INSTRUCTION MANUAL
FOR
MODEL L-2200 AUTOSAMPLER

 Part No. 890-9201 TF-G (FT-LT)

PREFACE

Thank you very much for purchasing Hitachi Model L-2200 autosampler, which has been specifically designed for automatic analysis in a liquid chromatograph system.
The Model L-2200 autosampler is intended for use by persons having a basic knowledge of chemical analysis.
Remember that improper use of analytical instruments, chemicals or samples would result not only in wrong analytical data but also in consequences adverse to safety.
Carefully read this instruction manual before attempting operation. For proper use of the autosampler, please acquaint yourself with it.
After reading this manual, keep it in a safe place nearby so it can be referred to whenever needed.

ABOUT THIS MANUAL

The operating procedures and maintenance/checkup instructions for the L-2200 autosampler are described in this manual.
First of all, read "IMPORTANT" and "SAFETY SUMMARY" at the beginning of this manual for ensuring safety in operation of the autosampler.
If installation of the autosampler is not yet completed, refer to Section 2.
Before attempting operation, read through Sections 3 and 4 to become acquainted with the structure of the instrument and its basic operations.

IMPORTANT

Precautions on Electromagnetic Wave Interference

1. Possible Electromagnetic Wave Interference Caused by This Instrument

Where this instrument is used in a residential area or an adjacent area thereto, it may cause interference to radio and television reception.
To prevent this, use the specified system connection cables in strict accordance with the instruction manual. The instrument is designed to minimize possible electromagnetic wave interference caused by it if the specified cables are connected properly.
However, there is no guarantee that electromagnetic wave interference will not be caused by the instrument.
If the instrument does cause interference to radio or television reception, which can be determined by turning the instrument off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the antenna of the radio/television receiver.
- Increase separation between the instrument and the radio/TV receiver.
- Connect the instrument to an outlet on a circuit different from that to which the radio/TV receiver is connected.

2. Possible Electromagnetic Wave Interference Affecting This Instrument

Where this instrument is used near an intense electromagnetic source, interference noise may be given to the instrument to incur an adverse effect on its performance or functionality.
To present this, use the specified system connection cables in strict accordance with the instruction manual. The instrument is designed to minimize possible electromagnetic wave interference affecting it if the specified cables are connected properly.
However, there is no guarantee that electromagnetic wave interference will not occur in the instrument. If the instrument does incur electromagnetic wave interference, which can be determined by turning on and off possible sources of electromagnetic interference nearby, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the instrument.
- Increase separation between the instrument and possible sources of electromagnetic interference.
- Connect the instrument to an outlet on a circuit different from that to which possible sources of electromagnetic interference are connected.
- Check that any other device connected with the instrument is not affected by electromagnetic interference.

Warranty on Product

The Model L-2200 autosampler is warranted to be free from defects in material or workmanship under normal use within the product specifications indicated in this manual and under conditions given below. This warranty is void if the instrument is not used according to the instruction manual.
Hitachi High-Technologies Corporation makes no warranties, either express or implied, as to marketability/merchantability and fitness for a particular purpose. Oral or written information or advice given by Hitachi High-Technologies Corporation dealers, distributors, agents or their employees without the express permission of Hitachi High-Technologies Corporation shall not create a warranty or in any way increase the scope of this warranty.

(1) Scope of Warranty

Any parts which prove to be defective in design or workmanship during the warranty period will be repaired, adjusted or replaced without charge. A substitute part may be used for repair, or replacement with an equivalent product may be made instead of repair. Such system components as a personal computer and printer to be updated frequently for improvement may not be available in original versions at the time of replacement. Note that this warranty does not apply to the instrument if modified by the user or resold without permission from the manufacturer, consumable parts, and any failure of lifetime-expired parts. No liability is assumed for breakage of data or application software due to troubles of this instrument.

(2) Warranty Period

One year from the date of initial installation

(3) Availability of Technical Support Service

Technical support service for this instrument is available within regular working hours on workdays specified by Hitachi High-Technologies Corporation.

(4) Limitations and Exclusions on Warranty

Note that the following cases are excluded from the scope of this warranty.

(a) Failure due to operation at a place not meeting the installation requirements specified by Hitachi High-Technologies Corporation.
(b) Failure due to power supply voltage/frequency other than specified by Hitachi High-Technologies Corporation or due to abnormality in power supply.
(c) Corrosion or deterioration of the tubing due to impurities contained in reagent, gas, air or cooling water supplied by the user.
(d) Corrosion of the electric circuits or deterioration of the optical elements due to highly corrosive atmospheric gas.
(e) Failure due to use of hardware, software or spare parts other than specified by Hitachi High-Technologies Corporation.
(f) Failure due to improper handling or maintenance by the user.
(g) Failure due to maintenance or repair by a service agent not approved or authorized by Hitachi High-Technologies Corporation.
(h) After disposal of this instrument, or after its resale without Hitachi High-Technologies Corporation approval.
(i) Failure due to relocation or transport after initial installation.
(j) Failure due to disassembly, modification or relocation not approved by Hitachi High-Technologies Corporation.
(k) Consumables, and failure of parts that have reached the end of specified useful life.
(l) Failure of parts excluded from the warranty in the instruction manual or other documents.

(m) Failure due to acts of God, including fire, earthquake, storm, flood, lightning, social disturbance, riot, crime, insurrection, war (declared or undeclared), radioactive pollution, contamination with harmful substance, etc.
(n) Failure of the hardware, or damage to the system software, application software, data or hard disk due to computer virus infection.
(o) Failure of the personal computer connected with the instrument, or damage to the system software, application software, data or hard disk due to power interruption or momentary power voltage drop caused by lightning.
(p) Failure of the personal computer connected with the instrument, or damage to the system software, application software, data or hard disk due to disconnection of main power to the personal computer without taking the specified normal shutdown procedure.

(5) Disclaimer of Warranty

THE MANUFACTURER MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, EXCEPT AS PROVIDED HEREIN, INCLUDING WITHOUT LIMITATION THEREOF, WARRANTIES AS TO MARKETABILITY, MERCHANTABILITY, FOR A PARTICULAR PURPOSE OR USE, OR AGAINST INFRINGEMENT OF ANY PATENT.
IN NO EVENT SHALL THE MANUFACTURER BE LIABLE FOR ANY DIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE, OR LOSSES OR EXPENSES RESULTING FROM ANY DEFECTIVE PRODUCT OR THE USE OF ANY PRODUCT.
NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY THE MANUFACTURER, ITS DEALERS, DISTRIBUTORS, AGENTS OR EMPLOYEES SHALL CREATE A WARRANTY OR IN ANY WAY INCREASE THE SCOPE OF THIS WARRANTY.

(6) Warranty Card

The warranty card will not be reissued. Keep it in a safe place.

Installation, Relocation and After-sale Technical Service

(a) Installation at delivery shall not be carried out by customer. It shall be carried out by Hitachi High-Technologies Corporation service representative or the engineers who have been trained and qualified for this purpose by Hitachi High-Technologies Corporation in order to use the instrument safely and exactly.

(b) Installation of the instrument shall be carried out by or under supervision of qualified service personnel of the manufacturer or its authorized service agent.
Before installation of the instrument, the customer is requested to prepare necessary utilities referring to this manual.

(c) When relocation of the instrument becomes necessary after initial installation (delivery), please notify your local Hitachi High-Technologies Corporation sales representative or service office.

(d) For after-sales service of the instrument, contact the Hitachi High-Technologies Corporation sales or service representative in charge.

(e) For service after warranty period, consult us with regard to a maintenance and inspection service contract.

Technical Seminars and Training for Customers

For the customers to acquire in-depth understanding of the analytical instruments, technical seminars and customer training courses are available at Hitachi High-Technologies Corporation or your site. For further information, contact your local Hitachi High-Technologies Corporation sales representative.
(The technical seminars and customer training courses are available on a chargeable basis.)

Other Precautions

1. Handling of Chemicals and Samples

(1) The user is responsible for following relevant legal standards and regulations in the handling, storage and discarding of chemicals and samples used in analytical operations of the instrument.

(2) Reagents, standard solutions and accuracy-control samples shall be handled, stored and discarded as instructed by the respective suppliers.

2. Notice on This Instruction Manual

(1) The information contained in this manual is subject to change without notice for product improvement.

SAFETY SUMMARY

General Safety Guidelines

Before using the Hitachi Model L-2200 autosampler, be sure to read the following safety instructions carefully.

- Follow all the operating procedures provided in this manual.
- Installation of the instrument shall be carried out by or under supervision of qualified service personnel of the manufacturer or its authorized service agent. Installation by the user is not allowed.
- Be sure to observe the warnings indicated on the product and in the instruction manual. Failure to do so could result in personal injury or damage to the product.
- The hazard warnings which appear on the warning labels on the product or in the manual have one of the following alert headings consisting of an alert symbol and signal word DANGER, WARNING, or CAUTION.

⚠	:	This is a safety alert symbol. It is used for calling attention to danger that will potentially harm a person. To avoid possible injury or death, all the safety messages after this symbol must be followed.
⚠ **DANGER**	:	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ **WARNING**	:	Indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.
⚠ **CAUTION**	:	Indicates a hazardous situation which, if not avoided, will or can result in minor or moderate injury, or serious damage to the product.
NOTICE	:	Used to present warnings which are not directly related to personal injury hazards, but concern the proper use of the product.

SAFETY SUMMARY

General Safety Guidelines (Continued)

Besides the above, the following signal word is used to present warnings which concern the proper use of the instrument.

NOTE:	provides an explanation for using the instrument properly and performing measurement exactly while avoiding instrument troubles.

Precautions on Use

- Before using this instrument, be sure to read the instruction manual carefully to attain a solid understanding of its functions and operations.
- Keep the instruction manual handy so that it can be referred to whenever needed.
- Be sure to follow the operating procedures and usage described in the instruction manual.
- Be sure to understand and follow all the safety instructions given in the manual.
  Observe all of the above instructions. Failure to do so could result in wrong analytical data or personal injury.
- Do not modify the instrument, replace parts that are not user-serviceable, use non-specified parts, nor remove safety devices, as it could be hazardous.
- When using a chemical for analytical operation, be sure to provide proper ventilation in the laboratory room as per local requirements. Inadequate ventilation could endanger your health.

SAFETY SUMMARY

General Safety Guidelines (Continued)

Precautions on Installation, Maintenance and Relocation

- Installation at delivery shall not be carried out by customer. It shall be carried out by Hitachi High-Technologies Corporation service representative or the engineers who have been trained and qualified for this purpose by Hitachi High-Technologies Corporation in order to use the instrument safely and exactly.
- At the time of installation, it is requested for the customer to check that all the ordered items have been delivered. If any item is missing or damaged or if you have any question, contact your local Hitachi High-Technologies Corporation sales representative.
  If the instrument is operated without any standard accessory equipped, a failure could occur to cause an unsafe condition. In such a case, follow instructions to be given by the qualified service personnel.
- Do not perform any operation or action other than described in this manual. When in doubt, please contact your local Hitachi High-Technologies Corporation sales representative or service office.
- Keep in mind that the hazard warnings in this manual or on the product cannot cover every possible case, as it is impossible to predict and evaluate all circumstances beforehand.
  Be alert and use your common sense.
- Maintenance to be carried out by the customer is restricted to the items described in this manual. Before maintenance, carefully read the relevant instructions given in the manual. Maintenance of the items other than described in the manual must not be attempted. Otherwise, instrument trouble or human injury might be caused.
- After installation, avoid moving the instrument unless absolutely required. The precisely adjusted mechanism might be misaligned due to vibration, etc.
- If any warning label is deteriorated due to long use or damaged, contact the nearest Hitachi High-Technologies Corporation service representative.

SAFETY SUMMARY

WARNING: Ignition of Flammable Chemicals!

Exercise utmost care when handling flammable chemicals.

- Beware of ignition hazard when using flammable chemicals such as organic solvents.
- Always check the following conditions. If an abnormality is found, stop operation immediately.
  - ◇ Leakage of solvent or waste solution.
  - ◇ Leakage of solvent inside the instrument.
- Well-ventilate the laboratory room where the instrument is used.
- This instrument is not explosion-proof. Although aqueous solvents or organic solvents having an ignition point of 70 °C or higher are usable, do not use organic solvents having an ignition point below 70 °C.
- When using flammable chemicals, be careful about possible ignition due to static electricity. Particularly when using non-conductive chemicals, employ a conductive vessel and provide grounding connection correctly.

(Section 4.2)

WARNING: Explosion of Vapor from Flammable Chemicals!

Exercise utmost care when handling flammable chemicals.

- If a flammable chemical such as organic solvent leaks from the flow path of the instrument and its vapor concentration exceeds the explosion limit, it may cause spontaneous combustion with dangerously explosive results.
- When using a flammable and readily volatile chemical, be sure to check for leakage from the instrument flow path and ventilate the laboratory room adequately.

(Section 4.2)

SAFETY SUMMARY

WARNING: Beware of Electric Shock in Contact with Inside of Instrument!

Potentially dangerous voltages are present within the instrument.

Before removing the instrument cover for replacement or adjustment of inside parts, be sure to turn OFF the power switch and unplug the power cord.

WARNING: Ground Properly to Prevent Electric Shock Hazard!

Improper grounding could cause electric shock.

- Be sure to use the power cable supplied with the instrument. Use of a different power cable could result in an electric shock hazard.
- This instrument is of a "plug-connected type" specified in European Norm EN61010-1, so connect the power cable to a grounded three-wire outlet.
- Where a grounded three-wire outlet is not available, the power cable may be connected to a two-wire outlet through an adapter plug. In this case, be sure to provide proper grounding connection as required.

(Section 2.3.1)

WARNING: Injury of Hand by Needle or Internal Mechanism!

Never touch the inside of the autosampler during operation, as your hand or finger may be seriously injured by the needle or internal mechanism.

SAFETY SUMMARY

CAUTION: Beware of Heavy Objects!

This instrument is as heavy as 19 kg (24 kg with the optional cooling unit equipped).
When carrying this instrument, exercise care not to incur injury by dropping it off accidentally. Be sure to hold the front and rear parts of the instrument securely when moving it.

CAUTION: Fatigue due to Long-Hour Operation!

If you keep working with the CRT monitor in the same posture for long hours, your eyes and body will be fatigued.
When working with the CRT monitor for a long time, take a break for 10 to 15 minutes per hour for health of your eyes and body.

NOTICES:

Restriction on Use of Reagents

Fluorocarbon resin and quartz crystal materials are used in the flow path in this instrument. Never use reagents that would corrode these materials.

Precautions on Use of Corrosive Solvents

- The drain path for carrying leakage solutions is made of polypropylene.
- The materials inside the instrument are susceptible to corrosion by strong acid, strong alkali and organic solvents.
- When using corrosive solvents, make sure that the tubing connections are not loose.
- Using the pump pressure limiter function or by other means, make setting so that liquid delivery is forced to stop automatically if leakage occurs.

SAFETY SUMMARY

Precautions on Disposal of Waster Solution

Be sure to collect waste solution and treat it properly for disposal according to the relevant environmental protection regulations. Improper disposal treatment of waste solution may result in environmental pollution. Be sure to observe the law related to environmental protection.

Precaution on Accuracy/Precision of Measured Values

Perform control sample measurements to ensure that the performance of the instrument is normal.

Precaution on High Pressure

In the liquid chromatograph system, liquid is under high pressure during operation. Beware of accidental emission of a chemical solution. When using a harmful solvent, be sure to wear safety goggles.

Prevention of Instrument Tipover

Provide a proper means for preventing the instrument from tipping over accidentally.

Precaution on Waste Solution Bottle

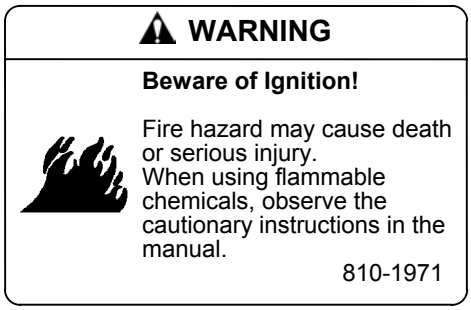
Prepare a waste solution bottle having a sufficient capacity (sufficient for the total quantity of mobile phase at least).

⚠ SAFETY SUMMARY

WARNING LABELS

The waning labels shown below are attached on Model L-2200 autosampler.
Carefully read each warning label shown below and check the contents on the actual label.
The warning labels should be checked occasionally and kept clean so that they can be read adequately at a safe distance.
If any warning label becomes illegible due to deterioration, ask the Hitachi High-Technologies Corporation service representative for a new label.

(1) Ignition of Flammable Chemicals



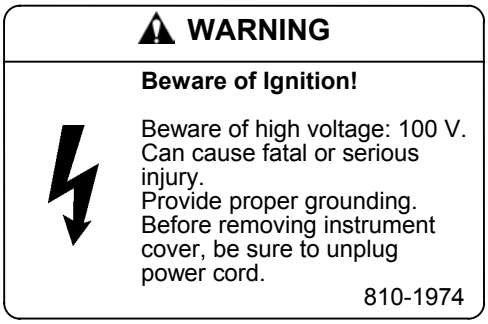
[Attached on left front]

(2) Explosion of Vapor from Flammable Chemicals

[Attached on left front]

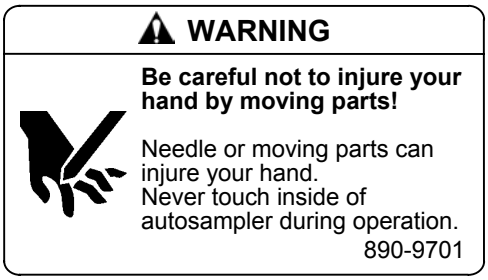
SAFETY SUMMARY

(3) Electric Shock in Contact with Inside of Instrument



[Attached on cooling unit power supply (option)]

(4) Injury of Hand by Needle or Internal Mechanism



[Attached on needle cover]

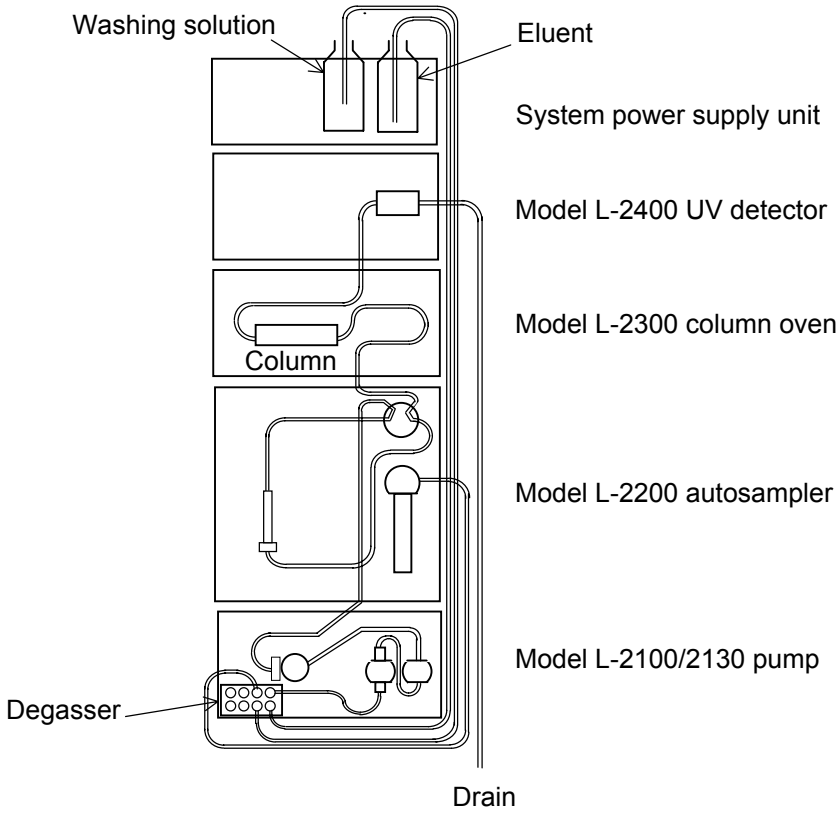
CONTENTS

1. OUTLINE

The liquid chromatograph system consists of a pump for feeding an eluent, a sample introducing section (autosampler, manual injector) for injecting a sample, a column for chromatographic separation of the injected sample, a column oven for maintaining the column at a constant temperature, and a detector section for detecting a signal of a separated component of the sample.
In addition, a degasser for deaerating an eluent, a gradient device for varying a mixing ratio of eluents with time, and other optional devices are incorporated in the system.

1.1 Isocratic System

The isocratic system has a simple configuration in which single-solvent analysis is performed.



(1) An eluent is fed by the pump through the degasser.

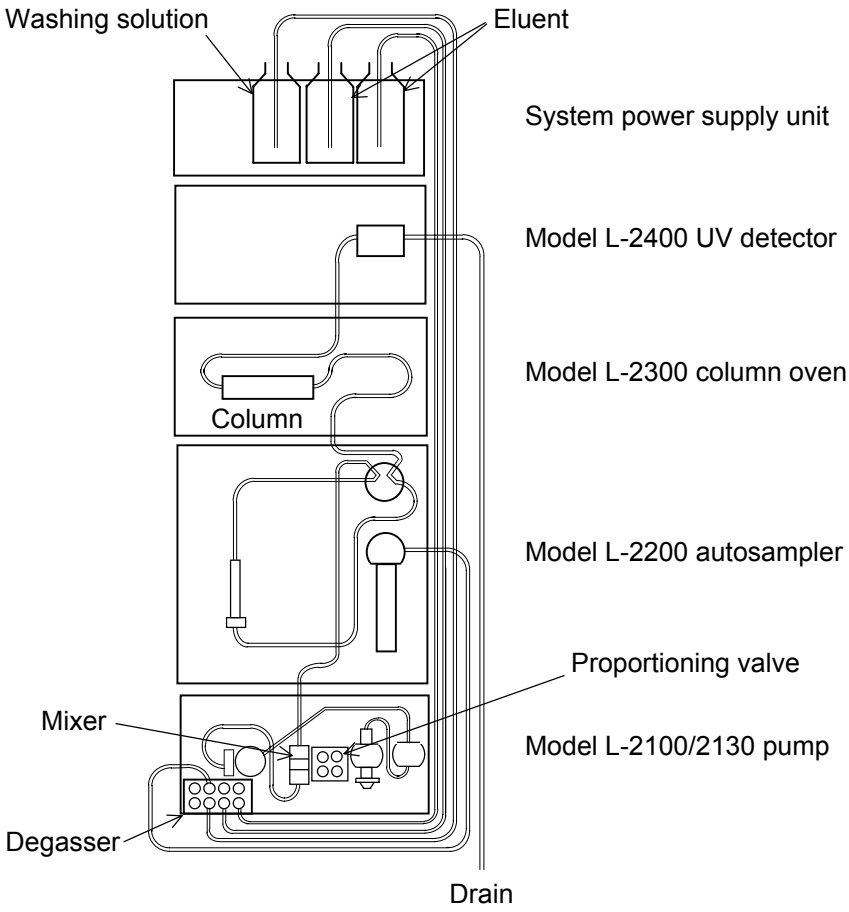
(2) A sample is injected from the autosampler.

(3) The injected sample is separated through the column which is maintained at a constant temperature by the column oven.

(4) Each component separated from the sample is then detected as a signal by the detector.

1.2 Low-Pressure Gradient System

In the low-pressure gradient system, two or more solvents are mixed in its low-pressure section from which a liquid feed is performed by a single pump. The composition of an eluent is made to vary with time in chromatographic separation.



(1) Each of plural eluents is fed from the degasser to the low-pressure unit.

(2) In the low-pressure unit, the eluents are mixed at a pre-specified ratio.

(3) Through the mixer, the mixture eluent is delivered.

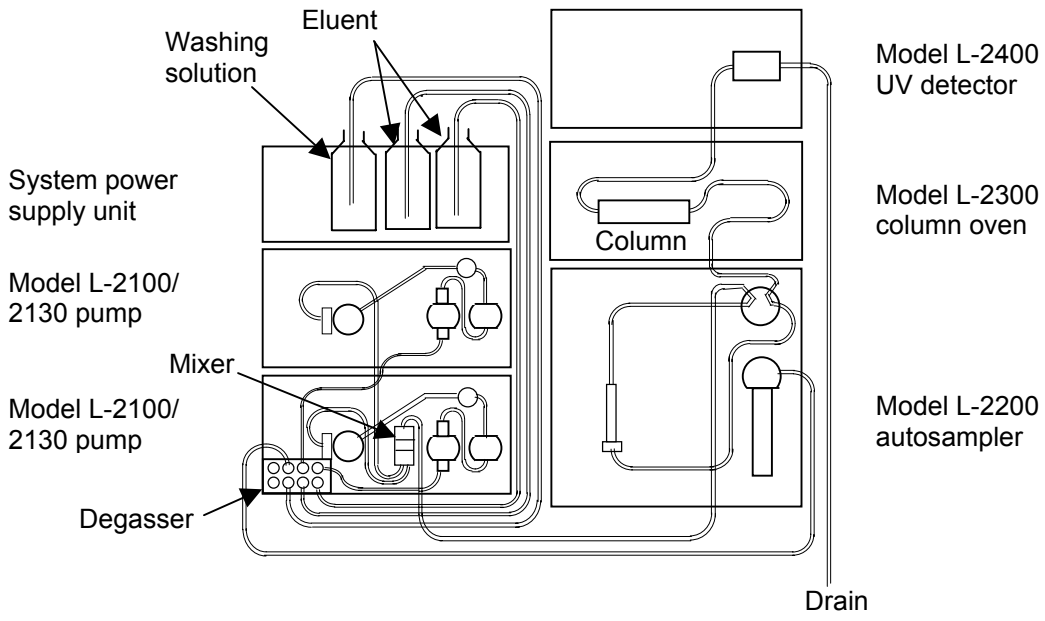
(4) A sample is injected by the autosampler.

(5) The injected sample is separated through the column which is maintained at a constant temperature by the column oven.

(6) Each component separated from the sample is detected as a signal by the detector.

1.3 High-Pressure Gradient System

In the high-pressure gradient system, two or more solvents are fed by respective pumps and mixed in the high-pressure section for liquid delivery.



(1) From the degasser, each of plural eluents is applied to the pump.

(2) The plural eluents are fed at a flow rate corresponding to a pre-specified mixing ratio.

(3) The plural eluents thus fed are mixed in the high-pressure gradient section. Through the mixer, the mixture eluent is delivered.

(4) A sample is injected by the autosampler.

(5) The injected sample is separated through the column which is maintained at a constant temperature by the column oven.

(6) Each component separated from the sample is detected as a signal by the detector.

2. INSTALLATION

CAUTION

Beware of heavy objects!

This instrument is as heavy as 19 kg (24 kg with the optional cooling unit equipped).
When carrying this instrument, exercise care not to incur injury by dropping it off accidentally. Be sure to hold the front and rear parts of the instrument securely when moving it.

2.1 Unpacking

Carefully unpack the shipping case, take out module units and standard accessories, and place them on a sturdy, level desk or bench.

NOTICE: Installation at delivery shall not be carried out by customer. It shall be carried out by Hitachi High-Technologies Corporation service representative or the engineers who have been trained and qualified for this purpose by Hitachi High-Technologies Corporation in order to use the instrument safely and exactly.
Before installation of this instrument, the customer shall make preparations for satisfying the installation requirements in accordance with this manual.
When relocation of this instrument becomes necessary after initial installation (delivery), please notify your local Hitachi High-Technologies Corporation sales representative or service office.

2.2 Installation Place

When selecting an installation place for this instrument, be sure to check the following conditions:

(1) Operating Ambient Temperature

15 to 25 °C
Temperature variations during measurement should be minimized. Take sufficient care to prevent dew condensation.

(2) Operating Ambient Humidity

45 to 85% RH

(3) Atmosphere

(a) Well ventilated.

(b) Free from acidic or alkaline gases that could corrode metals significantly.

(c) Free from vapors of solvents (e.g., benzene, thinner) that could affect the paint coating on the instrument.

(4) Other Requirements

(a) Not exposed to direct sunlight.
Exposure to direct sunlight could result in deteriorated performance or discoloration of the instrument.
Avoid installing the instrument near a window of the laboratory room.

(b) Not exposed to drafts directly.

(c) Free from intense vibrations and shocks.

(d) Apart from a heat source such as a gas burner, electric heater, or oven.

(e) Apart from a strong magnetism source such as an electronic welder, high-frequency electronic furnace, or voltage transformer.

(f) Free from an amount of dust and dirt.
Contamination with dust and dirt could deteriorate the performance of the instrument.

(g) No abrupt fluctuations in power voltage.
Fluctuations in power voltage could cause noise in analytical data.

(h) Do not connect the instrument to a power line used by an electric device that is not equipped with a noise suppressor circuit (e.g., stirrer, vibrator).

2.3 Items to be Prepared by the User

2.3.1 Power Supply

(1) Power voltage : 100 to 240 V AC
Fluctuation ..... Within ±10% with respect to rated voltage

(2) Frequency : 50 or 60 Hz
Fluctuation ..... Within ±0.5 Hz with respect to rated frequency

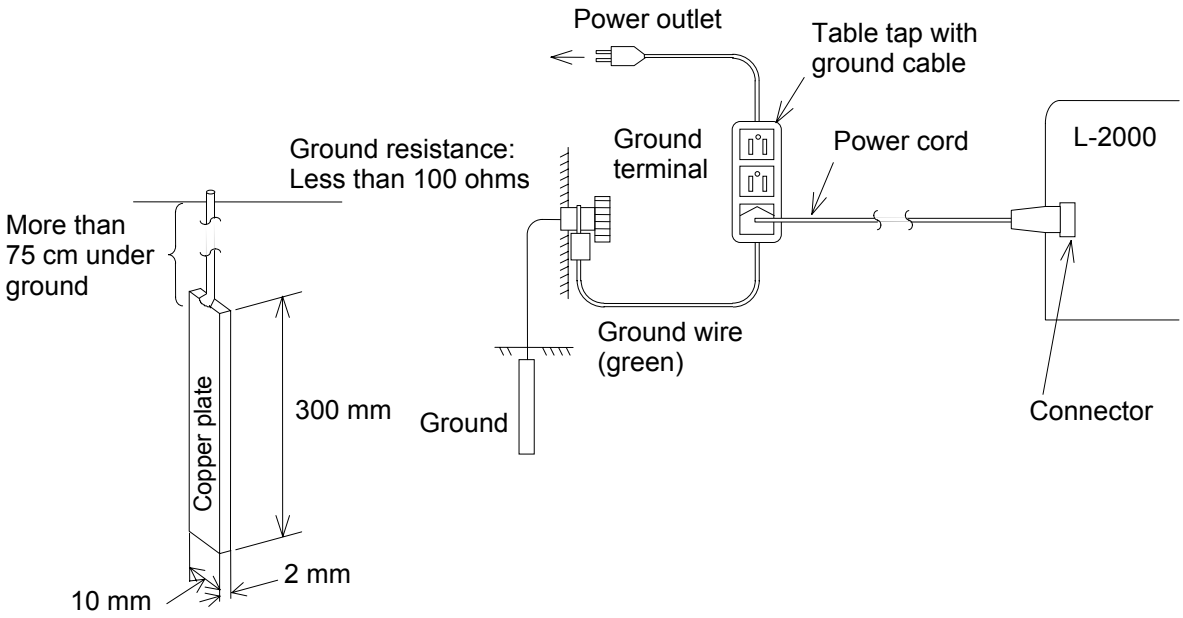
(3) Power consumption : 500 VA or more in total system
Provide power supply sufficient for combinational use with other devices.
50 VA (L-2200 alone)

(4) Grounding : Grounding connection of Electric Installation Technical Standard Class 3 or higher should be provided.

WARNING

Ground Properly to Prevent Electric Shock Hazard!

- Be sure to use the power cable supplied with the instrument. Use of a different power cable could result in an electric shock hazard.
- This instrument is of a "plug-connected type" specified in European Norm EN61010-1, so connect the power cable to a grounded three-wire outlet.
- If a grounded three-wire outlet is not available, the power cable may be connected to a two-wire outlet through an adapter plug. In this case, be sure to provide proper grounding connection as required.



2.3.2 Installation Space For installation of this system, it is required to provide a space of at least 640 mm (width) × 550 mm (depth). Prepare a sturdy, level desk or bench capable of supporting a weight load of at least 150 kg. On the rear of the main unit, allow at least 100 mm of clearance.
Secure a space of at least 100 mm each on the left and right sides of the main unit.

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Before installation of the instrument, the customer is requested to prepare necessary utilities referring to this manual.
When relocation of the instrument becomes necessary after initial installation (delivery), please notify your local Hitachi High-Technologies Corporation sales representative or service office.

2.4 Checking the Contents

After unpacking, check the contents of each case against the packing list attached to it.

2.5 Assembling

> **NOTE**: Installation at delivery shall not be carried out by customer. It shall be carried out by Hitachi High-Technologies Corporation service representative or the engineers who have been trained and qualified for this purpose by Hitachi High-Technologies Corporation in order to use the instrument safely and exactly.

2.5.1 Removal of Fixture Parts Used for Transport

(1) How to Remove Fixture Parts Used for Transport

Open the front door (left). Then, using a Phillips screwdriver, remove the fixture part X and the fixture part Y-Z.

(2) Removal of Cushioning Material

Remove the cushioning material around the syringe.

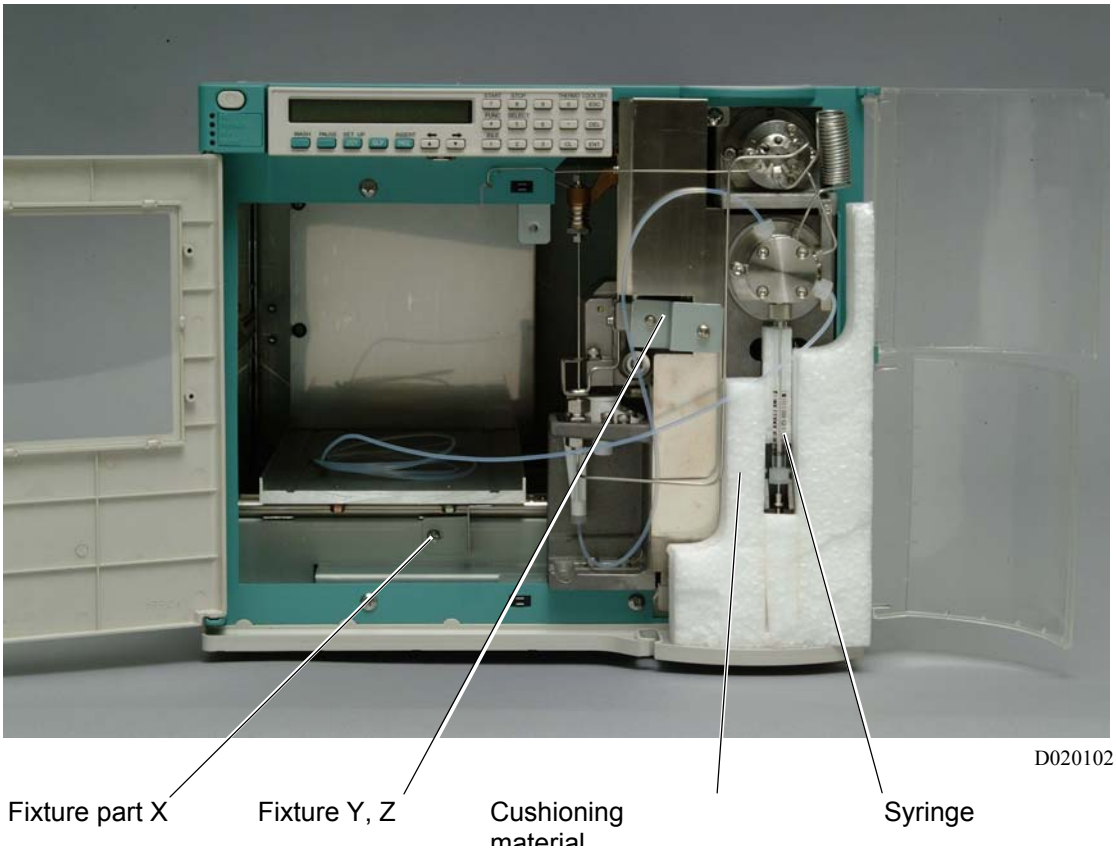


Fig. 2-1 Removal of Fixtures and Cushioning Material

(3) How to Mount Needle Cover

Using the screw holes for the fixture part Y-Z, mount the needle cover as shown below.

(4) Attachment of Doors

Attach the right-hand doors A and B.

NOTICE:	Be sure to mount the needle cover. If the instrument is operated with the needle cover removed, there could occur a personal injury or a failure in the instrument.

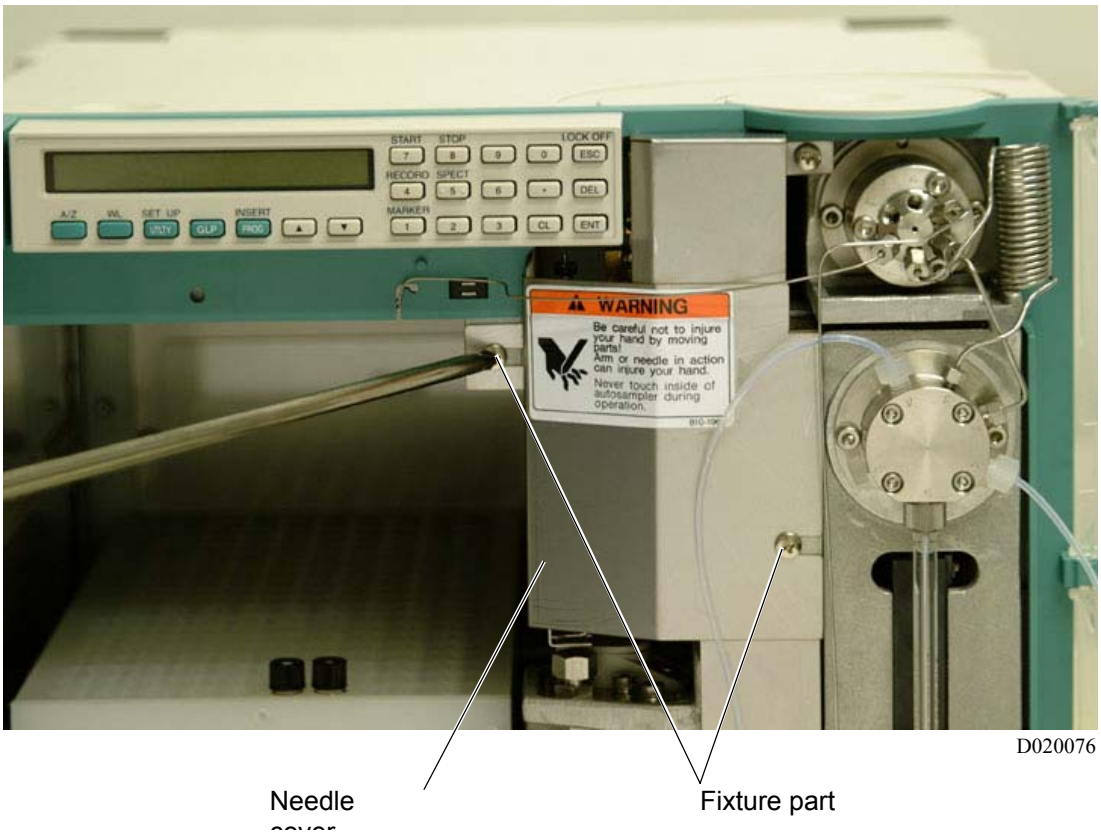


Fig. 2-2 Mounting of Needle Cover

(4) How to Mount Leak Sensor

Mount the leak sensor (adjust its position) so that the tip of the leak sensor comes in contact with the drain reservoir.

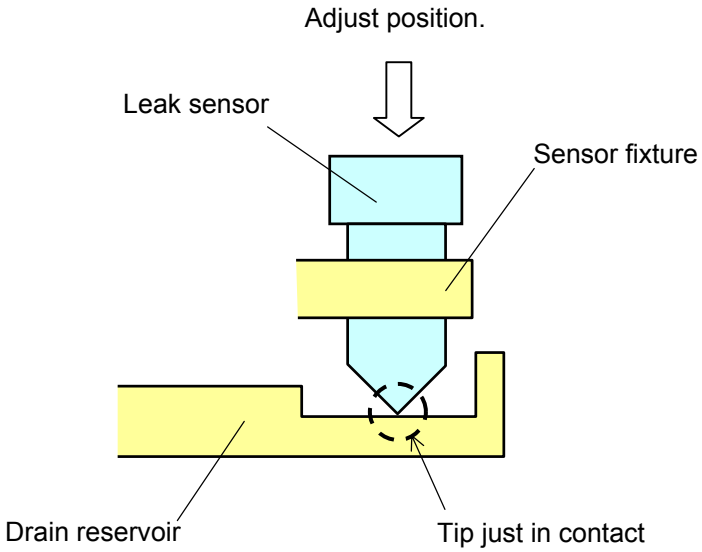
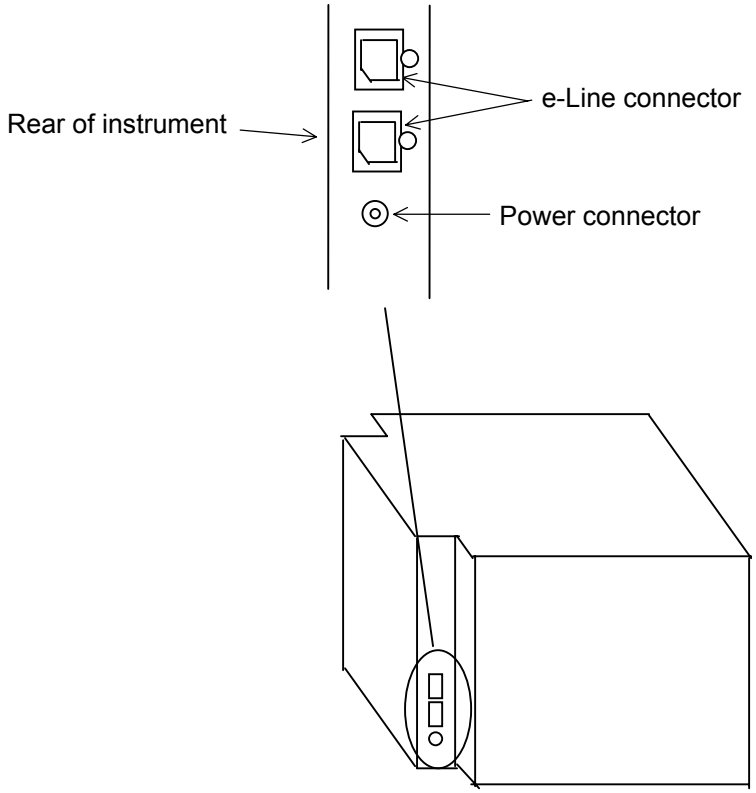


Fig. 2-3 Mounting of Leak Sensor

NOTES: 1. Mount the leak sensor at the correct position. If the mounting position is inappropriate, the leak sensor may not function normally or an error may occur.
2. Before removing the drain reservoir for cleaning, etc., remove the sensor fixture (including the leak sensor) with a screwdriver. If the drain reservoir is removed forcibly, the leak sensor may be damaged.

