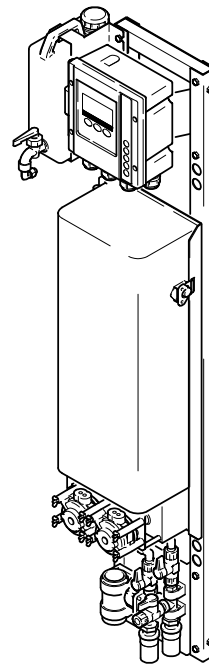


ALKALINITY ANALYZER

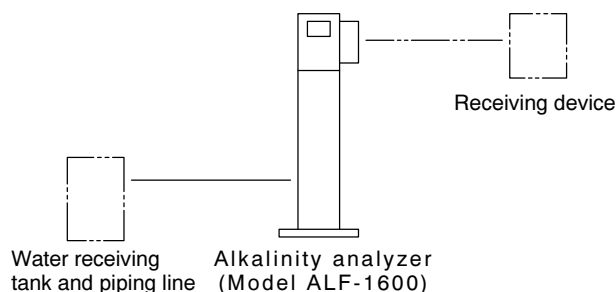
MODEL ALF-1600



- Please keep this instruction manual close at hand of the persons who are in charge of the operation of this product.
- Before operating this product, please read this instruction manual carefully for its correct handling.

Introduction

- (a) Thank you for your purchase of the Model ALF-1600 Alkalinity Analyzer (hereinafter called the analyzer or product). The analyzer measures the alkalinity of raw water for water supply and purified water. It has two measurement systems; continuous and intermittent (batch measurement at a minimum 1 hour interval).




Example of Measuring System

- (b) This product measures alkalinity by the neutralization titration method of coulometric titration.
- (c) Depending on the order specifications, when measuring raw water for water supply and other dirty high turbidity water, a water cleaning or ozone + water cleaning function that automatically cleans the pipeline and flow cell are available as options.
- (d) Depending on the option specifications, the following parts are supplied with the product;
- (i) Water cleaning Solenoid valve (1), pressure reducing valve (1)
 - (ii) Ozone + water cleaning ... Air pump, air filter, ozone generator, solenoid valve (2), and pressure reducing valve (2)
- (e) The measurement range is 0 to 50/100mg/L(or ppm). The 2 ranges are switched manually or remotely. The units are set to mg/L or ppm by order specifications. Normally, the units cannot be changed.
- (f) The product may indicate or output an incorrect measured value due to the following reasons. We recommend preparing a system such that the related facilities will not be damaged even in cases like these.
- Any problem of the product such as deterioration or damage of the detecting section or inappropriate insulation of cables.
 - Improper setting of operating conditions or calibration operation.
 - Electrical interference such as noise in the vicinity or improper grounding.
 - Other unpredictable phenomena
- (g) Since important items are described in “Safety Information”, read the contents carefully.
- (h) The product should be handled by persons who have received proper training. In addition, for technical services such as repairs, ask a specialist to do who is qualified for the technical certification system in our company or a person who has technical skills equivalent to that certification system.

Safety Information

(1) Meaning of markings

Meaning of signal terms and symbols used in notations of warning in the instruction manual is described below. In addition, the alert symbol (: General caution symbol) used on a product label, etc. is meant to notify the existence of hazard/loss and it also means “Refer to the Instruction Manual”.

WARNING:



Indicates the degree of hazard which can lead to death or serious injury if you fail to operate the product properly.

Serious injury means an injury such as loss of sight, burns (high temperature or low temperature), electric shock, bone fracture and poisoning, and the aftereffects of the injury remains or the injury requires hospitalization or long periods of outpatient treatment.

CAUTION:

Indicates the degree of hazard/loss which can result in injury or property damage if you fail to operate the product properly.

Injury means an injury not requiring hospitalization or long periods of outpatient treatment and refers to burns or electric shock. Property damage refers to widespread damage to the home, household goods and livestock, pets, equipment, materials, etc. (damage to other than the product itself).

[IMPORTANT] Indicates important matters other than  **WARNING** and  **CAUTION**. They are the matters such as preventing damage to the product main body, preventing data destruction, preventing wasting time, maintaining performance, and observing regulations.

[NOTE] Indicates comments, reasons, background information, a case example and other items to help the reader understand the meaning.

>> Indicates reference items.

①, ②, ③ Indicates item numbers such as the ones used in operations.

(2) Safety compliance items

WARNING

Hazardous Gasses

- Do not use the product in an area where explosive gas or flammable gas exists. Using the product in any of these areas can cause explosion or fire.

Electric Shock

- Do not touch the terminals inside the product while power is applied. Touching the terminals may cause electric shock.
- The ground terminal must be grounded. If the terminal is not grounded and a problem occurs in the power supply system, electric shock may result.

Hazardous substances

- Wear protective gear when handling the chemicals or the solutions which are prepared based on it. Also always check the Material Safety Data Sheet (MSDS).



Disassembly and Modification

- Do not disassemble or modify the sections of the product that are not described in the instruction manual. The product can be damaged.

Warning Label Lost

- If any warning label affixed to this product becomes too difficult to read or lost, please order a new one through your local sales agent or our sales office and affix it to its original position.

Disposal

- In case you dispose of this product or any part of this product, handle it as industrial waste as specified by law.
-

(3) Notes on use of the instruction manual

Important items such as “Safety compliance items” are described in this manual. Handle the manual as follows:

- (a) The instruction manual is required not only at the start of operation but also required when maintenance is performed or in case a failure occurs. Please keep the manual at hand all the time so that the operator who actually operates the product can read the manual at any time.
- (b) If the manual is lost or too smeared to read, please order a new copy through your local sales agent or directly from our sales office.
- (c) Some of the diagrams used in the manual or on product labels may be modified with part of their shapes or displays omitted or they may be described in abstract form. In addition, numbers etc. shown on the screen example are just examples for such cases.
- (d) The contents of the manual may be changed without prior notice for reasons such as to improve performance.
- (e) Intellectual property right of the manual belongs to DKK-TOA. All or part of the manual must not be reproduced without permission.

Warranty

(1) Warranty Coverage

DKK-TOA Corporation (DKK-TOA) warrants its products against defective material or workmanship for the warranty period.

- (a) The warranty period is one year from the date of delivery to the original user. If the date of delivery cannot be specified, the warranty period is 24 months from the month following the date of manufacture shown on the product nameplate.
- (b) Specific written agreements with DKK-TOA, if any, shall take precedence over this warranty.
- (c) The limitation of warranty described herein may not apply where applicable laws do not allow such limitation.

(2) Limited Warranty

This warranty does not cover the cases listed below.

- (a) Direct or indirect failure or damage caused by the use of the product for a purpose or in a manner not prescribed by the specifications or the instruction manual for the product.
- (b) Direct or indirect failure or damage caused by force majeure, including but not limited to an act of God, natural disaster such as earthquake, storm and flood damage, and lightning, fire, accident, abnormal voltage, salt damage, gas damage, labor unrest, acts of war (declared or undeclared), terrorism, civil strife, or acts of any governmental jurisdiction.
- (c) Failure or damage caused by any repair or modification not authorized by DKK-TOA.
- (d) Failure or damage caused by the transport, moving, or dropping of the product after the purchase that is not attributable to DKK-TOA.
- (e) Electrodes and consumables (The warranty period for each part has priority when the period is shorter than that for the main unit of the product. If the customer requires any part after more than six months from the date of manufacture, consult DKK-TOA or its distributor.)
- (f) Failure or damage caused by the use of consumables, parts, or software not supplied by DKK-TOA.
- (g) Malfunctions or damage caused by the use of connecting equipment not supplied by DKK-TOA.
- (h) Loss of data, settings, programs, or software stored on the product not attributable to DKK-TOA.
- (i) Any product other than DKK-TOA's, if specified by the purchaser or user, that incorporates, or is incorporated into or combined with DKK-TOA's products (*1). In such cases, this warranty covers DKK-TOA's products only.
- (j) Any product not under proper maintenance in accordance with the instruction manual furnished by DKK-TOA.
- (k) Products without a nameplate (excluding products proved to have been delivered by DKK-TOA).

EXCEPT AS EXPRESSLY SET FORTH IN THE PRECEDING SENTENCES, DKK-TOA MAKES NO WARRANTY OF ANY KIND WHATSOEVER WITH RESPECT TO ANY PRODUCT. DKK-TOA EXPRESSLY DISCLAIMS ANY WARRANTY IMPLIED BY LAW, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

LIMITATION OF REMEDIES: In the event that a defect is discovered within the warranty period, DKK-TOA or its authorized distributor will, at its option, repair or replace the defective product or its part, or will refund the purchase price of the product. **THIS IS THE EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.**

LIMITATION OF DAMAGES: IN NO EVENT SHALL DKK-TOA BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND FOR BREACH OF ANY WARRANTY, NEGLIGENCE, ON THE BASIS OF STRICT LIABILITY, OR OTHERWISE.

(3) Others

- (a) Product parts for maintenance (*2) will normally be supplied for five years (*3) from the date manufacturing and sales are discontinued.
- (b) The cause of any malfunction or damage shall be determined by a DKK-TOA technician.
- (c) For repairs, contact a local distributor in your country or state.

*1: Warranties for products from other companies must be maintained by the user.

*2: Maintenance parts refers to parts that are required to maintain operation of the product.

*3: This five-year period is subject to availability of parts or their replacement.

Reading Guide

Refer to the necessary sections of this instruction manual depending on your purposes such as understanding the outline of this product or starting the product as shown below. The numbers in circles indicate sections to be referred to in sequential order.

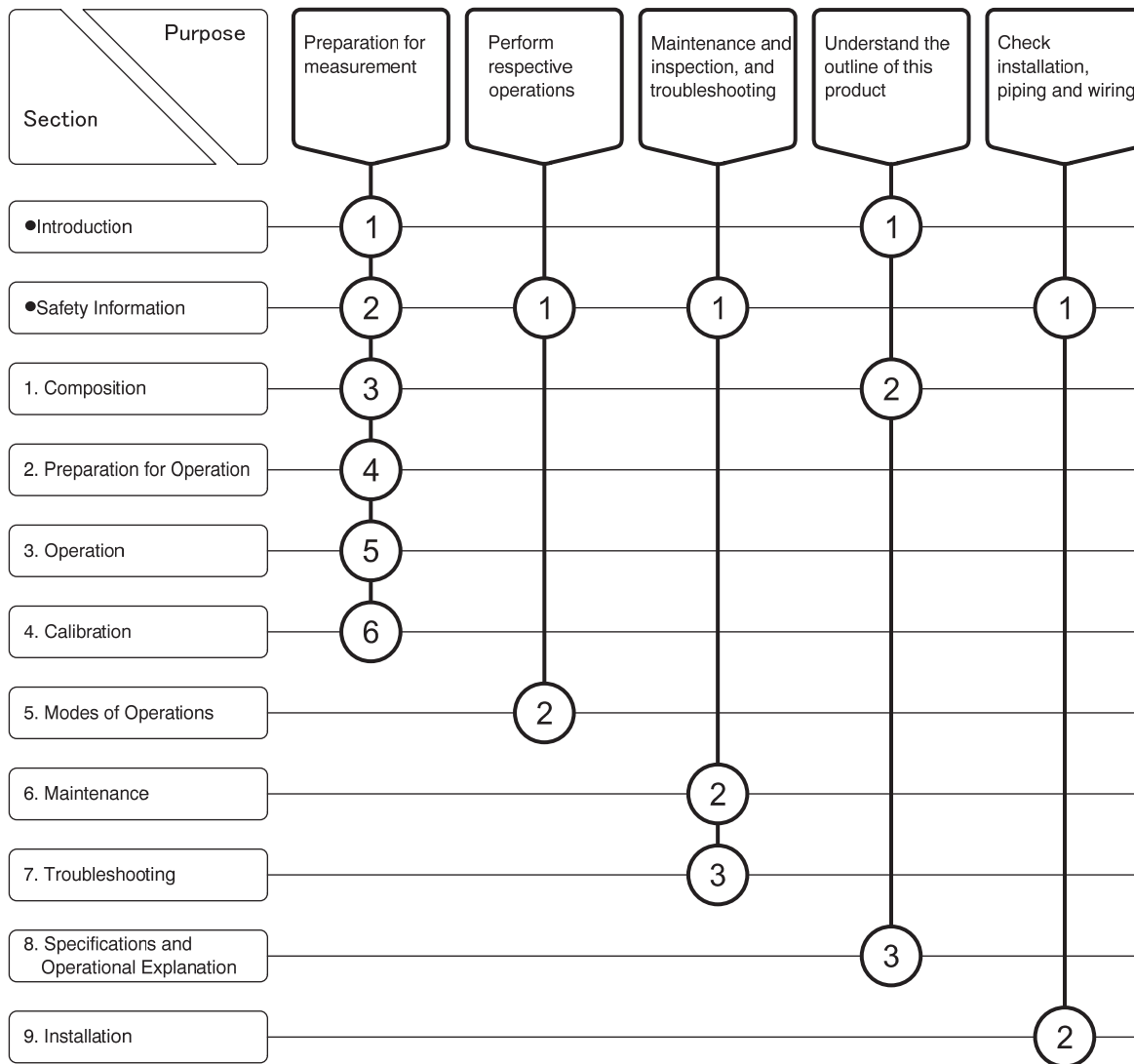


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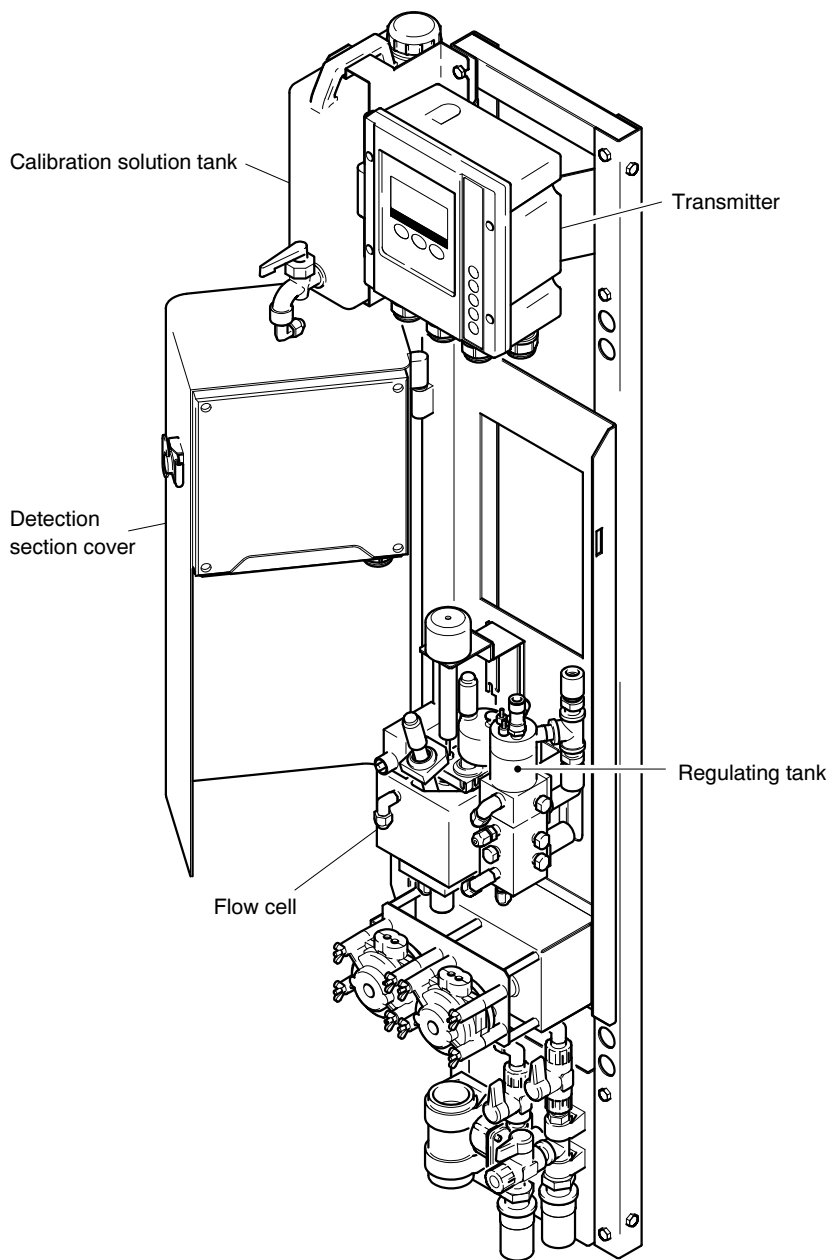
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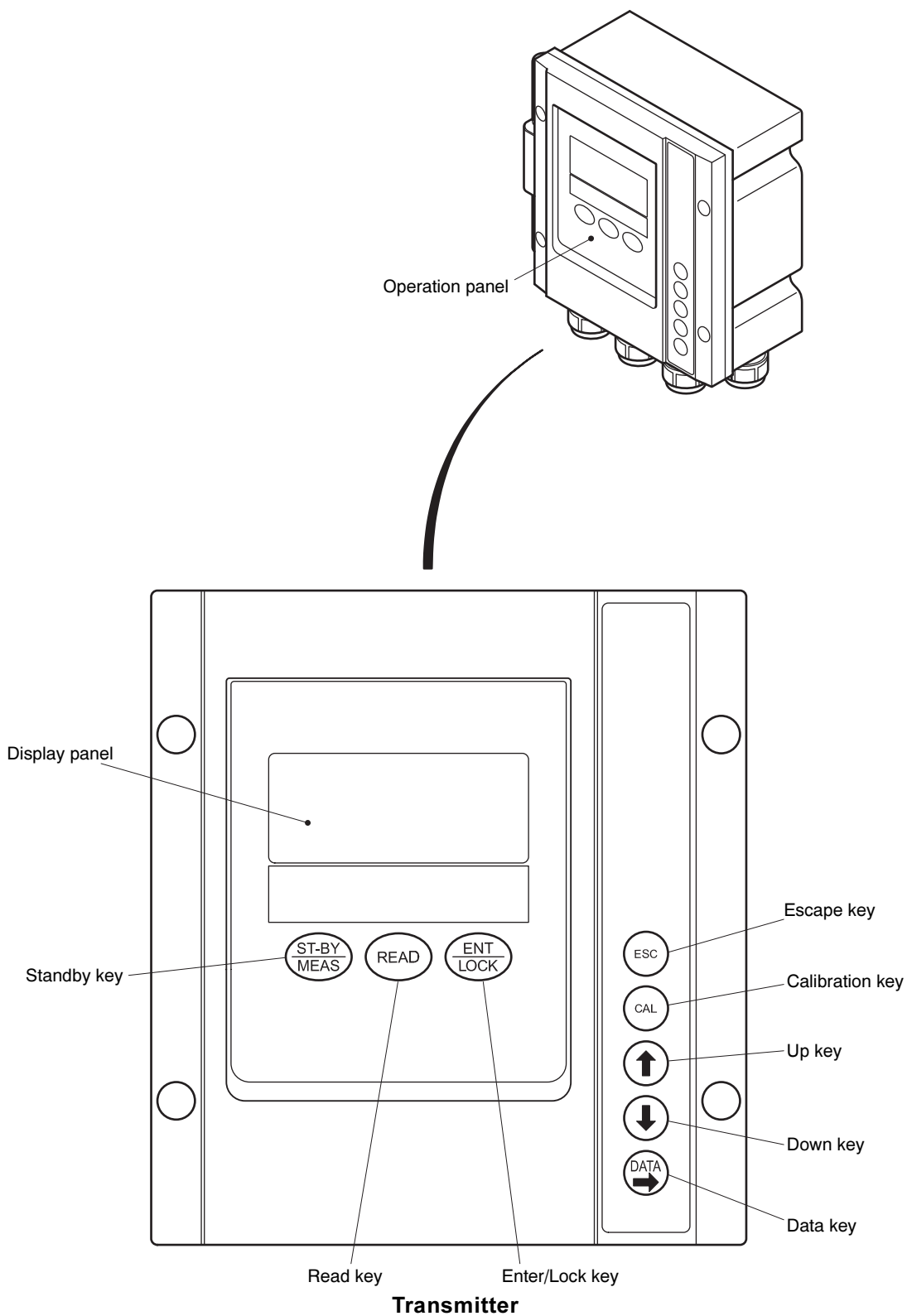
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1. Composition

