-4 Abnormal noise is heard when opening the lid.

- The retort lid makes squeaking noise when opening.

[1] Possible cause
  a. Noise from the hinge spring

[2] Key equipment used for check
  Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Remove the retort lid cover and apply grease on the hinge springs on both sides.

E-5 Odor leaks from the lid.

- Odor still leaks from the retort lid even after the lid is closed.

[1] Possible cause

a. The retort flange or seal gasket is dirty.
b. The lid seal gasket is leaking.
c. The lid tightening force is insufficient.

[2] Key equipment used for check

Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a

  Remove dust and dirt from the flange contacting the seal gasket. Clean using xylene, etc. Clean the seal gasket in the same manner.

- Checking for possible cause b

  Remove the seal gasket and reinstall it in a different position. If odor still leaks, replace the gasket with a new one.

- Checking for possible cause c

  If the problem persists after replacing the seal gasket, remove the front panel, take out the hook catch, and remove one retort lid liner.

F-1 Bottle has swollen and cannot be set in the bottle rack.

- The reagent bottle has swollen and no longer fits the bottle rack.

[1] Possible cause
a. The reagent bottle has swollen.

[2] Key equipment used for check
None

[3] Cause identification and remedial action
- Checking for possible cause a
  Replace the reagent bottle with a new one.

F-2 Reagent leaks from the bottle.

- Reagent leaks from the reagent bottle.

[1] Possible cause
  a. The reagent bottle cap is loose.
  b. The reagent bottle cap seal is defective.

[2] Key equipment used for check
None

[3] Cause identification and remedial action

- Checking for possible cause a
  Firmly tighten the cap.

- Checking for possible cause b
  If the bottle still leaks after taking the remedial action for possible cause a, replace the gasket and seal in the cap.

G-1 Odor leaks from the system in operation.

- Reagent odor leaks from the system while operating.

[1] Possible cause

a. No activated carbon cartridge is set.
b. The activated carbon cartridge was set without unpacking it.
c. The activated carbon cartridge is not set properly.
d. The activated carbon cartridge has reached its life.
e. The fume fan stopped.
f. The inlet port on the system was blocked.
g. Each gasket in the fume unit deteriorated.
h. The outlet port was blocked.
i. The exhaust duct is not connected correctly.
j. The exhaust duct is too long.
k. The exhaust duct was crushed.
l. The exhaust system on the facility side is not operating.

[2] Key equipment used for check

None

[3] Cause identification and remedial action

- Checking for possible cause a
  Confirm that an activated carbon cartridge is set in the fume unit. If there is no activated carbon cartridge, set a cartridge.

- Checking for possible cause b
  If the cartridge is set without unpacking it, the exhaust capacity becomes significantly low. Visually confirm that the cartridge is unpacked, and set the cartridge again.

- Checking for possible cause c
  Confirm that the activated carbon cartridge is set correctly. If the cartridge is slanted, set it again.

- Checking for possible cause d
  Check the date/time the activated carbon cartridge was last replaced. If the activated carbon cartridge has expired, replace it with a new cartridge.

- Checking for possible cause e
  Refer to Error No. 91.

- Checking for possible cause f
  Check the inlet port of the fume unit for attachment of foreign matter. Remove foreign matter, if any.

- Checking for possible cause g
  Lightly press the gasket installed at the bottom of the fume unit door to confirm resistance. If no resistance is felt, the gasket has deteriorated. Remove the old gasket and attach a new gasket.

- Checking for possible cause h
  Check if the outlet port is blocked by other system, equipment, wall, etc. If the port is blocked, provide a sufficient clearance.

- Checking for possible cause i
  Confirm that the exhaust duct is firmly fitted into the duct connection adapter. If the duct is loose, tighten with a hose clamp, etc.

- Checking for possible cause j
  Check the length of the exhaust duct. The φ38 duct will generate a large pressure loss if its length becomes 5 m or more, in which case the exhaust air flow will drop. Change the ducting so that the length can be kept within 5 m.

- Checking for possible cause k
  Check if the exhaust duct is pinched and crushed by other system or equipment.

- Checking for possible cause l
  If the exhaust duct is connected to an exhaust system on the facility side, confirm that the exhaust system on the facility side is operating.

G-2 Odor leaks from the system when not in use.

- Reagent odor leaks from the system while its operation is stopped with reagent still remaining in the system.

[1] Possible cause
  a. The retort lid is open.
  b. The oven door is open.
  c. Reagent bottles are not set.

[2] Key equipment used for check
  None

[3] Cause identification and remedial action

- Checking for possible cause a.
  Check the condition of the retort lid. If open, close the lid.

- Checking for possible cause b
  Check the condition of the oven door. If open, close the door.

- Checking for possible cause c
  Install all reagent bottles regardless of whether or not the system is operating. Reagent odor in the system tends to leak from the empty bottle positions.

H-1 Paraffin overflowed.

- Paraffin overflowed from the paraffin container in the oven.

[1] Possible cause

a. Too much paraffin was charged.
b. Tissues, etc., that tend to cause transfer of paraffin residue were set.
c. The paraffin container was replenished while paraffin was still in the retort.
d. Tissues are cold and the paraffin process time is short.

[2] Key equipment used for check

None

[3] Cause identification and remedial action

- Checking for possible cause a

  Paraffin must be less than the upper level in the paraffin container.

- Checking for possible cause b

  Many cassettes containing biopsy sheets or other tissues that tend to cause transfer of paraffin residue were used.

- Checking for possible cause c

  Paraffin was added to the paraffin container at station 14 after the end of tissue processing, while paraffin was still in the retort.

- Checking for possible cause d

  At paraffin station 11, paraffin is input to the retort when the tissue and other loads are cold. Accordingly, the temperature may drop due to the tissues, etc., and paraffin may solidify in the retort. If the processing is completed while paraffin is solid, residual paraffin in the retort may be brought into the paraffin container at the next station. If the load is high, provide a sufficient process time at the first paraffin station.

H-2 Paraffin hardened in the oven.

- Paraffin solidified in the paraffin container inside the oven.

[1] Possible cause
a. The ambient operating temperature is too low.
b. The preset paraffin oven temperature is too low for the paraffin melting point.
c. A power failure occurred.
d. Solid paraffin was added.

[2] Key equipment used for check
None

[3] Cause identification and remedial action

- Checking for possible cause a
  Paraffin sometimes solidifies when the operating temperature of the system drops to 10°C or below. Do not install the system in a place where the operating temperature may drop to 10°C or below.

- Checking for possible cause b
  Since the paraffin melting point has a variation band, paraffin may solidify if the paraffin oven temperature is set exactly to the melting point.

- Checking for possible cause c
  If a power failure occurs, the heaters cannot be energized and thus paraffin may solidify during the power failure.

- Checking for possible cause d
  If solid paraffin is added to the paraffin container, temperature may drop to cause paraffin solidification in the container.

H-3 The front side gets dirty with paraffin.

- Paraffin overflows from the oven and dirties the front door of the bottle rack.

[1] Possible cause
  a. Paraffin spills when the paraffin container is inserted/removed.
  b. The paraffin container has too much paraffin.

[2] Key equipment used for check
  None

[3] Cause identification and remedial action
- Checking for possible cause a
  When inserting/removing the paraffin container, do so slowly to prevent spilling of paraffin. Wipe off spilled paraffin immediately.

- Checking for possible cause b
  If the paraffin container has too much paraffin, paraffin overflows during pumping-out. Adjust the amount of paraffin to the upper level in the paraffin container.

I-1 Door does not easily move or close.

- When the door is opened/closed, it does not move or close smoothly.

[1] Possible cause
  a. The door hinge is deformed/damaged.
  b. The door support is deformed/damaged.

[2] Key equipment used for check
  Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Visually check the operating part of the door hinge for pinching of foreign matter or deformed/damaged hinge. Replace the hinge if any abnormality is found.

- Checking for possible cause b
  If the door supports on the left and right sides of the oven door are deformed, the door may contact the exterior panels when opened/closed. If the door is deformed significantly, straighten the door.

I-2 Door cannot be opened and/or closed.

- The door would not open. The door would not close.

[1] Possible cause
a. Foreign matter is pinched.
b. The magnet catch is not adjusted properly or is damaged.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  If the door would not open from a closed state, foreign matter may be pinched. Open the door and check from the interior of the system.
  Also check the condition of the magnet catch and make adjustment.

- Checking for possible cause b
  If the installation position of the magnet catch is changed or the catch is deformed, the door may not close fully.
  Check the condition of the magnet catch and make adjustment. Replace the magnet catch if damaged, etc.

J-1 External alarms are not output.

[1] Possible cause
a. External alarms were not communicated due to an external wiring error.
b. External alarms are not output due to an interface board relay error.
c. External alarms are not output due to a CPU board error.
d. The connection harness is broken.

[2] Key equipment used for check
- Tester
- Harness with clip
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Start the check program and open the external alarm output screen. Check the electrical continuity of each alarm output using a tester.
  If the contacts open when ON and close when OFF, the problem in question is due to possible cause a.
  Check the cable connected to the external device.

- Checking for possible cause b
  Unplug the CN25 connector on the CPU board and measure the voltage between the applicable external alarm output pin and pin 26 (GND) on the board. If 24 V is output from the external alarm relay when an alarm is output, the problem in question is due to possible cause b. Replace the interface board.

- Checking for possible cause c
  If either a or c above is not the cause, replace the CPU board.

J-2 Rust was caused.

[1] Possible cause
   a. Corrosive reagent was used.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a.
  If very corrosive reagent is used, the retort, etc., may rust. Use only the permitted reagents. If any new reagent is to be used, check if the reagent can be used or submit an evaluation request beforehand to confirm feasibility before actually using the reagent.

J-3 Noises from the system became louder.

- Noises generated by each drive part became louder than before.

[1] Possible cause
  a. Rotating noise of the rotary valve
  b. Rotating noise of the gate valve
  c. Abnormal noise from the air pump

[2] Key equipment used for check
- Grease
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a and b
  Motor noise from the rotary valve or gate valve may increase when the axial torque increases. In this case, disassemble the valve, clean the parts, and apply new grease.

- Checking for possible cause c
  The air pump contains parts that generate various noises, such as the mechanism part of the motor shaft in the air pump, muffler, diaphragm, and lead valve. Noises generate easily when these parts come in contact with reagent. Accordingly, if fluid is collected at the front or back of the intake/discharge ports of the air pump, disassemble the diaphragm and remove the collected reagent. If mechanical contact noise generates, replace the air pump.

J-4 Hose cannot be connected.

- Reagent does not flow even when the connection hose is connected to the external drain/fill port.

[1] Possible cause

a. The coupler is faulty.

[2] Key equipment used for check

- Grease
- Disassembly/assembly tools

[3] Cause identification and remedial action

- Checking for possible cause a and b

  Movement of the fastening ball at the coupler may have become heavy, so apply grease in this area. If the hose still cannot be connected, replace the coupler.

J-5 Smoke came from the system.

[1] Possible cause
a. The primary power line was overheated and smoke generated from the vinyl wire.
b. Smoke generated due to a printed circuit board error.
c. Smoke generated due to a heater error.

[2] Key equipment used for check
- Disassembly/assembly tools

[3] Cause identification and remedial action
- Checking for possible cause a
  Remove all control boxes from the system. Check the connection parts of the noise filter, power switch and switching power for burned damage caused by abnormal heating due to loose terminals.
  If any burned area is found, the problem in question is due to possible cause a. Replace the burned harness.

- Checking for possible cause b
  Remove the printed circuit boards from the system and check for traces of smoke. If abnormal smell or burned damage is found, the problem in question is due to possible cause b. Replace the burned part.

- Checking for possible cause c
  Remove the heaters from the system and check for abnormality. If abnormal smell or burned damage is found, the problem in question is due to possible cause c. Replace the burned part.

J-6 Reagent or water was spilled inside the system.

[1] Possible cause

a. Human error

[2] Key equipment used for check

- Disassembly/assembly tools
- Insulation resistance tester

[3] Cause identification and remedial action

- Checking for possible cause a.

  Turn off the power and check the interior.

  If spilled reagent/water contacted the top of a control box, remove the control box and check for damage to the electrical parts. Also check the condition of the system base and if the base is wet, wipe with a cloth.

  If spilled reagent/water contacted the areas around drive parts at the back of the system, remove the back panel, check the interior and wipe any wet locations.

Note) In either case, wipe clean spilled water or reagent thoroughly. Wiping is sufficient for volatile reagents such as organic solvents. With water-soluble reagents, however, use a dry cloth, etc., and wipe clean the fluid fully. (Wiping alone may still cause rusting, so rewipe using a cloth that has been moistened with water and wrung tightly.)

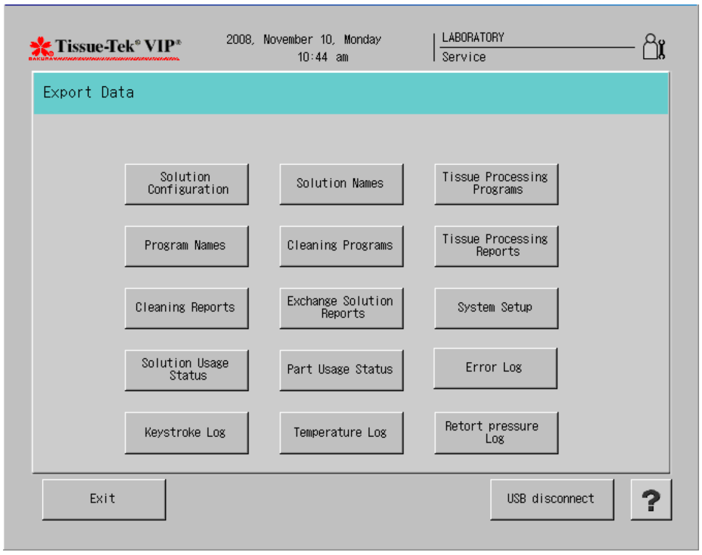
When the wiped area becomes completely dry, measure the insulation resistance. If no problem is found, turn on the power and perform operation check.

3-4 Maintenance Information

This system has Solution Usage, Parts Usage, Error Log, Keystroke Log, Temperature Log, and Retort Pressure Log as maintenance information. The information is outputted into the USB flush memory by export function and the contents can be confirmed in the computer. Moreover, the Parts Usage and Error Log also can be confirmed on the screen. For the Error Log, refer to the「3-2 Error information」.

3-4-1 Export Data Screen

Solution Usage, Parts Usage, Error Log, Keystroke Log, Temperature Log, Retort Pressure Log can be outputted into the USB flush memory as the report of text form on the Export Data Screen.



Screen3-4-1 Export Data screen

When exported the information, the output is performed with the following folder and file name of USB flush memory.

• File Name	¥EXPORT**¥xxxxxxxx¥yyyymmdd	
	**	: Last two-digit of year
	xxxxxxxx	: Serial Number（Eight-digit）
	yyyymmdd	: Year Month Day
• Solution Usage List	SUL*****.txt	（***** are the number of 00001～99999）
• Parts Usage List	PUL*****.txt	（***** are the number of 00001～99999）
• Error Log Report	ERR*****.txt	（*****are the number of 00001～99999）
• Keystroke Log Report	KEY*****.csv	（***** are the number of 00001～99999）
• Temperature Log Report	TMP*****.csv	（***** are the number of 00001～99999）
• Retort Pressure Log Report	PRS*****.csv	（***** are the number of 00001～99999）

3-4-2 Solution Usage List

Output the Solution Usage of the station performing the usage management.

```
-------------------------------- Solution Usage List -----------------------------------
                                                   Exported Date: yyyy-mm-dd hh:mm:ss
                                                    [1]

  Institution Name : cccccccccccccccccccccc [2]
  User Name        : cccccccccccccccccccccc [3]

  Sta. Solution                 Count   Set    Management  Update date       Schedule date
[4]---[5]----------------------[6]-----[7]----[8]---------[9]---------------[10]------------
    1  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
    2  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
    3  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
    4  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
    5  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
    6  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
    7  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
    8  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
    9  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
   10  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
   11  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
   12  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
   13  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
   14  cccccccccccccccccccccc   nnnn    nnnn   kkkkkkkkk   yyyy-mm-dd hh:mm  yyyy-mm-dd
   15  Wax Drain                --      --     --          --                --
   16  cccccccccccccccccccccc   nn      nn     kkkkkkkkk   yyyy-mm-dd hh:mm  --
   17  cccccccccccccccccccccc   nn      nn     kkkkkkkkk   yyyy-mm-dd hh:mm  --
   18  Drain/Fill Port          --      --     --          --                --
   19  cccccccccccccccccccccc   --      --     --          yyyy-mm-dd hh:mm  --
   20  cccccccccccccccccccccc   --      --     --          yyyy-mm-dd hh:mm  --
```

Fig.3-4-2 Solution Usage List

[1] Exported Date	: Display the date that performed the export
[2] Institution Name	: Display the institution name
[3] User Name	: Display the user name outputted the report
[4] Station	: Display the number of station
[5] Solution	: Display the solution name Display「Wax Drain」in 15th station Display「Drain/Fill Port」in 18th station
[6] Count	: Display the record during solution usage management Display「--」for the station not performing the solution usage management
[7] Set	: Display set number during solution usage management Display「--」for the station not performing the solution usage management

[8] Management : Display the type of solution usage management

OFF : No solution usage management

Runs : Manage the number of runs

Days : Manage the number of days

Cassettes : Manage the number of cassettes

[9] Update date : Display the date that performed the solution exchange/usage log reset

Display「--」for the station not performing the solution usage management

[10] Schedule date : Display solution exchange schedule during the management of the number of day.

Display「--」for the station not performing solution usage management or the station except the number of days management.

3-4-3 Parts Usage List

Output the parts usage performing the usage management.

```
----------------------------- Parts Usage List --------------------------------
                                                Exported Date[1]: yyyy-mm-dd hh:mm:ss

  Institution Name : cccccccccccccccccccccc[2]
  User Name        : cccccccccccccccccccccc[3]

  Parts                                     Unit     Setting  Actual
[4]--------------------------------------   -------- -------- -------
  Pump Diaphragm                        [5] Hour [6] nnnn [7] nnnn
  Rotary valve O ring                       Days       nnn      nnn
  Gate valve O ring                         Days       nnn      nnn
  Retort Gasket                             Days       nnn      nnn
```

Fig.3-4-3 Parts Usage List

[1] Exported Date : Display date that performed export

[2] Institution Name : Display the institution name

[3] User Name : Display user name that outputted report.

[4] Parts : Display parts name

Pump Diaphragm

Rotary valve O ring

Gate valve O ring

Retort Gasket

[5] Unit : Display time unit of management

Hour : Time unit

Days : Day unit

[6] Setting : Display the number of setting

[7] Actual : Display the record

3-4-4 Error Log Report

Output Error Log

```
-------------------------------------- Error Report ---------------------------------------
                                                          Exported Date: yyyy-mm-dd hh:mm:ss
                                                                        [1]
  Institution Name : cccccccccccccccccccccc [2]
  User Name        : cccccccccccccccccccccc [3]
  From             : yyyy-mm-dd hh:mm:ss [4]
  To               : yyyy-mm-dd hh:mm:ss [5]


                                                              Oven Temp.
  Code  Sta.  Date                   Retort       RV    GV    11    12    13    14    Top   Lid   St.16
[6]---- [7]-- [8]------------------ [9]----------[10]--[11]--[12]--[13]--[14]--[15]--[16]--[17]--[18]--[19]
   nn    nn    yyyy-mm-dd hh:mm:ss   nnC.   nnkPa  nnC.  nnC.  nnC.  nnC.  nnC.  nnC.  nnC.  nnC.  nnC.
   [20] cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc


                                                                                     [21]
                                                                          Total nnnn errors
                                                     [22]
--------------------- Serial Number and Software Version ---------------------

          Instrument Serial Number: XXXXXXXXXXXXXXXXXX [23]
          Main Software Version   : 070-900-XX [24]
```

Fig.3-4-4 Error Log Report

[1] Exported Date	: Display date that performed export
[2] Institution Name	: Display institution name
[3] User Name	: Display user name that outputted report
[4] From	: Display the occurrence date of the oldest error
[5] To	: Display the occurrence date of the latest error
[6] Code	: Display error number
[7] Sta.	: Display station number during occurrence of error
[8] Date	: Display occurrence date of error
[9][10] Retort	: Display the retort temperature (nnC.) and retort pressure (nnkPa) during occurrence of error
[11] RV	: Display rotary valve temperature (nnC.) during occurrence of error
[12] GV	: Display gate valve temperature (nnC.) during occurrence of error
[13] Oven Temp. 11	: Display the temperature (nnC.) of paraffin 11th station during occurrence of error.
[14] Oven Temp. 12	: Display the temperature (nnC.) of paraffin 12th station during occurrence of error.

[15] Oven Temp. 13 : Display the temperature (nnC.) of paraffin 13th station during occurrence of error.

[16] Oven Temp. 14 : Display the temperature (nnC.) of paraffin 14th station during occurrence of error.

[17] Oven Temp. Top : Display the temperature (nnC.) of oven top plate during occurrence of error.

[18] Lid : Display the temperature (nnC.) of retort lid during occurrence of error.

[19] St.16 : Display the temperature (nnC.) of clean xylene station during occurrence of error.

[20] Display the simple explanation of error.

Also display file name turned to error for the error 811 and 812.

[21] Total nnnn errors : Display the number of error registered (nnnn 1～1000)

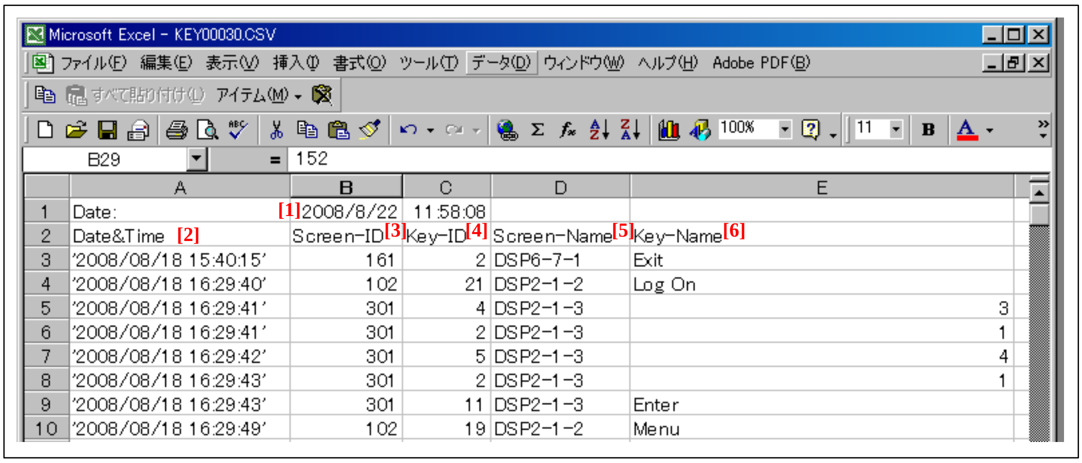
[22] Serial Number and Software Version : Display serial number of instrument and version of control software.

[23] Instrument Serial Number : Display serial number of instrument.

[24] Main Software Version : Display version of control software.

3-4-5 Keystroke Log Report

Output Keystroke Log



	A	B	C	D	E
1	Date: [1]	2008/8/22	11:58:08		
2	Date&Time [2]	Screen-ID[3]	Key-ID[4]	Screen-Name[5]	Key-Name[6]
3	'2008/08/18 15:40:15'	161	2	DSP6-7-1	Exit
4	'2008/08/18 16:29:40'	102	21	DSP2-1-2	Log On
5	'2008/08/18 16:29:41'	301	4	DSP2-1-3	3
6	'2008/08/18 16:29:41'	301	2	DSP2-1-3	1
7	'2008/08/18 16:29:42'	301	5	DSP2-1-3	4
8	'2008/08/18 16:29:43'	301	2	DSP2-1-3	1
9	'2008/08/18 16:29:43'	301	11	DSP2-1-3	Enter
10	'2008/08/18 16:29:49'	102	19	DSP2-1-2	Menu

Fig.3-4-5 Keystroke Log Report

[1] Date : Display the date that performed export.

[2] Date & Time : Display the date that keystroke was performed.

[3] Screen-ID : Display screen ID.

[4] Key-ID : Display Key ID.

[5] Screen-Name : Display screen name.

[6] Key-Name : Display key name.

Screen Name	Explanation
DSP2-1-2	System idle and no user logged on
DSP2-1-3	Enter Password Window
DSP2-1-5	Retort /Valve Heating Window Notice
DSP2-1-5-1	Check Paraffin Window
DSP2-1-5-2	Paraffin Status Notice Window
DSP2-2-1	Process Menu
DSP2-2-2	Progress Menu
DSP2-5-1	Processing Mode Selection
DSP2-5-1-1	Log Off Time Setting Window
DSP2-6-1	Reset Solution Usage Information
DSP2-6-2	Reset Solution Usage Confirmation Window
DSP2-7-1	Error Log
DSP2-7-1-1	Error Clear Confirmation Window
DSP2-7-2	Error Description
DSP2-7-2-1	Description Window
DSP2-8-1	Start Paraffin Melt
DSP2-8-2	Paraffin Melt
DSP2-9-1	Software Version and Serial Number Window
DSP2-10-1	Run History
DSP2-11-1	Exchange Solution Calendar
DSP2-12-1	Solution Configuration Selection
DSP2-12-1-1	Solution Configuration Setup Window
DSP2-12-2	View Solution Configuration
DSP3-1-1	System Setup
DSP3-1-1-1	Display Sleep Mode Timing Window
DSP3-1-2	Date and Time
DSP3-1-2-1	Year Input Window
DSP3-1-2-2	Hour Input Window
DSP3-1-2-3	Minute Input Window
DSP3-1-3	Password Setup
DSP3-1-4	Create User’s ID
DSP3-1-5	Password Setup
DSP3-1-6	Password Setup > Screen Access
DSP3-1-9	Create Institution Name
DSP3-1-10	Fume Filter Management
DSP3-1-10-1	Input Numerical Data Window
DSP3-1-10-2	Fume Filter Clear Confirmation Window
DSP3-1-11	Alarm Sound Selection
DSP3-1-11-1	Select Alarm Sound
DSP3-1-12	External Alarm Setup
DSP3-1-14	External Alarm and Signal Description
DSP3-2-1	Language Selection
DSP3-2-2	Notice Window
DSP3-3-1	Language Selection
DSP3-3-2	Export Data

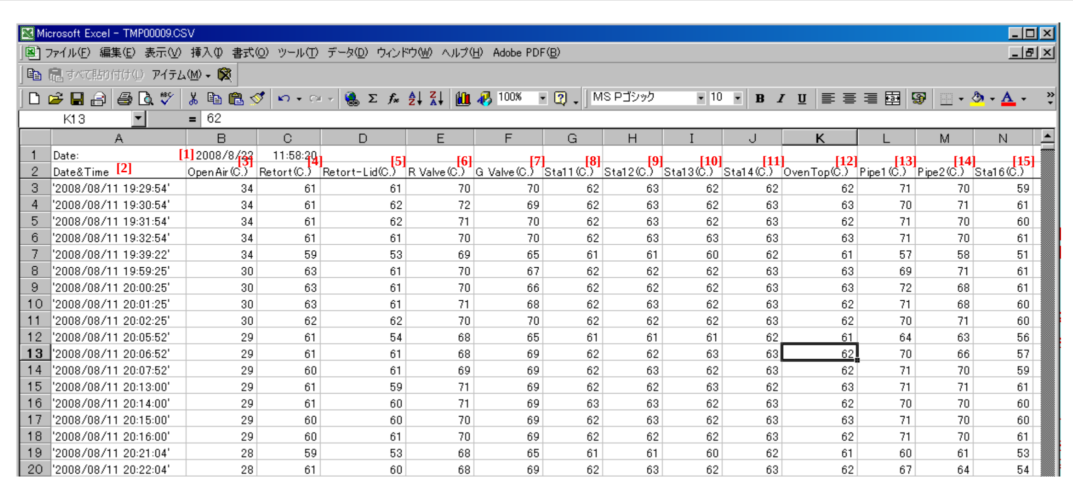
DSP3-3-3	Export Data
DSP3-3-4	Export Data
DSP3-3-5	Export Data
DSP3-3-6	External Output File Name Window
DSP3-3-7	Export Data
DSP3-4-1	Manual Operations
DSP3-4-1-1	Retort/Valve Level Sensor Heating Window
DSP3-4-2	Drain Retort
DSP3-5-1	Part Status
DSP3-5-1-1	Parts Status Confirmation Window
DSP4-1-1	Edit Solution Name
DSP4-1-1-1	Edit Solution Name Window
DSP4-1-2	Create Solution Name Screen
DSP4-2-1	Solution Configuration Setup
DSP4-2-1-1	Clean Xylene Input Temperature Window
DSP4-2-1-2	Oven Input Temperature
DSP4-2-1-3	Solution Group Confirmation Window
DSP4-2-1-4	Number of Stations
DSP4-2-2	Edit Solution Configuration
DSP4-2-2-1	Edit Solution Configuration Confirmation Window
DSP4-2-3	Edit Solution Configuration
DSP4-2-3-1	Input Limit Window
DSP4-2-3-2	Solution Configuration Change Window
DSP4-2-4	Edit Solution Group Name Screen
DSP4-2-5	Solution Configuration Station List
DSP4-2-7	Edit Solution Configuration
DSP4-2-8	Edit Solution Configuration Name
DSP4-2-9	Copy Solution Configuration
DSP4-3-1	Select Program
DSP4-3-1-1	Program Select Confirmation Window
DSP4-3-1-2	Program Select Caution Window
DSP4-3-2	Edit Program Name
DSP4-3-3	Edit Programs
DSP4-4-1	Cory Program
DSP4-5-1	Edit Program
DSP4-5-2-1	Input Times Window
DSP4-5-5-1	Input Temperature Window
DSP4-5-6	Input Predicted End Time
DSP4-5-6-1	Input Date Window
DSP4-5-7	Mixing Mode Section
DSP4-5-7-1	Detailed Setting Window
DSP4-5-7-2	Short Mixing
DSP4-6-1	Delete Data
DSP4-6-2	Delete Data
DSP4-6-3	Delete Data
DSP4-6-4	Delete Data confirmation
DSP4-6-5	Delete Data

DSP5-1-1	Start Tissue Processing
DSP5-1-1-1	Start Confirmation Delayed Start
DSP5-1-1-2	Bottle Check Confirmation Window
DSP5-1-1-3	Automatic Transfer Confirmation
DSP5-1-1-4	Wax Drain Container Confirmation
DSP5-1-1-5	Baskets Switches Confirmation Window
DSP5-1-1-6	Start Process Notice
DSP5-1-2	View Program
DSP5-1-4	Input Cassette Count
DSP5-1-4-1	Cassette Count Confirmation Window
DSP5-1-5	Input Experiment Number
DSP5-2-1	Tissue Processing
DSP5-2-2	Tissue Processing
DSP5-3-1-1	Protect Confirmation Window
DSP5-3-1-2	Tissue Processing Completed Notice Window
DSP5-3-1-3	Protect Notice Window
DSP5-3-5-1	Solution Manager Operation Window
DSP5-4-2	Tissue Processing Hold Screen
DSP5-4-2-1	Tissue Processing Abort Confirmation Window
DSP5-4-3	Baskets are Removed Window
DSP5-5-1	Tissue Processing (End)
DSP5-5-1-1	Drain Retort Window
DSP5-5-1-2	Drain Retort Abort Confirmation Window
DSP5-5-1-3	Automatic Transfer Window
DSP5-5-1-4	Automatic Transfer Abort Window
DSP5-5-1-5	Fill Paraffin 14 Station Window
DSP5-5-1-6	Automatic Transfer Performed Window
DSP6-1-1	Clean Retort Start
DSP6-1-1-1	Input Warm-up Time Window
DSP6-1-2	Edit Clean Programs
DSP6-1-2-1	Input Cycles Window
DSP6-1-3-1	Input Time Window
DSP6-1-4-1	Input Temperature Window
DSP6-1-5	Crate Clean Program Name Screen
DSP6-1-8	Clean Start Confirmation Window
DSP6-1-9	Clean Start Notice Window
DSP6-2-1	Clean Retort
DSP6-2-2	Clean Retort
DSP6-3-2-1	Warm Water Flush Preparation Confirmation Window
DSP6-5-1	Clean Retort Hold Screen
DSP6-5-4	Clean End Notice Window
DSP6-5-5	Clean Abort Confirmation Window
DSP6-6-1	Drying Cycle Monitor Screen
DSP6-7-1	Clean Retort End Screen
DSP7-1-1	Exchange Solution
DSP7-1-6	Exchange Start Confirmation Window
DSP7-1-7	Solution Configuration Station List

DSP7-1-8	Exchange Start Notice Window
DSP7-2-1	Solution Group Exchange(External fill)
DSP7-2-2	Solution Group Exchange(External fill)
DSP7-2-8-1	Wax Drain Container Confirmation
DSP7-2-10-1	Bulk Reservoir Fill Connection Confirmation Window
DSP7-2-11	Exchange Confirmation Window
DSP7-2-12	Fill Replenishment Confirmation Window
DSP7-2-13	Exchange End Notice Window
DSP7-3-1	Solution Group Exchange(Hold)
DSP7-3-6	Exchange Abort Confirmation Window
DSP7-4-1	Solution Group Exchange(End)
DSP8-1-1	Service Operation
DSP8-2-1	Manual Operations
DSP8-2-1-2	Manual Operations
DSP8-2-1-3	Change Station
DSP8-2-1-4	Heat Input Window
DSP8-3-1	Error Log
DSP8-3-1-1	Error Log Clear Confirmation Window
DSP8-4-1	Service Settings
DSP8-5-1	Reset Memory Confirmation Window
DSP8-5-1-1	Reset Memory Execution Confirmation Window
DSP8-6-1	Software/Data Update
DSP8-6-1-1	Software Update Confirmation Window
DSP8-6-1-2	Software Update Window
DSP8-6-1-3	Demand System Reset Window
DSP8-6-1-4	Completed Notice Window
DSP8-7-1	Part Status
DSP8-7-1-1	Input Data Window
DSP9-1-1	Error Window
DSP9-2-1	Warning Window
DSP9-2-2	Retort Lid Warning Window
DSP9-3-1	Caution
DSP9-5-1	Retort Fill Error
DSP9-6-1	Solution Exchange Notice
DSP9-7-1	Solution Excess Notice Window
DSP9-8-1	Power Outage Notice Window
DSP9-8-2	Power Outage Stop Notice Window
DSP9-8-3	Power Outage Restoration Window
DSP9-9-1	Paraffin Melt Caution Window
DSP9-10-1	Sensor abnormality window
HELP	HELP
KeyVoard	Keyboard
KeyVoardA	KeyboardA

3-4-6 Temperature Log Report

Output Temperature Log



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Date: [1]	2008/8/22	11:58:20											
2	Date&Time [2]	[3] OpenAir(C.)	[4] Retort(C.)	[5] Retort-Lid(C.)	[6] R Valve(C.)	[7] G Valve(C.)	[8] Sta11(C.)	[9] Sta12(C.)	[10] Sta13(C.)	[11] Sta14(C.)	[12] OvenTop(C.)	[13] Pipe1(C.)	[14] Pipe2(C.)	[15] Sta16(C.)
3	'2008/08/11 19:29:54'	34	61	61	70	70	62	63	62	62	62	71	70	59
4	'2008/08/11 19:30:54'	34	61	62	72	69	62	63	62	63	63	70	71	61
5	'2008/08/11 19:31:54'	34	61	62	71	70	62	63	62	63	62	71	70	60
6	'2008/08/11 19:32:54'	34	61	61	70	70	62	63	63	63	63	71	70	61
7	'2008/08/11 19:39:22'	34	59	53	69	65	61	61	60	62	61	57	58	51
8	'2008/08/11 19:59:25'	30	63	61	70	67	62	62	62	63	63	69	71	61
9	'2008/08/11 20:00:25'	30	63	61	70	66	62	62	62	63	63	72	68	61
10	'2008/08/11 20:01:25'	30	63	61	71	68	62	63	62	63	62	71	68	60
11	'2008/08/11 20:02:25'	30	62	62	70	70	62	62	62	63	62	70	71	60
12	'2008/08/11 20:05:52'	29	61	54	68	65	61	61	61	62	61	64	63	56
13	'2008/08/11 20:06:52'	29	61	61	68	69	62	62	63	63	62	70	66	57
14	'2008/08/11 20:07:52'	29	60	61	69	69	62	63	62	63	62	71	70	59
15	'2008/08/11 20:13:00'	29	61	59	71	69	62	62	63	62	63	71	71	61
16	'2008/08/11 20:14:00'	29	61	60	71	69	63	63	62	63	62	70	70	60
17	'2008/08/11 20:15:00'	29	60	60	70	69	62	63	62	63	63	71	70	60
18	'2008/08/11 20:16:00'	29	60	61	70	69	62	62	62	63	62	71	70	61
19	'2008/08/11 20:21:04'	28	59	53	68	65	61	61	60	62	61	60	61	53
20	'2008/08/11 20:22:04'	28	61	60	68	69	62	63	62	63	62	67	64	54

Fig.3-4-6 Temperature Log Report

[1] Date : Display the date that performed export.

[2] Date & Time : Display the date that temperature log was taken.

[3] OpenAir(C.) : Display outside temperature.

[4] Retort(C.) : Display retort temperature.

[5] Retort-Lid(C.) : Display retort lid temperature.

[6] R Valve(C.) : Display rotary valve temperature.

[7] G Valve(C.) : Display gate valve temperature.

[8] Sta11(C.) : Display temperature of paraffin 11th station.

[9] Sta12(C.) : Display temperature of paraffin 12th station.

[10] Sta13(C.) : Display temperature of paraffin 13th station.

[11] Sta14(C.) : Display temperature of paraffin 14th station.

[12] OvenTop(C.) :Display temperature of retort top plate

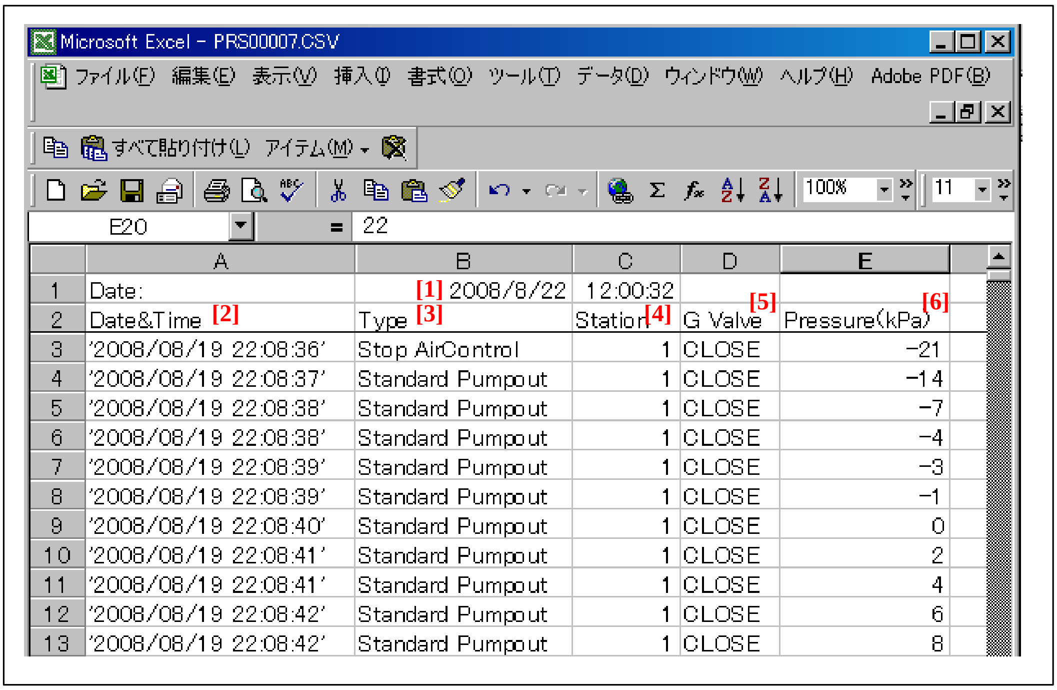
[13] Pipe1(C.) : Display temperature of common plumbing for fill

[14] Pipe2(C.) : Display temperature of common plumbing for drain

[15] Sta16(C.) : Display temperature of clean xylene station

3-4-7 Retort Pressure Log Report

Output Retort Pressure Log



	A	B	C	D	E
1	Date:	2008/8/22	12:00:32		
2	Date&Time	Type	Station	G Valve	Pressure(kPa)
3	'2008/08/19 22:08:36'	Stop AirControl	1	CLOSE	-21
4	'2008/08/19 22:08:37'	Standard Pumpout	1	CLOSE	-14
5	'2008/08/19 22:08:38'	Standard Pumpout	1	CLOSE	-7
6	'2008/08/19 22:08:38'	Standard Pumpout	1	CLOSE	-4
7	'2008/08/19 22:08:39'	Standard Pumpout	1	CLOSE	-3
8	'2008/08/19 22:08:39'	Standard Pumpout	1	CLOSE	-1
9	'2008/08/19 22:08:40'	Standard Pumpout	1	CLOSE	0
10	'2008/08/19 22:08:41'	Standard Pumpout	1	CLOSE	2
11	'2008/08/19 22:08:41'	Standard Pumpout	1	CLOSE	4
12	'2008/08/19 22:08:42'	Standard Pumpout	1	CLOSE	6
13	'2008/08/19 22:08:42'	Standard Pumpout	1	CLOSE	8

Fig.3-4-7 Retort Pressure Log Report

[1] Date : Display the date that the export was performed

[2] Date & Time : Display the date and time that retort pressure log was collected

[3] Type: Display the type of pressure control executed

Standard Pumpin	: Standard Pump-in
All Pumpin	: All Pump-in
Cont Pumpin	: Short Mixing Pump-in
Stop Pumpin	: Stop Pump-in
NoSensor Pumpin	: Standard pump-in without using level sensor
Standard Pumpout	: Standard Pump-out
Cont Pumpout	: Short Mixing Pump-out
Stop Pumpout	: Stop Pump-out
Natural Fall Pumpout	: Natural Fall Pump-out
P Cycle	: P Cycle
V Cycle	: V Cycle
Stop P/V Cycle	: Stop P/V Cycle
Pressure/Vacuum	: Manual Pressurization or Vacuum
Supply Bulk Tank	: Fill Bulk Reservoir
Stop Bulk Tank	: Stop Filling Bulk Reservoir
Drain Common	: Drain Common Plumbing

Stop Drain Common	: Stop Draining Common Plumbing
Drain Condenser	: Drain Condenser
Stop Drain Condenser	: Stop Draining Condenser
Check Bottle	: Execute Check Bottle Connection
Stop Check Bottle	: Stop Checking Bottle Connection
Manual Move GV	: Gate valve move during manual operation
Stop AirControl	: Stop Air Pressure Control

[4] Station : Display Station Number

[5] G Valve : Display Gate Valve Position

CLOSE	: Closed Position
FILL	: Upper Opening (Fill Port)
DRAIN	: Lower Opening (Drain Port)

[6] Pressure(kPa) : Display pressure value (kPa)

3-4-8 Part Status Screen

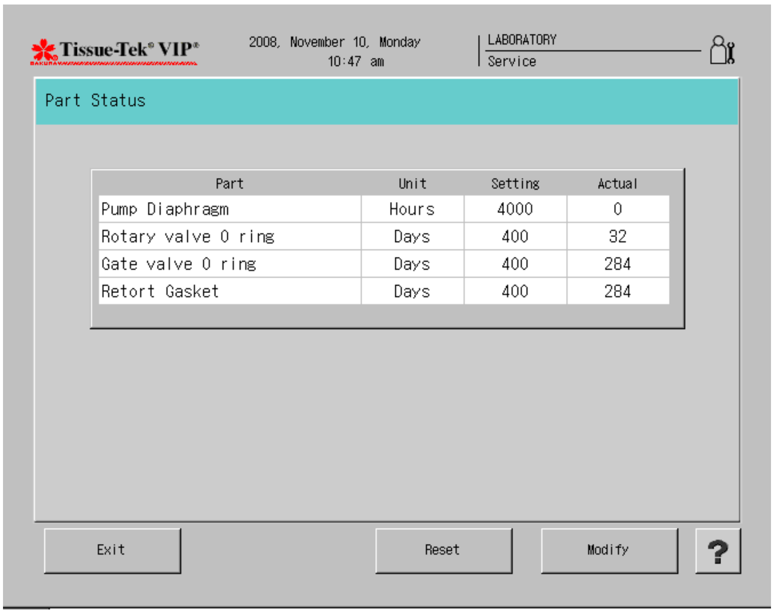
Display the status of following parts on Part Status Screen

·Pump Diaphragm

·Rotary valve O ring

·Gate valve O ring

·Retort Gasket ·



Screen3-4-8 Part Status Screen

To change the setting deadline, press display of setting deadline of parts to be changed. As pressing display of setting deadline allows touch of「setting deadline change」button, press「setting deadline change」button and then enter changed setting deadline.

To clear the usage status, press display of usage status of parts to be cleared. As pressing display of usage status allows touch of 「usage status clear」button, press「usage status clear」button to clear.

Chapter 4 Disassembly, Repair and Adjustment

4-1 Overview

This chapter explains how to disassemble, repair and assemble each location should the system experience a failure. If the system fails, follow the work flow shown below.

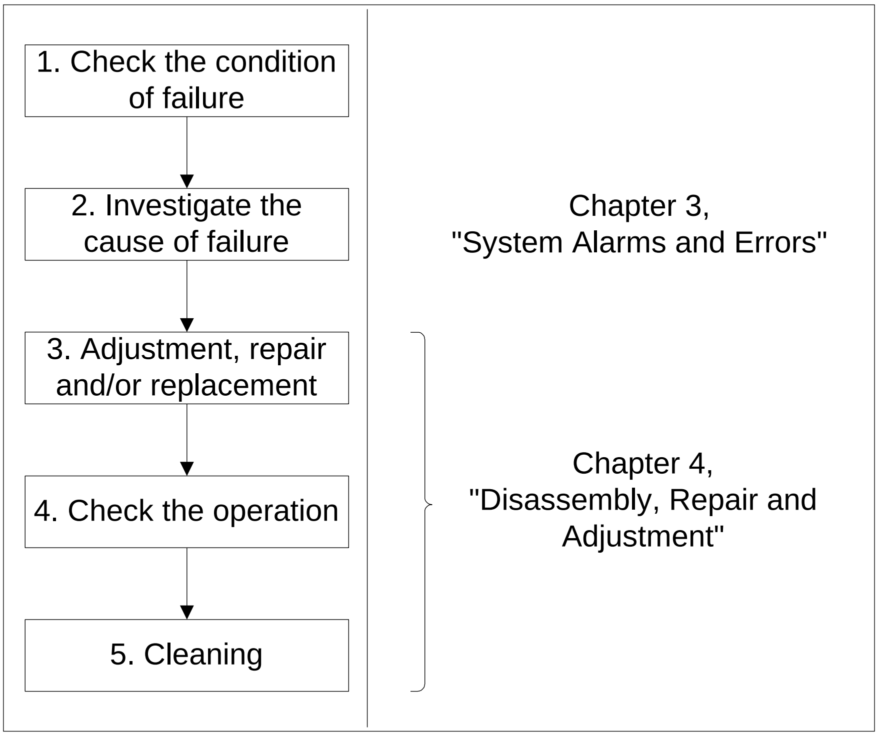


Fig. 4-1-1 Work Flow to Be Followed upon Occurrence of Failure

[1] Check the condition of the failure that occurred.

[2] Based on the condition of failure, investigate the cause of failure by following the troubleshooting procedure (refer to Chapter 3).

[3] Turn off the power and unplug the power cord set from the power outlet.

[4] If necessary, remove the paraffin containers, reagent bottles, condensate bottle, etc., from the system.

[5] Adjust, repair and/or replace each component by referring to this chapter.

[6] When the disassembled parts have been assembled, confirm that the system operates properly.

[7] Clean the system and surrounding areas.

The items to note when disassembling, repairing and adjusting the system are listed on the following page.

<Items to Note on Disassembly, Repair and Adjustment>

1) When disassembling or repairing the system, be sure to turn off the power. If necessary, record the condition of the tissue processing program and retorts (soiled by paraffin, containing reagent). Before the system is restarted, clean the retorts and drain reagent according to their condition.

2) The system houses live parts. Before disassembling the system, disconnect the power plug from the power outlet to prevent electric shock.

3) If the power must be turned on while any of the exterior panels, etc., is still removed for the purpose of adjustment, wear/use protective gears, etc., and exercise due caution to prevent electric shock.

4) Some parts of the system become very hot. When accessing these areas, wait until they cool down sufficiently or wear protective gears.

5) Before accessing rotating parts such as the rotary valve, be sure to disconnect the power plug from the power outlet and be careful not to get your fingers accidentally dragged into the rotating parts. When disassembling the rotary valve and/or gate valve, always confirm beforehand that the retort is empty and that the reagent level in the bulk reservoirs is lower than the valves. If necessary, drain the retort and/or bulk reservoirs in advance of disassembly.

6) After disassembling/assembling the retort unit, oven unit or control box of the system or replacing any of the heaters, power cord, switching power supply, noise filter or heater driver board, perform the insulation resistance test and grounding/continuity test to confirm electrical safety.

   * As for the grounding/continuity test, measure the resistances between the ground of the power plug and the hook on the retort lid, hinges on the reagent bottle rack door, top shelf of the bottle rack and sheet metal part of the front panel of the control panel (gap at the edge), and confirm that the measured resistances are 1 Ω or below. As for the insulation resistance test, measure the resistance between the grounding wire and other power wires with the power switch set to ON, using a 500VDC insulation resistance tester, to confirm that the measured resistance is 10M Ω or above.

7) Be sure to check the connection of the grounding wire of the power cord.

8) Do not access electronic components directly, because the components may be damaged by static electricity. If doing so is unavoidable, wear an antistatic wrist strap that a 1MΩ resistance is placed in.

9) The system contains reagents, so wear protective gears and exercise caution to prevent contact with or exposure to reagents when accessing each bottle, container, pipe or unit. Also, pay attention to the work environment and do not bring fire near the system. Also provide ventilation.

10) Be careful of injury or damage caused by falling heavy articles such as the control box, retort and oven.

11) After the assembly/adjustment, be sure to check the operation in the system test mode, etc.

12) The table below lists the standard screw tightening torques. (If any other torque is specified, follow the specified torque.)

Table 5-1 Standard Tightening Torques

Nominal diameter	Tightening torque (N•m)
M3	0.63
M4	1.5
M5	3.0
M6	5.2
M12	42

13) For the pan head screws, upset head bolts and hex head bolts assembled with a washer(s), the following combinations of parts may be used instead:
    Sems A: Screw (bolt) + Spring washer
    Sems B: Screw (bolt) + Spring washer + Flat washer

14) Tighten the union joints as follows according to the applicable tube size:
    ϕ6 --- Tighten the joint by hand and then turn it by a 5/6 turn using a wrench (width across flats: 14 mm) to firmly tighten the joint.
    ϕ8 --- Tighten the joint by hand and then turn it by a 5/6 turn using a wrench (width across flats: 17 mm) to firmly tighten the joint.

15) Wrap sealing tape by three times. (If other number of wraps is specified, follow the specified number.)

4-2 Retort Lid

4-2-1 Replacing the Retort Gasket

Tools required • Paper towel

<Note> Exercise due caution not to damage the gasket when it is inserted.

(1) Remove the old gasket from the groove.

(2) Thoroughly clean the inside of the gasket groove using alcohol or xylene.

(3) Check the gasket orientation.
(The wider side in cross-section view should face the bottom of the gasket groove.)

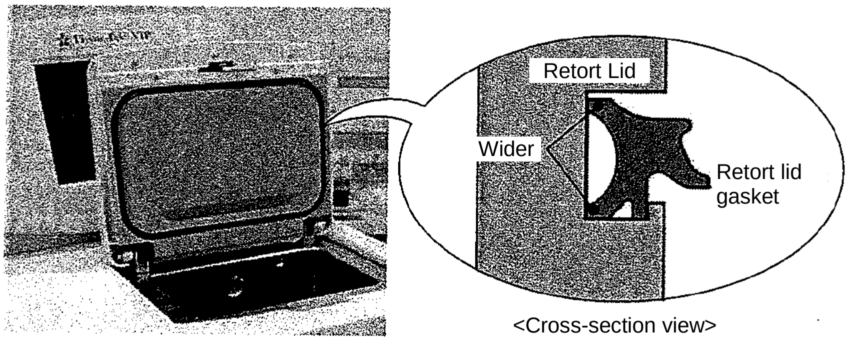


Fig. 4-2-1-1 Gasket orientation

(4) Install the new gasket.

A. Determine points **a** and **b** so that the right and left sides become uniform.
B. Insert points **a** and **b** into the gasket groove. (Insert the inner periphery first.)
C. Insert points **c** and **d** so that the top and bottom sides become uniform, and then insert the rest of the gasket toward the corners.

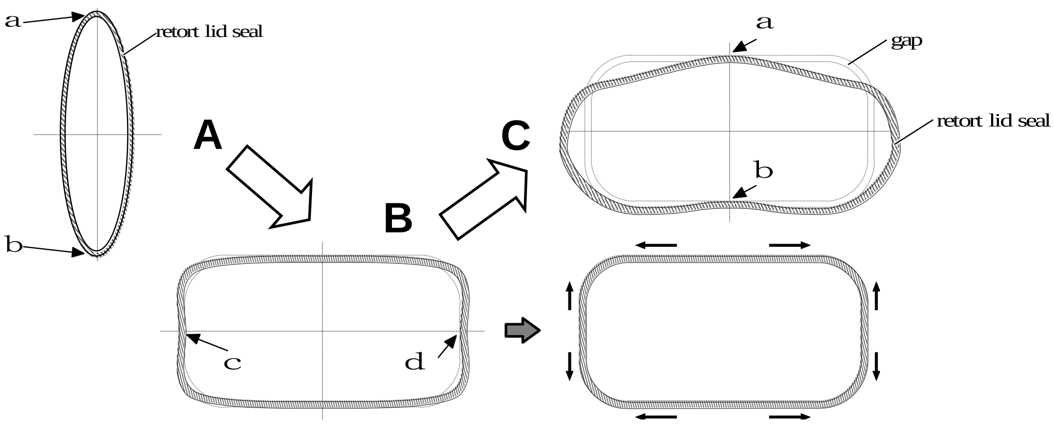


Fig. 4-2-1-2 Gasket Installation Procedure

(5) Pressurize and vacuum the retort by manual operation to confirm absence of leaks.

4-2-2 Adjusting the Retort Lid Hook

Tools required
- Phillips screwdrivers No. 1, No. 2
- Stubby screwdriver No. 2
- Hexagon key wrench, width across flats 5

(1) Open the retort lid.

(2) Remove the front panel.
Remove the screws shown below and then pull out the panel downward.

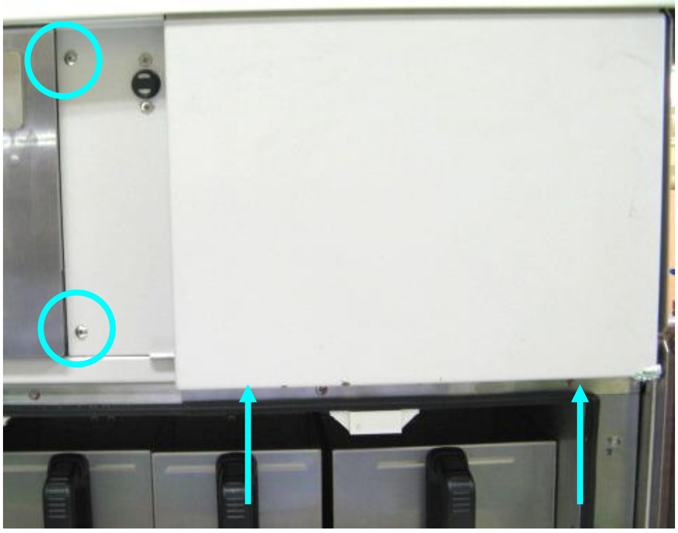


Fig. 4-2-2-1 Removal of Front Panel and Screw Positions

(3) Remove the hook catch and take out the retort lid liner.

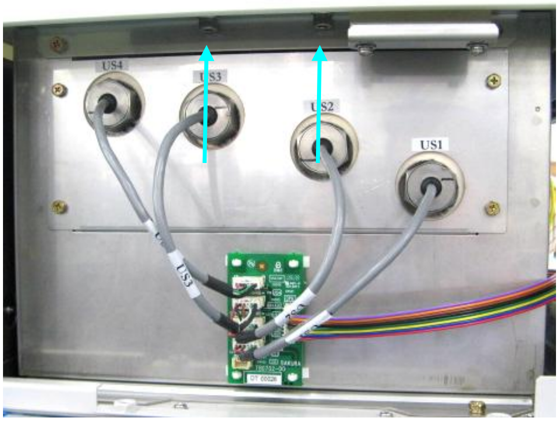


Fig. 4-2-2-2 Positions of Hook Catch Mounting Screws

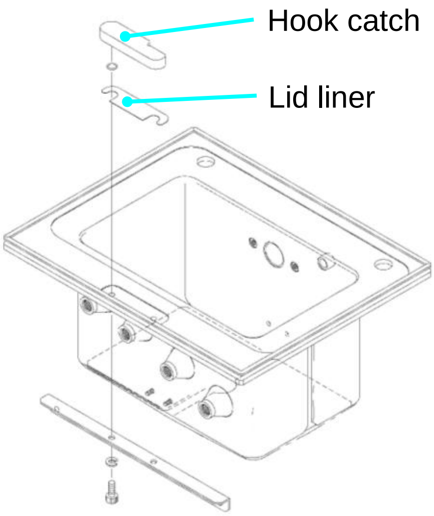


Fig. 4-2-2-3 Hook Catch and Lid Liner

(4) Assemble the parts by following steps (1) to (3) above in reverse.

* The lid gasket is pressed stronger due to removal of the lid liner (0.3mm thick).
* The lid lever feels a little bit heavier when operating.

(5) Pressurize and vacuum the retort by manual operation to confirm absence of leaks.

4-2-3 Replacing the Retort Lid Lever

Tools required
- Phillips screwdriver No. 2
- Slotted screwdriver

(1) Remove the retort lid lever.

1) Close the retort lid.
2) Remove the lever cap using a slotted screwdriver, etc. (See the figure below.)
   <Note> Do not damage the lever or cap.
3) Remove the lid lever mounting screws.
   Remove the lever mounting screw and lift the lever. (See the figure below.)

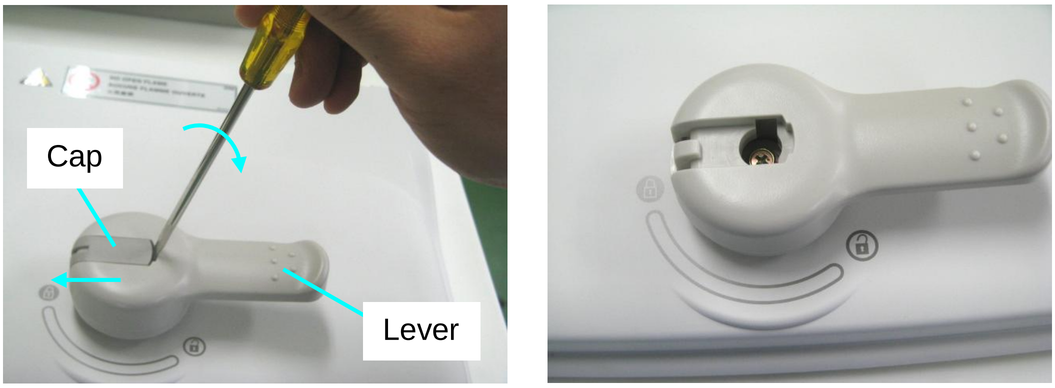


Fig. 4-2-3-1 Removal of Retort Lid Lever

* To remove the lid lever only, you may not refer to the steps (2) and (3) below.

(2) Remove the lever mounting from the lever. (Remove the screws shown below.)

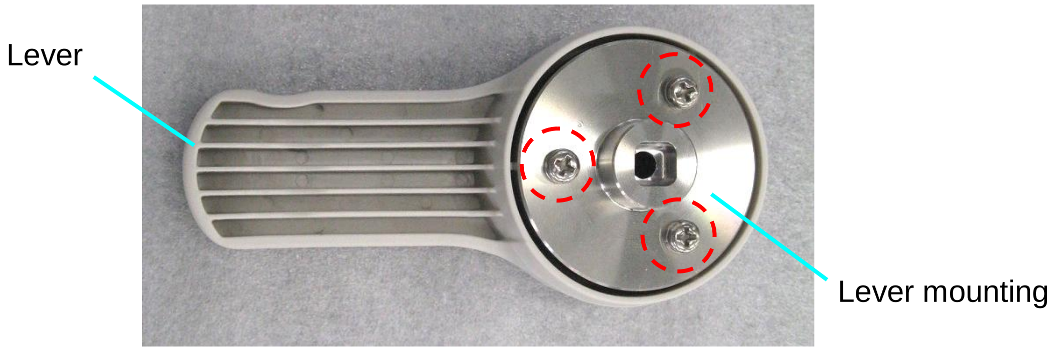
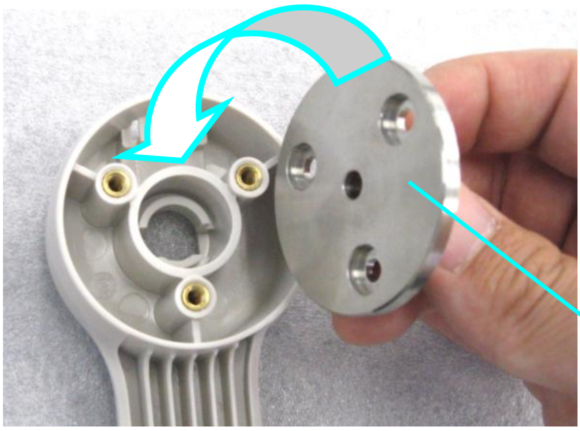
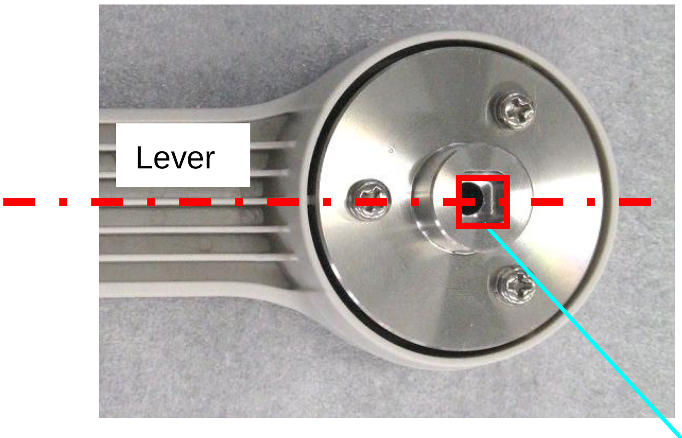


Fig. 4-2-3-2 Removal of Mounting for Retort Lid Lever

(3) Install the new retort lid lever.



Align the lever with the counterbored side.



This square hole must be vertical to the lever.

Fig. 4-2-3-3 Installation of Retort

(4) Install the lid lever cap.

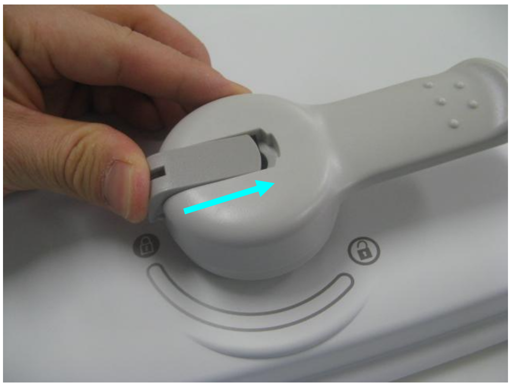


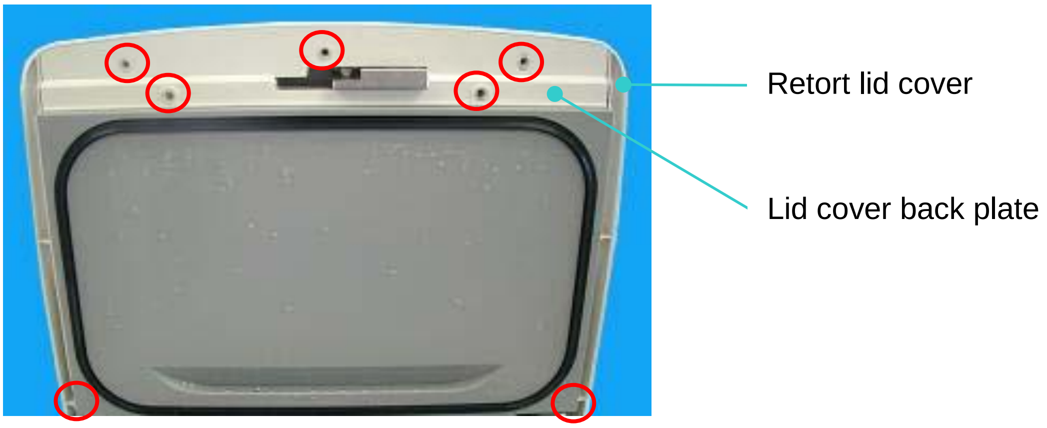
Fig. 4-2-3-4 Installation of Lid Lever Cap

4-2-4 Replacing the Retort Lid Cover

Tools required
- Phillips screwdrivers No. 1, No. 2
- Slotted screwdriver No. 2

(1) Remove the retort lid lever.
⇒ Refer to 4-2-3, "Replacing the Retort Lid Lever."

(2) Remove the retort lid cover.
1) Open the retort lid.
2) Remove the lid cover and remove the mounting screws from the cover back plate.
3) Remove the cover back plate.
4) Close the retort lid.
Loosely install the lever removed earlier, and then close the lid.
5) Remove the lid cover.
Remove the lid cover by pressing the cover toward the back.



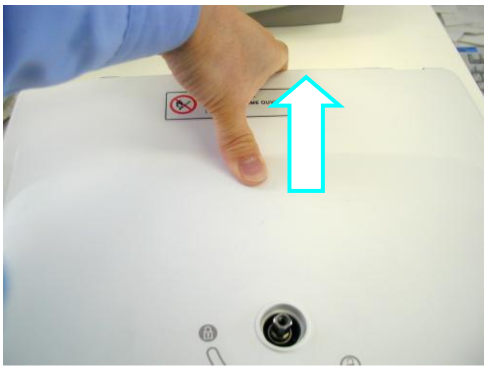


Fig. 4-2-4-1 Removal of Retort Lid Cover

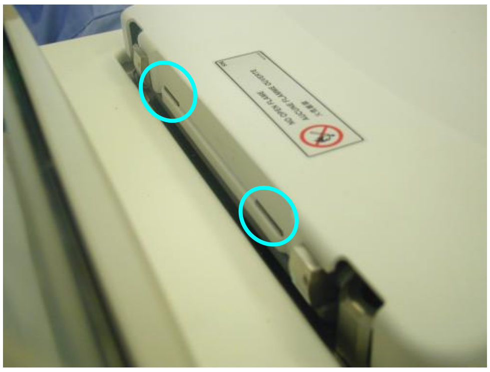
(3) Install the retort lid cover.

1) Close the retort lid.

2) To install the lid cover, align the square hole at the back of the cover and slide the cover toward you while pressing it from above.

* If the cover has been inserted correctly, the center of the cover will not depress when pressed from above.

3) Open the retort lid, install the cover back plate, and then tighten the mounting screws.



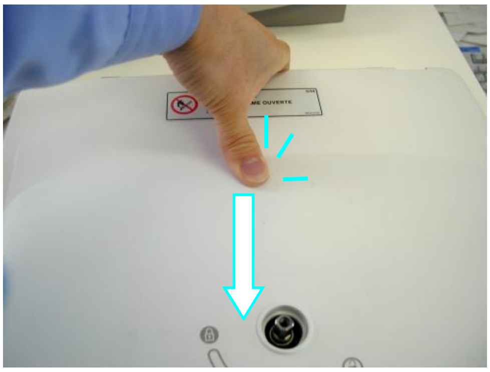


Fig. 4-2-4-2 Installation of Retort Lid Cover

(4) Install the retort lid lever and cap.

⇒ Refer to 4-2-3, "Replacing the Retort Lid Lever."

4-2-5 Replacing the Hinge Spring

Tools required
- Phillips screwdrivers No. 1, No. 2
- Slotted screwdriver No. 2
- Water pump pliers

(1) Remove the retort lid lever.
⇒ Refer to 4-2-3, “Replacing the Retort Lid Lever.”

(2) Remove the retort lid cover.
⇒ Refer to 4-2-4, “Replacing the Retort Lid Cover.”

(3) Remove the hinge spring.
1) Remove the E ring, using a slotted screwdriver (with the retort lid open).
2) Draw the spring from the spring guide.
3) Draw the end of spring from the hinge spring support.

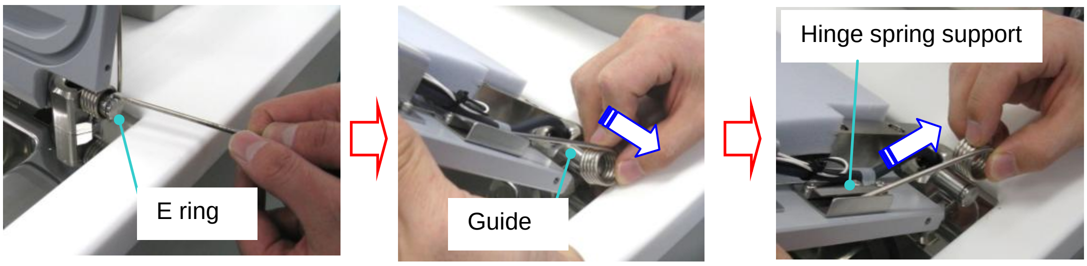


Fig. 4-2-5-2 Removal of Hinge Spring

(4) Install the new hinge spring.
1) Apply grease on the inner side of the spring and also on the spring guide.
2) Install the spring.
1. Insert the end of spring into the hinge spring support.
2. Put the spring on the spring guide.
3. Insert the hooking part of spring into a guide of the groove on the column support.
4. Fit the E ring into the groove.

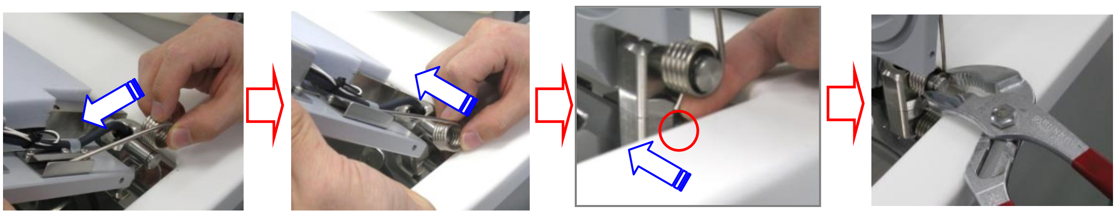


Fig. 4-2-5-3 Installation of Hinge Spring

3) After the spring has been installed, move the retort up and down several times by hand to confirm absence of abnormal noise.

(5) Install the retort lid cover.
⇒ Refer to 4-2-4, “Replacing the Retort Lid Cover.”

(6) Install the retort lid lever and cap.
⇒ Refer to 4-2-3, “Replacing the Retort Lid Lever.”

4-2-6 Replacing the Lid Heater

Tools required
- Phillips screwdrivers No. 1, No. 2
- Slotted screwdriver No. 2

(1) Remove the retort lid lever.
⇒ Refer to 4-2-3, “Replacing the Retort Lid Lever.”

(2) Remove the retort lid cover.
⇒ Refer to 4-2-4, “Replacing the Retort Lid Cover.”

(3) Remove the lid cover support and heat insulation.

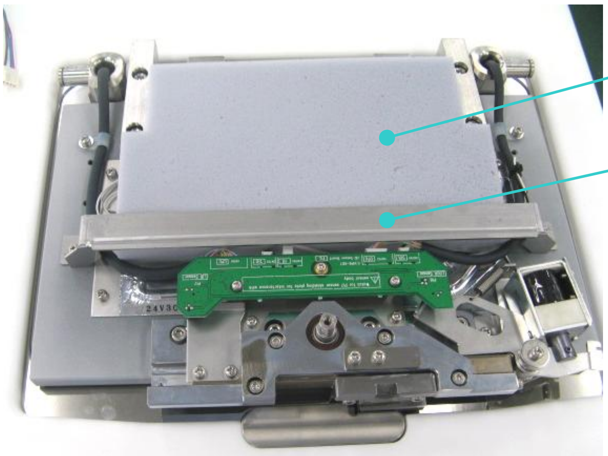


Fig. 4-2-6-1 Lid Cover Support and Heat Insulator

(4) Remove the temperature sensor (thermistor) and lid heater (aluminum foil heater).
First disconnect each connector from the lid sensor board, and then remove four lock screws.
* Keep the release button pressed when disconnecting the connector from the board.

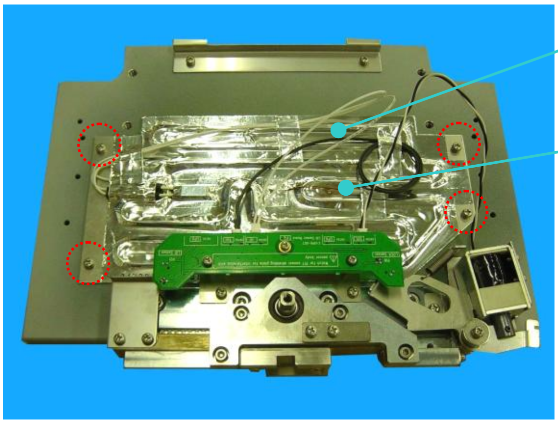


Fig. 4-2-6-2 Temperature Sensor and Lid Heater

(5) Install the new heater.

1) Install the heater using lock screws.
2) Install the temperature sensor on the heater.
   Position the sensor at the center of the heater and secure it with aluminum foil tape.
3) Connect the connectors for the heater and temperature sensor to the board.

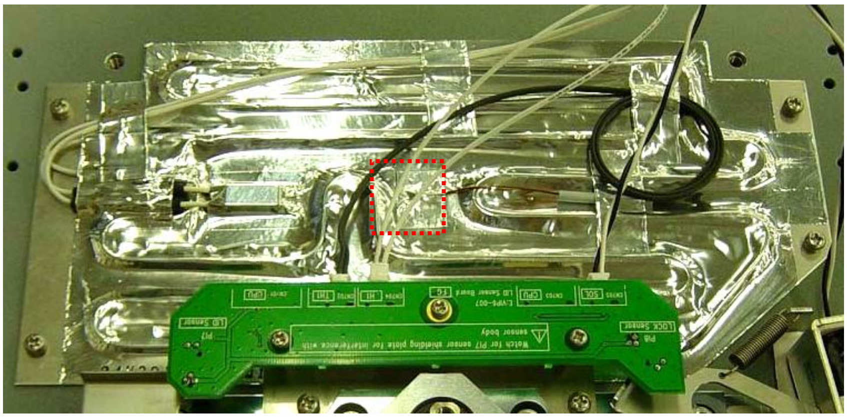


Fig. 4-2-6-3 Installation Position of Temperature Sensor

(6) Check the operation of the heater and temperature sensor in the manual operation mode.

(7) Install the retort lid cover.

⇒ Refer to 4-2-4, “Replacing the Retort Lid Cover.”

(8) Install the retort lid lever and cap.

⇒ Refer to 4-2-3, “Replacing the Retort Lid Lever.”

4-2-7 Replacing the Lid Sensor Board

Tools required
- Phillips screwdriver No. 2
- Slotted screwdriver No. 2

(1) Remove the retort lid lever.

⇒ Refer to 4-2-3, "Replacing the Retort Lid Lever."

(2) Remove the retort lid cover.

⇒ Refer to 4-2-4, "Replacing the Retort Lid Cover."

(3) Remove the lid senor board and replace it with new one.

Remove the lid cover support, unplug the connectors, and then remove three screws that hold the lid sensor board in place.

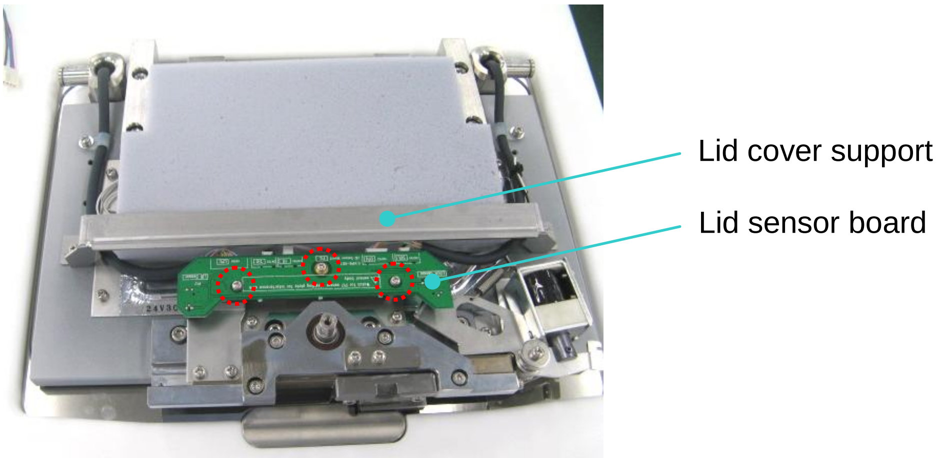


Fig. 4-2-7-1 Removal of Lid PC Board

(4) Attach the lid lever, and slowly move the rack to the position that it has contact with the lock lever (refer to Fig. 4-2-7-2).
* When moving the rack, prevent the lid close position plate from interfering with the lid close sensor on the lid sensor board.

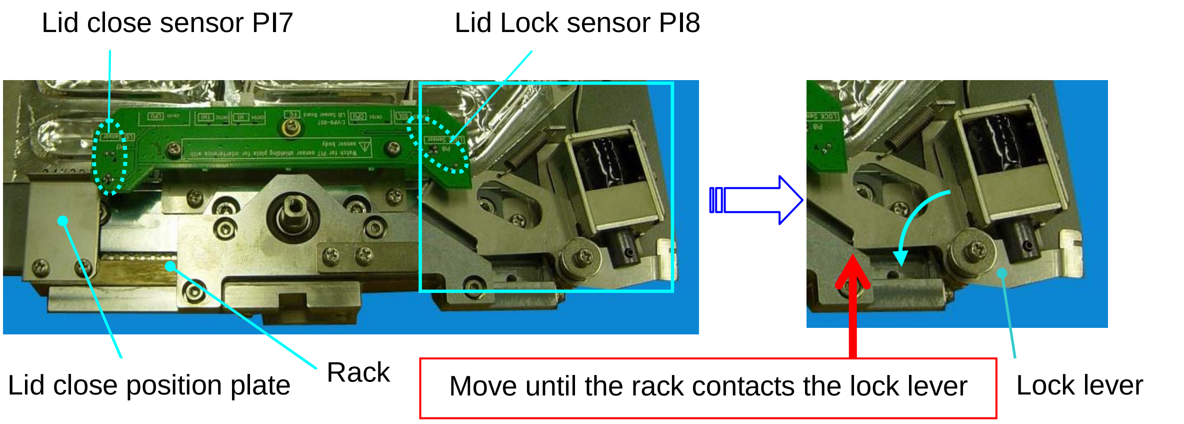


Fig.4-2-7-2 Positioning of lid close position

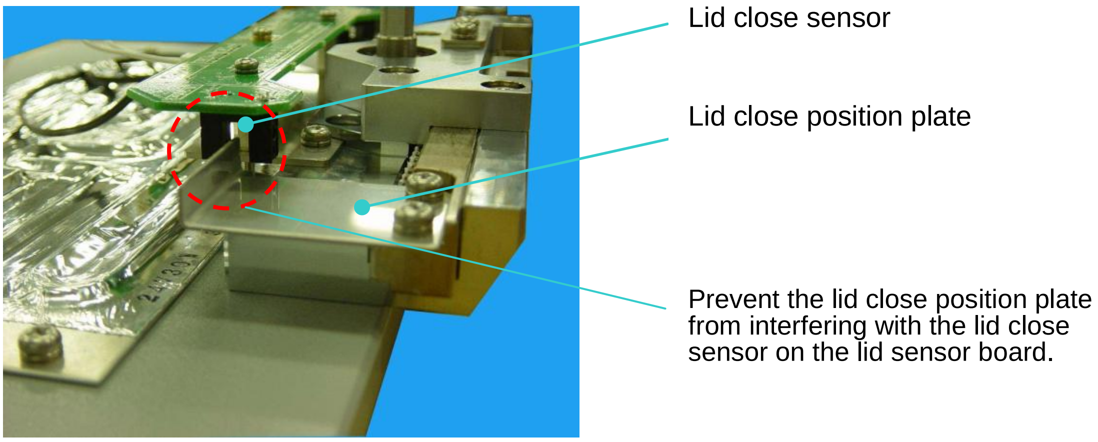


Fig.4-2-7-3 Confirmation of position of lid sensor board and lid close position plate

(5) Start the manual operation mode to position the lid close position plate.

Adjust the position of the lid close position plate while watching the lid close and lid lock indicators on the detailed monitor screen under the service manual operations (accessible only in the service operation mode).

Once the position is achieved where the lid closed sensor (Lid close) turns ON (illuminates in red), tighten the screws.

Fig.4-2-7-4 Detailed monitor screen under service manual operations

(6) Install the retort lid cover.

⇒ Refer to 4-2-4, "Replacing the Retort Lid Cover."

(7) Install the retort lid lever and cap.

⇒ Refer to 4-2-3, "Replacing the Retort Lid Lever."

4-2-8 Replacing the Solenoid

Tools required
- Phillips screwdrivers No. 1, No. 2
- Slotted screwdriver No. 2
- Long-nose pliers

(1) Remove the retort lid lever.

⇒ Refer to 4-2-3, “Replacing the Retort Lid Lever.”

(2) Remove the retort lid cover.

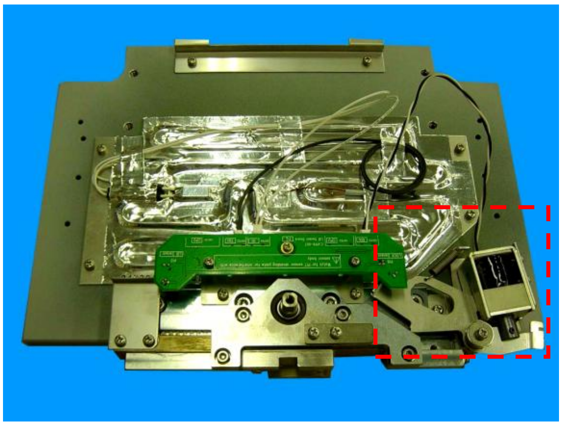
⇒ Refer to 4-2-4, “Replacing the Retort Lid Cover.”

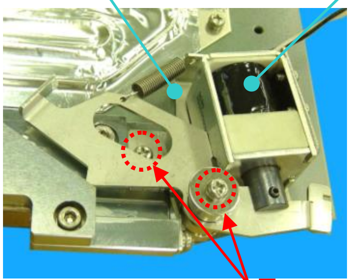
(3) Remove the solenoid.

Remove the lid cover support and heat insulation in order. Disconnect the connector for the solenoid from the lid sensor board.

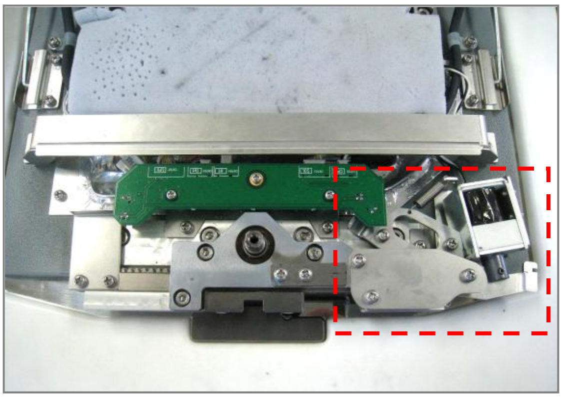
Remove the solenoid together with the solenoid housing (by removing two screws shown below).

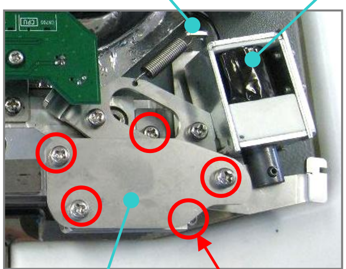
* When the lock lever clamping plate is provided, remove the plate first (see Fig. 4-2-8-1.)





<Up to the production in Feb. 2009>





<From the production in Mar. 2009>

Fig. 4-2-8-1 Removal of solenoid housing

(4) Remove screws from the solenoid housing to take out the solenoid.

1) Remove the spring, lock lever and solenoid mounting screws.
(See the figure below.)

2) Release the solenoid from the catch of the lock lever.

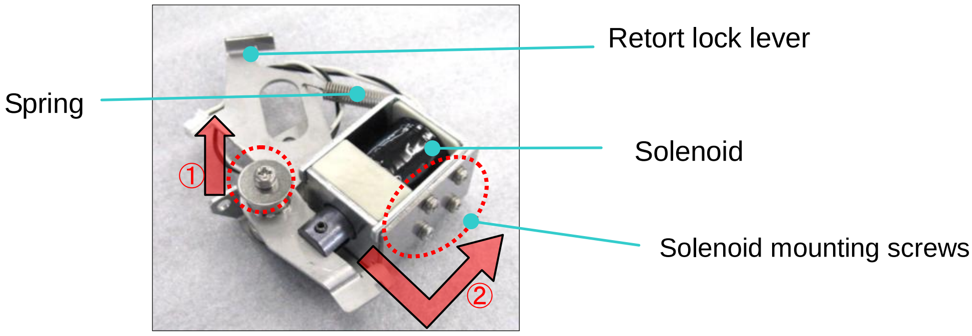


Fig. 4-2-8-2 Removal of Solenoid

(5) Install the new solenoid by following steps (1) to (4) above in reverse.

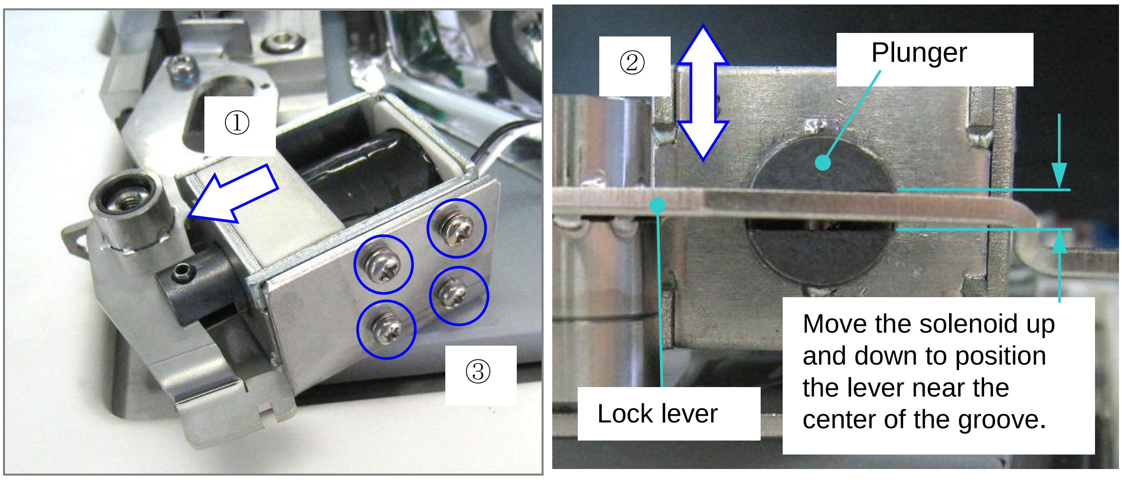


Fig. 4-2-8-3 Installation of solenoid

* Apply Loctite 242 to mounting screws for the lock lever clamping plate (Fig. 4-2-8-1).

(7) Operate (lock / unlock) the solenoid in the manual operation mode to confirm absence of abnormal operation.

(8) Install the retort lid cover.

⇒ Refer to 4-2-4, “Replacing the Retort Lid Cover.”

(9) Install the retort lid lever and cap.

⇒ Refer to 4-2-3, “Replacing the Retort Lid Lever.”

* Section 4-2-9 deleted.

4-2-10 Maintaining the Latch and Replacing the Latch Collar

Tools required

- Phillips screwdrivers No. 1, No. 2
- Slotted screwdriver No. 2
- Hexagon key wrench, width across flats 4
- Grease (Sealub S-11)
- Screw lock glue (Loctite 242)

(1) Remove the retort lid lever.

⇒ Refer to 4-2-3, "Replacing the Retort Lid Lever."

(2) Remove the retort lid cover.

⇒ Refer to 4-2-4, "Replacing the Retort Lid Cover."

(3) Disassemble the latch.

1) Remove the lid close position plate.

* When removing the plate, be careful not to damage the lid sensor board.

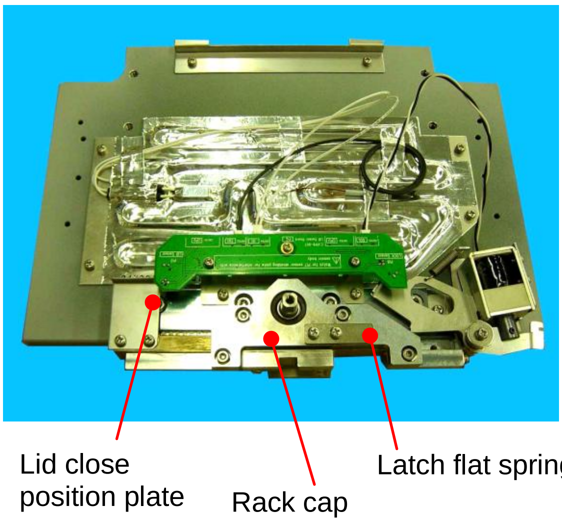
2) Remove the latch flat springs.

3) Remove the rack cap.

* For the units produced in and after April 2009 or having similar mechanism (see Fig. 4-2-10-4), remove the lock lever clamping plate before moving the rack cap.

* When lifting the rack cap, be careful not to lose the latch collar and steel ball (refer to Fig. 4-2-10-4).

<Up to the production in March 2009>



<From the production in April 2009>

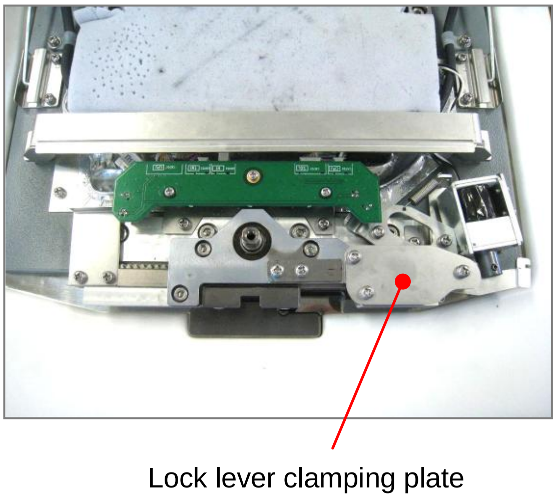


Fig. 4-2-10-1 Disassembly of Latch

(4) Using a paper towel, thoroughly remove the grease attached on the rack, pinion meshing joint, and rack/hook slide surfaces.

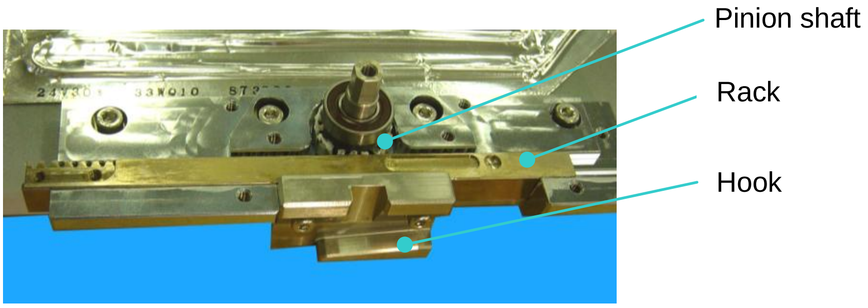


Fig. 4-2-10-2 Disassembly of Latch

(5) Apply grease (Sealub S-11) on each area of the latch (in a thin layer to allow the surface to show).