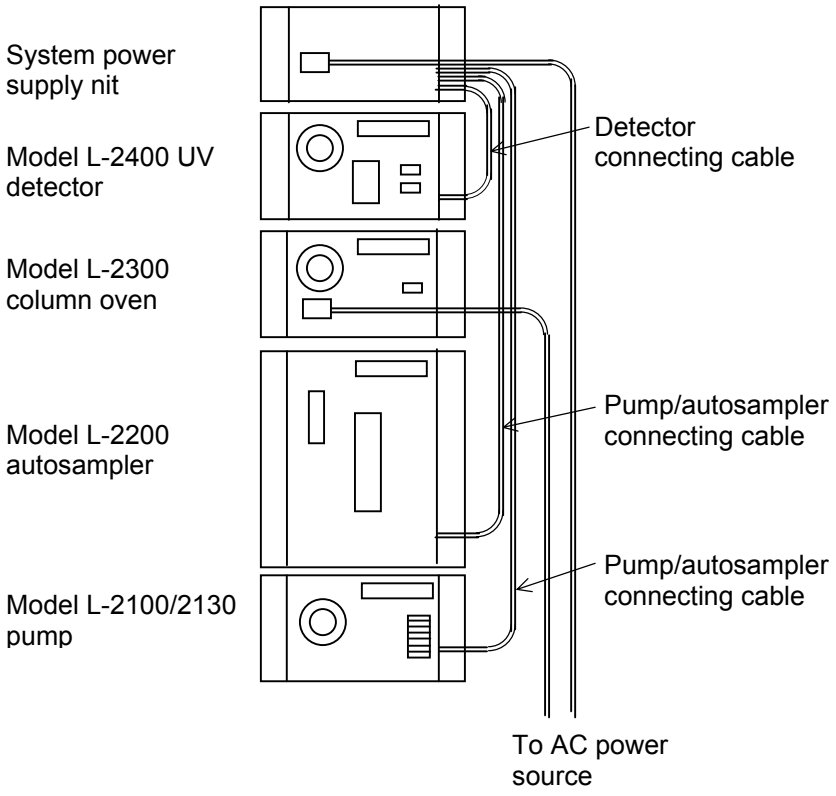
2.5.2 Power Supply Unit

The L-2000 Series system is provided with a system power supply unit which is capable of connecting two pumps, one autosampler, and one detector. The column oven has its own power cord. In an instance where provision of a single system power supply unit is insufficient for the use of two detectors, use an AC adapter suitable for each instrument.
The power cable from the system power supply unit and the AC adapter power cable should be connected to the power connector equipped on the left rear side of the instrument.



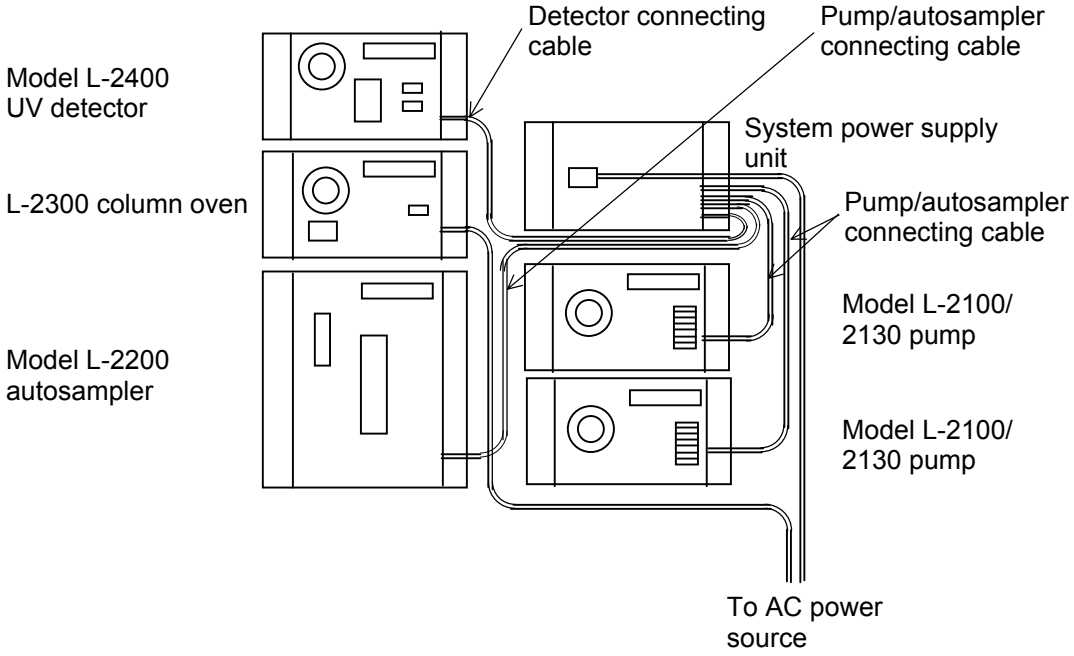
(1) Isocratic System/Low-Pressure Gradient System

Connect the power cables of the system power supply unit and column oven to AC power source. For the L-2100/2130 pump, connect the pump/autosampler connecting cable from the system power supply unit to the instrument power connector. For the L-2200 autosampler, connect the pump/autosampler connecting cable from the system power supply unit to the instrument power connector. For the L-2400 UV detector, connect the detector connecting cable from the system power supply unit to the instrument power connector.



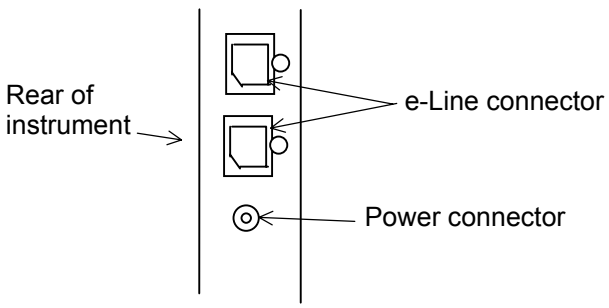
(2) High-Pressure Gradient System

Connect the power cables of the system power supply unit and column oven to AC power source. For the L-2100/ 2130 pump, connect the pump/autosampler connecting cable from the system power supply unit to the instrument power connector. For the L-2200 autosampler, connect the pump/autosampler connecting cable from the system power supply unit to the instrument power connector. For the L-2400 UV detector, connect the detector connecting cable from the system power supply unit to the instrument power connector.



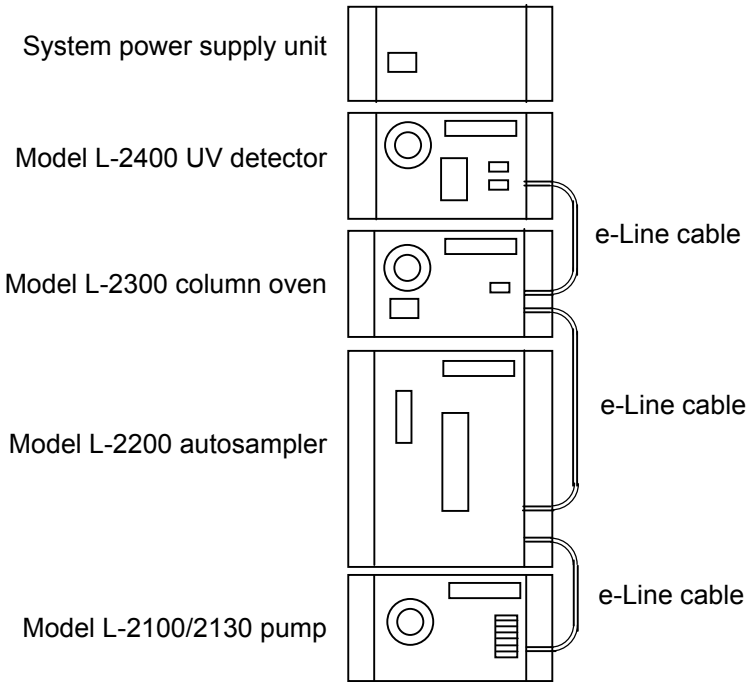
2.5.3 Wiring Arrangement

In the L-2000 Series, connect the e-Line cable to the e-Line connector equipped on the left rear of each instrument for instrument-to-instrument wiring connection.

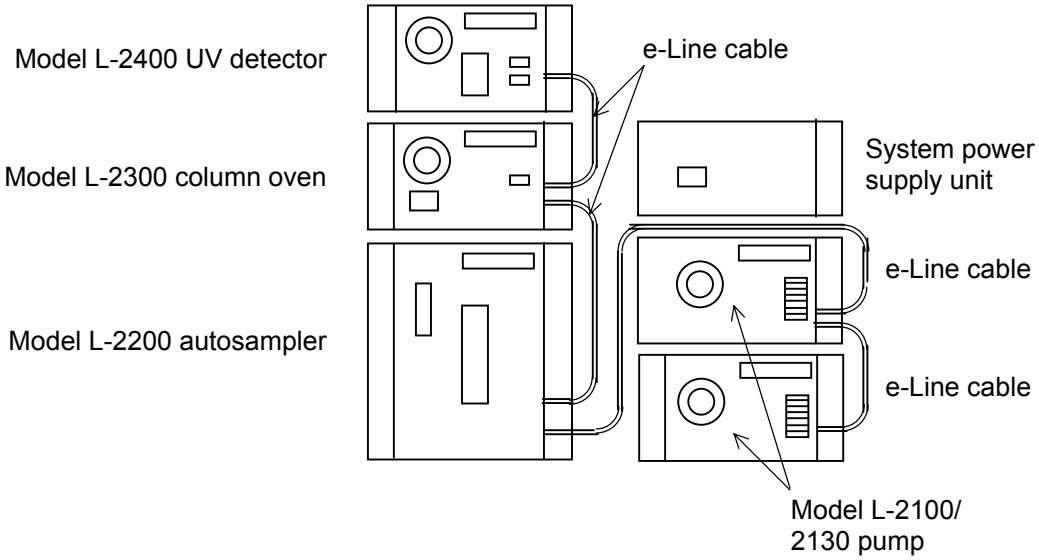


2.5 Assembly

(1) Isocratic System/Low-Pressure Gradient System

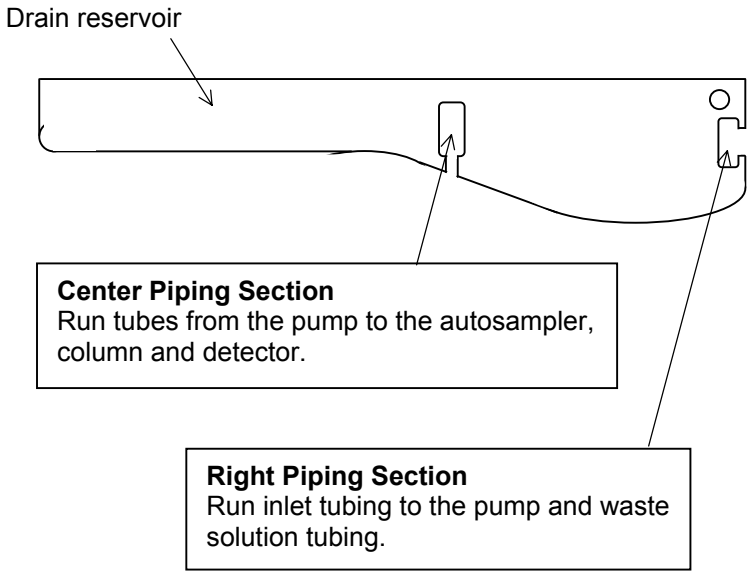


(2) High-Pressure Gradient System



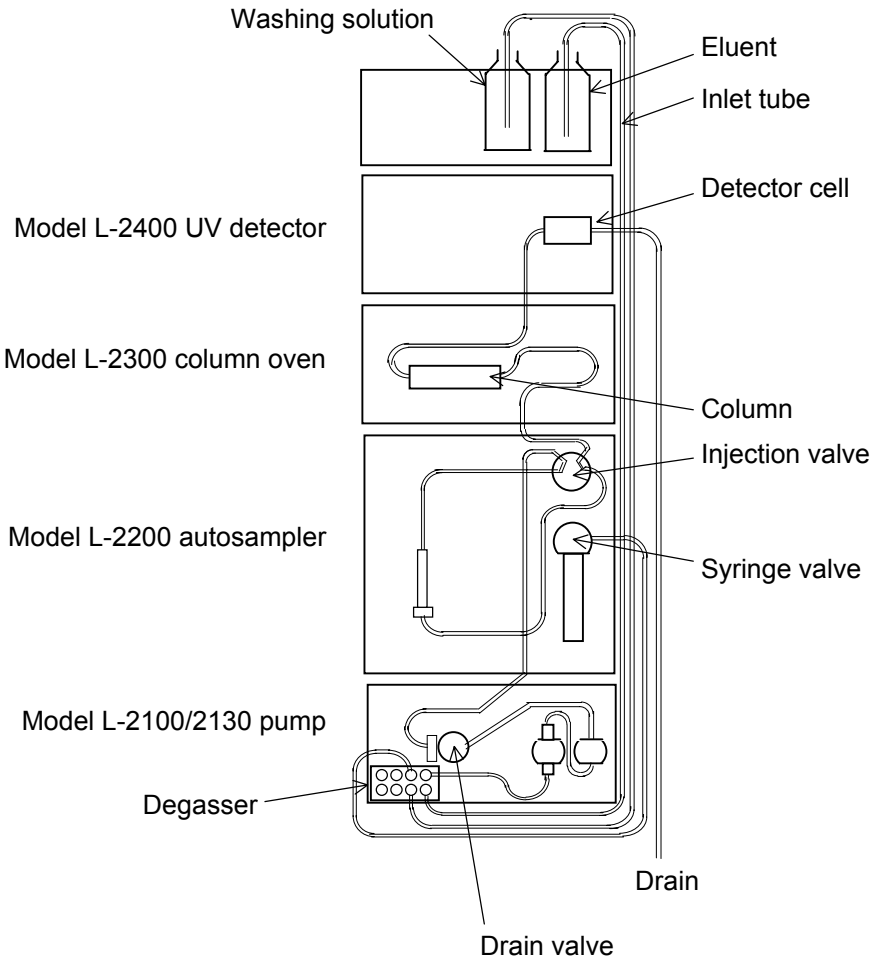
2.5.4 Piping Arrangement

In the L-2000 Series, provide inlet tubing to the pump and waste solution tubing through the right piping section of the drain reservoir. Provide tubing from the pump to the autosampler, column and detector through the center piping section of the drain reservoir.



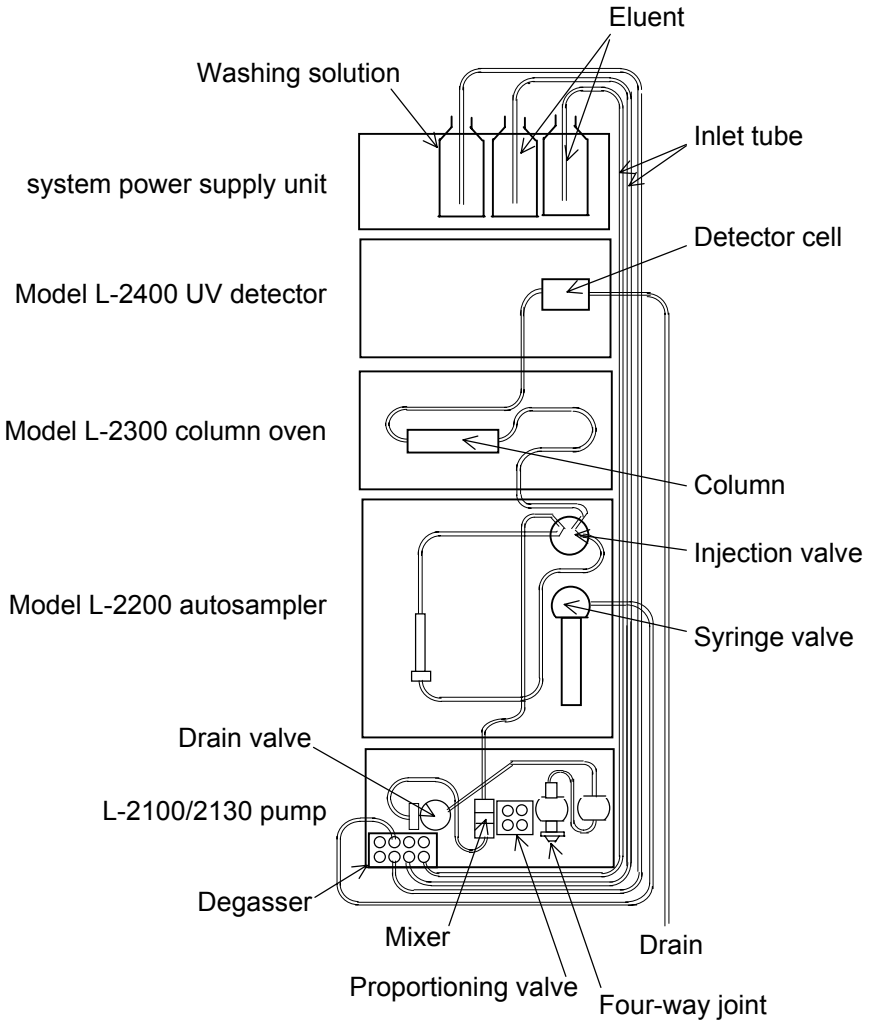
(1) Isocratic System

Connect the inlet tube of eluent to the IN port of the degasser. Connect the OUT port of the degasser to the inlet of the pump. Connect the drain valve of the pump to port 1 of the injection valve of the autosampler.
Connect port 2 of the injection valve to the column inlet. Connect the column outlet to the inlet tube of the detector cell. For washing solution, provide connection to port 1 of the syringe valve of the autosampler through the degasser.



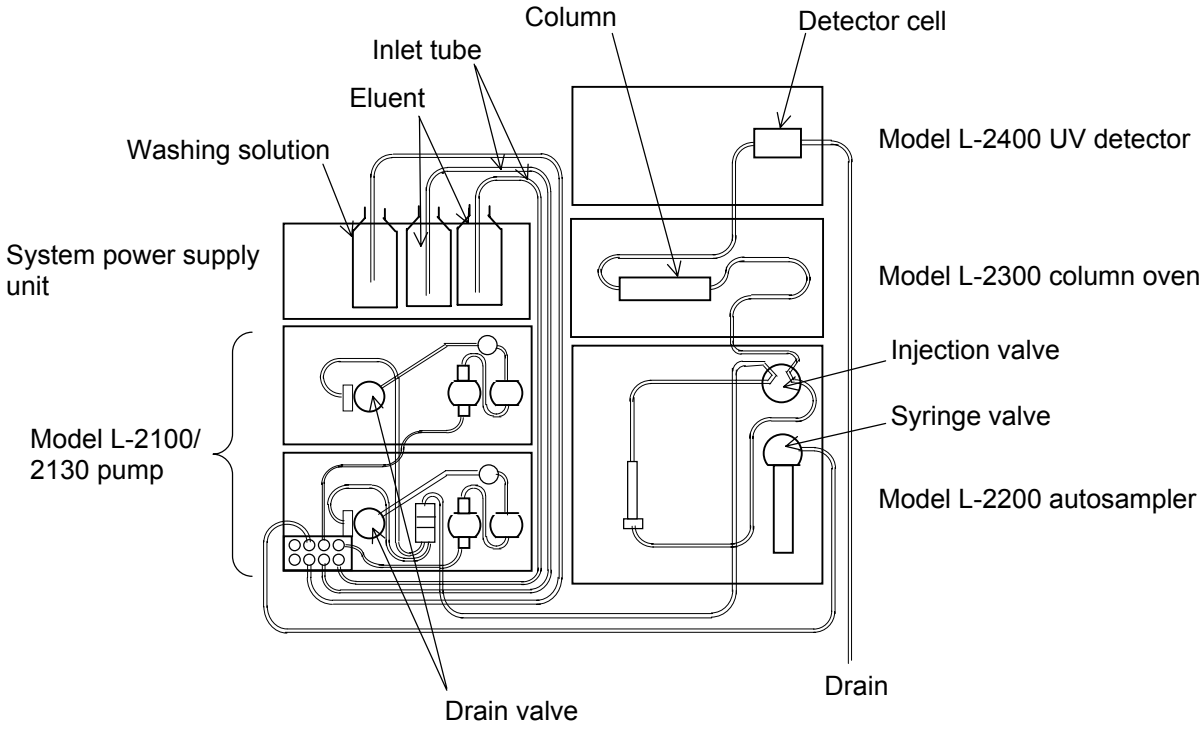
(2) Low-Pressure Gradient System

Connect the inlet tube of eluent to the IN port of the degasser. Connect the OUT port of the degasser to the IN port of the proportioning valve. Connect the OUT port of the proportioning valve to the four-way joint.
Connect the mixer of the pump to port 1 of the injection valve of the autosampler. Connect port 2 of the injection valve to the column inlet. Connect the column outlet to the inlet tube of the detector cell. For washing solution, provide connection to port 1 of the syringe valve of the autosampler through the degasser.



(3) High-Pressure Gradient System

Connect the inlet tube of eluent to the IN port of the degasser. Connect the OUT port of the degasser to the IN port of the pump. Connect the drain valve of the pump to the mixer. Connect the mixer of the pump to port 1 of the injection valve of the autosampler. Connect port 2 of the injection valve to the column inlet. Connect the column outlet to the inlet tube of the detector cell.
For washing solution, provide connection to port 1 of the syringe valve of the autosampler through the degasser.

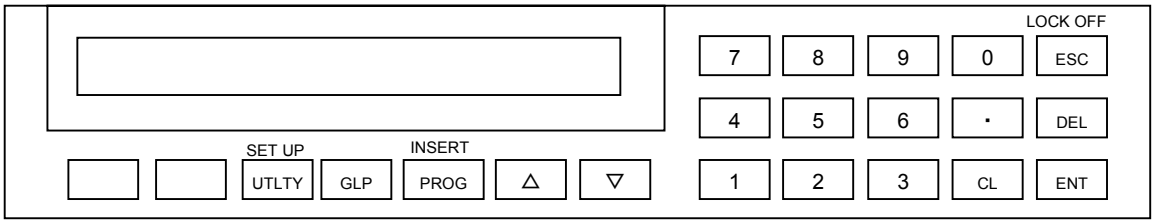


2.5.5 Module Unit Operating Procedure

Where the chromato data station is not used for controlling operations, each module can be operated using the optional UI pad.
This section describes how to use the UI pad for operations.
The UI pad is provided with common control keys available for different modules and unique control keys for particular modules.
The functions of the common control keys are mentioned below.

(1) Using the UI Pad

(a) Functions of common control keys

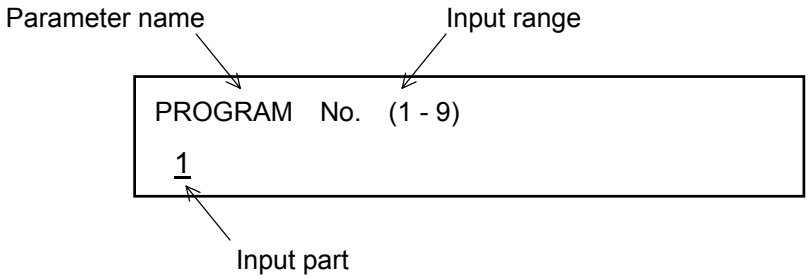


Key Designation	Function
UTLTY	Starts instrument parameter setting.
GLP	Starts GLP function setting. Available for displaying a logbook of component parts of each module, triggering a reset, and locking the UI pad keys.
PROG	Starts program editing.
ESC	Returns control to the monitor window.
DEL	Deletes a cursor-pointed step. This key is effective only in program editing. When the cursor is positioned on the TIME input part, pressing the **DEL** key removes a step pointed by the cursor. When the cursor is positioned on another input part, pressing the **DEL** key removes an item pointed by the cursor. Pressing the **ESC** key on a window where "-" is indicated returns control to the monitor window, causing cancellation of a **DEL** key action. • Pump/detector time program When the **DEL** key is pressed, "-" is indicated. This deletion can then be defined by pressing the **ENT** key. • Autosampler sequential program When the **DEL** key is pressed, the relevant step number is deleted and "-" is indicated. This deletion can then be defined by pressing the **ENT** key.
CL	Clears an input numeric value during input (after a numeric value or the decimal point is entered; before the **ENT** key is pressed). The cursor is indicated at the top of the input part. The previous input value is presented as a preset value.
ENT	Defines the current entry of a parameter.
INSERT	Use this key in program editing. • Pump/detector A new line is presented following the last line of the current program. • Autosampler A new step is inserted.
△, ▽ (Arrows)	(1) Monitor window • ▽ key : Goes to the next window. • △ key : Goes back to the previous window. (2) Program editing • ▽ key : The next line is presented. Pressing this key at the last line causes the first line to appear in a circular fashion. • △ key : The previous line is presented. Pressing this key at the first line causes the last line to appear in a circular fashion.

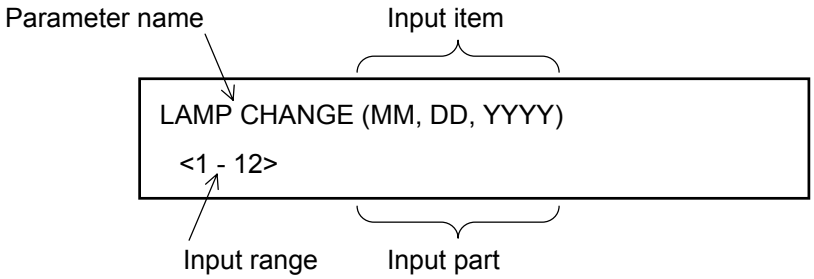
(b) Contents on screen

The parameter input window and the program setup window are described below.

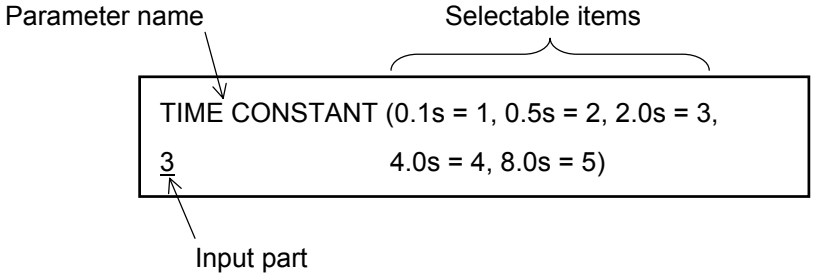
1) Input of a single numeric value:



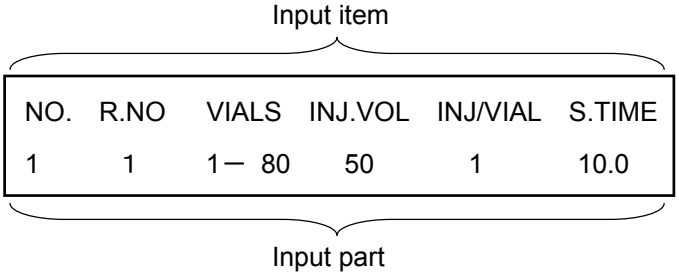
2) Input of plural numeric values



3) Selection of a numeric value:



4) Program setup window:



(c) Numeric Value Input Procedure

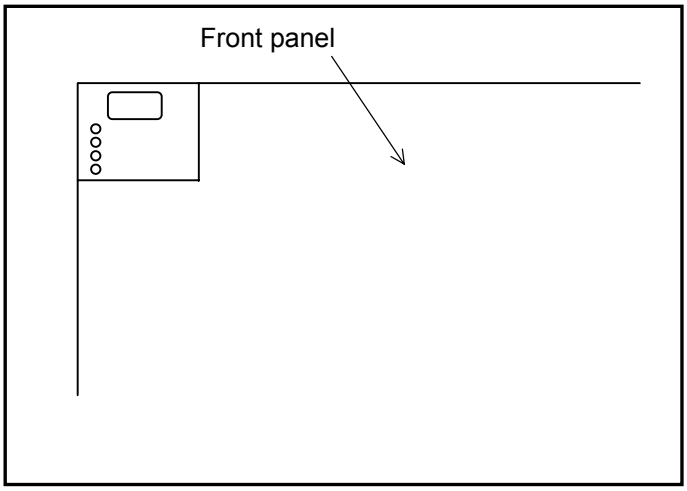
1) The cursor is indicated at the top of the input part. The previous numeric value is presented in the input part.
2) Numeric and decimal point key inputs are accepted in each allowable range.
3) To define an input numeric value, press the **ENT** key. The cursor will then move to the next item. If an erroneous numeric value is input, the cursor is brought back to the top of the input part with the input numeric value displayed. In this state, you are prompted to enter a correct numeric value. Pressing the **ESC** key brings you back to the initial window (monitor window).
If the **ESC** key is pressed during numeric key input, the parameter being entered is discarded (the previous numeric value is set).

NOTICE: At power-on, a default number is indicated in each item selection part.

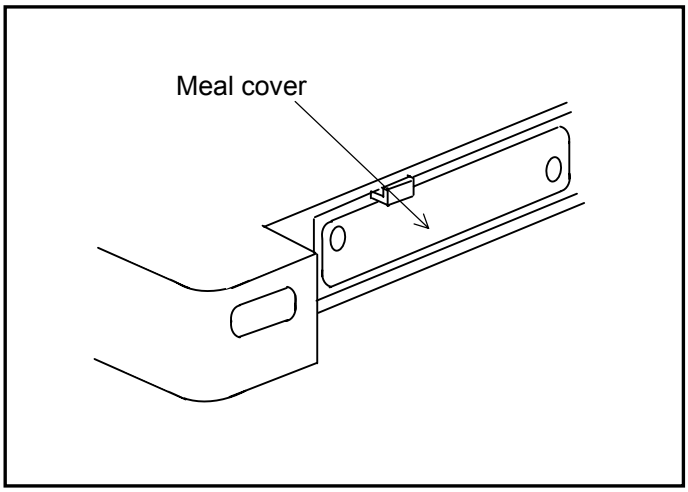
Pressing the **CL** key in the input part clears its contents.
The cursor is then brought back to the top of the input part.
In program editing, pressing the **DEL** key in the input part removes an item pointed by the cursor.
If the **ESC** key is pressed in the course of setting plural parameters, the items preceding the press of the **ESC** key remain intact.

(2) Mounting the UI Pad

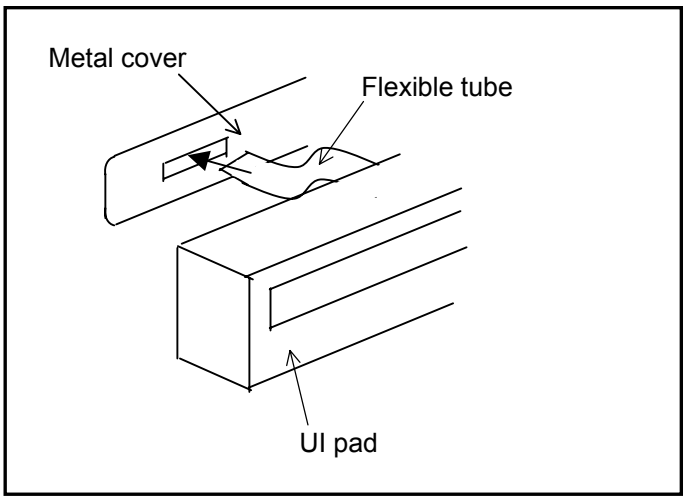
(a) Remove the front panel from the instrument.



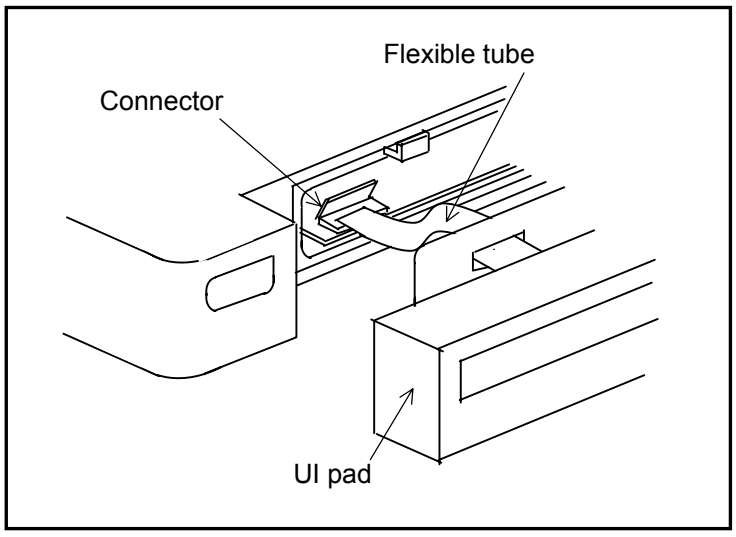
(b) Remove the metal lid from the instrument.



(c) Run the flexible tube of the UI pad through the metal lid.

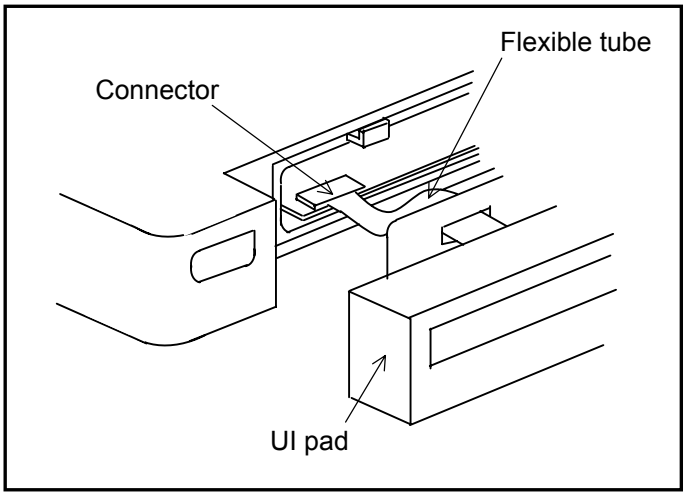


(d) Turn up the lid of the connector, and insert the flexible tube of the UI pad as far as it will go.

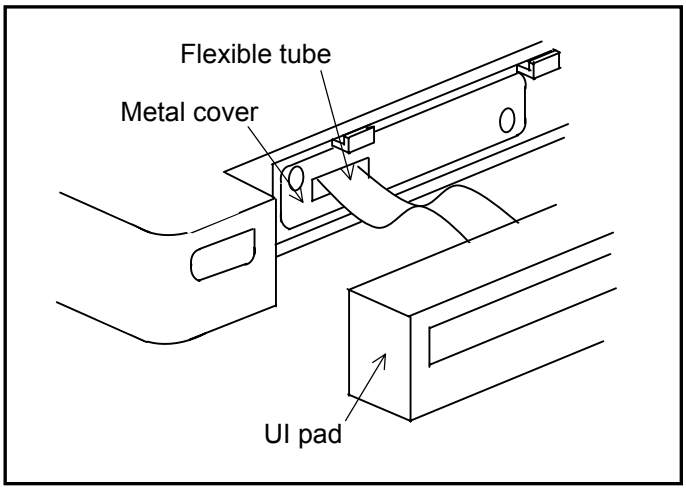


NOTES: 1. The connector should be handled carefully, because it is apt to be damaged.
2. The front and back sides of the flexible tube are determined. Connect this tube with the blue side set at the top.

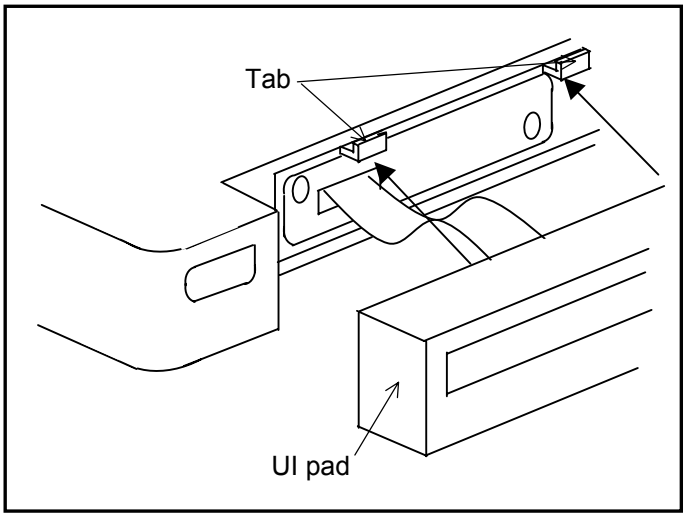
(e) Turn down the connector lid, and mount the UI pad.



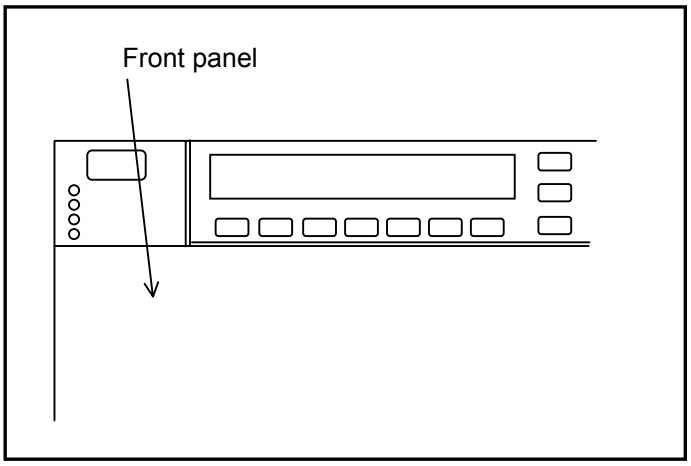
(f) Attach the metal lid dedicated for the UI pad.



(g) Set the of the UI pad to the of the instrument.



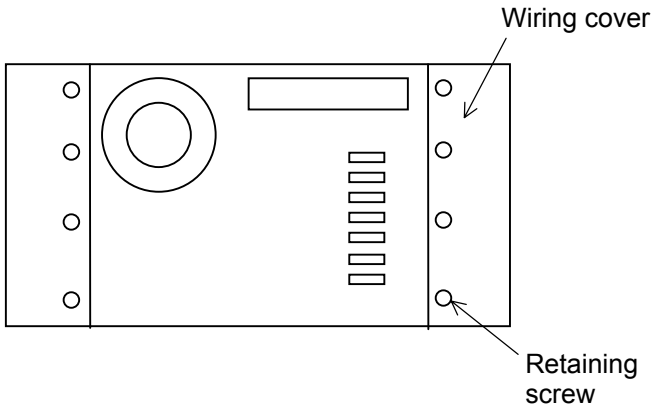
(h) Mount the front panel dedicated for the UI pad on the instrument.



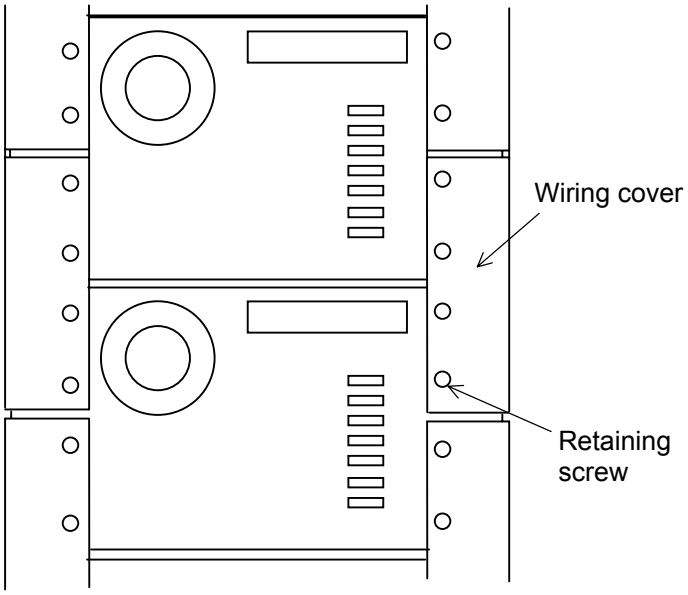
2.5.6 Instrument-to-Instrument Fastening

The wiring cover is provided on the rear of each instrument. Instrument-to-instrument fastening can be made by shifting each wiring cover as shown below.

(1) Remove the retaining screws, and detach the wiring cover.



(2) Shift the mounting position of each wiring cover.