(1) Names




























Standard Specifications

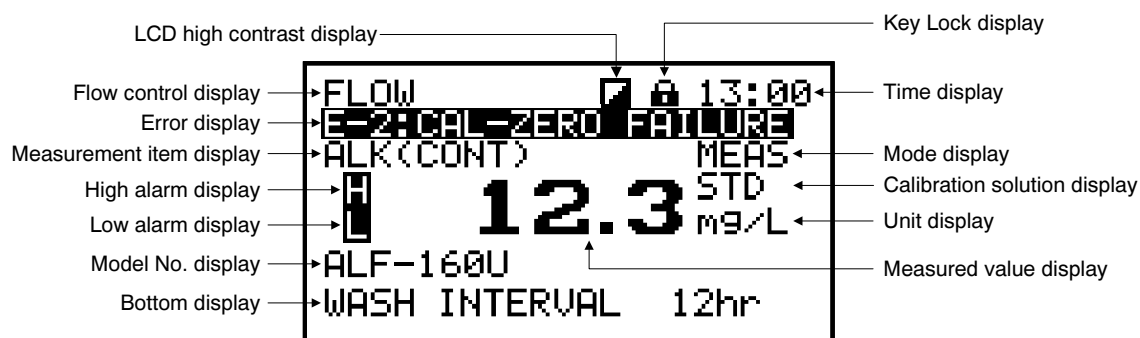


(2) Operation keys and screen display

Operation Key Functions

Operation key (Notation in the text)	Function
Measure/Standby key  ()	<ul style="list-style-type: none"> • Switches to the maintenance mode when this key is pressed for 4 seconds or more in the measurement mode. • Returns to the measurement mode when this key is pressed for 4 seconds or more in the maintenance mode.
Read key  ()	<ul style="list-style-type: none"> • Displays the parameters at the bottom of the screen (bottom display). • The parameters are not displayed when  is pressed after parameters display.
Enter/Lock key  ()	<ul style="list-style-type: none"> • Confirms the number or symbol that was input and simultaneously switches to the next screen. • The operation keys are locked when this key is pressed for 4 seconds or more in the measurement mode. The keys are released when this key is pressed for 4 seconds or more in the locked state.
Escape key  ()	<ul style="list-style-type: none"> • Returns to the state before operation. • Cancels input. • Cancel during operation is possible when this key is pressed for 4 seconds or more during calibration.
Calibration key  ()	<ul style="list-style-type: none"> • Switches to the calibration mode when this key is pressed in the maintenance mode. Returns to the maintenance mode when  is pressed.
Up key  ()	<ul style="list-style-type: none"> • Sequentially displays each parameter when  is pressed and the parameters are displayed at the bottom of the screen in the measurement mode. • Sequentially displays each parameter when pressed after switching to the setting mode by pressing  in the maintenance mode. • Sequentially displays each calibration operation when pressed after switching to the calibration mode by pressing  in the maintenance mode. • Increments the number or switches the alternative when pressed at number setting in the setting mode and calibration mode.
Down key  ()	<ul style="list-style-type: none"> • Sequentially displays each parameter when  is pressed and the parameters are displayed at the bottom of the screen in the measurement mode. (Displayed in the reverse order of the Up key.) • Sequentially displays each parameter when pressed after switching to the setting mode by pressing  in the maintenance mode. (Displayed in the reverse order of the Up key.) • Sequentially displays each calibration operation when pressed after switching to the calibration mode by pressing  in the maintenance mode. (Displayed in the reverse order of the Up key.) • Decrements the number or switches the alternative when pressed at number setting in the setting mode and calibration mode.
Data key  ()	<ul style="list-style-type: none"> • Switches to the setting mode and displays “PARAMETER” on the screen when pressed in the maintenance mode. Returns to the maintenance mode when  is pressed. • Moves “digit” of the number to the right when pressed at setting mode value setting.

- [NOTE] • About modes and screen groups ... >> 5.1(1) “Mode switching”
 • About screen composition and switching ... >> 5.1(4) “Operation map”



Screen Display

Kinds of Displays

Display	Function	
Measured value display	<ul style="list-style-type: none"> • Displays the measured value mainly in the measurement mode and setting mode. • Blinks when the measured value has exceeded measuring range 2. 	
Bottom display	<ul style="list-style-type: none"> • Displays the parameters at the bottom of the display in the measurement mode and setting mode. 	
Unit display	<ul style="list-style-type: none"> • Displays the unit of the value shown on the main display. 	
Mode display	MEAS	<ul style="list-style-type: none"> • “MEAS” is displayed when the analyzer is in the measurement mode.
	ST-BY	<ul style="list-style-type: none"> • “ST-BY” is displayed when the analyzer is in the maintenance mode.
	PARAM	<ul style="list-style-type: none"> • “PARAM” is displayed when the analyzer is in the setting mode.
	CAL	<ul style="list-style-type: none"> • CAL is displayed when the analyzer is in the calibration mode.
Model No. display	<ul style="list-style-type: none"> • Displays the model No. of the analyzer. 	
Measurement item display	<ul style="list-style-type: none"> • Displays the item to be measured and the measurement system. “ALK(CONT)” ... Alkalinity (continuous measurement) “ALK(ITMC)” ... Alkalinity (intermittent measurement) 	
Alarm displays (high, low)	<ul style="list-style-type: none"> • Display “H”, “L” when the measured value has exceeded the set alarm value. 	
Error display	<ul style="list-style-type: none"> • Error display is displayed when an error was generated at the analyzer. >> 7 “Troubleshooting” 	
Flow control display	<ul style="list-style-type: none"> • Displays “FLOW” when the flow is being controlled. 	
Time display	<ul style="list-style-type: none"> • Displays the current time. 	
Key lock display	<ul style="list-style-type: none"> • Displays key lock icon when other key functions are stopped. 	
Calibration solution display	<ul style="list-style-type: none"> • Blinks when the calibration solution is being measured. 	
LCD high contrast display	<ul style="list-style-type: none"> • Displays LCD high contrast icon when the LED indicator is displayed in the maximum contrast. >> 5.1(2) “LCD high contrast” 	

2. Preparation for Operation

2.1 Preparing the Reagent Solution



Hazardous substances

- Wear protective gear when handling the Extra pure grade anhydrous sodium sulfate used for preparing the reagent. Also always check the Material Safety Data Sheet (MSDS).
-

(1) Amount of reagent 1L

-
- 【IMPORTANT】**
- Decide the amount of reagent to be prepared by taking into account the measurement interval (for intermittent measurement), reagent solution consumption, and similar factors.
 - Normally, the preparation criterion is the amount used in 1 month.
 - When 1 month has elapsed from the preparation date, prepare a new reagent solution even if there is reagent solution remaining.
-

The reagent solution consumption is generally as follows:

Continuous measurement: Approx. 720mL/day, Approx. 22L/month

Intermittent measurement 1 hour interval ⇒ Approx. 540mL/day, Approx. 16L/month

3 hour interval ⇒ Approx. 420mL/day, Approx. 13L/month

① **Ready the reagent.** Ready the following reagent as a 1L portion of the reagent preparation amount.

- Extra pure grade anhydrous sodium sulfate: 25g

② **Prepare the reagent.** Prepare the reagent by the following procedure and pour it into the reagent tank (hereinafter referred to as tank A).

- ① Put about 900mL of ion exchange water in a beaker or similar container.
- ② While stirring the liquid with a stirrer, gradually add and dissolve the reagent of step ①.

【IMPORTANT】

- Add the solid reagent after breaking it up by shaking the container vigorously beforehand. If the reagent is solid, it will take a long time for it to dissolve.

③ After checking that the reagent has dissolved, re-stir the entire amount as 1L.

④ Pour the reagent solution into the reagent tank.

③ **Remove the cover.** Remove the cover of tank A by the following procedure:

- ① Place a clean plastic container (bucket, etc.) near the side of the analyzer.
- ② Loosen the white hexagon cap nut of tank A, and remove the cover.
- ③ Rinse the cover with ion exchange water and place it into the container of step ①.

【IMPORTANT】 • A float switch and suction tube are attached to the cover. Do not get them dirty.

- ④ **Wash the tank A.** …… Discard the reagent remaining in tank A and wash tank A with ion exchange water.
- ⑤ **Pour the reagent solution into tank A.** …… Pour the reagent solution of step ② into tank A.
- ⑥ **Install the cover.** …… Check that the suction tube is not bent, and install the cover of tank A.

(2) Amount of reagent 30L

① **Ready the reagent.** …… Ready the following reagent as a 30L portion of the reagent preparation amount.

- Extra pure grade anhydrous sodium sulfate: 750g

② **Remove the cover.** …… >> Step ③ of 2.1(1)

③ **Wash the tank A.** …… >> Step ④ of 2.1(1)

④ **Prepare the reagent.** …… Prepare the reagent by the following procedure.

- ① Fill tank A with ion exchange water to about 90% (about 27L) of its capacity.
- ② Gradually add the reagent of step ① while stirring it with a stirring rod, etc.

【IMPORTANT】 • Add the solid reagent after breaking it up by shaking the container vigorously beforehand. If the reagent is solid, it will take a long time for it to dissolve.

- ③ After checking that the entire reagent has dissolved completely, re-stir the entire amount as 30L.

【IMPORTANT】 • Always stir.

- Add the reagent gradually while confirming that it has dissolved. If a large amount of reagent is added at one time, it will solidify in tank A and will be difficult to dissolve.
-

[NOTE] • A Model MX5 stirrer (option) can also be used to stir the reagent.

<How to use>

Set the MX5 at the cover mounting mouth of tank A containing the reagent and ion exchange water.

→ Supply power and thoroughly stir the solution with the electric arm.

→ Dissolving is complete in about 15 to 30 minutes.

- However, always add the reagent gradually at this time also.

- The reagent usually dissolves in 15 to 30 minutes, but may take more than 30 minutes when the water temperature is low. When the water temperature is extremely low, fill the tank with the ion exchange water beforehand so that the water temperature rises up to normal temperature.

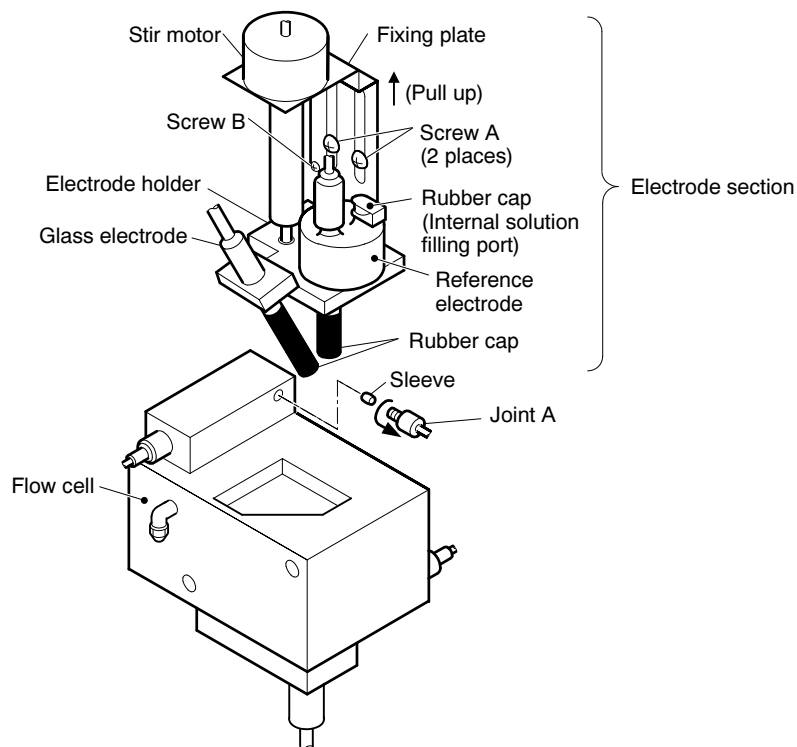
⑤ **Install the cover.** …… Check that the suction tube is not bent, and install the cover of tank A.

-
- 【IMPORTANT】**
- When reagent was prepared, always perform zero and span calibration.
>> 4. “Calibration”.
 - When changing the reagent solution, turn off the analyzer power or place the analyzer into the maintenance mode.
 - We recommend that a spare tank A be provided. The replacement time can be shortened by preparing the reagent in the spare tank A and replacing the cover of empty tank A.
-

- [NOTE]**
- When changing the reagent, to accelerate reagent replacement inside the analyzer, the reagent can be fed at high speed by operating the pump at high speed. We recommend about 5 minutes high speed operation.
>> 5.3(21) “Pump control”
 - If preparing 30L at one time is difficult, prepare the reagent in 5 to 10L batches and use it to replenish the reagent tank.

2.2 Removing the Electrode Caps

To prevent damage during transportation, a rubber cap is attached to the glass electrode and reference electrode. Remove these caps by the following procedure:



Removing the Electrode Caps

【IMPORTANT】 • Since the glass electrode breaks easily, handle it with care.

- ① **Disconnect the piping.** Loosen flow cell joint A (including the sleeve) and hexagon cap nut, and disconnect the piping.
- ② **Raise the electrode section.** Loosen screws A (2 places), B and raise the electrode section. After raising the electrode section, fix it by tightening screws A and B.

[NOTE] • Two electrodes, a stirrer, and an electrode holder are fixed to the fixing plate. Collectively they are called the electrode section.

- ③ **Remove the rubber caps.** Remove the rubber caps at the end of the glass electrode, the reference electrode and at the internal solution filling port.

【IMPORTANT】 • Check that the electrodes are not damaged and that there is sufficient internal solution in the reference electrode.

- ④ **Return to original state.** Return the electrode section and piping to their original state by the opposite procedure of steps ① and ②.

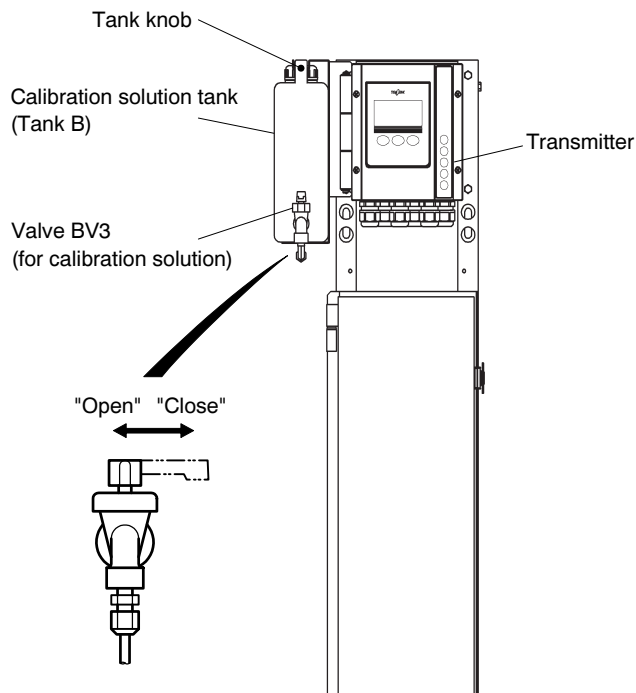
【IMPORTANT】 • Do not damage the end of the electrodes by striking it against the flow cell.

2.3 Preparing the Calibration Solution Tank

Before starting operation, connect the empty calibration solution tank (hereinafter referred to as tank B) to the analyzer. Before performing manual calibration, fill tank B with zero or span calibration solution.

>> 4.1 “Preparing the Calibration Solution”

① **Install the tank B.** Install empty tank B to the frame.



Preparing the Calibration Solution Tank (Tank B)

② **Connect the tube.** Connect the tube (for calibration solution) to valve BV3 (for calibration solution) of tank B.

③ **Check the valve BV3.** Check that valve BV3 is closed.

3. Operation

3.1 Starting Operation

① **Check the installation work.** Make sure that the installation work (installation, piping, wiring and power) is completed. >> 8.1 “Specifications”, 9. “Installation”, “Specification for delivery”

② **Make the operation preparations.** Perform the following work or make sure that preparations have been completed.

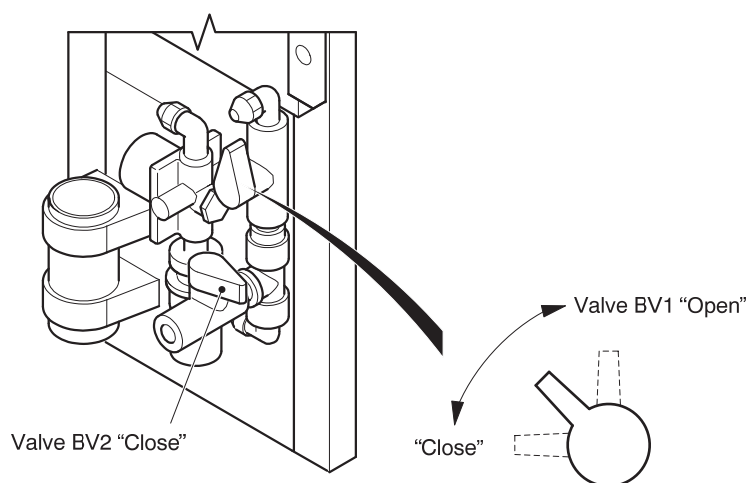
- 2.1 “Preparing the Reagent Solution”
- 2.2 “Removing the Electrode Caps”
- 2.3 “Preparing the Calibration Solution Tank”

【IMPORTANT】 • Make sure that valve BV1 (for sample water) and valve BV2 (for sampling port) are closed. If the valves are open and passing water, the sample water will spout from the open-to-air port at the top of the regulating tank and from BV2 and the analyzer may be damaged.

③ **Pass the sample water.** Gradually open valve BV1.

【IMPORTANT】 • After flow adjustment, make sure that the sample water is overflowing from the regulating tank. At this time be sure that the sample water is not overflowing from the open-to-air port of the regulating tank.