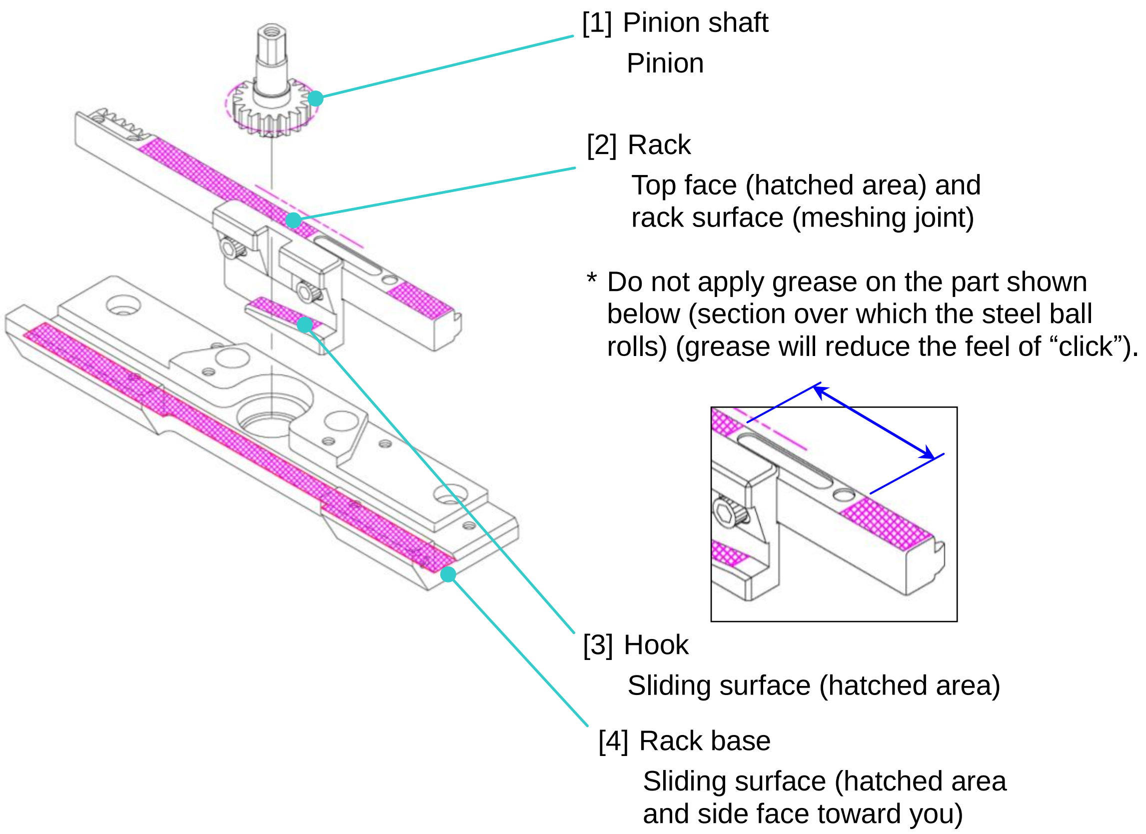


Fig. 4-2-10-3 Greasing Locations

(6) Assemble the latch by following the disassembly procedure in step (3) above in reverse.
* When replacing the latch collar, assemble the new collar.
* Apply Loctite 242 to fixing screws before installing the lock lever clamping plate (see Fig. 4-2-10-1).

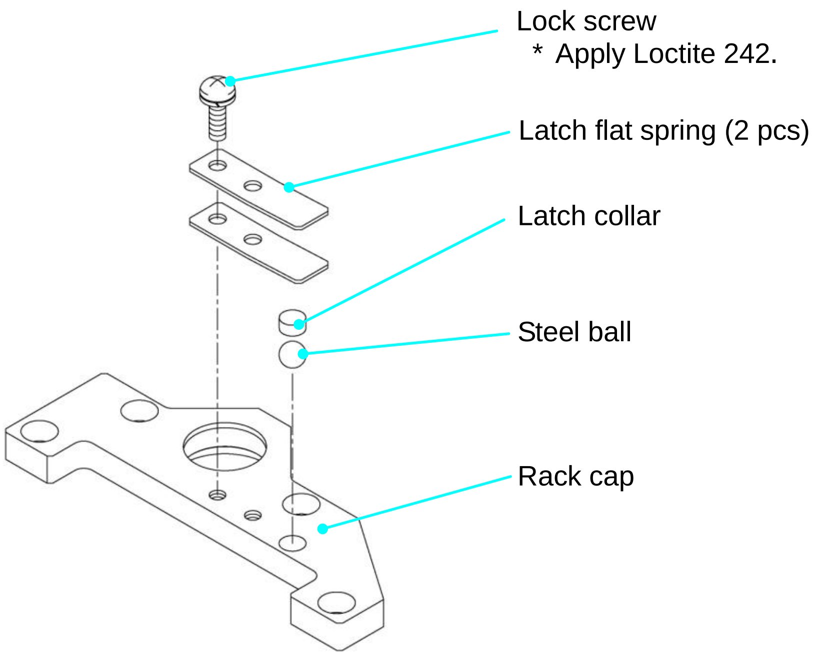


Fig. 4-2-10-4 Flat Spring and Surrounding Area

(7) Loosely install the lid lever on the latch and move the lever to the right and left to break in the sliding section.

(8) Operate the solenoid in the manual operation mode to confirm absence of abnormal operation.

(9) Install the retort lid cover.
⇒ Refer to 4-2-4, "Replacing the Retort Lid Cover."

(10) Install the retort lid lever and cap.
⇒ Refer to 4-2-3, "Replacing the Retort Lid Lever."

4-3 Retort

4-3-1 Replacing the Ultrasonic Sensor

Tools required
- Phillips screwdriver No. 2
- Stubby screwdriver No. 2
- Wrench, width across flats 26 (or monkey wrench)
- Valqua sealing tape (8 mm)

(1) Remove the front panel.

Remove the screws shown below and then pull out the panel downward.

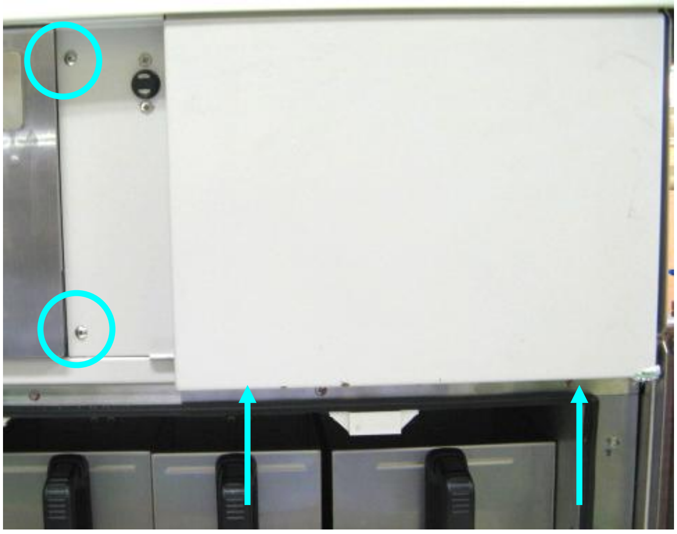


Fig.4-3-1-1 Removal of front panel and screw locations

(2) Remove the connector for the ultrasonic sensor to be replaced, and then loosen the sensor screw to remove.

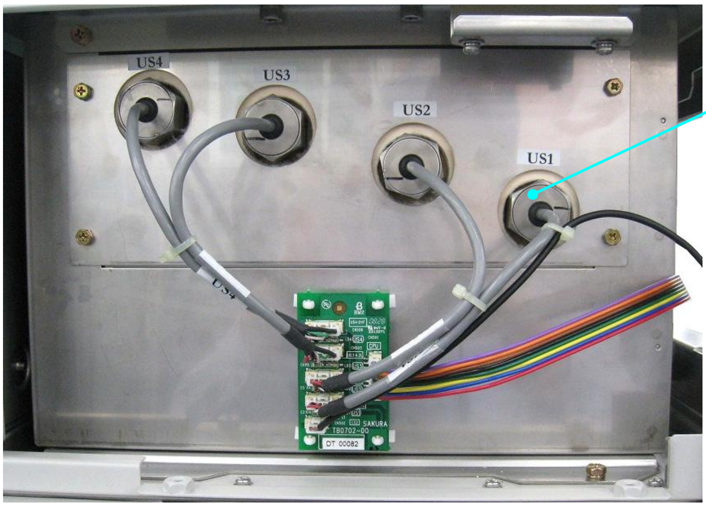


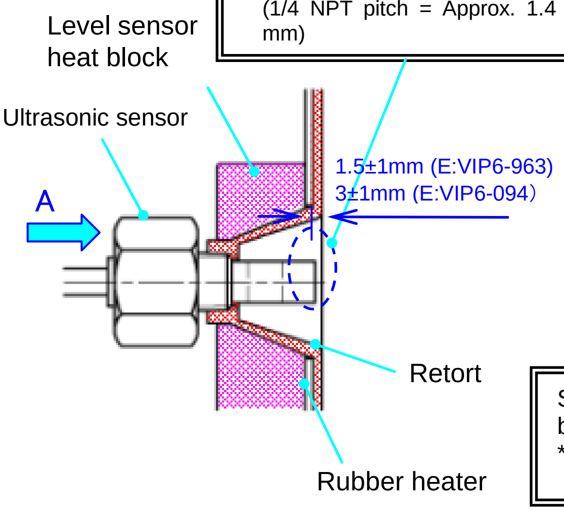
Fig.4-3-1-2 Ultrasonic sensor

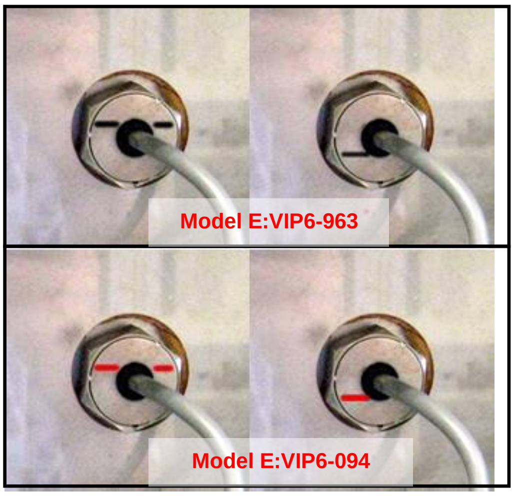
(3) Wrap sealing tape around the new ultrasonic sensor (by four to five times).

The service part for ultrasonic sensors is different depending on the serial number of the instrument. For detailed information, see NOTE on the next page.

(4) Install the ultrasonic sensor on the retort.

The sensor probe must not project from the retort wall.
* Reference
Screw-in amount per each half-turn = Approx. 0.7 mm
(1/4 NPT pitch = Approx. 1.4 mm)





Secure the sensor with the line marked on it being horizontal.
* Note: The cutout on the probe is vertical.

View from the side face of the retort | **View from “A” direction**

Sensor tightening amount | **Sensor orientation**

Fig.4-3-1-3 Installation of ultrasonic sensor

(5) Connect the connector of the new ultrasonic sensor to the connector assigned on the ultrasonic sensor board.

(6) Check the sensor operation using the check program.

1) Perform the leakage test for the retort and air line to confirm absence of abnormality.
2) Supply reagent to the retort by manual operation to confirm that the sensor actuates. However, when checking the overflow sensor (US4), directly pour water or reagent in the retort.
3) Confirm that the sensor works properly in a heated condition.

(7) Attach the front panel.

NOTE: The type of the ultrasonic sensors used on the instrument is different, depending on the serial number, as shown below. At replacement, make sure to cross-reference the type of ultrasonic sensors to be used for service with the applicable serial numbers.
As shown in step (4) above, the horizontal line to level the sensor is marked in a different color, according to the type of ultrasonic sensor. Basically, the sensor should be replaced with the one marked in the same color.

Table.4-3-1-1 Corss-reference table for ultrasonic sensors

Ultrasonic Sensor Unit	Marking Color	Serial Number		
		VIP6-A1	VIP6-J0	VIP6-E2
E:VIP6-963	Black	60300051 - 60300157	60310051 - 6030069	60320051 - 60320110
E:VIP6-094	Red	60300158 -	60310070 -	60320111 -

4-3-2 Replacing the Ultrasonic Sensor Board

Tools required
- Phillips screwdriver No. 2
- Stubby screwdriver No. 2
- Needle nose pliers

(1) Remove the front panel.

Remove the screws shown below and then pull out the panel downward.

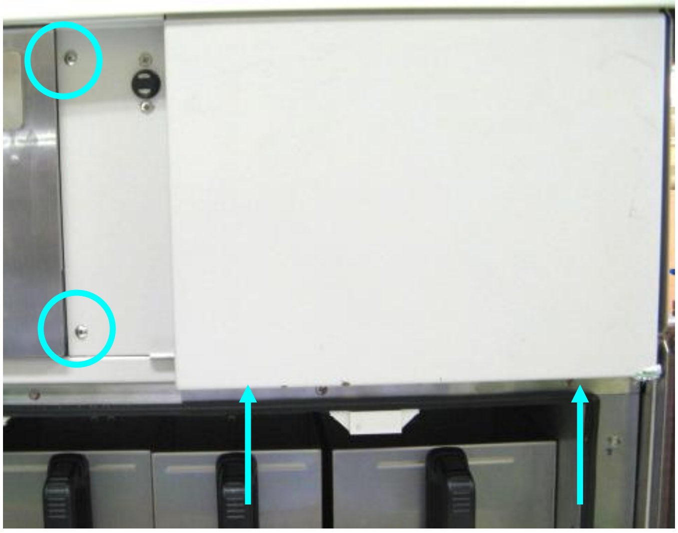


Fig.4-3-2-1 Removal of front panel and screw locations

(2) Remove connectors for ultrasonic sensors and oven door sensor from the ultrasonic sensor (US) board.

Remove the US board by pulling out each spacer while softly gripping the spacer head with needle nose pliers, etc.

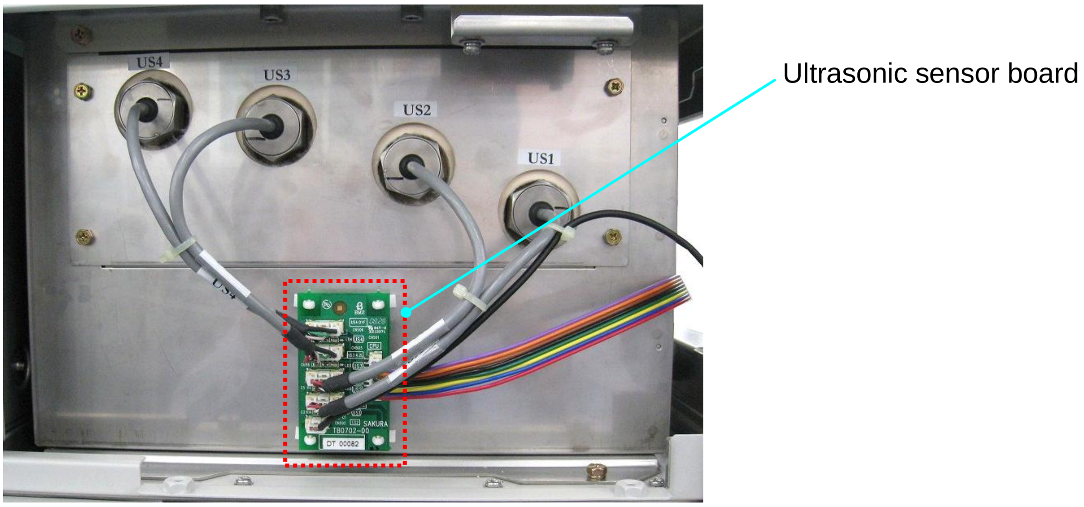


Fig.4-3-2-2 US board location

(3) Install the new US board by pushing in spacers in an appropriate order.

(4) Connect connectors for ultrasonic sensors and oven door sensor to the new board.
The ultrasonic sensor connectors are arranged on the board corresponding to the height each ultrasonic sensor is located. The bottom connector is for the oven door sensor.

(5) Check the sensor operation using the check program.
1) Supply reagent to the retort by manual operation to confirm that the sensors actuate. However, when checking the overflow sensor (US4), directly pour water or reagent in the retort.
2) Open and close the oven door to confirm that the sensor works properly.

(6) Attach the front panel.

4-3-3 Disassembling the Retort

Tools required
- Phillips screwdrivers No. 1, No. 2
- Slotted screwdriver No. 2
- Hexagon key wrenches, width across flats 3, 4, 5
- 2 Monkey wrenches 200mm
- Cutter knife
- Nipper

(1) Remove the power cord and pull out cables from the control box.

1) Remove the control box cover.

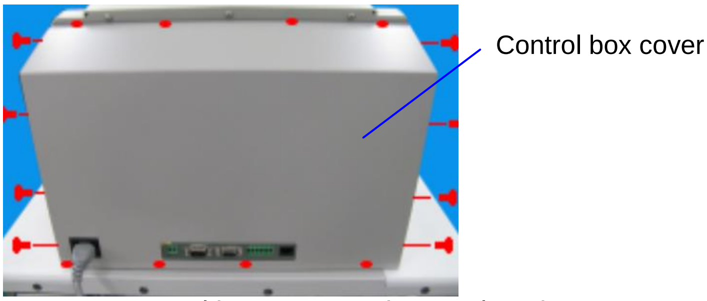


Fig.4-3-3-1 Control box cover and screw locations

2) Remove the interface board.

First, disconnect cables from the connectors shown below and then remove fixing screws located at both ends.

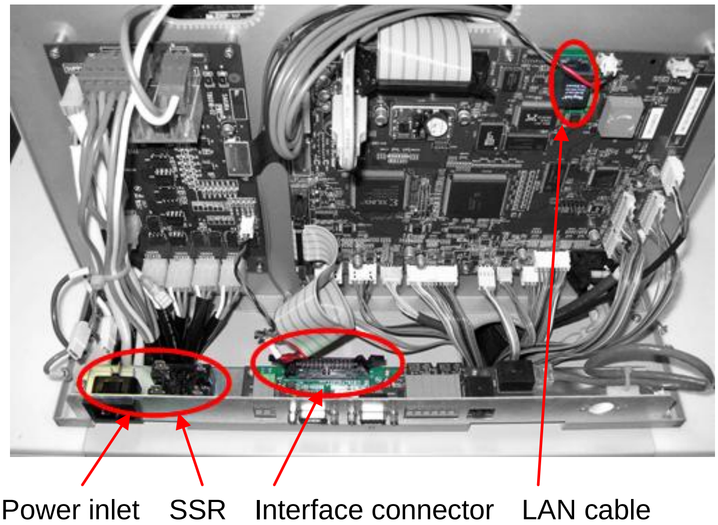


Fig.4-3-3-2 Removal of connectors from the interface board

Following the above, remove the interface board together with the IF board mounting plate.

Fig.4-3-3-3　View after the interface board removed

3) Remove the top plate back base.
   Remove with care to avoid damaging cables as they are secured to the base.

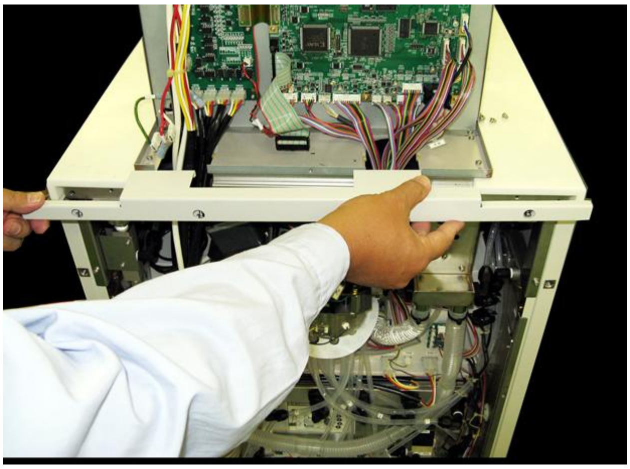


Fig.4-3-3-4　Removal of top plate back base

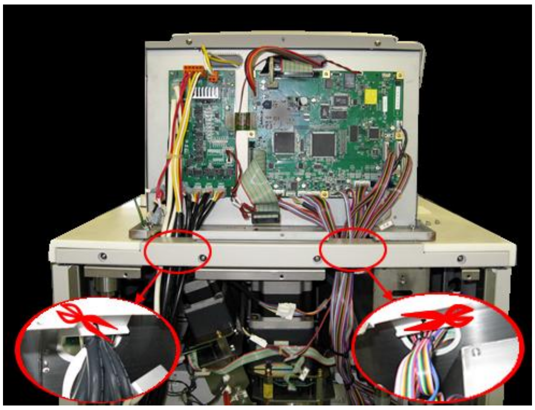


Fig.4-3-3-5　Removal of cable ties

4) Remove cables from the CPU board and heater driver board.

Fig.4-3-3-6 Removal of cables

⇒ Refer to 4-13-2 “Replacing the CPU board” and 4-13-3 “Replacing the heater driver board” to remove cables in an orderly manner.

(2) Remove exterior panels.

Remove the front panel, right side panel and left side panel.

⇒ Refer to 4-16 “Exterior Panels”.

(3) Remove the retort lid lever.

⇒ Refer to 4-2-3 “Replacing the Retort Lid Lever”.

(4) Remove the retort lid cover.

⇒ Refer to 4-2-4 “Replacing the Retort Lid Cover”.

(5) Remove both retort flange holders (front and back) and top plate together with the control box.

1) Remove both retort flange holders (front and back).

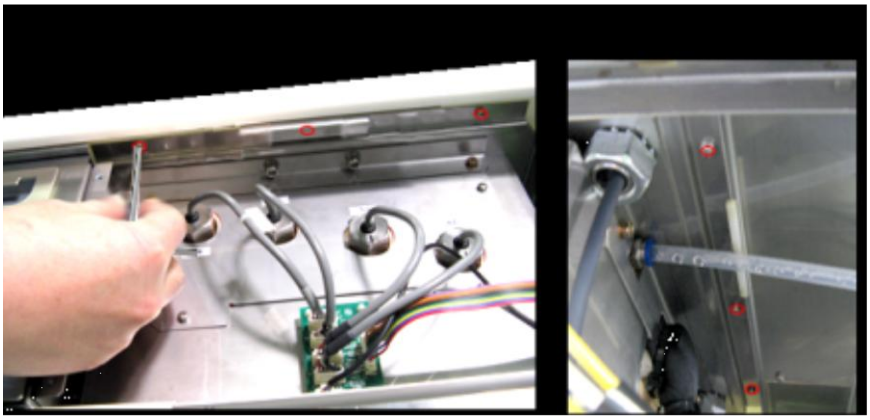


Fig.4-3-3-7 Removal of retort flange holders

2) Remove the top plate

Remove eight screws at both sides under the top plate.

Fig.4-3-3-8 Removal of top plate

<Lift the top plate> <Top plate removed>

Fig.4-3-3-9 Removal of top plate (together with the control box)

(6) Remove the fill/drain tubes, air line tube and cables that connect to the retort.

Remove two tubes at the gate valve side. Pull out each tube while pressing the blue release part of the insertion fitting. Take care not to bend the tube.

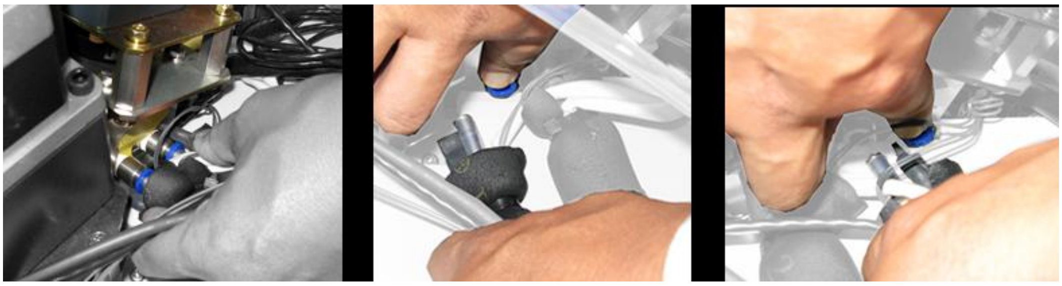


Fig.4-3-3-10 Removal of tubes at the gate valve side

Similarly, remove the air line tube. Pull it out while pressing the blue release part of the insertion fitting. Take care not to bend the tube.

Fig.4-3-3-11 Removal of air line tube

Following the above, get cables connected at the retort side together. They are two cables connecting to the retort lid and cables for the retort heaters, retort temperature sensor, fill tube heater, temperature sensor for the fill tube heater, drain tube heater and temperature sensor for the drain tube heater.

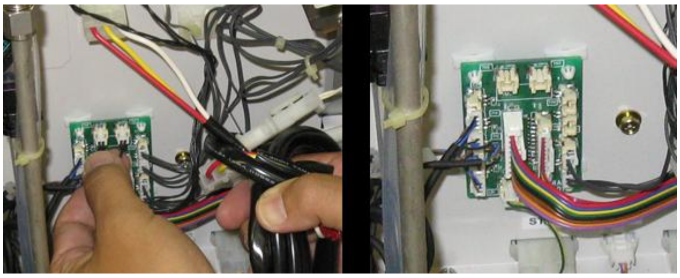


Fig.4-3-3-12 Remove the temperature senor connectors from the right relay board

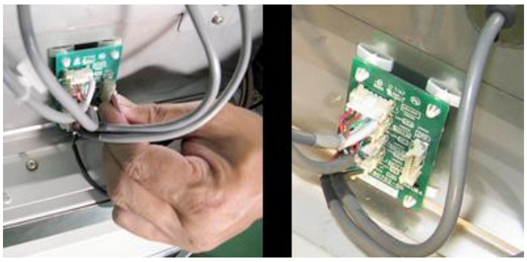


Fig.4-3-3-13 Remove the US relay cable and oven door sensor cable from the US board

(7) Remove the retort.

Remove bolts show below.

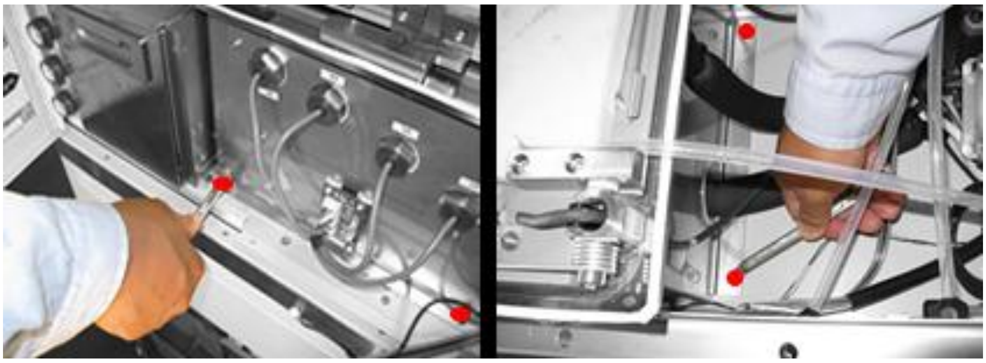


Fig.4-3-3-14　Removal of retort fixing bolts

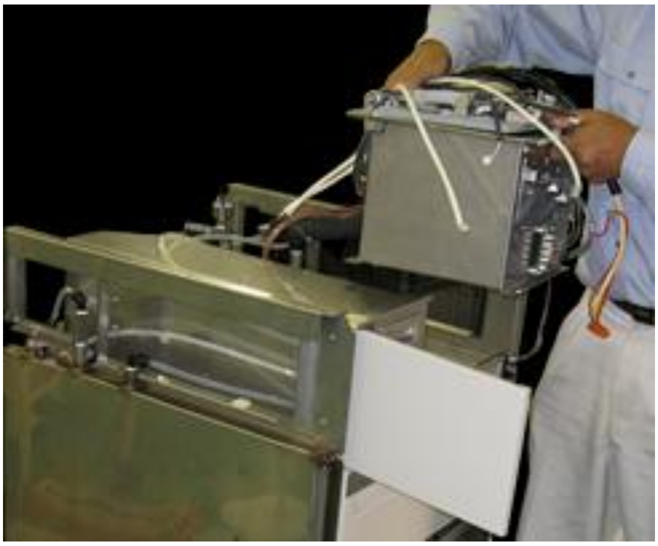


Fig.4-3-3-15　Removal of the retort

Remove the retort toward the front of the instrument while grasping the front and rear edges of the retort.　At this time, take care not to damage cables attached to the retort as they are drawn out together.

(8) Preparation for assembly of the retort:

Check the retort flange gaskets attached around the retort flange. If they have squashed and deformed, replace them with new ones.
Have two each of long retort flange gasket and short retort flange gasket ready.

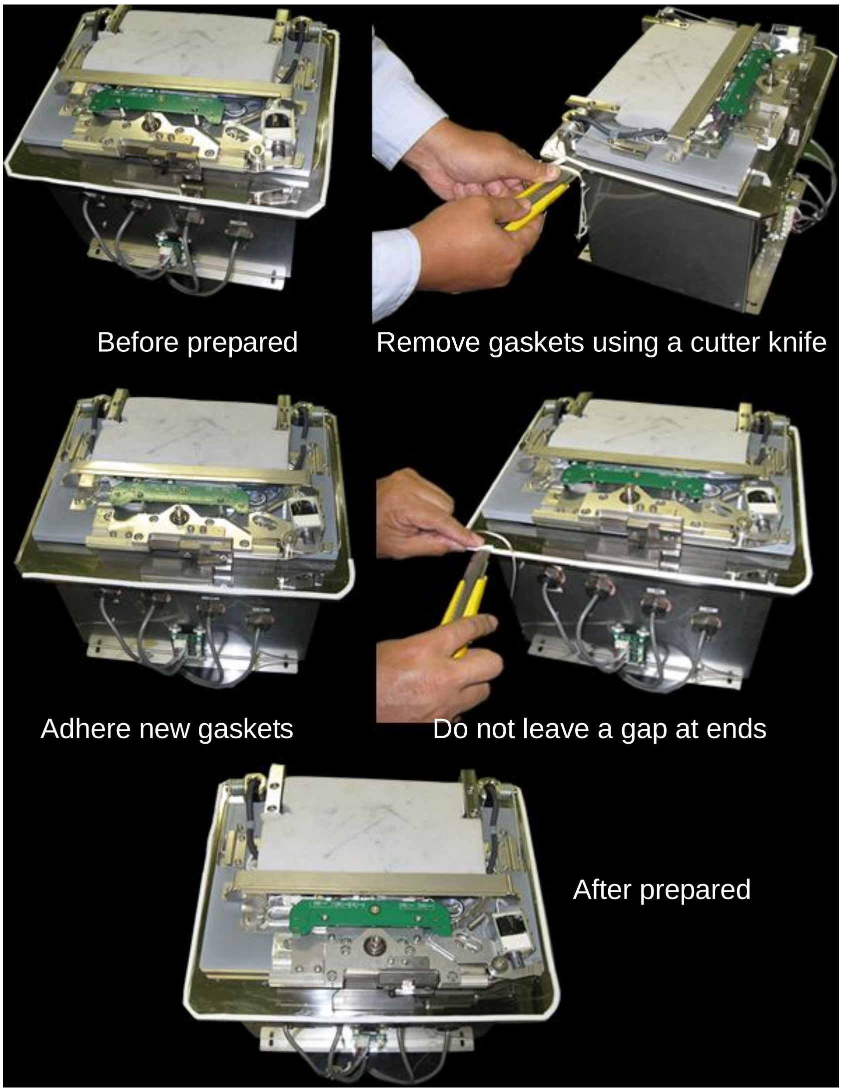


Fig.4-3-3-16 Replacement of retort flange gaskets

4-3-4 Replacing the Fill Tube Heater Unit and Drain Tube Heater Unit

Tools required
- Phillips screwdrivers No. 1, No. 2
- Slotted screwdriver No. 2
- Hexagon key wrench, width across flats 5
- 2 Monkey wrenches 200mm
- Glass cloth tape • Aluminum foil tape
- Cable ties (T30R-TZ, T50R-TZ, HellermannTyton)

(1) Remove the retort.

⇒ Refer to 4-3-3 “Disassembling the Retort”.

(2) Remove the retort case.

1) Remove the retort case front plate.

2) Remove the retort case bottom plate.

3) Remove the retort case mountings (front and back).

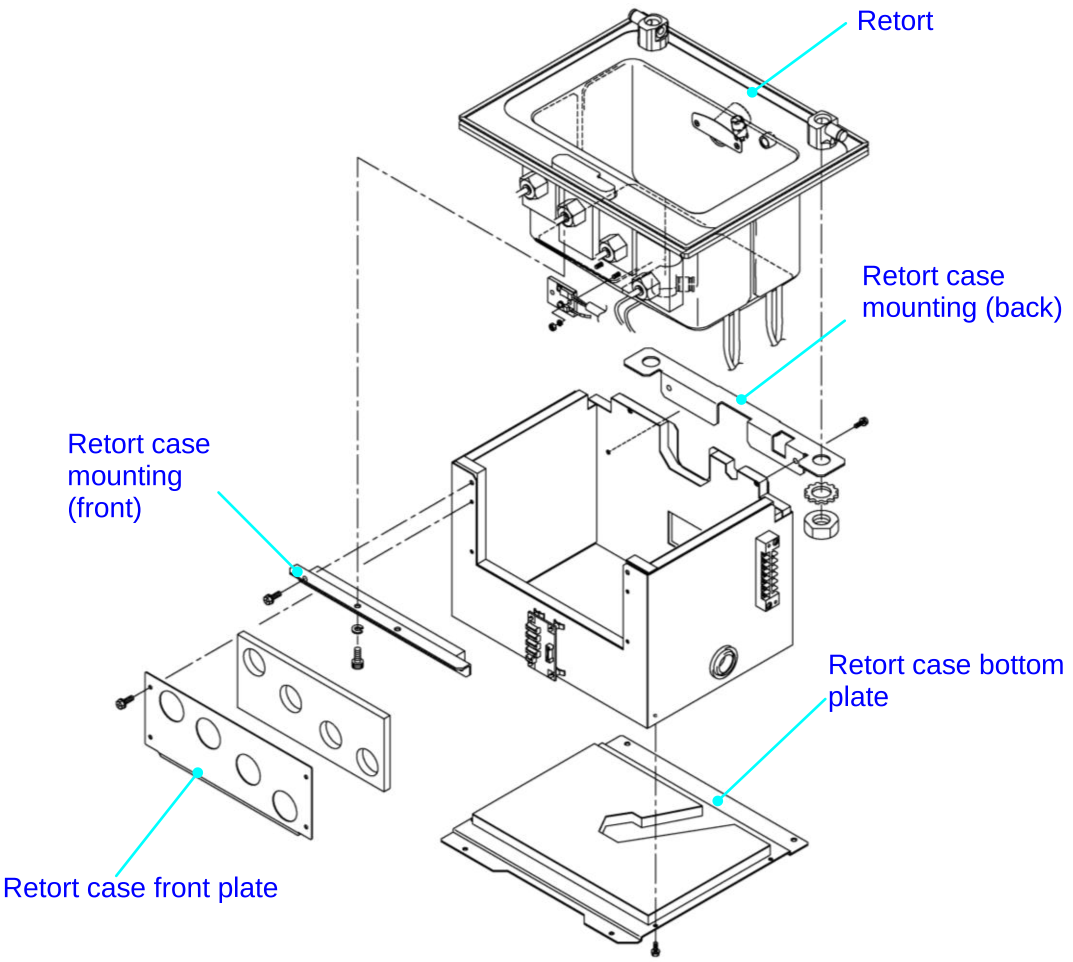
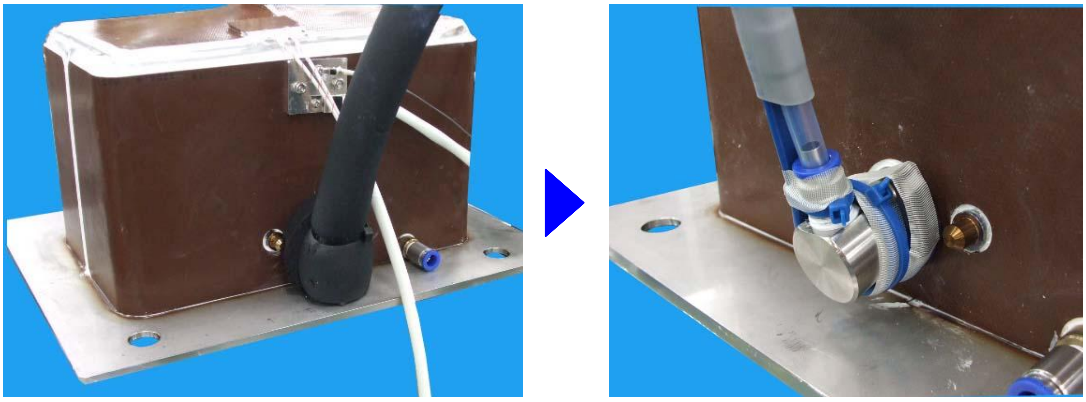


Fig.4-3-4-1 Removal of the retort case

(3) Remove tube heater units.

1) Detach cable ties from heat insulation and slowly draw out heat insulation.

2) Remove the heater wrapped around the tube. Remove the tube from the insertion fitting.



I. Fill Tube

II. Drain Tube

Fig.4-3-4-2 Fill / drain tube heater units installed on the retort

3) Remove the temperature sensor (thermistor).

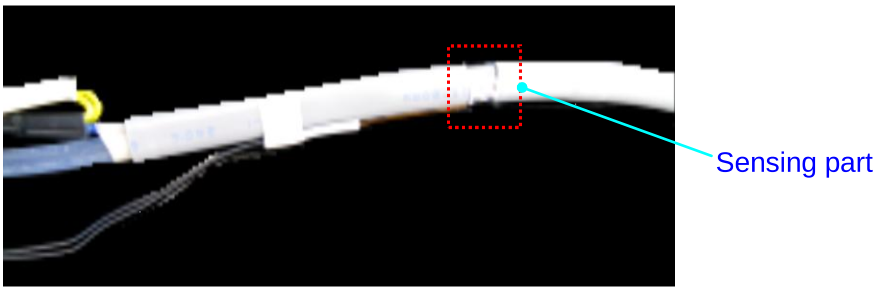


Fig.4-3-4-3 Temperature sensor for tube heater unit

(4) Replace with the new tube heater units. (Refer to Fig. 4-3-4-2, 4-3-4-3.)

1) Attach the temperature sensor using an aluminum foil tape.
2) Stick heat insulation over the tube.
3) Wind the end of the heater.
   Wrap glass cloth tape around the heater and secure it with cable ties.
   * Make sure to use specified cable ties (HellermannTyton T30R-TZ, T50R-TZ).

(5) Install the retort in reverse order of steps (1) and (2) above.

(6) Start the check program to confirm each tube heater and temperature sensor works properly.

4-3-5 Replacing the Retort Temperature Sensor and Over-temperature Protector

Tools required

- Phillips screwdrivers No. 1, No. 2
- Slotted screwdriver No. 2
- Hexagon key wrench, width across flats 5
- 2 Monkey wrenches 200mm
- Bar thermometer
- Silicone compound (for thermistor replacement)
- Silicone adhesive RE-45 (for OTP replacement)

(1) Remove the retort.

⇒ Refer to 4-3-3 "Disassembling the Retort".

(2) Remove the retort case.

1) Remove the retort case front plate.
2) Remove the retort case bottom plate.
3) Remove the retort case mountings (front and back).

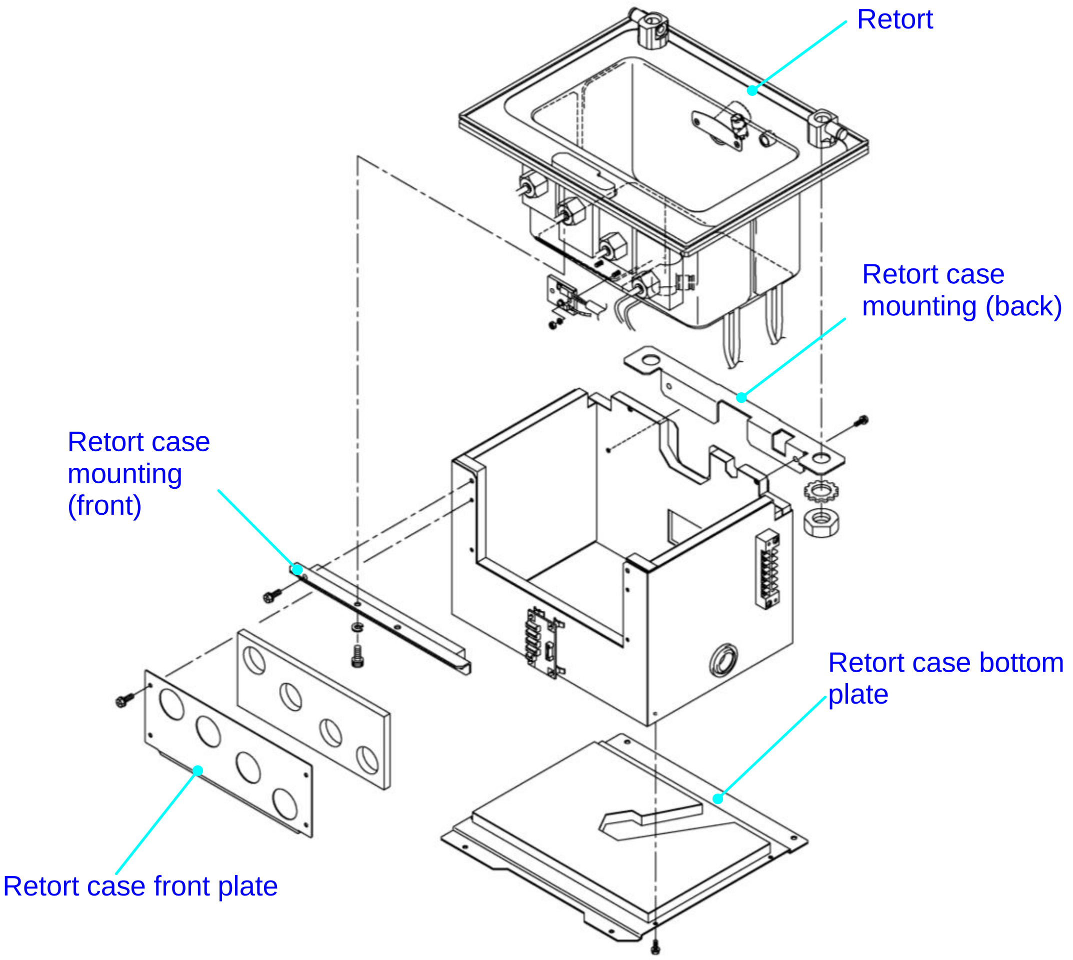


Fig.4-3-5-1 Removal of the retort case

(3) Remove the temperature sensor (thermistor) or over-temperature protector (OTP).

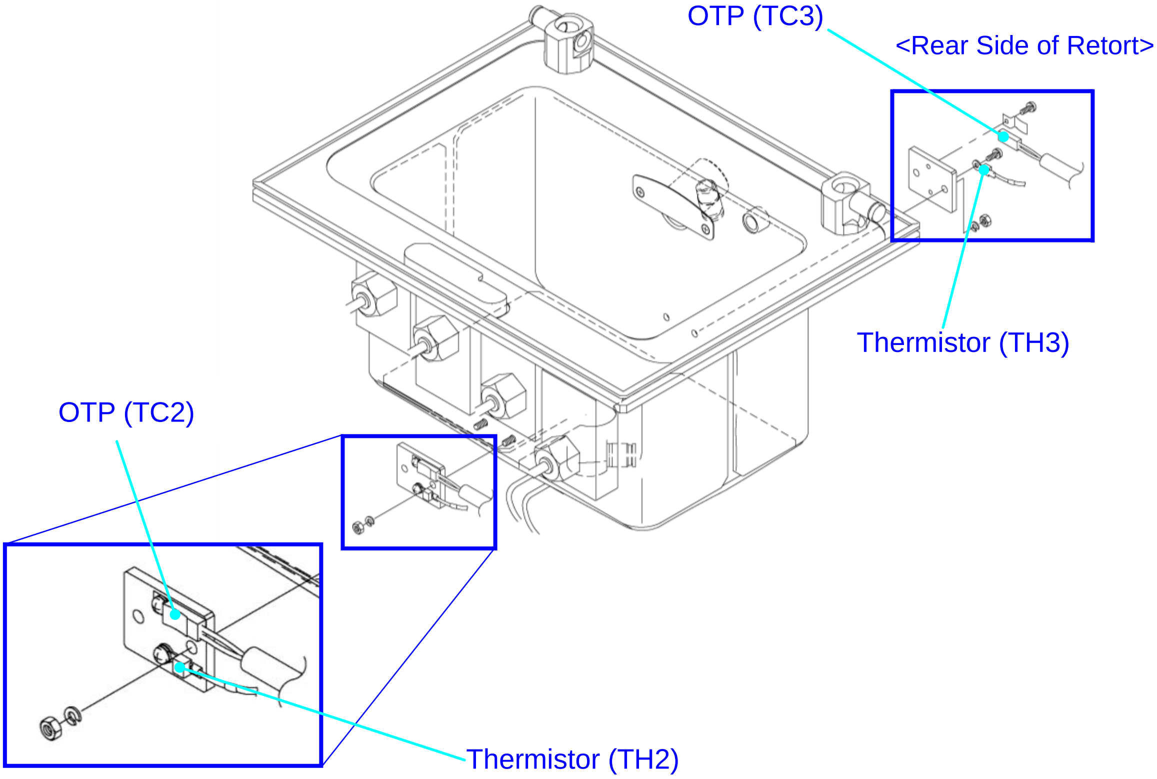


Fig.4-3-5-2 Temperature sensors and over-temperature protectors for the retort

(4) Install the new temperature sensor or over-temperature protector.

- ∗ Apply silicone compound over the sensing face of the temperature sensor before installing with a screw.
- ∗ Stick the over-temperature protector using silicone adhesive and secure it with an exclusive clip.

(5) Install the retort in reverse order of steps (1) and (2) above.

(6) Start the check program to energize the retort heaters.

- ∗ Place 4.5L of distilled water in the retort and heat at 60°C. Confirm that an error derived from the retort over-temperature protectors does not occur during the heating.
- ∗ Measure water temperature at a depth of 60 mm in the center of the retort after 4 hours have passed or when the temperature was stable. Confirm that the measured temperature is within 60°C ±2°C. If it is out of the range, set the offset value as follows:

  Offset value to be set = (60°C – measured value + current offset value/10) x 10

⇒ For the setting procedure, refer to 2-5 “Check Program”.

4-4 Paraffin Oven

4-4-1 Replacing the Oven Door Sensor

Tools required • Phillips screwdriver No. 2

(1) Turn the power off.

(2) Remove the front panel.
Remove the screws shown below and then pull out the panel downward.

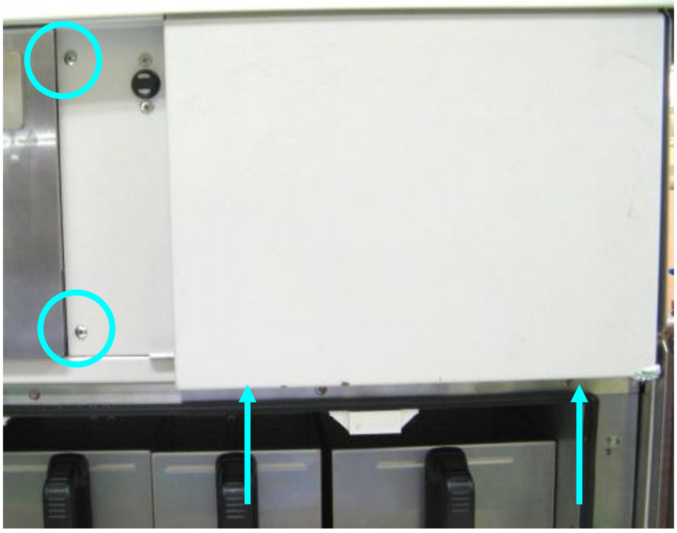
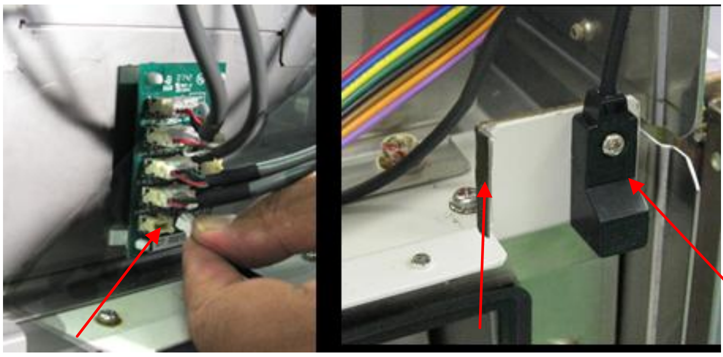


Fig.4-4-1-1 Removal of front panel and screw locations

(3) Remove the oven door sensor.

Remove the sensor connector from the ultrasonic sensor board (bottommost connector). Remove the screw holding the sensor and the door switch nut plate at the rear.



Remove this connector. Door switch nut plate Sensor body

Fig.4-4-1-2 Removal of oven door sensor

(4) Install the new oven door sensor.

Loosely tighten the screw to hold the sensor and door switch nut plate while placing the mounting plate between them. At this time, leave a gap of approximately 2 mm between the end of the sensor and the oven door.

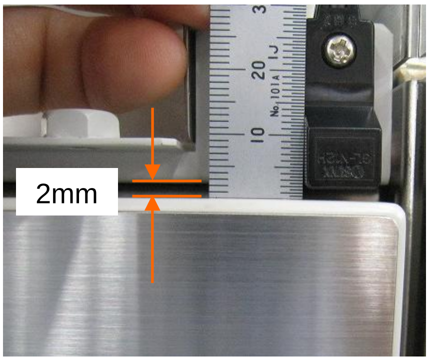


Fig.4-4-1-3 Installation of oven door sensor

Next, connect the sensor connector to the bottom connector on the ultrasonic sensor board.

(5) Check the operation of the oven door sensor.

Access the detailed monitor screen under the service manual operations to perform the operation check on the oven door sensor. If the oven door close indicator on the screen illuminates in red when the oven door is closed, the sensor is working properly.
Confirm that the sensor indicator illuminates in red when the door is closed and that it turns gray when it is opened. Also, confirm that the sensor does not interfere with the door when closing and opening it.
If the sensor does not detect the door when it is closed, make the gap between the door and the sensor smaller without interfering with each other.
Firmly tighten the screw after positioning the sensor properly.

(6) Attach the retort front panel.

4-4-2 Replacing the Oven Door Gasket

Tools required • Spring balance (measurable up to 4N)

(1) Turn the power off.

(2) Open the oven door and pull out the gasket.

Fig.4-4-2-1 Removal of oven door gasket

(3) Remove solid paraffin residues from the inside and periphery of the gasket groove, using a scraper. Clean with a cloth moistened with xylene.

(4) Install the new gasket.
Insert the gasket and push into the gasket groove with thumb.
To insert the gasket without slackness, insert it into the corners first (red circles below) and then into the middle of each side (dotted squares below).

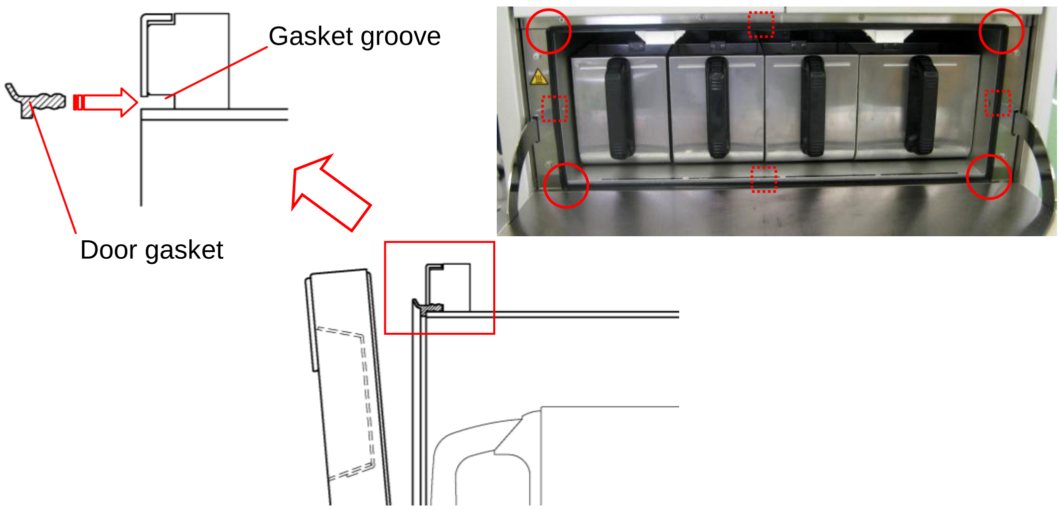


Fig.4-4-2-2 Installation of oven door gasket

(5) Measure the force to open the oven door by using a spring balance. Confirm that the measured value is within 21.6 - 26.5N (2.2 - 2.7kgf). If it is out of the range, adjust the position of the door magnet catch.

4-4-3 Replacing the Oven Heater and Temperature Sensor

Tools required
- Phillips screwdrivers No. 1, No. 2
- Stubby screwdriver No. 2
- Slotted screwdriver No. 2
- Hexagon key wrenches, width across flats 2, 3, 4, 5
- 2 monkey wrenches, 200mm
- Wrench, width across flats 14, 17 • Pliers
- Spring balance (measurable up to 4N)
- Insulation-resistance meter 500VDC

(1) Remove the retort.

⇒ Refer to 4-3-3 "Disassembling the Retort".

(2) Remove the access door.

Remove screws to remove the access door.

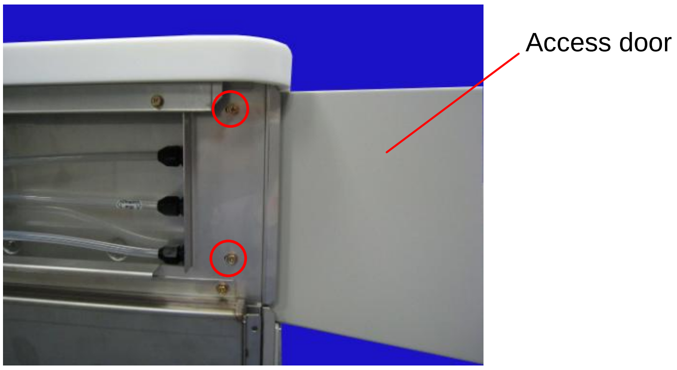


Fig.4-4-3-1 Removal of access door

(3) Remove the external drain/fill port assembly.
1) Remove cap nut from Z union joint.
2) Remove screws that hold the external drain/fill port assembly.
3) Draw out the external drain/fill port assembly.

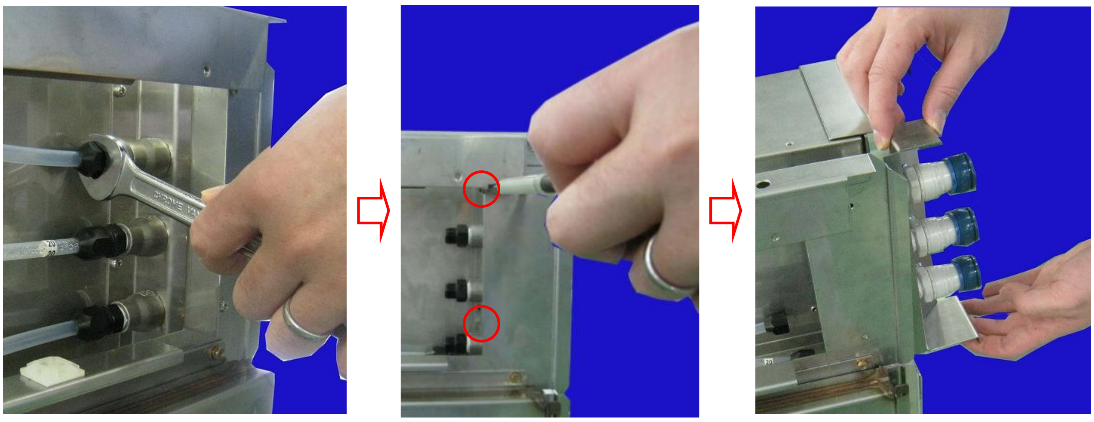


Fig.4-4-3-2 Removal of external drain/fill port assembly

(4) Remove the fume control unit.

1) Remove cap nut from Z union joint (4 places) and corrugated hose (2 pcs.)
2) Remove three screws that hold the fume control unit.
3) Lift the fume control unit to remove.

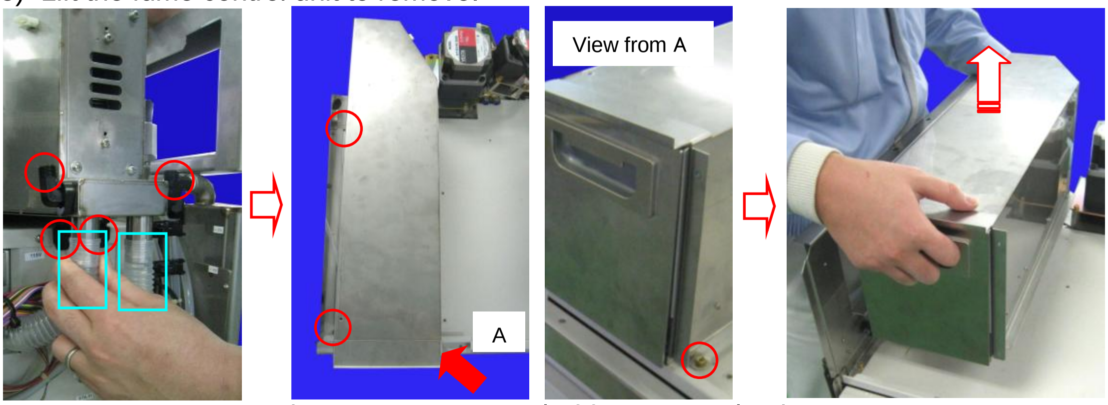


Fig.4-4-3-3 Removal of fume control unit

(5) Remove joints connected to the right and left bulk reservoirs

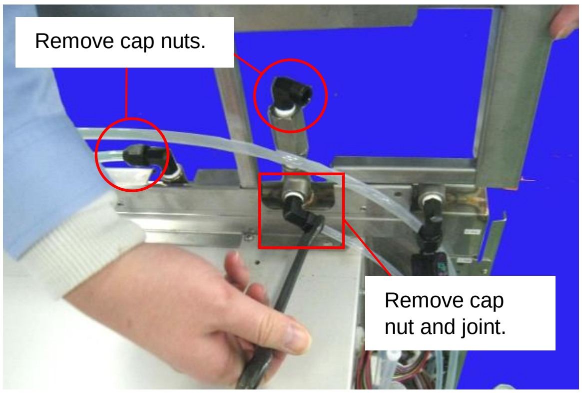
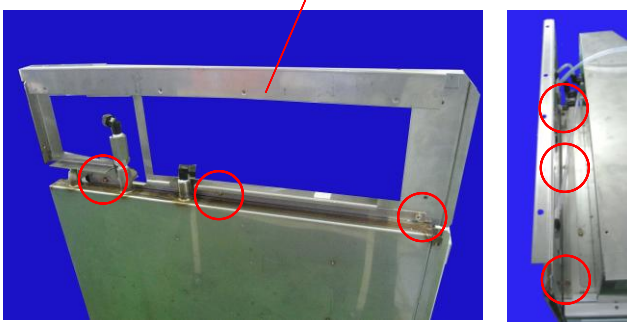


Fig.4-4-3-4 Removal of joints for bulk reservoirs

(6) Remove right and left frames.

Remove six screws indicated below to remove each frame.

Frame



Make sure to remove cap nuts connected to the pressure sensor housing prior to removing the right frame.

Pressure sensor housing

Fig.4-4-3-5 Removal of right and left frames

(7) Remove the oven door.

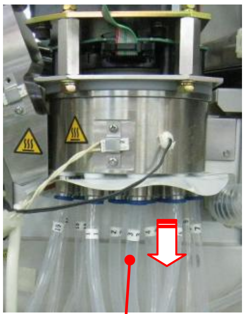
1) Remove screws that connect the hinge to the oven.

2) Remove screws that hold the oven right and left frames. Remove the oven door.

Fig.4-4-3-6 Removal of oven door

(8) Remove the rotary valve/gate valve assembly.

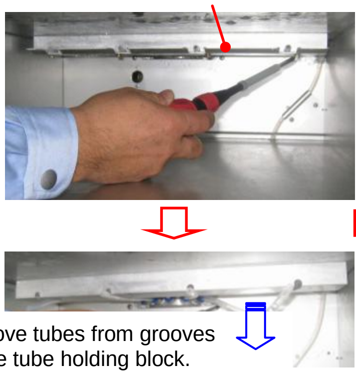
1) Remove flow tubes connected to the rotary valve housing.



Flow tubes

2) Remove tubes inside the oven.

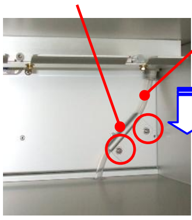
Remove the tube support plate.



Remove tubes from grooves on the tube holding block.

Tube clamp

Paraffin drain container tube



Remove the tube from the insertion fitting.

3) Remove the rotary valve/gate valve assembly.
Remove four screws circled in red below to remove the RV.

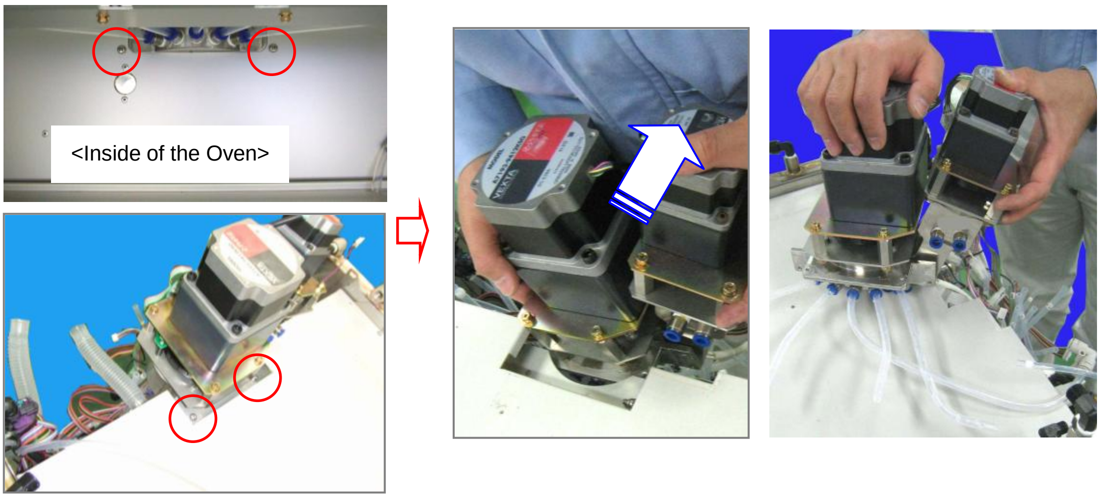


Fig.4-4-3-7 Removal of rotary valve/gate valve assembly

(9) Loosen screws that hold each bulk reservoir.

Pull the bulk reservoir outward until the elbow union on the reservoir is away from the edge of the oven outer case cover.

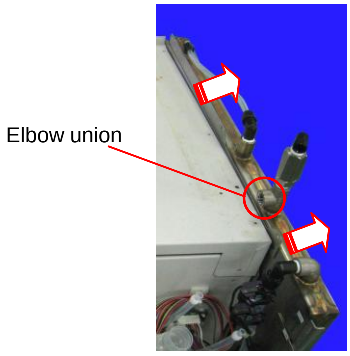


Fig.4-4-3-8 Looseness of screws for bulk reservoirs

(10) Remove the oven outer case cover.

* To remove the bottom oven heaters and temperature sensors from the underside of the oven, go to step (12).

Remove screws circled in red blow (8 screws on the top and 4 screws at the rear).

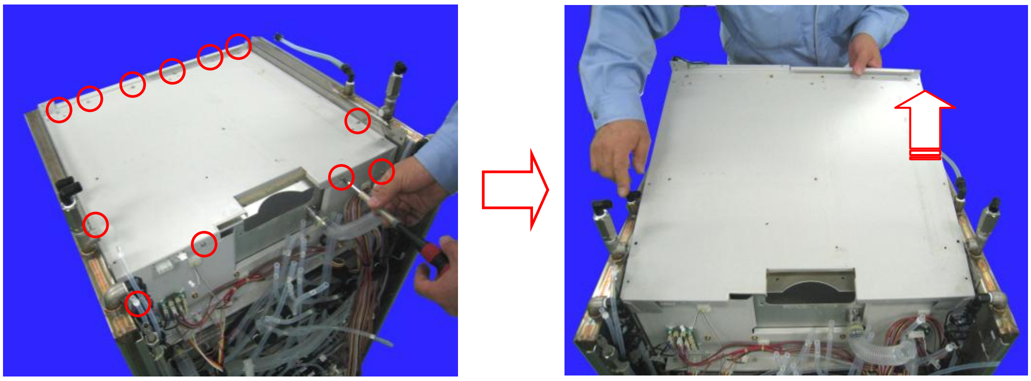


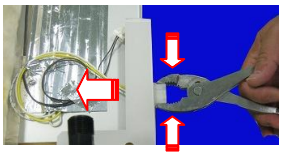
Fig.4-4-3-9 Removal of oven outer case cover

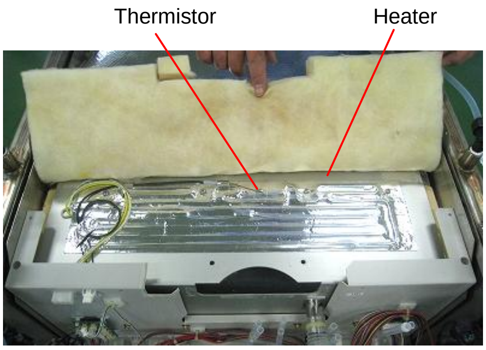
(11) Replace the oven heater and temperature sensor (thermistor) on the top of the oven.

1) Remove the connectors.
Heater: OVEN
Thermistor: TH12

2) Remove the connector housing

While holding the claw of the housing with pliers, push it toward the oven.





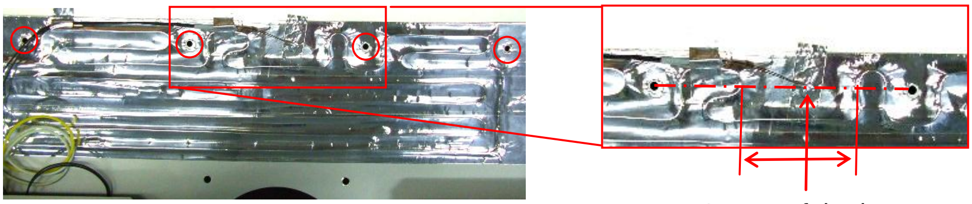
3) Peel off the heater and thermistor as they are stuck by an aluminum foil. (If an adhesive is remaining, wipe off using xylene.

Fig.4-4-3-10 Replacement of oven top heater and temperature sensor (1)

4) Stick the new heater and thermistor in the place shown below.

5) Connect the connectors for the heater and thermistor.

<Heater> <Thermistor>



Align screw holes circled in red before sticking the heater.

Center of the heater

Fig.4-4-3-11 Replacement of oven top heater and temperature sensor.

(12) Remove the oven assembly.

1) Remove the connectors from the right and left relay boards.
2) Remove screws that hold the oven assembly in place.
3) Remove the oven assembly.

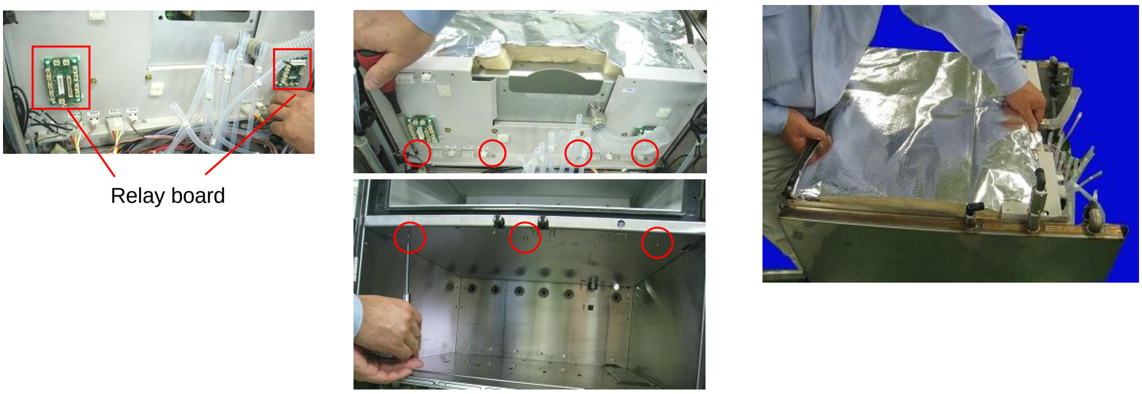


Fig.4-4-3-12 Removal of oven assembly

(13) Remove the heat insulation from the underside of the oven.

1) Cut aluminum foil tapes holding the inner case heat insulation (bottom) to remove the heat insulation.
2) Remove the inner case glass wool (bottom).

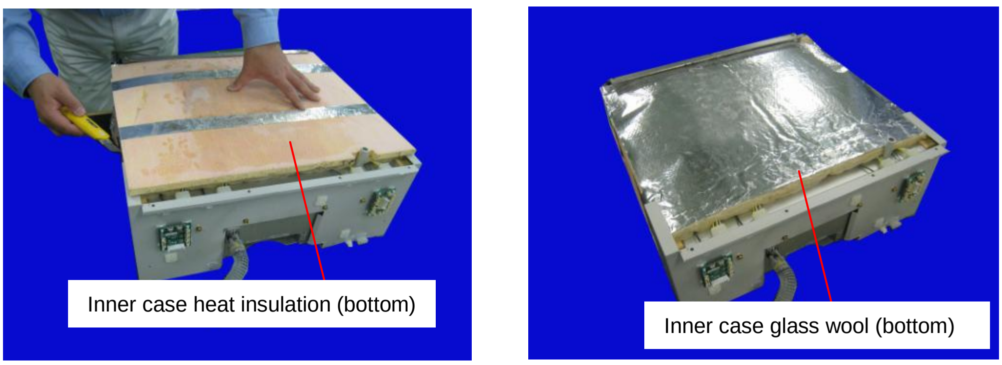


Fig.4-4-3-13 Removal of bottom heat insulation

(14) Replace the oven heater and temperature sensor (thermistor) on the underside of the oven.

Refer to step (11).

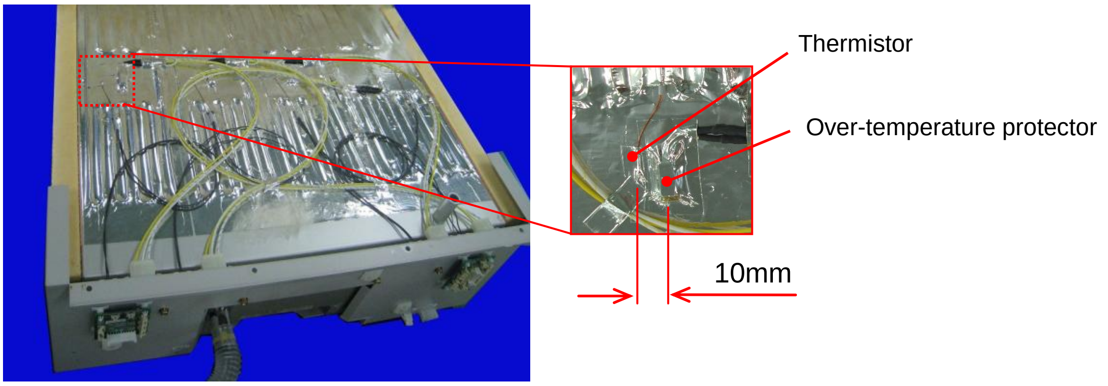


Fig.4-4-3-14 Replacement of bottom oven heater and temperature sensor

(15) Reassemble the instrument in reverse order of steps (1) to (13).

For screws used in each component, refer to Chapter 5 "Exploded Views and Parts List".

(16) Check the following items after reassembly.

1) Measurement of insulation resistance

With the power cord removed from the power outlet and the power switch set to ON, measure insulation resistance between the ground terminal of the power plug and other power line terminals, using an insulation-resistance meter, to confirm that the measured value is 10 MΩ or above.

2) Perform the following tests under the check program ⇒ Refer to 2-5 "Check Program".

* "I/O check"
* "Check leakage from the tubing system"
* "Temperature test" to check operation of oven heaters and temperature sensors

(17) Install the back panel and left side panel.

⇒ Refer to 4-16-1 "Removing and Installing the Exterior Panels".

4-5 Paraffin Container

4-5-1 Replacing the O ring in the Connection Tube

Tools required
- Forceps
- Wrench, width across flats 21
- Grease (Sealub S-11)

(1) To remove the tube seal cap, turn it to the arrowed direction using a wrench.

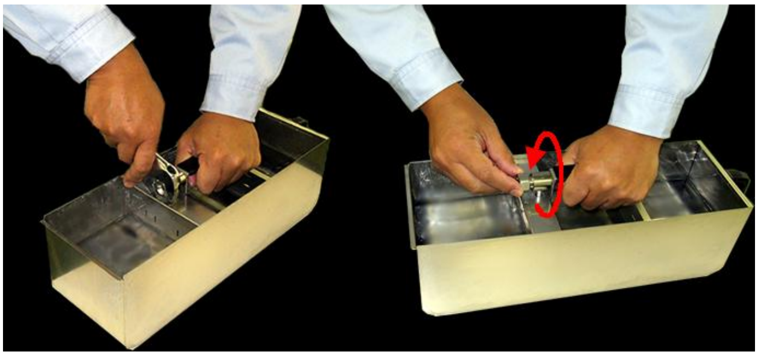


Fig. 4-5-1-1 Removal of tube seal cap

(2) Remove the O ring using a forceps.

Fig. 4-5-1-2 Removal of O ring

(3) Apply a thin layer of grease to the new O ring and insert it.

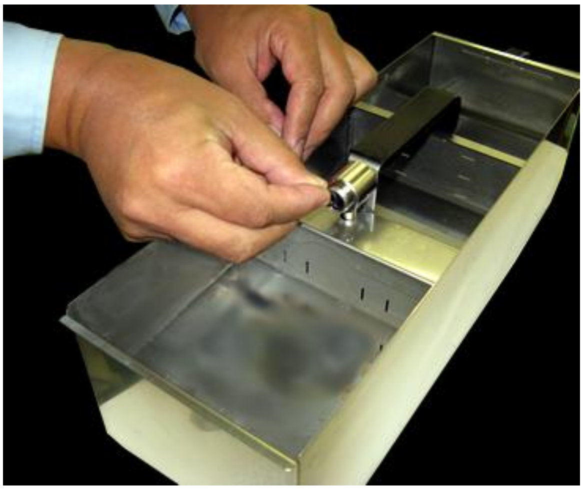


Fig. 4-5-1-3 Insertion of O ring

(4) Firmly tighten the tube seal cap.

4-6 Bottle Rack and Base

4-6-1 Replacing and Adjusting the Bottle Rack Door

Tools required
- Phillips screwdriver No. 2
- Adhesive (Aron Alpha 201)
- Screw lock glue (Three Bond 1401C)

(1) Open the bottle rack door. Remove cross-recessed pan head screws from the upper and lower door hinges that fasten each door in place. Remove the rack doors and door mountings.
Confirm that each hinge and door mounting has the nylon washer. If the nylon washer comes off, attach it to both the hinge and door mounting using an adhesive.

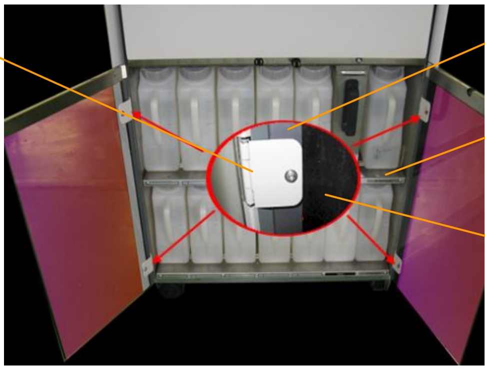


Fig 4-6-1-1 Rack door hinges

(2) Stick the sheet on the top of the new rack door and fit the door magnet plate on it. Symmetrically fold the sheet in the center before sticking it. Fit the door magnet plate on the sheet stuck on the door.

∗ Stick the door magnet plate with a cutout in the middle (for the wax drain container LED indicator) to the right rack door. Stick the other door magnet plate (without a cutout) to the left rack door.

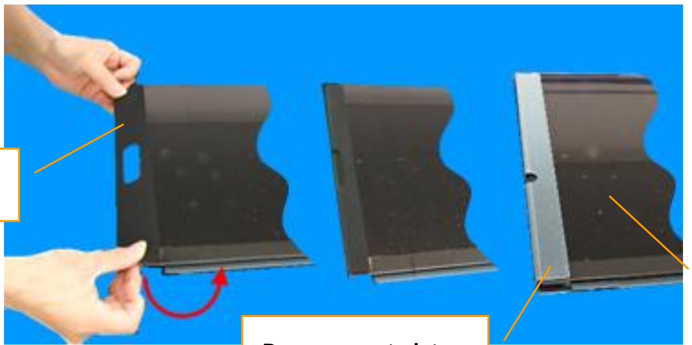


Fig 4-6-1-2 Attachment of sheet and door magnet plate

(3) Place the new rack door between the door hinge and door mounting before loosely holding them on the bottle rack.

(4) Align each rack door as mentioned below before firmly tightening the screws to fasten the door hinges.

* Level the top of each door to make the right door level with the left door.
* Make a gap between the right and left doors uniform from top to bottom. Keep an appropriate gap so that the doors do not hit each other when opening and closing.

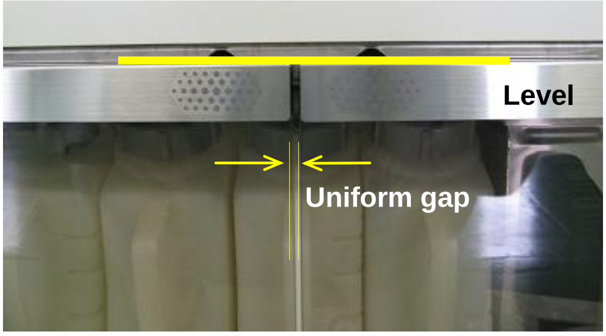


Fig 4-6-1-3 Alignment of rack door

After tightening the screw, apply screw lock glue to the screw head to fix.

Fig 4-6-1-4 Application of screw lock glue

4-6-2 Cleaning the Inside of the Bottle Rack

Tools required
- Waste cloth or sponge
- Alcohol
- Xylene and/or scraper (to remove slid paraffin), as necessary

(1) Remove all reagent bottles, the wax drain container and the bottom shelf from the bottle rack.

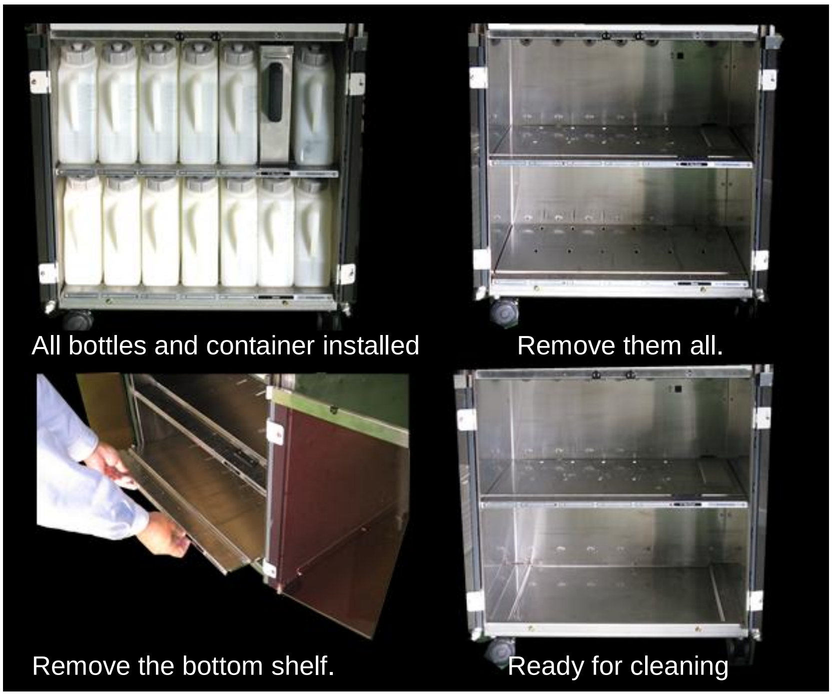
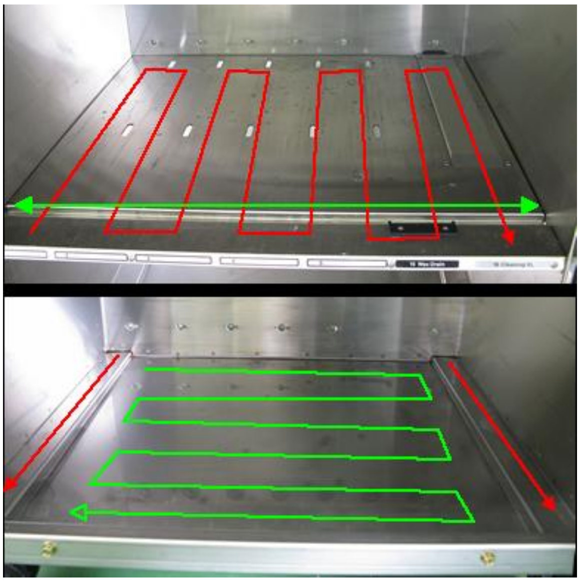


Fig.4-6-2-1 Preparation for cleaning

(2) Wipe the inside of the bottle rack with a waste cloth moistened a little with alcohol.



Upper stage

Lower stage

Fig.4-6-2-2 Directions to wipe the inside of the rack

Wipe the upper stage first and then the lower stage in the bottle rack. As indicated in Fig. 4-6-2-2, wipe along the red line first and then along the green line. Concretely, clean the upper stage by wiping the surface of hair-line finish running back and forth and wiping the groove to remove dusts corrected in it. For the lower stage, first wipe the guide at each side and then move the waste cloth from side to side and from the back of the rack to the front. If any reagent is remaining, remove it with a sponge to dispose.

The paraffin oven is located above the bottle rack and the wax drain container is set in the upper stage. Therefore, if there is solidified paraffin, remove it using a scraper and wipe with xylene.

Fig.4-6-2-3 If paraffin is found …

(3) Wipe the bottom shelf

Follow the instruction to wipe the upper stage. Also, wipe the underside.

Fig.4-6-2-4 Cleaning of bottom shelf

(4) Place each reagent bottle and the wax drain container into its original position in the bottle rack.

For easier placement, insert each bottle orderly from both sides of the rack since the neighboring bottle acts as a guide.
However, place the condensation bottle last. Confirm that the red inner tube is set in the bottle, as shown below, before inserting into the position labeled “Condensate”.

Fig.4-6-2-5 Placement of condensation bottle

4-6-3 Replacing the Wax Drain Container Indicator

Tools required
- Phillips screwdriver No. 1
- Wrench, width across flats 10

(1) Turn the instrument power off.

(2) Open the bottle rack door. Remove cross-recessed pan head screws that fasten the indicator mounting on the bottle rack.

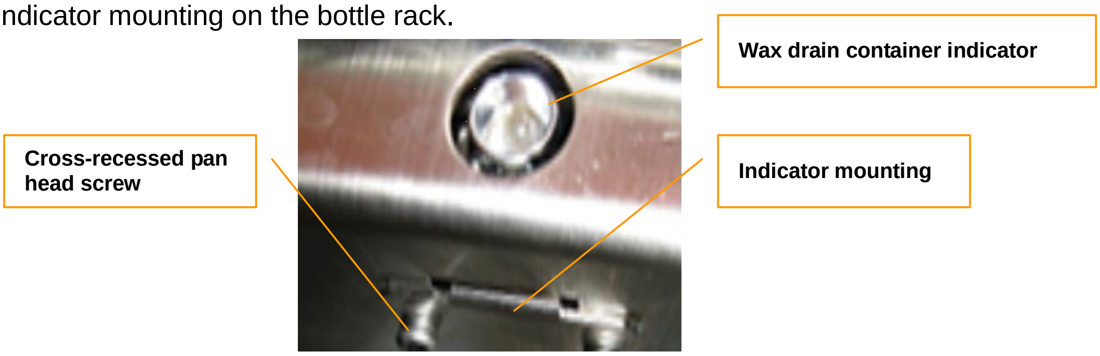


Fig. 4-6-3-1 Removal of the indicator (1)

(3) Remove the indicator together with the mounting from the bottle rack.

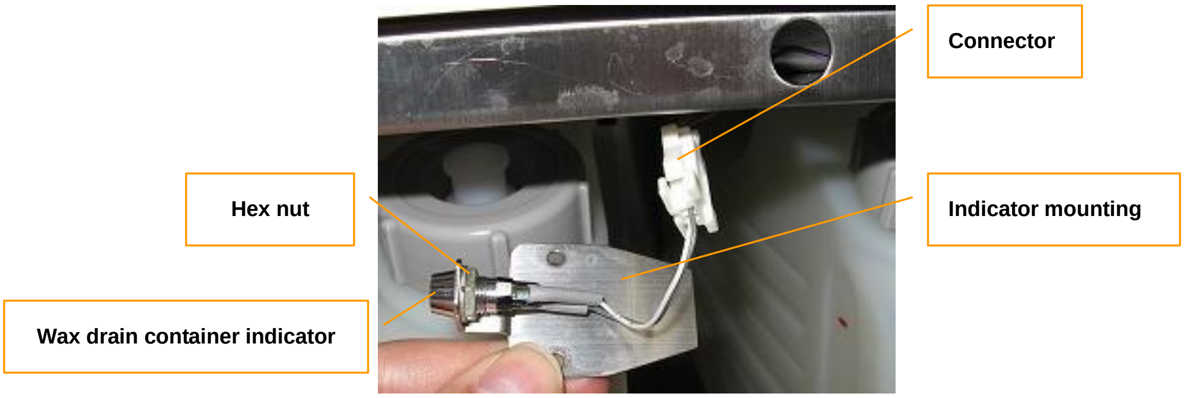


Fig. 4-6-3-2 Removal of the indicator (2)

(4) Pull the connector cable until the connector appears (see above). Remove the connector.

(5) Remove the hex nut to replace the indicator with a new one.

(6) Connect the connector for the new indicator.

(7) Install the indicator mounting on the bottle rack.

(8) Start the check program to check that the wax drain container indicator operates properly.

⇒ Refer to 2-5 “Check Program”.

4-6-4 Replacing the Xylene Heater

Tools required
- Phillips screwdriver No. 2
- Wrench, width across flats 7
- Screw lock glue (Locktite 242)
- Silicone compound
- Glass cloth tape (3M 361)
- Insulation-resistance meter 500VDC

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Detach the connectors for the xylene heater unit and thermistor.

(4) Remove cross-recessed hexagon head bolts that fasten the xylene heat plate unit to the bottle rack.

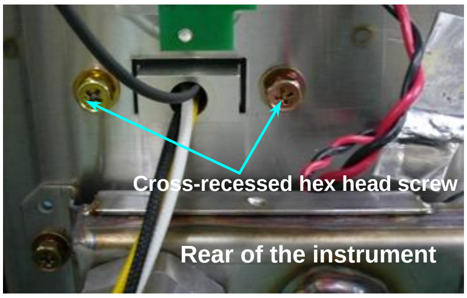


Fig. 4-6-4-1 Removal of xylene heat plate unit (1)

(5) While supporting the xylene heat plate unit from below, remove cross-recessed truss head screws fastening the xylene heat plate unit on the bottle rack. Remove the unit from the rack.

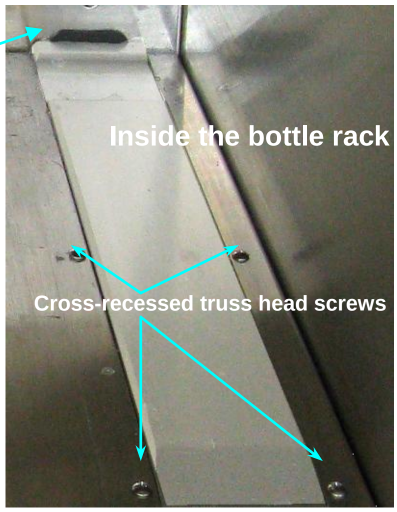


Fig. 4-6-4-2 Removal of xylene heat plate unit (2)

(6) Remove cross-recessed pan head screws that fasten the heat plate cover to the xylene heat plate unit to remove the heat plate cover.

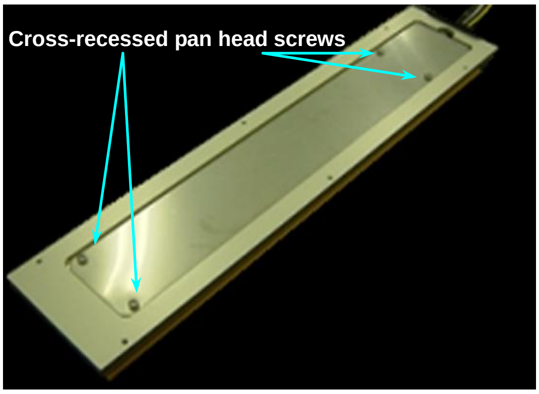
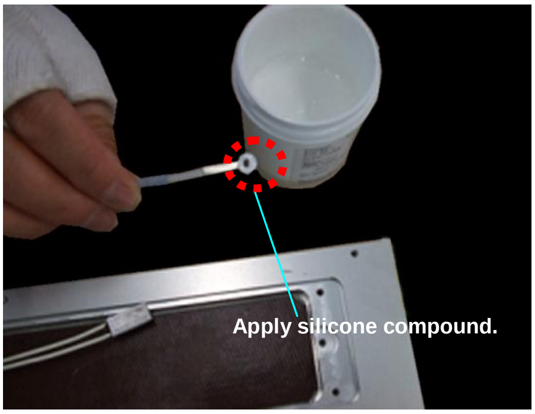


Fig. 4-6-4-3 Removal of heat plate cover

(7) Remove cross-recessed pan head screw to remove the thermistor from the xylene heat plate unit.

Fig. 4-6-4-4 Removal of thermistor

(8) Have the new xylene heat plate unit ready. Apply silicone compound to the thermistor and attach it to this new unit. Secure the thermistor cable to the unit using glass cloth tape.



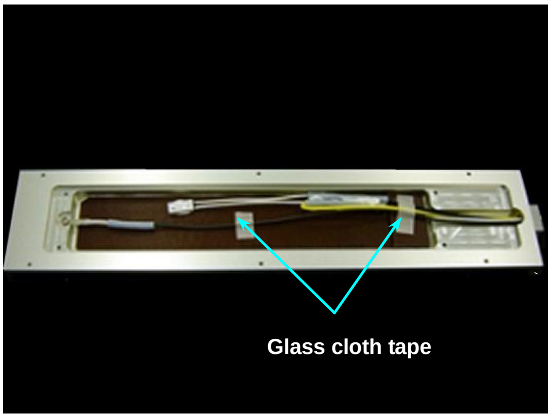


Fig. 4-6-4-5 Installation of thermistor

(9) Fit the heat plate cover onto the xylene heat plate unit and hold it by cross-recessed pan head screws.

(10) Attach the plate gasket to the xylene heat plate unit. Pass the connector cables coming from the xylene heat plate unit and thermistor through a square hole in the bottle rack. Secure the xylene heat plate unit on the bottle rack with cross-recessed truss head screws (refer to Fig. 4-6-4-2). Apply screw lock glue to these screws.

(11) Fasten the xylene heat plate unit to the bottle rack with cross-recessed hex head bolts.

(12) Measure insulation resistance between the bottle rack and heater lead wires using an insulation-resistance meter. Confirm that the measured value is 10 MΩ or above.

(13) Attach the connectors from the xylene heater unit and thermistor to the boards.

(14) Attach the back panel.

(15) Start the check program to check the temperature control for the xylene heater. Confirm that the reading on the screen reaches 40°C.

⇒ Refer to 2-5, “Check Program”.

4-6-5 Replacing the Reagent Bottle LED

Tools required • Phillips screwdriver No. 1

(1) Turn the instrument power off.

(2) Remove back panel.

(3) Remove the connector for the bottle LED unit to be replaced.

(4) Remove the hexagon socket head bolt, and replace the bottle LED with a new one.

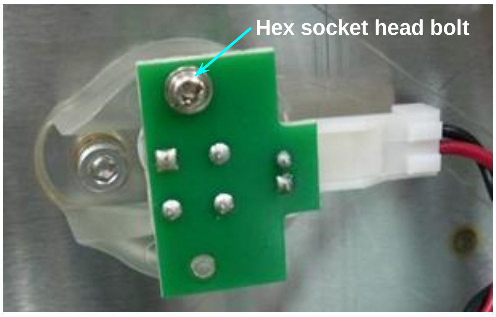


Fig. 4-6-5-1 Replacement of bottle LED

(5) Connect the connector.

(6) Start the check program to check if bottle LED properly goes on and off.

⇒ Refer to 2-5 “Check Program”.

(7) Attach the back panel.

4-7 Wax Drain Container

4-7-1 Handling the Wax Drain Container

This section provides the information on how to place, remove and clean the wax drain container, particularly explaining about the procedure from setting the new anti-adhesion sheet to placing the container into the bottle rack.

Tools required None

(1) The anti-adhesion sheet has two differently-processed faces; the top side contacts with the vinyl bag (waste paraffin bag) and the reverse side contacts with the wax drain container. Prior to placing the sheet into the wax drain container, face the top side upward and fold the sheet inward along two perforations in the middle (the sheet should not be folded too much to remove the vinyl bag easier).

