Automatic COD Monitor
CODA-500

Instruction Manual

CODE:GZ0000246575M

Preface

This manual describes the operation of the Automatic COD Monitor, CODA-500.
Be sure to read this manual before using the product to ensure proper and safe operation of the product. Also safely store the manual so it is readily available whenever necessary.

Product specifications and appearance, as well as the contents of this manual are subject to change without notice.

Warranty and responsibility

HORIBA Advanced Techno Co., Ltd. warrants that the Product shall be free from defects in material and workmanship and agrees to repair or replace free of charge, at option of HORIBA Advanced Techno Co., Ltd., any malfunctioned or damaged Product attributable to responsibility of HORIBA Advanced Techno Co., Ltd. for a period of one (1) year from the delivery unless otherwise agreed with a written agreement. In any one of the following cases, none of the warranties set forth herein shall be extended;

- Any malfunction or damage attributable to improper operation
- Any malfunction attributable to repair or modification by any person not authorized by HORIBA Advanced Techno Co., Ltd.
- Any malfunction or damage attributable to the use in an environment not specified in this manual
- Any malfunction or damage attributable to violation of the instructions in this manual or operations in the manner not specified in this manual
- Any malfunction or damage attributable to any cause or causes beyond the reasonable control of HORIBA Advanced Techno Co., Ltd. such as natural disasters
- Any deterioration in appearance attributable to corrosion, rust, and so on
- Replacement of consumables

HORIBA Advanced Techno Co., Ltd. SHALL NOT BE LIABLE FOR ANY DAMAGES RESULTING FROM ANY MALFUNCTIONS OF THE PRODUCT, ANY ERASURE OF DATA, OR ANY OTHER USES OF THE PRODUCT.

Trademarks

Company names and brand names are either registered trademarks or trademarks of the respective companies. (R), (TM) symbols may be omitted in this manual.

Regulations

EU regulations

Conformable standards

This equipment conforms to the following standards:

CE

EMC: EN61326-1
Class A, Industrial electromagnetic environment
Safety: EN61010-1
RoHS: EN50581
9. Industrial monitoring and control instruments

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Note

When the analog input/output cable, contact input/output cable, or serial input/output cable is extended to 30 meters or more, the surge test in the EMC Directive for CE Marking is not applicable.

Installation environment

This product is designed for the following environment.

- Overvoltage category II
- Pollution degree 2

Information on disposal of electrical and electronic equipment and disposal of batteries and accumulators

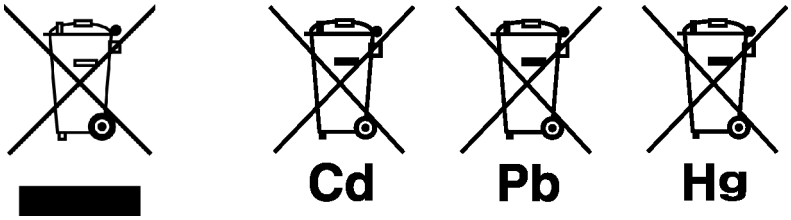
The crossed out wheeled bin symbol with underbar shown on the product or accompanying documents indicates the product requires appropriate treatment, collection and recycle for waste electrical and electronic equipment (WEEE) under the Directive 2012/19/EU, and/or waste batteries and accumulators under the Directive 2006/66/EC in the European Union.

The symbol might be put with one of the chemical symbols below. In this case, it satisfies the requirements of the Directive 2006/66/EC for the object chemical.

This product should not be disposed of as unsorted household waste.

Your correct disposal of WEEE, waste batteries and accumulators will contribute to reducing wasteful consumption of natural resources, and protecting human health and the environment from potential negative effects caused by hazardous substance in products.

Contact your supplier for information on applicable disposal methods.



FCC rules

Any changes or modifications not expressly approved by the party responsible for compliance shall void the user's authority to operate the equipment.

■ Warning

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Korea certification

A급 기기 (업무용 방송통신기자재)

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

For Your Safety

Hazard classification and warning symbols

Warning messages are described in the following manner. Read the messages and follow the instructions carefully.

- **Hazard classification**

⚠DANGER	This indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This is to be limited to the most extreme situations.
⚠WARNING	This indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	This indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

- **Warning symbols**

Description of what should be done, or what should be followed

Description of what should never be done, or what is prohibited

Safety precautions

This section provides precautions for using the product safely and correctly and to prevent injury and damage. The terms of DANGER, WARNING, and CAUTION indicate the degree of imminency and hazardous situation. Read the precautions carefully as it contains important safety messages.

⚠ WARNING
Electric shock Ground the CODA-500 to prevent an electric shock. Do not ground it to any dangerous location such as a gas pipe.
Electric shock Any wrong terminal connection can cause an electric shock or a failure of the CODA-500. Be careful of any wrong connection.
Electric shock • Before connecting a lead wire to the terminal block, turn OFF the external power supply. Otherwise an electric shock may occur. • Always put the terminal block cover to prevent an electric shock. • Only those who have knowledge of electricity can open and close the operation panel.
Waste water Waste water contains acid or alkali. To handle waste water, use protective gloves and goggles not to touch it directly. If waste water touches your skin or gets into your eye, immediately rinse it off with a large quantity of water and then seek medical attention. If you swallow it by mistake, seek immediate medical attention.
Chemicals handling When the reagent bottle is changed, its content may be spilled over. The reagent contains deleterious substances. Touching it by bare hands is very dangerous. To change the bottle, be sure to use protective gloves and goggles and be very careful not to directly touch the bottle. Carefully wipe off any spilled chemical fluid.
Chemicals handling When the electrode is removed, chemicals in the flow may come out. The chemicals contain deleterious substances. Touching them by bare hands is very dangerous. To attach or remove the electrode, be sure to use protective gloves and goggles and be very careful not to directly touch the electrode. Carefully wipe off any spilled chemical fluid.
Chemicals handling The residual fluid in the reaction tank contains the reagent. The reagent contains deleterious substances. Touching it by bare hands is very dangerous. To remove the reaction tank, be sure to use protective gloves and goggles and be very careful not to directly touch the fluid. Carefully wipe off any spilled chemical fluid.
Chemicals handling To perform any work, be sure to use protective gloves and goggles. When a reagent dissolves, hydrogen chloride vapor and heat are generated. • Perform dissolving a reagent in a well-ventilated area such as a draft chamber. • Pour hydrochloric acid into deionized water. Do not pour deionized water into hydrochloric acid. • A 35% to 37% hydrochloric acid is a deleterious substance. Be very careful when handling hydrochloric acid. • If the reagent touches your skin, wash it sufficiently in running water. • If the reagent gets into your eyes, wash them sufficiently in running water and seek medical attention.

⚠ WARNING

Fire or electric shock

- Do not bundle the power supply cord during use.
- Do not damage the power supply cord nor apply an excessive load to it, such as bending and stretching it repeatedly, putting a heavy thing on it.

If may result in overheating, a fire, an electrical shock, or breakdown.

⚠ CAUTION

Electrode breakage

- Do not bundle the power supply cord during use.
- When attaching or removing the electrode, obliquely giving force may break the electrode. In handling it, be sure to give force vertically to the electrode.

Hot component

There is a hot part behind the cover. Touching the part burns your skin. Before opening the cover, turn OFF the main power and wait until the inside cools down. After maintenance, put the cover back in place.

Product Handling Information

Operational precautions

Use of the product in a manner not specified by the manufacturer may impair the protection provided by the product. And it may also reduce product performance.
Exercise the following precautions.

- Only use the product including accessories for their intended purpose.
- Use the CODA-500 in the temperature range specified in the general specifications.
- Use the CODA-500 in an environment free from corrosive gas.
- Do not give a shock or marked vibration to the CODA-500. To move the CODA-500, contact the service station or our sales department.
- Avoid momentarily turning ON and OFF the power.
- Do not press the touch panel with your nail or any sharp-pointed object.
- Do not use organic solvent.
- In handling chemicals, exercise sufficient care.
- For the disposal method, refer to the separate volume for installation procedures.
- The solution tray is provided with a sensor to detect any residual amount. In setting or changing a solution, take care not to set the solution in a wrong place.
- A new reagent bottle is full of reagent. When the reagent bottle receives pressure with the cap open, the reagent may spill out. Pay attention not to spill reagent when you set or replace the bottle. For example, open the bottle cap with the bottle placed on a flat surface.

Disposal of the product

When disposing of the product, follow the related laws and/or regulations of your country.
Waste water from the CODA-500 contains acid and is therefore subject to the statutory regulations for wastes.
Dispose of waste water under each division's standard in accordance with the applicable laws and regulations.

Manual Information

Description in this manual

Note

This interprets the necessary points for correct operation and notifies the important points for handling the product.

Reference

This indicates the part where to refer for information.

Tip

This indicates reference information.

Original language

This is the English translation of an original Japanese document.

Contents

Overview

Introduction

COD stands for Chemical Oxygen Demand. COD is one of the index for water pollution, indicating an approximate quantity of organic matter that becomes a water pollution source. A smaller COD value shows a smaller quantity of pollutant.

COD is used for environmental standards for seas and lakes. The Water Pollution Prevention Law (1970) provides criteria for control of discharged water. Specific companies have to report to their local governments.

A method of measuring COD is specified in "Oxygen consumption by potassium permanganate at 100°C" included in JIS K 0102 Industrial Waste Water Test Method. In this method, sample is acidified by sulfuric acid, and potassium permanganate is added as oxidant and then the solution is reacted in boiling water bath for 30 minutes. The quantity of consumed potassium permanganate is obtained after reaction, it indicates the equivalent quantity of oxygen in mgO/L. This is called "Acidic method" because the measurement is conducted in acid condition. The CODA-500-A is designed for automatically COD measurement by this acidic method. In acidic method, chloride ion must be masked by silver ions before oxidation.

Silver chloride is produced from the masked chloride ion, and may affect a measurement as dirt. The CODA-500-C has the reagent cleaning function for the dirt of silver chloride, and can be operated more stably.

In the case of the sample containing high concentration of chloride ion such as seawater, it is difficult to mask chloride ions with silver ions. For this reason, the measurement is conducted by the 100°C alkaline potassium permanganate method specified in Sewage Test Method that does not require this masking process. This method is called the "Alkaline method" because measurement is conducted in alkaline condition which is made by adding sodium hydroxide solution into the sample. Its difference from the acidic method lies in that the sample condition is alkaline. The CODA-500-B is designed for automatically COD measurement by alkaline method.

Features of the CODA-500

- **Reagent consumption reduced to one tenth, resulting in lower running costs (as compared with our former product)**

  The reagent consumption has been reduced to one tenth that of our former product. This saves running costs and successfully reduces the quantity of waste water and the environmental load.

- **Power consumption reduced to half, resulting in lower environmental load (as compared with our former product)**

  The direct heating method is used to decrease the electric power consumption and to eliminate the need of cooling water.

- **Improved operability with the use of a touch-panel type color LCD**

  The operation unit can be used by following the menu guidance on the touch panel.

- **Self-diagnostic function**

  The CODA-500 has a self-diagnostic function based on diagnostics using various detectors and software, which allows the user to find any failure of the CODA-500.
  The diagnostic result is externally output through the touch panel, printer, external contact, or the like.

- **Improved data saving capability (printer and USB)**

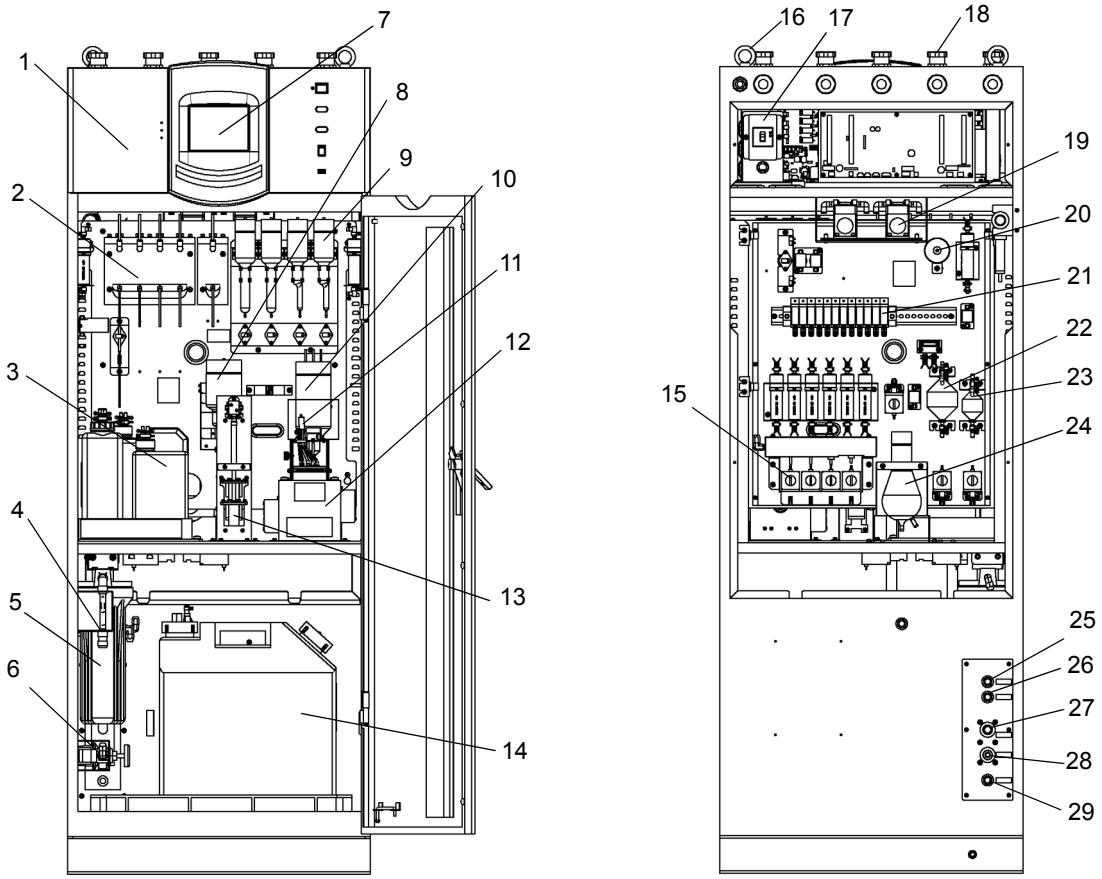
  The printed items on the printer can be selected from a list of items. The measured values, titration data, and daily reports can be printed out.
  The parameters for the CODA-500 are stored on the memory. Even if the power is temporarily turned OFF, the previously entered information is not lost. The past data is retained and can be displayed or printed out by specifying a data and time. This capability can be effectively used, e.g. when printer paper has run out or when data must be subsequently reviewed more carefully.
  Data can also be stored on the USB flash drive.

- **Improved output capability**

  Seven points can be freely selected for each of the status output and the warning output.

Part names

Analyzer



No.	Name	Description
1	Printer	Incorporates an automatic take-up device.
2	Reagent gauge unit	Gauges the sent quantity of each reagent.
3	Reagent bottle	Accommodates bottles for reagents A to F. Outputs an warning with external contact signal when the residual quantity of any reagent becomes small (optionally available). Refer to “ Reagent bottle ” (page 4).
4	Flowmeter	Monitors the flow rate if tap water is fed.
5	Activated carbon cylinder	Deionized water is required for blank calibration and sample dilution. If any measurement component is included in deionized water, no accurate measurement results can be obtained. If tap water is fed, tap water is passed through the activated carbon cylinder to eliminate impurities.
6	Valve for tap water	Regulates the feed flow rate if tap water is fed.
7	Operation unit	Refer to “ Operation unit ” (page 5).
8	Dilution water gauge (optional)	Gauges dilution water.
9	Gauge unit (partially optional)	Gauges sample water, diluted sample water, and blank water.
10	Diluted sample mixing tank (optional)	Dilution becomes necessary depending on the sample concentration. The sample is mixed/diluted with dilution water in this mixing tank.
11	Platinum electrode	Detects the end point of titration.

No.	Name	Description
12	Reaction tank unit	Carries out reagent addition, heating, and stirring by the JIS method to measure COD in the sample.
13	Titrator	Adds potassium permanganate to the reaction tank by titration.
14	Waste water tank (Rear: standard)	The quantity of waste water is approx. 40 L per month. CODA-500 can output a contact signal to warn full waste water. The tank capacity is 20 L. Check the content of the tank and process it accordingly.
	Deionized water tank (front: optional)	The quantity of deionized water is approx. 15 L per month. CODA-500 can output a contact signal to warn low blank water level (this tank is not required if tap water is fed).
15	Sample selector (partially optional)	Selects the sample, deionized water, or a cleaning fluid.
16	Suspending bolt	Used to install or move the CODA-500.
17	Main power switch (earth leakage breaker)	Turns ON/OFF the CODA-500.
18	Wiring inlet	Leads the power wiring and the signal wiring into the CODA-500.
19	Air pump	-
20	Air filter	-
21	Manifold	-
22	Drain trap	-
23	Drain trap S	-
24	Drain pot	-
25	Sample 1 inlet	Introduces the line-1 sample.
26	Sample 2 inlet	Introduces the line-2 sample.
27	Drain outlet	Drains the residual fluid from sample measurement.
28	Tap water inlet	Sends tap water used as blank water and sample dilution water, if tap water is fed.
29	Cleaning solution inlet	Sends cleaning solution to flush the dirt accumulated in the piping in the CODA-500.

● Reagent bottle

Different reagents are used between the acidic method (CODA-500-A), the alkaline method (CODA-500-B) and the acidic method with the reagent cleaning function (CODA-500-C).
The top of each reagent bottle has labels of different colors to indicate corresponding different reagents.

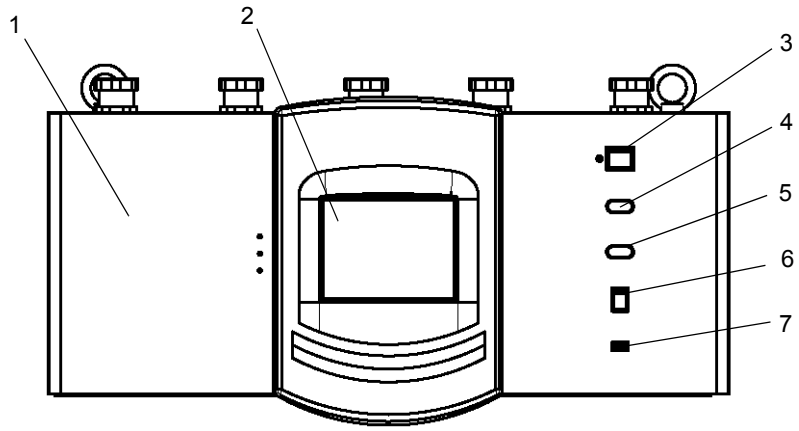
	Bottle capacity	Label color	Reagent
Reagent A	2 L	Black	5 mmol/L potassium permanganate
Reagent B	1 L	Blue	12.5 mmol/L sodium oxalate
Reagent C	1 L	Green	(1+2) sulfuric acid
Reagent D	1 L	Yellow	200 g/L silver nitrate
Reagent E	2 L	Orange	0.025 mol/L sodium thiosulfate and 0.02% sodium carbonate
Reagent F	1 L	Red	20 g/L sodium hydroxide

The reagent gauge unit detects the rising fluid level and then returns any excessive reagent to the reagent bottle by siphon action to store a certain quantity of reagent in the gauge tube.

Note

Purchase reagents from us. If you use any reagent you have conditioned by yourself, we do not warrant the accuracy of the CODA-500.

Operation unit



No.	Name	Description
1	Printer door	Located behind this door are the printer, printer paper, and take-up device.
2	Touch panel	Displays the measurement results including the measured value, time, measurement points; parameter settings; maintenance guide and warning; and function key guide. This is a touch panel allowing you to directly operate with the screen.
3	Power switch	Turns ON/OFF the operation unit.
4	Warning indicator	Illuminated when a warning is issued.
5	Access indicator	Illuminated while internal information in the CODA-500 is being saved to the internal memory or the USB flash drive. **Note** **Do not turn OFF the power while the access indicator is ON.**
6	Maint switch	Used to carry out maintenance of the CODA-500.
7	USB socket	Accepts the connection of the USB flash drive.

Display part

The following explanation is made assuming typical screens.

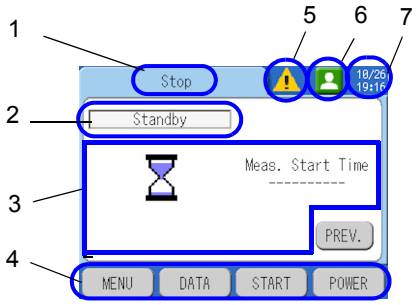
Note

The display part is a touch panel. Do not use a pen, a screwdriver, or any other hard object to press a button. Avoid using wet hand to operate with the touch panel.

Screen examples

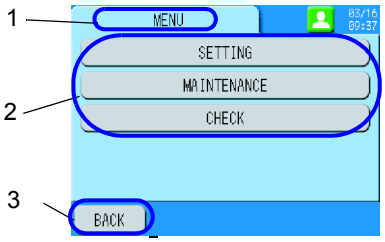
(Example 1) displays values for measurement items

When the power is turned ON, this MAIN screen appears first.



No.	Description	Display example
1	Screen title	Preparation, measurement, settings, log data, etc.
2	Display item	Shows the operating items.
3	Details of displayed item	Shows the measured values, etc.
4	Operation buttons	Change the display or performs other operations.
5	Status of CODA-500	Shows whether any warning is issued.
6	Authority	Shows the operator's authority.
7	Time	04/06 15:33

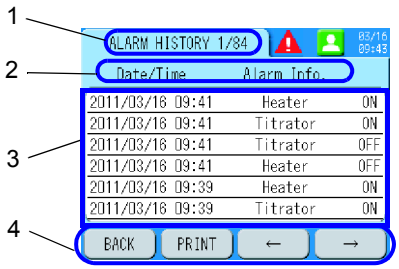
(Example 2) displays operation buttons



No.	Description	Display example
1	Screen title	Menu, data, start, stop, etc.
2	Selectable item	Shows selectable items.
3	Operation button	Changes the display or performs other operations.

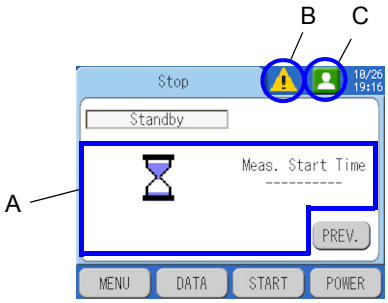
● (Example 3) displays the details of the selected item

This screen displays the details of each item.



No.	Description	Display example
1	Screen title	Warning history, etc.
2	Table title	Shows the currently displayed item.
3	Details of displayed item	Shows the details of the displayed item.
4	Operation buttons	Change the display or performs other operations.

Description of icons



A: Description of icons for details of displayed items

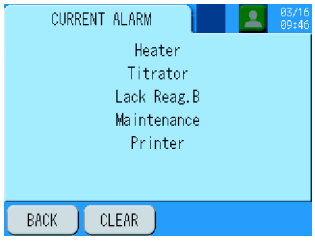
Item	Icon	Description
Preparation		Preparations are now being carried out to start a measurement.
Gauging		The sample, deionized water, and reagent are now being gauged and then sent to the reaction tank.
Decomposition		Organic matter in the sample is now being decomposed in the reaction tank.
Wait for reaction		The CODA-500 is now waiting for the temperature and the mixture with the reagent to be stabilized.
Titration (measurement)		COD is now being measured by adding the reagent A.
Discharge wastes		The sample in the reaction tank is now being drained.
Cleaning		The reaction tank is now being cleaned. Normally, it is cleaned with deionized water alone. When using the reagent cleaning function (CODA-500-C), the reaction tank is further cleaned by adding reagent E for cleaning.
Standby		The CODA-500 has finished the measurement and is now standing by for the next measurement.

● B: Description of icons for statuses of CODA-500

Item	Icon		Description
Warning issued		Severe (red)	A warning is issued. For checking the warning history, refer to “ [DATA]-[ALARM HISTORY] ” (page 121)
		Mild (yellow)	
No warning issued	Nothing displayed		No warnings are issued.

Tip

Pressing the icon displays the current warning.
To cancel the warning, take remedial actions and press [CLEAR]. Refer to “ Possible causes and remedial actions for warnings ” (page 173) about the actions. For “Titrator”, however, the warning is cancelled only by dealing with it (without pressing [CLEAR]).

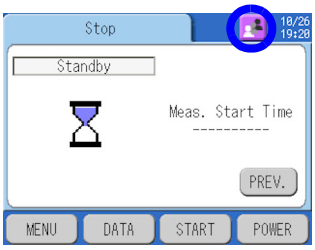


● C: Description of authority-related icons

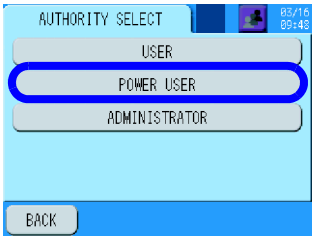
Item (mode)	Icon	Description
General user		Can make ordinary measurements.
Power user		Can set the parameters related to measurement, calibration, etc. For login, the administrator is prompted to enter his or her password. Reference **“ AUTHORITY SET ” (page 87)**
Administrator		Can configure all the settings. For login, the administrator is prompted to enter his or her password. Reference **“ AUTHORITY SET ” (page 87)**

How to change the user level

1. **Press the icon.**



2. **Press the button of the desired user level.**



3. **Enter the password and then press [ENTER].**

Installation

Contact for installation

Manufacturer: HORIBA Advanced Techno Co., Ltd.
31, Miyanonishi-cho, Kisshoin Minami-ku, Kyoto 601-8306, Japan

Installation site

The CODA-500 is designed as the indoor installation type. Install it at indoor site with the least temperature changes. In order to ensure that stable measurement results are obtained, select a location where the following requirements are satisfied.
For maintenance space, refer to the separate volume for installation procedures.

- Transient overvoltage of main power source: Overvoltage category II (EN61010-1), pollution degree 2
- Indoor installation with good ventilation
- Protection from rain and wind
- Location with minimum temperature changes and without exposure to direct sunlight
- Relative humidity 85% maximum
- Nearest to a sampling point
- Location without a corrosive atmosphere
- Location providing sufficient maintenance space

Installation

Installation of the CODA-500 requires various kinds of piping and wiring.
For more information, refer to the separate volume for installation procedures.

● Foundation work to anchor the cabinet

Securely anchor the cabinet with M12 bolts in accordance with the drawing for installation procedures.

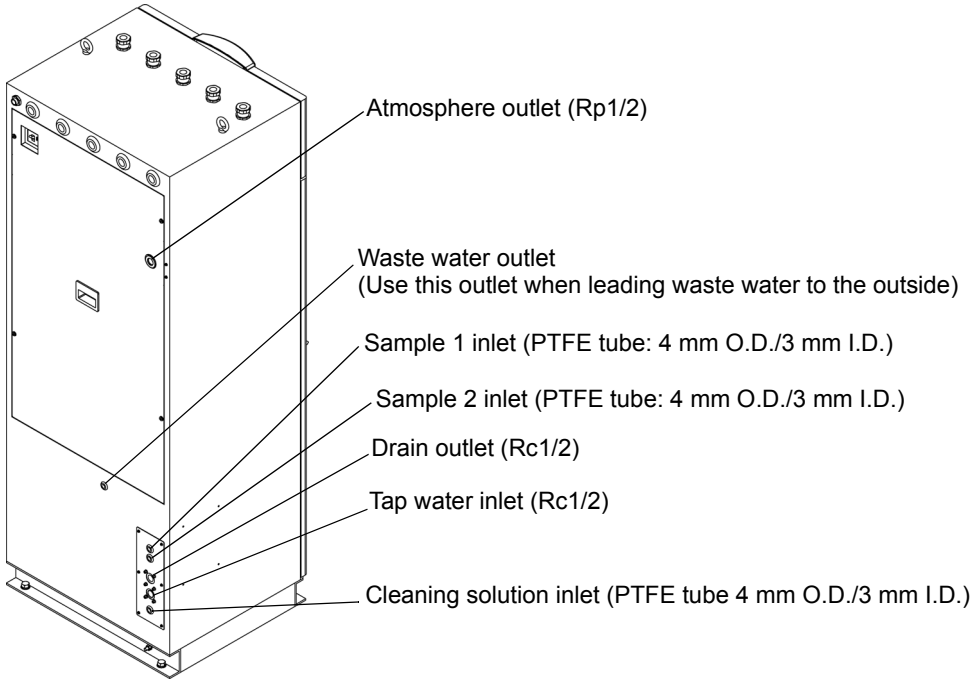
● Wiring for power source and signals, and installation

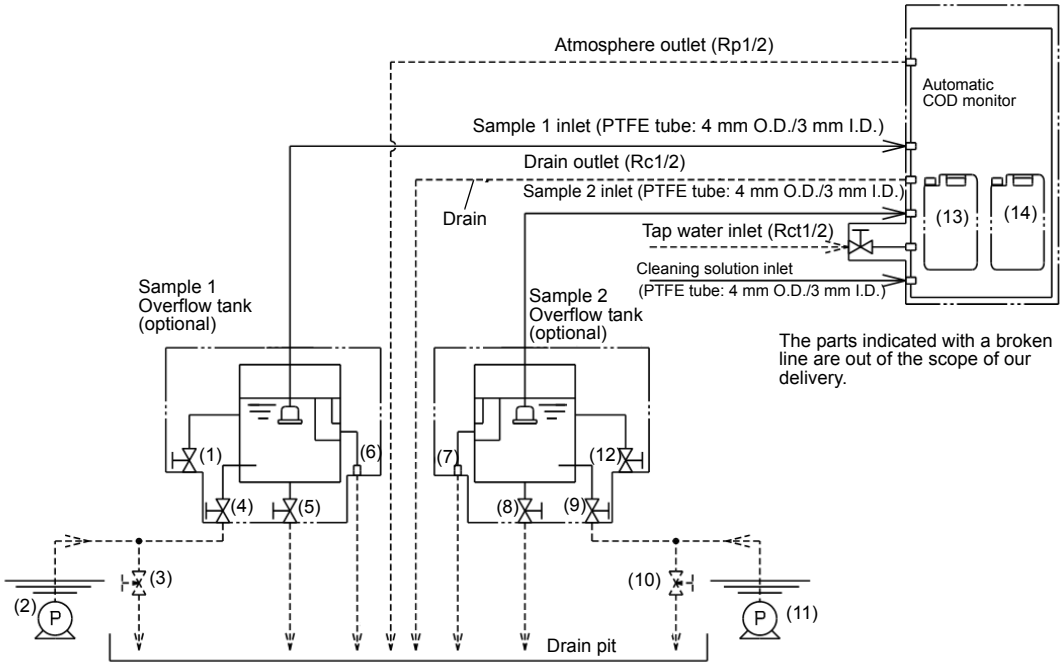
⚠ WARNING

Electric shock
Ground the CODA-500 to prevent an electric shock.
Do not ground it to any dangerous location such as a gas pipe.

Specification of power source is 100 V to 240 V AC ±10%, 50 Hz/60 Hz.
The maximum power consumption is approx. 250 VA at 100 V to 120 V AC or approx. 350 VA at 120 V to 240 V AC.
Do not use the same wiring for the power source and signals.

Piping method





(1)	16 mm dia. hose end for sampling valve for manual analysis	(8)	Drain outlet Rc1/2 (always closed)
(2)	P-1 pump (for sample) (supplied by the customer)	(9)	Sample 2 inlet Rc1/2 (0.5 L/min to 5.0 L/min)
(3)	Valve for bypass (supplied by the customer)	(10)	Valve for bypass (supplied by the customer)
(4)	Sample 1 inlet Rc1/2 (0.5 L/min to 5.0 L/min)	(11)	P-2 pump (for sample) (supplied by the customer)
(5)	Drain outlet Rc1/2 (always closed)	(12)	16 mm dia. hose end for sampling valve for manual analysis
(6)	Drain outlet Rp3/4	(13)	20 L waste water tank
(7)	Drain outlet Rp3/4	(14)	20 L waste water tank

Piping for sample water

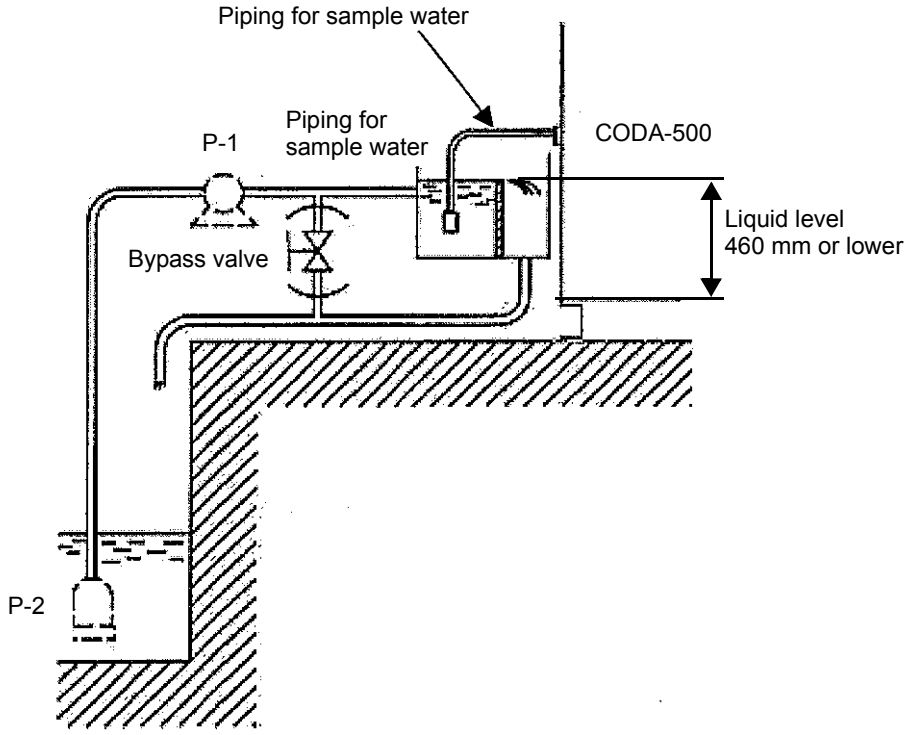
The piping for sample water is a PTFE tube of 4 mm O.D./3 mm I.D. (connected to the rear of the CODA-500.)

Any loosen fitting causes a suction failure. Prior to operation, check for such loosen fitting.

If an optional overflow tank (OF-5) is used, it can be installed on the left or right side of the CODA-500. Connect the piping for sample water to the sample water inlet on the overflow tank.

The following diagram shows a standard sampling flow.

When there are many suspended solids (SS), provide a main conditioning tank with a filter before the overflow tank. Incline the drain line from the overflow tank so that no waste water is suspended.



Note

- **Make the length of PTFE tube for the sample inlet within 3 m. Otherwise, COD measurement values may be affected by it.**
- **Install the overflow tank so that the liquid level becomes 460 mm or lower from the bottom of the CODA-500. A higher liquid level affects the sampling operation, causing the measurement performance to deteriorate.**

Reference

For the sample water conditions, refer to " Specification " (page 203).

Piping for tap water

Connect the tap water piping to the tap water inlet (Rc1/2).
Use this piping to clean the CODA-500, perform the zero calibration, or dilute the sample.
If any measurement component is included in deionized water, no accurate measurement results can be obtained. For the activated carbon built-in type, the supplied tap water can be used by purifying it with activated carbon. Regulate the flow rate of tap water so that the flowmeter reads 500 mL/min to 800 mL/min.
To connect the tap water piping to the CODA-500, install the provided valve.
This valve is used to shut off tap water when any part in the CODA-500 is maintained or replaced.

Note

- **Raw water to be passed through activated carbon should have the same quality level of tap water.**

Item	Criteria
Nitrate-nitrogen	10 mg/L max.
Nitrite-nitrogen	10 mg/L max.
Organic matter [quantity of total organic carbon (TOC)]	3 mg/L max.
Iron (Fe)	0.3 mg/L max.
Manganese (Mn)	0.05 mg/L max.
Hydrogen ion concentration (pH)	5.8 to 8.6
Odor	Not abnormal
Taste	Not abnormal
Chromaticity	5 degrees max.
Turbidity	2 degrees max.

* Excerpted from reference items for water quality standard under Water Supply Law

- **If a large amount of rust is separated off the piping for tap water or if tap water contains residual chloride, preparation is required. If tap water is used without eliminating rust and residual chloride, the performance of resin deter will deteriorate faster.**
- **For maintenance and activated carbon, refer to " Maintenance " (page 128) and " Replacing the activated carbon cartridge " (page 158).**
- **The Water Supply Law prohibits direct supply from waterworks. Use a tap water pressurizing unit or the like to insulate the piping for the CODA-500 from any general tap water piping. When tap water is likely to be frozen, install thermally insulated piping.**

Reference

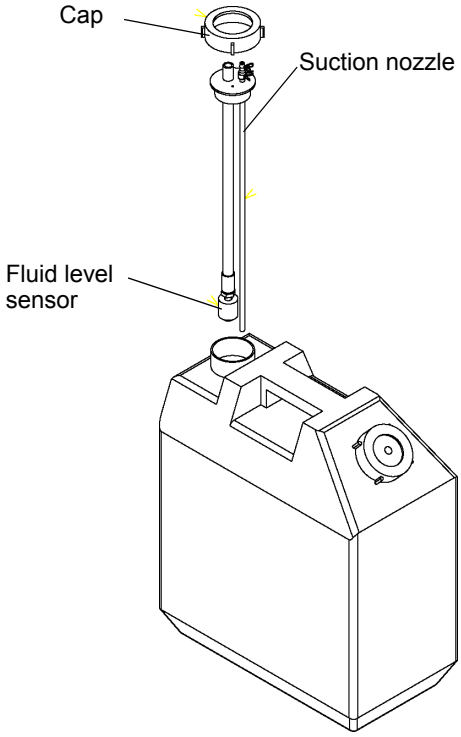
For the blank water conditions, refer to " Specification " (page 203).

■ Piping for deionized water tank (optional)

This piping is used to clean the CODA-500, perform the zero calibration, or dilute the sample. If deionized water contains any measurement component, no accurate measurement results can be obtained. Use deionized water of 10 mS/m (= 1.0 μS/cm) maximum.

A fluid level sensor is attached to the deionized water tank. When the residual deionized water level is low, a warning is issued. In this case, immediately replenish deionized water.

We recommend replacing all the rest with new deionized water.



● Replacement interval of deionized water tank (for deionized water tank type)

In case of the measurement condition with 20 L tank, every-hour measurement, and 1-range type.

Measurement range (mgO/L)	Replacement interval (days)	
	"Smp. Line Wash" OFF	"Smp. Line Wash" ON
0 to 20	41.7	8.6
30	20.8	3.7
40	13.9	3.4
50	10.4	3.1
100	8.3	2.9
200	4.2	2.2
500	7.2	2.8
1000	3.9	2.1
2000	2	1.4

Reference

For the details of the sample line cleaning, refer to " SMP. LINE WASH SET " (page 58).

Piping for drain water

Connect drain piping observing the following instructions (refer to “ Piping method ” (page 12)).

- Use descending piping.
- Use piping with the diameter as large as possible and ensure that no back pressure applies to the piping.
- Minimize the distance to the drainage ditch.
- Lead the outlet to atmosphere.
- As drain water contains acid or alkali, metal piping may cause corrosion. Using resin piping is recommended.

Piping for waste water

⚠ WARNING

Waste water

Waste water contains acid or alkali. To handle waste water, use protective gloves and goggles not to touch it directly.

If waste water touches your skin or gets into your eye, immediately rinse it off with a large quantity of water and then seek medical attention. If you swallow it by mistake, seek immediate medical attention.

Send waste water to the waste water tank using the provided soft tube.

In this case, also ensure that no back pressure applies to the piping. Connect the tube so that its leading end is not immersed in waste water. Dispose of waste water before the leading end of the tube is immersed as the waste water tank becomes full with waste water. Failure to observe this instruction causes a malfunction.

Disposal of waste water

⚠ WARNING

Waste water

Waste water contains acid or alkali. To handle waste water, use protective gloves and goggles not to touch it directly.

If waste water touches your skin or gets into your eye, immediately rinse it off with a large quantity of water and then seek medical attention. If you swallow it by mistake, seek immediate medical attention.

Waste water from the waste water outlet (Rp1/2) contains sulfuric acid and heavy metals. Therefore, be sure to collect it in the waste water tank.

Waste water must be controlled so as not to overflow from the tank. The quantity of waste water per measurement is approx. 15 mL for the standard type. When using the reagent cleaning function, the quantity is twice as much as the standard type. The standard capacity of the waste water tank is 20 L (equivalent to approx. 2 weeks assuming that a measurement is made every hour in standard type). When the fluid level in the waste water tank becomes 3/4 or higher, dispose of waste water. If the tank becomes full with waste water, the warning of “Full Drain Tank“ will be issued.

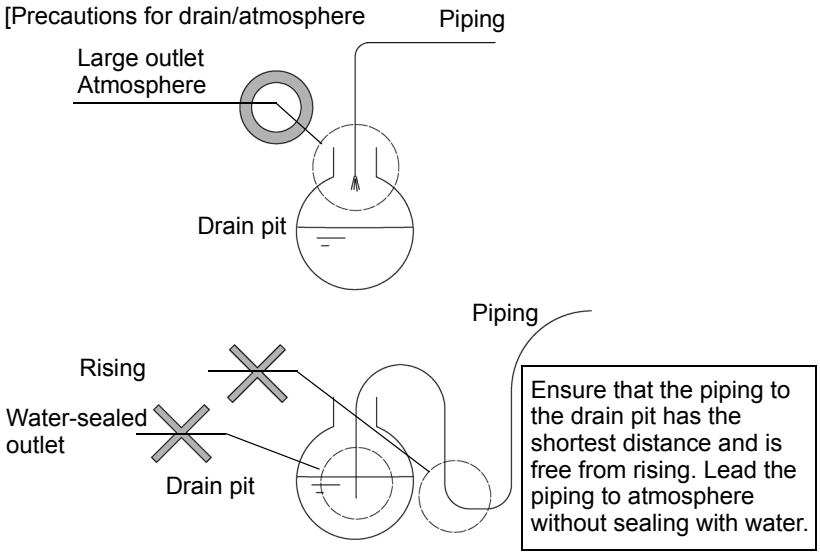
Dispose of waste water under each division's standard in accordance with the related laws and regulations.

Atmosphere outlet

Externally release pressure so that no pressure applies to the flow in the CODA-500.

Note

- **If the atmosphere outlet is likely to be frozen, provide thermal insulation.**
- **Minimize the length of piping for drain outlet/atmosphere release piping and ensure that no back pressure applies. Lead the outlet to atmosphere and avoid getting the outlet water-sealed (ascending piping is not acceptable).**
- **It will be convenient if piping is made removable so that it can be cleaned periodically.**



Connecting power/signal wiring

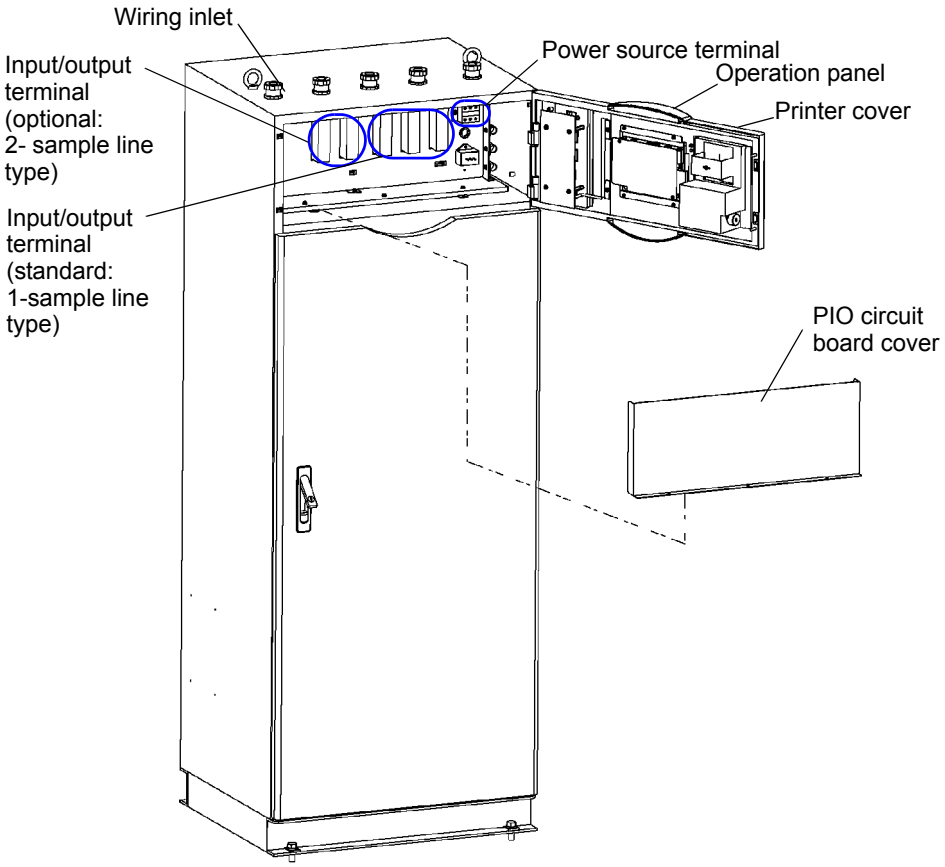
⚠ WARNING

Electric shock

- Before connecting a lead wire to the terminal block, turn OFF the external power supply. Otherwise an electric shock may occur.
- Always put the terminal block cover to prevent an electric shock.
- Only those who have knowledge of electricity can open and close the operation panel.

CODA-500 has terminals for power contact input/output and analog output plus input/output terminals, RS-485 (standard) and RS-232C (optional).

Use these terminals when alarm signal output, measured value signal output, and remote signal input are required.



1. **Open the printer cover and loosen 2 screws on the left side.**
2. **Open the operation panel.**
3. **Detach the PIO circuit board cover.**
4. **Lead in the power/signal wiring from the wiring inlet and connect it to each terminal.**
5. **After finishing the connections, be sure to attach the PIO circuit board cover and close the operation panel.**

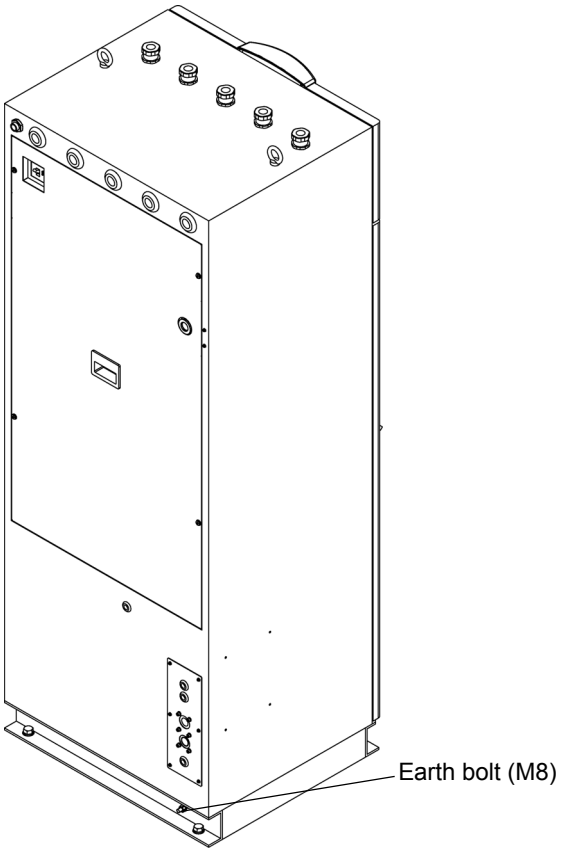
Grounding and power wiring

● Grounding

⚠ WARNING

Electric shock
Ground the CODA-500 to prevent an electric shock.
Do not ground it to any dangerous location such as a gas pipe.

- Work at class D grounding.
- Be sure to ground the earth bolt.



Power wiring

WARNING

Electric shock

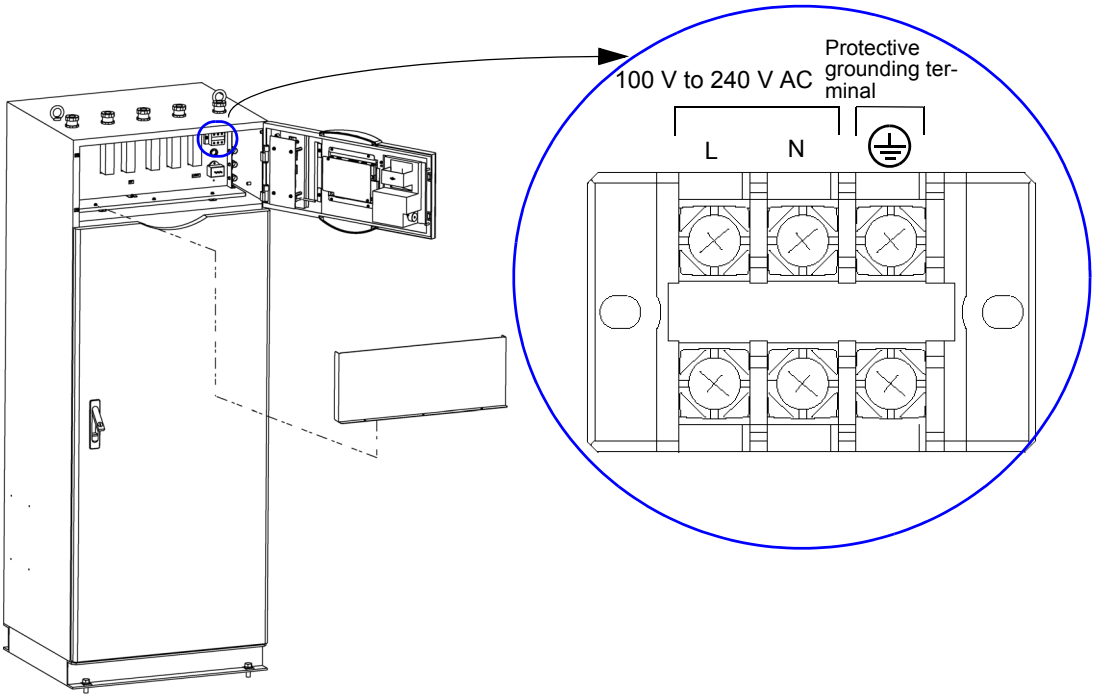
Any wrong terminal connection can cause an electric shock or a failure of the CODA-500. Be careful of any wrong connection.

Electric shock

- Before connecting a lead wire to the terminal block, turn OFF the external power supply. Otherwise an electric shock may occur.
- Always put the terminal block cover to prevent an electric shock.
- Only those who have knowledge of electricity can open and close the operation panel.

To send power, connect the power cable to the power terminal block shown in the following illustration.

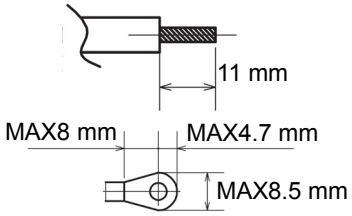
- Connect a surge absorber, noise killer, or the like in parallel with the power cable in order to protect against noise.
- It is recommended that a circuit breaker for the power supply to the CODA-500 be installed as nearest as possible to the CODA-500.
- A releasing device (breaker) for the CODA-500 is installed on the rear of the CODA-500. In order to enable access to the breaker in case of emergency, provide maintenance space behind the rear in accordance with the instruction manual for installation.



Grounding standard	Class D grounding (with ground resistance of 100 Ω or less)
Terminal screw	M4
Outer diameter of crimping terminal	9.5 max. (A M8 grounding terminal is also provided on the channel base.)
Voltage range	100 V to 240 V AC ±10%
Frequency range	50 Hz/60 Hz
Max. power consumption	100 V to 120 V AC: approx. 250 VA 120 V to 240 V AC: approx. 350 VA

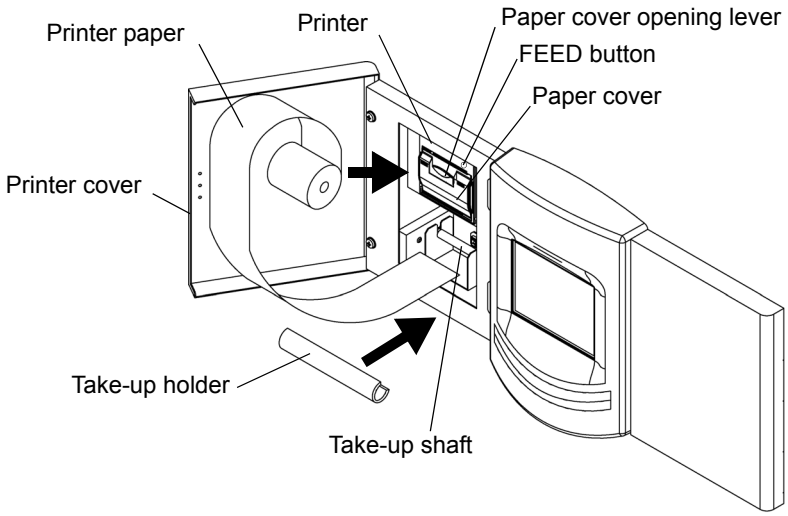
Power supply

To connect the power source, use a power cable of 1.25 mm^2 (AWG16) minimum.
Be sure to connect the ground.



Preparation

Preparation for printer



1. **Open the printer cover.**
2. **Pull the paper cover opening lever on the printer to open the paper cover.**
3. **Set paper in the direction indicated in the illustration.**
   If paper is set in the opposite direction, nothing is printed out.
4. **Draw the leading end of paper out of the paper outlet, push both ends of the paper cover, and the close the cover.**
5. **Press the FEED button to feed paper so that it is wound on the take-up shaft.**
6. **Hold the printer paper wound on the shaft with the take-up holder.**

Note

Periodically check the remaining amount of printer paper by taking into account the printer print mode setting (consumption of printer paper). If the remaining amount of printer paper is small, a new roll of paper should be early replaced to prevent a failure printing.

The printer paper used for CODA-500 is high thermosensitive for high-speed printers. If the conventional printer paper is used, printout may be faint. To place an order for our printer paper, specify the part code described “ Spares ” (page 167).

To store printed paper, take the following precautions.

- Store the printed paper in a dark place at temperature of 40°C maximum and humidity of 80% maximum without exposure to direct sunlight.
- If the printed paper is put in a soft PVC case, its part exposed to the case will discolor. Select a bag made of polyethylene, polypropylene, or the like.
- Rubber-based adhesive or adhesive containing organic solvent produces color. Do not use such adhesive to attach the printed paper to another paper.
- Close contact with eraser or adhesive tape causes the printed paper to discolor.
- Strongly scrubbing the surface of the printed paper may produce color.
- The thermosensitive paper is not suitable for long-term storage. If you want to keep the printouts for a long period, we recommend making a dry copy.

Printout examples

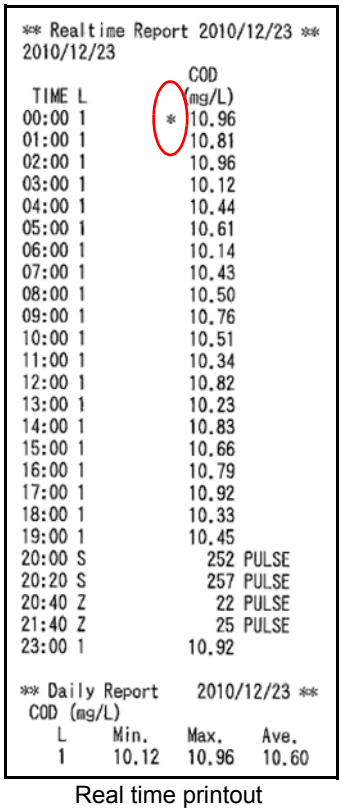
The following figures are the printout examples.
The following items are automatically printed out.

Automatically printouts

- Power-on
- Warning information
- Hourly report (measured value) in real time
  Printout can be enabled or disabled at Print (Hourly) of [PRINT OUT SET].
- Daily report in real time
  Printout can be enabled or disabled at Print (Daily) of [PRINT OUT SET].

Tip

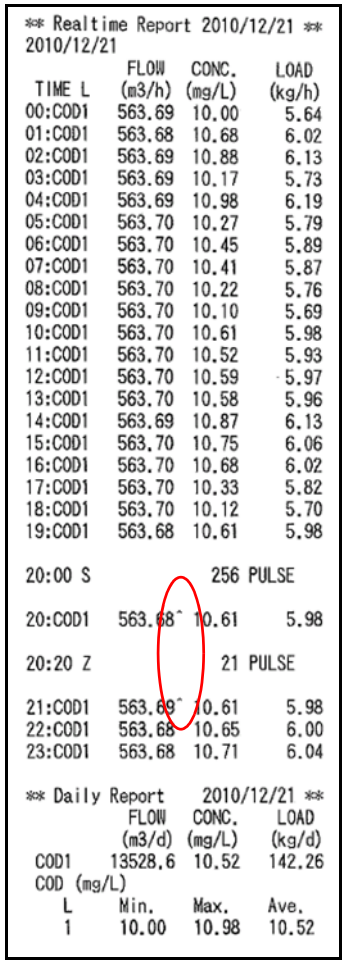
- **In the initial settings, printout occurs as shown in the example of real time printout (without calculation of load).**
- **When load calculation is specified, printout occurs as shown in the example of real time printout (with calculation of load).**



```
** Realtime Report 2010/12/23 **
2010/12/23
                    COD
 TIME L             (mg/L)
00:00 1          *  10.96
01:00 1             10.81
02:00 1             10.96
03:00 1             10.12
04:00 1             10.44
05:00 1             10.61
06:00 1             10.14
07:00 1             10.43
08:00 1             10.50
09:00 1             10.76
10:00 1             10.51
11:00 1             10.34
12:00 1             10.82
13:00 1             10.23
14:00 1             10.83
15:00 1             10.66
16:00 1             10.79
17:00 1             10.92
18:00 1             10.33
19:00 1             10.45
20:00 S              252 PULSE
20:20 S              257 PULSE
20:40 Z               22 PULSE
21:40 Z               25 PULSE
23:00 1             10.92

** Daily Report     2010/12/23 **
 COD (mg/L)
    L     Min.    Max.    Ave.
    1    10.12   10.96   10.60
```

Real time printout
(without calculation of load)



```
** Realtime Report 2010/12/21 **
2010/12/21
                FLOW    CONC.     LOAD
 TIME L        (m3/h)  (mg/L)    (kg/h)
00:COD1        563.69   10.00      5.64
01:COD1        563.68   10.68      6.02
02:COD1        563.69   10.88      6.13
03:COD1        563.69   10.17      5.73
04:COD1        563.69   10.98      6.19
05:COD1        563.70   10.27      5.79
06:COD1        563.70   10.45      5.89
07:COD1        563.70   10.41      5.87
08:COD1        563.70   10.22      5.76
09:COD1        563.70   10.10      5.69
10:COD1        563.70   10.61      5.98
11:COD1        563.70   10.52      5.93
12:COD1        563.70   10.59      5.97
13:COD1        563.70   10.58      5.96
14:COD1        563.69   10.87      6.13
15:COD1        563.70   10.75      6.06
16:COD1        563.70   10.68      6.02
17:COD1        563.70   10.33      5.82
18:COD1        563.70   10.12      5.70
19:COD1        563.68   10.61      5.98

20:00 S                  256 PULSE

20:COD1        563.68^  10.61      5.98

20:20 Z                  21 PULSE

21:COD1        563.68^  10.61      5.98
22:COD1        563.68   10.65      6.00
23:COD1        563.68   10.71      6.04

** Daily Report     2010/12/21 **
                FLOW    CONC.     LOAD
               (m3/d)  (mg/L)    (kg/d)
 COD1        13528.6   10.52     142.26
 COD (mg/L)
    L     Min.    Max.    Ave.
    1    10.00   10.98   10.52
```

Real time printout
(with calculation of load)

Note

- *** is a value that is measured while an alarm is issued.**
- **^ is a held value that is kept from the previous measurement (A held value while an alarm is issued is shown as *).**

The following items can be printed out by operating with the screen.

Screen operation printouts

- Calibration history
  [DATA] -> [CALIBRATION HISTORY] -> [PRINT]
- Warning information
  [DATA] -> [ALARM HISTORY] -> [PRINT]
- Measurement history
  [DATA] -> [LOG DATA] -> [MEASURE VALUE] -> [PRINT]
- Daily report history
  [DATA] -> [LOG DATA] -> [HOUR REPORT HISTORY] -> [PRINT]

Installation of reagent bottle

WARNING

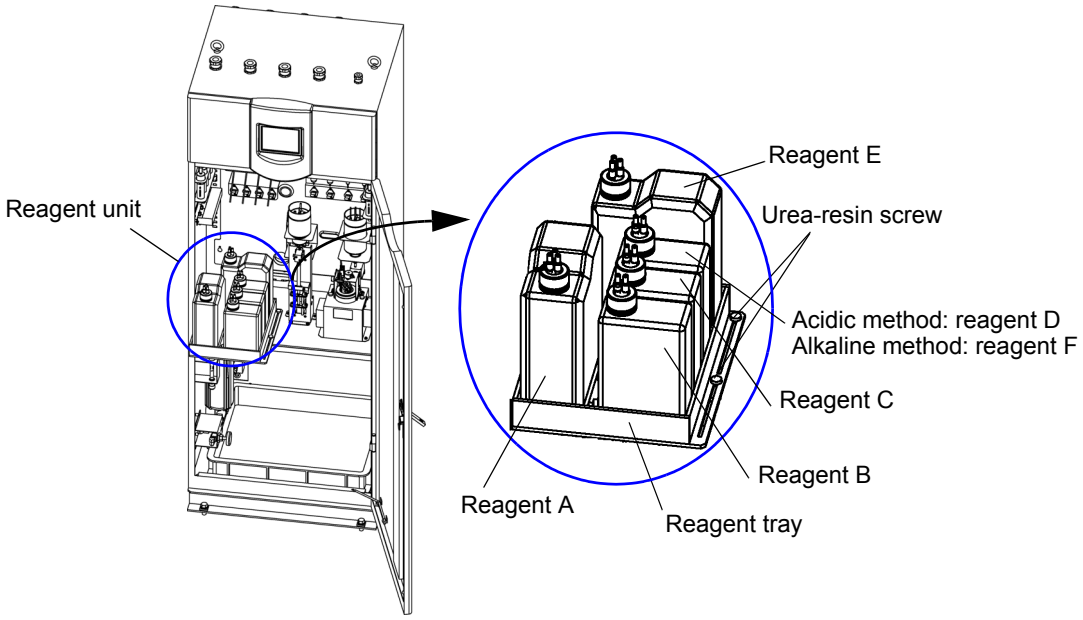
Chemicals handling

When the reagent bottle is changed, its content may be spilled over. The reagent contains deleterious substances. Touching it by bare hands is very dangerous.
To change the bottle, be sure to use protective gloves and goggles and be very careful not to directly touch the bottle. Carefully wipe off any spilled chemical fluid.

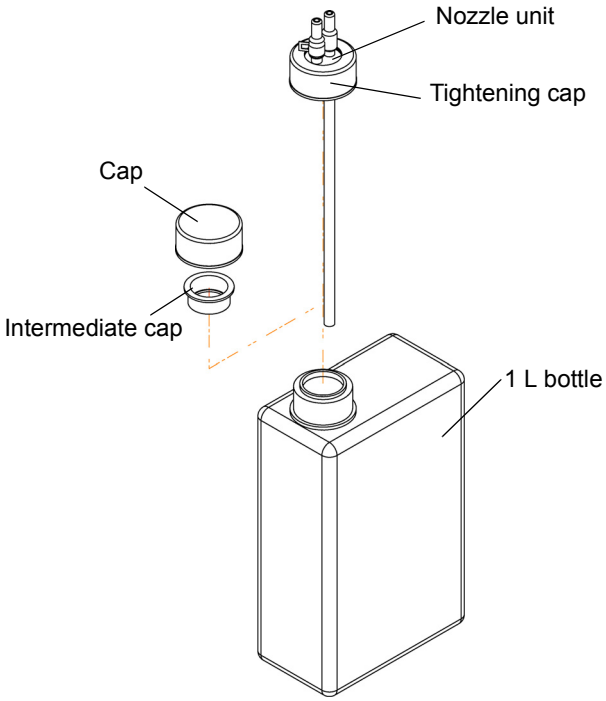
Note

- **A new reagent bottle is full of reagent. When the reagent bottle receives pressure with the cap open, the reagent may spill out. Pay attention not to spill reagent when you set or replace the bottle. For example, open the bottle cap with the bottle placed on a flat surface.**
- **Caution: Fragile (withstand load: 5.0 kg)**
  Place nothing but the reagent bottles specified by us on the reagent tray with the tray drawn out.
- **When placing or replacing reagents, take care to place them correctly matching the color of tubes connected to the nozzle unit with the color of labels on the top of reagent bottles.**
  If a reagent is misplaced, measurement results are incorrect.
- **When the reagent tray is equipped with a sensor to detect the remaining fluid level (optional), take care not to spill reagents on the sensor. Reagent spill may damage the sensor.**

1. **Loosen 2 urea-resin screws.**
2. **Slide out the reagent tray.**



3. **Loosen the tightening cap and then remove it together with the nozzle unit.**



4. **Remove the cap and intermediate cap on a new reagent bottle and attach the nozzle unit to the bottle.**
5. **Check that the color of the tube connected to the nozzle unit is the same as that of the corresponding label on the top of the reagent bottle.**
6. **Put the bottle back in the original position.**

Preparation for reagents

For the acidic method and the alkaline process, check that the following reagents are respectively installed in place.

	Acidic method (CODA-500-A)
Reagent A	5 mmol/L potassium permanganate
Reagent B	12.5 mmol/L sodium oxalate
Reagent C	(1+2) sulfuric acid
Reagent D	200 g/L silver nitrate

	Alkaline method (CODA-500-B)
Reagent A	5 mmol/L potassium permanganate
Reagent B	12.5 mmol/L sodium oxalate and 0.1 g/L manganese sulfate
Reagent C	(1+2) sulfuric acid
Reagent F	20 g/L sodium hydroxide

	Acidic method (CODA-500-C)
Reagent A	5 mmol/L potassium permanganate
Reagent B	12.5 mmol/L sodium oxalate
Reagent C	(1+2) sulfuric acid
Reagent D	200 g/L silver nitrate
Reagent E (When reagent cleaning function is ON)	0.025 mol/L sodium thiosulfate and 0.02% sodium carbonate

Installation of reagent tank (for reagent line cleaning type)

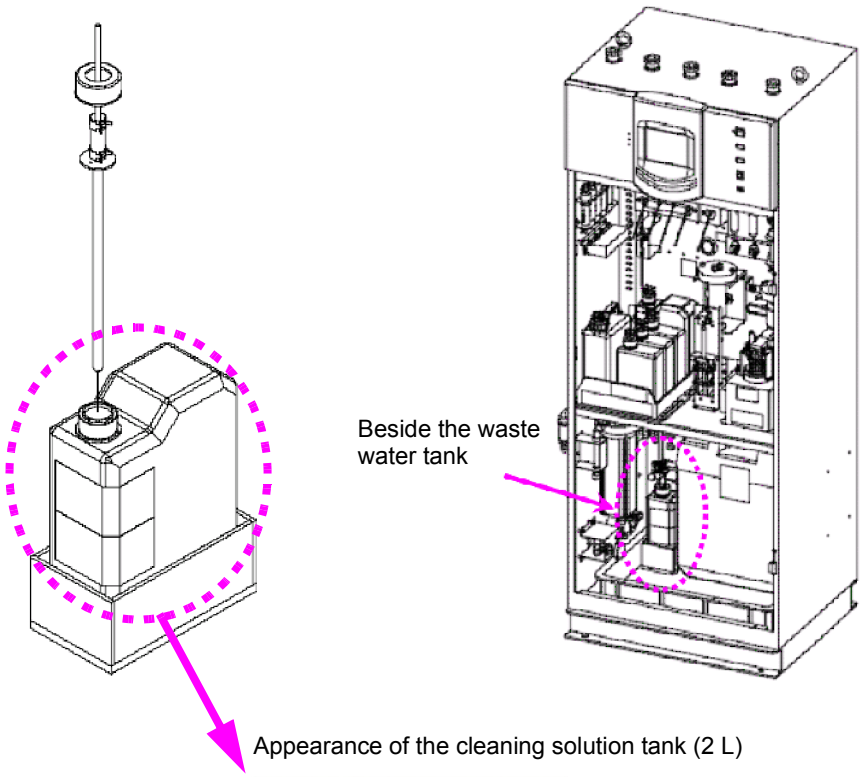
⚠ WARNING

Chemicals handling

To perform any work, be sure to use protective gloves and goggles.
When a reagent dissolves, hydrogen chloride vapor and heat are generated.

- Do the work of dissolving a reagent in a well-ventilated area such as a draft chamber.
- Pour hydrochloric acid into deionized water. Do not pour deionized water into hydrochloric acid.
- A 35% to 37% hydrochloric acid is a deleterious substance. Be very careful when handling hydrochloric acid.
- If the reagent touches your skin, wash it sufficiently in running water.
- If the reagent gets into your eyes, wash them sufficiently in running water and seek medical attention.

Pour the cleaning reagent into the attached reagent tank, and install the tank as shown below.



Appearance of the cleaning solution tank (2 L)

Cleaning solution for line cleaning

A 5% diluted hydrochloric acid is recommended for a cleaning solution.

Tip

When dissolving a reagent, cool a vessel with water or ice, etc. if necessary.

● Method of mixing a cleaning solution

1. **Prepare 300 mL of hydrochloric acid (special class: 35% to 37% hydrochloric acid).**
2. **First pour 1 L of deionized water into the vessel for mixing.**
3. **Slowly pour 300 mL of hydrochloric acid of step 1. into the vessel while stirring deionized water.**
4. **Pour deionized water into the solution of step 3., increasing the whole quantity to 2 L.**
5. **Pour the solution of step 4. into the cleaning solution tank, and mount the tank on the device.**

Tip

Cleaning solution consumptions are approx. 60 mL per occurrence.