[NOTE] • If the sample water is not overflowing from the regulating tank, there is probably air in the piping or the sample water pressure is low. Remove the air or check the sample water conditions. >> 8.1 “Specifications”



Passing the Sample Water

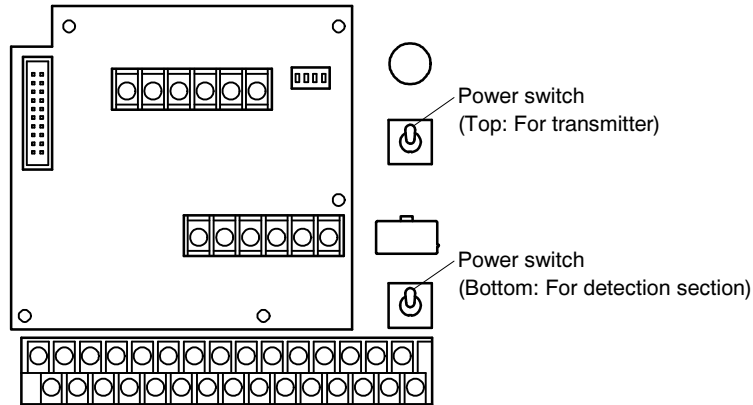
④ **Turn on the power.** Turn on the transmitter power switches in the following order:

- Bottom switch → Top switch
- After the screens are sequentially switched, the analyzer enters the measurement mode.

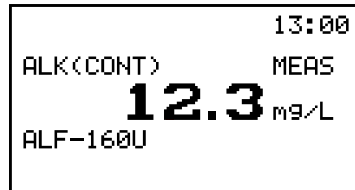
⚠ WARNING

Electric Shock

- Do not touch the terminals inside the product while power is applied. Touching the terminals may cause electric shock.
-



Position of Power Switches



Measurement Mode Screen

- ⑤ **Set the date and time.** >> 5.4 “Clock Adjustment”
- ⑥ **Perform a warm-up operation.** Time criteria: Approximately 1 hours

[NOTE] • Warm-up operation is performed to stabilize the electrode output.

- ⑦ **Check the washing operation.** >> 3.2 “Checking the Wash Operation”
- ⑧ **Perform calibration.** >> 4.2 “Zero Calibration”, 4.3 “Span Calibration”
- ⑨ **Check the operating conditions.** Check the measuring range and other operating conditions.
>> 5.2 “Measurement Mode Operation”

Now the analyzer is in normal operating condition. The measured value appears on the screen.

[NOTE] • Blinking of the measured value indicates that it has exceeded the measuring range.

3.2 Checking the Wash Operation (when automatic wash function is provided)

Check the wash operation at the start of operation by the following procedure:

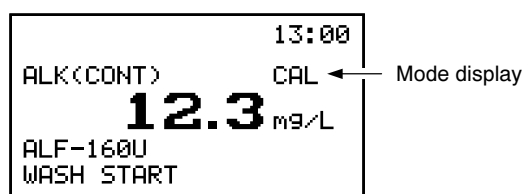
>> 8.2(3) "Measurement system with wash"

① **Check valve BV4.** After warm-up operation, check that valve BV4 (for washing water) is closed.

② **Select the calibration mode.** After pressing **(ST-BY/MEAS)** for 4 seconds or more, press **(CAL)** (At MEAS display)

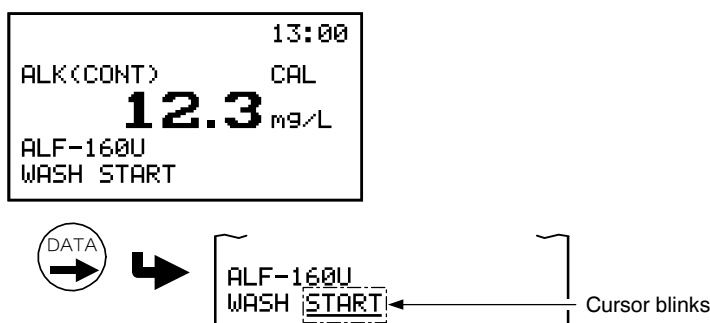
- After operation, the following are displayed on the mode display and bottom display:
- Mode display: "MEAS" → "ST-BY" → "CAL"
- Bottom display: (No display) → "WASH START"

[NOTE] •If WASH START is not displayed on the bottom display, press **(↑)** or **(↓)** several times.



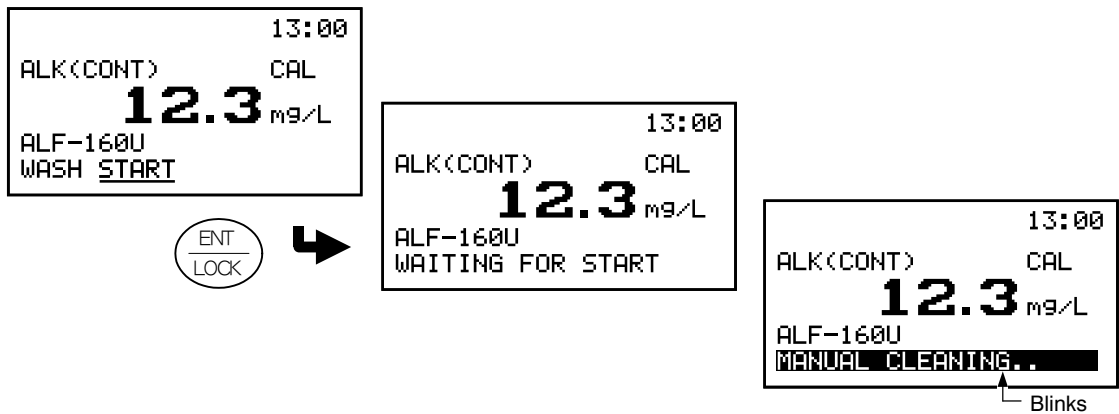
③ **Confirm washing.** Press **(DATA/→)**.

- After operation the cursor blinks at "START".
- Bottom display: "WASH START"



④ **Start washing.** Press **(ENT/LOCK)**.

- After operation, the following are displayed on the bottom display:
- Bottom display: "WASH START" → "WAITING FOR START" → "MANUAL CLENGING..."
- Solenoid valve: SV1 (washing water) Open (2 minutes)
SV3 (sample water) Closed
- When ozone + water washing function provided SV5 (ozone) Open (8 minutes)
SV1 (washing water) Open (2 minutes)
SV3 (sample water) Closed



⑤ Open valve BV4 little by little.

- 【IMPORTANT】**
- When passing the wash water for the first time, always open valve BV4 little by little. If valve BV4 is opened fully at one stroke, washing water may spurt from the open-to-air port (overflow) of the regulating tank.
 - When the ozone wash function is provided, open BV4 little by little at the washing process after the ozone gas has been ventilated for 8 minutes.

⑥ Check the washing operation. Check the following:

- Water wash Wash water flows into the flow cell and regulating tank and the water surface condition changes. (operating time: 2 minutes continuously from the operation of step ④)
- Ozone wash Bubbles of ozone gas fed to the flow cell are visible (operating time: Ozone gas generated approximately 1 minute after operation of step ④, 8 minutes continuously)
Continuing, wash water flows into the flow cell and regulating tank and the water surface condition changes. (operating time: 2 minutes continuously)

⑦ Check that washing is finished. Check that the display has changed to the following screen:

- Bottom display: "ZERO CAL START"
- Solenoid valve: SV1 (washing water) Closed
SV3 (sample water) Open
- When ozone washing function provided SV5 (ozone) Closed (8 minutes)
SV1 (washing water) Closed (2 minutes)
SV3 (sample water) Open



⑧ Select the maintenance mode. Press (ESC).

⑨ Return to original state. Press (ST-BY/MEAS) for 4 seconds or more.

3.3 Stopping and Restarting Operation

(1) Stopping operation

① **Start washing.** To wash the sample water piping, start the wash function (when the wash function is provided). >> 3.2 “Checking the Wash Operation (when automatic wash function is provided)”

② **Turn off the power.** Turn off the transmitter power switches in the following order:

- Top switch → Bottom switch

[NOTE] •Setting of the operating conditions, etc. is saved even when the power is turned off. There are no restrictions on the off timing.

•If there is no special problem, finally turn off the distribution panel power switch.

③ **Stop the sample water and washing water.** Close valve BV1 (sample water) and valve BV4 (washing water). For safety, also stop supply from upstream.

(2) Restarting operation

① **Start the water flow.** Open valve BV1 (sample water) and valve BV4 (washing water).

② **Turn on the power.** >> Step ④ of 3.1 “Starting Operation”

③ **Set the date and time.** >> 5.4 “Clock Adjustment”

④ **Perform the warm-up operation.** Time criteria: Approx. 1 hour

⑤ **Perform calibration.** >> 4.2 “Zero Calibration”, 4.3 “Span Calibration”

4. Calibration

- At the start of operation and after the electrodes have been washed, perform warm-up operation for 1 hour or more for the sensing electrode to stabilize. Furthermore, perform zero and span calibration after the indication stabilizes.
- When new reagent solution was prepared, always perform calibration using zero calibration solution and span calibration solution. >> 4.2 “Zero Calibration, 4.3 “Span Calibration”

4.1 Preparing the Calibration Solution

(1) Zero calibration solution

Use ion exchange water as the zero calibration solution.

(2) Preparing the span calibration solution

(a) Use the sodium carbonate specified in JIS K 8005 Reference Materials for Volumetric Analysis in the span calibration solution.

(b) Prepare 2L.

[NOTE] • Since the span calibration solution consumption is approximately 4mL/min, 1L is sufficient. However, make it 2L to increase the accuracy of the scale.

① **Heat** Heat enough sodium carbonate (Na_2CO_3) to weigh 0.2g at 500 to 600°C for 40 to 50 minutes.

② **Weigh** After cooling the sodium carbonate in a desiccator, weigh 0.2g with a chemical balance.

③ **Dissolve** Put the sodium carbonate of step ② into 2L of ion exchange water and dissolve it. This makes 100mg/L of span calibration solution.

[NOTE] • Relationship between sodium carbonate solution and calcium carbonate solution
According to the Standard Methods for the Examination of Water (Japan Water Works Association), the alkalinity in the water is represented by mg/L of calcium carbonate CaCO_3 . The analyzer indication of the sodium carbonate solution prepared at steps ① to ③ is expressed by the following formula. Since CaCO_3 formula weight: 100.09g, Na_2CO_3 formula weight: 105.99g.

$$\text{Analyzer indication} = 100\text{mg/L} = \frac{100.09}{105.99} = 94.43\text{mg/L (CaCO}_3\text{ converted value)}$$

- Storing the span calibration solution (sodium carbonate solution)

The characteristics of the calibration solution change as follows depending on the storage state:

① Sealed container Stable for 2 to 3 months

② Open container Analyzer indication drops

(Because sodium hydrogen carbonate is generated by the adsorption carbon dioxide)

4.2 Zero Calibration

- (a) Perform zero calibration using the zero calibration solution.
- (b) Fill tank B with ion exchange water. >> 4.1(1) “Zero calibration solution”

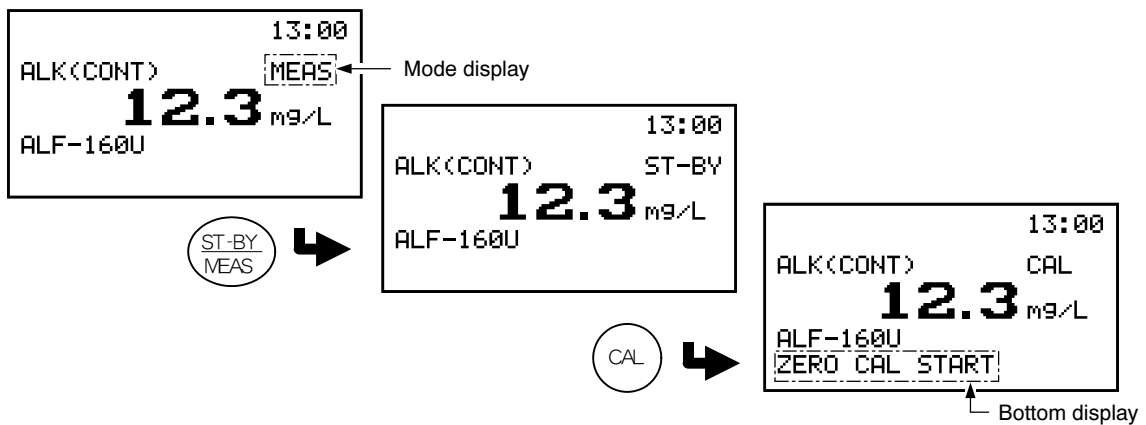
① **Install tank B.** Install tank B prepared at (b) to the frame. Check the tube connection and open valve BV3 (for calibration solution). >> 2.3 “Preparing the Calibration Solution Tank”

【IMPORTANT】 • Always loosen the cover of tank B to open the tank to the air. If the tank remains sealed, the calibration solution will not flow.

② **Select the calibration mode.** After pressing **(ST-BY/MEAS)** for 4 seconds or more, press **(CAL)** (At MEAS display)

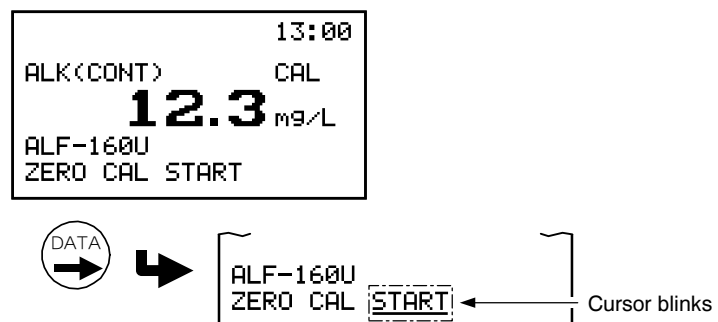
- After operation, the following are displayed on the mode display and bottom display:
- Mode display: “MEAS” → “ST-BY” → ”CAL”
- Bottom display: (No display) → “ZERO CAL START” (When wash is provided, “WASH START”)

[NOTE] • If the bottom display is not “ZERO CAL START”, change it by pressing **(↑)** or **(↓)** several times.



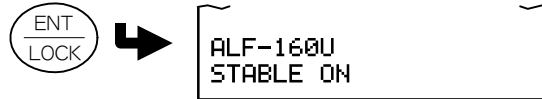
③ **Confirm the calibration method.** Press **(DATA/→)**.

- After operation, the cursor blinks at “START”.
- Bottom display: “ZERO CAL START”



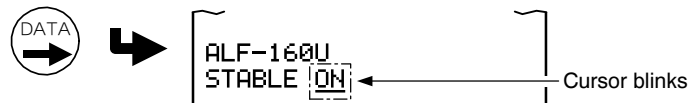
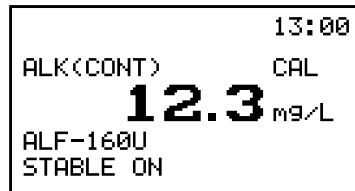
④ Start the calibration. Press **ENT/LOCK**.

- After operation, the following are displayed on the bottom display:
- Bottom display: “ZERO CAL START” → “STABLE ON”



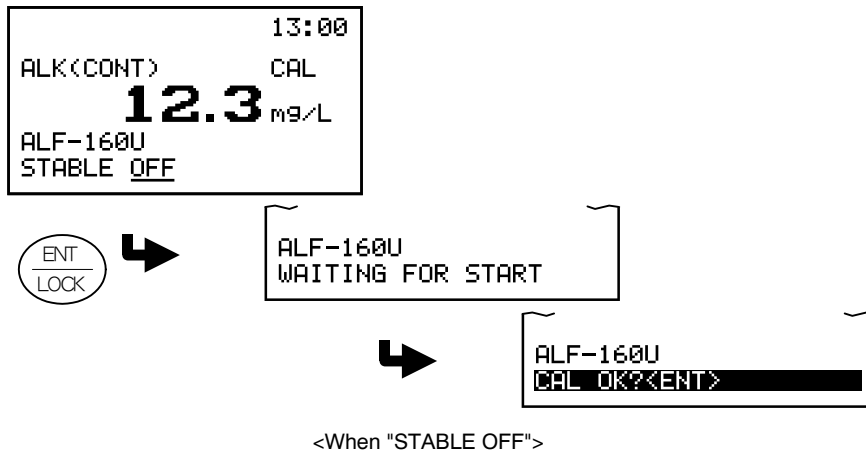
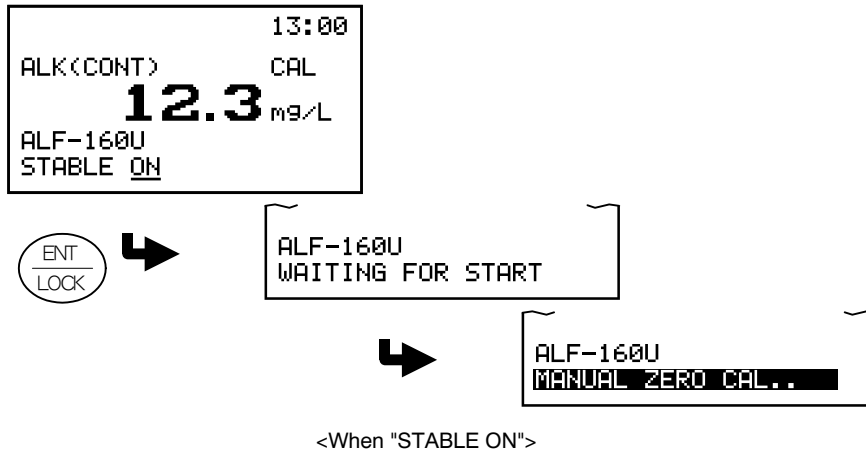
⑤ Check stability check. Press **DATA/→**.

- After operation, the cursor blinks at “ON”.



⑥ Confirm stability check. Select stability check on/off and press **ENT/LOCK**.

- On/off change ... **↑** or **↓**
 “ON” ... Perform stability check
 “OFF” ... Do not perform stability check
- After operation, the following are displayed on the bottom display:
- Bottom display: “ON” ... “STABLE ON” → “WAITING FOR START” → “MANUAL ZERO CAL ... ” → Go to step ⑧.
 “OFF” ... “STABLE OFF” → “WAITING FOR VALVE” → “CAL OK?” → Go to step ⑦.

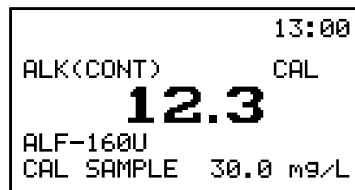


⑦ Check the indication. Check the stability of the indication and press **ENT/LOCK**.

[NOTE] •The calibration value when **ENT/LOCK** was pressed is calculated and the screen of step ⑧ appears. When this key was not pressed, the calibration value 20 minutes after calibration starts is automatically calculated and the screen of step ⑧ appears.

⑧ Check that calibration is finished. Check that the display has changed to the following screen:

- Bottom display: “CAL SAMPLE *.* mg/L”



[NOTE] •This screen appears about 20 minutes after calibration starts.

⑨ Select the maintenance mode. Press **ESC**.

⑩ Return to the measurement mode. Press **ST-BY/MEAS** for 4 seconds or more.

4.3 Span Calibration

(a) There are 2 methods of span calibration. Select the method according to the conditions.

- Span calibration 1 (by sample water)
- Span calibration 2 (by calibration solution)

(b) Always perform span calibration after zero calibration.