	
Top side (fine, wrinkle-free surface)	Reverse side (glossy, wrinkled surface)

Fig.4-7-1-1 Two sides of anti-adhesion sheet

Fig.4-7-1-2 How to fold the anti-adhesion sheet

Do not bend the sheet at a sharp angle. Make the sheet a little loosely open.

(2) Insert the anti-adhesion sheet into the wax drain container and set the waste paraffin bag inside. Bend the top end of the liner in the bag at each side of the container to secure with the wax drain container lid.

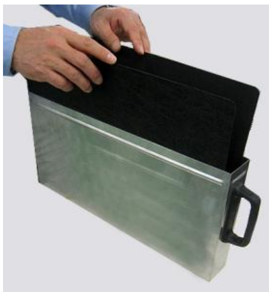


Fig.4-7-1-3 Placement into the wax drain container

(3) Place the container lid on the top of the wax drain container including the vinyl bag. Set the container into its position at the upper stage in the bottle rack.

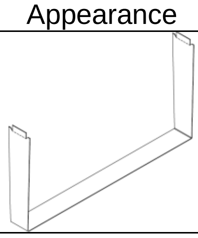
(4) After drain of waste paraffin, remove the container lid and lift hardened paraffin up while gripping both the bag and the liner.

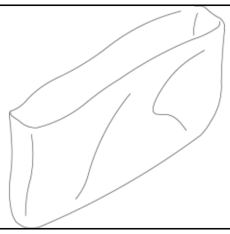

Fig.4-7-1-4 Removal of paraffin from the wax drain container

When removing waste paraffin, make sure to grip and lift up the liner together with the bag since paraffin may not completely harden.

(5) Fold back the top of the bag removed from the container so that a smell of clearing reagent emitting from waste paraffin can be blocked. Dispose of waste paraffin together with the bag and the liner. The material of them are as follows:

Table.4-7-1-1 Composition of waste paraffin bag set

Name	Appearance	Material
Liner		Foamed polypropylene

Vinyl bag		Polyethylene

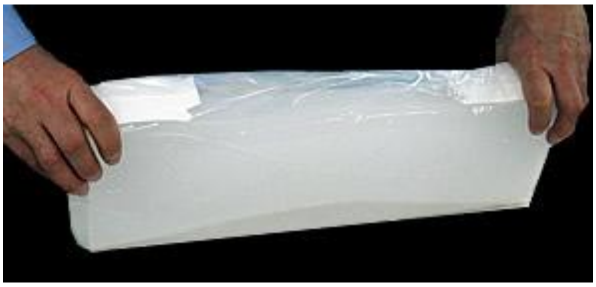


Fig.4-7-1-5 Disposal of waste paraffin

To care for the wax drain container, following the procedure below.

Tools required
- Paper towel
- Scraper

(1) Remove the anti-adhesion sheet from the wax drain container.

(2) Wipe the inside and outside of the container with paper towel. If paraffin is adhering, remove it using a scraper.

4-7-2 Replacing the Wax Drain Container Sensor

Tools required • Phillips screwdriver No. 2

(1) Remove the back panel.

⇒ Refer to 4-16-1, “Removing and Installing the Exterior Panels”.

(2) Remove the wax drain container sensor.

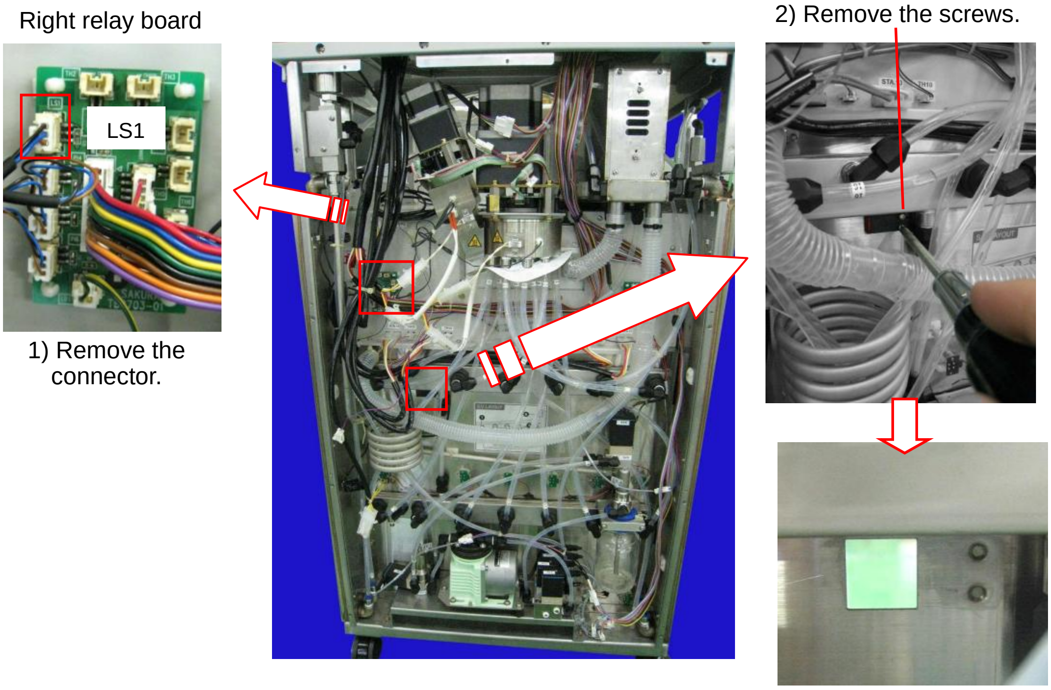


Fig.4-7-2-1 Removal of wax drain container sensor

(3) Install the new sensor, aligning with the square hole.

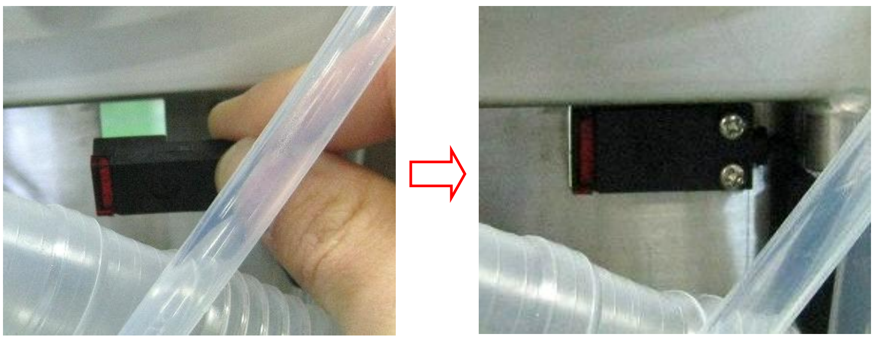


Fig.4-7-2-2 Installation of wax drain container sensor

(4) Turn the instrument power on. Log on the system using the service password.
Perform the operation check on the sensor under the service manual operations.
⇒ For the service manual operations, refer to 4-2, “Manual Operations”.

Confirm that the wax drain sensor indicator is turned on (illuminates in red).

Perform the operation check when the wax drain container is contacting with the stopper (a black part).

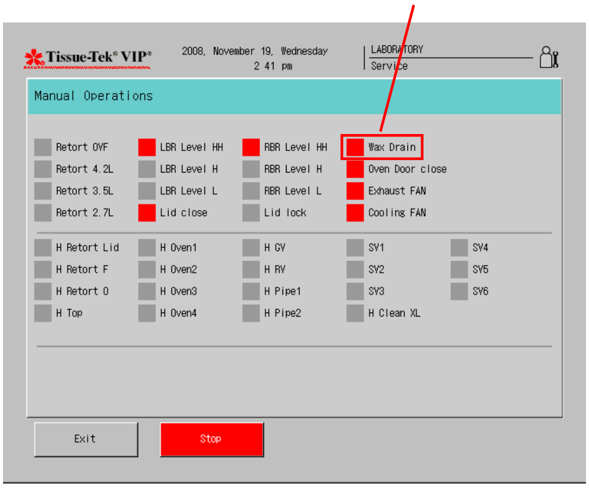


Fig.4-7-2-3 Operation check on the wax drain container

(5) Attach the back panel.
⇒ Refer to 4-16-1, “Removing and Installing the Exterior Panels”.

4-8 Reagent Bottle

4-8-1 Cleaning the Bottle Coupler and Replacing the O ring

Tools required
- Grease (Sealub S-11)
- Hexagon key wrench, L-shape, width across flats 5
- Wrench, width across flats 13
- Forceps
- Brush
- Wire (1mm in diameter)

(1) Remove the reagent bottle from the bottle rack.

(2) Remove the bottle coupler from the bottle.

Fig. 4-8-1-1 Removal of bottle coupler

(3) Clean or replace the bottle tube and replace the O ring, as necessary.

To replace the bottle tube,

1) Prepare the bottle tube (FEP, 8 dia. x 6 dia., L=505mm)
2) Push the tube into the plug.

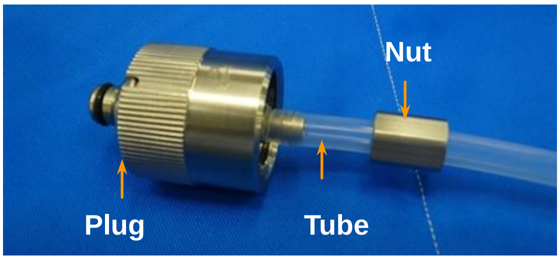


Fig. 4-8-1-2 Attachment of tube

3) Install the nut by 3 N.m of the tightening torque.

Fig. 4-8-1-3 Attachment of nut

§ Cleaning

- ∗ If the bottle tube and/or the plug is clogged with participates and/or paraffin, remove clean by immersing them in hot water.
- ∗ Clean the plug using a brush. If an air line hole is clogged, clean away by inserting a sharp object like a wire into the hole.

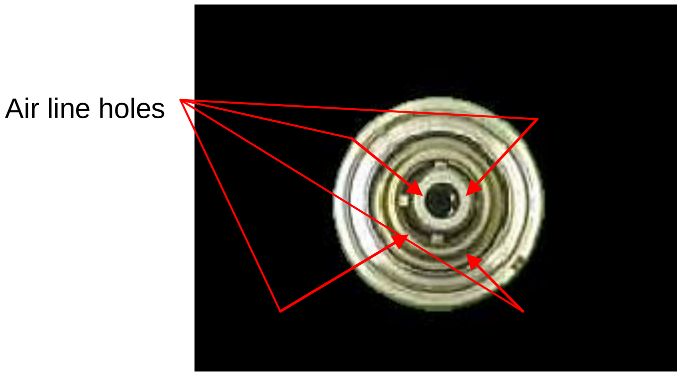


Fig.4-8-1-4 Locations of air line hole (front view of the plug)

§ Replacement of O ring and gasket

- ∗ Remove the O ring or the gasket from the plug (using forceps, if necessary).
- ∗ Wipe clean with waste cloth and insert the new O ring or gasket into the plug.

(4) Install the bottle coupler on the reagent bottle.

- ∗ Insert the end of the bottle tube into the bottle first and attach the bottle coupler.
- ∗ Tighten the sleeve cover to the arrowed direction with care to prevent the plug from rotating.

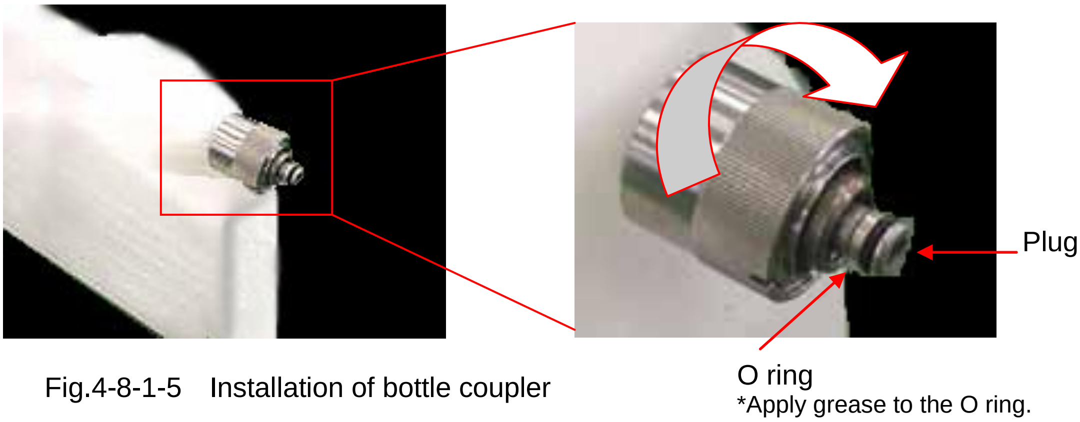


Fig.4-8-1-5 Installation of bottle coupler

(5) Return the reagent bottle to its original position in the bottle rack.

4-8-2 Replacing the Bottle Cap Gasket and PTFE Sheet

Tools required • Forceps

< Caution> Handle the PTFE sheet with care as it is easy to deform.

(1) Remove the bottle cap from the reagent bottle.

(2) Remove the PTFE sheet.

∗ Release the sheet from the claws inside the cap, using forceps.

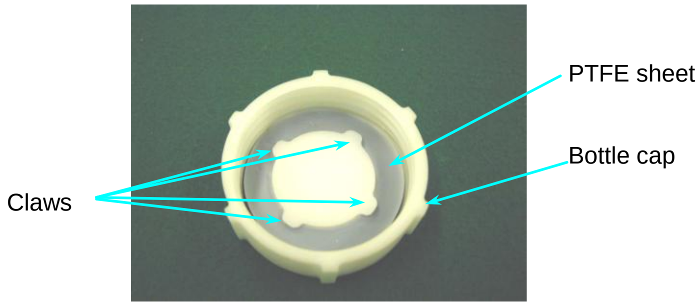


Fig. 4-8-2-1 Removal of PTFE sheet

(3) Remove the gasket

∗ Release the gasket from the claws inside the cap, using forceps.

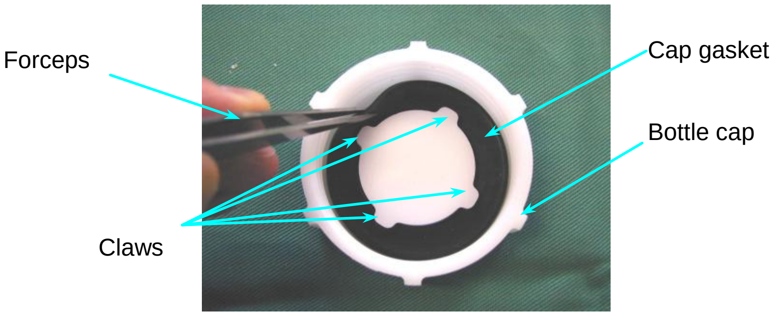


Fig. 4-8-2-2 Removal of cap gasket

(4) Fit the new gasket in the cap.

∗ Tuck the gasket in each claw.

(5) Fit the new PTFE sheet in the cap.

∗ Tuck the sheet in each claw.

4-8-3 Cleaning the Reagent Bottle

Tools required • Brush

(1) Remove the plug with the tube and the bottle cap

(2) Empty the reagent bottle.

(3) Clean the bottle with a brush and cleaning agent.

Fig. 4-8-3-1 Cleaning of reagent bottle

(4) Rinse the bottle well with warm water.

(5) Pour approximately 500 mL of alcohol in the bottle to rinse.

(6) Dry the bottle and attach the plug with the tube and the bottle cap.

4-9 Bulk Reservoir

4-9-1 Draining the Bulk Reservoir

4-9-1-1 Draining the bulk reservoir via the retort

When the bulk reservoir needs to be emptied in order to put a different reagent in the bulk reservoir or replace the bulk reservoir, follow the instructions below to drain the bulk reservoir.

Tools required

- Phillips screwdriver No. 2
- Monkey wrench 150mm
- Waste tray (height of 60mm or below, capacity of around 500cc)
  * A capacity of around 1 liter is necessary to drain both bulk reservoirs.
- External waste container (a capacity of 12 liters or larger is needed.)
  * A capacity of 24 liters or larger is necessary to drain both bulk reservoirs.)
- Toe jack (Allowable load at toes: 1 ton)
- Wooden block (able to have the caster on it; recommendable size: 50 x 25 x 700mm)
- Joint sealing tape (8mm wide)
- Rock Paint (red) or permanent marker (red)
- O ring (P/N B3-00-0081, JIS B2401, P12)

(1) Start the check program.

(2) Connect an external waste container to the drain/fill port and drain the bulk reservoir.

⇒ Refer to (26) Check the function of bulk reservoir" in 2-5-3 "Check Program Function" in 2-5 "Check Program".

To empty the bulk reservoir completely, follow the step (3) and after.

(3) Turn the instrument power off.

(4) Remove the paraffin containers from the oven and reagent bottles and the wax drain container from the bottle rack.

(5) Place a waste tray under the drain nozzle (Fig. 4-9-1-1) for the bulk reservoir to be drained. Loosen the hexagon plug at the drain nozzle to drain a reagent remaining in the bulk reservoir.

(6) Confirm that the front caster is locked by its stopper. While the waste tray stays under the waste nozzle as it is, slowly jack up the rear side of the instrument and place the rear caster on a wooden block to tilt the instrument.

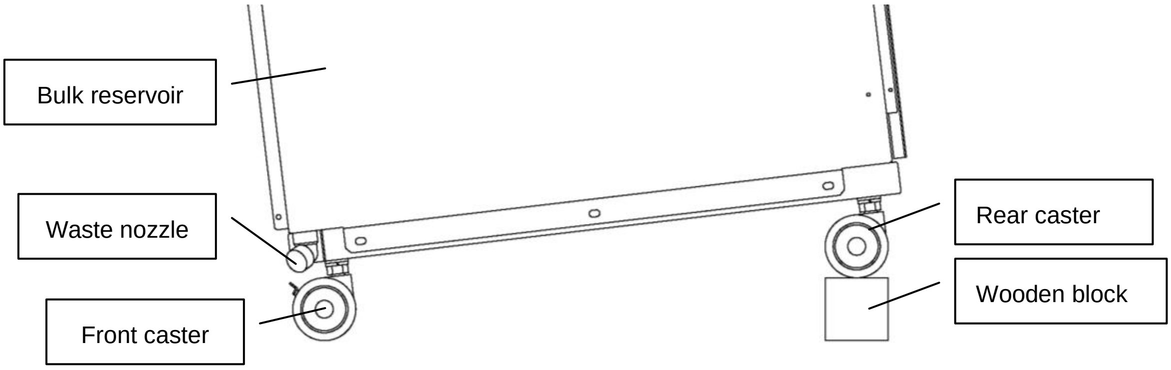


Fig.4-9-1-1 Tilting the instrument

Take extra care not to tilt the instrument too much when lifting the instrument.

(7) Thoroughly drain a reagent remaining in the bulk reservoir.

(8) Remove the wooden block from under the rear caster and level the instrument.

The sealing for the hexagon plug attached to the waste nozzle (drain port) was changed as from the following serial numbers. Refer to applicable serial numbers below.

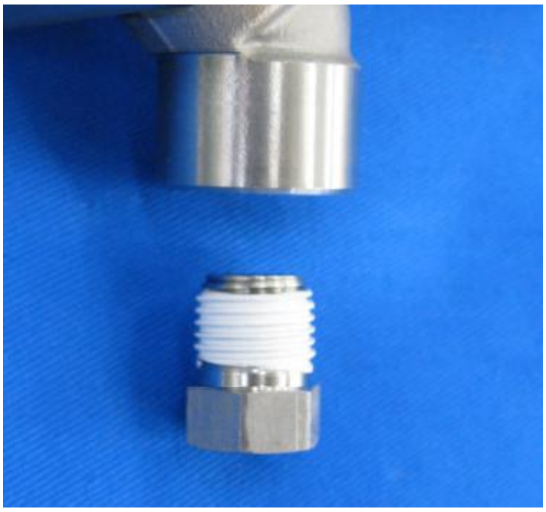
Applicable instrument serial numbers:

Sealing of Plug / Model	VIP 6-A1 (6030)	VIP 6-J0 (6031)	VIP 6-E2 (6032)
Sealing tape	0051 - 0218	0051 - 0089	0051 - 0123
O ring	0219 and after	0090 and after	0124 and after

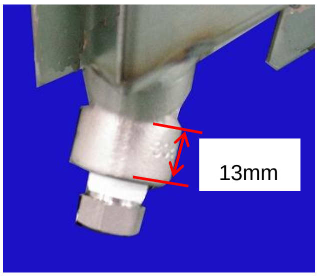
(9) Screw the hexagon plug into the waste nozzle.

Sealing tape

Completely remove the old sealing tape both from the hexagon plug and waste nozzle. Wrap the new sealing tape around the hexagon plug by four times and screw the plug into the waste nozzle (screwed depth: 8mm).



Width across flats of the old hex plug is 14mm.

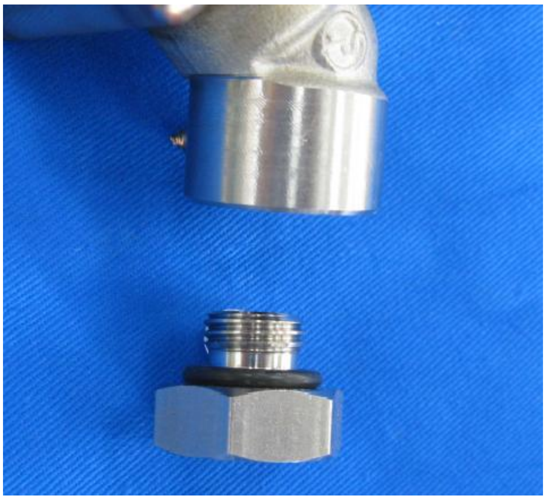


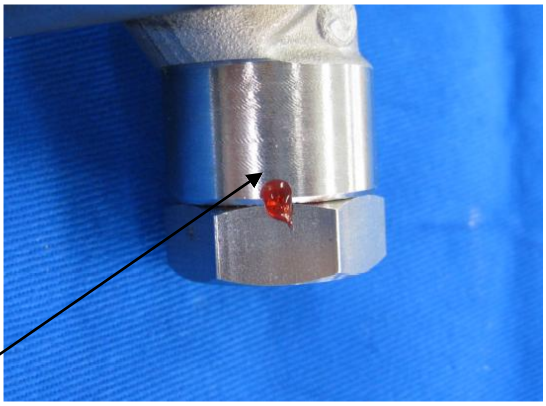
●Hexagonal plug

Wrap the sealing tape around the plug by 4 turns, starting one thread inside from open end of the plug in order to prevent tape chips from entering the reservoir.

O ring

Remove the old O ring and attach the new one to the hex plug. Screw the plug into the waste nozzle. Tighten the plug finger tight, and then use a wrench to make the final turn by 1.5mm along the plug. Mark the tightened plug and nozzle with a permanent marker.





Put a mark for complete tightening

Width across flats of the new hex plug is 21mm.

4-9-1-2 Draining the bulk reservoir directly

If the solution level in the bulk reservoirs is higher than the rotary valve position at the disassembly of the gate valve or rotary valve, the reagent may flow back and run out from disconnected portions (such as, in the tubing). To prevent this, it is necessary to reduce the solution level in the bulk reservoir to below the rotary valve position. However, in some cases, the bulk reservoir cannot be drained via the retort at the disassembly of the gate valve or rotary valve. To cope with such a situation, this section explains how to drain the bulk reservoir directly.

Tools required
- Wrench, width across flats 17
- Waste tray (capacity of around 5 liters)
- Waste cloth

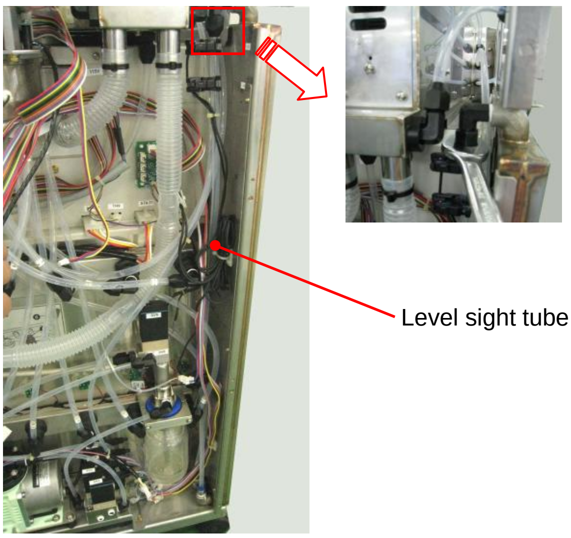
(1) Turn the instrument power off.

(2) Remove the rear panel.

⇒ Refer to 4-16-1, “Removing and Attaching Exterior Panels”

(3) Remove the level sight tube from the joint located on top.

1) Loose the joint nut.



Loosen the cap nut on the joint, using wrench (across flats 17).

Fig.4-9-1-2 Loosen the joint nut

2) Pull out the level sight tube from the joint.

Remove the tube with enough care to prevent a reagent from dropping since wetting the level sensor with reagent drops will cause malfunction.

Fig.4-9-1-3 Removal of level sight tube

(4) Drain the bulk reservoir.

1) Attach an elbow union to the level sight tube to prevent the level sensor from getting wet with a reagent.

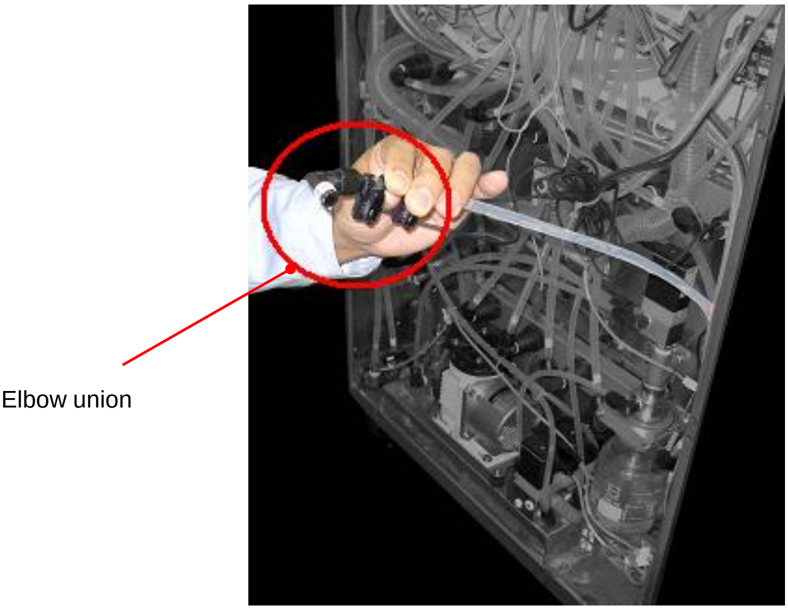


Fig.4-9-1-4 Attachment of elbow union

2) Flow a reagent out by tilting the level sight tube and receive it with a waste tray until the solution level in the bulk reservoir becomes lower than the rotary valve position or the drain of reagent stops.

Fig.4-9-1-5　Drain of reagent

3) After a reagent has flown out, wipe clean the elbow union with waste cloth to remove a reagent in it.　To be safe, face the elbow union upward in the order shown in Fig. 4-9-1-6 to prevent a reagent from dropping onto the level sensor before returning the level sight tube.

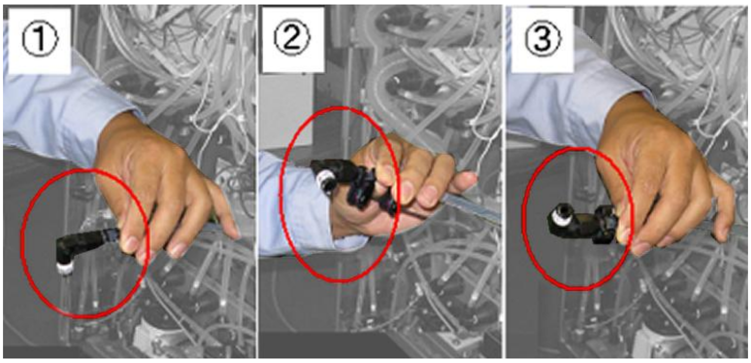


Fig.4-9-1-6　Face the elbow union upward.

4) Remove the elbow union from the level sight tube.

(5) Insert the level sight tube into the joint and tighten the cap nut on the joint [in the reverse order of step (3)].

4-9-2 Replacing the Level Sensor

Tools required
- Phillips screwdriver No. 2
- Nipper

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Remove the connector for the level sensor to be replaced from the board. Cut the cable tie that holds the level sensor and remove the level sensor from the level sight tube.

* Take care not to lose the non-slip tube being used on the cable tie as it will be reused.

(4) Pass the end of the cable tie through the new level sensor first and then the non-slip tube. Loosely secure the level sensor with the cable time (refer to Fig. 4-9-2-1).

The cable tie to be used must be 2.5mm wide or less.

Do not deform even a little the level sight tube. Since the level sensor has a fastening mechanism, the cable tie can be fastened softly enough to keep the level sight tube from deforming. (Refer to Fig. 4-9-2-3.)

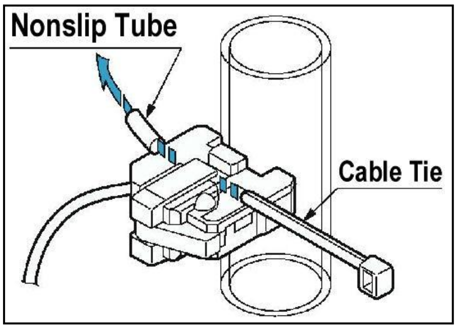


Fig.4-9-2-1 Installation of level sensor

(5) There are an alignment hole and an identification label for each level sensor on the wall of the bulk reservoir. Adjust to position the level sensor at a proper height, and secure it in the specified position (refer to Fig. 4-9-2-2).

By loosening the mount position adjust lever, the senor can move up and down. After the sensor has been positioned, return the lever to its original position to hold the sensor in place. (Refer to Fig. 4-9-2-3.)

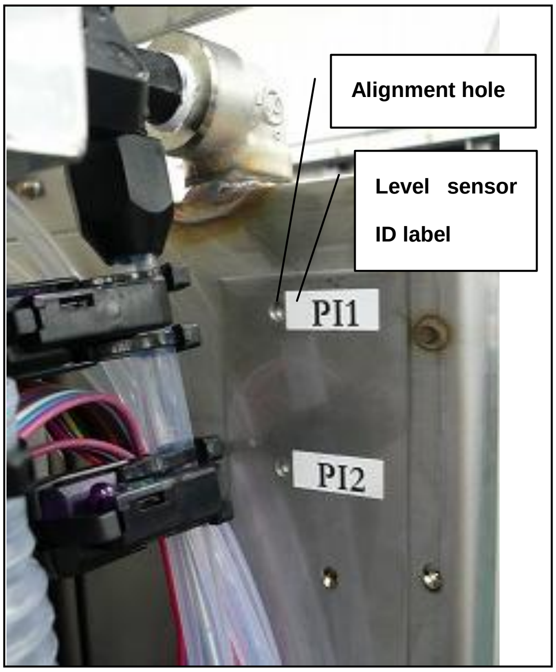


Fig.4-9-2-2 Positioning the level sensor

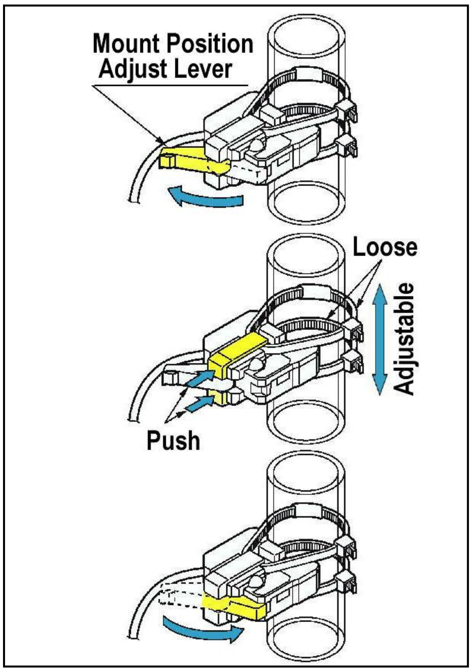


Fig.4-9-2-3 Adjusting the level sensor position

(6) Perform the operation check on the level sensor.

⇒ Refer to 4-9-5, “Checking the Function of the Level Sensors”.

(7) Attach the back panel.

4-9-3 Cleaning and Replacing the Safety Valve (Teflon Ball)

Tools required
- Phillips screwdriver No. 2
- 2 wrenches, width across flats 21

(1) Turn the instrument power off.

(2) Remove the back panel, right and left panels.

(3) Remove the Teflon tube connected to the air outlet of the safety valve.

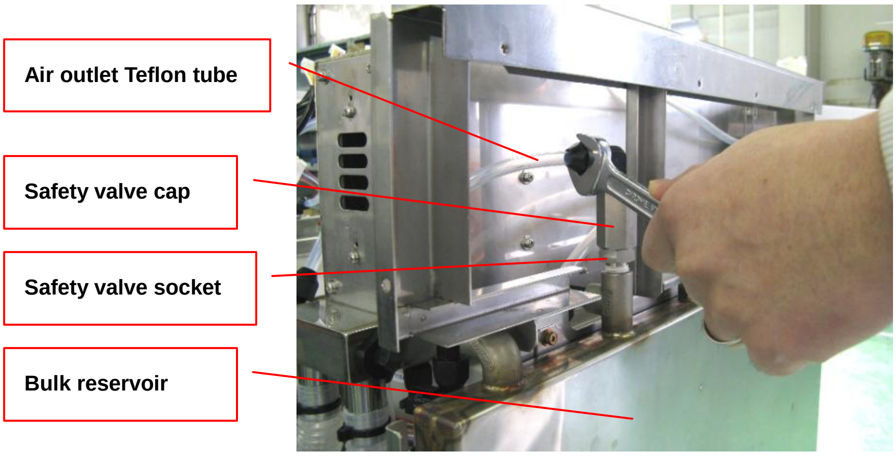


Fig.4-9-3-1 Removal of Teflon tube

(4) While holding the hexagonal part of the safety valve socket by a wrench, remove the safety valve cap.

Fig.4-9-3-2 Removal of safety valve cap

(5) Remove the Teflon ball from the safety valve socket and wipe it clean. If the Teflon ball seems deteriorated, replace it with a new one.

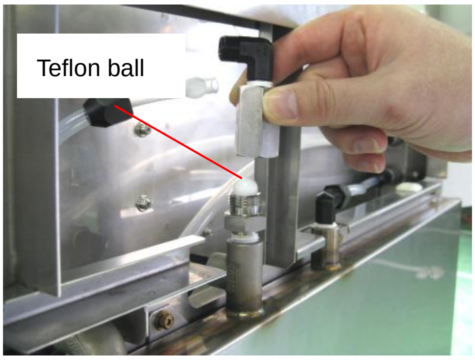


Fig.4-9-3-3 Removal of Teflon ball

Fig.4-9-3-4 Cleaning of Teflon ball

(6) After the Teflon ball was cleaned or replaced, reassemble the safety valve in the reverse order of steps (3) to (5).

(7) Start the check program. Perform the functional check on the check valve of the bulk reservoir to confirm if the safety valve works properly.

⇒ Refer to (20) Check the check valve of bulk reservoir in 2-5-3 “Check Program Function” in 2-5 “Check Program”.

(8) Attach the right and left panels and back panel.

4-9-4 Replacing the Bulk Reservoir

Tools required

- Phillips screwdriver No. 2
- Monkey wrench 150mm
- Wrench, width across flats 14, 17
- Waste tray (capacity of around 2 liters)
- External waste container (capacity of 12 liters or larger)
- Toe jack (Allowable load at toes: 1 ton)
- Wooden block (able to have the caster on it; recommendable size: 50 x 25 x 700mm)
- Sealing tape (8mm wide)

(1) Drain the bulk reservoir to be replaced.

⇒ Refer to 4-9-1, “Draining the Bulk Reservoir”.

(2) Remove the exterior panels (side panels and back panel).

⇒ Refer to 4-16-1, “Removing and Installing the Exterior Panels”.

(3) Remove joints on top of the bulk reservoir.

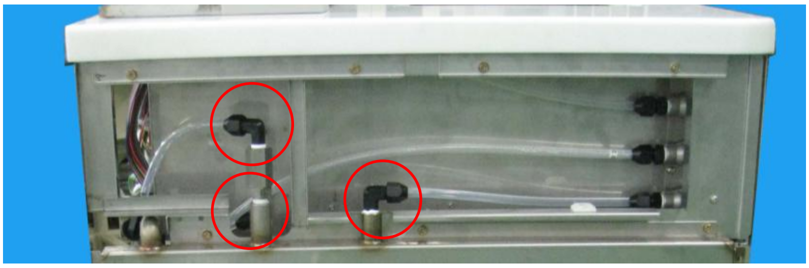


Fig.4-9-4-1 Removal of joints on top of bulk reservoir

(4) Remove the level sight tube (level sensors)

1) Remove the level sensor connectors from the relay board.

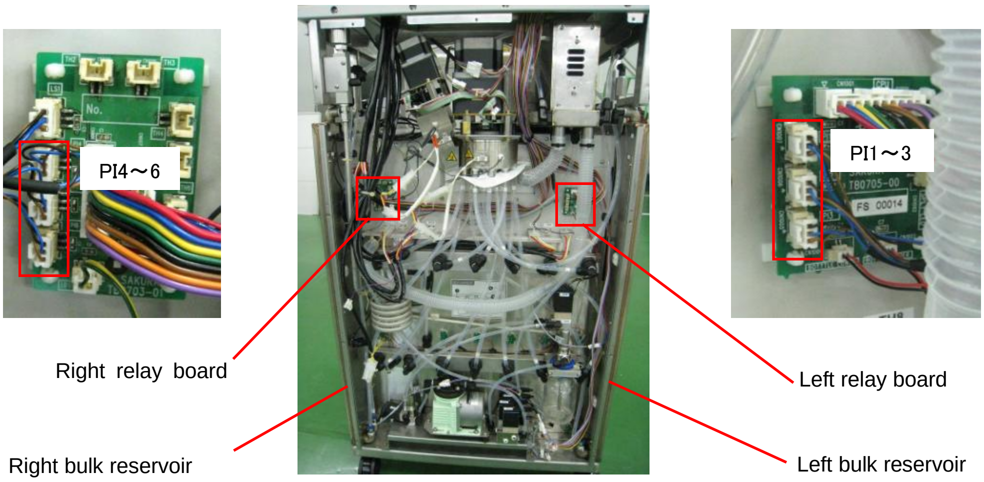
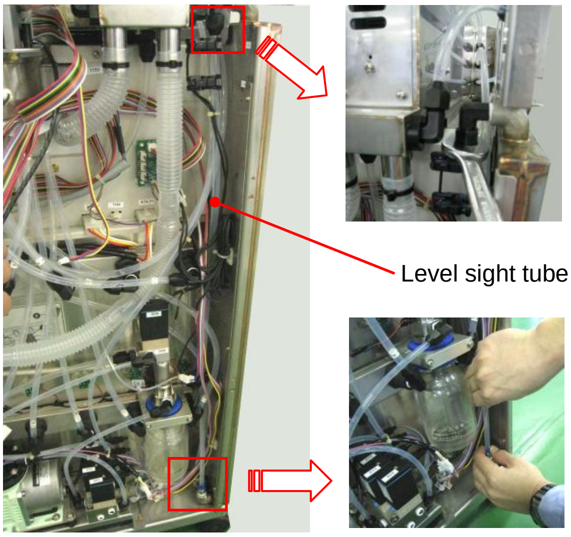


Fig.4-9-4-2 Connector locations for level sensors

2) Remove the level sight tube from joints at both ends.



Loosen the joint cap nut using a wrench (across flats 17).

Pull out the tube while pressing the blue potion of the insertion joint.
Take care not to fold the tube.

Fig.4-9-4-3 Removal of level sight tube

(5) Remove the flow tube only from the insertion joint connected to the bulk reservoir.

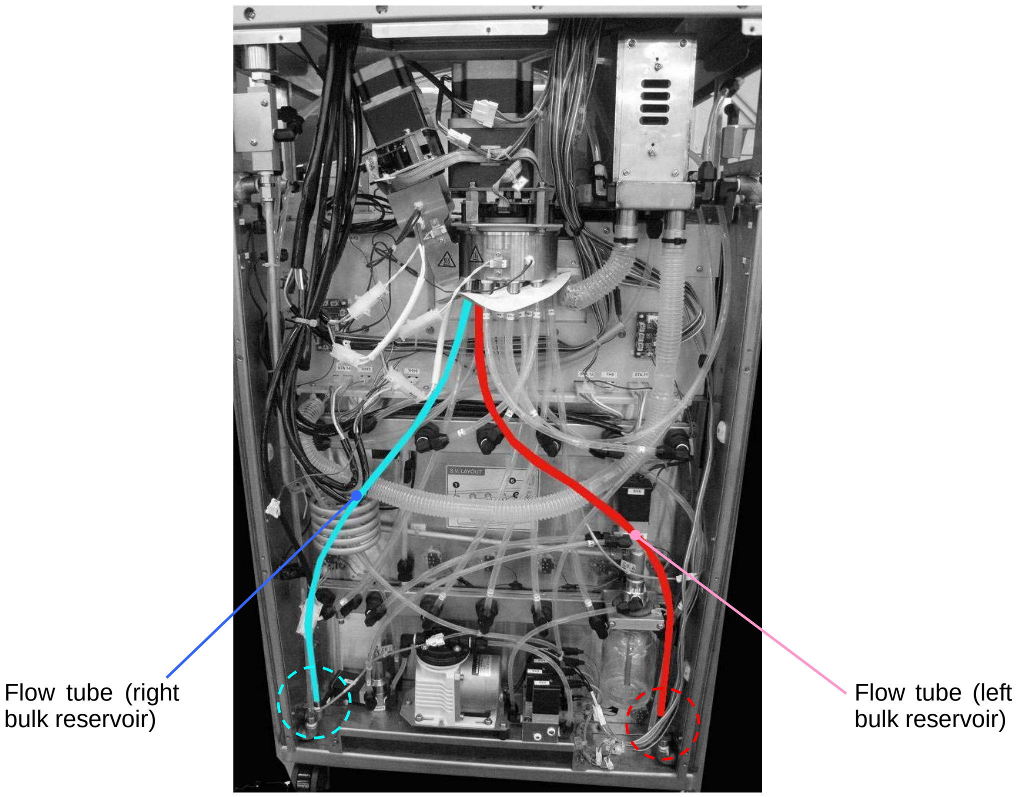


Fig.4-9-4-4 Removal of flow tubes

(6) Remove fixing screws from the bulk reservoir and remove it from the instrument.

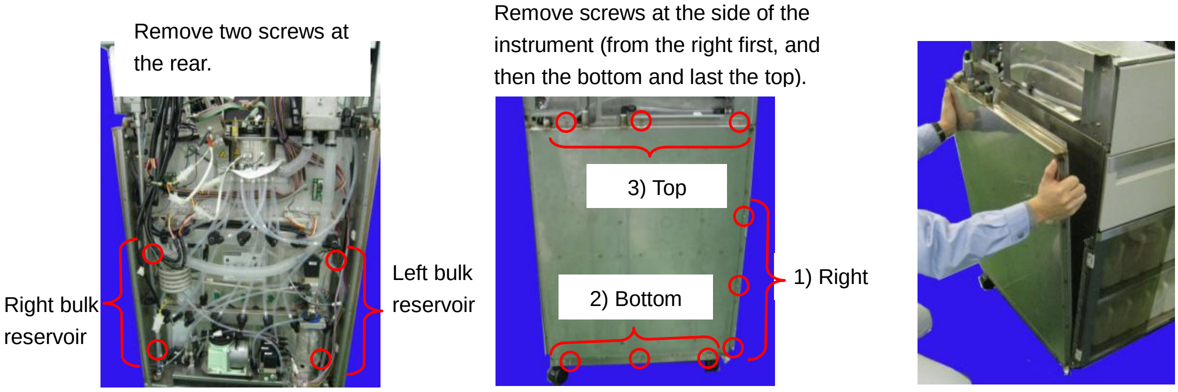


Fig.4-9-4-5 Removal of bulk reservoir

(7) Install the new bulk reservoir.

1) Remove joints (hex plug, safety valve, Z union joint, and insertion joint) from the old bulk reservoir and attach them to the new bulk reservoir.

* For the hexagon plug, refer to 4-9-1 "Draining the Bulk Reservoir". For the safety valve, refer to 4-9-3 "Replacing the Safety Valve (Teflon Ball)".

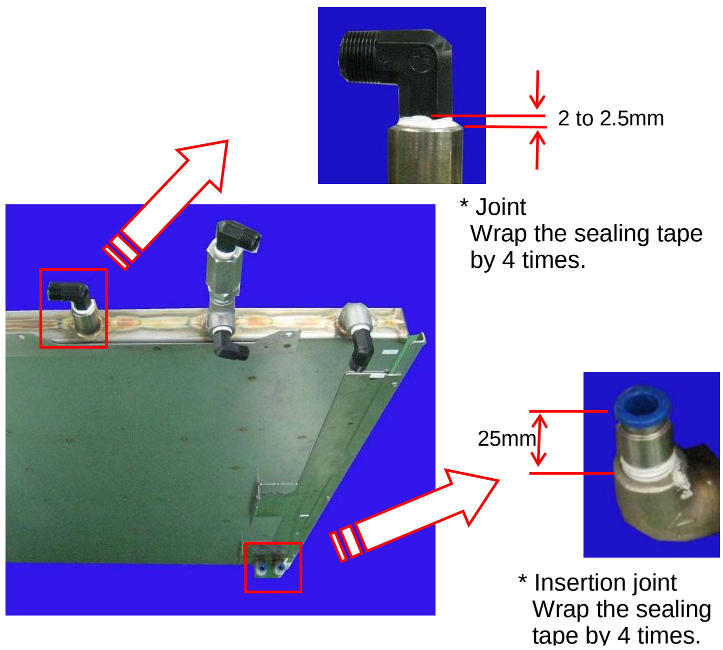


Fig.4-9-4-6 Attachment of joints

2) Install the bulk reservoir [by tightening screws in the reverse order of step (6)].

3) Connect the flow tube to the insertion joint.

4) Connect the level sight tube (level sensors).

Confirm that each level sensor is level with each alignment hole.
If they are not aligned, adjust the position of each sensor.

Fig.4-9-4-7 Positioning of level sensors

(8) Start the check program to perform the following operation checks.

⇒ Refer to 2-5, “Check Program”.

* “Check leakage from the bulk reservoir”
* “Check the check valve of bulk reservoir”
* Check the level sensors for the bulk reservoir

⇒ Refer to 4-9-5, “Checking the Function of the Level Sensors”.

(9) Attach the exterior panels (side panels and back panel).

⇒ Refer to 4-16-1, “Removing and Installing the Exterior Panels”.

4-9-5 Checking the Function of the Level Sensors

(1) Start the check program.

(2) Pump a reagent into the bulk reservoir with the level sensors to be checked.

⇒ Refer to (26) Check the function of bulk reservoir in 2-5-3 "Check Program Function" in 2-5 "Check Program".

(3) Confirm that each level sensor is turned on (LED is lit) when a reagent reaches each sensing level in the level sight tube. (Refer to Fig. 4-9-5-1.)

If the overflow level (HH) sensor fails to detect a reagent, the pump-in does not stop even when a reagent passes the overflow level. In this case, the pump-in needs to be stopped by turning off the instrument power. Therefore, check the level sensors while being ready to unplug the instrument (Fig. 4-9-5-2).

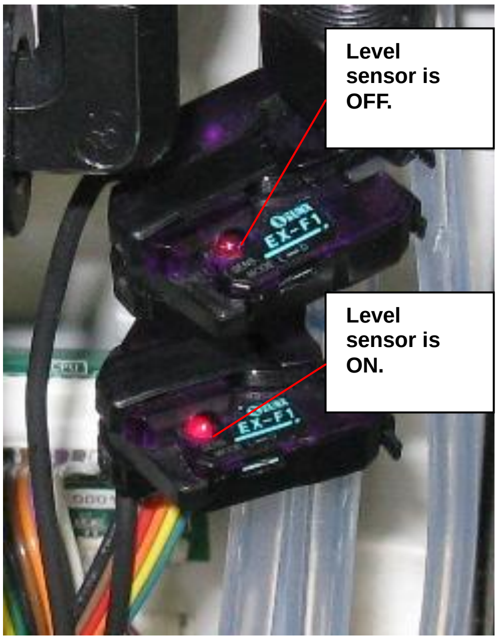


Fig. 4-9-5-1 Check on level sensors


Fig. 4-9-5-2 Ready for stop of pump-in

∗ When the overflow level sensor operates, the pump-in is automatically stopped. However, the overflow level sensor will be turned off (LED is turned off) as the reagent level slightly decreases after stop of the pump-in. Therefore, confirm that the overflow level sensor is turned on (LED is lit) when it detects a reagent.

(4) If any of the level sensors fails to detect a reagent, stop the pump-in and replace the defective level sensor. After replacement, perform again the operation check on the level sensors.

⇒ Refer to 4-9-2, "Replacing the Level Sensor."

4-9-6 Cleaning the Bulk Reservoir

Prior to placing a different reagent in the bulk reservoir, follow the instructions below to clean the bulk reservoir.

Tools required
- Phillips screwdriver No. 2
- Monkey wrench 150mm
- External container filled with clean alcohol (volume of 12 liters or larger)
- Waste tray (height of 60mm or below, capacity of around 500cc)
- External waste container (a capacity of 12 liters or larger is needed.)
- Toe jack (Allowable load at toes: 1 ton)
- Wooden block (able to have the caster on it; recommendable size: 50 x 25 x 700mm)
- Joint sealing tape (8mm wide)

(1) Start the check program.

(2) Connect the external container filled with clean alcohol to the exclusive fill port for the bulk reservoir to be cleaned [the bottom fill port is for the left bulk reservoir (Station 19) and the top fill port is for the right bulk reservoir (Station 20)]. Pump in the clean alcohol to the bulk reservoir.

⇒ Refer to (26) Check the function of bulk reservoir in 2-5-3 “Check Program Function” in 2-5 “Check Program”.

(3) After completion of the pump-in to the bulk reservoir, drain the bulk reservoir.

⇒ Follow the steps (2) to (8) in 4-9-1-1, “Draining the bulk reservoir via the retort”.

(Note) Leave the waste nozzle open even after the drain was completed.

(4) Turn the instrument power on to start the check program.

(5) Using the manual operation in the check program, energize the air pump (“Operate Air Pump”) first and then the solenoid valves below by pressing the applicable bottom.

∗ Turn on SV1, SV3 and SV4 for the left bulk reservoir (Station 19).

∗ Turn on SV1, SV3 and SV5 for the right bulk reservoir (Station 20).

⇒ Refer to (2) Manual operation in 2-5-3 “Check Program Function” in 2-5 “Check Program”.

(6) Keep the air pump and solenoid valves running for over one hour.

(7) Stop the air pump and solenoid valves after one-hour operation or longer.

(8) Completely remove the old sealing tape from the hexagon plug and waste nozzle. Wrap the new sealing tape around the hexagon plug by five times and screw the plug into the waste nozzle (screwed depth: 8mm).

⇒ Refer to 4-9-1-1, “Draining the bulk reservoir via the retort”.

4-10 Rotary Valve / Gate Valve

4-10-1 Replacing the Motor

Tools required
- Phillips screwdriver No. 2
- Large flathead screwdriver
- Ratchet wrench + box, width across flats 8mm
- Socket, width across flats 8
- Hexagon wrench, width across flats 2
- Screw lock glue (Loctite 242, blue, 50mL)
- Hex socket cup-point set screw, FE, M5x6
- Waste cloth

4-10-1-1 Replacing the rotary valve motor

(1) Check the reagent level in each bulk reservoir through the level sight tube.
If the reagent level is higher than the rotary valve position, drain the bulk reservoir in either one of the following ways.

* If the bulk reservoir can be drained via the retort:
  Manually pump in a reagent from the bulk reservoir and pump out to an external container through the drain/fill port (Sta. 18). Repeat the procedure several times until the reagent level in the bulk reservoir becomes lower than the rotary valve.
* If the bulk reservoir cannot be drained via the retort:
  Remove the union joint located at top of the level sight tube and drain a reagent to an external container through the level sight tube until he reagent level in the bulk reservoir becomes lower than the rotary valve.

(2) Turn instrument power off.

(3) Remove the back panel.

(4) Remove the connector being connected to the rotary valve motor.

(5) Using the ratchet with socket 8 attached, remove four cross-recessed hex head bolts which fasten the RV motor housing. Gently lift the motor unit and tilt the motor head toward the front of the instrument to remove the motor unit.

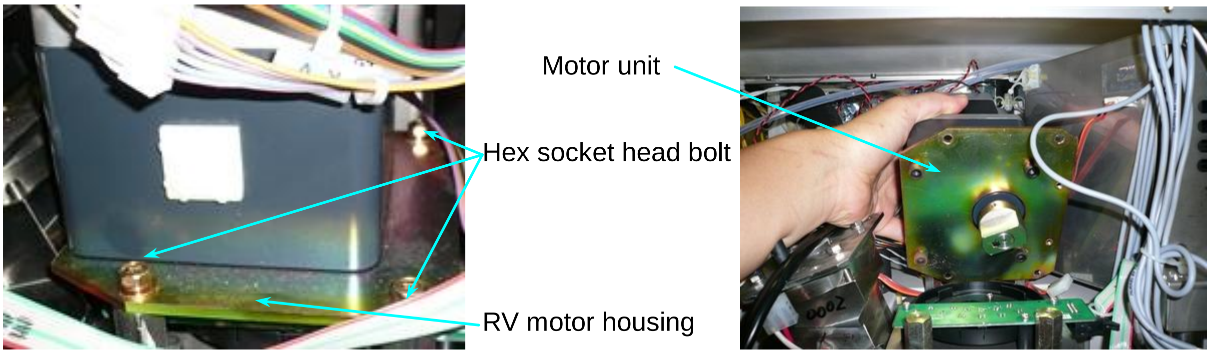


Fig. 4-10-1-1 Removal of motor unit

(6) Loosen two hex socket head set screws which fasten the coupling and key, and remove them from the motor shaft. Loosen hex socket head bolts which fasten the RV motor housing to the motor, and replace the motor.

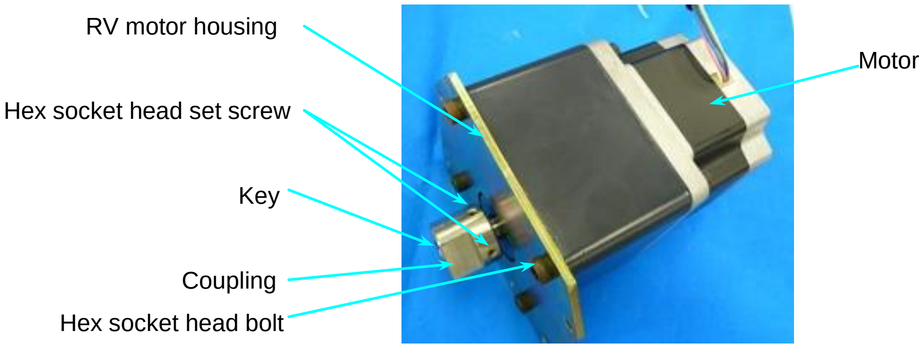


Fig. 4-10-1-2 Appearance of motor unit

(7) Fix the coupling and key to the gear head shaft by hex socket head screws with screw lock glue applied (Loctite 242, blue), adjusting a clearance between the end of the coupling and the RV motor housing to be 7mm.

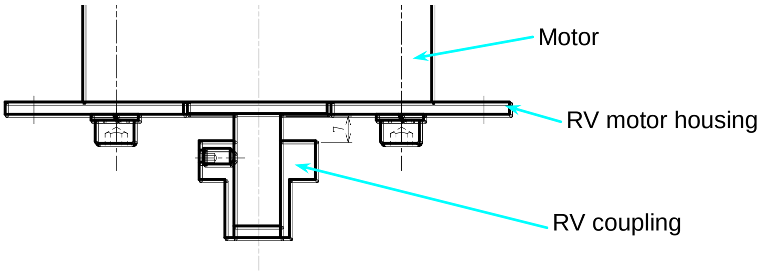


Fig. 4-10-1-3 Rotary valve coupling

(8) Place the motor unit into the instrument, aligning the coupling with the groove on the rotary disk. If the rotary disk is not positioned to allow cross-recessed hex head bolts to be tightened, hold the motor body by hand and rotate the rotary disk to fit the coupling.

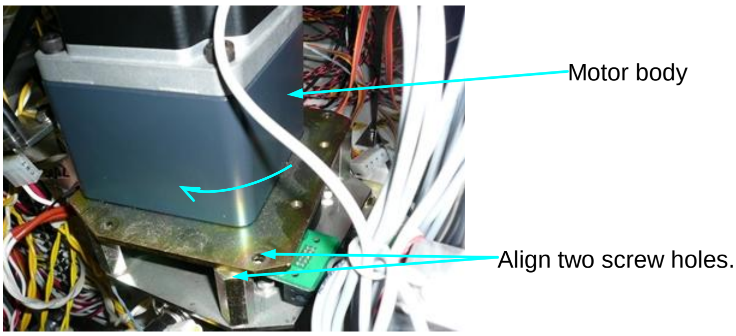


Fig. 4-10-1-4 Alignment of motor unit

(9) Tighten cross-recessed hex head bolts to fasten the motor unit on the RV motor housing.

(10) Connect the connector for the rotary valve motor to the connector at the instrument side.

(11) Turn the instrument power on in the service mode to check if the rotary valve can work properly without an error and any abnormal noise by advancing the rotary valve to an appropriate station under the service manual operation.

(12) Attach the back panel.

4-10-1-2 Replacing the gate valve motor

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Remove the connector being connected to the gate valve motor.

(4) Using the ratchet with socket 8 attached, remove three cross-recessed hex head bolts which fasten the GV motor housing. Gently lift up the motor unit to remove from the gate valve body.

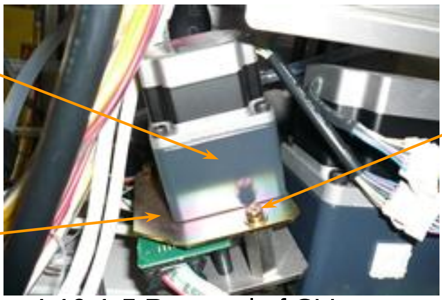


Fig. 4-10-1-5 Removal of GV motor unit

(5) Remove hex socket head bolts which fasten the GV motor housing to the GV motor, and replace the GV motor set.

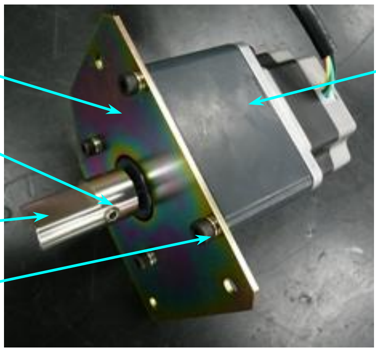


Fig. 4-10-1-6 Appearance of motor unit

(6) Place the motor unit into the instrument, and make the GV coupling fit in with the rotary disk before fastening the GV motor housing. (Refer to Fig. 4-10-1-5.) If they are not fitted, rotate the GV positioning disk by hand to make them fit.

(7) Connect the connector for the gave valve motor.

(8) Turn the instrument power on. Under Service Manual Operations, shift the gave valve position four times to verify that gave valve properly moves to “Close”, “Fill”, “Close” and to “Drain” without any abnormal noise.

(9) Attach the back panel.

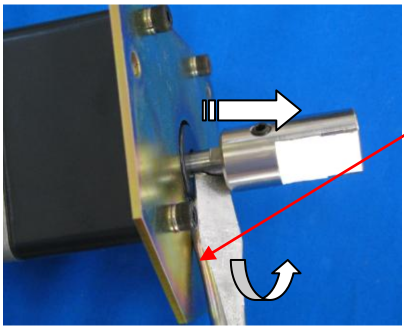
(Note) In order to prevent a play between the GV motor and the GV coupling, the process to fit the motor shaft in and glue to the GV coupling has been conducted for the units with the following serial numbers. Therefore, the GV coupling cannot be separated from the motor. When replacing the GV motor, the coupling also needs to be replaced together. For the units with lower serial numbers, if a play occurs on the GV coupling or EC53 is stored in the error log, it is necessary to reconnect the motor shaft with the GV coupling, following the procedure below. In this case, use the FE set screw, not the SUS set screw.

* Serial numbers affected

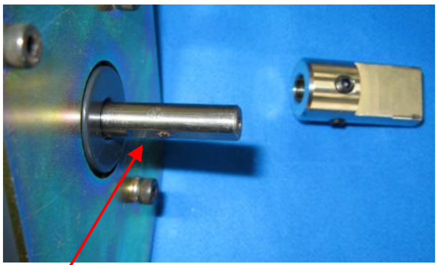
Model	VIP 6-A1 (6030)	VIP 6-J0 (6031)	VIP 6-E2 (6032)
S/N	0158 and after	0070 and after	0111 and after

<u>Reconnection of GV coupling to motor shaft</u>

1. Loosen hex socket cup-point set screws (SUS, M5x6), and remove the coupling by using the end of a large flathead screwdriver like jacking up the coupling.
2. Since the motor shaft probably has indentation produced by the set screw, you will feel resistance when fitting the coupling onto the shaft. Therefore, file the indented surface.



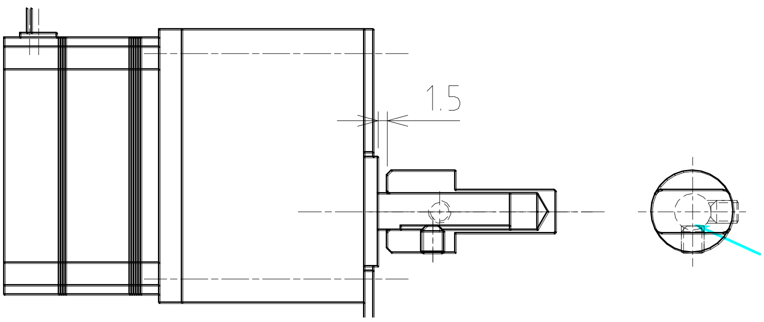
Draw out, applying the leverage theory.



Sandpaper the indented surface.

Fig. 4-10-1-7 Pretreatment

3. Use the new FE hex socket cup-point set screw. Make sure to remove oil both from the FE set screw and the motor shaft.
4. Apply screw lock glue "Loctite 242 (Blue)" to FE set screws.
5. To tighten two set screws, while adjusting to leave a 1.5mm clearance between the end face of the coupling and the motor boss, first tighten one set screw straight into the screw hole on the D-cut side (align with the D-cut face of the coupling) and then tighten the other set screw into the cylinder body. Firmly tighten these set screws with 3N.m tightening torque or by using a longer handle of a hexagon wrench.



Align with D-cut of motor shaft

Fig. 4-10-1-8 Gate valve coupling

4-10-2 Maintaining the Rotary and Stationary Disks, Valve Housing and O rings

Tools required
- Phillips screwdriver No. 2
- Ratchet
- Socket, width across flats 8
- Stubby screwdriver No. 2
- Brush
- Grease (Sealub S-11)
- Paper towel
- Forceps

<Caution>

1. When disks and valve housing are very hot, wear protective gear to prevent burns.
2. To prevent dusts from entering the inside of valve housing and/or between the rotary disk and the stationary disk, quickly perform the work or cover components with a cloth when leaving them alone.
3. Rotary and stationary disks are made of ceramic. Take much care not to drop or damage them.
4. Check to make sure that slits on the positioning disk are free of dusts.
5. Take extreme care not to damage the positioning disk and the positioning board when removing or installing the motor unit.

4-10-2-1 Rotary valve

(1) Check the reagent level in each bulk reservoir through the level sight tube.
If the reagent level is higher than the rotary valve position, drain the bulk reservoir
Refer to the step (1) in 4-10-1-1 for how to drain the bulk reservoir.

(2) Turn the instrument power off.

(3) Remove the back panel.

(4) Remove the connector being connected to the rotary valve motor.

(5) Using the ratchet with socket 8 attached, remove four cross-recessed hex head bolts that fasten the rotary valve motor housing. Gently lift the motor unit to remove from the rotary valve body.

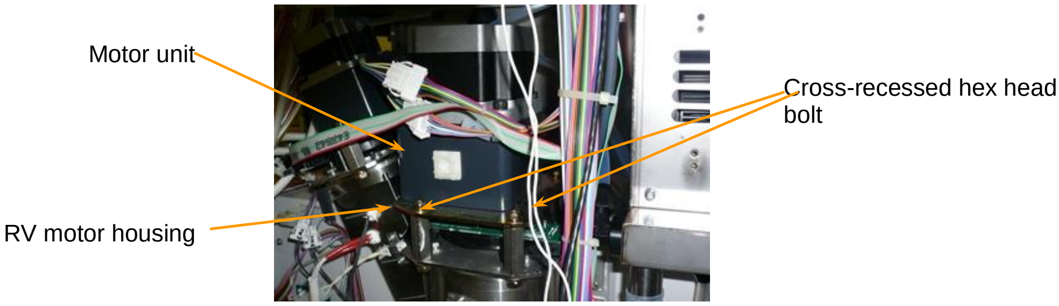


Fig. 4-10-2-1 Removal of RV motor unit

Remove the RV positioning board and then remove the RV positioning disk 6.

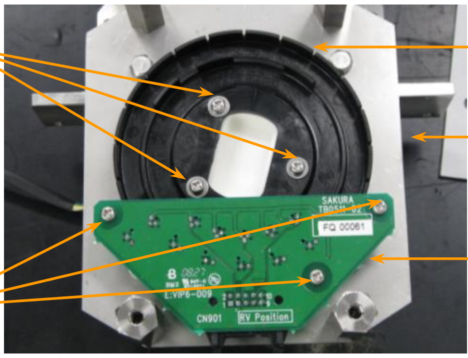


Fig. 4-10-2-2 Removal of RV positioning board and positioning disk

(6) Remove hex bolts from the RV spring hold plate. When removing bolts, loosen them diagonally and evenly.

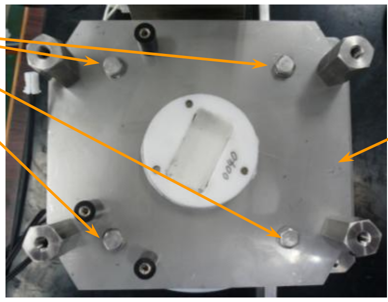


Fig. 4-10-2-3 Removal of RV spring hold plate

(7) Remove the RV spacer ring, two wave washers and the RV thrust ring in order. Wipe off old grease with paper towel.

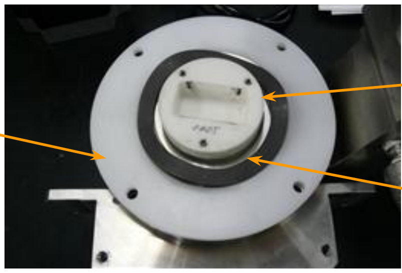


Fig. 4-10-2-4 Removal of RV spacer ring

(8) Remove the bearing, and then lift up on the flange of the RV disk hold rind to remove the stationary disk, the rotary disk and the RV disk hold ring together.

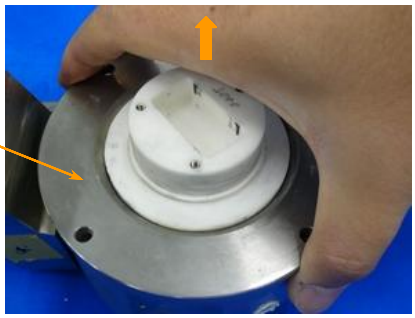


Fig. 4-10-2-5 Removal of disks

(9) While holding the flange of the RV disk hold ring, rotate the stationary disk to release the stationary disk from the pawl of the RV disk hold ring.

Fig. 4-10-2-6 Release of RV stationary disc

(10) With the component laid upside down, push down the RV disk hold ring to detach the rotary disk and stationary disk from RV disk hold ring.

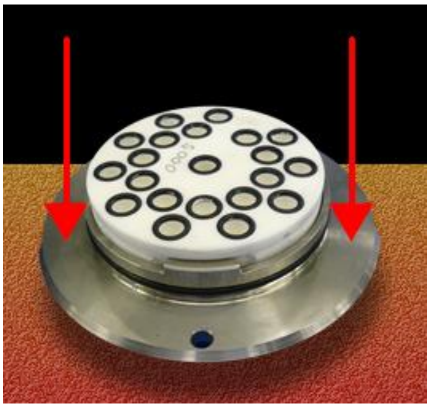


Fig. 4-10-2-7 Removal of RV rotary disc and stationary disk

Remove O rings from the RV disk hold ring and clean grooves for O rings by wiping off old grease with paper towel.

(11) Separate the rotary disk from the stationary disk by sliding the rotary disk sideways. If difficult, place them in warm water of around 60°C to allow for easy separation.

Fig. 4-10-2-8 Separation of RV rotary disk from stationary disk

(12) Remove O rings from the rotary disk. Clean the rotary disk by wiping off old grease remaining on the sliding surface with paper towel. Old grease can be almost completely removed from the sliding surface by using alcohol.

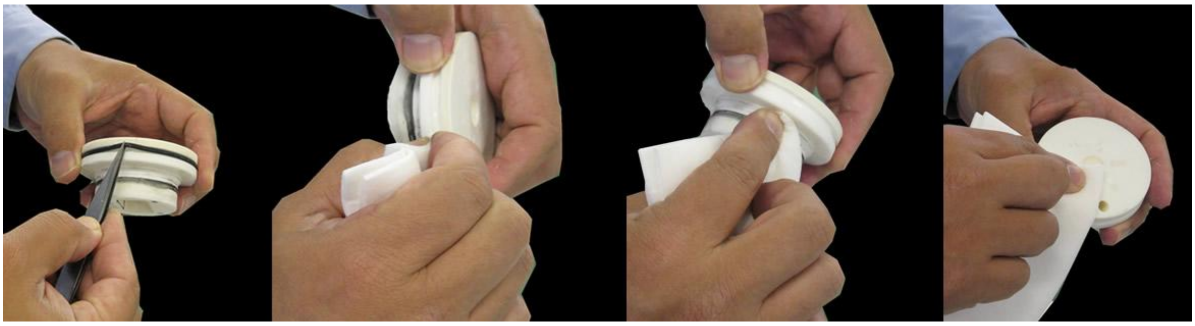


Fig. 4-10-2-9 Cleaning of RV rotary disk

(13) To replace O rings for the stationary disk, remove old O rings from the bottom face. Clean the stationary disk by wiping off old grease remaining on the sliding surface with paper towel. Old grease can be almost completely removed from the sliding surface by using alcohol.

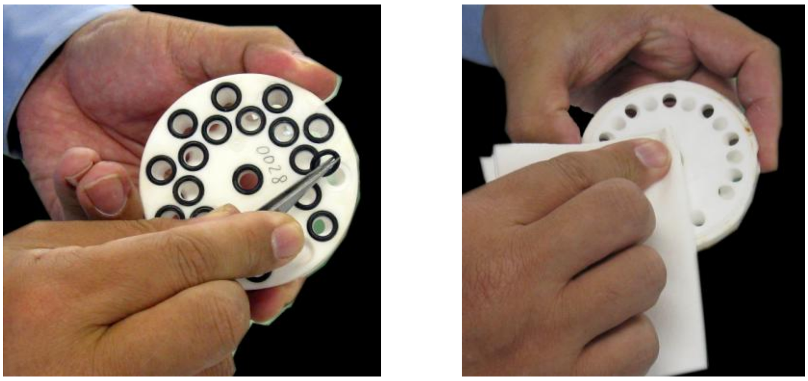


Fig. 4-10-2-10 Cleaning of RV stationary disk.

(14) Wipe clean the inside of the RV housing and key with a cloth moistened with alcohol.

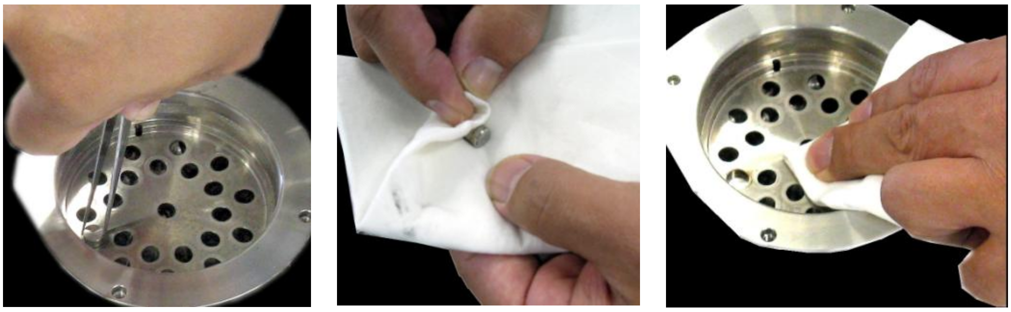


Fig. 4-10-2-11Cleaning of RV housing

(15) To replace O rings for the stationary disk, fit new O rings onto the bottom face of the stationary disk and coat them with a thin layer of grease.

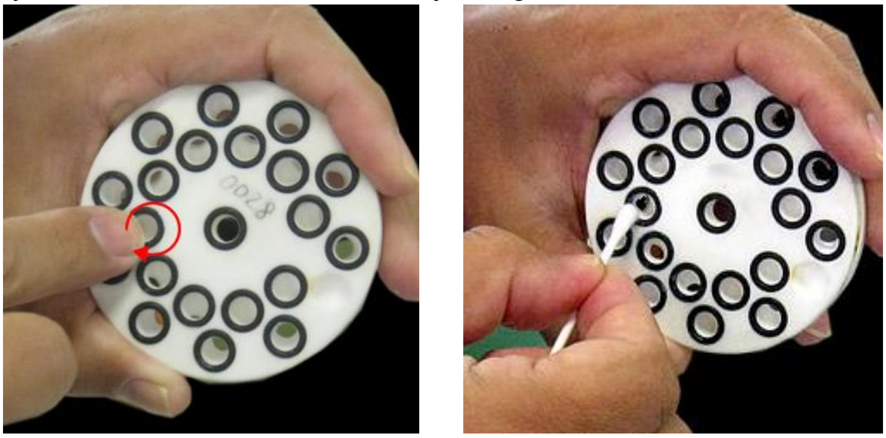


Fig. 4-10-2-12 Apply grease to O rings for the stationary disk

To apply grease, put a slight amount of grease on the tip of your finger and slide the finger round each O ring. After grease has been applied to all O rings, use a stick like a cotton swab to remove excessive grease from the inner side of each O ring.

(16) To replace the O ring for the RV disk hold ring, grease the new ring in advance. Fit the new O ring on the RV disk hold ring and smoothen it entirely with your fingers to eliminate unevenness.

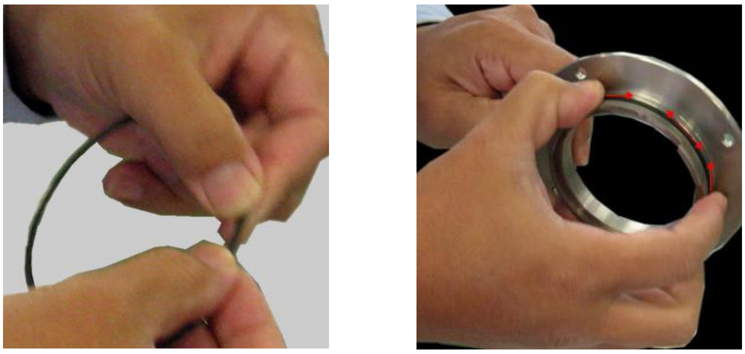


Fig. 4-10-2-13 Attachment of O ring to RV disk hold ring

(17) Coat the inside of the RV disk hold ring with a thin layer of grease.

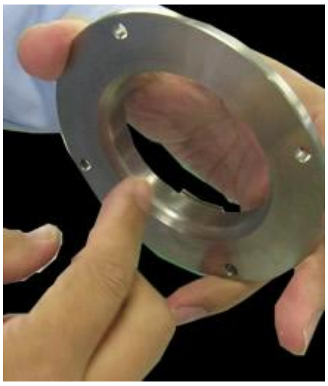


Fig. 4-10-2-14 Apply grease to the RV disk hold ring

(18) Insert the stationary disk into the RV disk hold ring so that they can be fitted together. Rotate the stationary disk to lock in. Attach the key into the RV housing.

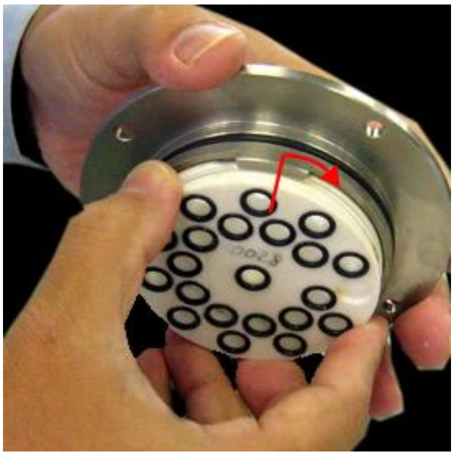
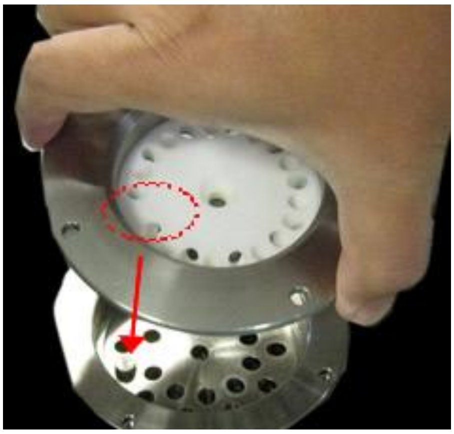


Fig. 4-10-2-15 Preparation of RV disk hold ring

Carefully install the RV disk hold ring containing the stationary disk into the RV housing straight from above, aligning the key in the housing with the port-free position (red dotted circle) that indicates the position of the key groove on the bottom face of the stationary disk, viewing from the top. After that, rotate the RV disk hold ring to align four fixing screw holes.



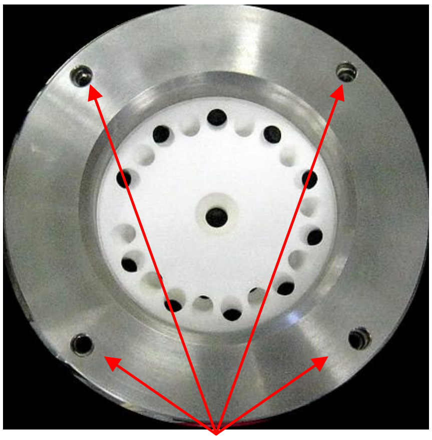


Fig. 4-10-2-16 Installation of RV disk hold ring

(19) Attach the O ring to the rotary disk. Apply a small amount of grease over the sliding surface of the rotary disk and the O ring to the extent that grease is left white.

1) In advance, clean the O ring for the rotary disk using alcohol. Do not apply grease to it.
2) Fit the O ring on the rotary disk and grease the circumference of the rotary disk.
3) Apply a tea-spoonful of grease (approximately 0.1g) to the rotary disk surface that contacts with the stationary disk.

Fig. 4-10-2-17 Apply grease to the rotary disk

The rotary disk O ring slides against the RV disk hold ring. Therefore, it is important to control the slip surface by limiting the greased portion to only its circumference.

(20) Fit the rotary disk into the RV disk hold ring.

Fig. 4-10-2-18 Insertion of rotary disk

After the rotary disk has been inserted, confirm that the bearing seating surface of the rotary disk is almost level with the top surface of the RV disk hold ring and that the bearing seating surface is level. If the key groove on the bottom face of the stationary disk is not aligned with the key, the rotary disk cannot be properly fitted.

(21) Lightly coat the bearing, RV thrust ring, two wave washers and RV spring hold plate with grease.

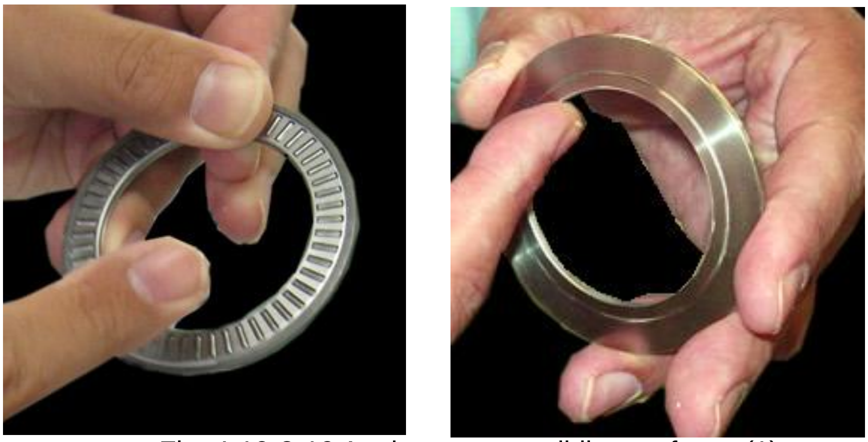


Fig. 4-10-2-19 Apply grease to sliding surfaces (1)

In advance, wipe off old grease from the bearing and apply grease to the bearing roller surface. Apply grease to the convex face and inner ring face of the RV thrust ring.

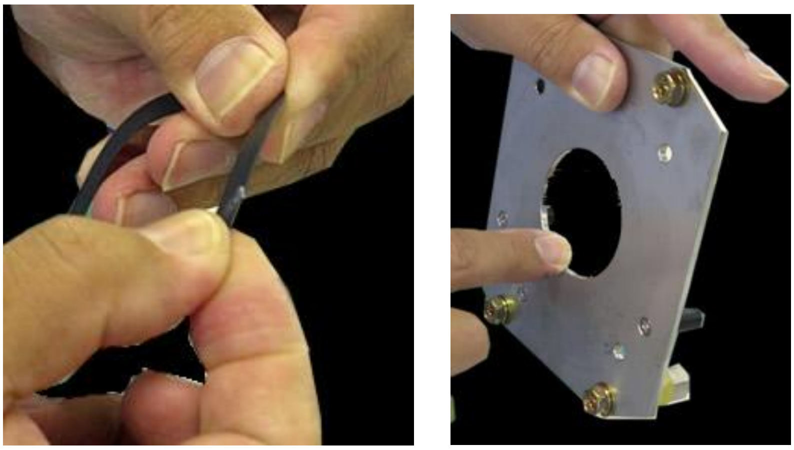


Fig. 4-10-2-20 Apply grease to sliding surfaces (2)

Lightly and evenly coat both sides of each wave washer with grease. Grease lightly inside the center hole of the RV spring hold plate that contacts with the rotary valve.

(22) Place the bearing, RV thrust ring, two wave washers, RV disk hold ring and RV spring hold plate in order onto the rotary valve.

Place the bearing, facing the roller side up, and the RV thrust ring with the convex side up on the rotary valve.

Insert two wave washers together.

Place the RV disk hold ring, facing the concave side downward.
Take care not to stick wave washers between the housing and the ring.

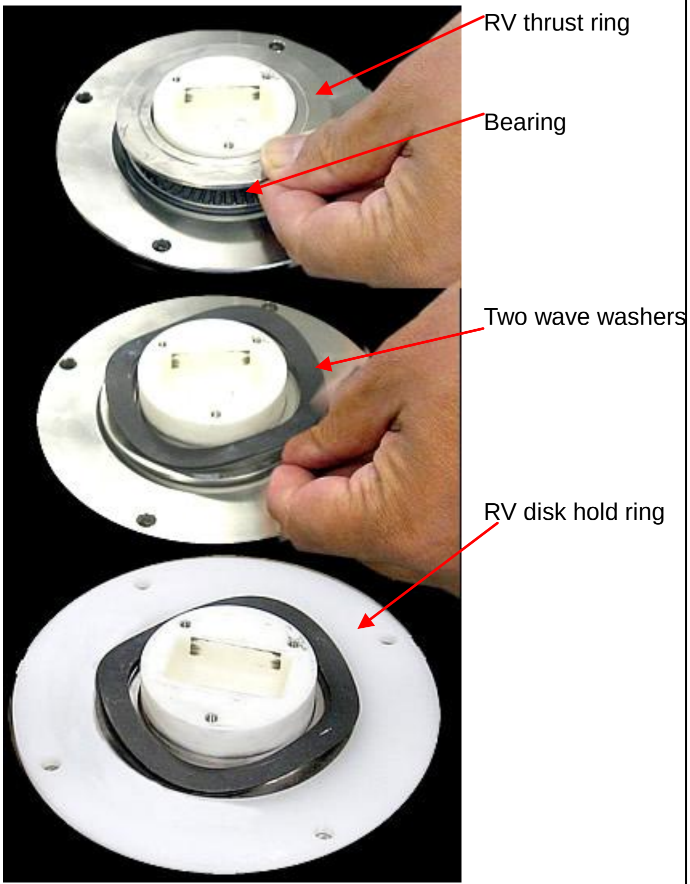


Fig. 4-10-2-21 Installation of sliding parts

Place the RV spring hold plate on the above parts and tighten diagonally and evenly hex bolts to fasten the RV spring hold plate.

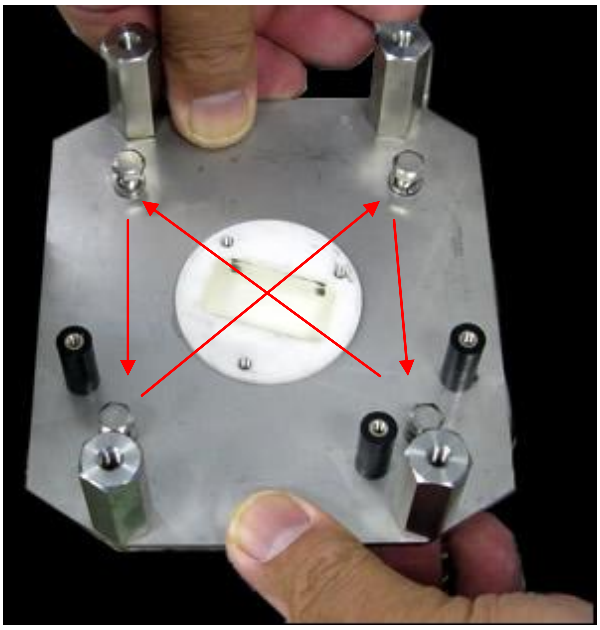


Fig. 4-10-2-22 Installation of RV spring hold plate

(23) To align the coupling of the motor unit with the groove on the rotary disk, place the motor unit into the instrument first and align the coupling with the groove on the rotary disk. Hold the motor by hand and rotate the rotary disk to bring the motor unit to an appropriate position. When positioned, remove the motor unit again.

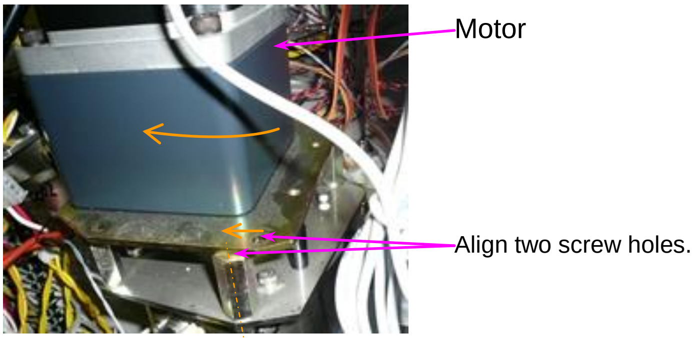


Fig. 4-10-2-23 Alignment of motor unit

(24) Attach the RV positioning disk and the RV positioning board in order (refer to Fig. 4-10-2-2). Connect the positioning board connector to the instrument.

(25) Place the motor unit again into the instrument and fasten to the RV spring hold plate using cross-recessed hex head bolts (refer to Fig. 4-10-2-1).

(26) Connect the rotary valve motor connector to the instrument.

(27) Start the check program to test the rotary valve and/or the gate valve, using the function “Check rotary valve and gate valve operations” in the check program. Confirm that the rotary valve operates properly without generating abnormal noise during rotation. Also, pump a reagent in and out at Station 1 first and Station 17 (clean alcohol) next to confirm that a leak does not occur around the valves.

(28) Attach the back panel.

4-10-2-2 Gate valve

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Disconnect the connector being connected to the gate valve motor.

(4) Using the ratchet with socket 8 attached, remove three cross-recessed hex head bolts which hold the GV motor housing. Gently lift the motor unit to remove from the GV spring hold plate.

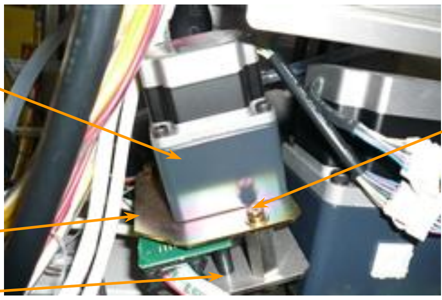


Fig. 4-10-2-24 Removal of GV motor unit

(5) Remove the GV positioning board first and then the GV positioning disk.

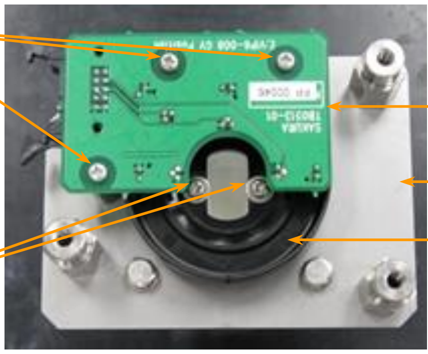


Fig. 4-10-2-25 Removal of GV positioning board and positioning disk

(6) Remove hex bolts from the GV spring hold plate. When removing bolts, loosen them diagonally and evenly.

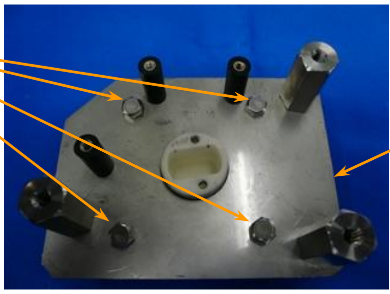


Fig. 4-10-2-26 Removal of GV spring hold plate

(7) By lifting up on the flange of the GV disk hold ring, remove the stationary disk, rotary disk, GV disk hold ring, bearing, GV wave washer guide and three wave washers all together.

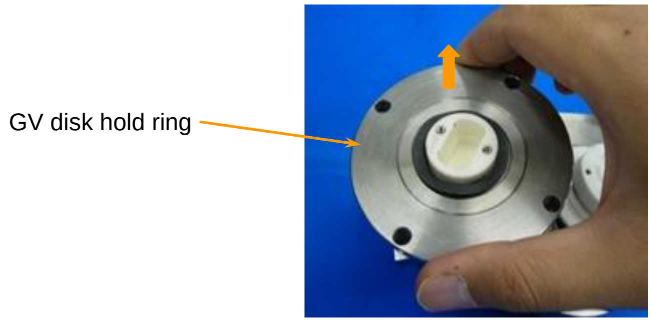


Fig. 4-10-2-27 Removal of GV parts

(8) Detach three wave washers, GV wave washer guide and bearing in order. Wipe off old grease with paper towel.

(9) While holding the flange of the GV disk hold ring, rotate the stationary disk to unlock it. (Refer to Fig. 4-10-2-28.)

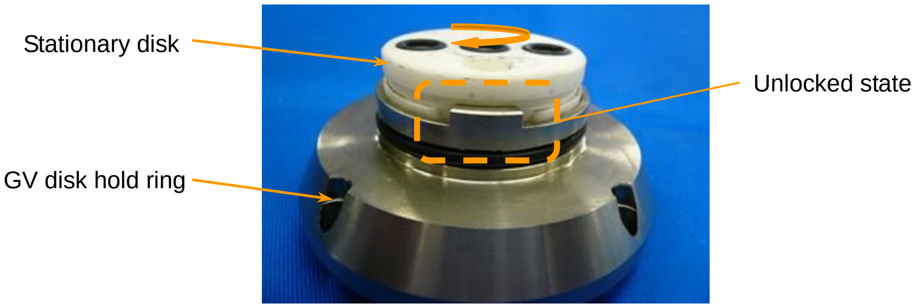


Fig. 4-10-2-28 Unlocking of stationary disk

(10) After unlocking the stationary disk, remove the rotary disk and stationary disk from the GV disk hold ring. Remove O rings from the GV disk hold ring and clean grooves for O rings by wiping off old grease with paper towel.

Fig. 4-10-2-29 Removal of GV disk hold ring

(11) Separate the rotary disk from the stationary disk by sliding the rotary disk sideways. If difficult, place them in warm water at around 60°C to allow for easy separation.

Fig. 4-10-2-30 Separation of rotary disk from stationary disk

(12) Remove the O ring from the rotary disk. Clean the disk by wiping off old grease remaining on the sliding surface with paper towel. Clean the O ring groove, using something like a cotton swab.

Fig. 4-10-2-31 Cleaning of O ring groove

(13) Remove old O rings from the bottom face of the stationary disk. Clean the stationary disk by wiping off old grease remaining on the sliding surface with paper towel. Old grease can be almost completely removed from the sliding surface by using alcohol.