Adjusting the gauged values

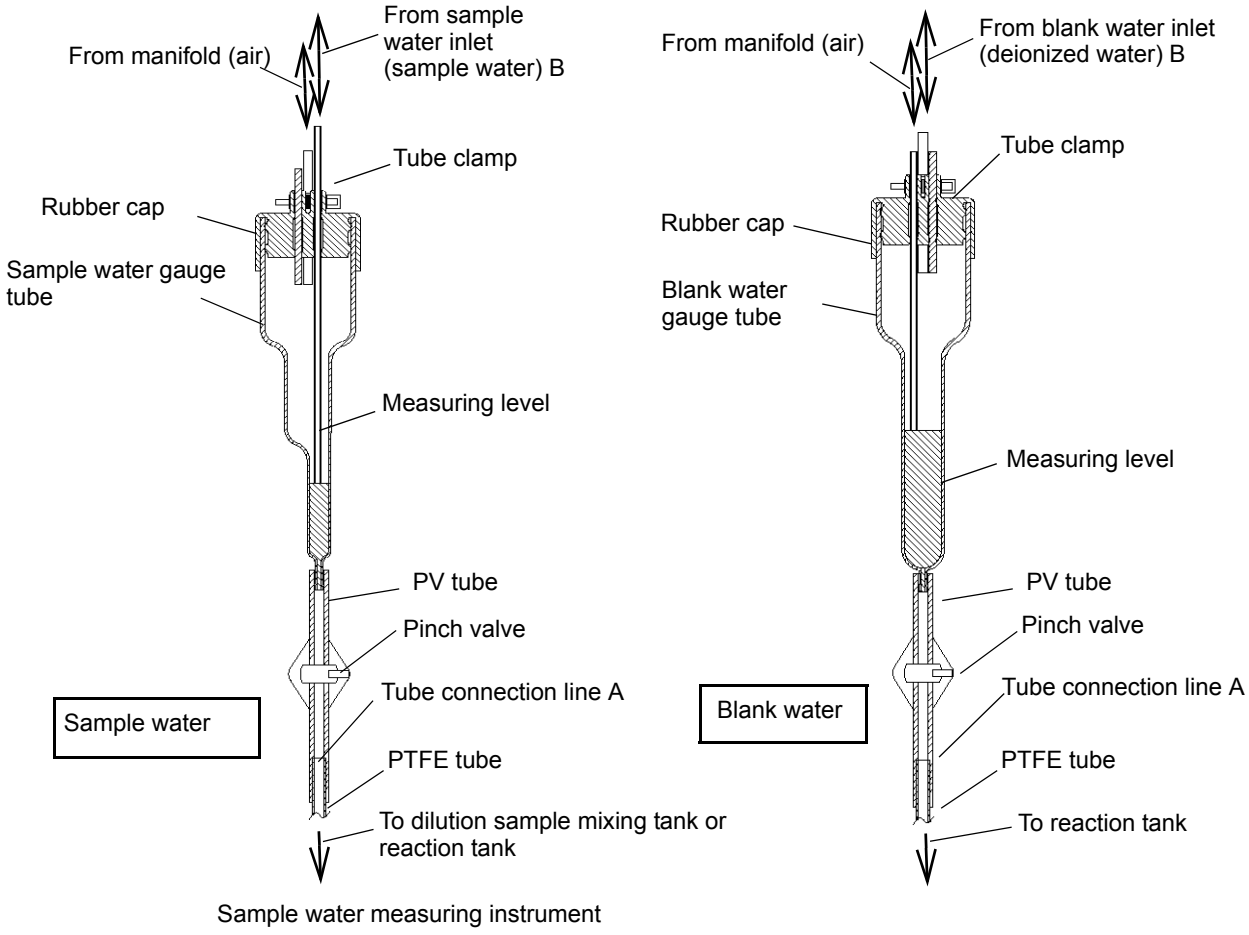
The automatic COD monitor allows accurately measured values to be obtained within 50% of the full-scale value because of its characteristics. For any sample water that is expected to show a high COD value, therefore, dilute it to make the total quantity of 10 mL and then measure it. The relationship between the measurement range of the CODA-500 and the gauged values for sample water, dilution water, and blank water is shown in the tables below.

Note

Gauged values are adjustable within ±0.5% for sample water, and within ±1% for dilution/blank water.

	Measurement range (mgO/L)		Gauged value of sample water (mL)		Gauged value of dilution water (mL)		Total sample quantity (mL)		Final sample quantity (mL)	
For 1-sample line type	0 to 20		10		0		10		10	
	30		20		10		30		10	
	40		20		20		40		10	
	50		20		30		50		10	
	100		10		40		50		10	
	200		10		90		100		10	
	500		2		48		50		10	
	1000		2		98		100		10	
	2000		2		99 × 2		200		10	
For 2-sample line type	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
	20	20	10	10	0	0	10	10	10	10
	30	30	20	20	10	10	30	30	10	10
	30	50	20	2	10	10	30	22	10	10
	40	40	20	20	20	20	40	40	10	10
	40	500*1	20	2	20	20 × 2	40	42	10	10
	50	50	20	20	30	30	50	50	10	10
	50	200	20	2	30	30	50	32	10	10
	50	500	20	2	30	30 × 2	50	62	10	10
	100	100	10	10	40	40	50	50	10	10
	100	500*2	10	2	40	40	50	42	10	10
	100	1000*3	10	2	40	40 × 2	50	82	10	10
	200	200	10	10	90	90	100	100	10	10
	200	1000*4	10	2	90	90	100	92	10	10
	200	2000*5	10	2	90	90 × 2	100	182	10	10
	500	500	2	2	48	48	50	50	10	10
	1000	1000	2	2	98	98	100	100	10	10
	2000	2000	2	2	99 × 2	99 × 2	200	200	10	10
	R1 means the range for the 1st line, and R2 means the range for the 2nd line. *1: The full scale is 420 mgO/L *2: The full scale is 420 mgO/L *3: The full scale is 820 mgO/L *4: The full scale is 920 mgO/L *5: The full scale is 1820 mgO/L									

● **Adjusting the gauged values for sample water and blank water**



Sample water measuring instrument

Adjustment procedure

1. **Remove the PTFE tube connected at tube connection line A. Supply a measuring flask with capacity about twice as large as the measured value.**
2. **In the step performing setting in the MAINTENANCE mode, perform the steps for the measuring instrument to be adjusted (“ STEP ACTION ” (page 96)). Use the measuring flask to receive the fluid measured with the gauge tube from part A.**
3. **After finishing the steps, read the scale of the measuring flask to check that the reading falls within the range of the specified value.**
4. **If the measured value is larger than the specified value, loosen the tube clamp and further insert tube B. If the measured value is smaller than the specified value, draw back tube B to shorten the inserted length.**
5. **Repeat steps 2. through 4. until the measured value falls within the range of the specified value.**
6. **Once the measured value falls within the range of the specified value, check that the tube clamp is clamped. Put the PTFE tube removed at tube connection line A back in place.**

Operation

Measuring method

■ Acidic method (CODA-500-A, CODA-500-C)

- **Standard**

  Set reagents A, B, C, and D in place on the reagent tray.

- **No silver nitrate used**

  Set reagents A, B, and C in place on the reagent tray.
  Set the empty bottle that comes with your CODA-500, in the position of reagent D.
  Refer to " $AgNO_3$ ADDITION " (page 94) and select [no addition].

- **Reagent cleaning function (CODA-500-C only)**

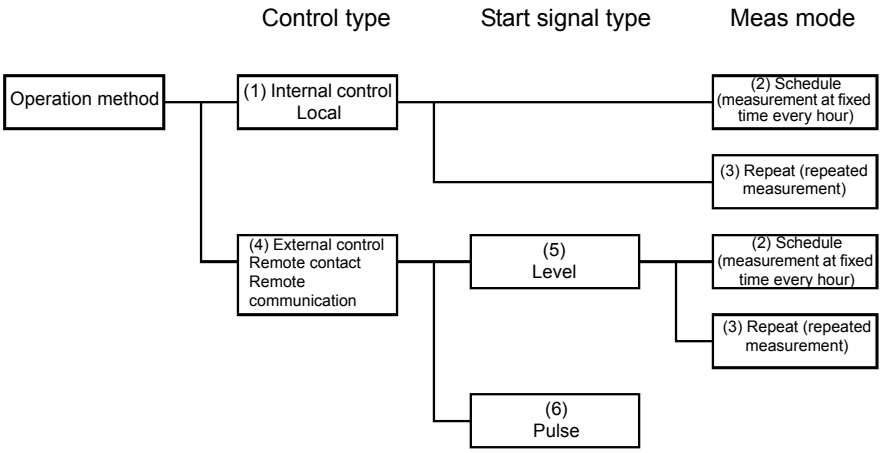
  Set reagents A, B, C, D and E in place on the reagent tray.

■ Alkaline method (CODA-500-B)

Place reagents A, B, C, and F in place on the reagent tray.

Operation method

The following operation methods are available.



(1) Internal control

Operation is controlled using the time setting in the instrument.

(2) Schedule (measurement at fixed time every hour)

Measurement is made every hour.
Measurement can be interrupted by pause, blank measurement, cleaning, or the like.
Establish a daily or weekly measurement schedule.
Measurement start time can be specified.

(3) Repeat (repeated measurement)

A measurement cycle can be selected from 1, 2, 3, 4, 6, 12, and 24 hours.
Measurement is made in the selected cycle after the initial measurement time.

(4) External control

- Remote contact
  Operation is controlled using contact input outside the instrument.
- Remote communication
  The instrument operation is controlled with communication signal input.
  For details of commands, refer to “ Modbus ” (page 190).

(5) Level

Operation occurs in the measurement mode selected by internal control while the measurement start terminal is short-circuited. When the contact is opened, the CODA-500 becomes the Standby mode after the ongoing sequence is finished.

(6) Pulse

This signal type is used to control each measurement with external input.
When a specified terminal is short-circuited, the action assigned to that terminal is started.

At initial operation

If operation is performed without calibration, the measured value is calculated using the calibration data obtained at factory.
The calibration value differs depending on the installation environment and may not be displayed correctly.
We recommend performing calibration and check the instrument operations, such as gauging sample water or reagents, before measurement.

Note

Check that the instrument is installed properly.
For details of installation, refer to the installation manual.

Reference

Refer to " Installation " (page 11), where explanations are made about installation and piping.

The water quality and total quantity control for companies that drain waste water to closed water areas, which was performed by the environment agency, requires that a conversion equation be used by a method of obtaining the correlation between the measured value by an automatic COD monitor and the measured value (by the specified measurement method) by the manual analysis specified in 17 of JIS K 0102.
The conversion equation is shown below.

$y = a + bx$

where

x: measured value by automatic COD monitor
y: converted value

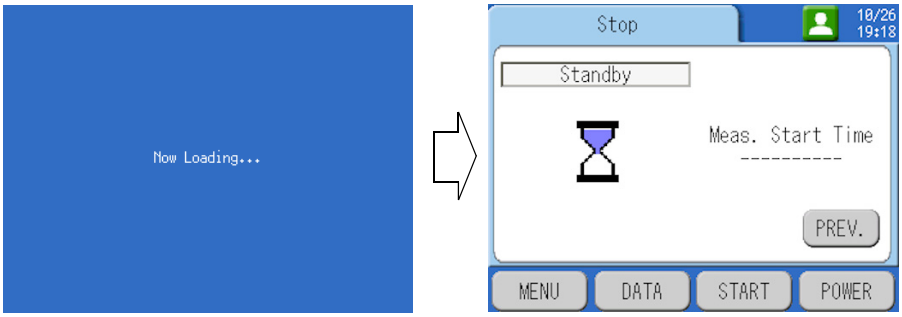
The value for y is handled as the COD value by the specified measurement method.

Reference

For entering coefficients a and b, refer to " CONV. COEF. SET " (page 64).

Starting operation

1. **Turn ON the main power switch located on the rear of the CODA-500 and also turn ON the power switch located on the front.**
   "Now Loading" will be displayed, then the MAIN screen will be displayed after a while.



Note

- **Do not remove the CF card while "Now Loading" is displayed. When the power is turned ON, the internal data is saved to the CF card.**
- **The printer is started when the power is turned ON. Noise and vibration may occur at this time, but this is normal and involves no problem.**
- **The instrument enters the warming-up mode (an alarm is issued) right after the power is turned ON. The alarm is cancelled in one minute.**

2. **Turn ON the Maint switch (refer to " Operation unit " (page 5)).**
3. **Refer to the followings to adjust the clock and change settings.**
   - " CLOCK ADJUST " (page 85)
   - " CONV. COEF. SET " (page 64)
   - " AUTO MEAS. (SCHE) SET " (page 50)
   - " AUTO CAL. SET " (page 53)/" AUTO BLANK MEAS. SET " (page 55)
   - " AUTO WASH SET " (page 56)
   - " $AgNO_3$ ADDITION " (page 94)

Reference

Be sure to complete the above settings.
Set other settings as necessary (refer to " Functions " (page 41)).

4. **Carry out calibration.**

Reference

" Calibration " (page 38)

Measurement starts after calibration is completed.

5. **Turn OFF the Maint switch.**

Stopping operation

To stop operation for 1 week maximum

1. **Turn ON the Maint switch.**
2. **Turn OFF the power switch.**

Note

Even when the stopping is for 1 week maximum, the initial value may be unstable depending on the environment.

To stop operation for more than 1 week

Note

To clean the reaction tank and the waste water line, execute “Gage Blank Tank“ and “Discharge wastes“ one or more times on the SAPARATE ACTION .

1. **Turn ON the Maint switch.**
2. **Close the valve for tap water.**
3. **Turn OFF the power switch and the main power switch.**
4. **Clean the overflow tank (optional), reaction tank and platinum electrode.**

Reference

- **“ SEPARATE ACTION ” (page 97)**
- **“ Maintaining the reaction tank ” (page 134)**
- **“ Maintaining the platinum electrode ” (page 132)**

Resuming operation

Note

When the power is turned ON, the latest value just before the power was turned OFF is displayed. To determine whether the displayed value is the latest one, check the history data loaded from the CF card. If no history data is available, no value is displayed.

After stopping operation for 1 week maximum

Follow the steps described in “ Starting operation ” (page 35).

After stopping operation for more than 1 week

1. **Open the valve for tap water.**
2. **Turn ON the power switch and the main power switch.**
3. **Clean the overflow tank (optional) and reaction tank.**

Reference

“ Maintaining the reaction tank ” (page 134)

4. **Follow the steps described in “ Starting operation ” (page 35).**

Calibration

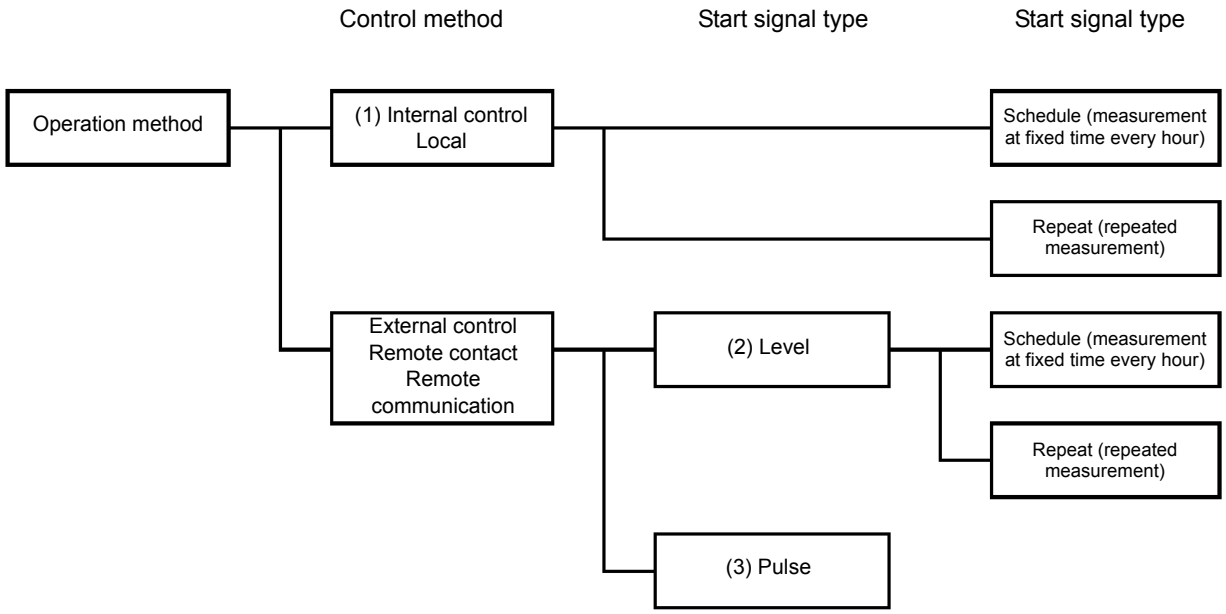
In order to previously determine the zero point and full-scale point of COD, carry out calibration. We recommend performing operation checks, such as gauging sample and reagents before performing calibration.

Calibration pattern

Calibration must be performed regularly.
For calibration, carry out span calibration and zero calibration in this order.

● Description of each calibration type

Calibration type	Description
Span calibration	10 mL of diluting water is added to 1 mL of sodium oxalate and then this solution is titrated with potassium permanganate. The resulting value of the titration is used as the calibration value. 1 mL of sodium oxalate is equivalent to 20 mgO/L of COD.
Zero calibration	COD in blank water is measured and the titration value during that measurement is used as the zero calibration value.



The following 3 calibration methods are available:

(1) When the operation mode is Local:

- Automatic calibration [refer to " AUTO CAL. SET " (page 53)]

  Set parameters on the AUTO CAL. SET screen and start operation. The operation will be interrupted by calibration at the specified intervals.

- Calibration from stop

  Press START - CAL on the MAIN screen.

- Forced calibration during operation

  Press START - CAL on the MAIN screen.

(2) When the operation method is Remote and the start signal type is Level:

- Automatic calibration [refer to " AUTO CAL. SET " (page 53)]

  Set parameters on the AUTO CAL. SET screen and start operation. The operation will be interrupted by calibration at the specified intervals.
  When the measurement start signal type is Low Level at interruption time, calibration is not performed.

- Calibration from stop [refer to " Calibration procedure " (page 40)].

  Press START - CAL on the MAIN screen and then input the calibration start signal.

- Forced calibration during operation

  When the calibration start signal is input, a reservation is made. Accordingly, the operation will be interrupted by calibration at the next starting time.

(3) When the operation mode is Remote and the start signal type is Pulse:

- Automatic calibration [refer to " AUTO CAL. SET " (page 53)]

  Set parameters on the AUTO CAL. SET screen and input the measurement start signal at the time of interruption by calibration. The operation will be interrupted by calibration. However, if no pulses are input as the measurement starting signal at the interruption time, calibration is not performed.

- Calibration from stop [refer to " Calibration procedure " (page 40)].

  Press START - CAL on the MAIN screen and then input the calibration start signal.

- Forced calibration during operation

  Input the calibration starting signal during the Standby mode. Calibration will be started.
  However, no signals are accepted during the sequence.

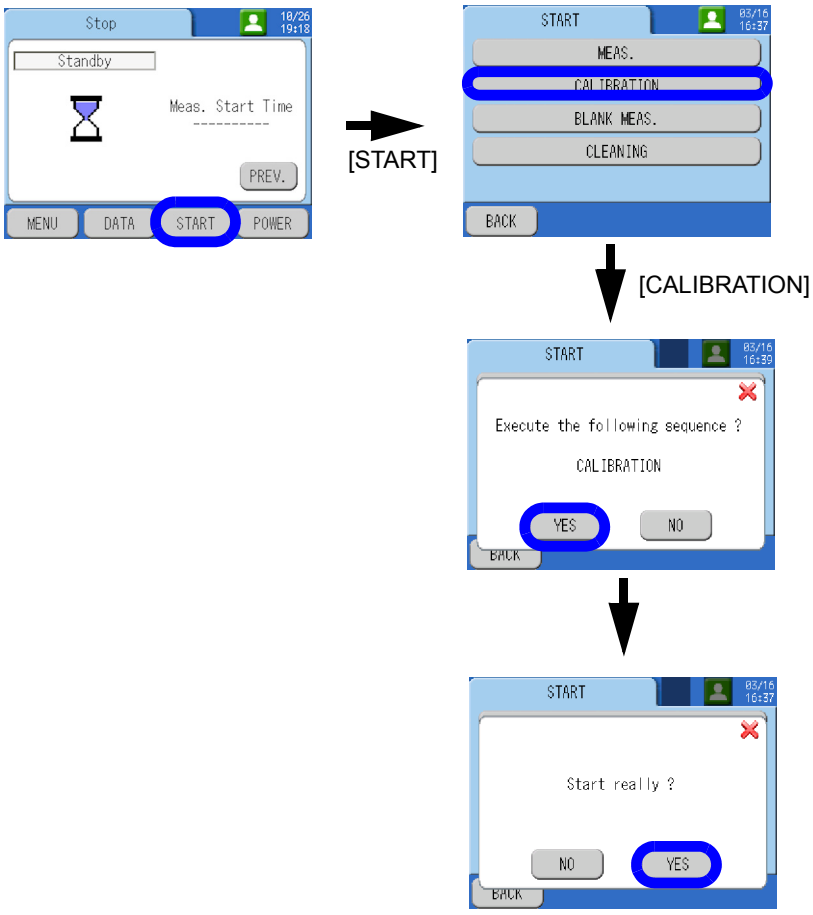
Calibration procedure

● Points to be checked before calibration

Check:

- that measurement is stopped; and
- that the quantity of each reagent is sufficient; and
- that the calibration conditions, such as cycle and counts, are set (refer to “ AUTO CAL. SET ” (page 53)).

1. **Press START on the MAIN screen.**



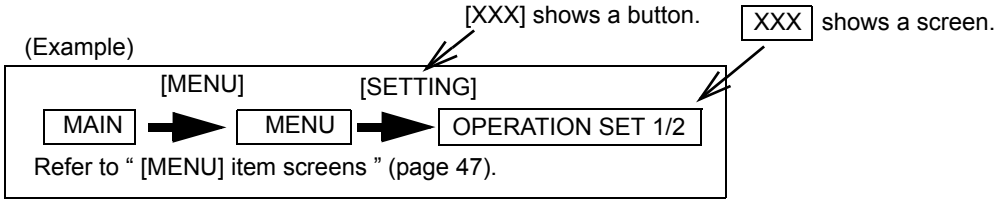
2. **Span calibration and zero calibration will be carried out automatically.**

Functions

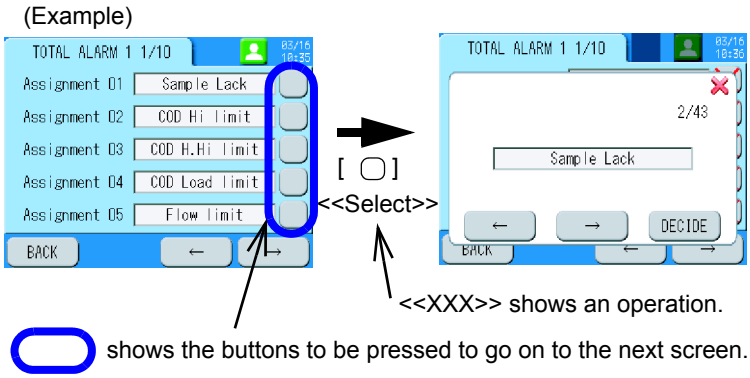
The CODA-500 has various functions. To use those functions, you need to previously set conditions.
This chapter describes the functions and the setting procedures.

How to describe operations

In this chapter, we describe the operation procedures using the following method.
Simplified flow charts are used to introduce the operation procedures to the target screen.

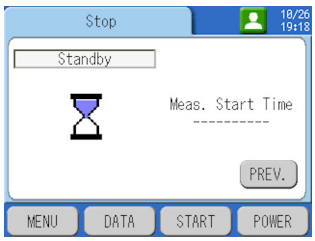


Screen images are used to instruct the operations that follows the target screen.



MAIN screen

This is the MAIN screen, which appears first after the power is turned ON.

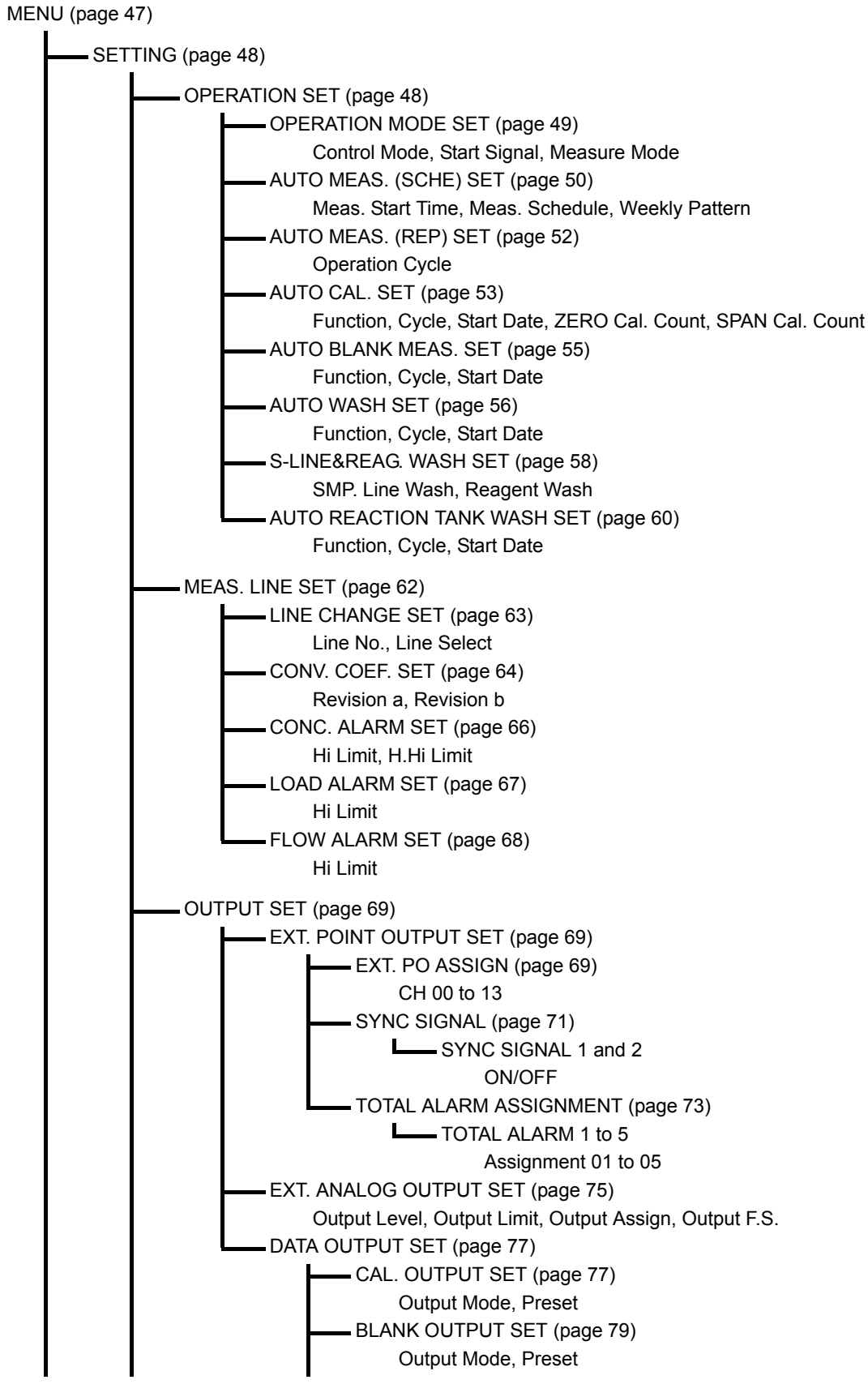


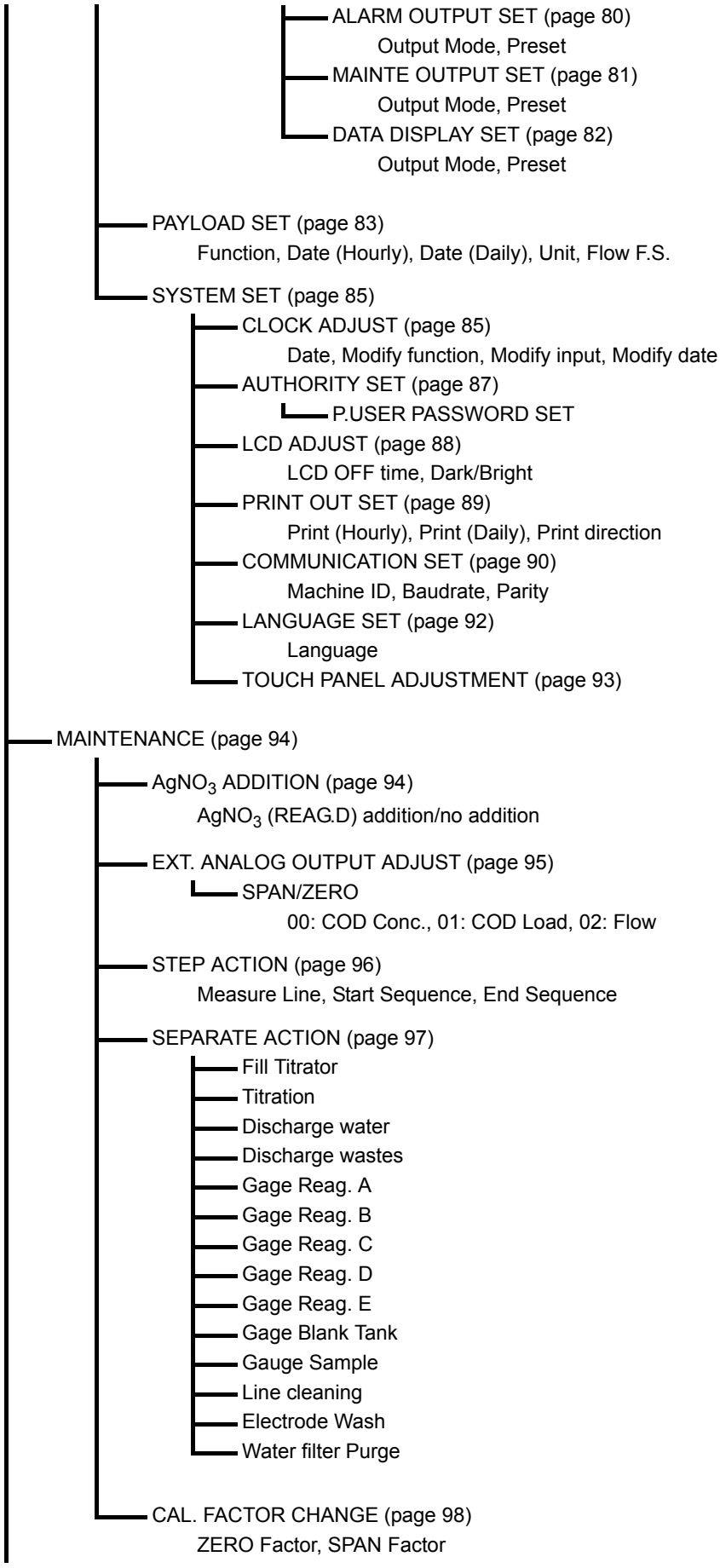
List of functions

Understand the functions and set them in accordance with the customer's requirements.

Functions		Description	Source
MENU	SETTING	Settings for acceptance and assignment of external signals and input/output during operation.	page 48
	MAINTENANCE	Adjust the instrument and configure individual settings.	page 94
	CHECK	Verify the analog input/output and contact output of the instrument.	page 99
Data	LOG DATA	Review past data as values.	page 108
	GRAPH	Review past and present data as graphs.	page 111
	CALIBRATION HISTORY	Review the calibration history.	page 120
	ALARM HISTORY	Review the warning history.	page 121
	SAVE TO USB	Save the warning history and past data to the USB flash drive.	page 122
	DATA CLEAR	Clear the settings and history.	page 125
Start	-	Manually start measurement (ordinary or blank), calibration, or cleaning.	page 126
Stop	-	Manually stop measurement (ordinary or blank), calibration, or cleaning.	page 127

Tree of functions




ALARM OUTPUT SET (page 80)
Output Mode, Preset
MAINTE OUTPUT SET (page 81)
Output Mode, Preset
DATA DISPLAY SET (page 82)
Output Mode, Preset
PAYLOAD SET (page 83)
Function, Date (Hourly), Date (Daily), Unit, Flow F.S.
SYSTEM SET (page 85)
CLOCK ADJUST (page 85)
Date, Modify function, Modify input, Modify date
AUTHORITY SET (page 87)
P.USER PASSWORD SET
LCD ADJUST (page 88)
LCD OFF time, Dark/Bright
PRINT OUT SET (page 89)
Print (Hourly), Print (Daily), Print direction
COMMUNICATION SET (page 90)
Machine ID, Baudrate, Parity
LANGUAGE SET (page 92)
Language
TOUCH PANEL ADJUSTMENT (page 93)
MAINTENANCE (page 94)
AgNO3 ADDITION (page 94)
AgNO3 (REAG.D) addition/no addition
EXT. ANALOG OUTPUT ADJUST (page 95)
SPAN/ZERO
00: COD Conc., 01: COD Load, 02: Flow
STEP ACTION (page 96)
Measure Line, Start Sequence, End Sequence
SEPARATE ACTION (page 97)
Fill Titrator
Titration
Discharge water
Discharge wastes
Gage Reag. A
Gage Reag. B
Gage Reag. C
Gage Reag. D
Gage Reag. E
Gage Blank Tank
Gauge Sample
Line cleaning
Electrode Wash
Water filter Purge
CAL. FACTOR CHANGE (page 98)
ZERO Factor, SPAN Factor

- CHECK (page 99)
  - MACHINE INFORMATION (page 99)
    - MAIN BOARD INFO./SUB BOARD INFO.
  - EXT. POINT INPUT (page 100)
  - EXT. POINT OUTPUT (page 101)
    ON/OFF of each external contact output
  - EXT. ANALOG INPUT (page 102)
  - EXT. ANALOG OUTPUT (page 103)
    00: COD Conc., 01: COD Load, 03: Flow
  - INT. ANALOG INPUT (page 104)

DATA (page 105)

- LOG DATA (page 108)
  - MEASURE VALUE (page 108)
    - Line
    - Date
    - PRINT
  - HOUR REPORT HISTORY (page 110)
    - Line
    - Date
    - PRINT
- GRAPH (page 111)
  - MEASURE VALUE (page 111)
    - SET
      Measure Line, Scale, Start Time, Period, Vertical Top, Vertical Under
  - TREND GRAPH (MEASURE VALUE) (page 113)
    - SET
      Measure Line, Scale, Vertical Top, Vertical Under
  - HOUR REPORT HISTORY (page 115)
    - SET
      Measure Line, Component, Scale, Start Time, Period, Vertical Top, Vertical Under
  - TITRATION DATA (page 117)
    - SET
      Measure Line, Component, Vertical Top, Vertical Under
  - TREND GRAPH (TITRATION) (page 119)
    - SET
      Vertical Top, Vertical Under
- CALIBRATION HISTORY (page 120)
  - PRINT
- ALARM HISTORY (page 121)
  - PRINT

- SAVE TO USB (page 122)
- DATA CLEAR (page 125)
  - Setting/Alarm History/Calibration History/Measure History/Hour Report History/Day Report History/Pulse Data

START (page 126)
- MEAS./CALIBRATION/BLANK MEAS./CLEANING

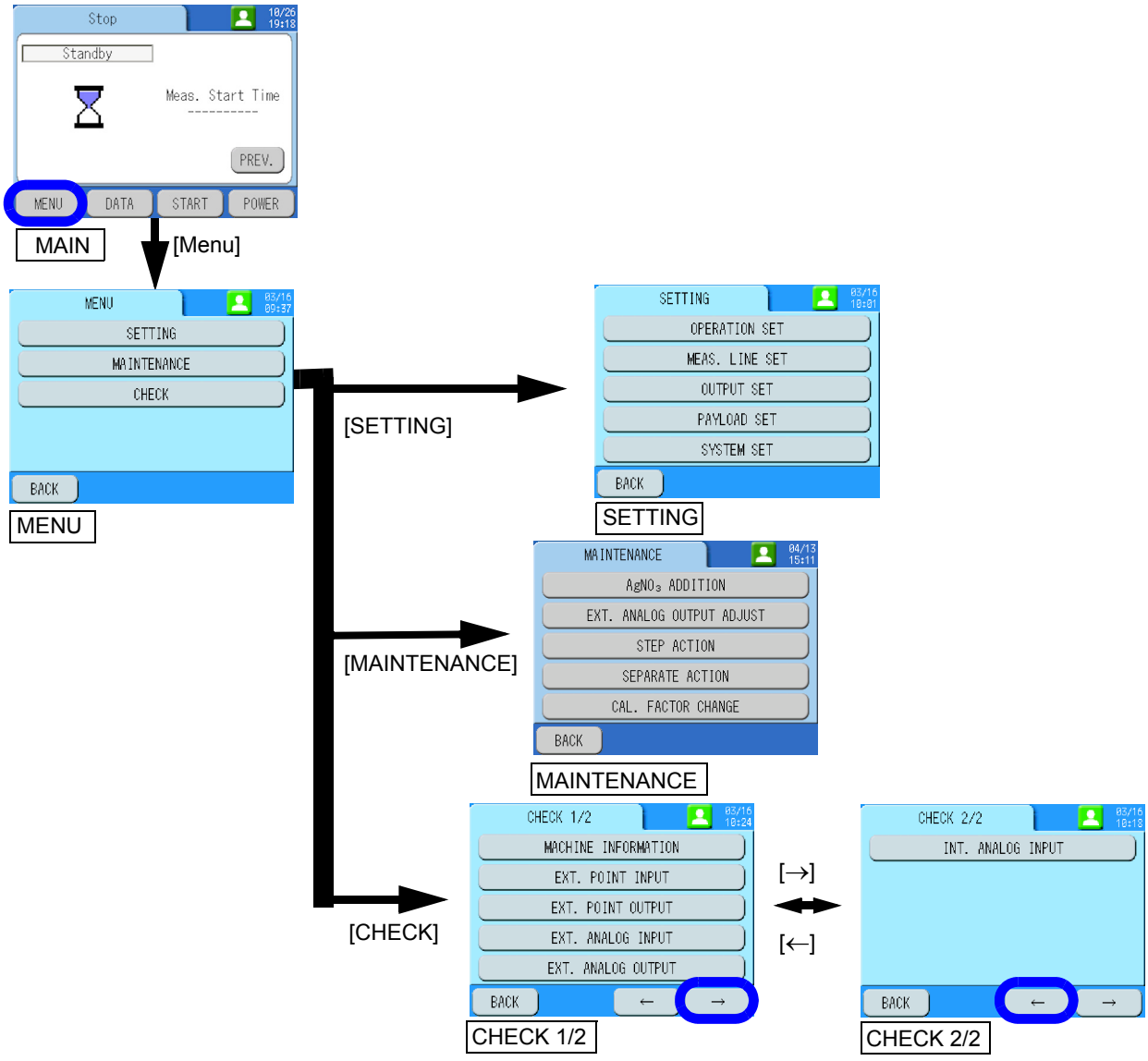
START (page 127)
- STOP RESERVE/STOP

[MENU] item screens

1. **Press [MENU] on the MAIN screen.**
   The MENU screen will be displayed.
2. **Press a button displayed on the MENU screen.**
   The screen for the selected item will be displayed.

Reference

- **“ [MENU]-[SETTING] ” (page 48)**
- **“ [MENU]-[MAINTENANCE] ” (page 94)**
- **“ [MENU]-[CHECK] ” (page 99)**



[MENU]-[SETTING]

This section describes various setting.

Item	Function	Reference
OPERATION SET	Select an operation method and establish an automatic operation schedule.	page 48
MEAS. LINE SET	Configure the settings for enabling/disabling, conversion coefficient and concentration warnings for lines.	page 62
OUTPUT SET	Set up the external point output and external analog output.	page 69
PAYLOAD SET	Configure the settings for load calculation.	page 83
SYSTEM SET	Configure the settings for clock, Authority, LCD, printout, communication, and language.	page 85

■ OPERATION SET

Select an operation method and establish an automatic operation schedule.

Item	Function	Reference
OPERATION MODE SET	Select an operation mode.	page 49
AUTO MEAS. (SCHE) SET	Configure the settings for the scheduled automatic measurement.	page 50
AUTO MEAS. (REP) SET	Configure the setting for the repeated automatic measurement.	page 52
AUTO CAL. SET	Configure the settings for the automatic calibration.	page 53
AUTO BLANK MEAS. SET	Configure the settings for automatic blank measurement.	page 55
AUTO WASH SET	Configure the settings for the intervals and starting time for automatic cleaning.	page 56

● OPERATION MODE SET

Select an operation mode.

Item	Setting range	Initial value	Description
Control Mode	Local	Local	No control
	Remote (contact)		Operation is controlled by contact input.
	Remote (communication)		Operation is controlled by communication.
Start Signal	Pulse	Pulse	Operation is started by pulse input.
	Level		Measurement is made in accordance with the MEAS. mode while a signal is being input.
Measure Mode	Schedule	Repeat	Measurement is made in accordance with the established schedule.
	Repeat		Measurement is repeated.

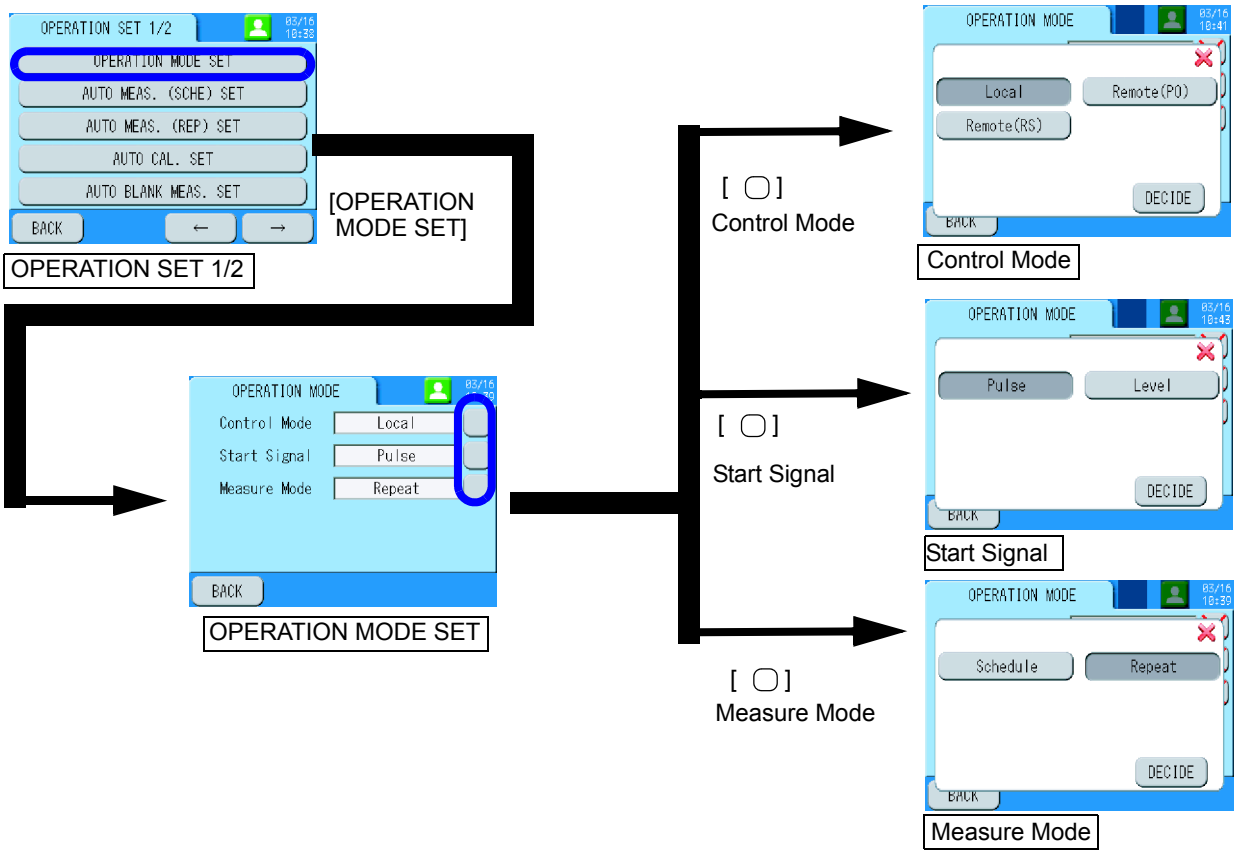
● Operation procedures

[MENU] [SETTING] [OPEATION SET]

MAIN → MENU → SETTING → OPERATION SET 1/2

Refer to “ [MENU] item screens ” (page 47).

1. **Press [OPERATION MODE SET] on the OPERATION SET 1/2 screen.**
   The OPERATION MODE SET screen will be displayed.
2. **Set the items.**



● AUTO MEAS. (SCHE) SET

Configure the settings for the scheduled automatic measurement.

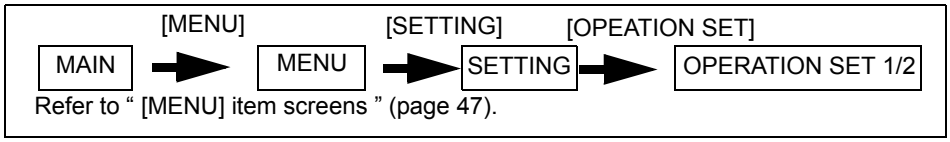
Item	Setting range	Initial value	Description
Meas. Start Time	0 min to 59 min	0 min	Specify the minute to start measurement.
Meas. Schedule	Patterns 1 to 7	L1 to L2	Select one from L1 measurement, pause, blank measurement, cleaning, and L2 measurement.
Weekly Pattern	Day of week	-	Measurement is made in accordance with the measurement schedule.

* L2 is only selectable for the 2-sample line type.

Note

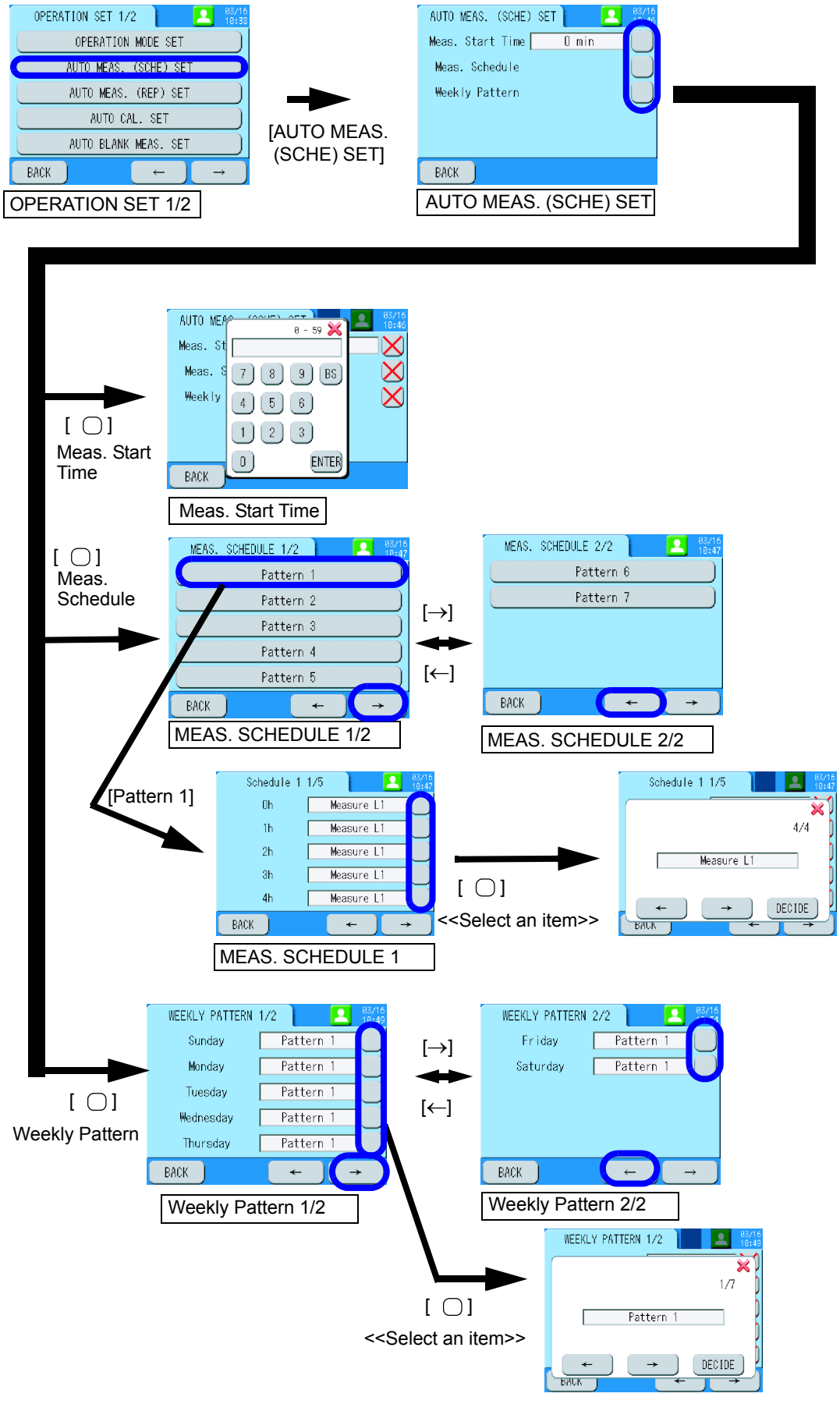
If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

● Operation procedures



Refer to " [MENU] item screens " (page 47).

1. **Press [AUTO MEAS. (SCHE) SET] on the OPERATION SET 1/2 screen.**
   The AUTO MEAS. (SCHE) SET screen will be displayed.
2. **Set the items on the AUTO MEAS. (SCHE) SET screen.**
3. **Set the items for scheduled automatic measurement.**


OPERATION SET 1/2
OPERATION MODE SET
AUTO MEAS. (SCHE) SET
AUTO MEAS. (REP) SET
AUTO CAL. SET
AUTO BLANK MEAS. SET
BACK
[AUTO MEAS. (SCHE) SET]
AUTO MEAS. (SCHE) SET
Meas. Start Time
0 min
Meas. Schedule
Weekly Pattern
BACK
OPERATION SET 1/2
AUTO MEAS. (SCHE) SET
[ ]
Meas. Start Time
0 - 59
7 8 9 BS
4 5 6
1 2 3
0 ENTER
BACK
Meas. Start Time
[ ]
Meas. Schedule
MEAS. SCHEDULE 1/2
Pattern 1
Pattern 2
Pattern 3
Pattern 4
Pattern 5
BACK
[→]
[←]
MEAS. SCHEDULE 2/2
Pattern 6
Pattern 7
BACK
MEAS. SCHEDULE 1/2
MEAS. SCHEDULE 2/2
[Pattern 1]
Schedule 1 1/5
0h Measure L1
1h Measure L1
2h Measure L1
3h Measure L1
4h Measure L1
BACK
[ ]
<<Select an item>>
Schedule 1 1/5
4/4
Measure L1
DECIDE
BACK
MEAS. SCHEDULE 1
[ ]
Weekly Pattern
WEEKLY PATTERN 1/2
Sunday Pattern 1
Monday Pattern 1
Tuesday Pattern 1
Wednesday Pattern 1
Thursday Pattern 1
BACK
[→]
[←]
WEEKLY PATTERN 2/2
Friday Pattern 1
Saturday Pattern 1
BACK
Weekly Pattern 1/2
Weekly Pattern 2/2
[ ]
<<Select an item>>
WEEKLY PATTERN 1/2
1/7
Pattern 1
DECIDE
BACK

● AUTO MEAS. (REP) SET

Configure the setting for the repeated automatic measurement.

Item	Setting range	Initial value	Description
Operation Cycle	1 hour 2 hours 3 hours 4 hours 6 hours 12 hours 24 hours	1 hour	Measurement is made at the selected intervals.

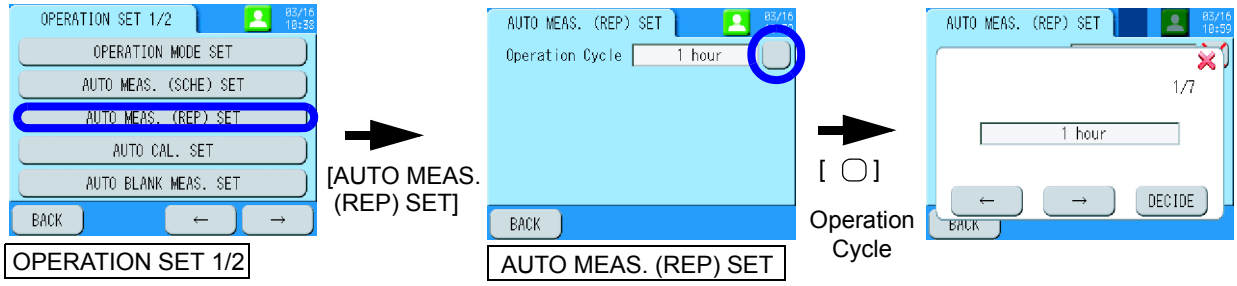
● Operation procedures

[MENU] [SETTING] [OPEATION SET]

MAIN → MENU → SETTING → OPERATION SET 1/2

Refer to “ [MENU] item screens ” (page 47).

1. **Press [AUTO MEAS. (REP) SET] on the OPERATION SET 1/2 screen.**
   The AUTO MEAS. (REP) SET screen will be displayed.
2. **Set the items for repeated automatic measurement.**



OPERATION SET 1/2 → [AUTO MEAS. (REP) SET] → AUTO MEAS. (REP) SET → [ ] Operation Cycle

● AUTO CAL. SET

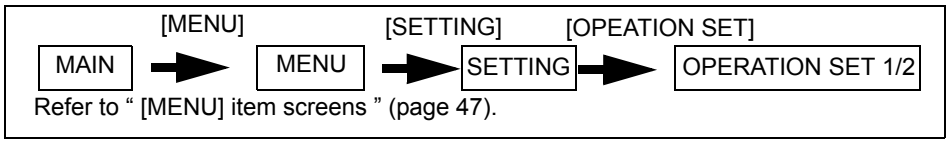
Configure the settings for the automatic calibration.

Item	Setting range	Initial value	Description
Function	ON OFF	OFF	Select enabling or disabling the setting.
Cycle	1 day to 31 days	1 day	Set automatic calibration intervals.
Start Date	2009/01/01 00 to 2099/12/31 23	2009/01/01 00	Set the initial automatic calibration date and time.
ZERO Cal. Count	1 to 10	3	Set the number of zero calibrations that are performed at a time. If you enter 3, 3 calibration results are averaged and the averaged result is used for the zero calibration.
SPAN Cal. Count	1 to 10	3	Set the number of span calibrations that are performed at a time. If you enter 3, 3 calibration results are averaged and the averaged result is used for the span calibration.

Note

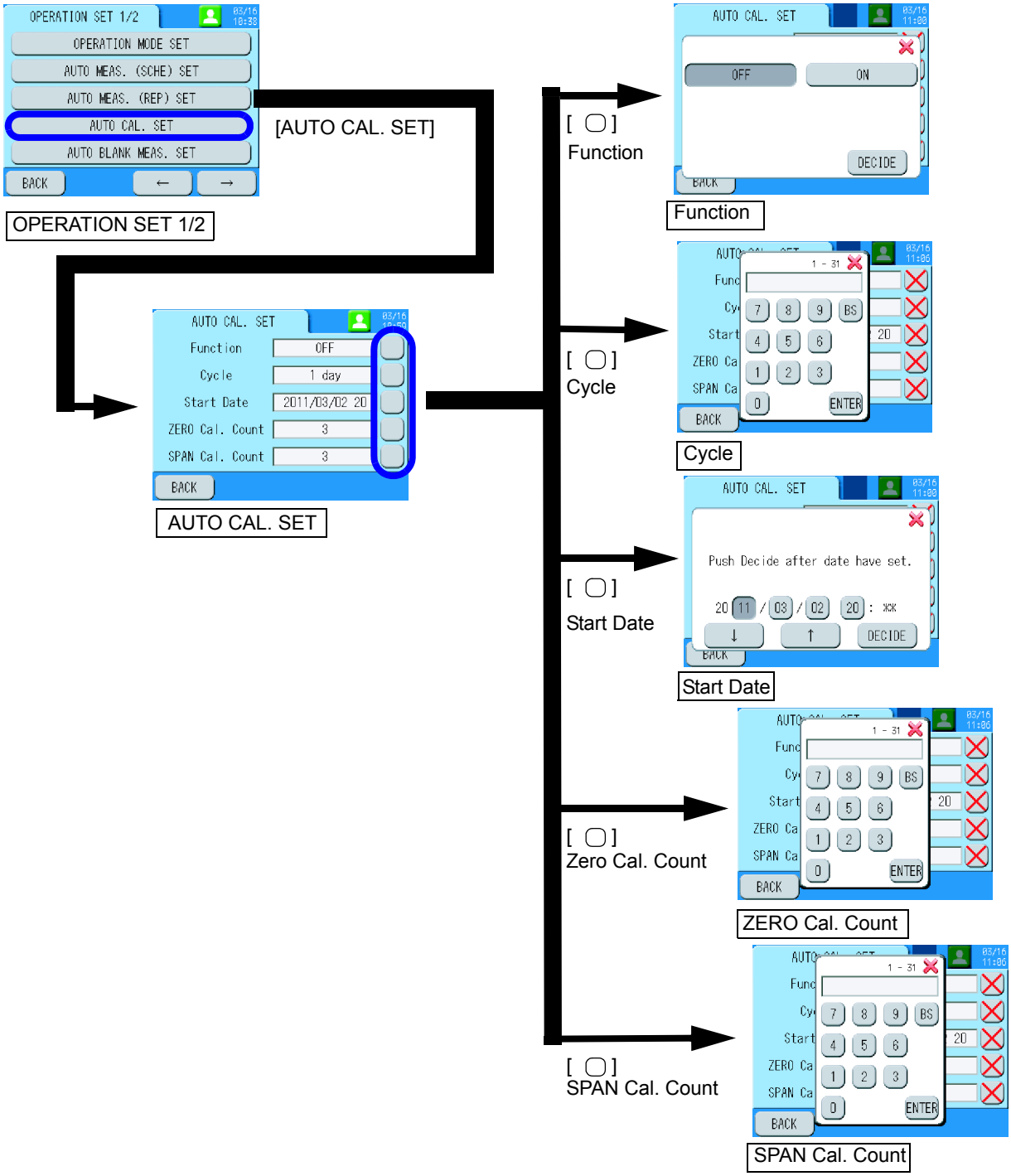
If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

● Operation procedures



Refer to “ [MENU] item screens ” (page 47).

1. **Press [AUTO CAL. SET] on the OPERATION SET 1/2 screen.**
   The AUTO CAL. SET screen will be displayed.
2. **Set the items for automatic calibration.**


OPERATION SET 1/2
OPERATION MODE SET
AUTO MEAS. (SCHE) SET
AUTO MEAS. (REP) SET
AUTO CAL. SET
AUTO BLANK MEAS. SET
BACK
[AUTO CAL. SET]
OPERATION SET 1/2
AUTO CAL. SET
Function OFF
Cycle 1 day
Start Date 2011/03/02 20
ZERO Cal. Count 3
SPAN Cal. Count 3
BACK
AUTO CAL. SET
[ ]
Function
AUTO CAL. SET
OFF
ON
DECIDE
BACK
Function
[ ]
Cycle
Cycle
[ ]
Start Date
AUTO CAL. SET
Push Decide after date have set.
20 11 / 03 / 02 20 : xx
DECIDE
BACK
Start Date
[ ]
Zero Cal. Count
ZERO Cal. Count
[ ]
SPAN Cal. Count
SPAN Cal. Count

● AUTO BLANK MEAS. SET

Configure the settings for automatic blank measurement.

Item	Setting range	Initial value	Description
Function	ON OFF	OFF	Select enabling or disabling the setting.
Cycle	1 hour to 999 hours	24 hours	Set automatic blank measurement intervals.
Start Date	2009/01/01 00 to 2099/12/31 23	2009/01/01 00	Set the date and time for the initial automatic blank measurement.

Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

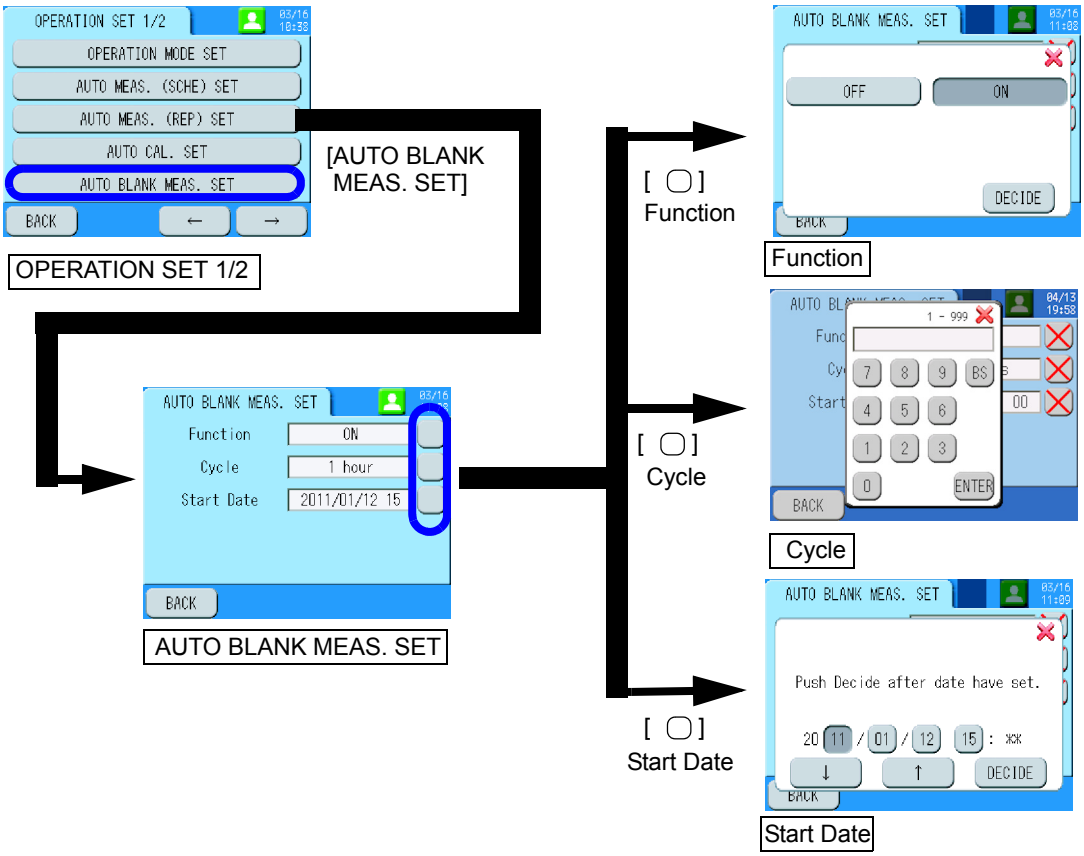
● Operation procedures

[MENU] [SETTING] [OPEATION SET]

MAIN → MENU → SETTING → OPERATION SET 1/2

Refer to “ [MENU] item screens ” (page 47).

1. **Press [AUTO BLANK MEAS. SET] on the OPERATION SET 1/2 screen.**
   The AUTO BLANK MEAS. SET screen will be displayed.
2. **Set the items for automatic blank measurement.**



● AUTO WASH SET

Configure the settings for the intervals and starting time for automatic cleaning.

Tip

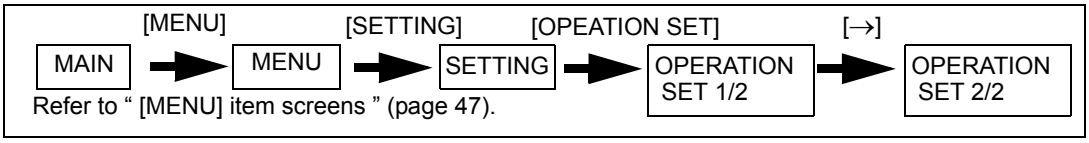
This operation carries out the sampling line cleaning and the electrolytic cleaning on the electrode surface.
When cleaning the sampling line, use the blank water for the standard type, and use the reagent for the reagent line cleaning type.
When a lot of dirt accumulates in the sampling line and the electrode due to long-term use of CODA-500, it may affect the accuracy of the indicated value and measuring tube level detection. By setting periodical AUTO WASH, continuously stable measurements can be performed. Set the automatic cleaning cycle according to the customer's usage environment.

Item	Setting range		Initial value	Description
Function	ON	OFF	OFF	Select enabling or disabling the setting.
Cycle	1 hour to 999 hours		12 hours	Set automatic cleaning intervals.
Start Date	2009/01/01 00 to 2099/12/31 23		2009/01/01 00	Set the date and time for the initial automatic cleaning.

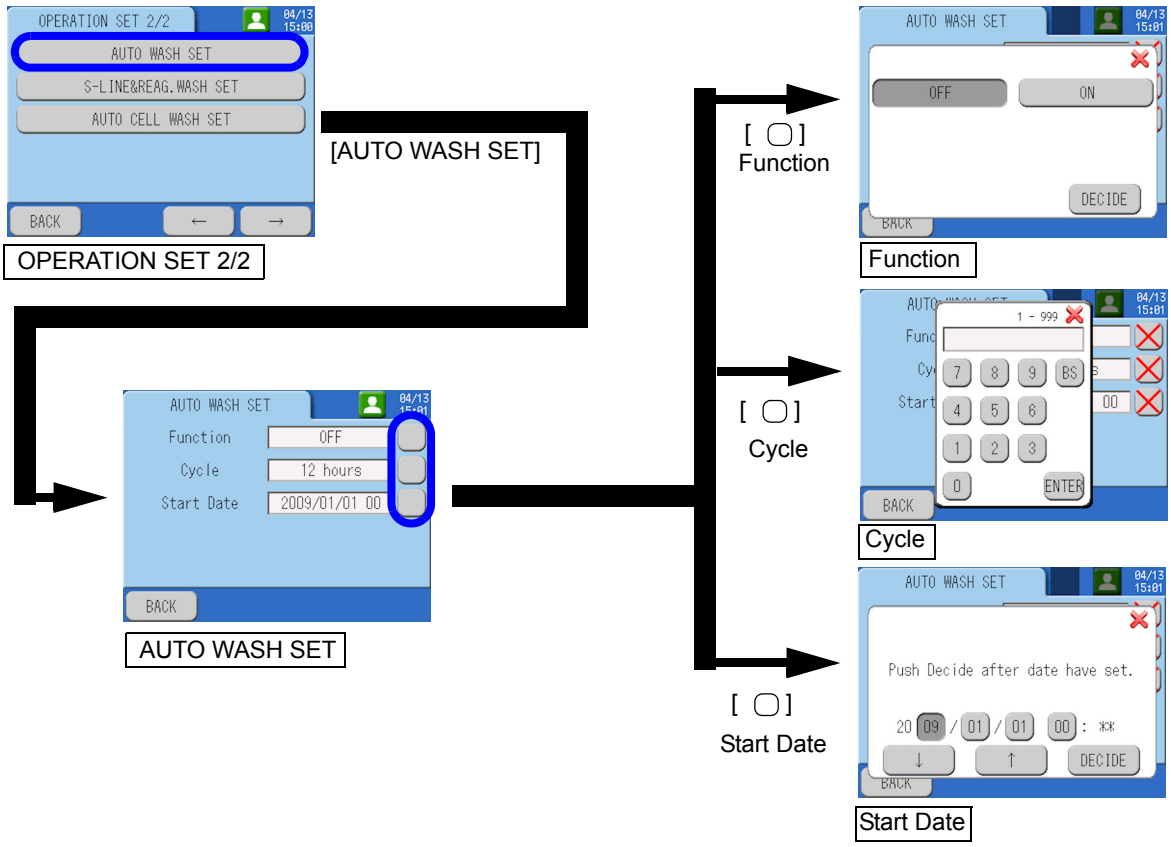
Note

- **Automatic cleaning takes one hour, and measurements cannot be performed during automatic cleaning.**
- **If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.**

● Operation procedures



1. **Press [AUTO WASH SET] on the OPERATION SET 2/2 screen.**
   The AUTO WASH SET screen will be displayed.
2. **Set the intervals and start time for automatic cleaning.**


OPERATION SET 2/2
AUTO WASH SET
S-LINE&REAG.WASH SET
AUTO CELL WASH SET
BACK
OPERATION SET 2/2
[AUTO WASH SET]
AUTO WASH SET
Function
OFF
Cycle
12 hours
Start Date
2009/01/01 00
BACK
AUTO WASH SET
[ ]
Function
OFF
ON
DECIDE
Function
[ ]
Cycle
1 - 999
7
8
9
BS
4
5
6
1
2
3
0
ENTER
BACK
Cycle
[ ]
Start Date
AUTO WASH SET
Push Decide after date have set.
20 09 / 01 / 01 00 : **
DECIDE
Start Date

SMP. LINE WASH SET

Configure the settings for sampling line cleaning.

Tip

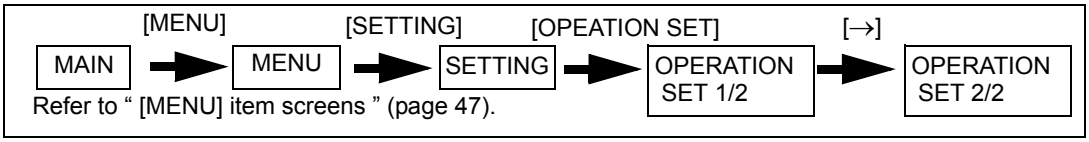
Depending on the sample condition, a lot of dirt accumulates on inner surface of sample gauge. In that case, setting SMP. Line Wash to ON is recommended. This function conducts intensive cleaning of the sample gauge. As the cleaning is conducted in parallel with each measurement, the lack of measurement does not occur.

Item	Setting range		Initial value	Description
Function	ON	OFF	OFF	Select ON/OFF of Smp. Line Wash.