(c) When the correction coefficient (SPAN KA) is other than 1.000, the measured value multiplied by the correction coefficient will be displayed.

>> 5.3 (19) “Correction coefficient”

[NOTE] • Set this correction coefficient as required.

(1) Span calibration 1 (CAL SAMPLE)

Span calibration 1 sets the analyzer indication to the manual analysis value of the sample water.

① **Decide the manual analysis value.** Take the sample water and analyze it manually to decide the alkalinity.

② **Select the calibration mode.** >> Refer to the step ② of 4.2 “Zero Calibration”

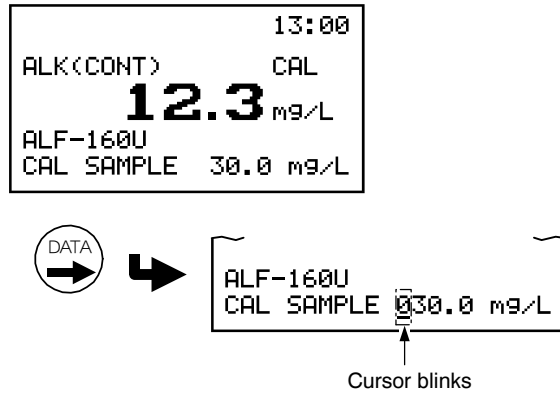
③ **Set the bottom display to “CAL SAMPLE *.* mg/L”.** Press  or  several times.

- After operation, the following are displayed on the bottom display:
- Bottom display: “ZERO CAL START” → “CAL SAMPLE *.* mg/L”



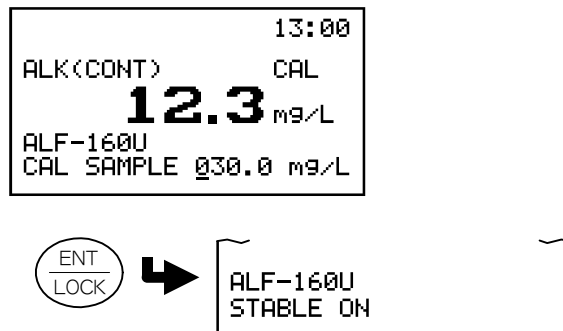

④ **Confirm the calibration method.** Press .

- After operation, the cursor blinks at the concentration input area.
- Bottom display: “CAL SAMPLE *.* mg/L”



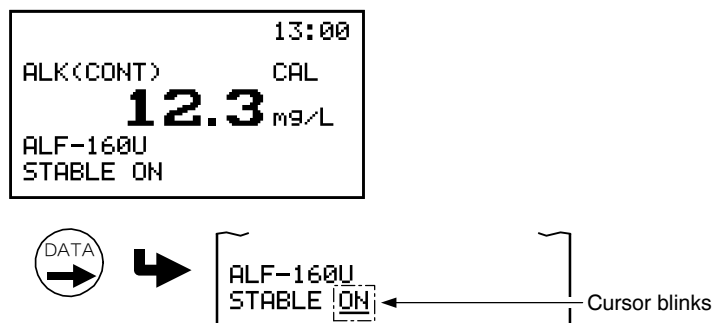
⑤ Enter the concentration. Enter the sample water concentration using the following operation and press **ENT/LOCK**.

- Numeric change **↑** or **↓**
- Digit change **DATA/→**
- After operation, the following are displayed on the bottom display:
- Bottom display: “CAL SAMPLE *.*.* mg/L” → “STABLE ON”



⑥ Select stability check. Press **DATA/→**.

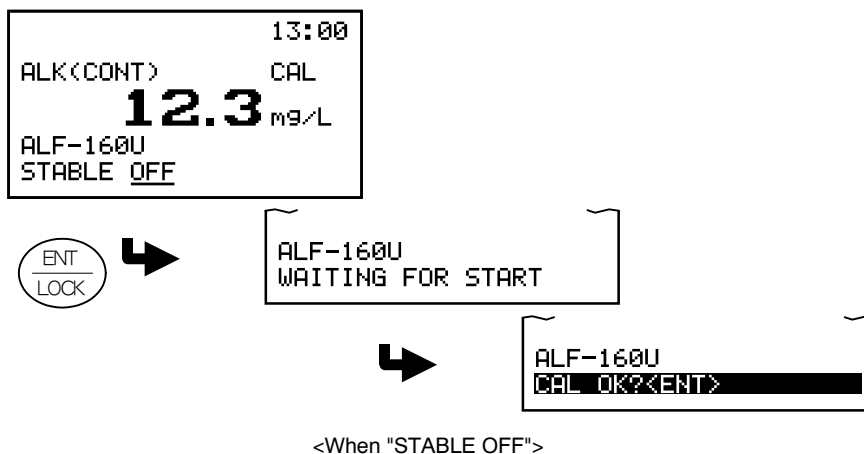
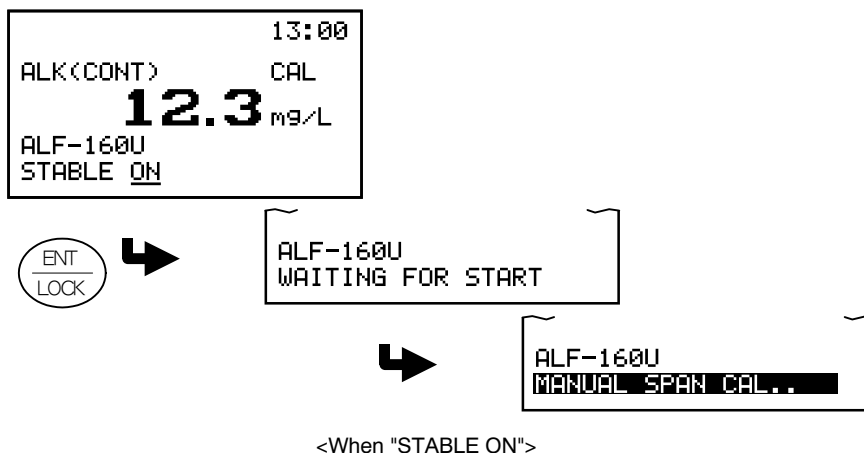
- After operation, the cursor blinks at “ON”.



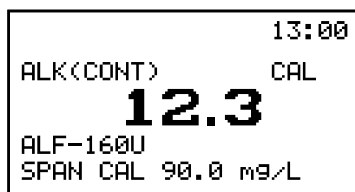
⑦ Confirm stability check. Select stability check on/off and press **ENT/LOCK**.

- On/off change **↑** or **↓**
 “ON” ... Perform stability check
 “OFF” ... Do not perform stability check
- After operation, the following are displayed on the bottom display:

- Bottom display: “ON” ... “STABLE ON” → “WAITING FOR START” → “MANUAL SPAN CAL ...” → Go to step ⑨.
 “OFF” ... ”STABLE OFF” → “WAITING FOR START” → “CAL OK?” → Go to step ⑧.



- ⑧ **Check the indication.** Check the stability of the indication and press **ENT/LOCK**.
- ⑨ **Check that calibration is finished.** Check that the display changed to the following screen.
 - Bottom display: “SPAN CAL *.*mg/L”



- ⑩ **Select the maintenance mode.** Press **ESC**.
- ⑪ **Return to the measurement mode.** Press **ST-BY/MEAS** for 4 seconds or more.



(2) Span calibration 2 (SPAN CAL)

- (a) Span calibration 2 sets the analyzer indication to the concentration of the calibration solution.
- (b) Pour the span calibration solution into tank B. >> 4.1(2) “Preparing the span calibration solution”

① **Install tank B.** After installing tank B prepared at (b) to the frame and checking the tube connection, open valve BV3 (for calibration solution).

【IMPORTANT】 • Always loosen the lid of tank B to open the tank to the air. If the tank remains sealed, the calibration solution will not flow.

② **Select the calibration mode.** >> Refer to step ② of 4.2 “Zero Calibration ”

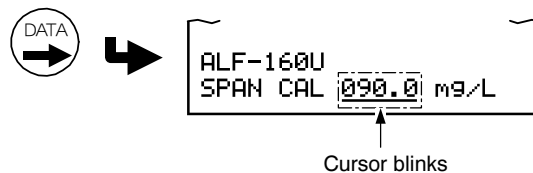
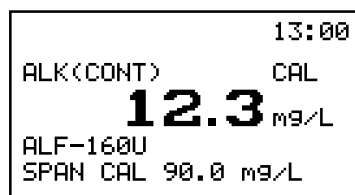
③ **Set the bottom display to “SPAN CAL *.* mg/L”.** Press  or  several times.


- After operation, the following are displayed on the bottom display:
- Bottom display: “ZERO CAL START” → “SPAN CAL *.* mg/L”






④ **Confirm the calibration method.** Press .

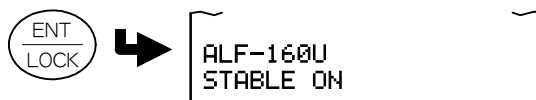
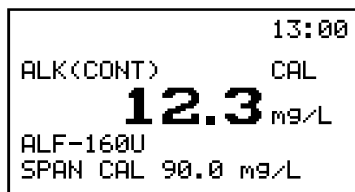
- After operation, the cursor blinks at the concentration input area.



⑤ **Enter the concentration.** Enter the calibration solution concentration using the following operation and press .

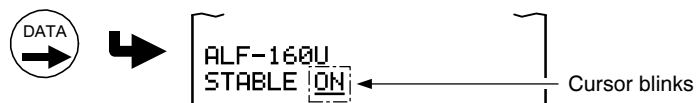
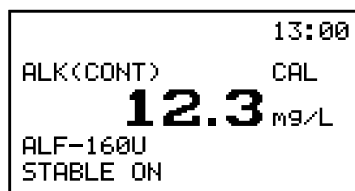
- Numeric change  or 
- Digit change 
- After operation, the following are displayed on the bottom display:

- Bottom display: “SPAN CAL *.* mg/L” → “STABLE ON”



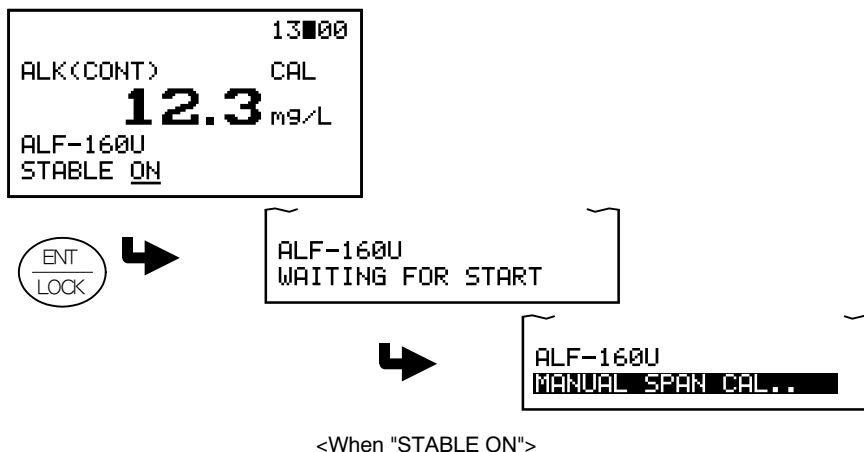
⑥ Select stability check. Press .

- After operation, the cursor blinks at “ON”.

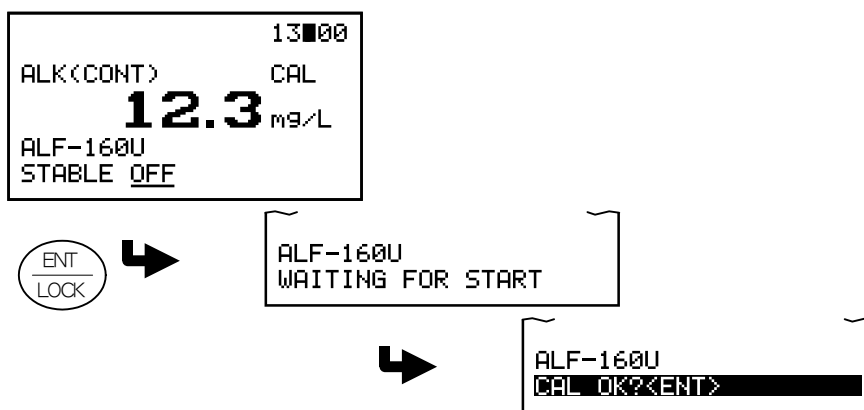


⑦ Confirm stability check. Select stability check on/off and press .

- On/off change or
 “ON” ... Perform stability check
 “OFF” ... Do not perform stability check
- After operation, the following are displayed on the bottom display:
- Bottom display: “ON” ... “STABLE ON” → “WAITING FOR START” → “MANUAL SPAN CAL ... ” → Go to step ⑨.
 “OFF” ... ”STABLE OFF” → “WAITING FOR START” → “CAL OK?” → Go to step ⑧.



<When "STABLE ON">



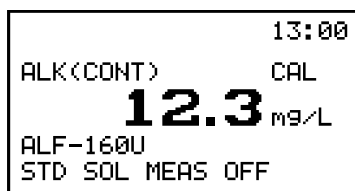
<When "STABLE OFF">

⑧ **Check the indication.** Check that the indication is stable and press **ENT/LOCK** .

- The calibration value when this key was pressed is calculated and the calibration operation ends.
- If **ENT/LOCK** was not pressed, about 20 minutes after calibration starts, the calibration value is automatically calculated and the calibration operation ends.

⑨ **Check that calibration is finished.** Check that the display changed to the following screen.

- This screen is displayed about 20 minutes after calibration starts.
- Bottom display: “STD SOL MEAS OFF”



⑩ **Select the maintenance mode.** Press **ESC** .

⑪ **Return to the measurement mode.** Press **ST-BY/MEAS** for 4 seconds or more.

4.4 Automatic Span Calibration

- (a) “Automatic span calibration” is the span calibration performed by switching the flow path at a period set beforehand and automatically flowing the span calibration solution.
- (b) Here automatic span calibration can perform only 1 process.
- Operation process >> Figure “Automatic Span Calibration Process (continuous measurement)” of 5.3(12) “Calibration interval”

- [NOTE]
- Operation of only 1 process has no wait time.
 - Measured value output hold depends on the setting. >> 5.3(18) “Hold system”
 - When an interrupt signal enters during calibration, the analyzer enters the measurement state.

- ① **Install tank B.** After installing the prepared tank B to the frame and checking the tube connection, open valve BV3 (for calibration solution).

[IMPORTANT] • Always loosen the cover of tank B to open the tank to the air. If the tank remains sealed, the calibration solution will not flow.

- ② **Select the calibration mode.** >> Step ② of 4.2 “Zero Calibration”

- ③ **Set the bottom display to “AUTO SPAN CAL START”.** Press  or  several times.

- After operation, the following are displayed on the bottom display:
- Bottom display: “ZERO CAL START” → ... → “AUTO SPAN CAL START”



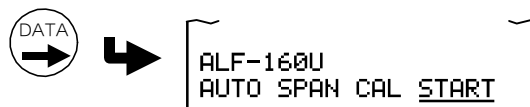
13:00
ALK(CONT) CAL
12.3 mg/L
ALF-160U
AUTO SPAN CAL START


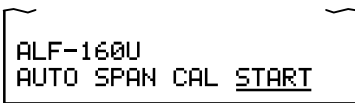
- ④ **Confirm the calibration method.** Press .

- After operation, the cursor blinks at “START”.
- Bottom display: “AUTO SPAN CAL START”



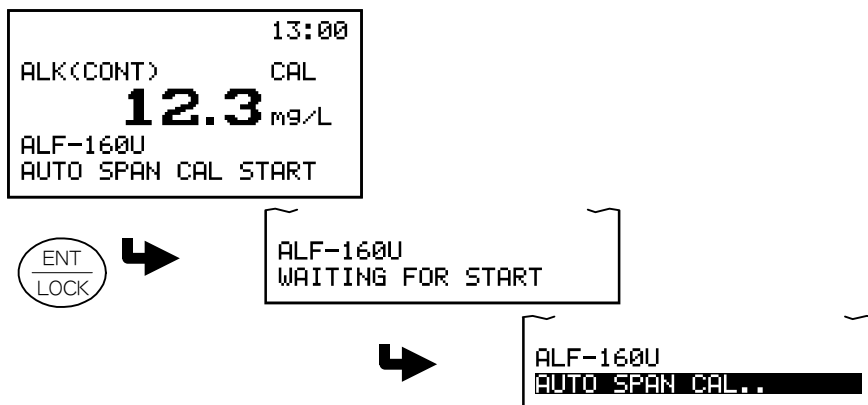
13:00
ALK(CONT) CAL
12.3 mg/L
ALF-160U
AUTO SPAN CAL START



 → 

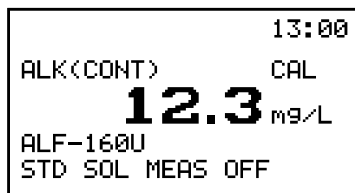
- ⑤ **Start the calibration.** Press .

- After operation, the following are displayed on the bottom display:
- Bottom display: “AUTO SPAN CAL START” → “AUTO SPAN CAL...” (blinking) → step ⑥



⑥ **Check that calibration is finished.** Check that the display changed to the following screen.

- Bottom display: “STD SOL MEAS OFF”



⑦ **Select the maintenance mode.** Press (ESC).

⑧ **Return to the measurement mode.** Press (ST-BY/MEAS) for 4 seconds or more.



4.5 Calibration Solution Measurement

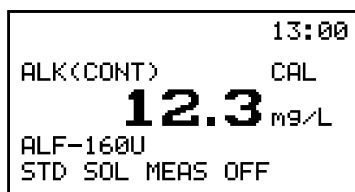
After zero and span calibration, flow the calibration solution and check the analyzer indication.




- ① **Install the calibration solution tank.** After installing the prepared calibration solution tank to the frame and checking the tube connection, open valve BV3 (for calibration solution).

【IMPORTANT】 • Always loosen the lid of tank B to open the tank to the air. If the tank remains sealed, the calibration solution will not flow.

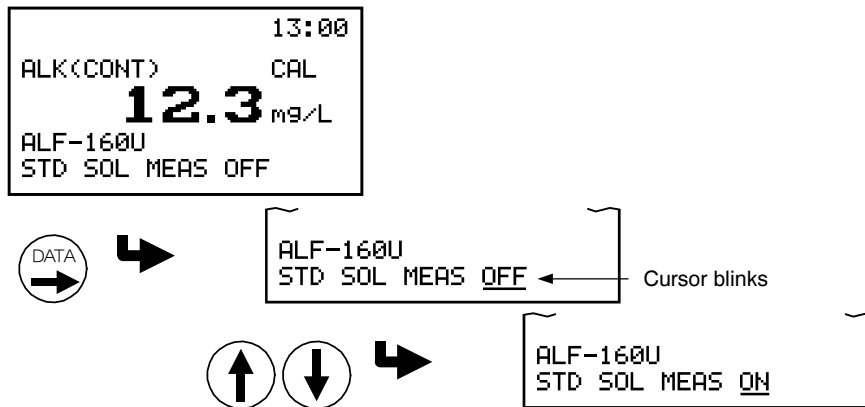
- ② **Select the calibration mode.** >> Step ② of 4.2 “Zero Calibration”

- ③ **Select the calibration solution measurement** Select “STD SOL MEAS OFF” by pressing  or  several times.