3. FUNCTION

3.1 The Instrument Keypad

3.1.1 Name and Function of Each Part

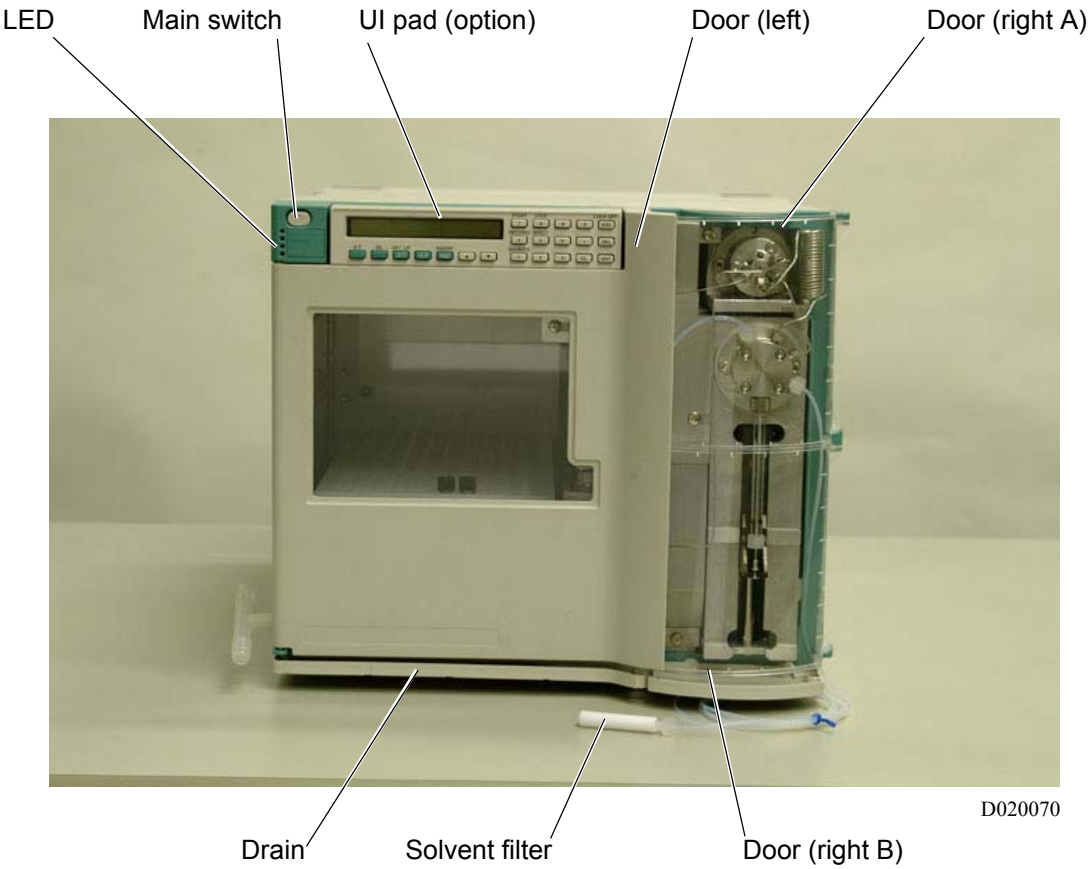


Fig. 3-1 Front View (A)

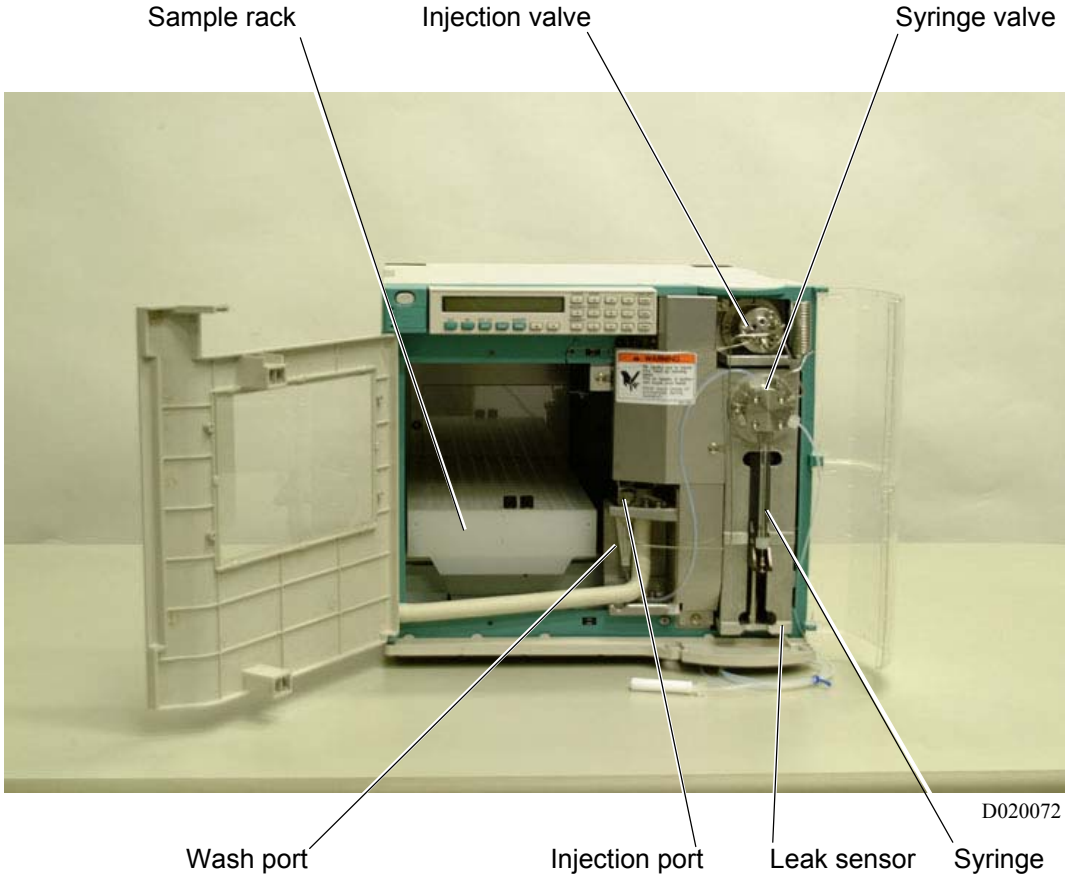


Fig. 3-2 Front View (B)

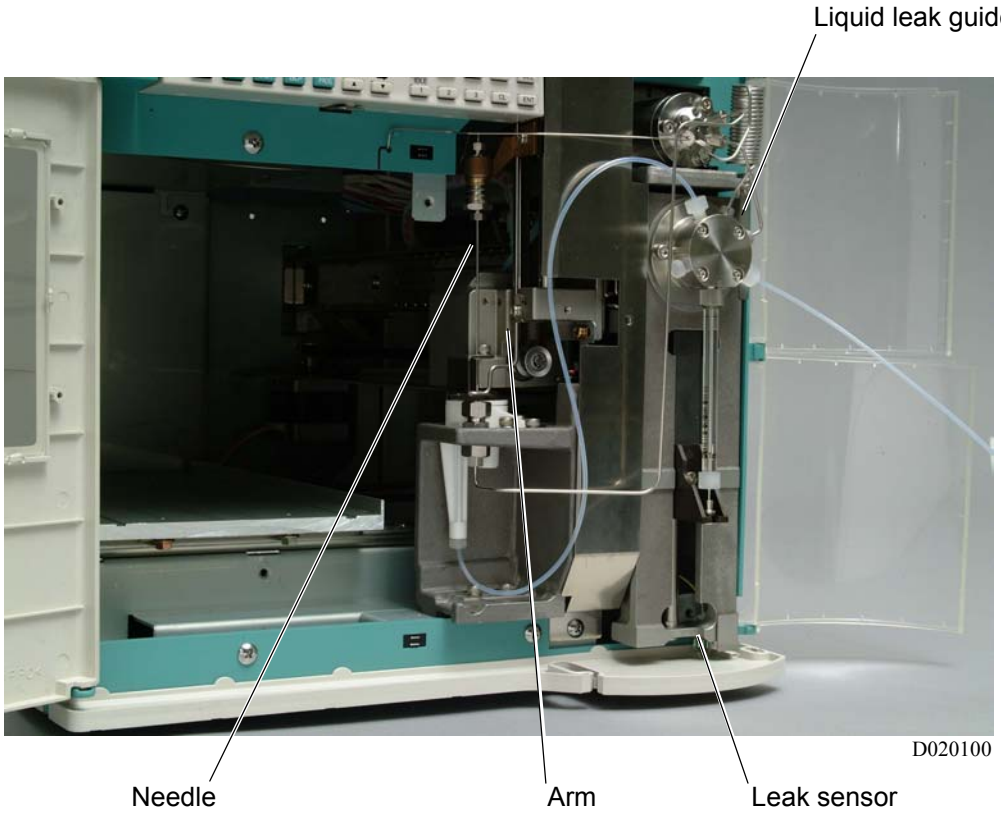


Fig. 3-3 Front View (C)

- Main switch : Turns on/off power supply.
- Sample rack : Accommodates sample vials. Moves in the X direction.
- Injection valve : Switches the flow path for delivering a sample and mobile phase to the column.
- Syringe valve : Selects the aspirating/discharging direction of sample and detergent. (Has 5 positions.)
- Syringe : Aspirates and discharges a sample and detergent.
- Needle : Aspirates a sample. Moves up and down (Z direction).
- Arm : Moves back and forth (Y direction).
- Injection port : A port into which the needle is inserted to inject a sample into the column.
- Wash port : A port in which the needle is washed.
- Solvent filter : Filters the detergent. To be removed when a degasser is connected.
- Doors : Three doors are provided.
- Drain : A pan for receiving the leaking fluid if any.
- Liquid leak guide : Leads out liquid that has leaked from the injection valve.
- Leak sensor : Detects fluid leakage.
- UI-PAD : A keypad required for operating the autosampler independently (available at option).
- LED : There are 4 LEDs, and each LED lights in a specific color for the determined indication.

Name (color)	LED Status
AS (green, orange)	Green : POWER ON Orange : Autosampler error
THERMO (green, orange)	Green : Under temperature control with cooling unit (option) Orange : Error of cooling unit (option)
RUN (green)	Green : Sequential program under execution
PAUSE (green)	Green : Under pause (temporary stop)

NOTE: In the pause status, you can edit a sequential program, add a stat sample or replace the sample rack.

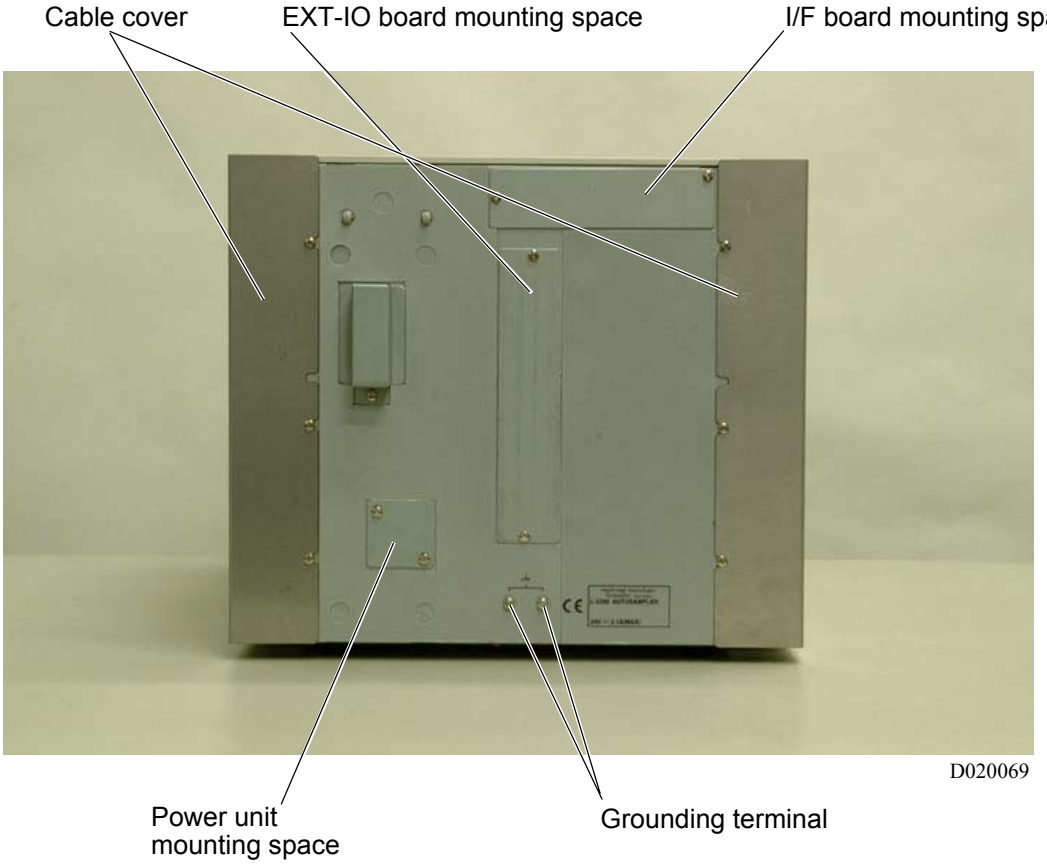


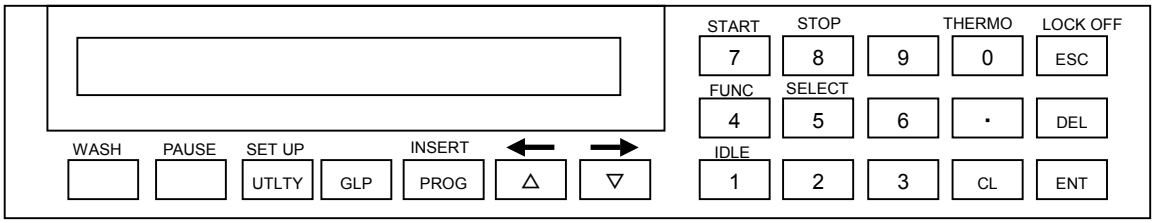
Fig. 3-4 Rear View

- Cable cover : Removal of the left cable cover (as seen from the front) gives access to the e-Line connector for connecting the units of L-2000 series and the power connector.
  The cable cover is also usable as a plate for fastening with other L-2000 series unit.
- Grounding terminal : Grounds the autosampler (2 terminals provided). Used when an optional unit is mounted.
- Power unit mounting space : Used for mounting the power supply of cooling unit (option).
- I/F board mounting space : Receives the I/F board (option) required for connecting the PC (data station) and HPLC system.
- EXT-IO board mounting space : Receives the EXT-IO board (option) required for external output of contact signals.

3.1.2 Part Name and Function of UI Pad (option)

(1) Operation Keys

Each key on the UI pad (option) type operation panel is explained here.



WASH	Replaces detergent in the wash port with the fresh one.
PAUSE	Puts an analysis sequence to pause. Releases pause when pressed again.
UTLTY	Sets the basic operating conditions.
GLP	Used for confidence-level reporting.
PROG	Sets conditions for sample injection.
△, ▽	Scroll up and down display.
START	Starts a sequential program.
STOP	Stops a sequential program.
THERMO	Sets the cooling unit.
ESC	Press this key when the basic analysis condition has been set or when the analysis condition setting is to be interrupted.
FUNC	Moves the mechanism for maintenance, etc.
SELECT	Used for selecting a setting item when setting the rack parameter in the robotic mode.
IDLE	Returns the autosampler to the idle position. Used after a midway stop of a sequential program, execution of ALL END or erasure of an error message by CL in the event of an error.
CL	Used for erasure of data under input. Also usable for erasure of an error message at occurrence of an error.
DEL	Used for deleting a step in a sequential program.
ENT	Inputs a numeral.

NOTE: If a mistake is made during operation, press the **ESC** key. In almost all cases, the initial status returns when pressing this key.

(2) Monitor Screen

The UI pad is provided with an LCD monitor on which instrument status can be indicated. The screen which indicates instrument status is called a monitor screen. Operation method of the monitor screen and example indications on it are shown below.

(a) 1st monitor screen
This screen mainly indicates information about the autosampler main frame.

```
STEP  RACK   VIAL   VOL(µl)   INJ     TIME    [I]
  1     1      1      10.0    1/1      0.0
```

Indication	Description
STEP	A step in the running program
RACK	No. of the sample rack under analysis
VIAL	No. of the sample vial under analysis
VOL (µl)	Sample injection volume per injection
INJ	Number of actual injections into each sample vial per set number of injections
TIME	Analysis time

Status indications appearing at the top right of the monitor screen are explained below.

[I] Idle status (initial status)
[B] Busy status
[R] Program is running.
[L] Keyboard locked
[W] Waiting for **IDLE** key input
[P] Under a pause (temporary stop)

(b) 2nd monitor screen

This screen indicates information about the cooling unit (option).

```
TEMP      RANGE                              [I]
35.0   30.0-40.0
```

Indication	Description
TEMP	Present temperature of cooling unit ("-" is indicated when the cooling unit is not under control.)
RANGE	Temperature range in which temperature ready status is assumed (set temperature ± tolerance temperature) ("-" is indicated when the cooling unit is not under control.)

The following screen appears when the cooling unit is not connected or its use is not set.

```
THERMO UNIT IS NOT AVAILABLE            [I]
```

(c) Changeover of monitor screen

1) 1st monitor screen

```
STEP  RACK   VIAL   VOL(µl)   INJ     TIME    [I]
  1     1      1      10.0    1/1      0.0
```

▽ or △ | △ or ▽ or ESC

2) 2nd monitor screen

```
TEMP      RANGE                              [I]
35.0   30.0-40.0
```

NOTE: Even in the key-locked status, the monitor screens can be switched over by the ▽ and △ keys.

3.2 Application

The autosampler is combined with a liquid chromatograph and used for injecting a sample.

3.3 Operating Principle and Functions

3.3.1 Configuration

The configuration of the L-2200 Autosampler is shown in Fig. 3-5. Sample vials are placed in the form of a rack. The sample rack moves along the transverse axis (X), and the arm moves along the longitudinal axis (Y) and the vertical axis (Z), whereby the needle can move freely among the sample vials, wash port and injection port. To the needle, a valve and a syringe are connected, so a sample can be aspirated and dispensed.
After a sample is aspirated through the needle tip, the needle is washed in the wash port and the sample is led into the flow path with the injection valve set on the injection side.
When the UI pad (option) is mounted, all operations can be carried out by the keys on the operation pad while checking display on the screen.

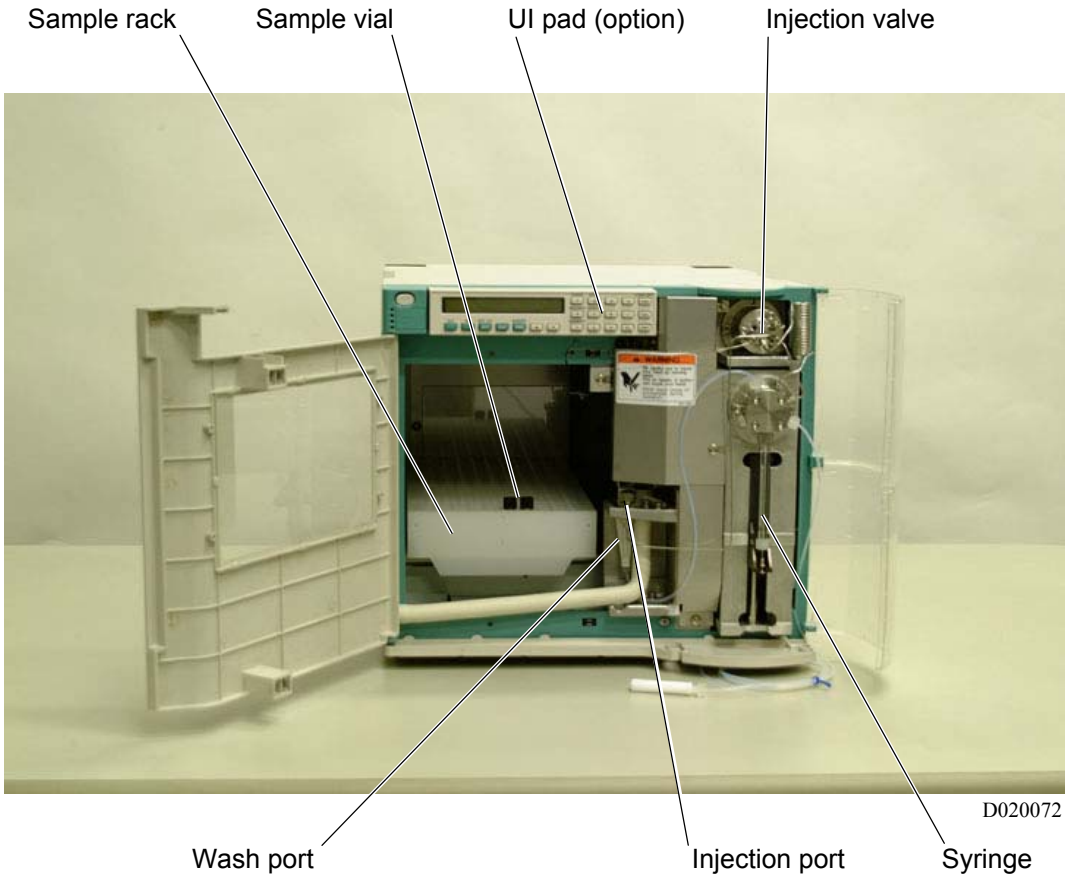
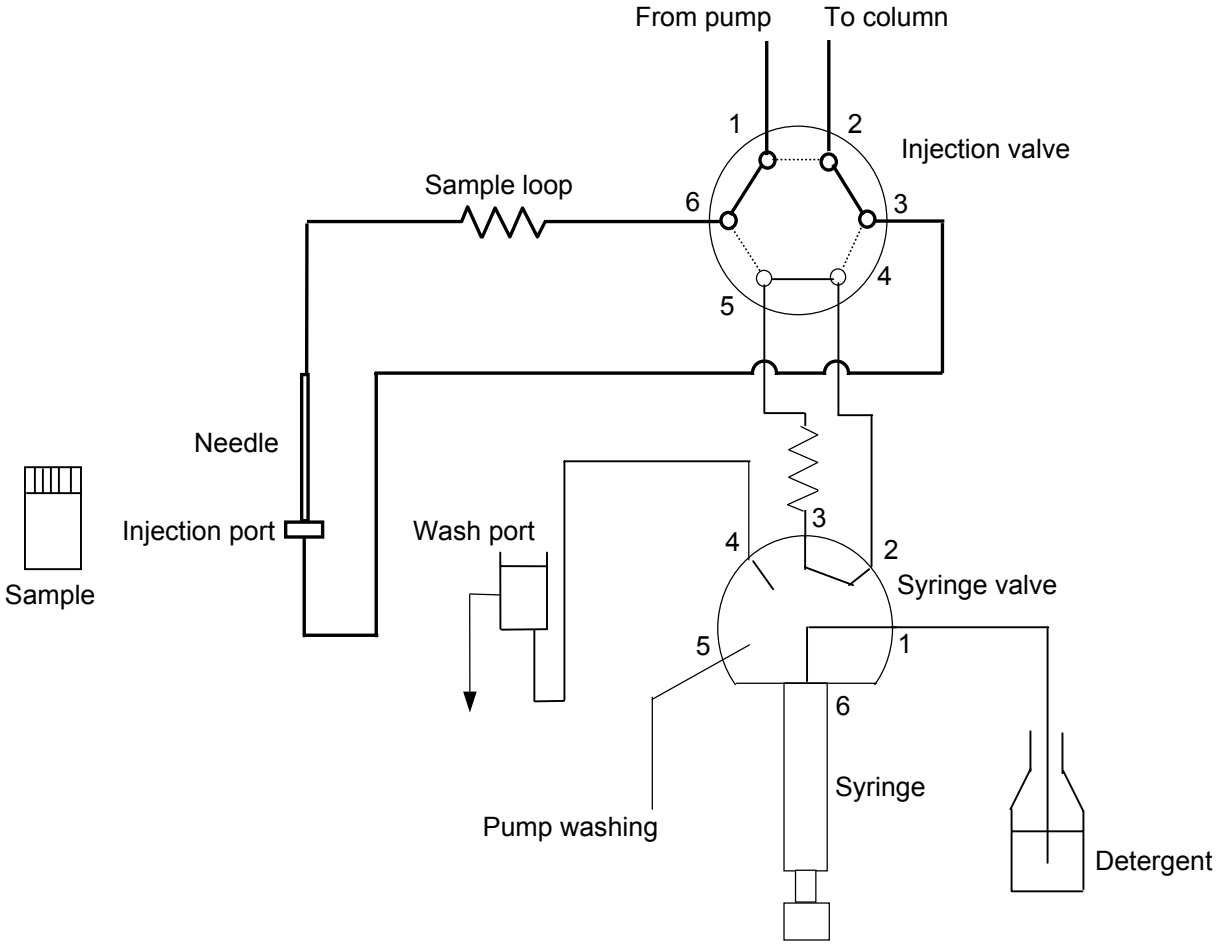


Fig. 3-5 Autosampler Configuration

3.3.2 Sample Injecting Actions

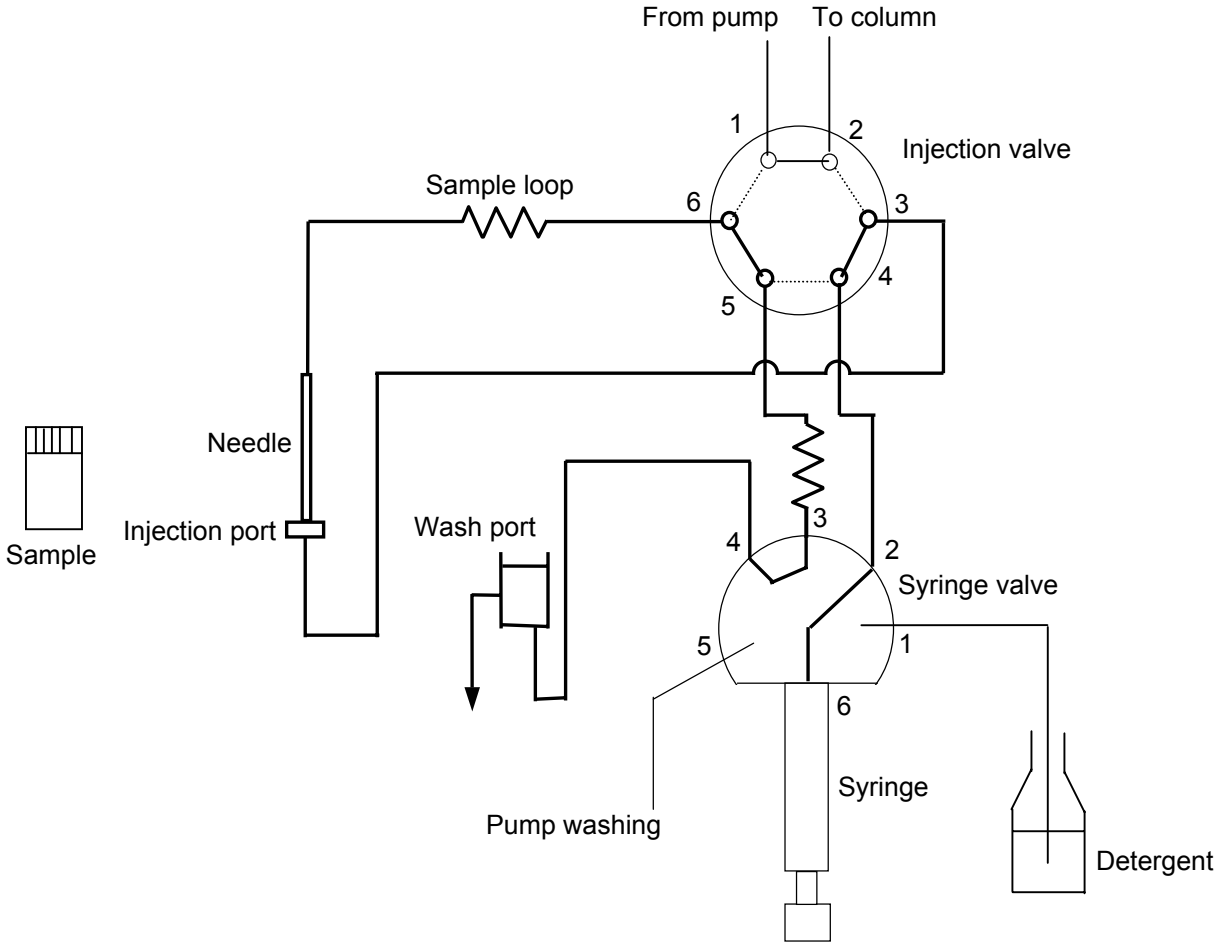
This instrument adopts the direct injection method in which the needle is built in the analysis flow path. Because an aspirated sample can be led with no waste into the flow path, this method is suitable for analysis of trace samples.

(1) Idle Status



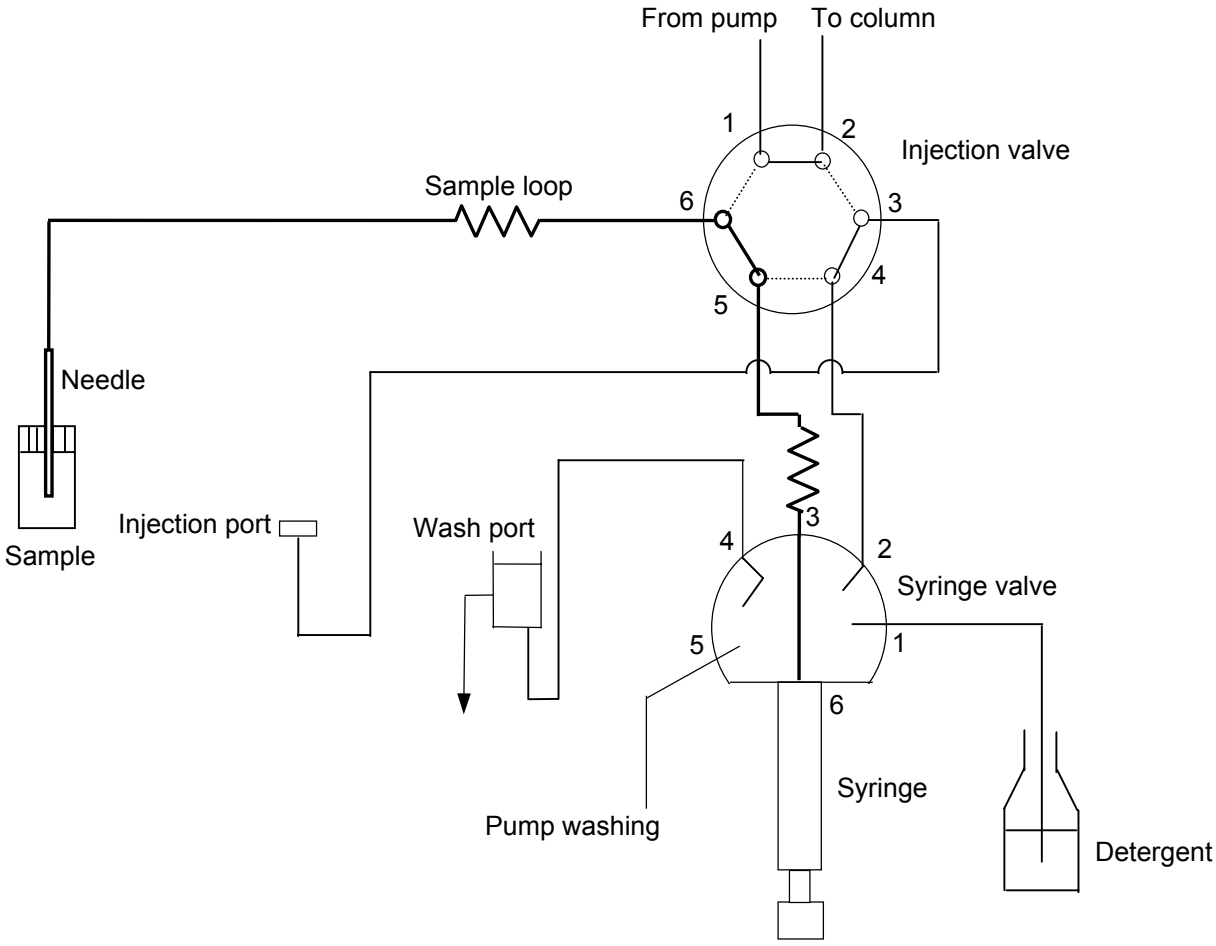
(2) Pressure Relief Position

Pressure can be relieved from the sampling tube by switching the syringe valve to port 2, and the injection valve to the LOAD side.



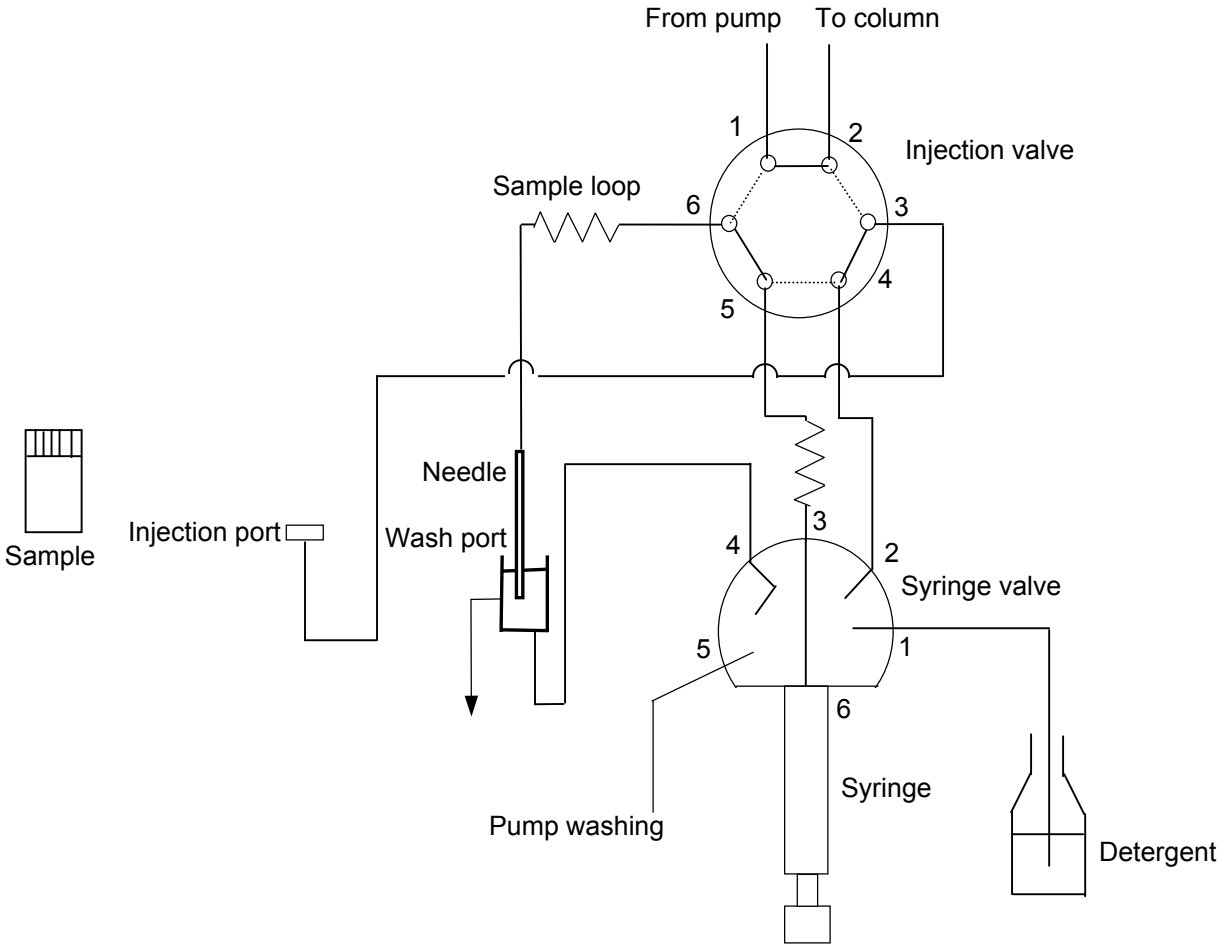
(3) Sampling

After moving the needle to a sample vial, the sample is aspirated with syringe.



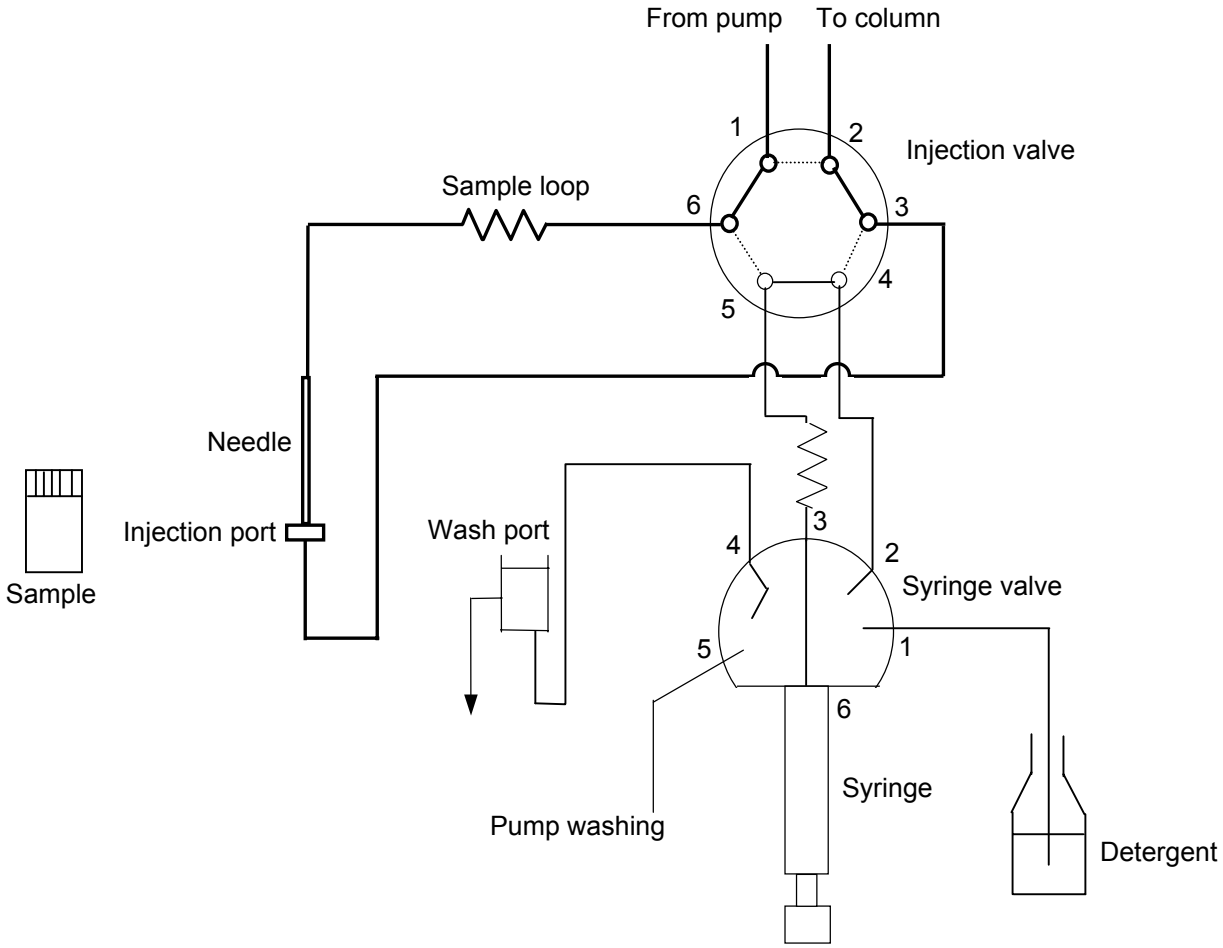
(4) Washing of Outer Needle Wall

The needle is dipped into the wash port and its outer wall is washed.



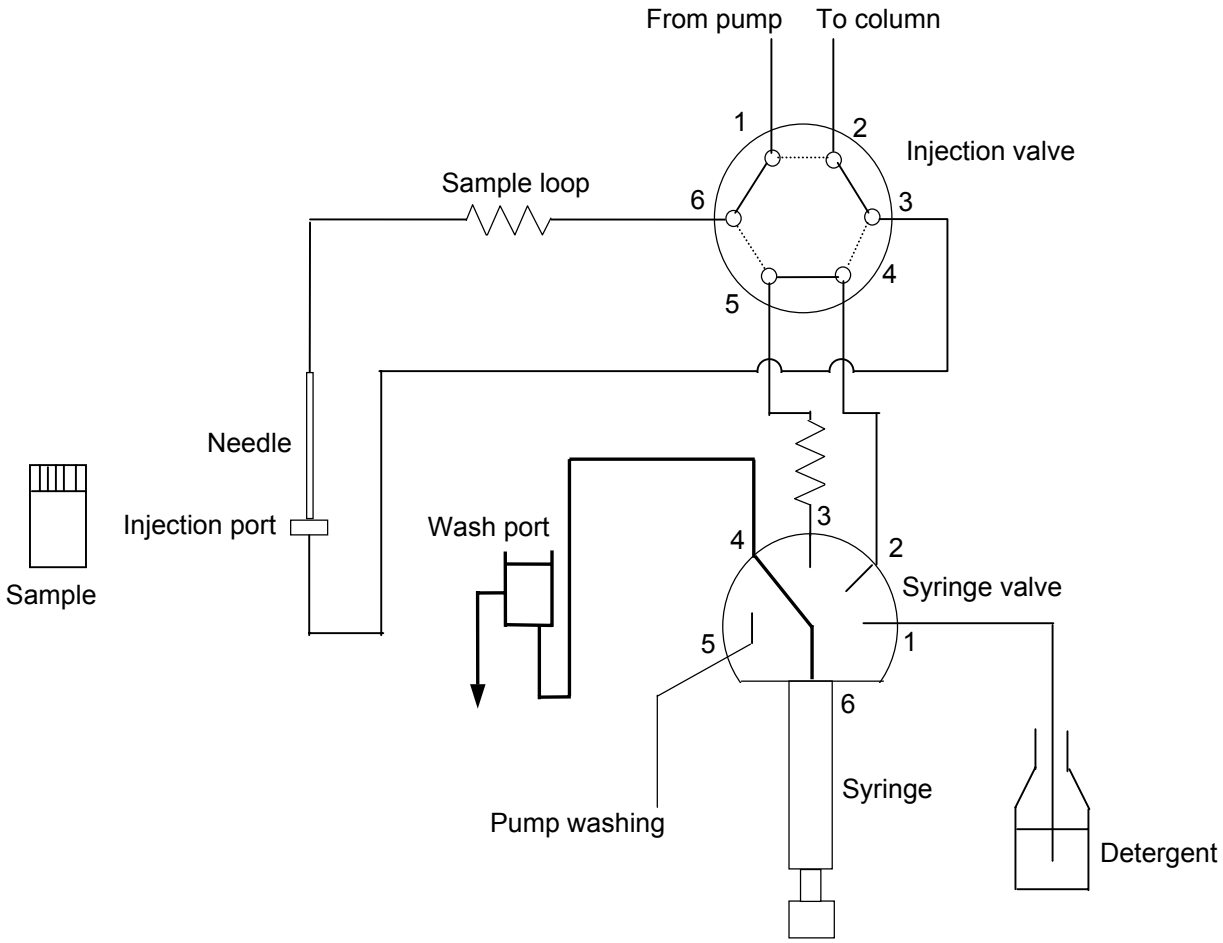
(5) Injection

After the needle has moved into the injection port, the injection valve is switched to inject the sample (analysis starts).



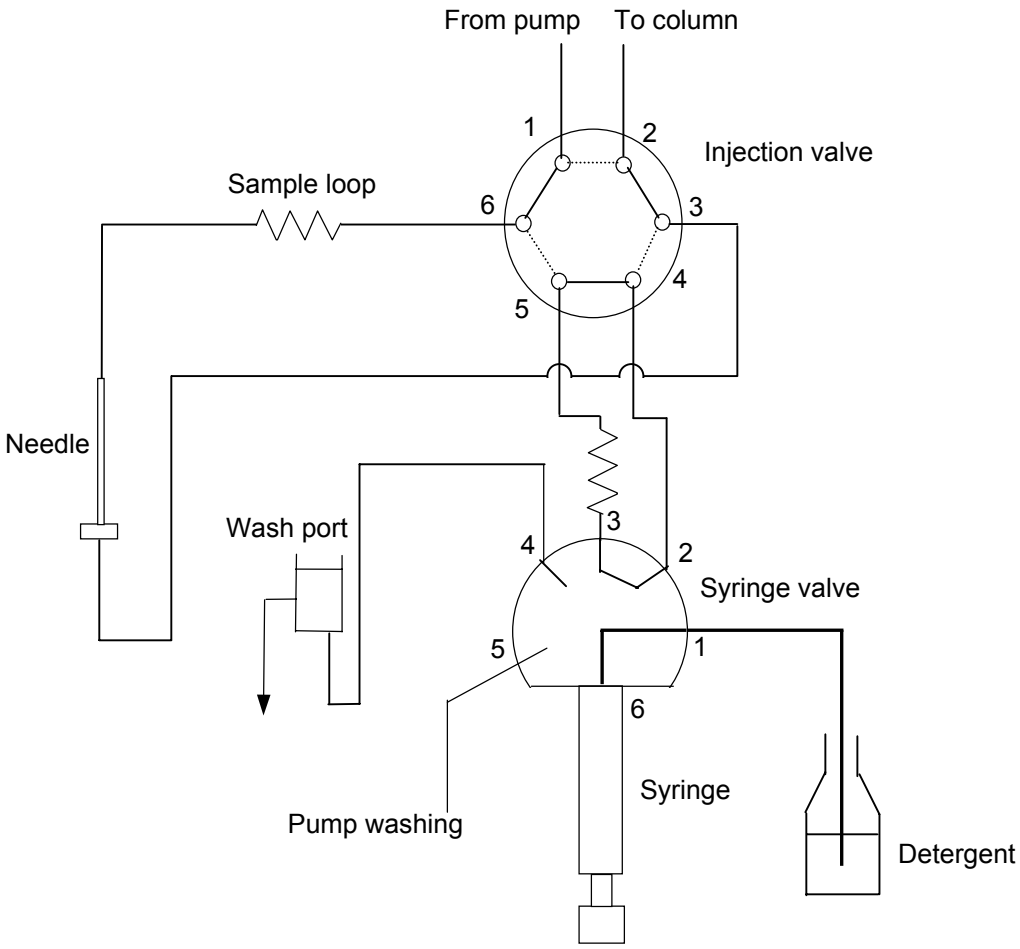
(6) Discharge of Solution in Syringe

Detergent in the syringe is discharged.