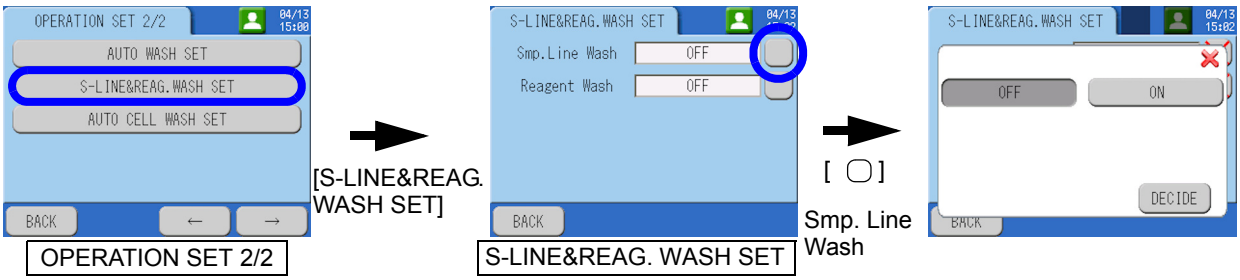
Note

- **If the setting is ON, the blank water consumption increases 125 mL per each measurement when the measurement range is 0 mgO/L to 20 mgO/L, 155 mL per each measurement when the measurement range is out of above. For the deionized water tank type, the replacement interval of the tank becomes shorter. (Refer to " Replacement interval of deionized water tank (for deionized water tank type) " (page 15).)**
- **This function only conducts the cleaning of sample gauge line. It does not conduct cleaning other lines or an electrode, reagent cleaning. If auto cleaning is necessary, use " AUTO WASH SET " (page 56).**
- **This function can extend the maintenance interval of sample gauge, but dirt may adhere to the sample gauge depending on the sample type. Even if this function is used, performing periodical cleaning of sample gauge, about once one month, is recommended for stable operation. Refer to " Maintaining the sample gauge " (page 150).**

Operation procedures



1. **Press [S-LINE&REAG. WASH SET] on the OPERATION SET 2/2 screen.**
   The S-LINE&REAG. WASH SET screen will be displayed.
2. **Set the sampling line cleaning ON/OFF.**



● REAGENT WASH SET (CODA-500-C only)

Configure the settings for reagent cleaning.
Reagent Wash function can be used only in CODA-500-C.

Tip

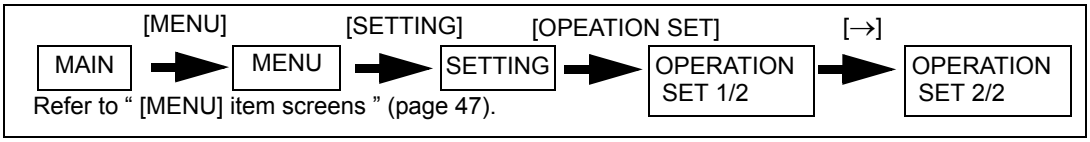
Depending on the sample condition, a lot of silver chloride accumulates on inner surface of reaction tank. In that case, setting Reagent Wash to ON is recommended. This function conducts intensive dissolution of silver chloride using reagent E. As the washing is conducted during each measurement, the lack of measurement does not occur.

Item	Setting range		Initial value	Description
Function	ON	OFF	ON	Select ON/OFF of Reagent Wash.

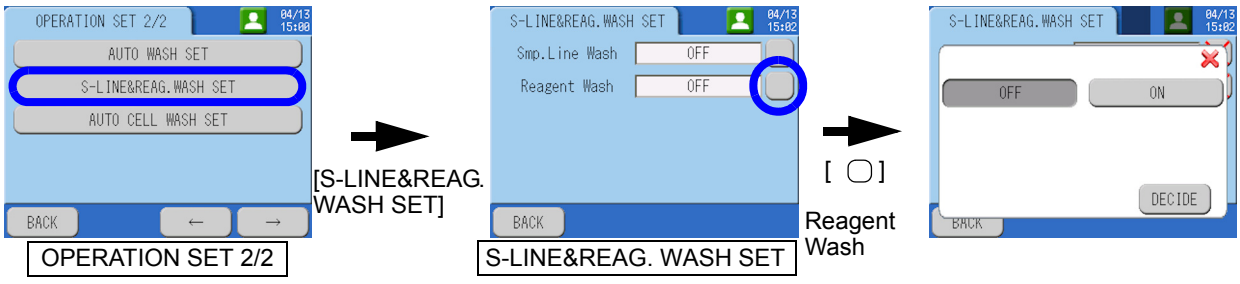
Note

- **If the setting is ON, the reagent E consumption increases 2 mL per each measurement regardless of the range.**
- **This function only conducts the washing of reaction tank.**
- **This function can extend the maintenance interval of reaction tank, but silver chloride may adhere to the reaction tank depending on the sample type. Even if this function is used, performing periodical cleaning of the reaction tank, about once one month, is recommended for stable operation. Refer to “ Maintaining the reaction tank ” (page 134).**

● Operation procedures



1. **Press [S-LINE&REAG. WASH SET] on the OPERATION SET 2/2 screen.**
   The S-LINE&REAG. WASH SET screen will be displayed.
2. **Set the reagent cleaning ON/OFF.**



● AUTO CELL WASH SET

Configure the settings for the cycle and start time of the automatic reaction tank cleaning.

Tip

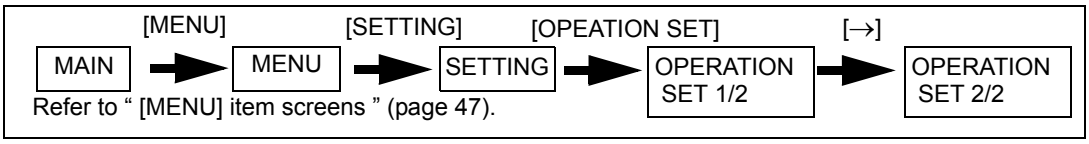
The automatic reaction tank cleaning is the function of removing oxide dirt in the reaction tank. Reagent B and Reagent C are used as cleaning solutions by pouring them into the reaction tank. Oxide dirt may accumulate in the reaction tank due to long-term use, or in a short period depending on samples. In this case, an indicative value may be affected, or a zero calibration error may occur. By setting periodical automatic reaction tank cleaning, continuously stable measurements can be performed. Set a cleaning cycle according to the customer's usage environment.

Item	Setting range		Initial value	Description
Function	ON	OFF	OFF	Select enabling or disabling the setting.
Cycle	1 hour to 999 hours		12 hours	Set automatic reaction tank cleaning intervals.
Start Date	2009/01/01 00 to 2099/12/31 23		2009/01/01 00	Set the date and time for the initial automatic cleaning.

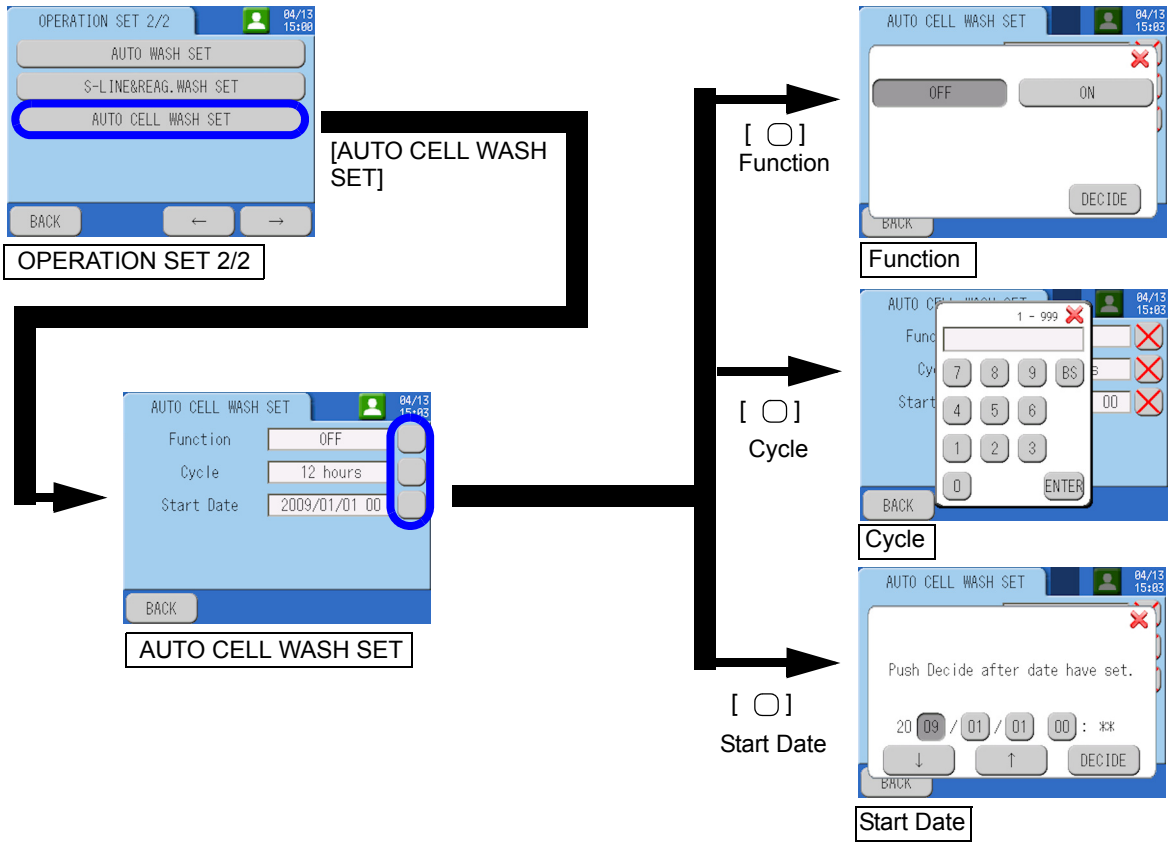
Note

- **The automatic reaction tank cleaning takes approx. one hour. Measurements cannot be performed for one hour during automatic reaction tank cleaning.**
- **If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.**
- **The amount of use of Reagent B is 18 mL. If Reagent B is used in a cycle of once a week, a replacing cycle for the reagent tank is usually changed from 40 days (target) to 36 days (target).**
- **The amount of use of Reagent C is 2 mL. If Reagent C is used in a cycle of once a week, a replacing cycle for the reagent tank is usually changed from 40 days (target) to 39 days (target).**

● Operation procedures



1. **Press [AUTO CELL WASH SET] on the OPERATION SET 2/2 screen.**
   The AUTO CELL WASH SET screen will be displayed.
2. **Set the cycle and start time for the automatic reaction tank cleaning.**


OPERATION SET 2/2
AUTO WASH SET
S-LINE&REAG.WASH SET
AUTO CELL WASH SET
BACK
[AUTO CELL WASH SET]
OPERATION SET 2/2
AUTO CELL WASH SET
Function
OFF
Cycle
12 hours
Start Date
2009/01/01 00
BACK
AUTO CELL WASH SET
[ ]
Function
[ ]
Cycle
[ ]
Start Date
AUTO CELL WASH SET
OFF
ON
DECIDE
Function
1 - 999
7
8
9
BS
4
5
6
1
2
3
0
ENTER
Cycle
Push Decide after date have set.
20 09 / 01 / 01 00 : **
DECIDE
Start Date

MEAS. LINE SET

Configure the settings for enabling/disabling, conversion coefficient and concentration warnings for lines.

Item	Function	Reference
LINE CHANGE SET	Configure the settings for assignment of measurement lines.	page 63
CONV. COEF. SET	Configure the settings for conversion coefficients.	page 64
CONC. ALARM SET	Configure the settings for COD concentration warning values.	page 66
LOAD ALARM SET	Configure the setting for COD load warning value.	page 67
FLOW ALARM SET	Configure the setting for flow rate warning value.	page 68

● LINE CHANGE SET

Configure the settings for assignment of measurement lines.

Item	Setting range		Initial value	Description
Line No. (L1/L2)	1 to 99		1	Select a sample line used for the L1 line.
Line Select (L1/L2)	1 to 99	Inactive	Inactive	Set for enabling or disabling for the L1 line.

* L2 is only selectable for the 2-sample line type.

Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

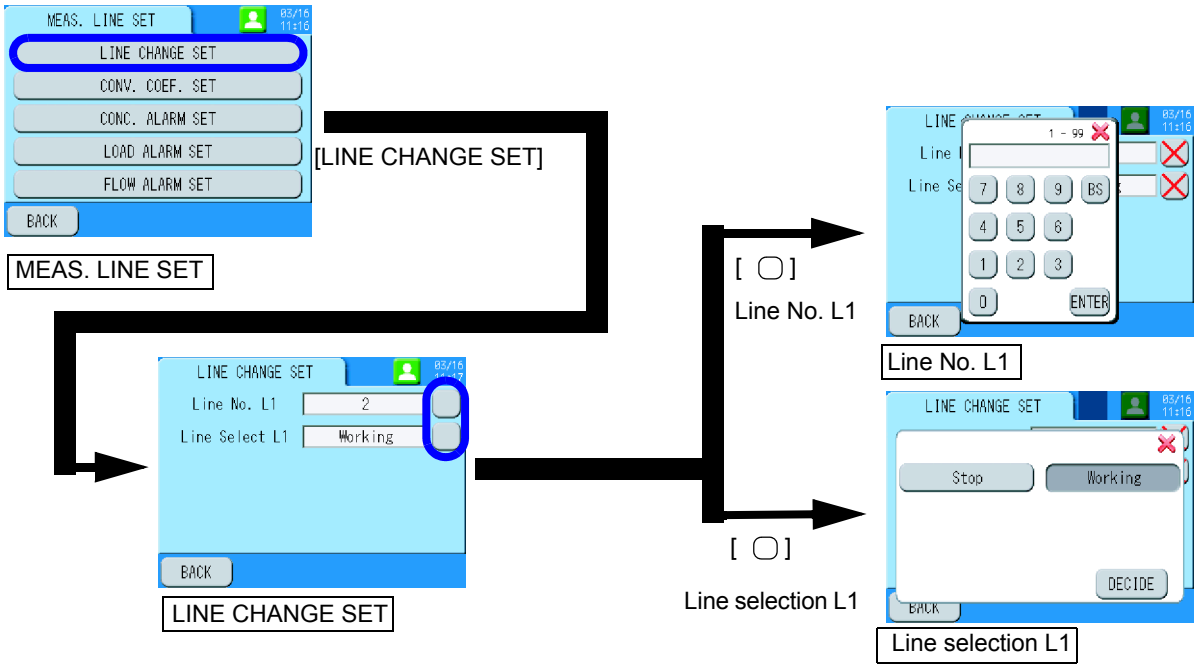
● Operation procedures

[MENU] [SETTING] [MEAS. LINE SET]

MAIN → MENU → SETTING → MEAS. LINE SET

Refer to “ [MENU] item screens ” (page 47).

1. **Press [LINE CHANGE SET] on the MEAS. LINE SET screen.**
   The LINE CHANGE SET screen will be displayed.
2. **Set the items for assignment of measurement lines.**



● CONV. COEF. SET

Configure the settings for conversion coefficients.

Item	Setting range	Initial value	Description
Revision a (L1/L2)	−999.9 to 999.9	0.0000	Specify a conversion coefficient (intercept).
Revision b (L1/L2)	0.0000 to 9999	1.000	Specify a conversion coefficient (slope).

* L2 is only selectable for the 2-sample line type.

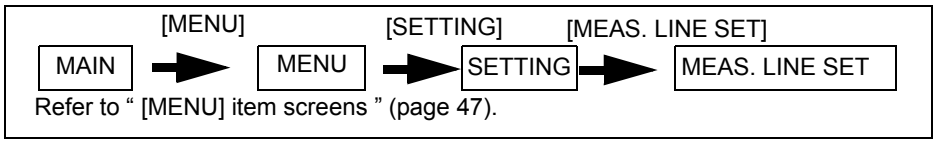
Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

【The digit limit for number setting】

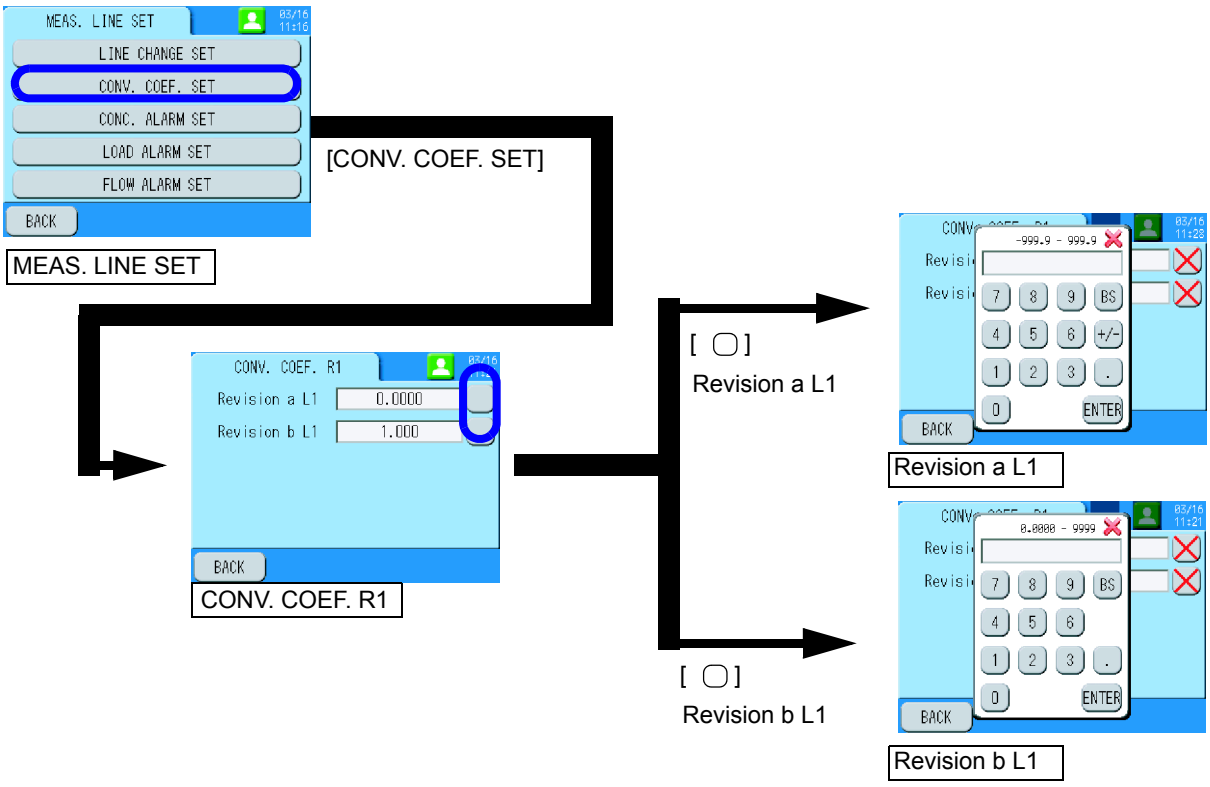
0≦	Absdute value of Revision parameter<	1: Display up to 4 decimal places
1≦	Absdute value of Revision parameter<	10: Display up to 3 decimal places
10≦	Absdute value of Revision parameter<	100: Display up to 2 decimal places
100≦	Absdute value of Revision parameter<	1000: Display up to 1 decimal place
1000≦	Absdute value of Revision parameter<	10000: No decimal point display.

● Operation procedures



Refer to “ [MENU] item screens ” (page 47).

1. **Press [CONV. COEF. SET] on the MEAS. LINE SET screen.**
   The CONV. COEF. SET screen will be displayed.
2. **Set the coefficients.**


MEAS. LINE SET
LINE CHANGE SET
CONV. COEF. SET
CONC. ALARM SET
LOAD ALARM SET
FLOW ALARM SET
BACK
MEAS. LINE SET
[CONV. COEF. SET]
CONV. COEF. R1
Revision a L1
0.0000
Revision b L1
1.000
BACK
CONV. COEF. R1
[ ]
Revision a L1
-999.9 - 999.9
7 8 9 BS
4 5 6 +/-
1 2 3 .
0 ENTER
BACK
Revision a L1
[ ]
Revision b L1
0.0000 - 9999
7 8 9 BS
4 5 6
1 2 3 .
0 ENTER
BACK
Revision b L1

● CONC. ALARM SET

Configure the settings for COD concentration warning values.

Item	Setting range	Initial value	Description
Hi Limit (L1/L2)	0.0000 mg/L to 2000 mg/L	0.0000 mg/L	Specify an upper limit warning value for COD concentration.
H.Hi Limit (L1/L2)	0.0000 mg/L to 2000 mg/L	0.0000 mg/L	Specify a superior upper limit warning value for COD concentration.

* L2 is only selectable for the 2-sample line type.

Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

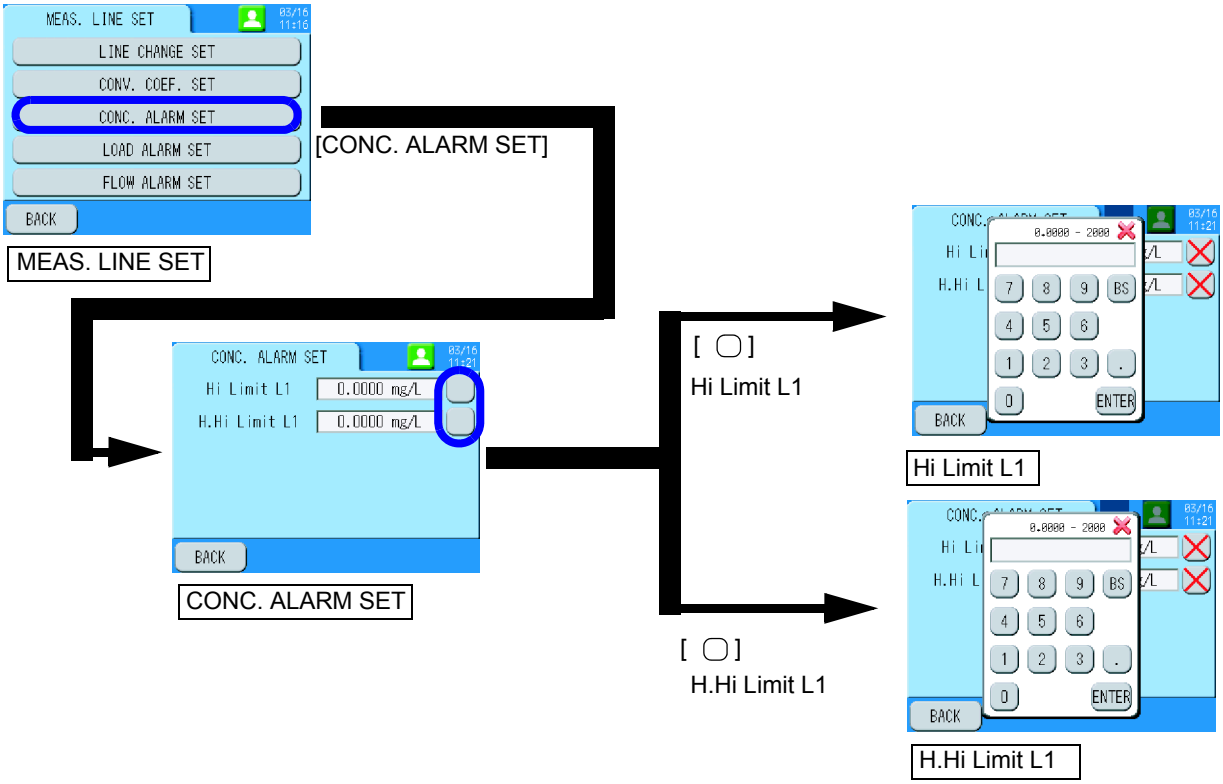
● Operation procedures

[MENU] [SETTING] [MEAS. LINE SET]

MAIN → MENU → SETTING → MEAS. LINE SET

Refer to “ [MENU] item screens ” (page 47).

1. **Press [CONC. ALARM SET] on the MEAS. LINE SET screen.**
   The CONC. ALARM SET screen will be displayed.
2. **Set the COD concentration warning values.**



● LOAD ALARM SET

Configure the setting for COD load warning value.

Item	Setting range	Initial value	Description
Hi Limit (L1/L2)	0.00 kg/d to 9999999 kg/d	0.00 kg/d	Specify a warning value for load (= COD concentration × flow rate).

* L2 is only selectable for the 2-sample line type.

Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

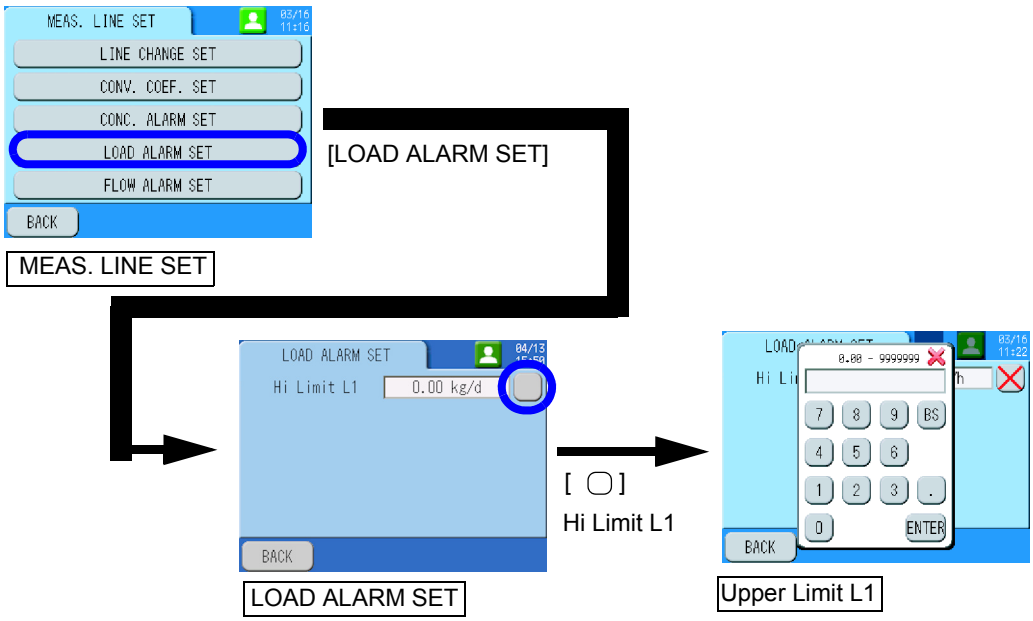
● Operation procedures

[MENU] [SETTING] [MEAS. LINE SET]

MAIN → MENU → SETTING → MEAS. LINE SET

Refer to " [MENU] item screens " (page 47).

1. **Press [LOAD ALARM SET] on the MEAS. LINE SET screen.**
   The LOAD ALARM SET screen will be displayed.
2. **Set the COD load warning value.**



● FLOW ALARM SET

Configure the setting for flow rate warning value.

Item	Setting range	Initial value	Description
Hi Limit (L1/L2)	0.00 m^3/d to 9999999 m^3/d	0.00 m^3/d	Specify a warning value for flow rate.

* L2 is only selectable for the 2-sample line type.

Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

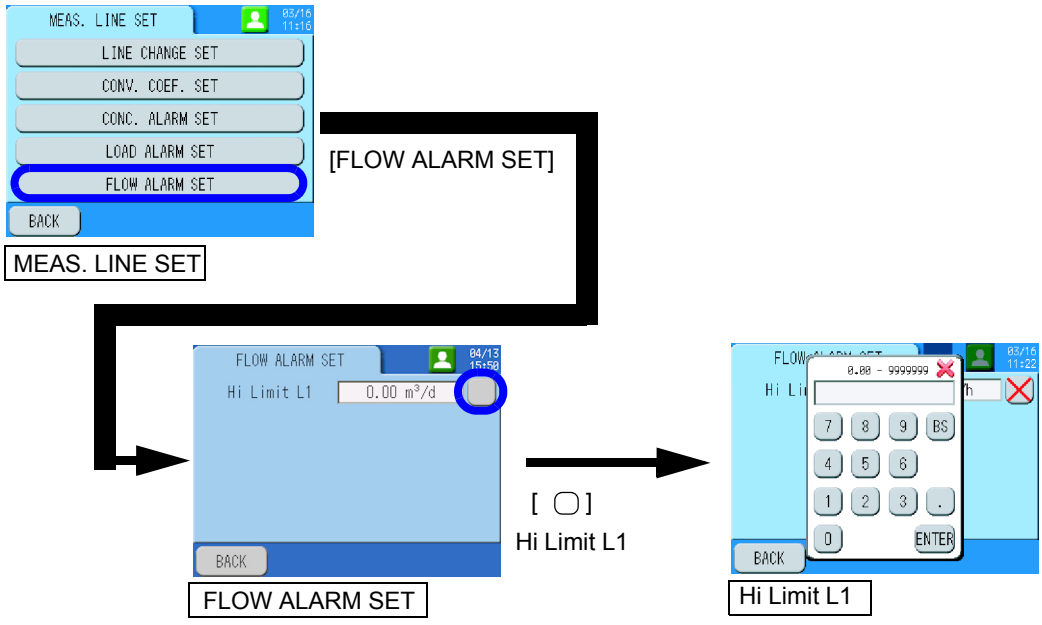
● Operation procedures

[MENU] [SETTING] [MEAS. LINE SET]

MAIN → MENU → SETTING → MEAS. LINE SET

Refer to " [MENU] item screens " (page 47).

1. **Press [FLOW ALARM SET] setting on the MEAS. LINE SET screen.**
   The FLOW ALARM SET screen will be displayed.
2. **Set the flow rate warning value.**



■ OUTPUT SET

Set up the external point output and external analog output.

Item	Function	Reference
EXT. POINT OUTPUT SET	Configure the settings for external contact output.	page 69
EXT. ANALOG OUTPUT	Configure the settings for analog output.	page 75
DATA OUTPUT SET	Configure the settings for data output.	page 77

● EXT. POINT OUTPUT SET

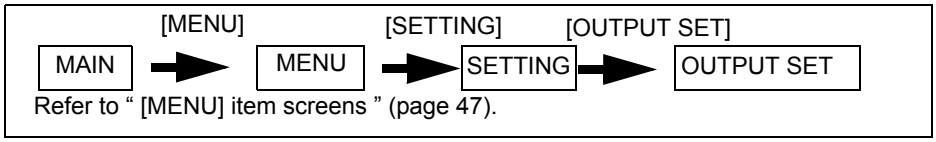
Configure the settings for external contact outputs.

Item	Function	Reference
EXT. PO ASSIGN	Configure the settings for assignment of contact outputs.	page 69
SYNC SIGNAL	Configure the settings for synchronous signals.	page 71
TOTAL ALARM ASSIGNMENT	Configure the settings for total alarm assignment.	page 73

● EXT. PO ASSIGN

For the setting details, refer to " Contact output " (page 182).

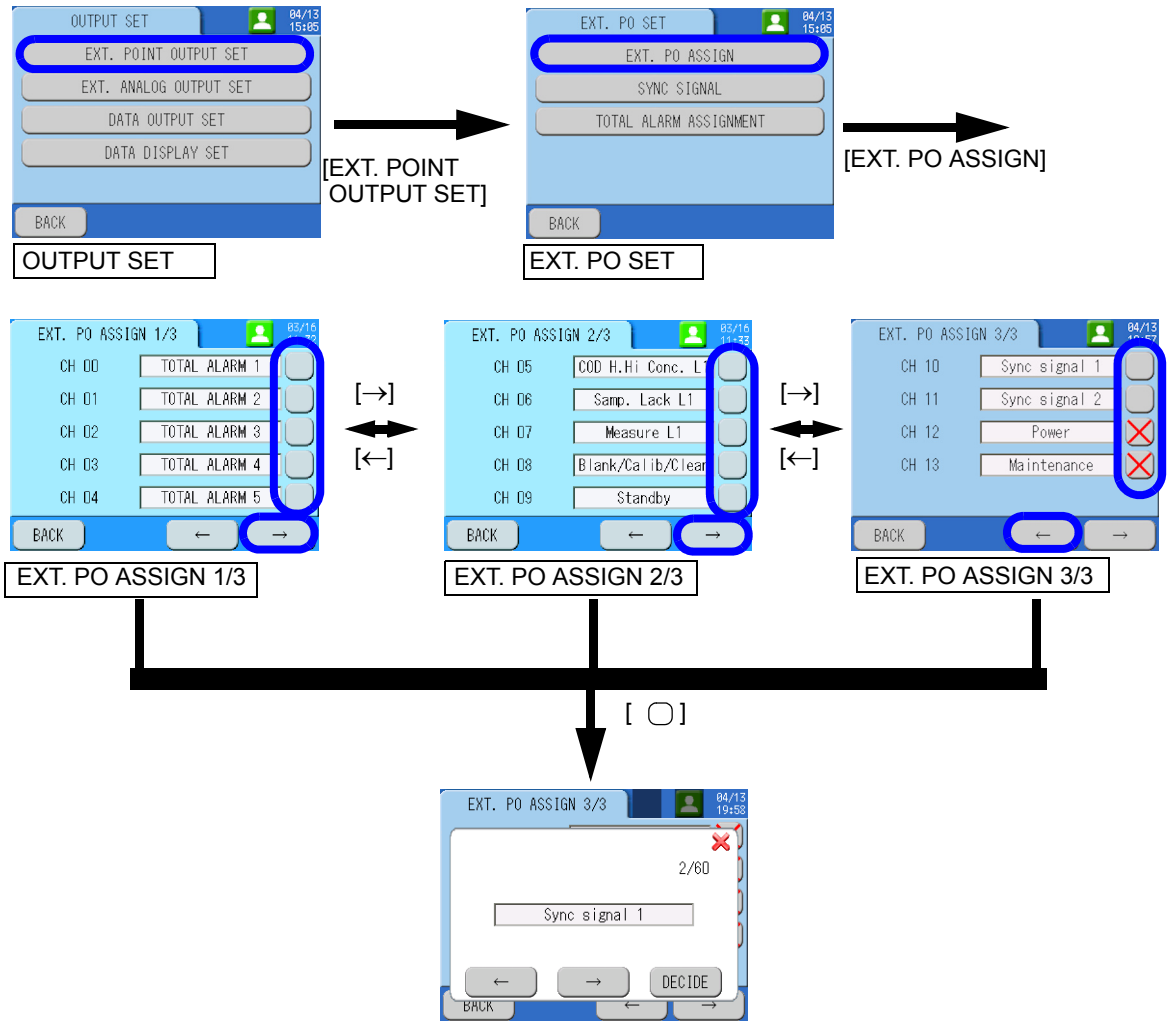
Operation procedures



1. **Press [EXT. POINT OUTPUT SET] on the OUTPUT SET screen.**
   The EXT. PO SET screen will be displayed.
2. **Press [EXT. PO ASSIGN] on the EXT. PO SET screen.**
   The EXT. PO ASSIGN screen will be displayed.
3. **Set the assignment of contact outputs.**

Reference

For the setting details, refer to " Contact output " (page 182).
For the relationship between channel numbers set on the screen and terminal numbers, refer to " Terminal assignment " (page 184).


OUTPUT SET
EXT. POINT OUTPUT SET
EXT. ANALOG OUTPUT SET
DATA OUTPUT SET
DATA DISPLAY SET
BACK
[EXT. POINT OUTPUT SET]
EXT. PO SET
EXT. PO ASSIGN
SYNC SIGNAL
TOTAL ALARM ASSIGNMENT
[EXT. PO ASSIGN]
EXT. PO ASSIGN 1/3
CH 00 TOTAL ALARM 1
CH 01 TOTAL ALARM 2
CH 02 TOTAL ALARM 3
CH 03 TOTAL ALARM 4
CH 04 TOTAL ALARM 5
[→]
[←]
EXT. PO ASSIGN 2/3
CH 05 COD H.Hi Conc. L1
CH 06 Samp. Lack L1
CH 07 Measure L1
CH 08 Blank/Calib/Clear
CH 09 Standby
EXT. PO ASSIGN 3/3
CH 10 Sync signal 1
CH 11 Sync signal 2
CH 12 Power
CH 13 Maintenance
[🖵]
2/60
Sync signal 1
DECIDE

● SYNC SIGNAL

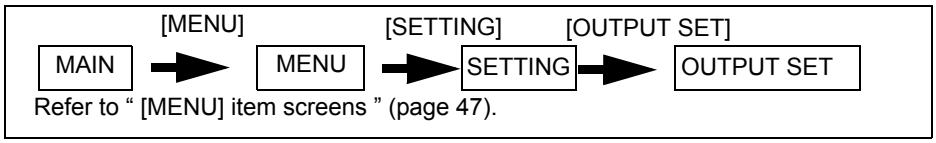
Configure the settings for synchronous signals.

Operation method		Setting range	Initial value	Description
SYNC SIGNAL 1	ON	−3600 seconds to 3600 seconds	0 seconds	Time to turn ON the signal in synchronism with the sequence for measurement or blank measurement.
	OFF		3600 seconds	Time to turn OFF the signal in synchronism with the sequence for measurement or blank measurement.
SYNC SIGNAL 2	ON	−3600 seconds to 3600 seconds	0 seconds	Time to turn ON the signal in synchronism with the sequence for measurement or blank measurement.
	OFF		3600 seconds	Time to turn OFF the signal in synchronism with the sequence for measurement or blank measurement.

Note

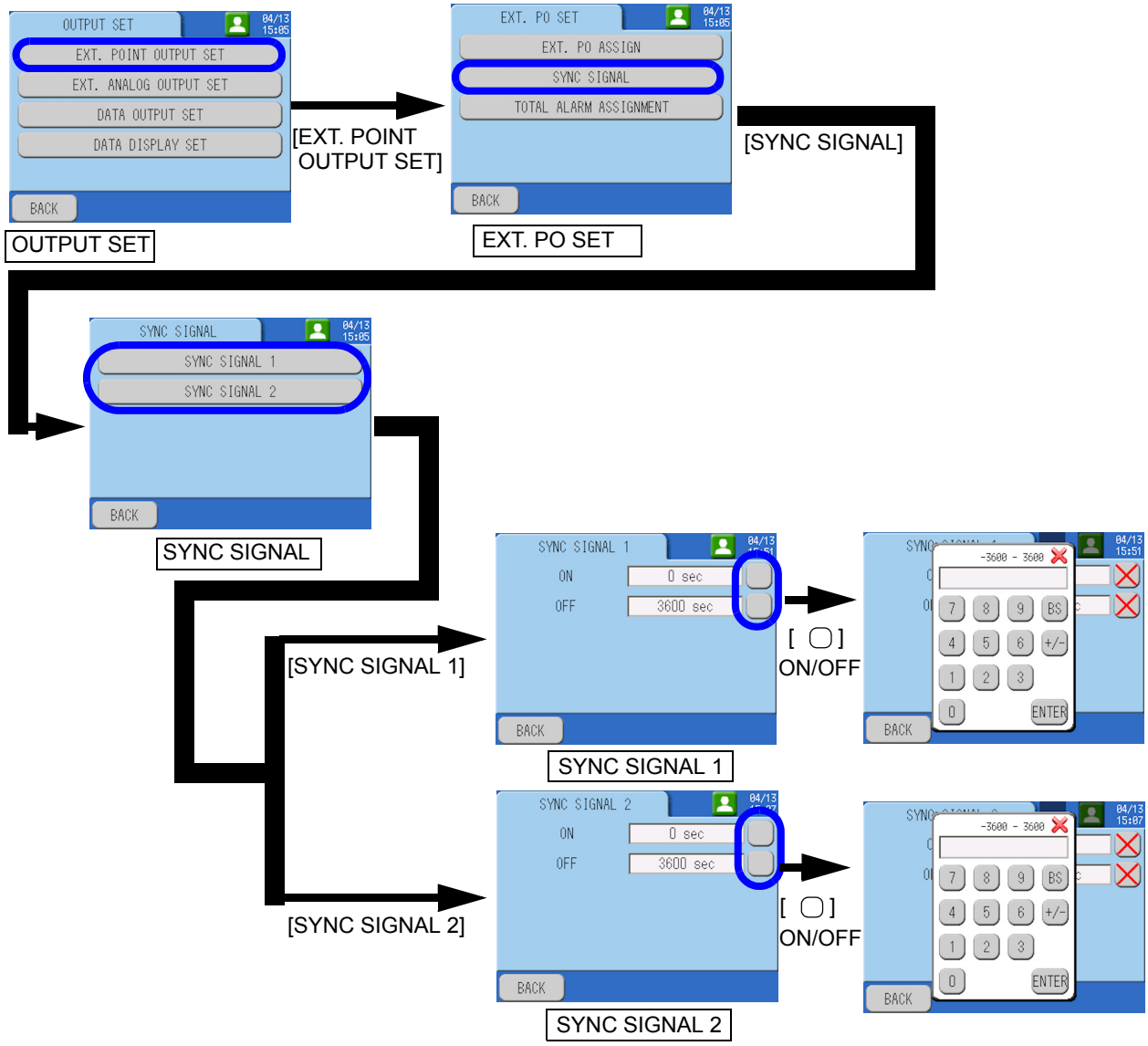
If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

Operation procedures



Refer to “ [MENU] item screens ” (page 47).

1. **Press [EXT. POINT OUTPUT SET] on the OUTPUT SET screen.**
   The EXT. PO SET screen will be displayed.
2. **Press [SYNC SIGNAL] on the EXT. PO SET screen.**
   The SYNC SIGNAL screen will be displayed.
3. **Set the synchronous signals.**


OUTPUT SET
EXT. POINT OUTPUT SET
EXT. ANALOG OUTPUT SET
DATA OUTPUT SET
DATA DISPLAY SET
BACK
OUTPUT SET
[EXT. POINT OUTPUT SET]
EXT. PO SET
EXT. PO ASSIGN
SYNC SIGNAL
TOTAL ALARM ASSIGNMENT
BACK
EXT. PO SET
[SYNC SIGNAL]
SYNC SIGNAL
SYNC SIGNAL 1
SYNC SIGNAL 2
BACK
SYNC SIGNAL
[SYNC SIGNAL 1]
[SYNC SIGNAL 2]
SYNC SIGNAL 1
ON
OFF
0 sec
3600 sec
BACK
SYNC SIGNAL 1
[▢]
ON/OFF
-3600 - 3600
7 8 9 BS
4 5 6 +/-
1 2 3
0 ENTER
BACK
SYNC SIGNAL 2
ON
OFF
0 sec
3600 sec
BACK
SYNC SIGNAL 2
[▢]
ON/OFF
-3600 - 3600
7 8 9 BS
4 5 6 +/-
1 2 3
0 ENTER
BACK

● TOTAL ALARM ASSIGNMENT

Configure the settings for total alarm assignment.

Setting item					
Not Assigned	Sample Lack	COD Hi limit	COD H.Hi limit	COD Hi Load	Flow limit
Int. hard. Err.	Int. memory Err.	Cal. Err.	Clock	Int. comm. Err.	Heater
Leak Err.	Electrode	Titrator	Gauge Blank	Temp. Sensor	Air Pressure
Gauge Samp. 2 mL	Gauge Samp. 10 mL	Gauge Dil. Samp.	Gauge Diluent	Reag. A Err.	Reag. B Err.
Reag. C Err.	Reag. D (F) Err.	Reag. E Err.	Lack Blank	Titration	Heat Low Temp
Heat High Temp	Lack Reag. A	Lack Reag. B	Lack Reag. C	Lack Reag. D (F)	Lack Reag. E
Full Drain Tank	Printer	Sample Lack (L1 to L6)	COD Hi limit (L1 to L6)	COD H.Hi Conc. (L1 to L6)	COD Hi Load (L1 to L6)
Flow limit (L1 to L6)	Gauge Diluent				

Reference

For initial settings, refer to " Initial settings " (page 74).

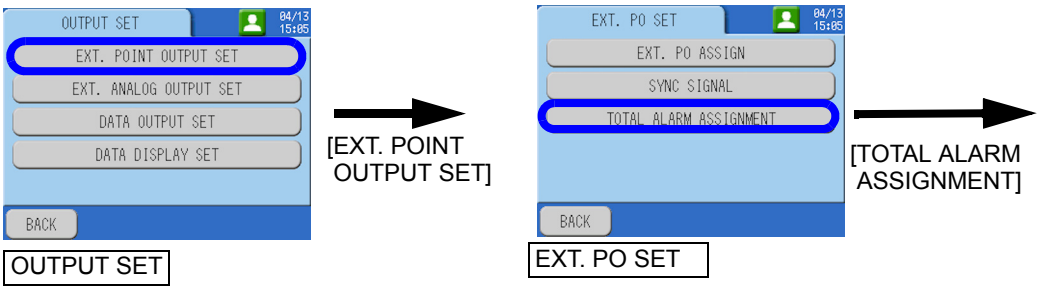
Operation procedures

[MENU] [SETTING] [OUTPUT SET]

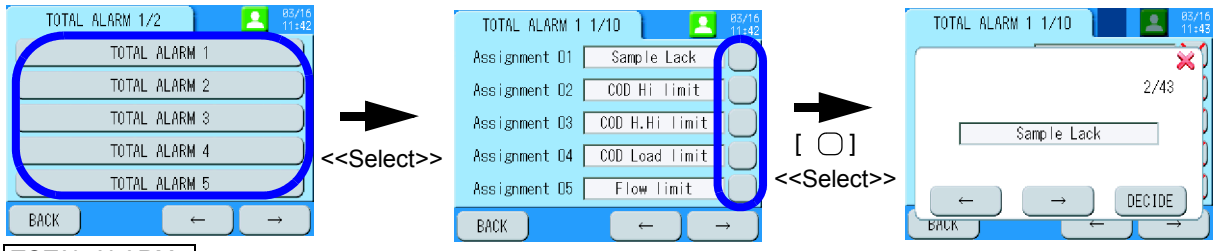
MAIN → MENU → SETTING → OUTPUT SET

Refer to " [MENU] item screens " (page 47).

1. **Press [EXT. POINT OUTPUT SET] on the OUTPUT SET screen.**
   The EXT. PO SET screen will be displayed.
2. **Press [TOTAL ALARM ASSIGNMENT] on the EXT. PO SET screen.**
   The TOTAL ALARM screen will be displayed.
3. **Configure the settings for the total alarm assignment.**



OUTPUT SET EXT. PO SET



TOTAL ALARM

Initial settings

Initial settings						
	TOTAL ALARM 1	TOTAL ALARM 2	TOTAL ALARM 3	TOTAL ALARM 4	TOTAL ALARM 5	TOTAL ALARM 6
1	Sample Lack	Int. hard. Err.	Lack Reag. A	Gauge Samp. 2 mL	COD Hi Conc. L1 L1	COD Hi Conc. L2
2	COD Hi Conc.	Int. memory Err.	Lack Reag. B	Gauge Samp. 10 mL, 20 mL	COD Hi Load L1	COD Hi Load L2
3	COD H. Hi Conc.	Clock	Lack Reag. C	Gauge Dil. Samp.	Hi Flow L1	Upper limit of flow rate on L2
4	COD Hi Load	Int. comm. Err.	Lack Reag. D	Gauge Diluent		
5	Flow limit	Temp. Sensor	Lack Reag. E	Gauge Blank		
6	Int. hard. Err.	Leak Err.		Reag. A Err.		
7	Int. memory Err.	Electrode		Reag. B Err.		
8	Cal. Err.	Titrator		Reag. C Err.		
9	Clock	Gauge Blank		Reag. D (F) Err.		
10	Int. comm. Err.	Heat Empty		Reag. E Err.		
11	Heater	Air Pressure		Gauge Blank		
12	Leak Err.	Gauge Samp. 2 mL				
13	Electrode	Gauge Samp. 10 mL, 20 mL				
14	Titrator	Gauge Dil. Samp.				
15	Gauge Blank	Gauge Diluent				
16	Temp. Sensor	Reag. A Err.				
17	Air Pressure	Reag. B Err.				
18	Gauge Samp. 2 mL	Reag. C Err.		Not Assigned		
19	Gauge Samp. 10 mL, 20 mL	Reag. D (F) Err.				
20	Gauge Dil. Samp.	Reag. E Err.				
21	Gauge Diluent	Titration				
22	Reag. A Err.	Heat Low Temp				
23	Reag. B Err.	Heat High Temp				
24	Reag. C Err.					
25	Reag. D (F) Err.					
26	Reag.E					
27	Lack Blank					
28	Titration					
29	Heat Low Temp					
30	Heat High Temp					
31	Lack Reag. A					
32	Lack Reag. B					
33	Lack Reag. C					
34	Lack Reag. D (F)					
35	Lack Reag. E					
36	Full Drain Tank					
37						

● EXT. ANALOG OUTPUT

Configure the settings for analog output.

Item	Setting range	Initial value	Description
Output Level	0 mA to 16 mA	4 mA to 20 mA	Data is output at 0 mA to 16 mA against the full-scale value of the measurement range.
	4 mA to 20 mA		Data is output at 4 mA to 20 mA against the full-scale value of the measurement range.
Output Limit	100%	110%	Data is output in 100% of the output range against the full-scale value of the measurement range.
	110%		Data is output in 110% of the output range against the full-scale value of the measurement range.
Output Assign	COD concentration L1 to L2 COD load L1 to L2 Flow rate L1 to L2		Specify an output object.
Output F.S.	0.01 to 999999		Specify a full-scale value for the output object.

* L2 is only selectable for the 2-sample line type.

Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

Operation procedures

[MENU] [SETTING] [OUTPUT SET]

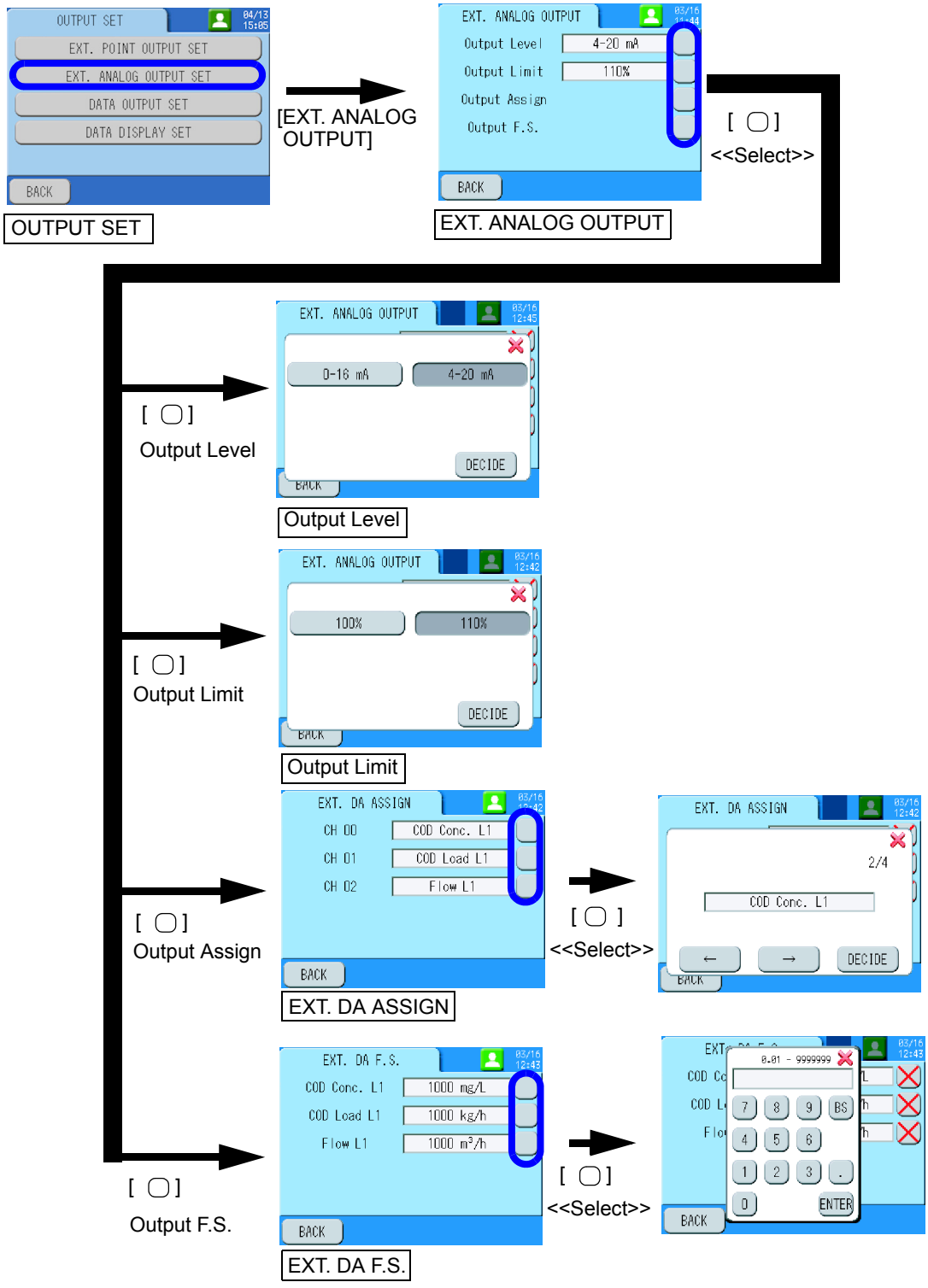
MAIN → MENU → SETTING → OUTPUT SET

Refer to " [MENU] item screens " (page 47).

1. **Press [EXT. ANALOG OUTPUT] on the OUTPUT SET screen.**
   The EXT. ANALOG OUTPUT screen will be displayed.
2. **Configure the settings for external analog output.**

Reference

For the relationship between channel numbers set on the screen and terminal numbers, refer to " Terminal assignment " (page 181).


OUTPUT SET
EXT. POINT OUTPUT SET
EXT. ANALOG OUTPUT SET
DATA OUTPUT SET
DATA DISPLAY SET
BACK
OUTPUT SET
[EXT. ANALOG OUTPUT]
EXT. ANALOG OUTPUT
Output Level
4-20 mA
Output Limit
110%
Output Assign
Output F.S.
BACK
EXT. ANALOG OUTPUT
[ ]
<<Select>>
[ ]
Output Level
0-16 mA
4-20 mA
DECIDE
Output Level
[ ]
Output Limit
100%
110%
DECIDE
Output Limit
[ ]
Output Assign
EXT. DA ASSIGN
CH 00
COD Conc. L1
CH 01
COD Load L1
CH 02
Flow L1
BACK
EXT. DA ASSIGN
[ ]
<<Select>>
EXT. DA ASSIGN
2/4
COD Conc. L1
DECIDE
[ ]
Output F.S.
EXT. DA F.S.
COD Conc. L1
1000 mg/L
COD Load L1
1000 kg/h
Flow L1
1000 m³/h
BACK
EXT. DA F.S.
[ ]
<<Select>>
0.01 - 9999999
7
8
9
BS
4
5
6
1
2
3
.
0
ENTER
BACK

● DATA OUTPUT SET

Configure the settings for data output.

Item	Function	Reference
CAL. OUTPUT SET	Configure the setting for output during calibration.	page 77
BLANK OUTPUT SET	Configure the settings for output during blank measurement.	page 79
ALARM OUTPUT SET	Configure the settings for output while an alarm is issued.	page 80
MAINTE OUTPUT SET	Configure the settings for output during maintenance.	page 81
DATA DISPLAY SET	Configure the settings for data display.	Page 82

● CAL. OUTPUT SET

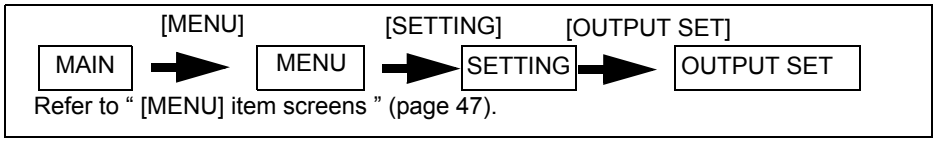
Configure the setting for output during calibration.

Operation method	Setting range	Initial value	Description
Output Mode	Hold	Hold	Fix the output to one previous measurement value during calibration.
	Preset		Fix the output to the preset value during calibration.
Preset	0 mA to 22 mA	22 mA	Set the output during calibration.

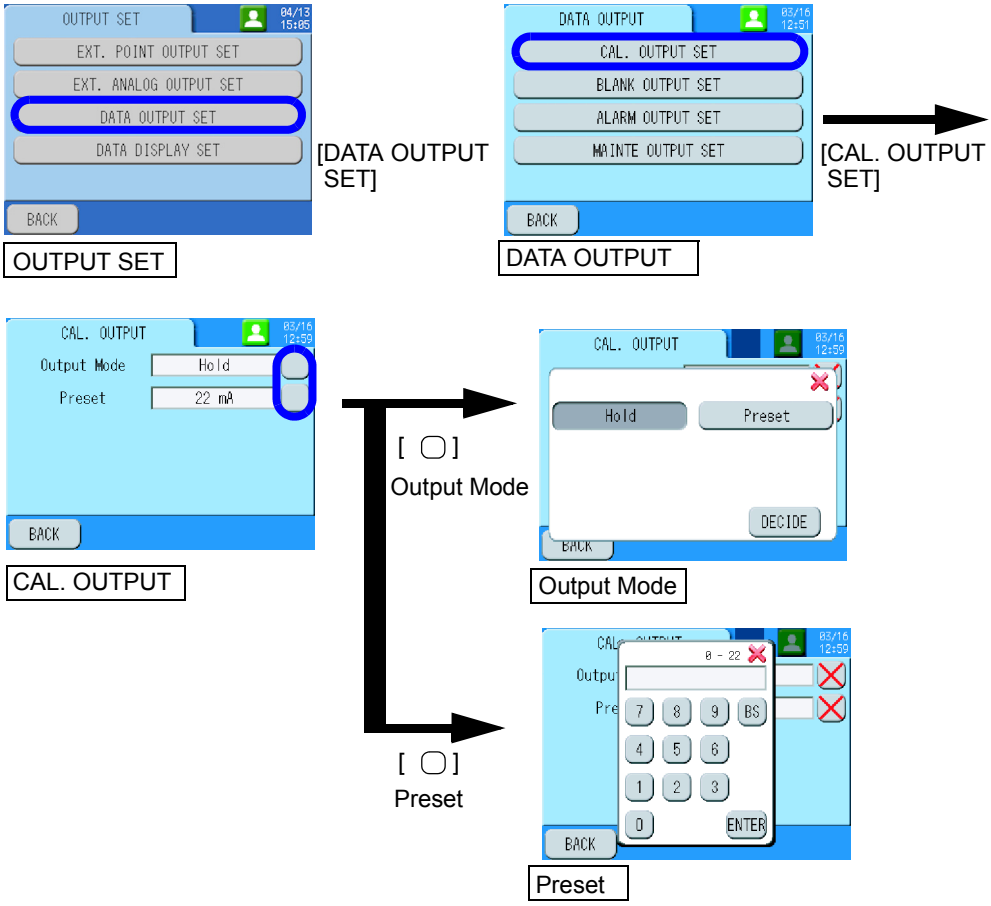
Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

Operation procedures



1. **Press [DATA OUTPUT SET] on the OUTPUT SET screen.**
   The DATA OUTPUT screen will be displayed.
2. **Press [CAL. OUTPUT SET].**
   The CAL. OUTPUT screen will be displayed.
3. **Configure the settings for output during calibration.**


OUTPUT SET
EXT. POINT OUTPUT SET
EXT. ANALOG OUTPUT SET
DATA OUTPUT SET
DATA DISPLAY SET
BACK
[DATA OUTPUT SET]
DATA OUTPUT
CAL. OUTPUT SET
BLANK OUTPUT SET
ALARM OUTPUT SET
MAINTE OUTPUT SET
BACK
[CAL. OUTPUT SET]
CAL. OUTPUT
Output Mode
Hold
Preset
22 mA
BACK
[ ]
Output Mode
CAL. OUTPUT
Hold
Preset
DECIDE
[ ]
Preset
0 - 22
7 8 9 BS
4 5 6
1 2 3
0 ENTER
BACK

● BLANK OUTPUT SET

Configure the settings for output during blank measurement.

Item	Setting range	Initial value	Description
Output Mode	Hold	Hold	Fix the output to one previous measurement value during blank measurement.
	Preset		Fix the output to the preset value during blank measurement.
Preset	0 mA to 22 mA	22 mA	Set the output during blank measurement.

Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

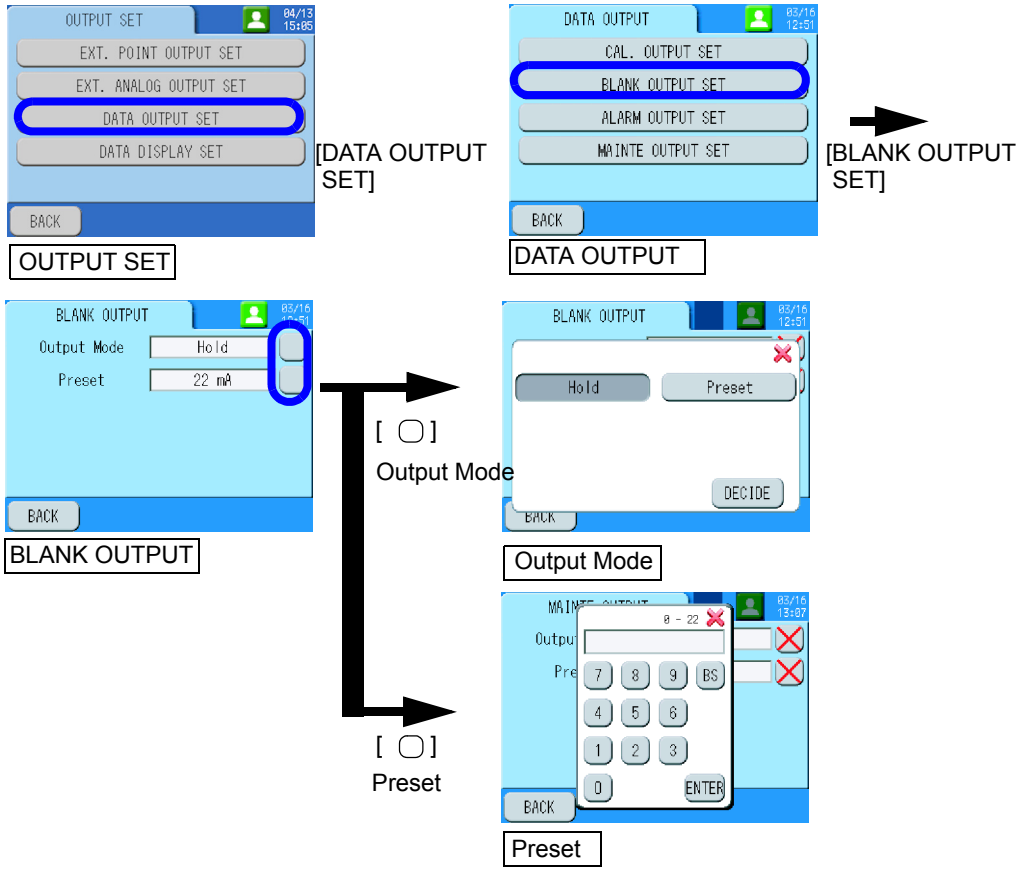
Operation procedures

[MENU] [SETTING] [OUTPUT SET]

MAIN → MENU → SETTING → OUTPUT SET

Refer to “ [MENU] item screens ” (page 47).

1. **Press [DATA OUTPUT SET] on the OUTPUT SET screen.**
   The DATA OUTPUT screen will be displayed.
2. **Press [BLANK OUPTUT SET].**
   The BLANK OUTPUT screen will be displayed.
3. **Configure the settings for output during blank measurement.**



● ALARM OUTPUT SET

Configure the settings for output while an alarm is issued.

Item	Setting range	Initial value	Description
Output Mode	Hold	Hold	Fix the output to one previous measurement value during warning.
	Preset		Fix the output to the preset value during warning.
Preset	0 mA to 22 mA	22 mA	Set the output during warning.

Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

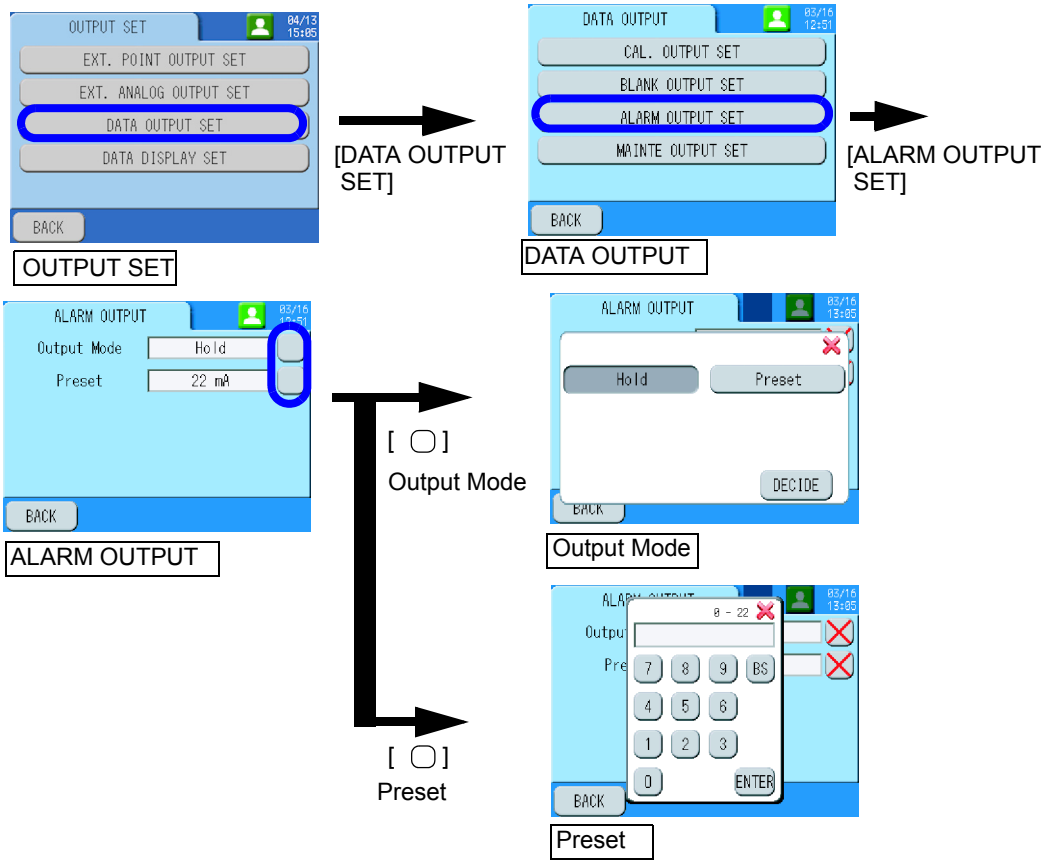
Operation procedures

[MENU] [SETTING] [OUTPUT SET]

MAIN → MENU → SETTING → OUTPUT SET

Refer to “ [MENU] item screens ” (page 47).

1. **Press [DATA OUTPUT SET] on the OUTPUT SET screen.**
   The DATA OUTPUT screen will be displayed.
2. **Press [ALARM OUTPUT SET].**
   The ALARM OUTPUT screen will be displayed.
3. **Configure the settings for output while an alarm is issued.**



● MAINTE OUTPUT SET

Configure the settings for output during maintenance.

Item	Setting range	Initial value	Description
Output Mode	Hold	Hold	Fix the output to one previous measurement value during maintenance.
	Preset		Fix the output to the preset value during maintenance.
Preset	0 mA to 22 mA	22 mA	Set the output during maintenance.

Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

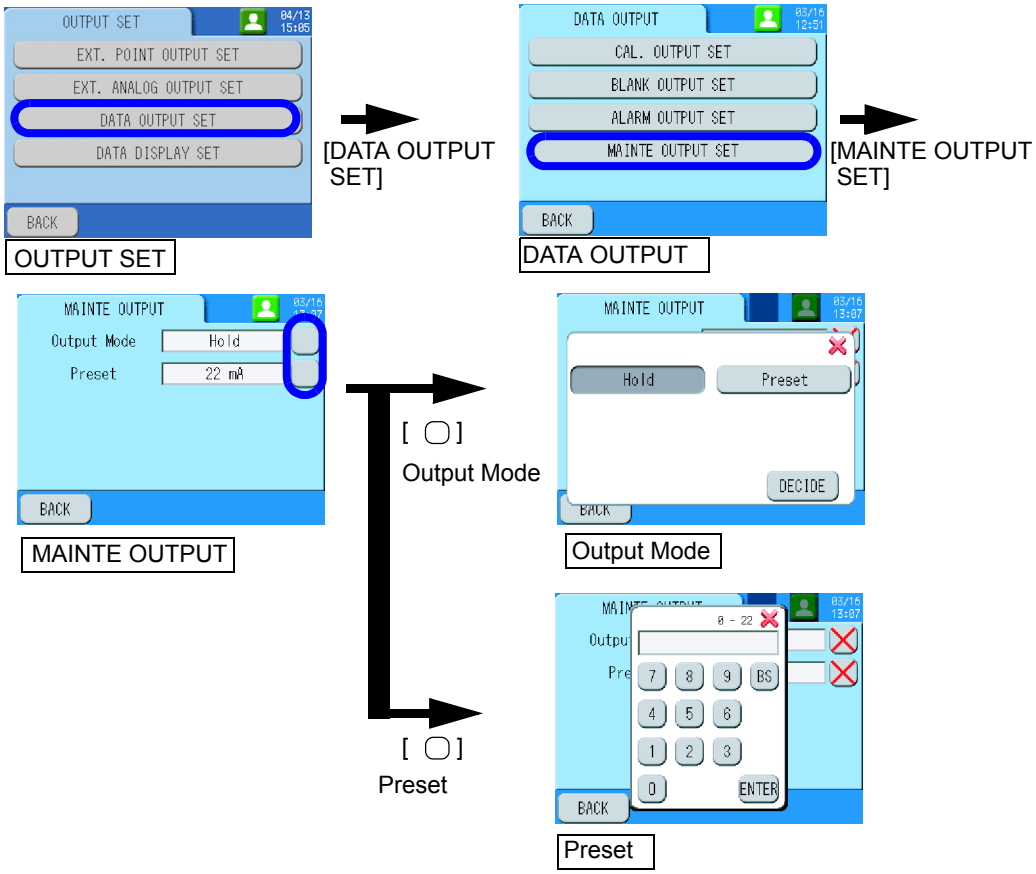
Operation procedures

[MENU] [SETTING] [OUTPUT SET]

MAIN → MENU → SETTING → OUTPUT SET

Refer to “ [MENU] item screens ” (page 47).