Fig. 4-10-2-32 cleaning of stationary disk

(14) Wipe clean the inside of the GV housing and the key with a cloth moistened with alcohol.

(15) Fit new O rings onto the bottom face of the stationary disk and coat them with a thin layer of grease.

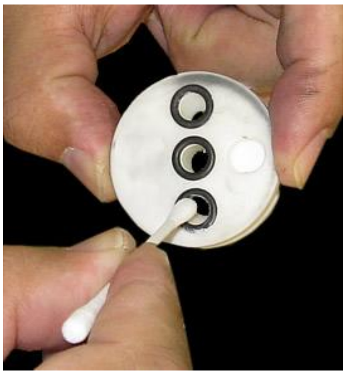


Fig. 4-10-2-33 Apply grease to O rings for the stationary disk

To apply grease to O rings, put a slight amount of grease on the tip of your finger and slide the finger round each O ring. After that, use a stick like a cotton swab to remove excessive grease from the inner side of each O ring.

(16) Fit the key into the GV housing.

(17) To replace the O ring for the GV disk hold ring, slightly coat the new O ring with grease before fitting it onto the GV disk hold ring.

(18) Assemble the stationary disk and the RV disk hold ring.

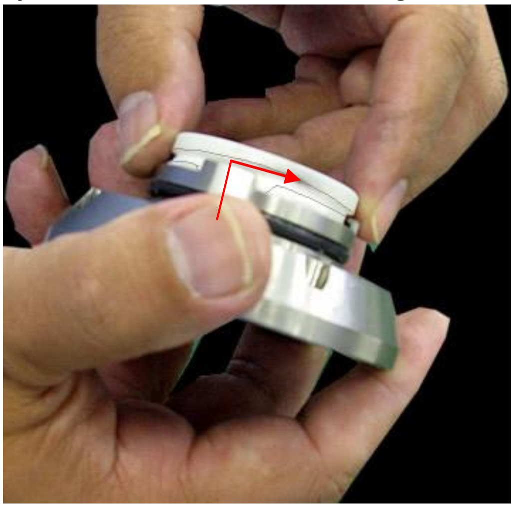


Fig. 4-10-2-34 Assembly of stationary disk

While facing the bottom face of the stationary disk up, insert the sliding surface side of the stationary disk into the GV disk hold ring, aligning a pawl of the hold ring with a cutout of the stationary disk. After that, rotate the stationary disk to lock it in the GV disk hold ring.

(19) Carefully install the GV disk hold ring containing the stationary disk into the GV housing straight from above, aligning the holes in the stationary disk with the GV housing holes.

Fig. 4-10-2-35 Assembly of GV disk hold ring

When installing the stationary disk, make sure to align the key groove on the bottom face of the disk with the key in the GV housing.

(20) Attach the O ring to the rotary disk. Apply a slight amount of grease over the sliding surface of the rotary disk and the O ring to the extent that grease is left white.

1) In advance, clean the O ring for the rotary disk using alcohol. Do not apply grease to it.
2) Fit the O ring on the rotary disk and grease the circumference of the rotary disk.
3) Apply a very small ball of grease having diameter of around 3 mm (approximately 0.1g) to the rotary disk surface that contacts with the stationary disk.

Fig. 4-10-2-36 Apply grease to the rotary disk

The rotary disk O ring slides against the GV disk hold ring. Therefore, it is important to control the slip surface by limiting the greased portion to only its circumference.

(21) Fit the rotary disk into GV disk hold ring.

(22) Coat the bearing, GV wave washer guide, three wave washers and GV spring hold plate with grease.


Fig. 4-10-2-37 Apply grease to sliding surfaces (1)

Apply grease to the bearing directly. Lightly coat the inner side of the GV wave washer guide with grease.

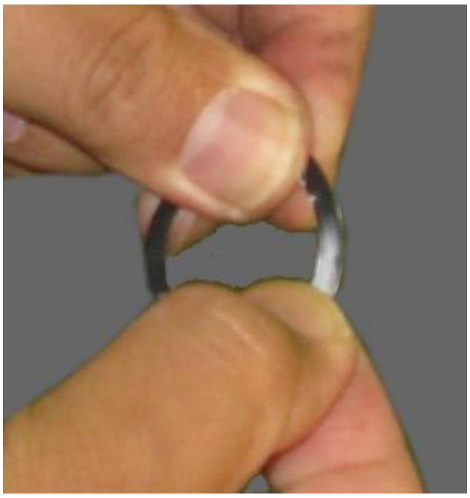



Fig. 4-10-2-38 Apply grease to sliding surfaces (2)

Lightly coat both sides of each wave washer with grease. Grease lightly inside the center hole of the GV spring hold plate that contacts with the rotary valve

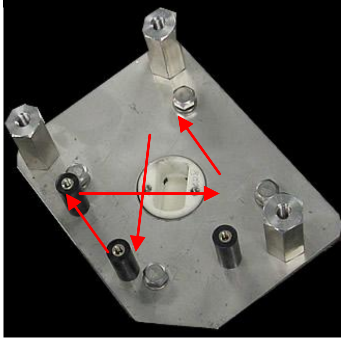
(23) Place orderly onto the rotary disk the smaller-diameter bearing seat first, bearing body, larger-diameter bearing seat, GV wave washer guide, three wave washers and GV spring hold plate last.

Attach the smaller-diameter bearing seat.

Attach the bearing body. Either side can be used.

Attach the larger-diameter bearing seat first and the GV wave washer guide next onto the rotary disk.

Attach three wave washers.



Attach the GV spring hold plate with facing the cutout of the plate (the place where the GV positioning board is attached) to the left front, viewing from the back of the instrument. Fasten the plate by tightening four bolts with spring washer in a diagonal order.

Fig. Attachment of sliding parts

(24)	Tighten hex bolts diagonally and evenly to fasten the GV spring hold plate.

(25)	Attach the GV positioning disk and GV positioning board in order.

(26)	Place the motor unit into the instrument. Mesh the GV coupling with the rotary disk and fasten the GV motor housing. If they are not fitted, rotate the GV positioning disk by hand to align them.

(27)	Connect the connector for the gate valve motor.

(28)	Start the check program to test the gate valve, using the function “Check rotary valve and gate valve operations” in the check program. Confirm that the gate valve operates properly. Also, perform the “Leakage test of seal for retort and air line” with the retort being empty to confirm that the retort pressure can be held properly.

(29)	Attach the back panel.

4-10-3 Replacing the Cartridge Heater

Tools required
- Phillips screwdriver No. 2
- Silicone compound
- Silicone adhesive (KE45W)
- Cutter knife
- Insulation-resistance meter 500VDC

4-10-3-1 Replacing the rotary valve cartridge heater

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Remove the cartridge heater connector.

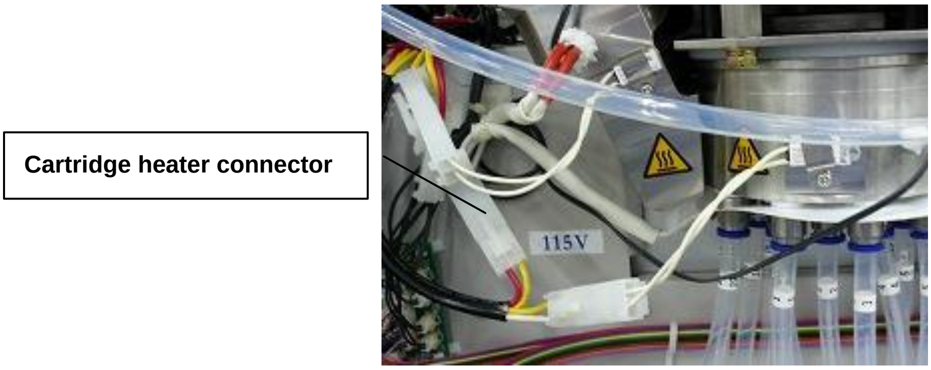


Fig.4-10-3-1 Cartridge heater connector

(4) Remove Teflon tubes located at the front of the rotary valve, viewing from you, as shown below, to allow for access to the RV heater housing.
For the tubes connected to the top manifold, remove them from the top manifold first, as they are short, and then remove from the bottom of the rotary valve.
After the appropriate tubes have been removed, remove two screws that fasten the RV heater housing to the bottom of the RV housing, using a screwdriver.

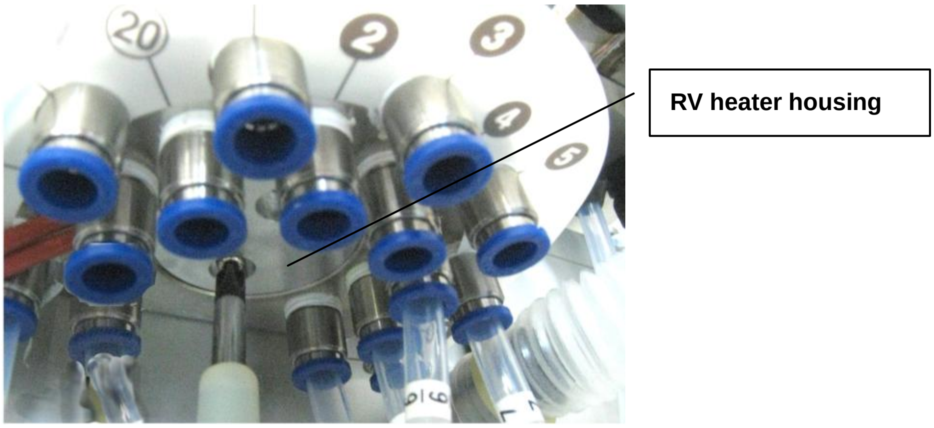


Fig.4-10-3-2 Removal of RV heater housing (1)

(5) Remove the RV heater housing and cartridge heater together from the RV housing. If it is difficult to remove the RV heater housing, grasp the rim of two screw holes with long-nose pliers and pull straight downward.

Fig.4-10-3-3 Removal of RV heater housing (2)

(6) Use a cutter knife to cleanly cut away silicone adhesive left at the groove of the RV heater housing. Also, wipe off hardened silicone compound.

Fig.4-10-3-4 Cleaning of RV heater housing

(7) Check to make sure that the proper rating is marked on the new cartridge heater.

* For VIP6-J0, use the valve heater unit 100V E: VIP6-068.
* For VIP6-A1, use the valve heater unit 115V E: VIP6-071.
* For VIP6-E2, use the valve heater unit 230V E: VIP6-072.

Each valve heater unit has the following appearance.

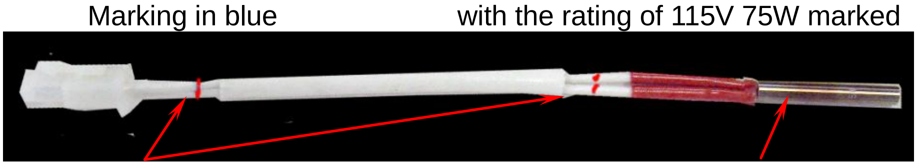
For VIP6-J0
Valve Heater Unit 100V
E:VIP6-068

Marking in black with the rating of 100V 75W marked

For VIP6-A1
Valve Heater Unit 115V
E:VIP6-071

Marking in blue with the rating of 115V 75W marked

For VIP6-E2
Valve Heater Unit 230V
E:VIP6-072



Marking in red with the rating of 230V 75W marked

Fig. 4-10-3-5 Applicable heater unit

(8) Apply silicone compound to the new cartridge heater and the top face of the RV heater housing.

(9) Insert the cartridge heater into the RV heater housing until the stainless-steel heating portion is just hidden in the mounting hole.

(10) Seal the entrance (portion of lead wires) with silicone adhesive. Fasten the RV heater housing to the RV housing.

(11) Put silicone adhesive into the RV housing groove.

(12) Using an insulation-resistance meter, measure insulation resistance between the RV housing and heater lead wires to confirm the measured value is more than 10 M ohm.

(13) Connect the cartridge heater connector. Mark "H7" on the connector, using a permanent marker pen.

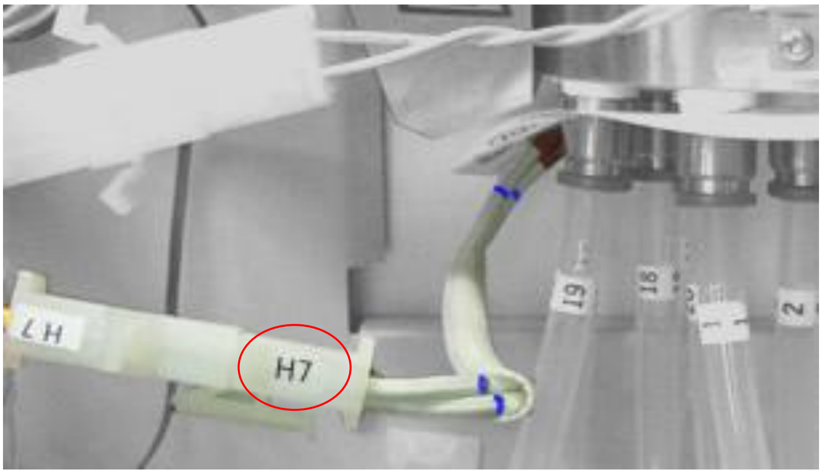


Fig.4-10-3-6 Marking of connector ID

(14) Start the check program to test the temperature control of the rotary valve only. Confirm that the temperature rises to 70°C.

(15) Attach the back panel.

4-10-3-2 Replacing the gate valve cartridge heater

(1) Turn the instrument power off.

(2) Remove the back panel

(3) Remove the GV cartridge heater connector.

Cartridge heater connector

Cartridge heater

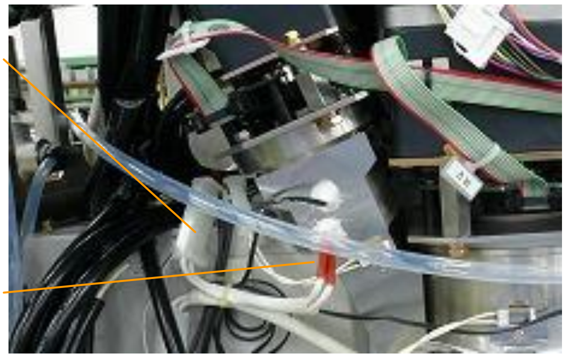


Fig.4-10-3-7 Cartridge heater connector

(4) Pull the cartridge heater out of the GV housing. Using a knife, cleanly remove silicone adhesive remaining.

GV housing

Silicone adhesive

Cartridge heater

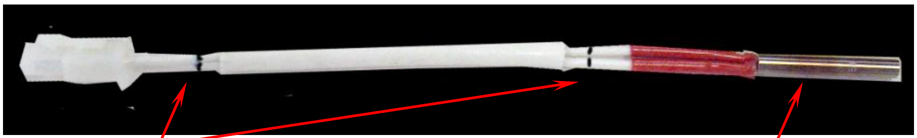
Fig.4-10-3-8 Cartridge heater inserted in the GV housing

(5) Check to make sure that the proper rating is marked on the new cartridge heater.

* For VIP6-J0, use the valve heater unit 100V E: VIP6-068.
* For VIP6-A1, use the valve heater unit 115V E: VIP6-071.
* For VIP6-E2, use the valve heater unit 230V E: VIP6-072.

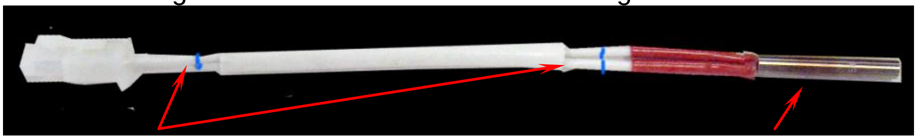
Each valve heater unit has the following appearance.

For VIP6-J0
Valve Heater Unit 100V
E:VIP6-068



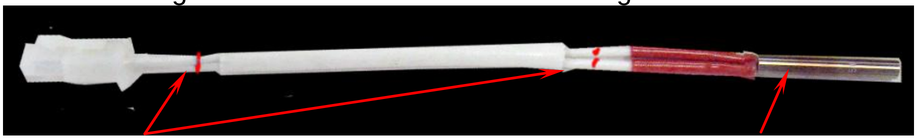
Marking in black with the rating of 100V 75W marked

For VIP6-A1
Valve Heater Unit 115V
E:VIP6-071



Marking in blue with the rating of 115V 75W marked

For VIP6-E2
Valve Heater Unit 230V
E:VIP6-072



Marking in red with the rating of 230V 75W marked

Fig. 4-10-3-9 Applicable cartridge heater

(6) Apply silicone compound to the new cartridge heater and insert into the GV housing until the stainless-steel heating portion is just hidden in the mounting hole. Take care not to insert the cartridge heater fully into the hole.

(7) Seal the entrance (portion of lead wires) with silicone adhesive.

(8) Using an insulation-resistance meter, measure insulation resistance between the GV housing and heater lead wires to confirm the measured value is more than 10 M ohm.

(9) Connect the cartridge heater connector and mark “H6” on the connector, using a permanent marker pen.

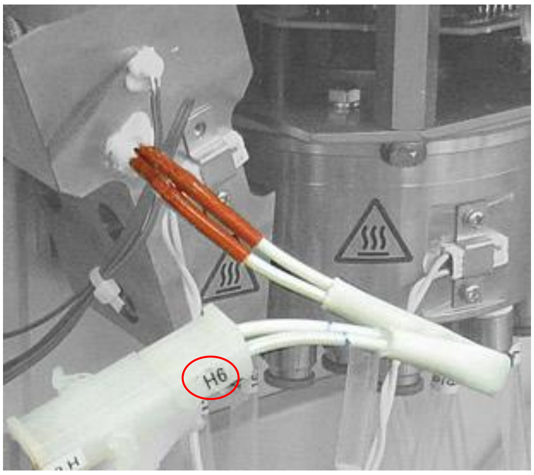


Fig.4-10-3-10 Marking of connector ID

(10) Start the check program to test the temperature control of the gate valve only. Confirm that the temperature rises to 70°C.

(11) Attach the back panel.

4-10-4 Replacing the Over-Temperature Protector

Tools required
- Phillips screwdriver No. 2
- Silicone adhesive (KE45W)
- Cutter knife

4-10-4-1 Replacing the rotary valve over-temperature protector

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Remove the rotary valve over-temperature protector connector.

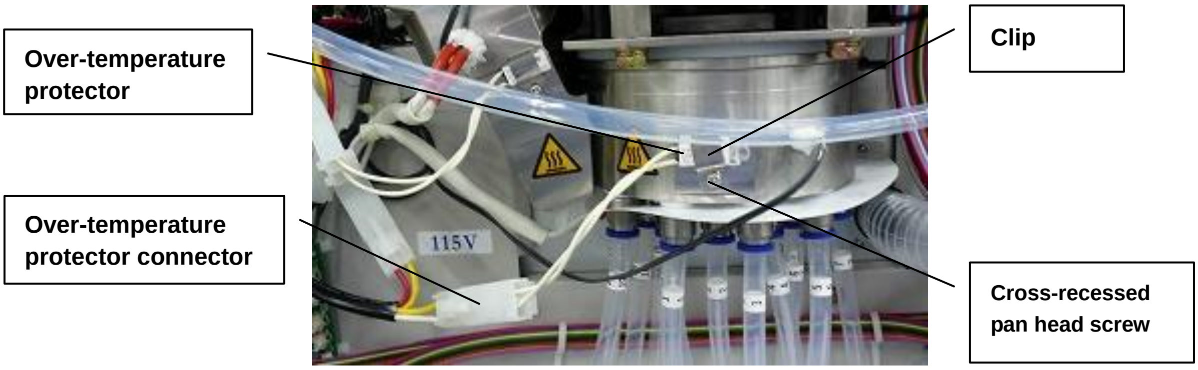


Fig.4-10-4-1 Rotary valve over-temperature protector

(4) Remove the cross-recessed pan head screw that holds the clip in place. Using a cutter knife, remove the over-temperature protector (OTP) from the valve housing. Cleanly remove adhesive residues from the valve housing surface and wipe with alcohol.

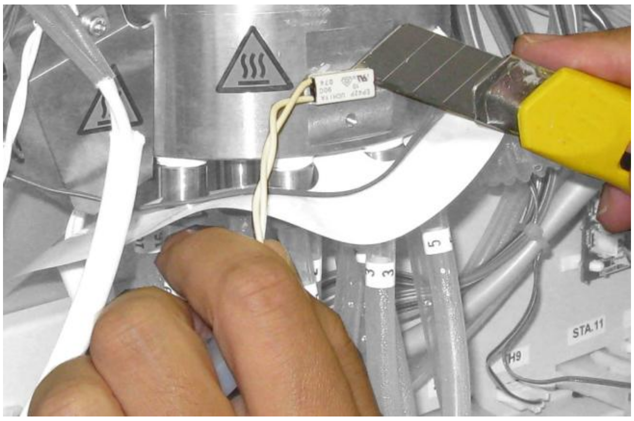


Fig.4-10-4-2 Removal of rotary valve over-temperature protector

(5) Lightly coat the sensing side (unmarked side) of the new OTP with silicone adhesive. Confirm that “EP42 UCHYA 90C” is marked on the casing. Facing the marked side outward, fasten the OTP with the clip.

Fig.4-10-4-3 Installation of rotary valve over-temperature protector

The OPT is secured by silicone adhesive and the clip.

(6) Mark the connector ID “TC7” on the connector surface using a magic marker and connect the connector to the corresponding connector at the instrument side.

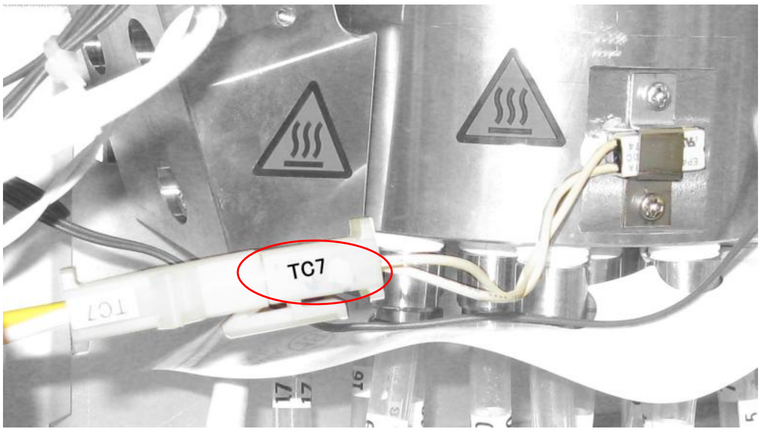


Fig.4-10-4-4 Connection of rotary valve over-temperature protector connector

(7) Attach the back panel.

(8) Start the instrument in the service mode. Under the service manual operations, move the rotary valve to Station 11 to confirm that the rotary valve is properly heated.

4-10-4-2 Replacing the gate valve over-temperature protector (OTP)

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Remove the gate valve over-temperature protector connector.

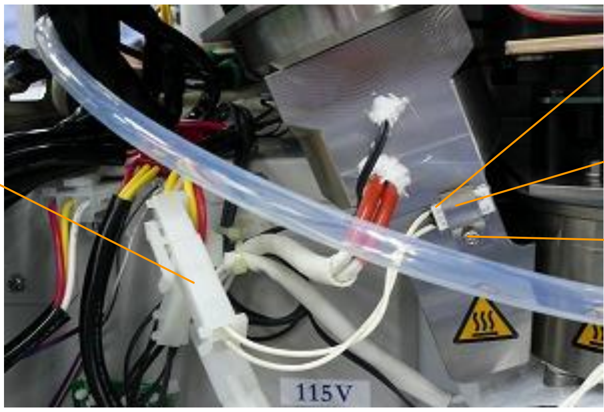


Fig4-10-4-5 Gate valve over-temperature protector

(4) Remove the cross-recessed pan head screw that holds the clip in place. Using a cutter knife, remove the over-temperature protector (OTP) from the valve housing. Cleanly remove adhesive residues from the valve housing surface and wipe with alcohol.

Fig4-10-4-6 Removal of gate valve over-temperature protector

(5) Lightly coat the sensing side (unmarked side) of the new OTP with silicone adhesive. Confirm that “EP42 UCHYA 90C” is marked on the casing. Facing the marked side outward, fasten the OTP with the clip. The OPT is secured by silicone adhesive and the clip.

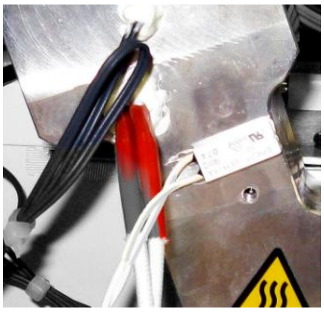


Fig. 4-10-4-7 Installation of gate valve over-temperature protector

(6) Mark the connector ID “TC6” on the connector surface using a magic marker and connect the connector to the corresponding connector at the instrument side.

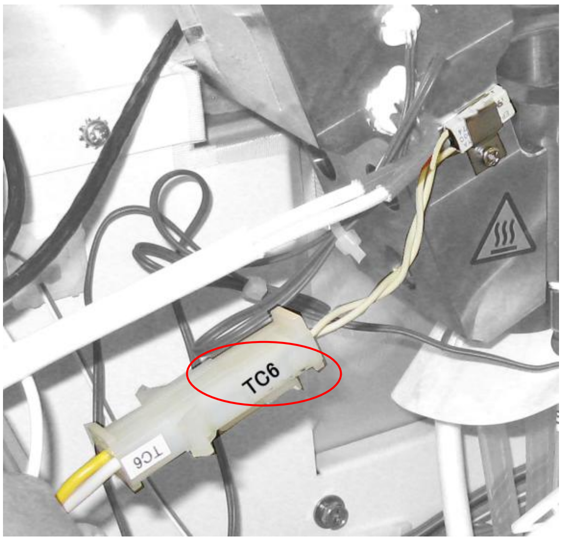


Fig.4-10-4-8　Connection of gate valve over-temperature protector connector

(7) Attach the back panel.

(8) Start the instrument in the service mode.　Under the service manual operations, move the rotary valve to Station 11 to confirm that the gate valve is properly heated.

4-10-5 Replacing the Temperature Sensor

Tools required
- Phillips screwdriver No. 2
- Silicone compound
- Silicone adhesive
- Cutter knife
- Nipper

4-10-5-1 Replacing the rotary valve temperature sensor

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Remove the temperature sensor connector “CN613” from the relay board located in the left side of the back of the instrument (viewing from the rear). Pull out lead wires toward the rotary valve. (Cut wire ties using a nipper.)

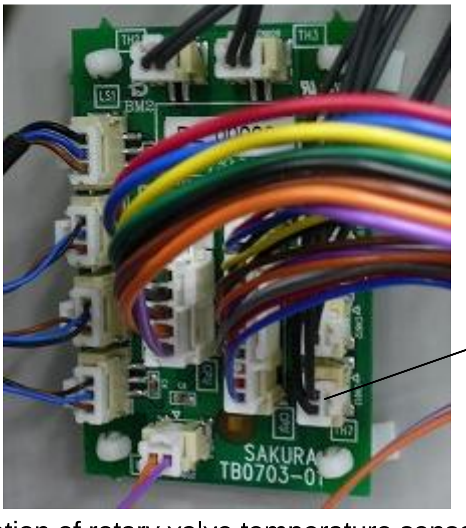


Fig.4-10-5-1 Location of rotary valve temperature sensor connector

(4) The end of the temperature sensor is embedded in the valve housing and the entrance is sealed with silicone adhesive. Pull out the temperature sensor. Remove silicone adhesive left using a cutter knife.

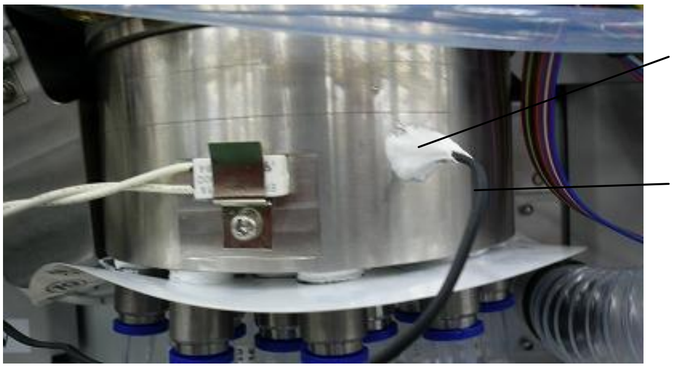


Fig.4-10-5-2 Location of rotary valve temperature sensor

(5) Apply silicone compound to the sensing portion of the new temperature sensor. Insert the sensor fully into the mounting hole in the valve housing. Secure the lead wires by silicone adhesive.

(6) Connect the lead wires for the temperature sensor to the connector "CN613" on the relay board. (Fasten the middle of lead wires with wire ties in several placed.)

(7) Start the instrument in the service mode. Access the service manual operations screen to check the temperature indication for the rotary valve. Confirm that the proper temperature is indicated (almost the same reading as the gate valve temperature).

(8) Attach the back panel.

4-10-5-2 Replacing the gate valve temperature sensor

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Remove the temperature sensor connector “CN612” from the relay board located in the left side of the back of the instrument (viewing from the rear). Pull out lead wires toward the gate valve. (Cut wire ties using a nipper.)

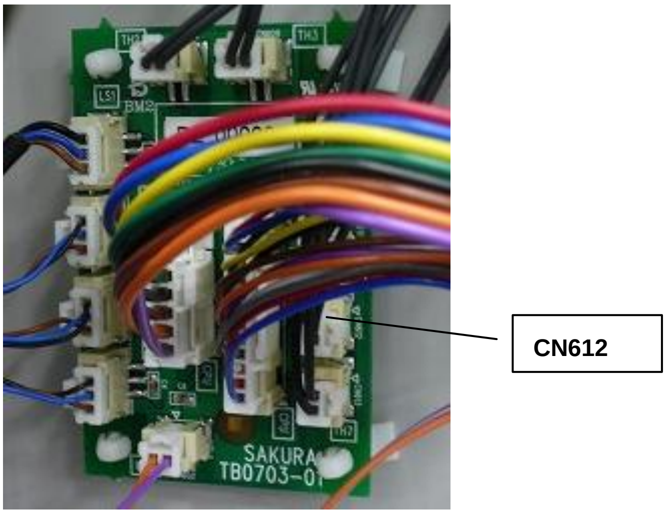


Fig.4-10-5-3 Location of gate valve temperature sensor connector

(4) The end of the temperature sensor is embedded in the valve housing and the entrance is sealed with silicone adhesive. Pull out the temperature sensor. Remove silicone adhesive left using a cutter knife.

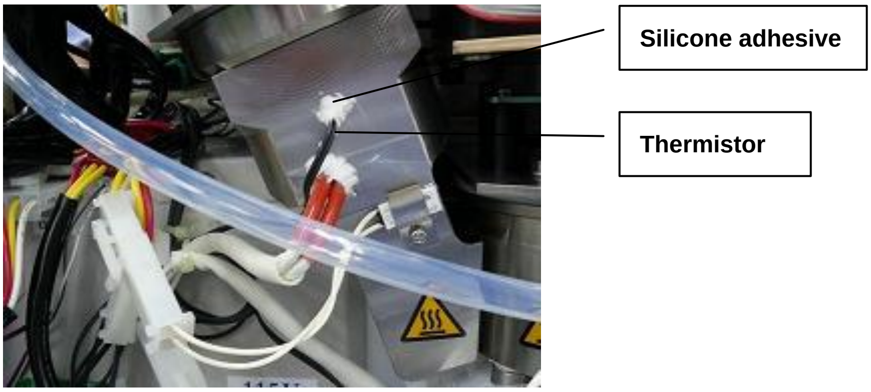


Fig.4-10-5-4 Location of gate valve temperature sensor

(5) Cleanly remove silicone adhesive remaining on the valve housing, using a cutter knife.

(6) Apply silicone compound to the sensing portion of the new temperature sensor. Insert the sensor fully into the mounting hole in the valve housing. Secure the lead wires by silicone adhesive.

(7) Connect the lead wires for the temperature sensor to the connector “CN612” on the relay board. (Fasten the middle of lead wires with wire ties in several placed.)

(8) Start the instrument in the service mode. Access the service manual operations screen to check the temperature indication for the gate valve. Confirm that the proper temperature is indicated (almost the same reading as the rotary valve temperature).

(9) Attach the back panel.

4-10-6 Cleaning the Flow Tubes

Tools required
- Phillips screwdriver No. 2
- Wrench, width across flats 8, 17
- Opening tool (OJ-B), if available

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Loosen the cap nut for the flow tube to be cleaned from the joint on the exhaust manifold and remove the flow tube.

(4) Remove the flow tube from the insertion fitting on the rotary valve. While pushing the blue release ring at the end of the insertion fitting up with fingers or by an opening tool, pull out the tube.

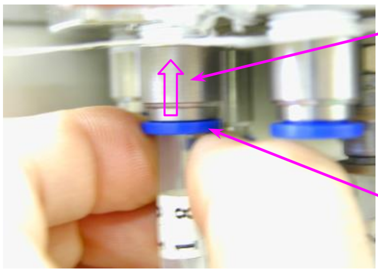


Fig. 4-10-6-1 Removal of flow tube

(5) If the tube is blocked with precipitate or paraffin, immerse it in warm water to clean up.

(6) Firmly insert the clean tube into the insertion fitting until a gap of approximately 27mm is left between the wire marker and the release ring. Gently pull the tube to verify that the tube does not come off. Take care not to mistake the port number when inserting the tube.

Fig. 4-10-6-2 Insertion of flow tube

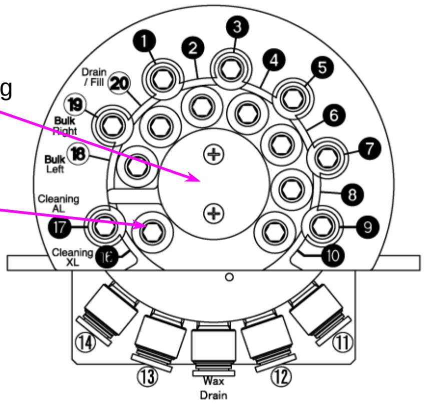


Fig. 4-10-6-3 Port numbers (viewing from below)

(7) Connect the other end of the tube to the joint on the exhaust manifold. Tighten the joint by hand and use a wrench to make a final 1/2 turn.

(8) Turn the instrument power on. Under the service manual operations, perform the pump-in and pump-out twice at the appropriate station to verify that a leak does not occur from the joint.

(9) Attach the back panel.

4-11 Exhaust Manifold, Condenser and Trap Bottle

4-11-1 Draining, Cleaning an Assembling the Trap Bottle

Tools required

- Phillips screwdriver No. 2
- Wrench, width across flats 22
- Wrench, width across flats 28, or monkey wrench 250 mm

(1) Start the instrument in the service mode. Under the service manual operations, perform "Drain Condenser" to drain the trap bottle. (Refer to 2-4-2, "Service Manual Operations".)

(2) Turn the instrument power off. Remove the back panel.

(3) Remove the trap bottle and discard the remaining reagent inside the bottle. Clean the inside of the bottle using xylene.

Cap holder

Cap tightener

Cross-recessed pan

Trap bottle

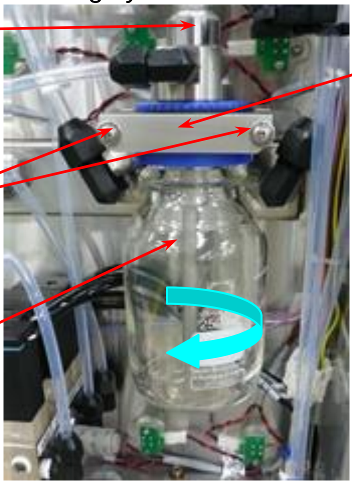


Fig. 4-11-1-1 Removal of Trap Bottle (1)

(4) Remove all Teflon tubes, condenser coil and connector connected to the trap bottle/solenoid valve (SV6).

Teflon tubes

Solenoid valve connector

Condenser coil

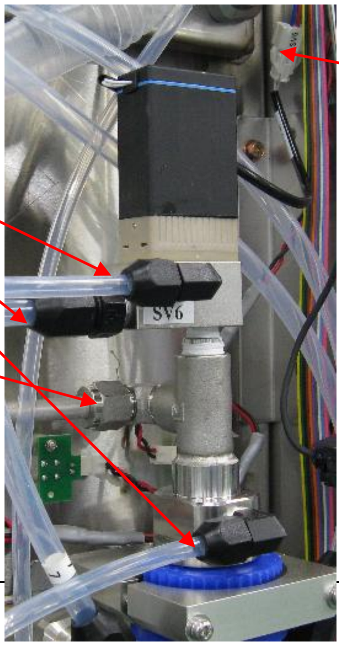


Fig. 4-11-1-2 Removal of Tap Bottle (2)

(5) While holding the cap holder by hand, remove the cross-recessed pan-head screws (refer to Fig. 4-11-1-1), remove the cap tightener, and then remove the trap bottle cap and solenoid valve (SV6) together.

(6) While holding the across-flat section of the cap holder with a wrench (width across flats 28), remove the cap hold nut using another wrench (width across flats 22).

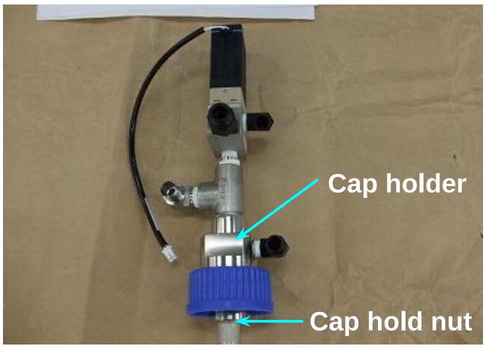


Fig. 4-11-1-2 Removal of Cap Hold Nut

(7) Remove and clean the O-ring. Replace the O-ring if it is discolored or shows other sign of deterioration.

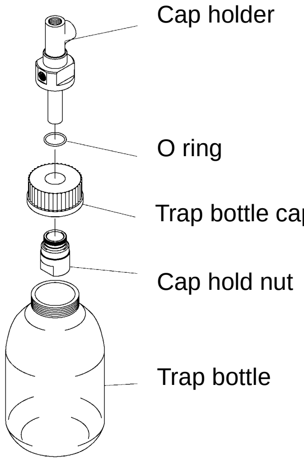


Fig. 4-11-1-3 Removal of O-ring

(8) Clean the cap holder, trap bottle cap and cap hold nut using xylene.

(9) Install the trap bottle cap and O-ring onto the cap holder using the cap hold nut, and tighten the nut with a wrench.

(10) Install the trap bottle cap onto the system using the cap tightener. (Refer to Fig. 4-11-1-1.)

(11) Install the Teflon tubes and condenser coil removed earlier (Refer to Fig. 4-11-1-2), and then firmly screw the trap bottle into the trap bottle cap.

Fig. 4-11-1-5 Installation of Trap Bottle

(12) Turn the instrument power on in the service mode. Using the service manual operations, confirm that the system can successfully increase and decrease the pressure. (Refer to 2-4-2, “Service Manual Operations”.)

(13) Install the back panel.

4-11-2 Draining the Exhaust Manifolds

Tools required

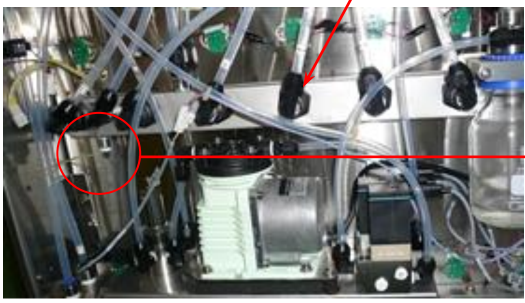
- Phillips screwdriver No. 2
- Wrench, width across flats 7
- Waste container (capacity of approximately 150mL)
- Sealing tape

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Remove the drain plug to drain the exhaust manifolds.
The drain plug is located at the lower left of the bottom manifold, viewing from the rear of the instrument.

Bottom manifold



Drain plug

Fig. 4-11-2-1 Location of drain plug

Fig. 4-11-2-2 Removal of drain plug

1) Place a waste container under the drain plug.

2) Turn and remove the plug using a wrench.

Drain plug

Waste container

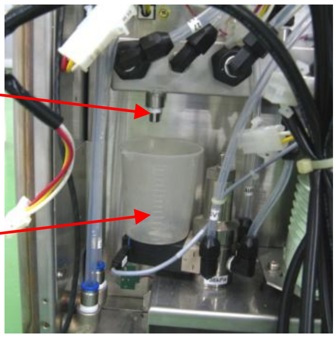


Fig. 4-11-2-3 Placement of waste container

Fig. 4-11-2-4 Removal of drain plug

3) Finish the drain when a fluid does not run off any more.

Fig. 4-11-2-5 End of drain

(4) Install the drain plug.

- ∗ Remove old sealing tape from the plug.
- ∗ Wrap sealing tape around threads of the plug (by around 3 times) and screw the plug into the bottom manifold. (Refer to Fig. 4-11-2-1 for location of the drain plug.)

(5) Attach the back panel.

4-11-3 Cleaning the Bottle Coupler and Replacing the O rings

Tools required
- Phillips screwdriver No. 2
- Wrench, width across flats 29
- Wrench, width across flats 7
- Grease (Sealub S-11)

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Remove reagent bottles and wax drain container from the bottle rack.

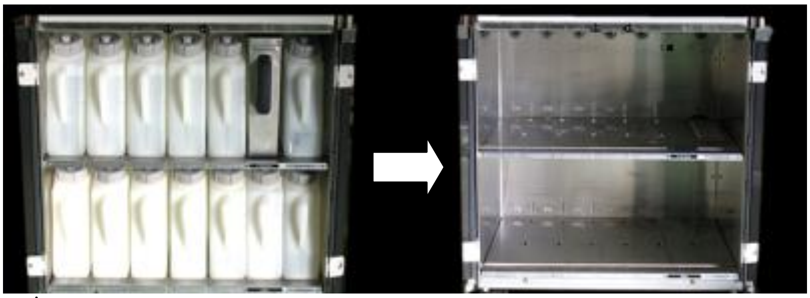


Fig. 4-11-3-1 Removal of bottles

(4) Drain the exhaust manifolds. (Refer to 4-11-2, "Draining the exhaust manifolds.")

(5) Remove the exhaust manifolds.

* Remove tubes connected to the manifolds in advance.

Remove tubes from the top manifold (8 places)

Remove tubes from the bottom manifold (9 places)

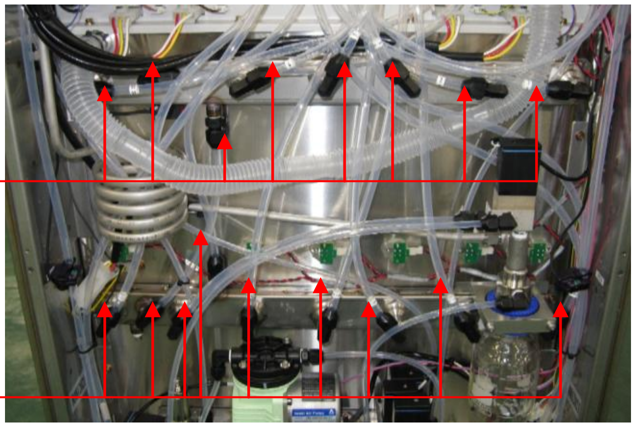


Fig. 4-11-3-2 Removal of tubes

<u>Removal of manifold mounting screws</u>

Remove the screw located at each side of the manifold (two each screws for the top and bottom manifolds).

Fig. 4-11-3-3 Removal of manifold

(6) Remove the bottle coupler.

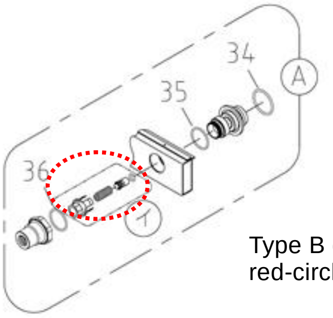
Fig. 4-11-3-4 Removal of bottle coupler

(7) Clean or replace the bottle coupler (or replace O rings).

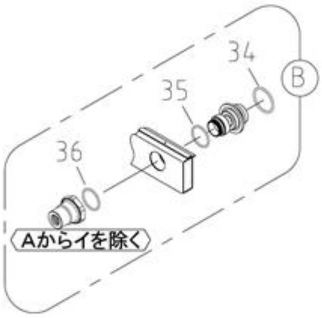
* Take note that the bottle couplers are differently constructed depending on the station position.

Type A:
Stations 1 – 10, Stations 16 – 17

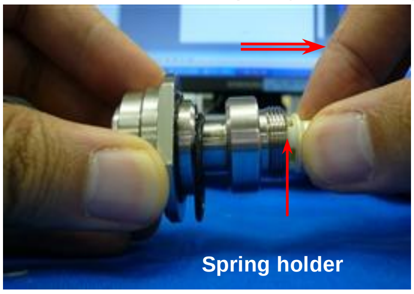
Type B:
Condensate



Type B does not have the red-circled parts.



To convert Type A to Type B,
Pull the spring holder by hand to remove the valve and spring.



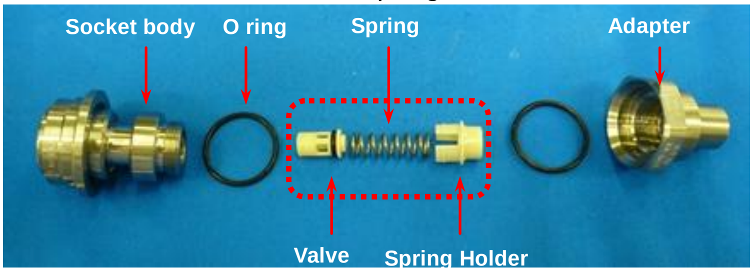


Fig. 4-11-3-5 Removal of spring holder

(8) Install the bottle coupler.

* Aligning the coupler with the stopper on the manifold, tighten it (tightening torque: 1 N.m).

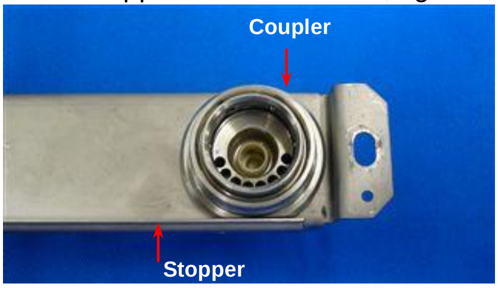


Fig. 4-11-3-6 Installation of bottle coupler

No.5

(9) Install the exhaust manifolds and connect the tubes.

* Secure each manifold by loosely tightening mounting screws first and then place bottles in the bottle rack before adjusting the manifold height. When the manifold is positioned, firmly tighten screws.

Fig. 4-11-3-7 Installation of exhaust manifold

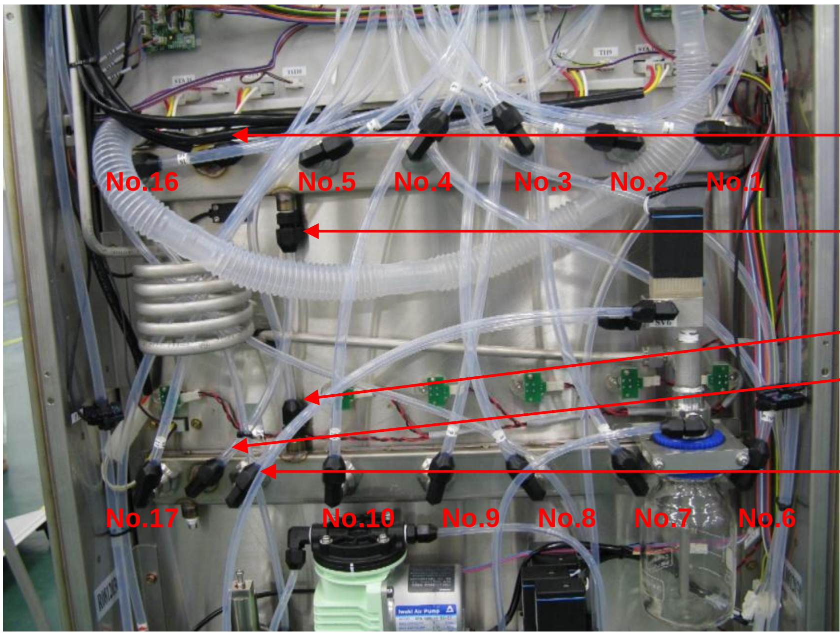


Fig. 4-11-3-8 Connection of manifold tubes

(10) Start the instrument in the service mode. Under the service manual operations, perform the pump-in and pump-out twice to confirm that no leak occurs. (Refer to 2-4-2, “Service Manual Operations.”)

(11) Attach the back panel.

4-11-4 Cleaning and Replacing the Pressure Sensor

Tools required
- Phillips screwdriver No. 2
- Wrench, width across flats 19
- Monkey wrench 200mm
- Pipette
- Sealing tape

(1) Turn the power switch off. Unplug the power cord and the cables connected to the interface board (if available).

(2) Remove the back panel and control box cover.
⇒ Refer to 4-13, “Control Panel Cover and Control Box”.

(3) Remove the connector CN9 located at the right middle of the CPU board (viewing from the rear) and pull the lead wires to draw the pressure sensor.

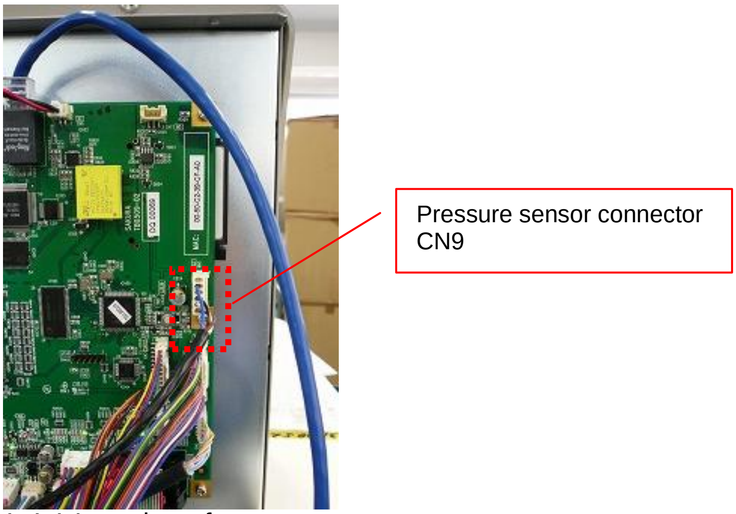


Fig. 4-11-4-1 Location of pressure sensor connector

(4) Remove the Teflon tubes and condenser coil from the pressure sensor housing.

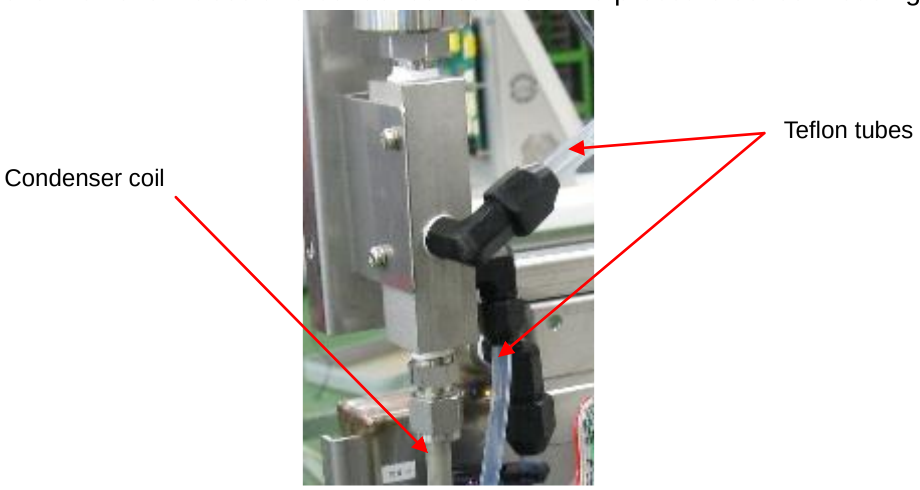


Fig. 4-11-4-2 Removal of pressure sensor housing (1)

(5) Remove cross-recessed pan head screws from the pressure sensor mounting to remove the pressure sensor housing and pressure sensor together.

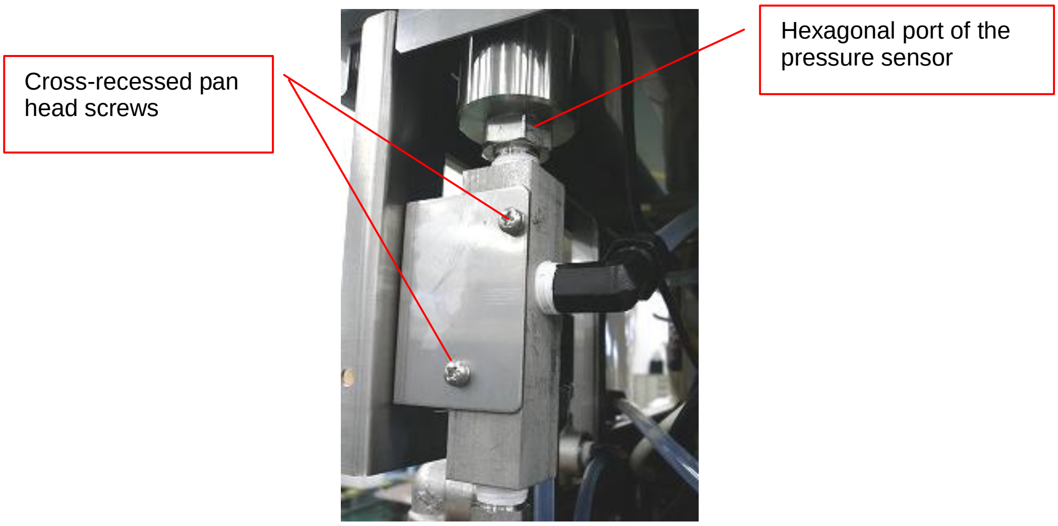


Fig. 4-11-4-3 Removal of pressure sensor housing (2)

(6) While holding the pressure sensor housing by a monkey wrench, use a wrench to turn the hexagonal portion of the pressure sensor (see above) and remove the pressure sensor.

(7) To clean the pressure sensor, follow the steps below.
1) Clean the periphery of the sensing portion. Do not directly touch the sensing portion with a tool because it is very mechanically weak. Place xylene into the sensing portion, using a pipette, and gently shake the sensor to rinse the inside.
2) Empty out xylene and let the sensor dry naturally.
3) Clean threads of old sealing tape.

Fig. 4-11-4-4 Pour xylene in the hole

Fig. 4-11-4-5 Rise the sensor

(8) Install the pressure sensor in the pressure sensor housing.
* Wrap sealing tape around the thread of the sensor by two and one-half times.
* Completely remove old sealing tape from the internal thread of the pressure sensor housing.

<Caution> Take extreme care for dusts and sealing tape not to enter the airflow line because they may cause the airflow system to be functionally damaged.

(9) Tighten cross-recessed pan head screws that fasten the pressure sensor housing to the pressure sensor mounting.

(10) Connect the condenser coil and Teflon tubes to the pressure sensor housing (refer to Fig. 4-11-4-2).

(11) Connect the pressure sensor connector CN9 to the CPU board (refer to Fig. 4-11-4-1).

(12) Connect the power cord to a power outlet and start the check program to adjust the pressure sensor.

⇒ Refer to (14) Calibration of pressure sensor in 2-5-3 “Check Program Function” in 2-5 “Check Program”.

(13) After the pressure sensor has been properly adjusted, unplug the power cord again and attach the back panel and control box cover. Connect the power cord and cables to be connected to the interface board.

4-12 Air Unit

4-12-1 Pump Replacement

4-12-1-1 Replacing the air pump

Tools required

- Phillips screwdriver No. 2
- Nut driver, width across flats 7
- Nut driver, width across flats 8
- Wrench, width across flats 14
- Sealing tape

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Loosen cross-recessed hex head bolts that hold the air unit. Remove cross-recessed hex head bolt at the back under the air unit base. Draw the air unit toward the back of the instrument.

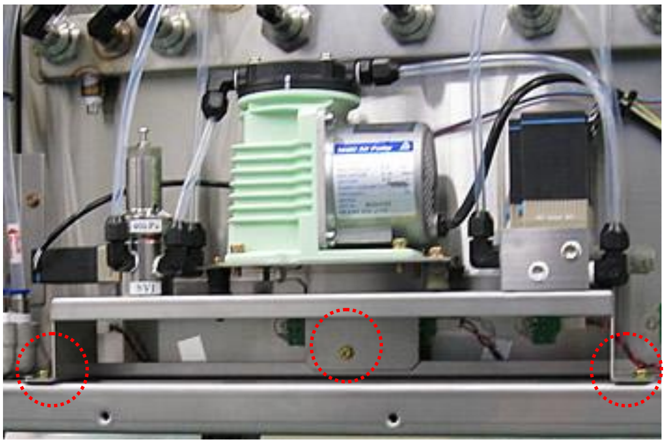


Fig. 4-12-1-1 Drawing of air unit

(4) Secure the air unit base again by tightening bolts at both sides of the air unit base. Remove cap nuts from union joints attached to the pump head to remove Teflon tubes.

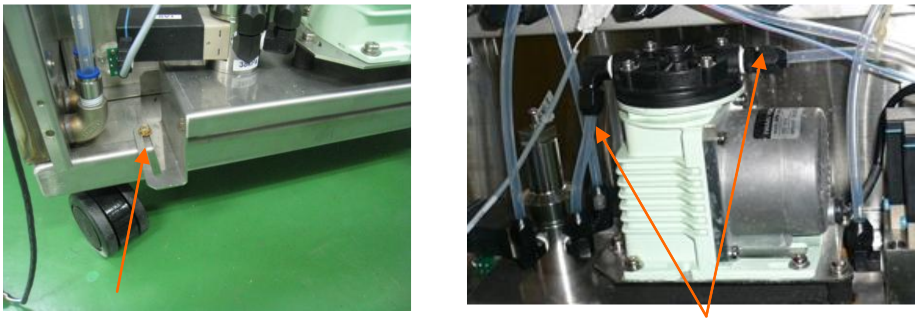


Fig. 4-12-1-2 Removal of tubes from pump

(5) Remove the air pump connector.

(6) Remove four cross-recessed hex head bolts that fasten the air pump to the pump base. Remove the air pump from the instrument.

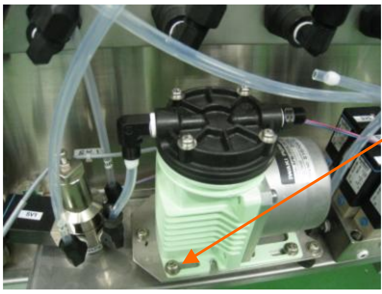


Fig. 4-12-1-3 Removal of air pump

(7) Wrap new sealing tape around threads of union joints (by four times). Screw them into the new air pump. Tighten four cross-recessed hex head bolts to fasten the air pump to the pump base.

(8) Connect Teflon tubes to union joints on the pump head.

(9) Connect the air pump connector.

(10) Slide the air unit into the instrument. Tighten three bolts that hold the air unit at both sides and at the back.

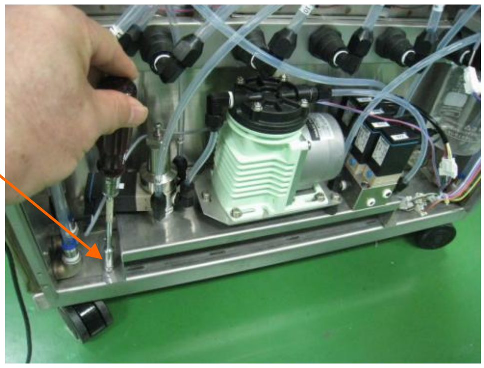


Fig. 4-12-1-4 Installation of air unit

(11) Turn the instrument power on in the service mode. Under the service manual operations, check that the pressure reaches the range of 31 – 36 kPa and goes below -65 kPa in the vacuum phase of P/V Cycle.

(12) Attach the back panel.

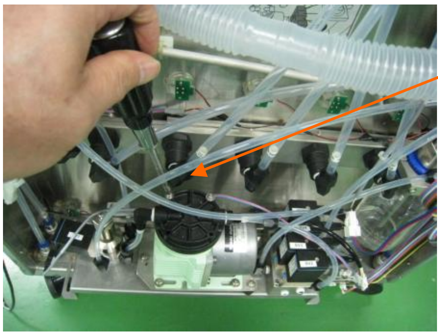
4-12-1-2 Replacing the valve, diaphragm and diaphragm sheet

Tools required

- Phillips screwdriver No. 2
- Torque driver
- Screw lock glue (Loctite #222)
- Wrench, width across flats a4
- Thin stick (less than 4mm in diameter)
- Forceps
- Alcohol, waste cloth

(1) Follow the steps (1) to (4) in 4-12-1-1.

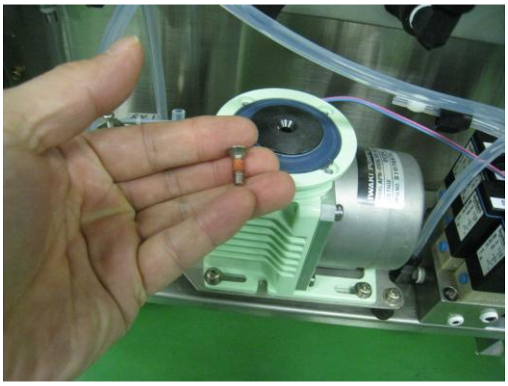
(2) Remove four pan head screws from the pump head to remove the pump head.



Remove cross-recessed pan head screws, avoiding the exhaust manifold and joints above the air pump.

Fig. 4-12-1-5 Removal of pump head

(3) Remove flat head screw that holds the diaphragm in the air pump.

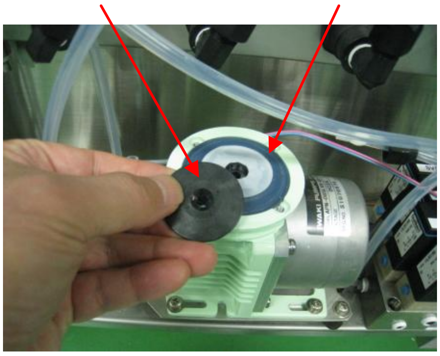


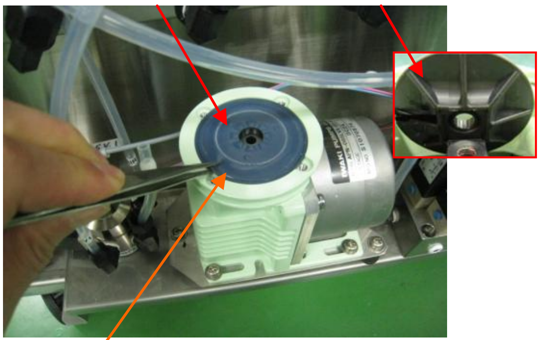
Remove cross-recessed flat head screw. Wipe the screw with a waste cloth moistened with alcohol to remove remaining screw lock glue.

Fig. 4-12-1-6 Removal of flat head screw from air pump

(4) Remove cross-recessed flat head screw fastening retainer plate. Remove retainer plate, diaphragm sheet, diaphragm, lower retainer plate.

Retainer plate Diaphragm sheet Diaphragm Lower retainer plate

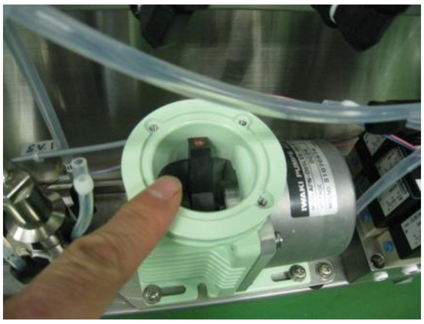




If the diaphragm is sticking to the pump, use forceps to remove the diaphragm.

Fig. 4-12-1-7 Removal of diaphragm

(5) As screw lock glue is applied to the connection rod, wipe clean with a waste cloth moistened with alcohol.



After the lower retainer plate has been removed, the connection rod can sway. Therefore, hold the connection rod by your finger when cleaning.

Fig. 4-12-1-8 Removal of lock glue from connection rod

(6) With connecting rod stayed down (lower support point), properly align the square part of the lower retainer plate with the square top of the connecting rod to install the plate on the rod. When installing, use a thin stick like a hex wrench as a guide for easy alignment.

Fig. 4-12-1-9 Installation of lower retainer plate

(7) Confirm that the diaphragm and diaphragm sheet are free of foreign particle and dusts. Attach the retainer plate to diaphragm with diaphragm sheet, aligning the protrusion of retainer plate with the central hole of diaphragm.

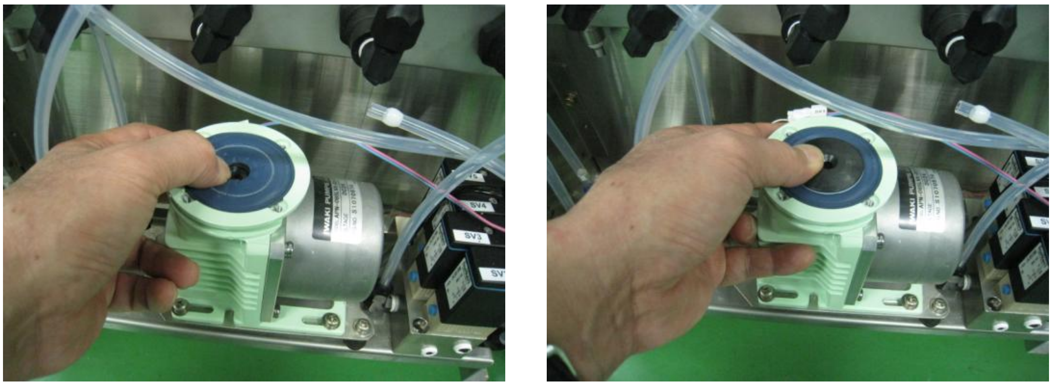


Fig. 4-12-1-10 Installation of retainer plate

(8) Check if the retainer plate is properly installed on the lower retainer plate. Also, check that the lower retainer sheet is aligned with the connecting rod by turning the retainer plate circumferentially while pressing it with fingers.

Fig. 4-12-1-11 Check of seated diaphragm

(9) Check that the circumference of the diaphragm is securely installed in the inside of the bracket. Tighten cross-recessed flat head screw (screw lock glue, Loctite #222, applied) to fasten the retainer plate to the connecting rod (tightening torque: 1.96 N.m).

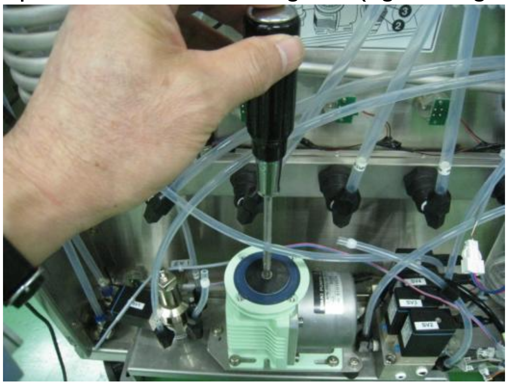


Fig. 4-12-1-12 Fastening of diaphragm

(10) Wipe clean the inner surface of the valve sheet with a cloth moistened with alcohol. Attach the new valve to the valve sheet.

Align the cutout of the valve sheet with the boss of the valve.

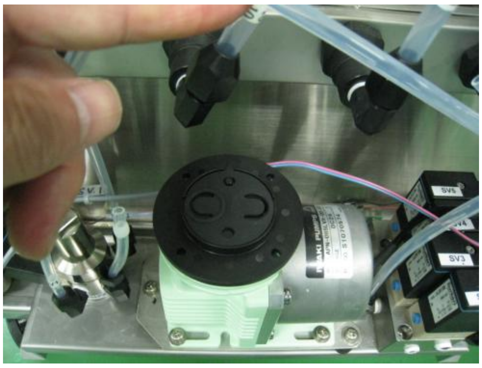


Fig. 4-12-1-13 Installation of valve sheet and valve

(11) Install the pump head on the valve sheet. Confirm that the while alignment marks are matched. .

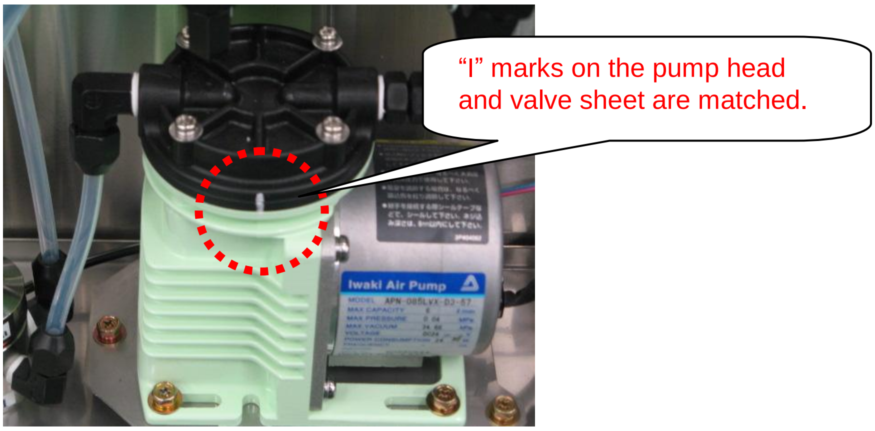


Fig. 4-12-1-14 Alignment of valve sheet and pump head

(12) Fasten the pump head to the bracket, using four cross-recessed pan head screws (tightening torque: 1.37 N.m). Tighten the screws diagonally and evenly.

(13) Connect Teflon tubes to union joints on the pump head and tighten with cap nuts.

(14) Turn the instrument power on. Under the service manual operations, check that the pressure reaches the range of 31 – 36 kPa and goes below -65 kPa in the vacuum phase of P/V Cycle.

(15) Attach the back panel.

Name of air pump components

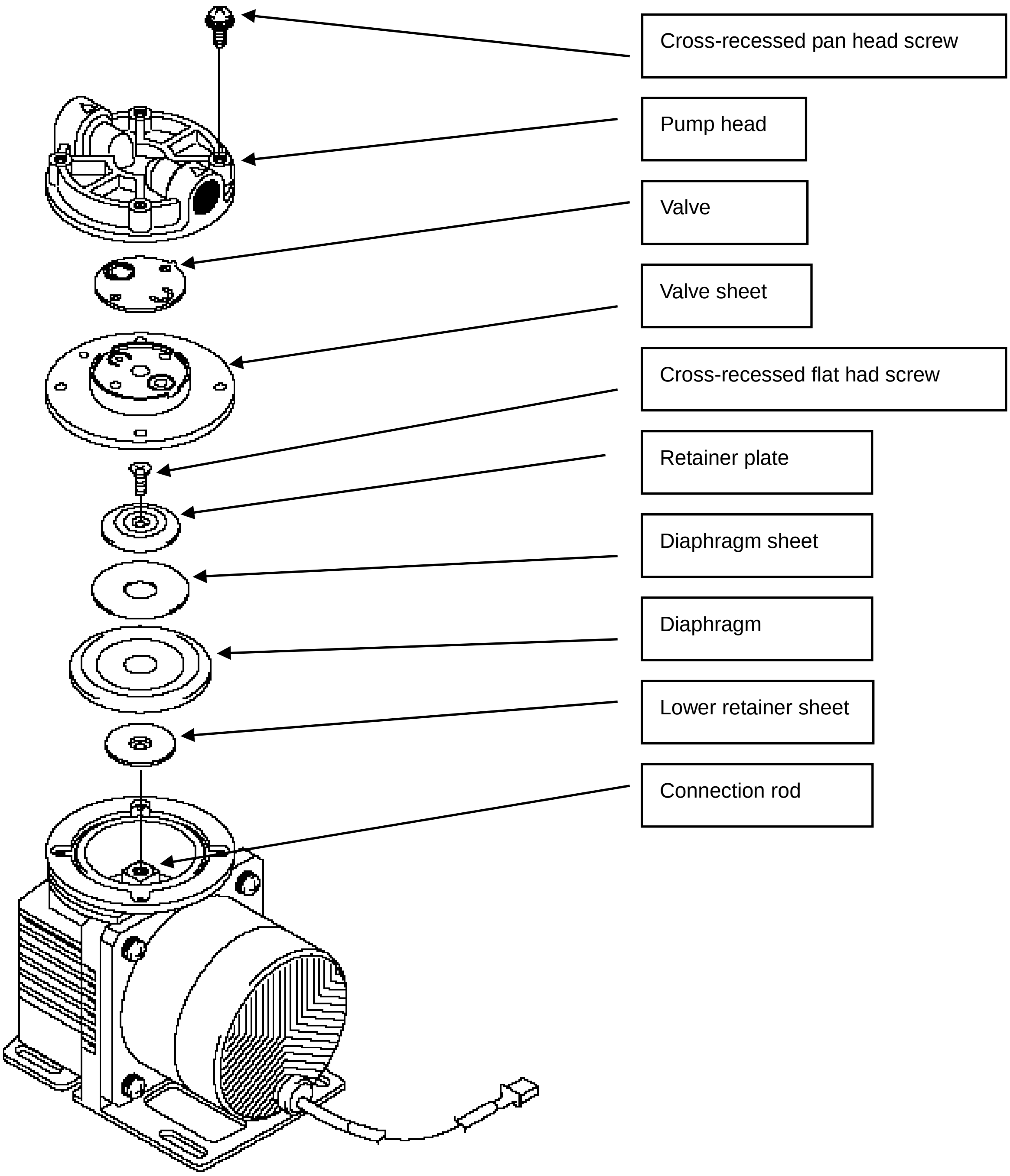


Fig. 4-12-1-15 Names of air pump components

4-12-2 Disassembling, Cleaning and Replacing the Solenoid Valve

4-12-2-1 Disassembling and cleaning the solenoid valve

Tools required
- Phillips screwdriver No. 2
- Torx driver TH10
- Wrench, width across flats 7
- Wrench, width across flats 14

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Disconnect the connector for the solenoid valve to be disassembled.

(4) Remove the Torx screw from the coil body of the solenoid valve to be disassembled. Since each solenoid valve has been fine-adjusted by its manufacturer, do not shuffle the combination of the valve body and the coil body. If the Torx driver cannot reach the target solenoid valve, remove all Teflon tubes connected to the air unit and, with referring to Fig. 4-12-2-2, draw (or remove) the air unit from the instrument before work.

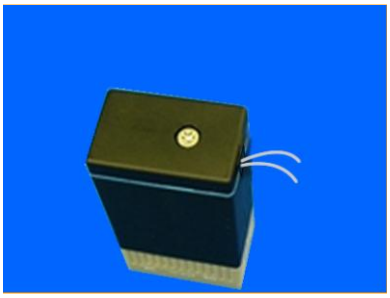


Fig. 4-12-2-1 Removal of coil body

To draw (or remove) the air unit from the instrument, remove one cross-recessed hex head bolt that fastens the air unit to the bottle rack at the back and loosen two cross-recessed hex head bolts that fasten the air unit to the base.

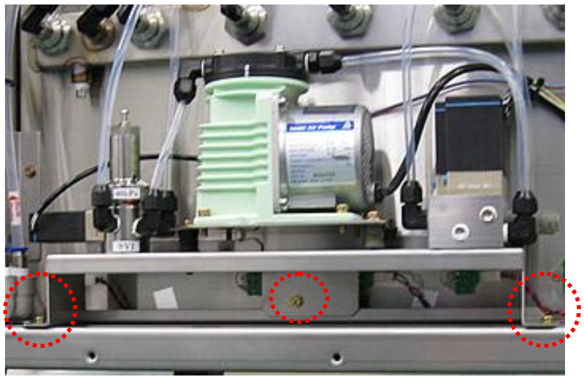


Fig. 4-12-2-2 Removal of air unit

(5) Remove Torx screws from the valve body to detach the valve body.

For the solenoid valve SV1 located to the left of the air pump, viewing from the back of the instrument, remove the pressure regulator first because SV1 is fastened to the regulator. To remove the regulator, remove one cross-recessed pan head screw which fastens the regulator to the air unit base from below.

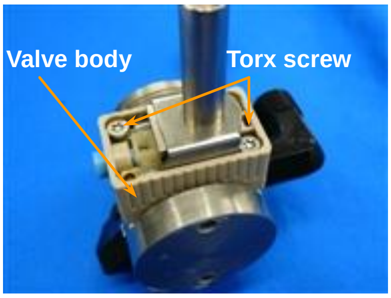


Fig. 4-12-2-3 Removal of valve body

(6) Wipe clean the gasket and ports of the valve body using xylene.

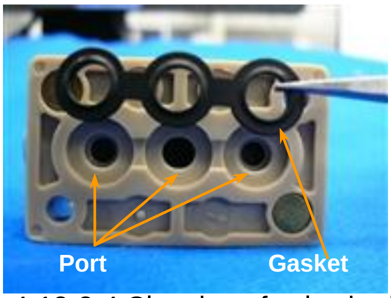
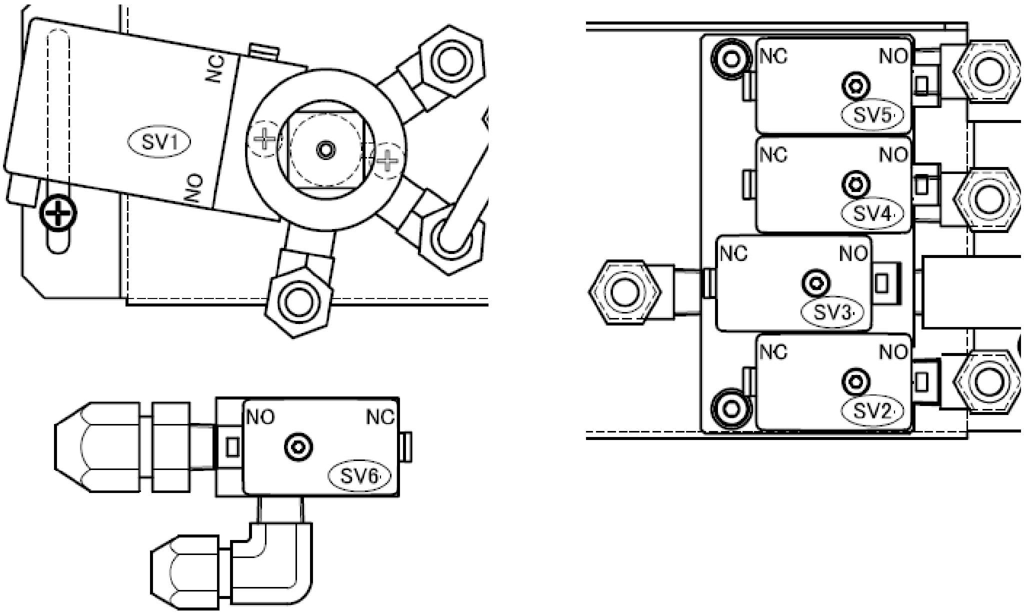


Fig. 4-12-2-4 Cleaning of valve body

(7) Install the valve body. When installing, check for orientation of the ports with care (see Fig. 4-12-2-5).



* “NC” and “NO” are printed on the side of each valve body.

Fig. 4-12-2-5 Installation of valve body

(8) Attach the coil body. (Refer to Fig. 4-12-2-1.)

(9) Install the air unit if you removed it from the instrument. Connect Teflon tubes to the air unit. (See Fig. 4-12-2-2.)

(10) Connect the solenoid valve connector.

(11) Turn the instrument power on.

(12) Start the check program to check for operation of the solenoid valve you disassembled. For the solenoid valves SV1 to SV3, confirm that pressure can properly increase and decrease.
For SV4 and SV5, confirm that vacuum is created in the bulk reservoir corresponding to either one of the solenoid valves. SV4 is for the left bulk reservoir and SV5 for the right bulk reservoir. To check the operation, run the "check leakage from the bulk reservoir" test in the check program. Confirm that the pressure indicator returns to atmospheric pressure by connecting the hose to the appropriate external fill port during the test in progress.

(13) Attach the back panel.

4-12-2-2 Replacing the solenoid valve

Tools required
- Phillips screwdriver No. 2
- Torx driver TH10
- Wrench, width across flats 7
- Wrench, width across flats 14

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Disconnect the connector for the solenoid valve to be replaced.

(4) Remove the Torx screw from the coil body of the solenoid valve to be replaced. (See Fig. 4-12-2-1.) Since each solenoid valve has been fine-adjusted by its manufacturer, do not shuffle the combination of the valve body and the coil body. If the Torx driver cannot reach the target solenoid valve, remove all Teflon tubes connected to the air unit and, with referring to Fig. 4-12-2-2, draw (or remove) the air unit from the instrument before the work.

(5) Remove Torx screws from the valve body (see Fig. 4-12-2-3) and replace with the new valve body. At this time, take care to properly orient ports of the valve body. (See Fig. 4-12-2-5.)

(6) Install the coil body. (See Fig. 4-12-2-1.)

(7) Install the air unit if you removed it from the instrument. Connect Teflon tubes to the air unit. (See Fig. 4-12-2-2.)

(8) Connect the solenoid valve connector.

(9) Start the check program to check for operation of the solenoid valve you disassembled. For the solenoid valves SV1 to SV3, confirm that pressure can properly increase and decrease.
For SV4 and SV5, confirm that vacuum is created in the bulk reservoir corresponding to either one of the solenoid valves. SV4 is for the left bulk reservoir and SV5 for the right bulk reservoir. To check the operation, run the “check leakage from the bulk reservoir” test in the check program. Confirm that the pressure indicator returns to atmospheric pressure by connecting the hose to the appropriate external fill port during the test in progress.

(10) Attach the back panel.

4-12-3 Adjusting the Regulator (replacement of diaphragm and O ring)

Tools required
- Phillips screwdriver No. 2
- Wrench, width across flats 7
- Wrench, width across flats 8
- Wrench, width across flats 14
- Wrench, width across flats 17
- Screw lock glue (Three Bond 1401C)
- Grease (Sealub S-11)

<Replacement>

(1) Turn the instrument power off.

(2) Remove the back panel.

(3) Remove the pressure adjustment screw. Loosen the P bonnet to remove, using a wrench (width across flats 17).

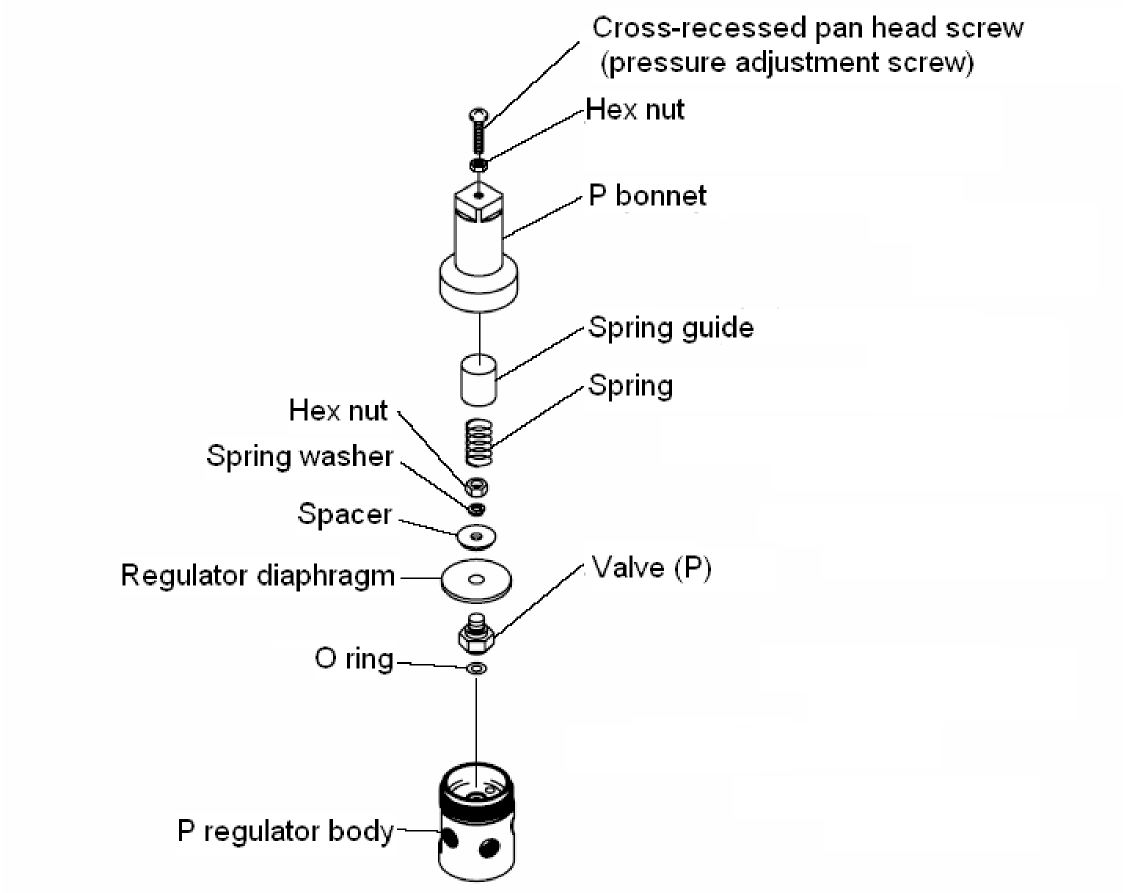


Fig. 4-12-3-1 Exploded view of regulator

(4) Remove the valve (P) assembled with the diaphragm. Loosen the hex nut, using wrenches (width across flats 8 and 14). Replace the diaphragm with a new one before reassembly. At this time, take care to orient the spacer. Face the “R” processed side of the spacer downward.

(5) Remove the O ring from the P regulator body. Clean the inside of the body.

(6) Place the new O ring into the P regulator body and apply a slight amount of grease (Sealub S-11) to the O ring and the rim (the contact surface with the diaphragm) of the P regulator body as well.

(7) Clean the surface that the valve (P) contacts the O ring. Place the valve (P) into the P regulator body.

(8) Place the spring, spring guide and P bonnet in order. Carefully screw the P bonnet into the P regulator body.

(9) Firmly tighten the P bonnet hand tight and then use a wrench (width across flats 17) to make a final turn by 10 mm along circumference of the internal thread of the P bonnet.

(10) Tighten the pressure adjustment screw and hex nut.

<Adjustment>

(1) Confirm that the pressure adjustment screw is loose.

(2) Perform the “pressure regulator test” in the check program. Make adjustment with an interval of around 5 minutes after the “pressure regulator test.” With the nut loosened, turn the adjustment screw until the pressure indicator reaches the range of 38 to 42 kPa. Turning the screw clockwise increases the pressure and counterclockwise decreases it.

(3) When the setting value is obtained, the alarm starts sounding. At that time, tighten the nut while holding the adjustment screw with a Phillips screwdriver. Confirm that the pressure stays in the setting range after the nut is tightened.

(4) Apply screw lock glue to the adjustment screw and between the regulator body and P bonnet.

4-13 Operation Panel Cover and Control Box

4-13-1 Removing and Installing the Compact Flash Memory Card

Tools required • Phillips screwdriver No. 2

<Removal>

(1) Turn the power off.

(2) Remove the control box cover.

Fig. 4-13-1-1 Removal of control box cover

(3) Remove the compact flash memory card located at the top right of the CPU board.

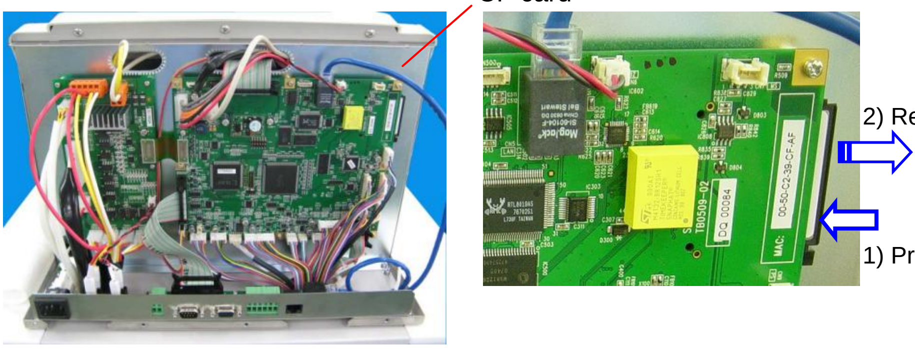


Fig. 4-13-1-2 Removal of CF card

<Installation>

(4) Install the compact flash memory card.

Facing the side with the model name label inward, insert the CF card into the slot until a click is heard (see below).

If the CF card is securely inserted, the eject button pops up (refer to Fig. 4-13-1-2).

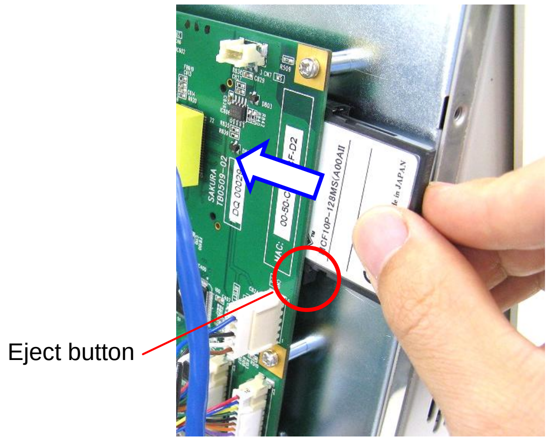


Fig.4-13-1-3 Insertion of CF card

(5) Attach the control box cover.

(6) Turn the power on to check if the system properly starts the control software and causes no file-related error to occur.

4-13-2 Replacing the CPU Board

Tools required • Phillips screwdriver No. 2

(1) Turn the instrument power off. (Also, unplug the power cord.)

(2) Remove the control box cover.

Fig.4-13-2-1 Removal of control box cover

(3) Remove the compact flash memory card from the instrument.
⇒ Refer to 4-13-1, “Replacing the Compact Flash Memory Card.”

(4) Remove the IF board mounting plate.
Remove wires/cables from the connectors shown below first and then remove fixing screws at both ends of the mounting plate.

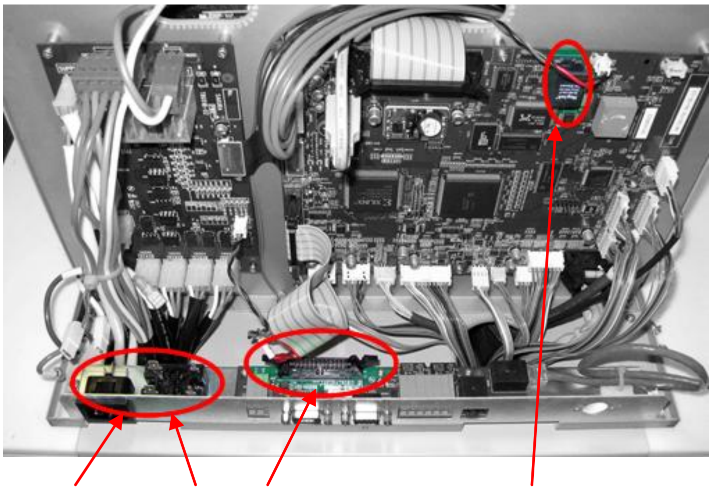


Fig. 4-13-2-2 Removal of cables from interface board

Remove the IF board mounting plate and interface board together from the instrument.

(5) Remove the CPU board.

1) Disconnect all the cable connectors connected to the CPU board.

2) Remove screws that hold the CPU board.

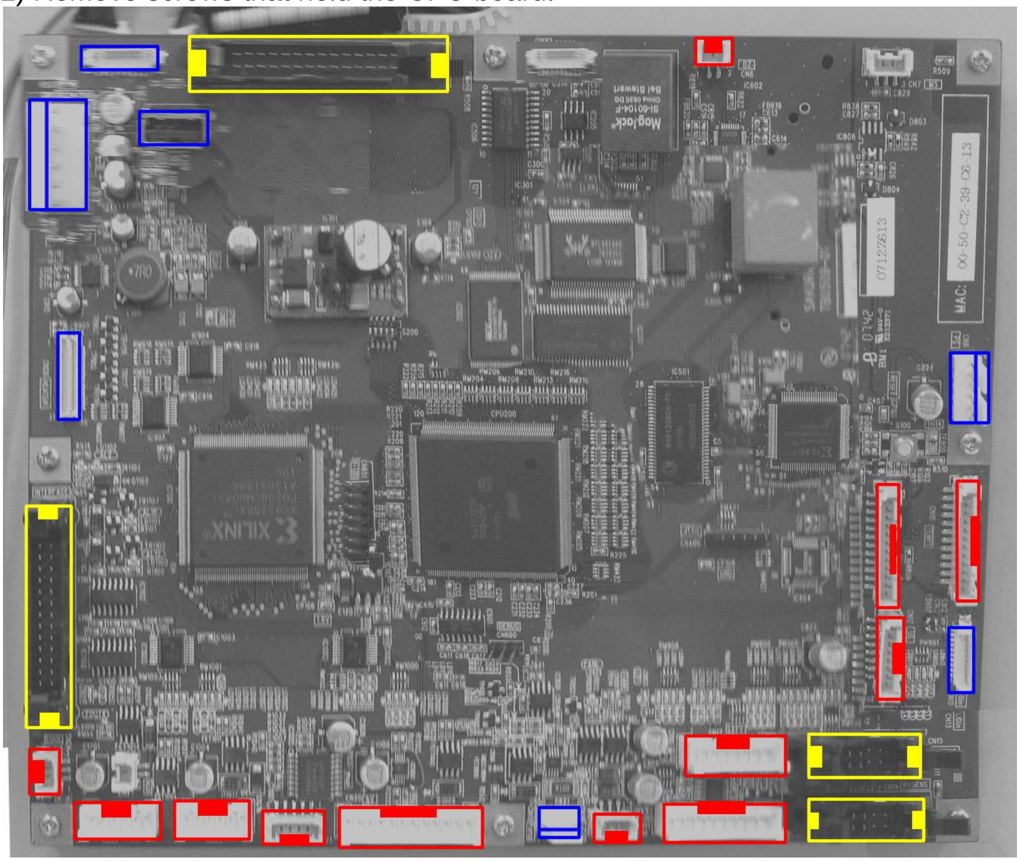
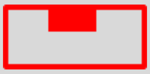


Fig.4-13-2-3 Type of connectors on CPU board

The connectors are roughly grouped by type and color-coded in the above figure.