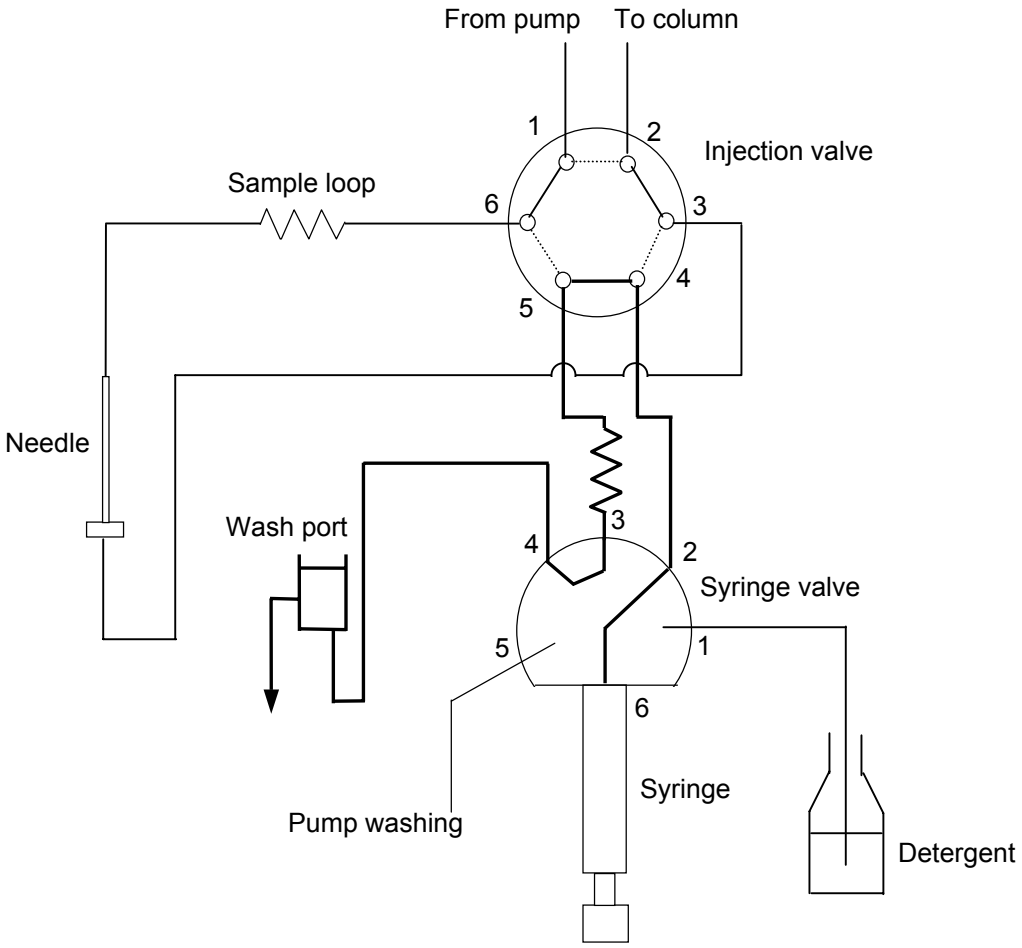


(7) Washing

(7)-(1) Detergent aspiration
The syringe aspirates detergent.

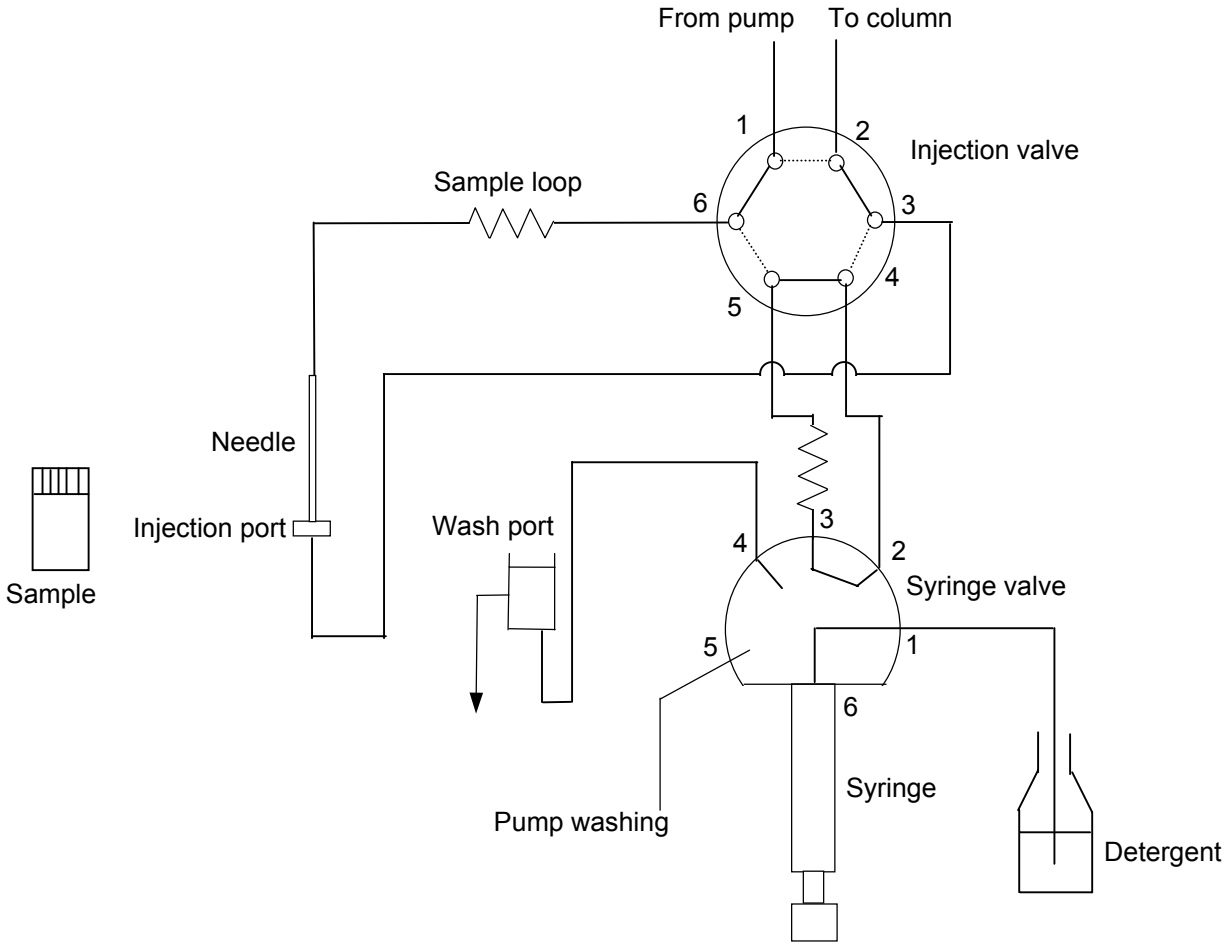


(7)-(2) Detergent replacement in wash port
The syringe delivers the detergent into the wash port (the detergent contaminated by washing the outer wall of the needle is replaced with fresh one).



(8) Idle Status

The idle status is assumed again.



3.4 Specifications

3.4.1 Main Unit

(1) Number of standard samples:
200 (1.5 mL)
1,152 (384-hole microplate × 3) (option)

(2) Rack/sample vials:
Conditions settable depending on sample vial and rack shape

(3) Sample injection method: Direct injection

(4) Syringe capacity:
100 μL (standard)
500 μL, 2.5 mL, 1 mL, 5 mL (option)

(5) Sample injection volume:
0.1 to 50 μL (with standard syringe)
5 to 4500 μL (with optional syringe)

(6) Syringe speed: Settable in 5 steps

(7) Reproducibility of injection volume:
< 0.3% RSD (in 10 μL injection)

(8) Carryover: < 0.01%

(9) Linearity of injection volume:
Correlation coefficient : > 0.999
Response factor : < 5% RSD

(10) Injection mechanism:
X direction : Sample rack movement
Y/Z directions : Needle movement

(11) Vial detecting function : Provided

(12) Pressure resistance : 34 MPa

(13) Number of injections per sample : 99 max.

(14) Max. cycle time : 999.9 minutes

(15) External communication : e-Line

(16) GLP function : Maintenance logbook

(a) Injection port seal
(b) Injection valve seal
(c) Syringe valve seal
(d) Syringe

(17) Dimensions : 340 W × 400 D × 300 H

(18) Weight : About 19 kg

(19) Ambient temperature : 4 to 35 °C (non-condensing)

(20) Ambient humidity : 45 to 85%

(21) Power supply : 24 V DC, 2.1 A

3.4.2 Cooling Unit (option)

(1) Settable temperature range : 1 to 35 °C (in increments of 1 °C)

(2) Cooling performance : 4 to (room temperature - 5) °C at ambient temperature 15 to 25 °C and relative humidity 60%

(3) Temperature setting accuracy : ±4°C
(Target temperature 4 °C, ambient temperature 25 °C, relative humidity 60%, water temperature measured in central sample vial (1.5 mL), without sample freezing)

(4) Temperature distribution : ±2°C
(Target temperature 4 °C, ambient temperature 25 °C, relative humidity 60%, water temperature measured in central and 4-corner sample vials (1.5 mL), without sample freezing)

(5) Number of sample vials : 200 (1.5 mL vials)

(6)	Ambient temperature	:	15 °C to 35 °C (For performance guarantee, refer to (2).)
(7)	Ambient humidity	:	45 to 85% (For performance guarantee, refer to (2).)
(8)	Cooling system	:	Peltier effect-based thermoelectronic cooling type
(9)	Power supply	:	100 V to 240 V AC ± 10% (50/60 Hz), 150 VA

4. OPERATIONS

4.1 Preparatory Operations

(1) Check that the autosampler is correctly connected to the pump and detector before turning on the power.

(2) Check that the drain tube is correctly connected to the waste (solution) bottle. The waste bottle must be positioned at a level lower than the autosampler.

(3) Prepare other components to be connected to the autosampler, referring to the respective instruction manual.

(4) The drain tube of the detector must be placed in a waste bottle that is dedicated for the detector.

(5) Connect the eluent bottle to the pump and connect the detergent bottle to the autosampler.

(6) Start the pump to fill the flow paths in the pump and autosampler with liquid. Before a new connection to the column, fill the flow path with the eluent, and then connect a tube in order to prevent air bubbles from entering the column. And connect the column after making sure the tube up to the column is filled with the eluent.

(7) After the eluent has reached the injection valve of the autosampler, turn on power supply to the autosampler. Avoid switching the injection valve before the eluent reaches it, otherwise the valve seal might be damaged.

(8) Replace the detergent in the wash port with fresh one by pressing the **WASH** key. Fill the inside of the wash port securely with the detergent. Then, make sure the detergent flows normally, there are no leaks and the waste solution runs into the waste bottle.

NOTE: As a detergent for the autosampler, use the same solution as used for the eluent. But if a solvent that includes salt, such as a buffer solution, is being used for the eluent, then utilize for the detergent a solvent having an eluent composition that doesn't include salt.

4.2 Measuring Operation

⚠ WARNING

Ignition of Flammable Chemicals!

- Beware of ignition hazard when using such flammable organic solvents as ethanol and methanol for flow cell cleaning.
- Always check the following conditions. If an abnormality is found, stop operation immediately.
  - ◇ Leakage of solvent or waste solution.
  - ◇ Leakage of solvent inside the instrument.
- Well-ventilate the laboratory room where the instrument is used.
- This instrument is not explosion-proof. Although aqueous solvents or organic solvents having an ignition point of 70 °C or higher are usable, do not use organic solvents having an ignition point below 70 °C.
- When using flammable chemicals, be careful about possible ignition due to static electricity. Particularly when using non-conductive chemicals, employ a conductive vessel and provide grounding connection correctly.

⚠ WARNING

Explosion of Vapor from Flammable Chemicals!

- If a flammable chemical such as organic solvent leaks from the flow path of the instrument and its vapor concentration exceeds the explosion limit, it may cause spontaneous combustion with dangerously explosive results.
- When using a flammable and readily volatile chemical, be sure to check for leakage from the instrument flow path and ventilate the laboratory room adequately.

4.2.1 Basics of Operation

(1) Initialization

Turn on the power switch, and self-diagnosis and automatic origin adjustment of each mechanism will be carried out.
In this process, memory check, arm drive mechanism check, valve switching mechanism check, etc. are performed.
When all items are normal, the initial screen automatically appears.

(2) Handling of Sample Rack

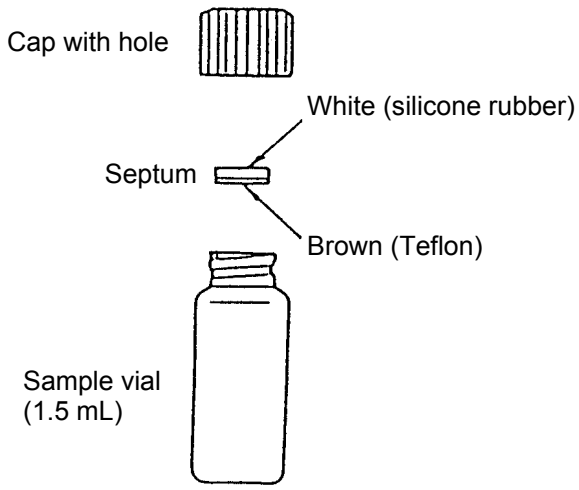
For taking out the sample rack, slightly lift its grip, and then pull it out toward you.
For mounting the sample rack, put its rear side on the rack holder, and then slowly insert the rack toward the rear.
Fix the rack at the position where a pin engaging sound can be heard.

Fig. 4-1 Handling of Sample Rack

NOTES:
1. Mount the sample rack at the correct position. If the rack is mounted at a wrong position, the instrument may be caused to malfunction.
2. Be sure to use both hands for handling the sample rack. Avoid hooking your fingers onto sample vials for handling the rack. Otherwise, you may receive an injury.

(3) Setting of Standard Sample Vial

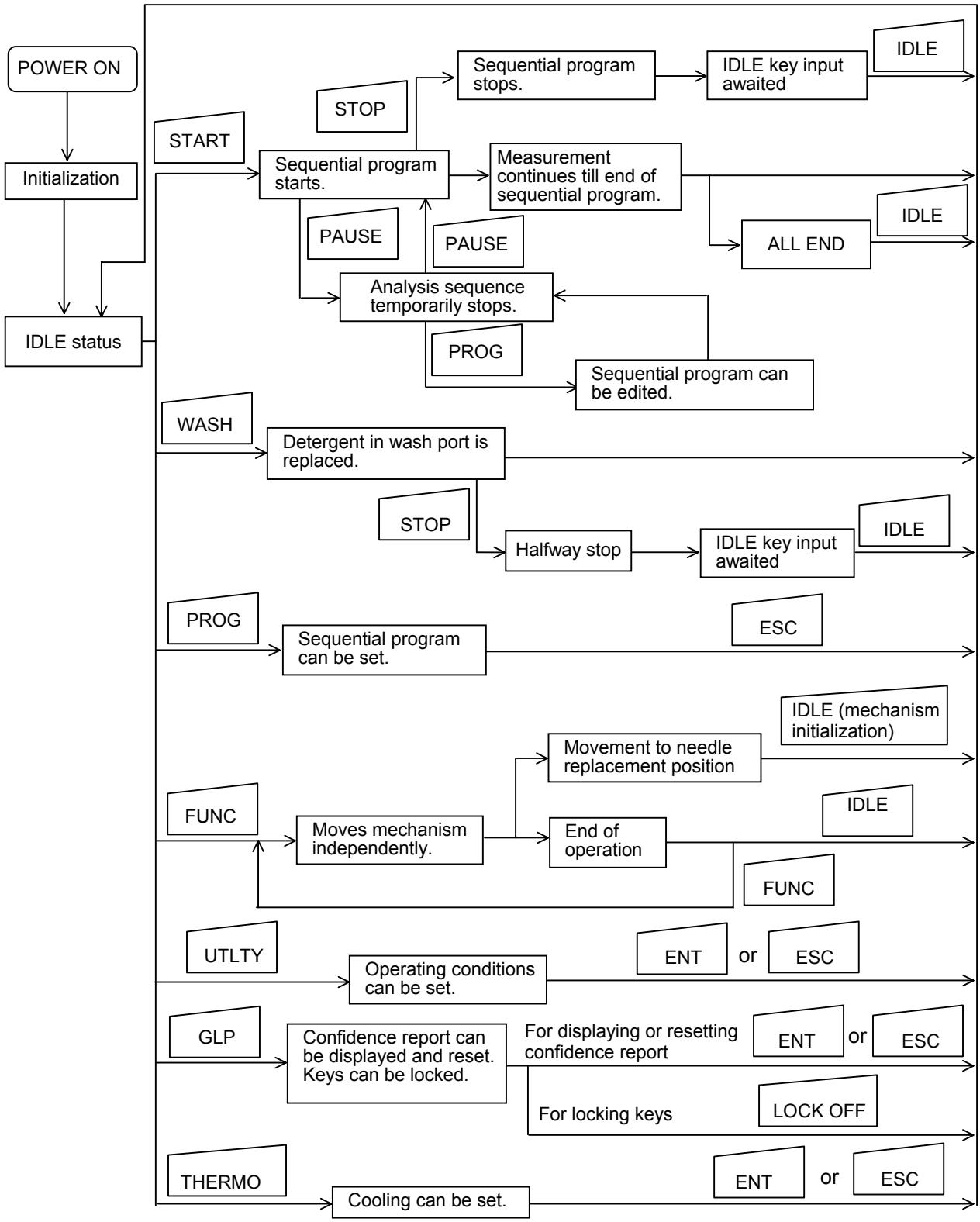
Orient the septum as shown below.



(4) Flow of Operation

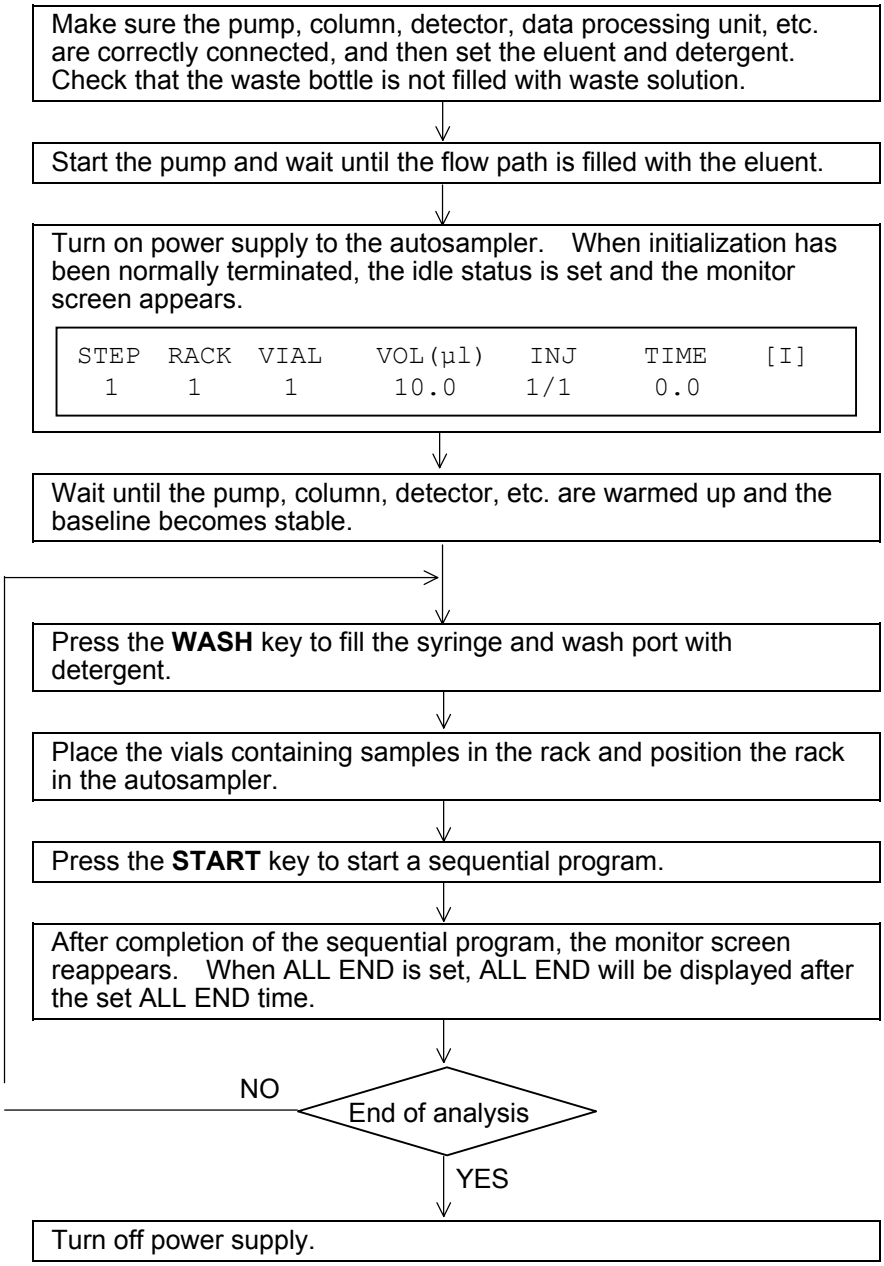
The flow of operation is shown in the figure below.
Each frame is used as follows.

: Indicates a key operation.
: Indicates a status.



4.2.2 Analyzing Operation

(1) Routine Analyzing Operation



(2) Setting of Sequential Program

(a) Setting method

As a method of setting a sequential program, the setting procedure is shown below on the following conditions; analysis time 5 minutes and injection of 200 samples of 10 μL each sequentially once.

```
STEP  RACK  VIAL   VOL(μl)   INJ     TIME    [I]
  1     1     1      10.0    1/1      0.0
```

This display appears at the end of initialization after power-on.

PROG

```
EDIT MODE (MODIFY=0, NEW=1)
 0
```

Select MODIFY for editing the previous program or NEW for creating a new program.

0 ENT or 1 ENT

```
STEP  RACK   VIALS    VOL(μl)   INJ    TIME
  1    _1     1-  1     10.0     1      5.0
```

Input a rack code.

1 ENT

```
STEP  RACK   VIALS    VOL(μl)   INJ    TIME
  1     1  _   1-  1     10.0     1      5.0
```

Input the first vial number.

1 ENT

```
STEP  RACK   VIALS    VOL(μl)   INJ   TIME
  1     1     1-_ 1     10.0     1     5.0
```

Input the last vial number.

200 ENT

```
STEP  RACK   VIALS    VOL(μl)   INJ   TIME
  1     1    1-200     _10.0     1     5.0
```

Input an injection volume (μL).

10 ENT

```
STEP  RACK   VIALS    VOL(µl)   INJ   TIME
  1     1    1-200     10.0      _1    5.0
```

Input the number of injections from each vial.

1 ENT

```
STEP  RACK   VIALS    VOL(µl)   INJ   TIME
  1     1    1-200     10.0       1    _5.0
```

Input a cycle time (min).

5 ENT

```
STEP  RACK   VIALS    VOL(µl)   INJ   TIME
  2     _
```

Repeat input by the same method as for STEP 1.
When pressing the **ESC** key, the monitor screen reappears.

ESC

```
STEP  RACK   VIAL    VOL(µl)   INJ   TIME    [I]
  1     1      1      10.0    1/1    0.0
```

(b) STEP deleting method
Unnecessary steps in a sequential program can be deleted.

```
STEP  RACK   VIALS    VOL(µl)   INJ   TIME
  3    _1    1-  1     10.0      1     5.0
```

Display the unnecessary step and press the **DEL** key.

```
STEP  RACK   VIALS    VOL(µl)   INJ    TIME
  -    _1    1-  1     10.0      1      5.0
```

Press the **ENT** key.

```
STEP  RACK   VIALS    VOL(µl)   INJ    TIME
  3     _1   5-  5     10.0      1      5.0
```

The old contents of the relevant step are deleted and those of the next step are brought in.

NOTE: STEP No. 1 cannot be deleted.

NOTE: Step cannot be added when there are 100 steps.

(c) STEP inserting method

A new STEP can be inserted in a sequential program.

```
STEP  RACK   VIALS    VOL(µl)   INJ    TIME
  3     _1    1- 1      10.0      1      5.0
```

Display a step where an insertion is desired and press the **INSERT** key.

```
STEP  RACK   VIALS    VOL(µl)   INJ    TIME
  _
```

A new step is inserted.

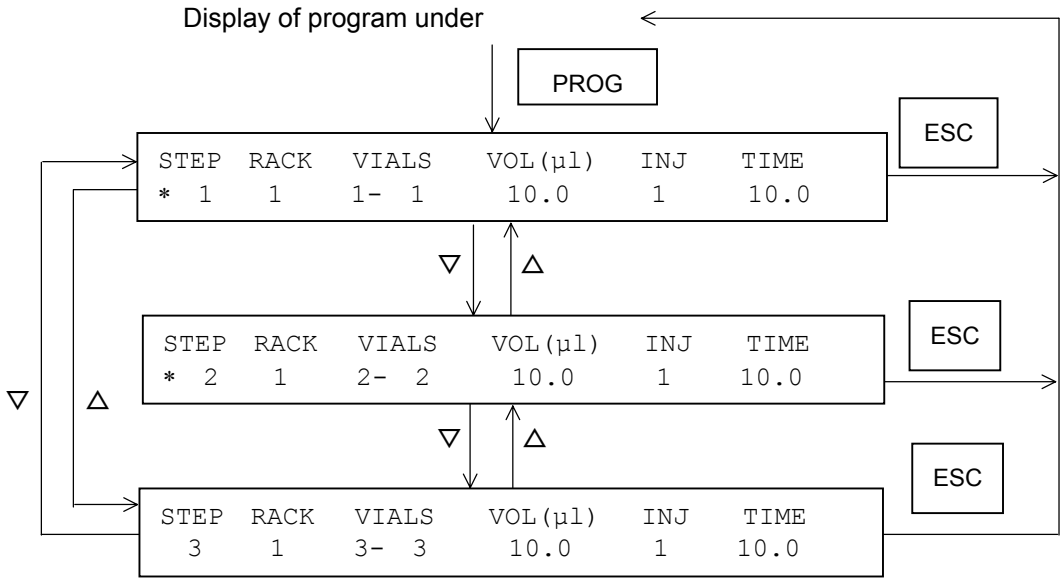
NOTE: No more insertion is allowed when a program already has 100 steps.

NOTE: STEP No. 1 cannot be deleted.

(d) Check of sequential program

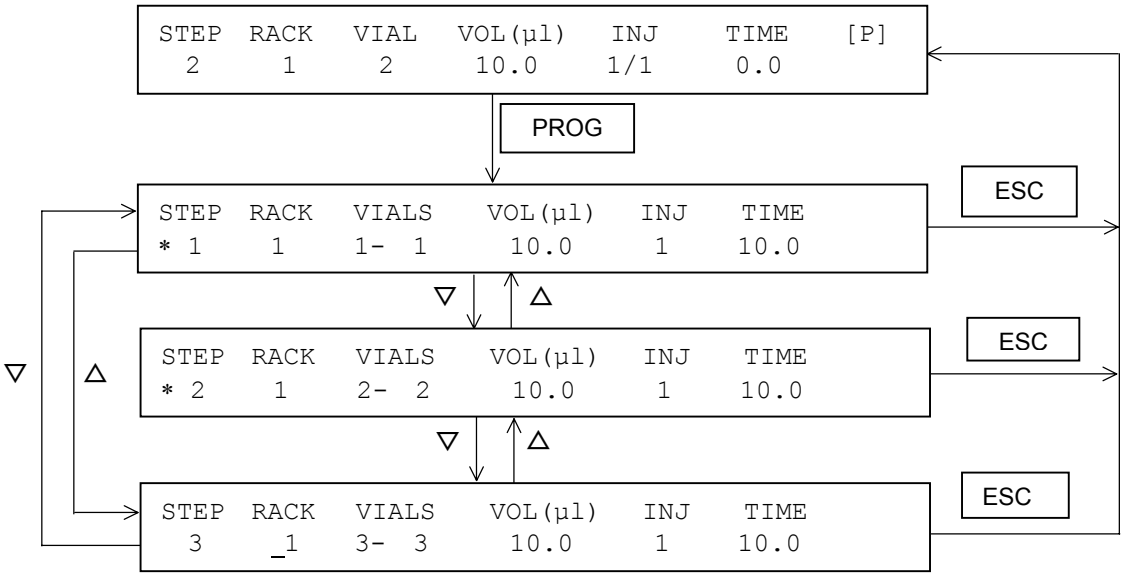
When pressing a **PROG** key during execution of a sequential program, the screen displays that program. An asterisk "∗" is displayed under the initial character S of the STEP which has already been executed or under execution. The previous and next steps can be displayed by △ and ▽ keys. The **ESC** key is usable for return to the monitor screen.

(Example) When a 3-step program has been created:



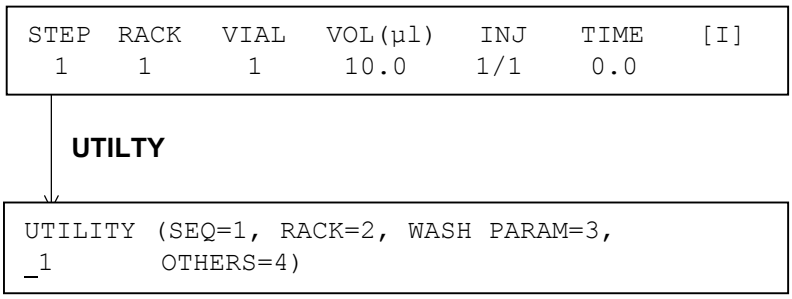
(e) Editing of program under execution

For editing a sequential program under execution, set the PAUSE status, and then editing will be allowed. However, a step which has already been executed or under execution cannot be edited. This is indicated by an asterisk "*" appearing under the initial character S of STEP. Program execution can be resumed by pressing the **PAUSE** key again.



(3) Setting of Operating Conditions

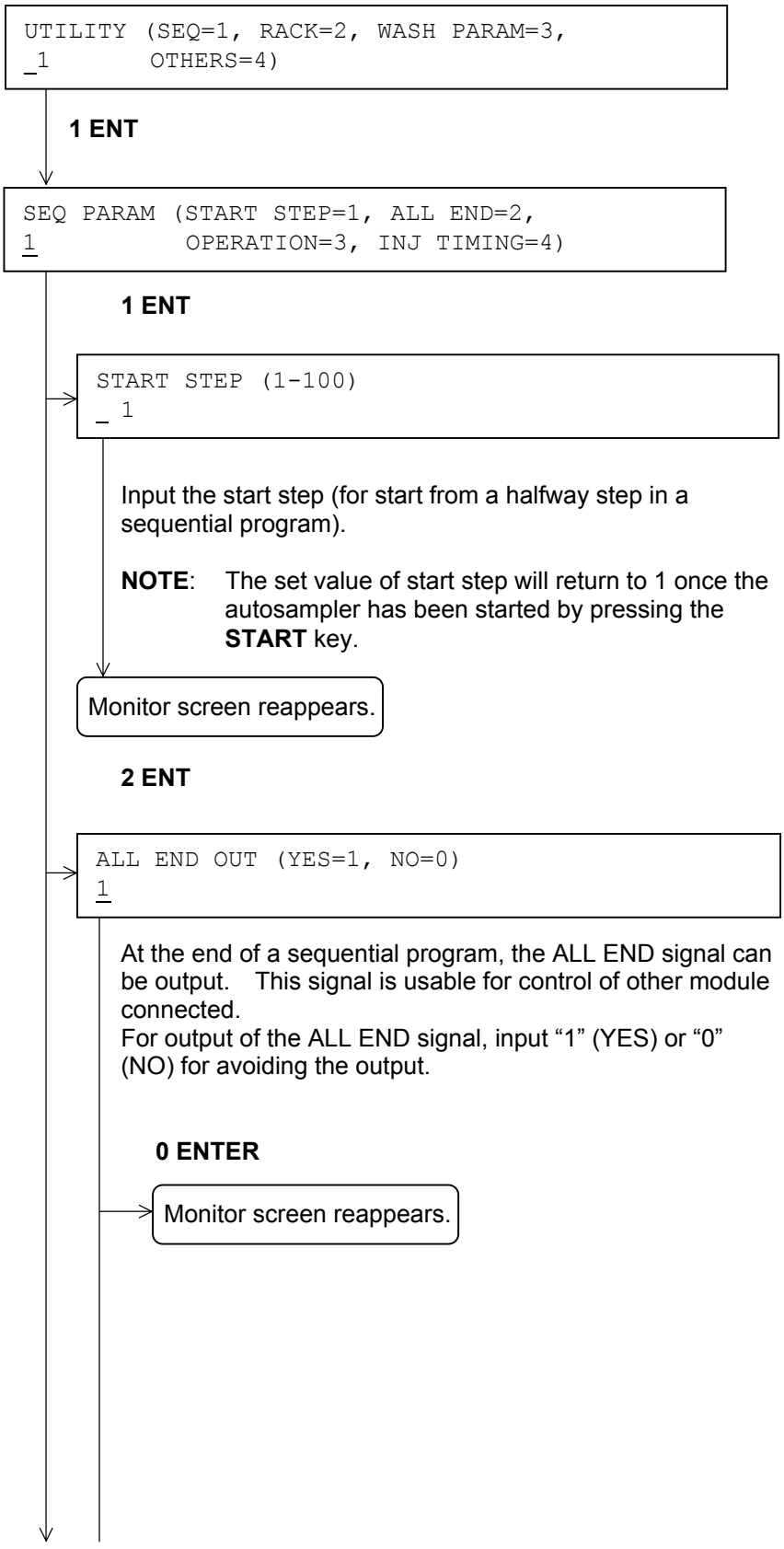
For this purpose, the **UTLTY** key is usable.

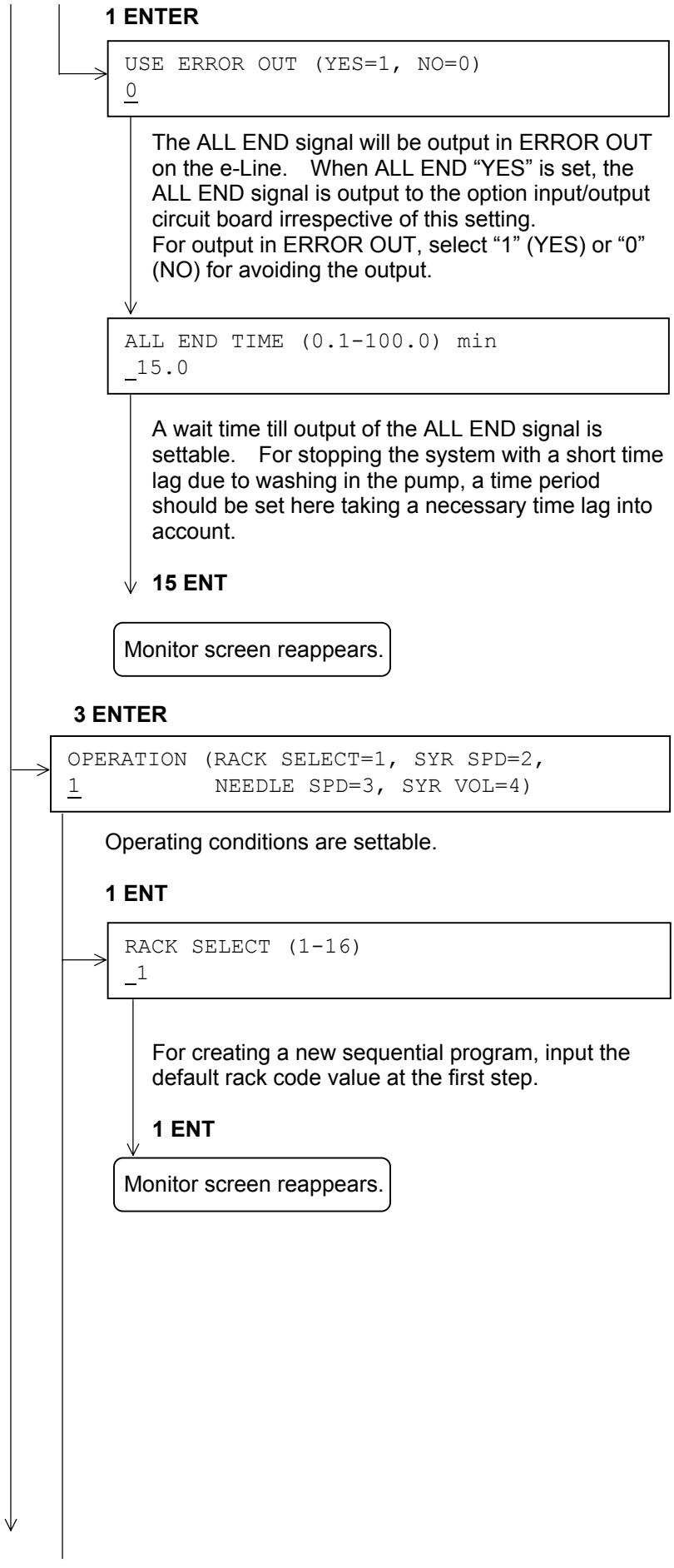


Under this display, a parameter is selectable and its contents are settable as you desire.

(a) Sequential parameter

The sequential parameter is settable in the following procedure.




1 ENTER
USE ERROR OUT (YES=1, NO=0)
0
The ALL END signal will be output in ERROR OUT on the e-Line. When ALL END "YES" is set, the ALL END signal is output to the option input/output circuit board irrespective of this setting.
For output in ERROR OUT, select "1" (YES) or "0" (NO) for avoiding the output.
ALL END TIME (0.1-100.0) min
_15.0
A wait time till output of the ALL END signal is settable. For stopping the system with a short time lag due to washing in the pump, a time period should be set here taking a necessary time lag into account.
15 ENT
Monitor screen reappears.
3 ENTER
OPERATION (RACK SELECT=1, SYR SPD=2,
1 NEEDLE SPD=3, SYR VOL=4)
Operating conditions are settable.
1 ENT
RACK SELECT (1-16)
_1
For creating a new sequential program, input the default rack code value at the first step.
1 ENT
Monitor screen reappears.

2 ENT

```
SYRINGE SPEED (1-5)
3
```

Set a syringe speed. This speed needs to be set according to sample viscosity. For a viscous sample, set a slow syringe speed.

2 ENT

Monitor screen reappears.

Relation between Syringe Capacity and Syringe Speed

Syringe capacity	Speed 1	Speed 2	Speed 3	Speed 4	Speed 5
100 µl	0.1 µl/s	0.5 µl/s	1 µl/s	2 µl/s	4 µl/s
500 µl	0.5 µl/s	2.5 µl/s	5 µl/s	10 µl/s	20 µl/s
1000 µl	1 µl/s	5 µl/s	10 µl/s	20 µl/s	40 µl/s
2500 µl	2.5 µl/s	12.5 µl/s	25 µl/s	Impossi-ble	Impossi-ble
5000 µl	5 µl/s	25 µl/s	50 µl/s	Impossi-ble	Impossi-ble

3 ENT

```
NEEDLE DOWN SPEED (SLOW=1, FAST=2)
2
```

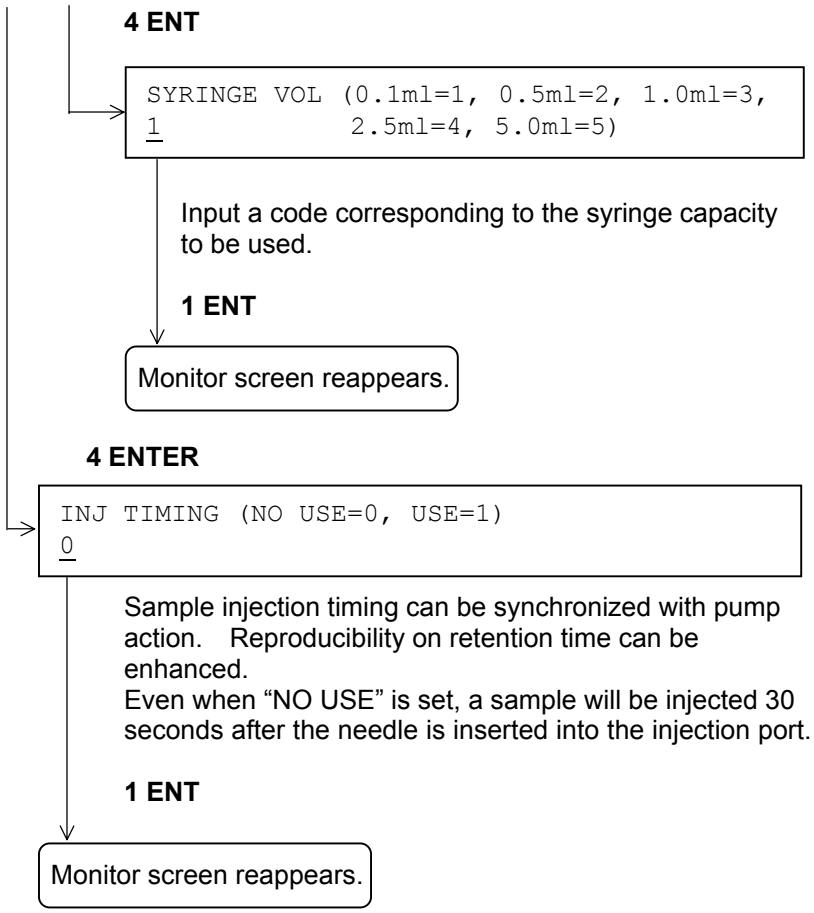
Input a needle lowering speed. Usually, set "FAST." For using a hard septum, "SLOW" should be set.

2 ENT

Monitor screen reappears.