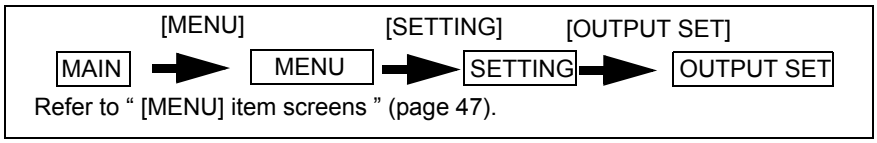
1. **Press [DATA OUTPUT SET] on the OUTPUT SET screen.**
   The DATA OUTPUT screen will be displayed.
2. **Press [MAINTE OUTPUT SET].**
   The MAINTE OUTPUT screen will be displayed.
3. **Configure the settings for output during maintenance.**



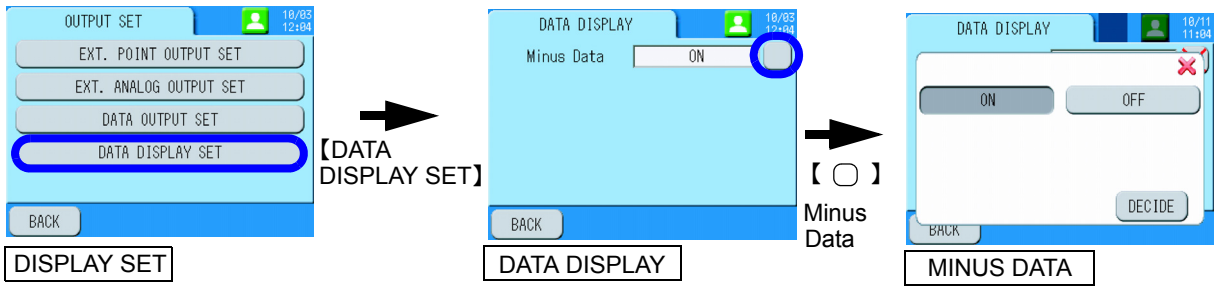
● DATA DISPLAY SET

Configure the setting for the data display. If the COD value of sample water is lower than that of blank water, the calculated COD value is negative. In this case, the display can be set up so that all the negative values are displayed and printed out as zeros.

Operation procedures



1. **Press [DATA DISPLAY SET] on the OUTPUT SET screen.**
   The DATA DISPLAY screen will be displayed.
2. **Configure the setting for the data display of negative values.**
   If ON is selected, any negative value is displayed and printed out as it is.
   If OFF is selected, any negative value is displayed and printed out as zeros.



■ PAYLOAD SET

Configure the settings for load calculation.

Item	Setting range		Initial value	Description
Function	ON	OFF	OFF	Select enabling or disabling the setting.
Date (Hourly)	0 min to 59 min		59 min	Specify time (min).
Date (Daily)	0 hours to 23 hours		23 hours	Specify time (hour).
Unit	$kg \cdot m^3$		$kg \cdot m^3$	Specify a unit.
	$g \cdot m^3$			
	g·L			
Flow F.S. L1	1 to 999999		1000	Specify a full-scale value.

* If one of Date (Hourly), Date (Daily), or Unit is changed, the daily report is output at this point and the load calculation is restarted from zero.

* L2 is only selectable for the 2-sample line type.

Note

- **If you enter a value exceeding the digit limit for number setting, the excessive digit are cut off.**
- **A set value of the Date (Hourly) must be different from that of the Modify time in " CLOCK ADJUST " (page 85).**

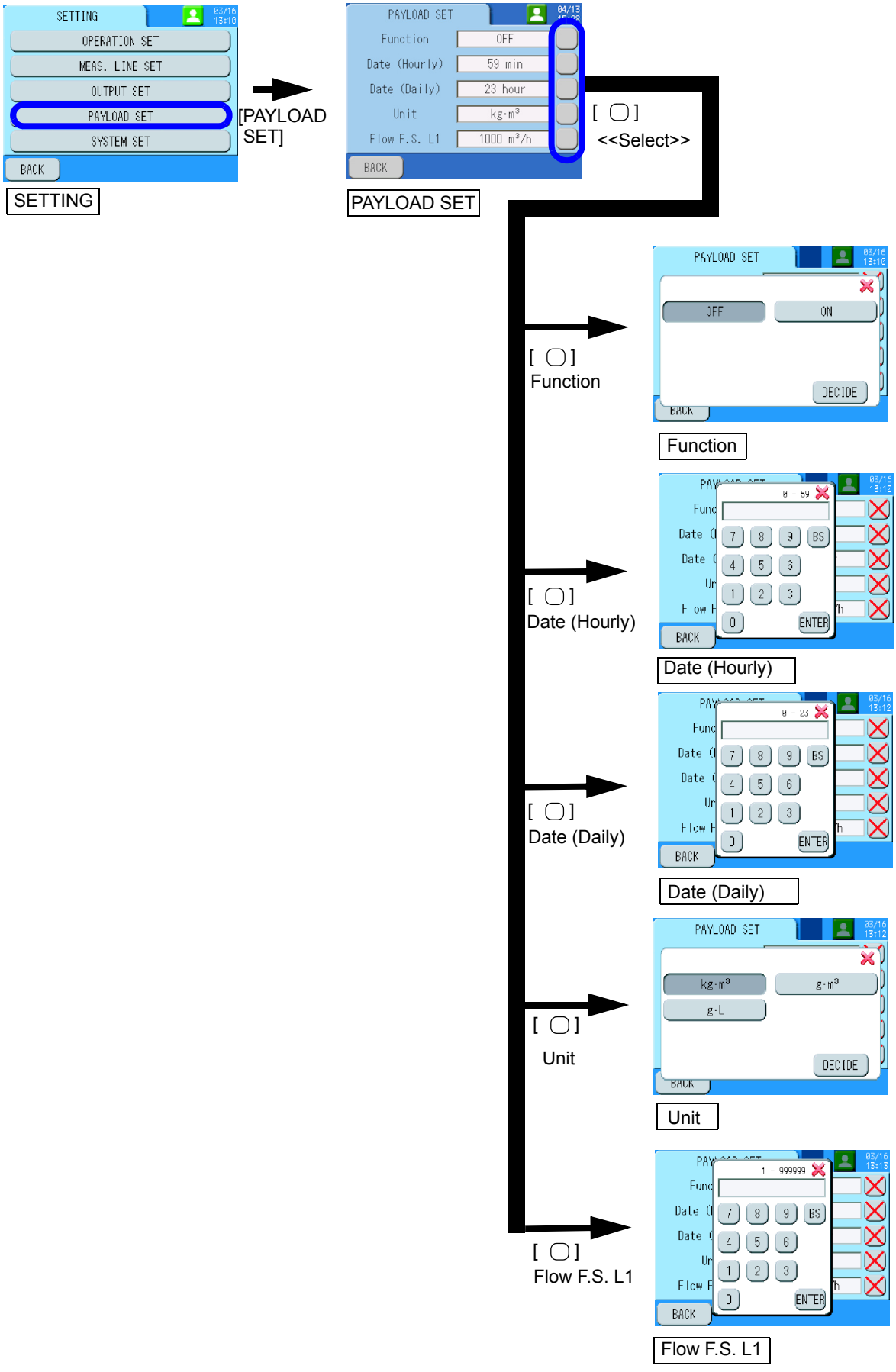
● Operation procedures

[MENU] [SETTING]

MAIN → MENU → SETTING

Refer to " [MENU] item screens " (page 47).

1. **Press [PAYLOAD SET] on the SETTING screen.**
   The PAYLOAD SET screen will be displayed.
2. **Configure the settings for load calculation.**


SETTING
OPERATION SET
MEAS. LINE SET
OUTPUT SET
PAYLOAD SET
SYSTEM SET
BACK
[PAYLOAD SET]
SETTING
PAYLOAD SET
Function
OFF
Date (Hourly)
59 min
Date (Daily)
23 hour
Unit
kg·m³
Flow F.S. L1
1000 m³/h
BACK
[▢]
<<Select>>
PAYLOAD SET
[▢]
Function
OFF
ON
DECIDE
BACK
Function
[▢]
Date (Hourly)
0 - 59
ENTER
BACK
Date (Hourly)
[▢]
Date (Daily)
0 - 23
ENTER
BACK
Date (Daily)
PAYLOAD SET
[▢]
Unit
kg·m³
g·m³
g·L
DECIDE
BACK
Unit
[▢]
Flow F.S. L1
1 - 999999
ENTER
BACK
Flow F.S. L1

■ SYSTEM SET

Configure the settings for clock, authority, LCD, printout, communication, and language.

Item	Function	Reference
CLOCK ADJUST	Configure the setting for the internal clock.	page 85
AUTHORITY SET	Configure the setting for a password for the power user Authority.	page 87
LCD ADJUST	Configure the settings for the LCD screen.	page 88
PRINT OUT SET	Configure the settings for printout on the printer.	page 89
COMMUNICATION SET	Configure the settings for communication.	page 90
LANGUAGE SET	Configure the setting for a language.	page 92
TOUCH PANEL ADJUSTMENT	Adjust the touch panel.	page 93

● CLOCK ADJUST

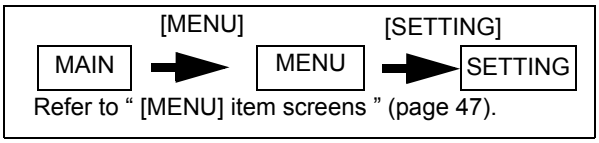
Configure the setting for the internal clock. When the Modify function is set to ON, the clock will be automatically reset to the specified time at the occasion you specify.

Item	Setting range	Initial value	Description
Date	2001/01/01 00:00 to 2099/12/31 23:59	Current time	Specify the current time.
Modify function	ON	OFF	Select enabling or disabling the Modify function.
	OFF		
Modify input (Selection of output signal)	Clock correction	Measurement start	Correct the time.
	Measurement start		Correct the time when measurement is started.
	Line selection L1 to L2		Correct the time when the line is changed.
Modify time	0 min to 59 min	0 min	Correct the time when signal is input.

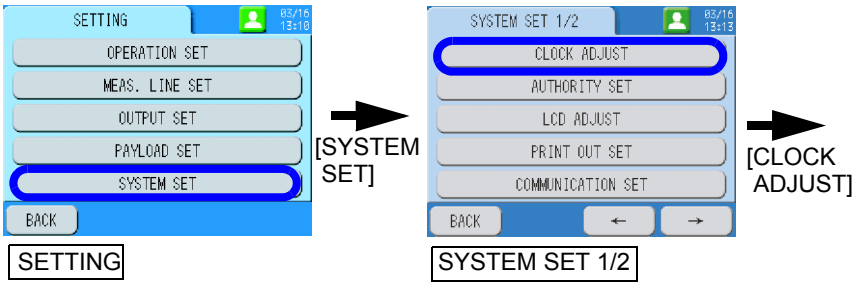
Note

- **If you enter a value exceeding the digit limit for number setting, the excessive digit are cut off.**
- **A set value of the Modify time must be different from that of the Date (Hourly) in " PAYLOAD SET " (page 83).**
- **The Modify function performs only when the external signal is inputted within ±1 minute of the Modify time.**

● Operation procedures

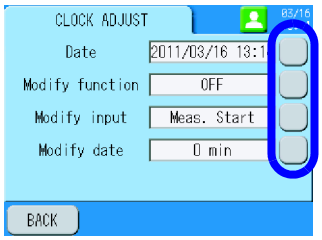


1. **Press [SYSTEM SET] on the SETTING screen.**
   The SYSTEM SET 1/2 screen will be displayed.
2. **Press [CLOCK ADJUST].**
   The CLOCK ADJUST screen will be displayed.
3. **Configure the settings for the system.**



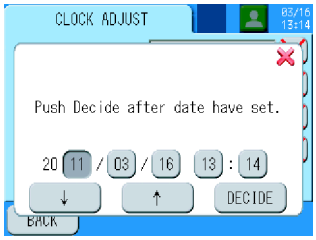
SETTING

SYSTEM SET 1/2



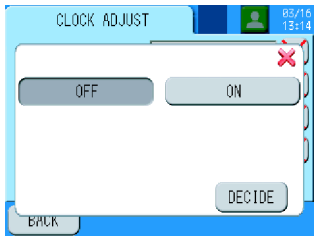
CLOCK ADJUST

[▢] Date



Date

[▢] Modify function

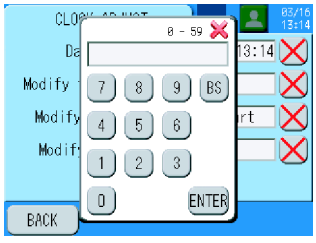


Modify function

[▢] Modify input

Modify input

[▢] Modify date



Modify date

● AUTHORITY SET

Configure the setting for a password for the power user Authority.

Item	Setting range	Initial value	Description
P.USER PASSWORD SET	0000 to 9999	1234	Specify a password for the power user.

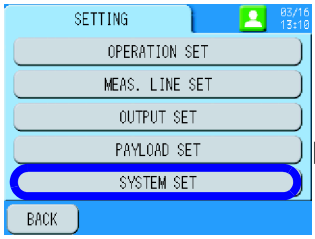
● Operation procedures

[MENU] [SETTING]

MAIN → MENU → SETTING

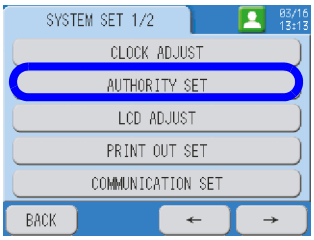
Refer to " [MENU] item screens " (page 47).

1. **Press [SYSTEM SET] on the SETTING screen.**
   The SYSTEM SET 1/2 screen will be displayed.
2. **Press [AUTHORITY SET].**
   The AUTHORITY SET screen will be displayed.
3. **Configure the setting for the password of the power user level.**



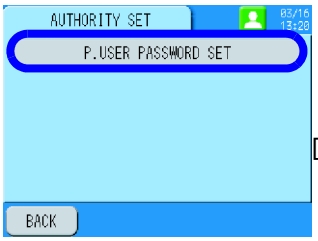
SETTING

[SYSTEM SET]



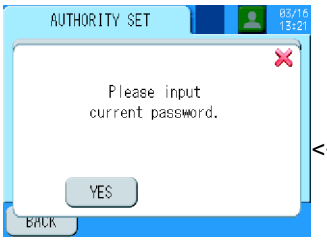
SYSTEM SET 1/2

[AUTHORITY SET]

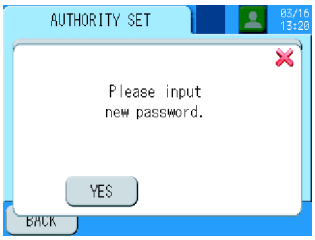


AUTHORITY SET

[P.USER PASSWORD SET]



<<Enter the current password.>>



<<Enter a password.>>

The setting is complete.

● LCD ADJUST

Configure the settings for the LCD screen.

Item	Setting range					Initial value	Description
LCD OFF time	OFF	10 min	20 min	30 min	60 min	10 min	Specify the time to automatically turn OFF the LCD.
Dark/Bright	Entire gray scale					Central part	The contrast on the LCD can be adjusted. One of 16 levels is selectable with the arrow keys.

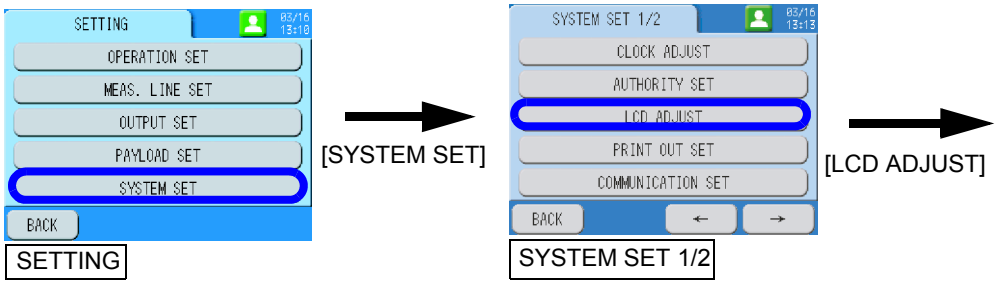
● Operation procedures

[MENU] [SETTING]

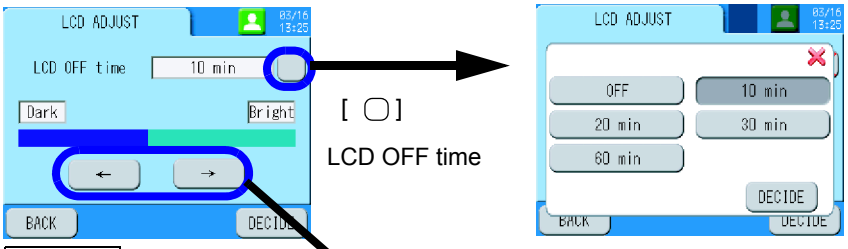
MAIN → MENU → SETTING

Refer to “ [MENU] item screens ” (page 47).

1. **Press [SYSTEM SET] on the SETTING screen.**
   The SYSTEM SET 1/2 screen will be displayed.
2. **Press [LCD ADJUST].**
   The LCD ADJUST screen will be displayed.
3. **Configure the settings for the LCD screen.**



SETTING SYSTEM SET 1/2



LCD SET LCD OFF time

● PRINT OUT SET

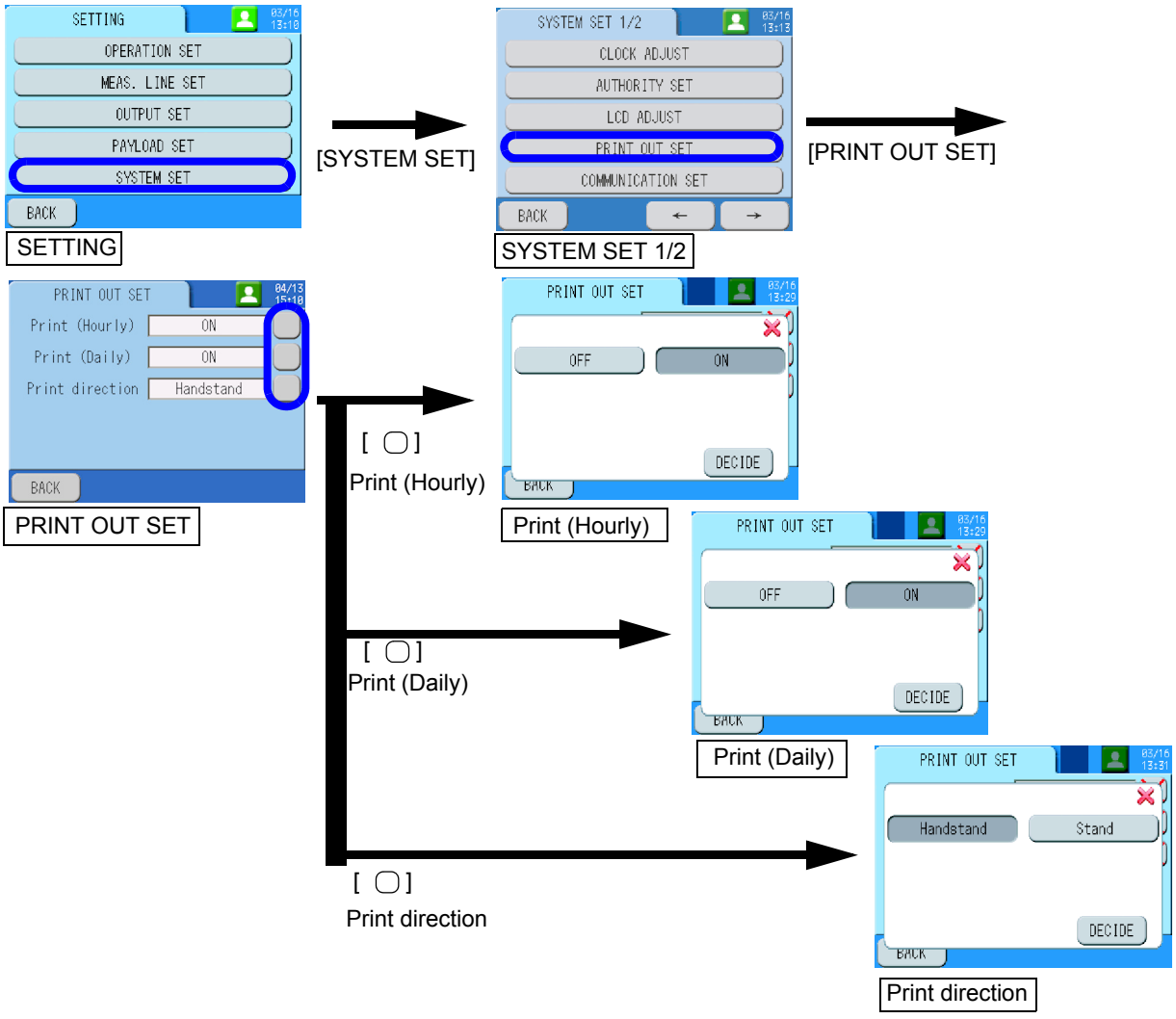
Configure the settings for printout on the printer.

Item	Setting range		Initial value	Description
Print (Hourly)	ON	OFF	ON	Select enabling or disabling the automatic printout (hourly).
Print (Daily)	ON	OFF	ON	Select enabling or disabling the automatic printout (daily).
Print direction	Handstand	Stand	Handstand	Specify a printing direction.

● Operation procedures

[MENU] [SETTING]
MAIN → MENU → SETTING
Refer to “ [MENU] item screens ” (page 47).

1. **Press [SYSTEM SET] on the SETTING screen.**
   The SYSTEM SET 1/2 screen will be displayed.
2. **Press [PRINT OUT SET].**
   The PRINT OUT SET screen will be displayed.
3. **Configure the settings for printout.**



● COMMUNICATION SET

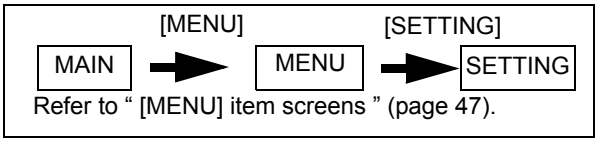
Configure the settings for communication.

Item	Setting range			Initial value	Description
Machine ID	1 to 247			1	Specify an instrument ID number.
Baudrate	9600 bps	19200 bps	38400 bps	19200 bps	Select a baudrate.
Parity	NONE	ODD	EVEN	NONE	Specify a communication parity.

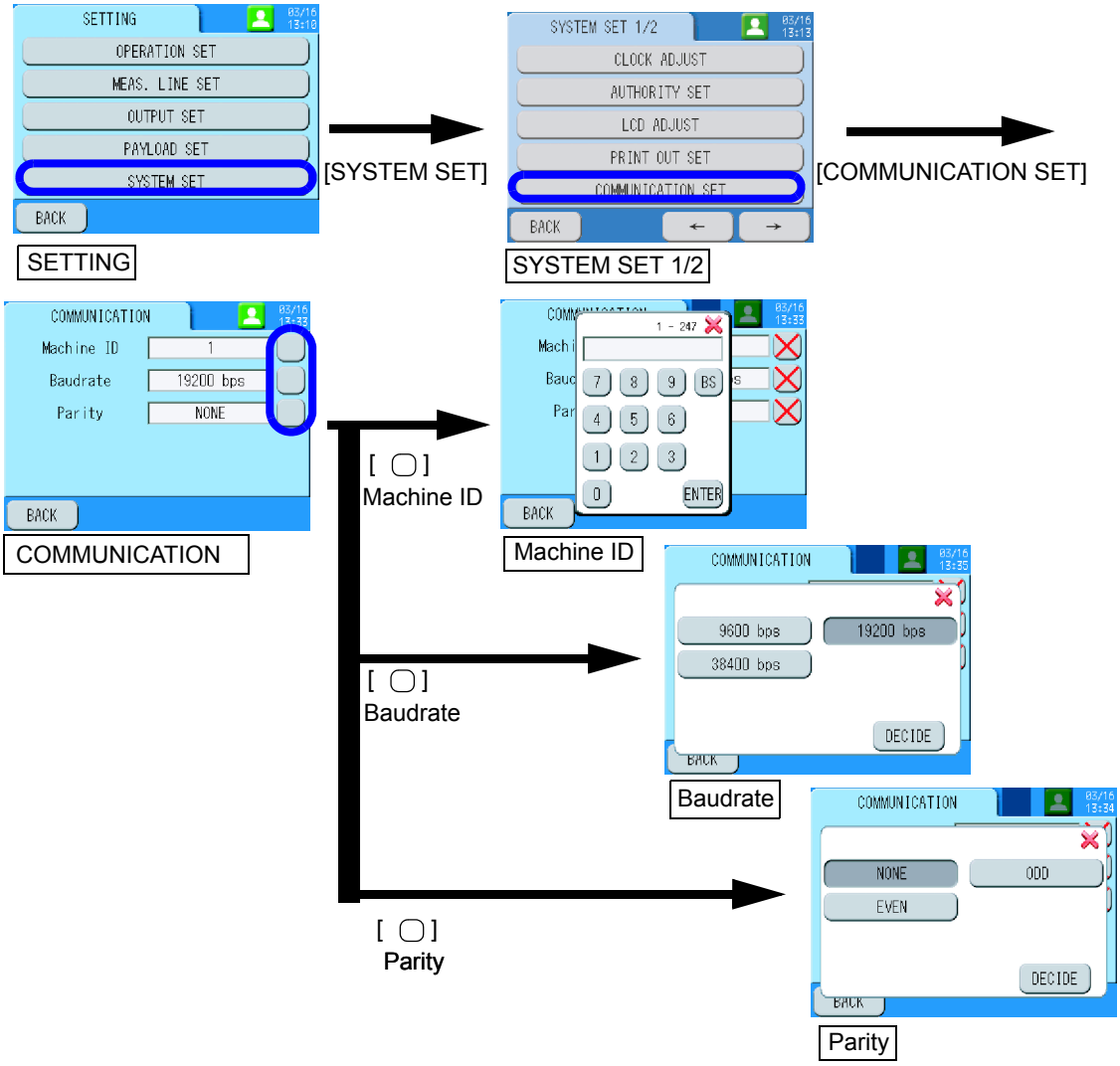
Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

● Operation procedures



1. **Press [SYSTEM SET] on the SETTING screen.**
   The SYSTEM SET 1/2 screen will be displayed.
2. **Press [COMMUNICATION SET].**
   The COMMUNICATION screen will be displayed.
3. **Configure the settings for communication.**


SETTING
OPERATION SET
MEAS. LINE SET
OUTPUT SET
PAYLOAD SET
SYSTEM SET
BACK
[SYSTEM SET]
SYSTEM SET 1/2
CLOCK ADJUST
AUTHORITY SET
LCD ADJUST
PRINT OUT SET
COMMUNICATION SET
BACK
[COMMUNICATION SET]
COMMUNICATION
Machine ID
1
Baudrate
19200 bps
Parity
NONE
BACK
[ ]
Machine ID
1 - 247
7 8 9 BS
4 5 6
1 2 3
0 ENTER
BACK
Machine ID
[ ]
Baudrate
COMMUNICATION
9600 bps
19200 bps
38400 bps
DECIDE
BACK
Baudrate
[ ]
Parity
COMMUNICATION
NONE
ODD
EVEN
DECIDE
BACK
Parity

● LANGUAGE SET

Configure the setting for a language.

Item	Setting range			Description
Language	English	Japanese	Chinese	Specify a displayed language.

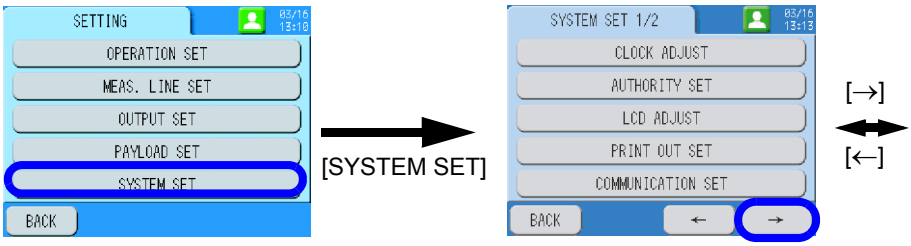
● Operation procedures

[MENU] [SETTING]

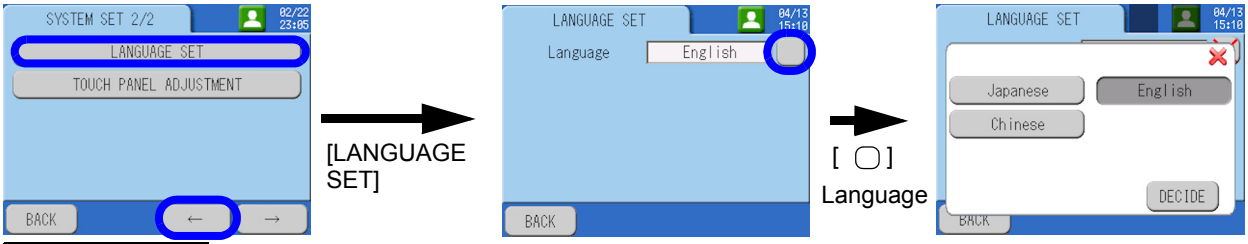
MAIN → MENU → SETTING

Refer to " [MENU] item screens " (page 47).

1. **Press [SYSTEM SET] on the SETTING screen.**
   Proceed to the SYSTEM SET 2/2 screen.
2. **Press [LANGUAGE SET].**
   The LANGUAGE SET screen will be displayed.
3. **Configure the setting for a language.**



SETTING SYSTEM SET 1/2



SYSTEM SET 2/2 LANGUAGE SET

● TOUCH PANEL ADJUSTMENT

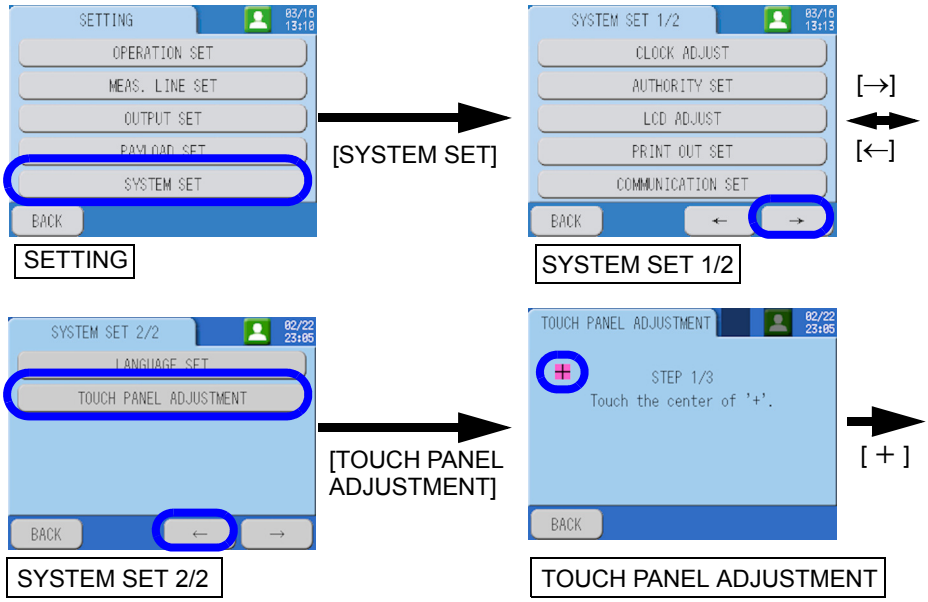
Adjust the touch panel.

Item	Description
TOUCH PANEL ADJUSTMENT	Adjust the position aberration of the touch panel.

● Operation procedure

[MENU] [SETTING]
MAIN → MENU → SETTING
Refer to " [MENU] item screens " (page 47).

1. **Press [SYSTEM SET] in the SETTING screen.**
   Proceed to the SYSTEM SET 2/2 screen.
2. **Press [TOUCH PANEL ADJUSTMENT].**
   The TOUCH PANEL ADJUSTMENT screen will be displayed.
3. **Adjust the touch panel in accordance with the instructions on the screen.**



[MENU]-[MAINTENANCE]

Performs the following operations for maintenance and adjustment.

Item	Function	Reference
$AgNO_3$ ADDITION	Specify whether silver nitrate (reagent D) is added.	page 94
EXT. ANALOG OUTPUT ADJUST	Configure the settings for external analog output adjustment.	page 95
STEP ACTION	Set up the step execution and perform steps.	page 96
SEPARATE ACTION	Specify and update individual actions.	page 97
CAL. FACTOR CHANGE	Specify and update calibration values.	page 98

■ $AgNO_3$ ADDITION

Specify whether silver nitrate (reagent D) is added.

Item	Setting range		Initial value	Description
$AgNO_3$ (REAG. D)	Present	Absent	Present	Specify whether or not to add silver nitrate.

* For the alkaline method, $AgNO_3$ is not added even if the setting of the $AgNO_3$ (REAG. D) is “Present.”
* When the reagent cleaning function is ON (refer to page 59), $AgNO_3$ is added even if the setting of $AgNO_3$ (REAG. D) is “Absent.”

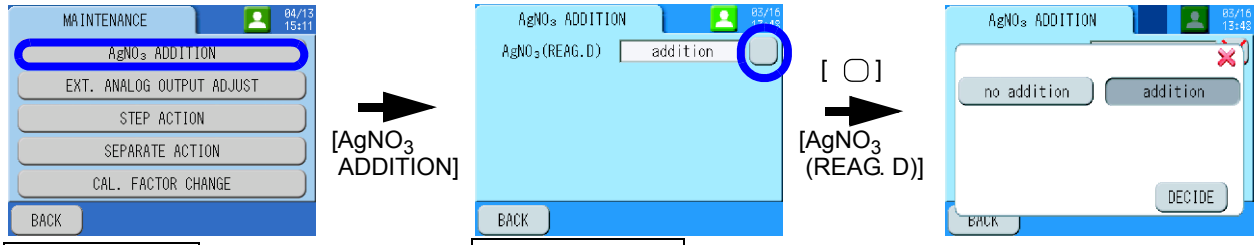
● Operation procedures

[MENU] [MAINTENANCE]

MAIN → MENU → MAINTENANCE

Refer to “ [MENU] item screens ” (page 47).

1. **Press $AgNO_3$ ADDITION on the MAINTENANCE screen.**
   The $AgNO_3$ ADDITION screen will be displayed.
2. **Specify whether or not to add silver nitrate (reagent D).**



MAINTENANCE

$AgNO_3$ ADDITION

EXT. ANALOG OUTPUT ADJUST

Configure the settings for external analog output adjustment.

Item (zero)	Setting range	Initial value	Description
ch00	0001 to 0FFE	03D0	ch00: Adjusts the concentration analog zero output.
ch01	0001 to 0FFE	03D0	ch01: Adjusts the load analog zero output.
ch02	0001 to 0FFE	03D0	ch02: Adjust the analog zero output.

Item (span)	Setting range	Initial value	Description
ch00	0001 to 0FFE	0DD4	ch00: Adjusts the concentration analog span output.
ch01	0001 to 0FFE	0DD4	ch01: Adjusts the load analog span output.
ch02	0001 to 0FFE	0DD4	ch02: Adjust the analog span output.

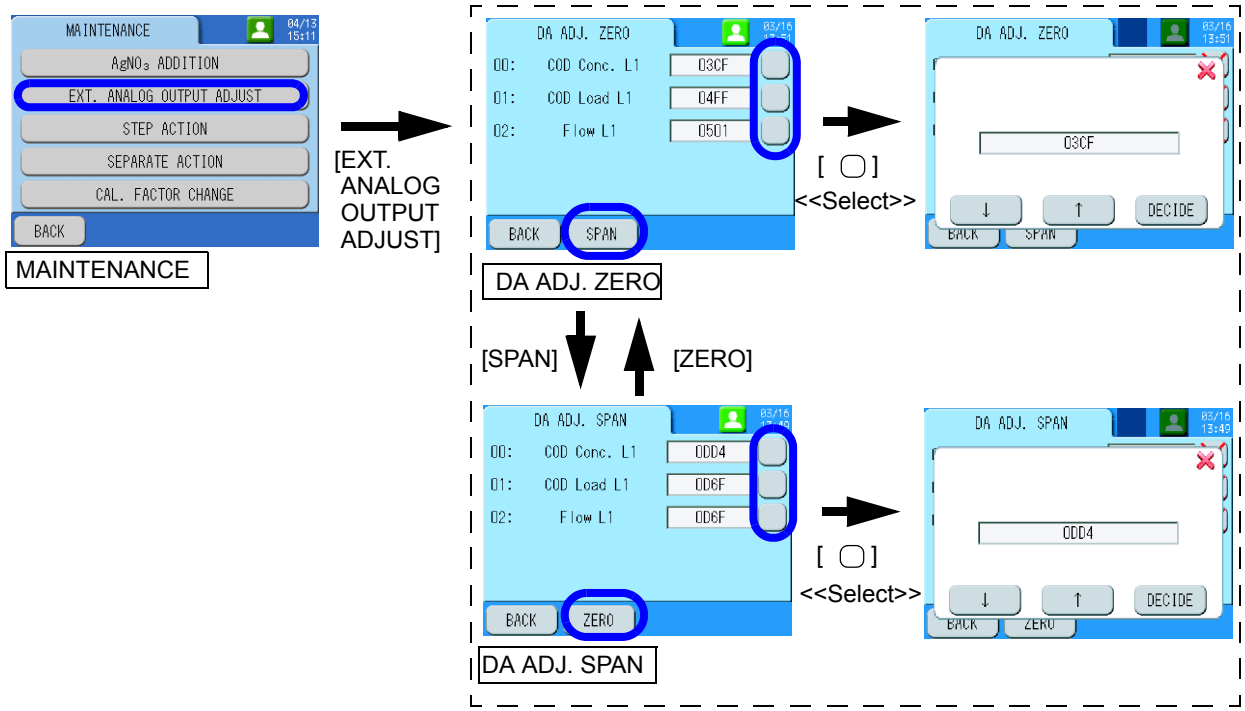
Operation procedures

[MENU] [MAINTENANCE]
MAIN → MENU → MAINTENANCE
Refer to “ [MENU] item screens ” (page 47).

1. **Press [EXT. ANALOG OUTPUT ADJUST] on the MAINTENANCE screen.**
   The screen for external analog output adjustment will be displayed.
2. **Configure the settings for external analog output adjustment.**

Note

If you do not press any button for more than 10 minutes on any screen shown within the broken-line square, the screen will return to the output specified in ch.



STEP ACTION

Set up the step execution and perform steps.

Item	Setting range	Initial value	Description
Measure Line	Measure L1 Measure L2 ZERO Cal. SPAN Cal. Blank Meas. Cleaning Cell Cleaning	Measure L1	Select an object.
Start Sequence	Select a sequence on the screen. For details, refer to “ Time chart ” (page 211)	Discharge Water	Specify a Start Sequence.
End Sequence		Inject Blank Water	Specify an End Sequence.

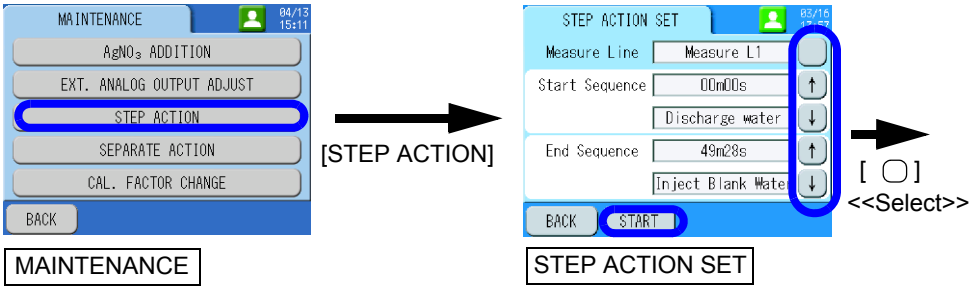
Operation procedures

[MENU] [MAINTENANCE]

MAIN → MENU → MAINTENANCE

Refer to “ [MENU] item screens ” (page 47).

1. **Press [STEP ACTION] on the MAINTENANCE screen.**
   The STEP ACTION SET screen will be displayed.
2. **Select the Measure Line and press [DECIDE].**
3. **Select Start and End Sequences and press [DECIDE].**
4. **Press [START] to execute the specified processes.**



SEPARATE ACTION

Specify and update individual actions.

SEPARATE ACTION		
SEPARATE ACTION 1/3	SEPARATE ACTION 2/3	SEPARATE ACTION 3/3
Fill Titrator	Gage Reag. B	Gauge Sample L1
Titration	Gage Reag. C	Gauge Sample L2
Discharge water	Gage Reag. D *	Line cleaning
Discharge wastes	Gage Reag. E	Electrode Wash
Gage Reag. A	Gage Blank Tank	Water filter Purge

* : When alkaline method is used, “Gage Reag. F“ is displayed.

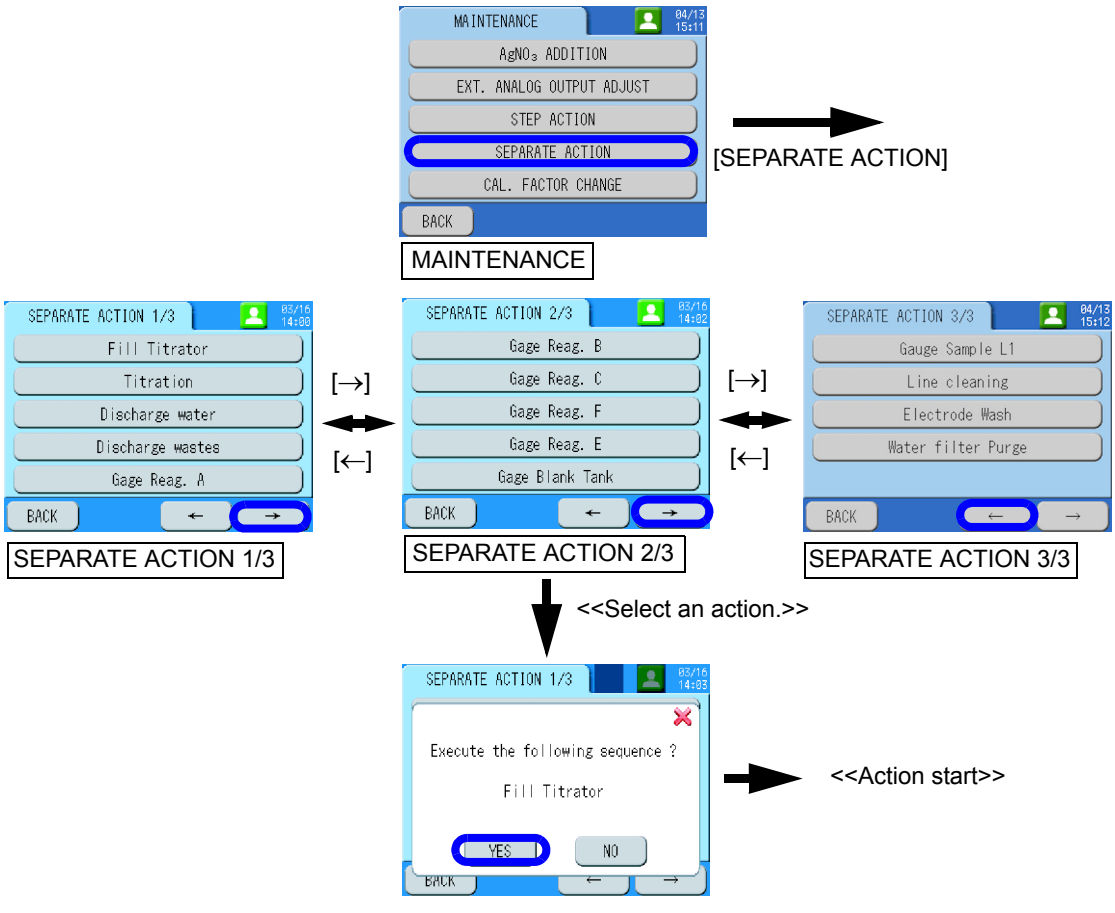
Operation procedures

[MENU] [MAINTENANCE]

MAIN → MENU → MAINTENANCE

Refer to “ [MENU] item screens ” (page 47).

1. **Press [SEPARATE ACTION] on the MAINTENANCE screen.**
   The SEPARATE ACTION screen will be displayed.
2. **Select actions to be executed and press [YES].**
   The selected action will be started.



CAL. FACTOR CHANGE

Specify and update calibration values optionally.

Item	Setting range
ZERO Factor	0 PULSE to 45 PULSE
SPAN Factor	220 PULSE to 285 PULSE

Note

- **An optional value can be input to use the only correct value since a part of the calibration data shows an aberrant value due to a malfunction. Otherwise operate the calibration normally.**
- **If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.**

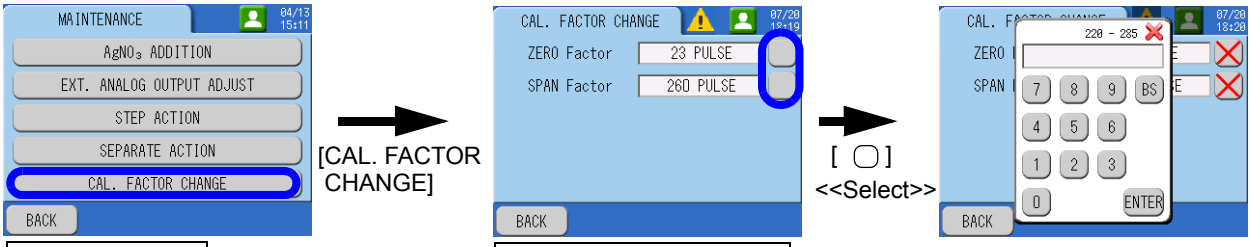
Operation procedures

[MENU] [MAINTENANCE]

MAIN → MENU → MAINTENANCE

Refer to " [MENU] item screens " (page 47).

1. **Press [CAL. FACTOR CHANGE] on the MAINTENANCE screen.**
   The CAL. FACTOR CHANGE screen will be displayed.
2. **Enter a calibration value.**



MAINTENANCE

CAL. FACTOR CHANGE

[MENU]-[CHECK]

Performs the following operations for check.

Item	Function	Reference
MACHINE INFORMATION	Check machine information.	page 99
EXT. POINT INPUT	Check the items and statuses (ON or OFF) of external contact inputs.	page 100
EXT. POINT OUTPUT	Check the items and statuses (ON or OFF) of external contact outputs. You can also switch the ON/OFF status of each output.	page 101
EXT. ANALOG INPUT	Check the items and set values of external analog inputs.	page 102
EXT. ANALOG OUTPUT	Check the items and set values of external analog outputs. You can also switch the value of each output.	page 103
INT. ANALOG INPUT	Check the item and set value of the internal analog input.	page 104

■ MACHINE INFORMATION

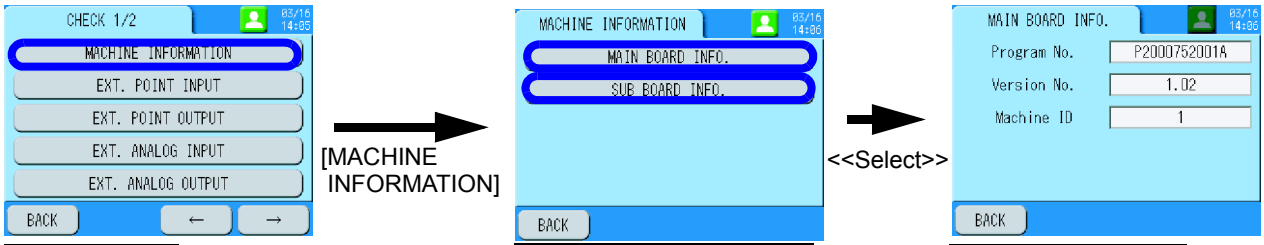
Check machine information.
Information on the main board and the sub-board can be checked.

Item	Description
Program No.	Number starting with P
Version No.	Software version number
Machine ID	To be specified when multiple equipment pieces are used.

● Operation procedures

[MENU] [CHECK]
MAIN → MENU → CHECK 1/2
Refer to “ [MENU] item screens ” (page 47).

1. **Press [MACHINE INFORMATION] on the CHECK 1/2 screen.**
The MACHINE INFORMATION screen will be displayed.



CHECK 1/2 | MACHINE INFORMATION | MAIN BOARD INFO.

2. **Press the button of the equipment you want to check.**
The information will be displayed.

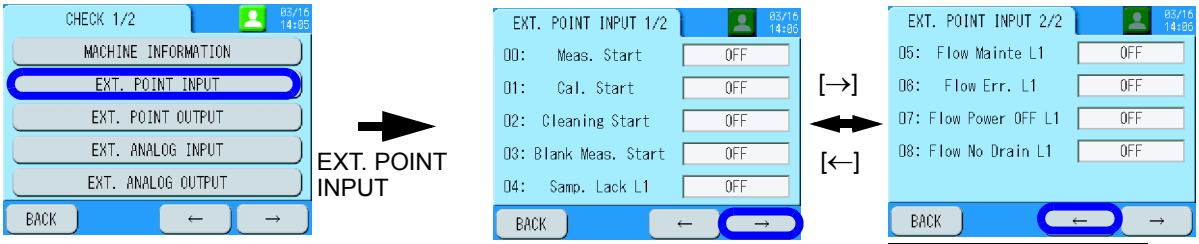
EXT. POINT INPUT

Check the items and statuses (ON or OFF) of external contact inputs.

Operation procedures

[MENU] [CHECK]
MAIN → MENU → CHECK 1/2
Refer to “ [MENU] item screens ” (page 47).

1. **Press [EXT. POINT INPUT] on the CHECK 1/2 screen.**
   The EXT. POINT INPUT screen will be displayed.
   You can check the items and statuses (ON or OFF) of the external contact inputs.



EXT. POINT OUTPUT

Check the items and statuses (ON or OFF) of external contact outputs.
You can also switch the ON/OFF status of each output.

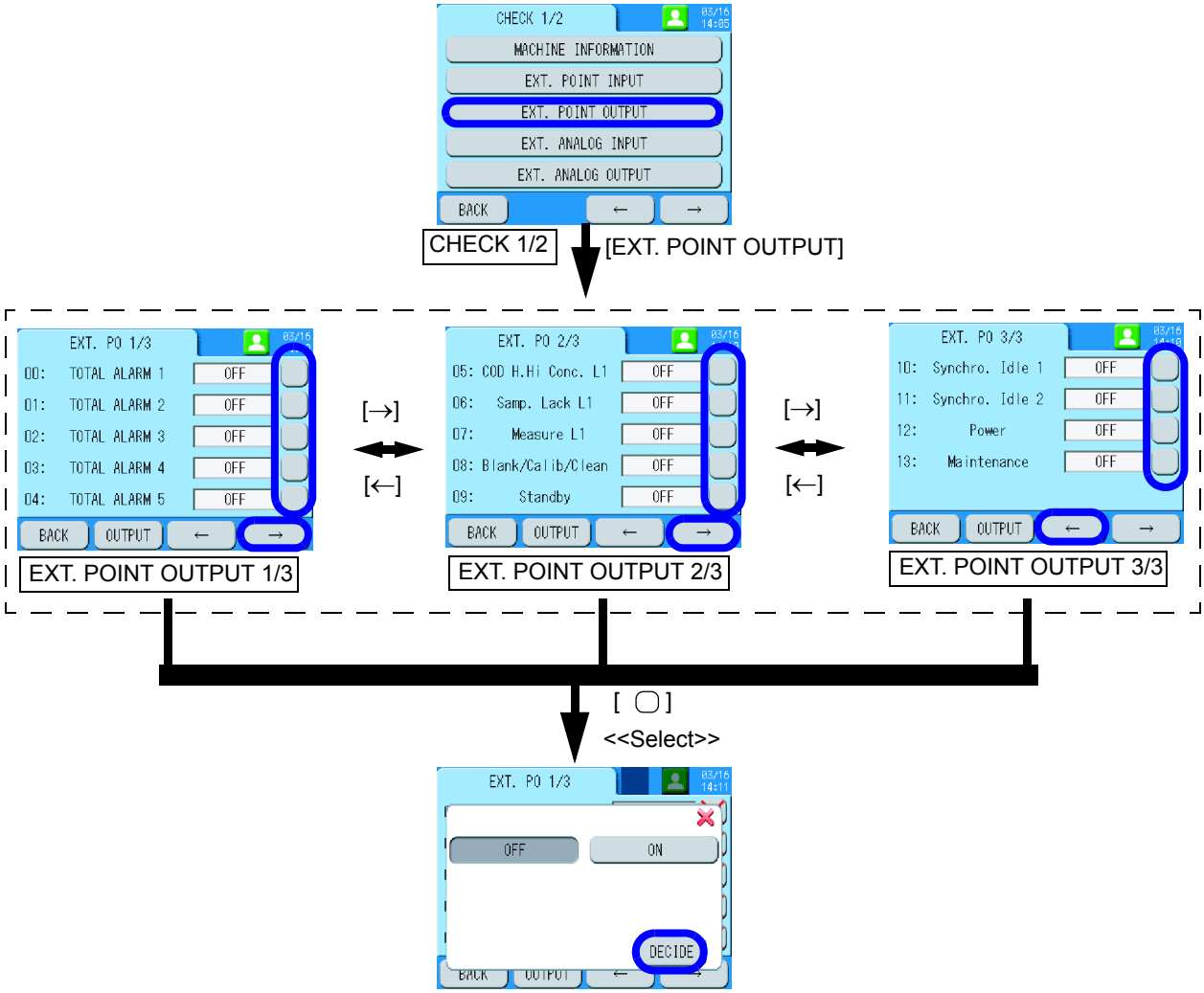
Operation procedures

[MENU] [CHECK]
MAIN → MENU → CHECK 1/2
Refer to " [MENU] item screens " (page 47).

1. **Press [EXT. POINT OUTPUT] on the CHECK 1/2 screen.**
   The EXT. PO screen will be displayed.
   You can check the items and statuses (ON or OFF) of the external contact outputs.
2. **To switch the ON/OFF status, select an output item.**
3. **Select ON or OFF and press [DECIDE].**

Note

If you do not press any button for more than 10 minutes on any screen shown within the broken-line square, the screen will return to the output specified in ch.



■ EXT. ANALOG INPUT

Check the items and set values of external analog inputs.

● Operation procedures

[MENU] [CHECK]

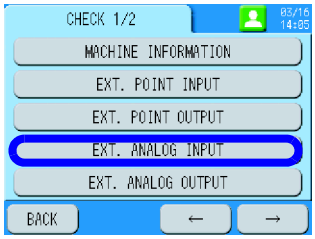
MAIN → MENU → CHECK 1/2

Refer to “ [MENU] item screens ” (page 47).

1. **Press [EXT. ANALOG INPUT] on the CHECK 1/2 screen.**

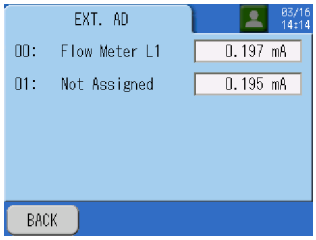
The EXT. AD screen will be displayed.

You can check the items and set values of the external analog inputs.



CHECK 1/2

[EXT. ANALOG INPUT]



EXT. AD

EXT. ANALOG OUTPUT

Check the items and set values of external analog outputs.
You can also switch the value of each output.

Item	Setting range	Initial value	Description
ch00	0.0 mA 4.0 mA 8.0 mA 12.0 mA 16.0 mA 20.0 mA	0.0 mA	ch00: Setting for analog output
ch01			ch01: Setting for analog output
ch02			ch02: Setting for analog output

Operation procedures

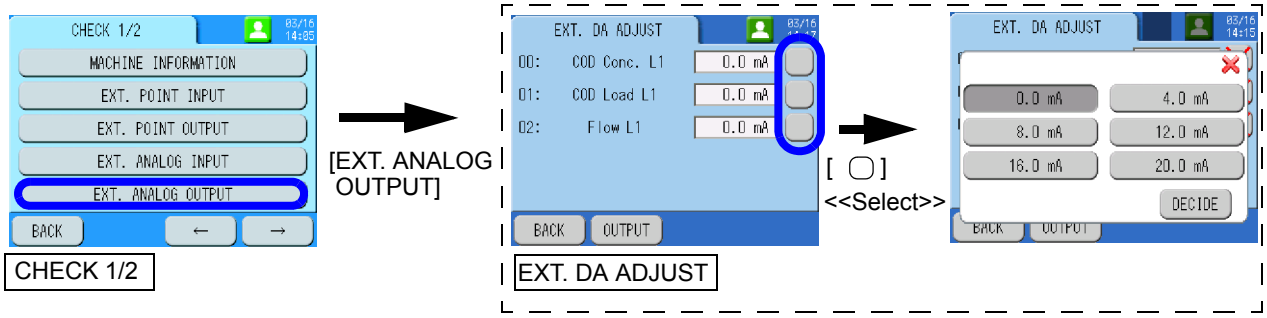
[MENU] → MAIN → MENU → [CHECK] → CHECK 1/2

Refer to “ [MENU] item screens ” (page 47).

1. **Press [EXT. ANALOG OUTPUT] on the CHECK 1/2 screen.**
   The EXT. DA ADJUST screen will be displayed.
   You can check the items and set values of the external analog outputs.
2. **To switch the set value, select an output item.**
3. **Select a set value press [DECIDE].**

Note

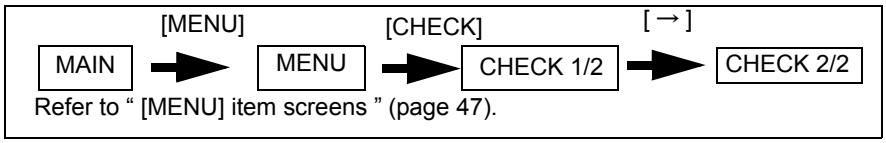
If you do not press any button for more than 10 minutes on any screen shown within the broken-line square, the screen will return to the output specified in ch.



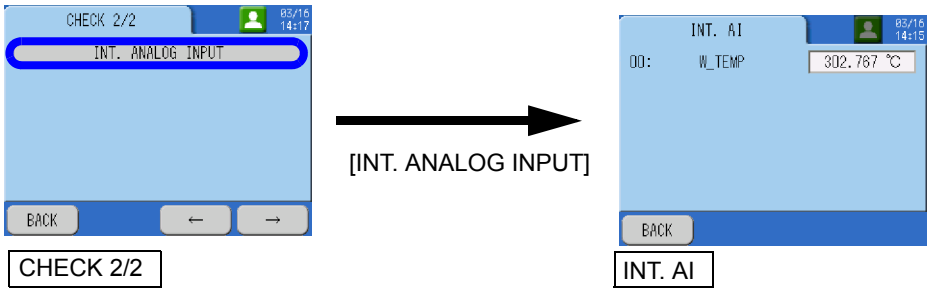
■ INT. ANALOG INPUT

Check the item and set value of the internal analog input.

● Operation procedures

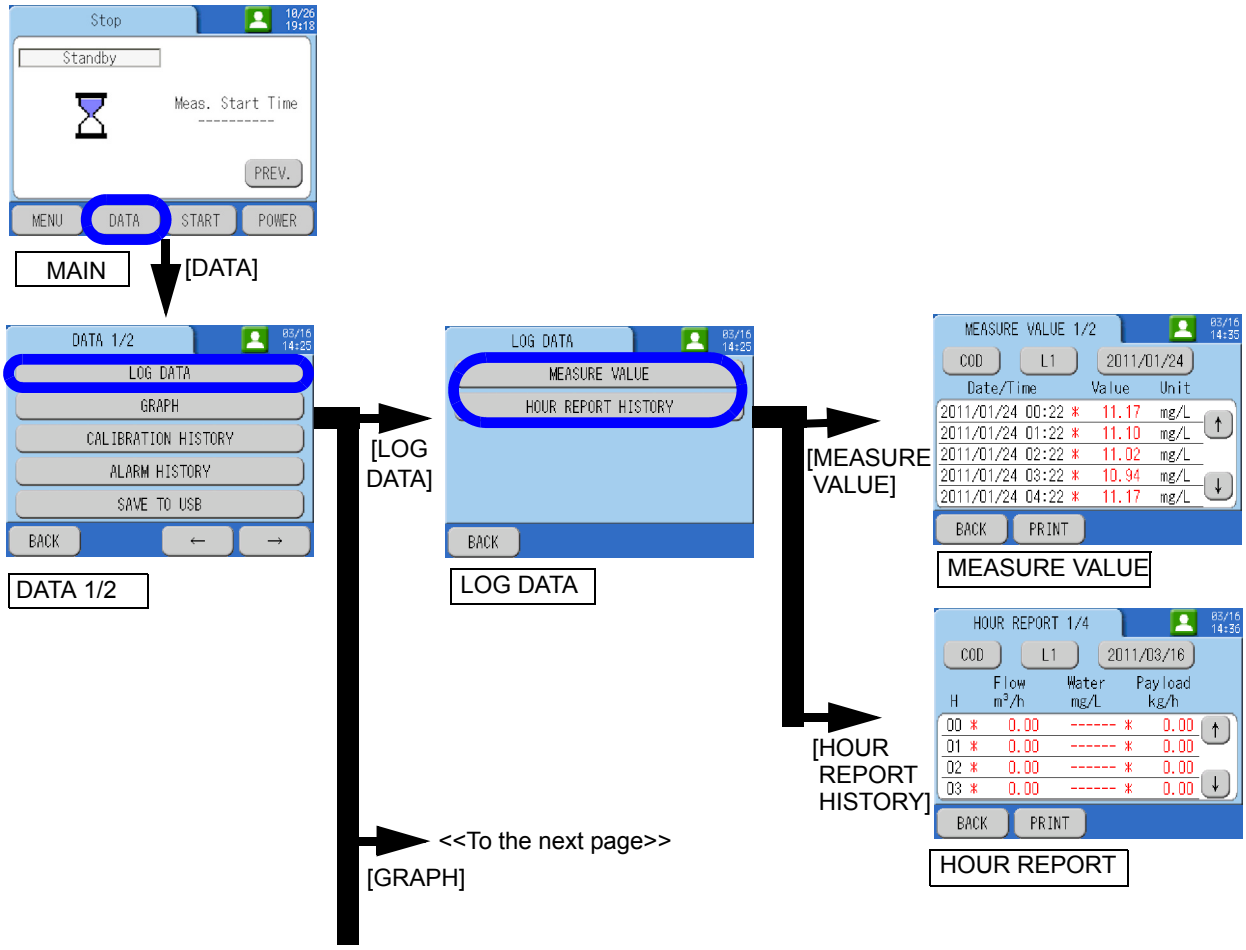


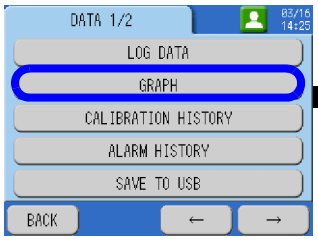
1. **Press [INT. ANALOG INPUT] on the CHECK 2/2 screen.**
The INT. AI screen will be displayed.
You can check the item and set value of the internal analog inputs.



[DATA] item screens

1. **Press [DATA] on the MAIN screen or MEAS. screen.**
   The DATA screen will be displayed.
2. **Select a button displayed on the DATA screen.**
   The screen for the selected item will be displayed.

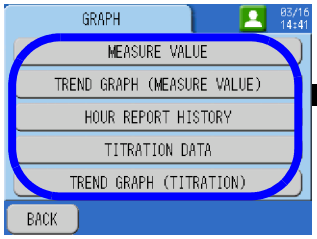




DATA 1/2

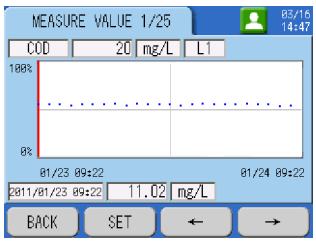
<<To the previous page>>
[LOG DATA]

[GRAPH]



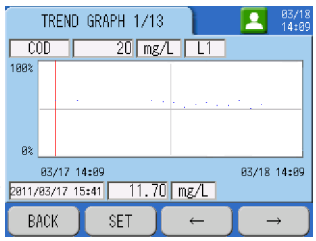
GRAPH

[MEASURE VALUE]



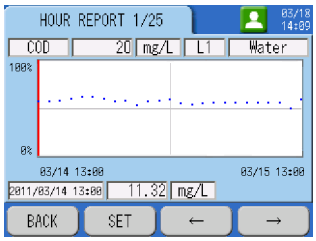
MEASURE VALUE

[TREND GRAPH (MEASURE VALUE)]



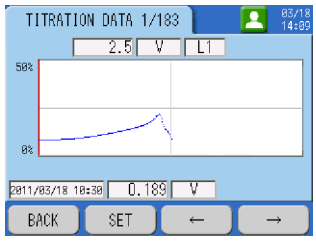
TREND GRAPH

[HOUR REPORT HISTORY]



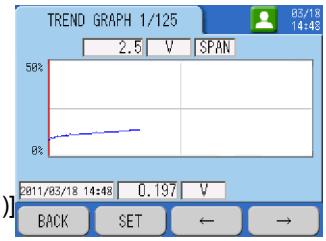
HOUR REPORT

[TITRATION DATA]



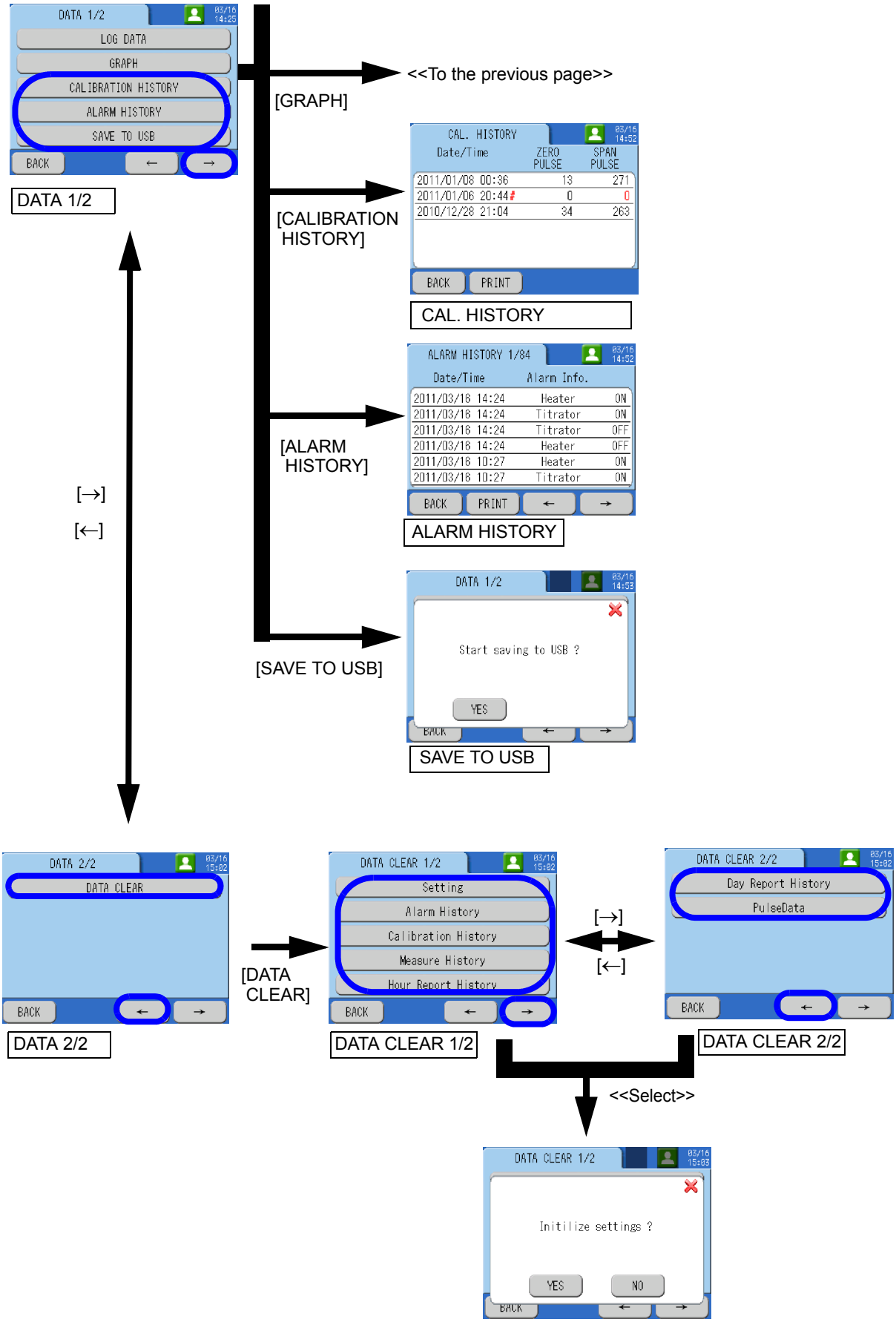
TITRATION DATA

[TREND GRAPH (TITARATION)]



TREND GRAPH

<<To the next page>>
[CALIBRATION HISTORY]


DATA 1/2
LOG DATA
GRAPH
CALIBRATION HISTORY
ALARM HISTORY
SAVE TO USB
BACK
DATA 1/2
<<To the previous page>>
[GRAPH]
[CALIBRATION HISTORY]
CAL. HISTORY
Date/Time
ZERO PULSE
SPAN PULSE
2011/01/08 00:36 13 271
2011/01/06 20:44 0 0
2010/12/28 21:04 34 263
BACK
PRINT
CAL. HISTORY
[ALARM HISTORY]
ALARM HISTORY 1/84
Date/Time
Alarm Info.
2011/03/16 14:24 Heater ON
2011/03/16 14:24 Titrator ON
2011/03/16 14:24 Titrator OFF
2011/03/16 14:24 Heater OFF
2011/03/16 10:27 Heater ON
2011/03/16 10:27 Titrator ON
BACK
PRINT
ALARM HISTORY
[→]
[←]
[SAVE TO USB]
DATA 1/2
Start saving to USB ?
YES
SAVE TO USB
DATA 2/2
DATA CLEAR
BACK
DATA 2/2
[DATA CLEAR]
DATA CLEAR 1/2
Setting
Alarm History
Calibration History
Measure History
Hour Report History
BACK
DATA CLEAR 1/2
[→]
[←]
DATA CLEAR 2/2
Day Report History
PulseData
BACK
DATA CLEAR 2/2
<<Select>>
DATA CLEAR 1/2
Initilize settings ?
YES
NO
BACK

[DATA]-[LOG DATA]

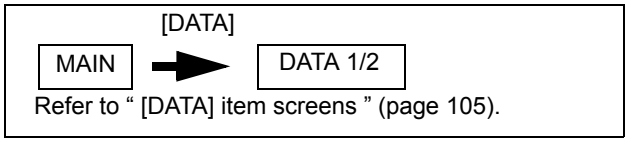
Call up the past data.