	Connector with lock. The lock is positioned at the red-filled portion. Make sure to push the lock when disconnecting the cable connector.
	MIL-compliant connector. Locks are positioned at the yellow-filled portions. Release the locks to disconnect the cable connector.
	Connector without lock. Normally, pull out the cable connector to disconnect this type of connector.

When disconnecting, handle with care these connectors with lock and disconnect clockwise from the top.

After all connectors have been removed, remove screws orderly from the bottom. When removing the CPU board, take great care not to damage the parts on the other side because the parts are mounted on both sides of the board.

(6) Install the new CPU board and the IF board mounting plate with the interface board in the reverse order of steps (4) and (5).

(7) Install the compact flash memory card.
⇒ Refer to 4-13-1, “Replacing the Compact Flash Memory Card.”

(8) Correct the misalignment of the LCD touch screen in the control panel.
⇒ Refer to 4-13-8, “Correcting the Touch Panel.”

(9) Attach the control box cover.

4-13-3 Replacing the Heater Driver Board

Tools required • Phillips screwdriver No. 2

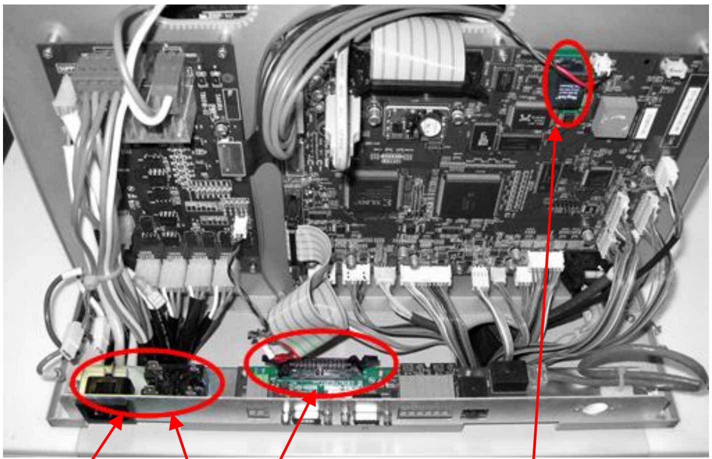
(1) Turn the instrument power off. (Also, unplug the power cord.)

(2) Remove the control box cover.

Control box cover

Fig.4-13-3-1 Removal of control box cover

(3) Remove the IF board mounting plate.
Remove wires/cables from the connectors shown below first and then remove fixing screws at both ends of the mounting plate.



Inlet SSR Interface connector LAN cable

Fig. 4-13-3-2 Removal of cables from interface board

Remove the IF board mounting plate and interface board together from the instrument.

(4) Remove the heater driver board.

1) Disconnect all the cable connectors connected to the heater driver board.
2) Remove screws that hold the heater driver board.

Heater driver board

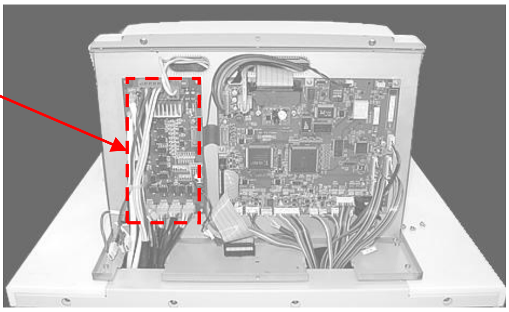


Fig.4-13-3-3 Heater driver board

Remove all the connectors from the heater driver board clockwise from the connector CN201 at the top. Remove screws from the bottom to the top. Take great care when handling because the parts are also mounted on the other side.

(5) Install the new heater driver board in the reverse order of steps (3) and (4).

(6) With the power cord removed from the power outlet and the power switch set to ON, measure insulation resistance between the ground terminal of the power plug and other power line terminals, using an insulation-resistance meter, to confirm that the measured value is 10 MΩ or above.

(7) Turn the instrument power on. Start the check program and run the temperature test to see if each heater, except for the retort lid heater, is properly temperature-controlled. Also, start the control software to see if the system properly operates.

4-13-4 Replacing the Control Panel Unit

Tools required • Phillips screwdriver No. 2

(1) Turn the instrument power off.

(2) Remove the control box cover.

Fig.4-13-4-1 Removal of control box cover

(3) Remove the control panel cover.

1) Remove three screws that hold the panel cover.

2) Push the panel cover downward to remove.

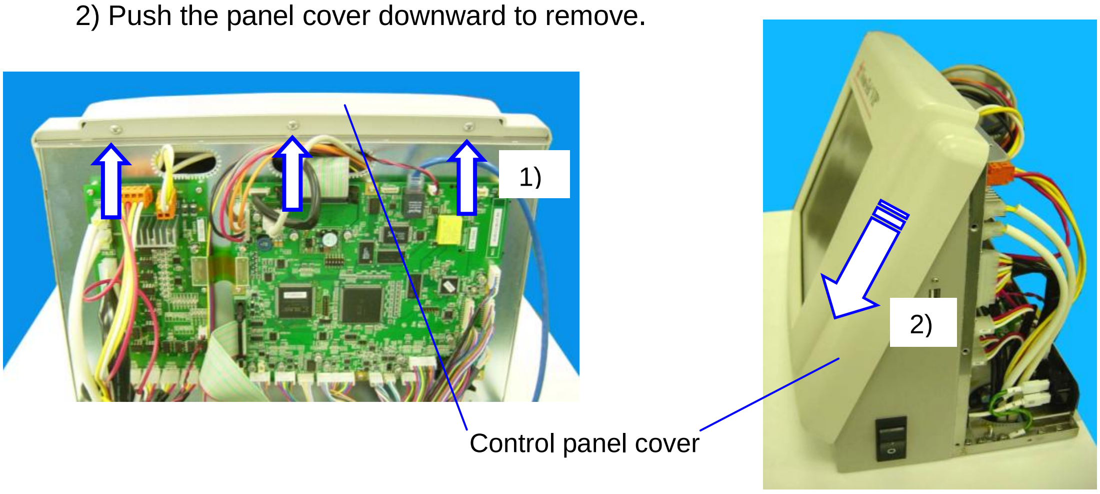
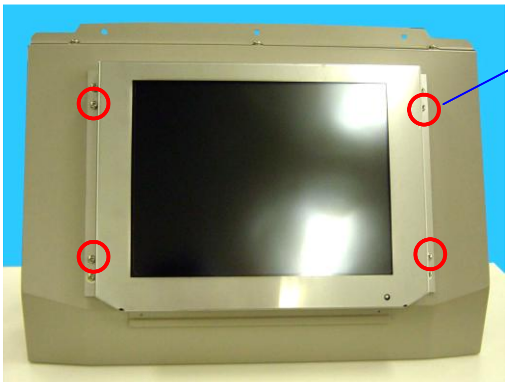


Fig.4-13-4-2 Removal of control panel cover

(4) Remove the TFT cover.



Screw locations
(4 inside screws)

Fig.4-13-4-3 Removal of TFT cover

(5) Remove the TFT base.
Remove screws and lift the base up to remove.

Screw locations (4 screws)

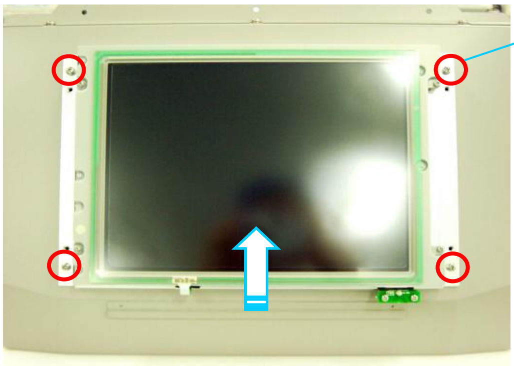
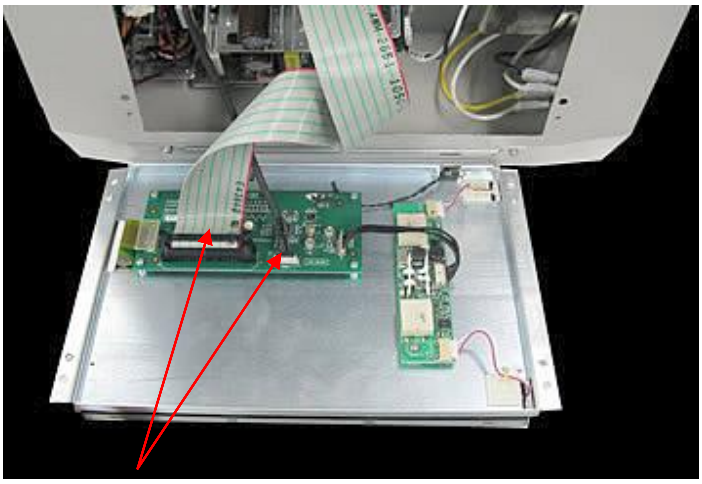


Fig.4-13-4-4 Removal of TFT base

(6) Disconnect the cables going to the CPU board from the LCD relay board located on the back of the TFT base. Separate the TFT base from the instrument.



Connectors to be disconnected

Fig. 4-13-4-5 Separation of TFT base

(7) Disconnect the connectors linking the LCD relay board and the inverter to the control panel unit in order to have the control panel unit ready for removal.

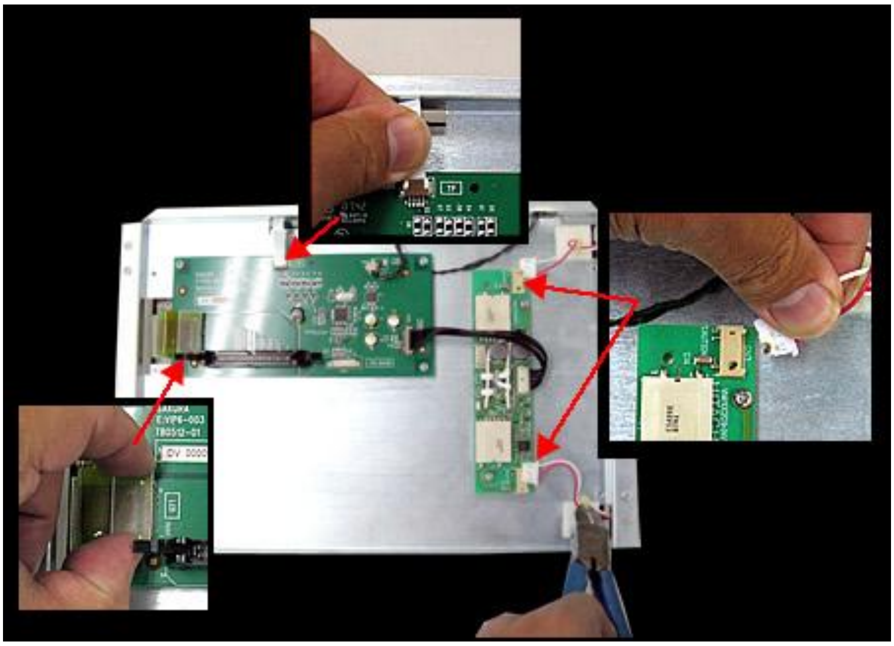


Fig.4-13-4-6 Disconnection from control panel unit

Disconnect the sheet connector TP for the touch panel and the LCD connector LCD of the LCD FPC cable from the LCD relay board and two connectors from the inverter.

(8) Attach the TFT base to the control box again and remove the control panel unit.

Fig.4-13-4-7 Removal of LCD module

To make the work easier, install the TFT base on the control box again because there are the LCD relay board and the inverter on the back of the TFT base.
When removing the control panel unit, remove the touch panel protection sheet that is attached to the LCD surface. Carefully disconnect the connectors from the control panel unit as they are very fragile. Also, remove the LCD FPC cable that is left on the back of the control panel unit (see Fig. 4-13-4-8 on the next page).

Fig.4-13-4-8 Removal of LCD FPC cable

(9) Install the new control panel unit.

(10) Assemble and install the TFT base and TFT cover in the reverse order of steps (5) to (8). Stick the touch panel protection sheet on the LCD screen.
⇒ Refer to 4-13-7, "Replacing and Cleaning the Touch Panel Protection Sheet."

(11) Install the control panel cover.

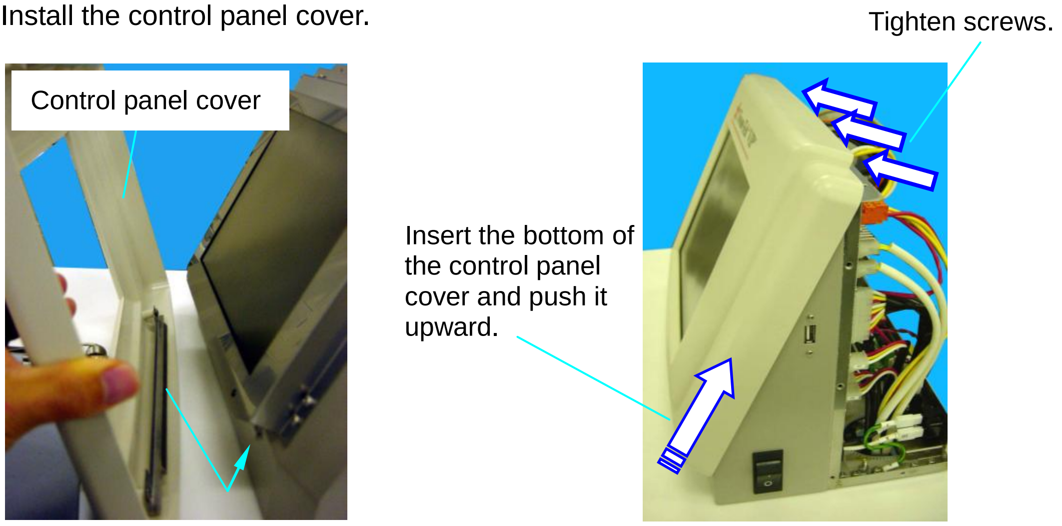


Fig.4-13-4-9 Installation of control panel cover

(12) Turn the power on. Check if the screen is properly displayed and that the touch panel responds.

(13) Correct the misalignment of the LCD touch screen in the control panel.
⇒ Refer to 4-13-8, "Correcting the Touch Panel."

(14) Install the control box cover.

4-13-5 Replacing the LCD Relay Board, Power Indicator Board and Inverter

<Caution> Take antistatic measures before beginning the work.

Tools required • Phillips screwdriver No. 2

(1) Turn the instrument power off.

(2) Remove the control box cover.

Fig.4-13-4-1 Removal of control box cover

(3) Remove the control panel cover.
1) Remove three screws that hold the panel cover.
2) Push the panel cover downward to remove.

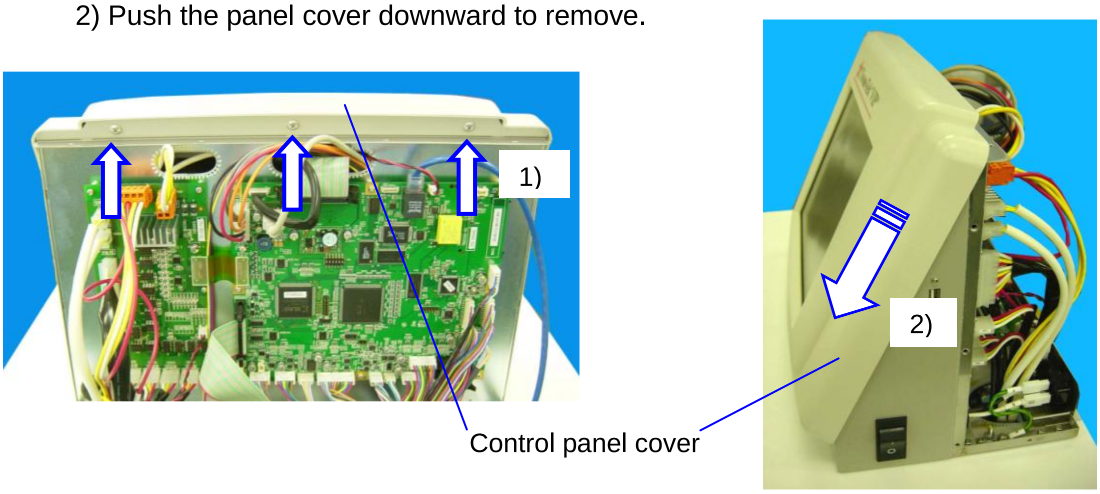


Fig.4-13-5-2 Removal of control panel cover

(4) Remove the TFT cover.

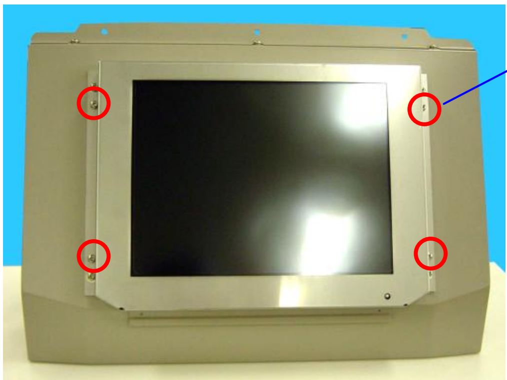


Fig.4-13-5-3 Removal of TFT cover

(5) Remove the TFT base.
Remove screws and lift the base up to remove.

Fig.4-13-5-4 Removal of TFT base

(6) Disconnect the cables going to the CPU board from the LCD relay board located on the back of the TFT base. Separate the TFT base from the instrument.

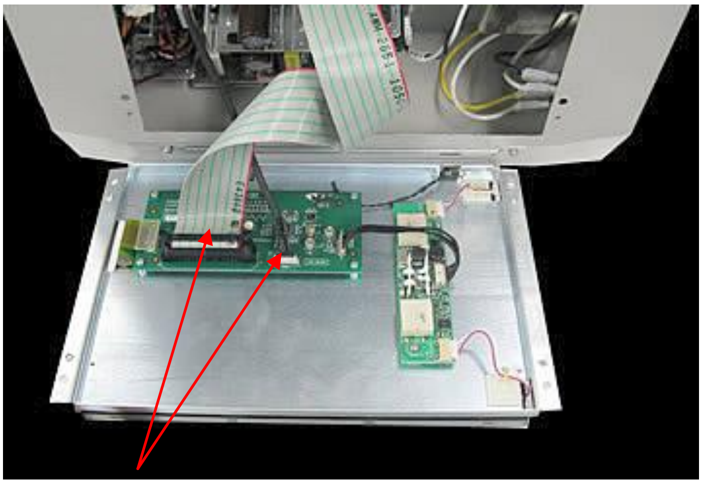


Fig. 4-13-5-5 Separation of TFT base

(7) Remove and replace the component as necessary.
Disconnect the red-arrowed connectors from the LCD relay board and the purple-arrowed connectors from the inverter.
<Note>
A. Since the touch panel sheet connector is fragile, handle it with care.
B. To remove the power indicator board, remove screws and disconnect the connector on the back.
C. Handle the LCD FPC cable with care.
D. Do not give a twist to the inverter connector when disconnecting as its corners are fragile.

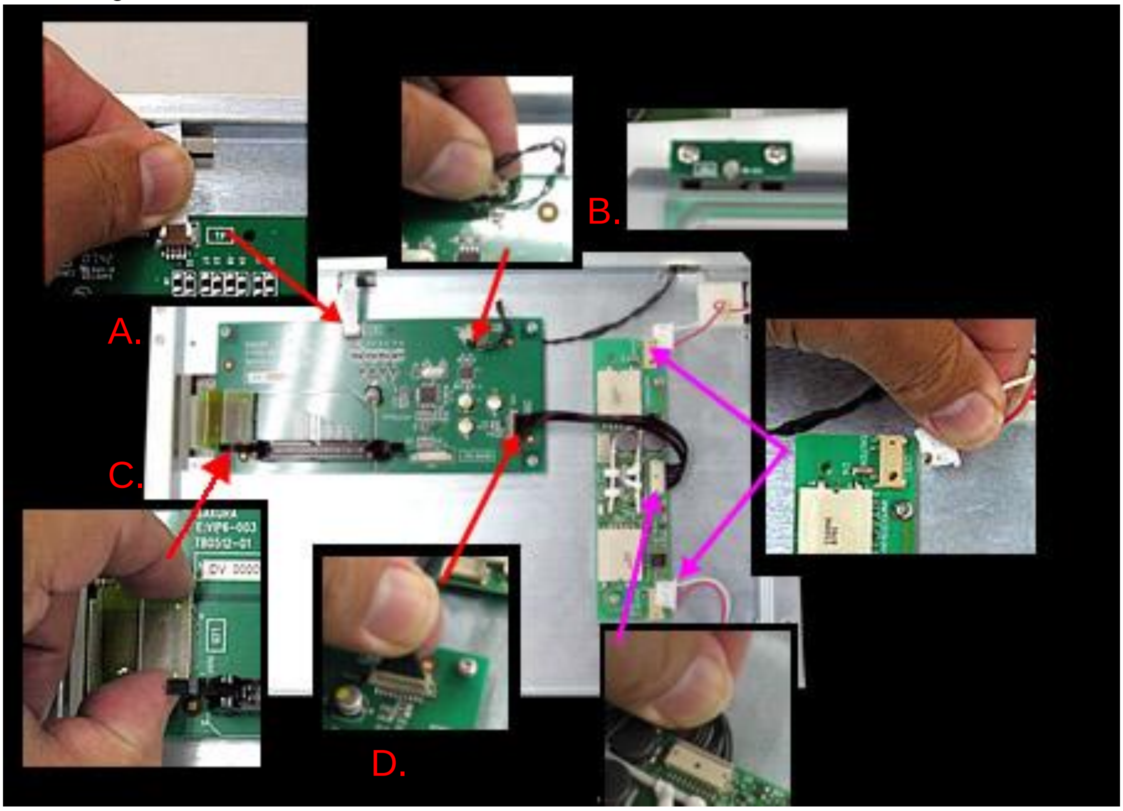
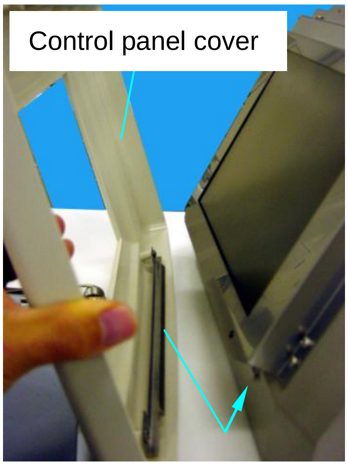


Fig. 4-13-5-6 Removal of each component

(8) Install the new component.

(9) Assemble and install the TFT base and TFT cover in the reverse order of steps (5) to (7).

(10) Install the control panel cover.



Insert the bottom of the control panel cover and push it upward.

Tighten screws.

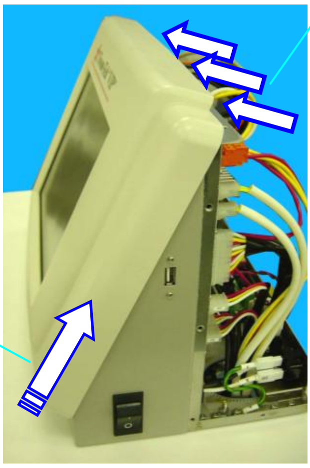


Fig.4-13-5-7 Installation of control panel cover

(11) Turn the power on. Check if the screen is properly displayed and that the touch panel responds. Also, confirm that the power LED is lit.

(12) Correct the misalignment of the LCD touch screen in the control panel.
⇒ Refer to 4-13-8, "Correcting the Touch Panel."

(13) Install the control box cover.

4-13-6 Replacing the Switching Power Supply, Cooling Fan and Other Components

Tools required
- Phillips screwdriver No. 2
- Nipper
- Wire ties
- Screw lock glue (Loctite 242) * for replacement of the USB cable/speaker

(1) Turn the instrument power off. (Also, unplug the power cord.)

(2) Remove the control box cover.

Fig.4-13-6-1 Removal of control box cover

(3) Remove the control panel cover.
1) Remove three screws that hold the panel cover.
2) Push the panel cover downward to remove.

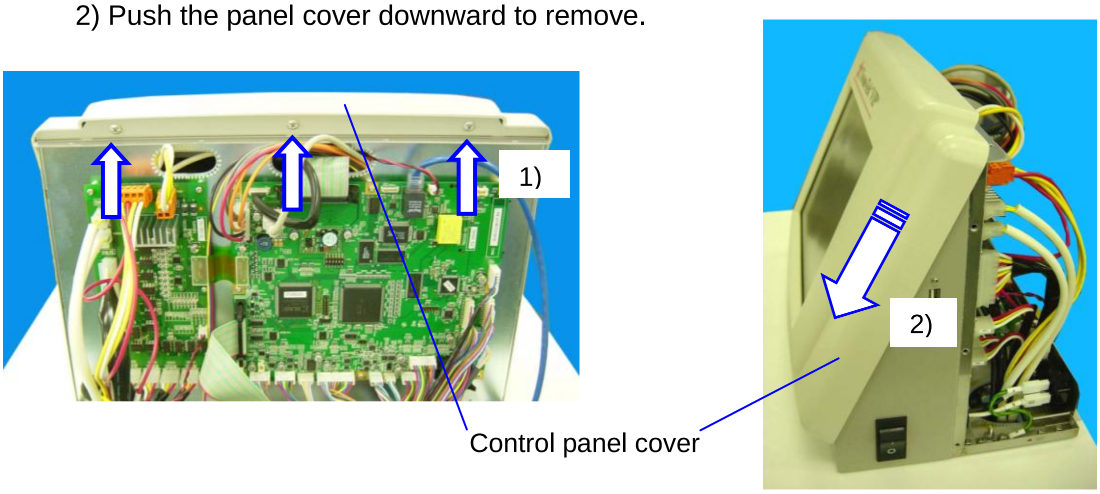


Fig.4-13-6-2 Removal of control panel cover

(4) Remove the CPU board mounting plate.

1) Remove the CPU board and heater driver board.

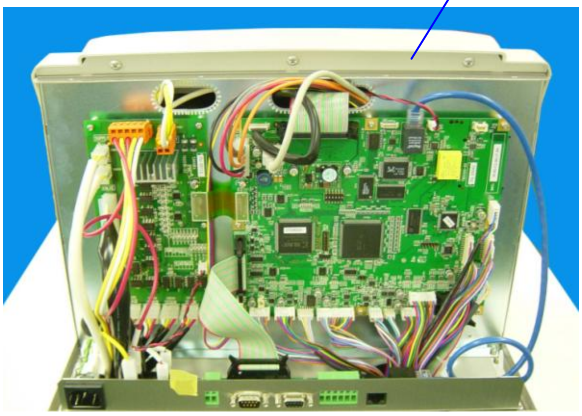
⇒ Refer to 4-13-2, "Replacing the CPU Board" and 4-13-3, "Replacing the Heater Driver Board."

2) Remove the TFT base.

⇒ Refer to 4-13-4, "Replacing the Control Panel Unit."

3) Remove terminals connected to the circuit protector.

4) Remove screws from the CPU board mounting plate (5 places at the top and bottom).



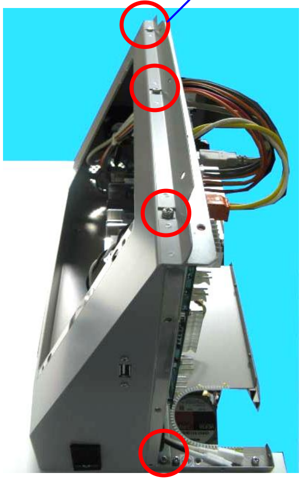


Fig.4-13-6-3 Removal of CPU board mounting plate

(5) Two components (the switching power supply and the noise filter) are installed on the back of the CPU board mounting plate.

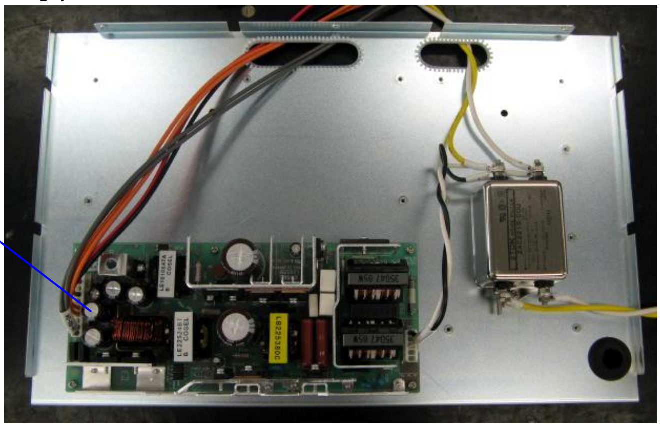


Fig.4-13-6-4 Components on CPU board mounting plate

Feed the power cables as shown above after the new switching power supply is installed.
Feed the noise filter cables so that top and bottom cables do not come close to each other.
Use the specified screws (M4 x 6, Sems A) to hold the noise filter because the heater driver board is installed on the other side.

(6) The USB cable, cooling fan and speaker are installed inside the control box body.

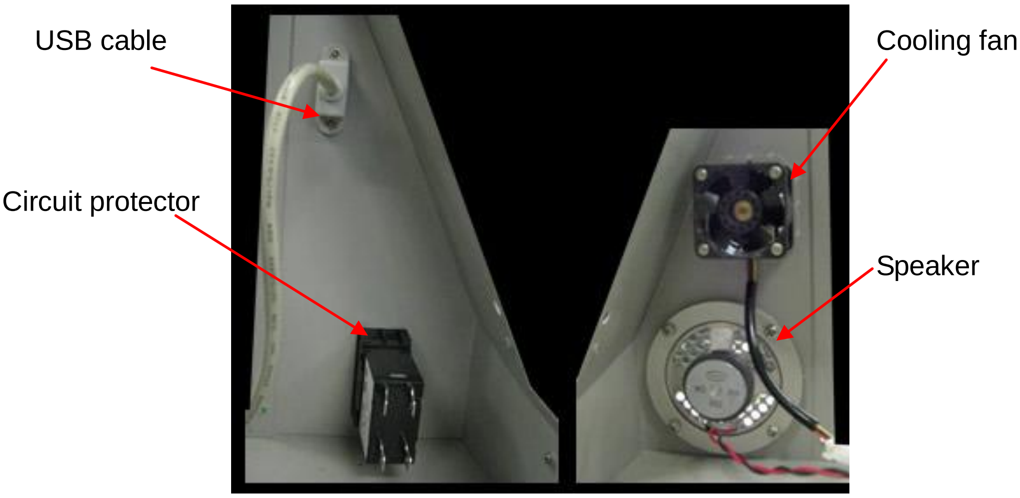


Fig.4-13-6-5 Components in control box body

a) USB cable

Apply Loctite 242 to screws.
Orient the USB as shown right.

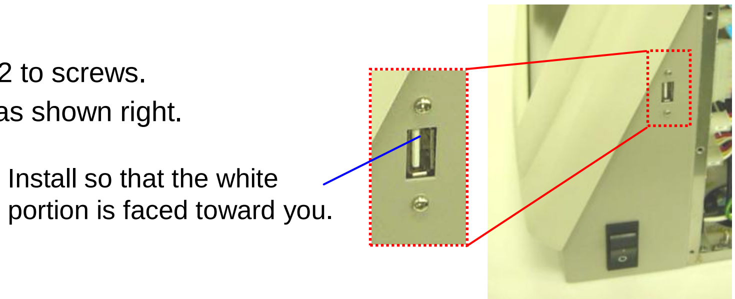


Fig.4-13-6-6 Orientation of USB connector

b) Cooling fan

The fan creates a unidirectional airflow and cools the control box by sending air inside the box to the outside. Therefore, set the cooling fan so that blades can be seen, as shown in Fig. 4-13-6-5, viewing from the inside of the control box.

c) Speaker

The speaker is secured by the speaker mounting plate that holds the entire speaker to prevent the sound from cracking. Apply Loctite 242 to screws.

d) Circuit protector

The circuit protector is inserted in a square mounting hole. The rating is different depending on the product model name.

* VIP6-J0, VIP6-A1 : 15A
* VIP6-E2 : 10A

Install the circuit protector so that the "|" mark is in the upper part of the switch side and the "O" mark in the lower part of it. The circuit protector has the [LOAD] side that is connected to the noise filter and the [LINE] side that is connected to the inlet for the power cord.

(7) After each component is installed, assemble the control box in the reverse order of steps (3) and (4).

(8) Prior to turning the power on, test the conductivity between the main body and the ground terminal at the end of the power plug. Also, with the power switch set to ON, measure insulation resistance between the power line terminal and ground terminal of the power plug, using a insulation-resistance meter, to confirm that the measured value is 10 MΩ or above.
Start the check program to perform the screen check, operation check on the touch panel and the I/O check. Start the control software to confirm that the system starts up without an error.

(9) Install the control box cover.

4-13-7 Replacing and Cleaning the Touch Panel Protection Sheet

<Caution> * Take care not to hit the touch panel hard when replacing/cleaning the protection sheet because the touch panel is made of glass.
* To wipe the touch panel unprotected with the protection sheet, use 10% diluted ethanol. Do not use any other solvents.

<Replacement>

Tools required
- Waste cloth or paper towel
- Scraper

(1) To prevent an operational error, turn the instrument power off.

(2) Peel off the protection sheet attached to the display screen in the control panel.
As an aid for easy peeling, one of the corners of the protection sheet is rounded off. Turn it up to peel off the sheet from there. (See Fig. 4-13-7-1.)

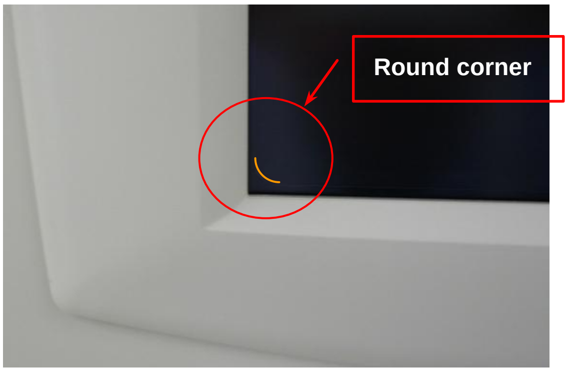


Fig. 4-13-7-1 Round corner of protection sheet

(3) If the display screen is dirty, wipe clean with waste cloth or paper towel.

(4) Peel a clear film off the adhesive side of the protection sheet halfway (see Fig. 4-13-7-2). Do not peel off all the way.

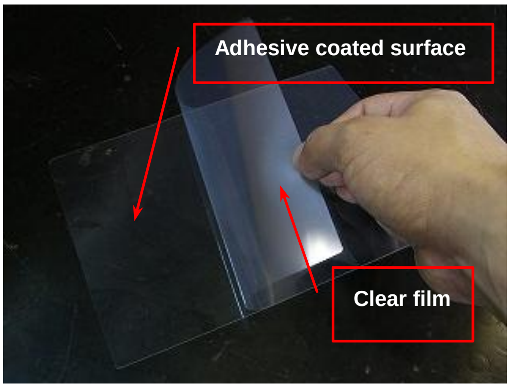


Fig.4-13-7-2 Touch panel protection sheet

(5) Stick the new protection sheet on the display screen.

Stick the protection sheet, starting from where the clear film was peeled off in step (4), with much care to prevent misalignment of the protection sheet with the display frame. Peel off the rest of the clear film and stick the sheet in the same manner (see Fig. 4-13-7-3). Dispose of the clear film after peeled.

When sticking the protection sheet, a bubble may be trapped between the sheet and the touch panel surface. In such case, use a scraper to push a bubble out of the protection sheet while sticking it on the display.

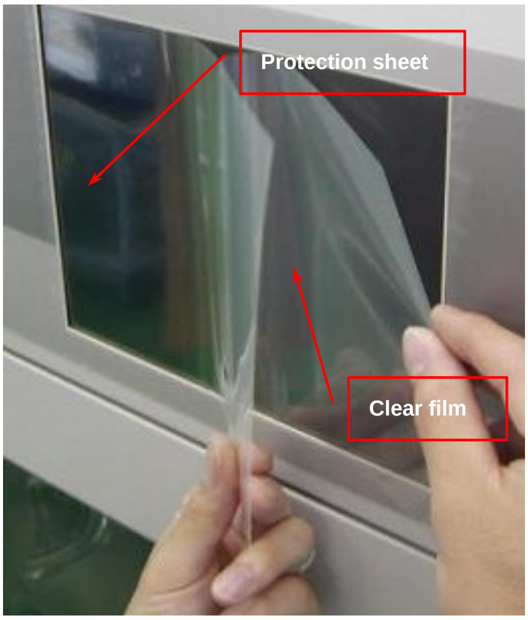


Fig. 4-13-7-3 Sticking of touch panel protection sheet

<Cleaning of the Touch panel protection Sheet>

Tools required • Waste cloth

(1) To prevent operational error, turn the instrument power off.

(2) If paraffin is stuck on the protection sheet, tightly wring a waste cloth moistened with xylene (to prevent xylene from running down the protection sheet) and wipe the sheet surface with the cloth to remove paraffin.

Fig.4-13-7-4 Cleaning of touch panel protection sheet

(3) To remove smudge from the protection sheet except for paraffin, wipe off them with a waste cloth moistened with 10% ethanol and tightly wrung.

4-13-8 Correcting the Touch Panel

Normally, misalignment of the display points and the detection points does not occur on the touch panel. However, after the CPU board, the touch panel and/or the LCD module are replaced or when a significant misalignment is present, it is necessary to correct the touch panel. This correction work is called “teaching”.

To “teach” the touch panel on this system, perform the following steps.

Tools required • Phillips screwdriver No. 2

(1) Turn the power off.

(2) Remove the control box cover.

Fig.4-13-8-1 Removal of control box cover

(3) Set “2” of the DIP switch [S200] on the CPU board to ON.

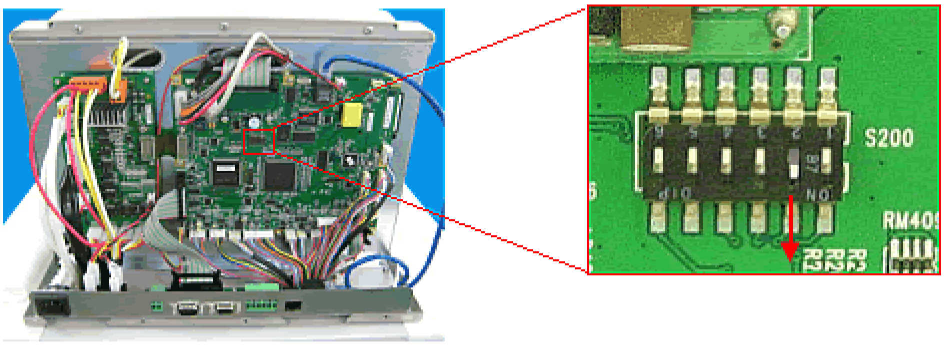


Fig.4-13-8-2 Flip of DIP switch

(4) Perform the “teaching.”

1) Turn the power on to start the teaching program.

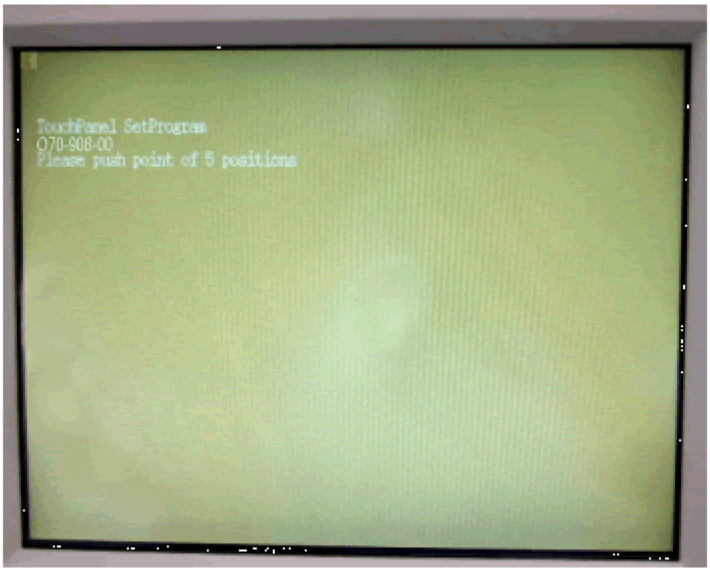


Fig.4-13-8-3 Start-up of teaching program

2) Using a round-ended stick, touch the numbers from 1 to 5 which are sequentially displayed on the screen. (For 1 to 4, push the screen corner in each number frame. For 5, push the center of its number frame.)

If you want to start over again or fail to touch the correct position, turn the instrument power off once.

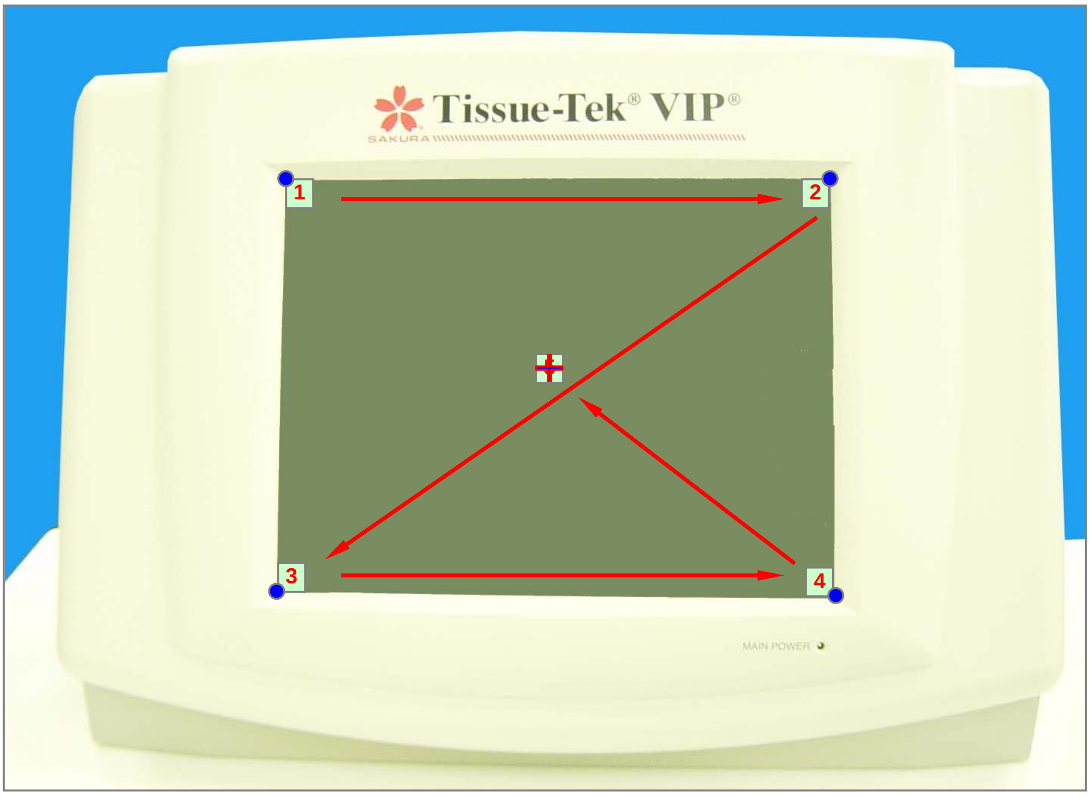


Fig.4-13-8-4 Teaching

3) When the “teaching” is completed, the following screen appears.

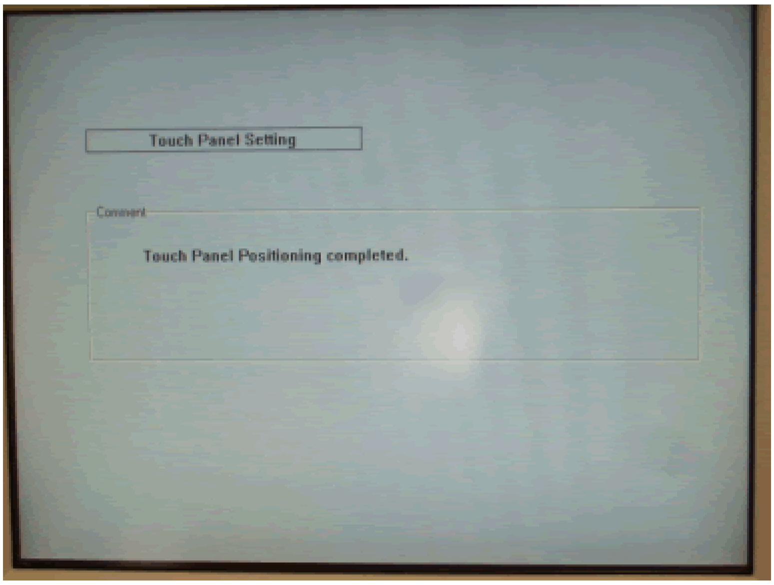


Fig.4-13-8-5 “Teaching” completion screen

(5) Return the DIP switch on the CPU board to the original setting (all OFF).

(6) Turn the power on. Check if the displayed buttons are properly aligned with their detection points.

(7) Attach the control box cover.

4-13-9 Replacing the Battery

Tools required
- Phillips screwdriver No. 2
- ROM remover

(1) Turn the power off.

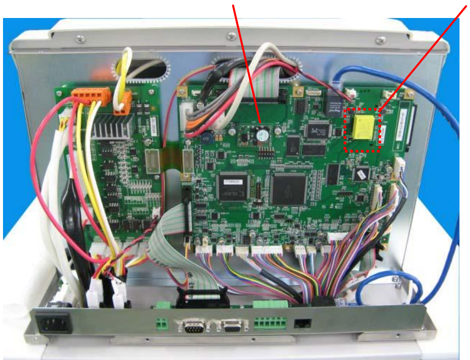
(2) Remove the control box cover.

Control box cover

Fig.4-13-9-1 Removal of control box cover

(3) Remove the batter using a ROM remover.
* Take care not to bend the pins.

CPU board Battery



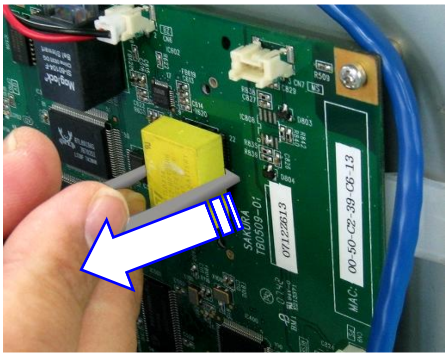
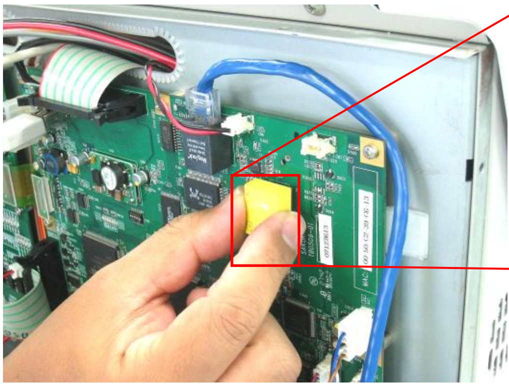


Fig.4-13-9-2 Removal of battery

(4) Attach the new battery.
Direct the battery as shown below and insert it.



Attach the battery with the black circle ● positioned at bottom right.

Fig.4-13-9-3 Installation of battery

(5) Turn the power on. Adjust the date and time settings.

(6) Attach the control box cover.

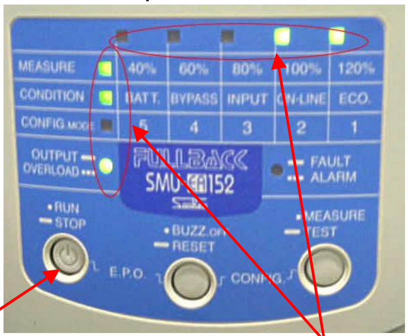
4-13-10 Installing the Uninterruptible Power Supply

Tools required
- Phillips screwdriver No. 2
- Flathead screwdriver, with a shaft diameter of around 3 mm

Equipment required
- Uninterruptible power supply unit, SMU-EA152, Sanken Electric
- External signal output unit, ESU-01E, Sunken Electric
- Additional battery pack, SMB-12-S   * as necessary
- Two vinyl wires, AWG#22 or 0.3 ~ 0.5SQ, 2m long

The following explanation is based on use of the uninterruptible power supply unit, SUM-EA152, of Sanken Electric Co., Ltd.   **When any other UPS unit is used, be sure to connect the power outage signal output of the UPS to the UPS input terminal of the VIP6.**

(1) Unpack the UPS.   Make sure that the unit is in the OFF condition.   Do not plug the power cord yet.   If the unit is in the ON condition, hold down the Run/Stop switch for more than 2 seconds so that the indicators go off on the control panel of the UPS.



Run/Stop switch   Indicators

Fig.4-13-1 Turning off the UPS

(2) Install the external signal output unit, ESU-01, in the optional board slot located on the back of the UPS.

1) Remove a screw that holds the panel, located on the back of the UPS, for an optional board.

Fig.4-13-2-1 Installation of External Signal Output Unit

(Note) Set all the function setting switches on the external signal output unit (DIP switches at the rear) to OFF.

2) Remove the panel for an optional board.

3) Insert the external signal output unit into the UPS.

4) Secure the external signal output unit, using the screw removed in step 1.

Fig.4-13-2-2 Installation of External Signal Output Unit

(3) To use an additional battery pack, follow the instructions below.

(Note) Up to 2 battery packs can be added. The battery pack is very heavy (30 kg. per unit). Take much care when handling.

One battery pack added

Two battery packs added

Fig.4-13-3 Installation of Additional Battery Pack

Place the additional battery pack(s) side-by-side to the right of the UPS. To place the battery pack horizontally, observe the instructions in the UPS user's manual. For details on how to wire the additional battery pack, refer to the user's manual for the UPS or the additional battery pack.
If the additional battery pack(s) is connected, it is necessary to change the function settings for the UPS. To add one battery pack SMB-12-S to the UPS SMU-EA152, set the number of additional battery packs to "2" packs. To add two battery packs, set it to "4" packs. For the setting procedure, see the UPS user's manual.

(4) Installation area

To avoid thermal influence from the system, it should be located over 15cm away from walls and other devices. If the UPS is located to the back of the system, use special care because the vent louvers for cooling the inside of the system are provided in the lower part of the back of the system. Install the UPS with reference to the illustration below.

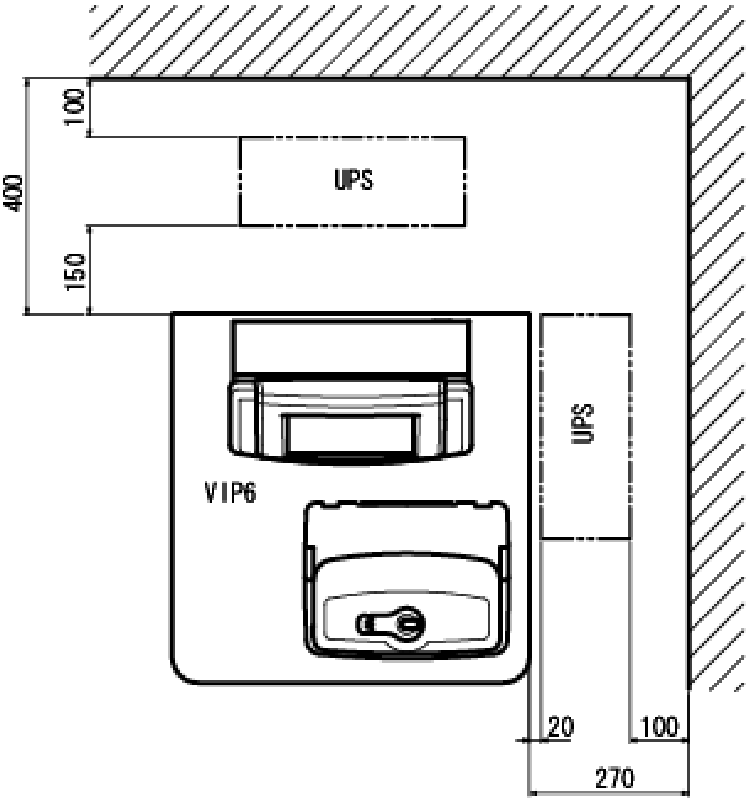


Fig.4-13-4 Standard Layout of the UPS

If the battery pack is added further, an additional space for the battery pack (150mm wide) is required on the side of the UPS. Provide clearance of 100mm or more between the battery pack and a wall. Also, provide space of 100mm to the back of the UPS to ensure ventilation for the exhaust fan.

(5) Connection of the UPS to the VIP6

The UPS and the VIP are connected in two ways; by the power cable and the UPS signal wires. Before connection, make sure that the UPS has stopped, the UPS power cord is not connected to a facility power source and the main power switch of the system is set to OFF.

Make UPS signal wires ready. Easily-identifiable wires in polarity are suitable for use because the UPS input terminal in the VIP6 external interface is polarized. Vinyl wires of 0.3 ~ 0.5SQ or AWG#22 or equivalent wires are recommended. Connect wires as shown below.

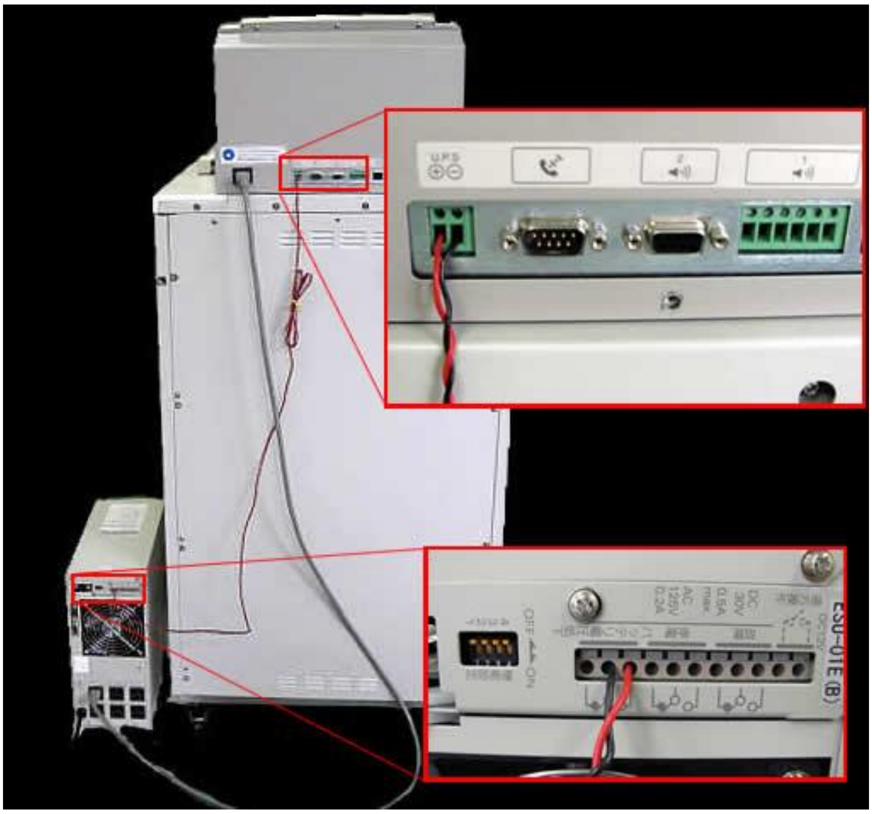


Fig.4-13-5 Wire Connection with the UPS

The recommendation is a polarity-distinct, twisted pair wire with a length of around 2m. Below is the reference drawing.

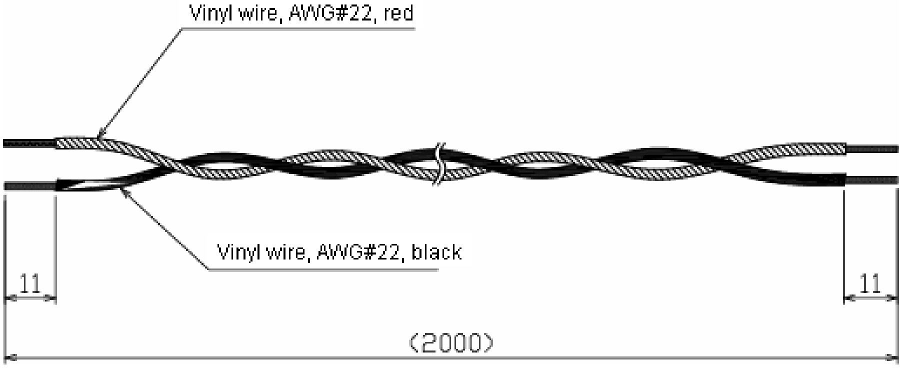


Fig.4-13-6 Connection Cable

(6) Follow the following steps to turn the power on.

1) With the VIP power switch being set in the OFF position and the UPS being stopped, connect the VIP power plug into the power outlet located on the back of the UPS. Next, connect the UPS power cord to a facility power outlet.
2) Hold down the UPS Run/Stop switch for over one second to start the UPS. The UPS performs the self-diagnosis for a while and outputs the power supply voltage.
3) Set the VIP power switch to the ON position. Once the VIP is properly started, energize the retort heaters through the manual operation in the service mode to confirm that the UPS works properly without overloading.

∗ The UPS will be able to perform the backup operation approximately 12 hours after power-on. To protect the VIP from power outage, it is recommended to set up the UPS 12 hours before start of the VIP operation.

∗ The service life of the UPS battery is around 4 years under the operating environment at 25°C. If the battery status lamp intermittently repeats 3-time rapid blinking, it indicates that the UPS battery is low. In this case, replace the UPS battery as soon as possible. Handle the UPS battery as directed in the UPS user's manual.

(7) Test the connection with the UPS.
Test the output from the UPS by temporarily changing the backup time for the case of the low battery voltage signal output. Change the UPS setting as follows:

1) Hold down both the BUZZ.OFF/RESET switch and the MEASURE/TEST switch for more than 2 seconds at a time. The UPS goes into the setting mode with lighting the CONFIG.MODE lamp in red.
2) Press the BUZZ.OFF/RESET switch repeatedly to change the address (the control panel is seen as shown below).

"CONFIG" lit in red "CONDITION" lit in green LED#4, at the top, lit in green

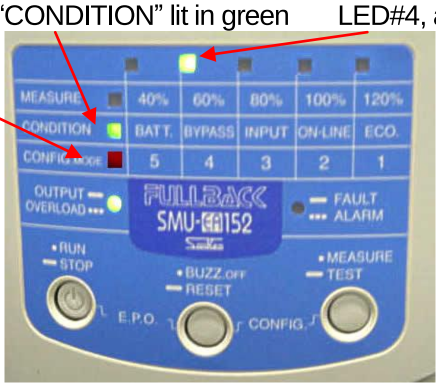


Fig.4-13-7 Functional setting display of the UPS

3) Press the MEASURE/TEST switch to turn off both the CONDITION lamp and the MEASURE lamp (to make the UPS ready to output the low battery voltage signal immediately after occurrence of power outage).

Both "CONDITION" and "MEASURE" lamps are not lit.

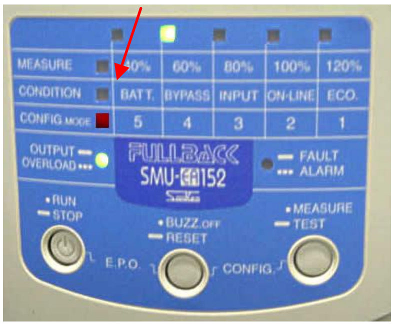


Fig.4-13-8 Change of Function Setting

4) Once again, hold down both the BUZZ.OFF/RESET switch and the MEASURE/TEST switch for more than 2 seconds at a time in order to exit from the setting mode.

5) With the power cord and wires of the VIP connected to the UPS, unplug the UPS from a power outlet. Confirm that the following caution window appears on the VIP display screen after approximately 5 seconds.

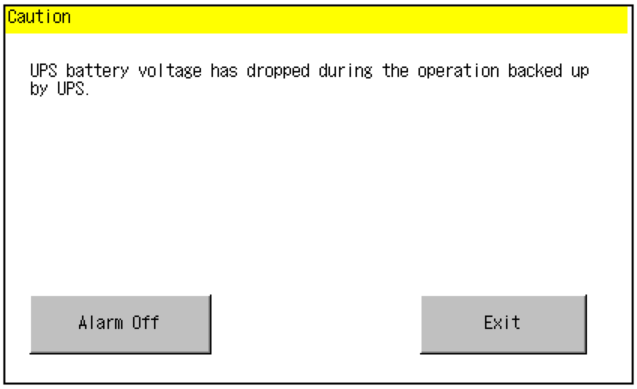


Fig. 4-13-9 Caution window for low battery voltage

◆ If the caution window is not displayed, check first if the setting for the low battery voltage signal output has been correctly made in the setting mode and then confirm if the UPS is properly connected to the VIP.

6) After confirmation, connect the UPS power cord to a power outlet again. Then, repeat steps 1) and 2) to switch to the setting mode again and obtain the condition shown in Fig. 4-13-7 ("CONFIG" lamp is lit in red, only LED#4 is lit at the top, "CONDITION" lamp is lit, and "MEASURE" lamp is not lit).
After obtaining the proper setting and exiting from the setting mode, unplug the UPS again to confirm that the above caution window does NOT appear.
Be sure to connect the UPS power cord to a power outlet after confirmation.

4-14 Top Plate

4-14-1 Cleaning the Top Plate

Tools required
- Waste cloth
- Sponge
- Mild kitchen detergent
- Dishwashing cleanser
- Scotch-Brite (equivalent to #600 – #800)
- Waterproof sandpaper (#240, #400, #600, #1200)

(1) Wipe off dusts attached on the top plate with a waste cloth or sponge using water or a kitchen detergent.

(2) To remove stains of a permanent pen that cannot be cleaned by a kitchen detergent, gently rub off with a dishwashing cleanser or a Scotch-Brite (equivalent to #600 – #800). Do not use a wire wool which causes the top plate to damage.

(3) To remove fine scratches or stains that are not possible to remove with a dishwashing cleanser, put a slight amount of water on waterproof sandpaper and polish the surface with the sandpaper #400 first and then #600. To remove deeper scratches, use sandpapers in the order from #240, #400 to #600. In either case, polish the surface very gently, using a batten as widely as possible.
If you mind polishing marks, polish further using finer waterproof sandpaper (#1200).

<Caution>
Do not use xylene to wipe the sides of the top plate because there are bonded connections.
The top face is allowed to be cleaned with a cloth moistened with xylene and tightly wrung.

4-15 Fume Control Unit and External Drain/Fill Ports

4-15-1 Cleaning the Fume Control Unit

Tools required • Waste cloth

(1) Turn the instrument power off.

(2) Open the access door and draw the filter case to remove the activated carbon filters and filter sponge.

(3) Remove the filter case from the instrument.
1) Draw the filter case until it stops.
2) With releasing the stopper on the slide rail located at each side, totally slide out the filter case to remove.

<Caution> Take note that the same slide rail is used on both left and right sides and each stopper is released in a reverse direction. To release, move the left-hand stopper upward (Fig. 4-15-1-1) and the right-hand stopper downward (Fig. 4-15-1-2).

Fig.4-15-1-1 Release of left slide rail stopper

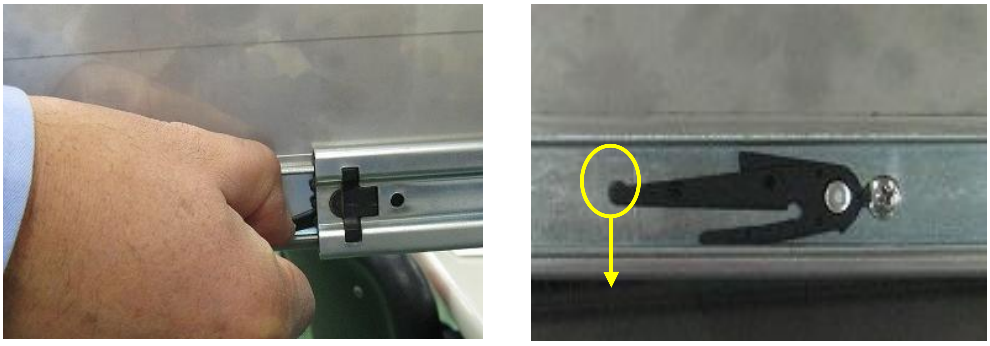


Fig.4-15-1-2 Release of right slide rail stopper

(4) Clean the fume control unit (filter outer case and filter case).
* Wipe condensates and remove carbon powders with a waste cloth.

(5) Insert the filter case.

∗ Aligning the rail on the filter case with the rail on the filter outer case (Fig. 4-15-1-3), push the filter case into the instrument (the slide rails slightly feel tight until the stoppers are locked).

<Note> Slide the filter case back and forth several times to confirm that it smoothly moves.

Fig.4-15-1-3 Insertion of filter case

(6) Place the filter sponge and activated carbon filters in the filter case. Slide in the filter case and close the access door.

4-15-2 Replacing the Exhaust Fan

Tools required • Phillips screwdriver No. 2

(1) Turn the instrument power off and unplug the power cord.

(2) Remove the back panel.

(3) Remove the exhaust fan cable.

<Note> The connector is of a lock type. Remove the cable with releasing the lock (Fig. 4-15-2-1).

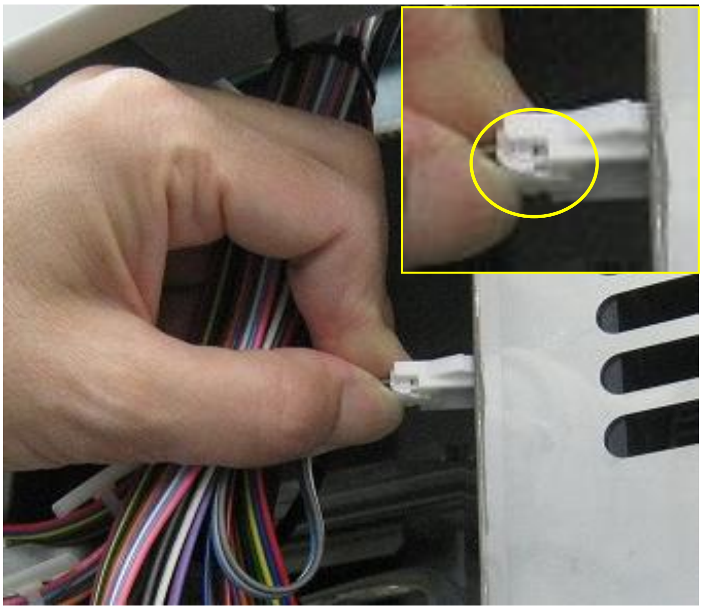


Fig.4-15-2-1 Removal of exhaust fan cable

(4) Remove the exhaust fan connector.

<Note> The connector is of a snap-in type. While pressing each lock (yellow-circled, Fig. 4-15-2-2) to the arrowed direction, push the connector into the filter outer case.

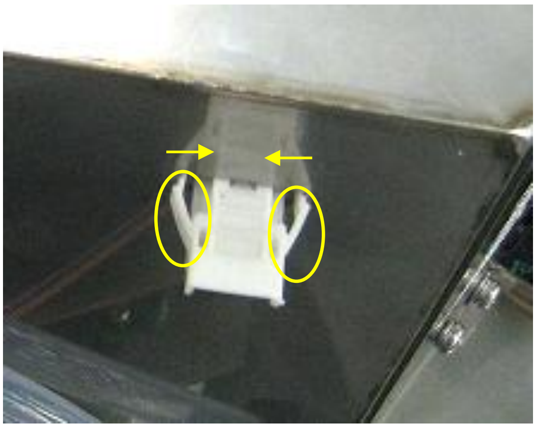


Fig.4-15-2-2 Removal of exhaust fan connector

(5) Remove cross-recessed pan head screws that fasten the fan cover to the filter outer case. Remove the fan cover from the filter outer case.

Fig.4-15-2-3 Fan cover

Fig.4-15-2-4 Removal of fan cover

(6) Remove cross-recessed pan head screws that fasten the exhaust fan to the fan cover. Replace the exhaust fan.

Fig.4-15-2-5 Replacement of exhaust fan

(7) Attach the exhaust fan connector to the filter outer case. Install the fan cover to the filter outer case.

<Note> With aligning the connector with the connector hole on the wall of the filter outer case, insert it until the snap-in lock is hooked.

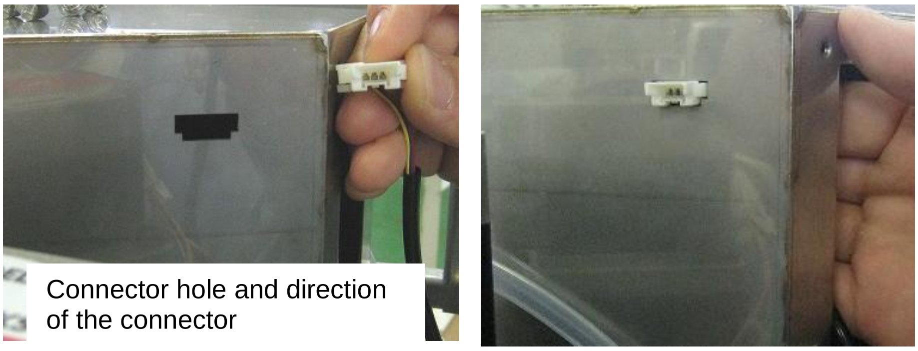


Fig.4-15-2-6 Installation of exhaust fan connector

(8) Connect the exhaust fan cable.

<Note> After the exhaust fan cable was connected, check to make sure that the connector is locked.

(9) Start the check program. Perform the operation check on the exhaust fan to confirm that the exhaust fan works properly.

⇒ Refer to (12) Check the exhaust fan in 2-5-3 “Check Program Function” in 2-5 “Check Program”.

(10) Attach the back panel.

4-15-3 Replacing the One-Touch Coupler

Tools required
- Phillips screwdriver No. 2
- Wrench, width across flats 14, 17
- Wrench, width across flats 26 (or monkey wrench 200mm)
- Sealing tape

(1) Turn the instrument power off.

(2) Remove the back panel and left side panel.

(3) Remove the access door.

Remove the screws to remove the access door.

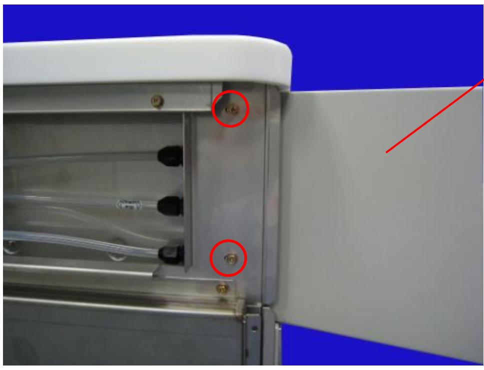


Fig. 4-15-3-1 Removal of access door

(4) Remove the external drain/fill port unit.

1) Remove cap nuts from z unions.
2) Remove screws that hold the external drain/fill port unit.
3) Draw out the external drain/fill port unit.

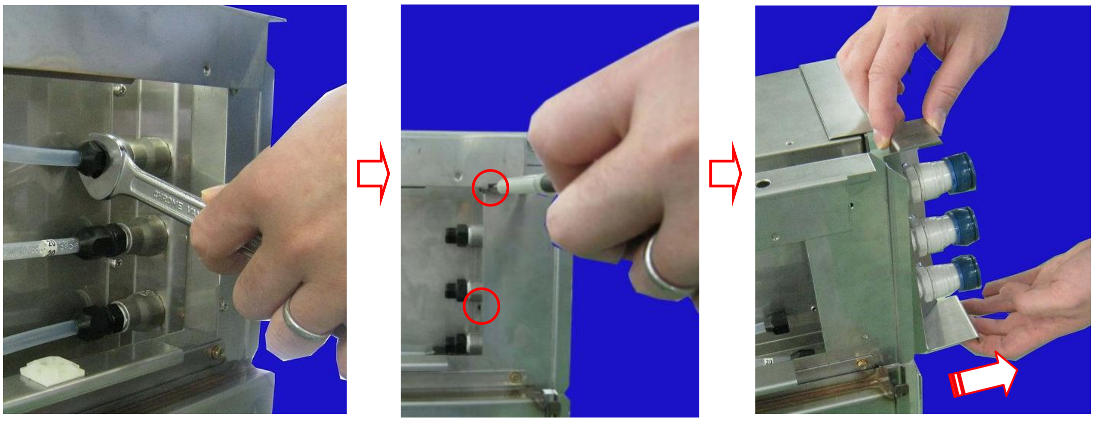


Fig. 4-15-3-2 Removal of external drain/fill port unit

(5) Using a wrench, rotate the hexagonal part of the one-touch coupler to remove the coupler (see Fig. 4-15-3-3).

Fig. 4-15-3-3 Removal of one-touch coupler

<Caution>

After the coupler was removed, completely remove old sealing tape from the thread of the reducing socket.

Take extreme care for dusts and sealing tape not to enter the flow system because they may cause the system to be functionally damaged.

(6) Use a wrench to tighten the new coupler so that the end of the coupler is 51mm away from the surface of the coupler mounting plate (see Fig. 4-15-3-4).

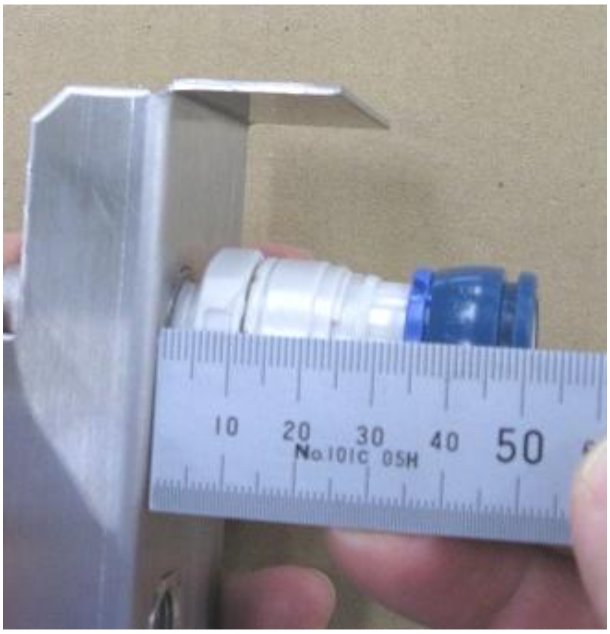


Fig. 4-15-3-4 Installation of one-touch coupler

(7) Install the external drain/fill port unit.

1) Insert the external drain/fill port unit.
2) Tighten screws to secure the port unit.
3) Connect appropriate flow tubes and tighten cap units.

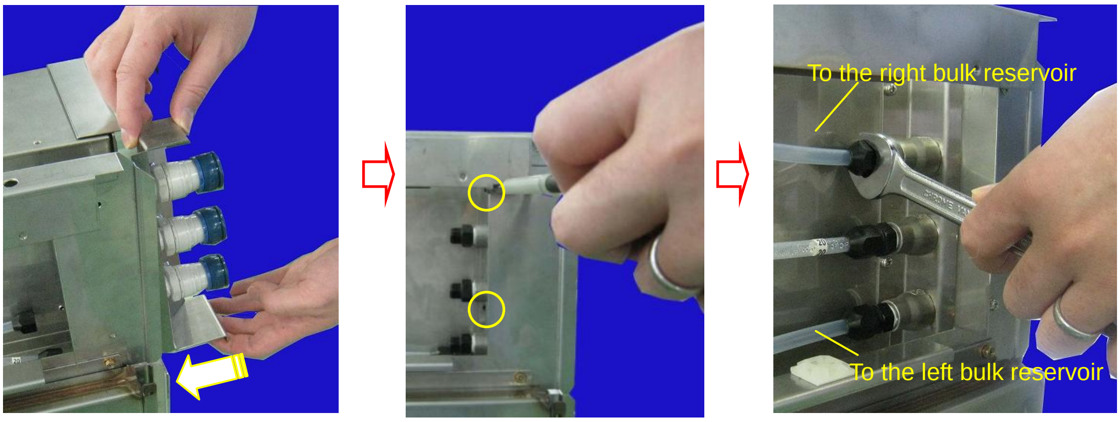


Fig. 4-15-3-5 Installation of external drain/fill port unit

<Caution>
Prior to tightening screws, align the external drain/fill port unit with the fume control unit (Fig. 4-15-3-6).

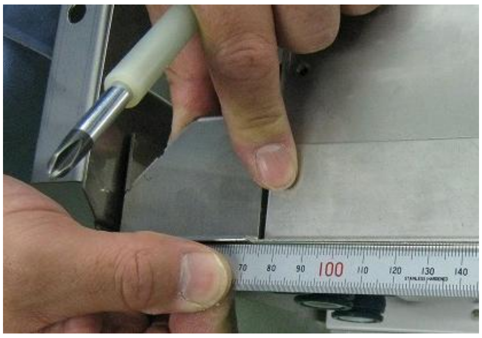


Fig.4-15-3-6 Positioning of external drain/fill port unit

(8) Turn the power on. Login the system in the service mode. Under the service manual operations, check the following items. (Refer to 2-4, “Service Manual Operations.”)

* Perform the pump-in and pump-out at each bulk reservoir (Station 19 and Station 20) to check for leak.
* Perform the pump-in and pump-out at the external drain/fill port (Station 18) to check for leak.

(9) Install the access door.

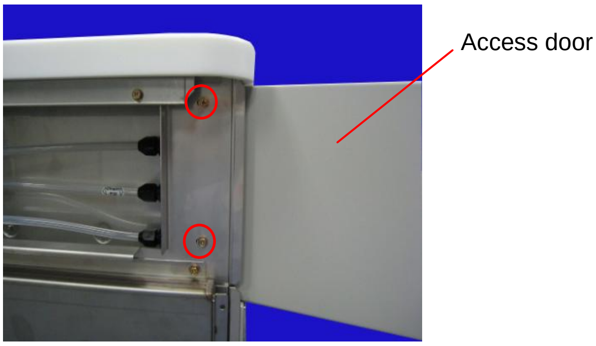


Fig. 4-15-3-7 Installation of access door

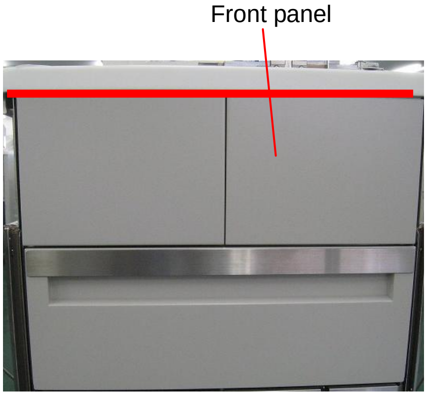


Fig. 4-15-3-8 Positioning of door

< Caution>

The access door has slotted screw holes. Prior to tightening screws, adjust the access door to make it level with the front panel (red top line in Fig. 4-15-3-8).

(10) Install the left side panel and back panel.

⇒ Refer to 4-16-1, “Removing and Installing the Exterior Panels”.

4-16 Exterior Panels

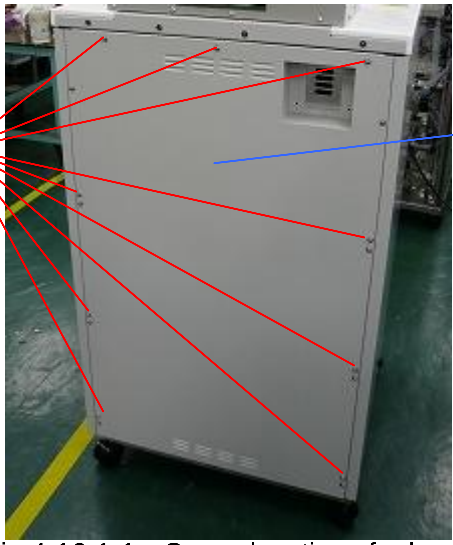
4-16-1 Removing and Installing the Exterior Panels

Tools required • Phillips screwdriver No. 2

<Removal>

(1) While supporting the back panel by hand, remove cross-recessed pan head screws Sems B (screws in slotted screw holes on the back panel) that hold the back panel. Shift the back panel backwards to remove it from the instrument.

Cross-recessed pan head screws Sems B that hold the back panel (9 places).

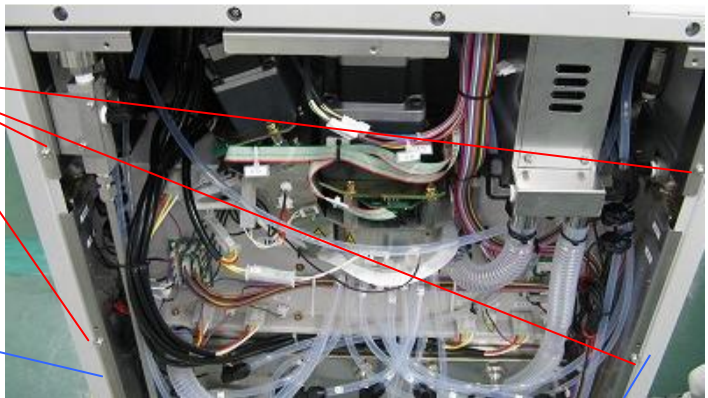


Back panel

Fig.4-16-1-1 Screw locations for back panel

(2) While supporting the side panel by hand, remove cross-recessed pan head screws Sems A that hold each side panel. (The side panel cannot be removed without removing the back panel.)

Cross-recessed pan head screws Sems A that hold the side panel (4 places each).



Right side panel

Left side panel

Fig.4-16-1-2 Screw locations for side panel

(3) Pull the side panel downward to release the inserted edge of the side panel from under the top plate.

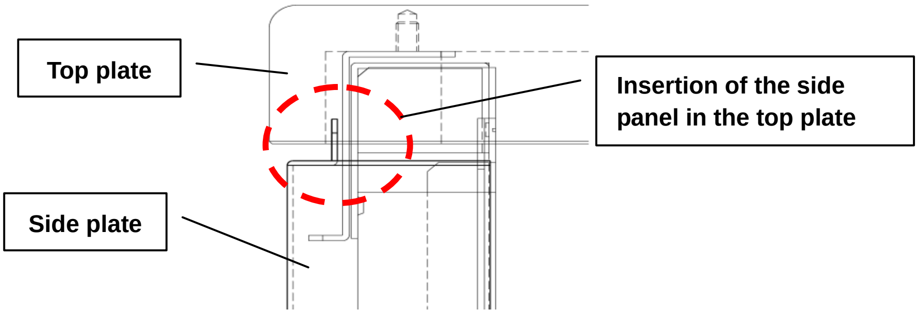


Fig.4-16-1-3 Insertion under top plate

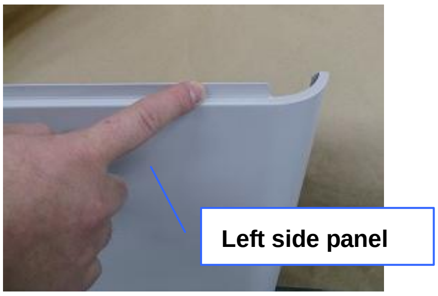


Fig.4-16-1-4 Top edge of side panel

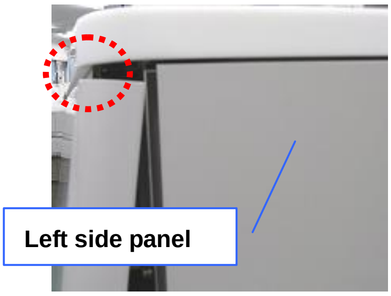


Fig.4-16-1-5 Release from top plate

(4) Slide the side panel toward the front of the instrument to release the inserted edge of the side panel from both the bottle rack and the left or right frame.

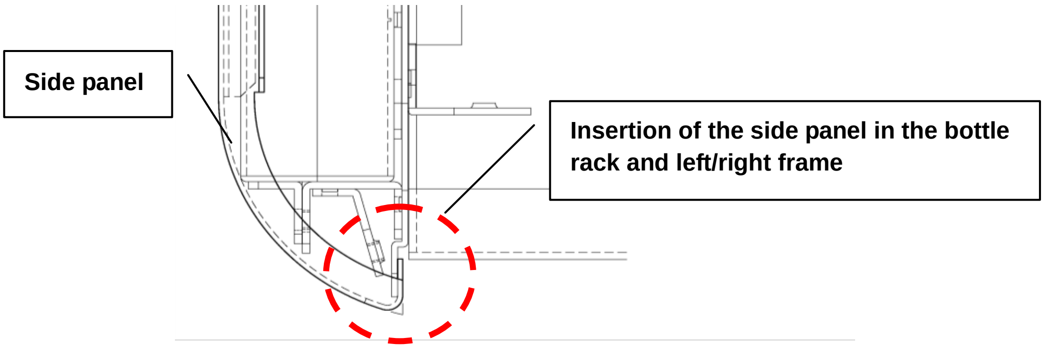


Fig. 4-16-1-6 Insertion in bottle rack and side frame

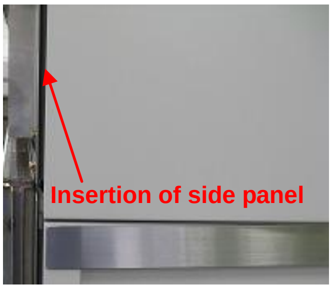


Fig.4-16-1-7 Insertion of side panel

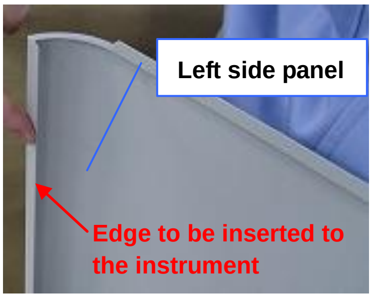


Fig.4-16-1-8 Insertion to the instrument

<Installation>

(1) Insert the top edge of the side panel into under the top plate. (Refer to Fig.4-16-1-3, Fig.4-16-14 and Fig.4-16-1-5.)

(2) Slide the side panel a little toward the front of the instrument and then slide back to fit the side panel with the bottle rack and the left or right frame. (Refer to Fig.4-16-1-6, Fig.4-16-1-7 and Fig.4-16-1-8.)

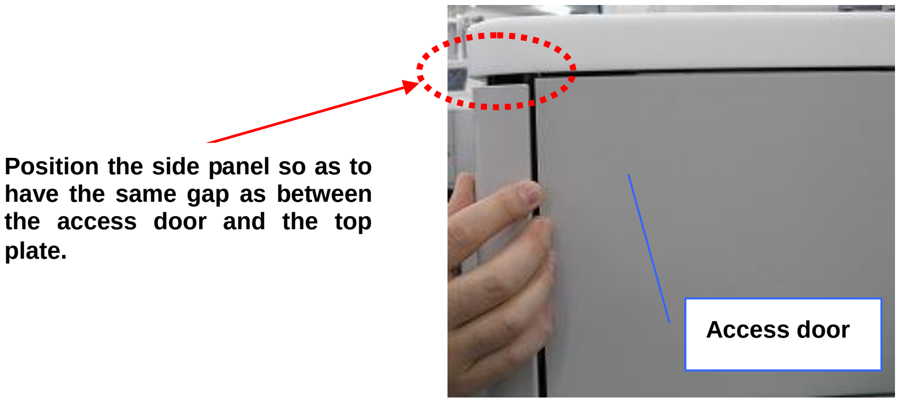


Fig.4-16-1-9 Positioning of side panel

(3) Tighten cross-recessed pan head screws Sems A to hold the side panel.
The side panel cannot be installed after the back panel was installed.

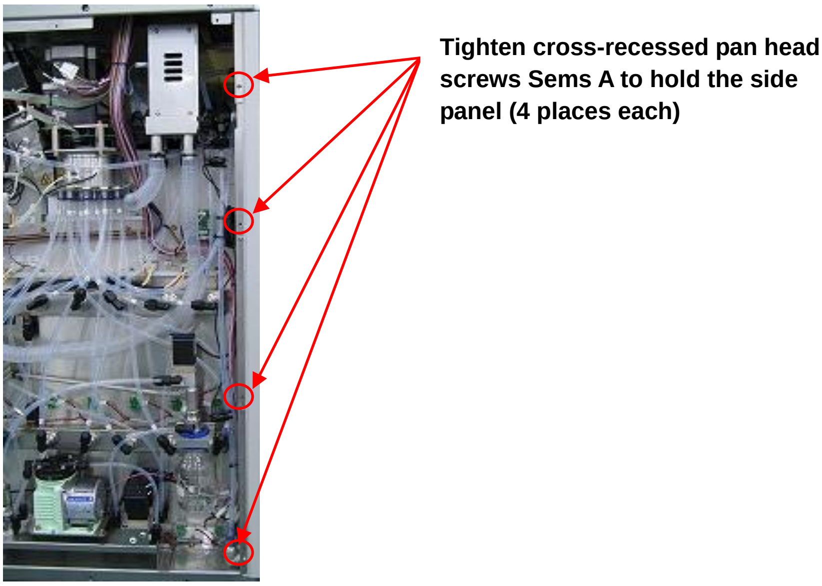


Fig.4-16-1-10 Screw locations for side panel

(4) Attach the back panel and tighten cross-recessed pan head screws Sems B (see Fig.4-16-1-1).

Chapter 5 Parts List and Exploded Views

<Reference>

- No. Callout numbers for the parts shown in each illustration.
- Part Code Part numbers assigned for ordering the parts.
- Description Part names and models.
- Model/Material Vender’s part model, size/length and material of each part.

  A combination of the following parts may be used instead for screws and bolts of the washer-assembled type, such as pan head screw, upset head bolt and hexagon head bolt.

  Sems A: Screw (Bolt) + spring washer

  Sems B: Screw (Bolt) + spring washer + plain washer

  Sems BK: Screw (Bolt) + spring washer + plain washer (small round)

- Q’ty Quantity of parts used per unit. However, the maintenance parts in the following table are listed one each.

Part Code	Description	Model
D9-60-0030	Lubricant Sealub (S-11)	S-11, 10g
D9-07-0112	Plastic Sealing Tape	8mm x 5m
D9-40-0004	Screw lock glue	Loctite 242, blue, 50mL
D9-80-0170	Ferrule	FF-8 (SUS)
D9-80-0190	Ferrule	FR-8 (SUS)
D9-80-0240	Sleeve, union joint (6mm)	6mm
D9-80-0250	Sleeve, union joint (8mm)	8mm

- Remarks Applicable voltage, vender’s part model, size, length or material of each part. If an incompatible part is used due to an engineering change, the manufacturing year and month of affected instruments will be specified. In Page 5-3 is the cross-reference table of manufacturing year and month vs. serial numbers.

- Class Replacement frequency and availability

A	may need to be replaced in a relatively short period of time (in approximately one year after start of use); consumables or equivalents	For example; Retort lid gasket, activated carbon filters, O rings for RV and GV, display protective sheet, pump diaphragm, valve, diaphragm sheet
B	may need to be replaced or serviced after a longer period of time than Class A (one to six years)	Solenoid valves, pump, regulator diaphragm, O rings (except for RV/GV), exhaust fan, switching power supply, LCD module, inverter, touch panel

C	can be used for a relatively long time, but it is recommended to carry stocks.	PC board, sensors, electric parts, springs, joints, tubes, trap bottle, casters, molded parts
x	NOT available as a replacement part	Retort assembly, rubber heaters
(blank)	Available as a replacement part, but not assumed to be replaced. Screws, bolts, washers, etc.	Exterior panels

- Material

This table may help you sort out used assemblies/parts by material when disposing of them after service/maintenance. Parts not listed in the table are composed of some kinds of material.