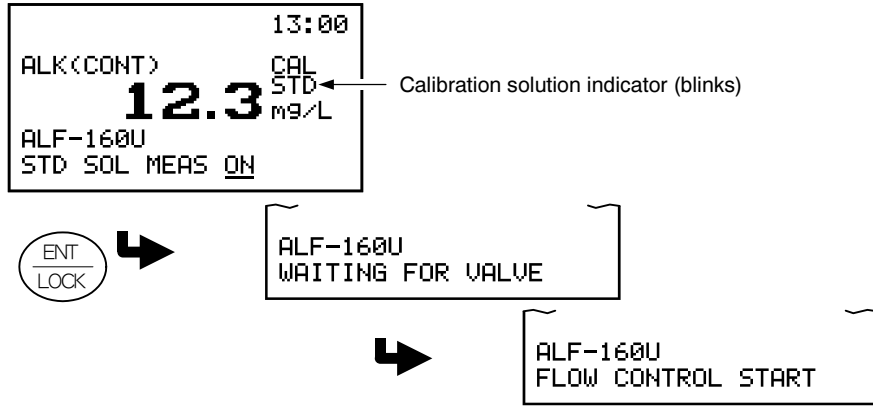
- ④ **Confirm the calibration solution measurement.** Press . After checking that the cursor blinks at “OFF”, select “ON” using  or .

- Bottom display: “STD SOL MEAS OFF” → “STD SOL MEAS ON”



- ⑤ **Start the measurement.** Press .

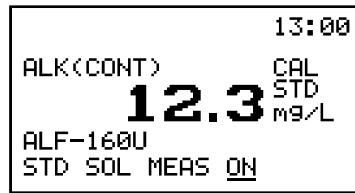
- After operation, the following are displayed on the bottom display:
- Bottom display: “STD SOL MEAS ON”
- At this time the solenoid valve will make a switching sound.



⑥ Check the indication. Check the indication value of analyzer.

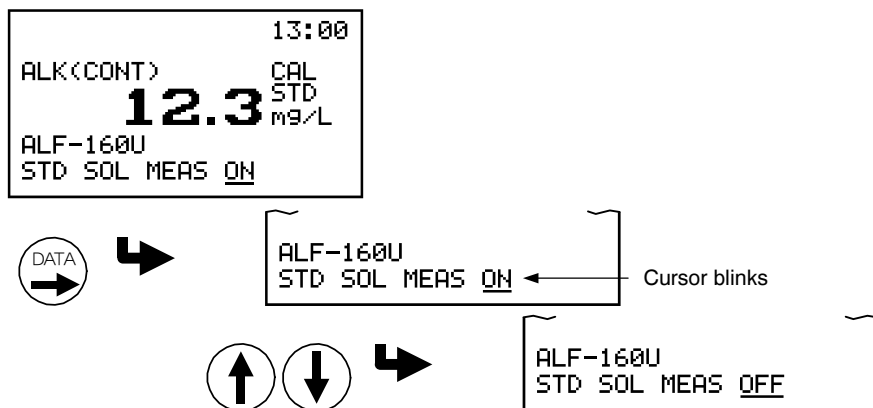
- If the calibration mode is set to the maintenance mode by pressing (ESC) on this screen, the parameters (electrode voltage value, etc.) can be checked.
- If the analyzer was placed into the maintenance mode, return it to the calibration mode.
>> Refer to step ② of 4.2 “Zero Calibration”.

⑦ Stop the measurement. Select “STD SOL MEAS ON” by pressing (↑) or (↓) several times.



⑧ Confirm that the measurement is finished. Press (DATA/→). After checking that the cursor blinks at “ON”, select “OFF” using (↑) or (↓).

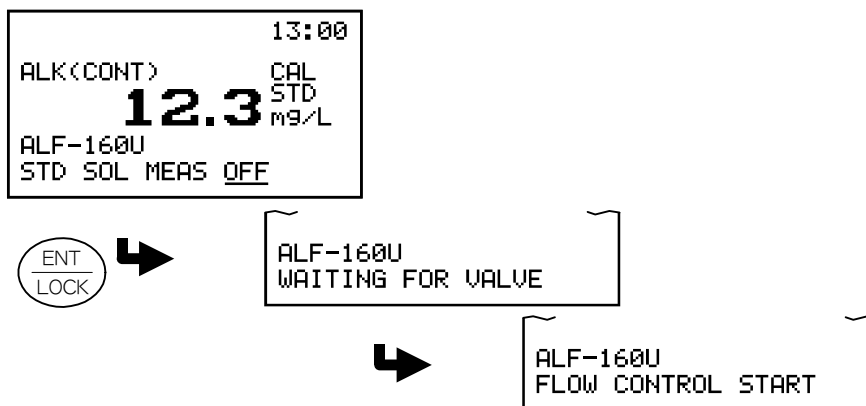
- Bottom display: “STD SOL MEAS ON” → “STD SOL MEAS OFF”



⑨ Stop the measurement. Press (ENT/LOCK).

- After operation, the following are displayed on the bottom display:
- Bottom display: “STD SOL MEAS OFF” → “WAITING FOR VALVE” → “FLOW CONTROL START”

- At this time the solenoid valve will make a switching sound.





⑩ Select the maintenance mode. Press (ESC).

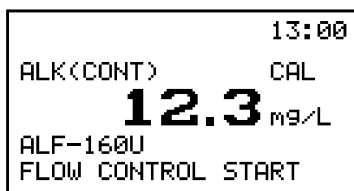
⑪ Return to the measurement mode. Press (ST-BY/MEAS) for 4 seconds or more.

4.6 Flow Control

In the measurement mode flow control is performed every 4 hours.

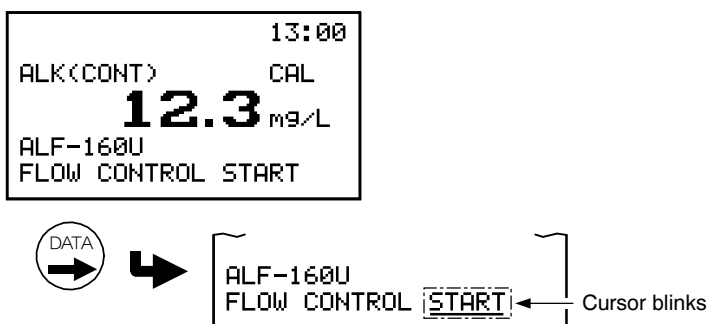
Manual flow control operation can be checked here.

- ① **Select the calibration mode.** >> Step ② of 4.2 “Zero Calibration”
- ② **Select the bottom display to “FLOW CONTROL START”.** Select “FLOW CONTROL START” by pressing  or  several times.



- ③ **Confirm the flow control.** Press .

- After operation, the cursor blinks at “START”.
- Bottom display: “FLOW CONTROL START”



- ④ **Start the flow control.** Press .

- After operation, the cursor blinks at “START”.
- Bottom display: “FLOW CONTROL START” → “WAITING FOR START” → “MANUAL FLOW CONTROL” (blinking) → step ⑤



⑤ **Confirm that the flow control is finished.** Check that the display changed to the following screen.

- When wash is provided, the bottom display changes into “WASH START”.



⑥ **Select the maintenance mode.** Press (ESC).

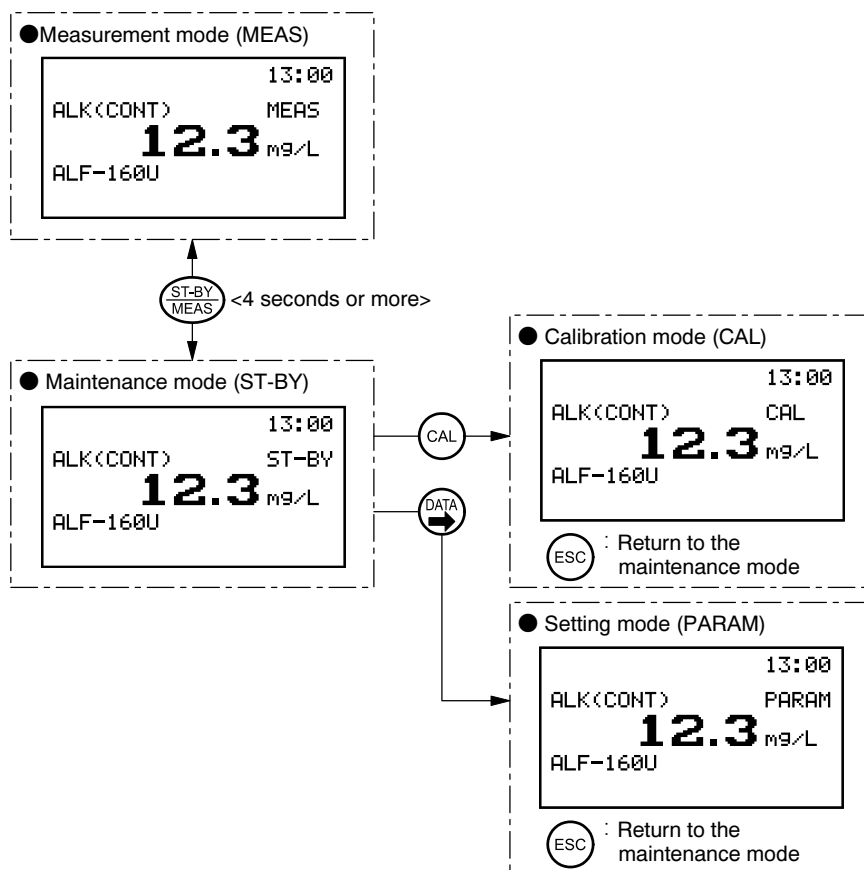
⑦ **Return to the measurement mode.** Press (ST-BY/MEAS) for 4 seconds or more.

5. Modes of Operations

5.1 Modes and Operation Map

(1) Mode switching

(a)The mode can be switched from the “measurement mode” to the “maintenance mode”, “setting mode”, or “calibration mode” by the key operations shown in the figure below.



Mode Switching

(b)The mode which the current screen belongs to can be checked by the mode display as shown in the table below.

- Example: “PARAM” display ... Setting mode

Displays and Modes

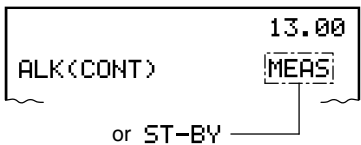
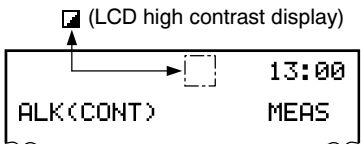


Display	Mode
MEAS	Measurement mode
ST-BY	Maintenance mode
PARAM	Setting mode
CAL	Calibration mode

- (c) In the “maintenance mode”, “setting mode”, and “calibration mode”, the measured value output is in the form (fixed value hold) automatically set by output type.
 >> 5.3(18) “Output type”
- (d) In the “maintenance mode”, “setting mode”, and “calibration mode”, alarm output is released.

(2) LCD high contrast

- (a) This function is used when the LCD is difficult to see in bright locations, such as the outdoors in fine weather.
- (b) When **READ** is pressed for 4 seconds or more in the “measurement mode” or “maintenance mode”, the contrast of the LCD can be temporally maximized.
 Setting the function ... >> 5.3(25) “LCD high contrast”

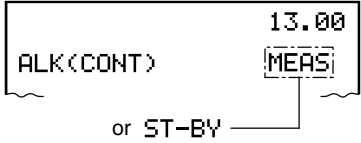
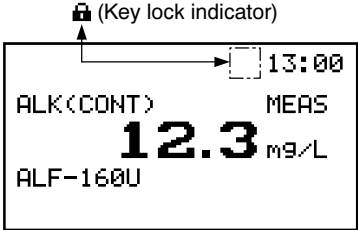


Operation Procedure

Procedure	Operation	Remarks
<p>① Check the mode.</p>  <p style="text-align: center;">or ST-BY</p>		<ul style="list-style-type: none"> • Check if the analyzer is in the “measurement mode” or “maintenance mode”. • “MEAS”……… Measurement mode “ST-BY”……… Maintenance mode >> 5.1(1) “Mode switching”
<p>② Set the LCD high contrast.</p>  <p style="text-align: center;">Measurement mode example</p>	<p>READ (4 seconds or more)</p>	<ul style="list-style-type: none"> • After operation, “” lights. • This also applies to the maintenance mode.
<p>③ Reset the LCD high contrast.</p>	<p>READ (4 seconds or more)</p>	<ul style="list-style-type: none"> • After operation, “” goes off.

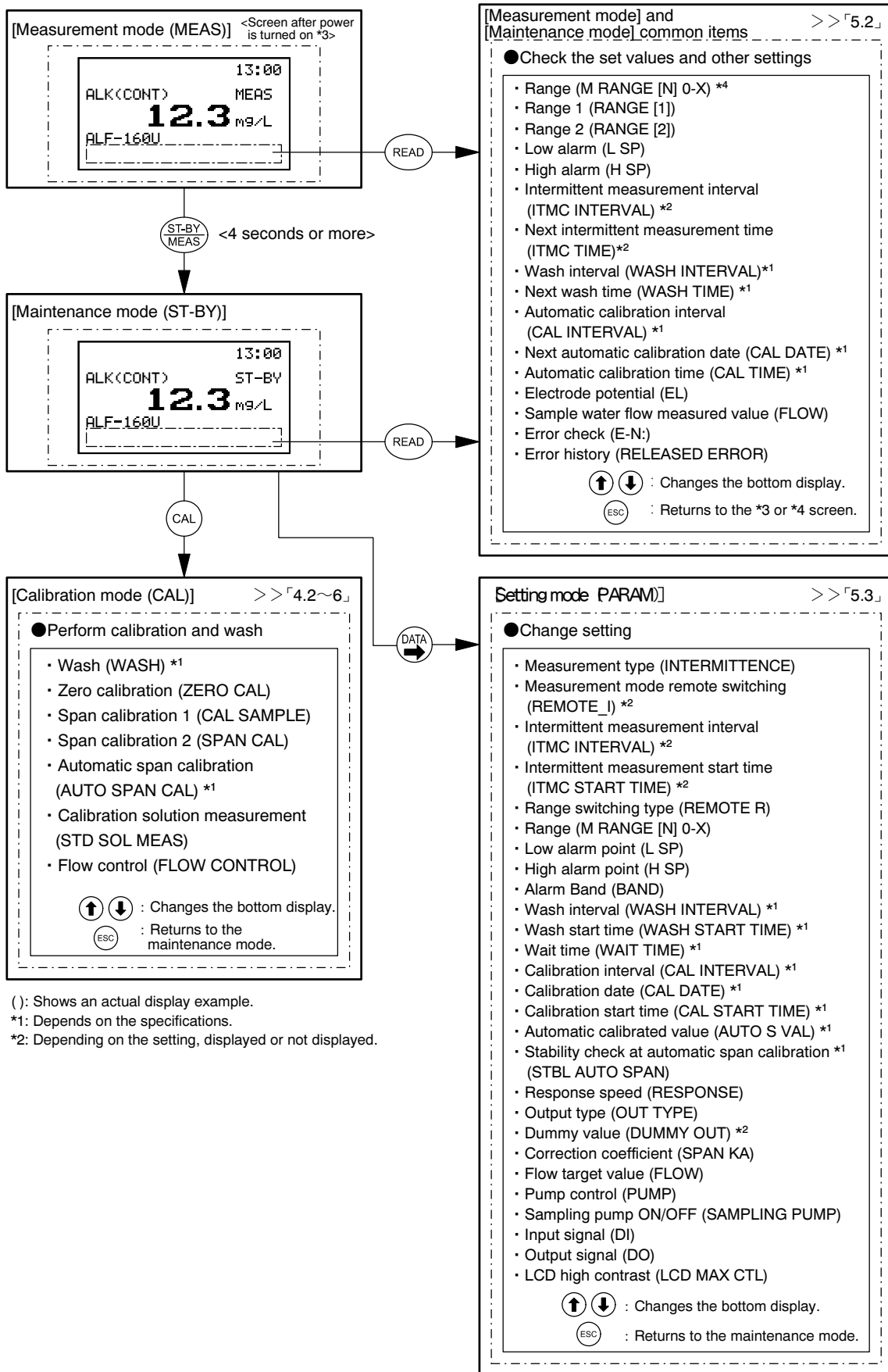
(3) Key lock

When **ENT/LOCK** is pressed for 4 seconds or more in the “measurement mode” or “maintenance mode”, the operation keys are locked.

Operation Procedure

Procedure	Operation	Remarks
<p>① Check the mode.</p> 		<ul style="list-style-type: none"> • Check if the analyzer is in the “measurement mode” or “maintenance mode”. • “MEAS”……Measurement mode • “ST-BY”……Maintenance mode >> 5.1(1) “Mode switching”
<p>② Lock the keys.</p>  <p>Measurement mode example</p>	<p>ENT/LOCK (4 seconds or more)</p>	<ul style="list-style-type: none"> • After operation, “” lights. Other keys cease to function. • This also applies to the maintenance mode.
<p>③ Unlock the keys.</p>	<p>ENT/LOCK (4 seconds or more)</p>	<ul style="list-style-type: none"> • After operation, “” goes off and the functions of all keys are restored.

(4) Operation map



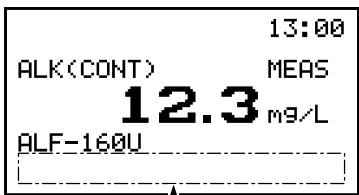

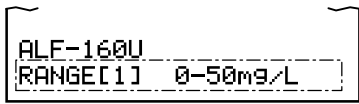
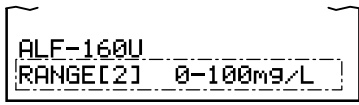
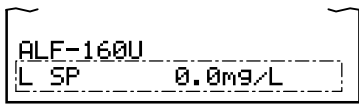
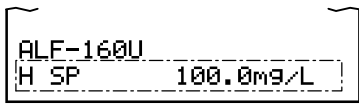
Operation Map

5.2 Measurement Mode Operation (MEAS)

In the “measurement mode”, the alkalinity concentration measured value (hereinafter called “alkalinity concentration”) and each set value can be checked.

[NOTE] • This operation can also be performed similarly in the maintenance mode.

Operation Procedure



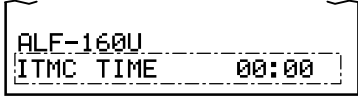



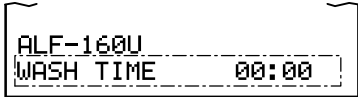





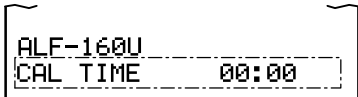

Procedure	Operation	Remarks
<p>① Alkalinity concentration</p>  <p style="text-align: center;">Bottom display</p>	—	<ul style="list-style-type: none"> • Main display: Alkalinity concentration (also applies to the following screens) • Bottom display: None • Initial screen in the measurement mode.
<p>② Setting range</p> 	<p>(READ) (While screen ① is displayed)</p>	<ul style="list-style-type: none"> • Bottom display: “M RANGE[1]” or “M RANGE[2]” • Currently set range
<p>③ Range 1</p> 	<p>⏴</p>	<ul style="list-style-type: none"> • Bottom display: “RANGE [1]”
<p>④ Range 2</p> 	<p>⏴</p>	<ul style="list-style-type: none"> • Bottom display: “RANGE [2]”
<p>⑤ Low alarm</p> 	<p>⏴</p>	<ul style="list-style-type: none"> • Bottom display: “L SP”
<p>⑥ High alarm</p> 	<p>⏴</p>	<ul style="list-style-type: none"> • Bottom display: “H SP”


⏴: The bottom display is switched in the reverse order.