Item	Function	Reference
MEASURE VALUE	Call up the past measurement data.	page 108
HOUR REPORT	Call up past hour report data.	page 110

■ MEASURE VALUE

Call up the past measurement data.
The data are arranged in the descending order of updates of measured values.

● Operation procedures

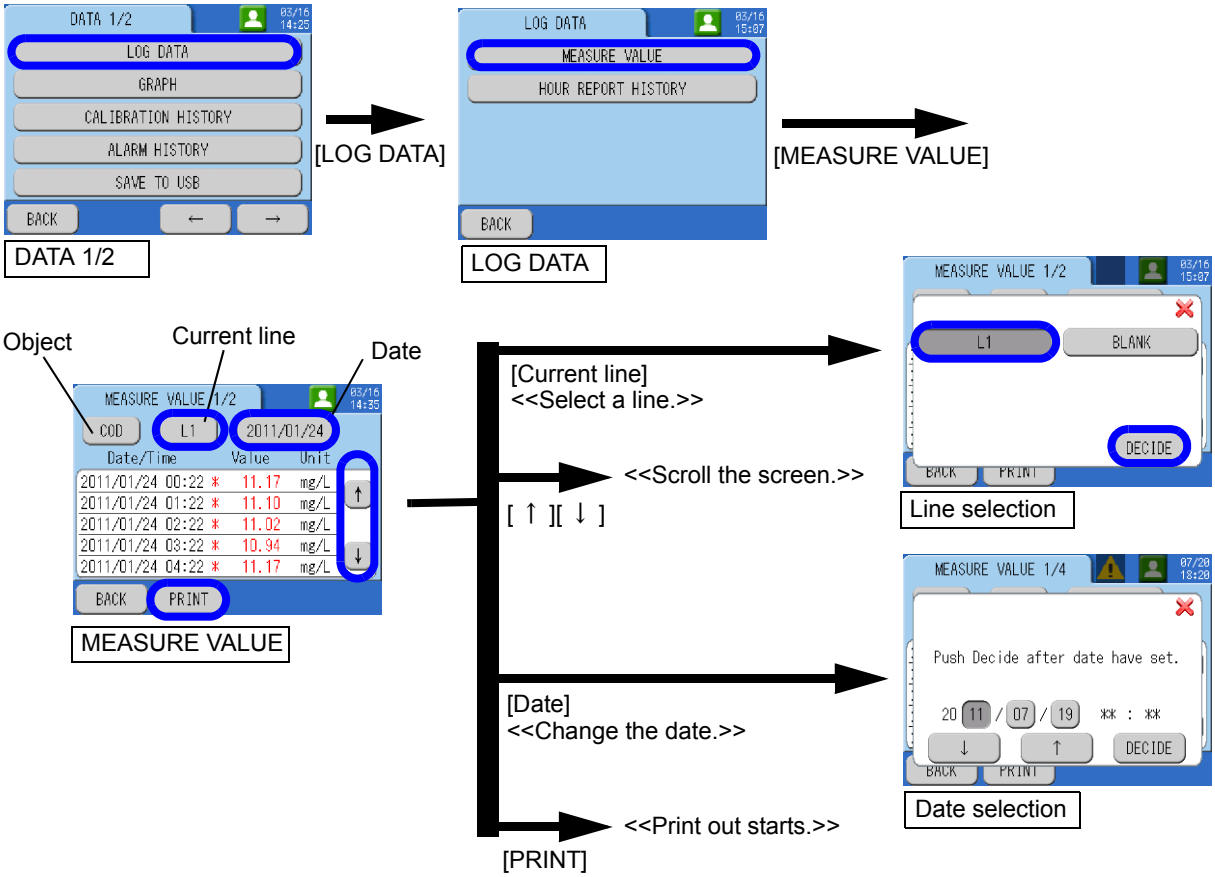


1. **Press [LOG DATA] on the DATA 1/2 screen.**
2. **Press [MEASURE VALUE] on the LOG DATA screen.**
   The MEASURE VALUE screen will be displayed.
   - Press ↑ ↓ buttons to scroll the screen. Press the Date button and select a desired date. And then press [DECIDE] to check the data on the specified date.
   - To change the line, press the current line button and select a desired line. And then press [DECIDE].

Setting range		
L1	L2	BLANK

* L2 is only selectable for the 2-sample line type.

   - To print out, press the [PRINT] button to print out the data list displayed on the screen.


DATA 1/2
LOG DATA
GRAPH
CALIBRATION HISTORY
ALARM HISTORY
SAVE TO USB
BACK
[LOG DATA]
LOG DATA
MEASURE VALUE
HOUR REPORT HISTORY
BACK
[MEASURE VALUE]
DATA 1/2
LOG DATA
Object
Current line
Date
MEASURE VALUE 1/2
COD
L1
2011/01/24
Date/Time
Value
Unit
2011/01/24 00:22 * 11.17 mg/L
2011/01/24 01:22 * 11.10 mg/L
2011/01/24 02:22 * 11.02 mg/L
2011/01/24 03:22 * 10.94 mg/L
2011/01/24 04:22 * 11.17 mg/L
BACK
PRINT
MEASURE VALUE
[Current line]
<<Select a line.>>
<<Scroll the screen.>>
[↑][↓]
[Date]
<<Change the date.>>
<<Print out starts.>>
[PRINT]
MEASURE VALUE 1/2
L1
BLANK
DECIDE
Line selection
MEASURE VALUE 1/4
Push Decide after date have set.
20 11 / 07 / 19 ** : **
DECIDE
Date selection

HOUR REPORT

Call up past hour report data.
The data are arranged in the descending order of data at 00 minutes every hour.

Operation procedures

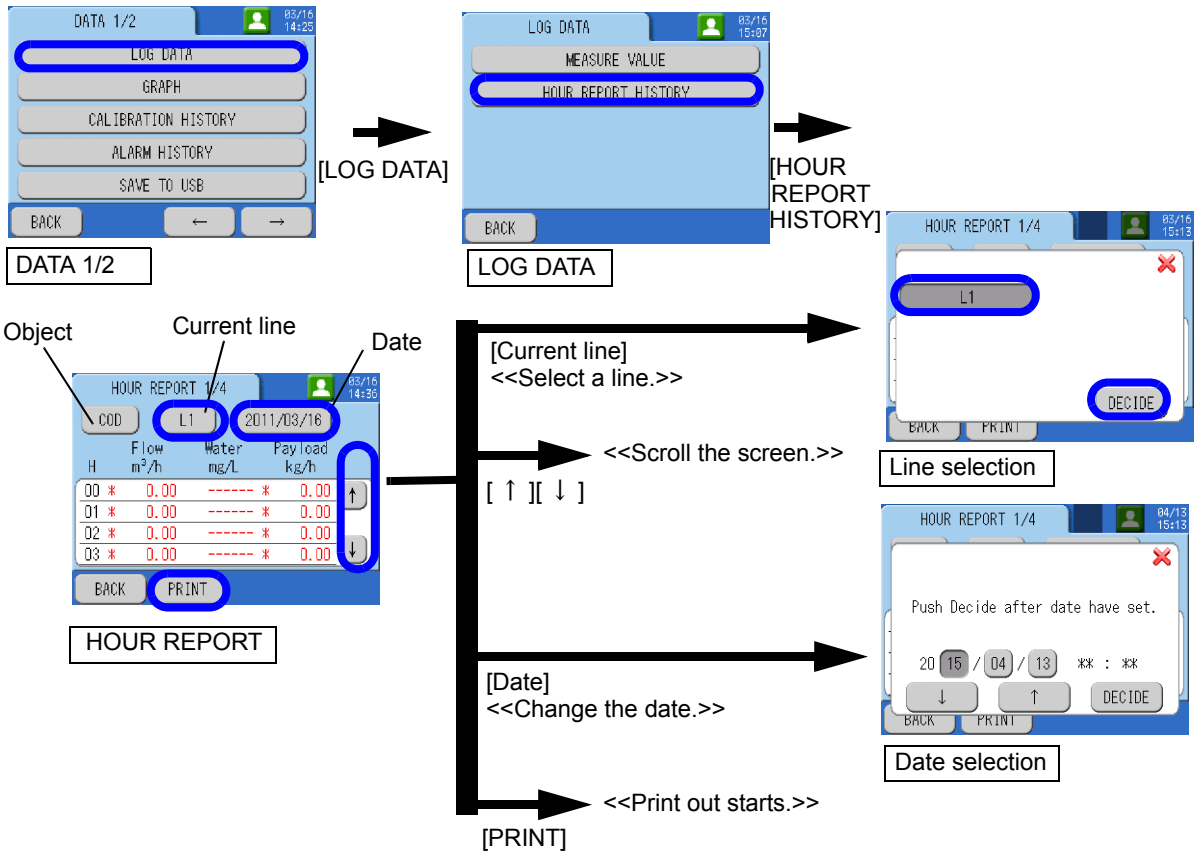
[DATA]
MAIN → DATA 1/2
Refer to " [DATA] item screens " (page 105).

1. **Press [LOG DATA] on the DATA 1/2 screen.**
2. **Press [HOUR REPORT HISTORY] on the LOG DATA screen.**
   The HOUR REPORT screen will be displayed. The load at every hour will displayed.
   - Press ↑ ↓ buttons to scroll the screen. Press the Date button and select a desired date. And then press [DECIDE] to check the data on the specified date.
   - To change the line, press the current line button and select a desired line. And then press [DECIDE].

Setting range		
L1	L2	BLANK

* L2 is only selectable for the 2-sample line type.

   - To print out, press the [PRINT] button to print out the data list displayed on the screen.



[DATA]-[GRAPH]

Display graphs of the following data. You can specify the graph display.

Item	Function	Reference
MEASURE VALUE	Display the graph of the past measurement data. You can specify the graph display.	page 111
TREND GRAPH	Display the trend graph of the past measurement data. You can specify the graph display.	page 113
HOUR REPORT	Display the graph of the past hour report data. You can specify the graph display.	page 115
TITRATION DATA	Display the graph of the signal output during titration for one past measurement run. You can specify the graph display.	page 117
TREND GRAPH (TITRATION)	Display the graph of the signal output during titration for the current measurement run. You can specify the graph display.	page 119

■ MEASURE VALUE

Display the graph of the past measurement data. You can specify the graph display.

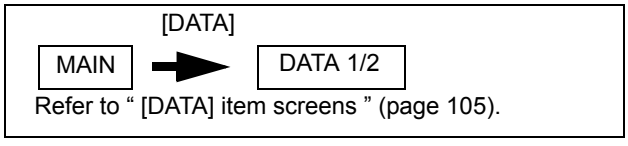
Item	Setting range				Description
Measure Line	L1	L2	BLANK		Specify a graph display line.
Scale	0.01 to 2000				Specify a graph display scale (concentration range).
Start Time	Each setting				Specify display starting date and time.
Period	1 day	7 days	30 days		Specify a display range (period).
Vertical Top	25%	50%	75%	100%	Specify an upper limit to display the vertical axis of the graph.
Vertical Under	0%	25%	50%	75%	Specify a lower limit to display the vertical axis of the graph.

* L2 is only selectable for the 2-sample line type.

Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

● Operation procedures

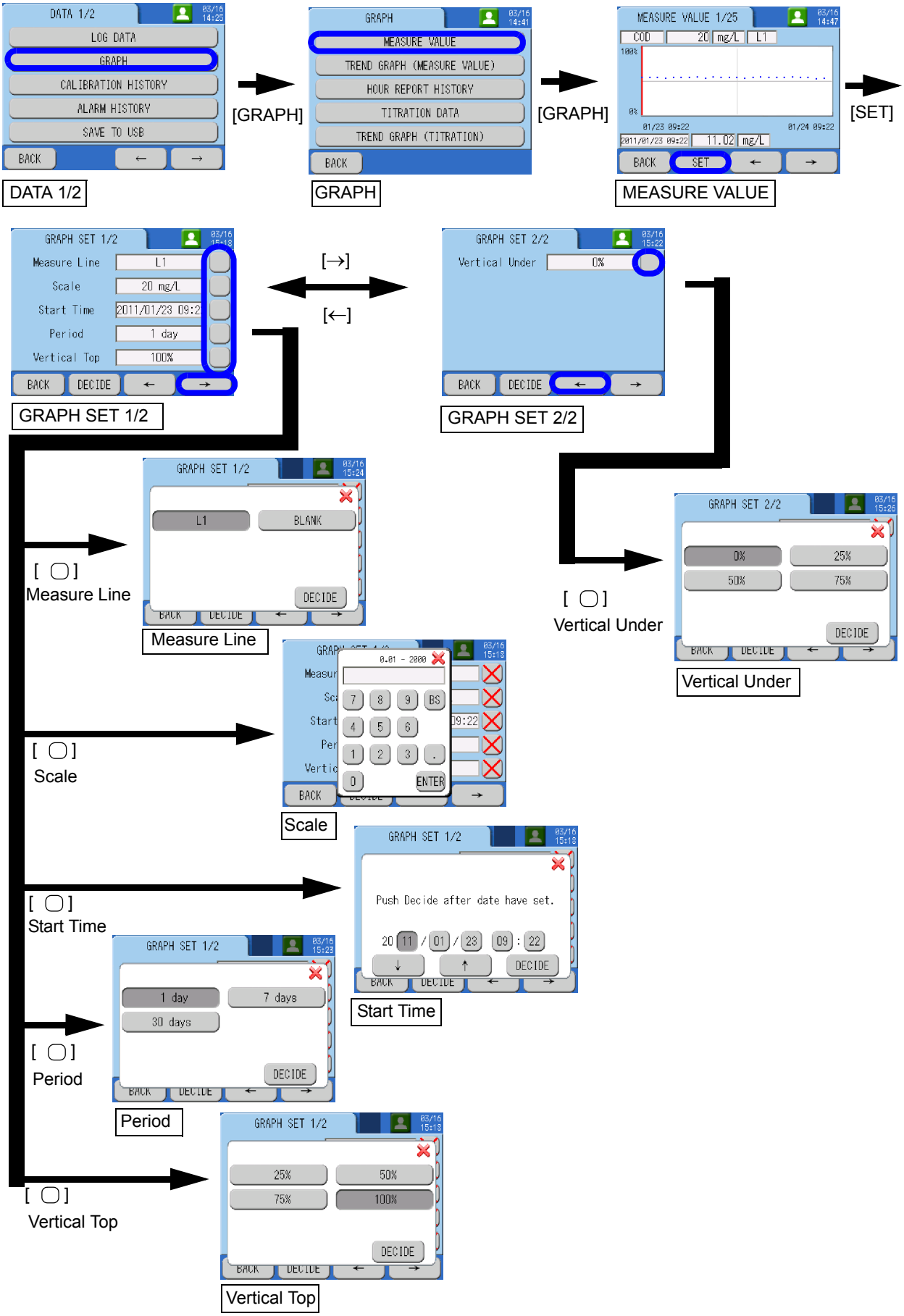


1. **Press [GRAPH] on the DATA 1/2 screen.**
2. **Press [MEASURE VALUE] on the GRAPH screen.**
   The MEASURE VALUE screen (graph display) will be displayed.

Tip

You can choose a plot with the arrow buttons to display the data on the screen.

3. **To change the display setting, press [SET] on the MEASURE VALUE screen.**
   The GRAPH SET screen will be displayed.
4. **Specify display conditions on the GRAPH SET screen.**


DATA 1/2
LOG DATA
GRAPH
CALIBRATION HISTORY
ALARM HISTORY
SAVE TO USB
BACK
[GRAPH]
GRAPH
MEASURE VALUE
TREND GRAPH (MEASURE VALUE)
HOUR REPORT HISTORY
TITRATION DATA
TREND GRAPH (TITRATION)
[GRAPH]
MEASURE VALUE 1/25
COD
20 mg/L
L1
11.02 mg/L
SET
[SET]
GRAPH SET 1/2
Measure Line L1
Scale 20 mg/L
Start Time 2011/01/23 09:22
Period 1 day
Vertical Top 100%
DECIDE
[→]
[←]
GRAPH SET 2/2
Vertical Under 0%
[ ]
Measure Line
[ ]
Vertical Under
[ ]
Scale
[ ]
Start Time
[ ]
Period
[ ]
Vertical Top
BLANK
0% 25% 50% 75%
Push Decide after date have set.
1 day 7 days 30 days
25% 50% 75% 100%

■ TREND GRAPH

Display the trend graph of the past measurement data. You can specify the graph display.

Item	Setting range				Description
Measure Line	L1	L2	BLANK		Specify a graph display line.
Scale	0.01 to 2000				Specify a graph display scale (concentration range).
Vertical Under	25%	50%	75%	100%	Specify an upper limit to display the vertical axis of the graph.
Vertical Under	0%	25%	50%	75%	Specify a lower limit to display the vertical axis of the graph.

* L2 is only selectable for the 2-sample line type.

Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

● Operation procedures

[DATA]

MAIN → DATA 1/2

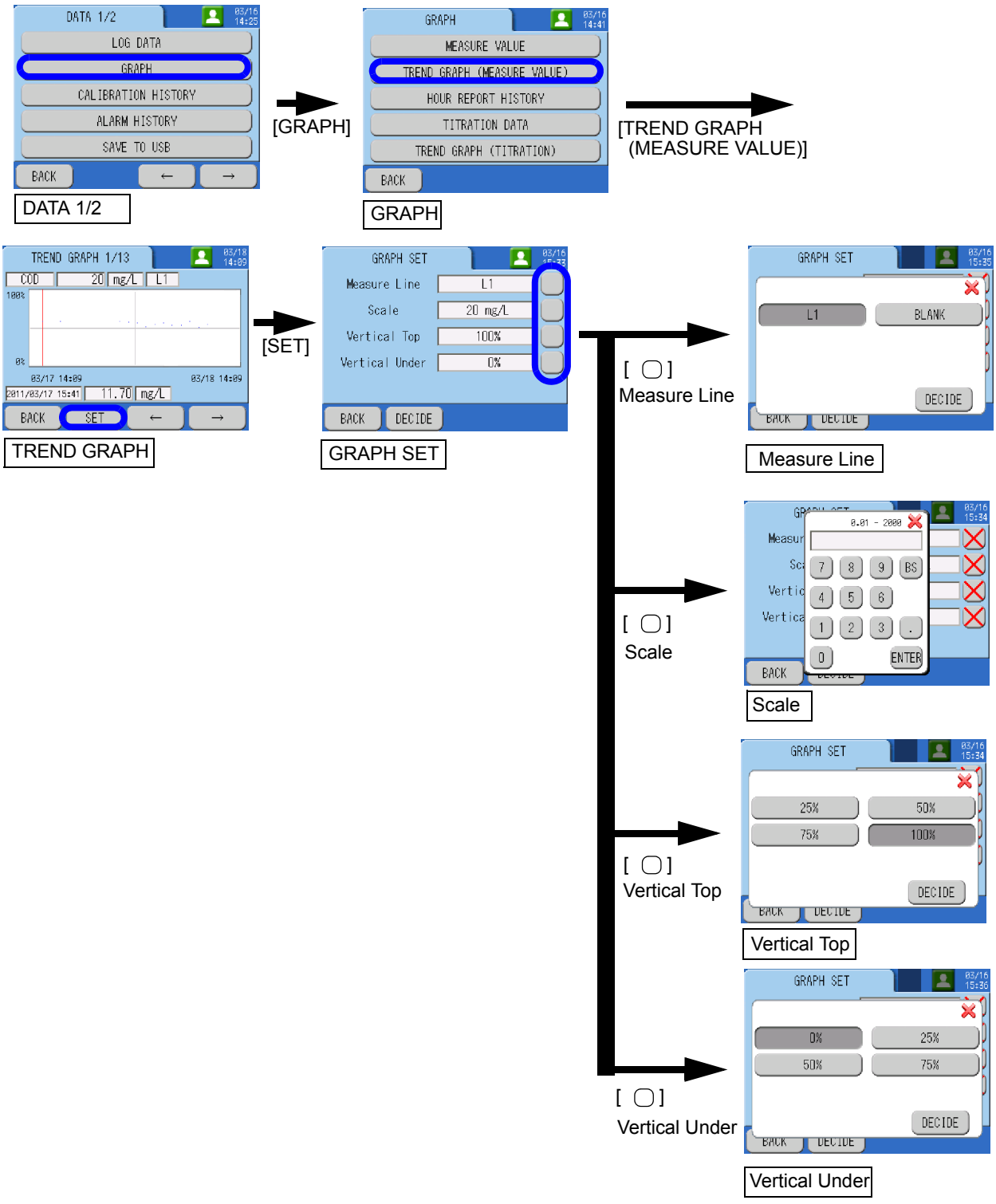
Refer to " [DATA] item screens " (page 105).

1. **Press [GRAPH] on the DATA 1/2 screen.**
2. **Press [TREND GRAPH (MEASURE VALUE)] on the GRAPH screen.**
   The TREND GRAPH screen for measurement values will be displayed.

Tip

You can choose a plot with the arrow buttons to display the data on the screen.

3. **To change the display setting, press [SET] on the TREND GRAPH screen.**
   The GRAPH SET screen will be displayed.
4. **Specify display conditions on the GRAPH SET screen.**


DATA 1/2
LOG DATA
GRAPH
CALIBRATION HISTORY
ALARM HISTORY
SAVE TO USB
BACK
[GRAPH]
GRAPH
MEASURE VALUE
TREND GRAPH (MEASURE VALUE)
HOUR REPORT HISTORY
TITRATION DATA
TREND GRAPH (TITRATION)
BACK
[TREND GRAPH (MEASURE VALUE)]
DATA 1/2
GRAPH
TREND GRAPH 1/13
COD
20 mg/L
L1
BACK
SET
[SET]
GRAPH SET
Measure Line
L1
Scale
20 mg/L
Vertical Top
100%
Vertical Under
0%
BACK
DECIDE
TREND GRAPH
GRAPH SET
[ ]
Measure Line
L1
BLANK
DECIDE
Measure Line
[ ]
Scale
0.01 - 2000
BS
ENTER
Scale
[ ]
Vertical Top
25%
50%
75%
100%
DECIDE
Vertical Top
[ ]
Vertical Under
0%
25%
50%
75%
DECIDE
Vertical Under

HOUR REPORT

Display the graph of the past hour report data. You can specify the graph display.

Item	Setting range				Description
Measure Line	L1	L2			Specify a graph display line.
Display item	Flow rate/water quality/load				Specify a component.
Scale	Water quality: 0.01 to 2000 Flow rate: 1 to 999999 Load: 0.00 to 9999999				Specify a graph display scale (concentration range).
Start Time	Each setting				Specify display starting date and time.
Period	1 day	7 days	30 days		Specify a display range (period).
Vertical Top	25%	50%	75%	100%	Specify an upper limit to display the vertical axis of the graph.
Vertical Under	0%	25%	50%	75%	Specify a lower limit to display the vertical axis of the graph.

* L2 is only selectable for the 2-sample line type.

Note

If you enter a number exceeding the digit limit for number setting, the excessive digit are cut off.

Operation procedures

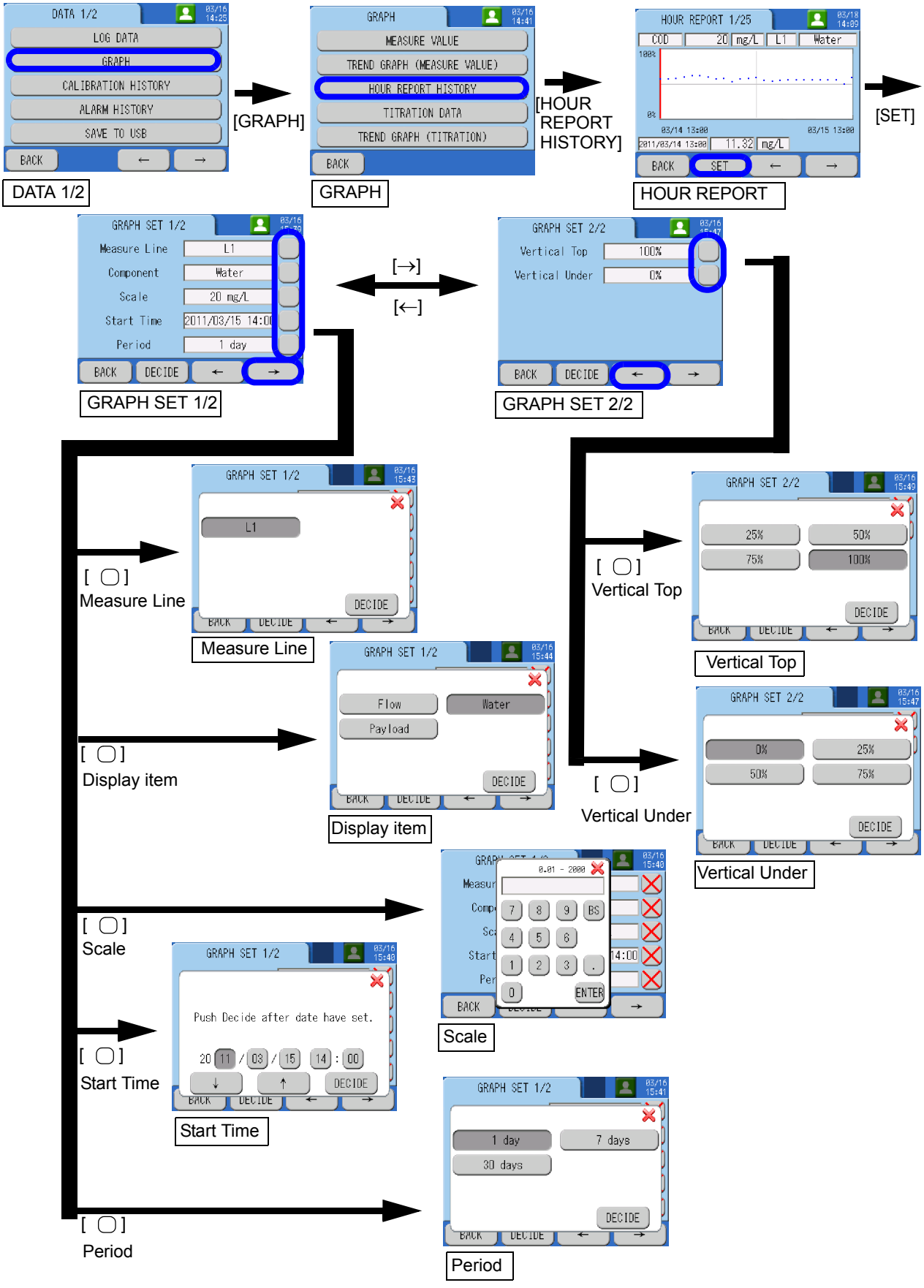
[DATA]
MAIN → DATA 1/2
Refer to " [DATA] item screens " (page 105).

1. **Press [GRAPH] on the DATA 1/2 screen.**
2. **Press [HOUR REPORT HISTORY] on the GRAPH screen.**
   The HOUR REPORT screen (graph display) will be displayed.

Tip

You can choose a plot with the arrow buttons to display the data on the screen.

3. **To change the display setting, press [SET] on the HOUR REPORT screen.**
   The GRAPH SET screen will be displayed.
4. **Specify display conditions on the GRAPH SET screen.**


DATA 1/2
LOG DATA
GRAPH
CALIBRATION HISTORY
ALARM HISTORY
SAVE TO USB
BACK
[GRAPH]
GRAPH
MEASURE VALUE
TREND GRAPH (MEASURE VALUE)
HOUR REPORT HISTORY
TITRATION DATA
TREND GRAPH (TITRATION)
[HOUR REPORT HISTORY]
HOUR REPORT 1/25
[SET]
HOUR REPORT
GRAPH SET 1/2
Measure Line
Component
Scale
Start Time
Period
DECIDE
[→]
[←]
GRAPH SET 2/2
Vertical Top
Vertical Under
[ ]
Measure Line
Display item
Scale
Start Time
Period
Vertical Top
Vertical Under
Push Decide after date have set.
ENTER

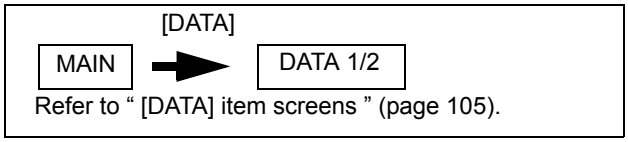
■ TITRATION DATA

Display the graph of the signal output during titration for one past measurement run. You can specify the graph display.

Item	Setting range					Description
Measure Line	L1	L2	ZERO	SPAN	BLANK	Specify a graph display line.
Start Time	Each setting					Specify display starting date and time.
Vertical Top	25%	50%	75%	100%		Specify an upper limit to display the vertical axis of the graph.
Vertical Under	0%	25%	50%	75%		Specify a lower limit to display the vertical axis of the graph.

* L2 is only selectable for the 2-sample line type.

● Operation procedures



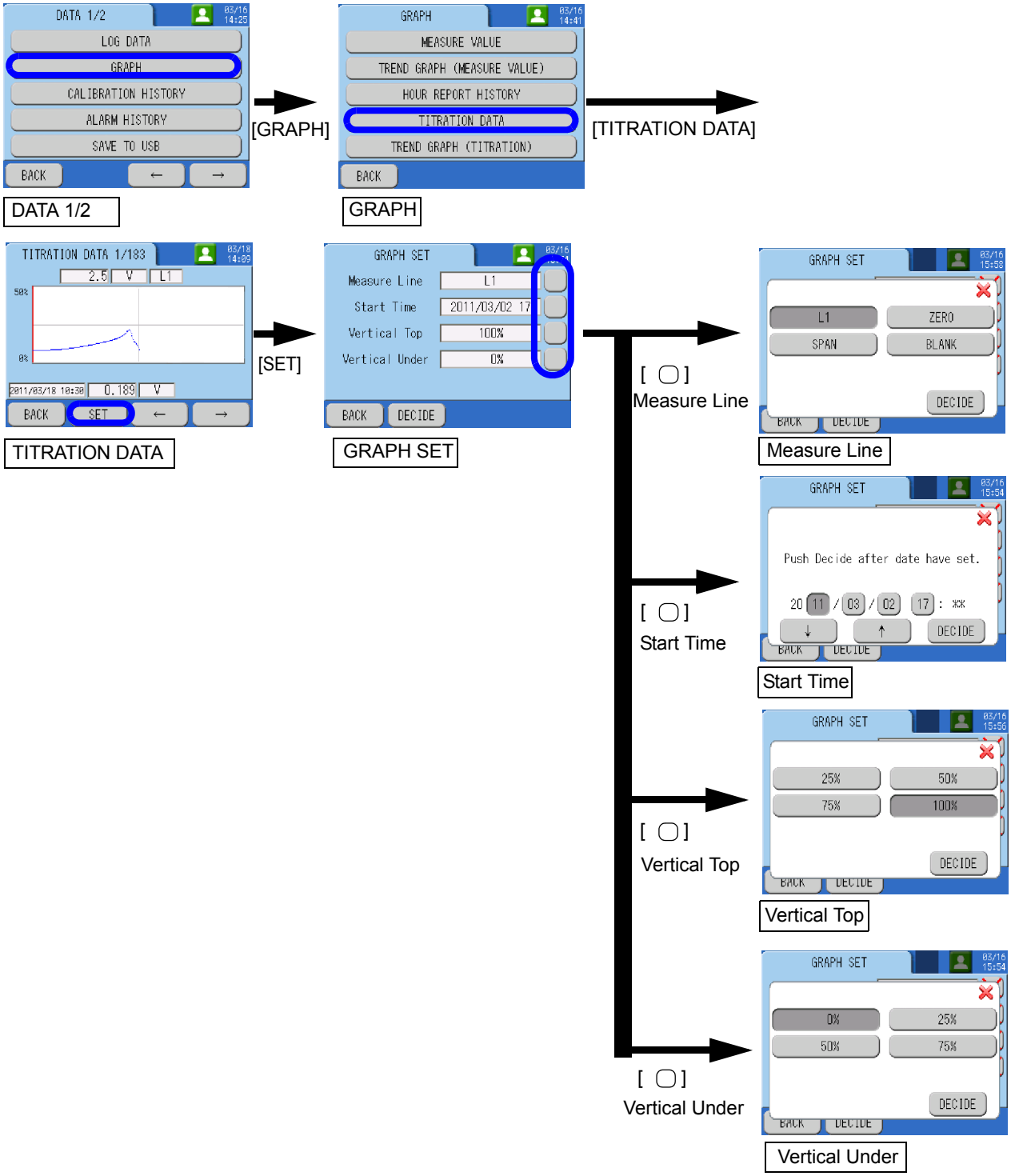
Refer to “ [DATA] item screens ” (page 105).

1. **Press [GRAPH] on the DATA 1/2 screen.**
2. **Press [TITRATION DATA] on the GRAPH screen.**
   The TITRATION DATA screen (graph display) will be displayed.

Tip

You can choose a plot with the arrow buttons to display the data on the screen.

3. **To change the display setting, press [SET] on the TITRATION DATA screen.**
   The GRAPH SET screen will be displayed.
4. **Specify display conditions on the GRAPH SET screen.**


DATA 1/2
LOG DATA
GRAPH
CALIBRATION HISTORY
ALARM HISTORY
SAVE TO USB
BACK
[GRAPH]
GRAPH
MEASURE VALUE
TREND GRAPH (MEASURE VALUE)
HOUR REPORT HISTORY
TITRATION DATA
TREND GRAPH (TITRATION)
BACK
[TITRATION DATA]
DATA 1/2
GRAPH
TITRATION DATA 1/183
BACK
SET
[SET]
GRAPH SET
Measure Line
Start Time
Vertical Top
Vertical Under
BACK
DECIDE
TITRATION DATA
GRAPH SET
[ ]
Measure Line
[ ]
Start Time
[ ]
Vertical Top
[ ]
Vertical Under
L1
ZERO
SPAN
BLANK
DECIDE
Measure Line
Push Decide after date have set.
DECIDE
Start Time
25%
50%
75%
100%
DECIDE
Vertical Top
0%
25%
50%
75%
DECIDE
Vertical Under

TREND GRAPH (TITRATION)

Display the graph of the signal output during titration for the current measurement run. You can change the settings of the graph display.

Item	Setting range				Description
Vertical Top	25%	50%	75%	100%	Specify an upper limit to display the vertical axis of the graph.
Vertical Under	0%	25%	50%	75%	Specify a lower limit to display the vertical axis of the graph.

Operation procedures

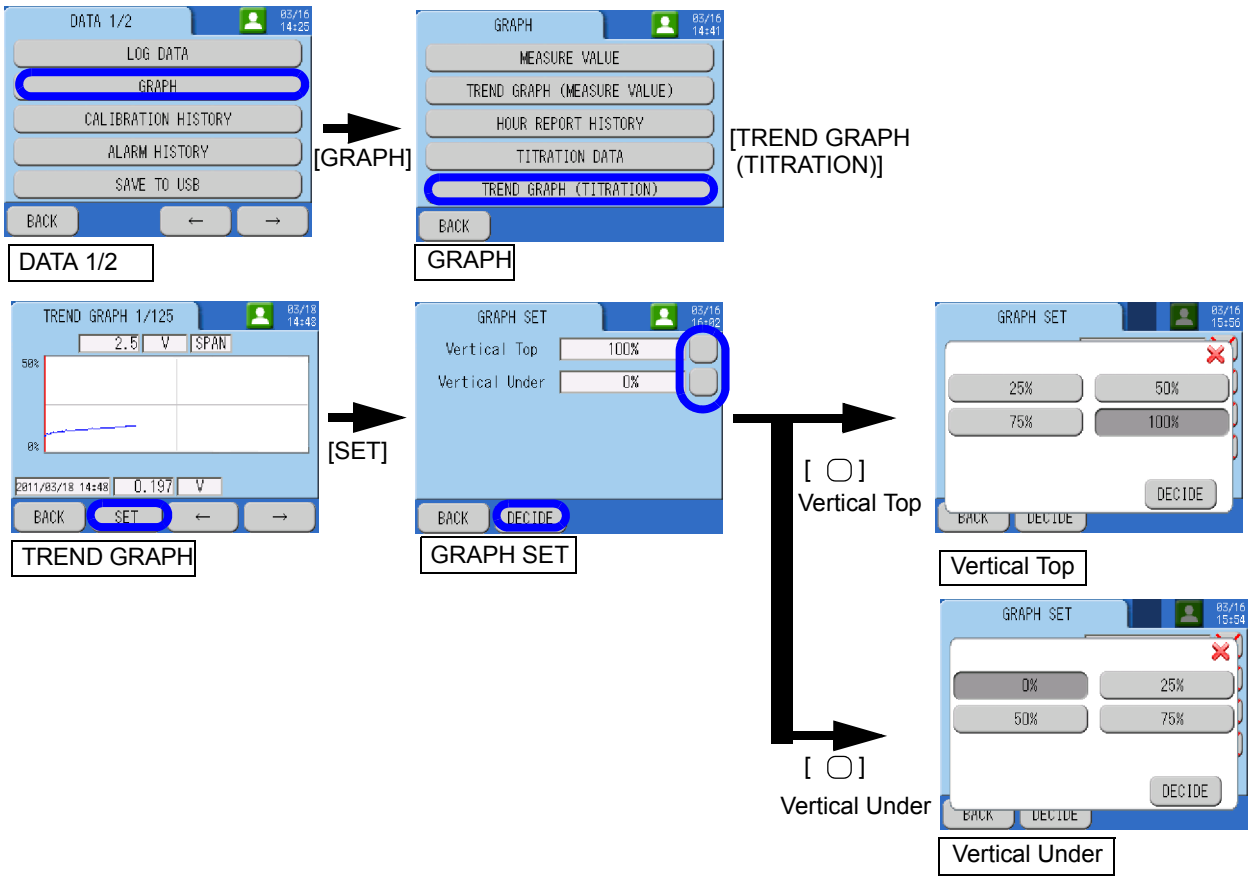
[DATA]
MAIN → DATA 1/2
Refer to " [DATA] item screens " (page 105).

1. **Press [GRAPH] on the DATA 1/2 screen.**
2. **Press [TREND GRAPH (TITRATION)] on the GRAPH screen.**
   The TREND GRAPH screen for titration data will be displayed.
   The MEASURE VALUE screen (graph display) will be displayed.

Tip

You can choose a plot with the arrow buttons to display the data on the screen.

3. **To change the display setting, press [SET] on the TREND GRAPH screen.**
   The GRAPH SET screen will be displayed.
4. **Specify display conditions on the GRAPH SET screen.**



[DATA]-[CALIBRATION HISTORY]

Display calibration history.

● Operation procedures

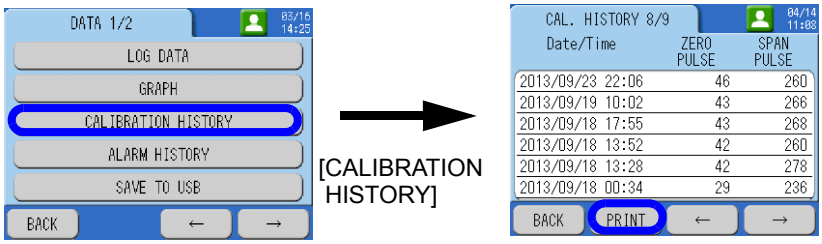
[DATA]
MAIN → DATA 1/2
Refer to “ [DATA] item screens ” (page 105).

1. **Press [CALIBRATION HISTORY] on the DATA 1/2 screen.**
The CAL. HISTORY screen will be displayed.

Tip

You can scroll the history with the arrow buttons.

2. **To print out the history data, press [PRINT].**



DATA 1/2 CAL. HISTORY

[DATA]-[ALARM HISTORY]

Display warning history data.

● Operation procedures

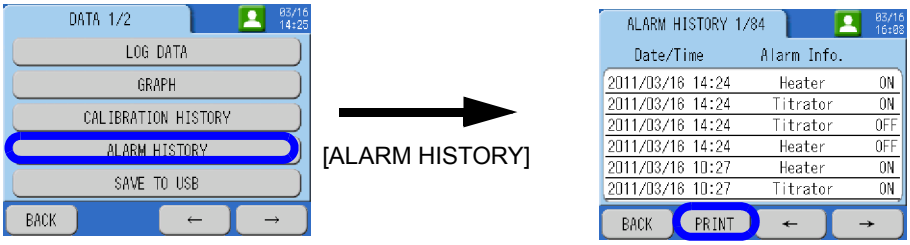
[DATA]
MAIN → DATA 1/2
Refer to “ [DATA] item screens ” (page 105).

1. **Press [ALARM HISTORY] on the DATA 1/2 screen.**
The ALARM HISTORY screen will be displayed.

Tip

You can scroll the history with the arrow buttons.

2. **To print out the history data, press [PRINT].**



DATA 1/2 → [ALARM HISTORY] → ALARM HISTORY

[DATA]-[SAVE TO USB]

Save data to a USB flash drive.
You can transfer the internally saved data using a USB flash drive and view them on the PC or the like.
For the data contents you can transfer, refer to “ Data transferable to USB ” (page 123).

Note

- **A USB flash drive may malfunction depending on its type.**
  USB flash drives recommended by us are available. For those memories, contact your dealer.
- **To use any USB flash drive other than our recommended ones, ensure that it was FAT- formatted .**

● Operation procedures

[DATA]
MAIN → DATA 1/2
Refer to “ [DATA] item screens ” (page 105).

1. **Press [SAVE TO USB] on the DATA 1/2 screen.**
2. **Press [YES].**
   The data are saved to the USB.

Note

Do not remove the USB flash drive while data is being saved. Failure to observe this instruction may corrupt the data.

DATA 1/2

About storing data

The data saved in the CODA-500 can be transferred by a USB flash drive and checked on PCs. And printer output is available for checking data later.

Data transferable to USB

Data	Maximum number of data sets saved	Items to be saved
Measurement values (MES.CSV)	The latest 26280 data sets of measurement values are saved.	● Measurement time ● Measure Line ● Measured component ● Measured concentration ● Measured concentration (before correction) ● Correction parameter A ● Correction parameter B ● Warning
Hour report history (HRS.CSV)	The latest 8760 data sets of each component per line are saved.	● Measurement time ● Measure Line ● Measured component ● Flow rate ● Water quality ● Load ● Flow rate warning ● Water quality warning ● Load warning ● Load unit system
Daily report (DAY.CSV)	The latest 365 data sets of each component per line are saved.	● Measurement time ● Measure Line ● Measured component ● Total drainage volume ● Effective drainage volume ● Water quality ● Water quality (minimum) ● Water quality (maximum) ● Water quality (average) ● Total load ● Flow rate warning ● Water quality warning ● Load warning ● Load unit system
Alarm history (ALM.CSV)	The latest 500 data sets are saved.	● Time ● Warning line ● Warning number ● Warning status ● Sequence information
Calibration history (CAL.CSV)	The latest 100 data sets are saved.	● Time ● Calibration component ● Calibration result ● Standard solution concentration ● Zero calibration value ● Span calibration value ● $AgNO_3$ addition ● Calibration curve parameters

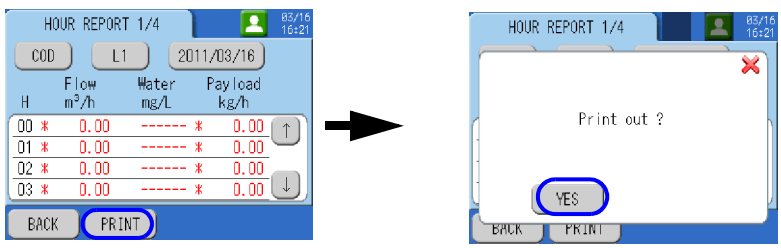
Data	Maximum number of data sets saved	Items to be saved
Titration data (PUL.CSV)	The latest 50 data sets are saved.	● Time ● Measure Line ● Titration data (for 360 pulses maximum) ● Pulse count for titration data ● End-point pulse count for titration data
Operation history (OPE.CSV)	History is saved when the user performs operations to save history or when the mode is changed. The latest 100 data sets are saved.	● Time ● Operation ● Set value numbers
Set values (USER.CSV)	The latest set values for the setting items are saved.	● Items of [MENU]-[SETTING], other than Date in [CLOCK ADJUST]. ● $AgNO_3$ ADDITION

About print out

The CODA-500 is normally full-automatically operated. Therefore, printer output is available for checking data later.

Item	Output timing	Reference
Power-on time	When the power is turned ON	-
Calibration history printout	When you request printout via screen	" [DATA]-[CALIBRATION HISTORY] " (page 120)
Warning information	When a warning is issued or canceled	-
Warning history printout	When you request printout via screen	" [DATA]-[ALARM HISTORY] " (page 121)
Measured value printout (real time)	When measurement is finished	" PRINT OUT SET " (page 89)
Hour report (real time)	When hour report calculation is finished	" PRINT OUT SET " (page 89)
Daily report in real time	When daily report calculation is finished	" PRINT OUT SET " (page 89)
Measurement history printout	When you request printout via screen	" MEASURE VALUE " (page 108)
Hour report history printout	When you request printout via screen	" HOUR REPORT " (page 110)
Daily report printout	When you request printout via screen	" HOUR REPORT " (page 110) * Printed out with hour reports.

(Example)

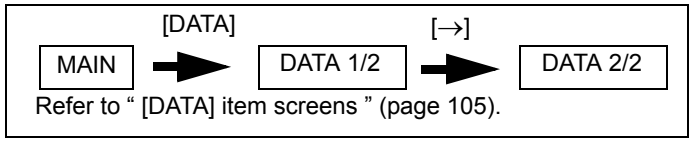


[DATA]-[DATA CLEAR]

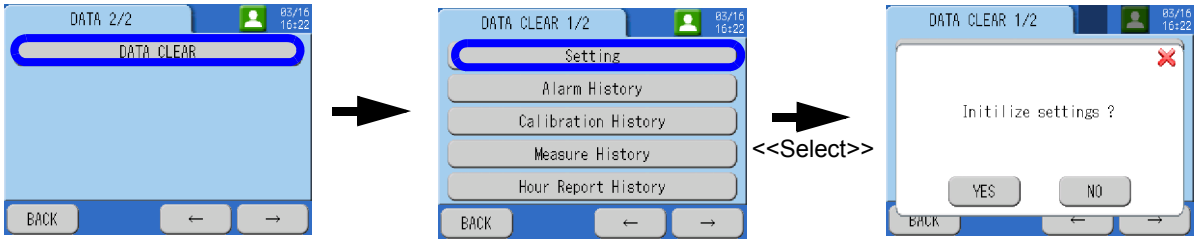
Clear data. The following items can be cleared.

- Set values
- Alarm history
- Calibration history
- Measurement values
- Hour reports
- Daily reports
- Pulse data

Operation procedures



1. **Press [DATA CLEAR] on the DATA 2/2 screen.**
   The DATA CLEAR screen will be displayed.



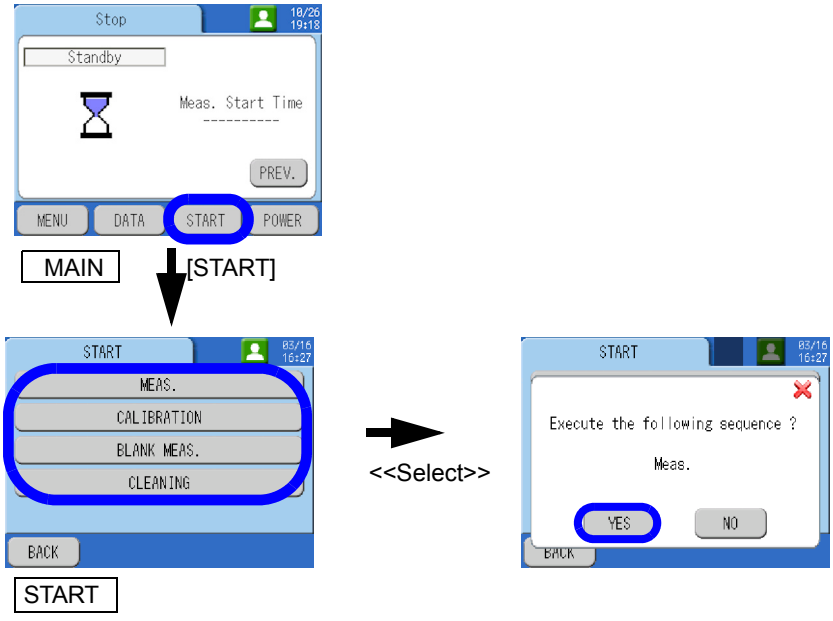
[START]

Start the actions. The following actions can be started.

- Measurement
- Calibration
- Blank measurement
- Cleaning

● Operation procedures

1. **Press [START] on the MAIN screen.**
   The START screen will be displayed.
2. **Select an item to be started and press [YES].**
   The selected item will be started.



[STOP]

Stop the current action. You can select STOP RESERVE and STOP.

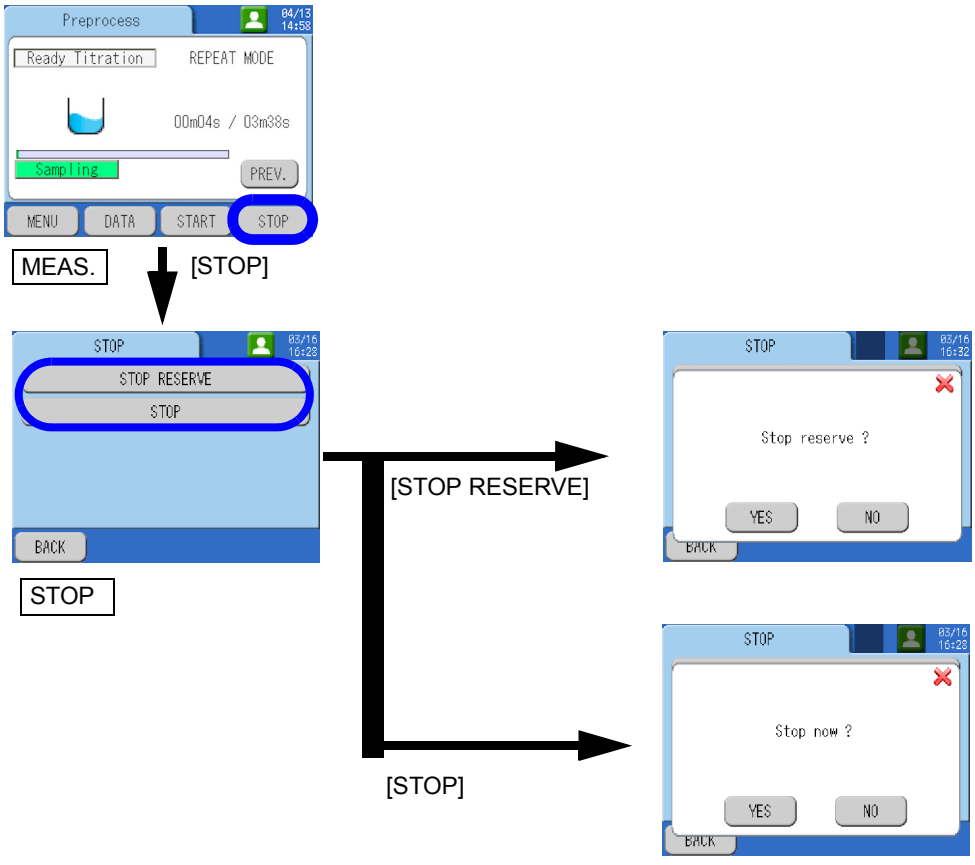
Item	Description
STOP RESERVE	The action is stopped after the currently active sequence has been finished.
STOP	The action is stopped immediately.

The following actions can be stopped.

- Measurement
- Calibration
- Blank measurement
- Cleaning

Operation procedures

1. **Press [STOP] on the MEAS. screen.**
   The STOP screen will be displayed.
2. **Select STOP RESERVE or STOP and press [YES].**
   The current screen will be stopped at the specified time.



Maintenance

In order to maintain the normal operation and performance of the CODA-500, periodical maintenance checks are necessary.

Note

Before maintenance work, stop measurement and then turn ON the Maint switch.

Contact for maintenance

Manufacturer: HORIBA Advanced Techno Co., Ltd.
31, Miyanonishi-cho, Kisshoin Minami-ku, Kyoto 601-8306, Japan

Periodical maintenance

Check the items listed in this table periodically.
However, the intervals specified in the table should be used as the recommended intervals subject to the use under the standard conditions and nothing is warranted about these intervals. The intervals differ depending on the operating environment and conditions. After use for a certain period, establish the most appropriate intervals for the actual situation.

Interval (recommended)	Work	Location		Brief description
(Acidic method) 1 week	Check Cleaning	Analyzer	Platinum electrode	Check that no foreign matter is attached on the electrode. If any foreign matters are found, clean the electrode. Refer to “ Maintaining the platinum electrode ” (page 132) for the details.
2 weeks	Waste water disposal		Waste water tank	Dispose of the waste water. Refer to “ Disposing of the waste water ” (page 138) for the details.
(Alkaline method) 1 month	Check Cleaning		Platinum electrode	Check that no foreign matter is attached on the electrode. If any foreign matters are found, clean the electrode. Refer to “ Maintaining the platinum electrode ” (page 132) for the details.
1 month	Check Cleaning		Reaction tank	Check that no sediment is deposited in the reaction tank. If any sediments are found, detach to clean the reaction tank. Refer to “ Maintaining the reaction tank ” (page 134) for the details.
				Check that no black crystals adhere in the reaction tank. If any adhesion matters are found, perform the “Reaction tank cleaning”. Refer to “ STEP ACTION ” (page 96) for the details.
			Drain pot	Check that the outlet of the drain pot is not clogged with deposited sediment. If any clog is found, clear the clog.
			Sample water suction part	Check that the sample inlets and suction tubes (PTFE) are not dirty and not clogged. If any dirt or clog is found, detach to clean the tubes. If it is difficult to clean the tubes, replace them.
			Sample gauge	Check that the inner surface of sample gauge is not dirty. When the inner surface of sample gauge is dirty, clean it. Refer to “ Maintaining the sample gauge ” (page 150).
	Check Replenishing		Reaction tank	Check that the thermal compound coated between the heater unit and the reaction tank glass tube has no crack or clearance. If any crack or clearance is found, detach the reaction tank and replenish the thermal compound. Refer to “ Replenishing thermal compound ” (page 140) for the details.
	Check Replacement	Operation unit	Printer paper	Check the remaining paper while considering the selected printout mode (paper consumption). If the paper is running out, replace the printer paper. Refer to “ Preparation for printer ” (page 22) for how to replace the paper.
40 days	Check Replacement	Analyzer	Reagent bottle	Check the remaining reagents. If a reagent is running out, replace the bottle with new one. Refer to “ Replacing the reagent bottle ” (page 144) for the details.

Interval (recommended)	Work	Location		Brief description
3 months	Check Cleaning	Analyzer	Titration tube	Check that ingredient of the titration reagent (manganese dioxide, black) is not precipitated at the leading end of the titration tube inserted into the reagent tank. If any precipitated matters are found, clean inside the tube or cut off the end of the tube with a cutter or the like. Refer to “ Maintaining the titration tube ” (page 147) for the details.
	Check Adjustment		Gauging values of sample water, diluting water, and blank water	Check the gauging values of sample water, diluting water, and blank water. And adjust them as necessary. Refer to “ Adjusting the gauged values ” (page 30) for the details.
	Operation Check Cleaning		Blank gauge	Check that the inner surface of blank gauge is not dirty. When the inner surface of blank gauge is dirty, clean it. Refer to “ Maintaining the blank gauge ” (page 152).
	(Alkaline method) Replacement		Stirrer	Replace the stirrer. Refer to “ Replacing the stirrer ” (page 148) for the details.
	(Alkaline method) Replacement		Reaction tank Reaction tank gasket	Replace the reaction tank and reaction tank gasket. Refer to “ Maintaining the reaction tank ” (page 134) for the details.
	Check Replacement		(Reagent A supply line, waste water line) PV tube (4 mm O.D./2 mm I.D.), PV replacement tube ((drain) 5 mm O.D./3 mm I.D., (waste water) 8 mm O.D./6 mm I.D.)	Check that the tubes do not deteriorate with adhesion of reagent and the pinch valve. Replace the tubes if necessary. Refer to “ Replacing the pinch valve tube ” (page 154) for the details.
6 months	Check Replacement	Analyzer	(Gauging line) PV tube (4 mm O.D./2 mm I.D.)	Check that the tubes do not deteriorate with adhesion of reagent and the pinch valve. Replace the tubes if necessary. Refer to “ Replacing the pinch valve tube ” (page 154) for the details.
	(Alkaline method) Replacement		Platinum electrode	Check that no foreign matter is attached on the electrode. If any foreign matters are found,clean the electrode. Refer to “ Maintaining the platinum electrode ” (page 132) for the details.
	Replacement		Activated carbon cartridge	Replace the activated carbon cartridge. Refer to “ Replacing the activated carbon cartridge ” (page 158) for the details.
	Replacement		Reaction tank gasket	Replace the reaction tank gasket. Refer to “ Maintaining the reaction tank ” (page 134) for the details.
Depends on the use conditions	Check Cleaning	Analyzer	Overflow tank (optional)	Check the overflow water level. Clean the tank periodically as necessary. Refer to “ Checking and cleaning the overflow tank (optional) ” (page 163) for the details.

Occasional maintenance

Occasion	Work	Location		Brief description
Reagent A is sent incorrectly.	Cleaning	Analyzer	Reagent A gauging line	Clean the reagent A gauging line. Refer to " Cleaning the reagent A gauging line " (page 160) for the details.
Bubbles are found in the titration line.	Bubble removal		Titration line	Perform the operation to "Fill Titrator" repeatedly until the bubbles are removed, and then clean the reaction tank. Refer to " Bubble removal from titration line " (page 161) for the details.
Electrode is broken.	Replacement		Platinum electrode	Replace the electrode. Refer to " Maintaining the platinum electrode " (page 132) for the details.

■ Maintaining the platinum electrode

When the platinum electrode is dirty with foreign matter, the measured values become inaccurate. Check the electrode periodically and clean it if necessary.
If the electrode is broken, replace it with new one.

Location	Analyzer	
	Platinum electrode	
Work	Check, Cleaning	Replacement
Interval/ Occasion (recommended)	Acidic method: 1 week, Alkaline method: 1 month	Acidic method: When electrode is broken. Alkaline method: 6 month

Note

- **In the acidic method, silver nitrate is added to mask chloride ions in the sample so that those ions are precipitated as silver chloride in the reaction tank. It is therefore common that the intervals of maintenance in the reaction tank be set to a shorter period for the acidic method than for the alkaline method.**
- **Before maintenance work, stop measurement and then turn ON the Maint switch.**

● Check

Check that no foreign matter is attached on the electrode.
If any foreign matters are found, clean the electrode according to the following procedures.

● Cleaning/replacement

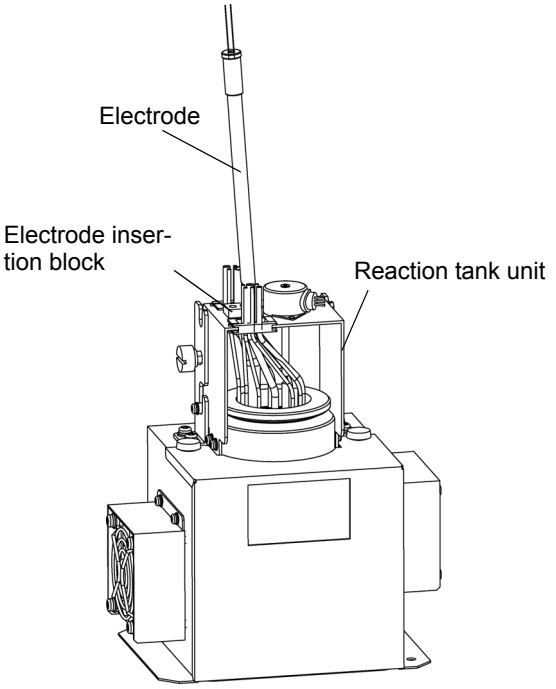
⚠ WARNING

Chemicals handling
When the electrode is removed, chemicals in the flow may come out. The chemicals contain deleterious substances. Touching them by bare hands is very dangerous. To attach or remove the electrode, be sure to use protective gloves and goggles and be very careful not to directly touch the electrode. Carefully wipe off any spilled chemical fluid.

⚠ CAUTION

Electrode breakage
- The electrode is made of glass. In handling it, exercise sufficient care. You may get injured with broken glass.
- When attaching or removing the electrode, obliquely giving force may break the electrode. In handling it, be sure to give force vertically to the electrode.

1. **Remove the electrode located at the top of the reaction tank unit.**



2. **(Cleaning) Wipe off any foreign matter attached to the leading end of the electrode. (Replacement) Replace the electrode with new one.**

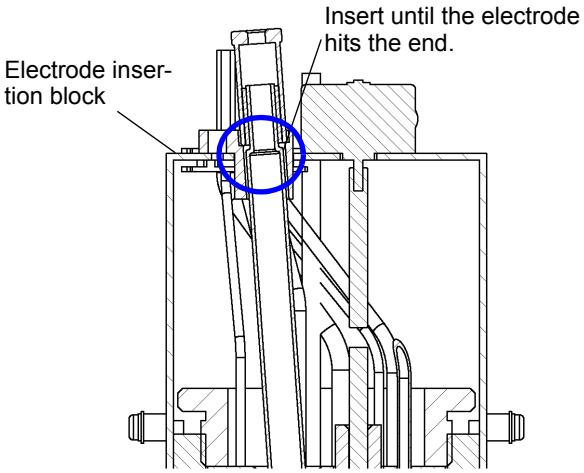
Note

- **During cleaning, take care not to damage the platinum film and ensure that the glass part sealing the platinum wire is not cracked.**
- **Take care not to touch the platinum film with bare hands and ensure that neither oil nor dirt attaches to the film.**

3. **Insert the electrode into the electrode insertion block located at the top of the reaction tank unit until it hits the end.**

Note

Insert the electrode until the electrode cap hits the end.



Maintaining the reaction tank

Sediment deposited in the reaction tank can cause adverse events such as inaccurate measured values and clogged piping. Check the reaction tank periodically and clean it if necessary. And replace the reaction tank gasket periodically.
In the alkaline method, an alkaline reagent is used, which will gradually erode glass, the material for the reaction tank. So, replace the reaction tank periodically, too.

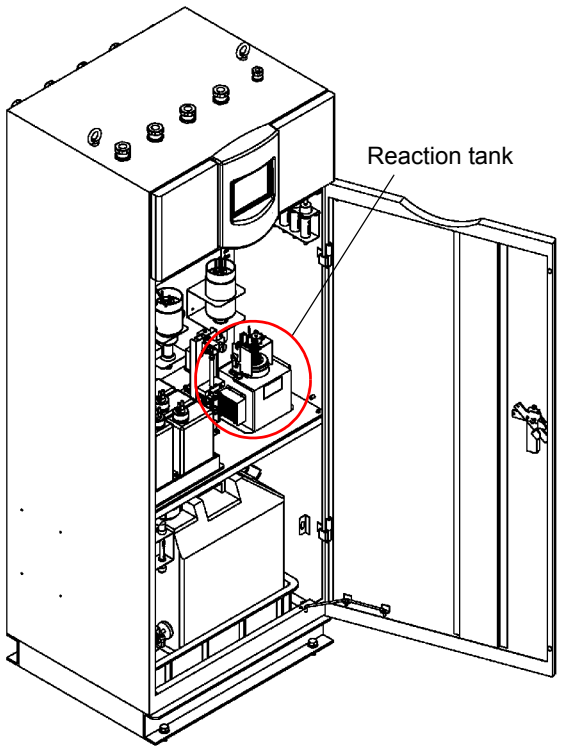
Location	Analyzer		
	Reaction tank		Reaction tank gasket
Work	Check, Cleaning	Alkaline method: Replacement	Replacement
Interval/ Occasion (recommended)	1 month	3 months	Acidic method: 6 months, Alkaline method: 3 months

Note

- **In the acidic method, silver nitrate is added to mask chloride ions in the sample so that those ions are precipitated as silver chloride in the reaction tank. It is therefore common that the intervals of maintenance in the reaction tank be set to a shorter period for the acidic method than for the alkaline method.**
- **Before maintenance work, stop measurement and then turn ON the Maint switch.**

Check

Check that no sediment is deposited in the reaction tank.
If any sediments are found, clean the reaction tank according to the following procedures.



● Cleaning/replacement

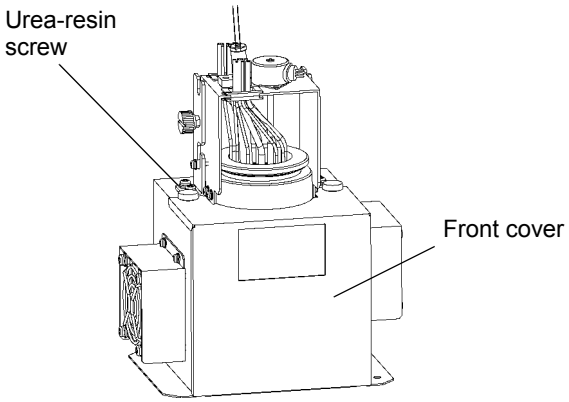
⚠ WARNING

Chemicals handling
The residual fluid in the reaction tank contains the reagent. The reagent contains deleterious substances. Touching it by bare hands is very dangerous. To remove the reaction tank, be sure to use protective gloves and goggles and be very careful not to directly touch the fluid. Carefully wipe off any spilled chemical fluid.

⚠ CAUTION

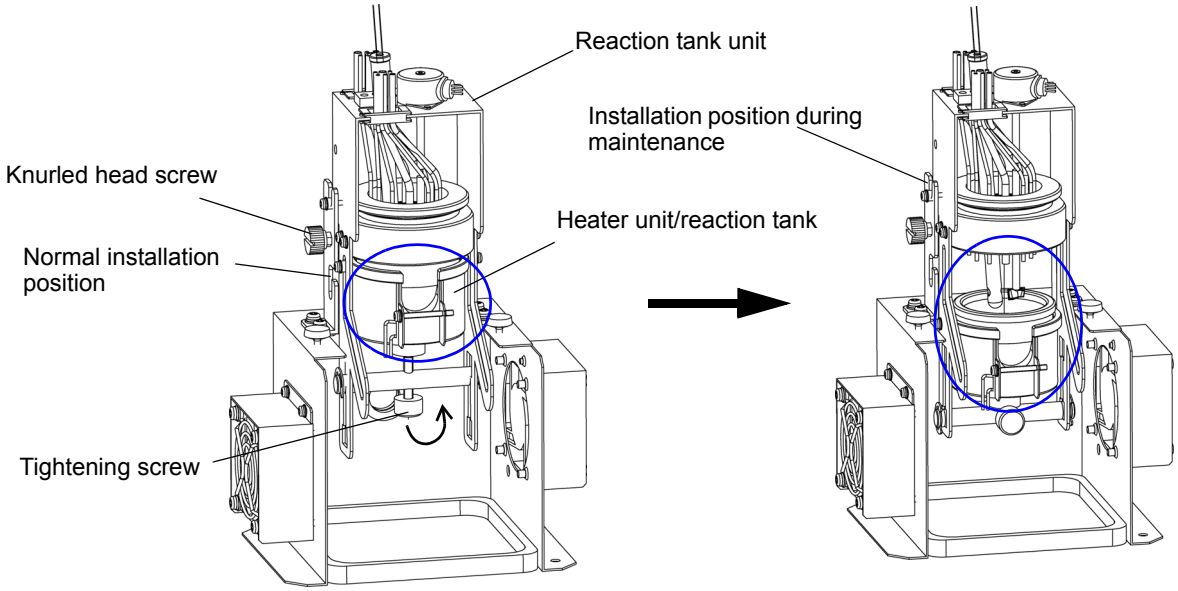
Hot component
There is a hot part behind the cover. Touching the part burns your skin. Before opening the cover, turn OFF the main power and wait until the inside cools down. After maintenance, put the cover back in place.