Category	Abbr.	Description	Major assemblies/parts
Metal	SUS	Stainless steel	Mechanical parts, retort, oven door
	FE	Iron	Exteriors, RV motor housing, bottle rack, hinge spring
	Al	Aluminum	Oven inner case, heat plate, trap bottle mounting, speaker mounting plate, RV heater housing, retort sensor mounting plate, level sensor heat block, tube holding block, rack base, rack cap, number plate
Plastic	ABS	ABS resin	Control panel cover, retort lid cover
	FEP	Fluorine resin	Tube
	PA	Nylon	Condensate bottle tube, wire tie
	PBT	Polybutylene terephthalate	Paraffin container handle, wax drain container handle
	PE	Polyethylene	Flexible hose, external connection hose, filter sponge
	PET	Polyethylene terephthalate	RV connection label, touch panel protection film
	PF	Phenol resin	Oven frame
	PMMA/aluminum hydroxide	Metacrylate resin including aluminum hydroxide	Top plate
	POM	Polyacetal resin	Retort lid lever, retort lid lever cap, latch collar, bottle cap, scraper
	PP	Polypropylene	Trap bottle cap
	PTFE	Fluorine resin	PTFE sheet, Teflon ball
	PVC	Vinyl chloride	Duct hose
	PU	Polyurethane	Trap bottle
	TPX	Methylpentene polymer	Bottle LED unit
Rubber	CR	Chloroprene rubber	Rack door gasket
	EPDM	Ethylene_propylene_diene rubber	Trap bottle gasket
	FKM	Fluorine rubber	Retort gasket, regulator diaphragm
	IIR	Butyl rubber	Sealing gasket
	NBR	Nitrile rubber	Insulation for common tubes (Fill line, Drain line)
Miscellaneous	Glass wool	Glass wool	Insulation (Oven)
	Phenol foam	Phenol foam	Insulation (Oven, Retort)
	Melamine foam	Melamine foam	Insulation (Retort lid)
	Ceramic	Ceramic	RV/GV stationary disk and rotary disk
	Glass	Glass	Bottle rack door
	Silicone rubber	Silicone rubber	Silicone adhesive

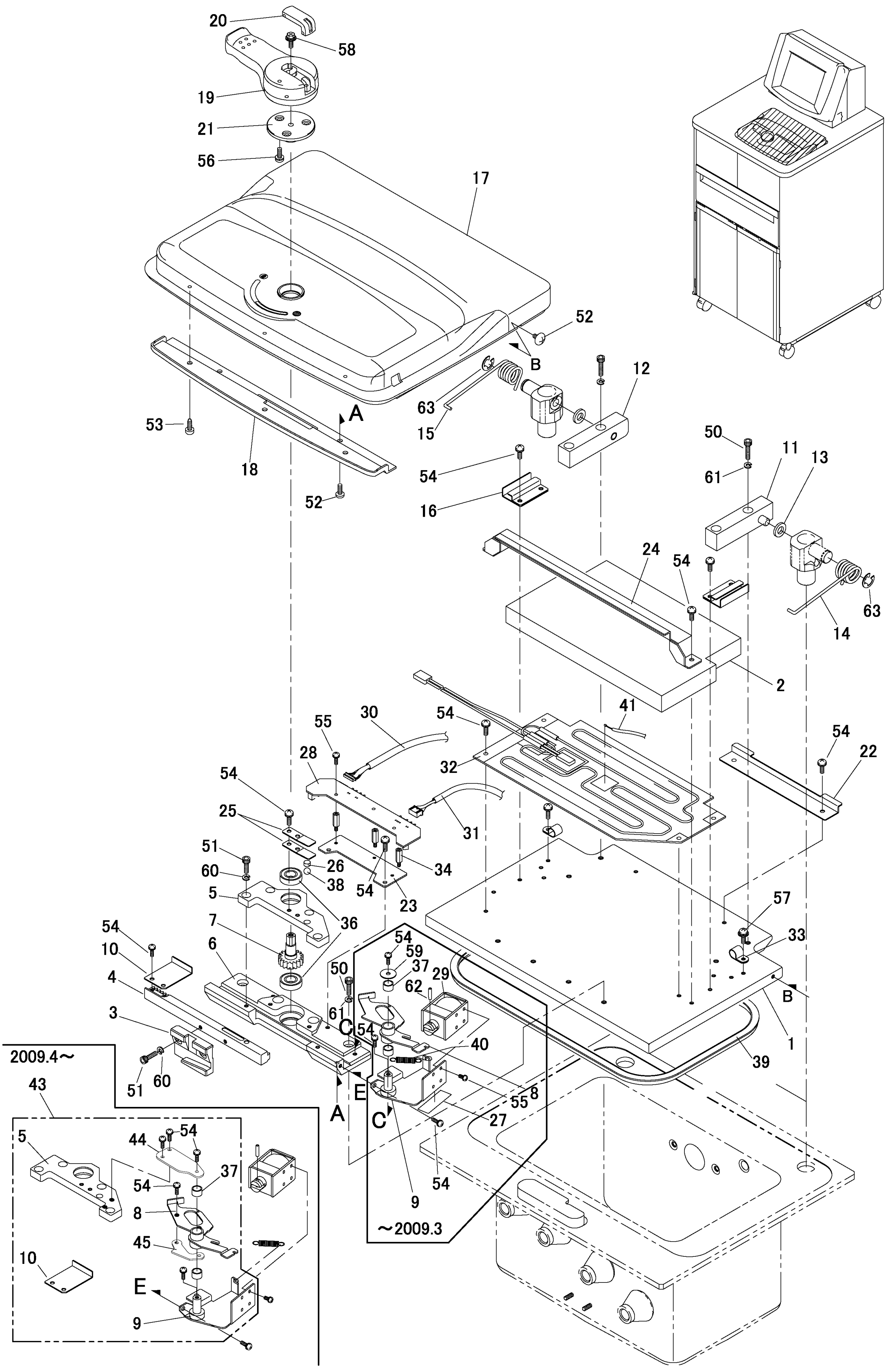
<Contents>

* Cross-reference table of manufacturing year and month vs. serial numbers

Production lot	VIP 6-A1	VIP 6-J0	VIP 6-E2
2008/10	6030 0051 - 0075	6031 0051 - 0060	6032 0051 - 0065
2008/11	0076 - 0100	0061 - 0063	-
2008/12	0101 - 0120	0064 - 0067	0066 - 0075
2009/1	0121 - 0140	0068 - 0069	0076 - 0095
2009/2	0141 - 0157	-	0096 - 0110
2009/3	0158 - 0177	0070 - 0076	0111 - 0119
2009/4	0178 - 0192	-	-
2009/5	0193 - 0202	0077 - 0081	-
2009/6	0203 - 0218	0082 - 0089	0121 - 0123
2009/7	0219 - 0232	-	0124 - 0129
2009/8	0233 - 0245	0090 - 0095	0130 - 0133
2009/9	0246 - 0255	0096 - 0097	0134 - 0141

* This parts list includes engineering changes up to SSCL’s reference #13076.

1. Retort Lid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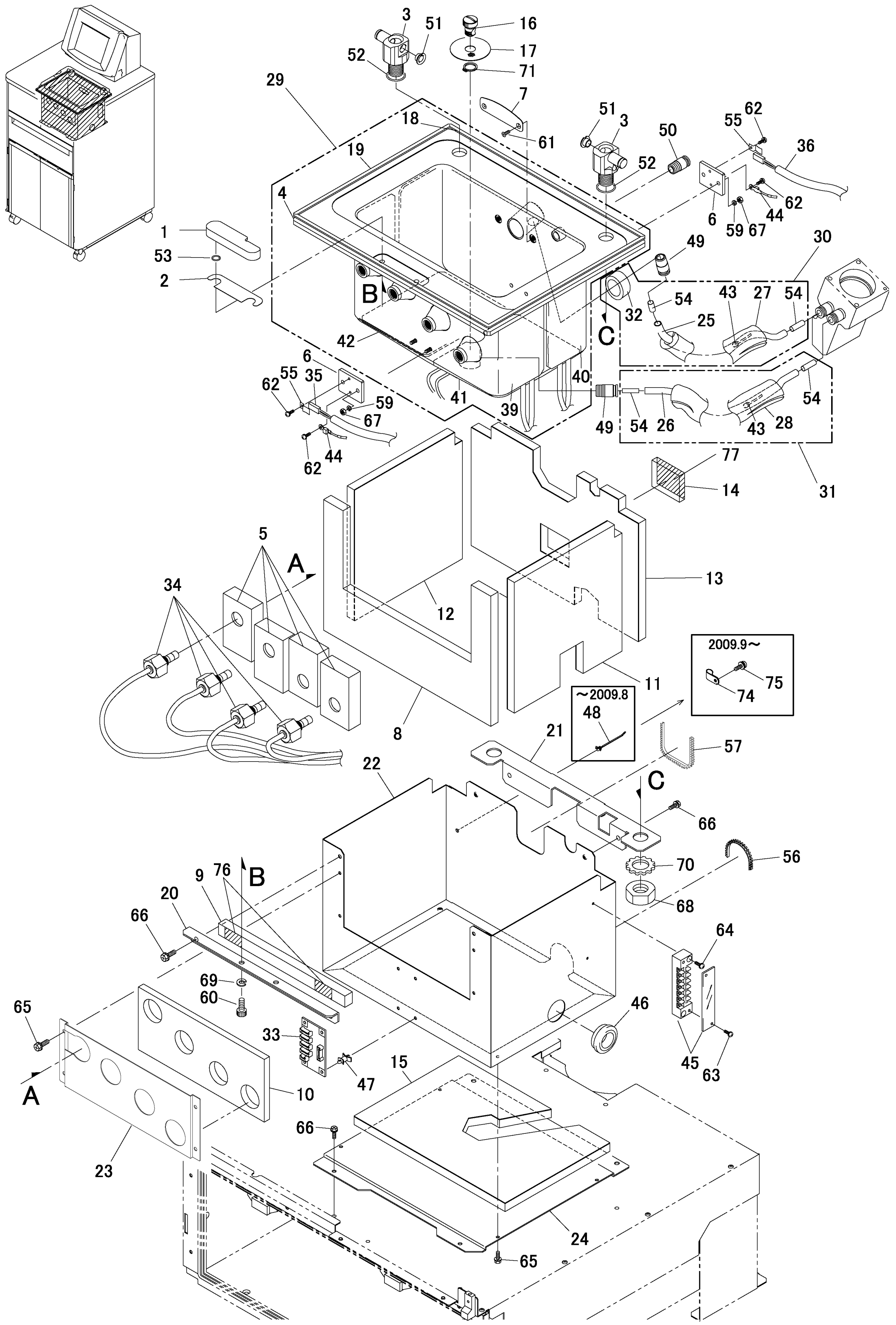
1. Retort Lid

No.	Part Code	Description	Model/Material	Qty			Remarks	Material	Class
				VIP6-A1 (6030)	VIP6-J0 (6031)	VIP6-E2 (6032)			
1	O70-210-00	Retort Lid		1	1	1		Al	
2	O70-211-00	Heat Insulation for Retort Lid		1	1	1		Melamine foam	C
3	O70-213-03	Retort Lid Hook		1	1	1		SUS	C
4	O70-214-01	Rack		1	1	1		Fe	C
5	O70-215-01	Rack Cap		1	1	1		Al	C
6	O70-216-00	Rack Base		1	1	1		Al	C
7	O70-217-00	Pinion		1	1	1		SUS	
8	O70-218-03	Retort Lock Lever		1	1	1		SUS	C
9	O70-221-01	Solenoid Valve Housing		1	1	1		SUS	
10	O70-224-01	Lid Close Position Plate		1	1	1		SUS	
11	O70-226-00	Retort Lid Stay (Right)		1	1	1		SUS	
12	O70-229-00	Retort Lid Stay (Left)		1	1	1		SUS	
13	O70-230-00	Retort Lid Stay Collar		2	2	2		POM	C
14	O70-235-03	Hinge Spring (Right)		1	1	1		Fe	C
15	O70-236-03	Hinge Spring (Left)		1	1	1		Fe	C
16	O70-237-00	Hinge Spring Support		2	2	2		SUS	
17	O70-240-02	Retort Lid Cover		1	1	1		ABS	C
18	O70-241-00	Retort Lid Cover Back Plate		1	1	1		ABS	C
19	O70-242-00	Retort Lid Lever		1	1	1		POM	C
20	O70-243-00	Retort Lid Lever Cap		1	1	1		POM	C
21	O70-244-00	Retort Lid Lever Mounting		1	1	1		SUS	
22	O70-245-00	Retort Lid Cover Mounting		1	1	1		SUS	
23	O70-246-00	Lid PC Board Mounting Plate		1	1	1		SUS	
24	O70-247-01	Retort Lid Cover Support		1	1	1		SUS	
25	O70-250-00	Flat Spring for Lid Latch		2	2	2		SUS	C
26	O70-251-00	Latch collar		1	1	1		POM	C
27	O70-252-00	Solenoid Valve Housing Spacer		1	1	1		POM	C
28	F52-707-00	Lid Sensor Board	E:VIP6-007	1	1	1			C
29	F52-743-00	Lid Solenoid	E:VIP6-045	1	1	1			C
30	F52-744-00	Lid Sensor Cable	E:VIP6-046	1	1	1			C
31	F52-742-00	Lid Cable	E:VIP6-043	1	1	1			C
32	A1-00-0058	Aluminum Foil Heater	33WQ10	1	1	1			C
33	A4-03-0003	Clamp	NK-4N	2	2	2		PA	
34	A4-07-0619	Spacer	BSB-315E	3	3	3		Bs	
36	B0-03-0118	Bearing	6900DD	2	2	2			C
37	B0-03-0119	Bearing	80B-0806	2	2	2		POM	C
38	B0-06-0002	SUS Ball	φ6 SUS	1	1	1		SUS	C
39	B3-12-3024	Gasket	N129-0318 Fluorinated rubber 1339-75	1	1	1		FKM	A
40	D9-28-0087	Coil Spring	E650	1	1	1		SUS	C
41	A3-60-3045	Thermistor	PB3L-41E-S2	1	1	1			C
43	F60-490-00		M:VIP6-190	1	1	1			
44	O70-253-00	Lock Lever Clamping Plate		1	1	1	2009.4 ~	SUS	
45	O70-255-00	Lock Plate		1	1	1	2009.4 ~	Fe	
50	B6-12-2005	Hex Socket Cap Screw	M5x15 SUS	8	8	8		SUS	
51	B6-12-2012	Hex Socket Cap Screw	M4x10 SUS	6	6	6		SUS	
52	B6-25-2001	Truss Head Screw	M4x8 SUS	4	4	4		SUS	
53	B6-26-2001	Truss Head Self-tapping Screw	M4x10 SUS	3	3	3		SUS	
54	B6-28-2000	Pan Head Screw, Sems A	M4x8 Sems A SUS	23	23	23		SUS	
55	B6-28-2002	Pan Head Screw, Sems A	M3x6 Sems A SUS	7	7	7		SUS	
56	B6-28-2008	Pan Head Screw, Sems A	M4x12 Sems A SUS	3	3	3		SUS	
57	B6-29-2004	Pan Head Screw, Sems B	M4x8 Sems B SUS	2	2	2		SUS	
58	B6-38-0002	Cross Recessed Hex Head Screw, Sems B	M5x15 Sems B Fe(chromate)	1	1	1		Fe	
59	B6-52-2022	Flat Washer	4x16xt0.8 SUS	1	1	1		SUS	
60	B6-53-2001	Spring Washer	ND.4(M4) SUS	6	6	6		SUS	
61	B6-53-2006	Spring Washer	ND.5(M5) SUS	8	8	8		SUS	
62	B6-64-2000	Spring Pin	3x14 SUS	1	1	1		SUS	
63	B6-72-2010	E-ring	ND.9(Size 9) SUS	2	2	2		SUS	

2. Retort



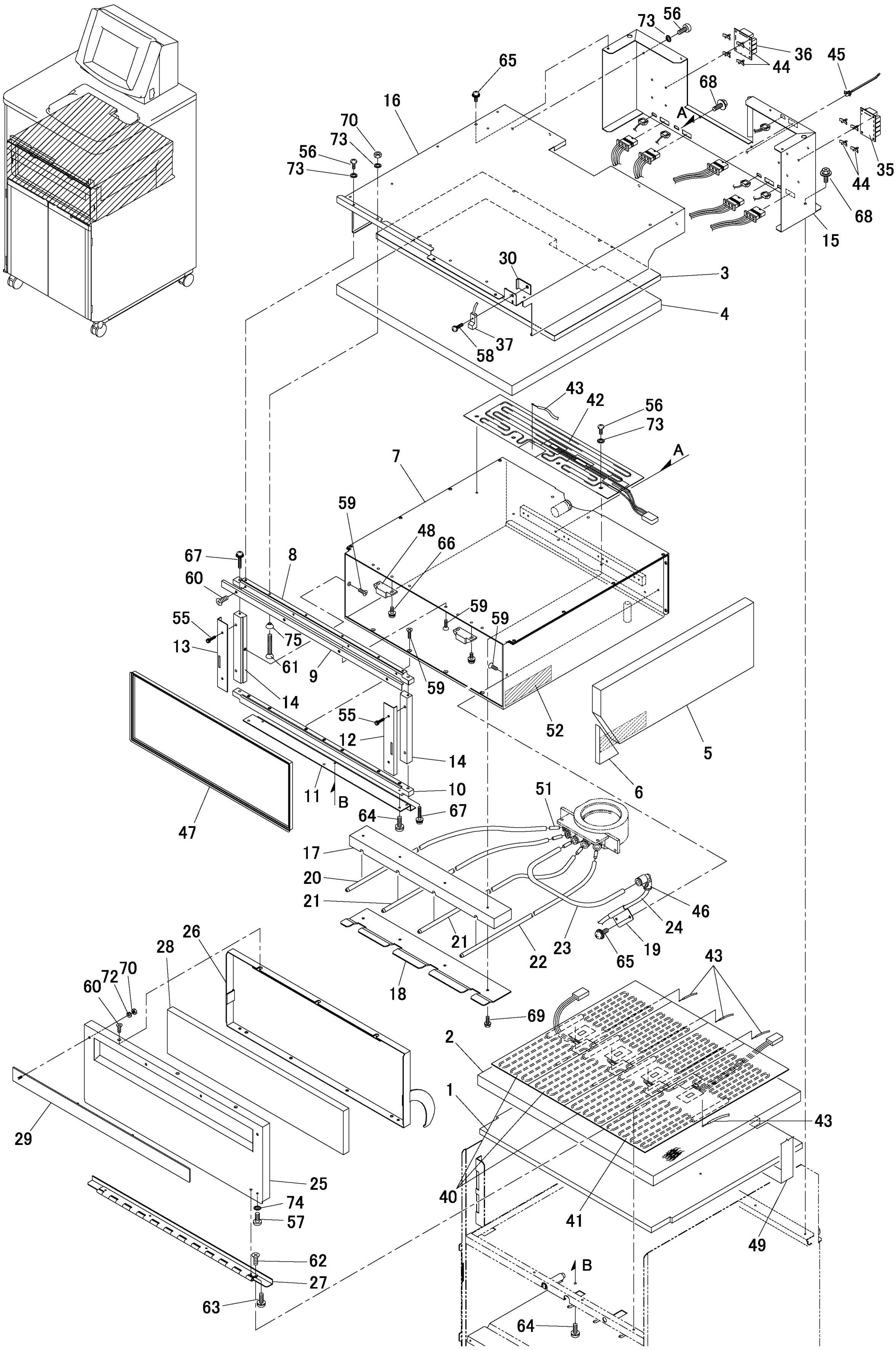
2. Retort

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	O70-212-01	Hook Catch		1	1	1		SUS	
2	O70-225-00	Liner		1	1	1		SUS	
3	O70-231-02	Retort Lid Support		2	2	2		SUS	
4	O70-260-02	Retort		1	1	1		SUS	x
5	O70-268-02	Level Sensor HeatBlock		4	4	4		Al	
6	O70-269-01	Retort Temperature SensorMounting Plate		2	2	2		Al	
7	O70-270-03	Retort Fill PortPlate		1	1	1		SUS	
8	O70-271-01	Retort Front HeatInsulation -1		1	1	1		Phenol foam	C
9	O70-272-00	Retort Front HeatInsulation -2		1	1	1		Phenol foam	C
10	O70-273-00	Retort Front HeatInsulation -3		1	1	1		Phenol foam	C
11	O70-274-00	Retort Right SideHeat Insulation		1	1	1		Phenol foam	C
12	O70-275-00	Retort Left SideHeat Insulation		1	1	1		Phenol foam	C
13	O70-276-01	Retort Back HeatInsulation -1		1	1	1		Phenol foam	C
14	O70-277-00	Retort Back HeatInsulation -2		1	1	1		Phenol foam	C
15	O70-278-01	Retort Bottom HeatInsulation		1	1	1		Phenol foam	C
16	O70-280-00	Retort Strainer Knob		1	1	1		SUS	
17	O68-318-02	Retort Strainer		1	1	1		SUS	
18	O70-281-00	Retort Flange Gasket(Long)		2	2	2		PE	C
19	O70-282-00	Retort Flange Gasket(Short)		2	2	2		PE	C
20	O70-283-00	Retort Case Mounting(Front)		1	1	1		SUS	
21	O70-284-02	Retort Case Mounting(Back)		1	1	1		SUS	
22	O70-285-04	Retort Case SidePlate		1	1	1		SUS	
23	O70-286-02	Retort Case FrontPlate		1	1	1		SUS	
24	O70-287-02	Retort Case BottomPlate		1	1	1		SUS	
25	O70-291-00	Retort Fill Tube	FEPφ8, L=318mm	1	1	1		FEP	C
26	O70-292-01	Retort Drain Tube	FEPφ8, L=348mm	1	1	1		FEP	C
27	O70-293-00	Retort Fill TubeHeat Insulation		1	1	1		NBR	C
28	O70-294-00	Retort Drain TubeHeat Insulation		1	1	1		NBR	C
29	F60-520-00	Retort Heater Unit(100/115V)	M:VIP6-121X	1	1	0	100/115V		C
	F60-521-00	Retort Heater Unit(230V)	M:VIP6-121E	0	0	1	230V		C
30	F60-522-00	Fill Tube Unit(100/115V)	M:VIP6-141X	1	1	0	100/115V		C
	F60-524-00	Fill Tube Unit(230V)	M:VIP6-141E	0	0	1	230V		C
31	F60-523-00	Drain Tube Unit(100/115V)	M:VIP6-142X	1	1	0	100/115V		C
	F60-525-00	Drain Tube Unit(230V)	M:VIP6-142E	0	0	1	230V		C
32	O70-295-00	Retort Fill TubeHeat Insulation(Small)		1	1	1		NBR	C
33	F52-705-00	Ultrasonic Sensor Board	E:VIP6-005	1	1	1			C
34	F52-789-00	Ultrasonic Sensor Rev.D	E:VIP6-963	4	4	4	~2009/1		B
	F52-790-00	Ultrasonic Sensor	E:VIP6-094	4	4	4	2009/2 ~		B
35	F52-762-00	Over Temperature Protector(Retort Front)	E:VIP6-064	1	1	1			C
36	F52-763-00	Over Temperature Protector(Retort)	E:VIP6-065	1	1	1			C
37	F52-764-00	Fill Tube Heater115V	E:VIP6-066	1	1	0	Not shown, 100/115V		x
	F52-771-00	Fill Tube Heater230V	E:VIP6-073	0	0	1	Not shown, 230V		x
38	F52-765-00	Drain Tube Heater115V	E:VIP6-067	1	1	0	Not shown, 100/115V		x
	F52-772-00	Drain Tube Heater230V	E:VIP6-074	0	0	1	Not shown, 230V		x
39	F52-774-00	Retort Front Heater115V	E:VIP6-076	1	1	0	100/115V		x
	F52-778-00	Retort Front Heater230V	E:VIP6-082	0	0	1	230V		x
40	F52-775-00	Retort Back Heater115V	E:VIP6-077	1	1	0	100/115V		x
	F52-779-00	Retort Back Heater230V	E:VIP6-083	0	0	1	230V		x
41	F52-776-00	Retort Bottom HeaterRight 115V	E:VIP6-078	1	1	0	100/115V		x
	F52-780-00	Retort Bottom HeaterRight 230V	E:VIP6-084	0	0	1	230V		x
42	F52-777-00	Retort Bottom HeaterLeft 115V	E:VIP6-079	1	1	0	100/115V		x
	F52-781-00	Retort Bottom HeaterLeft 230V	E:VIP6-085	0	0	1	230V		x
43	A3-60-3045	Thermistor	PB3L-41E-S2	2	2	2			C
44	A3-60-3046	Thermistor	PBP-41E-S4	2	2	2			C
45	A4-05-0097	Terminal Block	UF1003-20A-7P	1	1	1			
46	A4-07-0337	Grommet	C-30-SG-28A-EP-UL	1	1	1		EPDM	C
47	A4-07-0726	Spacer	SPD-4U	4	4	4		PA	C
48	A4-09-1212	Cable Tie	RSG-100 V0	2	2	2	~2009/8	PA	C
49	A6-39-1000	Instant Fitting	SPOC8-02-1339-D(R1/4)	2	2	2			C
50	A6-39-1001	Instant Fitting	SPOC8-01-1339-D(1/8)	1	1	1			C
51	B0-03-0121	MLE Bearing	R-MLEF0806	2	2	2			C
52	B3-00-0079	O-ring	JIS B2401 P18 1339-75	2	2	2		FKM	B
53	B3-00-0740	O-ring	JIS B2401 P8 1339-75	2	2	2		FKM	B
54	D9-80-0113	Insert Ring	WR0860	4	4	4		SUS	C
55	D9-80-0114	Clip	1020-40	2	2	2		SUS	
56	A4-07-0328	Grommet Edging	KG-008	0.08m	0.08m	0.08m		PA	C
57	A4-07-0328	Grommet Edging	KG-008	0.126m	0.126m	0.126m		PA	C
58									
59	B6-53-2001	Spring Washer	ND.4 SUS	4	4	4		SUS	

2. Retort

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
60	B6-12-2002	Hex Socket CapScrew	M6x15 SUS	2	2	2		SUS	
61	B6-14-2028	Flat Head Screw	M4x8 D-6 SUS	2	2	2		SUS	
62	B6-28-2012	Pan Head Screw,Sems A	M3x5 Sems A SUS	4	4	4		SUS	
63	B6-29-2000	Pan Head Screw,Sems B	M3x6 Sems B SUS	2	2	2	Attached to Terminal Block	SUS	
64	B6-29-2011	Pan Head Screw,Sems B	M3x15 Sems B SUS	2	2	2		SUS	
65	B6-38-1017	Cross Recessed HexHead Screw, Sems A	M4x8 Sems A Fe(chromate)	8	8	8		Fe	
66	B6-38-1102	Cross Recessed HexHead Screw, Sems A	M5x8 Sems A Fe(chromate)	8	8	8		Fe	
67	B6-41-2001	Hex Nut	M4 Class1 SUS	4	4	4		SUS	
68	B6-41-0505	Hex Nut	M18xP1.5 Fe Uni.chromate	2	2	2		Fe	
69	B6-53-2002	Spring Washer	ND.6 SUS	2	2	2		SUS	
70	B6-56-0700	External Tooth Washer	ND.18 Fe Tri. chromate	2	2	2		Fe	
71	B6-72-2010	E-ring	ND.9 SUS	1	1	1		SUS	
72	A4-09-1226	Cable Tie	T50R-TZ	1	1	1	Not shown	PTFE	
73	A4-09-1224	Cable Tie	T30R-TZ	3	3	3	Not shown	PTFE	
74	A4-03-0003		NK-4N	2	2	2	2009/9 ~	PA	
75	B6-29-2004	Pan Head Screw,Sems B	M4x8 Sems B SUS	2	2	2	2009/9 ~	SUS	
76	D9-07-0133	Double Sided Adhesive Tape	#500 30mm	15mm	15mm	15mm			
77	D9-07-0133	Double Sided Adhesive Tape	#500 30mm	20mm	20mm	20mm			

3. Paraffin Oven



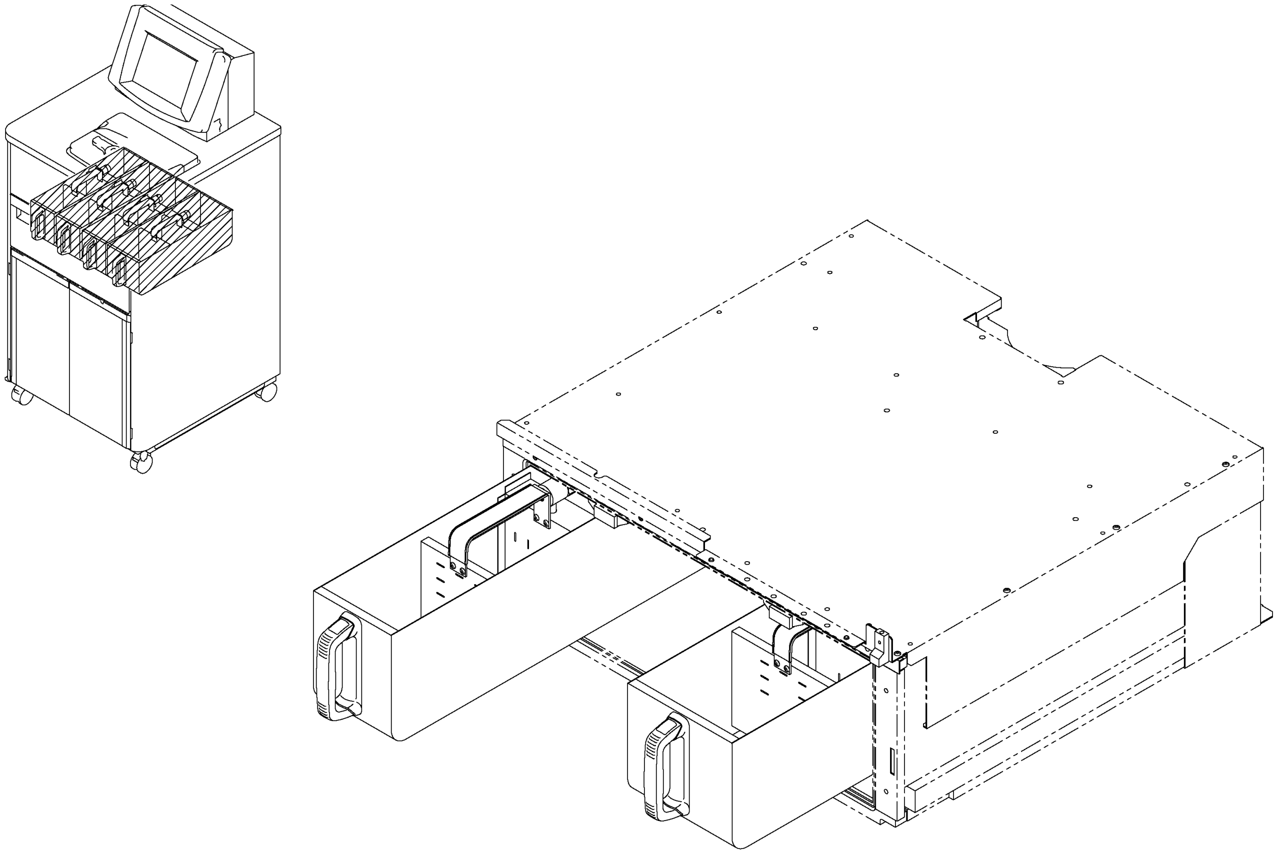
3. Paraffin Oven

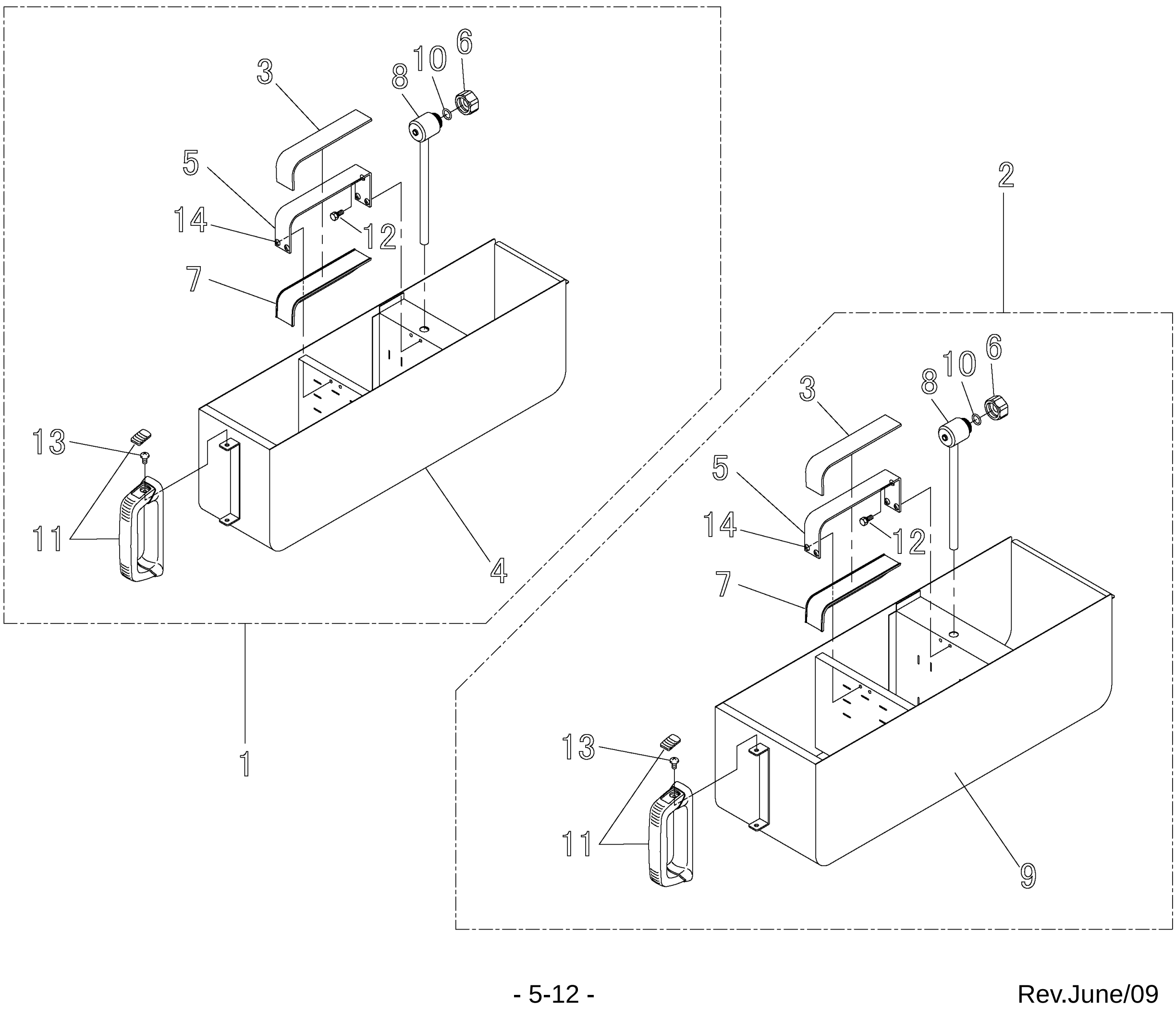
No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	O70-315-00	Inner Case Heat Insulation (Bottom)		1	1	1		Phenol foam	C
2	O70-316-00	Inner Case Glass Wool (Bottom)		1	1	1		Glass wool	C
3	O70-317-00	Inner Case Heat Insulation (Top)		1	1	1		Phenol foam	C
4	O70-318-00	Inner Case Glass Wool (Top)		1	1	1		Glass wool	C
5	O70-319-00	Inner Case Heat Insulation (Left and Right)		2	2	2		Phenol foam	C
6	O70-320-00	Inner Case Heat Insulation (Chip)		2	2	2		Phenol foam	C
7	O70-321-01	Oven Inner Case		1	1	1		Al	
8	O70-322-01	Oven Top Frame		1	1	1		PF	
9	O70-323-00	Oven Top Frame Front Plate		1	1	1		SUS	
10	O70-324-00	Oven Bottom Frame		1	1	1		PF	
11	O70-325-00	Oven Bottom Frame Base		1	1	1		SUS	
12	O70-326-01	Oven Right Frame		1	1	1		SUS	
13	O70-327-01	Oven Left Frame		1	1	1		SUS	
14	O70-328-00	Oven Side Frame		2	2	2		PF	
15	O70-330-01	Oven Back Plate		1	1	1		Fe	
16	O70-331-03	Oven Outer Case Cover		1	1	1		Fe	
17	O70-333-00	Tube Holding Block		1	1	1		Al	
18	O70-334-00	Tube Support Plate		1	1	1		Al	
19	O70-335-00	Tube Clamp		1	1	1		Al	
20	O70-337-00	Joint Tube P11	FEPφ8, L=210mm	1	1	1		FEP	C
21	O70-338-00	Joint Tube P12/13	FEPφ8, L=152mm	2	2	2		FEP	C
22	O70-339-00	Joint Tube P14	FEPφ8, L=225mm	1	1	1		FEP	C
23	O70-340-00	Joint Tube PDR	FEPφ8, L=353mm	1	1	1		FEP	C
24	O70-341-00	Joint Tube PDC	FEPφ8, L=225mm	1	1	1		FEP	C
25	O70-343-01	Oven Door Front		1	1	1		Fe	
26	O70-347-01	Oven Door Back		1	1	1		SUS	
27	O70-351-01	Oven Door Hinge		1	1	1		SUS	
28	O70-352-00	Oven Door Heat Insulation		1	1	1		Phenol foam	C
29	O70-353-00	Oven Door Handle		1	1	1		SUS	
30	O70-332-00	Door Switch Nut Plate		1	1	1		SUS	
35	F52-706-00	Relay Board (Right)	E:VIP6-006	1	1	1			C
36	F52-710-00	Relay Board (Left)	E:VIP6-010	1	1	1			C
37	F52-754-00	Oven Door Sensor	E:VIP6-056	1	1	1			C
40	A1-00-0049	Aluminum Foil Heater	33GQ10	3	0	0	115V		C
	A1-00-0048	Aluminum Foil Heater	33FQ10	0	3	0	100V		C
	A1-00-0051	Aluminum Foil Heater	33HQ10	0	0	3	230V		C
41	A1-00-0053	Aluminum Foil Heater	33KQ10	1	0	0	115V		C
	A1-00-0052	Aluminum Foil Heater	33JQ10	0	1	0	100V		C
	A1-00-0054	Aluminum Foil Heater	33LQ10	0	0	1	230V		C
42	A1-00-0056	Aluminum Foil Heater	33NQ10	1	0	0	115V		C
	A1-00-0055	Aluminum Foil Heater	33MQ10	0	1	0	100V		C
	A1-00-0057	Aluminum Foil Heater	33PQ10	0	0	1	230V		C
43	A3-60-3044	Thermistor	PB3L-41E-S1	5	5	5			C
44	A4-07-0726	Spacer	SPD-4U	8	8	8		PA	C
45	A4-09-1212	Cable Tie	RSG-100 V0	2	2	2		PTFE	C
46	A6-27-5085	Instant Fitting	APV-8	1	1	1			C
47	B3-10-7002	Door Gasket	SL-11997	1	1	1		FKM	C
48	D9-04-0145	Magnet Catch	JM-50WT	2	2	2			C
49	D9-07-0109	Aluminum Foil Tape	40mmx50m	1	1	1		Al	
50	D9-40-0090	RTV Silicone Rubber Compound	KE45, clear, cartridge, 1/3L	1	1	1	Not shown	Silicone rubger	
51	D9-80-0113	Insert Ring	WR0860	5	5	5		SUS	C
52	D9-07-0134		#1500 50mm	100mmx2	100mmx2	100mmx2			
55	B6-12-2068	Hex Socket Low Head Cap Screw	DIN7984 M4x20	4	4	4		SUS	
56	B6-13-2015	Pan Head Machine Screw	M4x8 SUS	10	10	10		SUS	
57	B6-13-2017	Pan Head Machine Screw	M3x6 SUS	2	2	2		SUS	
58	B6-28-2005	Pan Head Screw, Sems A	M3x12 Sems A SUS	1	1	1		SUS	
59	B6-14-2010	Flat Head Screw	M4x10 SUS	9	9	9		SUS	

3. Paraffin Oven

No.	Part Code	Description	Model/Material	Qty			Remarks	Material	Class
				VIP6-A1 (6030)	VIP6-J0 (6031)	VIP6-E2 (6032)			
60	B6-14-2011	Flat Head Screw	M3x8 SUS	7	7	7		SUS	
61	B6-14-2015	Flat Head Screw	M4x30 SUS	1	1	1		SUS	
62	B6-14-2028	Flat Head Screw	M4x8 D-6 SUS	4	4	4		SUS	
63	B6-28-2001	Pan Head Screw, Sems A	M4x10 Sems A SUS	4	4	4		SUS	
64	B6-28-2000	Pan Head Screw, Sems A	M4x8 Sems A SUS	4	4	4		SUS	
65	B6-29-2004	Pan Head Screw, Sems B	M4x8 Sems B SUS	4	4	4		SUS	
66	B6-29-2008	Pan Head Screw, Sems B	M4x12 Sems B SUS	4	4	4		SUS	
67	B6-29-2018	Pan Head Screw, Sems B	M4x20 Sems B SUS	4	4	4		SUS	
68	B6-38-1000	Cross Recessed Hex Head Screw, Sems B	M4x8 Sems B Fe(chromate)	8	8	8		Fe	
69	B6-38-1017	Cross Recessed Hex Head Screw, Sems A	M4x8 Sems A Fe(chromate)	4	4	4		Fe	
70	B6-41-2001	Hex Nut	M4 Class 1 SUS	5	5	5		SUS	
72	B6-53-2001	Spring Washer	ND.4 SUS	4	4	4		SUS	
73	B6-56-2000	External Tooth Washer	ND.4 SUS	11	11	11		SUS	
74	B6-56-2010	External Tooth Washer	ND.3 SUS	2	2	2		SUS	
75	B6-56-2011	Conical Tooth Washer	ND.4 SUS	1	1	1		SUS	

4. Paraffin Container

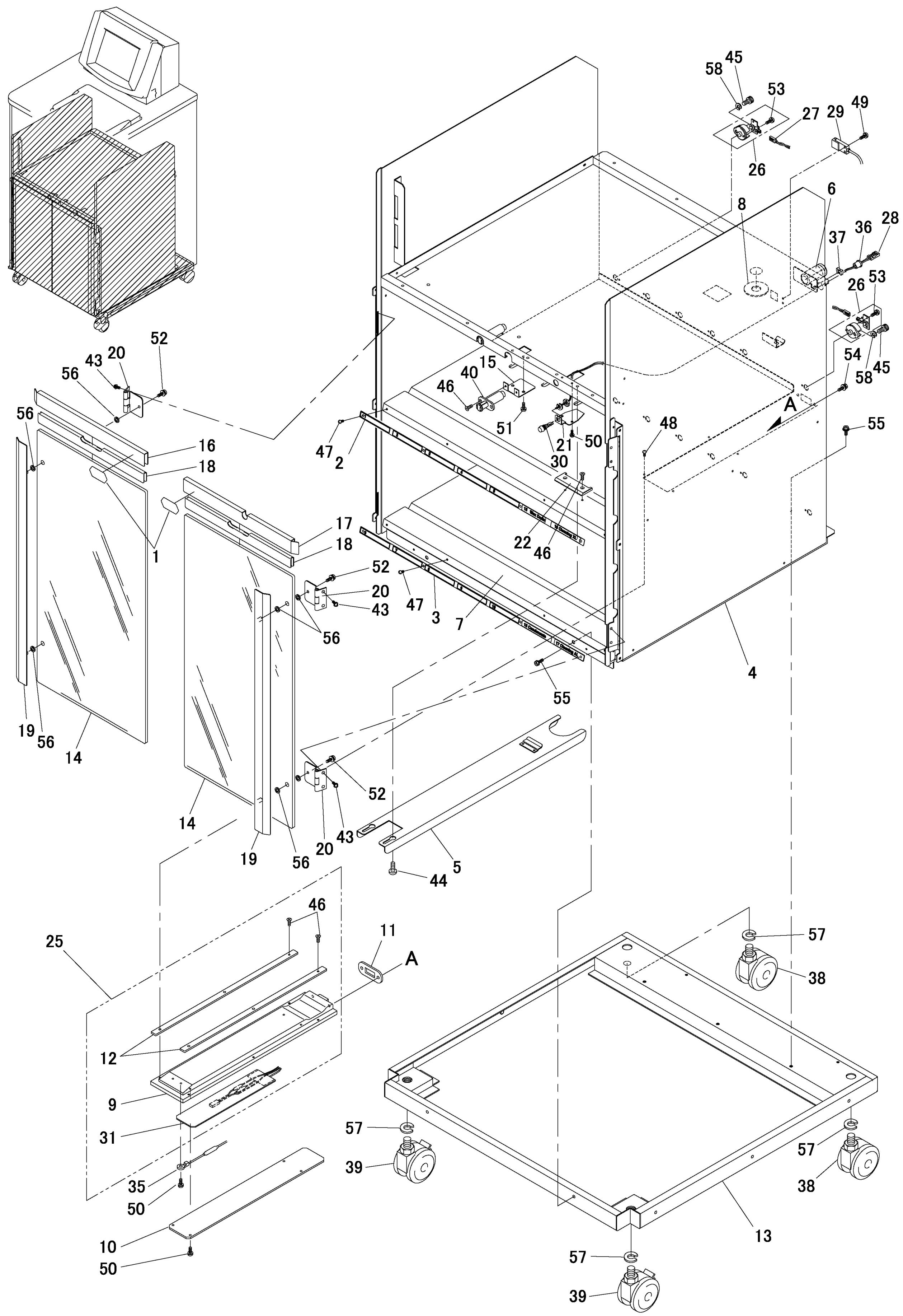




4. Paraffin Container

No.	Part Code	Description	Model/Material	Qty			Remarks	Material	Class
				VIP6-A1 (6030)	VIP6-J0 (6031)	VIP6-E2 (6032)			
1	F60-492-00	Paraffin Container (Small)	M:VIP6-230	3	3	3			C
2	F60-493-00	Paraffin Container (Large)	M:VIP6-240	1	1	1			C
3	O60-341-02	Handle Cover A		4	4	4		POM	x
4	O70-361-01	Paraffin Container S Body		3	3	3		SUS	x
5	O70-368-00	Handle		4	4	4		SUS	x
6	O70-369-00	Tube Seal Cap		4	4	4		SUS	
7	O70-370-00	Handle Cover (Back)		4	4	4		POM(black)	x
8	O70-371-00	Connection Tube		4	4	4		SUS	
9	O70-381-01	Paraffin Container L Body		1	1	1		SUS	x
10	B3-00-0740	O-ring	JIS B2401 P8 1339-75	4	4	4		FKM	B
11	B5-20-0011	Plastic Handle	902278-A001-001	4	4	4		PBT	x
12	B6-38-2073	Cross Recessed Hex Head Screw, Sems B	M4x8 Sems B SUS	4	4	4		SUS	
13	B6-39-5400	Cross Recessed Binder Head Screw	M4x5	8	8	8		SUS	
14	B6-76-4024	Blind Rivet	NTA4-2	16	16	16		Al/SUS	x

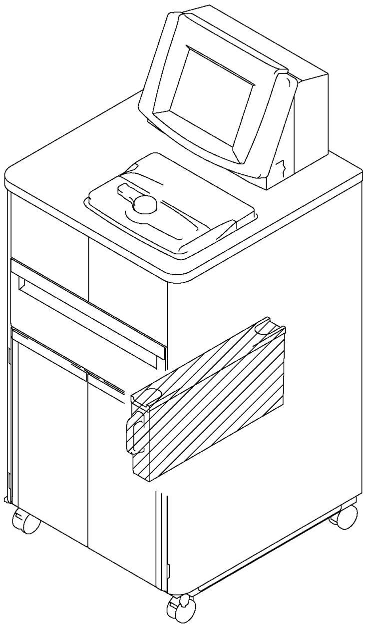
5. Bottle Rack and Base

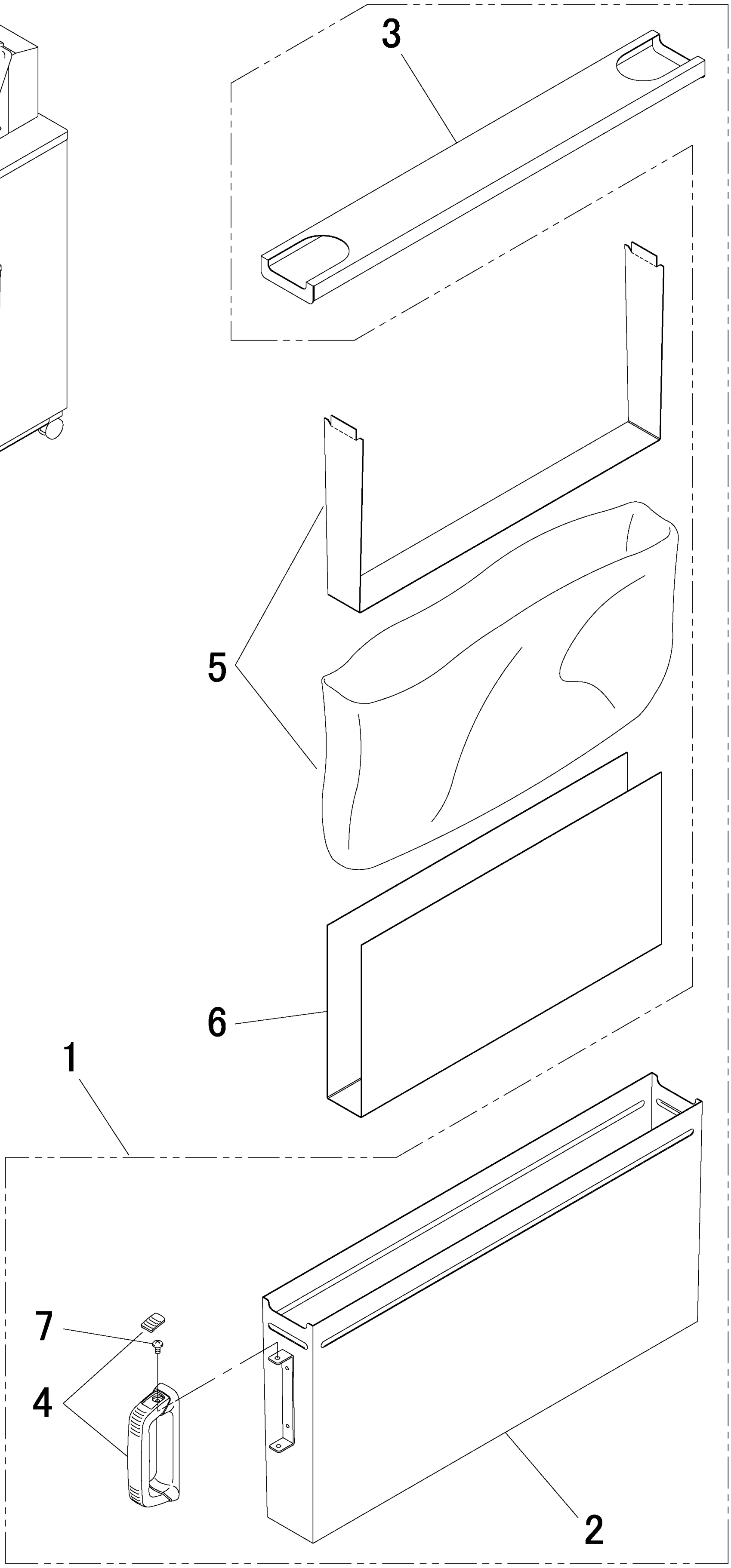


5. Bottle Rack, Base

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	O70-190-00	Bottle Rack Door Push Label		2	2	2		PE	C
2	O70-191-00	Number Plate (Top)		1	1	1		Al	
3	O70-192-00	Number Plate (Bottom)		1	1	1		Al	
4	O70-415-05	Bottle Rack		1	1	1		SUS	
5	O70-419-03	Wax Drain Container Guide (Top)		1	1	1		SUS	
6	O70-429-02	Fume Connection Pipe		1	1	1		SUS	x
7	O70-432-01	Bottom Shelf		1	1	1		SUS	
8	O70-438-00	Bottle Rack Gasket		1	1	1		Silicone rubber	C
9	O70-440-02	Heat Plate		1	1	1		Al	x
10	O70-441-00	Heat Plate Cover		1	1	1		SUS	
11	O70-442-00	Plate Gasket		1	1	1		FKM	C
12	O70-443-00	Plate Heat Insulation		2	2	2		PF	C
13	O70-455-02	Base		1	1	1		SUS	
14	O70-454-01	Bottle Rack Door (Glass)		2	2	2		Glass	C
15	O70-455-01	Catch Mounting		2	2	2		SUS	
16	O70-456-01	Door Magnet Plate (Left)		1	1	1		SUS	
17	O70-457-01	Door Magnet Plate (Right)		1	1	1		SUS	
18	O70-458-00	Sheet		2	2	2		CR	C
19	O70-459-01	Door Mounting (Left/Right)		2	2	2		SUS	
20	O70-461-00	Door Hinge		4	4	4		SUS	
21	O70-463-00	Indicator Mounting		1	1	1		SUS	
22	O70-469-00	Wax Drain Container Guide (Bottom)		1	1	1		POM	
23									
24									
25	F60-526-00	Xylene Heat Plate Unit (100/115V)	M:VIP6-341X	1	1	0	100/115V		C
	F60-527-00	Xylene Heat Plate Unit (230V)	M:VIP6-341E	0	0	1	230V		C
26	F52-712-00	Bottle LED Unit	E:VIP6-012	12	12	12		TPX	C
27	F52-718-00	Bottle LED Cable	E:VIP6-018	2	2	2			C
28	F52-752-00	Wax Drain Container Indicator Cable	E:VIP6-054	1	1	1			C
29	F52-753-00	Wax Drain Container Sensor	E:VIP6-055	1	1	1			C
30	F52-757-00	Wax Drain Container Indicator	E:VIP6-059	1	1	1			C
31	F52-768-00	Xylene Heater Unit 115V	E:VIP6-070	1	1	0	100/115V		x
	F52-773-00	Xylene Heater Unit 230V	E:VIP6-075	0	0	1	230V		x
32									
33									
34									
35	A3-60-3043	Thermistor	PB2M-41E-S17	1	1	1			C
36	A4-07-0118	Instant Bush	TB-0813	1	1	1		PA	C
37	A4-07-0175	Edge Holder	EHP-6U	1	1	1		PA	C
38	D9-20-0000	Caster without Lock	AWS-6017, w/o stopper	2	2	2			C
39	D9-20-0038	Caster with Lock	AWS-6017-SP, w/stopper	2	2	2			C
40	D9-04-0126	Cylindrical Magnetic Push Catch	C-107-3	2	2	2			C
41									
42									
43	B6-29-2003	Pan Head Screw, Sems B	M4x6 Sems B SUS	8	8	8		SUS	
44	B6-25-2001	Truss Head Screw	M4x8 SUS	2	2	2		SUS	
45	B6-12-2010	Hex Socket Cap Screw	M3x6 SUS	12	12	12		SUS	
46	B6-14-2009	Flat Head Screw	M3x6 SUS	4	4	4		SUS	
47	B6-25-2000	Truss Head Screw	M3x4 SUS	8	8	8		SUS	
48	B6-25-2020	Truss Head Screw	M3x8 SUS, w/lock glue	6	6	6		SUS	
49	B6-28-2016	Pan Head Screw, Sems A	M3x10 Sems A SUS	2	2	2		SUS	
50	B6-28-2002	Pan Head Screw, Sems A	M3x6 Sems A SUS	3	3	3		SUS	
51	B6-28-2014	Pan Head Screw, Sems A	M4x6 Sems A SUS	4	4	4		SUS	
52	B6-29-2004	Pan Head Screw, Sems B	M4x8 Sems B SUS	4	4	4		SUS	
53	B6-29-2014	Pan Head Screw, Sems B	M2x6 Sems B SUS	12	12	12	attached to Bottle LED	SUS	
54	B6-38-1000	Cross Recessed Hex Head Screw, Sems B	M4x8, Sems B, Fe(chromate)	2	2	2		Fe	
55	B6-38-1001	Cross Recessed Hex Head Screw, Sems B	M5x10, Sems B, Fe(chromate)	5	5	5		Fe	
56	B6-52-7011	Nylon Flat Washer	6mm	8	8	8		PA	
57	B6-53-2005	Spring Washer	ND.12 SUS	4	4	4		SUS	
58	B6-53-2007	Spring Washer	ND.3 SUS	12	12	12		SUS	

6. Wax Drain Container

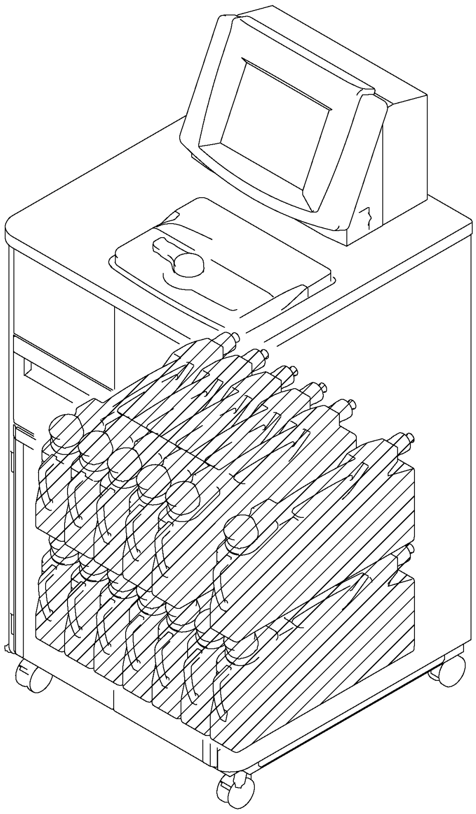


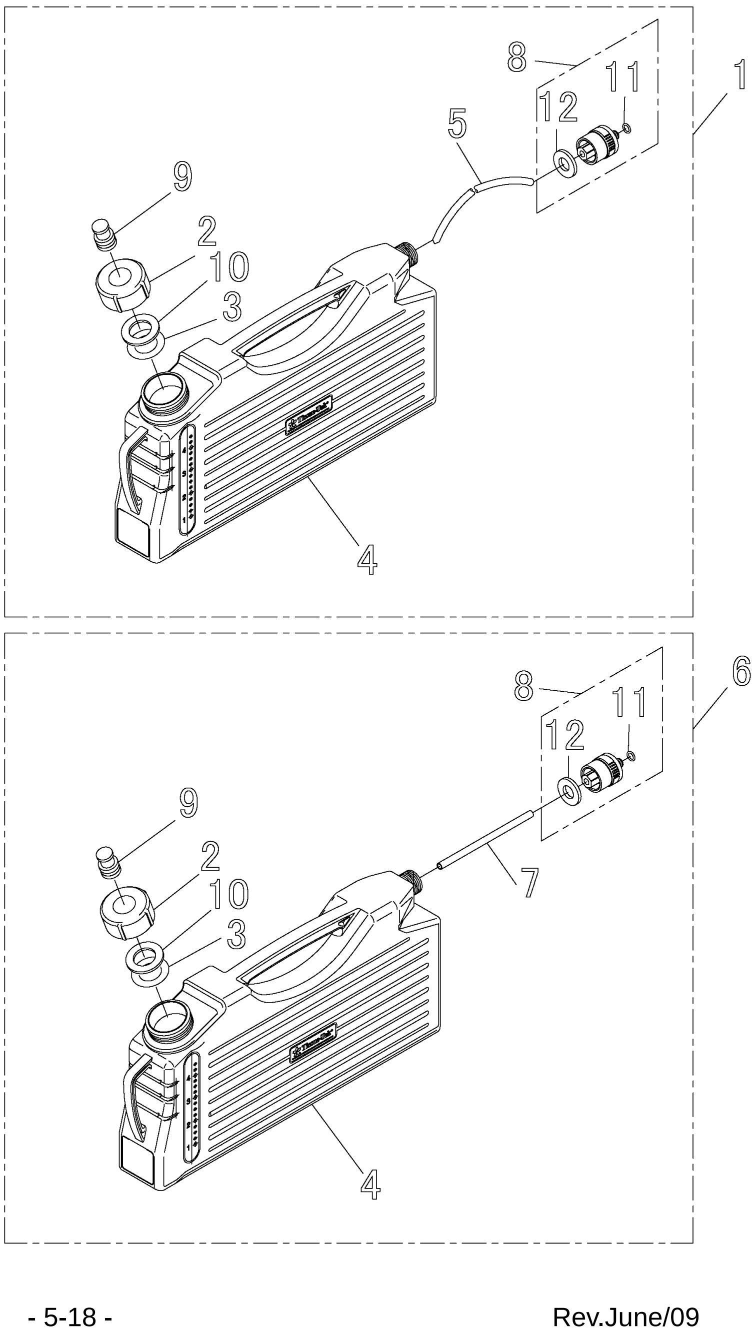


6. Wax Drain Container

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	F60-499-00	Wax Drain Container	M:VIP6-350	1	1	1			C
2	O70-465-01	Wax Drain Container Body		1	1	1		SUS	
3	O70-468-03	Wax Drain Container Lid		1	1	1		SUS	
4	B5-20-0011	Plastic Handle	902278-A001-001	1	1	1		PBT	x
5	D8-93-0138	Waste Paraffin Bag (12pcs)		1	1	1	Accessory	PE/PP	A
6	D9-80-0119	Anti-adhesion sheet		1	1	1		PE	A
7	B6-39-5400	Cross Recessed Binder Head Screw	M4x5	2	2	2		SUS	

7. Reagent Bottle and Condensate Bottle

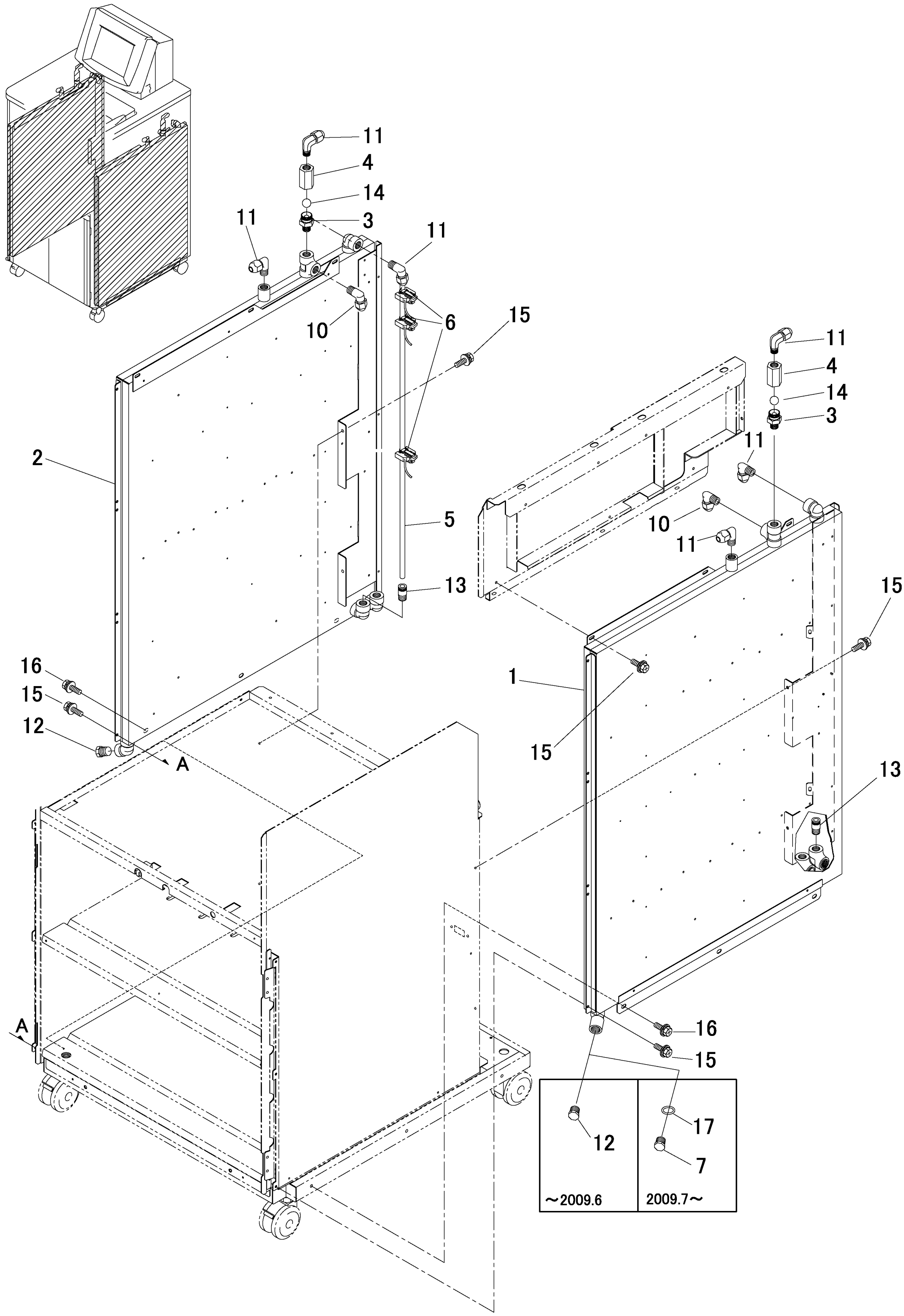




7. Reagent Bottle, Condensate Bottle

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	F60-500-00	Reagent Bottle Set	M:VIP6-360	12	12	12			C
2	O68-503-00	Reagent Bottle Cap		13	13	13	VIP5	POM	C
3	O68-578-00	PTFE Sheet		13	13	13	VIP5	PTFE	B
4	O70-411-00	Reagent Bottle (Fluorinated)		13	13	13		PE	B
5	O70-412-00	Reagent Bottle Tube		12	12	12		FEP	C
6	F60-501-00	Condensate Bottle Set	M:VIP6-370	1	1	1			C
7	O70-413-00	Condensate Bottle Tube		1	1	1		PA	C
8	A6-32-7000	TN Bottle Coupler, Plug	MDW-1TPN	13	13	13			C
9	A6-97-2000	TN Bottle Coupler, Plug Cap	MDW-1TP-D	13	13	13		PP	C
10	B3-12-3008	Cap Gasket	N123-0025	13	13	13		FKM	B
11	B3-00-0740	O-ring	JIS B2401 P-8 1339-75	13	13	13		FKM	B
12	B3-10-7000	Gasket for MDW-1TPN	I-19x31.7x1.8 1339-75	13	13	13		FKM	B

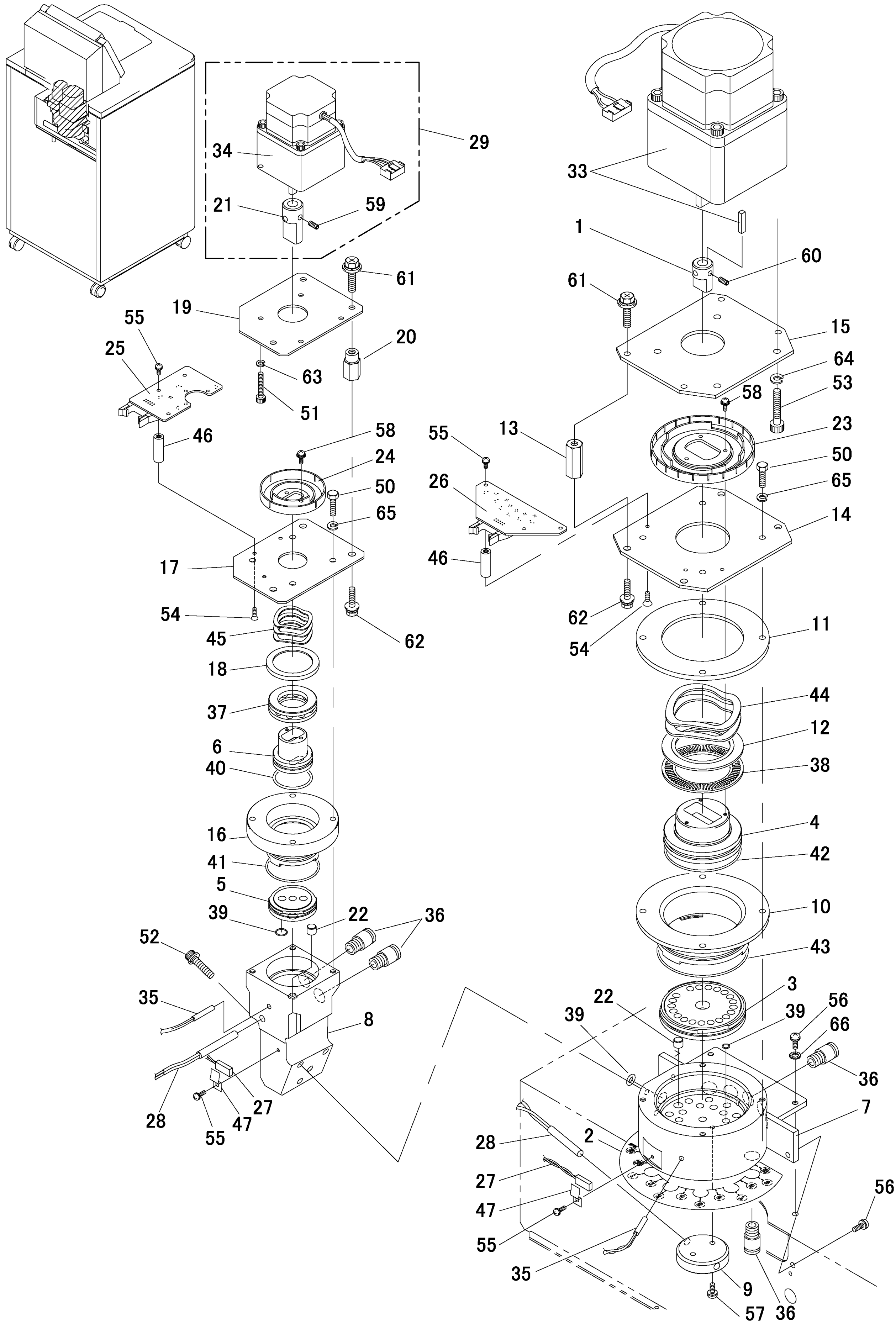
8. Bulk Reservoir



8. Bulk Reservoir

No.	Part Code	Description	Model/Material	Qty			Remarks	Material	Class
				VIP6-A1 (6030)	VIP6-J0 (6031)	VIP6-E2 (6032)			
1	O70-475-04	Right Bulk Reservoir		1	1	1		SUS	
2	O70-480-05	Left Bulk Reservoir		1	1	1		SUS	
3	O70-495-01	Safety Valve Socket		2	2	2		SUS	
4	O70-496-00	Safety Valve Cap		2	2	2		SUS	
5	O70-497-00	Level Sight Tube	FEPφ8, L=713mm	2	2	2		FEP	C
6	F52-755-00	Level Sensor	E:VIP6-057	6	6	6			C
7	O70-498-00	Drain Plug		2	2	2	2009.7 ~		
8									
9									
10	A6-27-5121	Elbow Union	LZ-6-02 Black	2	2	2		POM	C
11	A6-27-5171	Elbow Union	LZ-8-02 Black	6	6	6		POM	C
12	A6-35-5005	Hex Plug	STP1/4 SUS	2	2	2	~2009.6	SUS	
13	A6-39-1000	Instant Fitting	SPOC8-02-1339-D(R1/4)	4	4	4			C
14	B0-06-0001	Teflon Ball	ND. 1/2 inch.	2	2	2		PTFE	B
15	B6-38-1000	Cross Recessed Hex Head Screw, Sems B	M4x8 Sems B Fe(chromate)	16	16	16		Fe	
16	B6-38-1001	Cross Recessed Hex Head Screw, Sems B	M5x10 Sems B Fe(chromate)	6	6	6		Fe	
17	B3-00-0081	O-ring	JISB2401 P12 1339-75	2	2	2	2009.7 ~	FKM	A

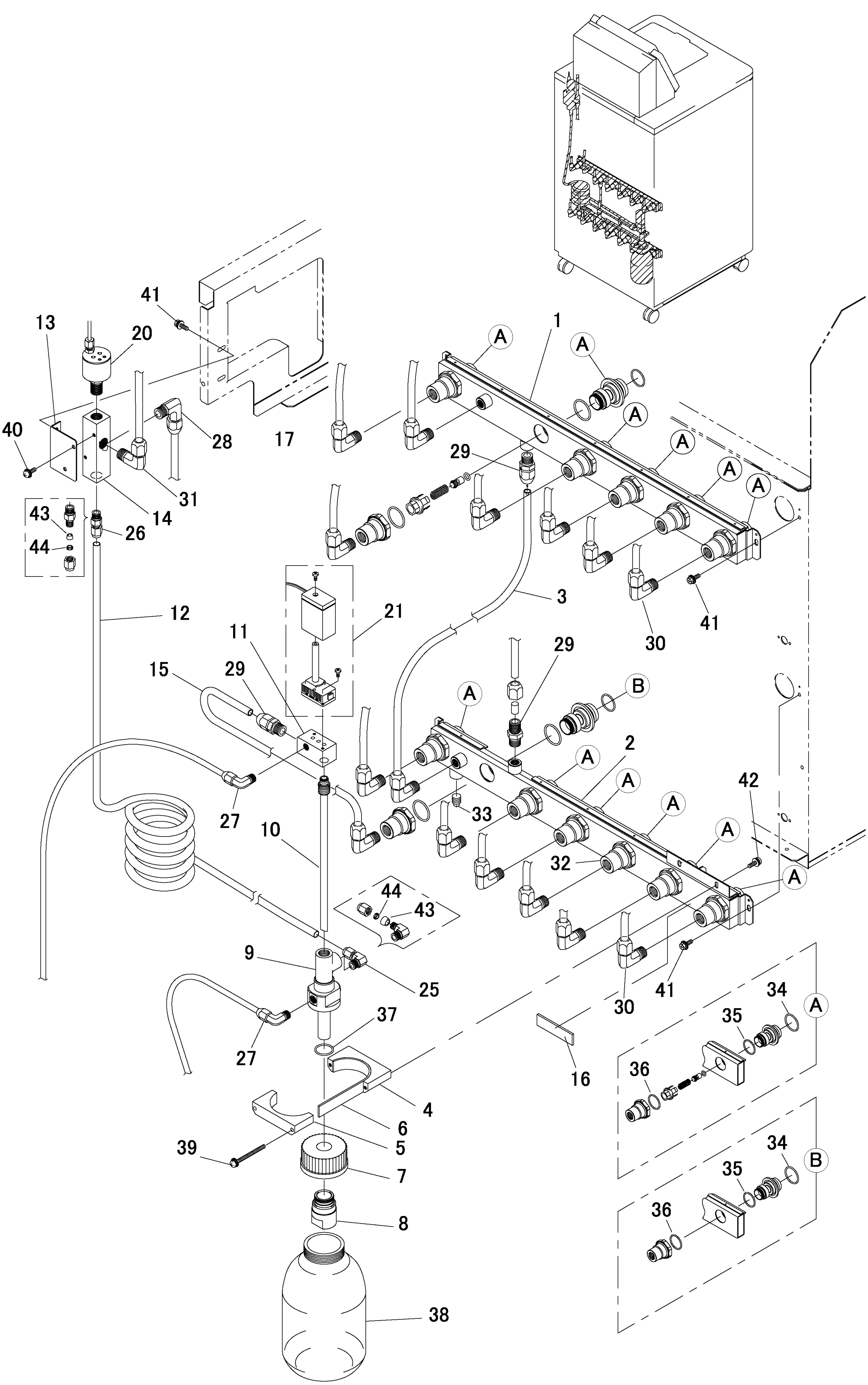
9. Rotary Valve and Gate Valve



9. Rotary Valve, Gate Valve

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	O68-205-00	RV Coupling		1	1	1	VIP5	SUS	
2	O70-189-00	RV Connection Label		1	1	1		PET	C
3	O70-510-00	RV Fixed Disk		1	1	1		Ceramic	B
4	O70-511-00	RV Rotary Disk		1	1	1		Ceramic	B
5	O70-512-00	GV Fixed Disk		1	1	1		Ceramic	B
6	O70-513-00	GV Rotary Disk		1	1	1		Ceramic	B
7	O70-516-02	RV Housing		1	1	1		SUS	
8	O70-517-01	GV Housing		1	1	1		SUS	
9	O70-518-00	RV Heater Housing		1	1	1		Al	
10	O70-519-01	RV Disk Hold Ring		1	1	1		SUS	C
11	O70-520-00	RV Spacer Ring		1	1	1		POM	
12	O70-521-00	RV Thrust Ring		1	1	1		SUS	
13	O70-522-00	RV Motor Mounting		4	4	4		SUS	
14	O70-523-00	RV Spring Hold Plate		1	1	1		SUS	
15	O70-524-00	RV Motor Housing		1	1	1		Fe	
16	O70-525-02	GV Disk Hold Ring		1	1	1		SUS	
17	O70-526-00	GV Spring Hold Plate		1	1	1		SUS	
18	O70-527-00	GV Wave Washer Guide		1	1	1		SUS	
19	O70-528-00	GV Motor Housing		1	1	1		Fe	
20	O70-529-00	GV Motor Mounting		3	3	3		SUS	
21	O70-530-01	GV Coupling		1	1	1		SUS	
22	O70-531-00	Anti Rotation Pin		2	2	2		SUS	
23	O70-532-00	RV Positioning Disk6		1	1	1		POM	C
24	O70-533-00	GV Positioning Disk6		1	1	1		POM	C
25	F52-708-00	GV Positioning Board	E:VIP6-008	1	1	1			C
26	F52-709-00	RV Positioning Board	E:VIP6-009	1	1	1			C
27	F52-767-00	Valve Over Temperature Protector	E:VIP6-069	2	2	2			C
28	F52-766-00	Valve Heater Unit 100V	E:VIP6-068	0	2	0	100V		C
	F52-769-00	Valve Heater Unit 115V	E:VIP6-071	2	0	0	115V		C
	F52-770-00	Valve Heater Unit 230V	E:VIP6-072	0	0	2	230V		C
29	F60-491-00	GV Motor Set	M:VIP6-411	1	1	1			C
33	A0-41-0007	Stepping Motor	A7193-9412KSG	1	1	1			C
34	A0-41-0008	Stepping Motor	C9937-9212KGM	1	1	1			C
35	A3-60-3043	Thermistor	PB2M-41E-S17	2	2	2			C
36	A6-39-1000	Instant Fitting	SPOC8-02-1339-D(R1/4)	22	22	22			C
37	B0-03-4050	Bearing	51105	1	1	1		SUS	C
38	B0-03-6540	Bearing	FB5002	1	1	1		SUS	C
39	B3-00-0074	O-ring	AS568A 011 1339-75	25	25	25		FKM	A
40	B3-00-0075	O-ring	AS568A 122 1339-75	1	1	1		FKM	A
41	B3-00-0076	O-ring	AS568A 130 1339-75	1	1	1		FKM	A
42	B3-00-0077	O-ring	AS568A 143 1339-75	1	1	1		FKM	A
43	B3-00-0078	O-ring	AS568A 151 1339-75	1	1	1		FKM	A
44	D9-28-0050	Wave Washer	BWW-6306	2	2	2		Fe	C
45	D9-28-0086	Wave Washer	WW-26, spring steel	3	3	3		Fe	C
46	D9-36-0001	Spacer	KSR-2A	6	6	6			
47	D9-80-0114	Clip	1020-40	2	2	2		SUS	
50	B6-11-2031	Hex Cap Screw	M5x25 SUS	8	8	8		SUS	
51	B6-12-2007	Hex Socket Cap Screw	M4x15 SUS	4	4	4		SUS	
52	B6-12-2085	Hex Socket Cap Screw, Sems A	M6x25 Sems A SUS	3	3	3		SUS	
53	B6-12-2063	Hex Socket Cap Screw	M6x18 SUS	4	4	4		SUS	
54	B6-14-2009	Flat Head Screw	M3x6 SUS	6	6	6		SUS	
55	B6-28-2002	Pan Head Screw, Sems A	M3x6 Sems A SUS	6	6	6		SUS	
56	B6-28-2003	Pan Head Screw, Sems A	M5x10 Sems A SUS	4	4	4		SUS	
57	B6-28-2008	Pan Head Screw, Sems A	M4x12 Sems A SUS	2	2	2		SUS	
58	B6-29-2010	Pan Head Screw, Sems B	M3x8 Sems B SUS	5	5	5		SUS	
59	B6-34-0018	Hex Socket Set Screw, Cup Point	M5x6 FE	2	2	2	2009.3 ~	Fe	
60	B6-34-0011	Hex Socket Set Screw, Cup Point	M4x6 FE	2	2	2	2009.3 ~	Fe	
61	B6-38-2000	Cross Recessed Hex Head Screw, Sems B	M5x10 Sems B Fe(chromate)	7	7	7		Fe	
62	B6-38-2002	Cross Recessed Hex Head Screw, Sems B	M6x10 Sems B Fe(chromate)	7	7	7		Fe	
63	B6-53-2001	Spring Washer	ND.4 SUS	4	4	4		SUS	
64	B6-53-2002	Spring Washer	ND.6 SUS	4	4	4		SUS	
65	B6-53-2006	Spring Washer	ND.5 SUS	8	8	8		SUS	
66	B6-56-2004	External Tooth Washer	ND.5 SUS	1	1	1		SUS	
70	D9-07-0112	Valqua Tape Seal	8mmx5m	1	1	1	Not shown		C
71	D9-29-0040	Silicone Grease	Amicon 910-50-1	1	1	1	Not shown		C
72	D9-29-0240	RTV Silicone Rubber Compound	KE45, white, 100g	1	1	1	Not shown	Silicone rubber	C
73	D9-60-0030	Lubricant SeaLub	S-11 1Kg.	1	1	1	Not shown		C

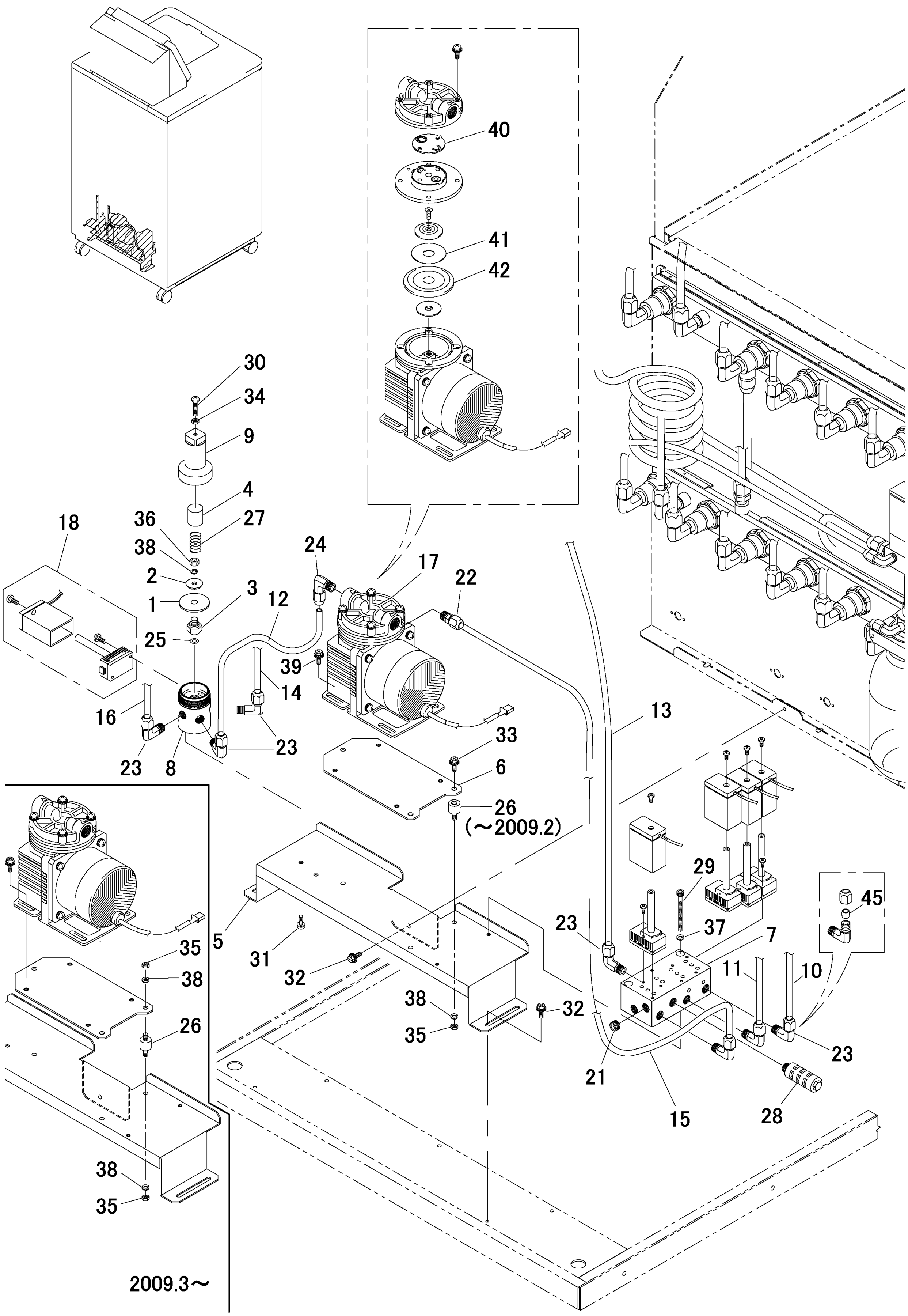
10. Fume Manifold, Condenser and Trap Bottle



10. Fume Manifold, Condenser, Trap Bottle

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	O70-560-01	Top Manifold		1	1	1		SUS	
2	O70-565-01	Bottom Manifold		1	1	1		SUS	
3	O70-571-01	Tube (Between Manifolds)	FEPφ8, L=210mm	1	1	1		FEP	C
4	O70-575-00	Trap Bottle Mounting		1	1	1		Al	
5	O70-576-00	Cap Tightener		1	1	1		Al	
6	O70-577-00	Trap Bottle Cap Gasket		1	1	1		EPDM	C
7	O70-578-00	Trap Bottle Cap		1	1	1		PP	C
8	O70-579-00	Cap Hold Nut		1	1	1		SUS	
9	O70-580-00	Trap Bottle Cap Holder		1	1	1		SUS	
10	O70-584-00	Trap Bottle Pipe		1	1	1		SUS	
11	O70-587-00	Solenoid Valve Block		1	1	1		SUS	
12	O70-588-00	Condenser Coil		1	1	1		SUS	
13	O70-589-00	Pressure Sensor Mounting		1	1	1		SUS	
14	O70-590-00	Pressure Sensor Housing		1	1	1		SUS	
15	O70-591-00	Tube (Connecting Condensate Bottle & SV6)	FEPφ8, L=320mm	1	1	1		FEP	C
16	O68-744-00	Cushion		1	1	1		PE	C
17									
18									
19									
20	F52-747-00	Pressure Sensor	E:VIP6-049	1	1	1			C
21	F52-760-00	Solenoid Valve	E:VIP6-062	1	1	1			B
22									
23									
24									
25	A6-27-5072	Elbow Union	ME-8-2 SUS	1	1	1		SUS	C
26	A6-27-5086	Half Union	MC-8-2 SUS	1	1	1		SUS	C
27	A6-27-5120	Elbow Union	LZ-6-01 PT cut	2	2	2		POM	C
28	A6-27-5121	Elbow Union	LZ-6-02 Black	1	1	1		POM	C
29	A6-27-5140	Half Union	HZ-8-01 Black	3	3	3		POM	C
30	A6-27-5170	Elbow Union	LZ-8-01 Black	15	15	15		POM	C
31	A6-27-5171	Elbow Union	LZ-8-02 Black	1	1	1		POM	C
32	A6-32-7001	TN Bottle Coupler, Socket	MDW-1SF	13	13	13			C
33	A6-35-5010	Plug	1/8 SUS	1	1	1		SUS	
34	B3-00-0023	O-ring	AS568A-018 1339-75	13	13	13		FKM	B
35	B3-00-0039	O-ring	AS568A-020 1339-75	13	13	13		FKM	B
36	B3-00-0041	O-ring	JIS B2401 P-5 1339-75	13	13	13		FKM	B
37	B3-00-0760	O-ring	JIS B2401 P22 1339-75	1	1	1		FKM	B
38	B4-00-0021	Trap Bottle	017280-250A	1	1	1		Glass + PU	C
39	B6-29-2040	Pan Head Screw, Sems B	M4x45 Sems B SUS	2	2	2		SUS	
40	B6-28-2000	Pan Head Screw, Sems A	M4x8 Sems A SUS	2	2	2		SUS	
41	B6-38-1000	Cross Recessed Hex Head Screw, Sems B	M4x8 Sems B Fe(chromate)	6	6	6		Fe	
42	B6-29-2008	Pan Head Screw, Sems B	M4x12 Sems B SUS	2	2	2		SUS	
43	D9-80-0170	Ferrule	FF-8 (SUS)	1	1	1		SUS	C
44	D9-80-0190	Ferrule	FR-8 (SUS)	1	1	1		SUS	C

11. Air Unit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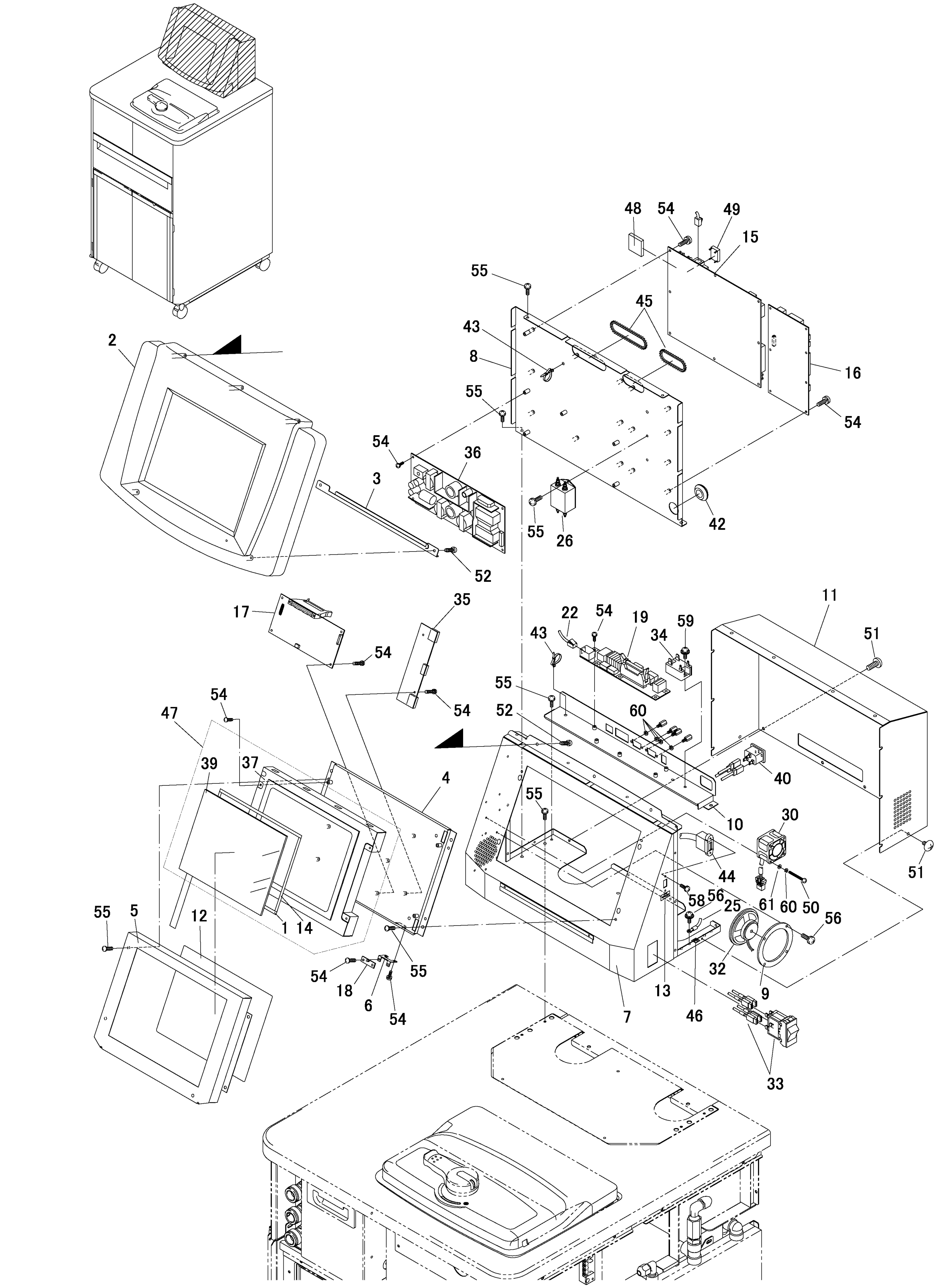
11. Air Unit

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	O60-547-01	Regulator Diaphragm		1	1	1		FKM	B
2	O60-548-00	Spacer		1	1	1		SUS	
3	O60-549-01	Valve (P)		1	1	1		SUS	
4	O60-553-00	Spring Guide		1	1	1		SUS	
5	O70-545-01	Air Unit Base		1	1	1		SUS	
6	O70-546-00	Pump Base		1	1	1		SUS	
7	O70-547-00	Valve Manifold		1	1	1		SUS	
8	O70-548-00	P Regulator Body		1	1	1		SUS	
9	O70-549-00	P Bonnet		1	1	1		SUS	
10	O70-551-00	Tube (Connecting SV5 & Bulk Right)	FEPφ6, L=943mm	1	1	1		FEP	C
11	O70-552-00	Tube (Connecting SV4 & Bulk Left)	FEPφ6, L=783mm	1	1	1		FEP	C
12	O70-553-00	Tube (Connecting SV1 & Air Pump, Out)	FEPφ6, L=100mm	1	1	1		FEP	C
13	O70-554-01	Tube (Connecting SV3 & Trap Bottle)	FEPφ6, L=293mm	1	1	1		FEP	C
14	O70-555-00	Tube (Connecting Regulator & Pressure	FEPφ6, L=735mm	1	1	1		FEP	C
15	O70-556-00	Tube (Connecting SV2 & Air Pump, In)	FEPφ6, L=235mm	1	1	1		FEP	C
16	O70-557-00	Tube (Connecting Regulator & SV6)	FEPφ6, L=485mm	1	1	1		FEP	C
17	F52-735-00	Air Pump	E:VIP6-036	1	1	1			B
18	F52-760-00	Solenoid Valve	E:VIP6-062	5	5	5			B
19									
20									
21	A6-35-5004	Taper Hex Socket Plug	GM-01S 1/8	2	2	2		SUS	
22	A6-27-5111	Half Union	HZ-6-02 Black	1	1	1		POM	C
23	A6-27-5120	Elbow Union	LZ-6-01 PT cut	7	7	7		POM	C
24	A6-27-5121	Elbow Union	LZ-6-02 Black	1	1	1		POM	C
25	B3-00-0720	O-ring	AS568A-010 1339-75	1	1	1		FKM	B
26	D9-03-0225	Anti-vibration Rubber	RS2005A2	3	3	3	~2009.2		C
	D9-03-0228	Anti-vibration Rubber	RS1005A2	3	3	3	2009.3 ~		C
27	D9-28-0170	Spring	1139	1	1	1		SUS	C
28	D9-80-4010	Muffler	SA-6	1	1	1			C
29	B6-12-2038	Hex Socket Cap Screw	M4x25 Half screw SUS	4	4	4		SUS	
30	B6-13-2004	Pan Head Screw	M4x25 SUS	1	1	1		SUS	
31	B6-28-2000	Pan Head Screw, Sems A	M4x8 Sems A SUS	2	2	2		SUS	
32	B6-38-1000	Cross Recessed Hex Head Screw, Sems B	M4x8 Sems B Fe(chromate)	3	3	3		Fe	
33	B6-38-1001	Cross Recessed Hex Head Screw, Sems B	M5x10 Sems B Fe(chromate)	3	3	3		Fe	
34	B6-41-2001	Hex Nut	M4 Class 1 SUS	1	1	1		SUS	
35	B6-41-2007	Hex Nut	M5 Class 1 SUS	3	3	3		SUS	
36	B6-42-2005	Hex Thin Nut	M5 Class 3 SUS	1	1	1		SUS	
37	B6-53-2001	Spring Washer	ND.4 SUS	1	1	1		SUS	
38	B6-53-2006	Spring Washer	ND.5 SUS	4	4	4		SUS	
39	B6-38-1020	Cross Recessed Hex Head Screw, Sems B	M5x15 Sems BK Fe(chromate)	4	4	4		Fe	
40	D9-80-0116	Valve	for APN-085LVX-D3-57	1	1	1		FKM	A
41	D9-80-0118	Diaphragm Sheet	for APN-085LVX-D3-57	1	1	1		PTFE	A
42	D9-80-0117	Diaphragm	for APN-085LVX-D3-57	1	1	1		PTFE+DPD	A
43									
44									
45	D9-80-0240	Sleeve for Z Union Fitting	6mm	1	1	1		POM	C