(ESC): Bottom display is turned off.

(To be continued)

(Continued from previous page)

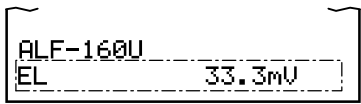
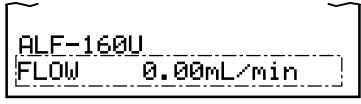
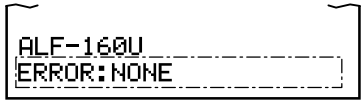

Procedure	Operation	Remarks
<p>⑦ Intermittent measurement interval</p> 		<ul style="list-style-type: none"> • Bottom display: “ITMC INTERVAL” • When intermittent measurement mode was selected
<p>⑧ Intermittent measurement start time</p> 		<ul style="list-style-type: none"> • Bottom display: “ITMC TIME” • When intermittent measurement mode is selected
<p>⑨ Automatic wash interval (with automatic wash)</p> 		<ul style="list-style-type: none"> • Bottom display: “WASH INTERVAL” • When automatic wash is provided
<p>⑩ Next wash time (with automatic wash)</p> 		<ul style="list-style-type: none"> • Bottom display: “WASH TIME” • When automatic wash is provided
<p>⑪ Automatic calibration interval (with automatic calibration)</p> 		<ul style="list-style-type: none"> • Bottom display: “CAL INTERVAL” • When automatic calibration is provided
<p>⑫ Next automatic calibration date (with automatic calibration)</p> 		<ul style="list-style-type: none"> • Bottom display: “CAL DATE” • When automatic calibration is provided
<p>⑬ Next automatic calibration time (with automatic calibration)</p> 		<ul style="list-style-type: none"> • Bottom display: “CAL TIME” • When automatic calibration is provided

: The bottom display is switched in the reverse order.

: Bottom display is turned off.

(To be continued)

(Continued from previous page)

Procedure	Operation	Remarks
<p>⑭ Electrode potential</p> 	<p>⬇</p>	<ul style="list-style-type: none"> • Bottom display: “EL”
<p>⑮ Sample water flow measured value</p> 	<p>⬇</p>	<ul style="list-style-type: none"> • Bottom display: “FLOW”
<p>⑯ Error check</p> 	<p>⬇</p>	<ul style="list-style-type: none"> • Bottom display: “ERROR” • >> 7. “Troubleshooting”
<p>⑰ Error history</p> 	<p>⬇</p>	<ul style="list-style-type: none"> • Bottom display: “RELEASED ERROR: E- *” • >> 7. “Troubleshooting”

⬆: The bottom display is switched in the reverse order.

ESC: Bottom display is turned off.

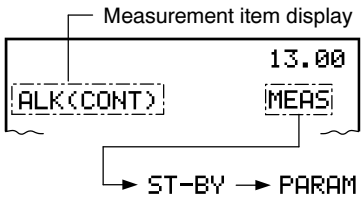
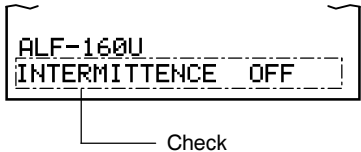
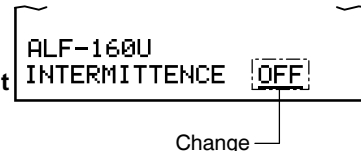
5.3 Setting Mode Operation

In the setting mode, the various set values related to measurement can be checked and changed.

(1) Measurement type (INTERMITTENCE)

(a) The measurement type can be set continuous measurement or intermittent measurement.

Operation Procedure

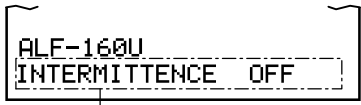

Procedure	Operation	Remarks
<p>① Select the setting mode "PARAM" screen.</p> 	<p>(ST-BY/MEAS) (4 seconds or more)</p> <p>↓ DATA/↔</p>	<p>>> 5.1(1) "Mode switching"</p>
<p>② Select "INTERMITTECE OFF" in the bottom display.</p> 	<p>DATA/↔</p>	<ul style="list-style-type: none"> The cursor blinks at the item to be changed.
<p>③ Change the measuring type.</p> 	<p>↑ or ↓ ↓ ENT/LOCK</p>	<ul style="list-style-type: none"> OFF...Continuous measurement (Factory setting) ON ... Intermittent measurement After entry, the cursor disappears. (ESC): Returns to original state without making the change.
<p>④ Return to measurement mode "MEAS" screen.</p>	<p>(ESC) ↓ (ST-BY/MEAS) (4 seconds or more)</p>	<ul style="list-style-type: none"> Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

- [NOTE]
- In the intermittent measurement mode, the measurement item display becomes ALK (ITMC).
 - Even if set to the intermittent mode, when intermittent measurement remote control (>> 5.3(2)) is set to remote system and an intermittent measurement start external input signal is applied, the analyzer enters the continuous measurement mode (measurement item display ALK (CONT)).

(2) Measurement mode remote switching (REMOTE I)

- (a) When intermittent measurement is selected at (1), this item is displayed.
- (b) Intermittent measurement/continuous measurement switching can be set to remote system here.
- (c) In the remote system, the analyzer enters the intermittent measurement state when the specified terminals are open and the continuous measurement state when specified terminals are closed.
 - Terminals specification >> 5.3(23) "Input Signal"

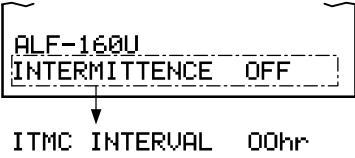
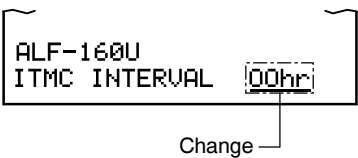
Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode "PARAM" screen.	ST-BY/MEAS (4 seconds or more) ↓ DATA/	>> 5.1(1) "Mode switching"
② Select "REMOTE I OFF" in the item.  ↓ REMOTE I OFF	\uparrow or \downarrow ↓ DATA/	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
③ Change the switching type.  Change	\uparrow or \downarrow ↓ ENT/LOCK	<ul style="list-style-type: none"> • OFF..... Manual method • ON Remote method • After entry, the cursor disappears. • ESC: Returns to original state without making the change.
④ Return to measurement mode "MEAS" screen.	ESC ↓ ST-BY/MEAS (4 seconds or more)	<ul style="list-style-type: none"> • Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

(3) Intermittent measurement interval (ITMC INTERVAL)

- (a) The intermittent measurement interval can be set. However, when set to 1h, the automatic calibration function is disabled.
- (b) Intermittent measurement is performed at the interval set here based on the time set at “intermittent measurement start time” of the next section. (For example, when the next intermittent measurement time is set to 12:00 and the measurement interval is set to 6H, measurement is repeated at 12:00, 18:00, 24:00, and 06:00.)

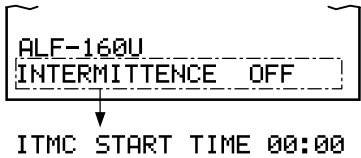
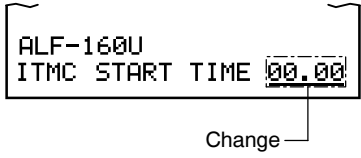
Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode “PARAM” screen.	ST-BY/MEAS (4 seconds or more) ↓ DATA/	>> 5.1(1) “Mode switching”
② Select “ITMC INTERVAL” in the item. 	\uparrow or \downarrow ↓ DATA/	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
③ Change intermittent measurement interval. 	\uparrow or \downarrow + DATA/ (digit shift) ↓ ENT/LOCK	<ul style="list-style-type: none"> • Setting range: 1 to 24 hours (Factory setting: 3hours) • After entry, the cursor disappears. • ESC: Returns to original state without making the change.
④ Return to measurement mode “MEAS” screen.	ESC ↓ ST-BY/MEAS (4 seconds or more)	<ul style="list-style-type: none"> • Return in the order of maintenance mode “ST-BY” screen → measurement mode “MEAS” screen.

(4) Intermittent measurement start time (ITMC START TIME)

The intermittent measurement start time can be set. Intermittent measurement is repeated at the interval set in the previous section beginning from this start time.

Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode "PARAM" screen.	ST-BY/MEAS (4 seconds or more) ↓ $\text{DATA} \rightarrow$	>> 5.1(1) "Mode switching"
② Select "ITMC START TIME 00:00". 	\uparrow or \downarrow ↓ $\text{DATA} \rightarrow$	<ul style="list-style-type: none"> The cursor blinks at the item to be changed.
③ Change intermittent measurement start time. 	\uparrow or \downarrow + $\text{DATA} \rightarrow$ (digit shift) ↓ ENT/LOCK	<ul style="list-style-type: none"> Setting range:0:00 to 23:00 After entry, the cursor disappears. ESC: Returns to original state without making the change.
④ Return to measurement mode "MEAS" screen.	ESC ↓ ST-BY/MEAS (4 seconds or more)	<ul style="list-style-type: none"> Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

(5) Range switching type (REMOTE R)


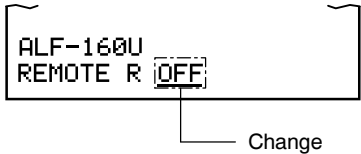
(a) The measuring range switching type can be changed to either of the following:

- Manual type >> 5.3(6) “Range”
- Remote type

(b) For the remote type, when between the specified terminals is “open”, range 1 (low side) is selected and when between the specified terminals is “closed”, range 2 (high side) is selected.

- Terminal specification >> 5.3(23) “Input signal”

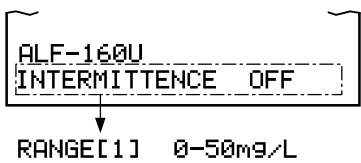
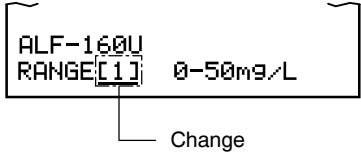
Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode “PARAM” screen.	ST-BY/MEAS (4 seconds or more) ↓ DATA/	>> 5.1(1) “Mode switching”
② Select “REMOTE_R OFF”.  ↓ REMOTE R OFF	\uparrow or \downarrow ↓ DATA/	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
③ Change the switching type. 	\uparrow or \downarrow ↓ ENT/LOCK	<ul style="list-style-type: none"> • OFF..... Manual type (Factory setting) • ON Remote type • After entry, the cursor disappears. • ESC: Returns to original state without making the change.
④ Return to measurement mode “MEAS” screen.	ESC ↓ ST-BY/MEAS (4 seconds or more)	<ul style="list-style-type: none"> • Return in the order of maintenance mode “ST-BY” screen → measurement mode “MEAS” screen.

(6) Range (RANGE)

- (a) The range can be set to either 0 to 50mg/L or 0 to 100mg/L.
- (b) The range is not displayed when the range switching system is the remote system. >> 5.3(5) "Range switching type"

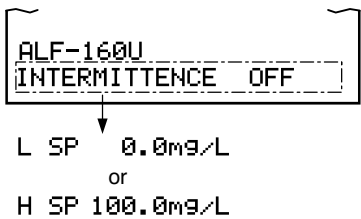
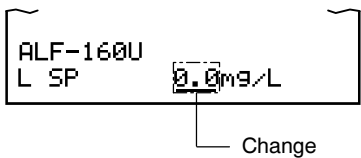
Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode "PARAM" screen.	(ST-BY/MEAS) (4 seconds or more) ↓ (DATA/→)	>> 5.1(1) "Mode switching"
② Select "RANGE[*]". 	(↑) or (↓) ↓ (DATA/→)	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
③ Change the switching type. 	(↑) or (↓) ↓ (ENT/LOCK)	<ul style="list-style-type: none"> • [1] 0 to 50mg/L • [2] 0 to 100mg/L • After entry, the cursor disappears. • (ESC): Returns to original state without making the change.
④ Return to measurement mode "MEAS" screen.	(ESC) ↓ (ST-BY/MEAS) (4 seconds or more)	<ul style="list-style-type: none"> • Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

(7) Alarm point (L SP, H SP)

The low limit alarm and high limit alarm points can be set.


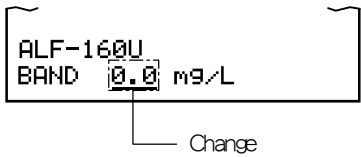
Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode "PARAM" screen.	ST-BY/MEAS (4 seconds or more) ↓ DATA/	>> 5.1(1) "Mode switching"
② Select "L SP" or "H SP". 	\uparrow or \downarrow ↓ DATA/	<ul style="list-style-type: none"> L SP 0.0 mg/L...Low alarm H SP 100.0 mg/L...High alarm The cursor blinks at the item to be changed.
③ Change the alarm point. 	\uparrow or \downarrow + DATA/ (digit shift) ↓ ENT/LOCK	<ul style="list-style-type: none"> Setting range: 0.0 to 100.0 (Factory setting: 0.0 and 100.0) After entry, the cursor disappears. ESC: Returns to original state without making the change.
Low limit alarm point example		
④ Return to measurement mode "MEAS" screen.	ESC ↓ ST-BY/MEAS (4 seconds or more)	<ul style="list-style-type: none"> Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

(8) Alarm band (BAND)

This is used when an alarm changed at par. 5.3(7) "Alarm point" is repeatedly turned on and off. Adjust the repetition frequency by gradually increasing the alarm dead band.

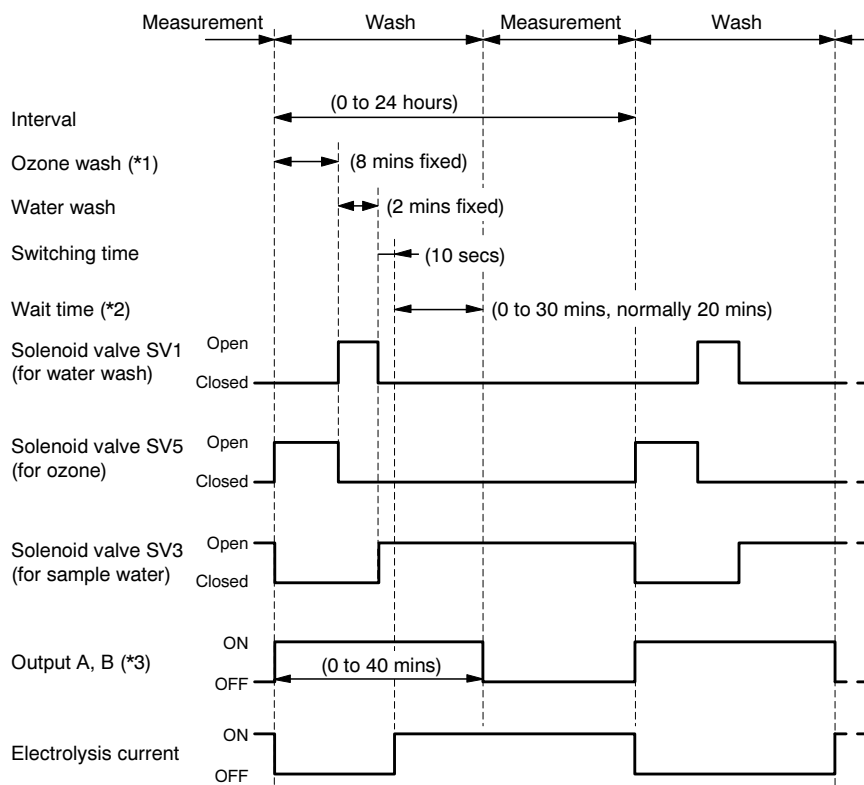
Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode "PARAM" screen.	ST-BY/MEAS (4 seconds or more) ↓ DATA/	>> 5.1(1) "Mode switching"
② Select the "BAND *.* mg/L".  ↓ BAND 0.0 mg/L	\uparrow or \downarrow ↓ DATA/	<ul style="list-style-type: none"> The cursor blinks at the item to be changed.
③ Change the alarm dead band. 	\uparrow or \downarrow + DATA/ (digit shift) ↓ ENT/LOCK	<ul style="list-style-type: none"> Setting range:0.0 to 5.0 (Factory setting:0.0) After entry, the cursor disappears. ESC: Returns to original state without making the change.
④ Return to measurement mode "MEAS" screen.	ESC ↓ ST-BY/MEAS (4 seconds or more)	<ul style="list-style-type: none"> Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

(9) Wash interval (WASH INTERVAL, when automatic wash or automatic span calibration is provided)

- (a) The wash interval can be set.
- (b) The wash operation is performed at the interval set here based on the time set at “wash start time” of the next section. (For example, when the next wash time is set to 12:00 and the wash interval is set to 6H, the wash operation is repeated at 12:00, 18:00, 24:00, and 06:00.)
- (c) The wash interval is usually 12 hours (factory setting), but make it suitably shorter according to the degree of soiling by the sample water. (For example, 6 hours, 3 hours, etc.)

[NOTE] •The wash operation set by this section (wash interval) and the next section (wash start time) is enabled only in the measurement mode and is not performed when the wash time arrives in the standby mode.



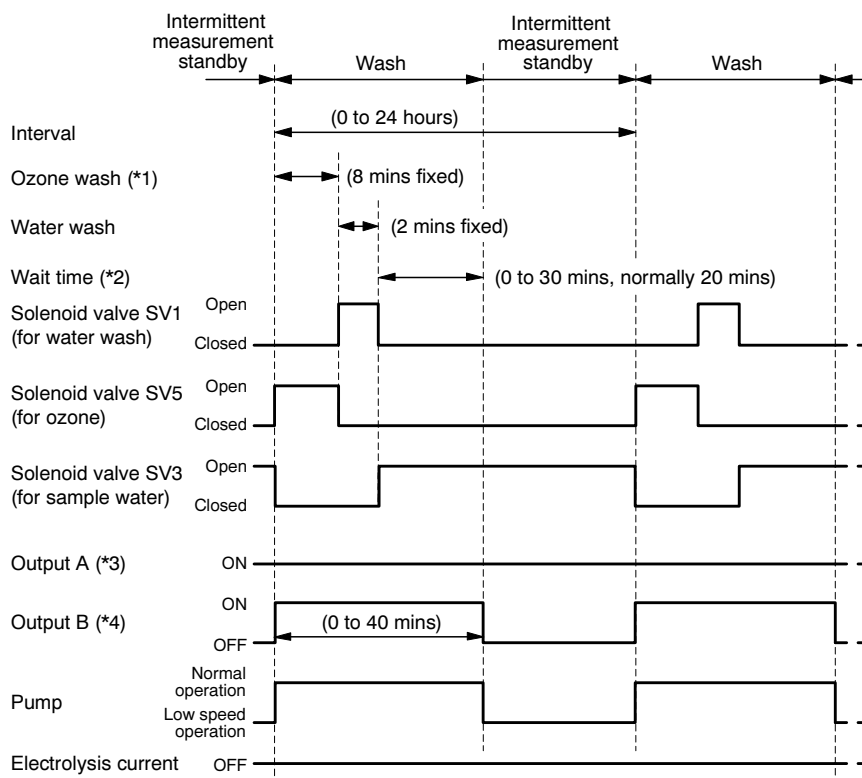
*1... Operates when automatic wash is selected and ozone wash and water wash are provided.