1. **Perform the operation of "Discharge wastes" referring to " SEPARATE ACTION " (page 97) to discharge the fluid from the reaction tank.**
2. **Loosen the urea resin screw.**
3. **Remove the front cover.**



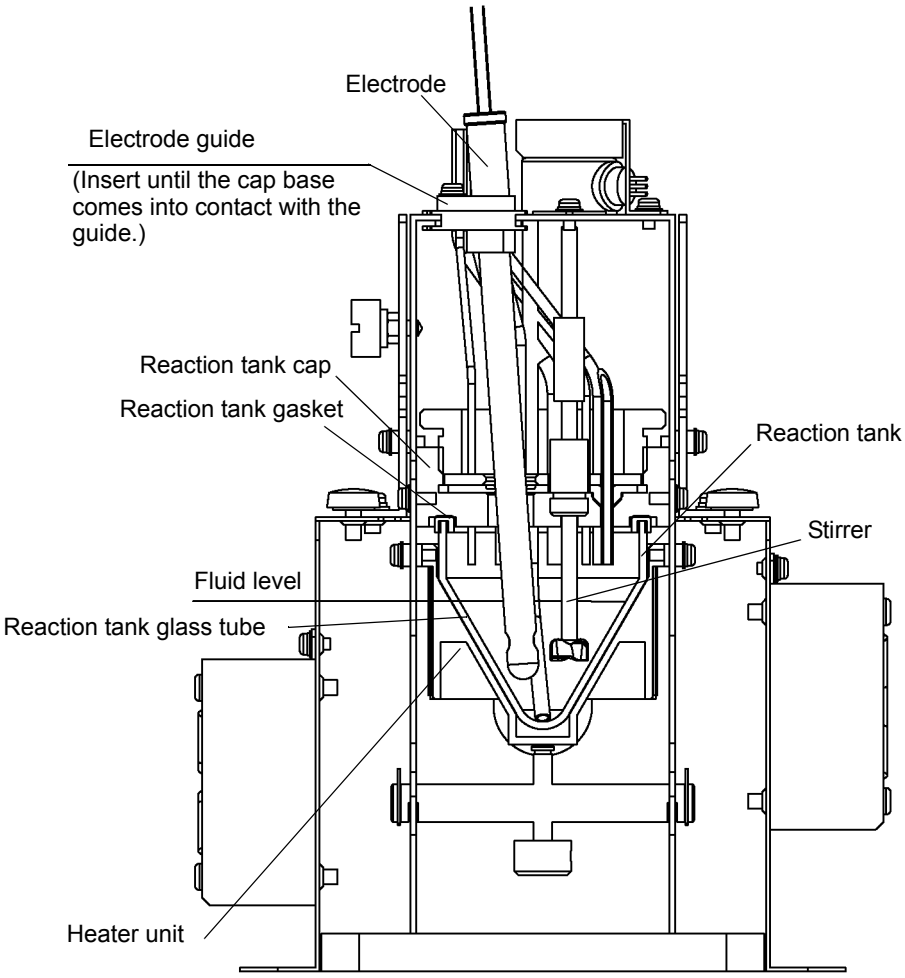
4. **Loosen the knurled head screw.**
5. **Rise the reaction tank unit and then hook it to the notch in the installation position to secure it during maintenance.**

6. **Loosen the tightening screw and rotate the reaction tank unit toward you.**



7. **Lower the heater unit/reaction tank together with the tightening screw.**

8. **Remove the reaction tank glass tube from the heater unit.**

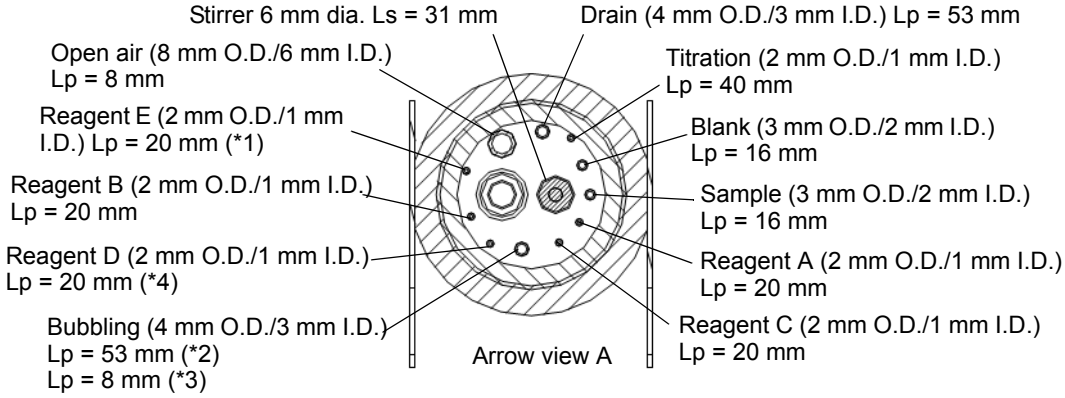


9. **(Cleaning) Fill the reaction tank with the reagent which is created by mixing reagent B and reagent C at approximately 3 : 1. Leave the reaction tank for approx. 30 minutes to dissolve the crystal substances on the wall of reaction tank.**
And then drain the fluid, and flush the inside with deionized water. As insufficient cleaning affects measured value, clean carefully.
(Replacement of the reaction tank gasket) Remove the reaction tank gasket from the reaction tank glass tube and replace it with new one.
(Replacement of the reaction tank) Replace the reaction tank with new one.

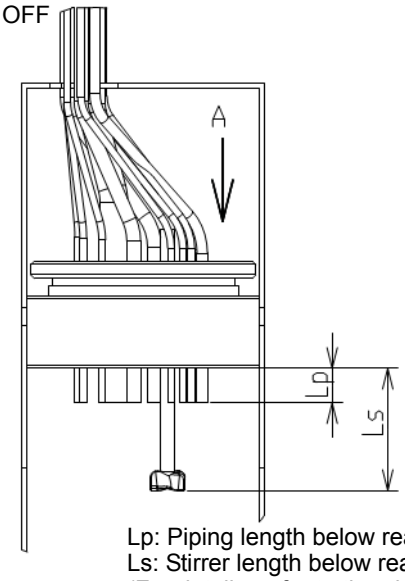
Note

During cleaning, take care not to damage the reaction tank inside.

10. **Attach the reaction tank cap and tubes to the reaction tank in place, checking that the length from the bottom of the reaction tank cap to the leading end of each tube is as shown below.**



(*1) When the function of CODA-500-C is either ON or OFF
(*2) When the function of CODA-500-C is ON
(*3) When the function of CODA-500-C is OFF
(*4) When using CODA-500-B, reagent F replaces D.



Lp: Piping length below reaction tank cap
Ls: Stirrer length below reaction tank cap
(For details, refer to the above dimensions.)

11. **Assemble the parts in the reverse steps.**

Note

Insert the electrode until the electrode cap hits the end.

■ Disposing of the waste water

To collect waste water in the tank, dispose of waste water when it reaches 3/4 of the waste water tank capacity. Check the waste water level in the tank and dispose of it periodically.

Location	Analyzer
	Waste water tank
Work	Waste water disposal
Interval/ Occasion (recommended)	When the waste water reaches 3/4 of the tank capacity. (2 weeks)

● Waste water disposal

⚠ WARNING

Waste water

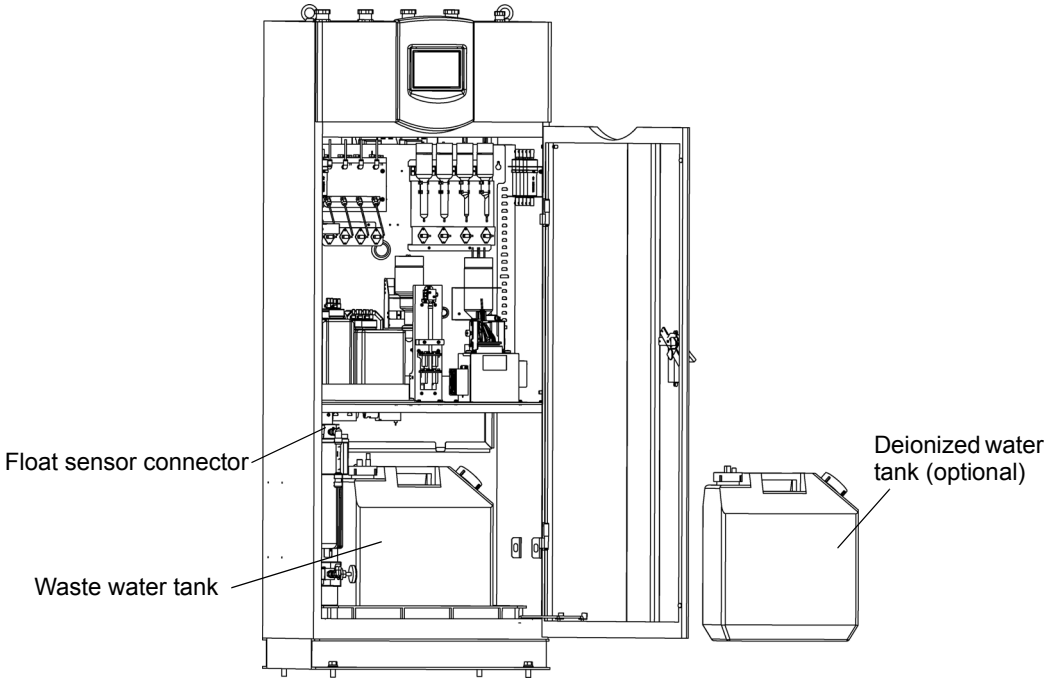
Waste water contains acid or alkali. To handle waste water, use protective gloves and goggles not to touch it directly.
If waste water touches your skin or gets into your eye, immediately rinse it off with a large quantity of water and then seek medical attention. If you swallow it by mistake, seek immediate medical attention.

Note

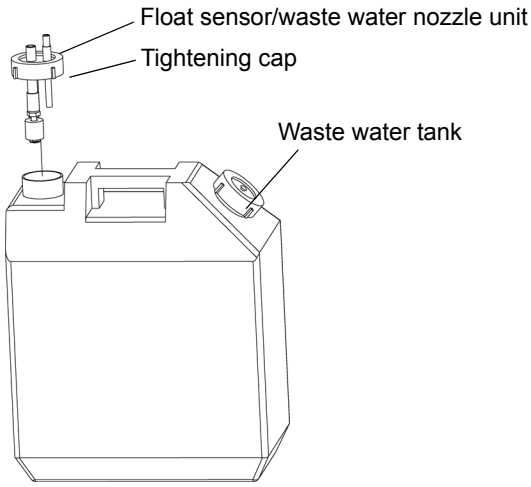
- **Before maintenance work, stop measurement and then turn ON the Maint switch.**
- **The measurement waste fluid has strong acidity and contains heavy metal ions. Therefore, it must be properly disposed of.**
- **Waste water must be controlled so as not to overflow from the tank.**

1. **If the deionized water tank (optional) is located before the waste water tank, remove the tube and float sensor connector from the deionized water tank, and then remove the deionized water tank.**
2. **Remove the waste water tube and float sensor connector from the waste water tank.**

3. **Remove the waste water tank.**



4. **In a place where work can be done safely, remove the tightening cap and then the float sensor/waste water nozzle unit.**



5. **Dispose of waste water of the waste water tank.**

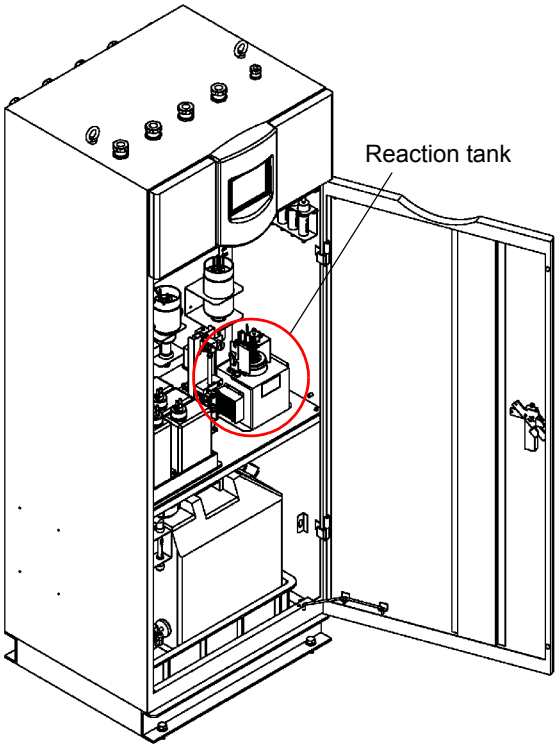
Replenishing thermal compound

If a crack or clearance is found in the thermal compound coated between the heater unit and the reaction tank, decomposition reaction becomes insufficient. Check the thermal compound periodically, and replenish then if necessary.

Location	Analyzer
	Reaction tank
Work	Check, Replenishment
Interval/ Occasion (recommended)	1 month

Check

Check that the thermal compound coated between the heater unit and the reaction tank glass tube has no crack or clearance. If any crack or clearance is found, replenish the thermal compound according to the following procedures.



Replenishment

⚠ WARNING

Chemicals handling

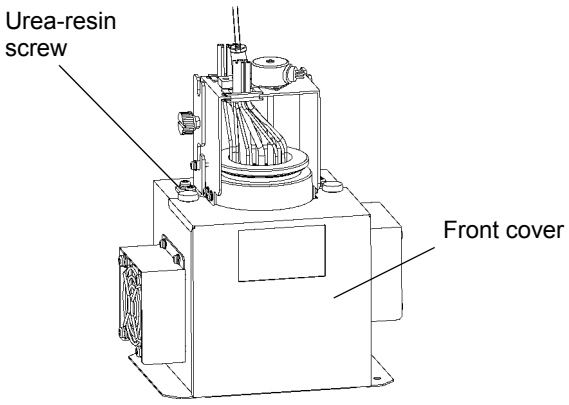
The residual fluid in the reaction tank contains the reagent. The reagent contains deleterious substances. Touching it by bare hands is very dangerous. To remove the reaction tank, be sure to use protective gloves and goggles and be very careful not to directly touch the fluid. Carefully wipe off any spilled chemical fluid.

⚠ CAUTION

Hot component

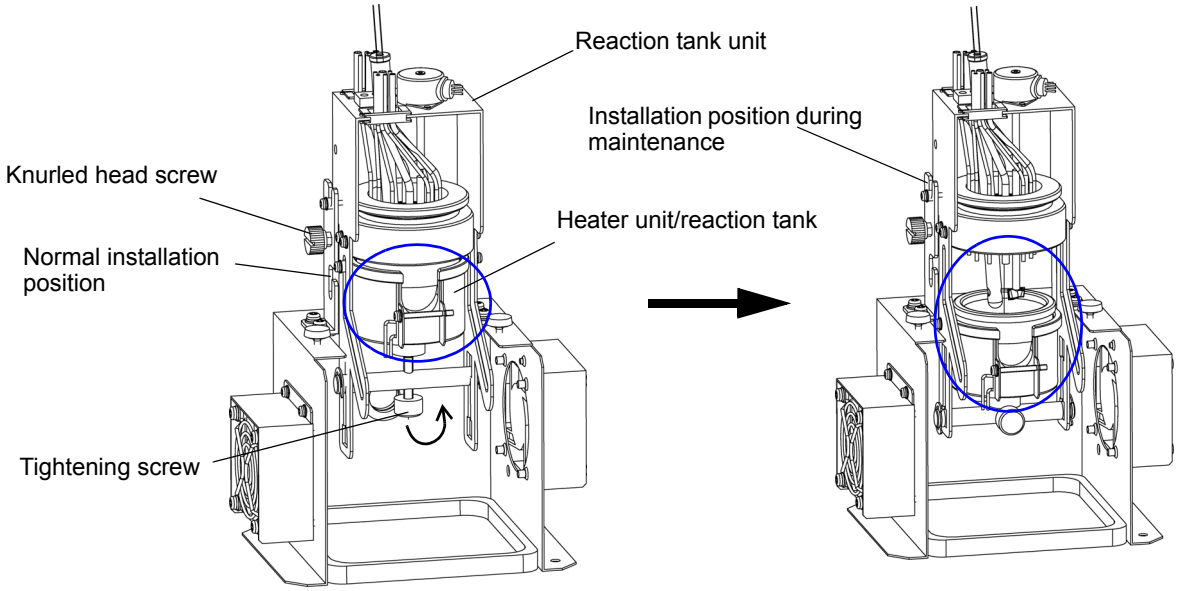
There is a hot part behind the cover. Touching the part burns your skin. Before opening the cover, turn OFF the main power and wait until the inside cools down. After maintenance, put the cover back in place.

1. **Perform the operation of "Discharge wastes" referring to " SEPARATE ACTION " (page 97) to discharge the fluid from the reaction tank.**
2. **Loosen the urea resin screw.**
3. **Remove the front cover.**



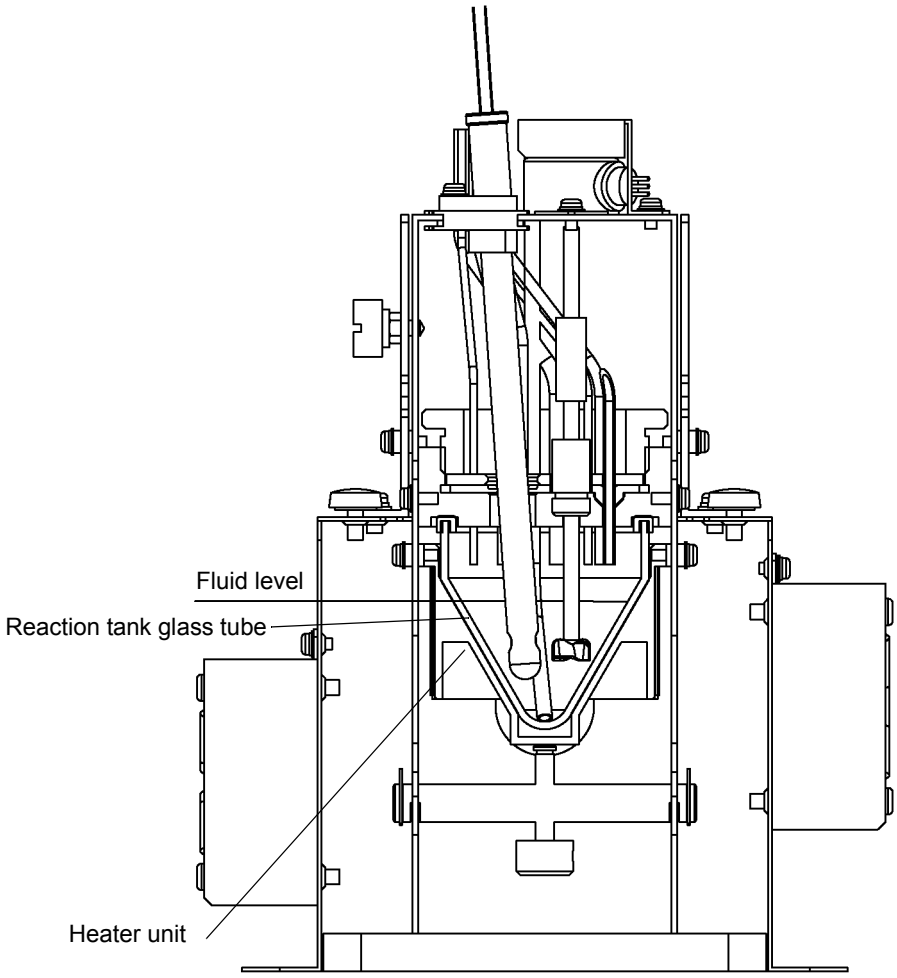
4. **Loosen the knurled head screw.**
5. **Rise the reaction tank unit and then hook it to the notch in the installation position to secure it during maintenance.**

6. **Loosen the tightening screw and rotate the reaction tank unit toward you.**

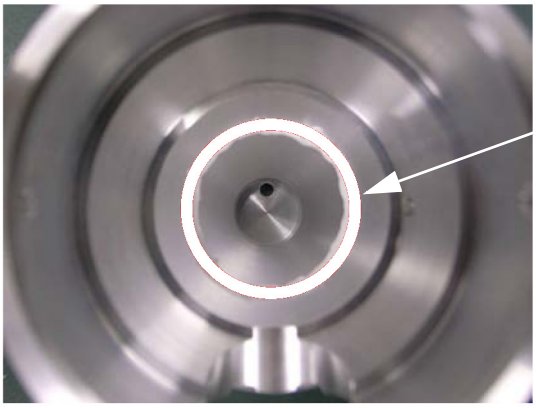


7. **Lower the heater unit/reaction tank together with the tightening screw.**

8. **Remove the reaction tank glass tube from the heater unit.**



9. **Coat approx. 0.2 mL of the supplied thermal compound on the position shown in the figure.**



10. **While rotating the glass reaction tank, push the glass reaction tank against the heater unit so that the thermal compound can be spread evenly.**

11. **Assemble the parts in the reverse steps.**

Replacing the reagent bottle

If a reagent is running out, measurement results are incorrect. Check the remaining reagents periodically, and replace reagent bottles with new ones if necessary.

Location	Analyzer
	Reagent bottle
Work	Check, Replacement
Interval/ Occasion (recommended)	40 days

Note

- **Use our designated reagent. If you use any other reagent, no measured values are warranted.**
- **The replacement interval for the reagent bottle depends on the operating condition.**
- **Before maintenance work, stop measurement and then turn ON the Maint switch.**

Check

Check the remaining reagents.
If a reagent is running out, replace the bottle with new one according to the following procedures.
Check the tightening cap of the reagent bottle has no crack or flaw. If any crack or flaw is found, replace the tightening cap. Otherwise that may cause an inaccurate measurement.

Note

- **When the residual reagent level is 1 cm maximum from the bottom of the reagent bottle, the reagent must be replaced as early as possible.**
- **Tightening excessively the tightening cap may cause a crack.**

Replacement

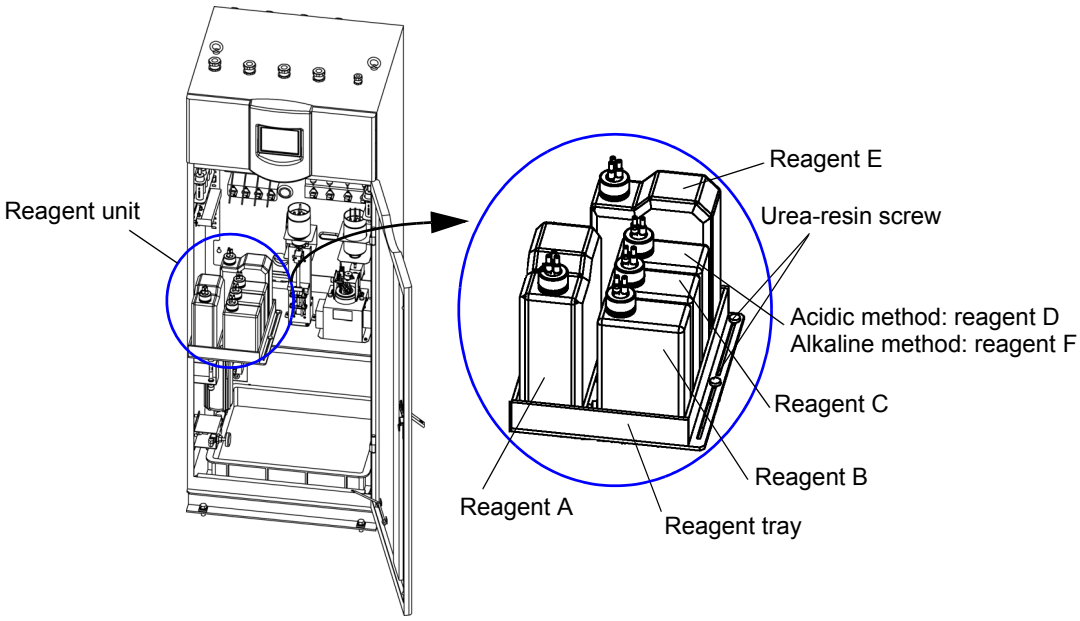
⚠ WARNING

Chemicals handling
When the reagent bottle is changed, its content may be spilled over. The reagent contains deleterious substances. Touching it by bare hands is very dangerous.
To change the bottle, be sure to use protective gloves and goggles and be very careful not to directly touch the bottle. Carefully wipe off any spilled chemical fluid.

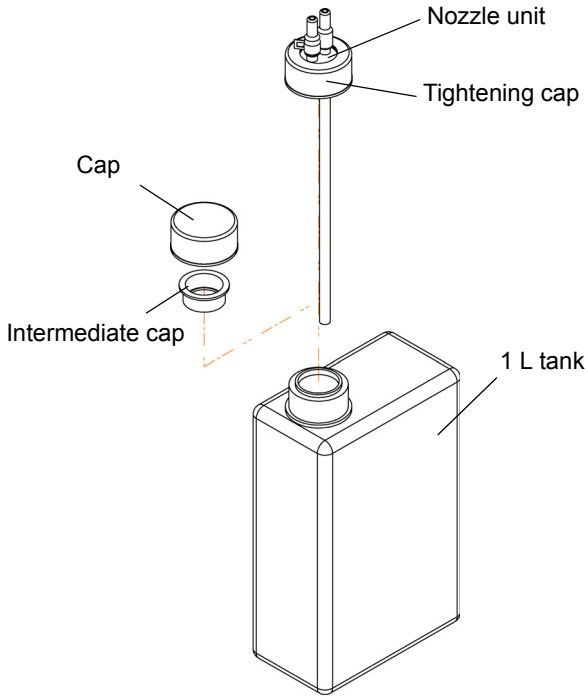
Note

- **When a reagent bottle is replaced, the warning of "Lack Reag." is issued. Clear the warning if necessary (" Possible causes and remedial actions for warnings " (page 173)).**
- **A new reagent bottle is full of reagent. When the reagent bottle receives pressure with the cap open, the reagent may spill out. Pay attention not to spill reagent when you set or replace the bottle. For example, open the bottle cap with the bottle placed on a flat surface.**
- **Caution: Fragile (withstand load: 5.0 kg)**
  Place nothing but the reagent bottles specified by us on the reagent tray with the tray drawn out.
- **When placing or replacing reagents, take care to place them correctly matching the color of tubes connected to the nozzle unit with the color of labels on the top of reagent bottles.**
  If a reagent is misplaced, measurement results are incorrect.
- **When the reagent tray is equipped with a sensor to detect the remaining fluid level (optional), take care not to spill reagents on the sensor. Reagent spill may damage the sensor.**

1. **Loosen 2 urea-resin screws.**
2. **Draw out the reagent tray.**



3. **Loosen the tightening cap and then remove it together with the nozzle unit.**



4. **Remove the cap and intermediate plug for a new reagent bottle and put the nozzle unit.**

Note

Check that the color of the tube connected to the nozzle unit is the same as that of the corresponding label on the top of the reagent bottle.

5. **Put the reagent tray in the original position, and tighten the urea-resin screws.**

6. **Check the action of the gauging reagent.**

When stopping: Check that the gauging reagent acts accurately in SEPARATE ACTION (Refer to “ SEPARATE ACTION ” (page 97)).

When acting: Check that no error occurs in the next measurement.

■ Maintaining the titration tube

Ingredients for titration are gradually precipitated as manganese dioxide at the leading end of the titration tube inserted into the reaction tube. If this precipitation is left unattended, the titration tube may be clogged, causing adverse events such as inaccurate measured values, output of "Titration error" warning, leakage from a fitting for the reagent piping, and a solenoid valve failure.
Check the titration tube periodically, and clean it if necessary.

Location	Analyzer
	Titration tube
Work	Check, Cleaning
Interval/ Occasion (recommended)	3 months

Note

Before maintenance work, stop measurement and then turn ON the Maint switch.

● Check

Check that the titration tube has no precipitated matter at the leading end.
If any precipitated matter is found, clean the titration tube according to the following procedures.

● Cleaning

1. **Stop measurement and then turn ON the Maint switch.**
2. **Remove the titration tube from the reaction tank cap.**

Tip

For the tube arrangement. refer to " Maintaining the reaction tank " (page 134).

3. **Clean inside the titration tube or cut off the leading end of the tube with a cutter or the like.**

Note

- **Do not use a nipper or the like.**
  If the leading end is cut off with a nipper or the like, the tube is deformed and the effective cross-section of piping becomes smaller. This makes the piping more likely to be clogged.
- **Do not try to remove any precipitated matter with a wire or the like as it damages the inside of the piping, making precipitation more likely to occur in the piping.**
- **To clean inside the tube, use the mixture of approx. 3 mL of reagent B and approx. 1 mL of reagent C. The mixture dissolves and cleans the precipitated matter of the reagent A. After cleaning, drain the mixture and flush the inside with deionized water. And then, flush the inside with reagent A.**

4. **Insert the titration tube into the reaction tank cap in place.**
5. **Make the length from the reaction tank cap bottom to the leading end of the tube 40 mm.**

■ Replacing the stirrer

In alkaline method, replace the stirrer periodically.

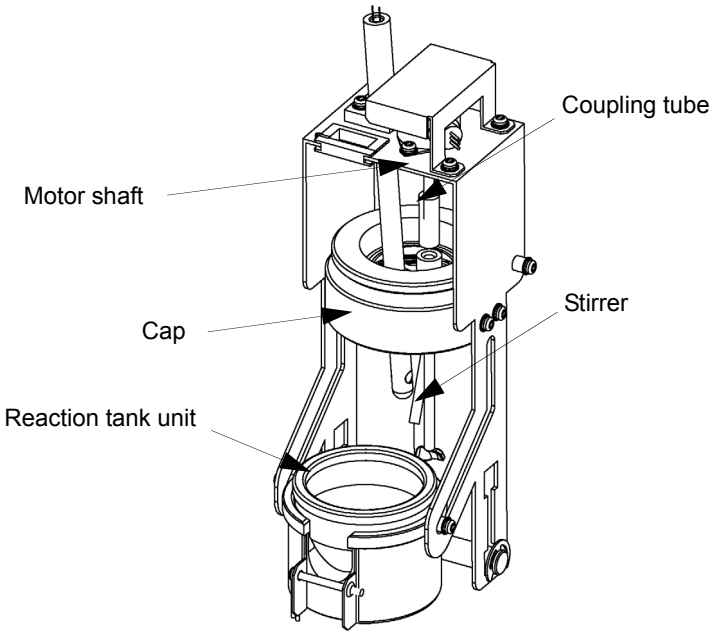
Location	Analyzer
	Stirrer
Work	Only alkaline method: Replacement
Interval/ Occasion (recommended)	3 months

Note

Before maintenance work, stop measurement and then turn ON the Maint switch.

● Replacement

1. **Put the reaction tank unit in the state indicated below.**

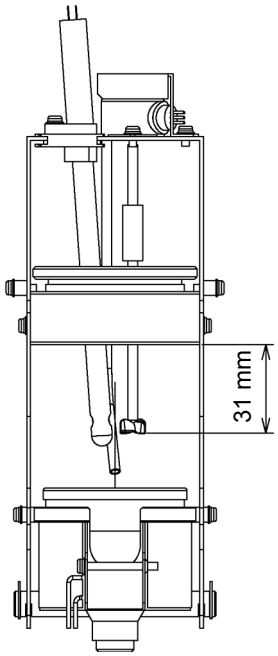


2. **Pull out the stirrer downward while holding the coupling tube between the motor shaft and the stirrer with your fingers.**

3. **Remove the coupling tube from the motor shaft halfway, and connect it to a new stirrer.**

4. **Insert the stirrer in place in the reverse steps while holding the coupling tube.**

5. **Check that the stirrer is approx. 31 mm long from the bottom of the cap. If not, adjust the length.**



6. **Put the reaction tank unit in place.**

■ Maintaining the sample gauge

When a lot of dirt accumulates on the inner surface of the gauge, it may affect the fluid level sensor. Check the gauge periodically and clean it if necessary.

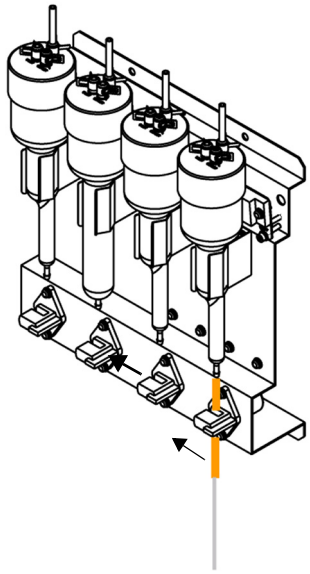
Location	Analyzer
	Sample gauge
Work	Cleaning
Interval/ Occasion (recommended)	1 month

Note

Do not detach the rubber cap when cleaning the gauge. If the cap is detached, readjustment of gauged value is necessary.

● Check

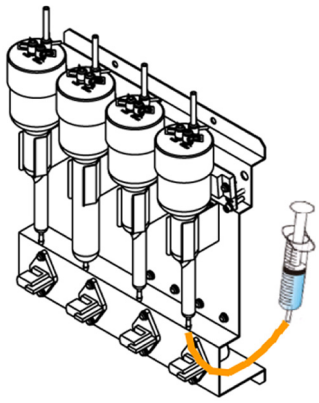
1. **Prepare an approx. 30 mL commercial syringe which is filled with cleaning fluid.**
   Normally, deionized water is used as the cleaning fluid. If dirt of organic matters is much accumulated, using 5% hydrochloric acid is more effective.
2. **Remove the PV tube（4 mm O.D./2 mm I.D.）from the pinch valve.**



Tip

The reagent tubes layout varies with the specification.

3. **With the gauge fixed to the analyzer, inject the cleaning fluid from the bottom into the gauge by using the syringe, and soak the dirt on the wall.**



4. **Keep soaking the gauge for approx. 30 minutes to dissolve the dirt.**
5. **Drain the cleaning fluid from the gauge, and clean it thoroughly with deionized water.**
   Inadequate cleaning may affect the accuracy of the indicated value.
6. **Attach the PV tube to the PTFE tube, and set it to the pinch valve.**

■ Maintaining the blank gauge

When a lot of dirt accumulates on inner surface of the gauge, it may affect the fluid level sensor. Check the gauge periodically and clean it if necessary.

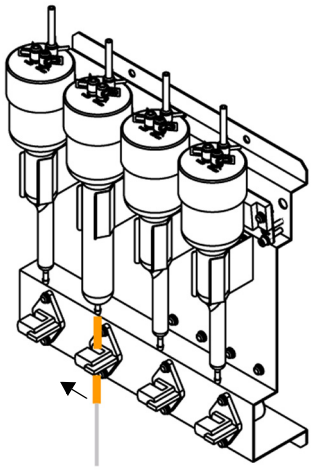
Location	Analyzer
	Blank gauge
Work	Cleaning
Interval/ Occasion (recommended)	3 month

Note

Do not detach the rubber cap when cleaning the gauge. If the cap is detached, readjustment of gauged value is necessary.

● Check

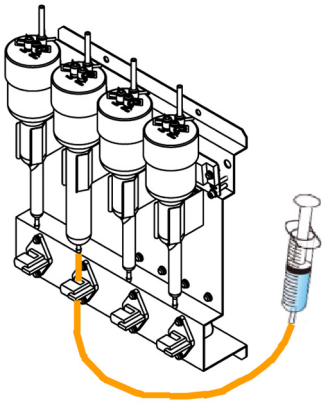
1. **Prepare an approx. 30 mL commercial syringe which is filled with cleaning fluid.**
   Normally, deionized water is used as the cleaning fluid. If dirt such as minerals is much accumulated, using 5% hydrochloric acid is more effective.
2. **Remove the PV tube (4 mm O.D./2 mm I.D.) from the pinch valve.**



Tip

The reagent tubes layout varies with the specification.

3. **With the gauge fixed to the analyzer, inject the cleaning fluid from the bottom into the gauge by using the syringe, and soak the dirt on the wall.**



4. **Keep soaking the gauge for approx. 30 minutes to dissolve the dirt.**
5. **Drain the cleaning fluid from the gauge, and clean it thoroughly with deionized water.**
   Inadequate cleaning may affect the accuracy of the indicated value.
6. **Attach the PV tube to the PTFE tube, and set it to the pinch valve.**

■ Replacing the pinch valve tube

The PV tube is pinched by the pinch valve, and it causes shutting off the line. Since the PV tube deteriorates over time, cracking occurs at the pinched part of the continuously used tube, causing fluid leakage. The reagent A supply line may clog due to the reagent adhesion.
It is recommended that the PV tube be checked periodically and replaced early.

	Analyzer	
Location	● Gauge line Reagent A supply line PV tube (4 mm O.D./2 mm I.D.) ● Waste water line Upper waste water PV replacement tube (drain) (5 mm O.D./3 mm I.D.) Lower water line PV replacement tube (waste water) (8 mm O.D./6 mm I.D.)	● Gauge line Gauge unit PV tube (4 mm O.D./2 mm I.D.)
Work	Check, Replacement	
Interval/ Occasion (recommended)	3 months	6 months

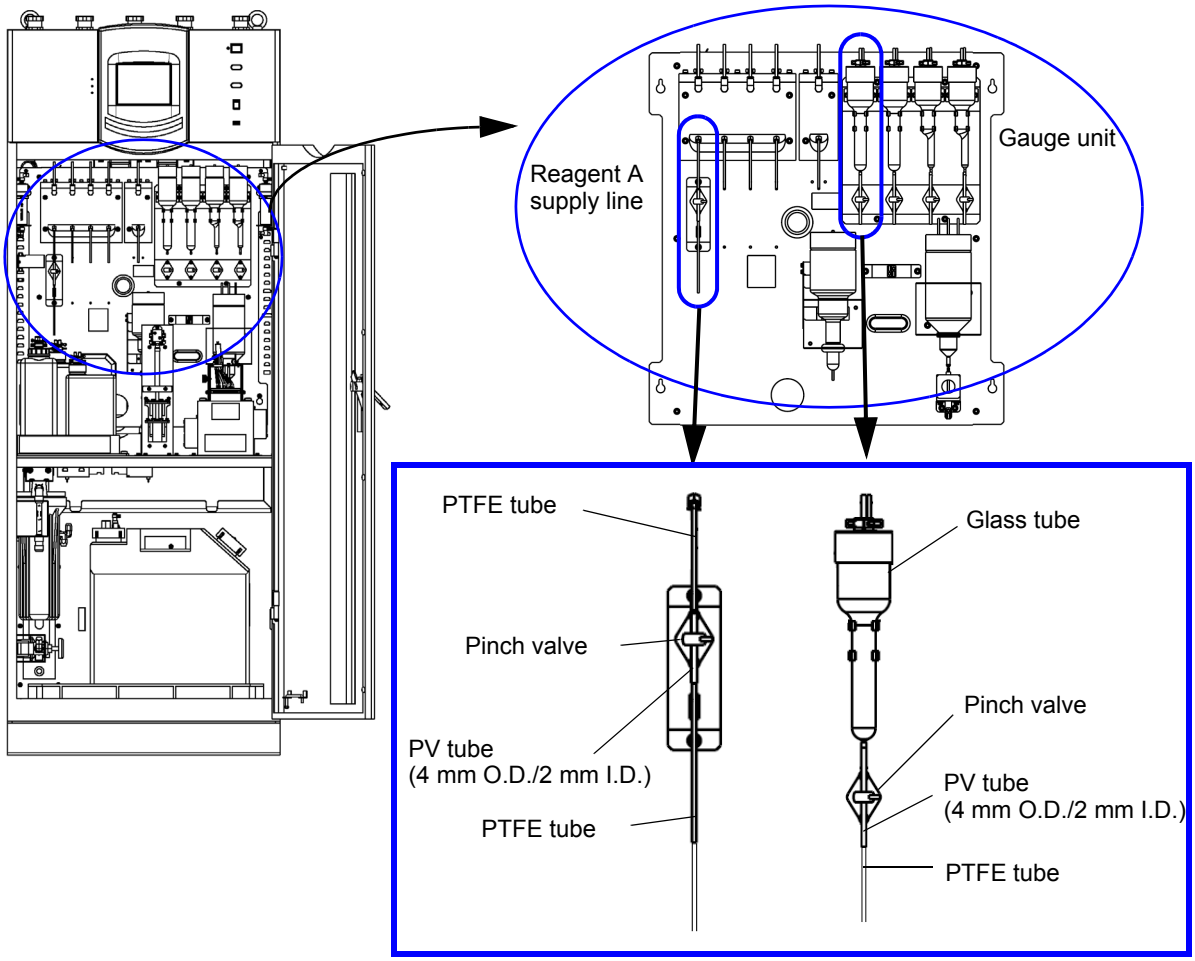
Note

Before maintenance work, stop measurement and then turn ON the Maint switch.

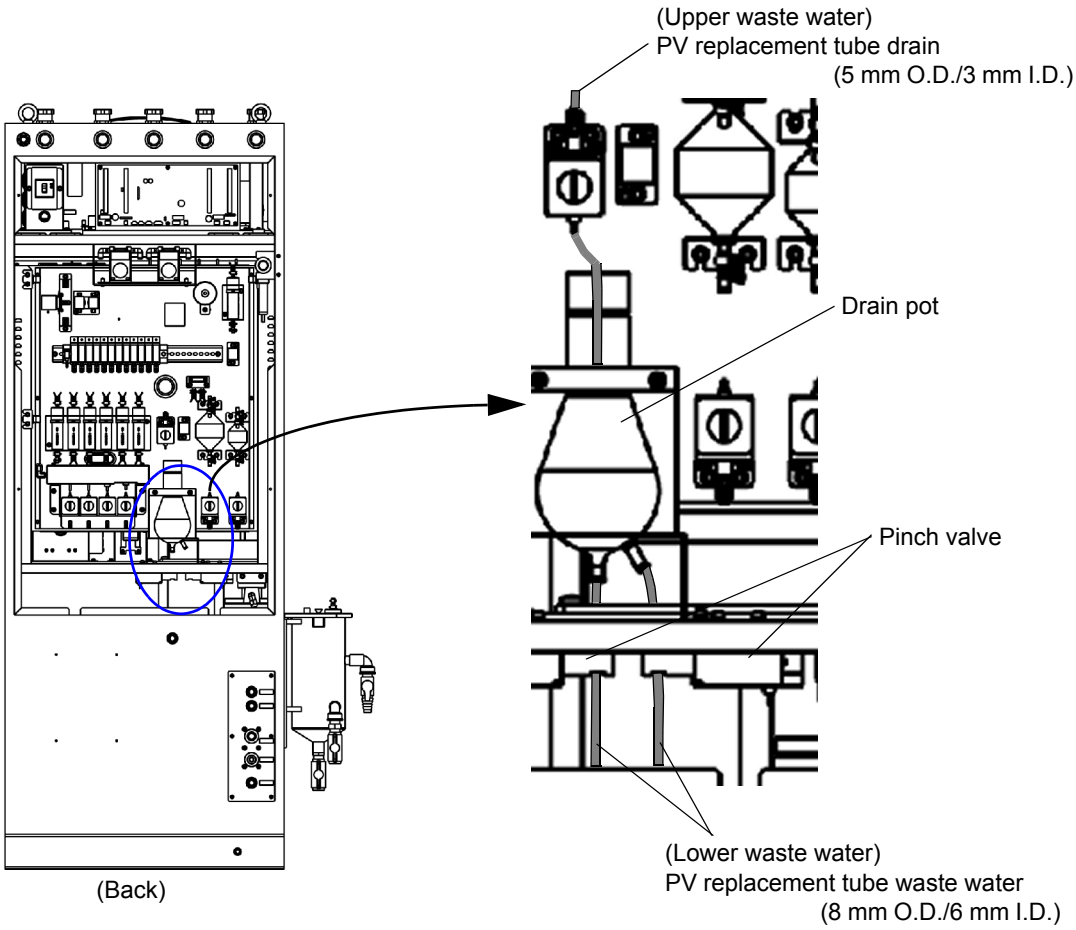
Check

Check the conditions of PV tube of each line, and replace the tube if necessary.

Gauging line



● **Waste water line**



● Replacement

Note

The tip of the glass tube is very thin. Take care not to break the glass tube.

● **Gauging line**

1. **Remove the PV tube (4 mm O.D./2 mm I.D.) from the glass tube or the PTFE tube.**
2. **Open the pinch valve and remove only the PV tube.**
3. **Connect a new PV tube in place in the reverse steps.**
   It is recommended to insert the silicone tube approx. 10 mm into the glass tube or the PTFE tube.

● **Waste water line (upper)**

1. **Remove the PV replacement tube drain (5 mm O.D./3 mm I.D.) from the PTFE tube.**
2. **Open the pinch valves and remove only the PV tube.**
3. **Connect a new PV tube in place in the reverse steps.**
   It is recommended to insert the PV tube approx. 10 mm into the PTFE tube.

● **Waste water line (lower)**

1. **Remove the two PV replacement tubes waste water (8 mm O.D./6 mm I.D.) attached to the drain pot bottom from the drain pot.**
2. **Open the pinch valves and remove only the PV tubes.**
   If a tube is stuck, cut off the tube with a cutter and pull it down from the pinch valve.
3. **Connect new PV tubes in place in the reverse steps.**
   It is recommended to insert the PV tubes approx. 10 mm into the drain pot.

■ Replacing the activated carbon cartridge

Treat the supplied tap water with activated carbon and use the treated tap water as diluting water and blank water. When the water quality treated with activated carbon deteriorates, the measured value increases or decrease, preventing you from obtaining normal measured values. Replace the activated carbon cartridge periodically.

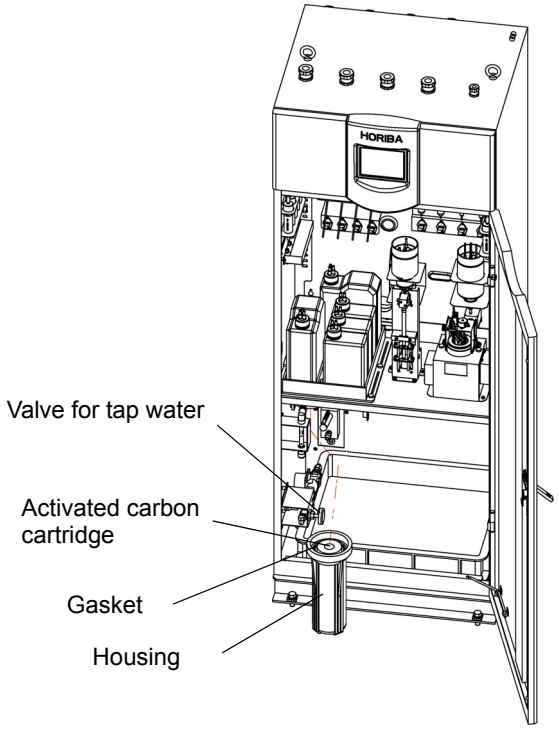
Location	Analyzer
	Activated carbon cartridge
Work	Replacement
Interval/ Occasion (recommended)	6 months

Note

- **The water quality treated with activated carbon may deteriorate earlier depending on the supplied water quality. In this case, we recommend replacing activated carbon at earlier intervals.**
- **Before maintenance work, stop measurement and then turn ON the Maint switch.**
- **Without a water filter purge, correct measurements may not be available.**
- **While a water filter purge, measurements cannot be executed.**

● Replacement

1. **Close the valve for tap water.**
2. **Remove the waste water tank and the deionized water tank.**
3. **Remove the housing by turning.**
   Water is accumulated in the housing.
4. **Remove the activated carbon cartridge in the housing.**
5. **Insert a new activated carbon cartridge into the housing.**
6. **Install the housing in place by turning.**
7. **Open the valve for tap water and adjust the flow rate between 500 mL/min and 800 mL/min.**
8. **Check that no water leaks from the housing attachment.**
9. **Execute a water filter purge (for 30 minutes) referring to " SEPARATE ACTION " (page 97).**


HORIBA
Valve for tap water
Activated carbon cartridge
Gasket
Housing

■ Cleaning the reagent A gauging line

If the reagent A is sent incorrectly, clean the reagent A gauging line.

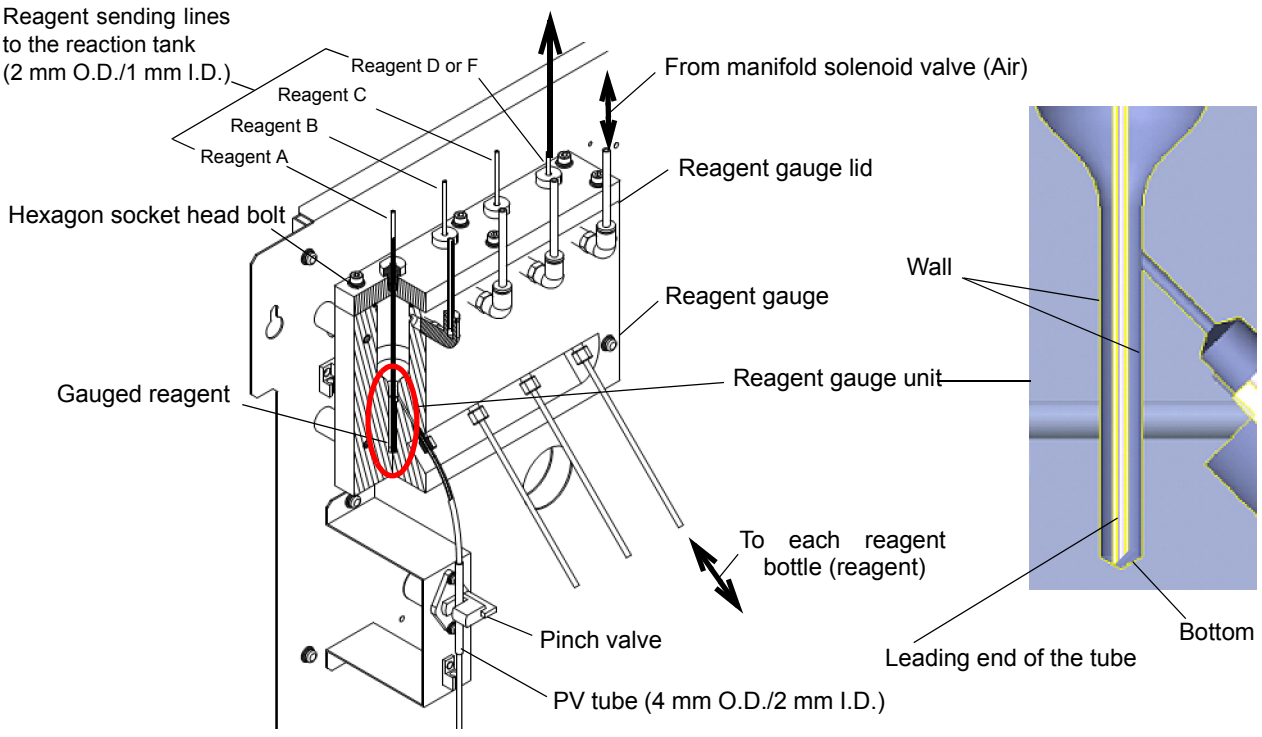
Location	Analyzer
	Reagent A gauging line
Work	Cleaning
Interval/ Occasion (recommended)	When the reagent A is sent incorrectly

Note

Before maintenance work, stop measurement and then turn ON the Maint switch.

● Cleaning

1. **Remove the PV tube (4 mm O.D./2 mm I.D.) located at the lower part of the reagent A gauging line from the pinch valve and then close it with a pinch cock or the like.**
2. **Use the hexagon socket head bolt to remove the reagent gauge lid.**
3. **Use a dropper or the like to put approx. 3 mL of reagent B and approx. 1 mL of reagent C in the reagent A gauge from its top. Subsequently allow them to stand for approx. 1 hour so that they dissolve and clean reagent A on the wall.**



4. **After dissolving and cleaning, drain the fluid and flush the inside with deionized water.**
5. **Flush the inside with reagent A.**
6. **Attach the reagent gauge lid and the PV tube in place.**

Note

Check that the leading ends of the tubes of the reagent sending lines to the reaction tank do not touch the walls of the reagent gauge unit. At the same time, check that the tubes reach the bottoms.

Bubble removal from titration line

If a bubble enters the titration line, such as micro syringe and tubes, it changes the discharge rate of the titration reagent and causes incorrect measurement. If a bubble is found in the titration line, remove it.

Location	Analyzer
	Titration line
Work	Bubble removal
Interval/ Occasion (recommended)	When a bubble enters the titration line

Note

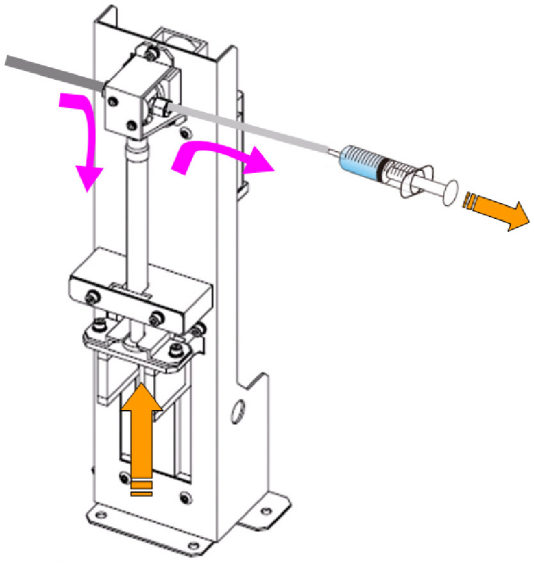
When the bubble length in the titration tube is 13 mm, measurement error becomes 1% of full scale.

Bubble removal

1. **Stop measurement and then turn ON the Maint switch.**
2. **Perform the operation of "Filling titrator" according to " SEPARATE ACTION " (page 97) to fill the titrator and its inlet/outlet tubes with potassium permanganate solution and push out bubbles.**
3. **Repeat the operation until the bubbles are pushed out completely.**
4. **After no bubbles are found, discharge the reagent (potassium permanganate solution) from the reaction tank glass tube and clean the reaction tank according to " Maintaining the reaction tank " (page 134).**
5. **Attach the reaction tank in place.**

If bubbles cannot be removed with the above procedure, perform the following operation.

1. **Stop measurement, and turn ON the Maint switch.**
2. **Detach the tube of the reaction tank side from the solenoid valve on the upper of titrator.**
3. **Prepare a connector, a tube (2 mm O.D.) and a commercial syringe, and connect them to the solenoid valve.**

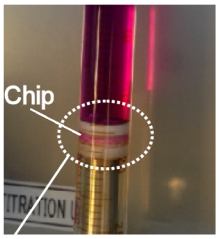


4. **Conduct the operation of "Fill Titrator" of “ SEPARATE ACTION ” (page 97).**
   While the micro syringe moves from bottom to top, the reaction tank line opens. During that time, pull the syringe to remove the bubbles in the tube. If bubbles still remain, repeat this procedure.
5. **Attach the tube of the reaction tank side to the solenoid valve as before.**
6. **Perform the operation of "Fill Titrator" to fill the reaction tank line with potassium permanganate solution. Check no bubbles are found in the tube.**

Tip

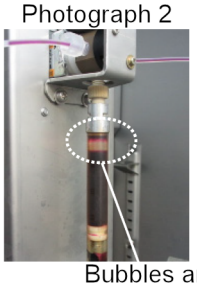
About liquid leaks from the chip of a syringe
When temperature falls, for example in winter, the solution A might seep through the chip of the syringe (see Photograph 1). Unless bubbles enter the device, there is no influence on the performance. If bubbles evolve in the syringe and still remain even after bubble removal is executed (see Photograph 2 and 3), there is a possibility that bubbles entered from the outside due to the looseness of joints or the deterioration of the chip of the syringe. In this case, contact us.

Photograph 1



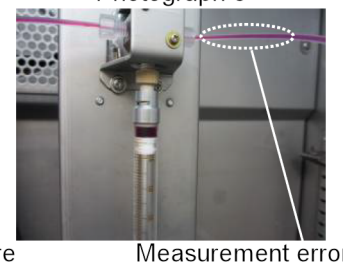
Seepage
⇒No influence on performance

Photograph 2



Bubbles are trapped
⇒Faulty

Photograph 3



Measurement error of 1% per bubble of 13 mm in length
⇒Faulty

■ Checking and cleaning the overflow tank (optional)

Check and clean the overflow tank (optional) periodically depending on the dirt level.

Location	Analyzer
	Overflow tank
Work	Check, Cleaning
Interval/ Occasion (recommended)	Depends on the use conditions

Note

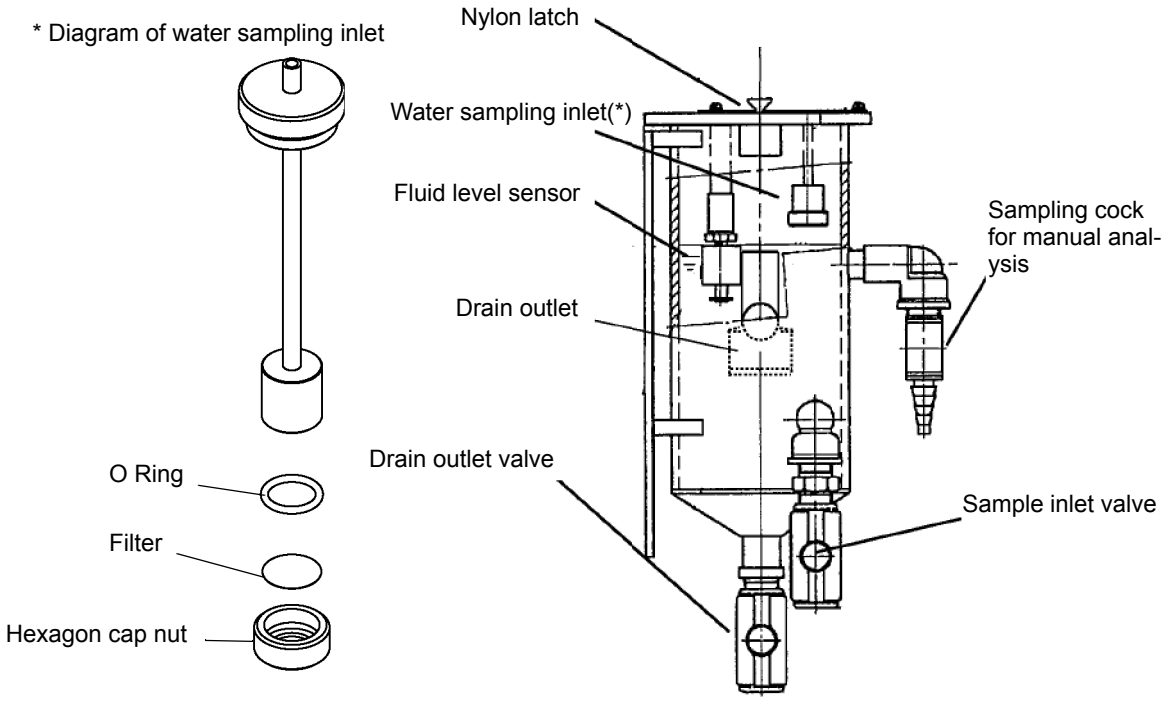
- **If the SS content of sample water is large, periodically clean the tank before the SS content is deposited in the tank.**
- **Before maintenance work, stop measurement and then turn ON the Maint switch.**

● Check

Check that the overflow water in the tank stays at a constant level (water flows into the overflow tube).

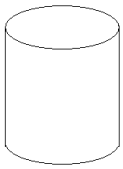
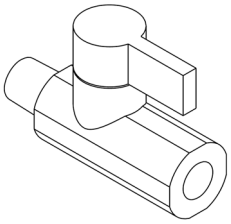
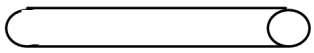
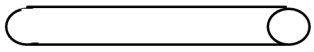
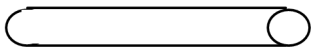
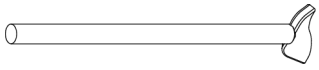
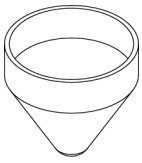
● Cleaning

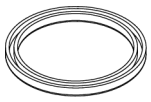
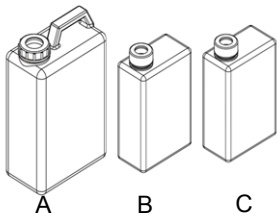
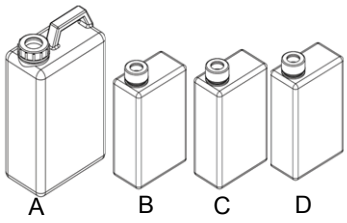
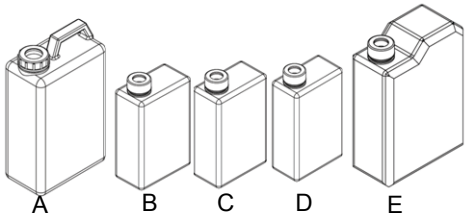
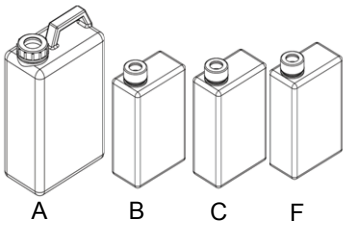
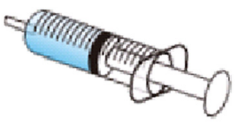
1. **Remove 2 nylon latches by pulling them up.**
   Be careful not to bend the connection piping.
2. **Remove the hexagon cap nut of the water sampling inlet and clean the filter.**
3. **Rinse off dirt attached to the fluid level sensor and check float movement.**
4. **Close the sample inlet valve and open the drain outlet valve to clean the inside of the tank while draining water.**
5. **After cleaning, put the lid and adjust the sample water level so that it remains constant.**



Accessories and spares

Accessories

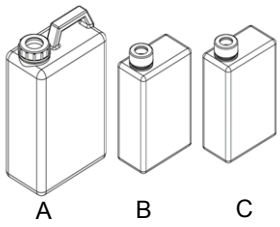
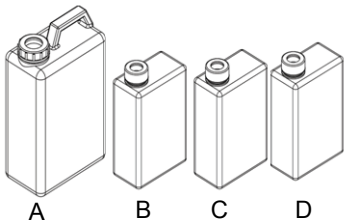
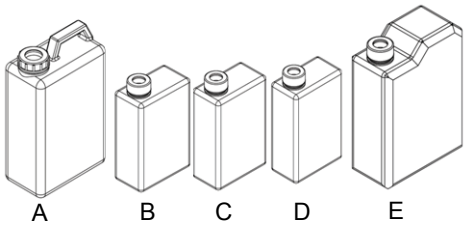
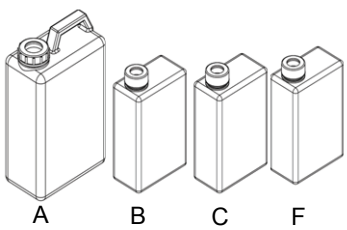
No.	Part	Quantity	Remarks
1	Printer paper 	10 rolls per box	-
2	Instruction manual (this document) 	1 copy	-
3	Ball valve (for shutting off tap water) 	1 piece	For tap water type
4	PV replacement tube set 	10 pieces per set	4 mm O.D./2 mm I.D., 70 mm length
5	PV replacement tube set (drain) 	4 pieces per set	5 mm O.D./3 mm I.D., 60 mm length
6	PV replacement tube set (waste water) 	8 pieces per set	8 mm O.D./6 mm I.D., 100 mm length
7	Stirrer 	3 pieces	For alkaline method
8	Reaction tank 	3 pieces	For alkaline method

No.	Part	Quantity	Remarks
9	Reaction tank gasket 	3 pieces	For alkaline method
10	501S Acidic method CODA-500-A without adding silver 	3 sets	One of the dedicated reagents is supplied in accordance with your CODA-500 type.
11	502S Acidic method ● CODA-500-A standard ● CODA-500-C reagent cleaning function OFF 	3 sets	
12	503S Acidic method CODA-500-C reagent cleaning function ON 	3 sets	
13	504S Alkaline method CODA-500-B 	3 sets	
14	Thermal compound 	1 piece (5 mL)	–

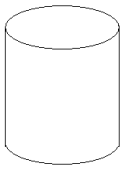
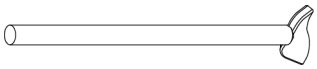
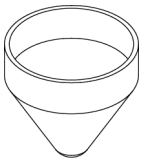
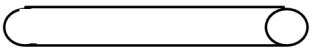
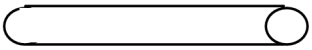
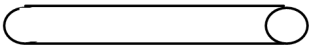
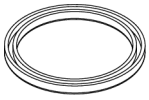
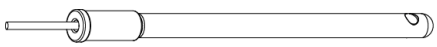
Dedicated reagent

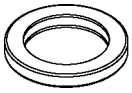
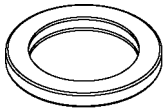
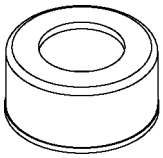
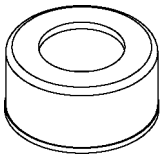
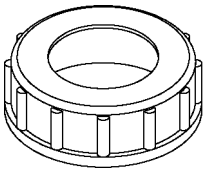
Note

For measurement, use the dedicated reagent we specify. If any reagent other than our designated ones is used, we do not warrant any measured value.
An annual purchase contract is available. For further information on this contract, contact your dealer.

No.	Part	Recommended interval	Part code	Quantity	Remarks
1	501S Acidic method CODA-500-A without adding silver  	About 1000 times	3200357133	1 set	-
2	502S Acidic method ● CODA-500-A standard ● CODA-500-C reagent cleaning function OFF  		3200357135	1 set	-
3	503S Acidic method CODA-500-C reagent cleaning function ON  		3200357136	1 set	-
4	504S Alkaline method CODA-500-B  		3200357137	1 set	-

■ Spares

No.	Part	Recommended interval	Part code	Quantity	Remarks
1	Printer paper 	2 months per roll	3200378127	10 rolls per box	-
2	Stirrer 	3 months	3200343523	1 piece	For alkaline method
3	Reaction tank 		3200343535	1 piece	For alkaline method
4	PV replacement tube set 		3200358984	10 pieces per set	4 mm O.D./2 mm I.D., 70 mm length
5	PV replacement tube set (drain) 		3200523781	4 pieces per set	5 mm O.D./3 mm I.D., 60 mm length
6	PV replacement tube set (waste water) 		3200393296	8 pieces per set	8 mm O.D./6 mm I.D., 100 mm length
7	Reaction tank gasket 	6 months	3200343538	1 piece	-
8	Activated carbon cartridge assembly 		3200634938	1 piece	-
9	Activated carbon cartridge gasket 		3200343547	1 piece	-
10	Platinum electrode 	When broken	3200348339	1 piece	#3050-05B

No.	Part	Recommended interval	Part code	Quantity	Remarks
11	Reagent tank gasket (white bottle) 	1 year	3200343568	3 pieces	● Common for 1 L bottle and 2 L bottle ● CODA-500-C: 1 piece added
12	Reagent tank gasket (black bottle) 	1 year	3200358712	1 piece	-
13	Reagent tank cap (white bottle, 1 L) 	1 year	3200358715	3 pieces	-
14	Reagent tank cap (white bottle, 2 L) 	1 year	3200358720	1 piece	CODA-500-C
15	Reagent tank cap (black bottle) 	1 year	3200358721	1 piece	-
16	Thermal compound 	Upon running out	3200527387	1 piece (5 Lm)	-
17	Mist catcher 	1 year	3200343625	6 pieces	● CODA-500-C: 2 pieces added ● 1-dilution type: 1 piece added ● 2 measuring ranges: 1 piece added
18	Mist catcher 	1 year	3200343626	5 pieces	● CODA-500-C: 1 piece added ● 1-dilution type: 1 piece added

Troubleshooting

When measurement cannot be started

When measurement cannot be started, the following possible causes are suspected. Carry out troubleshooting in accordance with the table below.

Symptom	Possible cause	Remedial action	Reference
The power cannot be turned ON.	The power is not supplied.	● Turn ON the main power switch and the power switch. ● Check to see whether the electrical wiring is properly carried out.	● “ Main power switch (earth leakage breaker) ” (page 4) ● “ Power switch ” (page 5) ● “ Power wiring ” (page 20)
A warning is issued.	A warning is not canceled.	Carry out troubleshooting in accordance with the reference page.	● “ OPERATION SET ” (page 48) ● “ Possible causes and remedial actions for warnings ” (page 173)
Measurement cannot be started.	The operational settings are incorrect.	Configure the proper operational settings.	“ Possible causes and remedial actions for warnings ” (page 173)

Remedial actions for measurement failure

First check to see whether any error is displayed.
If an error is displayed, follow the instructions given in " Possible causes and remedial actions for warnings " (page 173). If the measured value is inaccurate for any reason other than an error, the following possible causes are suspected.
Take the corresponding remedial action.

Symptom	Possible cause	Remedial action	Reference page
The measured value is instable.	The reaction tank is dirty.	Fill the reaction tank with the reagent which is created by mixing reagent B and reagent C at approximately 1 : 3. Leave the reaction tank for approx. 30 minutes to dissolve the crystal substances on the wall of reaction tank.	" Maintaining the reaction tank " (page 134)
	The electrode is dirty.	● Remove the electrode from the reaction tank and wipe the electrode surface with soft cloth or the like. ● Clean the electrode from the SEPARATE ACTION menu.	● " Maintaining the reaction tank " (page 134) ● " SEPARATE ACTION " (page 97)
	The electrode is not immersed in the sample.	● Remove the electrode from the reaction tank. Adjust the electrode position so that the electrode is immersed in the sample. ● Check to see whether the electrode is properly inserted. Also check to see whether the sample is sent to the reaction tank.	" Maintaining the reaction tank " (page 134)
	A reagent is not properly sent.	● If there is any clogging with a reagent in the gauge unit, clean it. ● After reagent has been sent from the gauge unit, check for any residual fluid. If any residual fluid is found, clean the sample gauge.	● " Replacing the pinch valve tube " (page 154) ● " Cleaning the reagent A gauging line " (page 160)
	The sample gauge is dirty.	Check the dirt of inner surface of sample gauge. When the inner surface of sample gauge is dirty, clean it.	" Maintaining the sample gauge " (page 150)
	Bubbles are found in the syringe and/or the titration line.	Remove the bubbles from the syringe and/or the titration line.	" Bubble removal from titration line " (page 161)

Symptom	Possible cause	Remedial action	Reference page
The measured value is inaccurate.	The reaction tank is dirty.	Fill the reaction tank with the reagent which is created by mixing reagent B and reagent C at approximately 1 : 3. Leave the reaction tank for approx. 30 minutes to dissolve the crystal substances on the wall of reaction tank.	" Maintaining the reaction tank " (page 134)
	The connector is not connected.	Connect the connector.	-
	Calibration has not been properly performed.	Carry out calibration again.	" Calibration " (page 38)
	The electrode is dirty.	● Remove the electrode from the reaction tank and wipe the electrode surface with soft cloth or the like. ● Clean the electrode from the SEPARATE ACTION menu.	● " Maintaining the reaction tank " (page 134) ● " SEPARATE ACTION " (page 97)
	Reagents A and B are not accurately sent.	● If there is any clogging with a reagent in the gauge unit, clean it. ● After a fluid has been sent from the gauge unit, check that no fluid remains. If any residual fluid is found, clean the reagent A gauging line.	● " Replacing the pinch valve tube " (page 154) ● " Cleaning the reagent A gauging line " (page 160)
	The sample gauge is dirty.	Check the dirt of inner surface of sample gauge. When the inner surface of sample gauge is dirty, clean it.	" Maintaining the sample gauge " (page 150)
	Bubbles are found in the syringe and/or the titration line.	Remove the bubbles from the syringe and/or the titration line.	" Bubble removal from titration line " (page 161)

Various warnings and relevant actions

The CODA-500 provides various warnings, of which priority levels are classified into serious warnings 1 to 3 and moderate warning 4 to 6.

Warning	Classification	Description	Priority level
Warning 1	Warning about something wrong in turning ON the power	This warning is issued if there is something wrong when the power is turned ON.	1
Warning 2	Warning to stop the CODA-500 immediately	If this warning is issued during operation, the CODA-500 stops the operation immediately and enters the Standby mode.	2
Warning 3	Warning to stop a retry	If this warning is issued during operation, the CODA-500 automatically retries the operation. If any error occurs again, the CODA-500 stops the operation and enters the Standby mode.	3
Warning 4	Warning for automatic restart	When this warning remains active, the CODA-500 stands by. When the warning is canceled, the operation is automatically restarted. If the operation cannot be continued when the warning is issued, the CODA-500 discontinues it and then stands by.	4
Warning 5	Warning with continued operation	This warning is issued without discontinuing the operation.	5
Warning 6	Hardware output warning	This warning is issued when a CPU failure occurs.	6

Possible causes and remedial actions for warnings

The following table shows a list of warnings and corresponding remedial actions.
When any operation is necessary, see the reference page.