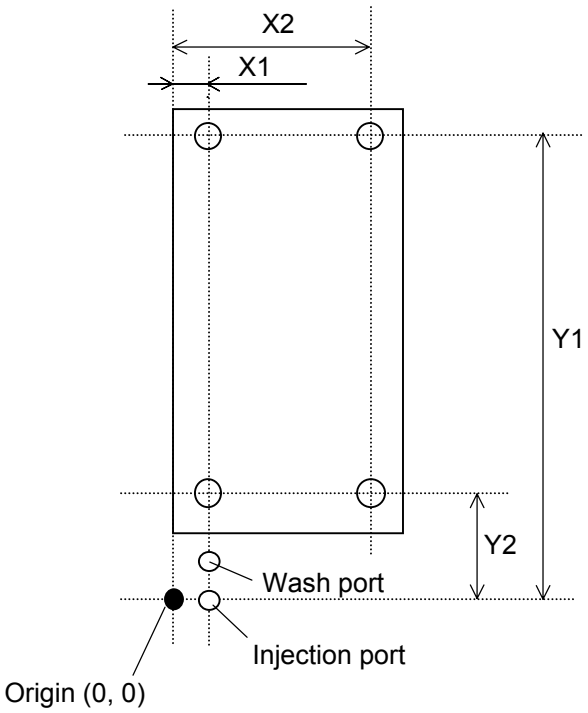
Needle Down Speed	Speed
SLOW	7.5 mm/s
FAST	60 mm/s

NOTE: When the slow needle down speed is selected, the needle is apt to be broken due to a strong falling force. Therefore, before operation, make sure vials, etc. are correctly set.

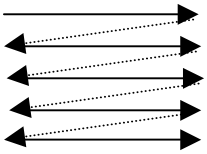

4 ENT
SYRINGE VOL (0.1ml=1, 0.5ml=2, 1.0ml=3,
1 2.5ml=4, 5.0ml=5)
Input a code corresponding to the syringe capacity to be used.
1 ENT
Monitor screen reappears.
4 ENTER
INJ TIMING (NO USE=0, USE=1)
0
Sample injection timing can be synchronized with pump action. Reproducibility on retention time can be enhanced.
Even when “NO USE” is set, a sample will be injected 30 seconds after the needle is inserted into the injection port.
1 ENT
Monitor screen reappears.

(b) Rack parameter
The shape of the rack to be used is settable as a parameter.

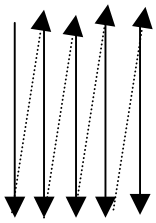
(i) Contents of rack parameter



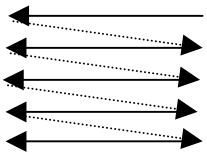
Rack Parameter
X1 : X coordinate of first vial within 14.5 to 139.0 mm
Y1 : Y coordinate of first vial within 0.0 to 307.5 mm
X2 : X coordinate of last vial within 14.5 to 139.0 mm
Y2 : Y coordinate of last vial within 0.0 to 307.5 mm
Z : Height of needle within 0.0 to 57.0 mm
Nx : Number of vials in X direction
Ny : Number of vials in Y direction



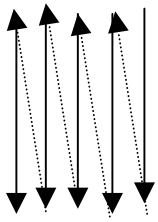
Sampling order pattern code: 1



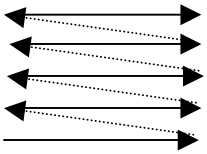
Pattern code: 2



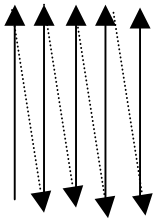
Pattern code: 3



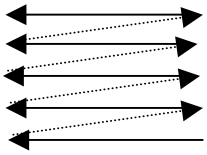
Pattern code: 4



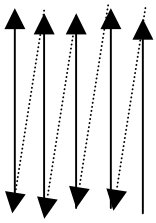
Pattern code: 5



Pattern code: 6

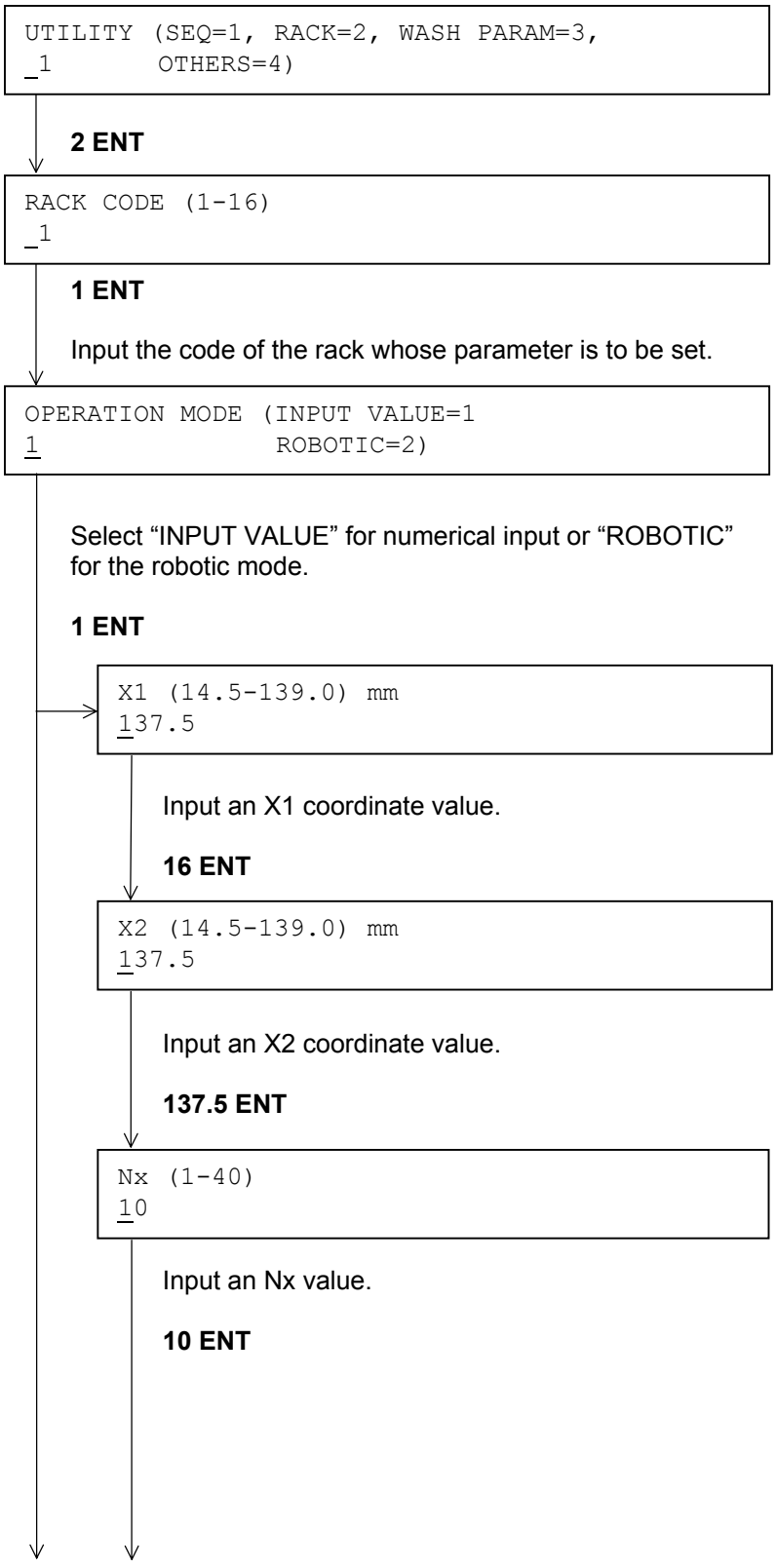


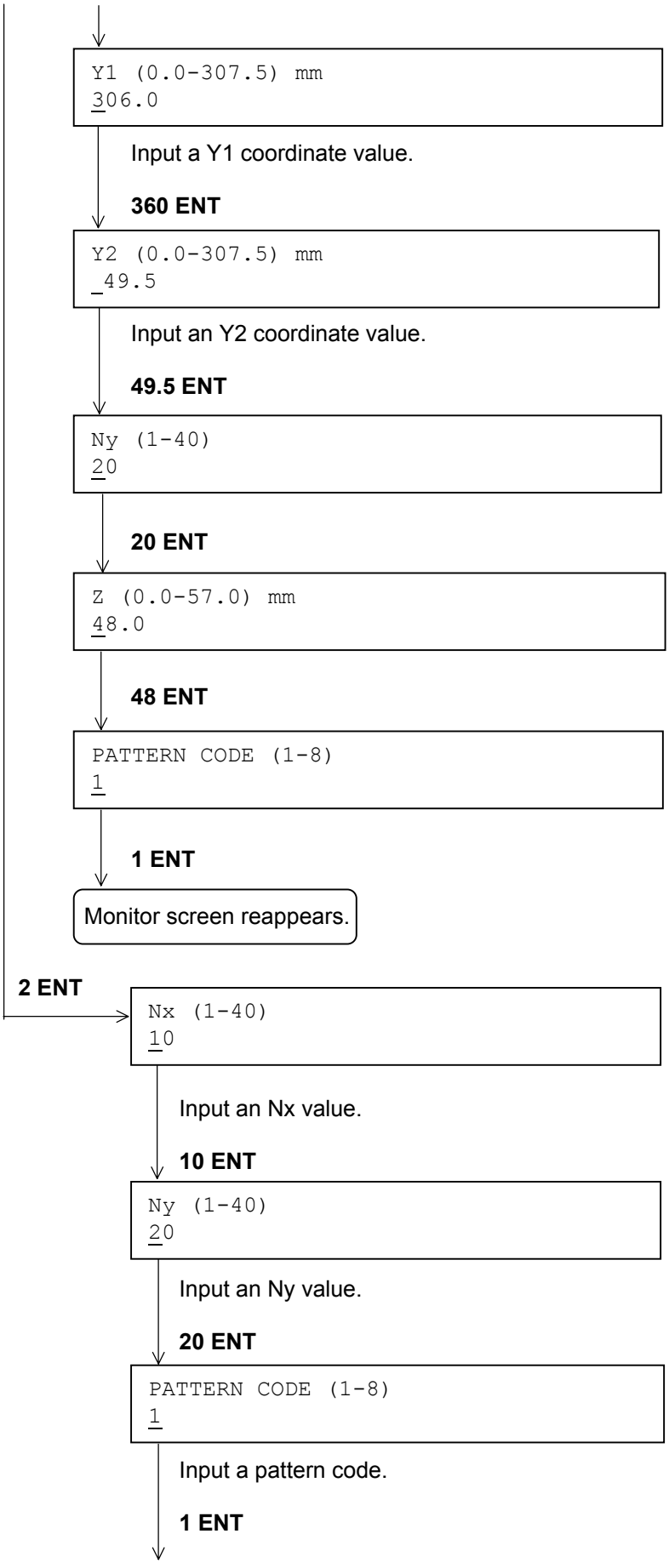
Pattern code: 7



Pattern code: 8

(ii) Rack parameter setting procedure
Rack parameter setting is described here.
This parameter is settable in a numerical input method or in the robotic mode where the needle is actually moved for adjustment.




Y1 (0.0-307.5) mm
306.0
Input a Y1 coordinate value.
360 ENT
Y2 (0.0-307.5) mm
49.5
Input an Y2 coordinate value.
49.5 ENT
Ny (1-40)
20
20 ENT
Z (0.0-57.0) mm
48.0
48 ENT
PATTERN CODE (1-8)
1
1 ENT
Monitor screen reappears.
2 ENT
Nx (1-40)
10
Input an Nx value.
10 ENT
Ny (1-40)
20
Input an Ny value.
20 ENT
PATTERN CODE (1-8)
1
Input a pattern code.
1 ENT

```
RACK SET (X1=19.0, Y1=15.0) mm
*NO CHANGE  X=14.5  Y=0.0  Z=0.0
```

Adjust the leading vial position in the following way.

1) The needle moves to the X1/Y1 position of the specified rack code. The Z position is relocated at the uppermost point.
2) Move "∗" to X by the **SELECT** key and adjust X by moving the needle using arrow keys. Also using the **SELECT** key, move "∗" to Y and finely adjust Y.
3) For further fine adjustment, move "∗" to Z and insert the needle into a vial by the arrow key.
4) Perform fine adjustment in the same procedure as in 2).
5) With "∗" located at a position other than NO CHANGE, press the **ENT** key to start adjustment of the last vial position. If the **ENT** key is pressed with "∗" located at NO CHANGE, the set values will not be updated.

NOTE: For fine adjustment in a vial with Z movement, be sure to perform X/Y adjustments to make sure the needle can be inserted into the vial before Z movement into the vial.
The Z shift value in this operation will not be taken into the rack parameter.
Be sure to perform Z adjustment in the following adjustment of the last vial position.
For adjustment with the needle inserted, attention should be paid to the moving distance so that the needle will not be broken.

```
RACK SET (X2=19.0, Y2=107.0, Z=48.0) mm
*NO CHANGE  X=14.5  Y=0.0  Z=0.0
```

Adjust the last vial position in the following way.

1) The needle moves to the X2/Y2 position of the specified rack code. The Z position is relocated at the uppermost point.
2) Move "∗" to X by the **SELECT** key and adjust X by moving the needle using arrow keys. Also using the **SELECT** key, move "∗" to Y and finely adjust Y.
3) Move "∗" to Z and insert the needle into a vial by the arrow key.
4) Perform fine adjustment in the same procedure as in 2) and 3).
5) With "∗" located at a position other than NO CHANGE, press the **ENT** key to terminate. If the **ENT** key is pressed with "∗" located at NO CHANGE, the set values will not be updated.

NOTE: For fine adjustment in a vial with Z movement, be sure to perform X/Y adjustments to make sure the needle can be inserted into the vial before Z movement into the vial.
The Z shift value in this adjustment will be taken into the rack parameter. So be sure to perform Z.
For adjustment with the needle inserted, attention should be paid to the moving distance so that the needle will not be broken.

Monitor screen reappears.

(c) WASH PARAM

Washing conditions can be set.

```
UTILITY (SEQ=1, RACK=2, WASH PARAM=3,
1        OTHERS=4)
```

3 ENT

```
WASH PARAM (WASH=1, INJ WASH=2
1           PUMP WASH=3)
```

Select “WASH” for setting the washing conditions to be arranged by pressing the **WASH** key, “INJ WASH” for setting the washing conditions during execution of a sequential program and “PUMP WASH” for setting the pump washing (option) conditions after a sequential program.

1 ENT

```
WASH STROKES (0-20)
_3
```

Input the number of syringe reciprocations for replacing the detergent in the wash port with the fresh one.

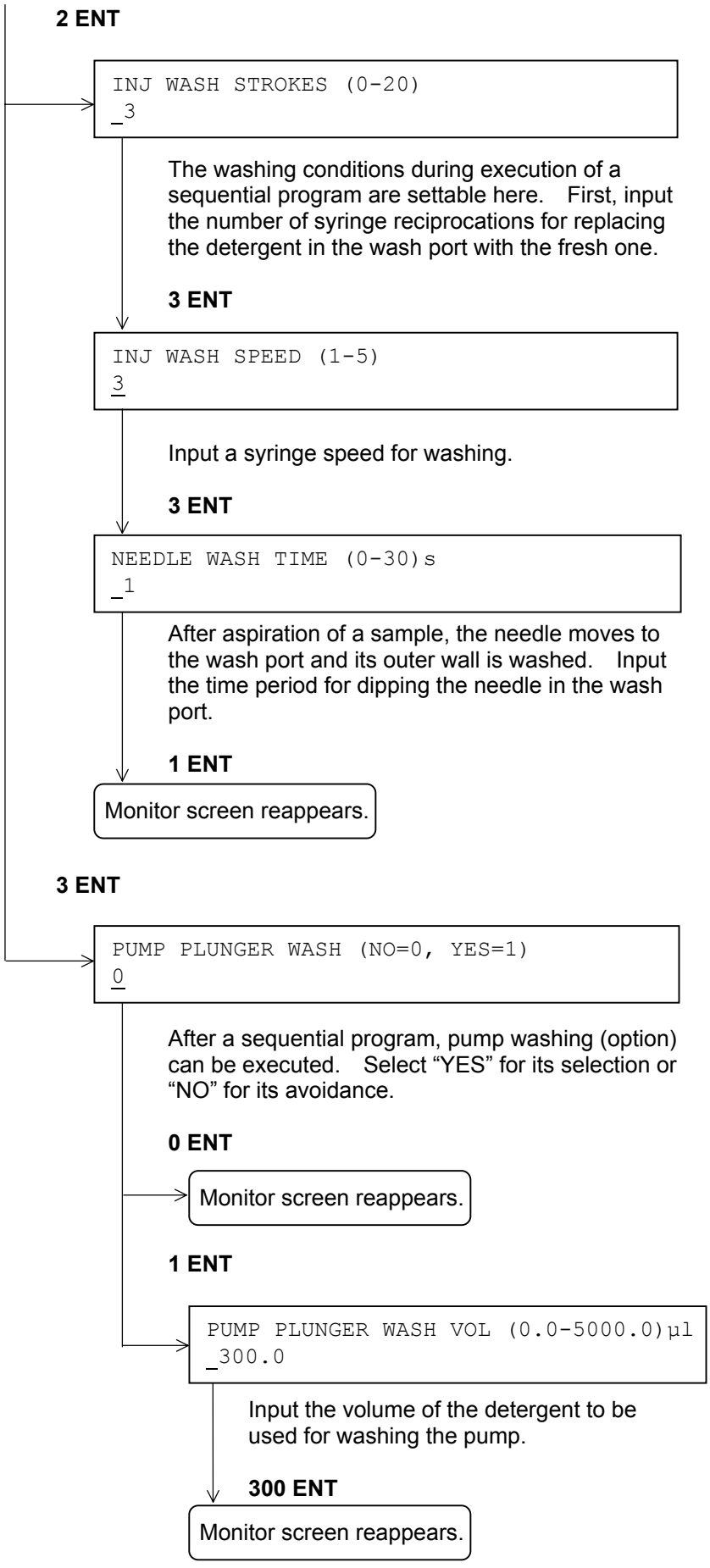
3 ENT

```
WASH SPEED (1-5)
3
```

Input a syringe speed for washing.

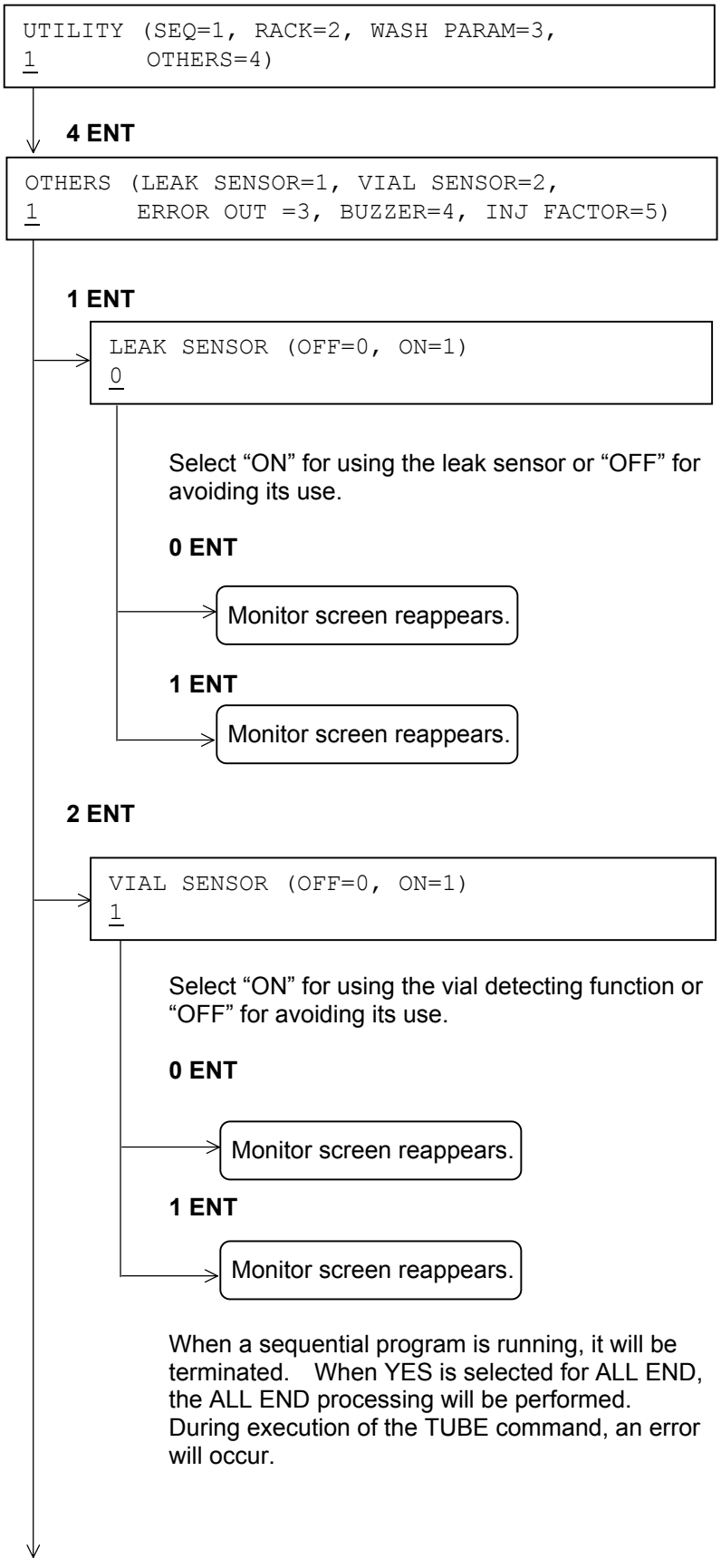
3 ENT

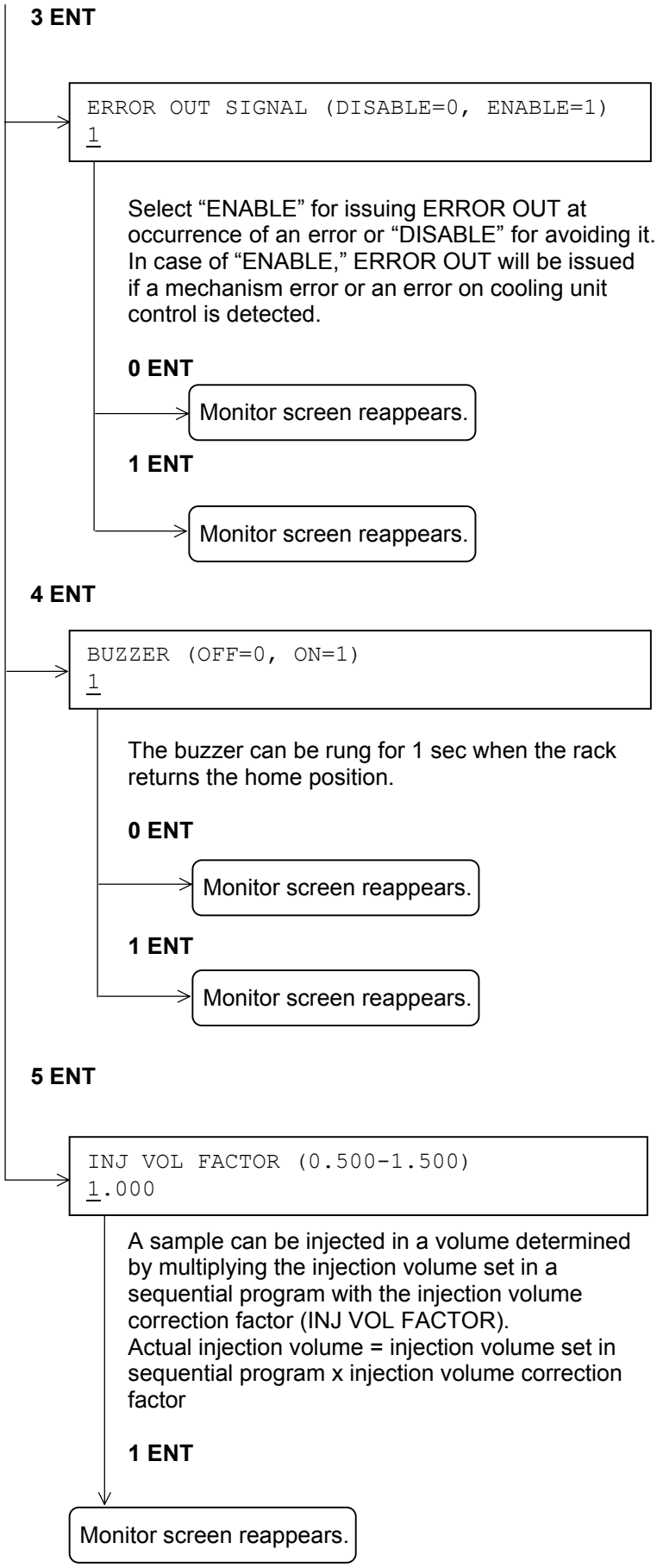
Monitor screen reappears.


2 ENT
INJ WASH STROKES (0-20)
_3
The washing conditions during execution of a sequential program are settable here. First, input the number of syringe reciprocations for replacing the detergent in the wash port with the fresh one.
3 ENT
INJ WASH SPEED (1-5)
3
Input a syringe speed for washing.
3 ENT
NEEDLE WASH TIME (0-30)s
_1
After aspiration of a sample, the needle moves to the wash port and its outer wall is washed. Input the time period for dipping the needle in the wash port.
1 ENT
Monitor screen reappears.
3 ENT
PUMP PLUNGER WASH (NO=0, YES=1)
0
After a sequential program, pump washing (option) can be executed. Select “YES” for its selection or “NO” for its avoidance.
0 ENT
Monitor screen reappears.
1 ENT
PUMP PLUNGER WASH VOL (0.0-5000.0)µl
_300.0
Input the volume of the detergent to be used for washing the pump.
300 ENT
Monitor screen reappears.

(d) OTHERS

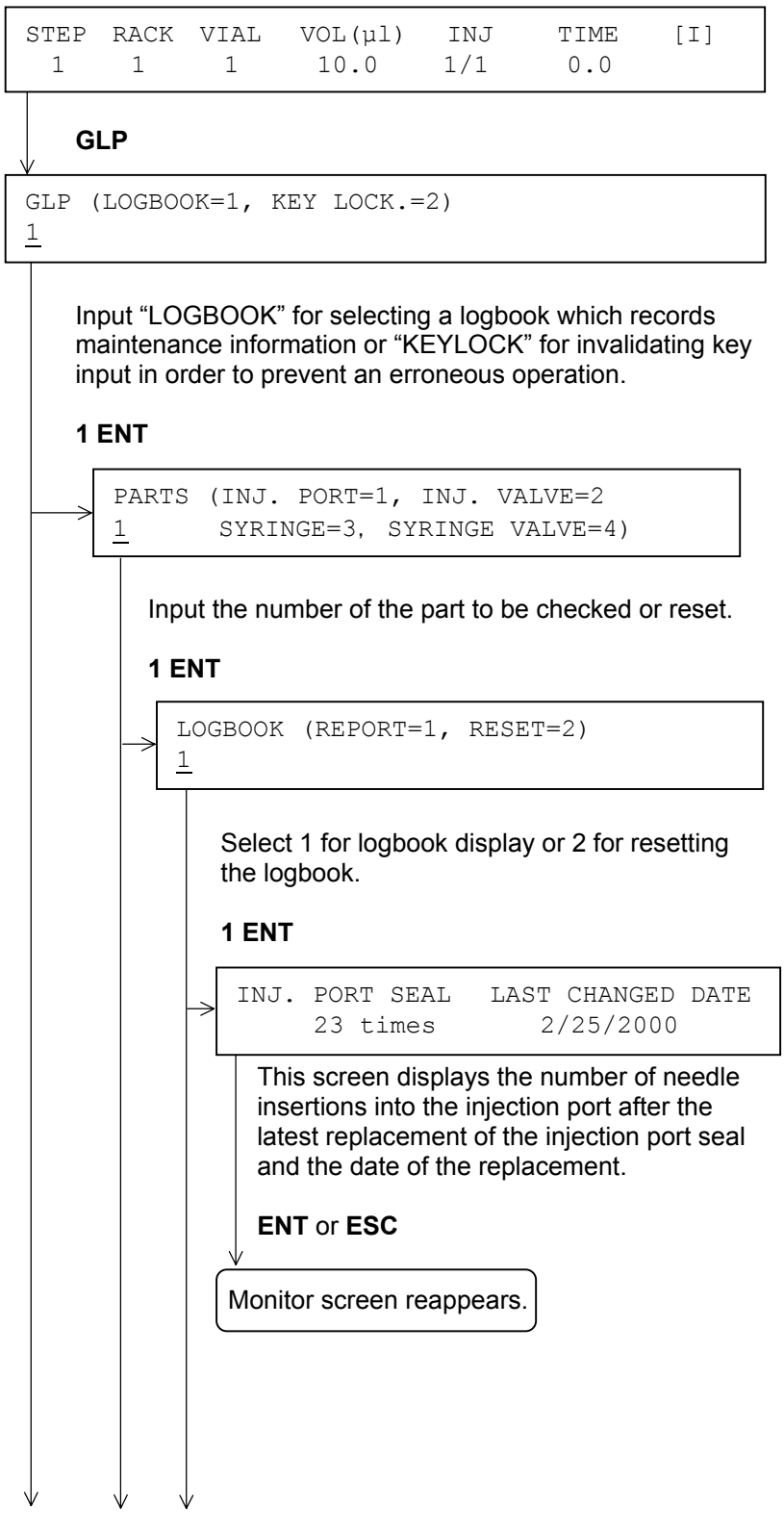
Other conditions can be set.

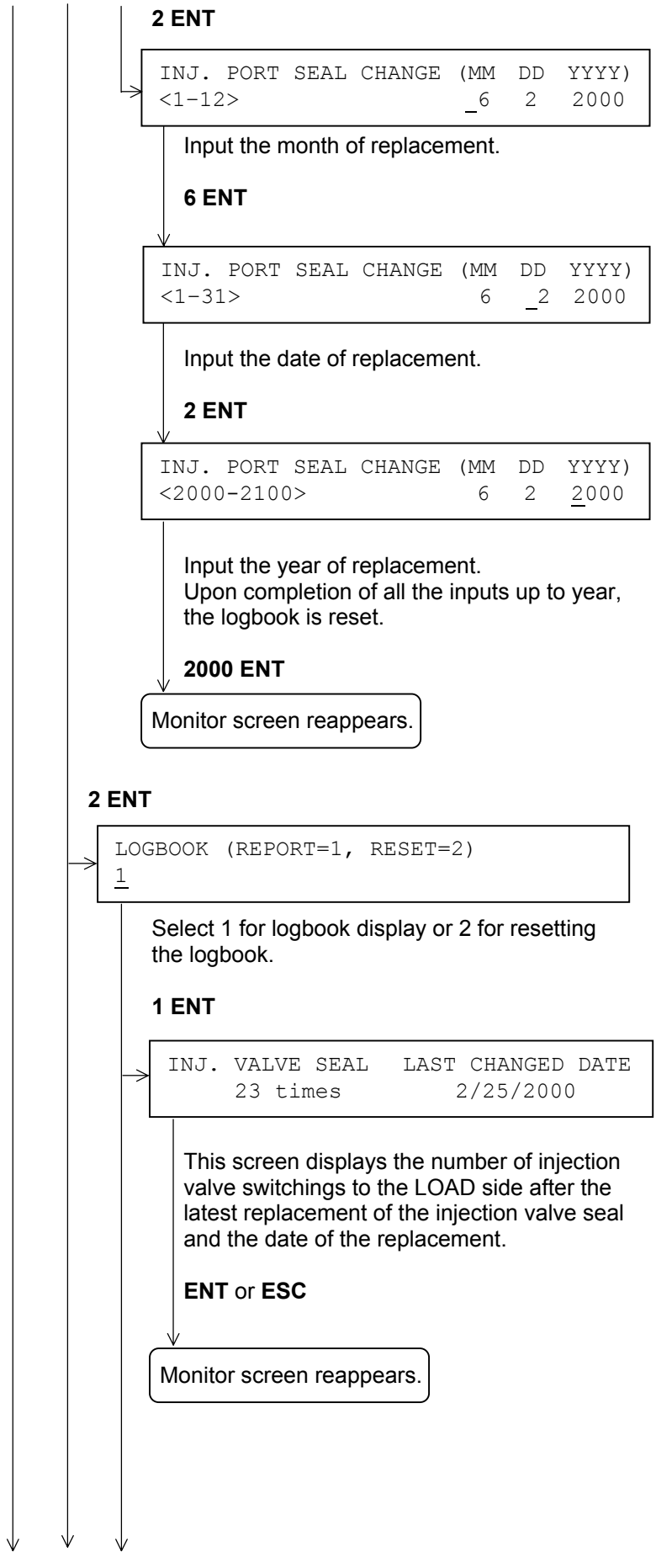



3 ENT
ERROR OUT SIGNAL (DISABLE=0, ENABLE=1)
1
Select “ENABLE” for issuing ERROR OUT at occurrence of an error or “DISABLE” for avoiding it. In case of “ENABLE,” ERROR OUT will be issued if a mechanism error or an error on cooling unit control is detected.
0 ENT
Monitor screen reappears.
1 ENT
Monitor screen reappears.
4 ENT
BUZZER (OFF=0, ON=1)
1
The buzzer can be rung for 1 sec when the rack returns the home position.
0 ENT
Monitor screen reappears.
1 ENT
Monitor screen reappears.
5 ENT
INJ VOL FACTOR (0.500-1.500)
1.000
A sample can be injected in a volume determined by multiplying the injection volume set in a sequential program with the injection volume correction factor (INJ VOL FACTOR).
Actual injection volume = injection volume set in sequential program x injection volume correction factor
1 ENT
Monitor screen reappears.

(4) Confidence-level Reporting

This autosampler incorporates the confidence-level reporting function for analysis to be carried out while checking data reliability.
For using this function, press the **GLP** key.




2 ENT
INJ. PORT SEAL CHANGE (MM DD YYYY)
<1-12> _6 2 2000
Input the month of replacement.
6 ENT
INJ. PORT SEAL CHANGE (MM DD YYYY)
<1-31> 6 _2 2000
Input the date of replacement.
2 ENT
INJ. PORT SEAL CHANGE (MM DD YYYY)
<2000-2100> 6 2 _2000
Input the year of replacement.
Upon completion of all the inputs up to year, the logbook is reset.
2000 ENT
Monitor screen reappears.
2 ENT
LOGBOOK (REPORT=1, RESET=2)
_1
Select 1 for logbook display or 2 for resetting the logbook.
1 ENT
INJ. VALVE SEAL LAST CHANGED DATE
23 times 2/25/2000
This screen displays the number of injection valve switchings to the LOAD side after the latest replacement of the injection valve seal and the date of the replacement.
ENT or ESC
Monitor screen reappears.

2 ENT

```
INJ. VALVE SEAL CHANGE (MM  DD  YYYY)
<1-12>                  _6  2   2000
```

Input the month of replacement.

6 ENT

```
INJ. VALVE SEAL CHANGE (MM  DD  YYYY)
<1-31>                   6  _2  2000
```

Input the date of replacement.

2 ENT

```
INJ. VALVE SEAL CHANGE (MM  DD  YYYY)
<2000-2100>              6   2  2000
```

Input the year of replacement.
Upon completion of all the inputs up to year, the logbook is reset.

2000 ENT

Monitor screen reappears.

3 ENT

```
LOGBOOK (REPORT=1, RESET=2)
1
```

Select 1 for logbook display or 2 for resetting the logbook.

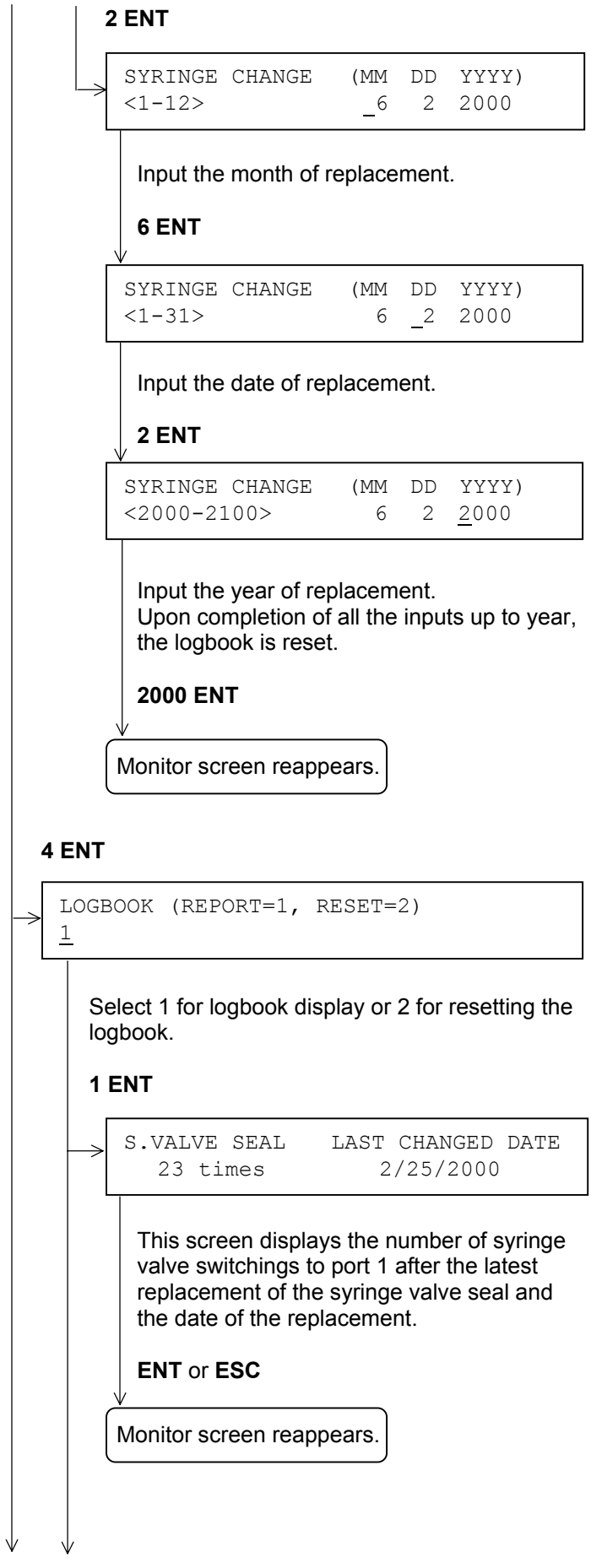
1 ENT

```
   SYRINGE      LAST CHANGED DATE
   23 times        2/25/2000
```

This screen displays the number of syringe movements to the 0 μL position after its replacement and the date of the replacement.

ENT or **ESC**

Monitor screen reappears.


2 ENT
SYRINGE CHANGE (MM DD YYYY)
<1-12> _6 2 2000
Input the month of replacement.
6 ENT
SYRINGE CHANGE (MM DD YYYY)
<1-31> 6 _2 2000
Input the date of replacement.
2 ENT
SYRINGE CHANGE (MM DD YYYY)
<2000-2100> 6 2 _2000
Input the year of replacement.
Upon completion of all the inputs up to year, the logbook is reset.
2000 ENT
Monitor screen reappears.
4 ENT
LOGBOOK (REPORT=1, RESET=2)
1
Select 1 for logbook display or 2 for resetting the logbook.
1 ENT
S.VALVE SEAL LAST CHANGED DATE
23 times 2/25/2000
This screen displays the number of syringe valve switchings to port 1 after the latest replacement of the syringe valve seal and the date of the replacement.
ENT or ESC
Monitor screen reappears.

2 ENT

```
S.VALVE SEAL CHANGE  (MM  DD  YYYY)
<1-12>                _6   2  2000
```

Input the month of replacement.

6 ENT

```
S.VALVE SEAL CHANGE  (MM  DD  YYYY)
<1-31>                 6  _2  2000
```

Input the date of replacement.

2 ENT

```
S.VALVE SEAL CHANGE  (MM  DD  YYYY)
<2000-2100>            6   2  2000
```

Input the year of replacement.
Upon completion of all the inputs up to year, the logbook is reset.