*2...>> 5.3 (11) "Wait time"

*3... A: Held measured value output >> 5.3 (18) "Output type"
 B: Set wash-in-progress output >> 5.3 (24) "Output signal"

[NOTE] •Solenoid valve operates as follows:
 SV1 and SV5: Closed normally (NC), SV3: Open normally (NO)

Automatic Wash Process (continuous measurement)



*1... Operates when automatic wash is selected and ozone wash and water wash are provided.

*2... >> 5.3 (11) "Wait time"

*3... A: Held measured value output >> 5.3 (18) "Output type"

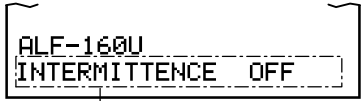

*4...B: Set wash-in-progress output >> 5.3 (24) "Output signal"

[NOTE] •Solenoid valve operates as follows:

SV1 and SV5: Closed normally (NC), SV3: Open normally (NO)

Automatic Wash Process (intermittent measurement)

Operation Procedure

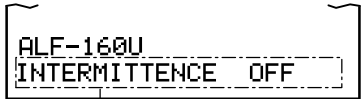

Procedure	Operation	Remarks
① Select the setting mode “PARAM” screen.	(ST-BY/MEAS) (4 seconds or more) ↓ DATA/→	>> 5.1(1) “Mode switching”
② Select “WASH INTERVAL **hr”.  WASH INTERVAL 12hr	↑ or ↓ ↓ DATA/→	<ul style="list-style-type: none"> The cursor blinks at the item to be changed.
③ Change the wash interval.  Change	↑ or ↓ + DATA/→ (digit shift) ↓ ENT/LOCK	<ul style="list-style-type: none"> Setting range:0 to 24h (Factory setting: 12) After entry, the cursor disappears. (ESC): Returns to original state without making the change.
④ Return to measurement mode “MEAS” screen.	(ESC) ↓ (ST-BY/MEAS) (4 seconds or more)	<ul style="list-style-type: none"> Return in the order of maintenance mode “ST-BY” screen → measurement mode “MEAS” screen. “MEAS” order.

(10) Wash start time (WASH START TIME, when automatic wash or automatic span calibration is provided)

The wash start time can be set.

- [NOTE]
- This item (next wash time) displays the next scheduled wash operation time. (For example, when the next wash time is set to 12:00 and the wash interval is set to 6H, after the 12:00, wash operation 18:00 is displayed.)
 - When set to before the current time, it becomes the time on the next day.
 - Even if set after the current time, when the set time has passed when the analyzer was returned to the measurement mode, the sum of the interval added to the set time becomes the next start time.

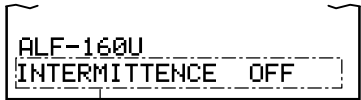
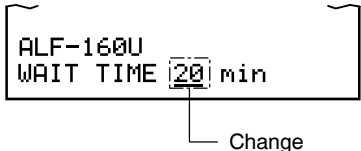
Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode "PARAM" screen.	<p>(ST-BY/MEAS)</p> <p>(4 seconds or more)</p> <p>↓</p> <p>(DATA/→)</p>	>> 5.1(1) "Mode switching"
② Select "WASH START TIME **:**.  WASH START TIME 12:00	<p>↑ or ↓</p> <p>↓</p> <p>(DATA/→)</p>	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
③ Change the wash start time.  Change	<p>↑ or ↓</p> <p>+</p> <p>(DATA/→) (digit shift)</p> <p>↓</p> <p>(ENT/LOCK)</p>	<ul style="list-style-type: none"> • Setting range:0:00 to 23:00 (Factory setting: 12:00) • After entry, the cursor disappears. • (ESC): Returns to original state without making the change.
④ Return to measurement mode "MEAS" screen.	<p>(ESC)</p> <p>↓</p> <p>(ST-BY/MEAS)</p> <p>(4 seconds or more)</p>	<ul style="list-style-type: none"> • Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

(11) Wait time (WAIT TIME, when automatic wash or automatic span calibration is provided)

- (a) The wait time after the end of automatic wash and automatic span calibration can be set.
- (b) The wait time sets the time until the analyzer returns to the actual sample water measurement state and the indication returns to its state before each operation after the end of automatic wash and automatic span calibration.
- (c) The automatic wash and automatic span calibration and wait time measured value output (transmission output) depends on the output type setting. >> 5.3(18) "Output type"

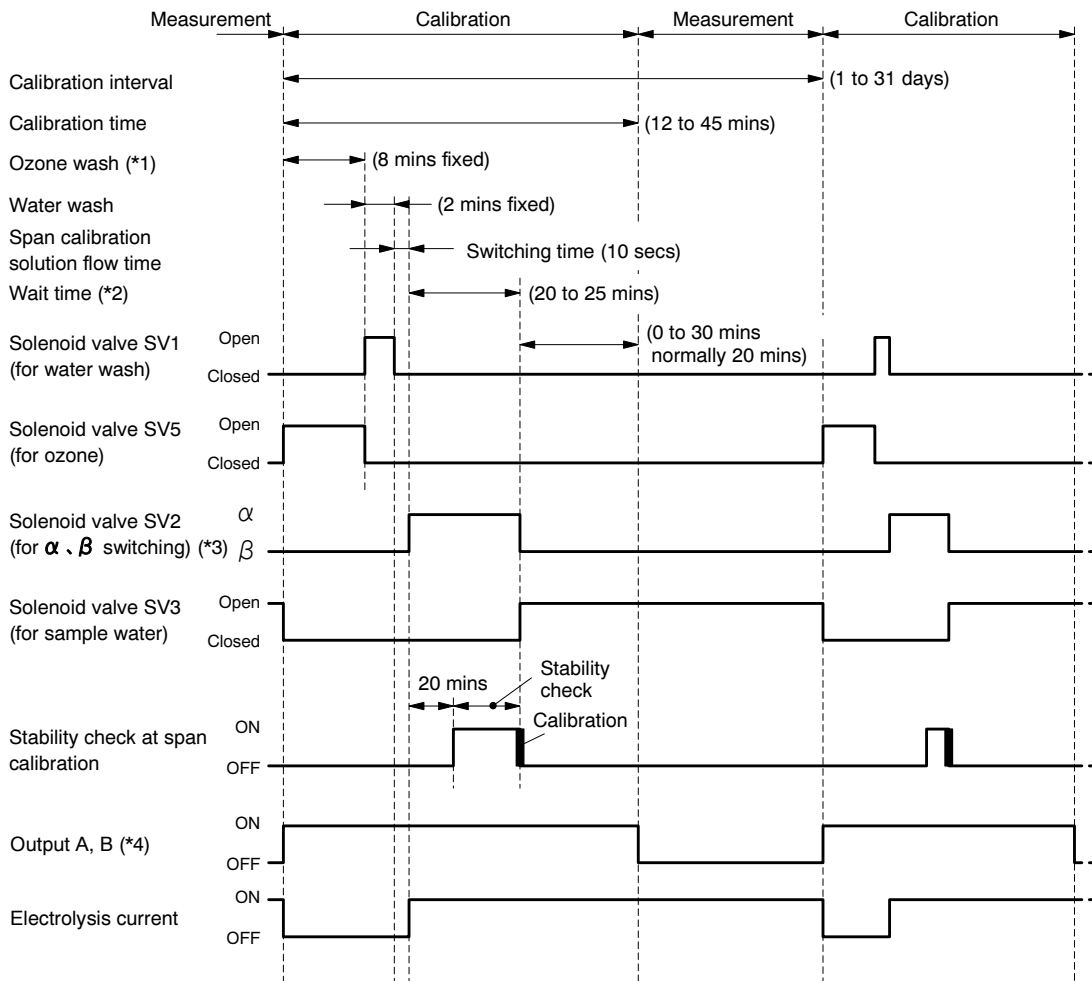
Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode "PARAM" screen.	ST-BY/MEAS (4 seconds or more) ↓ DATA/	>> 5.1(1) "Mode switching"
② Select "WAIT TIME ** min".  ↓ WAIT TIME 20 min	↑ or ↓ ↓ DATA/	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
③ Change the wait time. 	↑ or ↓ + DATA/ (digit shift) ↓ ENT/LOCK	<ul style="list-style-type: none"> • Setting range: 0 to 30min (Factory setting: 20) • After entry, the cursor disappears. • ESC: Returns to original state without making the change.
④ Return to measurement mode "MEAS" screen.	ESC ↓ ST-BY/MEAS (4 seconds or more)	<ul style="list-style-type: none"> • Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

(12) Calibration interval (CAL INTERVAL, when automatic span calibration is provided)

Automatic span calibration interval can be set.

- [NOTE]
- The calibration conditions set at this section (calibration interval) and the next section (calibration date) are effective in the measurement mode only. They are not applicable to the maintenance mode, setting mode, and calibration mode.
 - When the analyzer is switched to the maintenance mode midway, it enters the measurement state.
 - When an E-6, E-7, or E-8 error is generated during the calibration process, calibration is not performed.



*1... Operates when automatic wash is selected and ozone wash and water wash are provided.
When only water wash is provided, this operation is omitted.

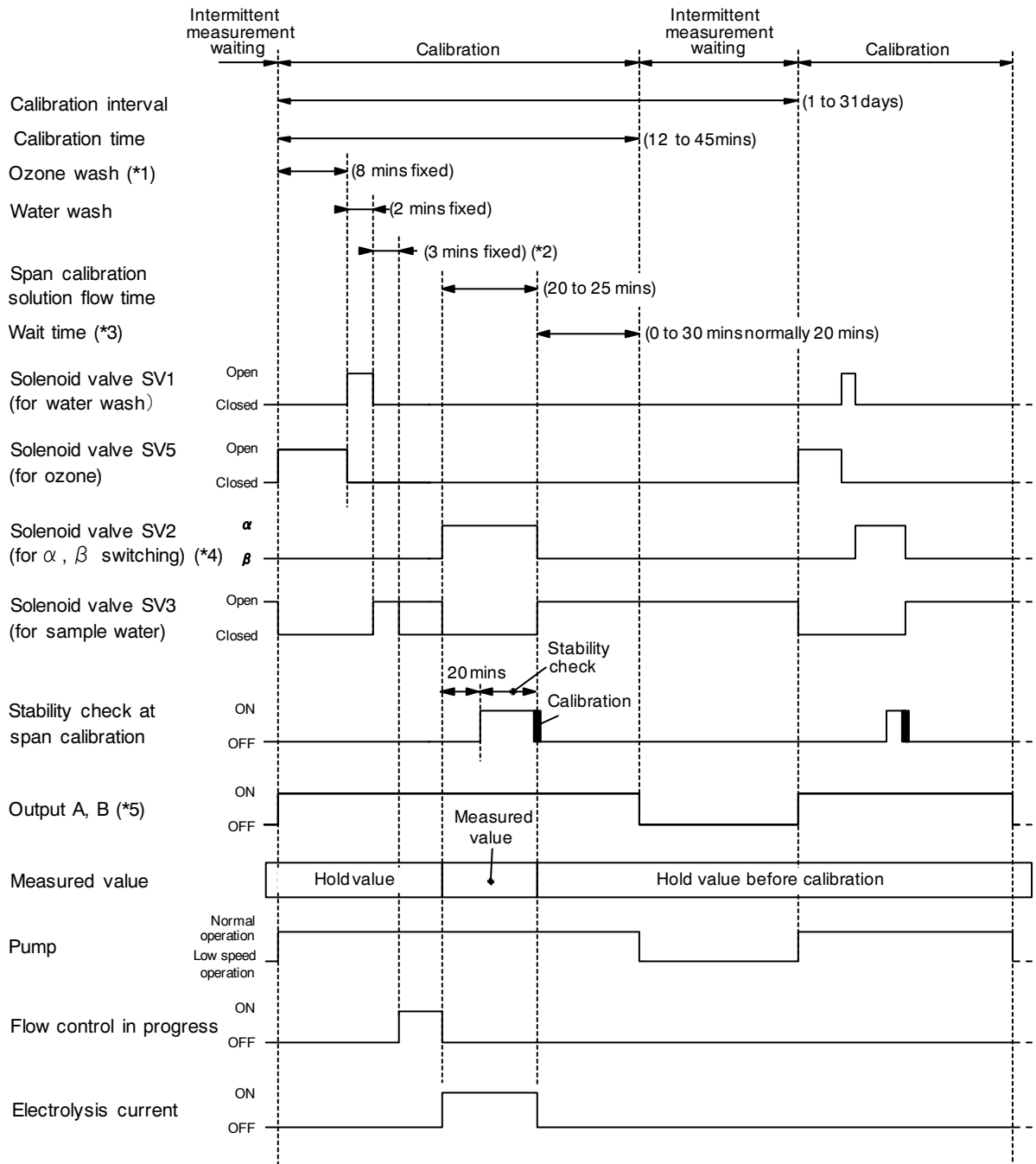
*2...>> 5.3 (11) "Wait time"

*3... α : calibration solution, β : sample water

*4... A: Held measured value output >> 5.3 (18) "Output type"
B: Set calibration-in-progress output >> 5.3 (24) "Output signal"

- [NOTE]
- Solenoid valve operates as follows:
2-way valve...SV1 and SV5: Closed normally (NC), SV3: Open normally (NO)
3-way valve...SV2: Sample water and calibration solution are switched.

Automatic Span Calibration Process (continuous measurement)



*1... Operates when automatic wash is selected and ozone wash and water wash are provided. When only water wash is provided, this operation is omitted.

*2... Time for only water wash. When ozone wash and water wash are provided, this time is 0 minute.

*3... >> 5.3 (11) "Waittime"

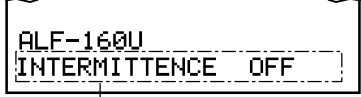

*4... α : calibration solution, β : sample water

*5... A: Held measured value output >> 5.3 (18) "Output type"
 B: Set calibration-in-progress output >> 5.3 (24) "Output signal"

[NOTE] • Solenoid valve operates as follows:
 2-way valveSV1 and SV5: Closed normally (NC), SV3: Open normally (NO)
 3-way valveSV2: Sample water and calibration solution are switched.

Automatic Span Calibration Process (intermittent measurement)

Operation Procedure

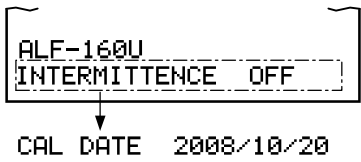
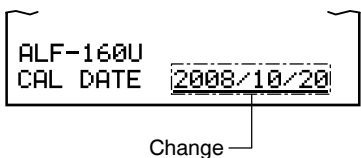
Procedure	Operation	Remarks
① Select the setting mode “PARAM” screen.	ST-BY/MEAS (4 seconds or more)	>> 5.1(1) “Mode switching”
↓		
DATA/		
② Select “CAL INTERVAL 10day”.	\uparrow or \downarrow	<ul style="list-style-type: none"> The cursor blinks at the item to be changed.
 <p style="text-align: center;">↓</p> <p style="text-align: center;">CAL INTERVAL 10day</p>	DATA/	
③ Change the calibration interval.	\uparrow or \downarrow	<ul style="list-style-type: none"> Setting range: 1 to 31 day (Factory setting: 10) After entry, the cursor disappears. ESC: Returns to original state without making the change.
 <p style="text-align: center;">Change</p>	+ DATA/ (digit shift) ↓ ENT/LOCK	
④ Return to measurement mode “MEAS” screen.	ESC ↓ ST-BY/MEAS (4 seconds or more)	<ul style="list-style-type: none"> Return in the order of maintenance mode “ST-BY” screen → measurement mode “MEAS” screen.

(13) Calibration date (CAL DATE, when automatic span calibration is provided)

- (a) The automatic span calibration execution date can be set.
- (b) The first automatic span calibration is performed on the date set here.
- (c) Thereafter automatic span calibration is performed at the calibration interval (CAL INTERVAL) set at the previous section.

[NOTE] • The next calibration start date is displayed at this item. (For example, when the next start date was set to 2008/10/02 and the calibration interval was set to 10 days, after the end of automatic calibration on October 2, “2008/10/12” is displayed.)

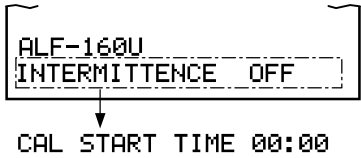
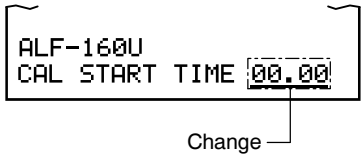
Operation Procedure

Procedure	Operation	Remarks
<p>① Select the setting mode “PARAM” screen.</p>	<p>(ST-BY/MEAS) (4 seconds or more)</p> <p>↓ DATA/→</p>	>> 5.1(1) “Mode switching”
<p>② Select “CAL DATE 200*/**/**”.</p> 	<p>↑ or ↓ DATA/→</p>	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
<p>③ Change the calibration date.</p> 	<p>↑ or ↓ + DATA/→ (digit shift) ↓ ENT/LOCK</p>	<ul style="list-style-type: none"> • Setting range: up to 2099/12/31 • After entry, the cursor disappears. • (ESC): Returns to original state without making the change.
<p>④ Return to measurement mode “MEAS” screen.</p>	<p>(ESC) ↓ (ST-BY/MEAS) (4 seconds or more)</p>	<ul style="list-style-type: none"> • Return in the order of maintenance mode “ST-BY” screen → measurement mode “MEAS” screen.

(14) Calibration start time (CAL START TIME, when automatic span calibration is provided)

The automatic span calibration start time can be set.



Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode "PARAM" screen.	(ST-BY/MEAS) (4 seconds or more) ↓ (DATA/→)	>> 5.1(1) "Mode switching"
② Select "CAL START TIME 00:00" 	(↑) or (↓) ↓ (DATA/→)	<ul style="list-style-type: none"> The cursor blinks at the item to be changed.
③ Change the calibration start time. 	(↑) or (↓) + (DATA/→) (digit shift) ↓ (ENT/LOCK)	<ul style="list-style-type: none"> Setting range: 0:00 to 23:00 by 1 hour After entry, the cursor disappears. (ESC): Returns to original state without making the change.
④ Return to measurement mode "MEAS" screen.	(ESC) ↓ (ST-BY/MEAS) (4 seconds or more)	<ul style="list-style-type: none"> Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

(15) Automatic calibrated value (AUTO S VAL, when automatic span calibration is provided)

The prepared standard solution concentration when automatic scan calibration is performed is set here.