Classification	Description	Possible cause	Remedial action	Reference
Warning 1	Factory Setting	The manufacture's settings saved to CF are corrupted.	Temporarily turn OFF the power and then turn it ON again. If this remedial action does not work out, contact us.	-
Warning 1	User Setting	The user's settings saved to CF are corrupted.	Temporarily turn OFF the power and then turn it ON again. If this remedial action does not work out, contact us.	-
Warning 1	History	The history data saved to CF are corrupted.	Temporarily turn OFF the power and then turn it ON again. If this remedial action does not work out, contact us.	-
Warning 1	EEPROM Read	The data saved to EEPROM are corrupted.	Temporarily turn OFF the power and then turn it ON again. If this remedial action does not work out, contact us.	-
Warning 1	Clock	A failure occurs in the instrument clock.	Contact us.	-
Warning 2	Int. Power	The power supply voltage of 24 V decreases.	Contact us.	-
Warning 2	ADC	The internal ADC malfunctions.	Contact us.	-
Warning 2	Sub-PCB communication error	● The CAN communication cable has electrical discontinuity. ● CAN Comm.	Contact us.	-
Warning 2	Heater	The heater has electrical discontinuity.	Check the connector. If the connector is not connected, connect it. If this remedial action does not work out, contact us.	-
Warning 2	Leak	● Fluid leaks and is accumulated in the instrument. ● Fluid leaks from the reaction tank.	● Search for a fluid leakage location. If the PV tube used for the pinch valve is damaged, replace it. ● Replace the PV tube used for the pinch valve on the waste water line.	“ Replacing the pinch valve tube ” (page 154)
Warning 2	Electrode	The electric potential of the electrode is abnormal when titration starts.	Remove the electrode from the reaction tank and wipe the electrode surface with soft cloth or the like.	-
Warning 2	Titrator	● The titrator malfunctions. ● Titrator	● Start the titrator from the SEPARATE ACTION menu to check its operation. ● If there is any obstacle against the syringe operation, remove it. ● Check the connector. If the connector is not connected, connect it.	-

Classification	Description	Possible cause	Remedial action	Reference
Warning 2	Reaction Tank Leak	The reaction tank is clogged.	If the PV tube used for the pinch valve on the waste water line is damaged, replace it.	" Replacing the pinch valve tube " (page 154)
Warning 2	Heat High Temp	The water temperature is high in the decomposition process.	Check the temperature data. Contact us.	" Maintaining the reaction tank " (page 134)
Warning 2	Temp. Sensor	The temperature sensor within the reaction tank does not work.	Contact us.	-
Warning 3	Air Pressure	● The piping is disconnected. ● The pump or the solenoid valve is abnormal.	● If the blue piping is disconnected, connect it. ● Contact us.	-
Warning 3	● Gauge Samp. 20 mL ● Gauge Samp. 10 mL ● Gauge Samp. 2 mL ● Gauge Dil. Samp.	● The sample water is shut off. ● The air pump malfunctions. ● The piping is defective. ● The proximity sensor malfunctions. ● The sample gauge is dirty.	● Check that there is sample water in the overflow tank. ● Check that the sample suction inlet is immersed in the overflow tank. ● Check for any disconnected or clogged piping. ● Check the dirt of inner surface of sample gauge. When the inner surface of sample gauge is dirty, clean it.	● " Adjusting the gauged values for sample water and blank water " (page 31) ● " Maintaining the sample gauge " (page 150)
Warning 3	● Gauge Diluent ● Gauge Blank	Lack Blank	(for the tap water type) ● Check that tap water is sent to the CODA-500. ● Check that the value on the flowmeter reaches a range between 500 mL/min and 600 mL/min. If not, adjust it with the tap water valve. (for the deionized water tank type) ● Check the remaining level in the deionized water tank.	" Adjusting the gauged values for sample water and blank water " (page 31)
Warning 3	Reag.A-F	● The reagent is insufficient. ● The air pump malfunctions. ● The piping is defective. ● The proximity sensor malfunctions.	● Check that the tightening cap of the reagent bottle is tightened. ● Check that the tightening cap of the reagent bottle has no crack. If any crack is found, replace it. ● Check the remaining level in the reagent bottle. ● Check that the pump operates. ● Check that no piping is disconnected.	" Replacing the reagent bottle " (page 144)
Warning 4	Lack Samp. L1-2[*1]	No sample water is sent.	● Check that there is sample water in the overflow tank. ● Check that the sample suction inlet is immersed in the overflow tank.	" Piping method " (page 12)
Warning 4	Lack Blank[*2]	No deionized water is sent.	Check the remaining level in the deionized water tank.	" Piping method " (page 12)

Classification	Description	Possible cause	Remedial action	Reference
Warning 5	Titration	● Changes in electric potential are abnormal during titration. ● The factor of the reagent is not normal.	● Remove the electrode from the reaction tank and wipe the electrode surface with soft cloth or the like. ● Perform "Electrode Cleaning" of SEPARATE ACTION. ● Replace the reagent with new normal one.	● “ Maintaining the reaction tank ” (page 134) ● “ SEPARATE ACTION ” (page 97) ● “ Replacing the reagent bottle ” (page 144)
Warning 5	Heat Low Temp	The water temperature is low in the decomposition process.	Check that the heater connector is connected. If this remedial action does not work out, contact us.	“ Maintaining the reaction tank ” (page 134)
Warning 5	Lack Reag.A to F	The reagent bottle is empty.	Replace the reagent bottle. Check that the reagent bottle is properly placed on the reagent tray.	“ Replacing the reagent bottle ” (page 144)
Warning 5	Full Drain Tank *3	The waste water level has reached the limit of the tank.	Replace the waste water tank. Connect the connector.	“ Disposing of the waste water ” (page 138)
Warning 5	ZERO Cal.	The calibrated value deviates from the normal range.	● Carry out calibration again. Clean the electrode and the reaction tank. ● Clean the reagent gauging line. ● Remove the bubbles from the titration line. ● Replace the activated carbon cartridge.	● “ Calibration ” (page 38) ● “ Maintaining the reaction tank ” (page 134) ● “ Cleaning the reagent A gauging line ” (page 160) ● “ Bubble removal from titration line ” (page 161) ● “ Replacing the activated carbon cartridge ” (page 158)
Warning 5	SPAN Cal.	The calibrated value deviates from the normal range.	Carry out calibration again.	● “ Calibration ” (page 38) ● “ Maintaining the reaction tank ” (page 134)
Warning 5	COD Hi limit	The COD concentration exceeds the specified upper limit.	This is not an instrument failure.	-
Warning 5	COD H.Hi limit	The COD concentration exceeds the superior upper limit.	This is not an instrument failure.	-
Warning 5	COD Hi Load	The COD load (COD concentration × flow rate) exceeds the specified upper limit.	This is not an instrument failure.	-

Classification	Description	Possible cause	Remedial action	Reference
Warning 5	Flow limit	The flow rate exceeds the specified upper limit.	Adjust the introduced quantity of sample.	“ Piping method ” (page 12)
Warning 5	Maintenance	The Maint switch has been pressed.	This is not an instrument failure. Turn OFF the Maint switch to go back to the normal mode.	“ Operation unit ” (page 5)
Warning 5	CF Write	● The capacity of CF is insufficient. ● The CF is defective.	Contact us.	-
Warning 5	FROM Write	Write to FROM has failed.	Contact us.	-
Warning 5	EEPROM Write	Write to EEPROM has failed.	Contact us.	-
Warning 5	USB Detect	The USB flash drive cannot be detected.	Recheck to see whether the USB flash drive is properly inserted.	“ Operation unit ” (page 5)
Warning 5	USB Full	● The capacity of the USB flash drive is insufficient. ● The USB flash drive is defective.	Recheck to see whether the USB flash drive is properly inserted. Check that the memory capacity of 500 MB minimum is available.	-
Warning 5	Printer	● The paper has run out. ● The cover is open. ● There is a connection failure.	● If the paper has run out, replace it. ● If the cover is open, close it. ● For any other cause, contact us.	“ Preparation for printer ” (page 22)
Warning 5	Gauge Diluent Sample	The dilution sample might not be correctly gauged.	Check that the dilution sample is injected into the reaction tank after the solution level in the gauging tube stops at 10 mL. If this motion is not correctly done, contact us.	-
Warning 6	CPU	The program malfunctions.	Temporarily turn OFF the power and then turn it ON again. If this remedial action does not work out, contact us.	-

*1: Measurement is not started on the line for which a warning is issued.
*2*3: If a warning is issued, the sequence is not started.

External input/output

Connecting power/signal wiring

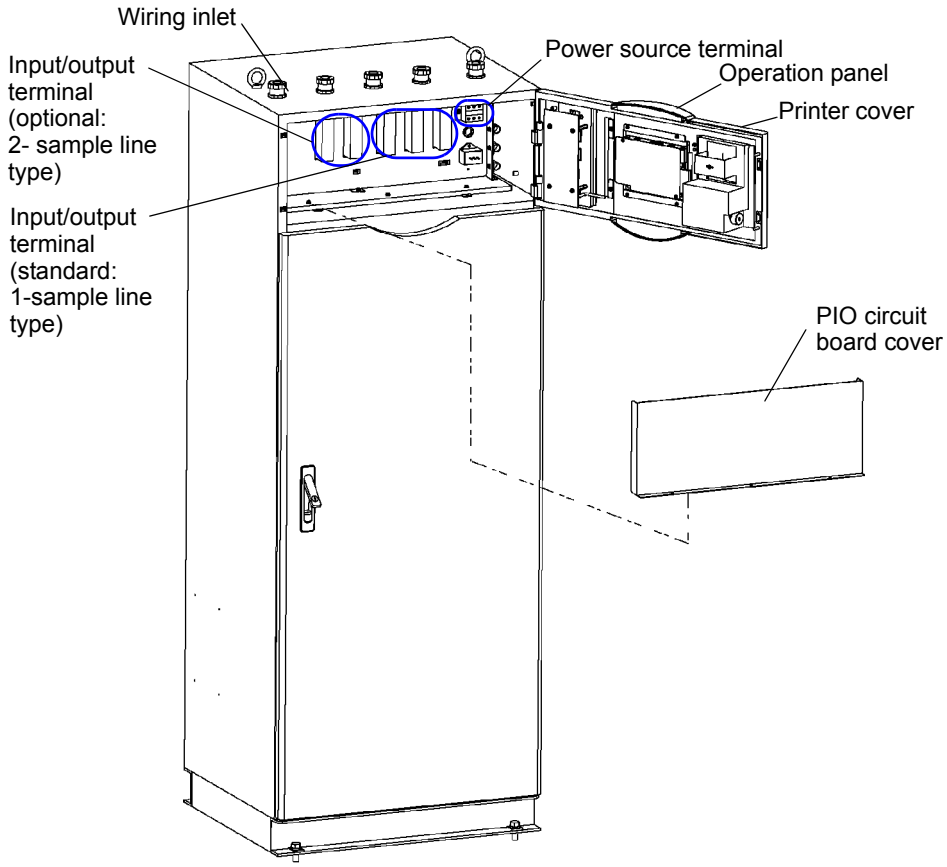
⚠ WARNING

Electric shock

- Before connecting a lead wire to the terminal block, turn OFF the external power supply. Otherwise an electric shock may occur.
- Always put the terminal block cover to prevent an electric shock.
- Only those who have knowledge of electricity can open and close the operation panel.

CODA-500 has terminals for power contact input/output and analog output plus input/output terminals, RS-485 (standard) and RS-232C (optional).

Use these terminals when alarm signal output, measured value signal output, and remote signal input are required.



1. **Open the printer cover and loosen 2 screws on the left side.**
2. **Open the operation panel.**
3. **Detach the PIO circuit board cover.**
4. **Lead in the power/signal wiring from the wiring inlet and connect it to each terminal.**
5. **After finishing the connections, be sure to attach the PIO circuit board cover and close the operation panel.**

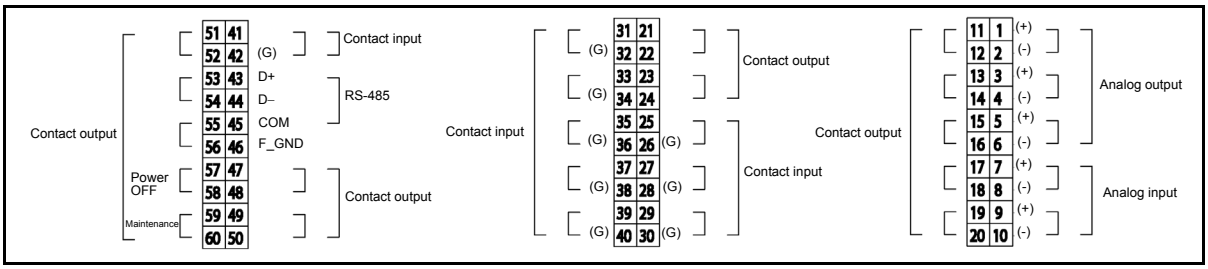
Signal wiring

External input/output terminals

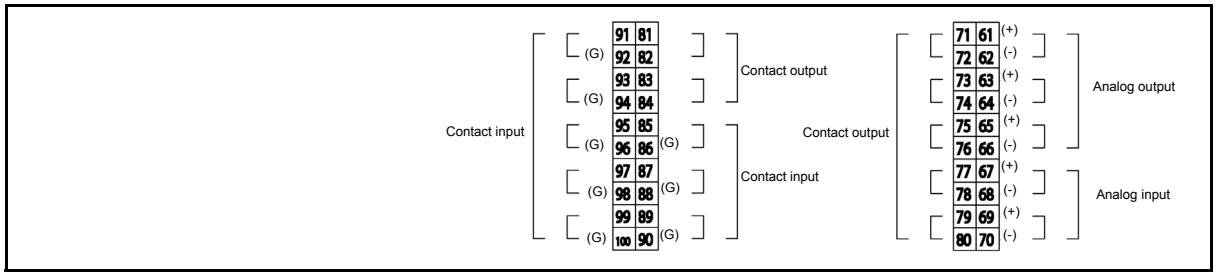
A diagram of input/output terminal connections for the CODA-500 is shown below.
The input/output terminals are the green screw terminals located below the operation unit.

- Connect the signal lines in accordance with the signal table.
- Use double shield cables for the current output signal line and ground the shield at the signal receiving side.
- Connect a surge absorber, noise killer, or the like in parallel with the contact output signal line in order to protect against noise.

[Input/output terminal (standard: 1-sample line type)]

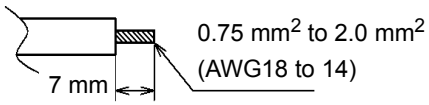


[Input/output terminal (optional: 2-sample line type)]

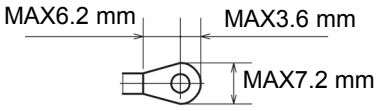


Terminal screw size: M3.5

Treat the terminal of the signal line as shown below.



Terminal treatment of signal line



Applicable terminal

Note

- **Do not apply load exceeding the maximum rating to each terminal. This can cause a failure.**
- **Do not connect the power line to the signal line wiring. This can cause a failure of the CODA-500.**

■ Analog output

The CODA-500 outputs the measured value as analog current.

- For the 1-sample line type, select components from the following 3 components.
- For the 2-sample line type, select components from the following 6 components.

CODA-500 outputs in accordance with full-scale value of measured value.

Type	Analog output	Description
1-sample line type (standard)	COD concentration (L1)	The COD concentration on L1 is output.
	COD load (L1)	The COD time load on L1 is calculated and then output.
	Flow rate (L1)	The flow rate on L1 is output.
2-sample line type (optional)	COD concentration (L1)	The COD concentration on L1 is output.
	COD load (L1)	The COD time load on L1 is calculated and then output.
	Flow rate (L1)	The flow rate on L1 is output.
	COD concentration (L2)	The COD concentration on L2 is output.
	COD load (L2)	The COD time load on L2 is calculated and then output.
	Flow rate (L2)	The flow rate on L2 is output.

● Measurement items and analog output ranges

● Example of output from 4 mA to 20 mA

Measurement item	Range	4 mA output	20 mA output
COD concentration	100 mg/L	0 mg/L	100 mg/L
COD load	100 kg/h	0 kg/h	100 kg/h
Flow rate	100 m^3/h	0 m^3/h	100 m^3/h

● Example of output from 0 mA to 16 mA

Measurement item	Range	0 mA output	16 mA output
COD concentration	100 mg/L	0 mg/L	100 mg/L
COD load	100 kg/h	0 kg/h	100 kg/h
Flow rate	100 m^3/h	0 m^3/h	100 m^3/h

● Terminal assignment

The terminals for analog output of measured values are assigned as shown below.

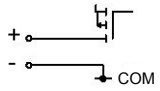
Ch.	Terminal No.	I/O No.	Assignment
00	1	AO1 (+)	COD concentration (L1)
	2	AO1 (–)	
01	3	AO2 (+)	COD load (L1)
	4	AO2 (–)	
02	5	AO3 (+)	Flow rate (L1)
	6	AO3 (–)	

(when the 2-sample line option is added)

Ch.	Terminal No.	I/O No.	Assignment
03	61	AO4 (+)	COD concentration (L2)
	62	AO4 (–)	
04	63	AO5 (+)	COD concentration (L2)
	64	AO5 (–)	
05	65	AO6 (+)	COD concentration (L2)
	66	AO6 (–)	

● Specification

The specification for analog current output is shown below.

Signal classification	I/O circuit	Specification
Analog signal output		● 0 mA to 16 mA/4 mA to 20 mA DC, current signal output ● Insulated type output (common to COM) ● Load resistance: 900 Ω max.

Voltage output (0 V to 1 V or 1 V to 5 V) is available (optional).

■ Analog input

The CODA-500 provides analog current/voltage input for flow rates.

Type	Analog input	Description
1-sample line type (standard)	Flow rate (L1)	The flow rate on L1 is input.
	Not assigned	-
2-sample line type (optional)	Flow rate (L2)	The flow rate on L2 is input.
	Not assigned	-

● Measurement items and analog input ranges

● Example of input from 4 mA to 20 mA

Item	Range	4 mA output	20 mA output
Flow rate	100 m^3/h	0 m^3/h	100 m^3/h

● Terminal assignment

The analog input terminals for flow rate are assigned as shown below.

Ch.	Terminal No.	I/O No.	Assignment
00	7	AI1 (+)	Flow rate (L1)
	8	AI1 (–)	
01	9	AI2 (+)	Not assigned
	10	AI2 (–)	

(when the 2-sample line option is added)

Ch.	Terminal No.	I/O No.	Assignment
02	67	AI3 (+)	COD concentration (L2)
	68	AI3 (–)	
03	69	AI4 (+)	Not assigned
	70	AI4 (–)	

● Specification

The specification for analog current input is as shown below.

Signal classification	I/O circuit	Specification
Analog signal input	(+) (-) 117.5 Ω	● 4 mA to 20 mA DC, current signal input ● Insulated type input (common to COM)

Voltage input (1 V to 5 V DC) is available (optional).

Contact output

The CODA-500 incorporates the following contact outputs.
Fourteen contact outputs are available. Twelve outputs other than those for power OFF and maintenance in progress can be freely set.

Warning	Description	Warning display/ history
Total Alarms 1 to 6	The individually specified Total Alarms 1 to 6 are now issued.	✓
Sync Signal 1	Operation is controlled with the specified Sync Signal 1.	-
Sync Signal 2	Operation is controlled with the specified Sync Signal 2.	-
Calibration	Calibration is now being carried out.	-
Standby	The CODA-500 is now standing by for measurement.	-
Cleaning	Cleaning is now being carried out.	-
Blank Measure	Blank water is now being measured.	-
Blank/Calib/Clean	Blank measurement, calibration, or cleaning is now being carried out.	-
Maintenance	The Maint switch is ON.	✓
Power	The power is OFF.	✓
Sample Lack	No sample water is sent.	✓
COD Hi Limit	The COD concentration exceeds the specified upper limit. COD Hi Limit indicates the total of COD Hi limit L1 and L2.	✓
COD H. Hi Limit	The COD concentration exceeds the superior upper limit. COD H. Hi Limit indicates the total of COD H. Hi limit L1 and L2.	✓
COD Load Limit	The COD load (COD concentration × flow rate) exceeds the specified upper limit. COD Load Limit indicates the total of COD load limit L1 and L2.	✓
Hi Flow	The flow rate exceeds the specified upper limit.	✓
Int.hard. Err.	A hardware failure occurs in the instrument. Int.hard. Err. indicates the error of internal power supply.	✓
Int.memory Err.	A memory failure occurs in the instrument. Int.memory Err. indicates the total of following errors. Factory setting, user setting, EEPROM read, CF write, FROM write, measurement value read, hour report read, daily report read, alarm history read, calibration history read, titration data read, operation history read	✓
Cal. Err.	The calibrated value deviates from the normal range.	✓
Clock failure	A failure occurs in the instrument clock.	✓
Int. comm. Err.	A failure occurs in communication in the instrument.	✓
Heater	The heater is abnormally hot or fails to operate.	✓
Leak Err.	Fluid leaks in the instrument. Leak Err. indicates the total of React Tank Leak and Leak Err.	✓
Electrode	The electrode malfunctions.	✓
Titrator	The titrator malfunctions.	✓
Temperature Sensor	The temperature sensor for the reaction tank temperature control malfunctions.	✓
Air Pressure	The pneumatic line pressure is low because of a pump failure or clogged piping.	✓
Gauge Samp. 2 mL, Gauge Samp. 10 mL, Gauge Samp. 20 mL	The sample gauge sensor does not work properly.	✓
Gauge Dil. Samp.	The dilution sample water gauge sensor does not work properly.	✓
Gauge Blank	The blank water gauge sensor does not work properly.	✓

Warning	Description	Warning display/ history
Gauge Diluent	The dilution water gauge sensor does not work properly.	✓
Reag. A Err., Reag. B Err., Reag. C Err., Reag. D (F) Err., Reag. E Err.,	The reagent gauge sensor does not work properly.	✓
Lack Blank	No blank water is sent.	✓
Titration	Electric potential change is abnormal during titration.	✓
Heat Low Temp	The water temperature in the decomposition process is low.	✓
Heat High Temp	The water temperature in the decomposition process is high.	✓
Lack Reag. A Lack Reag. B Lack Reag. C Lack Reag. D (F) Lack Reag. E	The reagent bottle is empty.	✓
Full Drain Tank	The waste water level has reached the limit of the tank.	✓
Printer	Paper runs out, the cover is open, or a contact failure occurs.	✓
Measure L1	Measurement is now being made on the L1 line.	-
Samp. Lack L1	No sample water is sent to the L1 line.	✓
COD Hi Conc. L1 or COD H.Hi Conc. L1	The L1 line exceeds the specified upper limit or superior upper limit for COD concentration.	✓
Hi Flow L1	The L1 line exceeds the upper limit for flow rate.	✓
COD Hi Load L1	The L1 line exceeds the specified upper limit for COD load (COD concentration × flow rate).	✓
Measure L2	Measurement is now being made on the L2 line.	-
Samp. Lack L2	No sample water is sent to the L2 line.	✓
COD Hi Conc. L2 or COD H.Hi Conc. L2	The L2 line exceeds the specified upper limit or superior upper limit for COD concentration.	✓
COD Hi Load L2	The L2 line exceeds the specified upper limit for COD load (COD concentration × flow rate).	✓
Hi Flow L2	The L2 line exceeds the upper limit for flow rate.	✓
Not Assigned	Not assigned	-

● Terminal assignment

The initial assignment of contact output terminals is shown below.

Ch.	Terminal No.	I/O No.	Assignment
00	11	PO1	TOTAL ALARM 1
	12	PO1	
01	13	PO2	TOTAL ALARM 2
	14	PO2	
02	15	PO3	TOTAL ALARM 3
	16	PO3	
03	17	PO4	TOTAL ALARM 4
	18	PO4	
04	19	PO5	TOTAL ALARM 5
	20	PO5	
05	21	PO6	COD H.Hi Conc. (L1)
	22	PO6	
06	23	PO7	Sample Lack (L1)
	24	PO7	

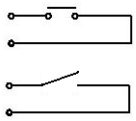
Ch.	Terminal No.	I/O No.	Assignment
07	47	PO8	Measure (L1)
	48	PO8	
08	49	PO9	Blank/Calib/Clean
	50	PO9	
09	51	PO10	Standby
	52	PO10	
10	53	PO11	Sync Signal 1
	54	PO11	
11	55	PO12	Sync Signal 2
	56	PO12	
12	57	PO13	Power (assignment fixed)
	58	PO13	
13	59	PO14	Maintenance (assignment fixed)
	60	PO14	

(when the 2-sample line option is added)

Ch.	Terminal No.	I/O No.	Assignment
14	71	PO15	TOTAL ALARM 6
	72	PO15	
15	73	PO16	COD H.Hi Conc. (L2)
	74	PO16	
16	75	PO17	Sample OFF (L2)
	76	PO17	
17	77	PO18	Measure (L2)
	78	PO18	
18	79	PO19	Not assigned
	80	PO19	
19	81	PO20	Not assigned
	82	PO20	
20	83	PO21	Not assigned
	84	PO21	

Specification

The specification for contact output is as shown below.

Signal classification	I/O circuit	Specification
Contact signal output	 Maintenance	● Contact rating 250 V AC 3 A, or 30 V DC 3 A (Only 30 V DC 3 A is available for the contact output of maintenance.) ● Contact output Power OFF: B-contact (standard)/A-contact (configured at factory) During maintenance: A-contact only Other than the above statuses: A-contact (standard)/B-contact (configured at factory)

Note

- **Do not apply any load exceeding the maximum rating. This can cause a failure.**
- **To open or close a load, connect a spark killer, surge absorber (AC or DC load), diode, or the like in parallel with the load in order to prevent noise occurring.**
- **a-contact output: normally OFF (open); turns ON when actuated (short-circuited)**
  b-contact output: normally ON (short-circuited); turns OFF when actuated (opened)

Contact input

For the CODA-500, the following contact inputs are available. When they are specified as contacts, they are enabled to take the corresponding actions indicated below.

Type	Item	Description	Input timing	Level[*1]	Pulse[*2]
1-sample line type (standard)	Meas. Start	Starts measurement.	Starts when the contact remains ON (short-circuited) for 3 seconds minimum after the OFF (open) status.	✓	✓
	Cal. Start	Starts calibration.		-	✓
	Cleaning Start	Starts cleaning.		-	✓
	Blank Meas. Start	Starts blank measurement.		-	✓
	Modify Date	Accepts time correction.	Accepts time correction when the contact remains ON (short-circuited) for 3 to 10 seconds minimum after the OFF (open) status.	-	✓
	Samp. Lack L1	Accepts the sample OFF (L1).	Accepts time correction when the contact remains ON (short-circuited) for 10 seconds minimum after the OFF (open) status.	✓	-
	Line Select L1	Accepts line selection (L1).	Accepts time correction when the contact remains ON (short-circuited) for 3 seconds minimum after the OFF (open) status.	✓	-
	Flow Mainte L1	Accepts flowmeter under maintenance.		✓	-
	Flow Err. L1	Accepts flowmeter failure.		✓	-
	Flow Power OFF L1	Accepts flowmeter power OFF.		✓	-
	Flow No Drain L1	Accepts drainless flowmeter.		✓	-
2-sample line type (optional)	Samp. Lack L2	Accepts the sample OFF (L2).	Accepts time correction when the contact remains ON (short-circuited) for 3 seconds minimum after the OFF (open) status.	✓	-
	Line Select L2	Accepts line selection (L2)		✓	-
	Flow Mainte L2	Accepts flowmeter under maintenance.		✓	-
	Flow Err. L2	Accepts flowmeter failure.		✓	-
	Flow Power OFF L2	Accepts flowmeter power OFF.		✓	-
	Flow No Drain L2	Accepts drainless flowmeter.		✓	-

*1: The contact continues to be short-circuited longer than the time specified for the input timing.

*2: The contact is short-circuited for 3 seconds minimum and then opened.

● Terminal assignment

The terminals are assigned to contact inputs as shown below.

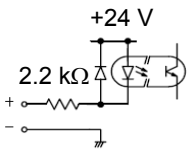
Ch.	Terminal No.	I/O No.	Assignment
00	25 26	PI1 PI1 (G)	Meas. Start
01	27 28	PI2 PI2 (G)	Cal. Start
02	29 30	PI3 PI3 (G)	Cleaning Start
03	31 32	PI4 PI4 (G)	Blank Meas. Start
04	33 34	PI5 PI5 (G)	Sample Lack (L1)
05	35 36	PI6 PI6 (G)	Flow Mainte (L1)
06	37 38	PI7 PI7 (G)	Flow Err. (L1)
07	39 40	PI8 PI8 (G)	Flow Power OFF (L1)
08	41 42	PI9 PI9 (G)	Flow No Drain (L1)

(when the 2-sample line option is added)

	Terminal No.	I/O No.	Assignment
09	85	PI10	Line Select (L1)
	86	PI10 (G)	
10	87	PI11	Line Select (L2)
	88	PI11 (G)	
11	89	PI12	Sample Lack (L2)
	90	PI12 (G)	
12	91	PI13	Flow Mainte (L2)
	92	PI13 (G)	
13	93	PI14	Flow Err (L2)
	94	PI14 (G)	
14	95	PI15	Flow Power OFF (L2)
	96	PI15 (G)	
15	97	PI16	Flow No Drain (L2)
	98	PI16 (G)	
16	99	PI17	Not assigned
	100	PI17 (G)	

Specification

The specification for contact inputs is shown below.

Signal classification	I/O circuit	Specification
Contact signal input		● No-voltage a-contact signal input (open collector acceptable) ● Insulated type input: common to (–) side ● ON resistance: 100 Ω max. ● Open voltage: 26 V DC max. ● Short-circuit current: 13 mA max.

Note

- **Do not connect any wiring with voltage to the input terminal. This can cause a failure.**
- **The contact input may not be accepted unless it continues for 3 seconds minimum. Therefore, ensure that the contact input remains ON for 3 seconds minimum.**

Serial input/output (RS-485/RS-232C)

The CODA-500 provides RS-485(standard)/RS-232C(optional) input/output.
The specifications are shown below.
For details of commands, refer to “ Modbus ” (page 190).

Interface	Set up at factory ● RS-485 (standard) ● RS-232C (optional)
Protocol	Modbus-RTU
Baudrate	● 38400 bps ● 19200 bps ● 9600 bps Selectable from the above options
Parity	● None ● Odd ● Even Selectable from the above options
Stop bit	● 1 stop bit (when parity is odd or even) ● 2 stop bits (when parity is none)
Communication method	Half duplex

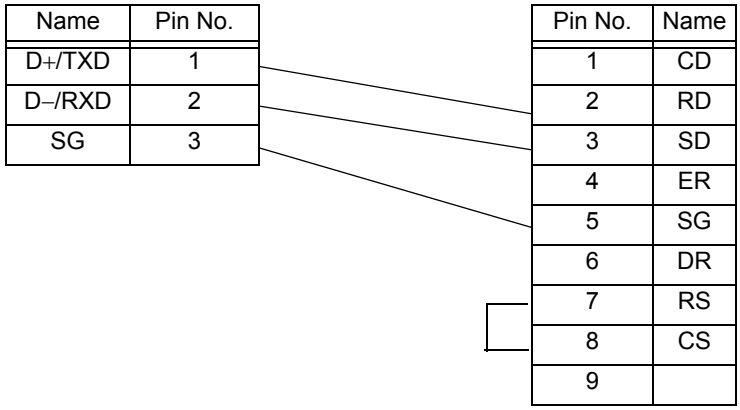
● Terminal assignment

The terminals are assigned as shown below.

Terminal No.	I/O No.
43	TXD/D+
44	RXD/D−
45	SG

● Cable type

On CODA-500 (3-pin stripped wire or round terminal) On PC (D-SUB 9-pin female connector)



Technical data

Modbus

■ Overview

CODA-500 employs Modbus for its serial communication protocol.
Modbus is a serial communication protocol developed by Modicon, Inc. and is widely used as a kind of field bus.
This section describes the Modbus address and its function in the CODA-500.
Refer to the respective items and website for the following points.

- Details of Modbus protocol specifications
  Modbus website URL: http://www.modbus.org/
- Terminal connections
  “ External input/output terminals ” (page 178)
- Serial communication settings (Machine ID, Baudrate, Parity)
  “ COMMUNICATION SET ” (page 90)

● Software information

Item	Specification		Remark
Physical I/F	RS-485 Optional: RS-232C 2 lines		Hardware setting change is necessary for RS-232C.
Serial Setting	Bit/s	9600/19200/38400	
	Data bit	8	
	Parity	None/Even/Odd	When Parity is None, Stop bit is 2. When Parity is Even or Odd, Stop bit is 1.
	Stop bit	1/2	
	flow control	None	
Protocol	Modbus	RTU mode	

● Function code

Code	Description
0x01	Read Coils
0x02	Read Discrete Inputs
0x03	Read Holding Registers
0x04	Read Input Registers
0x05	Write Single Coil
0x06	Write Single Register
0x0F	Write Multiple Coils
0x10	Write Multiple Registers
0x17	Read/Write Multiple Registers

● Exception code

Code	Description	Remark
01	Illegal Function	Refer to “ Function code ” (page 190).
02	Illegal Data Address	Includes the case when accessing with the data of unspecified size. Example: 2-byte access to 4-byte data * When accessing to an unused address, 0 is returned in general taking into account that several items are simultaneously set.
03	Illegal Data Value	When the value is out of the range.
04	Slave Device Failure	When the operation fails because of the instrument situations.

- The lower the code number the higher the priority.
- When several items setting are overwritten, correct data writing is performed even if error 03 occurs.

● Slave address

Instrument address (= Machine ID)	1 to 247

■ Address mapping

Register							
Address	Length	Data format	Read	Write	Item	Description	Group
1	1	short	○	×	Measuring line	(Reference 1)	Measurement (status)
2	1	short	○	×	Measuring main sequence No.	(Reference 1)	
3	2	long	○	×	Elapsed time in measuring main sequence		
5	2	long	○	×	Total time of measuring main sequence		
7	1	short	○	×	Measuring sub-sequence No.	(Reference 1)	
8	1	short	○	×	Elapsed time in measuring sub-sequence		
9	1	short	○	×	Total time of measuring sub-sequence		
10	1	short	○	×	Measuring process No.	(Reference 1)	
11	1	short	○	×	Elapsed time in measuring process		
12	1	short	○	×	Total time of measuring process		
257	4	clk	○	×	Date when the last alarm occurred		Measurement (occurring alarm)
261	2	long	○	×	Common alarm bit00-31	Common alarm (Reference 1)	
263	2	long	○	×	Common alarm bit32-63	↑	
265	2	long	○	×	Line 1 alarm bit00-31	Line alarm (Reference 1)	
267	2	long	○	×	Line 2 alarm bit00-31	↑	
269	2	long	○	×	Line 3 alarm bit00-31	↑	
271	2	long	○	×	Line 4 alarm bit00-31	↑	
273	2	long	○	×	Line 5 alarm bit00-31	↑	
275	2	long	○	×	Line 6 alarm bit00-31	↑	
513	1	short	○	○	Measurenert component	Fixed to 1 for CODA.	Measurement (measurement value)
514	1	short	○	×	Unused	Always 0 when read. Ignored wher written.	
515	1	short	○	×	Unused	Always 0 when read. Ignored wher written.	
516	1	short	○	×	Unused	Always 0 when read. Ignored wher written.	
517	19	mes_dat	○	×	Measurenert value	(Reference 2)	
769	1	short	○	○	Measurenert line		Measurement (hour report)
770	1	short	○	○	Measurenert component	Fixed to 1 for CODA.	
771	1	short	○	×	Unused	Always 0 when read. Ignored wher written.	
772	1	short	○	×	Unused	Always 0 when read. Ignored wher written.	
773	20	hour_rep_dat	○	×	Hour report value	(Reference 2)	
1025	1	short	○	○	Measurenert line		Measurement (daily report)
1026	1	short	○	○	Measurenert component	Fixed to 1 for CODA.	
1027	1	short	○	×	Unused	Always 0 when read. Ignored wher written.	
1028	1	short	○	×	Unused	Always 0 when read. Ignored wher written.	
1029	30	day_rep_dat	○	×	Daily report value	(Reference 2)	
1281	1	short	○	×	Externa analog input count 00	External analog input count	Measurement (external analog input)
1282	1	short	○	×	Externa analog input count 01	↑	
1283	1	short	○	×	Externa analog input count 02	↑	
1284	1	short	○	×	Externa analog input count 03	↑	
1285	1	short	○	×	Externa analog input count 04	↑	
1286	1	short	○	×	Externa analog input count 05	↑	
1287	1	short	○	×	Externa analog input count 06	↑	
1288	1	short	○	×	Externa analog input count 07	↑	
1289	1	short	○	×	Externa analog input count 08	↑	
1290	1	short	○	×	Externa analog input count 09	↑	
1291	1	short	○	×	Externa analog input count 10	↑	
1292	1	short	○	×	Externa analog input count 11	↑	
1293	1	short	○	×	Externa analog input count 12	↑	
1294	1	short	○	×	Externa analog input count 13	↑	
1295	1	short	○	×	Externa analog input count 14	↑	
1296	1	short	○	×	Externa analog input count 15	↑	
1297	2	float	○	×	Externa analog input current value 00	External analog input current	
1299	2	float	○	×	Externa analog input current value 01	↑	
1301	2	float	○	×	Externa analog input current value 02	↑	
1303	2	float	○	×	Externa analog input current value 03	↑	
1305	2	float	○	×	Externa analog input current value 04	↑	
1307	2	float	○	×	Externa analog input current value 05	↑	
1309	2	float	○	×	Externa analog input current value 06	↑	
1311	2	float	○	×	Externa analog input current value 07	↑	
1313	2	float	○	×	Externa analog input current value 08	↑	
1315	2	float	○	×	Externa analog input current value 09	↑	
1317	2	float	○	×	Externa analog input current value 10	↑	
1319	2	float	○	×	Externa analog input current value 11	↑	
1321	2	float	○	×	Externa analog input current value 12	↑	
1323	2	float	○	×	Externa analog input current value 13	↑	
1325	2	float	○	×	Externa analog input current value 14	↑	
1327	2	float	○	×	Externa analog input current value 15	↑	
1537	2	long	○	×	Externa contact input 00-31		Measurement (external contact input)
1539	2	long	○	×	Externa contact input 32-63		

(Reference 1) Refer to “ Data definition sheets ” (page 197). (Reference 2) Refer to “ Data format examples ” (page 196).

Register							
Address	Length	Data format	Read	Write	Item	Description	Group
5633	2	float	○	○	External analog input current value 00	External analog current value 0-20 [mA]	Control (external analog input)
5635	2	float	○	○	External analog input current value 01	↑	
5637	2	float	○	○	External analog input current value 02	↑	
5639	2	float	○	○	External analog input current value 03	↑	
5641	2	float	○	○	External analog input current value 04	↑	
5643	2	float	○	○	External analog input current value 05	↑	
5645	2	float	○	○	External analog input current value 06	↑	
5647	2	float	○	○	External analog input current value 07	↑	
5649	2	float	○	○	External analog input current value 08	↑	
5651	2	float	○	○	External analog input current value 09	↑	
5653	2	float	○	○	External analog input current value 10	↑	
5655	2	float	○	○	External analog input current value 11	↑	
5657	2	float	○	○	External analog input current value 12	↑	
5889	2	long	○	○	External contact input value bit00-31	Definition code 0-31 converted to bit pattern (Reference 1)	Control (external contact input)
5891	2	long	○	○	External contact input value bit32-63	Definition code 32-63 converted to bit pattern (Reference 1)	
6145	1	short	○	○	Output request	0: Output check 1: Output check completion	Control (external analog output check)
6146	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
6147	1	short	○	○	External analog output value 00	0-20: mA output	
6148	1	short	○	○	External analog output value 01	↑	
6149	1	short	○	○	External analog output value 02	↑	
6150	1	short	○	○	External analog output value 03	↑	
6151	1	short	○	○	External analog output value 04	↑	
6152	1	short	○	○	External analog output value 05	↑	
6153	1	short	○	○	External analog output value 06	↑	
6154	1	short	○	○	External analog output value 07	↑	
6155	1	short	○	○	External analog output value 08	↑	
6156	1	short	○	○	External analog output value 09	↑	
6157	1	short	○	○	External analog output value 10	↑	
6158	1	short	○	○	External analog output value 11	↑	
6159	1	short	○	○	External analog output value 12	↑	
6160	1	short	○	○	External analog output value 13	↑	
6161	1	short	○	○	External analog output value 14	↑	
6162	1	short	○	○	External analog output value 15	↑	
6163	1	short	○	○	External analog output value 16	↑	
6164	1	short	○	○	External analog output value 17	↑	
6165	1	short	○	○	External analog output value 18	↑	
6166	1	short	○	○	External analog output value 19	↑	
6167	1	short	○	○	External analog output value 20	↑	
6168	1	short	○	○	External analog output value 21	↑	
6169	1	short	○	○	External analog output value 22	↑	
6170	1	short	○	○	External analog output value 23	↑	
6171	1	short	○	○	External analog output value 24	↑	
6172	1	short	○	○	External analog output value 25	↑	
6173	1	short	○	○	External analog output value 26	↑	
6174	1	short	○	○	External analog output value 27	↑	
6175	1	short	○	○	External analog output value 28	↑	
6176	1	short	○	○	External analog output value 29	↑	
6177	1	short	○	○	External analog output value 30	↑	
6178	1	short	○	○	External analog output value 31	↑	
6179	1	short	○	○	External analog output value 32	↑	
6180	1	short	○	○	External analog output value 33	↑	
6181	1	short	○	○	External analog output value 34	↑	
6182	1	short	○	○	External analog output value 35	↑	
6183	1	short	○	○	External analog output value 36	↑	
6184	1	short	○	○	External analog output value 37	↑	
6185	1	short	○	○	External analog output value 38	↑	
6186	1	short	○	○	External analog output value 39	↑	
6401	1	short	○	○	Output request	0: Output check 1: Output check completion	Control (external contact output check)
6402	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
6403	2	long	○	○	External contact output 00-31		
6405	2	long	○	○	External contact output 32-63		

(Reference 1) Refer to “ Data definition sheets ” (page 197).

Register							
Address	Length	Data format	Read	Write	Item	Description	Group
7169	1	short	○	○	channel		Adjustment (external analog input adjustment)
7170	1	short	○	○	Mode	0: ZERO 1: SPAN	
7171	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
7172	1	short	○	○	Setting request	0: Data set 1: Applying settings 2: Completed	
7173	2	float	○	×	External analog input value		
7425	1	short	○	○	channel		Adjustment (external analog output adjustment)
7426	1	short	○	○	Mode	0: ZERO 1: SPAN	
7427	1	short	○	○	Adjusted value	Reset the current adjusted value when read.	
7428	1	short	○	○	Setting request	0: Data set 1: Applying settings 2: Completed	
16385	4	clk	○	○	Request start time	(Reference 2)	History (measurement value)
16389	4	clk	○	○	Request end time	(Reference 2)	
16393	1	short	○	○	Request component	Fixed to 1 (COD) for CODA	
16394	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
16395	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
16396	1	short	○	×	Request status	0: No response, 1: Initializing, 2: Next data, 3: Same data * When 1 is written, the latest data corresponding to the request time range is searched and memorized. When the data area is read with 2 written, the next data corresponding to the request time range is memorized and responded. When the data area is read with 3 written, the currently memorized data is responded. If no data is memorized, FF is set.	
16397	19	mes_dat	○	×	Measurement value history 01	(Reference 2)	
16897	4	clk	○	○	Request start time	(Reference 2)	History (hour report)
16901	4	clk	○	○	Request end time	(Reference 2)	
16905	1	short	○	○	Request line	Line No.	
16906	1	short	○	○	Request component	Component No. Fixed to 1 (COD) for CODA.	
16907	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
16908	1	short	○	×	Request status	0: No response, 1: Initializing, 2: Next data, 3: Same data	
16909	20	hour_rep_dat	○	×	Hour report history 01	(Reference 2)	
17409	4	clk	○	○	Request start time	(Reference 2)	History (daily report)
17413	4	clk	○	○	Request end time	(Reference 2)	
17417	1	short	○	○	Request line	Line No.	
17418	1	short	○	○	Request component	Component No. Fixed to 1 (COD) for CODA.	
17419	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
17420	1	short	○	○	Request status	0: No response, 1: Initializing, 2: Next data, 3: Same data	
17421	30	day_rep_dat	○	×	Daily report history 01	(Reference 2)	
17921	4	clk	○	○	Request start time	(Reference 2)	History (alarm)
17925	4	clk	○	○	Request end time	(Reference 2)	
17929	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
17930	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
17931	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
17932	1	short	○	○	Request status	0: No response, 1: Initializing, 2: Next data, 3: Same data	
17933	7	memalm	○	×	Alarm history 01	(Reference 2)	
18433	4	clk	○	○	Request start time	(Reference 2)	History (calibration)
18437	4	clk	○	○	Request end time	(Reference 2)	
18441	1	short	○	○	Request component	Fixed to 1 (COD) for CODA.	
18442	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
18443	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
18444	1	short	○	○	Request status	0: No response, 1: Initializing, 2: Next data, 3: Same data	
18445	26	calib_data	○	×	Calibration history 01	(Reference 2)	

(Reference 2) Refer to “ Data format examples ” (page 196).

Register							
Address	Length	Data format	Read	Write	Item	Description	Group
18945	4	clk	○	○	Request start time	(Reference 2)	History
18949	4	clk	○	○	Request end time	(Reference 2)	(titration)
18953	1	short	○	○	Request data No.		
18954	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
18955	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
18956	1	short	○	○	Request status	0: No response, 1: Initializing, 2: Next data, 3: Same data	
18957	4	clk	○	×	Titration history 01: time	(Reference 2)	
18961	1	short	○	×	Titration history 01: line		
18962	1	short	○	×	Titration history 01: number of data		
18963	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
18964	1	short	○	×	Unused	Always 0 when read. Ignored when written.	
18965	1	short	○	×	Titration history 01: request data No.+00		
18966	1	short	○	×	Titration history 01: request data No.+01		
18967	1	short	○	×	Titration history 01: request data No.+02		
18968	1	short	○	×	Titration history 01: request data No.+03		
18969	1	short	○	×	Titration history 01: request data No.+04		
18970	1	short	○	×	Titration history 01: request data No.+05		
18971	1	short	○	×	Titration history 01: request data No.+06		
18972	1	short	○	×	Titration history 01: request data No.+07		
18973	1	short	○	×	Titration history 01: request data No.+08		
18974	1	short	○	×	Titration history 01: request data No.+09		
18975	1	short	○	×	Titration history 01: request data No.+10		
18976	1	short	○	×	Titration history 01: request data No.+11		
18977	1	short	○	×	Titration history 01: request data No.+12		
18978	1	short	○	×	Titration history 01: request data No.+13		
18979	1	short	○	×	Titration history 01: request data No.+14		
18980	1	short	○	×	Titration history 01: request data No.+15		
18981	1	short	○	×	Titration history 01: request data No.+16		
18982	1	short	○	×	Titration history 01: request data No.+17		
18983	1	short	○	×	Titration history 01: request data No.+18		
18984	1	short	○	×	Titration history 01: request data No.+19		
18985	1	short	○	×	Titration history 01: request data No.+20		
18986	1	short	○	×	Titration history 01: request data No.+21		
18987	1	short	○	×	Titration history 01: request data No.+22		
18988	1	short	○	×	Titration history 01: request data No.+23		
18989	1	short	○	×	Titration history 01: request data No.+24		
18990	1	short	○	×	Titration history 01: request data No.+25		
18991	1	short	○	×	Titration history 01: request data No.+26		
18992	1	short	○	×	Titration history 01: request data No.+27		
18993	1	short	○	×	Titration history 01: request data No.+28		
18994	1	short	○	×	Titration history 01: request data No.+29		
18995	1	short	○	×	Titration history 01: request data No.+30		
18996	1	short	○	×	Titration history 01: request data No.+31		
18997	1	short	○	×	Titration history 01: request data No.+32		
18998	1	short	○	×	Titration history 01: request data No.+33		
18999	1	short	○	×	Titration history 01: request data No.+34		
19000	1	short	○	×	Titration history 01: request data No.+35		
19001	1	short	○	×	Titration history 01: request data No.+36		
19002	1	short	○	×	Titration history 01: request data No.+37		
19003	1	short	○	×	Titration history 01: request data No.+38		
19004	1	short	○	×	Titration history 01: request data No.+39		
19005	1	short	○	×	Titration history 01: request data No.+40		
19006	1	short	○	×	Titration history 01: request data No.+41		
19007	1	short	○	×	Titration history 01: request data No.+42		
19008	1	short	○	×	Titration history 01: request data No.+43		
19009	1	short	○	×	Titration history 01: request data No.+44		
19010	1	short	○	×	Titration history 01: request data No.+45		
19011	1	short	○	×	Titration history 01: request data No.+46		
19012	1	short	○	×	Titration history 01: request data No.+47		
19013	1	short	○	×	Titration history 01: request data No.+48		
19014	1	short	○	×	Titration history 01: request data No.+49		
24577	9	cpu_info	○	×	Main program information	(Reference 2)	Other
24586	9	cpu_info	○	×	Subprogram No.1 information	(Reference 2)	(program information)
24595	9	cpu_info	○	×	Subprogram No.2 information	(Reference 2)	
24604	9	cpu_info	○	×	Subprogram No.3 information	(Reference 2)	
24613	9	cpu_info	○	×	Subprogram No.4 information	(Reference 2)	
24622	9	cpu_info	○	×	Subprogram No.5 information	(Reference 2)	
24631	9	cpu_info	○	×	Subprogram No.6 information	(Reference 2)	
24640	9	cpu_info	○	×	Subprogram No.7 information	(Reference 2)	
24649	9	cpu_info	○	×	Subprogram No.8 information	(Reference 2)	
24658	1	short	○	○	Set value update	When 1 is written, the set values are saved to memory.	Other (setting write)
上記以外		-	○	×	Unused	Always 0 when read. Ignored when written.	

(Reference 2) Refer to “ Data format examples ” (page 196).

Data format examples

Example of data format		
Length	Data format	Description
4	clk	[0]: High 8 bit = Year (the last 2 digits) Low 8 bit = Month [1]: High 8 bit = Day Low 8 bit = Week [0 = SUN, 6 = SAT] [2]: High 8 bit = Hour Low 8 bit = Minute [3]: High 8 bit = Second Low 8 bit = Dummy
2	hval_t	[0]: Data [1]: High 8 bit = Digit Low 8 bit = Unit
3	wval_t	[0]:Data Lo [1]:Data Hi [2]: High 8 bit = Digit Low 8 bit = Unit
3	mes_info	[0]: Mesctl status number [1]: Measurement line [2]: Reserved
21	alm_info	[0-3]: Same as clk [4]: Number of alarms [5-8]: Common alarm (bit assignment) [9-10]: Line 01 alarm (bit assignment) [11-12]: Line 02 alarm (bit assignment) [13-14]: Line 03 alarm (bit assignment) [15-16]: Line 04 alarm (bit assignment) [17-18]: Line 05 alarm (bit assignment) [19-20]: Line 06 alarm (bit assignment)
2	seq_info	[0]: Sequence No. [1]: Sequence time
1	dout_t	[0]: High 8 bit = Mode [Hold/Direct/Preset] Low 8 bit = Preset value
19	mes_dat	[0-3]: Time (clk) [4]: Line (byte) [5]: Element (byte) [6-7]: Water quality (hval_t) [8-9]: Unadjusted water quality (hval_t) [10]: Water quality alarm (short) [11]: Always 0 [12-14]: RevisionA (wval_t) [15]: Always 0 [16-18]:RevisionB (wval_t)
20	hour_rep_da	[0-3] Time (clk) [4]: Line (byte) [5]: Element (byte) [6]: Unit system (byte) [7]: Always 0 [8-10]: Flow rate (wval_t) [11]: Flow rate alarm (short) [12-13]: Water quality (hval_t) [14]: Water quality alarm (short) [15]: Always 0 [16-18]: Load (wval_t) [19]: Load alarm (short)

Example of data format		
Length	Data format	Description
30	day_rep_dat	[0-3]: Time (clk) [4]: Line (byte) [5]: Element (byte) [6]: Unit system (byte) [7]: Always 0 [8-10]: Flow rate 1 (wval_t) [11]: Always 0 [12-14]: Flow rate 2 (wval_t) [15]: Flow rate alarm (short) [16-17]: Water quality (hval_t) [18-19]: Water quality MIN (hval_t) [20-21]: Water quality MAX (hval_t) [22-23]: Water quality AVE (hval_t) [24]: Water quality alarm (short) [25]: Always 0 [26-28]: Load (wval_t) [29]: Load alarm (short)
7	memalm	[0-3]: Time (clk) [4]: Line (byte) [5]: Code (short) [6]: ON/OFF (short)
26	calib_data	[0-3]: Time (clk) [4]: Element (byte) [5]: Zero result (byte) [6]: Span result (byte) [7]: Always 0 [8-9]: Zero value (float) [10-11]: Span value (float) [12-14]: Standard (wval_t) [15]: Always 0 [16-17]: Factor (hval_t) [18-19]: Parameter 0 (float) [20-21]: Parameter 1 (float) [22-23]: Parameter 2 (float) [24-25]: Parameter 3 (float)
14	ope_data	[0-3]: Time (clk) [4]: Operation (short) [5]: Always 0 [6-7]: Code 0 (long) [8-9]: Code 1 (long) [10-11]: Code 2 (long) [12-13]: Code 3 (long)
9	cpu_info	[0]: High 8 bit = 1st character of P number Low 8 bit = 2nd character of P number [1]: High 8 bit = 3rd character of P number Low 8 bit = 4th character of P number [2]: High 8 bit = 5th character of P number Low 8 bit = 6th character of P number [3]: High 8 bit = 7th character of P number Low 8 bit = 8th character of P number [4]: High 8 bit = 9th character of P number Low 8 bit = 10th character of P number [5]: High 8 bit = 11th character of P number Low 8 bit = 12th character of P number [6]: High 8 bit = 1st character of Ver. (ASCII) Low 8 bit = 2nd character of Ver. (ASCII) [7]: High 8 bit = 3rd character of Ver. (ASCII) Low 8 bit = 4th character of Ver. (ASCII) [8]: Machine ID

Data definition sheets

Data definition		
Data	Value	Definition
Line	0	L1
	1	L2
	2	L3
	3	L4
	4	L5
	5	L6
	7	Zero
	8	Span
	9	Blank
	10	Cleaning
Main sequence No.	0	Standby
	1	Measurement
	2	Zero calibration
	3	Span calibration
	4	Cleaning
	5	Blank measurement
	6	Wait cycle
	7	Separate action
	8	Pretreatment
Sub-sequence No.	0	No display
	1	Standby
	2	Wait cycle
	3	Waste water
	4	Waste water (bubbling)
	5	Drain
	6	Gauge blank water, tap water – open
	7	Gauge blank water, tap water – pressured
	8	Gauge blank water, tank – open
	9	Gauge blank water, tank – pressured
	10	Send blank water
	11	Gauge dilution water – tap water – open
	12	Gauge dilution water – tap water – pressured
	13	Gauge dilution water – tank – open
	14	Gauge dilution water – tank – pressured
	15	Send dilution water to mixing tank
	16	Gauge sample – 10 mL – L1
	17	Gauge sample – 10 mL – L2
	18	Gauge sample – 2 mL – L1
	19	Gauge sample – 2 mL – L2
	20	Sample 10 mL to reaction tank
	21	Sample 10 mL to mixing tank
	22	Sample 2 mL to mixing tank
	23	Gauge diluted sample 10mL
	24	Diluted sample to 10 mL tube
	25	Drain diluted sample
	26	Gauge reag. A
	27	Gauge reag. B
	28	Gauge reag. C
	29	Gauge reag. D
	30	Gauge reag. E
	31	Send reag. A
	32	Send reag. B

Data definition		
Data	Value	Definition
Sub-sequence No.	33	Send reag. C
	34	Send reag. D
	35	Send reag. E
	36	Degradation
	37	Degradation (bubbling)
	38	Wait reaction
	39	Fill titrator
	40	Titration
	41	Titration preparation
	42	Stir in mixing tank
	43	Blow activated carbon
	44	Line cleaning, 2 mL – reagent
	45	Line cleaning, 10 mL– reagent
	46	Line cleaning, 2 mL– tap water
	47	Line cleaning, 2 mL– tank water
	48	Line cleaning, 10 mL– tap water
	49	Line cleaning, 10 mL– tank water
	50	Sample reverse cleaning – 10 mL – L1
	51	Sample reverse cleaning – 10 mL – L2
	52	Sample reverse cleaning – 2 mL – L1
	53	Sample reverse cleaning – 2 mL – L2
	54	Wait cleaning
	55	Adjust dilution water gauge
	56	Adjust titrator
	57	Bubbling
	58	Gauge blank water, tap water – add
	59	Gauge blank water, tank – add
	60	Drain (bubbling)
Process No.	0	No display
	1	Sampling
	2	Degradation
	3	Titration
	4	Cleaning

Data definition		
Data	Value	Definition
External contact input	0	Not assigned
	1	Measurement start
	2	Calibration start
	3	Cleaning start
	4	Blank measurement start
	5	Correct time
	6	Sample lack (L1)
	7	Select line (L1)
	8	Flowmeter, maintenance (L1)
	9	Flowmeter, failure (L1)
	10	Flowmeter, power failure (L1)
	11	Flowmeter, drain failure (L1)
	12	Sample lack (L2)
	13	Select line (L2)
	14	Flowmeter, maintenance (L2)
	15	Flowmeter, failure (L2)
	16	Flowmeter, power failure (L2)
	17	Flowmeter, drain failure (L2)
	18	Sample lack (L3)
	19	Select line (L3)
	20	Flowmeter, maintenance (L3)
	21	Flowmeter, failure (L3)
	22	Flowmeter, power failure (L3)
	23	Flowmeter, drain failure (L3)
	24	Sample lack (L4)
	25	Select line (L4)
	26	Flowmeter, maintenance (L4)
	27	Flowmeter, failure (L4)
	28	Flowmeter, power failure (L4)
	29	Flowmeter, drain failure (L4)
	30	Sample lack (L5)
	31	Select line (L5)
	32	Flowmeter, maintenance (L5)
	33	Flowmeter, failure (L5)
	34	Flowmeter, power failure (L5)
	35	Flowmeter, drain failure (L5)
	36	Sample lack (L6)
	37	Select line (L6)
	38	Flowmeter, maintenance (L6)
	39	Flowmeter, failure (L6)
	40	Flowmeter, power failure (L6)
	41	Flowmeter, drain failure (L6)
Common alarm	0	Power
	1	Factory setting
	2	User setting
	3	History
	4	EEPROM Read
	5	Clock
	6	Int. Power
	7	ADC
	8	Sub-PCB communication error
	9	Heater

Data definition		
Data	Value	Definition
Common alarm	10	Leak
	11	Electrode
	12	Titrator
	13	Reaction tank leak
	14	Heat empty
	15	Air pressure
	16	Gauge samp. 2mL
	17	Gauge samp. 10mL
	18	Gauge diluted samp.
	19	Gauge diluent
	20	Reag.A
	21	Reag.B
	22	Reag.C
	23	Reag.D
	24	Reag.E
	25	Lack blank
	26	Titration
	27	Heat low temp
	28	Heat high temp
	29	Lack reag.A
	30	Lack reag.B
	31	Lack reag.C
	32	Lack reag.D
	33	Lack reag.E
	34	Full waste tank
	35	ZERO cal.
	36	SPAN Cal.
	37	Maintenance
	38	CF write
	39	FROM Write
	40	EEPROM Write
	41	Printer
	42	Usb detect
	43	USB full
	44	CPU
	45	Gauge blank
	46	Measurement value
	47	Hour report
	48	Daily report
	49	Alarm history
	50	Calibration history
	51	Titration data
	52	Operation history
Line alarm	0	Lack samp.
	1	COD Hi limit
	2	COD H.Hi limit
	3	COD Hi load
	4	Flow limit

How to use

Measurement (status)

1. Read.

Measurement (occurring warning)

1. Read.

Measurement (measurement value)

1. Set the measurement component (fixed to 1 in CODA).
2. Read.

Measurement (hour report)

1. Set the measurement line.
2. Set the measurement component (fixed to 1 in CODA).
3. Read.

Measurement (daily report)

1. Set the measurement line.
2. Set the measurement component (fixed to 1 in CODA).
3. Read.

Measurement (external analog input)

1. Read.

Measurement (external contact input)

1. Read.

Control (external analog input)

1. Set input value (the value can be read).

Control (external contact input)

1. Set input value (the value can be read).

● **Control (external analog output check)**

1. **Set output value (the value can be read).**
2. **Set output request: output check (0) to output.**
3. **Set output request: output check completion (1) to cancel the output check status.**

Note

The output adjustment status is valid for 10 minutes after the adjustment request is accepted.

● **Control (external contact output check)**

1. **Set output value (the value can be read).**
2. **Set output request: output check (0) to output.**
3. **Set output request: output check completion (1) to cancel the output check status.**

Note

The output adjustment status is valid for 10 minutes after the adjustment request is accepted.

● **Adjustment (external analog input adjustment)**

1. **Set the setting CH.**
2. **Set the adjustment mode.**
3. **Set adjustment request: data set (0) to read the current value.**
4. **Set adjustment request: setting reflection (1) and reflect to the set value.**
5. **Set adjustment request: completion (2) to cancel the adjustment status.**

Note

- **The input adjustment status is valid for 10 minutes after the adjustment request is accepted.**
- **Be sure to perform adjustment request: data set (0) before adjustment request: setting reflection (1).**

● **History (measurement value)**

1. **Set the request start time.**
2. **Set the request end time.**
3. **Set request status: initialization (1) to prepare the data.**
4. **Set request status: next data (2) to read the data.**

Note

Setting request status: same data (3) reads the same data as the one that was read last time.

- **History (hour report)**

1. **Set the request start time.**
2. **Set the request end time.**
3. **Set the request line.**
4. **Set the request component.**
5. **Set request status: initialization (1) to prepare the data.**
6. **Set request status: next data (2) to read the data.**

Note

Setting request status: same data (3) reads the same data as the one that was read last time.

- **History (daily report)**

1. **Set the request start time.**
2. **Set the request end time.**
3. **Set the request line.**
4. **Set the request component.**
5. **Set request status: initialization (1) to prepare the data.**
6. **Set request status: next data (2) to read the data.**

Note

Setting request status: same data (3) reads the same data as the one that was read last time.

- **History (warning)**

1. **Set the request start time.**
2. **Set the request end time.**
3. **Set the request line.**
4. **Set the request component.**
5. **Set request status: initialization (1) to prepare the data.**
6. **Set request status: next data (2) to read the data.**

Note

Setting request status: same data (3) reads the same data as the one that was read last time.

- **History (calibration)**

1. **Set the request start time.**
2. **Set the request end time.**
3. **Set the request component.**
4. **Set request status: initialization (1) to prepare the data.**
5. **Set request status: next data (2) to read the data.**

Note

Setting request status: same data (3) reads the same data as the one that was read last time.

● **History (titration)**

1. Set the request start time.
2. Set the request end time.
3. Set the request component.
4. Set request status: initialization (1) to prepare the data.
5. Set request status: next data (2) to read the data.

Note

- Max. 50 data from specified request data No. can be read.
- Setting request status: same data (3) reads the same data as the one that was read last time.

● **Other (main program information/subprogram information)**

1. Read.

● **Other (set value write)**

1. Writing the write request (1) saves the set value to the memory.

Specification

General specification	Name of equipment		Automatic COD monitor
	Model		CODA-500
	Object		COD concentration in water
	Dimensions		600 (W) mm × 510 (D) mm × 1600 (H) mm[*1]
	Mass		Approx. 150 kg
	Power source		100 V to 240 V AC ±10%, 50 Hz/60 Hz
	Power consumption		● 100 V to 120 V AC: Approx. 250 VA ● 120 V to 240 V AC: Approx. 350 VA
	Installation conditions		● Indoor installation type ● Transient overvoltage of main power source: Overvoltage category II (EN61010-1), pollution level 2
Performance	Measurement range (Actual upper limit of measurement is half-scale of the range.)		● 0 mg/L to 20 mg/L ● 0 mg/L to 30/40/50/100/200/500/1000/2000 mg/L (1-dilution type)
	Reproducibility (with standard solution for glucose)		20 mg/L: Within ±1% of full-scale value 30 mg/L to 500 mg/L: Within ±2% of full-scale value 1000 mg/L to 2000 mg/L: Within ±5% of full-scale value Optional specification[*2]: Within ±5% of full-scale value
	Stability	Zero drift (for 24 h)	20 mg/L: Within ±3% of full-scale value 30 mg/L to 500 mg/L: Within ±4% of full-scale value 1000 mg/L to 2000 mg/L: Within ±5% of full-scale value Optional specification[*2]: Within ±5% of full-scale value
		Span drift (for 24 h, with standard solution for glucose)	20 mg/L: Within ±3% of full-scale value 30 mg/L to 500 mg/L: Within ±4% of full-scale value 1000 mg/L to 2000 mg/L: Within ±5% of full-scale value Optional specification[*2]: Within ±5% of full-scale value
	Measuring principle[*3]	CODA-500-A (acidic method)	Acid potassium permanganate method at 100°C (based on JIS K 0806)
		CODA-500-B (alkaline method)	Alkaline potassium permanganate method at 100°C
		CODA-500-C (acidic method)	Acid potassium permanganate method at 100°C (based on JIS K 0806) With reagent cleaning function
	Number of measurement points		Standard: 1 Optional: 2
	Measuring range		Standard: 1 range Optional: 2 ranges
	Heating method		Direct heating
	End point detection		Potentiometric titration at constant current
	Titration method		Micro syringe titration
	Measurement interval		60 minutes
	Reagent cleaning		CODA-500-A, CODA-500-B: Not available CODA-500-C: Available
	Method without adding a silver nitrate solution[*4]		Available (by selecting this method when the chloride ion concentration is low)

Measuring conditions	Ambient temperature		2°C to 40°C
	Ambient humidity		Relative humidity: 85% max. (without condensation)
	Power supply voltage fluctuations		100 V to 240 V AC ±10%
	Sample water conditions	Temperature	2°C to 40°C (without freezing)
		Flow rate	When the overflow tank (optional) is used 0.5 L/min to 5 L/min (depends on the overflow tank type)
		Chloride ion concentration (for acidic method)	CODA-500-A: Up to 1 time the full-scale value CODA-500-C: Up to 100 times the full-scale value (maximun)*6 (The alkaline method is not influenced by chloride ion concentration. For more than 100 times the full-scale value, select the alkaline method.)
		Sampling point	Piping length from main unit: Within 3 m
	Blank water conditions	Supply method	Standard: Waterworks water Optional: Supply from deionized water tank
		Water quality*5	Waterworks water without COD components (hardness: 100 mg/L max.)
		Water supply pressure	100 kPa to 500 kPa (at the connection of the instrument inlet)
		Consumption	20 mL to 420 mL per measurement run (depends on the measurement range and cleaning function setting).
	Installation conditions		● Well ventilated indoor location without exposure to direct sunlight ● Flat and stable location with minimized vibrations and shocks ● Atmosphere free from dust, mist, corrosive gas, etc.

Input/output specification	Display		Color LCD with touch panel
	Analog output	Number of points	Standard: 3 Optional: 6
		Kinds	Standard 4 mA to 20 mA DC, 0 mA to 16 mA DC (4 mA to 20 mA DC is set at the factory. 0 mA to 16 mA DC is selectable on the screen.) Optional: 0 mA to 16 mA DC, 0 V to 1 V DC, and 1 V to 5 V DC
		Description	COD concentration, time COD load, and time flow rate
		Output impedance	900 Ω max.
	Contact output	Number of points	Standard: 14 Optional: 21
		Format	No-voltage contact output
		Kinds	Insulated output
		Output capacity	250 V AC, 3 A 30 V DC, 3 A (Only 30 V DC, 3 A are available for "Maintenance" contact.)
		Status output	Meas., Cal., Standby, Cleaning, Blank Meas., Synchro. Idle 1, Synchro. Idle 2, Maintenance, Power, etc.
		Warning output	Limit warnings (COD Hi limit, Flow limit, and COD Hi Load), COD H.Hi limit, Sample Lack, Total Alarm 1 to 6, various gauge errors, etc. (optional: Lack Reagent)
	Analog input	Number of points	Standard: 1 Optional: 2
		Kinds	Standard: 4 mA to 20 mA DC input Optional: 1 V to 5 V DC
		Description	Flow signal (full-scale value may be specified freely)
	Contact input	Number of points	Standard: 9 Optional: 17
		Format	No-voltage a-contact input (open collector is available)
		Kinds	Insulated type input: common to (–) side
		ON resistance	100 Ω max.
		Open voltage	26 V DC max.
		Short-circuit current	13 mA DC max.
		Functions	Meas. Start, Cal. Start, Cleaning Start, Blank meas. Start, Modify Date, Samp. Lack, Line Select, Flow Mainte, Flow Err., Flow Power OFF, and Flow No Drain
	Load calculation capability		COD load calculation capability
	Storage capability		Data retention for 1 year (measurement values) External USB storage is available.
	Communication capability		Standard: RS-485 Optional: RS-232C
	Communication protocol		Modbus
	Printer		Provided (58 mm); with automatic take-up device

Reagent consumption *7	Potassium permanganate Reagent A	2 mL per measurement run
	Sodium oxalate Reagent B	1 mL per measurement run*8
	Sulfuric acid solution Reagent C	1 mL per measurement run
	Silver nitrate solution Reagent D	0.5 mL per measurement run (used for acidic method)
	Sodium thiosulfate solution Reagent E	2 mL per measurement run (used for reagent cleaning function)
	Sodium hydroxide solution Reagent F	1 mL per measurement run (used for alkaline method)
	Reagent replacement interval	1 month or more.
	Tap water	20 mL to 420 mL per measurement run (depends on the measurement range)

*1: Channel-based compatibility with the former CODA-200 series products is available (standard).

*2: This means the optionally addable specifications such as 2-point measuring, 2 ranges and reagent line cleaning, and also means using the reagent cleaning function of CODA-500-C.

*3: To be specified when you place an order.

*4: If silver nitrate is not used, the performance in the specifications is not warranted.