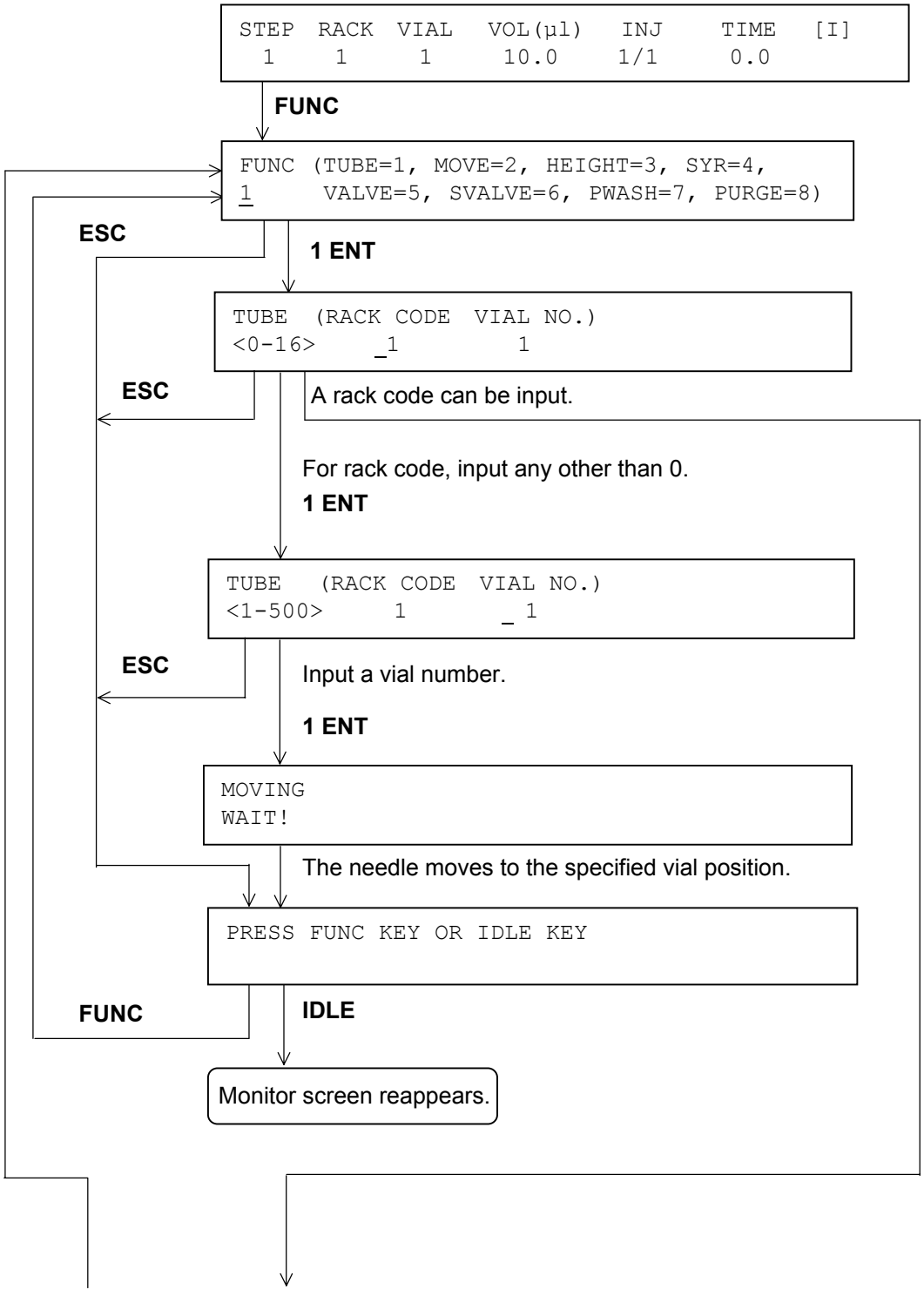
2000 ENT

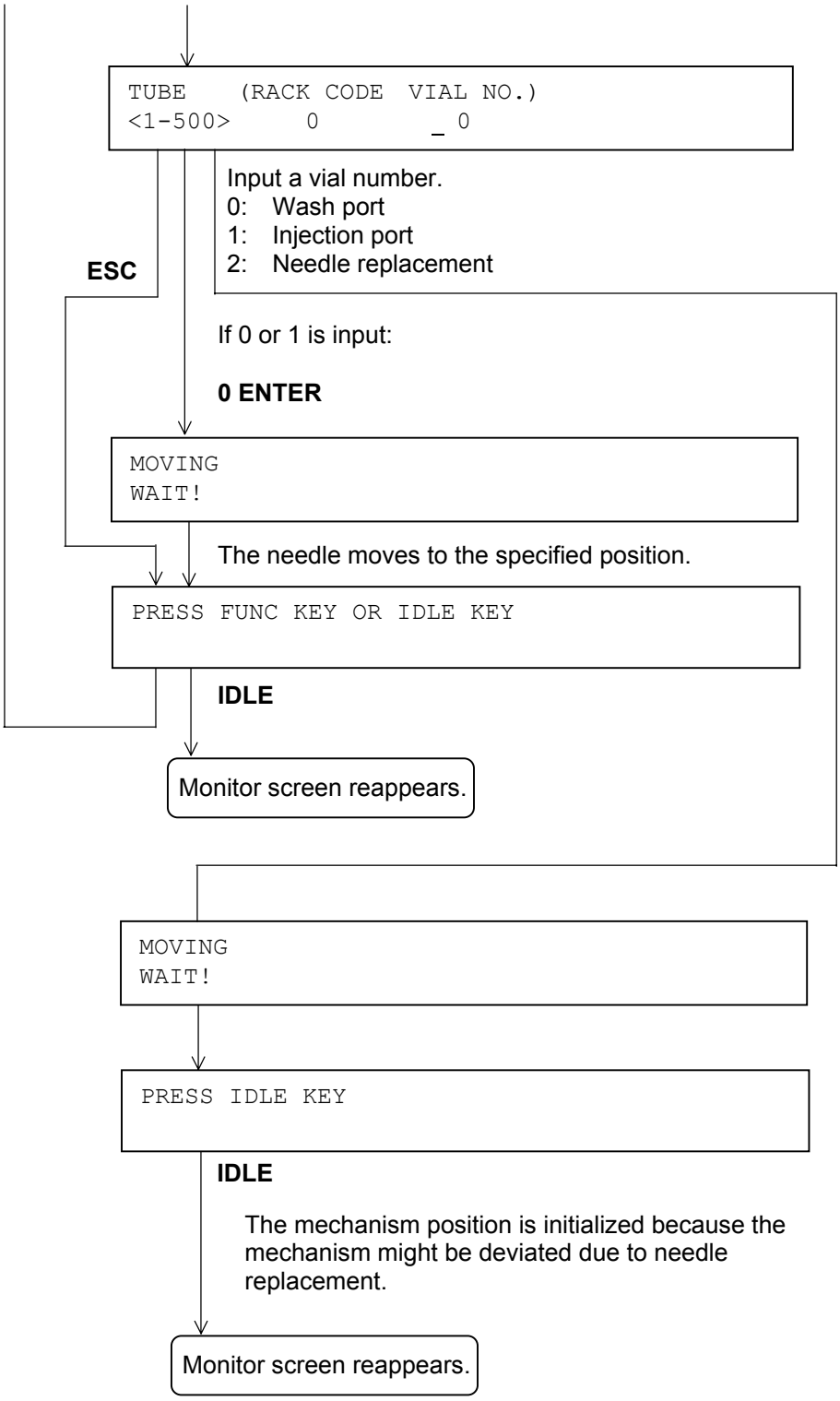
Monitor screen reappears.

(5) Functions

Each mechanism can be moved for maintenance such as replacement of the needle or injection port seal.

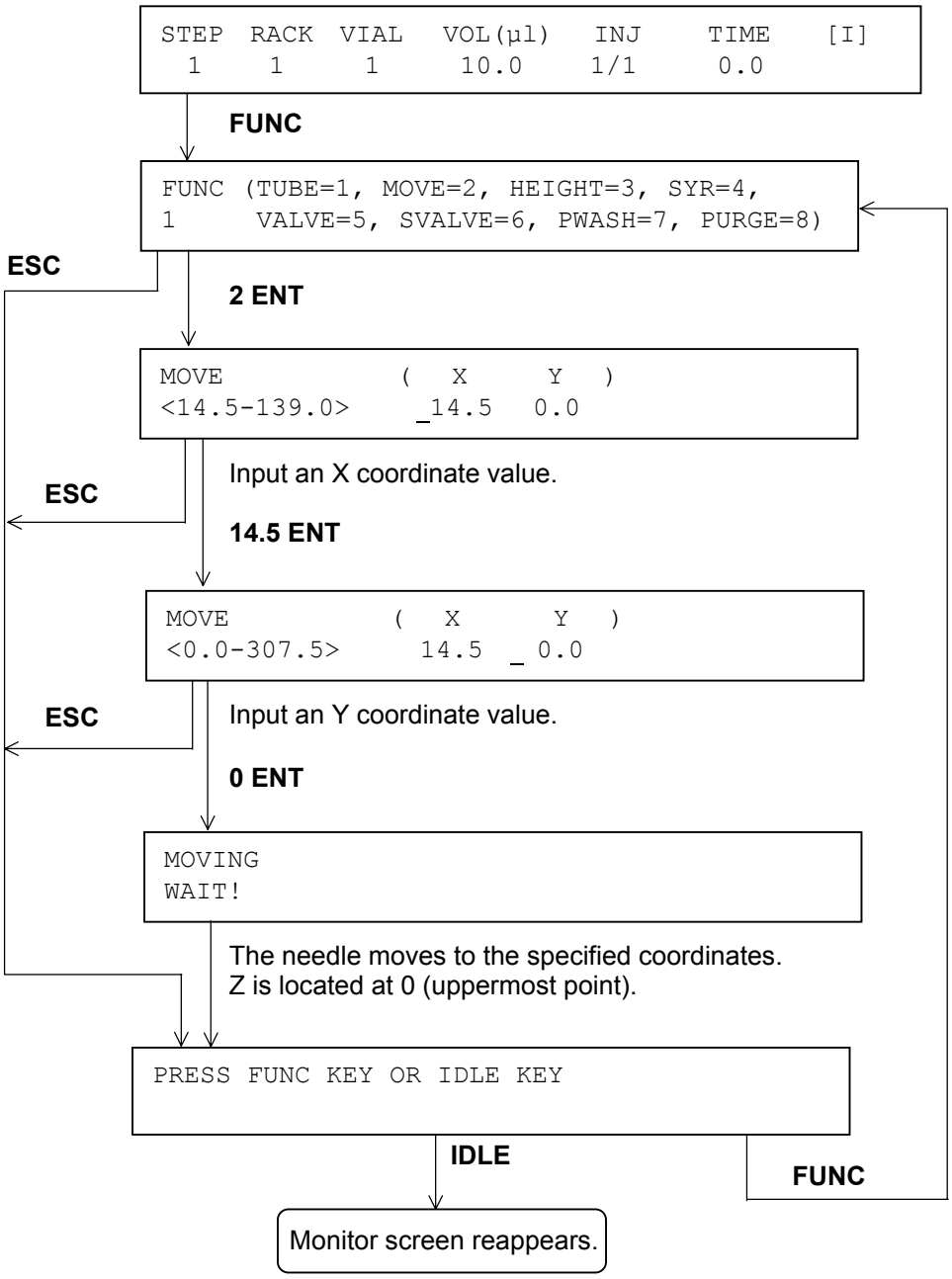
(a) TUBE
The needle can be moved to the vial position, injection port, wash port and needle replacement position.




TUBE (RACK CODE VIAL NO.)
<1-500> 0 _ 0
Input a vial number.
0: Wash port
1: Injection port
2: Needle replacement
ESC
If 0 or 1 is input:
0 ENTER
MOVING
WAIT!
The needle moves to the specified position.
PRESS FUNC KEY OR IDLE KEY
IDLE
Monitor screen reappears.
MOVING
WAIT!
PRESS IDLE KEY
IDLE
The mechanism position is initialized because the mechanism might be deviated due to needle replacement.
Monitor screen reappears.

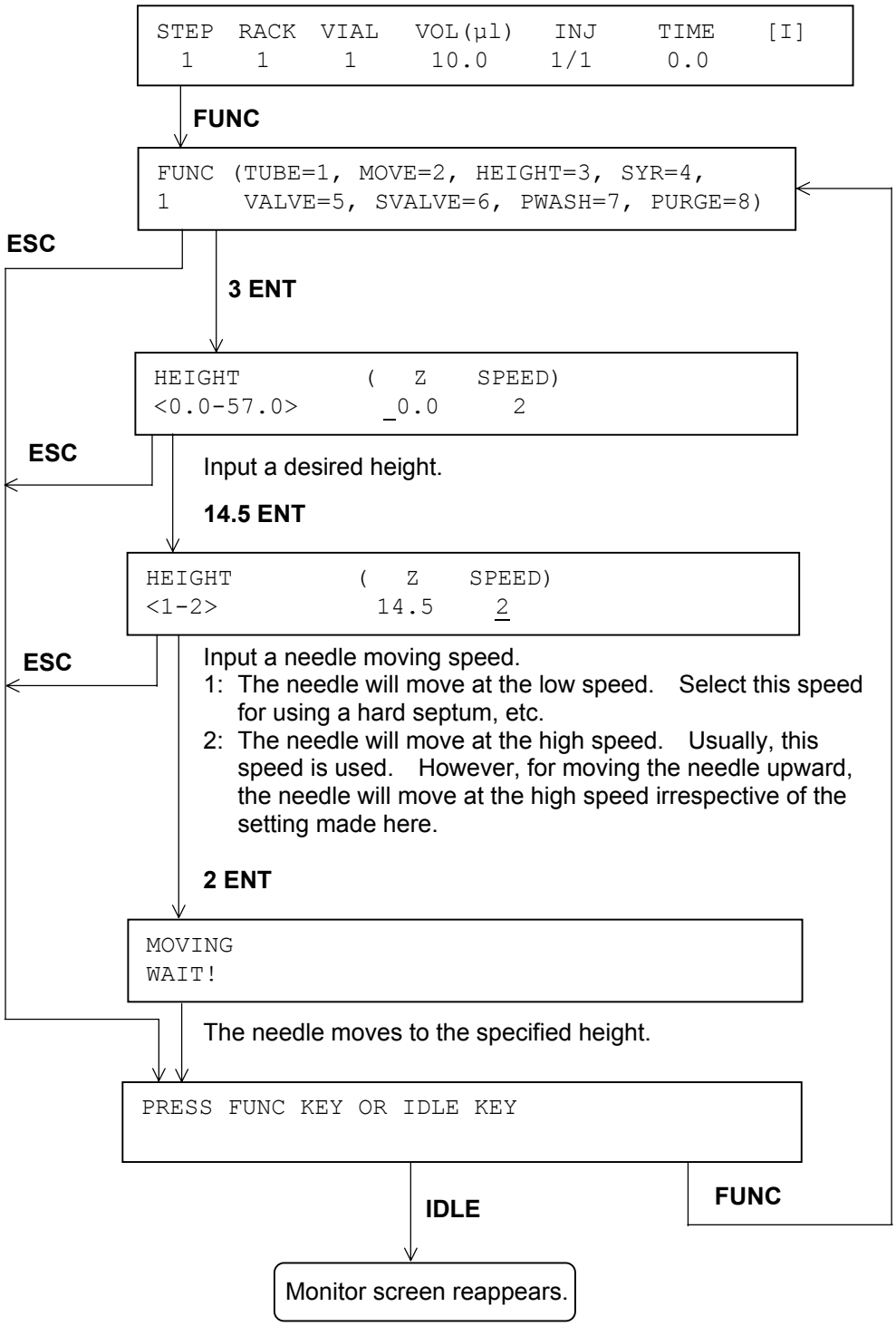
(b) MOVE

The needle can be moved to the specified coordinates.



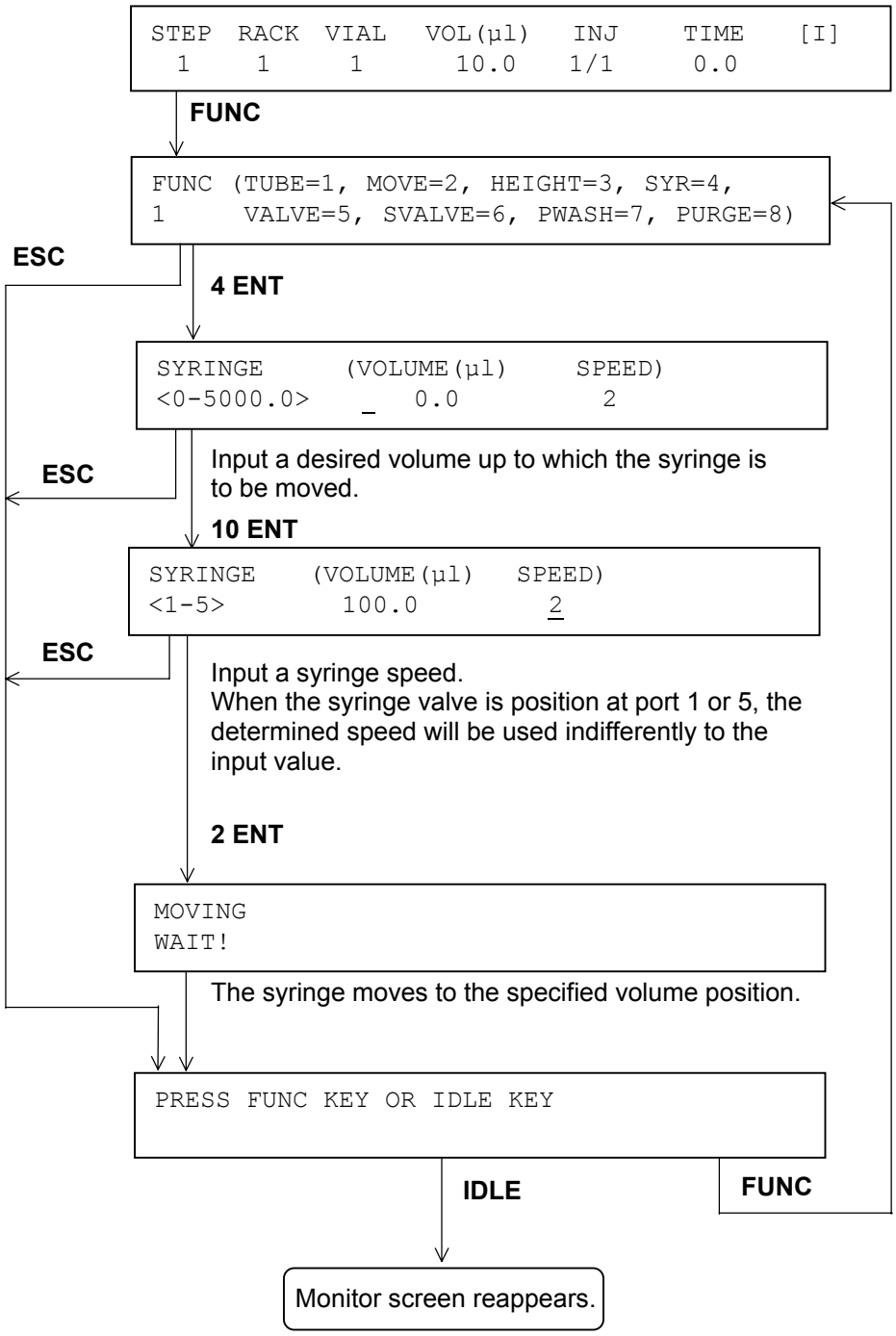
(c) HEIGHT

The needle can be moved to the specified height.



(d) SYR

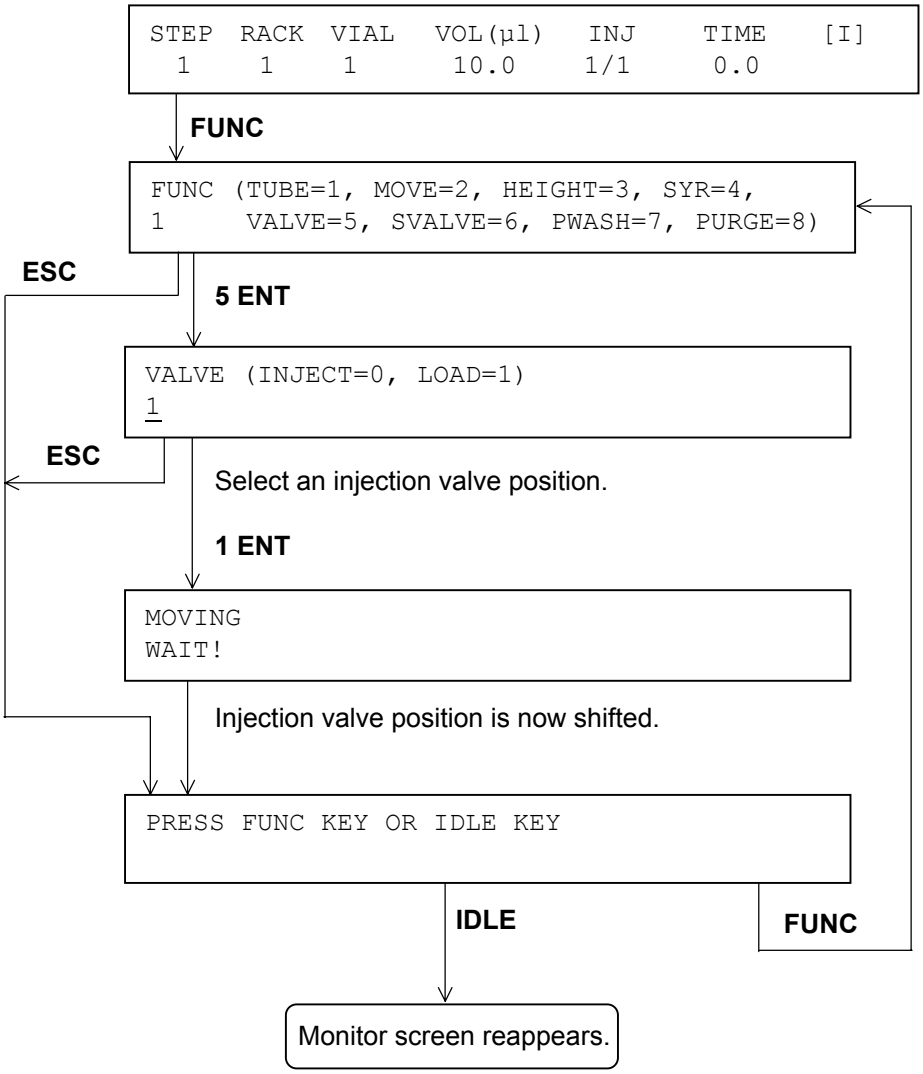
The syringe can be moved to the specified volume position.



NOTE: Because the flow path may be closed if the syringe valve is positioned at port 3, the valve position will be changed to port 4 before syringe operation.

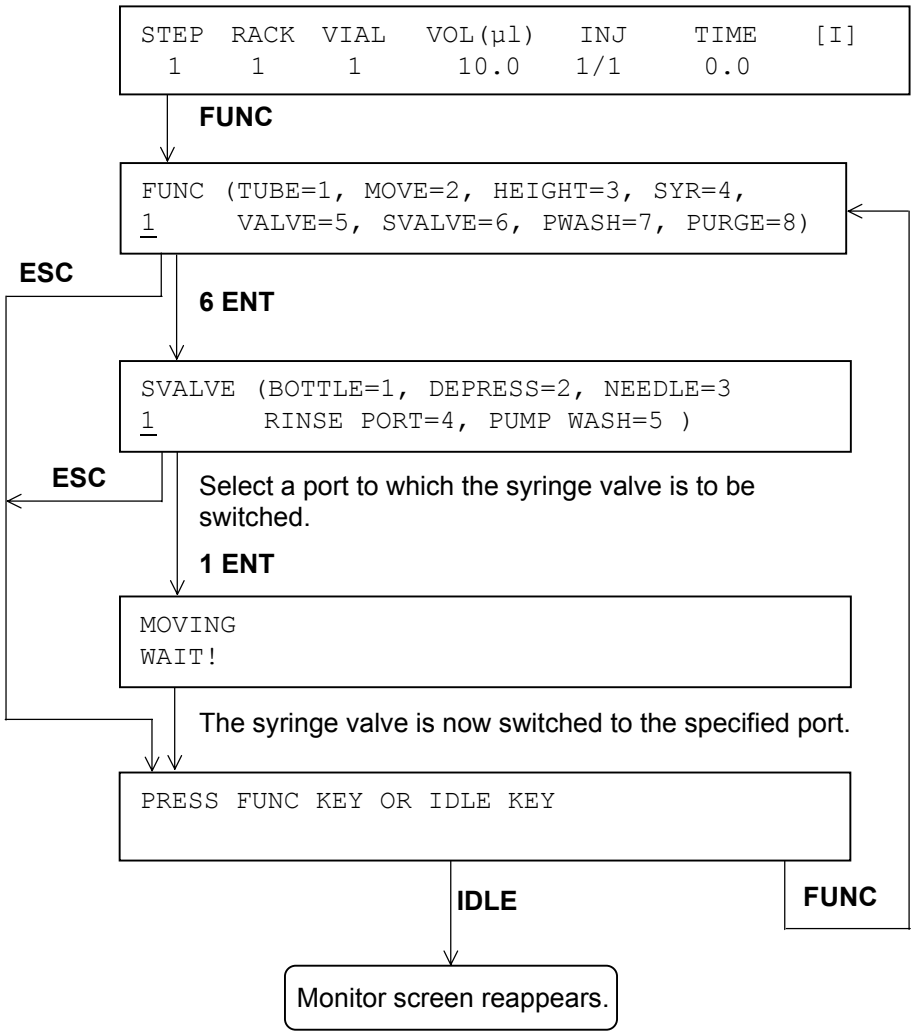
(e) VALVE

The injection valve can be operated.



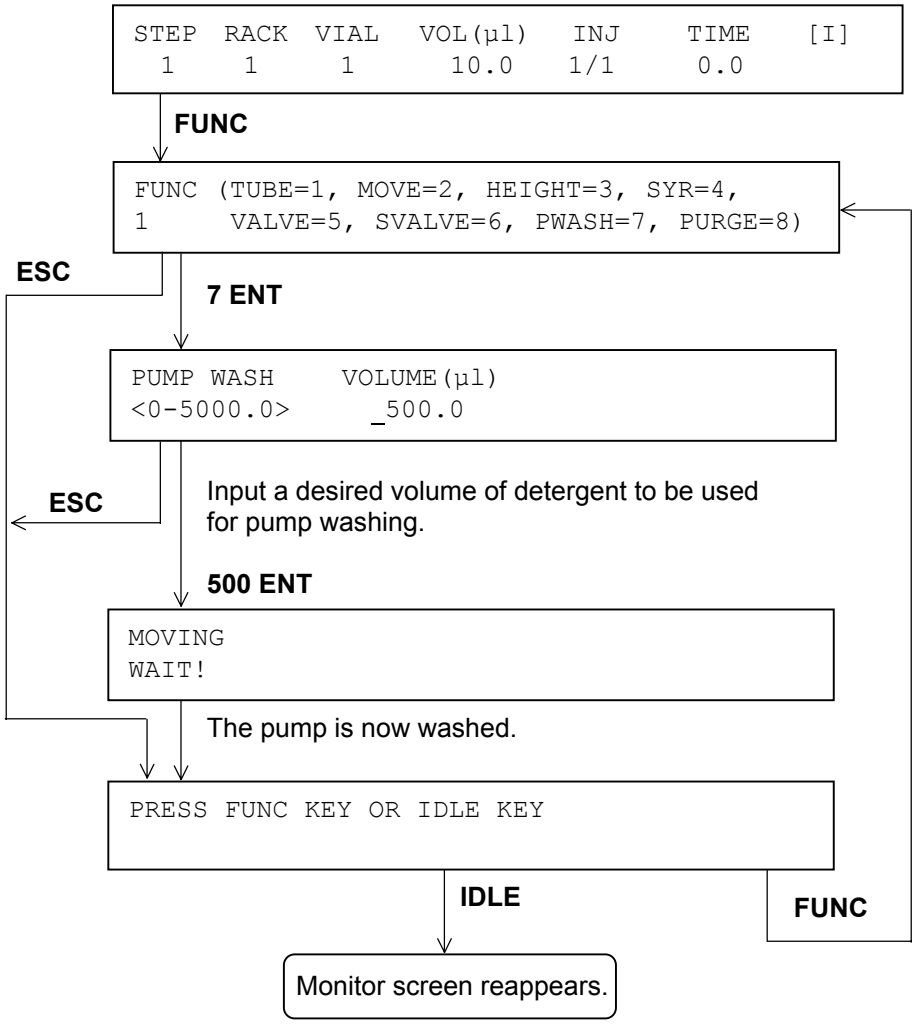
(f) SVALVE

The syringe valve position can be switched.



(g) PWASH

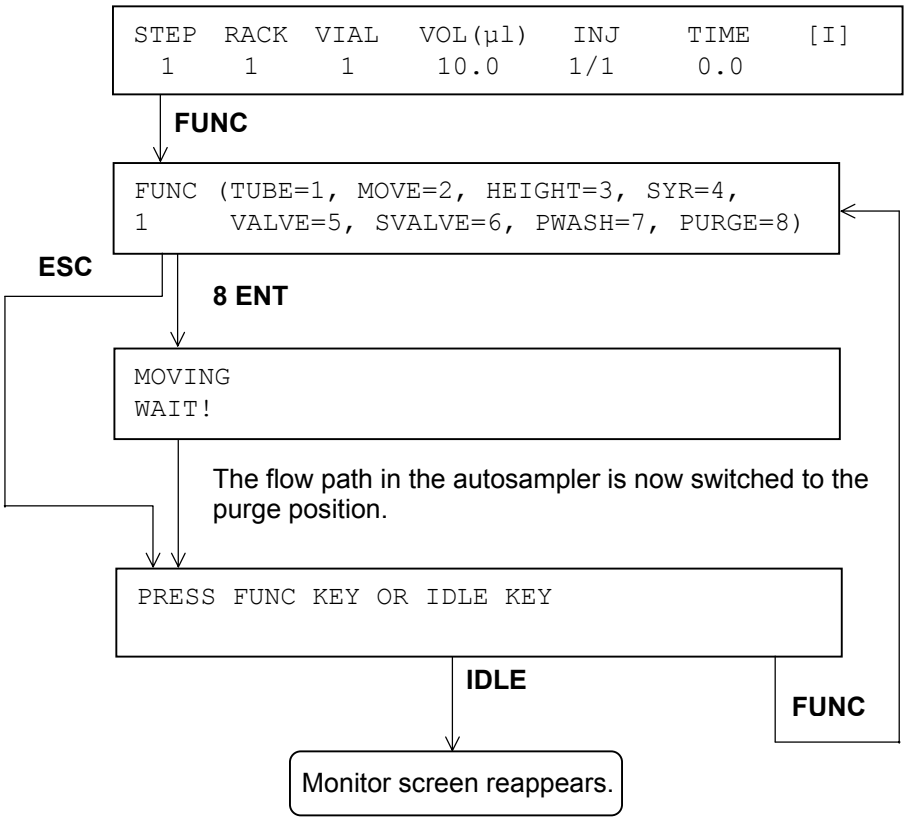
Pump washing (option) can be conducted.



NOTE: Prior to pump washing, be sure to disconnect the stop valve from port 7 of the syringe valve.

(h) PURGE

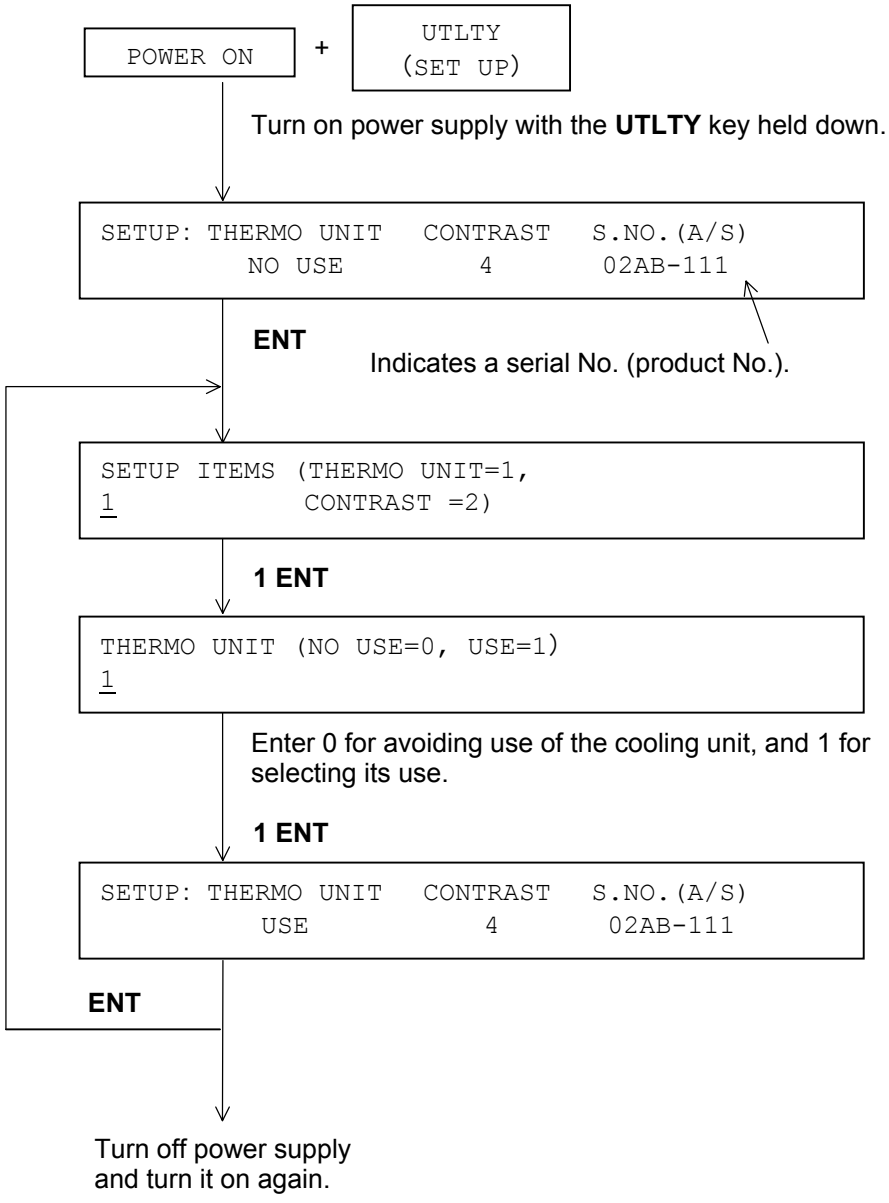
After moving the needle into the wash port, the injection valve can be switched to the injection side. The mobile phase delivered from the pump will be discharged into the wash port through the needle.



(6) Setup Processing

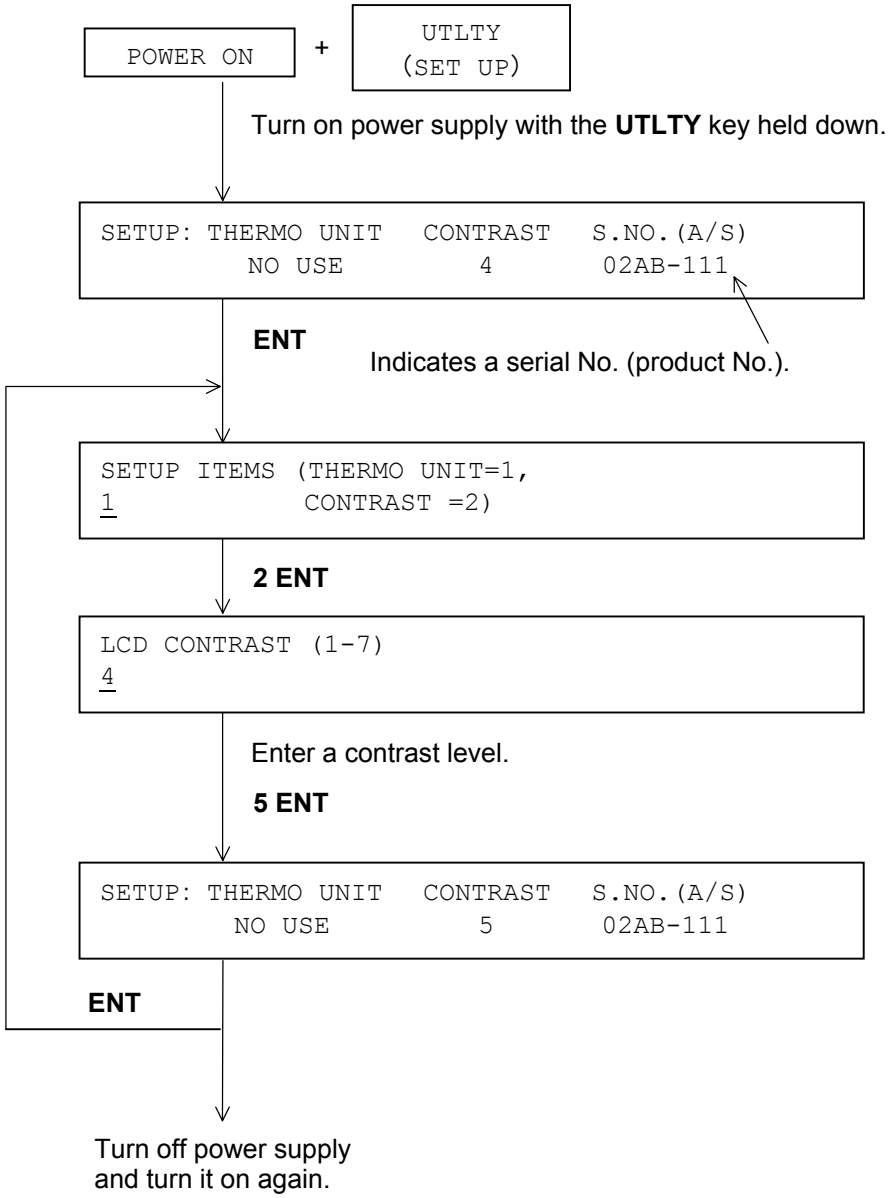
You can select use or nonuse of the cooling unit (option) and set LCD contrast of the UI pad (option).

(a) Selection of use or nonuse of cooling unit (option)



When turning on power supply again, the instrument starts under the set conditions.

(b) Setting of LCD contrast of UI (pad)



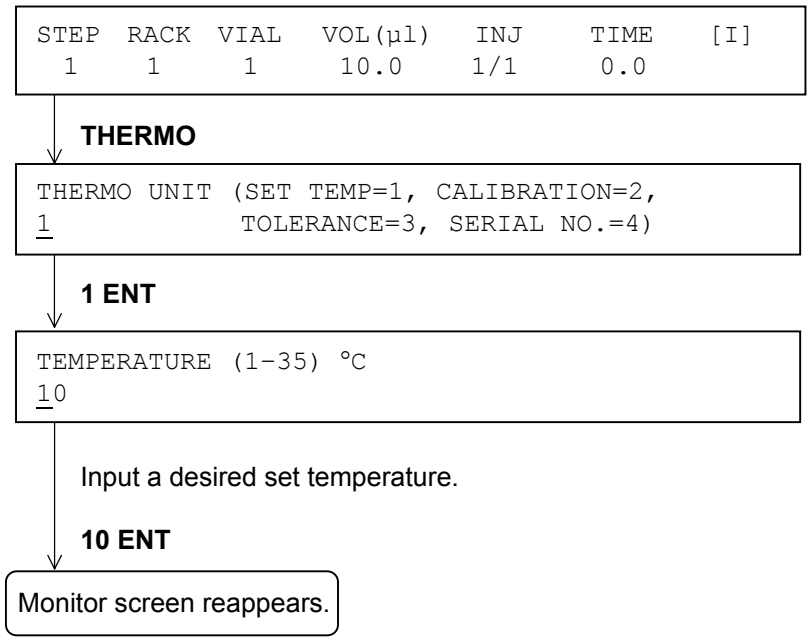
When turning on power supply again, the instrument starts under the set conditions.

(7) THERMO

Conditions need to be set when the cooling unit (option) is connected.

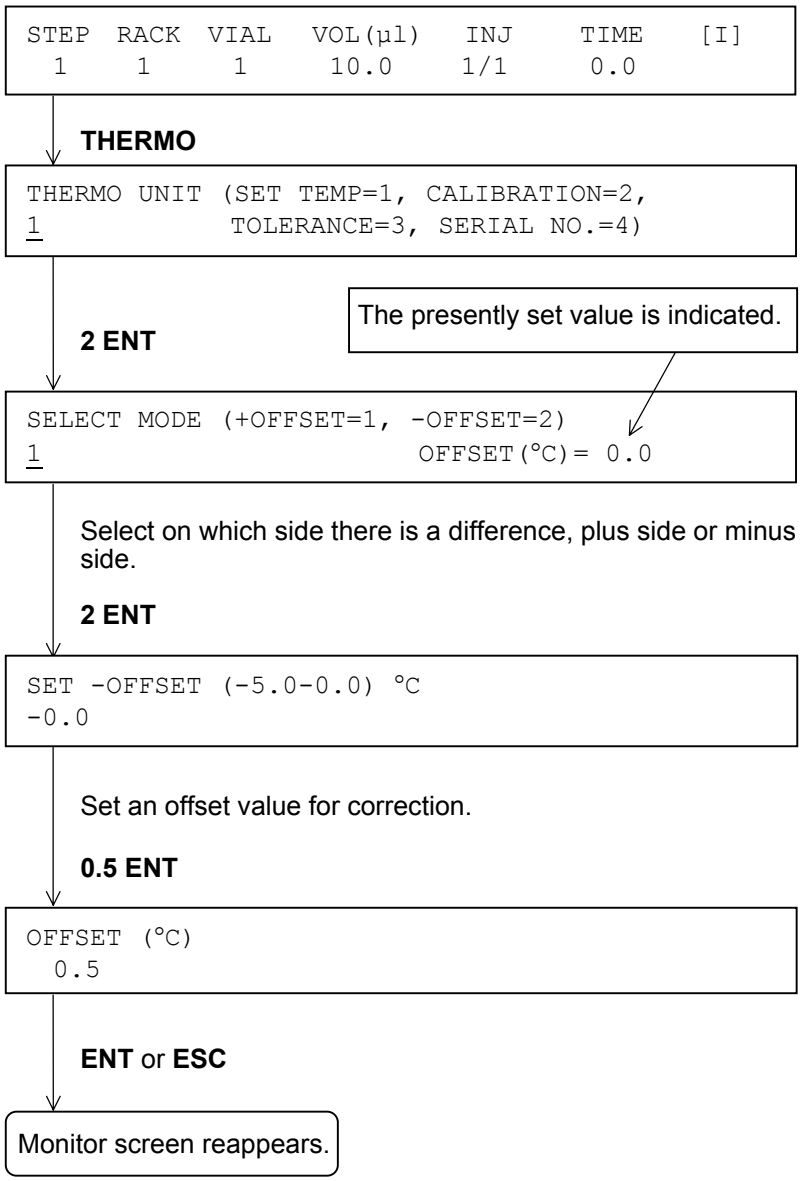
> **NOTE**: **THERMO** key operation is ineffective when the cooling unit is not connected or its use is not set.

(a) Temperature setting
A set temperature can be input.



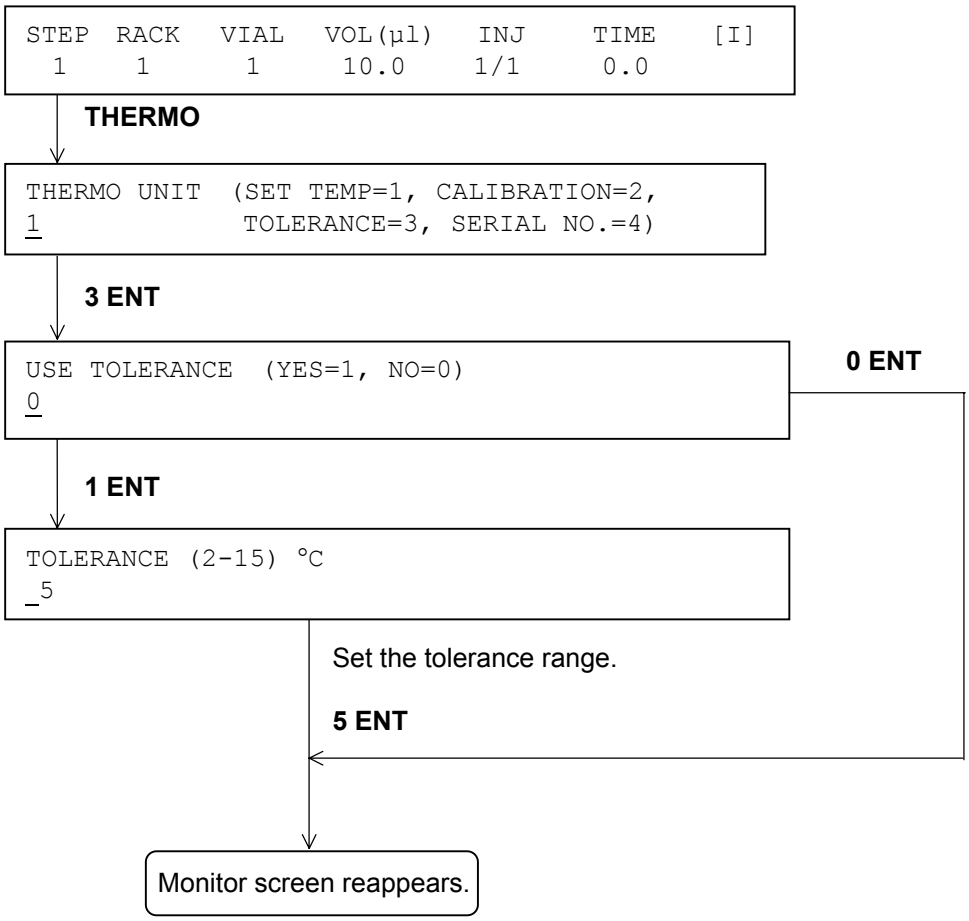
(b) Temperature calibration

If there is a difference between the indicated temperature of the cooling unit and the actual temperature of the liquid in a sample vial, it can be corrected by setting of temperature calibration.
In case the indicated temperature of the cooling unit is 10.0 °C and the actual temperature of the liquid in a sample vial as measured with a calibrated thermometer is 10.5 °C, the difference correction value (offset value) is +0.5. So, setting is required as follows.