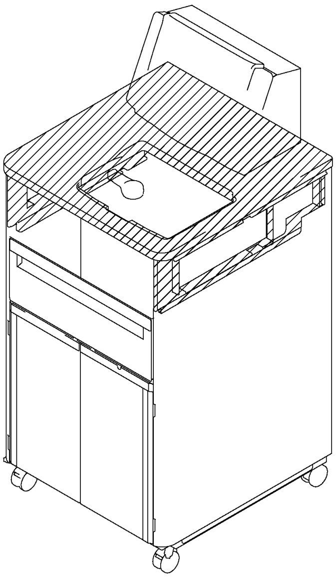
12. Control Panel Cover and Control Box

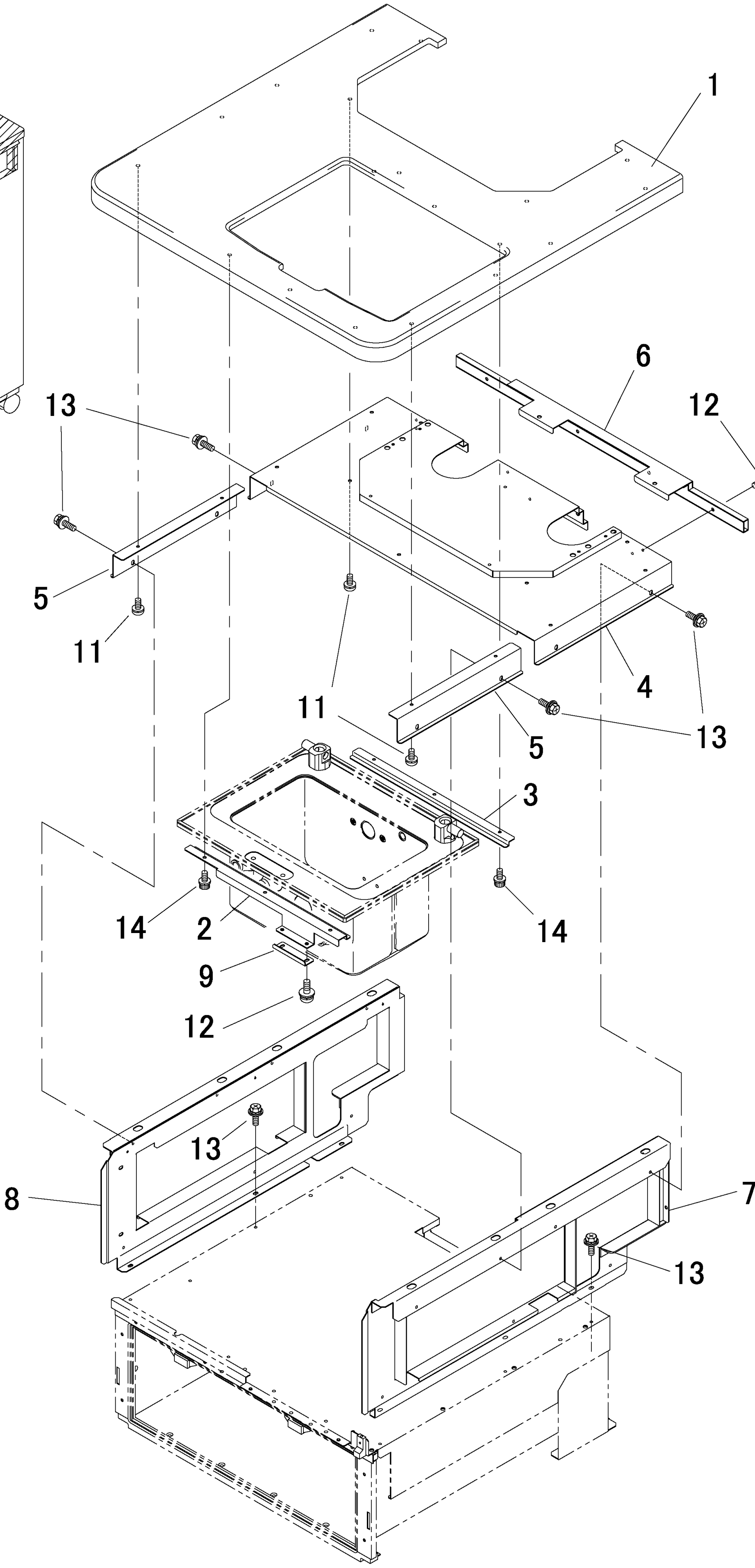


12. Control Panel Cover, Control Box

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	K24-641-01	Double Sided Adhesive Tape 1		2	2	2	Prisma		x
2	O70-610-01	Control Panel Cover		1	1	1		ABS	C
3	O70-611-00	Panel Cover Mounting Plate		1	1	1		SUS	
4	O70-612-00	TFT Base		1	1	1		Fe	
5	O70-613-02	TFT Cover		1	1	1		SUS	
6	O70-614-00	Power Indicator Mounting Plate		1	1	1		SUS	
7	O70-615-02	Control Box Body		1	1	1		SUS	
8	O70-622-00	CPU Board Mounting Plate		1	1	1		Fe	
9	O70-623-00	Speaker Mounting Plate		1	1	1		Al	
10	O70-624-01	IF Board Mounting Plate		1	1	1		SUS	
11	O70-625-01	Control Box Cover		1	1	1		SUS	
12	O70-626-00	Touch Panel Protection Sheet		1	1	1		PET	A
13	O71-955-00	USB Port Label		1	1	1		PE	
14	K24-650-00	Double Sided Adhesive Tape 2		2	2	2	Prisma		x
15	F52-701-00	CPU Board	E:VIP6-001	1	1	1			B
16	F52-702-00	Heater Driver Board	E:VIP6-002	1	1	1			B
17	F52-703-00	LCD Relay Board	E:VIP6-003	1	1	1			B
18	F52-704-00	Power Indicator Board	E:VIP6-004	1	1	1			C
19	F52-711-00	Interface Board	E:VIP6-011	1	1	1			C
20	F52-713-00	LCD FPC Cable	E:VIP6-013	2	2	2	Not shown		C
21	F52-714-00	Inverter Cable	E:VIP6-014	1	1	1	Not shown		C
22	F52-715-00	LAN Cable	E:VIP6-015	1	1	1			C
23	F52-716-00	LED Cable	E:VIP6-016	1	1	1	Not shown		C
24	F52-717-00	LCD Relay Cable 1	E:VIP6-017	1	1	1	Not shown		C
25	F52-719-00	Protective Grounding Cable	E:VIP6-020	1	1	1			C
26	F52-720-00	Noise Filter	E:VIP6-021	1	1	1			C
27	F52-721-00	DC Power Supply Cable	E:VIP6-022	1	1	1	Not shown		C
28	F52-722-00	LCD Relay Cable 2	E:VIP6-023	1	1	1	Not shown		C
29	F52-723-00	Interface Cable	E:VIP6-024	1	1	1	Not shown		C
30	F52-724-00	Cooling Fan	E:VIP6-025	1	1	1			C
31	F52-725-00	Cooling Fan Cable	E:VIP6-026	1	1	1	Not shown		C
32	F52-726-00	Speaker	E:VIP6-027	1	1	1			C
33	F52-782-00	Circuit Protector 115V	E:VIP6-086	1	1	0	100/115V		C
	F52-783-00	Circuit Protector 230V	E:VIP6-087	0	0	1	230V		C
34	A3-10-7008	Solid State Relay	AQJ112V	1	1	1			C
35	A3-16-1072	Inverter	VNR104A260-INV	1	1	1			B
36	A3-16-1073	Switching Power Supply	LEB225F-0524	1	1	1			B
37	A3-60-4225	LCD Module	LTA104A261F	1	1	1			x
38									
39	A3-91-0002	Touch Panel	ATP-104	1	1	1			x
40	A4-01-0609	Power Inlet	NC-176-F6.35-1.0	1	1	1			C
41									
42	A4-07-0336	Grommet	C-30-BW-14-1-EP-UL	1	1	1		EPDM	C
43	A4-09-1212	Cable Tie	RSG-100 V0	3	3	3		PA	C
44	A4-10-2024	USB Cable	USB-002A	1	1	1			C
45	A4-07-0036	Grommet Edging	KG-012	0.3m	0.3m	0.3m		PA	C
46	B5-03-6630	Protective Grounding Symbol Label		1	1	1			
47	F60-583-00	Control Panel Unit	M:VIP6-520	1	1	1			B
48	A3-60-4282	Compact Flash Card	MCF10P-128MS(A00AII	1	1	1			B
49	A3-50-0005	Battery	M4T32-BR12SH	1	1	1	installed on CPU board		C
50	B6-13-2036	Pan Head Screw	M3x32 SUS	4	4	4		SUS	
51	B6-25-2004	Truss Head Screw	M4x6 SUS	16	16	16		SUS	
52	B6-26-2001	Truss Head Self-tapping Screw	M4x10 SUS	3	3	3		SUS	
53									
54	B6-28-2002	Pan Head Screw, Sems A	M3x6 Sems A SUS	30	30	30		SUS	
55	B6-28-2014	Pan Head Screw, Sems A	M4x6 Sems A SUS	22	22	22		SUS	
56	B6-29-2004	Pan Head Screw, Sems B	M4x8 Sems B SUS	9	9	9		SUS	
57									
58		Pan Head Screw	M2.6x6 SUS	2	2	2	Attached to USB cable	SUS	
59	B6-29-2027	Pan Head Screw, Sems BK	M4x12 Sems BK SUS	2	2	2		SUS	
60	B6-53-2007	Spring Washer	ND.3 SUS	8	8	8		SUS	
61	B6-52-2019	Flat Washer	ND.3 SUS	4	4	4		SUS	

13. Top Plate, Right and Left Frames

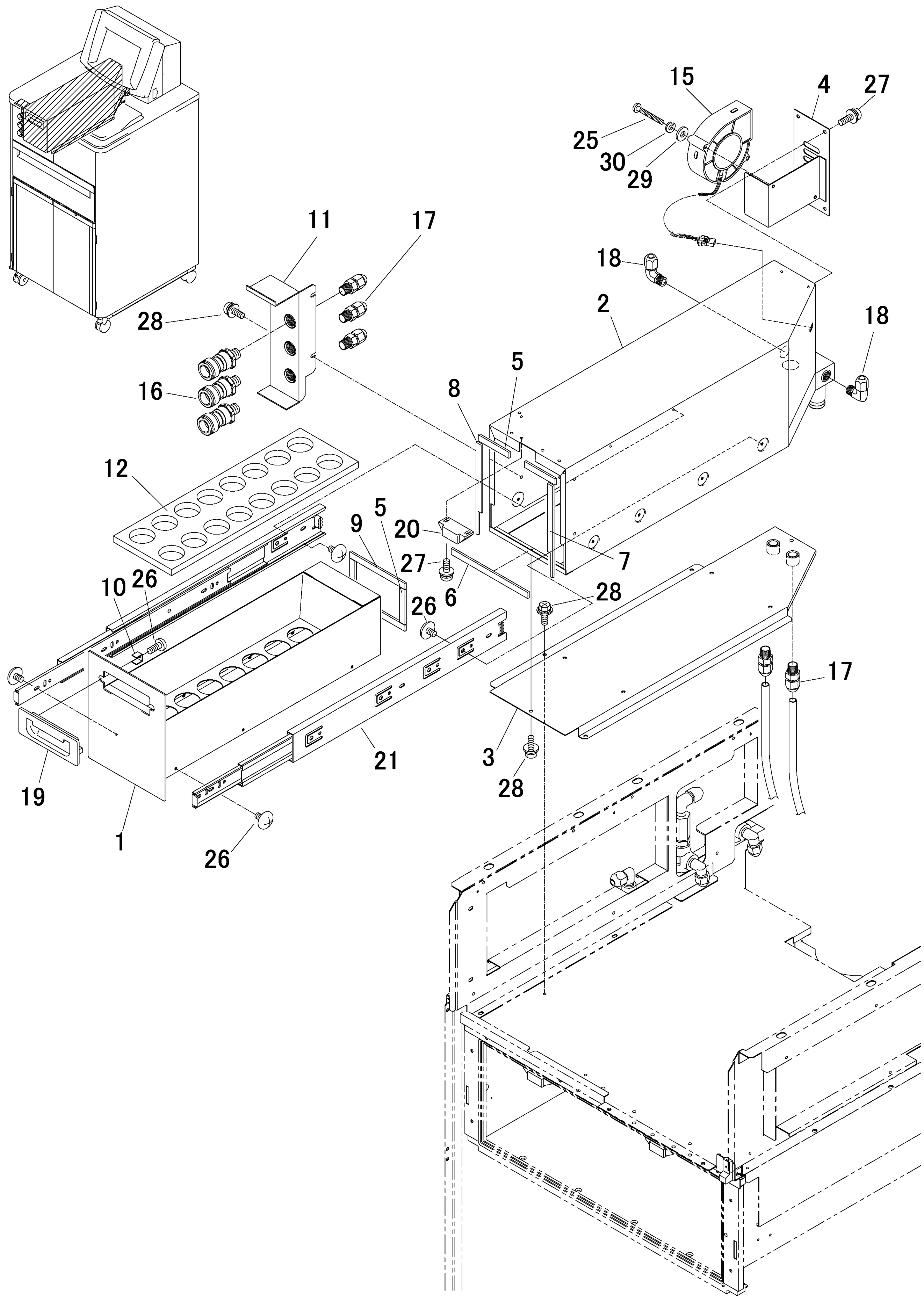




13. Top Plate, Right & Left Frames

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	O70-640-00	Top Plate		1	1	1		PMMA/aluminum hydroxide	C
2	O70-642-00	Retort Flange Holder, Front		1	1	1		SUS	
3	O70-643-00	Retort Flange Holder, Back		1	1	1		SUS	
4	O70-645-00	Top Plate Base		1	1	1		SUS	
5	O70-648-00	Top Plate Support		2	2	2		SUS	
6	O70-649-01	Top Plate Base, Back		1	1	1		Fe	
7	O70-654-01	Right Frame		1	1	1		SUS	
8	O70-657-01	Left Frame		1	1	1		SUS	
9	O70-764-00	Front Exterior Panel Support		1	1	1		SUS	
10									
11	B6-28-2014	Pan Head Screw, Sems A	M4x6 Sems A SUS	13	13	13		SUS	
12	B6-29-2004	Pan Head Screw, Sems B	M4x8 Sems B SUS	6	6	6		SUS	
13	B6-38-1000	Cross Recessed Hex Head Screw, Sems B	M4x8 Sems B Fe(chromate)	8	8	8		Fe	
14	B6-12-2081	Hex Socket Cap Screw, Sems A	M4x6 Sems A SUS	6	6	6		SUS	

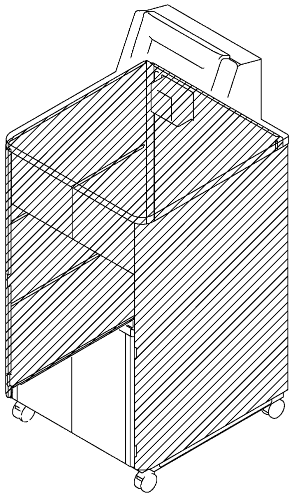
14. Fume Control Unit and External Drain/Fill Port Unit

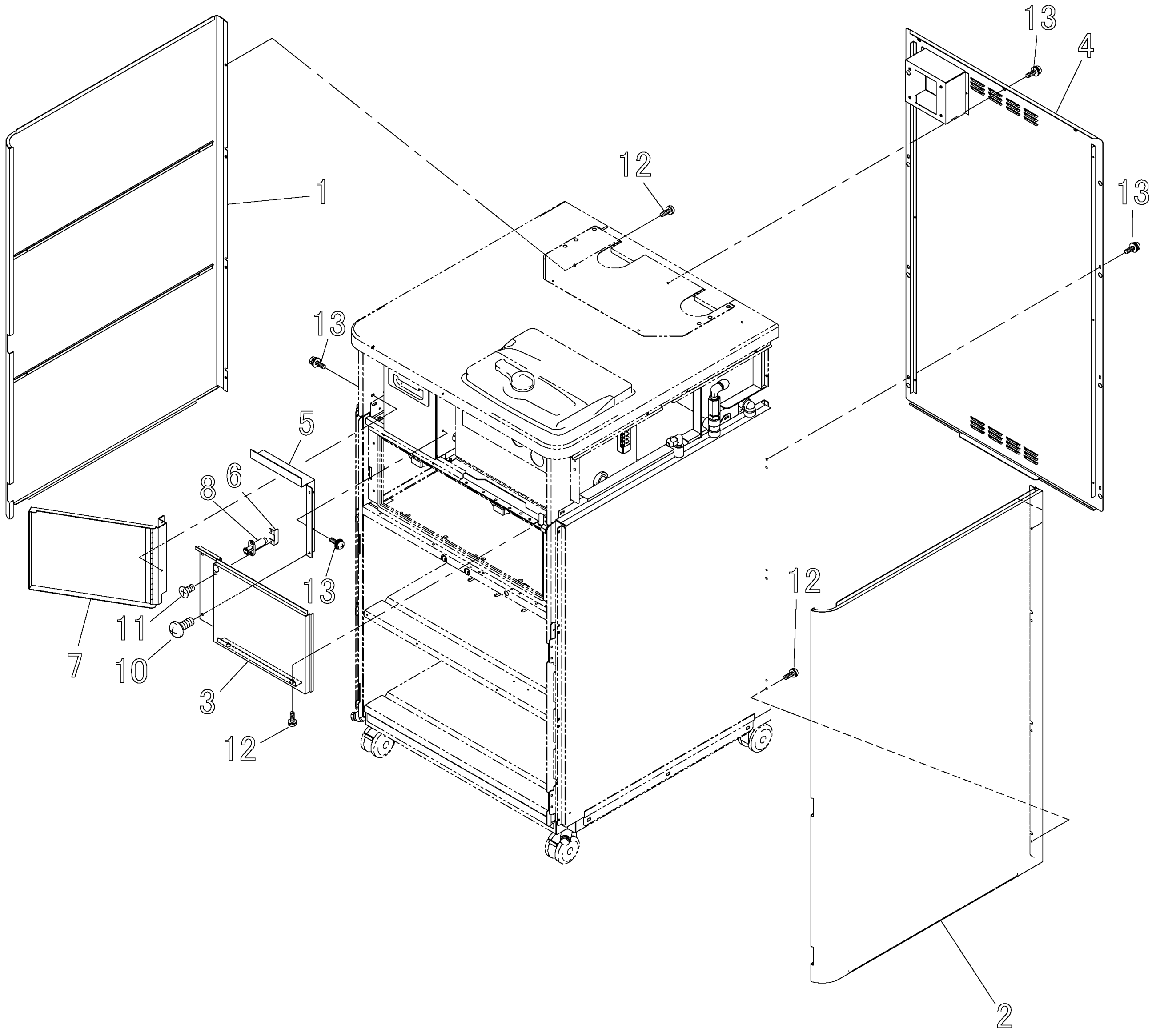


14. Fume Control Unit, External Fill/Drain Port

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	O70-710-02	Filter Case		1	1	1		SUS	
2	O70-714-02	Filter Outer Case		1	1	1		SUS	
3	O70-718-01	Filter Outer Case Base		1	1	1		SUS	
4	O70-720-00	Fan Cover		1	1	1		SUS	
5	O70-723-00	Gasket (Filter Outer Case, Top)		4	4	4		EPDM+IIR	C
6	O70-724-00	Gasket (Filter Outer Case, Bottom)		1	1	1		EPDM+IIR	C
7	O70-725-00	Gasket (Filter Outer Case, Right)		1	1	1		EPDM+IIR	C
8	O70-726-00	Gasket (Filter Outer Case, Left)		1	1	1		EPDM+IIR	C
9	O70-727-00	Gasket (Filter Case, Top & Bottom)		2	2	2		EPDM+IIR	C
10	O70-728-00	Handle Mounting		2	2	2		SUS	
11	O70-769-01	Coupler Mounting Plate		1	1	1		SUS	
12	N74-646-00	Filter Sponge		1	1	1	Film	PE	C
13									
14									
15	F52-732-00	Fume Fan	E:VIP6-033	1	1	1			B
16	A6-27-4024	One Touch Coupler, Socket	TSV-3WRT	3	3	3			C
17	A6-27-5141	Half Union	HZ-8-02 Black	5	5	5		POM	C
18	A6-27-5171	Elbow Union	LZ-8-02 Black	2	2	2		POM	C
19	B5-20-0044	Handle	3900-513	1	1	1			C
20	D9-04-0145	Magnet Catch	JM-50WT	1	1	1			C
21	D9-17-0015	Slide Rail	K-264-16	2	2	2		Fe	C
22									
23									
24									
25	B6-13-2005	Pan Head Screw	M4x35 SUS	2	2	2		SUS	
26	B6-25-2004	Truss Head Screw	M4x6 SUS	16	16	16		SUS	
27	B6-29-2004	Pan Head Screw, Sems B	M4x8 Sems B SUS	6	6	6		SUS	
28	B6-38-1000	Cross Recessed Hex Head Screw, Sems B	M4x8 Sems B Fe(chromate)	11	11	11		Fe	
29	B6-52-2001	Flat Washer	ND.4 (4x10xt0.8) SUS	2	2	2		SUS	
30	B6-53-2001	Spring Washer	ND.4 SUS	2	2	2		SUS	

15. Exterior Panels

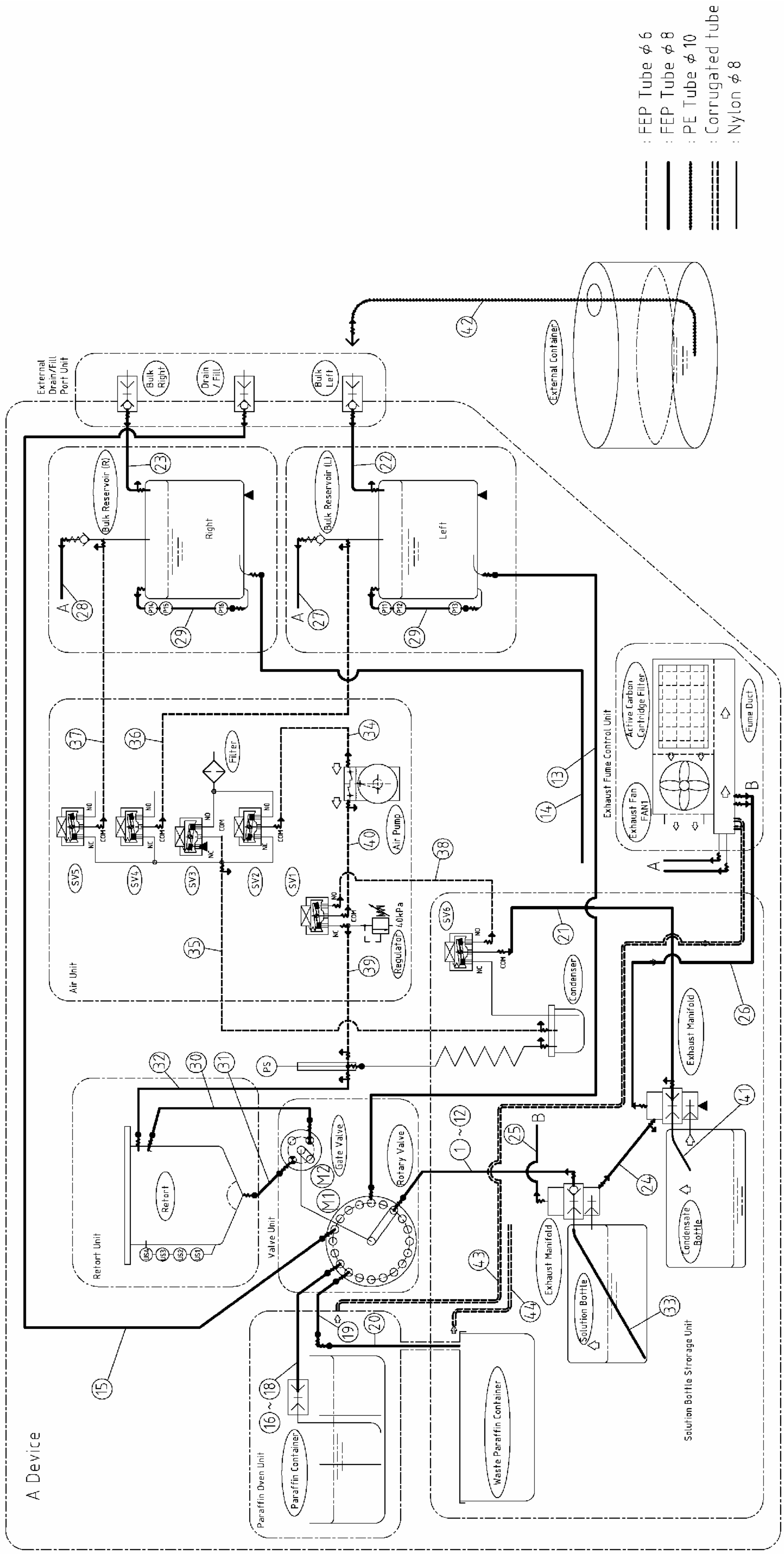




15. Exterior Panels

No.	Part Code	Description	Model/Material	Qty			Remarks	Material	Class
				VIP6-A1 (6030)	VIP6-J0 (6031)	VIP6-E2 (6032)			
1	O70-750-01	Left Side Panel		1	1	1		Fe	
2	O70-753-01	Right Side Panel		1	1	1		Fe	
3	O70-755-01	Front Panel		1	1	1		Fe	
4	O70-758-01	Back Panel		1	1	1		Fe	
5	O70-762-00	Front Panel Mounting Plate		1	1	1		SUS	
6	O70-763-00	Magnet Catch Mounting Plate		1	1	1		SUS	
7	O70-765-01	Access Door		1	1	1		Fe	
8	D9-04-0126	Cylindrical Magnetic Push Catch	C-107-3	1	1	1			C
9									
10	B6-25-2001	Truss Head Screw	M4x8 SUS	2	2	2		SUS	
11	B6-14-2011	Flat Head Screw	M3x8 SUS	2	2	2		SUS	
12	B6-28-2014	Pan Head Screw, Sems A	M4x6 Sems A SUS	10	10	10		SUS	
13	B6-29-2004	Pan Head Screw, Sems B	M4x8 Sems B SUS	12	12	12		SUS	

16. Tubing

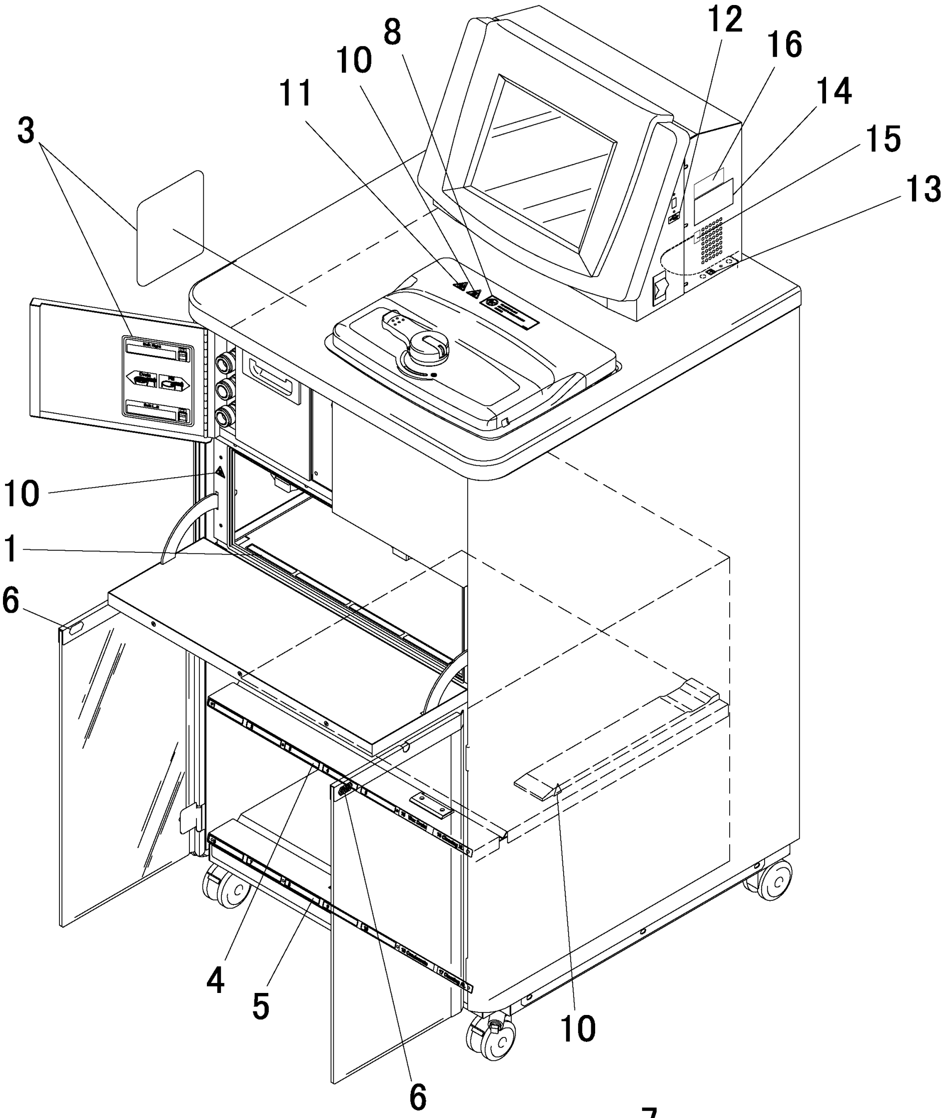


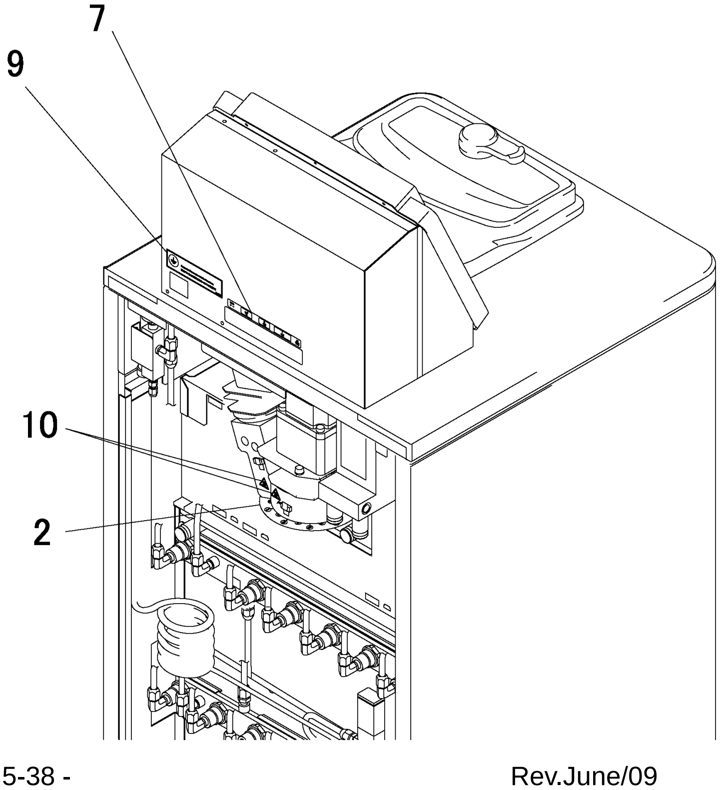
: FEP Tube φ6
: FEP Tube φ8
: PE Tube φ10
: Corrugated tube
: Nylon φ8
External Container
External Drain/Fill Port Unit
Bulk Right
Drain / Fill
Bulk Left
Bulk Reservoir (R)
Bulk Reservoir (L)
Right
Left
Exhaust Fume Control Unit
Active Carbon Cartridge Filter
Fume Duct
Exhaust Fan FAN1
Filter
Air Pump
Air Unit
SV1
SV2
SV3
SV4
SV5
SV6
Regulator 40kPa
Condenser
Exhaust Manifold
Retort
Retort Unit
Valve Unit
Gate Valve
Rotary Valve
Condensate Bottle
Solution Bottle
Solution Bottle Strorage Unit
Waste Paraffin Container
Paraffin Container
Paraffin Oven Unit
A Device

16. Tubing

No.	Part Code	Description	Model	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	O70-534-00	Tube, Station 1		1	1	1	FEPφ8, L=340mm	FEP	C
2	O70-535-00	Tube, Station 2		1	1	1	FEPφ8, L=260mm	FEP	C
3	O70-536-00	Tube, Station 3		1	1	1	FEPφ8, L=190mm	FEP	C
4	O70-537-00	Tube, Station 4		1	1	1	FEPφ8, L=190mm	FEP	C
5	O70-538-00	Tube, Station 5		1	1	1	FEPφ8, L=245mm	FEP	C
6	O70-539-00	Tube, Station 6		1	1	1	FEPφ8, L=545mm	FEP	C
7	O70-540-01	Tube, Station 7		1	1	1	FEPφ8, L=470mm	FEP	C
8	O70-541-01	Tube, Station 8		1	1	1	FEPφ8, L=440mm	FEP	C
9	O70-542-00	Tube, Station 9		1	1	1	FEPφ8, L=440mm	FEP	C
10	O70-543-00	Tube, Station 10		1	1	1	FEPφ8, L=460mm	FEP	C
11	O70-595-00	Tube, Cleaning Xylene		1	1	1	FEPφ8, L=335mm	FEP	C
12	O70-596-00	Tube, Cleaning Alcohol		1	1	1	FEPφ8, L=495mm	FEP	C
13	O70-597-01	Tube, Bulk Left		1	1	1	FEPφ8, L=751mm	FEP	C
14	O70-598-01	Tube, Bulk Right		1	1	1	FEPφ8, L=685mm	FEP	C
15	O70-772-01	Tube, Drain/Fill		1	1	1	FEPφ8, L=1050mm	FEP	C
16	O70-337-00	Tube, Station 11		1	1	1	FEPφ8, L=210mm	FEP	C
17	O70-338-00	Tube, Station 40160		2	2	2	FEPφ8, L=152mm	FEP	C
18	O70-339-00	Tube, Station 14		1	1	1	FEPφ8, L=225mm	FEP	C
19	O70-340-00	Tube, Paraffin Drain, Rotary Valve		1	1	1	FEPφ8, L=353mm	FEP	C
20	O70-341-00	Tube, Paraffin Drain, Wax Drain Container		1	1	1	FEPφ8, L=225mm	FEP	C
21	O70-591-00	Tube, Condensate Bottle - SV6		1	1	1	FEPφ8, L=320mm	FEP	C
22	O70-773-00	Tube, Bulk Left Fill		1	1	1	FEPφ8, L=265mm	FEP	C
23	O70-774-01	Tube, Bulk Right Fill		1	1	1	FEPφ8, L=1120mm	FEP	C
24	O70-571-01	Tube, Between Manifolds		1	1	1	FEPφ8, L=215mm	FEP	C
25	O70-731-01	Tube, Top Manifold - Fume Control Unit		1	1	1	FEPφ8, L=435mm	FEP	C
26	O70-732-00	Tube, Bottom Manifold - Fume Control Unit		1	1	1	FEPφ8, L=630mm	FEP	C
27	O70-733-01	Tube, Bulk Left - Fume Control Unit		1	1	1	FEPφ8, L=175mm	FEP	C
28	O70-734-00	Tube, Bulk Right - Fume Control Unit		1	1	1	FEPφ8, L=500mm	FEP	C
29	O70-497-00	Level Sight Tube		2	2	2	FEPφ8, L=713mm	FEP	C
30	O70-291-00	Retort Fill Tube		1	1	1	FEPφ8, L=318mm	FEP	x
31	O70-292-01	Retort Drain Tube		1	1	1	FEPφ8, L=358mm	FEP	x
32	O70-290-01	Tube, Retort Vacuum - Pressure Sensor		1	1	1	FEPφ8, L=345mm	FEP	C
33	O70-412-00	Reagent Bottle Tube		12	12	12	FEPφ8, L=505mm	FEP	C
34	O70-556-00	Tube, SV2 - Air Pump, In		1	1	1	FEPφ6, L=235mm	FEP	C
35	O70-554-01	Tube, SV3 - Trap Bottle		1	1	1	FEPφ6, L=283mm	FEP	C
36	O70-552-00	Tube, SV4 - Bulk Left		1	1	1	FEPφ6, L=783mm	FEP	C
37	O70-551-00	Tube, SV5 - Bulk Right		1	1	1	FEPφ6, L=943mm	FEP	C
38	O70-557-00	Tube, Regulator - SV6		1	1	1	FEPφ6, L=485mm	FEP	C
39	O70-555-01	Tube, Regulator - Pressure Sensor		1	1	1	FEPφ6, L=755mm	FEP	C
40	O70-553-00	Tube, SV1 - Air Pump, Out		1	1	1	FEPφ6, L=100mm	FEP	C
41	O70-413-00	Condensate Bottle Tube		1	1	1	Nylon φ8, L=150mm	PA	C
42	O70-775-01	External Fill/Drain Connection Tube		3	3	3	Soft polyethyleneφ10, L=1100mm	PE	C
43	O70-729-00	Flexible Hose, Oven - Fume Control Unit		1	1	1	Corrugated tube, L=160mm	PE	C
44	O70-730-00	Flexible Hose, Bottle Rack - Fume Control Unit		1	1	1	Corrugated tube, L=800mm	PE	C

17. Labels

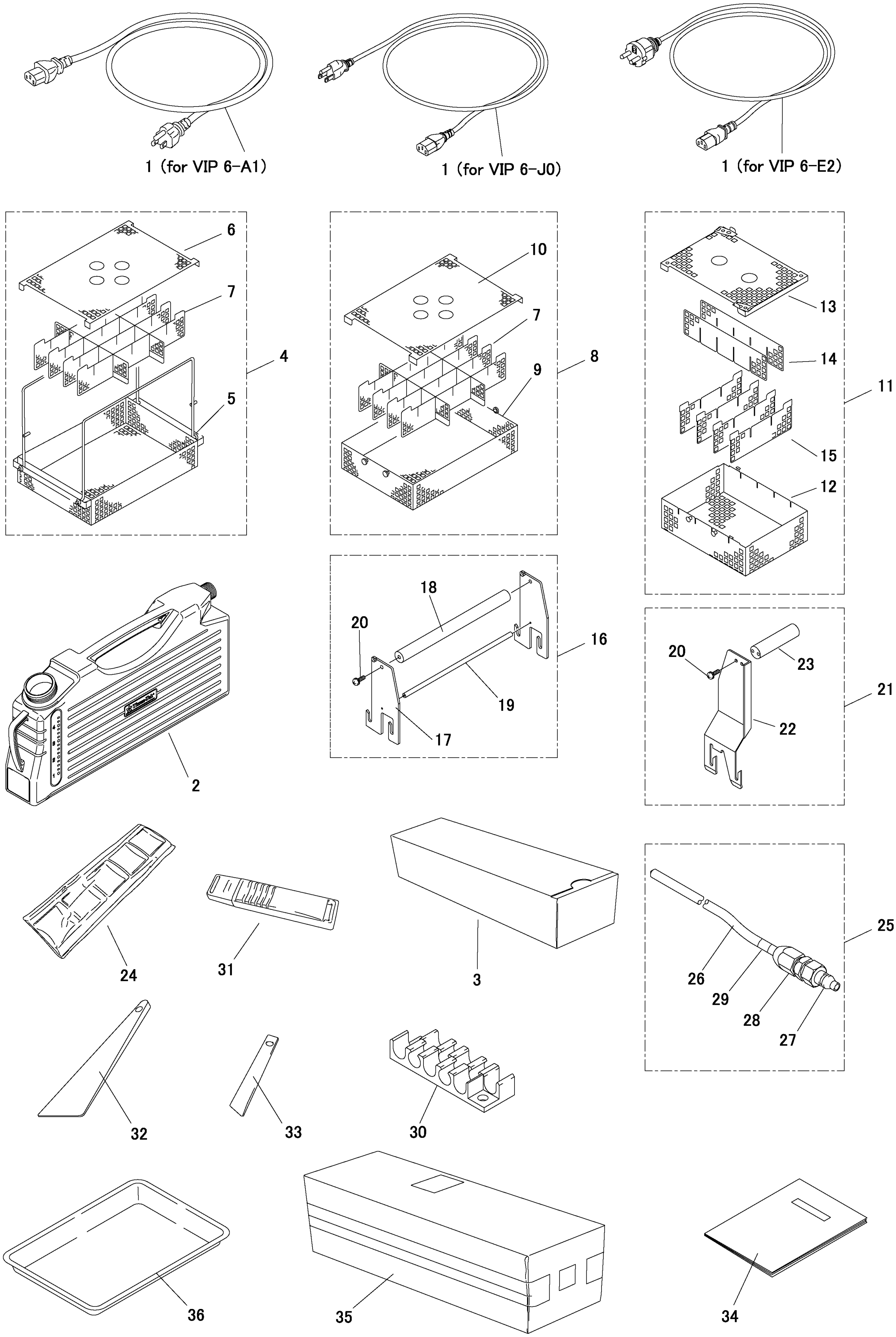




17. Labels

No.	Part Code	Description	Model/Material	Qty			Remarks	Material	Class
				VIP6-A1 (6030)	VIP6-J0 (6031)	VIP6-E2 (6032)			
1	O68-446-00	Paraffin Container Number Plate		1	1	1		Al	C
2	O70-189-00	Rotary Valve Connection Label		1	1	1		PET	C
3	O70-194-00	External Fill/Drain Port Label		2	2	2		PE	
4	O70-191-00	Bottle Rack Top Number Plate		1	1	1		Al	
5	O70-192-00	Bottle Rack Bottom Number Plate		1	1	1		Al	
6	O70-190-00	Bottle Rack Door Push Label		2	2	2		PE	C
7	O70-195-00	External Interface Label		1	1	1		PE	
8	O74-802-00	Label N0-010-S0		1	1	1		PE	C
9	O74-803-00	Label N1-003-S0		1	1	1		PE	C
10	O74-807-00	Label C1-063-S0		5	5	5		PE	C
11	O76-895-00	Label C1-064-S0		1	1	1		PE	C
12	O71-955-00	USB Port Label		1	1	1		PE	
13	B5-03-6630	Protective Grounding Symbol Label		1	1	1		PE	
14	-	Serial Number Label		1	1	1		PE	x
15	B5-08-0005	WEEE Label		0	0	1		PE	x
16	-	ETL Label		1	0	0			x

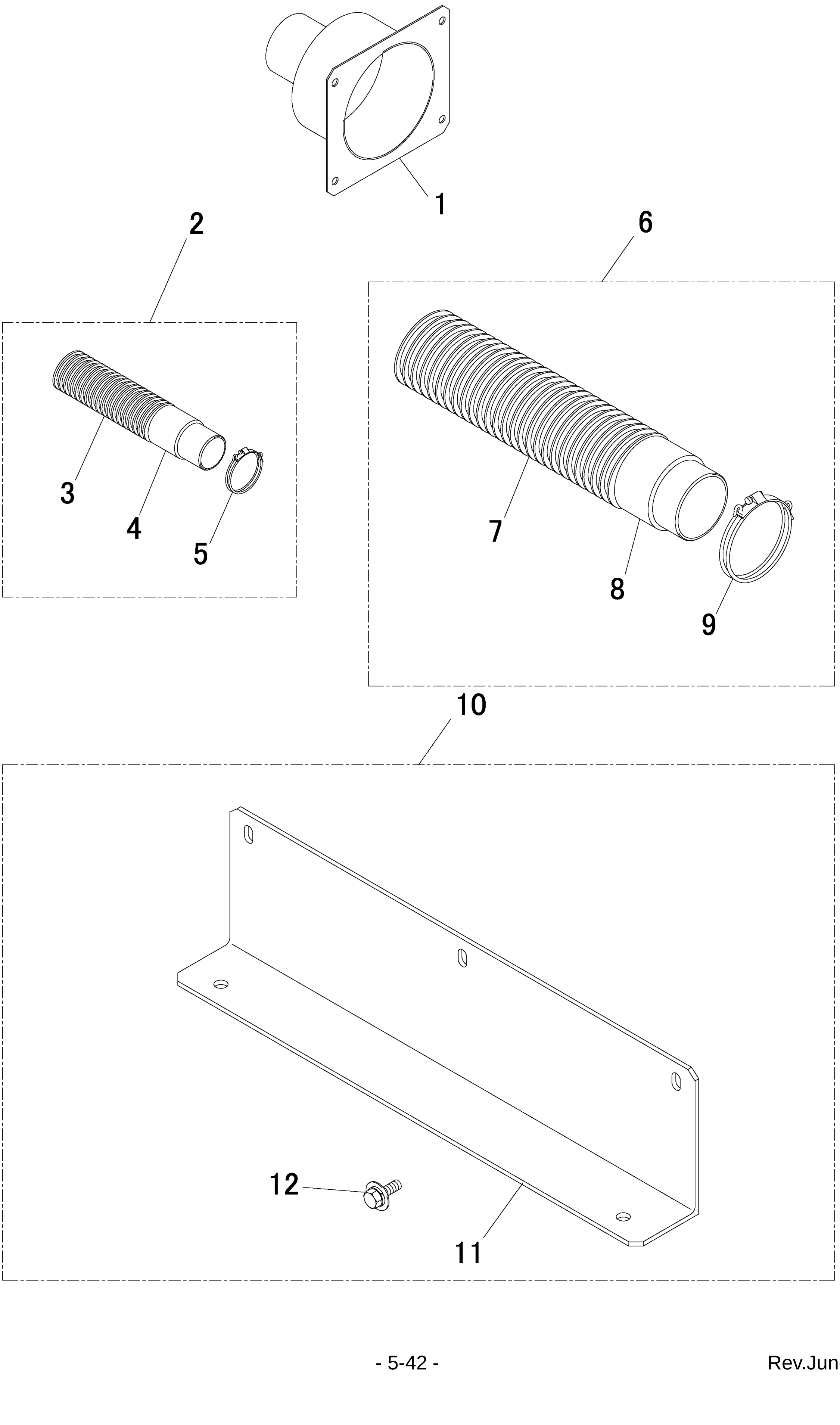
18. Accessories



18. Accessories

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Material	Class
1	A4-01-0518	Power Cord	ULJP-C-ULJPSS-2	1	0	0	115V		
	A4-01-0533	Power Cord	DC-041-N17	0	1	0	100V		
	A4-01-0508	Power Cord	EC-852-N02	0	0	1	230V		
2	O70-411-00	Reagent Bottle (Fluorinated)		1	1	1	Spare bottle body	PE	C
3	D8-93-0138	Waste Paraffin Bag		1	1	1		PE/PP	A
4	F60-024-00	Basket Unit, with Handle (150 cassettes)	M:VIP5-44	2	0	0	VIP5	SUS	
5	F60-055-00	Basket Body, with Handle (150 cassettes)	M:VIP5-92	2	0	0	VIP5	SUS	
6	O68-118-00	Basket Lid -1		2	0	0	VIP5	SUS	
7	O68-119-00	Basket Divider -1		2	0	0	VIP5	SUS	
8	F60-025-00	Basket, without Handle (150 cassettes)	M:VIP5-45	0	0	2	VIP5	SUS	
9	O68-127-00	Basket Body, without Handle -3		0	0	2	VIP5	SUS	
10	O68-129-00	Basket Lid -3		0	0	2	VIP5	SUS	
11	F60-094-00	Basket Unit (75 cassettes)	M:VIP5Jr-31	0	4	0	VIP5-Jr	SUS	
12	O69-621-00	Basket Body (75 cassettes)		0	4	0	VIP5-Jr	SUS	
13	O69-623-00	Basket Lid (75 cassettes)		0	4	0	VIP5-Jr	SUS	
14	O68-109-00	Divider		0	8	0	VIP5-Jr	SUS	
15	O68-132-00	Divider -3		0	16	0	VIP5-Jr	SUS	
16	F60-027-00	Basket Carrier (150 cassettes)	M:VIP5-47	0	0	1	VIP5		
17	O68-140-00	Basket Carrier Side Plate		0	0	2	VIP5	SUS	
18	O68-142-00	Basket Carrier Handle (150 cassettes)		0	0	1	VIP5	POM	
19	O68-143-00	Basket Carrier Bar		0	0	1	VIP5	SUS	
20	B6-28-2000	Pan Head Screw, Sems A	M4x8 Sems A SUS	0	4	0		SUS	
21	F60-095-00	Basket Carrier (75 cassettes)	M:VIP5Jr-32	0	1	0	VIP5-Jr		
22	O69-630-00	Basket Carrier Body (75 cassettes)		0	1	0	VIP5-Jr	SUS	
23	O69-628-00	Basket Carrier Handle (75 cassettes)		0	1	0	VIP5-Jr	POM	
24	F60-529-00	Bottle Label Set	M:VIP6-712	1	1	1			A
25	F60-528-00	External Drain/Fill Hose	M:VIP6-711	3	3	3		PE	C
26	O70-775-01	External Drain/Fill Tube		3	3	3		PE	C
27	A6-27-4025	One Touch Coupler, Plug	JF-02TK	3	3	3			C
28	A6-27-5211	Z Union Fitting	HZ-10-02 Black	3	3	3		POM	C
29	O70-776-00	External Drain/Fill Hose Label		1	1	1		PE	C
30	F60-584-00	Hose Holder	M:VIP6-715	1	1	1		PP	C
31	A3-60-4304	USB Memory	UDG3-1GAR	1	1	1			C
32	D9-06-0801	Scraper, Large	YK	1	1	1	Scraper (large)	POM	C
33	D9-06-0505	Scraper, Small	300105 0020	1	1	1	Scraper (small)	POM	C
34	-	Operating Manual (Japanese)		0	1	0			
	-	Operating Manual (English)		1	0	1			
35	F60-288-00	Activated Carbon Filter	Tissue-Tek 6160 (M:DRS05-33)	1	1	1			A
36	B4-00-0000	Basket Tray	18-0 10 inch.	1	1	1		SUS	

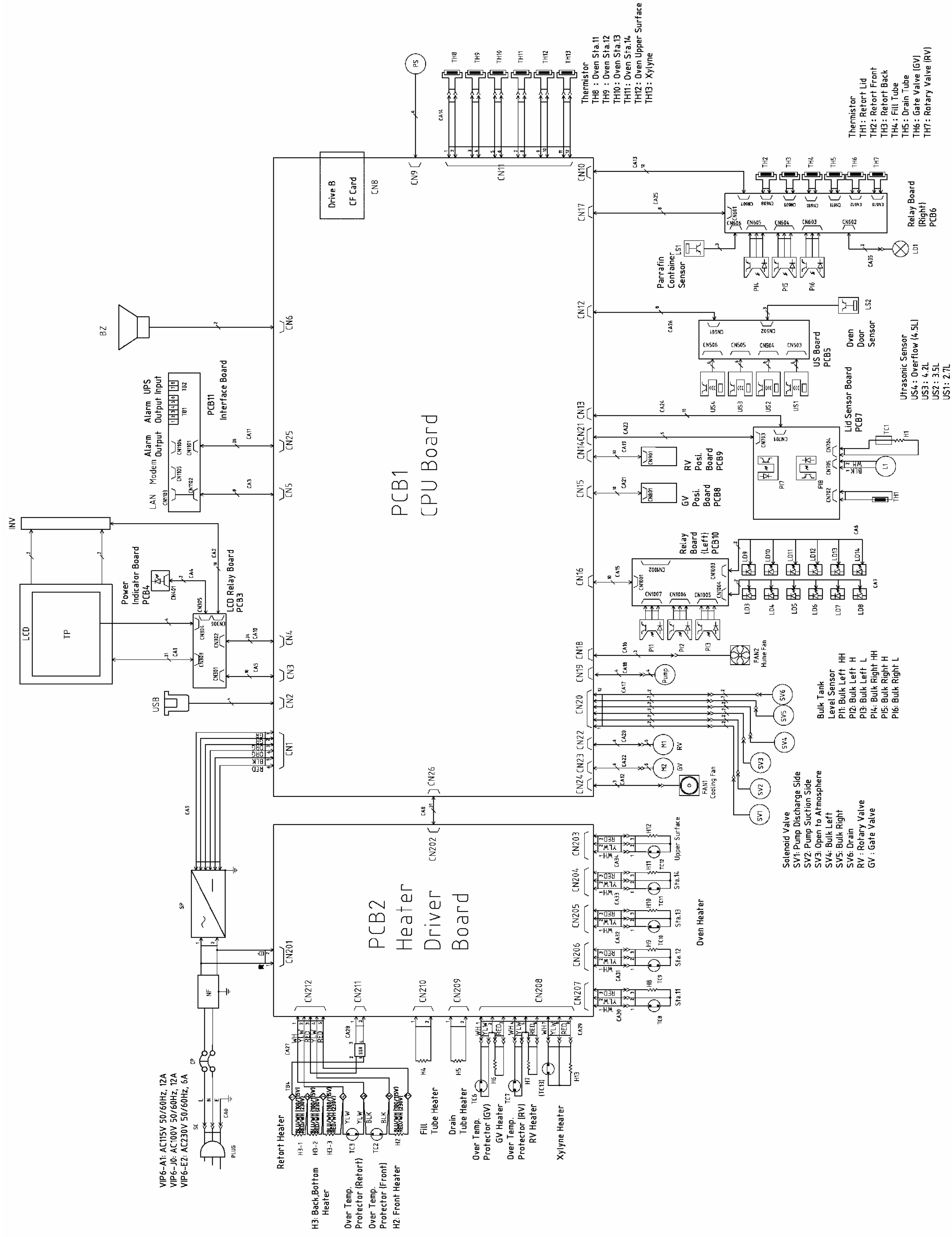
19. Options



19. Options

No.	Part Code	Description	Model/Material	Qty			Remarks	Material	Class
				VIP6-A1 (6030)	VIP6-J0 (6031)	VIP6-E2 (6032)			
1	N94-390-00	Duct Connection Adapter		1	1	1	Glas g2	Fe	
2	F60-536-00	Duct Hose Set (38mm OD)	M:VIP6-912	1	1	1			
3	B7-22-0030	Duct Hose	38mm	5m	5m	5m		PVC	
4	B7-22-0110	Duct Cuffs	38mm	1	1	1		PVC	
5	D9-00-0146	Hose Clamp	SY38	1	1	1		Fe	
6	F60-537-00	Duct Hose Set (75mm OD)	M:VIP6-913	1	1	1			
7	B7-22-0040	Duct Hose	75mm	5m	5m	5m		PVC	
8	B7-22-0111	Duct Cuffs	75mm	1	1	1		PVC	
9	D9-00-0158	Hose Clamp	SY75	1	1	1		Fe	
10	F60-535-00	Seismic Anchorage	M:VIP6-911	1	1	1		SUS	
11	O70-175-01	Bracket		2	2	2		SUS	
12	B6-11-2072	Hex Head Screw, Sems B	M6x12 Sems B SUS	3	3	3		SUS	

20. Schematic Diagram



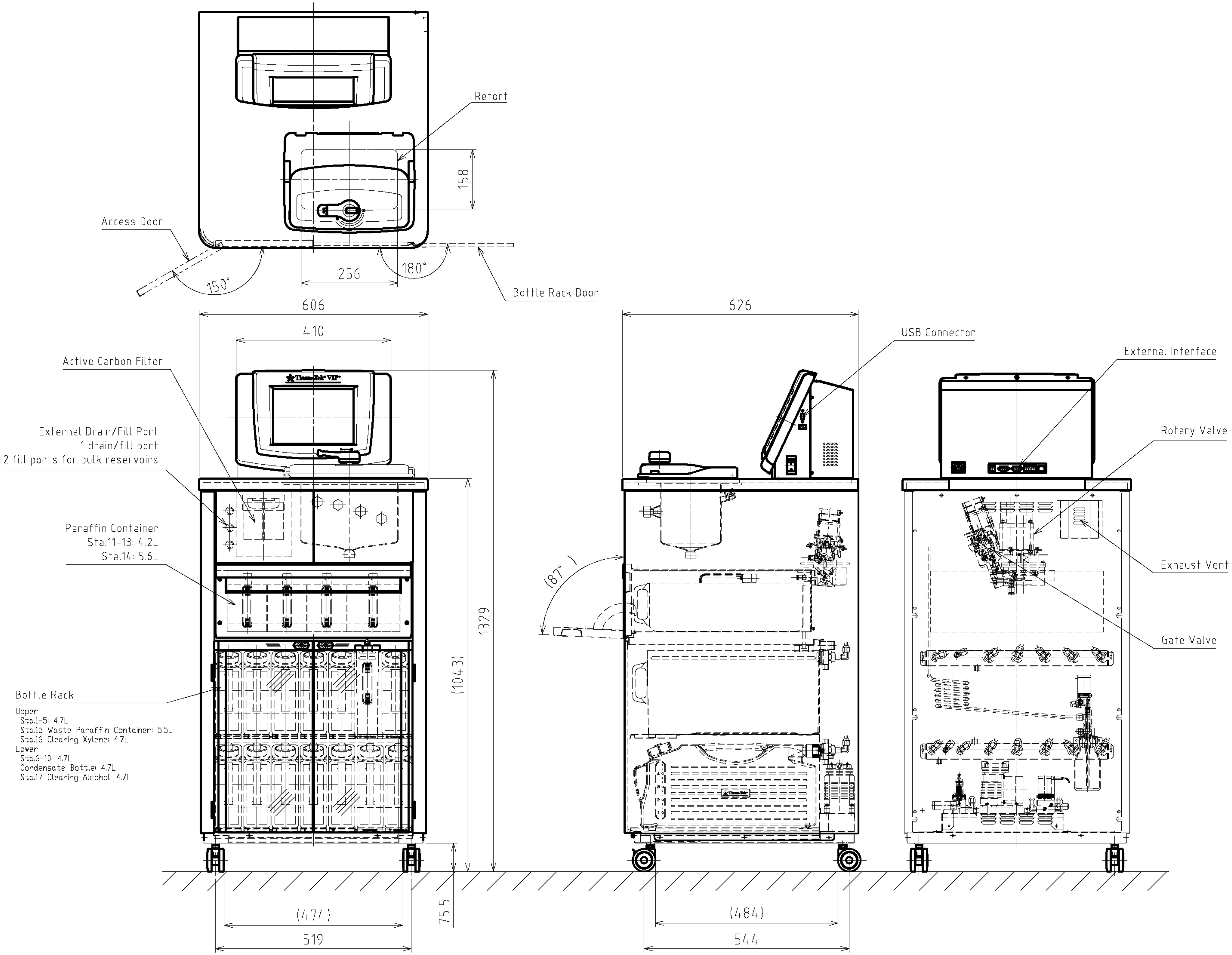
20. Schematic Diagram

No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Class
CP	F52-782-00	Circuit Protector 115V	E:VIP6-086	1	1	0	100/115V	C
	F52-783-00	Circuit Protector 230V	E:VIP6-087	0	0	1	230V	C
SP	A3-16-1073	Switching Power Supply	LEB225F-0524	1	1	1		B
M1	A0-41-0007	Stepping Motor	A7193-9412KSG	1	1	1		C
M2	A0-41-0008	Stepping Motor	C9937-9212KGM	1	1	1		C
LCD	A3-60-4225	LCD Module	LTA104A261F	1	1	1	available as a unit (Control Panel Unit, #47, 5-12)	x
INV	A3-16-1072	Inverter	VNR104A260-INV	1	1	1		B
TP	A3-91-0002	Touch Panel	ATP-104	1	1	1	available as a unit (Control Panel Unit, #47, 5-12)	x
PLUG	A4-01-0518	Power Cord	ULJP-C-ULJPSS-2	1	0	0	115V	C
	A4-01-0533	Power Cord	DC-041-N17	0	1	0	100V	C
	A4-01-0508	Power Cord	EC-852-N02	0	0	1	230V	C
USB	A4-10-2024	USB Cable	USB-002A	1	1	1		C
TH8-12	A3-60-3044	Thermistor	PB3L-41E-S1	5	5	5		C
TH2,3,13	A3-60-3046	Thermistor	PBP-41E-S4	3	3	3		C
TH6,7	A3-60-3043	Thermistor	PB2M-41E-S17	2	2	2		C
TH1,4,5	A3-60-3045	Thermistor	PB3L-41E-S2	3	3	3		C
PCB1	F52-701-00	CPU Board	E:VIP6-001	1	1	1		B
PCB2	F52-702-00	Heater Driver Board	E:VIP6-002	1	1	1		B
PCB3	F52-703-00	LCD Relay Board	E:VIP6-003	1	1	1		B
PCB4	F52-704-00	Power Indicator Board	E:VIP6-004	1	1	1		C
PCB5	F52-705-00	Ultrasonic Sensor Board	E:VIP6-005	1	1	1		C
PCB6	F52-706-00	Relay Board (Right)	E:VIP6-006	1	1	1		C
PCB7	F52-707-00	Lid Sensor Board	E:VIP6-007	1	1	1		C
PCB8	F52-708-00	GV Positioning Board	E:VIP6-008	1	1	1		C
PCB9	F52-709-00	RV Positioning Board	E:VIP6-009	1	1	1		C
PCB10	F52-710-00	Relay Board (Left)	E:VIP6-010	1	1	1		C
PCB11	F52-711-00	Interface Board	E:VIP6-011	1	1	1		C
LD3-14	F52-712-00	Bottle LED Unit	E:VIP6-012	12	12	12		C
CA1,CA8	F52-713-00	LCD FPC Cable	E:VIP6-013	2	2	2		C
CA2	F52-714-00	Inverter Cable	E:VIP6-014	1	1	1		C
CA3	F52-715-00	LAN Cable	E:VIP6-015	1	1	1		C
CA4	F52-716-00	LED Cable	E:VIP6-016	1	1	1		C
CA5	F52-717-00	LCD Relay Board 1	E:VIP6-017	1	1	1		C
CA6,CA7	F52-718-00	Bottle LED Cable	E:VIP6-018	2	2	2		C
SC	A4-01-0609	Power Inlet	NC-176-F6.35-1.0	1	1	1		C
NF	F52-720-00	Noise Filter	E:VIP6-021	1	1	1		C
CA9	F52-721-00	DC Power Supply Cable	E:VIP6-022	1	1	1		C
CA10	F52-722-00	LCD Relay Cable 2	E:VIP6-023	1	1	1		C
CA11	F52-723-00	Interface Cable	E:VIP6-024	1	1	1		C
FAN1	F52-724-00	Cooling Fan	E:VIP6-025	1	1	1		C
CA12	F52-725-00	Cooling Fan Cable	E:VIP6-026	1	1	1		C
BZ	F52-726-00	Speaker	E:VIP6-027	1	1	1		C
CA13	F52-727-00	Temperature Sensor Cable 1	E:VIP6-028	1	1	1		C
CA14	F52-728-00	Temperature Sensor Cable 2	E:VIP6-029	1	1	1		C
CA15	F52-729-00	Left Relay Board Cable	E:VIP6-030	1	1	1		C
CA16	F52-731-00	Fume Fan Cable	E:VIP6-032	1	1	1		C
FAN2	F52-732-00	Fume Fan	E:VIP6-033	1	1	1		B
CA17	F52-733-00	Solenoid Valve Cable	E:VIP6-034	1	1	1		C
CA18	F52-734-00	Pump Cable	E:VIP6-035	1	1	1		C
Pump	F52-735-00	Air Pump	E:VIP6-036	1	1	1		B
CA19	F52-736-00	RV Positioning Board Cable	E:VIP6-037	1	1	1		C
CA20	F52-737-00	RV Cable	E:VIP6-038	1	1	1		C
CA21	F52-739-00	GV Positioning Board Cable	E:VIP6-040	1	1	1		C
CA22	F52-740-00	GV Cable	E:VIP6-041	1	1	1		C
CA23	F52-742-00	Lid Cable	E:VIP6-043	1	1	1		C
H1(TC1)	A1-00-0058	Aluminum Foil Heater	33WQ10	1	1	1		C
L1	F52-743-00	Lid Solenoid	E:VIP6-045	1	1	1		C
CA24	F52-744-00	Lid Sensor Cable	E:VIP6-046	1	1	1		C
CA25	F52-745-00	Right Relay Board Cable	E:VIP6-047	1	1	1		C
CA26	F52-746-00	Ultrasonic Sensor Relay Cable	E:VIP6-048	1	1	1		C

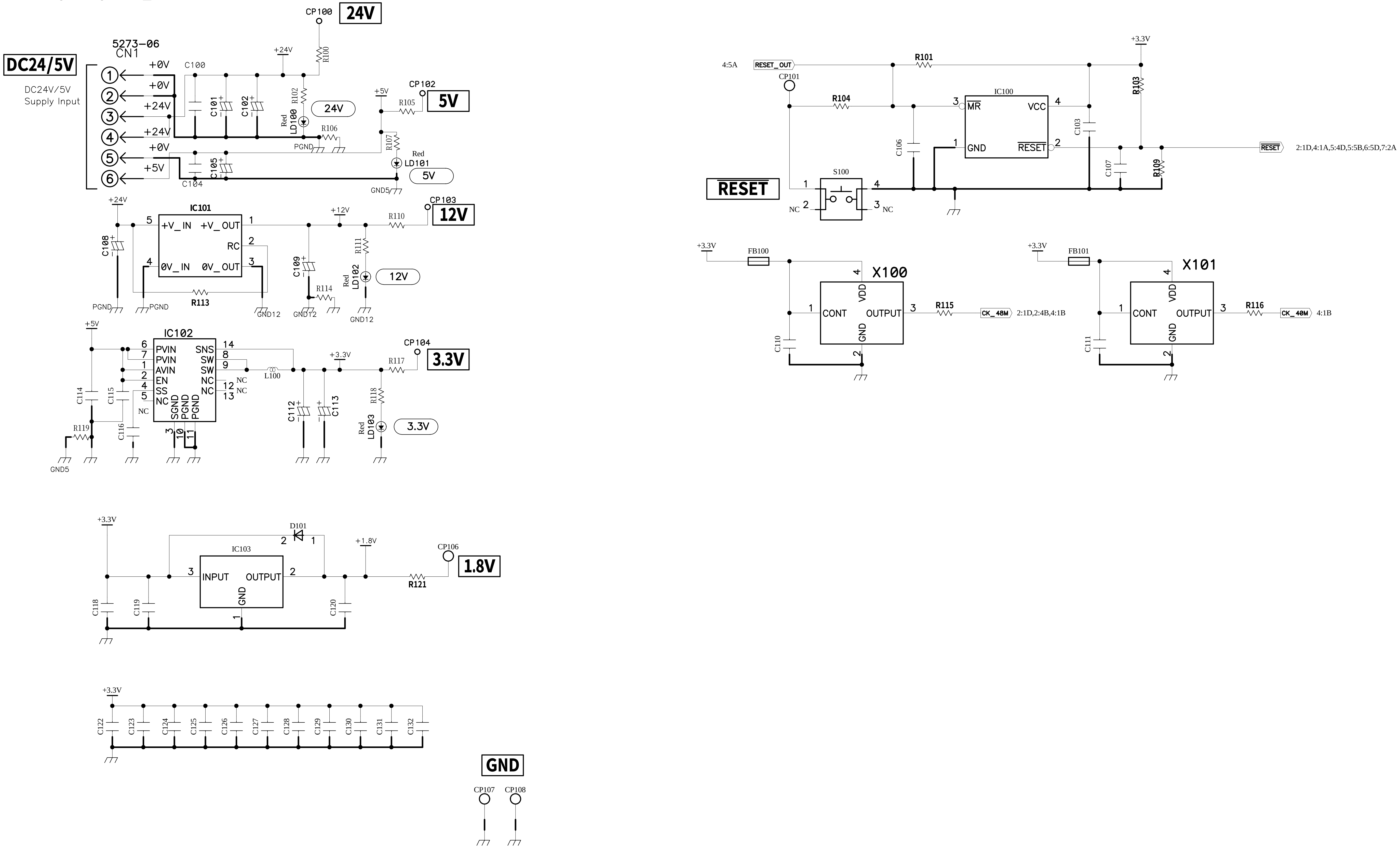
20. Schematic Diagram

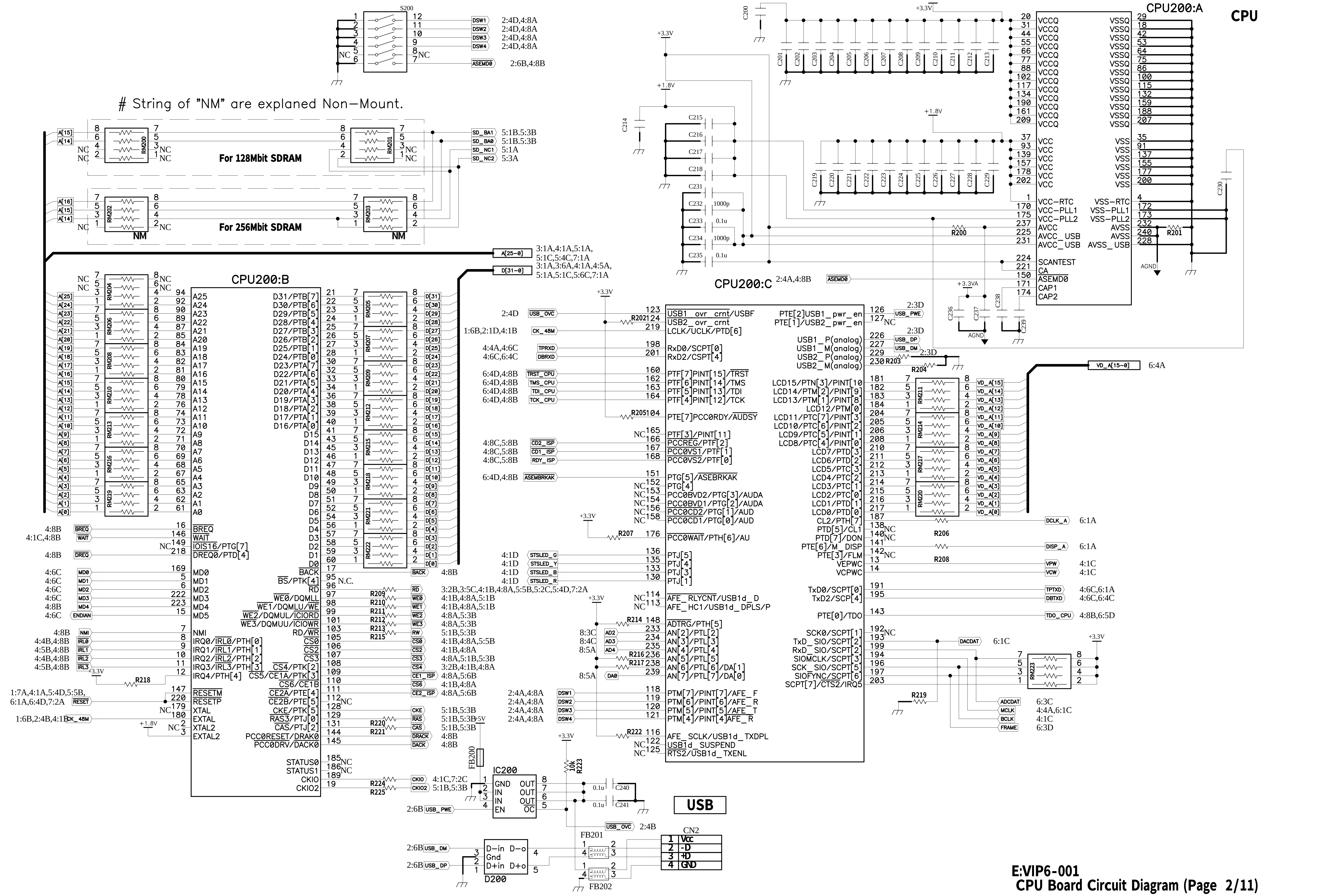
No.	Part Code	Description	Model/Material	Qty VIP6-A1 (6030)	Qty VIP6-J0 (6031)	Qty VIP6-E2 (6032)	Remarks	Class
PS	F52-747-00	Pressure Sensor	E:VIP6-049	1	1	1		C
CA27	F52-748-00	Retort Heater Cable	E:VIP6-050	1	1	1		C
CA28	F52-749-00	Retort Heater SSR Cable	E:VIP6-051	1	1	1		C
CA29	F52-750-00	Valve Heater Cable	E:VIP6-052	1	1	1		C
CA30	F52-784-00	Oven Heater Relay Cable 11	E:VIP6-088	1	1	1		C
CA31	F52-785-00	Oven Heater Relay Cable 12	E:VIP6-089	1	1	1		C
CA32	F52-786-00	Oven Heater Relay Cable 13	E:VIP6-090	1	1	1		C
CA33	F52-787-00	Oven Heater Relay Cable 14	E:VIP6-091	1	1	1		C
CA34	F52-788-00	Oven Heater Relay Cable OV	E:VIP6-092	1	1	1		C
CA35	F52-752-00	Wax Drain Container Indicator Cable	E:VIP6-054	1	1	1		C
LS1	F52-753-00	Wax Drain Container Sensor	E:VIP6-055	1	1	1		C
LS2	F52-754-00	Oven Door Sensor	E:VIP6-056	1	1	1		C
PI1	F52-791-00	Level Sensor 1	E:VIP6-101	1	1	1		C
PI2	F52-792-00	Level Sensor 2	E:VIP6-102	1	1	1		C
PI3	F52-793-00	Level Sensor 3	E:VIP6-103	1	1	1		C
PI4	F52-794-00	Level Sensor 4	E:VIP6-104	1	1	1		C
PI5	F52-795-00	Level Sensor 5	E:VIP6-105	1	1	1		C
PI6	F52-796-00	Level Sensor 6	E:VIP6-106	1	1	1		C
LD1	F52-757-00	Wax Drain Container Indicator	E:VIP6-059	1	1	1		C
SV1-SV6	F52-760-00	Solenoid Valve	E:VIP6-062	6	6	6		B
US1-US4	F52-789-00	Ultrasonic Sensor Rev.D	E:VIP6-963	4	4	4	~2009/1	B
	F52-790-00	Ultrasonic Sensor	E:VIP6-094	4	4	4	2009/2 ~	B
TC2	F52-762-00	Over Temperature Protector (Retort	E:VIP6-064	1	1	1		C
TC3	F52-763-00	Over Temperature Protector (Retort)	E:VIP6-065	1	1	1		C
H4	F52-764-00	Fill Tube Heater 115V	E:VIP6-066	1	1	0	100/115V	C
	F52-771-00	Fill Tube Heater 230V	E:VIP6-073	0	0	1	230V	C
H5	F52-765-00	Drain Tube Heater 115V	E:VIP6-067	1	1	0	100/115V	C
	F52-772-00	Drain Tube Heater 230V	E:VIP6-074	0	0	1	230V	C
H6,H7	F52-769-00	Valve Heater Unit 115V	E:VIP6-071	2	0	0	115V	C
	F52-766-00	Valve Heater Unit 100V	E:VIP6-068	0	2	0	100V	C
	F52-770-00	Valve Heater Unit 230V	E:VIP6-072	0	0	2	230V	C
TC6,TC7	F52-767-00	Valve Over Temperature Protector	E:VIP6-069	2	2	2		C
H13(TC13)	F52-768-00	Xylene Heater Unit 115V	E:VIP6-070	1	1	0	100/115V	x
	F52-773-00	Xylene Heater Unit 230V	E:VIP6-075	0	0	1	230V	x
H2	F52-774-00	Retort Front Heater 115V	E:VIP6-076	1	1	0	100/115V	x
	F52-778-00	Retort Front Heater 230V	E:VIP6-082	0	0	1	230V	x
H3-1	F52-775-00	Retort Back Heater 115V	E:VIP6-077	1	1	0	100/115V	x
	F52-779-00	Retort Back Heater 230V	E:VIP6-083	0	0	1	230V	x
H3-2	F52-776-00	Retort Bottom Heater Right 115V	E:VIP6-078	1	1	0	100/115V	x
	F52-780-00	Retort Bottom Heater Right 230V	E:VIP6-084	0	0	1	230V	x
H3-3	F52-777-00	Retort Bottom Heater Left 115V	E:VIP6-079	1	1	0	100/115V	x
	F52-781-00	Retort Bottom Heater Left 230V	E:VIP6-085	0	0	1	230V	x
H8-H10 (TC8-10)	A1-00-0049	Aluminum Foil Heater	33GQ10	3	0	0	115V	C
	A1-00-0048	Aluminum Foil Heater	33FQ10	0	3	0	100V	C
	A1-00-0051	Aluminum Foil Heater	33HQ10	0	0	3	230V	C
H11(TC11)	A1-00-0053	Aluminum Foil Heater	33KQ10	1	0	0	115V	C
	A1-00-0052	Aluminum Foil Heater	33JQ10	0	1	0	100V	C
	A1-00-0054	Aluminum Foil Heater	33LQ10	0	0	1	230V	C
H12(TC12)	A1-00-0056	Aluminum Foil Heater	33NQ10	1	0	0	115V	C
	A1-00-0055	Aluminum Foil Heater	33MQ10	0	1	0	100V	C
	A1-00-0057	Aluminum Foil Heater	33PQ10	0	0	1	230V	C
TB4	A4-05-0097	Terminal Block	UF1003-20A-7P, free termi	1	1	1		
CA0	F52-719-00	Protective Grounding Cable	E:VIP6-020	1	1	1		C
SSR	A3-10-7008	Solid State Relay	AQJ112V	1	1	1		C

Chapter 6 Instrument Configuration



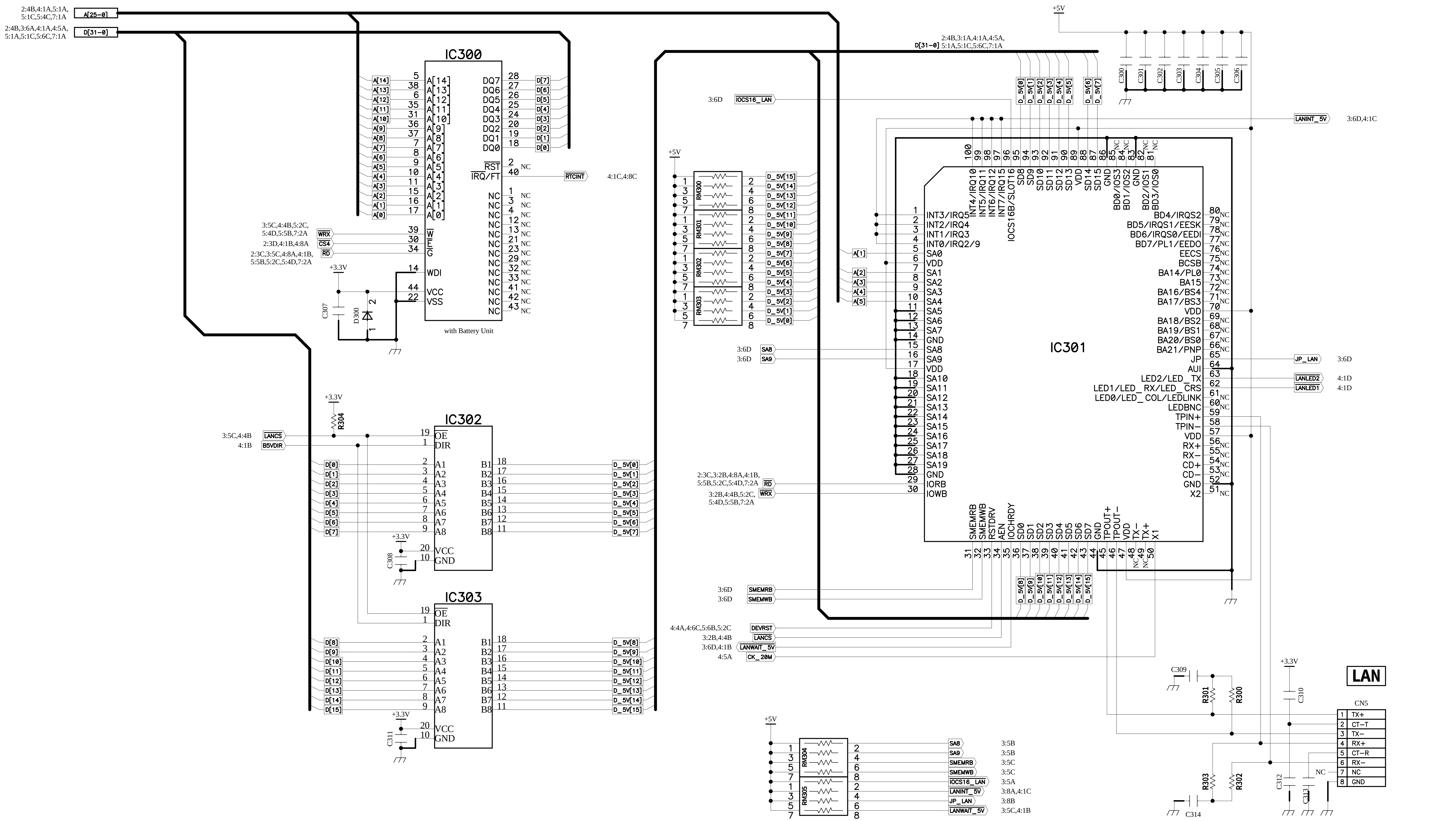
Chapter 7 Electric Circuit Diagrams


24V
DC24/5V
DC24V/5V Supply Input
5273-06 CN1
5V
12V
3.3V
1.8V
RESET
IC100
IC101
IC102
IC103
X100
X101
GND



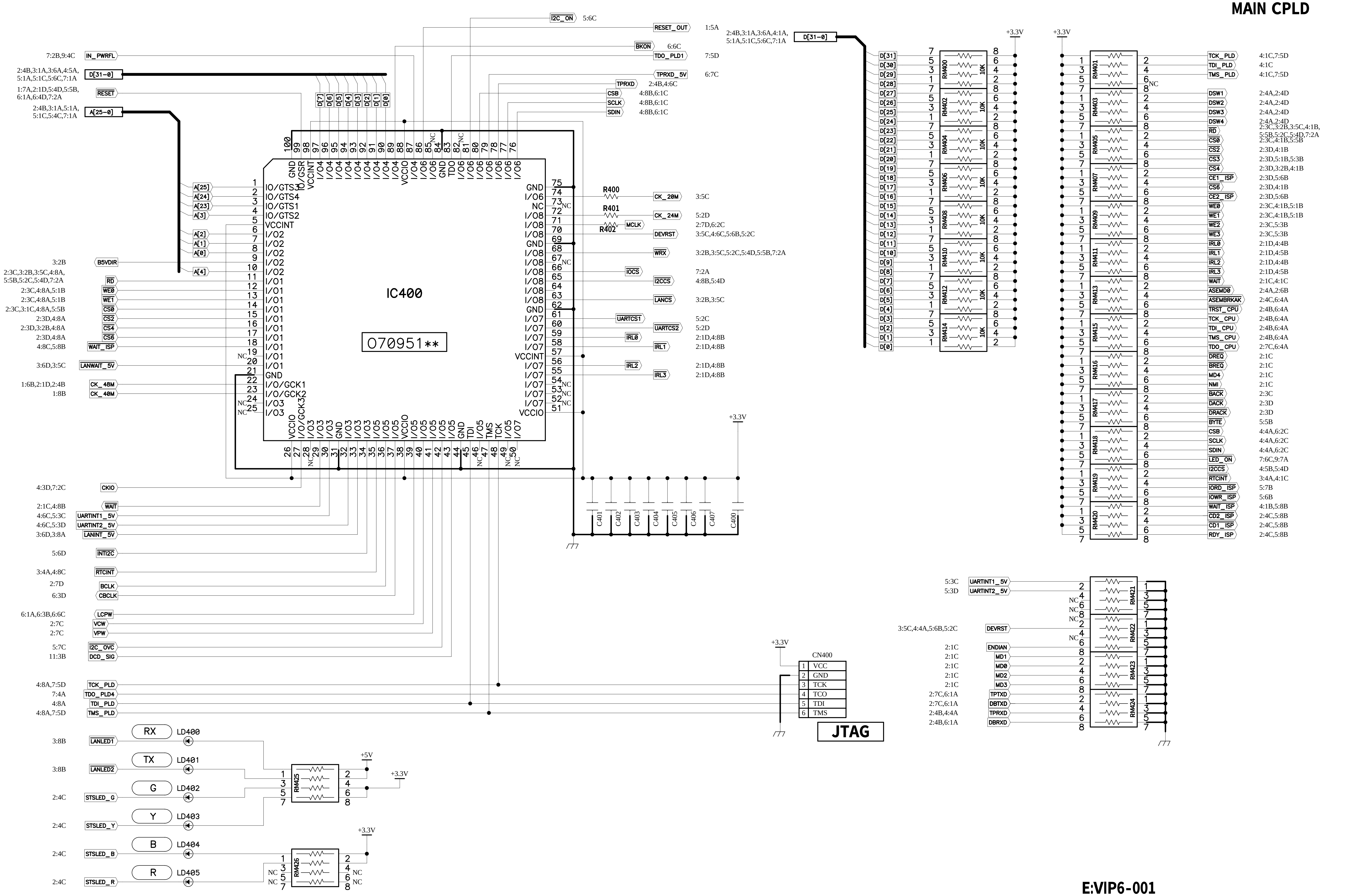
E:VIP6-001
CPU Board Circuit Diagram (Page 2/11)

LAN,NVRAM



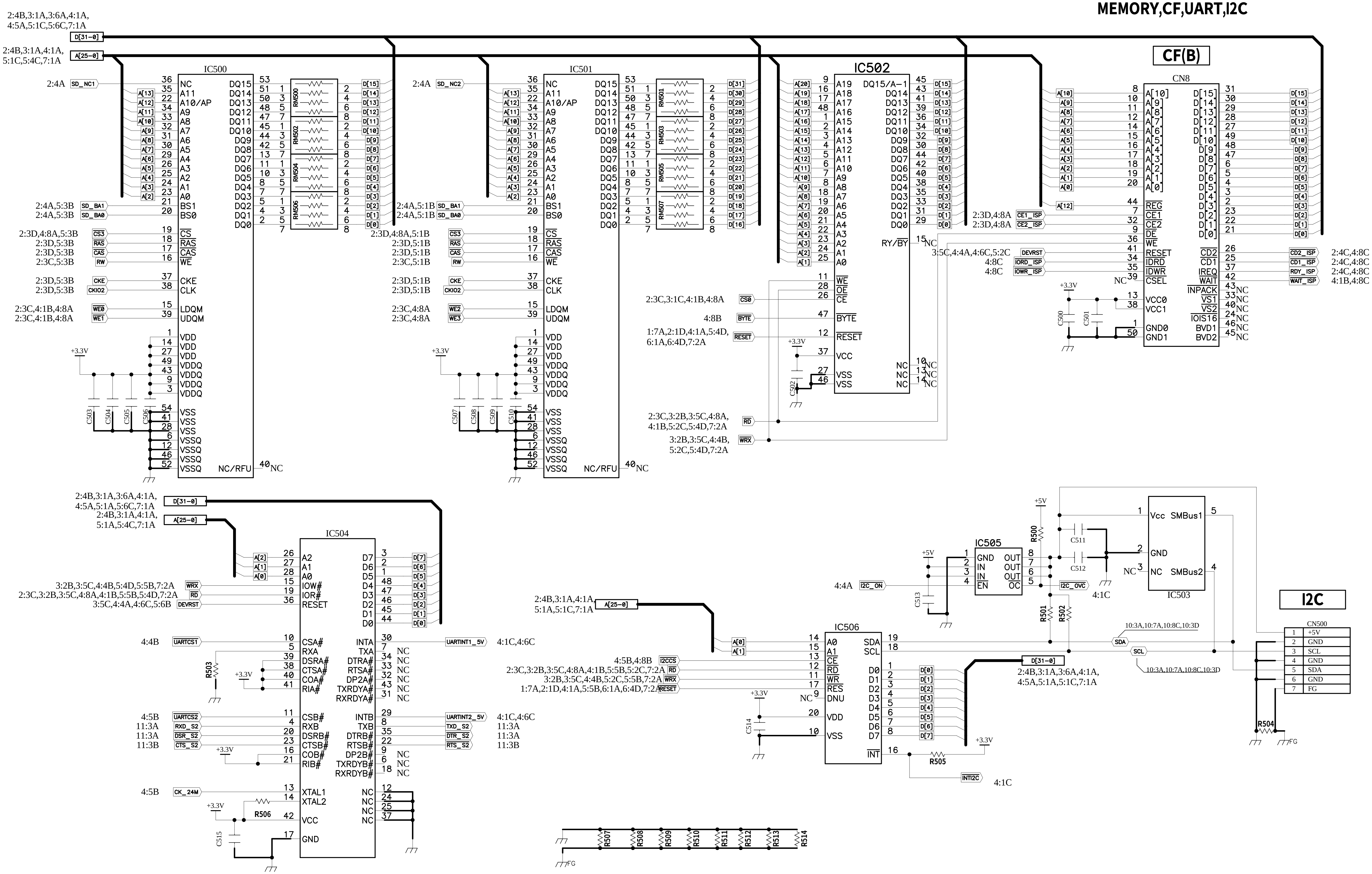
E:VIP6-001
CPU Board Circuit Diagram (Page 3/11)