*5: If tap water is used, first perform flushing for about 30 minutes and then send tap water to the CODA-500. For the version using a tank, use deionized water of 10 mS/m (=1.0 μS/cm) maximum.

*6: When the reagent cleaning function is not used, the concentration is up to 1 time the full-scale value. The setting of reagent cleaning function can be switched depending on the chloride ion concentration in the sample water.

*7: Use the reagents designated by our company. If any other reagents are used, no measured values are warranted. When reagent cleaning function is set, reagent consumption may grow.

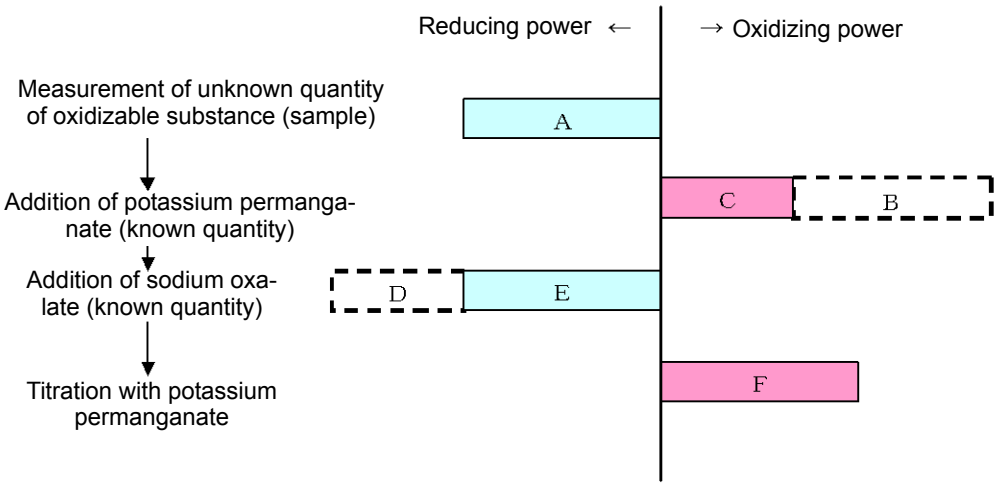
*8: Use sodium oxalate for the oxygen method or sodium oxalate containing 0.1 g/L manganese sulfate for the alkaline method.

The total volume control of water quality at companies which discharge waste water to a closed water area is implemented by the environmental agency. This regulation requires using a conversion equation for the method of obtaining the correlation between the values measured with an automatic COD monitor and those (by the designated measurement method) measured through the manual analysis specified in 17 of JIS K 0102. Before use, conduct the manual analysis and enter the conversion factor to the CODA-500.

Measuring principle

In CODA-500, organic compounds in water are oxidized by oxidant (potassium permanganate) and the COD value is obtained by converting the consumed quantity of the oxidant into the quantity of oxygen. In the actual measurement, after oxidation with the oxidant agent has been finished, an aqueous solution of sodium oxalate is added to reduce the residual unreacted potassium permanganate. Subsequently, the residual sodium oxalate is titrated with an aqueous solution of potassium permanganate to obtain the quantity of the oxidant consumed by oxidation (this is called reverse titration). There are a few methods available for detecting the end point of titration. The CODA-500 employs method (2).

- (1) Redox titration: A platinum electrode is used against a reference electrode to obtain the redox potential difference in the reaction and then determine the end point.
  Refer to " Fig. 1 Titration curve in redox titration " (page 208).
- (2) Potentiometric titration at constant current: Minute constant current is sent to two platinum electrodes to obtain the potential difference in the reaction between those electrodes and then determine the end point.
  Refer to " Fig. 2 Titration curve in potentiometric titration at constant current " (page 208).



A. Oxidizable substance
B. Potassium permanganate consumed in oxidation of A
C. Residual unreacted potassium permanganate
D. Sodium oxalate consumed in reduction of C
E. Residual unreacted sodium oxalate
F. Potassium permanganate consumed in titration of E

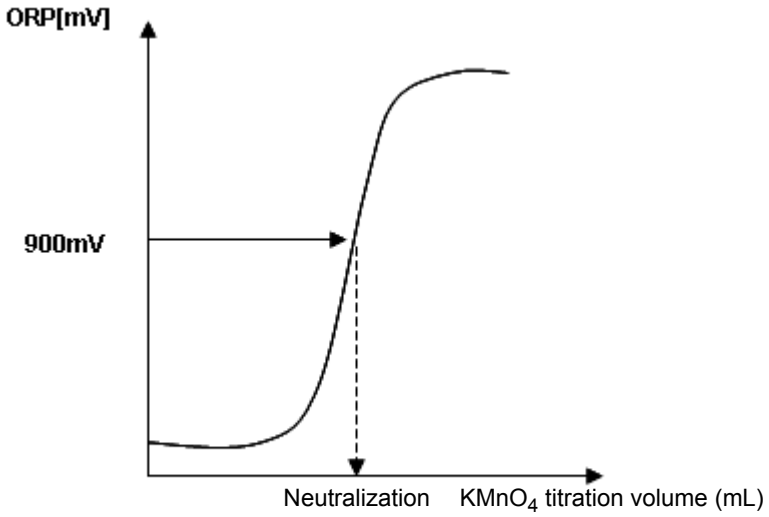


Fig. 1 Titration curve in redox titration

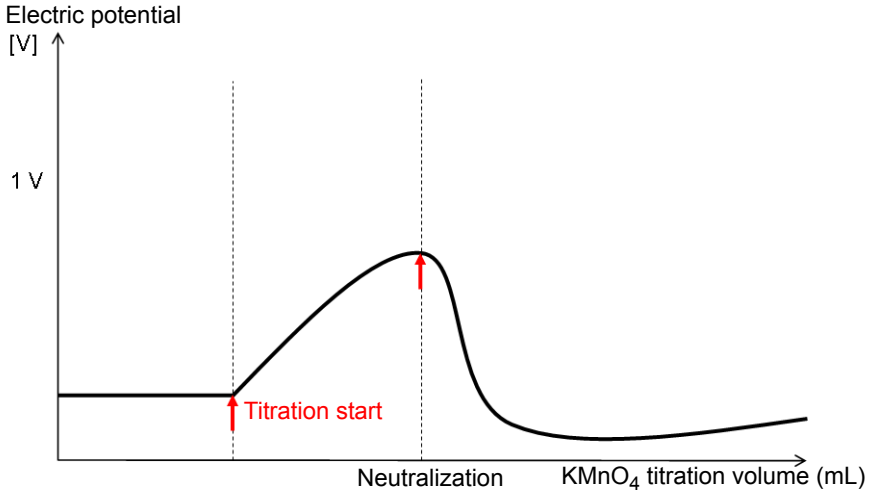


Fig. 2 Titration curve in potentiometric titration at constant current

The redox reaction between potassium permanganate and sodium oxalate is expressed by the formula below.

$2KMnO_4+5Na_2C_2O_4+8H_2SO_4 \rightarrow K_2SO_4+2MnSO_4+5Na_2SO_4+10CO_2+8H_2O$

From this titration result, the amount of residual sodium oxalate is found. The difference between this amount and the added amount is equal to the amount of the residual unreacted potassium permanganate which has been reduced. The difference between this value and the amount of the first added potassium permanganate shows the amount of potassium permanganate which has been consumed by oxidation.

The oxidation mechanism of potassium permanganate is expressed by the reaction formula below.

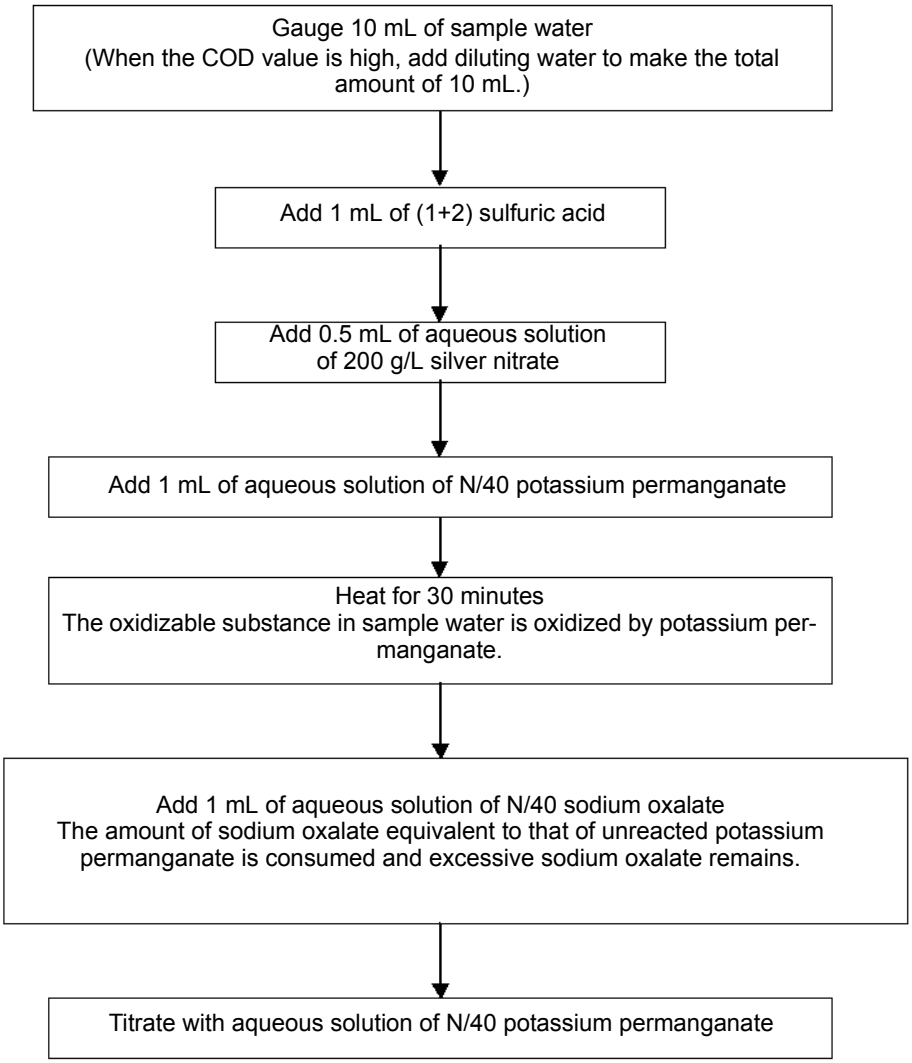
Acidic method: $2KMnO_4+3H_2SO_2 \rightarrow K_2SO_4+2MnSO_4+3H_2O+5(O)$

Alkaline method: $2KMnO_4+H_2O \rightarrow 2MnO_2+2KOH+3(O)$

Oxygen (O) resulting from this chemical reaction is consumed to oxidize the oxidizable substance. This means that COD can be obtained by finding the amount of potassium permanganate which has decreased as a result of the reaction.

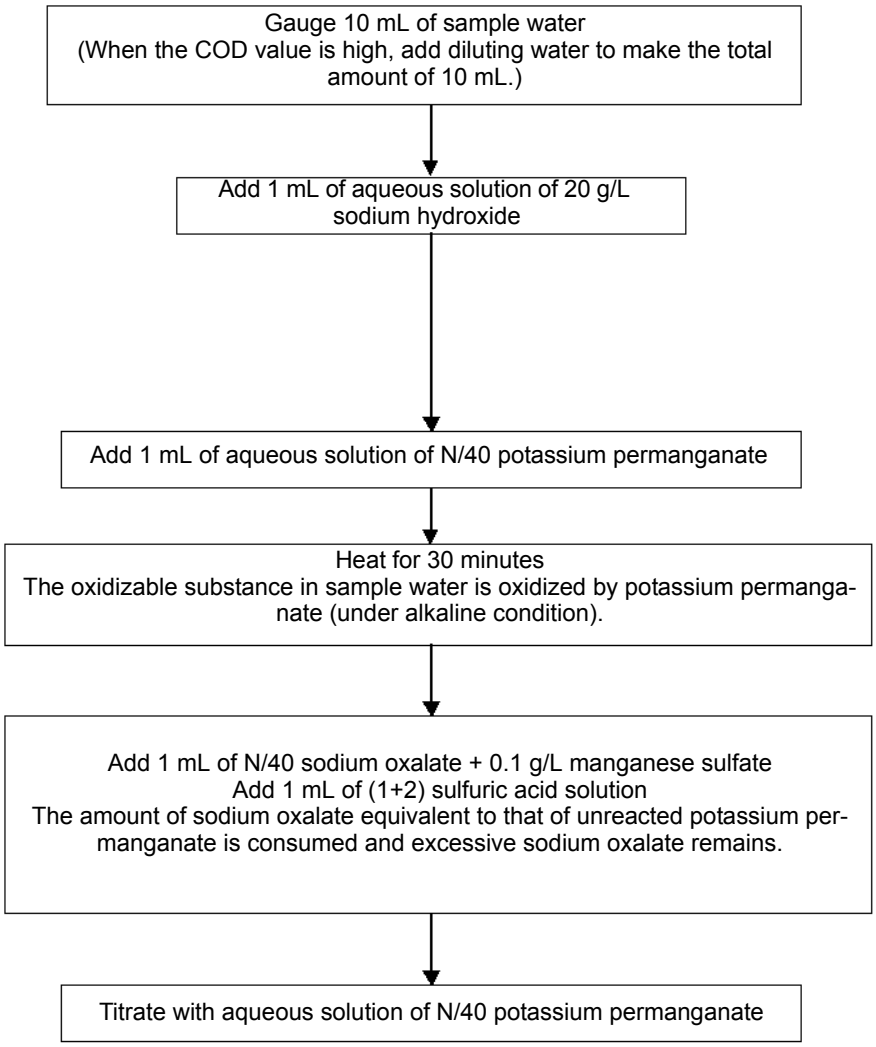
● Measurement schema (acidic method)

Under acid condition, ions are also oxidized by potassium permanganate. In order to avoid this reaction, aqueous solution of silver nitrate must be added to precipitate chloride ions as silver chloride. Therefore, the acidic method is suitable when the chloride ion concentration in the sample water is low (within 10 times the full-scale value of the measurement range).



● Measuring schema (alkaline method)

For sample that contains many chloride ions, such as seawater, the interfering effect of chloride ions cannot be eliminated by acidic method. For such a sample, use the alkaline method. In the alkaline method, ions are not oxidized by potassium permanganate. Therefore, COD can be measured without the interfering effect of chloride ions.



Time chart

The time chart of CODA-500 is shown below.
Application of "Measurement" sequence depends on the setting of “ SMP. LINE WASH SET ” (page 58).

Sequence		Condition	Total [m:s]	Reference
Measurement ("Smp. Line Wash" OFF)	1	Acidic method, No dilution	47:41	“ Measurement sequence: "Smp. Line Wash" OFF ” (page 213)
	2	Acidic method, 1-time dilution	54:01	
	3	Acidic method, 1-time dilution	53:31	
	4	Acidic method, 2-time dilution	58:01	
	5	Reagent cleaning function, No dilution	49:31	
	6	Reagent cleaning function, 1-time dilution	55:51	
	7	Reagent cleaning function, 1-time dilution	55:21	
	8	Reagent cleaning function, 2-time dilution	59:51	
	9	Alkaline method, No dilution	49:28	
	10	Alkaline method, 1-time dilution	55:48	
	11	Alkaline method, 1-time dilution	55:18	
	12	Alkaline method, 2-time dilution	59:48	
Measurement ("Smp. Line Wash" ON)	13	Acidic method, No dilution	53:28	“ Measurement sequence: "Smp. Line Wash" ON ” (page 219)
	14	Acidic method, 1-time dilution	54:01	
	15	Acidic method, 1-time dilution	53:31	
	16	Acidic method, 2-time dilution	58:01	
	17	Reagent cleaning function, No dilution	55:18	
	18	Reagent cleaning function, 1-time dilution	55:51	
	19	Reagent cleaning function, 1-time dilution	55:21	
	20	Reagent cleaning function, 2-time dilution	59:51	
	21	Alkaline method, No dilution	55:15	
	22	Alkaline method, 1-time dilution	55:48	
	23	Alkaline method, 1-time dilution	55:18	
	24	Alkaline method, 2-time dilution	59:48	
Calibration	25	Zero calibration/Blank measurement	45:32	“ Calibration/blank measurement sequence ” (page 225)
	26	Span calibration	18:05	
	27	Alkaline method, Zero calibration/Blank measurement	47:19	
	28	Alkaline method, Span calibration	19:52	

Sequence		Condition	Total [m:s]	Reference
Separate actions	29	Discharge water	00:53	“ Separate action sequence ” (page 226)
	30	Discharge wastes	00:53	
	31	Gauge Reag. A	01:47	
	32	Gauge Reag. B	01:47	
	33	Gauge Reag. C	02:07	
	34	Gauge Reag. D (F)	01:47	
	35	Gauge Reag. E (optional)	02:07	
	36	Gauge sample, standard	01:03	
	37	Gauge sample, 1-time dilution	04:23	
	38	Gauge sample, 1-time dilution	04:08	
	39	Gauge sample, 2-time dilution	06:23	
	40	Electrode cleaning	18:04	
	41	Gauge blank water	00:50	
	42	Water filter purge	30:00	
	43	Preprocess	03:38	
Cleaning	44	Line cleaning, Standard	41:16	“ Cleaning sequence ” (page 228)
	45	Line cleaning (for 1-line sample gauging)	53:56	
	46	Line cleaning (for 1-line sample gauging)	52:56	
	47	Line cleaning (for 2-line sample gauging)	56:16	
	48	Reaction tank cleaning	59:12	

Reference

For dilution times, refer to “ Adjusting the gauged values ” (page 30).

Measurement sequence: "Smp. Line Wash" OFF

Note

Do not replace the reagent bottles during the shaded processes.

	1				2			
	Acidic method, No dilution				Acidic method, 1-time dilution (with the 20 mL gauge tube)			
	Main process start [m:s]		Sub-process start [m:s]		Main process start [m:s]		Sub-process start [m:s]	
Sampling	Discharge water	00:00		00:00	Discharge water	00:00		00:00
	Gauge Blank Water	00:53			Gauge Blank Water	00:53		
	Inject Blank Water	01:28			Inject Blank Water	01:28		
	Discharge water	01:43	Samp. Reverse Wash	01:43	Discharge water	01:43	Samp. Reverse Wash	01:43
					Gauge Diluent	02:36		
					Diluent to mixer	04:11		
	Gauge Sample	02:36			Gauge Sample	04:51		
					Samp.to mixer	05:24		
					Stirring	05:54		
					Gauge Dil. Sample	06:04		
	Inject Sample	03:09			Inject Dil. Sample	06:29		
	Discharge water	03:39	Samp. Reverse Wash	03:39	Discharge water	06:49	Samp. Reverse Wash	06:49
					Gauge Diluent	07:42		
					Diluent to mixer	09:17		
	Gauge Sample	04:32			Gauge Sample	09:57		
					Samp.to mixer	10:30		
					Stirring	11:00		
					Gauge Dil. Sample	11:10		
	Inject Sample	05:05			Inject Dil. Sample	11:35		
	Inject Reag. C	05:35			Inject Reag. C	11:55	Discharge water	11:55
	Inject Reag. D	06:02			Inject Reag. D	12:22		
	Inject Reag. A	06:29			Inject Reag. A	12:49		
Decompose	Decompose	06:56	Gage Reag. B	06:56	Decompose	13:16	Gage Reag. B	13:16
			Gage Reag. C	07:36			Gage Reag. C	13:56
			Gage Reag. D	08:36			Gage Reag. D	14:56
			Gage Reag. A	09:16			Gage Reag. A	15:36
	Inject Reag. B	36:56			Inject Reag. B	43:16		
	Wait Reaction	37:23			Wait Reaction	43:43		
Titration	Titration	40:03	Samp. Reverse Wash	40:03	Titration	46:23	Samp. Reverse Wash	46:23
			Gauge Blank Water	40:33			Gauge Blank Water	46:53
Cleaning	Discharge wastes	46:28			Discharge wastes	52:48		
	Ready Titration	47:21			Ready Titration	53:41		
	Inject Blank Water	47:26			Inject Blank Water	53:46		
	Total 47:41				Total 54:01			

	3				4			
	Acidic method, 1–time dilution (with the 2 mL gauge tube)				Acidic method, 2–time dilution			
	Main process start [m:s]		Sub–process start [m:s]		Main process start [m:s]		Sub–process start [m:s]	
Sampling	Discharge water	00:00		00:00	Discharge water	00:00		00:00
	Gauge Blank Water	00:53			Gauge Blank Water	00:53		
	Inject Blank Water	01:28			Inject Blank Water	01:28		
	Discharge water	01:43	Samp. Reverse Wash	01:43	Discharge water	01:43	Samp. Reverse Wash	01:43
	Gauge Diluent	02:36			Gauge Diluent	02:36		
	Diluent to mixer	04:11			Diluent to mixer	04:11		
					Gauge Diluent	04:51		
					Diluent to mixer	06:26		
	Gauge Sample	04:51			Gauge Sample	07:06		
	Samp.to mixer	05:24			Samp.to mixer	07:39		
	Stirring	05:39			Stirring	07:54		
	Gauge Dil. Sample	05:49			Gauge Dil. Sample	08:04		
	Inject Dil. Sample	06:14			Inject Dil. Sample	08:29		
	Discharge water	06:34	Samp. Reverse Wash	06:49	Discharge water	08:49	Samp. Reverse Wash	09:04
	Gauge Diluent	07:27			Gauge Diluent	09:42		
	Diluent to mixer	09:02			Diluent to mixer	11:17		
					Gauge Diluent	11:57		
					Diluent to mixer	13:32		
	Gauge Sample	09:42			Gauge Sample	14:12		
	Samp.to mixer	10:15			Samp.to mixer	14:45		
	Stirring	10:30			Stirring	15:00		
	Gauge Dil. Sample	10:40			Gauge Dil. Sample	15:10		
	Inject Dil. Sample	11:05			Inject Dil. Sample	15:35		
	Inject Reag. C	11:25	Discharge water	11:55	Inject Reag. C	15:55	Discharge water	15:55
	Inject Reag. D	11:52			Inject Reag. D	16:22		
	Inject Reag. A	12:19			Inject Reag. A	16:49		
Decompose	Decompose	12:46	Gage Reag. B	12:46	Decompose	17:16	Gage Reag. B	17:16
			Gage Reag. C	13:26			Gage Reag. C	17:56
			Gage Reag. D	14:26			Gage Reag. D	18:56
			Gage Reag. A	15:06			Gage Reag. A	19:36
	Inject Reag. B	42:46			Inject Reag. B	47:16		
	Wait Reaction	43:13			Wait Reaction	47:43		
Titration	Titration	45:53	Samp. Reverse Wash	45:53	Titration	50:23	Samp. Reverse Wash	50:23
			Gauge Blank Water	46:23			Gauge Blank Water	50:53
Cleaning	Discharge wastes	52:18			Discharge wastes	56:48		
	Ready Titration	53:11			Ready Titration	57:41		
	Inject Blank Water	53:16			Inject Blank Water	57:46		
	Total 53:31				Total 58:01			

	5				6			
	Reagent cleaning function, No dilution				Reagent cleaning function, 1-time dilution			
	Main process start [m:s]		Sub-process start [m:s]		Main process start [m:s]		Sub-process start [m:s]	
Sampling	Discharge wastes	00:00		00:00	Discharge wastes	00:00		00:00
	Gauge Blank Water	00:53	Ready Titration (Injection)	00:53	Gauge Blank Water	00:53	Ready Titration (Injection)	00:53
	Discharge water	01:13			Discharge water	01:13		
	Gauge Blank Water	02:06	Ready Titration (Return)	02:06	Gauge Blank Water	02:06	Ready Titration (Return)	02:06
	Discharge water	02:26	Samp. Reverse Wash	02:26	Discharge water	02:26	Samp. Reverse Wash	02:26
					Gauge Diluent	03:19		
					Diluent to mixer	04:54		
	Gauge Sample	03:19			Gauge Sample	05:34		
					Samp.to mixer	06:07		
					Stirring	06:37		
					Gauge Dil. Sample	06:47		
	Inject Sample	03:52			Inject Dil. Sample	07:12		
	Discharge water	04:22	Samp. Reverse Wash	04:22	Discharge water	07:32	Samp. Reverse Wash	07:32
					Gauge Diluent	08:25		
					Diluent to mixer	10:00		
	Gauge Sample	05:15			Gauge Sample	10:40		
					Samp.to mixer	11:13		
					Stirring	11:43		
					Gauge Dil. Sample	11:53		
	Inject Sample	05:48			Inject Dil. Sample	12:18		
	Inject Reag. C	06:18			Inject Reag. C	12:38	Discharge water	12:38
	Inject Reag. D	06:45			Inject Reag. D	13:05		
	Inject Reag. A	07:12			Inject Reag. A	13:32		
Decompose	Decompose	07:39	Gage Reag. B	07:39	Decompose	13:59	Gage Reag. B	13:59
			Gage Reag. C	08:19			Gage Reag. C	14:39
			Gage Reag. D	09:19			Gage Reag. D	15:39
			Gage Reag. A	09:59			Gage Reag. A	16:19
			Gage Reag. E	10:39			Gage Reag. E	16:59
	Inject Reag. B	37:39			Inject Reag. B	43:59		
	Wait Reaction	38:06			Wait Reaction	44:26		
Titration	Titration	40:46	Samp. Reverse Wash	40:46	Titration	47:06	Samp. Reverse Wash	47:06
			Gauge Blank Water	41:16			Gauge Blank Water	47:35
Cleaning	Discharge wastes	47:11			Discharge wastes	53:31		
	Ready Titration	48:04			Ready Titration	54:24		
	Inject Reag. E	48:09			Inject Reag. E	54:29		
	Bubbling	48:36			Bubbling	54:56		
	Inject Blank Water	48:56			Inject Blank Water	55:16		
	Bubbling	49:11			Bubbling	55:31		
	Total	**49:31**			**Total**	**55:51**		

	7				8			
	Reagent cleaning function, 1-time dilution (with the 2 mL gauge tube)				Reagent cleaning function, 2-time dilution			
	Main process start [m:s]		Sub-process start [m:s]		Main process start [m:s]		Sub-process start [m:s]	
Sampling	Discharge wastes	00:00		00:00	Discharge wastes	00:00		00:00
	Gauge Blank Water	00:53	Ready Titration (Injection)	00:53	Gauge Blank Water	00:53	Ready Titration (Injection)	00:53
	Discharge water	01:13			Discharge water	01:13		
	Gauge Blank Water	02:06	Ready Titration (Return)	02:06	Gauge Blank Water	02:06	Ready Titration (Return)	02:06
	Discharge water	02:26	Samp. Reverse Wash	02:26	Discharge water	02:26	Samp. Reverse Wash	02:26
	Gauge Diluent	03:19			Gauge Diluent	03:19		
	Diluent to mixer	04:54			Diluent to mixer	04:54		
					Gauge Diluent	05:34		
					Diluent to mixer	07:09		
	Gauge Sample	05:34			Gauge Sample	07:49		
	Samp.to mixer	06:07			Samp.to mixer	08:22		
	Stirring	06:22			Stirring	08:37		
	Gauge Dil. Sample	06:32			Gauge Dil. Sample	08:47		
	Inject Dil. Sample	06:57			Inject Dil. Sample	09:12		
	Discharge water	07:17	Samp. Reverse Wash	07:17	Discharge water	09:32	Samp. Reverse Wash	09:32
	Gauge Diluent	08:10			Gauge Diluent	10:25		
	Diluent to mixer	09:45			Diluent to mixer	12:00		
					Gauge Diluent	12:40		
					Diluent to mixer	14:15		
	Gauge Sample	10:25			Gauge Sample	14:55		
	Samp.to mixer	10:58			Samp.to mixer	15:28		
	Stirring	11:13			Stirring	15:43		
	Gauge Dil. Sample	11:23			Gauge Dil. Sample	15:53		
	Inject Dil. Sample	11:48			Inject Dil. Sample	16:18		
	Inject Reag. C	12:08	Discharge water	12:08	Inject Reag. C	16:38	Discharge water	16:38
	Inject Reag. D	12:35			Inject Reag. D	17:05		
	Inject Reag. A	13:02			Inject Reag. A	17:32		
Decompose	Decompose	13:29	Gage Reag. B	13:29	Decompose	17:59	Gage Reag. B	17:59
			Gage Reag. C	14:09			Gage Reag. C	18:39
			Gage Reag. D	15:09			Gage Reag. D	19:39
			Gage Reag. A	15:49			Gage Reag. A	20:19
			Gage Reag. E	16:29			Gage Reag. E	20:59
	Inject Reag. B	43:29			Inject Reag. B	47:59		
	Wait Reaction	43:56			Wait Reaction	48:26		
Titration	Titration	46:36	Samp. Reverse Wash	46:36	Titration	51:06	Samp. Reverse Wash	51:06
			Gauge Blank Water	47:06			Gauge Blank Water	51:36
Cleaning	Discharge wastes	53:01			Discharge wastes	57:31		
	Ready Titration	53:54			Ready Titration	58:24		
	Inject Reag. E	53:59			Inject Reag. E	58:29		
	Bubbling	54:26			Bubbling	58:56		
	Inject Blank Water	54:46			Inject Blank Water	59:16		
	Bubbling	55:01			Bubbling	59:31		
	Total	**55:21**			**Total**	**59:51**		

	9				10			
	Alkaline method, No dilution				Alkaline method, 1-time dilution (with the 20 mL gauge tube)			
	Main process start [m:s]		Sub-process start [m:s]		Main process start [m:s]		Sub-process start [m:s]	
Sampling	Discharge water	00:00		00:00	Discharge water	00:00		00:00
	Gauge Blank Water	00:53			Gauge Blank Water	00:53		
	Inject Blank Water	01:28			Inject Blank Water	01:28		
	Discharge water	01:43	Samp. Reverse Wash	01:43	Discharge water	01:43	Samp. Reverse Wash	01:43
					Gauge Diluent	02:36		
					Diluent to mixer	04:11		
	Gauge Sample	02:36			Gauge Sample	04:51		
					Samp.to mixer	05:24		
					Stirring	05:54		
					Gauge Dil. Sample	06:04		
	Inject Sample	03:09			Inject Dil. Sample	06:29		
	Discharge water	03:39	Samp. Reverse Wash	03:39	Discharge water	06:49	Samp. Reverse Wash	06:34
					Gauge Diluent	07:42		
					Diluent to mixer	09:17		
	Gauge Sample	04:32			Gauge Sample	09:57		
					Samp.to mixer	10:30		
					Stirring	11:00		
					Gauge Dil. Sample	11:10		
	Inject Sample	05:05			Inject Dil. Sample	11:35		
	Inject Reag. F	05:35			Inject Reag. F	11:55	Discharge water	11:25
	Gage Reag. F	06:02			Gage Reag. F	12:22		
	Inject Reag. F	07:22			Inject Reag. F	13:42		
	Inject Reag. A	07:49			Inject Reag. A	14:09		
Decompose	Decompose	08:16	Gage Reag. B	08:16	Decompose	14:36	Gage Reag. B	14:36
			Gage Reag. C	08:56			Gage Reag. C	15:16
			Gage Reag. F	09:56			Gage Reag. F	16:16
			Gage Reag. A	10:36			Gage Reag. A	16:56
	Inject Reag. B	38:16			Inject Reag. B	44:36		
	Inject Reag. C	38:43			Inject Reag. C	45:03		
	Wait Reaction	39:10			Wait Reaction	45:30		
Titration	Titration	41:50	Samp. Reverse Wash	41:50	Titration	48:10	Samp. Reverse Wash	48:10
			Gauge Blank Water	42:20			Gauge Blank Water	48:40
Cleaning	Discharge wastes	48:15			Discharge wastes	54:35		
	Ready Titration	49:08			Ready Titration	55:28		
	Inject Blank Water	49:13			Inject Blank Water	55:33		
	Total 49:28				Total 55:48			

	11				12			
	Alkaline method, 1–time dilution (with the 2 mL gauge tube)				Alkaline method, 2–time dilution			
	Main process start [m:s]		Sub–process start [m:s]		Main process start [m:s]		Sub–process start [m:s]	
Sampling	Discharge water	00:00		00:00	Discharge water	00:00		00:00
	Gauge Blank Water	00:53			Gauge Blank Water	00:53		
	Inject Blank Water	01:28			Inject Blank Water	01:28		
	Discharge water	01:43	Samp. Reverse Wash	01:43	Discharge water	01:43	Samp. Reverse Wash	01:43
	Gauge Diluent	02:36			Gauge Diluent	02:36		
	Diluent to mixer	04:11			Diluent to mixer	04:11		
					Gauge Diluent	04:51		
					Diluent to mixer	06:26		
	Gauge Sample	04:51			Gauge Sample	07:06		
	Samp.to mixer	05:24			Samp.to mixer	07:39		
	Stirring	05:39			Stirring	07:54		
	Gauge Dil. Sample	05:49			Gauge Dil. Sample	08:04		
	Inject Dil. Sample	06:14			Inject Dil. Sample	08:29		
	Discharge water	06:34	Samp. Reverse Wash	06:34	Discharge water	08:49	Samp. Reverse Wash	08:49
	Gauge Diluent	07:27			Gauge Diluent	09:42		
	Diluent to mixer	09:02			Diluent to mixer	11:17		
					Gauge Diluent	11:57		
					Diluent to mixer	13:32		
	Gauge Sample	09:42			Gauge Sample	14:12		
	Samp.to mixer	10:15			Samp.to mixer	14:45		
	Stirring	10:30			Stirring	15:00		
	Gauge Dil. Sample	10:40			Gauge Dil. Sample	15:10		
	Inject Dil. Sample	11:05			Inject Dil. Sample	15:35		
	Inject Reag. F	11:25	Discharge water	11:25	Inject Reag. F	15:55	Discharge water	15:55
	Gage Reag. F	11:52			Gage Reag. F	16:22		
	Inject Reag. F	13:12			Inject Reag. F	17:42		
	Inject Reag. A	13:39			Inject Reag. A	18:09		
Decompose	Decompose	14:06	Gage Reag. B	14:06	Decompose	18:36	Gage Reag. B	18:36
			Gage Reag. C	14:46			Gage Reag. C	19:16
			Gage Reag. F	15:46			Gage Reag. F	20:16
			Gage Reag. A	16:26			Gage Reag. A	20:56
	Inject Reag. B	44:06			Inject Reag. B	48:36		
	Inject Reag. C	44:33			Inject Reag. C	49:03		
	Wait Reaction	45:00			Wait Reaction	49:30		
Titration	Titration	47:40	Samp. Reverse Wash	47:40	Titration	52:10	Samp. Reverse Wash	52:10
			Gauge Blank Water	48:10			Gauge Blank Water	52:40
Cleaning	Discharge wastes	54:05			Discharge wastes	58:35		
	Ready Titration	54:58			Ready Titration	59:28		
	Inject Blank Water	55:03			Inject Blank Water	59:33		
	Total	55:18			Total	59:48		

Measurement sequence: "Smp. Line Wash" ON

Note

Do not replace the reagent bottles during the shaded processes.

	13				14			
	Acidic method, No dilution				Acidic method, 1-time dilution			
	Main process start [m:s]		Sub-process start [m:s]		Main process start [m:s]		Sub-process start [m:s]	
Sampling	Discharge water	00:00		00:00	Discharge water	00:00		00:00
	Gauge Blank Water	00:53			Gauge Blank Water	00:53		
	Inject Blank Water	01:28			Inject Blank Water	01:28		
	Discharge water	01:43	Samp. Reverse Wash	01:43	Discharge water	01:43	Samp. Reverse Wash	01:43
							Discharge water	02:16
					Gauge Diluent	02:36		
					Diluent to mixer	04:11		
	Gauge Sample	02:36			Gauge Sample	04:51		
					Samp.to mixer	05:24		
					Stirring	05:54		
					Gauge Dil. Sample	06:04		
	Inject Sample	03:09			Inject Dil. Sample	06:29		
	Discharge water	03:39	Samp. Reverse Wash	03:39	Discharge water	06:49	Samp. Reverse Wash	06:49
					Gauge Diluent	07:42		
					Diluent to mixer	09:17		
	Gauge Sample	04:32			Gauge Sample	09:57		
					Samp.to mixer	10:30		
					Stirring	11:00		
					Gauge Dil. Sample	11:10		
	Inject Sample	05:05			Inject Dil. Sample	11:35		
	Inject Reag. C	05:35			Inject Reag. C	11:55	Discharge water	11:55
	Inject Reag. D	06:02			Inject Reag. D	12:22		
	Inject Reag. A	06:29			Inject Reag. A	12:49		
Decompose	Decompose	06:56	Gage Reag. B	06:56	Decompose	13:16	Gage Reag. B	13:16
			Gage Reag. C	07:36			Gage Reag. C	13:56
			Gage Reag. D	08:36			Gage Reag. D	14:56
			Gage Reag. A	09:16			Gage Reag. A	15:36
			Samp. Reverse Wash	09:56			Samp. Reverse Wash	16:16
							Rinse Wash	16:46
							Rinse Wash	17:21
							Rinse Wash	17:56
							Rinse Wash	18:31
							Rinse Wash	19:06
			Soak Wash	10:26			Soak Wash	19:41
	Inject Reag. B	36:56			Inject Reag. B	43:16		
	Wait Reaction	37:23			Wait Reaction	43:43		
Titration	Titration	40:03	Gauge Blank Water	40:03	Titration	46:23	Gauge Blank Water	46:23
Cleaning	Discharge wastes	46:28			Discharge wastes	52:48	Inject Sample	52:48
	Inject Sample	47:21						
	Discharge water	47:51						
	Rinse Wash	48:44						
	Discharge water	49:19						
	Rinse Wash	50:12						
	Discharge water	50:47						
	Rinse Wash	51:40						
	Discharge water	52:15						
	Ready Titration	53:08			Ready Titration	53:41		
	Inject Blank Water	53:13			Inject Blank Water	53:46		
	Total	53:28			Total	54:01		

	15				16			
	Acidic method, 1-time dilution (with the 2 mL gauge tube)				Acidic method, 2-time dilution			
	Main process start [m:s]		Sub-process start [m:s]		Main process start [m:s]		Sub-process start [m:s]	
Sampling	Discharge water	00:00		00:00	Discharge water	00:00		00:00
	Gauge Blank Water	00:53			Gauge Blank Water	00:53		
	Inject Blank Water	01:28			Inject Blank Water	01:28		
	Discharge water	01:43	Samp. Reverse Wash	01:43	Discharge water	01:43	Samp. Reverse Wash	01:43
			Discharge water	02:16			Discharge water	02:16
	Gauge Diluent	02:36			Gauge Diluent	02:36		
	Diluent to mixer	04:11			Diluent to mixer	04:11		
					Gauge Diluent	04:51		
					Diluent to mixer	06:26		
	Gauge Sample	04:51			Gauge Sample	07:06		
	Samp.to mixer	05:24			Samp.to mixer	07:39		
	Stirring	05:39			Stirring	07:54		
	Gauge Dil. Sample	05:49			Gauge Dil. Sample	08:04		
	Inject Dil. Sample	06:14			Inject Dil. Sample	08:29		
	Discharge water	06:34	Samp. Reverse Wash	06:49	Discharge water	08:49	Samp. Reverse Wash	09:04
	Gauge Diluent	07:27			Gauge Diluent	09:42		
	Diluent to mixer	09:02			Diluent to mixer	11:17		
					Gauge Diluent	11:57		
					Diluent to mixer	13:32		
	Gauge Sample	09:42			Gauge Sample	14:12		
	Samp.to mixer	10:15			Samp.to mixer	14:45		
	Stirring	10:30			Stirring	15:00		
	Gauge Dil. Sample	10:40			Gauge Dil. Sample	15:10		
	Inject Dil. Sample	11:05			Inject Dil. Sample	15:35		
	Inject Reag. C	11:25	Discharge water	11:55	Inject Reag. C	15:55	Discharge water	15:55
	Inject Reag. D	11:52			Inject Reag. D	16:22		
	Inject Reag. A	12:19			Inject Reag. A	16:49		
Decompose	Decompose	12:46	Gage Reag. B	12:46	Decompose	17:16	Gage Reag. B	17:16
			Gage Reag. C	13:26			Gage Reag. C	17:56
			Gage Reag. D	14:26			Gage Reag. D	18:56
			Gage Reag. A	15:06			Gage Reag. A	19:36
			Samp. Reverse Wash	15:46			Samp. Reverse Wash	20:16
			Rinse Wash	16:16			Rinse Wash	20:46
			Rinse Wash	16:51			Rinse Wash	21:21
			Rinse Wash	17:26			Rinse Wash	21:56
			Rinse Wash	18:01			Rinse Wash	22:31
			Rinse Wash	18:36			Rinse Wash	23:06
			Soak Wash	19:11			Soak Wash	23:41
	Inject Reag. B	42:46			Inject Reag. B	47:16		
	Wait Reaction	43:13			Wait Reaction	47:43		
Titration	Titration	45:53	Gauge Blank Water	45:53	Titration	50:23	Gauge Blank Water	50:23
Cleaning	Discharge wastes	52:18	Inject Sample	52:18	Discharge wastes	56:48	Inject Sample	56:48
	Ready Titration	53:11			Ready Titration	57:41		
	Inject Blank Water	53:16			Inject Blank Water	57:46		
	Total	53:31			Total	58:01		

	17				18			
	Reagent cleaning function, No dilution				Reagent cleaning function, 1-time dilution (with the 20 mL gauge tube)			
	Main process start [m:s]		Sub-process start [m:s]		Main process start [m:s]		Sub-process start [m:s]	
Sampling	Discharge wastes	00:00		00:00	Discharge wastes	00:00		00:00
	Gauge Blank Water	00:53	Ready Titration (Injection)	00:53	Gauge Blank Water	00:53	Ready Titration (Injection)	00:53
	Discharge water	01:13			Discharge water	01:13		
	Gauge Blank Water	02:06	Ready Titration (Return)	02:06	Gauge Blank Water	02:06	Ready Titration (Return)	02:06
	Discharge water	02:26	Samp. Reverse Wash	02:26	Discharge water	02:26	Samp. Reverse Wash	02:26
							Discharge water	02:56
					Gauge Diluent	03:19		
					Diluent to mixer	04:54		
	Gauge Sample	03:19			Gauge Sample	05:34		
					Samp.to mixer	06:07		
					Stirring	06:37		
					Gauge Dil. Sample	06:47		
	Inject Sample	03:52			Inject Dil. Sample	07:12		
	Discharge water	04:22	Samp. Reverse Wash	04:22	Discharge water	07:32	Samp. Reverse Wash	07:32
					Gauge Diluent	08:25		
					Diluent to mixer	10:00		
	Gauge Sample	05:15			Gauge Sample	10:40		
					Samp.to mixer	11:13		
					Stirring	11:43		
					Gauge Dil. Sample	11:53		
	Inject Sample	05:48			Inject Dil. Sample	12:18		
	Inject Reag. C	06:18			Inject Reag. C	12:38	Discharge water	12:38
	Inject Reag. D	06:45			Inject Reag. D	13:05		
	Inject Reag. A	07:12			Inject Reag. A	13:32		
Decompose	Decompose	07:39	Gage Reag. B	07:39	Decompose	13:59	Gage Reag. B	13:59
			Gage Reag. C	08:19			Gage Reag. C	14:39
			Gage Reag. D	09:19			Gage Reag. D	15:39
			Gage Reag. A	09:59			Gage Reag. A	16:19
			Gage Reag. E	10:39			Gage Reag. E	16:59
			Samp. Reverse Wash	11:19			Samp. Reverse Wash	17:39
							Rinse Wash	18:09
							Rinse Wash	18:44
							Rinse Wash	19:19
							Rinse Wash	19:54
							Rinse Wash	20:29
			Soak Wash	11:49			Soak Wash	21:04
	Inject Reag. B	37:39			Inject Reag. B	43:59		
	Wait Reaction	38:06			Wait Reaction	44:26		
Titration	Titration	40:46	Gauge Blank Water	40:46	Titration	47:06	Gauge Blank Water	47:06
Cleaning	Discharge wastes	47:11			Discharge wastes	53:31	Inject Sample	53:31
	Inject Sample	48:04						
	Discharge water	48:34						
	Rinse Wash	49:27						
	Discharge water	50:02						
	Rinse Wash	50:55						
	Discharge water	51:30						
	Rinse Wash	52:23						
	Discharge water	52:58						
	Ready Titration	53:51			Ready Titration	54:24		
	Inject Reag. E	53:56			Inject Reag. E	54:29		
	Bubbling	54:23			Bubbling	54:56		
	Inject Blank Water	54:43			Inject Blank Water	55:16		
	Bubbling	54:58			Bubbling	55:31		
	Total	55:18			Total	55:51		

	19				20			
	Reagent cleaning function, 1-time dilution (with the 2 mL gauge tube)				Reagent cleaning function, 2-time dilution			
	Main process start [m:s]		Sub-process start [m:s]		Main process start [m:s]		Sub-process start [m:s]	
Sampling	Discharge wastes	00:00		00:00	Discharge wastes	00:00		00:00
	Gauge Blank Water	00:53	Ready Titration (Injection)	00:53	Gauge Blank Water	00:53	Ready Titration (Injection)	00:53
	Discharge water	01:13			Discharge water	01:13		
	Gauge Blank Water	02:06	Ready Titration (Return)	02:06	Gauge Blank Water	02:06	Ready Titration (Return)	02:06
	Discharge water	02:26	Samp. Reverse Wash	02:26	Discharge water	02:26	Samp. Reverse Wash	02:26
			Discharge water	02:56			Discharge water	02:56
	Gauge Diluent	03:19			Gauge Diluent	03:19		
	Diluent to mixer	04:54			Diluent to mixer	04:54		
					Gauge Diluent	05:34		
					Diluent to mixer	07:09		
	Gauge Sample	05:34			Gauge Sample	07:49		
	Samp.to mixer	06:07			Samp.to mixer	08:22		
	Stirring	06:22			Stirring	08:37		
	Gauge Dil. Sample	06:32			Gauge Dil. Sample	08:47		
	Inject Dil. Sample	06:57			Inject Dil. Sample	09:12		
	Discharge water	07:17	Samp. Reverse Wash	07:17	Discharge water	09:32	Samp. Reverse Wash	09:32
	Gauge Diluent	08:10			Gauge Diluent	10:25		
	Diluent to mixer	09:45			Diluent to mixer	12:00		
					Gauge Diluent	12:40		
					Diluent to mixer	14:15		
	Gauge Sample	10:25			Gauge Sample	14:55		
	Samp.to mixer	10:58			Samp.to mixer	15:28		
	Stirring	11:13			Stirring	15:43		
	Gauge Dil. Sample	11:23			Gauge Dil. Sample	15:53		
	Inject Dil. Sample	11:48			Inject Dil. Sample	16:18		
	Inject Reag. C	12:08	Discharge water	12:08	Inject Reag. C	16:38	Discharge water	16:38
	Inject Reag. D	12:35			Inject Reag. D	17:05		
	Inject Reag. A	13:02			Inject Reag. A	17:32		
Decompose	Decompose	13:29	Gage Reag. B	13:29	Decompose	17:59	Gage Reag. B	17:59
			Gage Reag. C	14:09			Gage Reag. C	18:39
			Gage Reag. D	15:09			Gage Reag. D	19:39
			Gage Reag. A	15:49			Gage Reag. A	20:19
			Gage Reag. E	16:29			Gage Reag. E	20:59
			Samp. Reverse Wash	17:09			Samp. Reverse Wash	21:39
			Rinse Wash	17:39			Rinse Wash	22:09
			Rinse Wash	18:14			Rinse Wash	22:44
			Rinse Wash	18:49			Rinse Wash	23:19
			Rinse Wash	19:24			Rinse Wash	23:54
			Rinse Wash	19:59			Rinse Wash	24:29
			Soak Wash	20:34			Soak Wash	25:04
	Inject Reag. B	43:29			Inject Reag. B	47:59		
	Wait Reaction	43:56			Wait Reaction	48:26		
Titration	Titration	46:36	Gauge Blank Water	46:36	Titration	51:06	Gauge Blank Water	51:06
Cleaning	Discharge wastes	53:01	Inject Sample	53:01	Discharge wastes	57:31	Inject Sample	57:31
	Ready Titration	53:54			Ready Titration	58:24		
	Inject Reag. E	53:59			Inject Reag. E	58:29		
	Bubbling	54:26			Bubbling	58:56		
	Inject Blank Water	54:46			Inject Blank Water	59:16		
	Bubbling	55:01			Bubbling	59:31		
	Total	55:21			Total	59:51		

	21				22			
	Alkaline method, No dilution				Alkaline method, 1-time dilution (with the 20 mL gauge tube)			
	Main process start [m:s]		Sub-process start [m:s]		Main process start [m:s]		Sub-process start [m:s]	
Sampling	Discharge water	00:00		00:00	Discharge water	00:00		00:00
	Gauge Blank Water	00:53			Gauge Blank Water	00:53		
	Inject Blank Water	01:28			Inject Blank Water	01:28		
	Discharge water	01:43	Samp. Reverse Wash	01:43	Discharge water	01:43	Samp. Reverse Wash	01:43
							Discharge water	02:13
					Gauge Diluent	02:36		
					Diluent to mixer	04:11		
	Gauge Sample	02:36			Gauge Sample	04:51		
					Samp.to mixer	05:24		
					Stirring	05:54		
					Gauge Dil. Sample	06:04		
	Inject Sample	03:09			Inject Dil. Sample	06:29		
	Discharge water	03:39	Samp. Reverse Wash	03:39	Discharge water	06:49	Samp. Reverse Wash	06:49
					Gauge Diluent	07:42		
					Diluent to mixer	09:17		
	Gauge Sample	04:32			Gauge Sample	09:57		
					Samp.to mixer	10:30		
					Stirring	11:00		
					Gauge Dil. Sample	11:10		
	Inject Sample	05:05			Inject Dil. Sample	11:35		
	Inject Reag. F	05:35			Inject Reag. F	11:55	Discharge water	11:55
	Gage Reag. F	06:02			Gage Reag. F	12:22		
	Inject Reag. F	07:22			Inject Reag. F	13:42		
	Inject Reag. A	07:49			Inject Reag. A	14:09		
Decompose	Decompose	08:16	Gage Reag. B	08:16	Decompose	14:36	Gage Reag. B	14:36
			Gage Reag. C	08:56			Gage Reag. C	15:16
			Gage Reag. F	09:56			Gage Reag. F	16:16
			Gage Reag. A	10:36			Gage Reag. A	16:56
			Samp. Reverse Wash	11:16			Samp. Reverse Wash	17:36
							Rinse Wash	18:06
							Rinse Wash	18:41
							Rinse Wash	19:16
							Rinse Wash	19:51
							Rinse Wash	20:26
			Soak Wash	11:46			Soak Wash	21:01
	Inject Reag. B	38:16			Inject Reag. B	44:36		
	Inject Reag. C	38:43			Inject Reag. C	45:03		
	Wait Reaction	39:10			Wait Reaction	45:30		
Titration	Titration	41:50	Gauge Blank Water	41:50	Titration	48:10	Gauge Blank Water	48:10
Cleaning	Discharge wastes	48:15			Discharge wastes	54:35	Inject Sample	54:35
	Inject Sample	49:08						
	Discharge water	49:38						
	Rinse Wash	50:31						
	Discharge water	51:06						
	Rinse Wash	51:59						
	Discharge water	52:34						
	Rinse Wash	53:27						
	Discharge water	54:02						
	Ready Titration	54:55			Ready Titration	55:28		
	Inject Blank Water	55:00			Inject Blank Water	55:33		
	Total	55:15			Total	55:48		

	23				24			
	Alkaline method, 1-time dilution (with the 2 mL gauge tube)				Alkaline method, 2-time dilution			
	Main process start [m:s]		Sub-process start [m:s]		Main process start [m:s]		Sub-process start [m:s]	
Sampling	Discharge water	00:00		00:00	Discharge water	00:00		00:00
	Gauge Blank Water	00:53			Gauge Blank Water	00:53		
	Inject Blank Water	01:28			Inject Blank Water	01:28		
	Discharge water	01:43	Samp. Reverse Wash	01:43	Discharge water	01:43	Samp. Reverse Wash	01:43
			Discharge water	02:13			Discharge water	02:13
	Gauge Diluent	02:36			Gauge Diluent	02:36		
	Diluent to mixer	04:11			Diluent to mixer	04:11		
					Gauge Diluent	04:51		
					Diluent to mixer	06:26		
	Gauge Sample	04:51			Gauge Sample	07:06		
	Samp.to mixer	05:24			Samp.to mixer	07:39		
	Stirring	05:39			Stirring	07:54		
	Gauge Dil. Sample	05:49			Gauge Dil. Sample	08:04		
	Inject Dil. Sample	06:14			Inject Dil. Sample	08:29		
	Discharge water	06:34	Samp. Reverse Wash	06:34	Discharge water	08:49	Samp. Reverse Wash	08:49
	Gauge Diluent	07:27			Gauge Diluent	09:42		
	Diluent to mixer	09:02			Diluent to mixer	11:17		
					Gauge Diluent	11:57		
					Diluent to mixer	13:32		
	Gauge Sample	09:42			Gauge Sample	14:12		
	Samp.to mixer	10:15			Samp.to mixer	14:45		
	Stirring	10:30			Stirring	15:00		
	Gauge Dil. Sample	10:40			Gauge Dil. Sample	15:10		
	Inject Dil. Sample	11:05			Inject Dil. Sample	15:35		
	Inject Reag. F	11:25	Discharge water	11:25	Inject Reag. F	15:55	Discharge water	15:55
	Gage Reag. F	11:52			Gage Reag. F	16:22		
	Inject Reag. F	13:12			Inject Reag. F	17:42		
	Inject Reag. A	13:39			Inject Reag. A	18:09		
Decompose	Decompose	14:06	Gage Reag. B	14:06	Decompose	18:36	Gage Reag. B	18:36
			Gage Reag. C	14:46			Gage Reag. C	19:16
			Gage Reag. F	15:46			Gage Reag. F	20:16
			Gage Reag. A	16:26			Gage Reag. A	20:56
			Samp. Reverse Wash	17:06			Samp. Reverse Wash	21:36
			Rinse Wash	17:36			Rinse Wash	22:06
			Rinse Wash	18:11			Rinse Wash	22:41
			Rinse Wash	18:46			Rinse Wash	23:16
			Rinse Wash	19:21			Rinse Wash	23:51
			Rinse Wash	19:56			Rinse Wash	24:26
			Soak Wash	20:31			Soak Wash	25:01
	Inject Reag. B	44:06			Inject Reag. B	48:36		
	Inject Reag. C	44:33			Inject Reag. C	49:03		
	Wait Reaction	45:00			Wait Reaction	49:30		
Titration	Titration	47:40	Gauge Blank Water	47:40	Titration	52:10	Gauge Blank Water	52:10
Cleaning	Discharge wastes	54:05	Inject Sample	54:05	Discharge wastes	58:35	Inject Sample	58:35
	Ready Titration	54:58			Ready Titration	59:28		
	Inject Blank Water	55:03			Inject Blank Water	59:33		
	Total	55:18			Total	59:48		

Calibration/blank measurement sequence

Note

Do not replace the reagent bottles during the shaded processes.

	25				26			
	Zero calibration/Blank measurement				Span calibration			
	Main process start [m:s]		Sub-process start [m:s]		Main process start [m:s]		Sub-process start [m:s]	
Sampling	Discharge water	00:00		00:00	Discharge water	00:00		00:00
	Gauge Blank Water	00:53			Gauge Blank Water	00:53		
	Inject Blank Water	01:28			Inject Blank Water	01:28		
	Discharge water	01:43			Discharge water	01:43		
	Gauge Blank Water	02:36			Gauge Blank Water	02:36		
	Inject Blank Water	03:11			Inject Blank Water	03:11		
	Inject Reag. C	03:26			Inject Reag. C	03:26		
	Inject Reag. D (F)	03:53			Inject Reag. D (F)	03:53		
	Inject Reag. A	04:20						
Decompose	Decompose	04:47	Gage Reag. B	04:47	Gage Reag. B	04:20		
			Gage Reag. C	05:27	Gage Reag. C	05:00		
			Gage Reag. D (F)	06:27				
			Gage Reag. A	07:07				
	Inject Reag. B	34:47			Inject Reag. B	06:00		
	Wait Reaction	35:14			Wait Reaction	06:27		
Titration	Titration	37:54	Gauge Blank Water	37:54	Titration	09:07	Gage Reag. D (F)	09:07
							Gage Reag. A	09:47
							Gauge Blank Water	10:27
Cleaning	Discharge wastes	44:19			Discharge wastes	15:32		
	Ready Titration	45:12			Ready Titration	16:25		
	Inject Blank Water	45:17			Inject Blank Water	16:30		
	Total 45:32				**Total 16:45**			

	27				28			
	Alkaline method, Zero calibration/Blank measurement				Alkaline method, Span calibration			
	Main process start [m:s]		Sub-process start [m:s]		Main process start [m:s]		Sub-process start [m:s]	
Sampling	Discharge water	00:00		00:00	Discharge water	00:00		00:00
	Gauge Blank Water	00:53			Gauge Blank Water	00:53		
	Inject Blank Water	01:28			Inject Blank Water	01:28		
	Discharge water	01:43			Discharge water	01:43		
	Gauge Blank Water	02:36			Gauge Blank Water	02:36		
	Inject Blank Water	03:11			Inject Blank Water	03:11		
	Inject Reag. D (F)	03:26			Inject Reag. D (F)	03:26		
	Gage Reag. D (F)	03:53			Gage Reag. D (F)	03:53		
	Inject Reag. D (F)	05:13			Inject Reag. D (F)	05:13		
	Inject Reag. A	05:40						
Decompose	Decompose	06:07	Gage Reag. B	06:07	Gage Reag. B	05:40		
			Gage Reag. C	06:47	Gage Reag. C	06:20		
			Gage Reag. D (F)	07:47				
			Gage Reag. A	08:27				
	Inject Reag. B	36:07			Inject Reag. B	07:20		
	Inject Reag. C	36:34			Inject Reag. C	07:47		
	Wait Reaction	37:01			Wait Reaction	08:14		
Titration	Titration	39:41	Gauge Blank Water	39:41	Titration	10:54	Gage Reag. D (F)	10:54
							Gage Reag. A	11:34
							Gauge Blank Water	12:14
Cleaning	Discharge wastes	46:06			Discharge wastes	17:19		
	Ready Titration	46:59			Ready Titration	18:12		
	Inject Blank Water	47:04			Inject Blank Water	18:17		
	Total 47:19				**Total 18:32**			

Separate action sequence

Note

Do not replace the reagent bottles during the shaded processes.

29	
Discharge water	
Main process start [m:s]	
Discharge water	00:00
Total	**00:53**

30	
Discharge wastes	
Main process start [m:s]	
Discharge wastes	00:00
Total	**00:53**

31	
Gage Reag. A	
Main process start [m:s]	
Gage Reag. A	00:00
Inject Reag. A	01:20
Total	**01:47**

32	
Gage Reag. B	
Main process start [m:s]	
Gage Reag. B	00:00
Inject Reag. B	01:20
Total	**01:47**

33	
Gauge Reag. C	
Main process start [m:s]	
Gage Reag. C	00:00
Inject Reag. C	01:40
Total	**02:07**

34	
Gauge Reag. D (F)	
Main process start [m:s]	
Gage Reag. D (F)	00:00
Inject Reag. D (F)	01:20
Total	**01:47**

35	
Gauge Reag. E (optional)	
Main process start [m:s]	
Gage Reag. E	00:00
Inject Reag. E	01:40
Total	**02:07**

36	
Gauge sample, standard	
Main process start [m:s]	
Gauge Sample	00:00
Inject Sample	00:33
Total	**01:03**

37	
Gauge sample, 1-time dilution (with the 20 mL gauge tube)	
Main process start [m:s]	
Gauge Diluent	00:00
Diluent to mixer	01:35
Gauge Sample	02:15
Samp.to mixer	02:48
Stirring	03:28
Gauge Dil. Sample	03:53
Inject Dil. Sample	04:13
Discharge water	04:23
Total	**04:23**

38	
Gauge sample, 1-time dilution (with the 2 mL gauge tube)	
Main process start [m:s]	
Gauge Diluent	00:00
Diluent to mixer	01:35
Gauge Sample	04:30
Samp.to mixer	05:03
Stirring	05:18
Gauge Dil. Sample	05:28
Inject Dil. Sample	05:53
Discharge water	06:13
Total	**04:08**

39	
Gauge sample, 2–time dilution	
Main process start [m:s]	
Gauge Diluent	00:00
Diluent to mixer	01:35
Gauge Diluent	02:15
Diluent to mixer	03:50
Gauge Sample	02:15
Samp.to mixer	02:48
Stirring	03:03
Gauge Dil. Sample	03:13
Inject Dil. Sample	03:38
Discharge water	03:58
Total	**06:23**

40	
Electrode cleaning	
Main process start [m:s]	
Gauge Reag. C	00:00
Inject Reag. C	01:40
Gauge Reag. C	02:07
Inject Reag. C	03:47
Gauge Reag. B	04:14
Inject Reag. B	05:34
Gauge blank water	06:01
Inject Blank Water	06:36
Wait Reaction	06:51
Wait Reaction	09:31
Wait Reaction	12:11
Wait Reaction	14:51
Wait Reaction	17:31
Total	**20:11**

41	
Gauge blank water	
Main process start [m:s]	
Gauge blank water	00:00
Inject Blank Water	00:35
Total	**00:50**

42	
Charcoal blow	
Main process start [m:s]	
Charcoal blow	00:00
Total	**30:00**

43	
Preprocess	
Main process start [m:s]	
Ready Titration	00:00
Discharge wastes	00:05
Ready Titration	00:58
Gauge Reag. C	01:03
Gage Reag. D (F)	02:03
Gauge Reag. A	02:43
Total	**03:23**

Cleaning sequence

Note

Do not replace the reagent bottles during the shaded processes.

44	
Line cleaning, No dilution	
Main process start [m:s]	
Discharge wastes	00:00
Line cleaning	00:53
Wait Cleaning	01:28
Inject Sample	04:28
Wait Cleaning	04:58
Discharge wastes	07:58
Line cleaning	08:51
Wait Cleaning	09:26
Inject Sample	12:26
Wait Cleaning	12:56
Discharge wastes	15:56
Gage Reag. C	16:49
Inject Reag. C	18:29
Gage Reag. C	18:56
Inject Reag. C	20:36
Gage Reag. B	21:03
Inject Reag. B	22:23
Gauge Blank Water	22:50
Inject Blank Water	23:25
Gage Reag. C	23:40
Gage Reag. B	25:20
Wait Reaction	26:40
Wait Reaction	29:20
Wait Reaction	32:00
Wait Reaction	34:40
Discharge wastes	37:20
Line cleaning	38:13
Inject Sample	38:48
Discharge wastes	39:18
Line cleaning	40:11
Inject Sample	40:46
Total	41:16

45	
Line cleaning (with the 20 mL gauge tube)	
Main process start [m:s]	
Discharge wastes	00:00
Gauge Diluent	00:53
Diluent to mixer	02:28
Line cleaning	03:08
Wait Cleaning	03:43
Samp.to mixer	06:43
Stirring	07:13
Wait Cleaning	07:23
Gauge Dil. Sample	10:23
Inject Dil. Sample	10:48
Discharge wastes	11:08
Gauge Diluent	12:01
Diluent to mixer	13:36
Line cleaning	14:16
Wait Cleaning	14:51
Samp.to mixer	17:51
Stirring	18:21
Wait Cleaning	18:31
Gauge Dil. Sample	21:31
Inject Dil. Sample	21:56
Discharge wastes	22:16
Gage Reag. C	23:09
Inject Reag. C	24:49
Gage Reag. C	25:16
Inject Reag. C	26:56
Gage Reag. B	27:23
Inject Reag. B	28:43
Gauge Blank Water	29:10
Inject Blank Water	29:45
Gage Reag. C	30:00
Gage Reag. B	31:40
Wait Reaction	33:00
Wait Reaction	35:40
Wait Reaction	38:20
Wait Reaction	41:00
Discharge wastes	43:40
Gauge Diluent	44:33
Diluent to mixer	46:08
Line cleaning	46:48
Samp.to mixer	47:23
Stirring	47:53
Gauge Dil. Sample	48:03
Inject Dil. Sample	48:28
Discharge wastes	48:48
Gauge Diluent	49:41
Diluent to mixer	51:16
Line cleaning	51:56
Samp.to mixer	52:31
Stirring	53:01
Gauge Dil. Sample	53:11
Inject Dil. Sample	53:36
Total	53:56

46	
Line cleaning (with the 2 mL gauge tube)	
Main process start [m:s]	
Discharge wastes	00:00
Gauge Diluent	00:53
Diluent to mixer	02:28
Line cleaning	03:08
Wait Cleaning	03:43
Samp.to mixer	06:43
Stirring	06:58
Wait Cleaning	07:08
Gauge Dil. Sample	10:08
Inject Dil. Sample	10:33
Discharge wastes	10:53
Gauge Diluent	11:46
Diluent to mixer	13:21
Line cleaning	14:01
Wait Cleaning	14:36
Samp.to mixer	17:36
Stirring	17:51
Wait Cleaning	18:01
Gauge Dil. Sample	21:01
Inject Dil. Sample	21:26
Discharge wastes	21:46
Gage Reag. C	22:39
Inject Reag. C	24:19
Gage Reag. C	24:46
Inject Reag. C	26:26
Gage Reag. B	26:53
Inject Reag. B	28:13
Gauge Blank Water	28:40
Inject Blank Water	29:15
Gage Reag. C	29:30
Gage Reag. B	31:10
Wait Reaction	32:30
Wait Reaction	35:10
Wait Reaction	37:50
Wait Reaction	40:30
Discharge wastes	43:10
Gauge Diluent	44:03
Diluent to mixer	45:38
Line cleaning	46:18
Samp.to mixer	46:53
Stirring	47:08
Gauge Dil. Sample	47:18
Inject Dil. Sample	47:43
Discharge wastes	48:03
Gauge Diluent	48:56
Diluent to mixer	50:31
Line cleaning	51:11
Samp.to mixer	51:46
Stirring	52:01
Gauge Dil. Sample	52:11
Inject Dil. Sample	52:36
Total	**52:56**

47	
Line cleaning (with the 2 mL, 20 mL gauge tube)	
Main process start [m:s]	
Discharge wastes	00:00
Gauge Diluent	00:53
Diluent to mixer	02:28
Line cleaning	03:08
Line cleaning	03:43
Wait Cleaning	04:18
Samp.to mixer	07:18
Samp.to mixer	07:48
Stirring	08:03
Wait Cleaning	08:13
Gauge Dil. Sample	11:13
Inject Dil. Sample	11:38
Discharge wastes	11:58
Gauge Diluent	12:51
Diluent to mixer	14:26
Line cleaning	15:06
Line cleaning	15:41
Wait Cleaning	16:16
Samp.to mixer	19:16
Samp.to mixer	19:46
Stirring	20:01
Wait Cleaning	20:11
Gauge Dil. Sample	23:11
Inject Dil. Sample	23:36
Discharge wastes	23:56
Gage Reag. C	24:49
Inject Reag. C	26:29
Gage Reag. C	26:56
Inject Reag. C	28:36
Gage Reag. B	29:03
Inject Reag. B	30:23
Gauge Blank Water	30:50
Inject Blank Water	31:25
Gage Reag. C	31:40
Gage Reag. B	33:20
Wait Reaction	34:40
Wait Reaction	37:20
Wait Reaction	40:00
Wait Reaction	42:40
Discharge wastes	45:20
Gauge Diluent	46:13
Diluent to mixer	47:48
Line cleaning	48:28
Samp.to mixer	49:03
Line cleaning	49:33
Samp.to mixer	50:08
Stirring	50:23
Gauge Dil. Sample	50:33
Inject Dil. Sample	50:58
Discharge wastes	51:18
Gauge Diluent	52:11
Diluent to mixer	53:46
Line cleaning	54:26
Samp.to mixer	55:01
Line cleaning	55:31
Samp.to mixer	56:06
Stirring	56:21
Gauge Dil. Sample	56:31
Inject Dil. Sample	56:56
Total	**57:16**

48			
Reaction tank cleaning			
	Main process start [m:s]	Sub-process start [m:s]	
Sampling	Discharge wastes	00:00	00:00
	Gage Reag. B	00:53	
	Inject Reag. B	01:33	
	Gage Reag. B	02:00	
	Inject Reag. B	02:40	
	Gage Reag. B	03:07	
	Inject Reag. B	03:47	
	Gage Reag. B	04:14	
	Inject Reag. B	04:54	
	Gage Reag. B	05:21	
	Inject Reag. B	06:01	
	Gage Reag. B	06:28	
	Inject Reag. B	07:08	
	Gage Reag. B	07:35	
	Inject Reag. B	08:15	
	Gage Reag. B	08:42	
	Inject Reag. B	09:22	
	Gage Reag. B	09:49	
	Inject Reag. B	10:29	
	Gage Reag. B	10:56	
	Inject Reag. B	11:36	
	Gage Reag. B	12:03	
	Inject Reag. B	12:43	
	Gage Reag. B	13:10	
	Inject Reag. B	13:50	
	Gage Reag. B	14:17	
	Inject Reag. B	14:57	
	Gage Reag. B	15:24	
	Inject Reag. B	16:04	
	Gage Reag. B	16:31	
	Inject Reag. B	17:11	
	Gage Reag. B	17:38	
	Inject Reag. B	18:18	
	Gage Reag. B	18:45	
	Inject Reag. B	19:25	
	Gage Reag. B	19:52	
	Inject Reag. B	20:32	
	Gage Reag. C	20:59	
	Inject Reag. C	21:59	
	Gage Reag. C	22:26	
	Inject Reag. C	23:26	
Heating	Decompose	23:53	Gage Reag. B 23:53
			Gage Reag. C 24:33
Cleaning	Discharge wastes	53:53	
	Gauge Blank Water	54:46	
	Discharge water	55:16	
	Gauge Blank Water	56:09	
	Discharge water	56:39	
	Gauge Blank Water	57:32	
	Inject Blank Water	58:07	
	Gauge Blank Water	58:22	
	Inject Blank Water	58:57	
	Total	**59:12**	

HORIBA Advanced Techno
http://www.horiba-adt.jp

Headquarters
31, Miyanonishi-cho, Kisshoin Minami-ku, Kyoto 601-8306, Japan
TEL:+81-75-321-7184 FAX:+81-75-321-7291