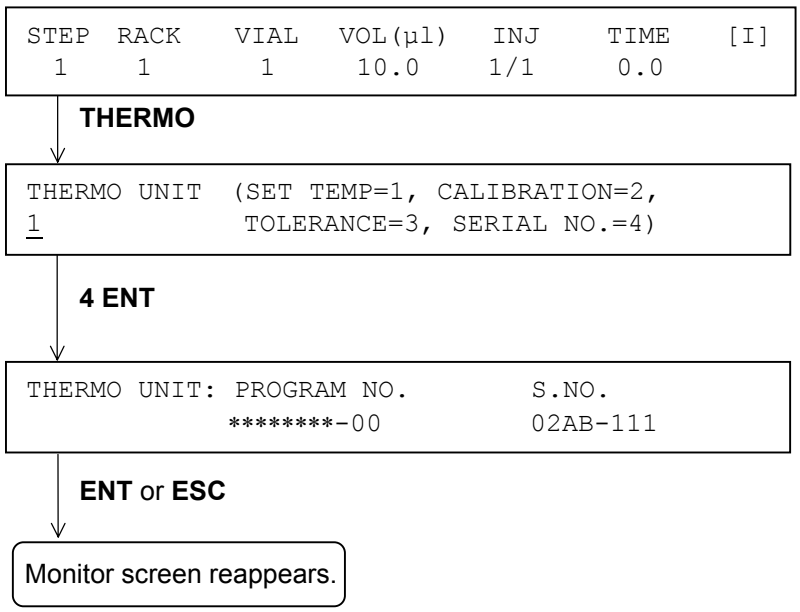
NOTES:
1. Before temperature calibration, be sure to measure the liquid temperature with a calibrated thermometer.
2. A difference from the liquid temperature in a sample vial varies slightly with the set temperature. For temperature calibration, it is recommended to determine the difference at the set temperature to be used most frequently. And for temperature calibration on multiple cooling units, be sure to correct all cooling units at the same temperature.
3. In the cooling unit, its aluminum block is subjected to temperature control. Therefore, a temperature difference occurs between the set temperature and the liquid temperature in a sample vial. If it is necessary to control the absolute liquid temperature, you should measure the liquid temperature in a sample vial after reaching the set temperature and carry out temperature calibration so that the target temperature can be attained.

(c) Selection of tolerance setting (USE TOLERANCE)
Condition for reaching the temperature ready status can be set.



NOTES:
1. In case the use of tolerance is avoided (by entering 0 (= NO) for USE TOLERANCE), the instrument starts a sequential program irrespective of the present temperature of the cooling unit.
2. In case the use of tolerance is selected (by entering 1 (= YES) for USE TOLERANCE), the instrument remains in the standby status (does not launch a sequential program) until the present temperature of the cooling unit enters a range of the set temperature ± tolerance.

(d) Display of program No. and serial No.
The program No. and serial No. (product No.) of the cooling unit can be indicated.



4.3 Stop Procedure

(1) When analysis has been completed up to the set last vial number or when no vial is detected with the vial detecting function turned ON, the autosampler activates the stopping process and returns to the idle status.

(2) When YES is selected for ALL END, the ALL END signal is output after ALL END TIME, so the ALL END screen is displayed. For returning to the idle status, press the **IDLE** key.

(3) For stop at the mid-point of analysis, press the **STOP** key. As a result, analysis stops and the autosampler waits for pressing of the **IDLE** key.

(4) Stop other units such as pump.

NOTES
1. When a saline solvent is used as an eluent, salt will precipitate in the flow path so that the path may be clogged or the seal face of valve may be damaged. To prevent this, wash the flow path adequately with distilled water after use.
2. Before a long shutdown of the instrument, clean the sample flow path sufficiently using a solvent capable of dissolving all the injected samples and their constituents and replace the inside with distilled water.

4.4 Precautions on Measurement

(1) Eluent and Detergent

(a) The same solvent should as a rule be used for the eluent and detergent. (When a gradient unit is used, the detergent must be the same as the first eluent.)

(b) Both the eluent and detergent must always be deaerated (use of a degasser is recommended).

> **NOTE**: If the eluent and detergent have not been deaerated adequately, the instrument may fail to provide full performance.

(c) When the same detergent must be used for a long time, it should be replace periodically in order to prevent bacterial growth.

5. MAINTENANCE

5.1 Checking the Performance and Specifications

Performance checking method is explained here.

5.1.1 Items to be Prepared for Performance Check

The following items are required for performance check.

(1) Component Units of Liquid Chromatography System

- Pump (Hitachi L-2100/2130 or equivalent)
- Degasser (Hitachi L-2100/2130's option or equivalent)
- Detector (Hitachi L-2400 or equivalent)
- Data processing unit
- Waste liquid bottle

> **NOTE**: Use of the online degasser is recommended for detergent. If the online degasser is not used, adequate deaeration is indispensable.

(2) Items for Performance Check

Prepare the following items for performance check.

- Load resistance coil
  A coiled stainless tube with an inner diameter of 0.25 mm and a length of 10 m
- 60% methanol in about 1000 mL
  A mixture of methanol 60% and distilled water 40% in volume. This should be prepared separately.
- Distilled water in about 500 mL

(3) Performance Check Parts Attached to Model L-2200 Autosampler

- Standard sample
  60% methanol solution of methylparaben
  (Methylparaben 6 mg in methanol 60 mL + distilled water 40 mL)
- Sample vial, cap, septum
- Standard rack

5.1.2 Preparing the System for Operation

(1) Figure 5-1 shows how to connect the units for performance check. According to this figure, carry out tubing. Before energizing the system, ensure that the tubing between the autosampler and pump/detector is properly connected.

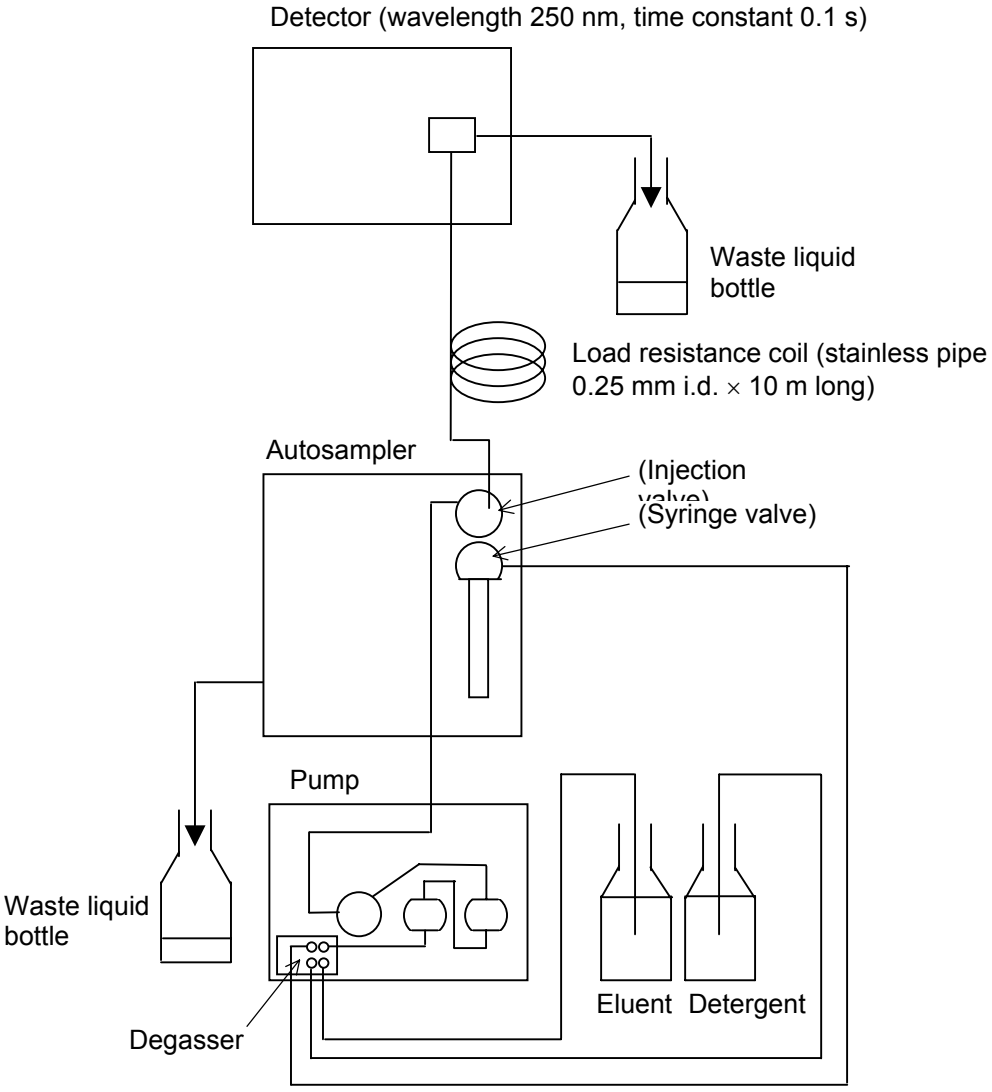


Fig. 5-1 Flow Path Diagram

(2) Connect the e-Line cable among the autosampler, detector and pump.

(3) Check if the drain tube is properly connected to the waste liquid bottle. The waste liquid bottle must be at a lower position than the autosampler.

(4) Prepare other units to be connected to the autosampler as described in the respective instruction manuals.

(5) Put the drain tube from the detector into the exclusive detector waste liquid bottle. If this tube is put into other waste liquid bottle such as for the Model L-2200 autosampler, baseline fluctuation may be caused due to unstable back pressure.

(6) After confirmation of the above steps, connect the eluent to the pump, and the detergent to the autosampler. Be sure to use the eluent and detergent of the same production lot.

(7) Start the pump to fill each flow path in the pump and autosampler with liquid.

(8) After the eluent has reached the injection valve of autosampler, turn on the autosampler power supply. If the injection valve is switched over when no liquid is in it, the valve seal may be damaged. To prevent this, be sure to start the pump earlier.
The autosampler will go through the initialization sequence, and then the initial screen will appear.

(9) Press the **WASH** key in order to replace the detergent in the wash port with the fresh one and fill the syringe with the detergent. Usually, the **WASH** key should be pressed at least three times so that the old detergent in the wash port can be completely replaced with the fresh one. During this step, check to see if the detergent flows normally, there are no leaks and the waste liquid flows into the waste bottle.

(10) Input the following contents as instrument conditions.

RACK CODE	:	1
SYRINGE SPEED	:	3
RACK PARAM	:	RACK CODE = 1
		X1 = 16.0
		X2 = 137.5
		Nx = 10
		Y1 = 306
		Y2 = 49.5
		Ny = 20
		Z = 48
		P = 1
WASH STROKES	:	3
WASH SPEED	:	4
INJ WASH STROKES	:	3
INJ WASH SPEED	:	4
NEEDLE WASH TIME	:	1
SYRINGE VOL	:	1

(11) Set the pump flow rate to 1.0 mL/min.

(12) Set the detector wavelength to 250 nm. Set the detector time constant to 0.1 s.

(13) Set the following conditions in the data processing unit.

SAMPLE PERIOD	:	100 ms
STOP TIME	:	3 min

5.1.3 Checking the Reproducibility

Check the reproducibility of the injection volume in the following procedure.

(1) Press the **PROG** key and set the following conditions.

STEP	RACK	VIALS	VOL(µl)	INJ	TIME
1	1	1- 1	10.0	6	3.0

Setting can be completed by pressing the **ESC** key.

(2) Prepare 60% methanol for the eluent and detergent. Wait until the pump, detector, etc. are warmed up and the baseline stabilizes.

(3) Press the **WASH** key. This will wash the needle and the injection port, and fill the syringe flow path with the detergent.

(4) Place a vial containing at least 1 mL of standard sample in rack position No. 1 and set the rack in the autosampler.

(5) Press the **START** key of autosampler to start analysis. The analysis is carried out 6 times. The operating conditions during analysis are indicated on the display. Ensure beforehand that the room temperature will not change suddenly during analysis.

(6) Upon completion of analysis, the operation of the system stops with the initial screen displayed. Instead of the initial screen, the ALL END screen will appear if ALL END is set. In this case, the initial screen appears when you press the **IDLE** key.

(7) Data Check

Determine the coefficient of variation (CV) of peak area by the following calculations.

Mean value $$x = \frac{\sum_{i=1}^{n} xi}{n}$$

Standard deviation $$SD = \sqrt{\frac{\sum_{i=1}^{n} (xi - x)^2}{n-1}}$$

Coefficient of variation $$CV = \frac{SD}{x} \times 100(\%)$$

xi: Area value due to each injection,
n: Number of injections

Make sure the CV value is 0.3% or less. However, this value represents the reproducibility of not the autosampler alone but the entire chromatographic system.
Therefore, the value varies with each stability of the pump and detector, accuracy of the data processing unit and its processing parameters.

5.2 Periodic Maintenance

5.2.1 Washing the Flow Path

The flow path should be washed on a periodic basis. Bubbles will be formed if the flow path between the syringe and needle is contaminated; these bubbles will adversely affect the analytical reproducibility of the system.

(1) When Using an Aqueous Detergent

At the end of measurement, wash the flow path with distilled water. If contamination is heavy, fill the syringe with detergent and leave it overnight. After cleaning the syringe, rinse it with distilled water. If the instrument will not be used for a week or loner, wash the flow path adequately with distilled water and keep the syringe filled with distilled water. In particular, the syringe and sample loop should be washed carefully to remove contaminants. And prevent the inside of flow path from drying out. If the flow path dries out though contaminated, decontamination may become impossible.

Table 5-1 Recommended Neutral Detergents

Part No.	Detergent (brand)	Concentration	Precaution
S264000	Extran	20 to 50 times	Dilute the detergent with ion-exchanged water or distilled water when using phosphorus-free neutral detergent (Extran MA03, etc.).
775-1365	Rinsing liquid	Not diluted	

(2) When Using a Saline Solvent

When a saline solvent is used as an eluent, salt may precipitate in the flow path to clog it or scratch the seal face of valve. After using such a solvent, wash the flow path adequately with distilled water.

(3) When Using an Organic Solvent

When the instrument using an organic-solvent eluent will not be operated for 1 week or longer, wash the sample line adequately with a solvent capable of dissolving all samples injected into the line and their chemical constituents, and replace the contents with the organic solvent.

5.2.2 Cleaning

(1) Clean the wash port periodically. If the port is contaminated, reproducibility of analytical results may be degraded and/or carry-over may increase.

(2) Clean the immersion filter for detergent periodically. (Refer to “solvent filter cleaning method” in 6.7.) If the filter is clogged, the detergent will not flow and performance may become poor.

5.2.3 Waste Liquid Tube

The waste tubes in the system are made of materials having a high chemical resistance (EPDM: ethylene propylene diene monomer).
For these tubes, however, be careful about use of solvents such as benzene, chloroform, hexane, THF (tetrahydrofuran) and acids.
If the above solvents are used, periodically check the tubes and their joints. After shutdown, be sure to wash them with a solvent capable of dissolving the used solvent.

5.3 Positioning the Mechanism

5.3.1 Adjusting the Height of Vial Detection Lever

The detection height of the vial detection lever has been factory-adjusted for use of standard sample vials of 35 mm high (including cap and septum thickness) to be placed in the standard sample rack of 1.5 mL × 200 vials.
If the vial that is actually used has a different height (because the optional sample rack is used), the height of the vial detection lever can be adjusted.
Loosen the screw and adjust the lever so that the gap between the top face of the vial and the bottom of the vial detection lever is 16 mm when the needle is raised to the uppermost position (home position: Z = 0) as shown in Fig. 5-2.

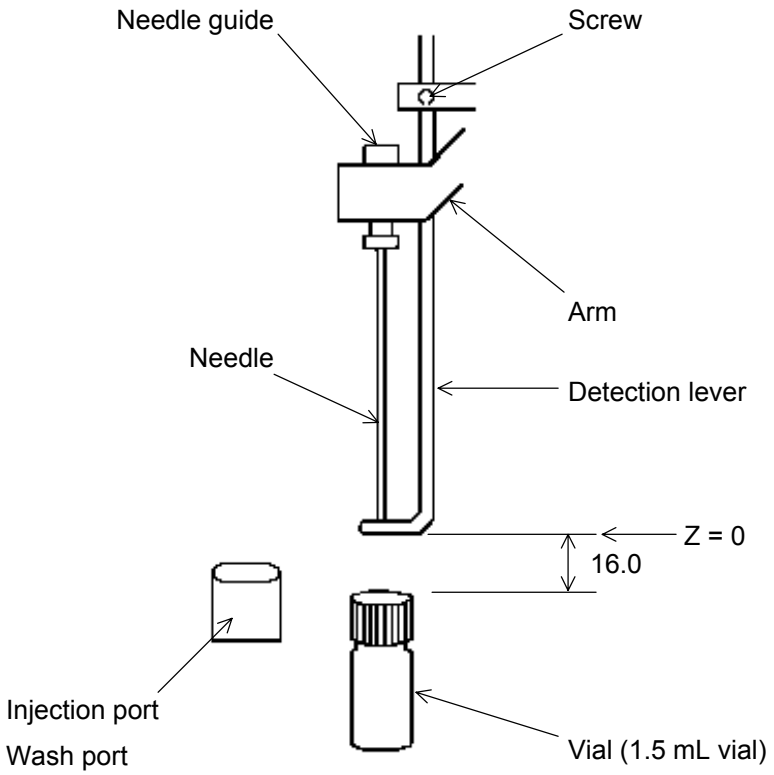


Fig. 5-2 Detection Lever Adjustment

5.3.2 Height Adjustment of Leak Sensor

The height of the leak sensor has been adjusted at installation so that its tip comes in contact with the drain reservoir.
If the drain reservoir was removed for cleaning, etc., the height of the leak sensor must be adjusted again.

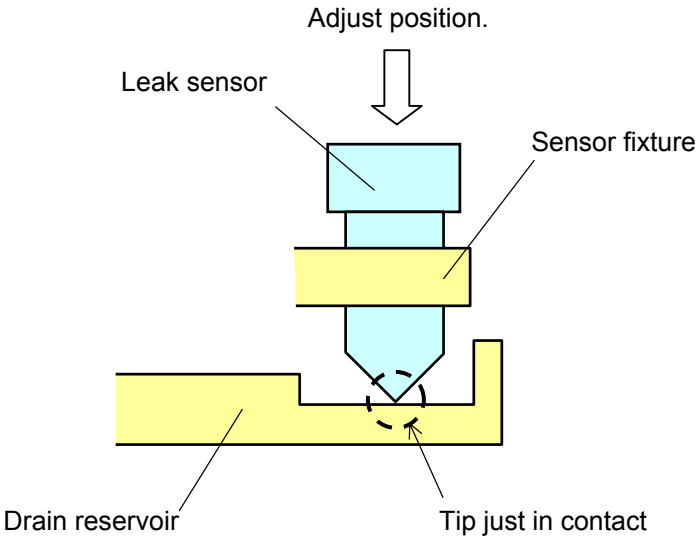


Fig. 5-3 Height Adjustment of Leak Sensor

NOTES:
1. Mount the leak sensor at the correct position. If the mounting position is inappropriate, the leak sensor may not function normally or an error may occur.
2. Before removing the drain reservoir for cleaning, etc., remove the sensor fixture (including the leak sensor) with a screwdriver. If the drain is removed forcibly, the leak sensor may be damaged.

5.4 Troubleshooting

5.4.1 Troubleshooting Table

If an abnormal phenomenon is encountered, reference should be made to the following table.

Table 5-2 Troubleshooting

No.	Symptom	Cause	Remedy
1	Error is indicated on the display.	a. Improper measuring conditions are entered or operation was wrong. b. Abnormal operation of the mechanism.	a. Perform correct operation according to the message. b. Check to see if anything is in the path of the mechanism. Also check whether the flow path is clogged or not.
2	ERROR-IVALVE is displayed. (Operation of the injection valve is abnormal.)	a. The injection valve seal has worn out. b. The inside of valve has dried out.	a. Replace the seal. b. Fill the valve with liquid and make a retry.
3	ERROR-SYRINGE is displayed. (Syringe operation is abnormal.)	a. The inside of syringe has dried out. b. Syringe capacity input code is wrong.	a. Fill the syringe with liquid and make a retry. b. Input the correct code corresponding to the capacity.
4	Reproducibility of analytical result is poor.	a. Air is trapped in the flow path (syringe, tube, etc.). b. The injection port leaks. c. The syringe valve leaks. d. The injection valve leaks. e. The tubing in the flow path leaks or is clogged. f. The syringe leaks or its inside is contaminated. g. The sample volume is too small. h. The detergent bottle is contaminated. i. The sample vial or septum is contaminated. j. The sample has evaporated or deteriorated. k. The needle has clogged. l. Excessive variation in the ambient temperature. m. Deaeration of detergent or eluent is inadequate. n. The detergent bottle filter (solvent filter) has clogged.	a. Repeat the WASH operation several times to get rid of air. Or wash the flow path. b. Check the lock nut and retighten if loose. Or replace the port seal. c. Check the fixing screw and retighten if loose. Or replace the valve seal or stator. d. Check the fixing screw and retighten if loose. Replace the tube seal or stator. e. Check the flow path setscrew and retighten if loose. f. Check the fixing screw and retighten if loose. Clean or replace the syringe. g. Increase the sample volume. h. Wash the bottle and replace the detergent. i. Replace the vial or septum. j. Replace the sample. k. Clean the needle. Or replace it. l. Select a site where the temperature variation is smaller. m. Deaerate the detergent or eluent. Use a degasser. n. Wash or replace the solvent filter.

(cont'd)

No.	Symptom	Cause	Remedy
5	Carryover occurs.	a. The flow path is contaminated. b. The injection port seal leaks. c. The detergent bottle is contaminated. d. The sample vial or septum is contaminated. e. The tip of need is deformed. f. The detergent in the wash port is contaminated.	a. Wash the flow path. b. Check the lock nut and retighten if loose. Or replace the seal. c. Wash the bottle and replace the detergent. d. Replace the vial or septum. e. Replace the needle. f. Increase the number of WASH times. Clean the wash port.
6	No peak is observed.	a. An insufficient sample volume is used. b. The injection port leaks. c. The flow path has clogged. d. The column is faulty. e. The detector or data processor is faulty.	a. Increase the sample volume. b. Check the lock nut and retighten if loose. Or replace the seal. c. Replace the tubing. d. Check the column. e. Check the relevant unit.

6. PARTS REPLACEMENT

6.1 Consumables and Spare Parts

6.1.1 Consumables

The following parts are consumables. They must always be on hand. "Yearly consumption" is a referential example on condition that the system runs in 250 days a year and for 8 hours a day. "Standard life" indicates the number of uses under running of pure water. This value varies widely with operating conditions. Therefore, each item should be prepared with a margin in quantity depending on the actual operating conditions.

Part No.	Name	Location	Yearly Consumption	Standard Life	Remarks
855-2370	1.5 mL sample vial (144 pcs)	Vial	100 to 200 pcs	——	——
855-2351	Septum (for 1.5 mL) (100 pcs)	Vial	500 to 1000 pcs	——	——
855-2371	Pierced cap (for 1.5 mL) (100 pcs)	Vial	100 to 200 pcs	——	——
890-3183	Injection port seal	Injection port	1 pc	10,000 injections	See 6.2.
890-3237	Injection valve stator	Injection valve	1 pc	20,000 switchings	See 6.5.
890-3238	Injection valve seal	Injection valve	1 pc	10,000 switchings	See 6.5.
890-3233	Syringe valve stator	Dilutor	1 pc	80,000 switchings	See 6.6.
890-3234	Syringe valve seal	Dilutor	1 pc	40,000 switchings	See 6.6.
890-3228	Syringe (0.1 mL)	Dilutor	1 pc	40,000 plunger reciprocations	See 6.4.
890-3252	Needle	Flow path	1 pc	20,000 injections	See 6.3.
890-3176	Needle sleeve	Flow path	1 pc	——	See 6.3.
890-3462	Sample loop (0.5 mm ID × 0.62 m)	Flow path	1 pc	20,000 injections	Tube between needle and injection valve

6.1.2 Spare Parts

It is desired to prepare the items listed below for running the system for a long time. Each item should be prepared in an adequate quantity depending on the operation time.

Part No.	Name	Location	Remarks
855-4074	Solvent filter	Detergent aspirating section	Refer to 6.7.
M790020	Setscrew	Injection valve	
L329109	Sleeve	Injection valve	
——	SUS pipe (inner dia. 0.25 mm)	——	Various types for pump connection, etc.

6.2 Replacement of Injection Port Seal

The injection port seal should be replaced periodically every about 10,000 sample injections as a standard.

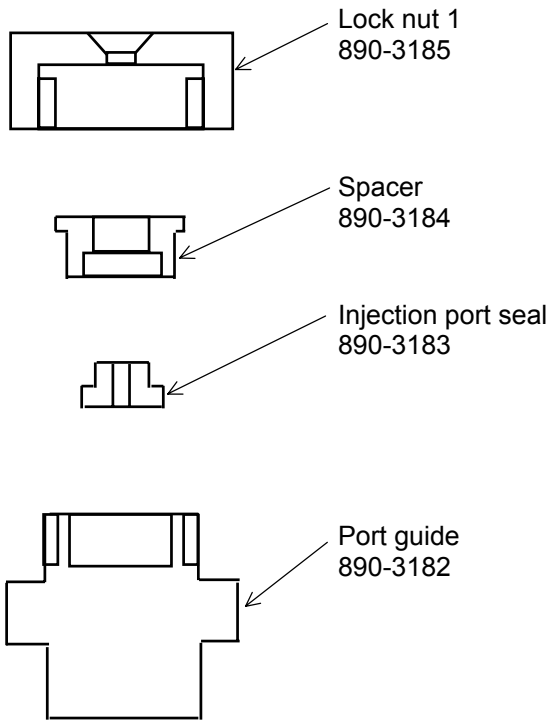


Fig. 6-1 Replacement of Injection Port Seal

(1) Detach the needle cover.

(2) Using the TUBE command, move the needle to the replacement position.

FUNC
1 ENTER
0 ENTER 2 ENTER

(For details, refer to “Needle replacement position” in “(a) TUBE” in “(5) Functions” of “4.2.2 Analyzing Operation.”)

(3) Loosen lock nut 1.

(4) Remove the spacer and replace the injection port seal.

(5) Insert the spacer into the port guide and fasten it tightly.

(6) After replacing the seal, press the **IDLE** key and carry out washing.

NOTES:
1. After replacement of the injection port seal, make sure liquid is not leaking through the seal.
2. If the tip of needle is deformed, the service life of port seal may be significantly shortened. Use the needle free from tip deformation.
3. If the tightening of the injection port is incomplete, poor performance may be caused. Make sure the port is not loose.

6.3 Needle Replacement

Replace the needle in the following procedure.

(1) Remove the needle cover.

(2) Using the TUBE command, move the needle to the replacement position.

[FUNC]
[1] [ENTER]
[0] [ENTER] [2] [ENTER]

(For details, refer to “needle replacement position” in “(a) TUBE” in “(5) Functions” of “4.2.2 Analyzing Operation.”)

(3) Remove the setscrew (N) by loosening it with the furnished wrench.

(4) Pull out the needle.

(5) Put the setscrew (N) and needle sleeve to a new needle and insert them into the needle guide. Then, tighten the setscrew (N). The needle should be fixed in the completely inserted status so that a gap will not be left between the top end of needle and the needle guide hole.

(6) After needle replacement, press the **IDLE** key for return to the idle position.

(7) Reattach the needle cover.

NOTE: Be sure to attach the needle cover. If the instrument is used without attaching the needle cover, injury or trouble may be caused.

Fig. 6-2 Attaching the Needle Cover

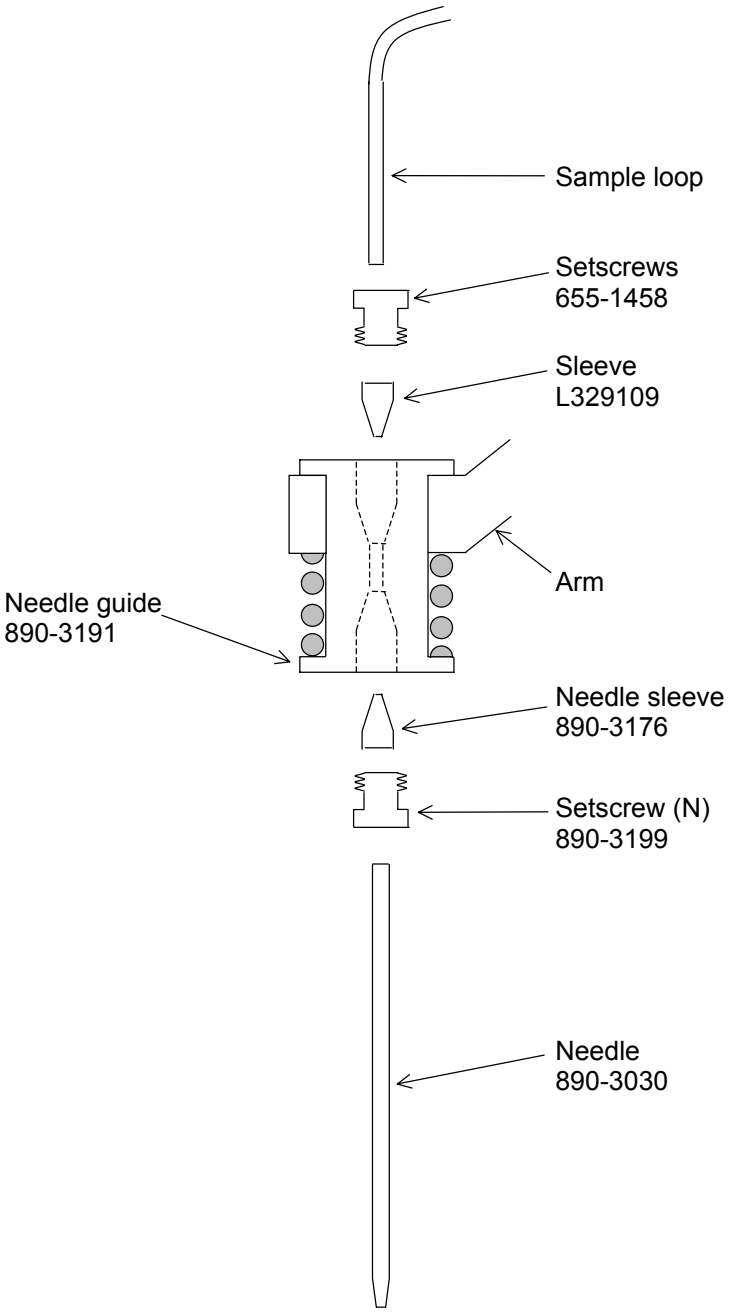


Fig. 6-3 Needle Replacement

6.4 Syringe Replacement

For syringe replacement, implement the following procedure.

(1) Using the SYR command, aspirate 50 μL of detergent.

[FUNC]
[4] [ENTER]
[50] [ENTER] [2] [ENTER]

(For details, refer to “(d) SYR (command)” in “(5) Functions” of “4.2.2 Analyzing Operation.”)

(2) Using the SVALVE command, change to port 4 (RINSE PORT).

[FUNC]
[6] [ENTER]
[4] [ENTER]

(For details, refer to “needle replacement position” in “(f) SVALVE” in “(5) Functions” of “4.2.2 Analyzing Operation.”)

(3) Remove the syringe (its top end is threaded so that it can be removed by turning it counterclockwise).

(4) Before placing a new syringe in the system, fill the syringe with distilled water (or the detergent to be used).

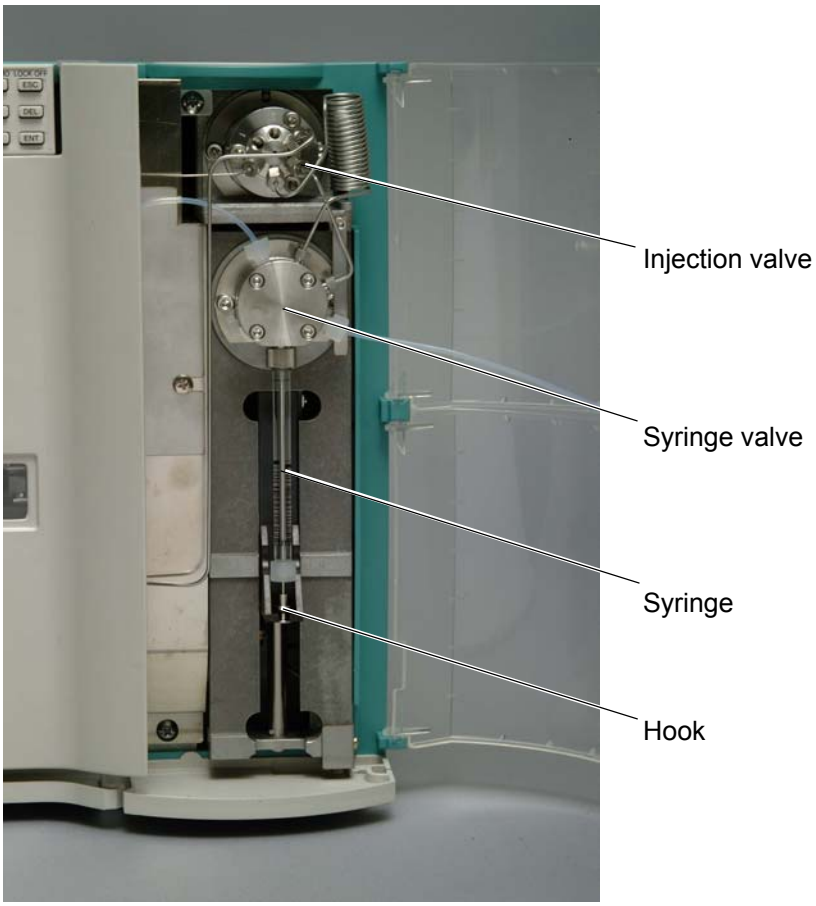
(5) Mount the syringe (first fit it in the plunger groove and then tighten the threaded top part).

(6) If air is trapped in the detergent tube, aspirate the detergent up to the tube connection port using the furnished plastic syringe and connect the tube to port 1 of the syringe valve.

(7) Press the **IDLE** key (air bubbles formed at the time of syringe mounting are directly discharged through the rinse port).

(8) Press the **WASH** key to replace the detergent in the wash port with fresh one.

NOTES:
1. Avoid moving the plunger, if possible, when the syringe interior is dry. This is required for protecting the plunger seal from abnormal wear.
2. If the syringe is not filled with liquid, it lacks lubricity. Therefore, the syringe may not move normally.
3. Securely screw the syringe manually to the valve. Incomplete screwing may deteriorate joint sealing and cause poor performance.
4. During syringe replacement, avoid moving the hook forcibly. Otherwise, a syringe action error will occur. (For recovery, press the **IDLE** key.)
5. When fitting the plunger groove of syringe into the hook, make sure the O-ring is placed at the position shown in Fig. 6-4. If the O-ring is not placed at the correct position, the instrument will not provide the original performance.



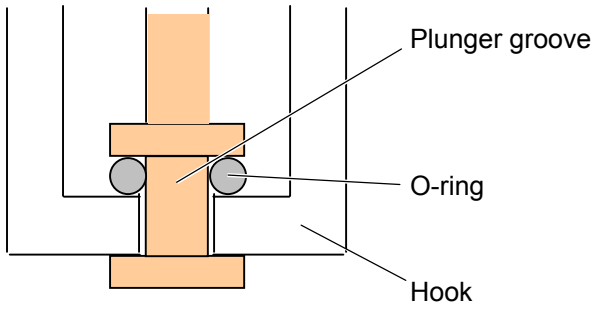


Fig. 6-4 Syringe Replacement

6.5 Replacing the Injection Valve Seal

> **NOTE**: Before replacement, stop liquid delivery from the pump connected to the system.

Replace the injection valve seal in the following manner.

(1) Loosen three stator setscrews with the furnished hexagonal wrench and remove the stator.

(2) Pull out the injection valve seal.

(3) Mount a new injection valve seal so that the seal guide pins enter the holes in the injection valve seal.

(4) Mount the stator so that the stator guide pin enters the stator hole, and tighten three stator setscrews.
These screws should be tightened gradually in an alternate order.

(5) After seal replacement, make sure the injection valve does not leak.

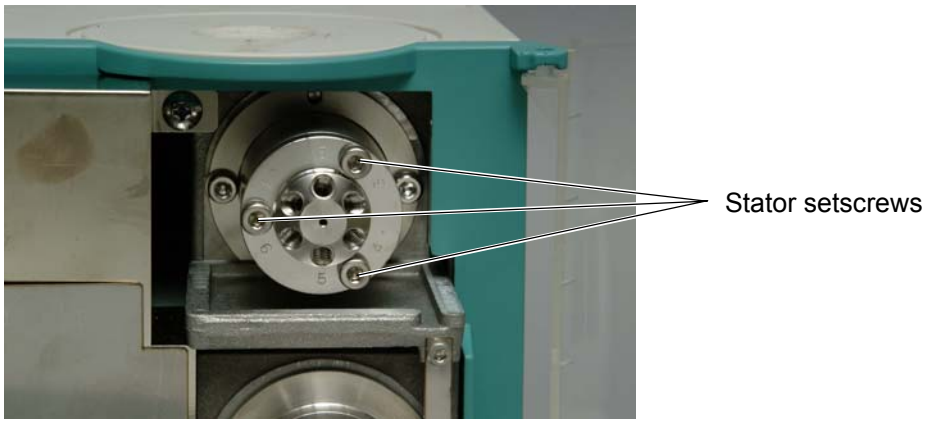


Fig. 6-5 Injection Valve

NOTES: 1. Avoid moving the plunger, if possible, when the syringe interior is dry. This is required for protecting the plunger seal from abnormal wear.
2. If the syringe is not filled with liquid, it lacks lubricity. Therefore, the syringe may not move normally.

6.6 Replacing the Syringe Valve Seal

Replace the syringe valve seal in the following way.

(1) Disconnect the tubing from the detergent bottle.

(2) Remove the syringe.

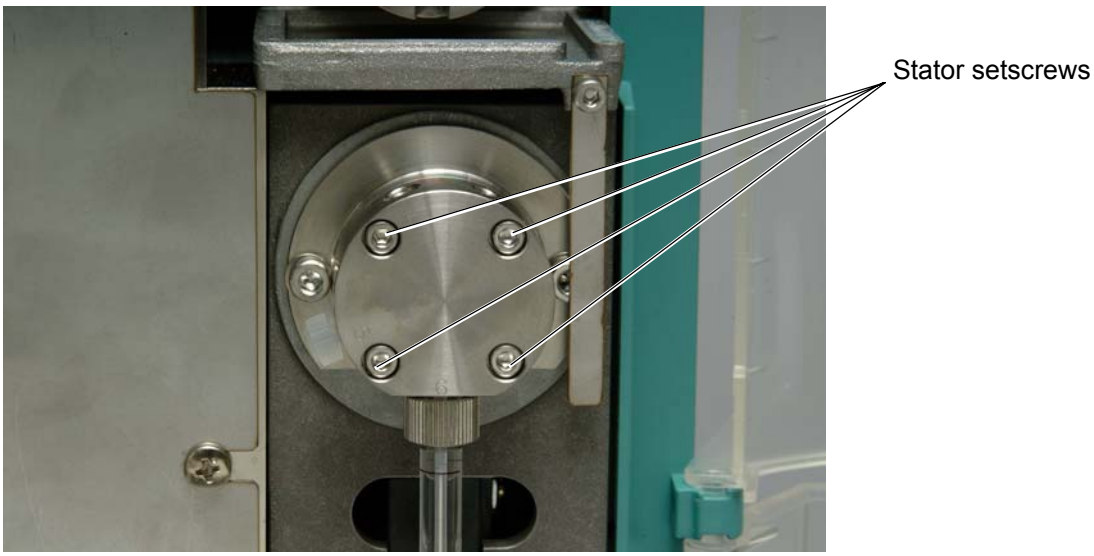
(3) Loosen four stator setscrews with the furnished hexagonal wrench and remove the stator.

(4) Pull out the syringe valve seal.

(5) Mount a new syringe valve seal so that the seal guide pin enters the hole in the syringe valve seal.

(6) Mount the stator so that the stator guide pin enters the stator hole, and tighten four stator setscrews.
These screws should be tightened gradually and alternately in a diagonal order.

(7) Mount the syringe to the stator.



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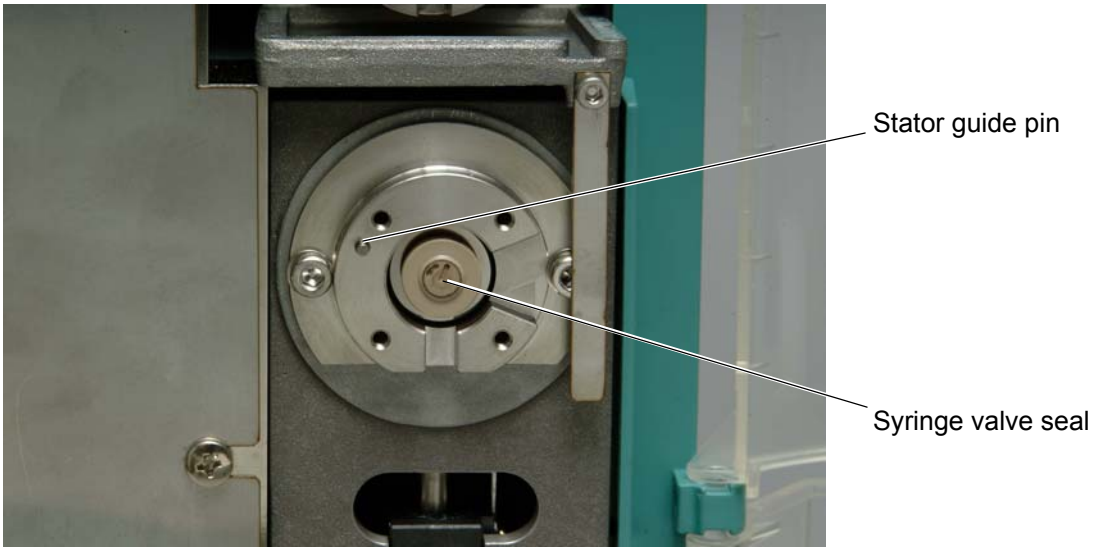


D020107

Fig. 6-6 Syringe Valve

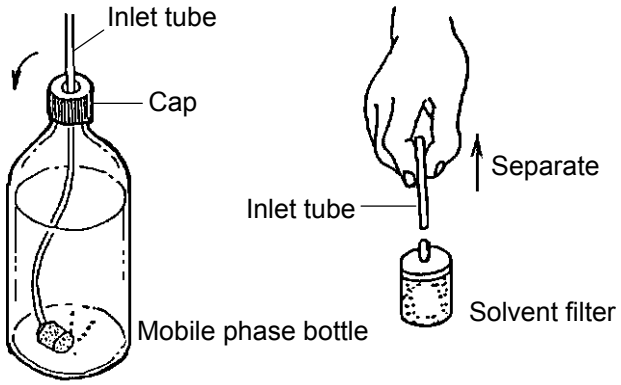
NOTES: 1. When the inside of valve is dry, the plunger should not be moved where possible. Otherwise, the seal will wear abnormally.
2. If there is no liquid in the valve, lubricity of the seal face will be poor. Therefore, the valve may not operate normally.