MAIN CPLD

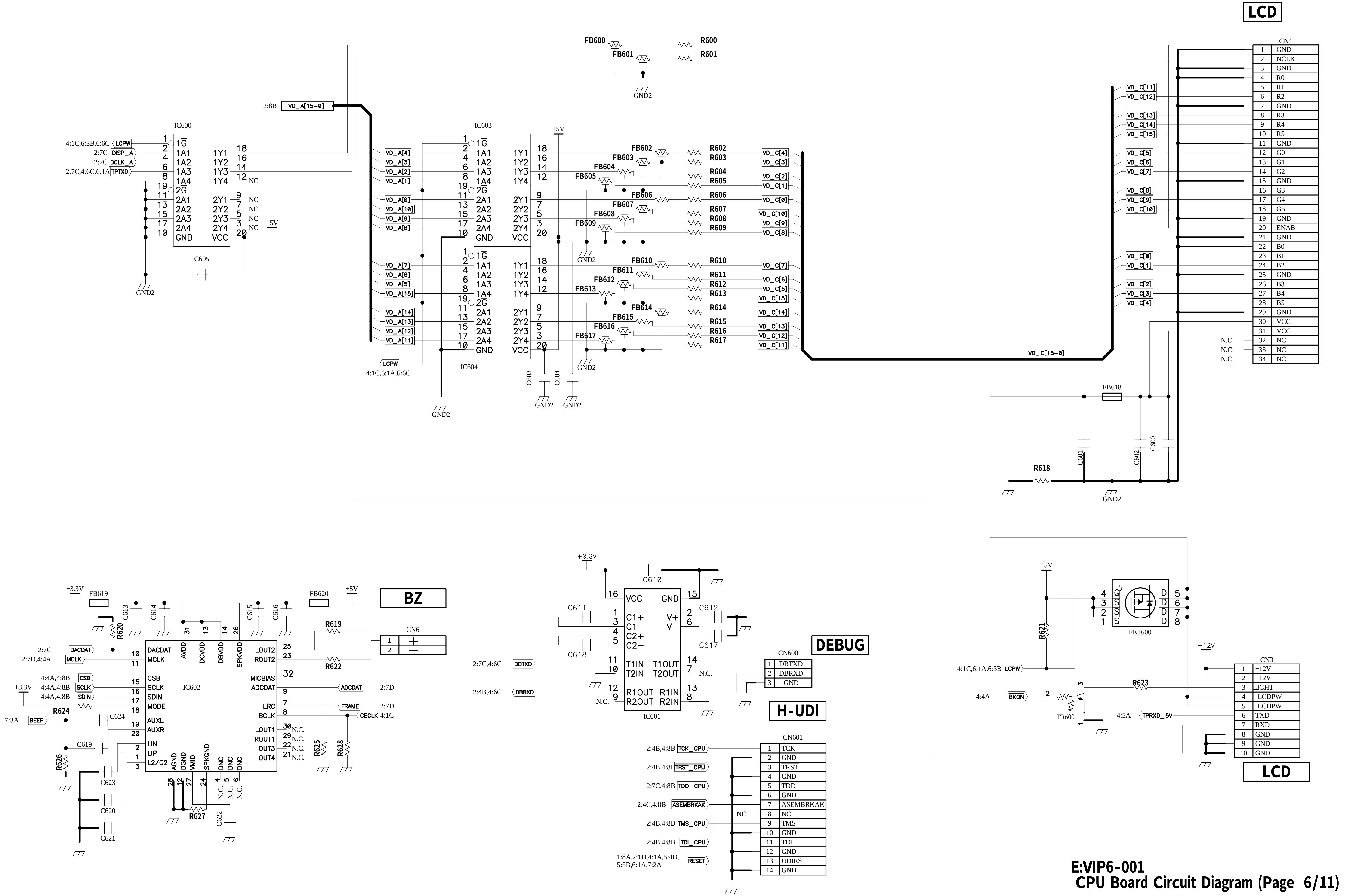


E:VIP6-001
CPU Board Circuit Diagram (Page 4/11)

MEMORY,CF,UART,I2C

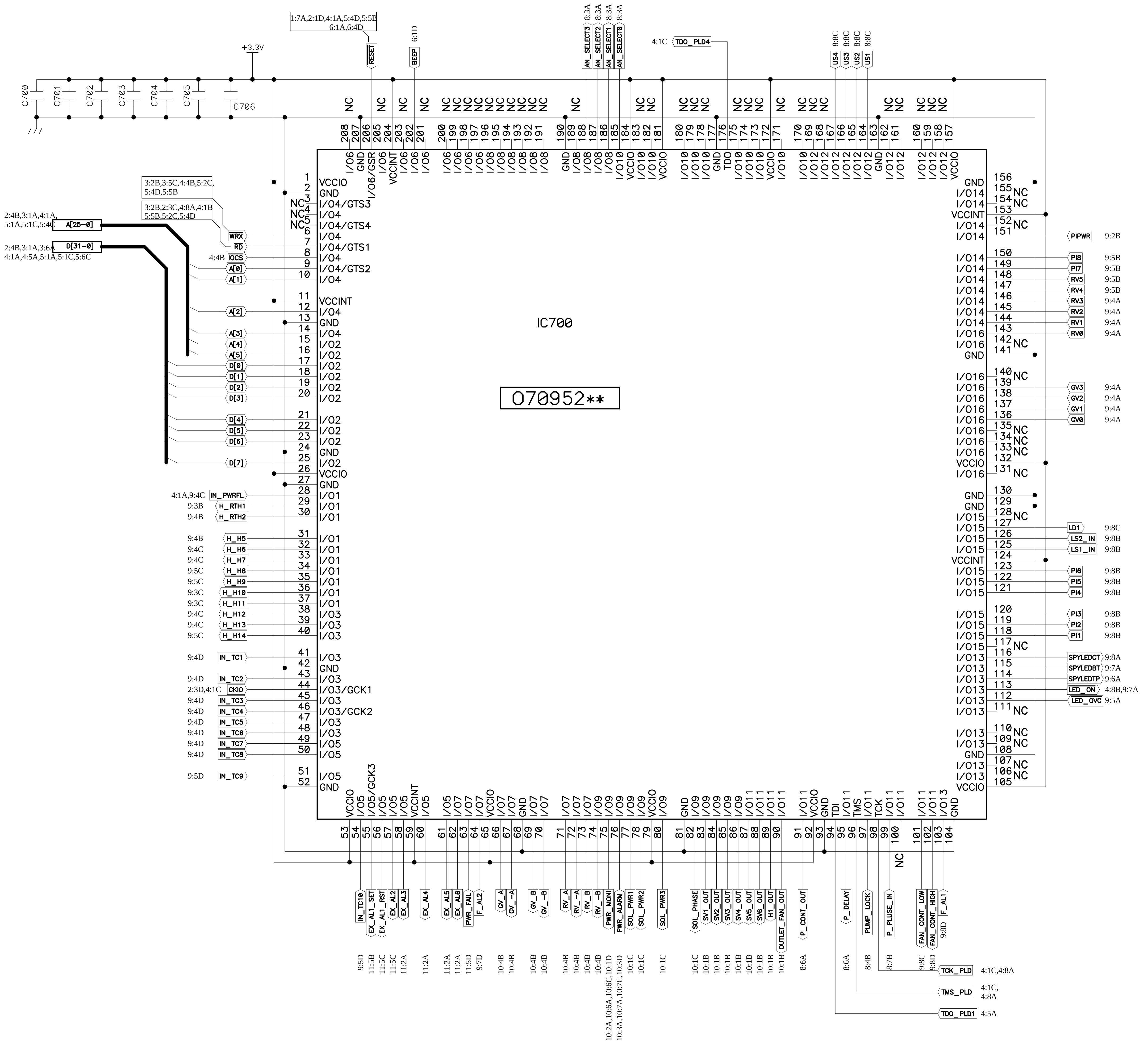


CPU Interface
(LCD,RS232C,Audio)



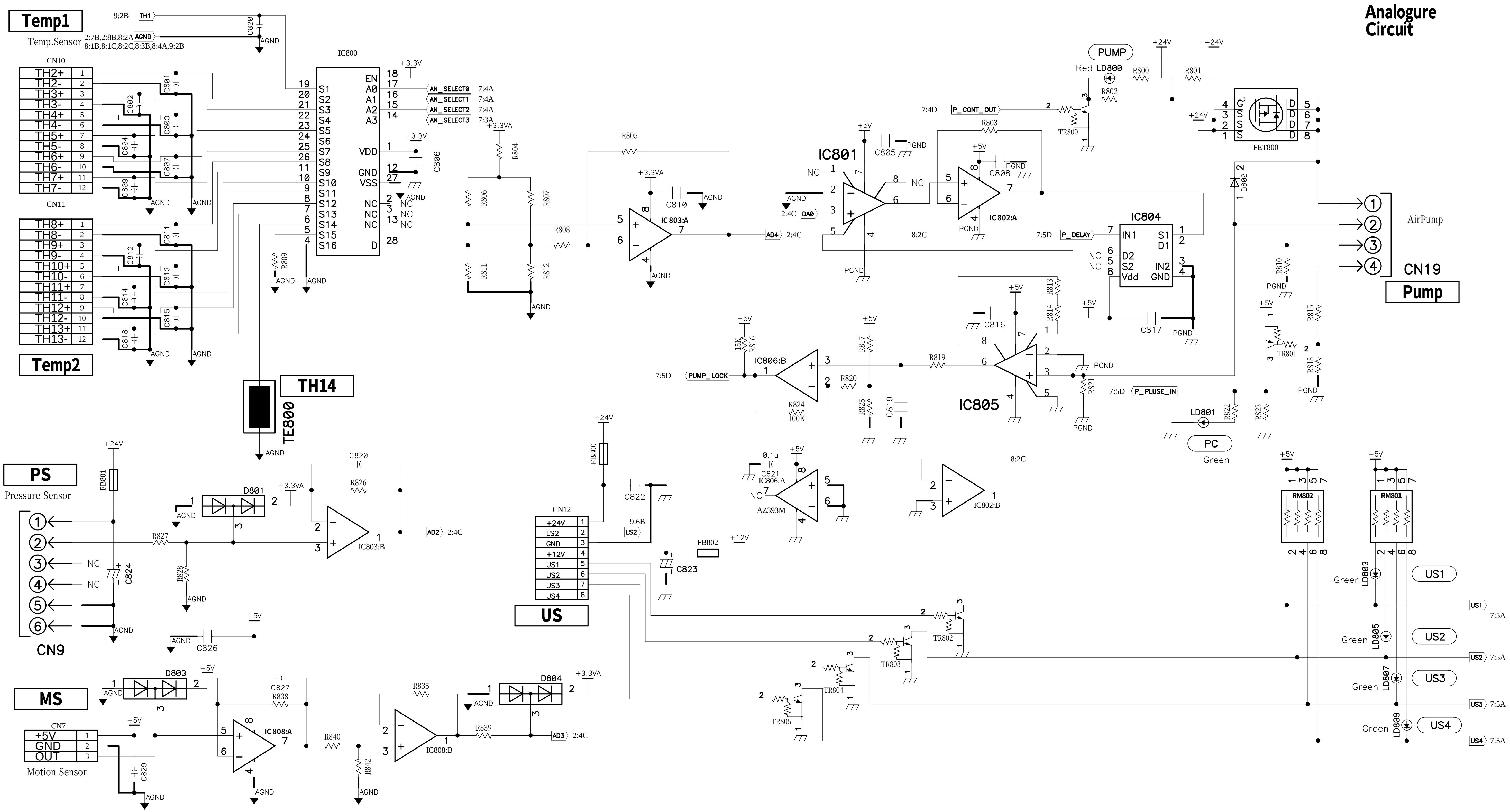
E:VIP6-001
CPU Board Circuit Diagram (Page 6/11)

Input/Output CPLD



E:VIP6-001
CPU Board Circuit Diagram (Page 7/11)

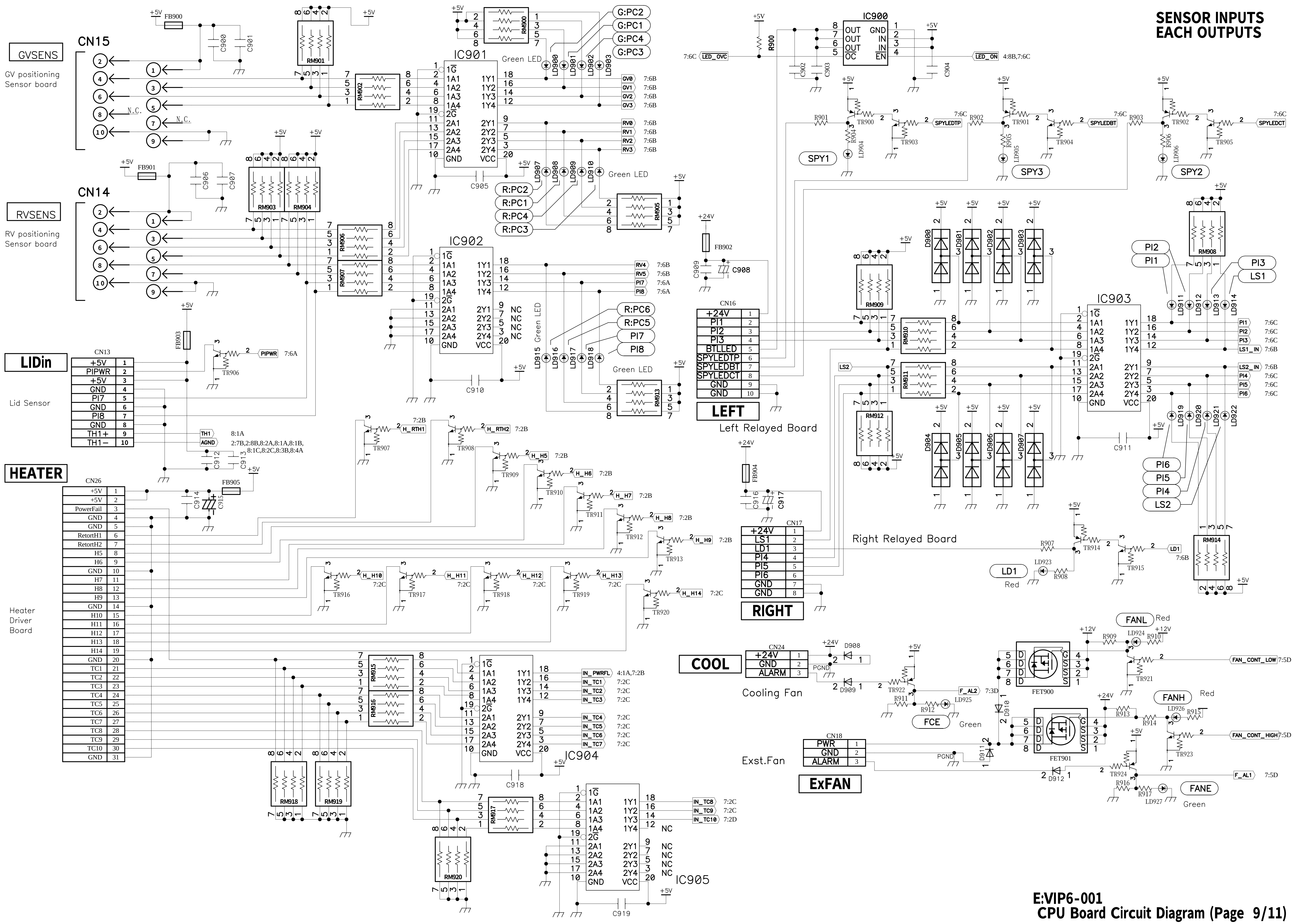
Analogure Circuit



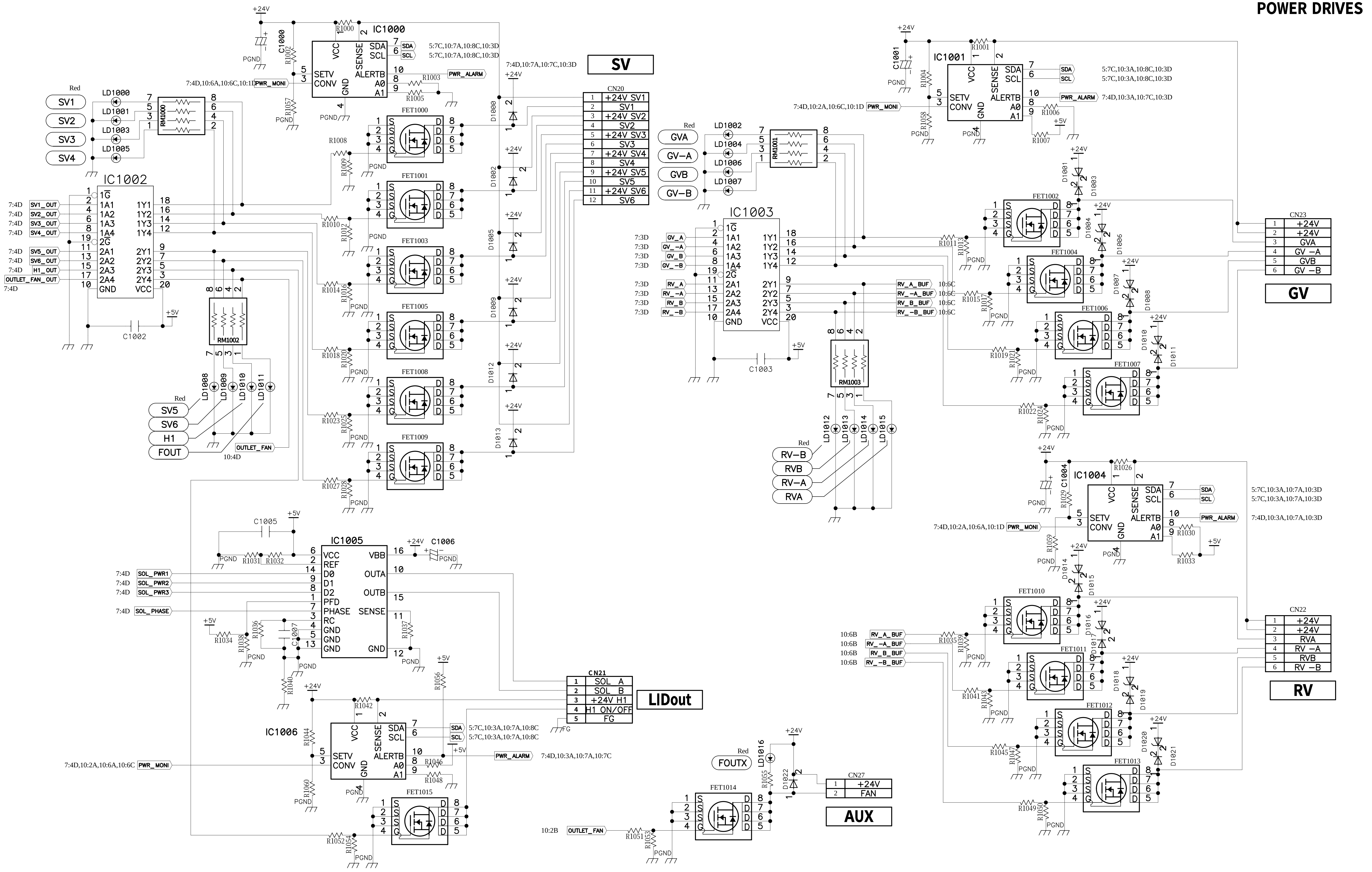
E:VIP6-001

CPU Board Circuit Diagram (Page 8/11)

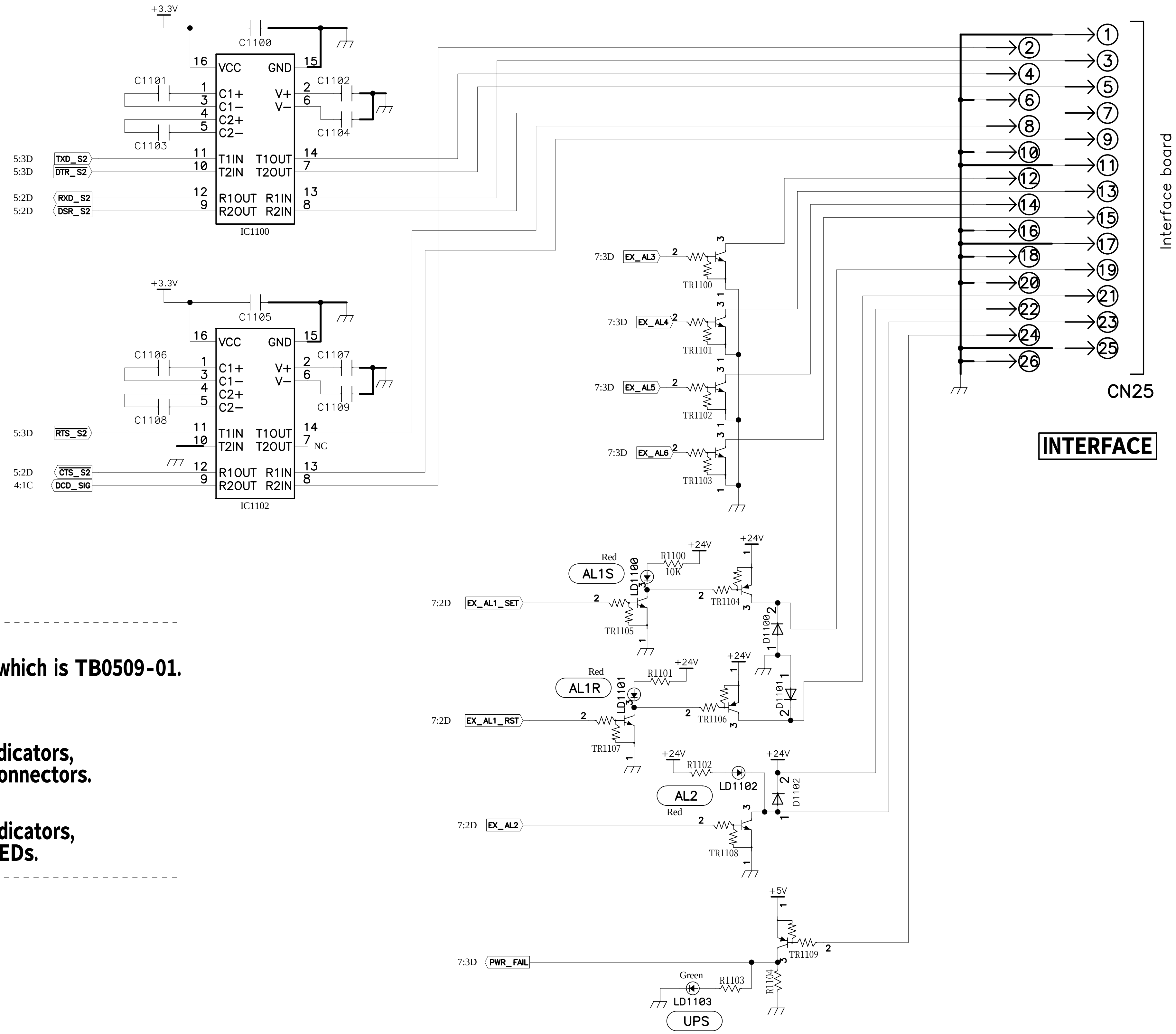
SENSOR INPUTS EACH OUTPUTS



E:VIP6-001
CPU Board Circuit Diagram (Page 9/11)



E:VIP6-001
CPU Board Circuit Diagram (Page 10/11)

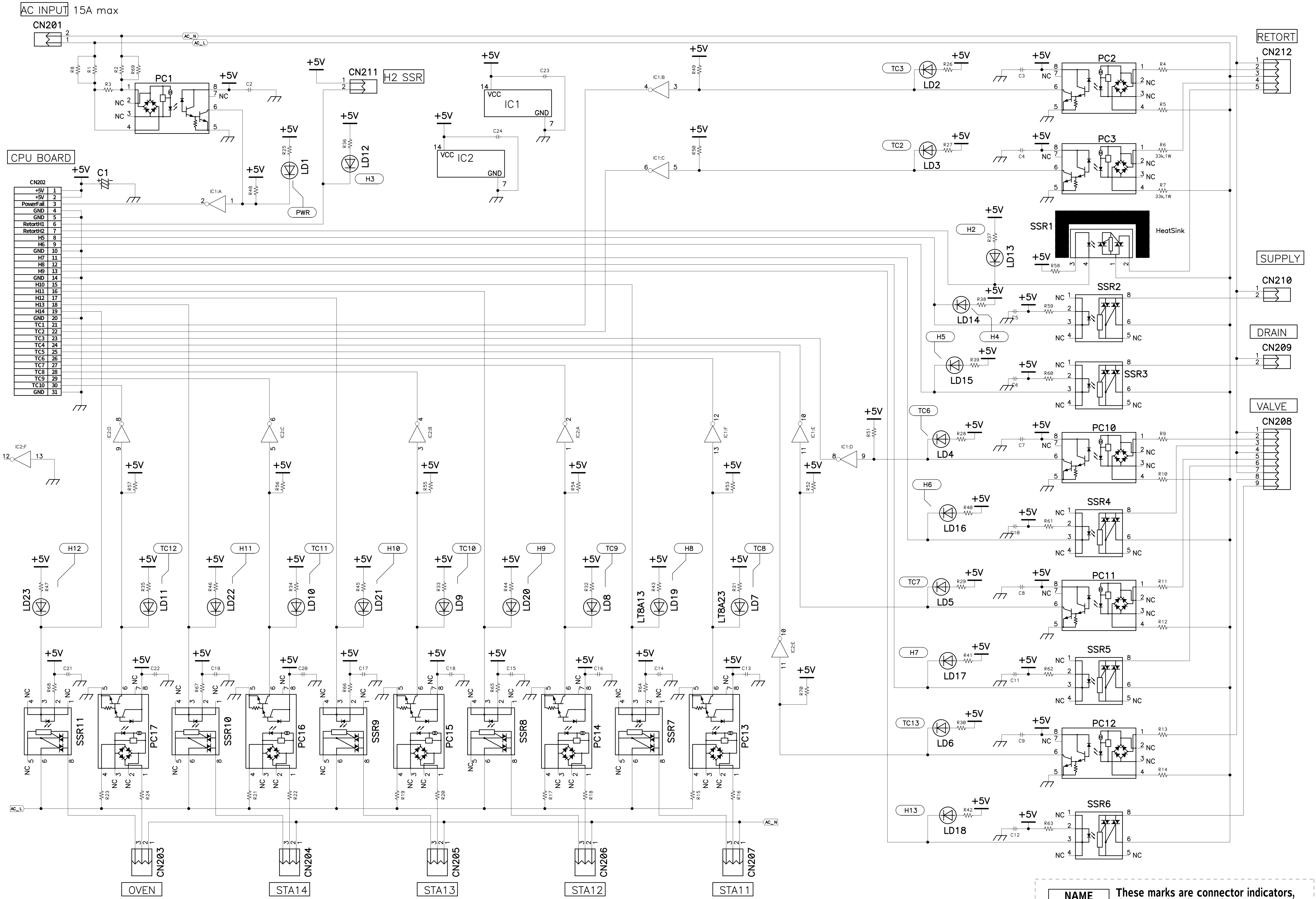


Total Comments

The CPU Board possess a unique number, which is TB0509-01.
It is printed on the board.

NAME These marks are connector indicators, they are printed near these connectors.

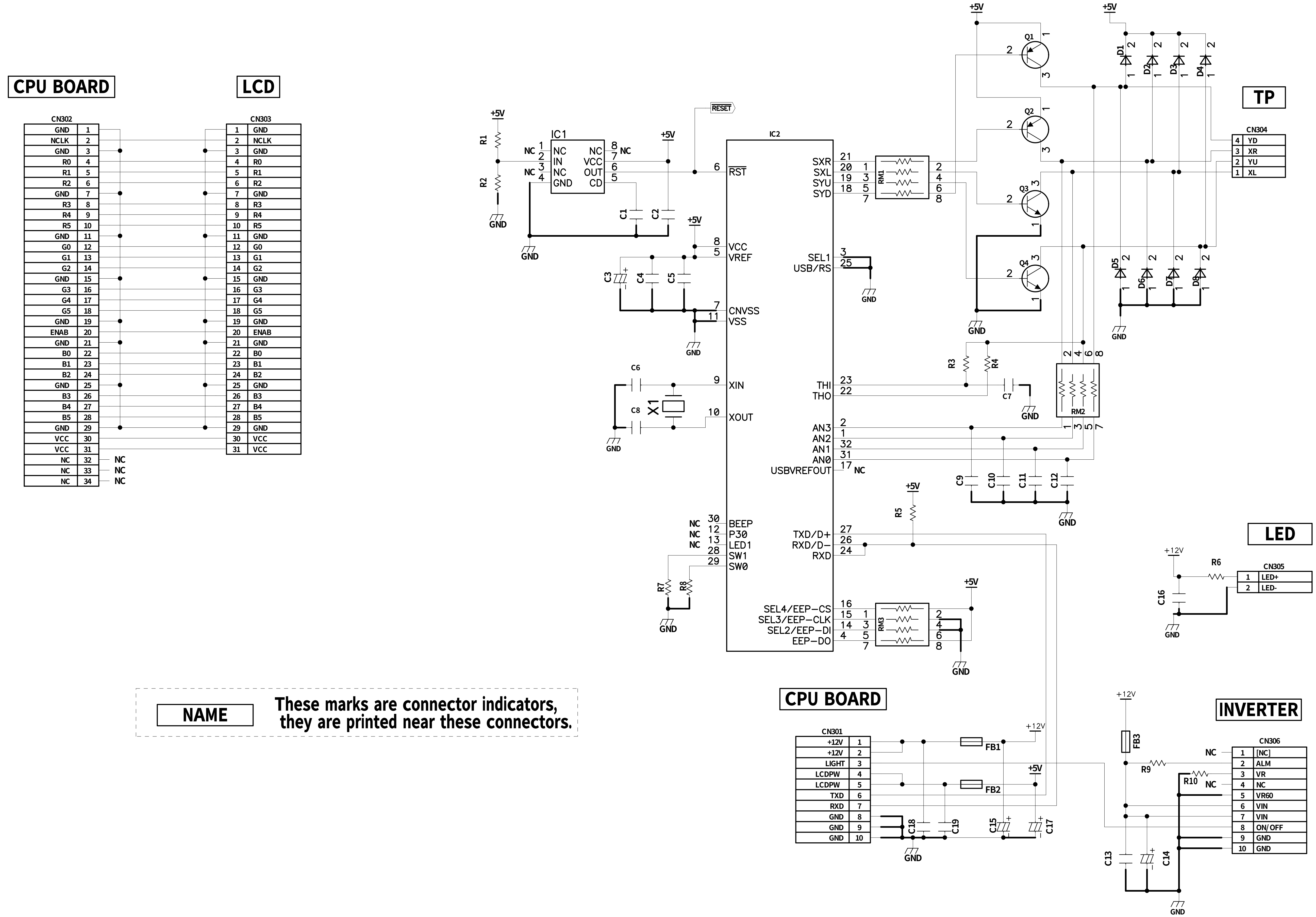
LED These marks are LED name indicators, they are printed near these LEDs.



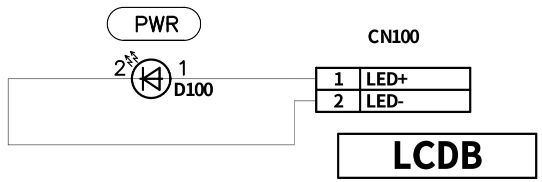
NAME These marks are connector indicators, they are printed near these connectors.

LED These marks are LED name indicators, they are printed near these LEDs.

E:VIP6-002
Heater Driver Board Circuit Diagram



E:VIP6-003
LCD Relay Board Circuit Diagram

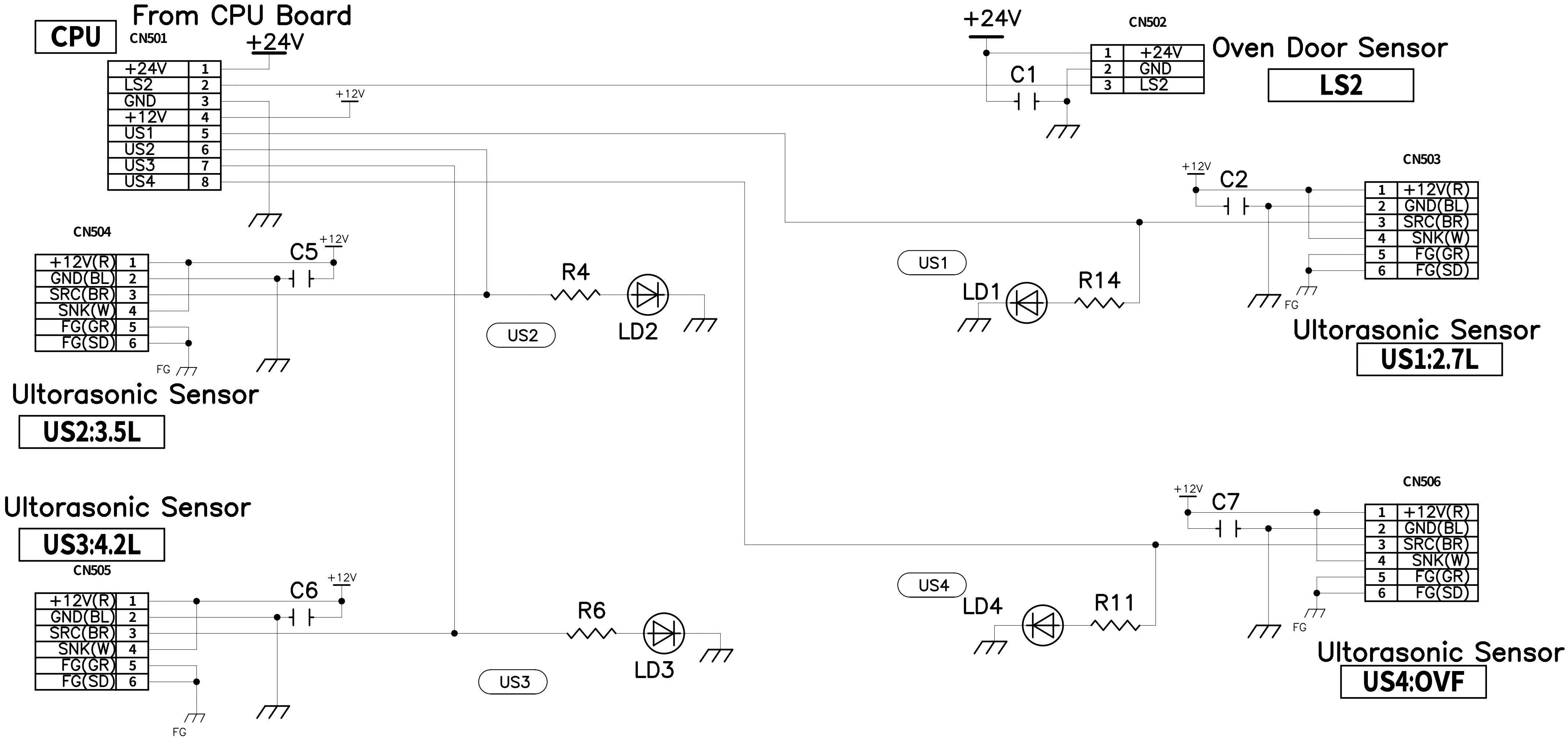


NAME These marks are connector indicators, they are printed near these connectors.

LED These marks are LED name indicators, they are printed near these LEDs.

E:VIP6-004

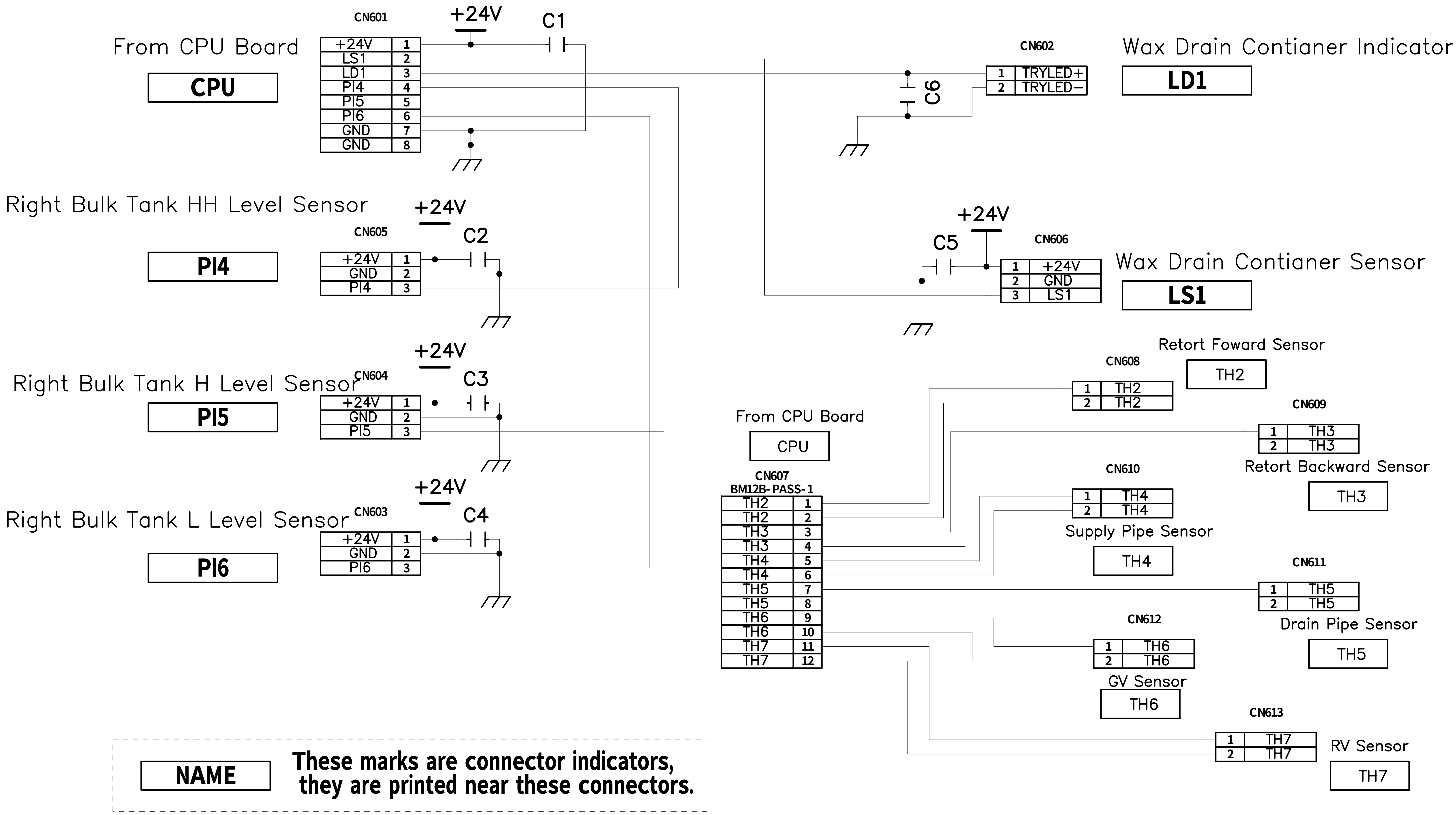
Operating Panel LED Borad Circuit Diagram



NAME These marks are connector indicators, they are printed near these connectors.

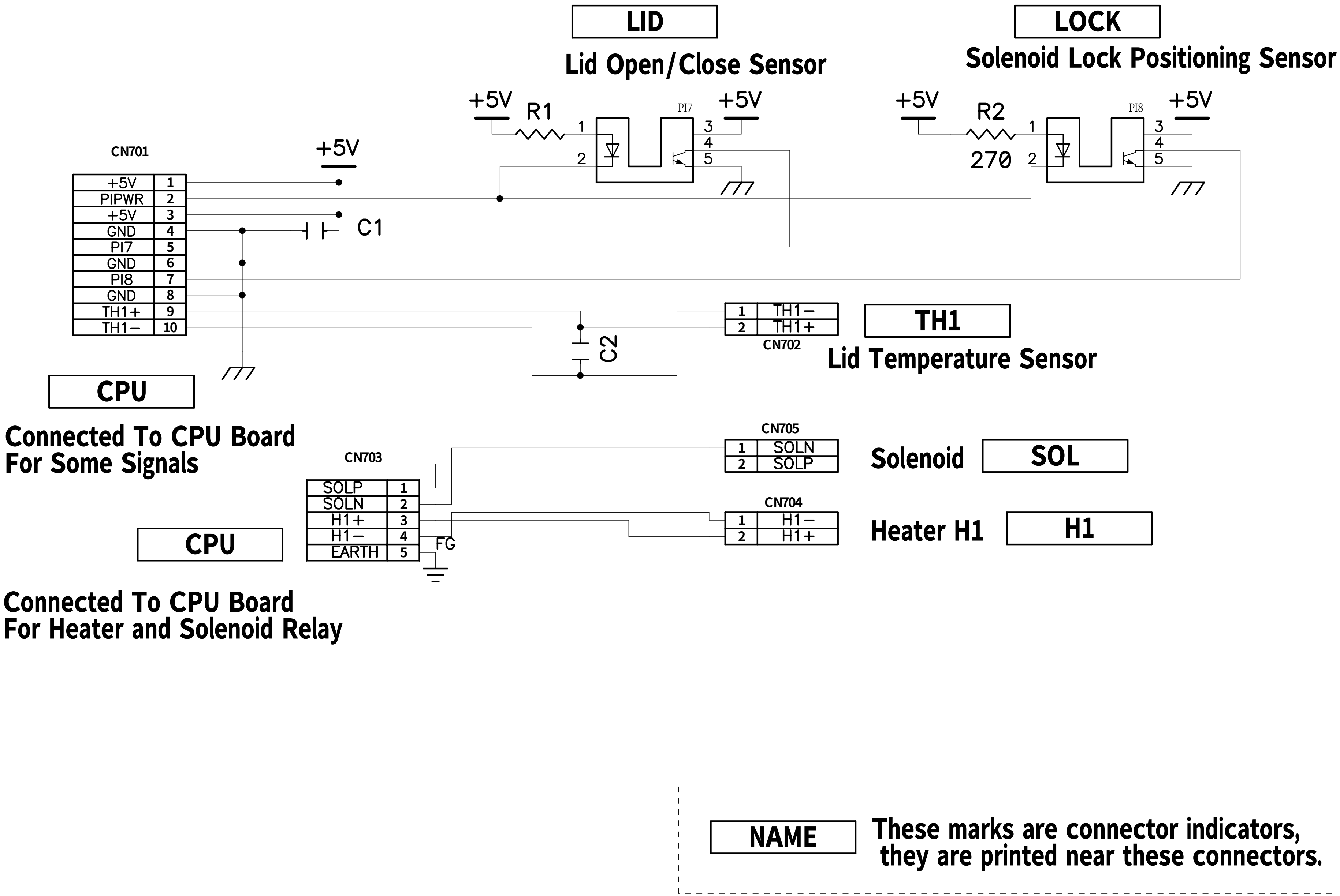
LED These marks are LED name indicators, they are printed near these LEDs.

E:VIP-005
US Board Circuit Diagram



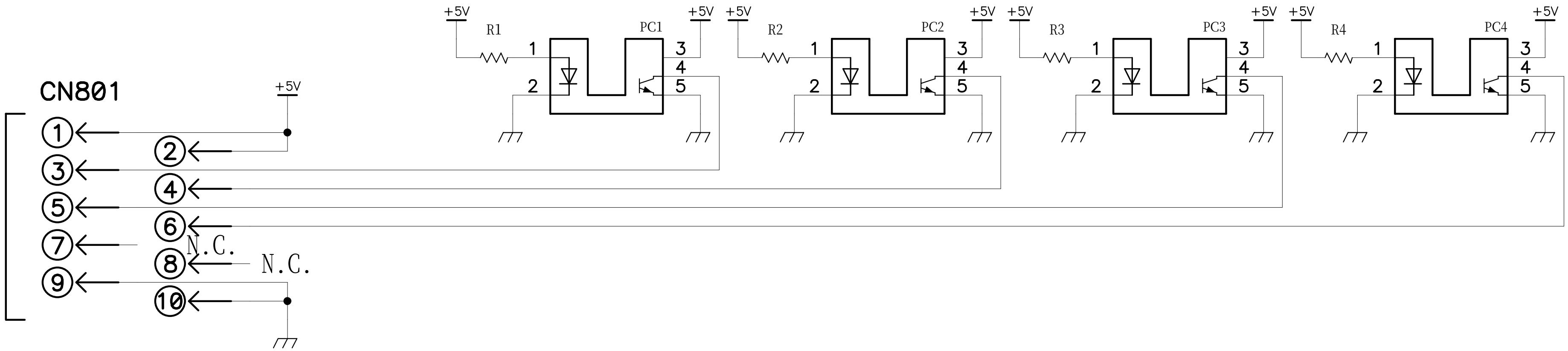
E:VIP6−006

Right Side Relay Board Circuit Diagram

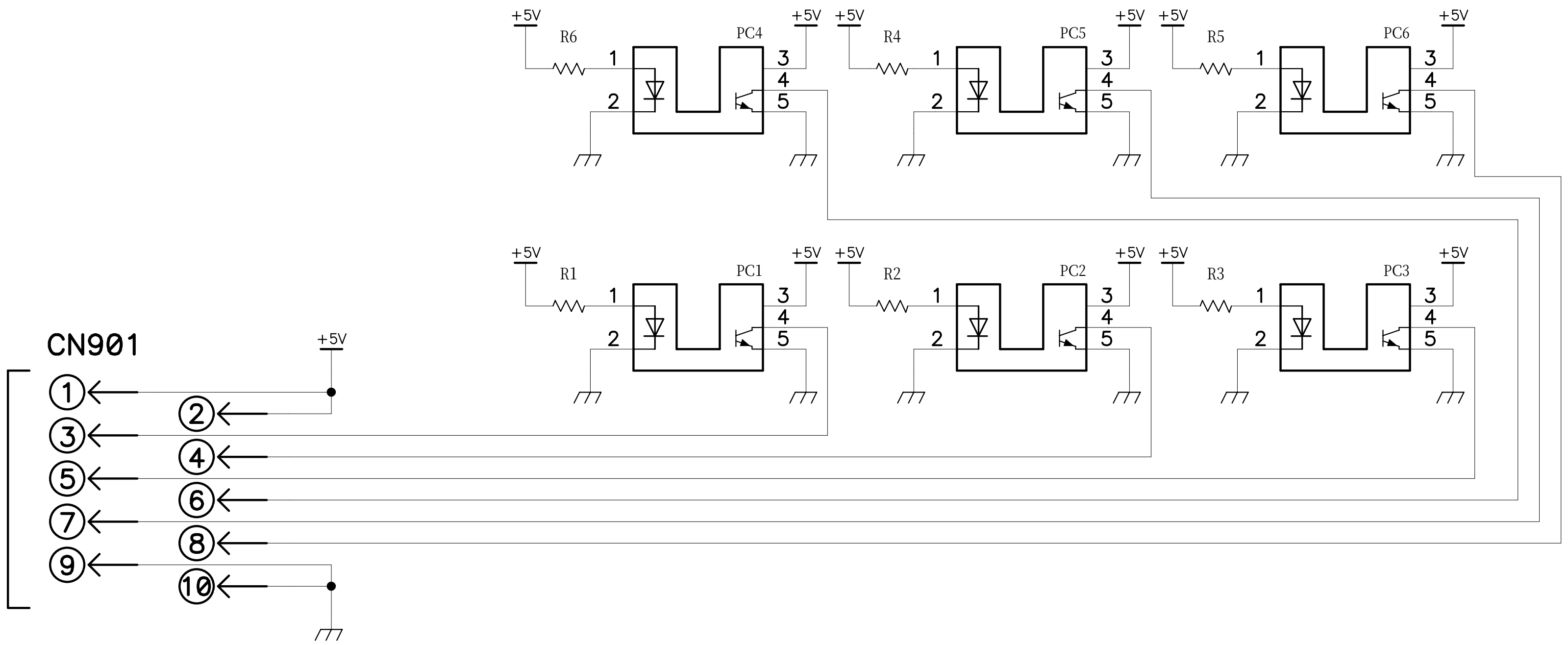


E:VIP6−007

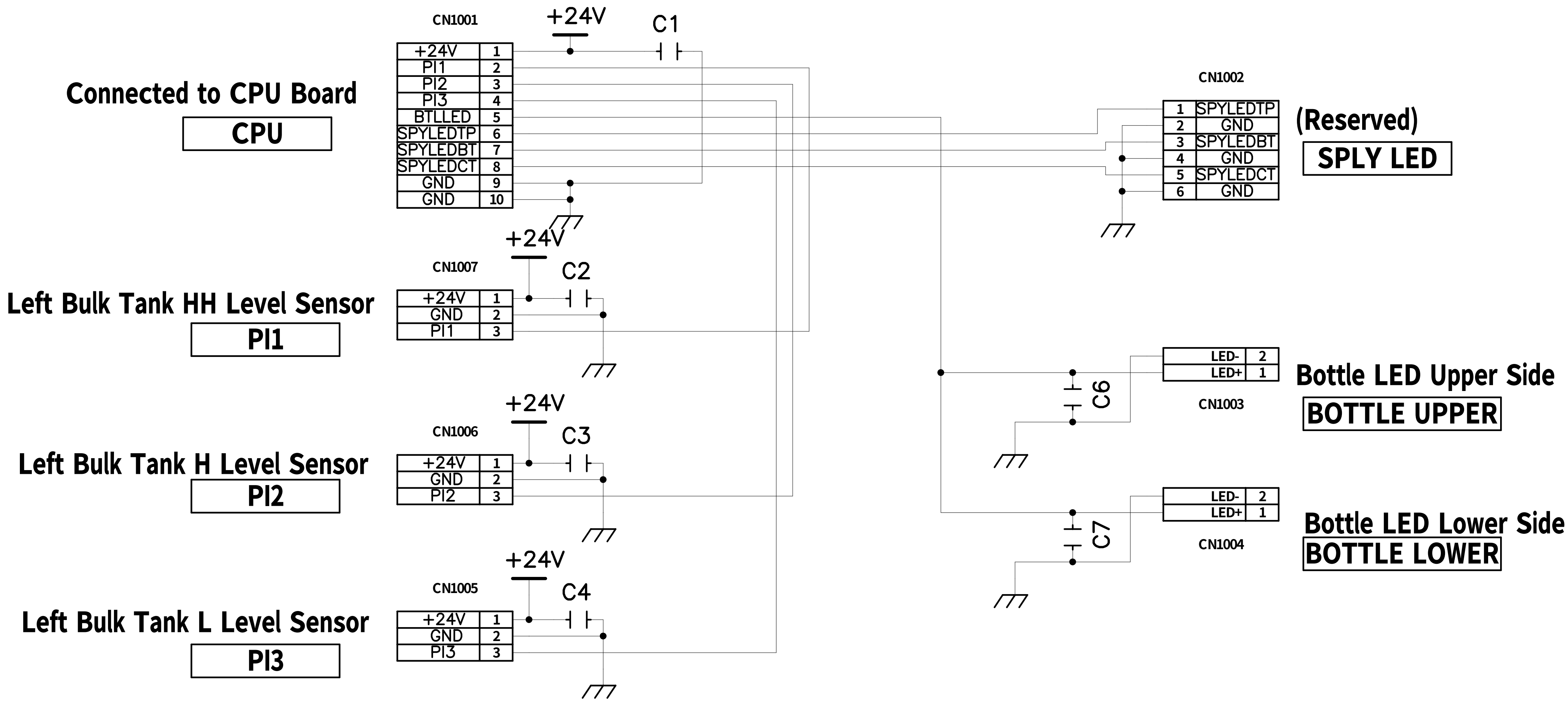
Lid Sensor Board Circuit Diagram



E:VIP6-008
Gate Valve Positioning Board Circuit Diagram



E:VIP6-009
Rotary Valve positioning Board Circuit Diagram

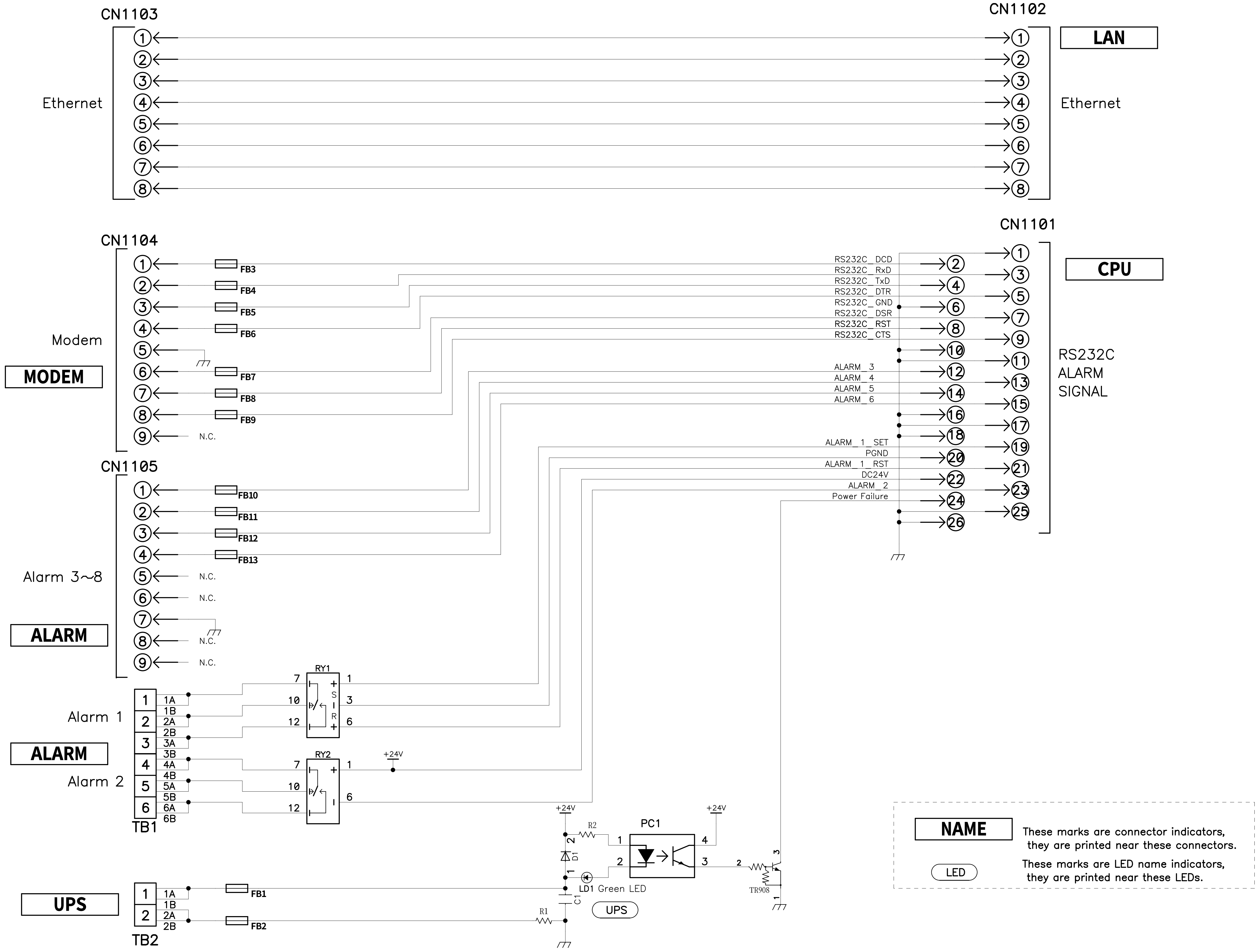


NAME

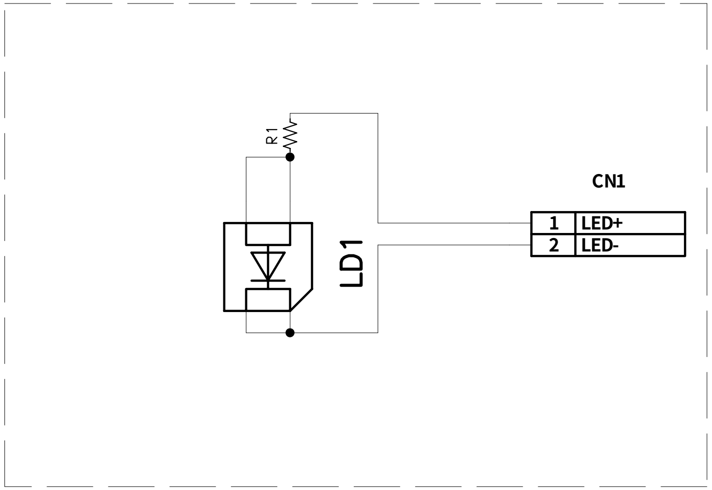
These marks are connector indicators,they are printed near these connectors.

E:VIP6−010

Left Side Relay Board Circuit Diagram



E:VIP6-011
Interface Board Circuit Diagram



E:VIP6-012
Bottle LED Board Circuit Diagram

PWB(Print Wiring Board) Side

LCD Side

E:VIP6-013
LCD FPC Cable Circuit Diagram

Chapter 8 Options

8-1 Seismic Anchorage

A set of seismic anchorage is available as an option. Install the seismic anchorage to both sides of the instrument.

To install the anti-topple bracket,

(1) Remove 3 cross-recessed head hexagon bolts (M5, L=10) that hold the bulk reservoir and base. Attach the bracket to the instrument, using cross-recessed head hexagon bolts (M5, L=15).
(2) Drill pilot holes into the floor as recommended by the anchor bolt manufacturer in diameter and depth.
(3) Clean the inside of holes, using a vacuum cleaner.
(4) Screw the anchor bolt into each hole.
(5) Hold the bracket by tightening nuts that are supplied with anchor bolts.

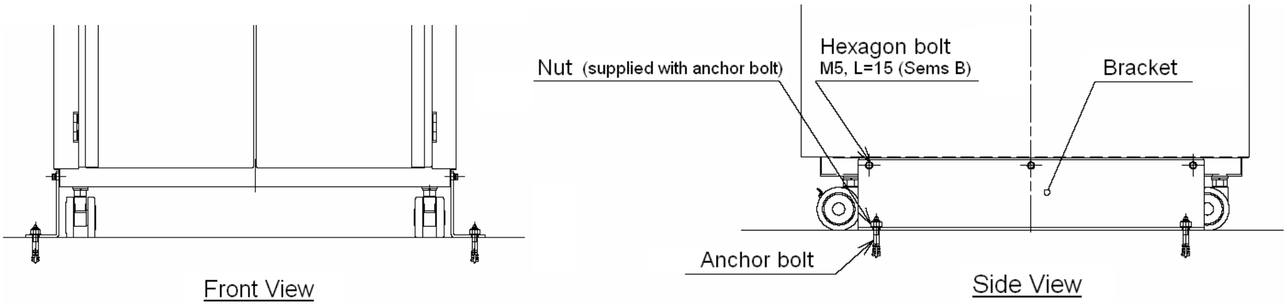


Fig.8-1-1 Installation of seismic anchorage

Fig.8-1-2 shows reference for anchor bolt hole locations.

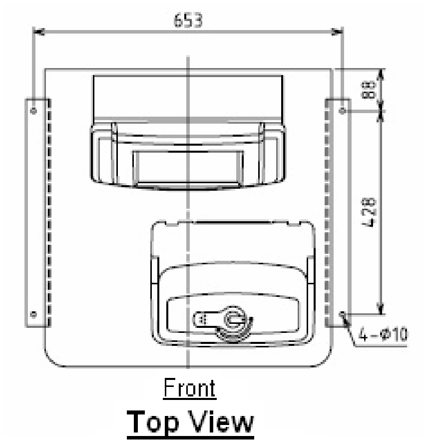


Fig.8-1-2 Anchor bolt hole locations

8-2 Exhaust Duct Hose

Two sets of exhaust duct hose (for duct hose diameter of 38mm and 75mm) are available as an option. The duct connection adapter to connect the duct hose is suitable for both sizes. (See Figure 8-2-1.)

To install the duct connection adapter,

(1) Fit the applicable duct cuffs onto the adapter and secure with the hose clamp. Tighten the hose clamp with the clamping part positioned at 45° against the adapter flange.

(2) Attach the adapter to the instrument, using cross-recessed pan head screws.

(3) Insert the duct hose into the cuffs. Connect the other end of the hose to exhaust gas treatment equipment.

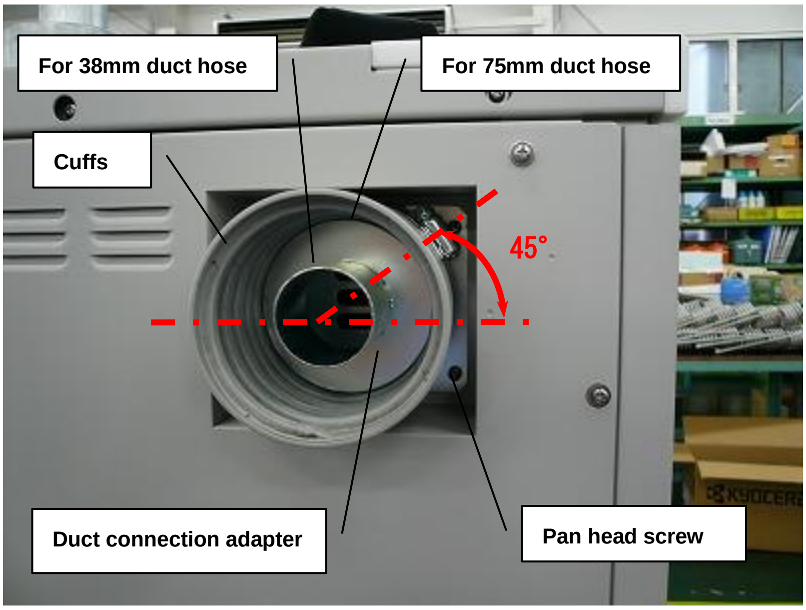


Fig.8-2-1 Installation of duct connection adapter

Chapter 9 Specifications

Item		Detail
Processing capacity		Up to 300 Uni-Cassette® cassettes
Number of processing steps		10 solution steps
		4 paraffin steps
Number of cleaning steps		3 steps (xylene, alcohol, drying)
Opening of the retort		256 x 158 mm (* same as VIP® E Series)
Fume control		Activated carbon
Solution volume	Processing solution	2.7 L when 150 cassettes are set 3.5 L when 300 cassettes are set
	Cleaning solution	4.2 liters
Timer	Process time	0 minute to 99 hours 59 minutes
	End time	Programmable up to 11:59 p.m. 99 days after
Temperature	Retort	Selectable range for solutions: 35 to 60° C
		Selectable range for paraffin: 45 to 70° C
	Paraffin oven	45 to 70° C
	Rotary valve	Heated at 70° C
	Gate valve	Heated at 70° C
	Melting point	Use paraffin of 65° C melting point or lower
Mixing method		Pump In, Pump Out, up-and-down movement of solution level
Control		Micro-computer control
Number of programs		50
Display		10.4 inch color LCD touch panel
Safety alarm device		Visible messages, audible electronic sound
Power requirement		VIP6-J0 AC100V 50/60Hz 12A VIP6-A1 AC115V 50/60Hz 12A VIP6-E2 AC230V 50/60Hz 6A
Over current protection		Circuit protector Rated current 100/115V 15A 230V 10A
Operating environment		Ambient temperature 10 to 40° C Relative humidity 30 to 85%
Dimensions		606 (W) x 626 (D) x 1,329 (H) mm Height to the retort surface from the floor: 1,043 mm
Weight		165 kg

Appendix 1 Control Files

1 Overview

This system retains the files containing system control information and historical data, listed in the table below, in the internal CF drive (drive B) of the system.

Table Appendix 1-1

Storage location	. File name
B:¥	VIP6GUT.BIN
B:¥	PRODUCTS.CSV
B:¥SYSTEM¥	VIP6KPG.BIN
B:¥SYSTEM¥	VIP6TCG.BIN
B:¥SYSDEF¥	INSTRMNT.CSV
B:¥SYSDEF¥	PASSWORD.CSV
B:¥SYSDEF¥	EXTALARM.CSV
B:¥SYSDEF¥	SOLUTION.CSV
B:¥SYSDEF¥	SYSWAV.CSV
B:¥SYSDEF¥	SYSDISP.CSV
B:¥CONFIG¥	CONFIG1.CSV ~ CONFIG5.CSV
B:¥PROGRAM¥	PROG01.CSV ~ PROG50.CSV
B:¥PROGRAM¥	CLEAN.CSV
B:¥LANGUAGE¥	MAIN001.VIP ~ MAIN016.VIP
B:¥LANGUAGE¥	SOUND01.WAV ~ SOUND10.WAV
B：¥PRESET¥	PRSNAME.CSV
B：¥PRESET¥	PRICNFG.CSV
B：¥PRESET¥	PRPROG1.CSV
B：¥PRESET¥	PRCLEAN.CSV
B：¥PRESET¥	PREXALRM.CSV
B:¥HISTORY¥	REPORT1.VIP
B:¥HISTORY¥	REPORT2.VIP
B:¥HISTORY¥	REPORT3.VIP
B:¥HISTORY¥	ERRHSTRY.VIP
B:¥HISTORY¥	SOLHSTRY.CSV
B:¥HISTORY¥	PULHSTRY.CSV
B:¥HISTORY¥	RUNINFO.CSV
B:¥HISTORY¥	DFTIME.CSV
B:¥HISTORY¥	VER_LOG.CSV
B:¥LOGDATA	LOGMX101.VIP ~ LOGMX199.VIP
B:¥LOGDATA	LOGMX201.VIP ~ LOGMX299.VIP
B:¥LOGDATA	LOGMX301.VIP ~ LOGMX399.VIP
B:¥LOGDATA	LOGMX401.VIP ~ LOGMX499.VIP
B:¥LOGDATA	LOGKEY01.VIP ~ LOGKEY99.VIP
B:¥LOGDATA	LOGRUN01.VIP ~ LOGRUN99.VIP
B:¥LOGDATA	LOGRV01.VIP ~ LOGRV99.VIP
B:¥LOGDATA	LOGARC01.VIP ~ LOGARC99.VIP
B:¥LOGDATA	LOGTMP01.VIP ~ LOGTMP99.VIP
B:¥LOGDATA	LOGPRS01.VIP ~ LOG`RS99.VIP

2 Types of Control Files

2-1 Executable Program Files

These executable program files are used to operate the system.

(1) Software file (VIP6GUT.BIN)
This file stores the program executed when the user runs the system in the auto operation mode or operates the screens. The software file is stored in the root directory of CF drive B.

(2) Product check program file (VIP6KPG.BIN)
This file stores the program executed when performing a product inspection after the system has been assembled, or when checking the system operation following a system maintenance performed by the service personnel. The product check program file is stored in the B:¥SYSTEM folder in CF drive B.

(3) Screen teaching program file (VIP6TCG.BIN)
This file stores the program executed when teaching the touch panel. The screen teaching program file is stored in the B:¥SYSTEM folder in CF drive B.

2-2 Product File (PRODUCTS.CSV)

This file retains the information specific to each system that is required to operate and control the system, as well as the information registered at the time of product inspection. The product file is created by the product check program at the time of product inspection, and stored in the root directory in CF drive B.
The following information is registered in this file.

[1] Serial number information
Serial number information regarding the system is retained.

[2] LAN setting information
Settings of the IP address, subnet mask and default gateway of the system are retained.

[3] Pressure offset information
Pressure offset information regarding the retort is retained.

[4] Temperature offset information
Temperature offset information regarding the retort, retort lid, ovens (stations 11 to 14 and top plate), rotary valve, gate valve, cleaning xylene station, fill pipe and drain pipe is retained.

2-3 User Setting Files

These files are used to retain the setting information registered by the user through the setting/editing functions of the system.

(1) System information file (INSTRMNT.CSV)
This file is used to retain system information. The information stored in this file includes information (excluding the password information) set using the “System Setup” function from the Utility Menu, as well as information set by each function on the Language Selection screen. The system information file is stored in the B:¥SYSDEF folder in CF drive B.

(2) Password file (PASSWORD.CSV)
This file is used to retain password information. The information stored in this file includes manager password and user password information set using the “System Setup” function from the Utility Menu. The password file is stored in the B:¥SYSDEF folder in CF drive B.

(3) Solution name file (SOLUTION.CSV)
This file is used to retain the solution name information used in tissue processing. The information stored in this file includes information regarding solution names set using the “Edit Solution Name” function from the Edit Menu. Up to 100 solution names can be registered. The solution name file is stored in the B:¥SYSDEF folder in CF drive B.

(4) External alarm file (EXTALARM.CSV)
This file is used to retain setting information regarding external alarms and external signals.

(5) Solution configuration files (CONFIG1.CSV ~ ONFIG5.CSV)
These files are used to retain solution configuration information. One station configuration file stores one set of solution configuration information. In other words, the system has five solution configuration files. The information stored in this file includes information regarding a solution configuration (including reagent management information) set using the “Edit Solution Configurations” function from the Edit Menu. The solution configuration files are stored in the B:¥CONFIG folder in CF drive B.

(6) Tissue processing program files (PROG 01.CSV ~ PROG 50.CSV)
These files are used to retain tissue processing programs. One tissue processing program file stores one tissue processing program. In other words, the system has 50 tissue processing program files. The information stored in this file includes information regarding a tissue processing program set using the “Edit Programs” function from the Edit Menu. The tissue processing program files are stored in the B:¥PROGRAM folder in CF drive B.

(7) Retort cleaning program file (CLEAN.CSV)
This file is used to retain retort cleaning programs. Three retort cleaning programs are stored in one file. The information stored in this file includes information regarding retort cleaning programs set using the “Edit” function on the Clean Retort screen. The retort cleaning program file is stored in the B:¥PROGRAM folder in CF drive B.

2-4 Operation Files

These files are used to retain information regarding screen operations and notifications.

(1) Screen display data information file (SYSDISP.CSV)
This read-only file is used to retain information regarding the screen display data in 16 languages used by the system. The screen display data information file is stored in the B:¥SYSDEF folder in CF drive B.

(2) Alarm sound file (SYSWAV.CSV)
This read-only file is used to retain information regarding the alarm sounds used by the system. The alarm sound file is stored in the B:¥SYSDEF folder in CF drive B.

(3) Screen display data files (MAIN001.VIP~MAIN016.VI)
These read-only files are used to retain data information (character strings) displayed on screens. The screen display data files are stored in the B:¥LANGUAGE folder in CF drive B.

(4) Alarm sound files (SOUND01.WAV~SOUND10.WAV)
These read-only files contain alarm sounds. The alarm sound files are stored in the B:¥LANGUAGE folder in CF drive B.

2-5 Factory Setting Files

These files are used to retain information regarding the settings made when the system was shipped (hereinafter referred to as “factory settings”). The information stored in these files is used when restoring the factory settings of each file after the “Rest Memory” function has been executed by the service personnel. The factory setting files are stored in the B:¥PRESET folder in CF drive B.

(1) Factory-set solution name file (PRISNAME.CSV)
This read-only file is used to retain the factory-set solution names. This file is used in the process of resetting the solution name file to the factory settings after the “Rest Memory” function has been executed. The file format is the same as that of the solution name file.

(2) Factory-set solution configuration file (PRICNFG.CSV)
This read-only file is used to retain the factory-set solution configurations. This file is used in the process of resetting the solution configuration files to the factory settings after the “Rest Memory” function has been executed. The file format is the same as that of the solution configuration files.

(3) Factory-set tissue processing program file (PRPROG 1.CSV)
This read-only file is used to retain the factory-set tissue processing programs. This file is used in the process of resetting the tissue processing program files to the factory settings after the “Rest Memory” function has been executed. The file format is the same as that of the tissue processing program files.

(4) Factory-set retort cleaning program file (PRCLEAN.CSV)
This read-only file is used to retain the factory-set retort cleaning programs. This file is used in the process of resetting the retort cleaning program file to the factory settings after the “Rest Memory” function has been executed. The file format is the same as that of the retort cleaning program file.

(5) Factory-set external alarm file (PREXALRM.CSV)
This read-only file is used to retain the factory-set external alarm information. This file is used in the process of resetting the external alarm file to the factory settings after the “Rest Memory” function has been executed. The file format is the same as that of the external alarm file.

2-6 Historical Data Files

These files are used to retain historical data generated as the system is used by the user. Historical data files are generated automatically by the system. Each historical data file is stored in the B:¥HISTORY folder in CF drive B.

(1) Tissue processing history file (REPORT1.VIP)
This file stores the tissue processing history. Up to 50 sets of processing history data can be registered.

(2) Cleaning history file (REPORT2.VIP)
This file stores the cleaning history (retort cleaning, warm-water cleaning, rinsing). Up to 50 sets of cleaning history data can be registered.

(3) Solution exchange history file (REPORT3.VIP)
This file stores the solution exchange history. Up to 50 sets of solution exchange history data can be registered.

(4) Error history data file (ERRHSTRY.VIP)
This file stores the history data of errors generated by the system. Up to 1,000 sets of error history data can be registered.

(5) Solution usage history data file (SOLHSTRY.CSV)
This file stores the usage history data of the reagent, paraffin and filter defined for a given solution

configuration.

(6) Part usage history data file (PULHSTRY.CSV)
This file stores the history data of part usage.

(7) Offset file (RUNINFO.CSV)
This file stores offset information for each tissue processing program and retort cleaning program.

(8) Fill/drain time file (DFTIME.CSV)
This file stores information regarding the recent fill/drain times applicable to each station.

(9) Software version file (VER_LOG.CSV)
This file stores information regarding the software used by the system.

2-7 Log Output Files

This system has the log output files specified below for logging system operating conditions. Each log file has multiple files of the same type and uses cyclically. Each log output file is stored in the B:¥LOGDATA folder in CF drive B.

(1) Mailbox message log files 1 (LOGMX101.VIP ~ LOGMX199.VIP)
These files are used to log send/receive mailbox messages generated in connection with mail tasks.

(2) Mailbox message log files 2 (LOGMX201.VIP ~ LOGMX299.VIP)
These files are used to log send/receive mailbox messages generated in connection with PEG tasks.

(3) Mailbox message log files 3 (LOGMX301.VIP ~ LOGMX399.VIP)
These files are used to log send/receive mailbox messages generated in connection with process tasks.

(4) Mailbox message log files 4 (LOGMX401.VIP ~ LOGMX499.VIP)
These files are used to log send/receive mailbox messages generated in connection with pressure control tasks.

(5) Key stroke log files (LOGKEY01.VIP ~ LOGKEY99.VIP)
These files are used to log key stroke information.

(6) Auto operation log files (LOGRUN01.VIP ~ LOGRUN99.VIP)
These files are used to log control information associated with auto operation.

(7) Valve operation log files (LOGRV01.VIP ~ LOGRV99.VIP)
These files are used to log control information associated with rotary valve tasks/gate valve tasks.

(8) Pressure control log files (LOGARC01.VIP ~ LOGARC99.VIP)
These files are used to log pressure control information as well as gate-valve control information associated with pressure control tasks.

(9) Temperature information log files (LOGTMP01.VIP ~ LOGTMP99.VIP)
These files are used to log temperature information regarding all units whose temperature is controlled.

(10) Retort pressure log files (LOGPRS01.VIP ~ LOGPRS99.VI)
These files are used to log retort pressures.

3 How to Restore the Internal CF Card for the System

This system has a CF card set in its drive B, and the software, product check program and system information files are retained in this CF card. Accordingly, should the CF card in drive B generate an error and the card becomes no longer readable/writable as a result (= the CF card has been corrupted), the CF card must be restored and set in the system again. The following describes the procedure to restore the CF card set in drive B.

3-1 Determining the Need for Re-creating a CF Card

If the CF card set in drive B of the system generates an error, error 811 or 812 will generate when the system is started or while it is operating. If the system is operated continuously in this condition, reading/writing of the CF card may become completely disabled. Because the CF card cannot be read/written at all, the software cannot be loaded when the system is started, in which case a square will be shown and blink at a specified frequency at the center of the loading screen. If error 811 or 812 generates frequently, it is recommended that you re-create a CF card.

To identify the file that generated an error, output an error history report. To output the error history, refer to 3-4, “Acquiring Maintenance Information.”

3-2 Structure of the CF Card Set in Drive B

(1) Root directory structure
The root directory structure of the CF card set in drive C of the system is shown below.

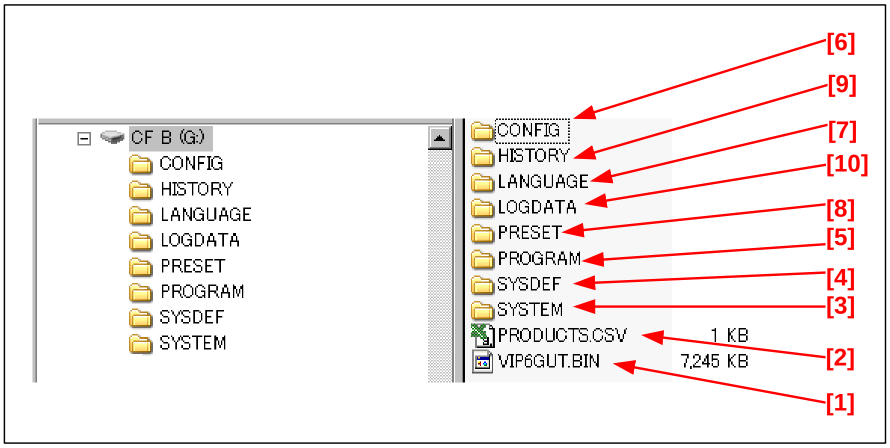


Fig. Appendix 1-1 Root Directory Structure of CF Card

[1] Software file (1)
[2] Product file (1)
[3] Executable program folder
[4] Control file folder
[5] Tissue processing program folder
[6] System setting file folder
[7] Operation file folder
[8] Factory setting file folder
[9] Historical data file folder
[10] Log output file folder

(2) Executable program folder structure
The structure of the executable program folder (SYSTEM folder) is shown below.

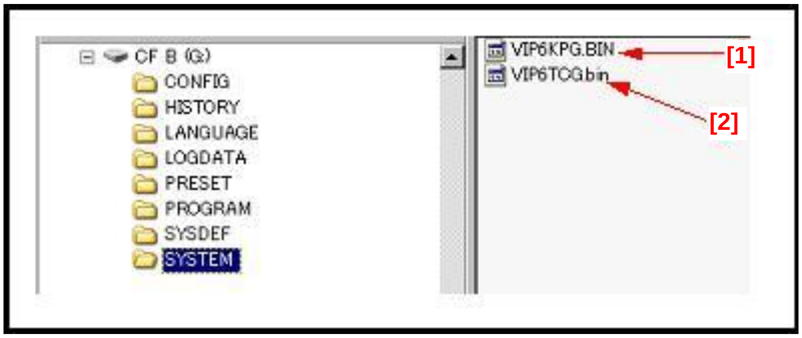


Fig. Appendix 1-2 Executable Program Folder Structure

[1] Product check program file (1)
[2] Screen teaching program file (1)

(3) Control file folder structure
The structure of the control information file folder (SYSDEF folder) is shown below.

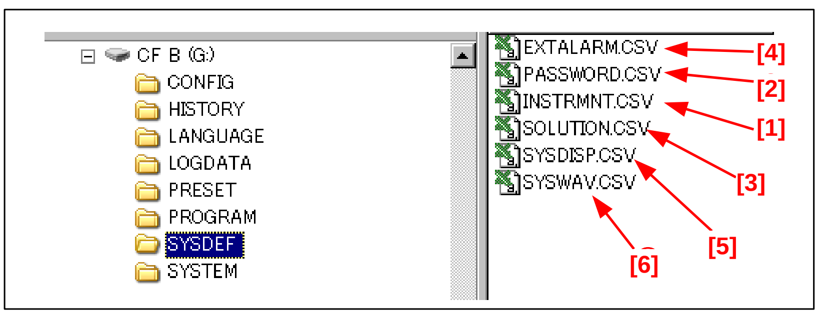


Fig. Appendix 1-3 Control File Folder Structure

[1] System file (1)
[2] Password file (1)
[3] Solution name file (1)
[4] External alarm file (1)
[5] Screen display data file (1)
[6] Alarm sound file (1)

(4) Tissue processing program folder structure
The structure of the tissue processing program folder (PROGRAM folder) is as follows.

Fig. Appendix 1-4 Tissue Processing Program Folder Structure

[1] Retort cleaning program file (1)
[2] Tissue processing program files (50)

(5) Solution configuration file folder structure
The structure of the solution configuration file folder (CONFIG folder) is as follows.

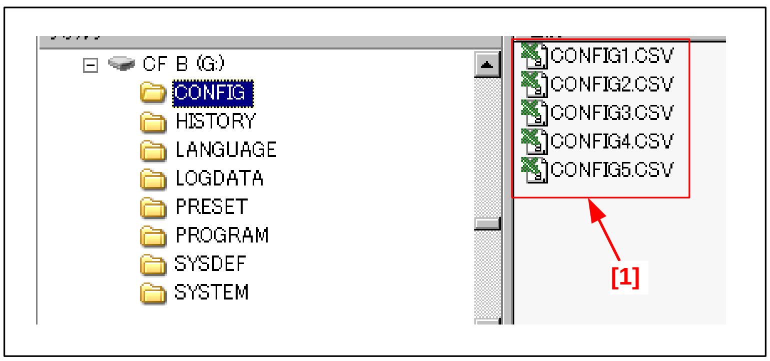


Fig. Appendix 1-5 Solution Configuration File Folder Structure

[1] Solution configuration files (5)

(6) Operation file folder structure
The structure of the operation file folder (LANGUAGE folder) is as follows.

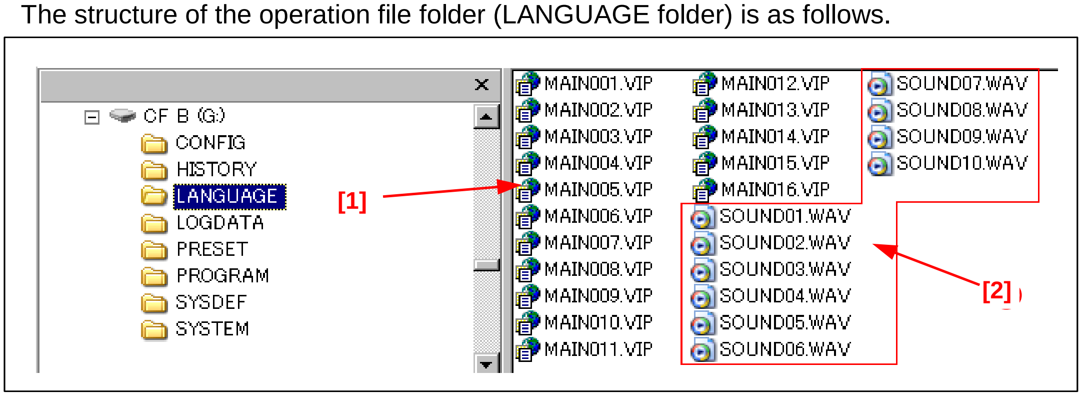


Fig. Appendix 1-6 Operation file folder structure

[1] Screen display data files (16)
[2] Alarm sound files (10)

(7) Factory setting file folder structure
The structure of the factory setting file folder (RESET folder) is as follows.

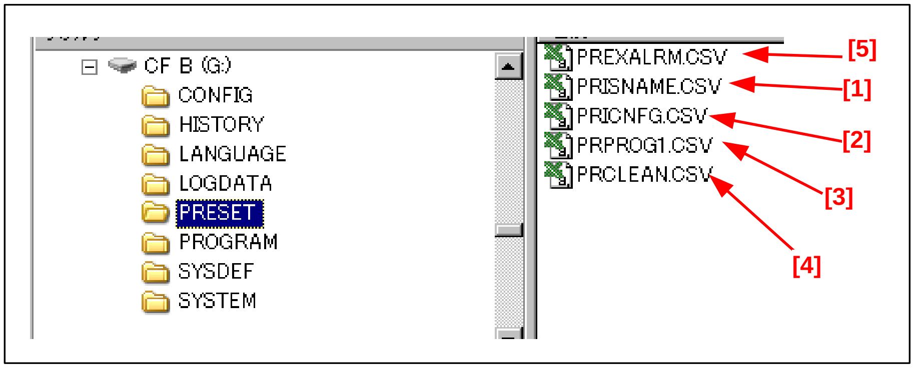


Fig. Appendix 1-7 Factory setting file folder structure

[1] Factory-set solution name file (1)
[2] Factory-set solution configuration file (1)
[3] Factory-set tissue processing program file (1)
[4] Factory-set retort cleaning program file (1)
[5] Factory-set external alarm file (1)

(8) History data file folder structure
The structure of the history data file folder (HISTORY folder) is as follows.

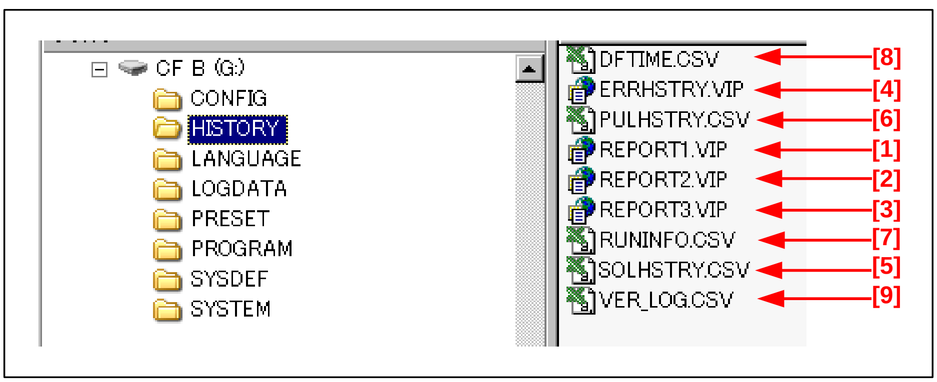


Fig. Appendix 1-8 History data file folder structure

[1] Tissue processing history file (1)
[2] Cleaning history file (1)
[3] Solution exchange history file (1)
[4] Error history file (1)
[5] Solution usage history file (1)
[6] Part usage history file (1)
[7] Offset file (1)
[8] Fill/drain time file (1)
[9] Software version file (1)

(9) Log output file folder structure
The structure of the log output file folder (LOGDATA folder) is as follows.

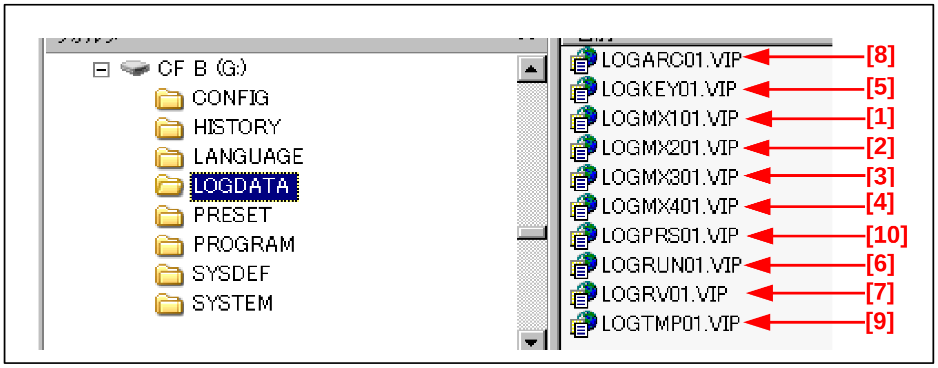


Fig. Appendix 1-9 Log Output File Folder Structure

[1] Mailbox message log files 1 (up to 99)
[2] Mailbox message log files 2 (up to 99)
[3] Mailbox message log files 3 (up to 99)
[4] Mailbox message log files 4 (up to 99)
[5] Key stroke log files (up to 99)
[6] Auto operation log files (up to 99)
[7] Valve operation log files (up to 99)
[8] Pressure control log files (up to 99)
[9] Temperature log files (up to 99)
[10] Retort pressure log files (up to 99)

3-3 CF Card Re-creating Procedure

3-3-1 Notes

(1) If the system cannot be started or error 811 or 812 still generates even after reformatting the CF card set in drive B of the system, use a new CF card.

(2) The manufacturer-assured life of the CF card is 100,000 rewriting operations. If the assured life of the system has already expired, however, it is recommended to use a new CF card even when the life of the current card is not yet reached.

(3) Use a CF card supplied by the manufacturer. Use of any other CF card may result in unstable operation or functional abnormality.

3-3-2 Backing Up the Files in the Current CF Card

In most cases the CF card set in drive B of the system can be read by a PC. Accordingly, back up the files in the CF card to a PC.

(1) Turn off the system power and remove the CF card from drive B of the system.

(2) Connect the CF card reader/writer to the PC. When the CF card reader/writer is connected to the PC, Explorer should launch to open a screen showing “Removable Disk (?:)” (? Indicates the volume number).

(3) Set the CF card you have removed from drive B of the system, in the CF card reader/writer.

(4) Use Explorer on the PC to copy all folders and files in the CF card to a desired folder in the PC. Take note that corrupted files cannot be copied. Do not copy those files that cannot be copied.

(5) When the copying is complete, right-click “Removable Disk (?:)” on the Explorer screen. When the menu is displayed, select **Eject (J)** and remove the CF card (the CF card can now be safely removed from the PC).

3-3-3 Preparing a Set of Factory Setting Files for Restoration

If any file has corrupted completely, it must be restored using the applicable factory setting file. Obtain a set of factory setting files from the manufacturer. (The product file specific to each system is required to restore files.)

3-3-4 Preparing a New CF Card (Reformatting a CF Card)

Obtain from the manufacturer a new CF card to be replaced with the current CF card. If a new CF card is not available, the corrupted CF card can be reformatted. Even when a new CF card is used, it is recommended that you still reformat the card. The reformatting method is specified below.

(1) Set in the CF card reader/writer the CF card you want to reformat.

(2) Right-click “Removable Disk (?:)” on the Explorer screen. When the menu is displayed, click **Format (A)**.

(3) When the Format – Removable Disk (?:) window opens, click **File System (F)** and select “FAT” (Note: Do not select “FAT32”), and then click **Start (S)** to reformat the card.

(4) When the CF card has been reformatted, right-click “Removable Disk (?:)” on the Explorer screen. When the menu is displayed, select **Eject (J)** and remove the CF card (the CF card can now be safely removed from the PC). If you want to create a new CF card, perform the procedure in 3-3-5, “Creating a New CF Card” from step (2).

3-3-5 Creating a New CF Card

Copy to the new CF card the folders and files you have backed up to a PC in 3-3-2, “Backing Up the Files in the Current CF Card,” and restore the corrupted files.

(1) Set the new CF card in the CF card reader/writer.

(2) Copy to the new CF card the folders and files you have backed up to a PC in 3-3-2, “Backing Up the Files in the Current CF Card,” and restore the corrupted files. (Perform steps (3) to (12).)

(3) Restore each corrupted file (Step 1).
To restore the file “VIP6GUT.BIN” [1] specified in (1), “Root directory structure” under 3-2, “Structure of the CF Card Set in Drive B,” copy the main software included in the set of factory setting files.

(4) Restore each corrupted file (Step 2).
The file “PRODUCTS.DAT” [2] specified in (1), “Root directory structure” under 3-2, “Structure of the CF Card Set in Drive B” contains information specific to the system. To restore this file, therefore, you must obtain the backup data held by the manufacturer and copy the data.

(5) Restore each corrupted file (Step 3).
To restore the file “VIP6KPG.BIN” or “VIP6TCG.BIN” specified in (2), “Executable program folder structure” under 3-2, “Structure of the CF Card Set in Drive B,” copy the product check program or screen teaching program file included in the set of factory setting files.

(6) Restore each corrupted file (Step 4).
To restore the file “INSTRMNT.CSV,” “PASSWORD.CSV,” “SOLUTION.CSV,” “EXTALARM.CSV,” “SYSDISP.CSV” or “CYSWAV.CSV” specified in (3), “Control file folder structure” under 3-2, “Structure of the CF Card Set in Drive B,” copy the file of the same name included in the set of factory setting files. Note that all information that had been registered by the user must be registered again.

(7) Restore each corrupted file (Step 5).
To restore the file “CLEAN.CSV” or “PROG**.CSV” specified in (4), “Tissue processing program folder structure” under 3-2, “Structure of the CF Card Set in Drive B,” copy the file of the same name included in the set of factory setting files. Note that all information that had been registered by the user must be registered again.

(8) Restore each corrupted file (Step 6).
To restore the file “CONFIG**.CSV” specified in (5), “Station configuration file folder structure” under 3-2, “Structure of the CF Card Set in Drive B,” copy the file of the same name included in the set of factory setting files. Note that all information that had been registered by the user must be registered again.

(9) Restore each corrupted file (Step 7).
To restore the file “MAIN0**.VIP” or “SOUND**.WAV” specified in (6), “Operation file folder structure” under 3-2, “Structure of the CF Card Set in Drive B,” copy the file of the same name included in the set of factory setting files.

(10) Restore each corrupted file (Step 8).
To restore the file “PRISNAME.CSV,” “PRICNFG.CSV,” “PRPROG1.CSV,” “PRCLEAN.CSV” or “PREXALRM.CSV” specified in (7), “Factory setting file folder structure” under 3-2, “Structure of the CF Card Set in Drive B,” copy the file of the same name included in the set of factory setting files.

(11) Restore each corrupted file (Step 9).
If file “REPORT1.VIP,” “REPORT2.VIP,” “REPORT3.VIP,” “ERRHSTRY.VIP,” “SOLHSTRY.CSV,” “PULHSTRY.CSV,” “RUNINFO.CSV,” “DFTIME.CSV” or “VER_LOG.CSV” specified in (8), “Historical data file folder structure” under 3-2, “Structure of the CF Card Set in Drive B” is corrupted, the file need not be restored. Since these files are generated by the system during operation, any file that is missing at the start of the system is generated automatically. However, all historical data will be lost.

(12) Restore each corrupted file (Step 10).
If any of the files specified in (9), “Log output file folder structure” under 3-2, “Structure of the CF Card Set in Drive B” is corrupted, the file need not be restored. Since these files are generated by the system during operation, any file that is missing at the start of the system is generated automatically. However, all historical data will be lost.

(13) Check the content of the new CF card.
Confirm that the structure of the new CF card corresponds to the one specified in 3-2, “Structure of the CF Card Set in Drive B.”

(14) After confirming the content of the new CF card, right-click “Removable Disk (?:)” on the Explorer screen. When the menu is displayed, select **Eject (J)** and remove the CF card (the CF card can now be safely removed from the PC).

(15) Set the new CF card in drive B of the system.

(16) When the system power is turned on, the software is loaded from the new CF card.