6.7 How to Wash Solvent Filter

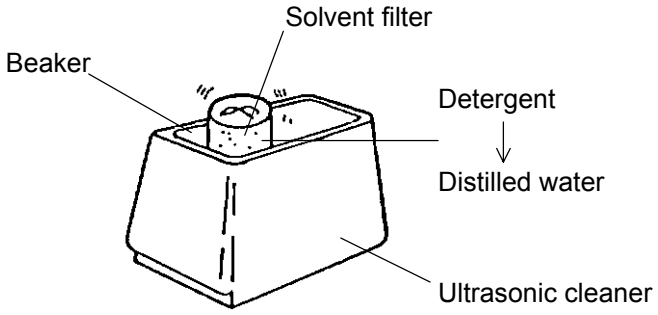
The solvent filter (filter for detergent bottle) should be washed in the following procedure.

Items to be prepared: Beaker, detergent and ultrasonic cleaner

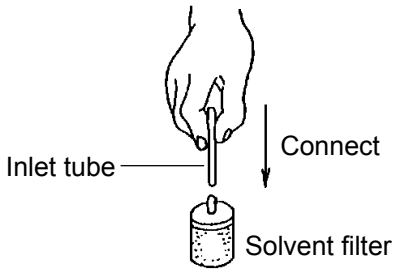
1) Loosen the cap of mobile phase bottle.
2) Pull out the inlet tube from the mobile phase bottle.
3) Separate the solvent filter from the inlet tube.



4) Put the detergent in the beaker and wash the filter in it for about 5 to 6 minutes.
5) Then, replace the detergent with distilled water and rinse the filter for 5 to 6 minutes. Rinse the filter at least 3 times until the detergent is completely removed.



6) After draining off water, connect the filter to the inlet tube.



7. ACCESSORIES

A wide variety of accessories are available for the Model L-2200 Autosampler to meet the specific requirements of the laboratory.

7.1 Cooling Unit

This unit is capable of cooling 200 sample vials (1.5 mL each) within a temperature range from 4 to (room temperature - 5) °C when the ambient temperature is within 15 to 25°C and humidity is 60%.

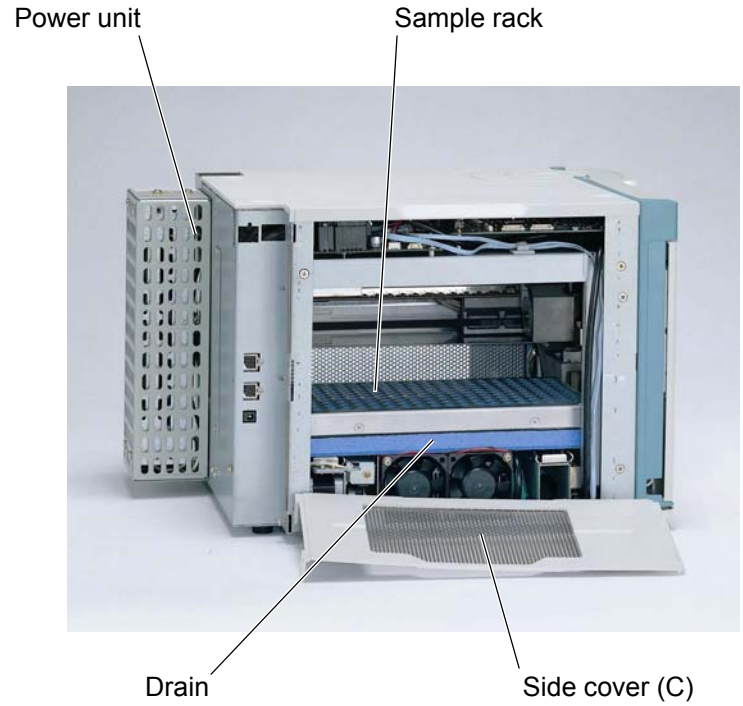


Fig. 7-1 Configuration of Cooling Unit

Table 7-1 Cooling Unit

Part No.	Part Name	Remarks
890-0221 890-0222 890-0223 890-0224	Cooling unit	Sample rack for cooling (part No. 810-3501) to accommodate 200 vials of 1.5 mL each is attached.

7.2 Sample Racks

Table 7-2, 7-3 describes the sample racks that can be used with the Model L-2200.
For using an optional sample rack, rack parameters should be set so as to match that rack. (For details, refer to 4.2.2 and the instruction manual for the optional sample rack.)

7.2.1 Racks for Standard Autosampler

Used when a cooling unit is unused.

Table 7-2 Sample Racks for Standard Autosampler

Part No.	Part Name	Remarks
890-3584	Sample rack for 200 vials (12 × 32) of 1.5 mL each	One rack attached to standard autosampler
890-3522	Sample rack for 3 micro plates	
890-3524	Sample rack for 128 vials (15 × 46) of 4 mL each	

7.2.2 Racks for Cooling

Used when a cooling unit is installed.

Table 7-3 Sample Racks for Cooling

Part No.	Part Name	Remarks
890-3501	Sample rack for 200 vials (12 × 32) of 1.5 mL each	One rack attached to cooling unit
890-3502	Sample rack for 3 micro plates	
890-3503	Sample rack for 100 vials (12 × 32) of 1.5 mL each	
890-3504	Sample rack for 128 vials (15 × 46) of 4 mL each	

7.3 Vials

Table 7-4 describes the vials that can be used with the Model L-2200 Autosampler.

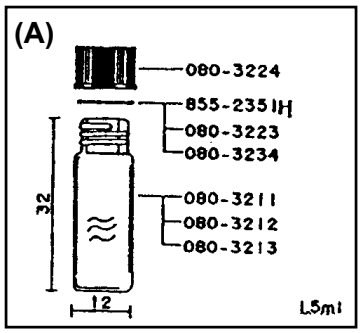
NOTE: For performance specification checkup (refer to 5.1), use the following parts in combination.

Part No.	Part Name
080-3211	1.5 mL sample vial
885-2351	Septum (S: -TEF), notch (-)
080-3224	Screw cap

In other cases, check performance using a combination of parts to be employed actually.

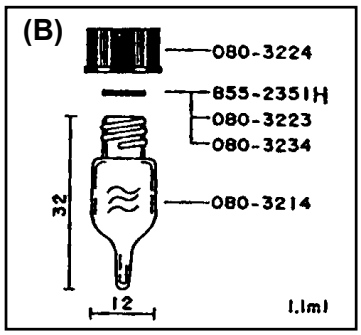
1. Screw-top Vials

Table 7-4 (a) Vials



Part No.	Name	Specification/Standard	Applicable Rack	Remarks
080-3211	1.5 mL sample vial, 250 pcs contained	Type of vial: 2-SV, ϕ12 × 32 mm	890-3584 890-3501 890-3503	With blue mark
080-3212	1.5 mL sample vial, 250 pcs contained	Type of vial: 2-SG (G), ϕ12 × 32 mm, low-alkaline glass		With yellow mark
080-3213	1.5 mL sample vial (brown), 250 pcs contained	Type of vial: 2-SV (A), ϕ12 × 32 mm Type		
855-2351H	Septum (Si-TEF), 100 pcs contained	With slit (-)		
080-3223	Septum (PTFE-Si-PTFE), 250 pcs contained	Without slit		
080-3234	Septum (Si-PTFE), 250 pcs contained	Without slit		
080-3224	Screw cap (black), 250 pcs contained	Type of cap: 8-SC		

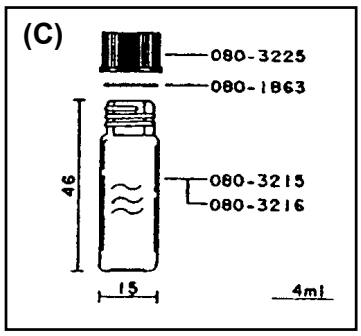
7.3 Vials



Part No.	Name	Specification/Standard	Applicable Rack	Remarks
080-3214	1.1 mL sample vial, 250 pcs contained	Type of vial: 1.1-STVG, ϕ12 × 32 mm, pointed-bottom type	890-3584 890-3501 890-3503	
855-2351H	Septum (Si-TEF), 100 pcs contained	With slit (-)		
080-3223	Septum (PTFE-Si-PTFE), 250 pcs contained	Without slit		
080-3234	Septum (Si-PTFE), 250 pcs contained	Without slit		
080-3224	Screw cap (black), 250 pcs contained	Type of cap: 8-SC		
080-3230	Support sleeve, 50 pcs contained	Type: TTS-312, Teflon		

* The support sleeve is required for use on the sample rack (890-3584, 890-3501, 890-3503).

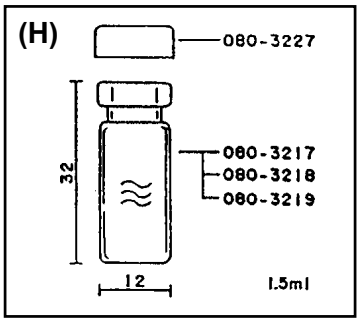
** When these vials are used for the sample rack 890-3501 or 890-3503, cooling performance will be degraded.



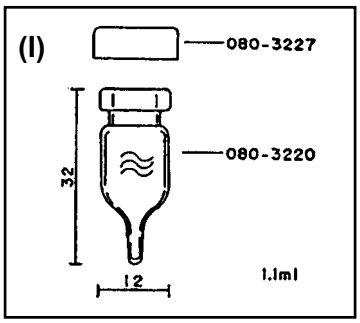
Part No.	Name	Specification/Standard	Applicable Rack	Remarks
080-3215	4 mL sample vial, 250 pcs contained	Type of vial: 4-SV, ϕ15 × 46 mm	890-3524 890-3504	
080-3216	4 mL sample vial (brown), 250 pcs contained	Type of vial: 4-SV (A), ϕ15 × 46 mm		
080-1863	Septum (Si-PTFE), 100 pcs contained	With slit (+)		
080-3225	Screw cap (black), 250 pcs contained	Type of cap: 12-SC		

2. Crimp-top Vials

Table 7-4 (b) Vials



Part No.	Name	Specification/Standard	Applicable Rack	Remarks
080-3217	1.5 mL crimp-top sample vial, 250 pcs contained	Type of vial: 2-CV, ϕ12× 32 mm	890-3584 890-3501 890-3503	With blue mark
080-3218	1.5 mL crimp-top sample vial, 250 pcs contained	Type of vial: 2-CV (G), ϕ12 × 32 mm, low-alkaline glass		With yellow mark
080-3219	1.5 mL crimp-top sample vial (blown), 250 pcs contained	Type of vial: 2-CV (A), ϕ12 × 32 mm		
080-3227	Crimp cap (with septum), 250 pcs contained	Type of cap: 11-AC-TST1, with PTFE-Si-PTFE (three-layer) septum		Without slit on septum



Part No.	Name	Specification/Standard	Applicable Rack	Remarks
080-3220	1.1 mL crimp-to sample vial, 250 pcs contained	Type of vial: 1.1-CTVG, ϕ12 × 32, pointed-bottom type	890-3584 890-3501 890-3503	
080-3227	Crimp cap (with septum), 250 pcs contained	Type of cap: 11-AC-TST1, with PTFE-Si-PTFE (three-layer) septum		Without slit on septum
080-3230	Support sleeve, 50 pcs contained	Type: TTS-312, Teflon		

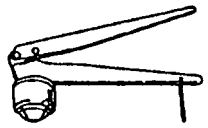
* The support sleeve is required for use on the sample rack (890-3584, 890-3501, 890-3503).

** When these vials are used for the sample rack 890-3501 or 890-3503, cooling performance will be degraded.

Crimp-top Vials

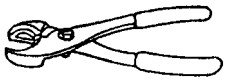
A septum is placed in the aluminum crimp cap which is sealed to the vial using the dedicated crimper tool.
To remove the cap, use the decapper.

Crimper



Part No.	Name	Remarks
080-3232	Crimper CR-8	For sealing of 080-3226
080-3233	Crimper CR-11	For sealing of 080-3227

Decapper



Part No.	Name	Remarks
080-3258	Decapper DCR-8	For removal of 080-3226
080-3259	Decapper DCR-11	For removal of 080-3227

7.4 Syringes

7.4.1 Syringe Types

The autosampler can be used with two different syringes (see Table 7-5). The syringe of each capacity is provided with a sample loop for connecting the needle and injection valve, and with a connecting coil for connecting the injection valve and syringe valve as listed in Table 7-5. (See Fig. 7-2). Be sure to use each syringe in the combination with tubing, which is specified in Table 7-5.

Table 7-5 Syringe Types

Syringe Capacity	Combined Syringe Part No.	Single Syringe Part No.	Sample Loop (connects needle and port 6 of injection valve)		Connecting Coil (connects port 5 of injection valve and port 3 of syringe valve)	
			Part No.	Dimensions (Capacity)	Part No.	Dimensions (Capacity)
0.1 mL*	890-3510	890-3228	890-3462	0.5 mm ID × 0.7 m (0.14 mL)	890-3455	0.25 mm ID × 1.0 m (0.05 mL)
0.5 mL	890-3511	080-1064	890-3466	0.8 mm ID × 1.2 m (0.6 mL)	890-3467	0.5 mm ID × 2.5 m (0.5 mL)
1 mL	890-3512	080-1592	890-3468	0.8 mm ID × 2.5 m (1.2 mL)	890-3469	1.0 mm ID × 1.6 m (1.2 mL)
2.5 mL	890-3513	080-1092	890-3470	0.8 mm ID × 6.4 m (3.2 mL)	890-3471	1.0 mm ID × 4.0 m (3.1 mL)
5 mL	890-3514	080-1593	810-3464	1.0 mm ID × 7.0 m (5.4 mL)	890-3465	1.0 mm ID × 6.6 m (5.2 mL)

* Standard furnished with L-2200

NOTE: The combined syringe part number indicates the syringe, sample loop and connecting coil.

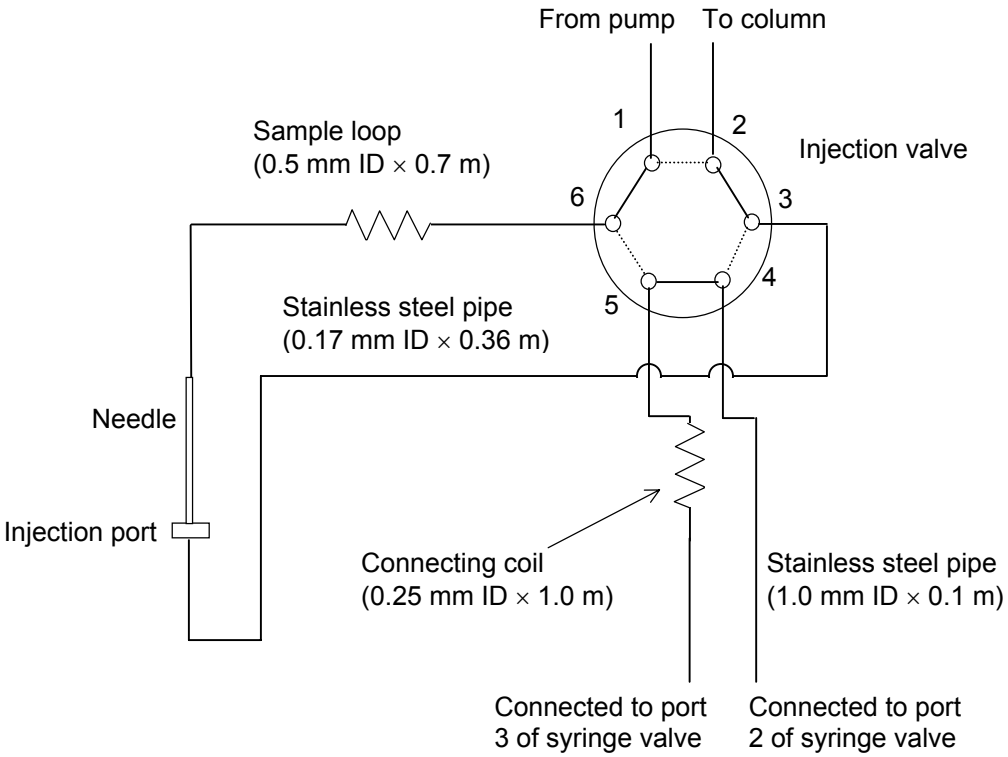


Fig. 7-2 Configuration of Tubing

APPENDIX

Appendix 1. Description on Contact Signal Communication

Appendix 1.1 Outline

The following two types of contact signals are used in the L-2000 series.

(1) Contact signals (START, ERROR, BUSY) entering the e-Line connector.

These are contact signals having input/output functions that are used in common for each unit. These signals are respectively formed from the START (IN/OUT), ERROR (IN/OUT) and BUSY (IN/OUT) lines.

(2) Individual contact signals used by each unit.

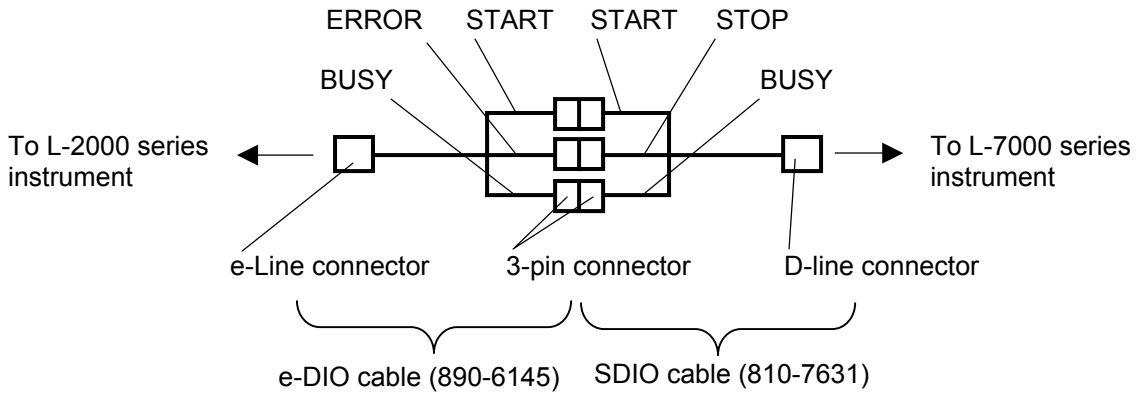
These are contact signals that are input and output via 3-pin connector. Their names and functions vary with the unit. A name that indicates the function is given at each connector.
Example of output contact signal : EVENT of pump
Example of input contact signal : LAMP OFF IN of detector

Appendix 1.2 Contact Signals Entering the e-Line Connector

Each unit has two e-Line connectors for connection at the rear of the main unit, and the signals of each unit in series via the e-Line cable, synchronism of the L-2000 series system can be easily achieved. For obtaining synchronism with the L-7000 series and/or D-2500 by way of contact signals, use the cables listed below for the connection.

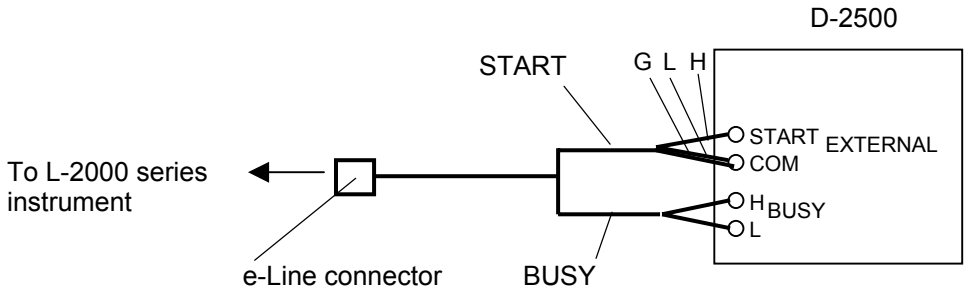
(1) Connection with L-7000 Series

Use 3-pin connectors of the e-DIO cable (890-6145) and SDIO cable (810-7631) in the connection shown below.



(2) Connection with Model D-2500

Use the e-DIO cable (890-6146) for connection.



Connect the START L and G terminals of the e-DIO cable (890-6146) to the EXTERNAL - COM terminal of the Model D-2500.

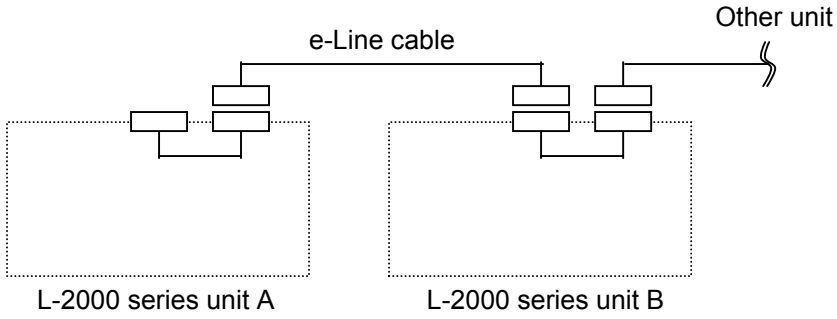
Appendix 1.3 Individual Contacts of Each Unit

(1) Contact Signal Input Terminals

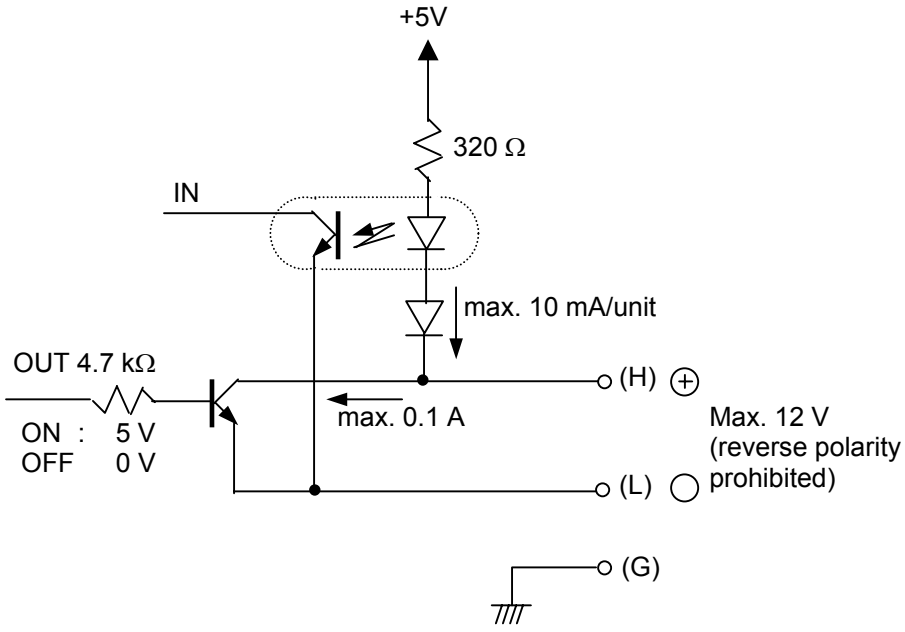
These are contact signal input terminals for control using contact signals from an external switch, relay, etc. Any of the signals is activated by shorting the terminal for 0.1 second or longer. The input circuit is shown in Appended Fig. 1-3.

(2) Contact Signal Output Terminals

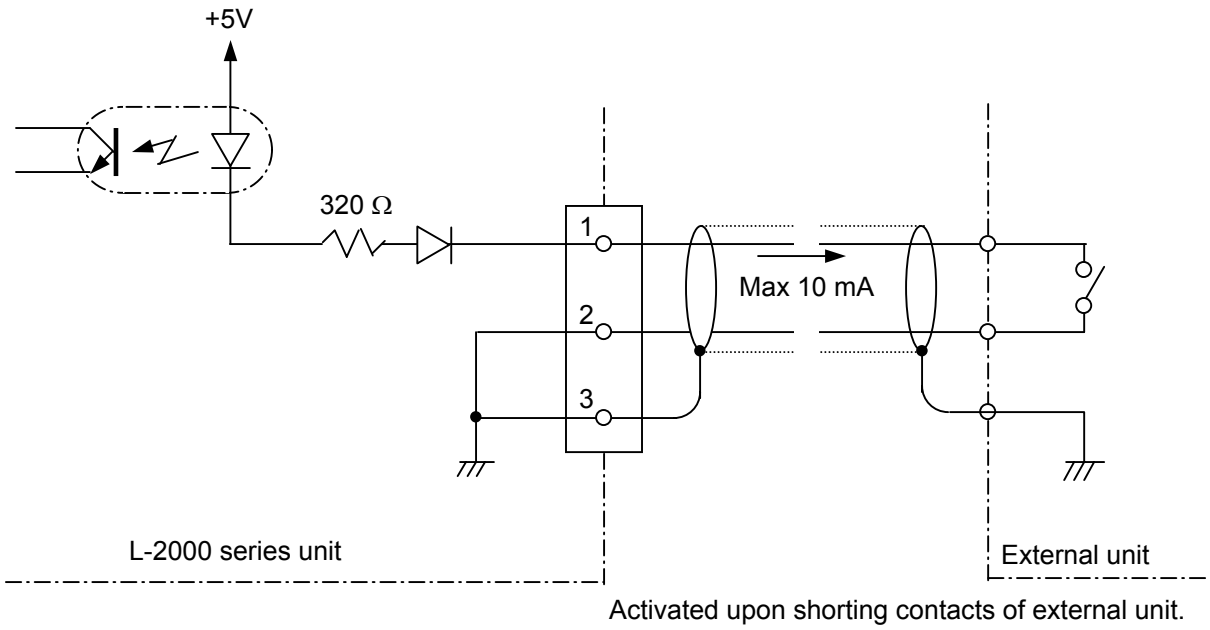
These are contact signal input terminals for control using contact signals of an external unit. The output circuit is shown in Appendix Fig. 1-4. The rating of contacts used is 12 V, 0.1 A. Make sure the load connected does not exceed this rating.



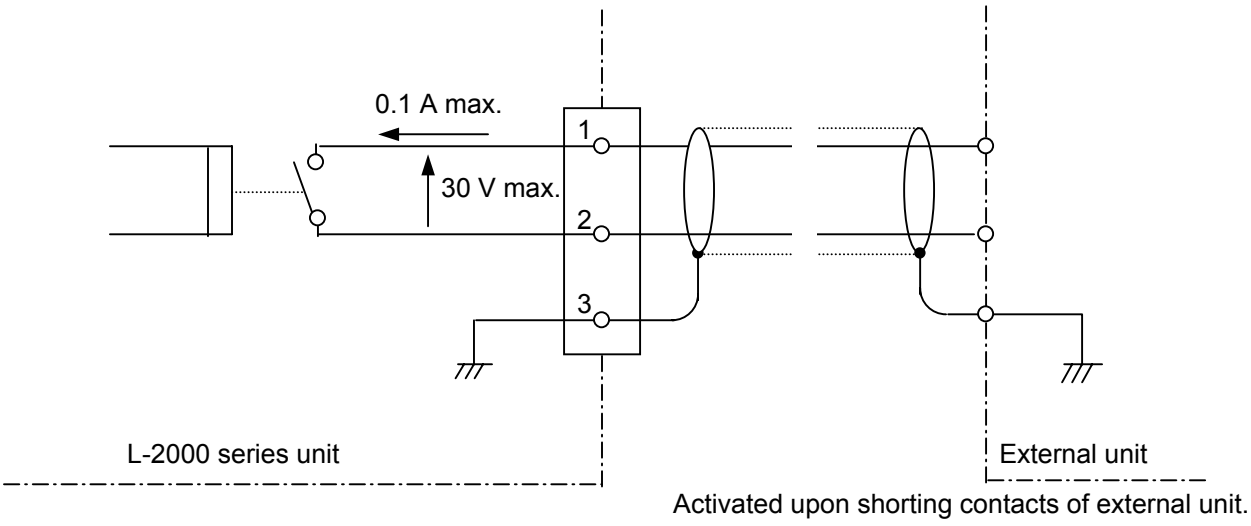
Appended Fig. 1-1 e-Line Cable Connection



Appended Fig. 1-2 e-Line Contact Circuit Configuration



Appended Fig. 1-3 Contact Signal Input Circuit



Appended Fig. 1-4 Contact Signal Output Circuit

Appendix 2. Error Message List

Appendix 2.1 Errors Related to Autosampler Proper

No.	Error Message	Possible Cause	Remedy
1	ROM ERROR	PC board malfunctions.	Turn on power supply again. If the same error is indicated again, contact Hitachi High-Technologies Corporation service representative.
2	RAM ERROR		
3	LOG_INFORMATION ERROR		
4	EEPROM ERROR		
5	PARAMETER ERROR		
6	COMMUNICATION ERROR	Communication is abnormal.	Check connection of the communication cable and reconnect the autosampler with the Chromato Data Station (CDS).
7	CHECK VIAL NO.	When starting analysis (pressing the **START** key), vial numbers beyond the maximum number of vials as a rack parameter are set in a sequential program.	Check and correct the set parameter value.
8	CHECK START STEP NO.	1. When starting analysis (pressing the **START** key), a start step No. which is not contained in a sequential program is set. 2. Setting of a start step No. which is not contained in a sequential program was attempted by the UTILITY function.	
9	CHECK TOTAL VOL	An injection volume that cannot be handled with the mounted syringe is set.	
10	CHECK SYRINGE SPEED	A syringe speed that cannot be achieved with the mounted syringe is set.	
11	CHECK WASH SPEED	A washing speed that cannot be achieved with the mounted syringe is set.	
12	SYSTEM_BUSY: CHECK OTHER MODULE STATUS	Other unit connected is in the busy status.	Check status of other units and release the busy status. (Stop of liquid delivery with the pump, setting of oven in condition before heating ready status, etc.)
13	STOPPED BY LEAKAGE	1. Solvent is leaking through the flow path of instrument. 2. Solvent remains in the drain.	1. Wipe off leaked fluid completely and retighten the pipe joint. 2. Wipe off remaining solvent completely.

(cont'd)

No.	Error Message	Possible Cause	Remedy
14	NO TUBE	1. No sample vials are set. 2. The clearance between the top face of sample vial and the detection lever is inappropriate. Or the detector lever is caught. 3. The electric system malfunctions.	1. Set sample vials. 2. Readjust the height of vial detection lever. (Refer to 5.3.1.) 3. Contact Hitachi High-Technologies Corporation service representative.
15	STOPPED BY EXTERNAL ERROR	An error has occurred in other unit connected.	Eliminate the cause of the error to release the error status.
16	SEQ PROGRAM BUFFER OVERFLOW	The number of steps has overflowed a sequential program (more than 100 steps).	Check and correct the set parameter value on the connected Chromato Data Station (CDS).
17	ERROR-X	1. The sample rack or sample vial is blocking movement. 2. There is an obstacle on the moving route of sample rack X (in left-right direction). 3. The electric system malfunctions.	1. Set the sample rack or sample vial correctly. 2. Remove the obstacle. 3. Contact Hitachi High-Technologies Corporation service representative.
18	ERROR-Y	1. There is an obstacle on the moving route of arm Y (in front-rear direction). 2. The electric system malfunctions.	1. Remove the obstacle. 2. Contact Hitachi High-Technologies Corporation service representative.
19	ERROR-Z	1. There is an obstacle on the moving route of needle Z (vertically). 2. The electric system malfunctions.	1. Remove the obstacle. 2. Contact Hitachi High-Technologies Corporation service representative.
20	ERROR-SYRINGE	1. The inside of syringe is dried up. 2. Syringe capacity input code is wrong. 3. There is an obstacle on the moving route of syringe (vertically). 4. The electric system malfunctions.	1. Fill the syringe with fluid and retry operation. 2. Input the correct code that matches capacity. 3. Remove the obstacle. 4. Contact Hitachi High-Technologies Corporation service representative.
21	ERROR-SVALVE	1. The syringe valve seal has worn out. 2. The inside of syringe valve is dried up. 3. The electric system malfunctions.	1. Renew the seal. 2. Fill the valve with fluid and retry operation. 3. Contact Hitachi High-Technologies Corporation service representative.
22	ERROR-IVALVE	1. The injection valve seal has worn out. 2. The inside of injection valve is dried up. 3. The electric system malfunctions.	1. Renew the seal. 2. Fill the valve with fluid and retry operation. 3. Contact Hitachi High-Technologies Corporation service representative.

Appendix 2.2 Errors Related to Cooling Unit (option)

No.	Error Message	Possible Cause	Remedy
1	THERMO UNIT ROM ERROR	PC board malfunctions.	Turn on power supply again. If the same error is indicated again, contact Hitachi High-Technologies Corporation service representative.
2	THERMO UNIT RAM ERROR		
3	THERMO UNIT PARAMETER ERROR		
4	THERMO UNIT TIME OUT ERROR	Communication is abnormal.	Turn on power supply again. If the same error is indicated again, contact Hitachi High-Technologies Corporation service representative.
5	THERMO UNIT POWER ON ERROR	1. At initialization, power supply of the cooling unit is not connected. 2. Power supply of the cooling unit is cut off after initialization.	1. Check proper connection of the power cord and clear the message. 2. Check proper connection of the power cord and turn on power supply again.
6	THERMO UNIT IS NOT CONNECTED	The cooling unit is set in the USE status though the autosampler is not equipped with this unit.	Set the cooling unit in the NO USE status.
7	ABNORMAL TEMPERATURE (THERMO UNIT)	The upper or lower limit of the temperature control range is exceeded.	Check the ambient temperature, and set temperature and upper/lower limits again.
8	START KEY IS NOT ACCEPTABLE	This message (warning message) is indicated if **START** key input cannot be accepted after recovery from an error.	Clear the message. Turn on power supply again.

Appendix 3. Terminology

Initialize .....To reset the instrument in the initial status.

Initial screen .....This screen appears when the initialization is completed after turning on power supply.

Injection.....Means sample injection.

Warming-up.....Warming-up of the instrument.
Adequate warming-up is indispensable for stable analysis.

Error message.....A message displayed if an error occurs on the instrument.

Calibration .....A procedure for preparing a working curve with which the concentration of a sample is figured out.

PAUSE .....Pause of the current sample analysis sequence to receive an interrupt for specific analysis.

Start.....Start of a sample analysis sequence.

Stop time .....A time period for analyzing a sample and determining its chromatogram. After this time, analysis of the next sample starts.

Septum.....A sheet used for capping a sample vial.

Direct injection system.....A sample injection system (full-volume injection system) in which the sampling needle is built in the analytical flow path.

Deaeration.....Purging of the air contained in detergent.

Table .....A display used to set analytical conditions for each sample on setting screen.

Pattern.....Specifies the analytical order of the samples on code rack

Utility .....A function for facilitating setting of operating conditions of the instrument.

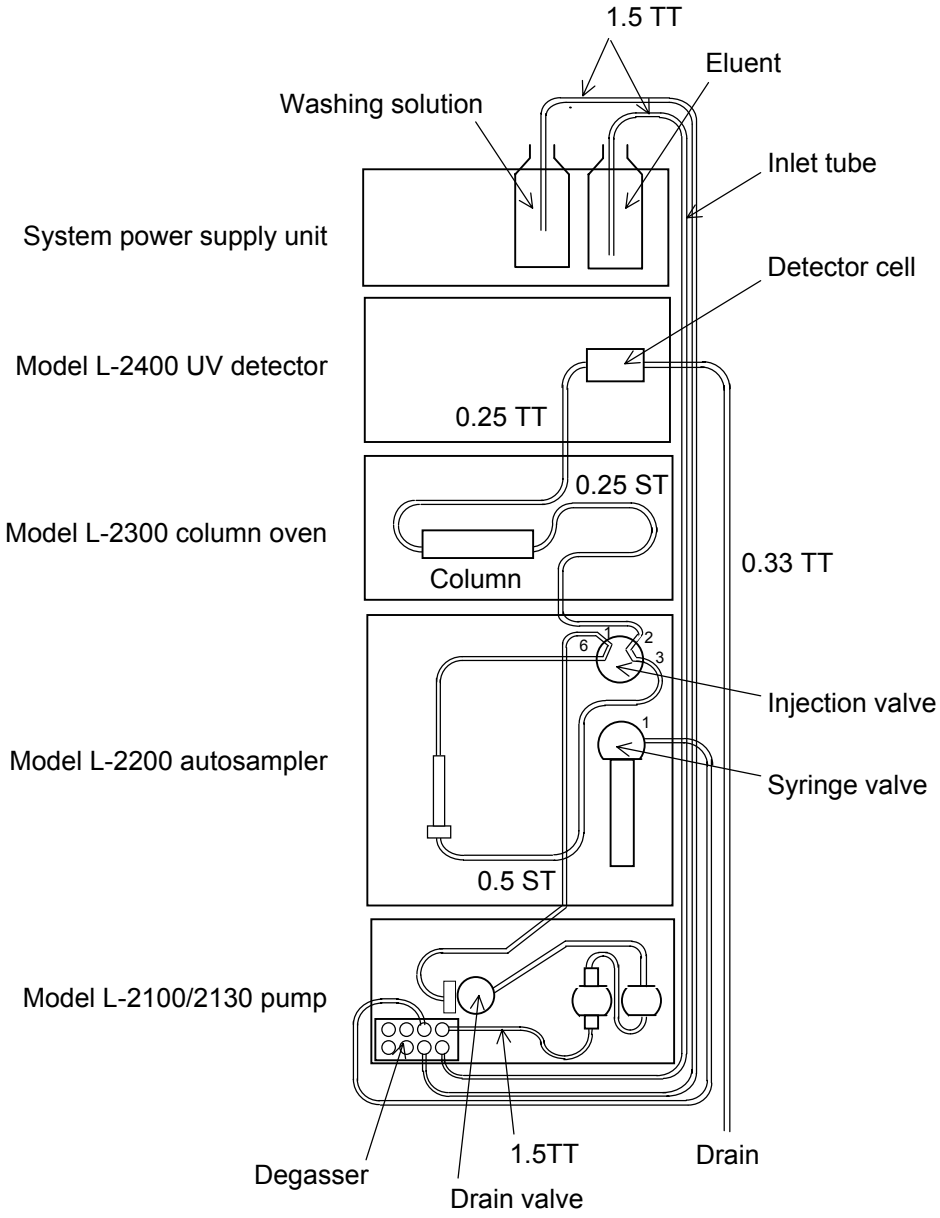
Sample rack .....A component for setting samples.

Logbook .....A record of the past instrument operations.

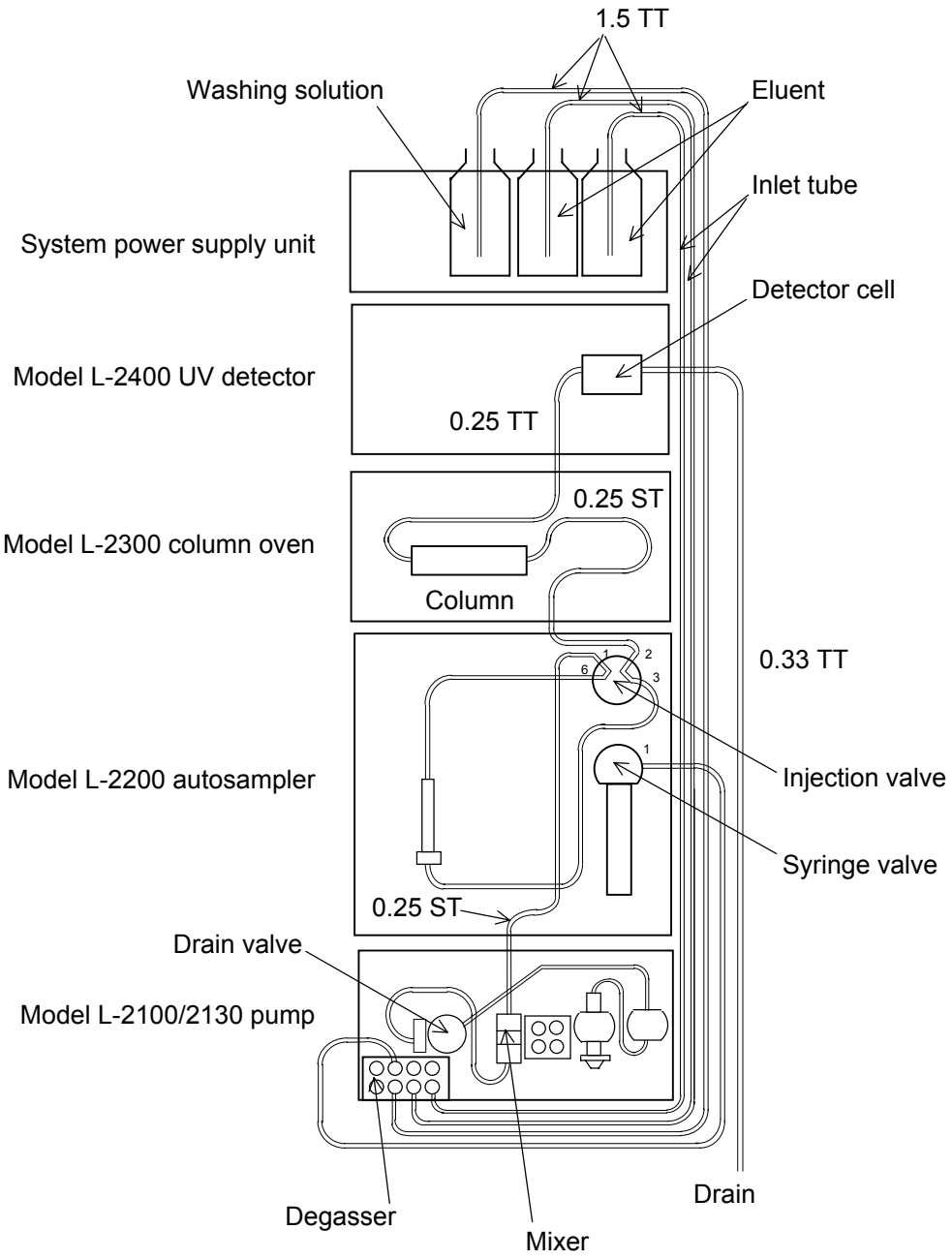
Appendix 4. Flow Path Diagram

A common flow path arrangement is shown here.
Provide proper piping/tubing connections according to the system configuration and the purpose of analytical operation.
“ST” indicates a stainless steel pipe, and “TT” indicates a teflon tube. A numeric value preceding "ST" or “TT” represents an inside diameter of each pipe/tube.

(1) Isocratic System



(2) Low-Pressure Gradient System



(3) High-Pressure Gradient System