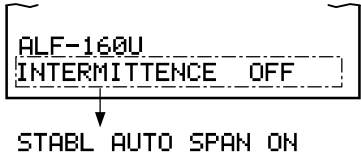
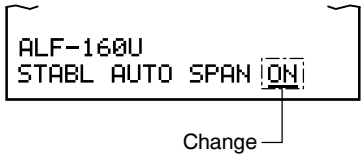
Operation Procedure

Procedure	Operation	Remarks
<p>① Select the setting mode "PARAM" screen.</p>	<p>(ST-BY/MEAS) (4 seconds or more)</p> <p>↓ DATA/→</p>	>> 5.1(1) "Mode switching"
<p>② Select "AUTO S VAL ***.*"</p>  <p>AUTO S VAL ***.* mg/L</p>	<p>↑ or ↓ ↓ DATA/→</p>	<ul style="list-style-type: none"> The cursor blinks at the item to be changed.
<p>③ Change the automatic span calibrated value.</p>  <p>Change</p>	<p>↑ or ↓ + DATA/→ (digit shift) ↓ ENT/LOCK</p>	<ul style="list-style-type: none"> Setting range: 0 to 100.0 After entry, the cursor disappears. (ESC): Returns to original state without making the change.
<p>④ Return to measurement mode "MEAS" screen.</p>	<p>(ESC) ↓ (ST-BY/MEAS) (4 seconds or more)</p>	<ul style="list-style-type: none"> Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

(16) Stability check at automatic span calibration (STBL AUTO SPAN, when automatic span calibration is provided)

Stability check at automatic span calibration can be selected.

Operation Procedure

Procedure	Operation	Remarks
<p>① Select the setting mode “PARAM” screen.</p>	<p>(ST-BY/MEAS) (4 seconds or more) ↓ DATA →</p>	<p>>> 5.1(1) “Mode switching”</p>
<p>② Select “STBL AUTO SPAN ON”</p> 	<p>↑ or ↓ ↓ DATA →</p>	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
<p>③ Change the stability check.</p> 	<p>↑ or ↓ ↓ ENT/LOCK</p>	<ul style="list-style-type: none"> • ON: Perform stability check • OFF: Do not perform stability check • After entry, the cursor disappears. • (ESC): Returns to original state without making the change.
<p>④ Return to measurement mode “MEAS” screen.</p>	<p>(ESC) ↓ (ST-BY/MEAS) (4 seconds or more)</p>	<ul style="list-style-type: none"> • Return in the order of maintenance mode “ST-BY” screen → measurement mode “MEAS” screen.

(17) Response speed (RESPONSE)

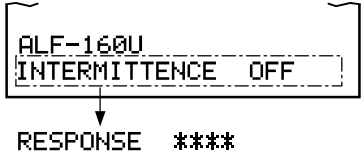
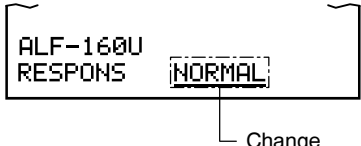
(a) The measured value response speed can be changed to any of the following:

- FAST (Fast response)
- NORMAL (Standard)
- SLOW (Slow response)

(b) Indication fluctuations during measurement are noticeable “SLOW”

For speeding up the response with sample water having a large indication change “FAST”

Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode “PARAM” screen.	ST-BY/MEAS (4 seconds or more) ↓ $\text{DATA} \rightarrow$	>> 5.1(1) “Mode switching”
② Select “RESPONSE ***”. 	\uparrow or \downarrow ↓ $\text{DATA} \rightarrow$	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
③ Change the response speed. 	\uparrow or \downarrow ↓ ENT/LOCK	<ul style="list-style-type: none"> • FAST...Fast • NORMAL...Normal (Factory setting) • SLOW...Slow • After entry, the cursor disappears. • ESC: Returns to original state without making the change.
④ Return to measurement mode “MEAS” screen.	ESC ↓ ST-BY/MEAS (4 seconds or more)	<ul style="list-style-type: none"> • Return in the order of maintenance mode “ST-BY” screen → measurement mode “MEAS” screen.

(18) Output type (OUT TYPE, DUMMY OUT)

(a) The output type can be changed to any of the following:

- Hold Output is fixed to the immediately preceding measured value.
- Dummy Output is fixed to an arbitrarily set value.
- Through Outputs the measured value directly (not held).

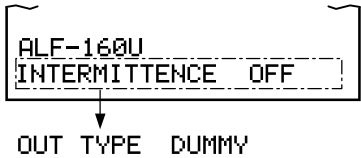
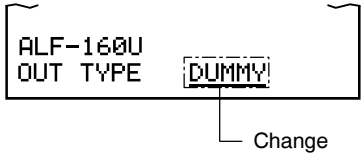
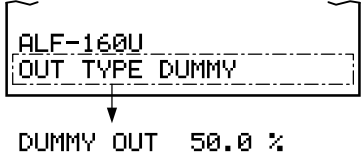
(b) This setting is applied to the following measured value outputs:

- Automatic wash in progress or automatic calibration in progress in the “measurement mode”
- In the “maintenance mode”, “setting mode”, and “calibration mode”

(c) When “dummy” is selected, a screen for changing the dummy value is displayed after the “OUT TYPE DUMMY” screen of the bottom display.

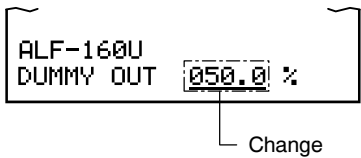
- Dummy value change “DUMMY OUT ***.* %”

Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode “PARAM” screen.	(ST-BY/MEAS) (4 seconds or more) ↓ DATA/→	>> 5.1(1) “Mode switching”
② Select “OUT TYPE ***”. 	↑ or ↓ ↓ DATA/→	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
③ Change the output type in the maintenance. 	↑ or ↓ ↓ ENT/LOCK	<ul style="list-style-type: none"> • HOLD Fixed output of immediately preceding value • DUMMY Fixed output of arbitrary value (Factory setting) • THROUGH ... Not held • After entry, the cursor disappears. • (ESC): Returns to original state without making the change. • When “HOLD” or “THROUGH” is selected, the screen goes to step ⑥.
④ Select “DUMMY OUT ***.* %”. 	↓ ↓ DATA/→	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.

(To be continued)

(Continued from previous page)

Procedure	Operation	Remarks
<p>⑤ Change the dummy value.</p> 	<p> (↑) or (↓) + (DATA/→) (digit shift) ↓ (ENT/LOCK) </p>	<ul style="list-style-type: none"> • Setting range: 000.0 to 100.0%FS (Factory setting: 50.0) • After entry, the cursor disappears. • (ESC): Returns to original state without making the change.

<p>⑥ Return to measurement mode "MEAS" screen.</p>	<p> (ESC) ↓ (ST-BY/MEAS) (4 seconds or more) </p>	<ul style="list-style-type: none"> • Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

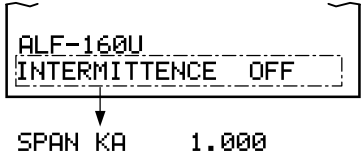
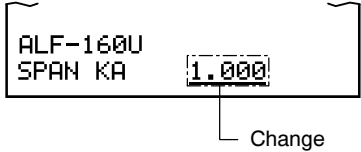
(19) Correction coefficient (SPAN KA)

- (a) The measured value can be corrected by correction coefficient (SPAN KA).
- (b) Perform this operation only when matching to manual analysis or other standard value is necessary. The measured value is changed by multiplying the calibration curve created by calibration by the correction coefficient.
- (c) This function is mainly for technical service. Do not perform it unnecessarily.
- (d) The following shows how to find this coefficient.

Correction coefficient = Original correction coefficient X (sample water analyzed value/measured value)

Example Analyzer measured value..... 50.0mg/L
 Sample water manual analysis value.... 40.0mg/L
 Original correction coefficient..... 1.000
 \therefore Correction coefficient = $1.000 \times (40.0/50.0) = 0.800$

Operation Procedure

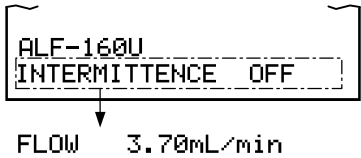
Procedure	Operation	Remarks
① Select the setting mode "PARAM" screen.	(ST-BY/MEAS) (4 seconds or more) ↓ (DATA/→)	>> 5.1(1) "Mode switching"
② Select "SPAN KA ****". 	(↑) or (↓) ↓ (DATA/→)	<ul style="list-style-type: none"> The cursor blinks at the item to be changed.
③ Change the correction coefficient. 	(↑) or (↓) + (DATA/→) (digit shift) ↓ (ENT/LOCK)	<ul style="list-style-type: none"> Setting range: 0.750 to 1.250 (Factory setting: 1.000) After entry, the cursor disappears. (ESC): Returns to original state without making the change.
④ Return to measurement mode "MEAS" screen.	(ESC) ↓ (ST-BY/MEAS) (4 seconds or more)	<ul style="list-style-type: none"> Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

(20) Flow target value (FLOW)

- (a) The sample water flow target value can be set.
- (b) This analyzer periodically measures the sample water flow automatically and controls it to 3.7mL/min (factory setting).
- (c) Here only check the flow target value, do not change it. If the target value is changed, correct measurement will become impossible.

[NOTE] •Setting range:1.7 to 5.1mL/min (for technical service)

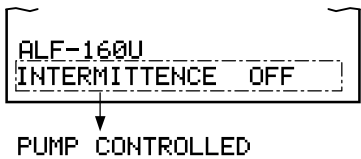
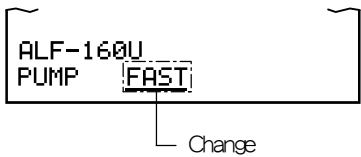
Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode "PARAM" screen.	(ST-BY/MEAS) (4 seconds or more) ↓ DATA →	>> 5.1(1) "Mode switching"
② Select "FLOW *.*mL/min". 	↑ or ↓	• Here only check the setting, do not change the value.
③ Return to measurement mode "MEAS" screen.	(ESC) ↓ (ST-BY/MEAS) (4 seconds or more)	• Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

(21) Pump control (PUMP)

- (a) The pump flow can be temporarily increased. Combined with “sampling pump ON/OFF” of the next section, only the reagent can be filled and replaced by fast feeding only the reagent pump.
- (b) To shorten the reagent replacement time at reagent replacement and tube replacement, fast feed for about 10 minutes is recommended.

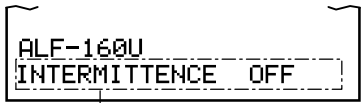
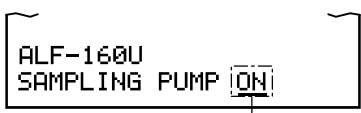
Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode “PARAM” screen.	(ST-BY/MEAS) (4 seconds or more) ↓ DATA →	>> 5.1(1) “Mode switching”
② Select “PUMP CONTROLLED”. 	↑ or ↓ ↓ DATA →	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
③ Change the setting. 	↑ or ↓ ↓ ENT/LOCK	<ul style="list-style-type: none"> • CONTROLLEDNormal operation speed FASTOperation speed gets faster. • After entry, the cursor disappears. • (ESC): Returns to original state without making the change.
④ Return to measurement mode “MEAS” screen.	(ESC) ↓ (ST-BY/MEAS) (4 seconds or more)	<ul style="list-style-type: none"> • Return in the order of maintenance mode “ST-BY” screen → measurement mode “MEAS” screen.

(22) Sampling pump ON/OFF (SAMPLING PUMP)

- (a) The sampling pump can be temporarily stopped when you want to fill the reagent, etc. by operating only the reagent pump at the start of operation, etc.
- (b) To shorten the reagent replacement time after reagent and tube replacement, stopping the sampling pump by the procedure described in this section and fast feeding the reagent pump for about 10 minutes is recommended.

Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode "PARAM" screen.	ST-BY/MEAS (4 seconds or more) ↓ $\text{DATA} \rightarrow$	>> 5.1(1) "Mode switching"
② Select "SAMPLING PUMP OFF".  ↓ SAMPLING PUMP	\uparrow or \downarrow ↓ $\text{DATA} \rightarrow$	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
③ Change the setting.  Change	\uparrow or \downarrow ↓ ENT/LOCK	<ul style="list-style-type: none"> • ON..... Sampling pump operates. • OFF.... Sampling pump stops. • After entry, the cursor disappears. • ESC: Returns to original state without making the change.
④ Return to measurement mode "MEAS" screen.	ESC ↓ ST-BY/MEAS (4 seconds or more)	<ul style="list-style-type: none"> • Return in the order of maintenance mode "ST-BY" screen → measurement mode "MEAS" screen.

(23) Input signal (DI-□□□□)

Terminal assignment of each of the following signal inputs can be set.

- Wash start
- Calibration start
- Measurement switching
- Range switching

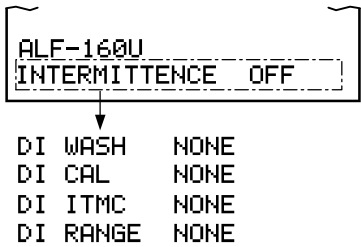
【IMPORTANT】 • If a terminal is not allocated, remote operation is impossible.

Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode “PARAM” screen.	ST-BY/MEAS (4 seconds or more)	>> 5.1(1) “Mode switching”
↓		
② Select the input signal.	$\text{DATA} \rightarrow$ ↓ \uparrow or \downarrow ↓ $\text{DATA} \rightarrow$	<ul style="list-style-type: none"> • Select the set signal. DI-WASH Wash start DI-CAL Calibration start DI-INMIT Measurement switching DI-RANGE ... Range switching • The cursor blinks at the item to be changed.

③ Change the setting.	\uparrow or \downarrow ↓ ENT/LOCK	<ul style="list-style-type: none"> • NONE Not set DIN-1.....Set to terminal “50-51” DIN-2.....Set to terminal “52-53” DIN-3.....Set to terminal “54-55” (Factory setting conforms to the specifications.) • Allocation is possible by duplicating each output terminal up to 3 points. • When multiple points are allocated, the allocated functions are performed simultaneously. • After the change is entered, the cursor goes off. • ESC: No change • To change the setting of other input signals, return to “②”.

④ Return to measurement mode “MEAS” screen.	ESC ↓ ST-BY/MEAS (4 seconds or more)	<ul style="list-style-type: none"> • Return in the order of maintenance mode “ST-BY” screen → measurement mode “MEAS” screen.



DI WASH NONE
DI CAL NONE
DI ITMC NONE
DI RANGE NONE



Change
Example of wash start

(24) Output signal (DO-□□□□)

Allocation of the terminals which output the following signals can be changed:

- Maintenance in progress • Wash in progress • Calibration in progress • Analyzer error
- Low limit alarm • High limit alarm • Range 1 • Range 2

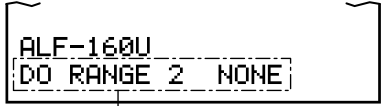

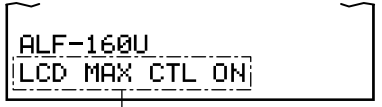
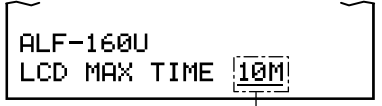
Operation Procedure

Procedure	Operation	Remarks
<p>① Select the setting mode “PARAM” screen.</p>	<p style="text-align: center;">(ST-BY/MEAS)</p> <p style="text-align: center;">(4 seconds or more)</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">(DATA/→)</p>	<p style="text-align: right;">>> 5.1(1) “Mode switching”</p>
<p>② Select the output signal.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>ALF-160U</p> <p>INTERMITTENCE OFF</p> </div> <p style="text-align: center;">↓</p> <pre> DO ST-BY NONE DO WASH NONE DO CAL NONE DO ERROR NONE DO L NONE DO H NONE DO RANGE 1 NONE DO RANGE 2 NONE </pre>	<p style="text-align: center;">(↑) or (↓)</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">(DATA/→)</p>	<ul style="list-style-type: none"> • Select the set output signal. DO STBY Maintenance in progress DO WASH Wash in progress DO CAL Calibration in progress DO ERROR Analyzer error DO L Concentration low limit alarm DO H Concentration high limit alarm DO RANGE-1... Range 1 DO RANGE-2... Range 2 • The cursor blinks at the item to be changed.
<p>③ Change the setting.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>ALF-160U</p> <p>DO ST-BY [NONE]</p> </div> <p style="text-align: center;">Change</p> <p style="text-align: center;">Example of maintenance in progress</p>	<p style="text-align: center;">(↑) or (↓)</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">(ENT/LOCK)</p>	<ul style="list-style-type: none"> • NONE Not set DOUT-1 ... Terminal “30-31-32” DOUT-2 ... Terminal “34-35” DOUT-3 ... Terminal “36-37” DOUT-4 ... Terminal “38-39” DOUT-5 ... Terminal “40-41” DOUT-6 ... Terminal “42-43” (Factory setting conforms to the specifications.) • Allocation is possible by duplicating each output terminal up to 3 points. • If multiple points are allocated, when any one of the allocated functions is turned “ON”, the contacts are “closed”. • If allocated to DOUT-1, when the allocated function is turned “ON” or the power is interrupted, the contacts are “closed”. (When connected to “31-32”.) • After the change is entered, the cursor goes off. • (ESC): No change • To change the setting of other output signals, return to “②”.
<p>④ Return to measurement mode “MEAS” screen.</p>	<p style="text-align: center;">(ESC)</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">(ST-BY/MEAS)</p> <p style="text-align: center;">(4 seconds or more)</p>	<ul style="list-style-type: none"> • Return in the order of maintenance mode “ST-BY” screen → measurement mode “MEAS” screen.

(25) LCD high contrast (LCD MAX CTL, LCD MAX TIME)

- (a) The contrast of LCD screen can be temporally maximized by this function.
- (b) Use this function in the measurement mode or maintenance mode when the LCD is difficult to see in locations, such as the outdoors in fine weather. For the method of using >> 5.1(2) “LCD high contrast”
- (c) When the set time (recovery time) passed, the screen returns to the regular contrast display.

Operation Procedure

Procedure	Operation	Remarks
① Select the setting mode “PARAM” screen.	(ST-BY/MEAS) (4 seconds or more) ↓ (DATA/→)	>> 5.1(1) “Mode switching”
② Select the “LCD MAX CTL ***” screen.  ↓ LCD MAX CTL ON	(↑) or (↓) ↓ (DATA/→)	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
③ Change the setting.  Change	(↑) or (↓) ↓ (ENT/LOCK)	<ul style="list-style-type: none"> • ONSet the LCD high contrast function. • OFFDo not set the LCD high contrast function. (Factory setting: ON) • After the change is entered, the cursor goes off. • (ESC): Return without updating the setting.
④ Select the “LCD MAX TIME ***” screen.  ↓ LCD MAX TIME 10M	(↓) (When ③ is “ON”)	<ul style="list-style-type: none"> • The cursor blinks at the item to be changed.
⑤ Change the contrast recovery time.  Change	(↑) or (↓) + (DATA/→) (digit shift) ↓ (ENT/LOCK)	<ul style="list-style-type: none"> • Setting range: 1 to 90 (Factory setting: 10M) • After the change is entered, the cursor goes off. • (ESC): Return without updating the setting.
⑥ Return to measurement mode “MEAS” screen.	(ESC) ↓ (ST-BY/MEAS) (4 seconds or more)	<ul style="list-style-type: none"> • Return in the order of maintenance mode “ST-BY” screen → measurement mode “MEAS” screen.

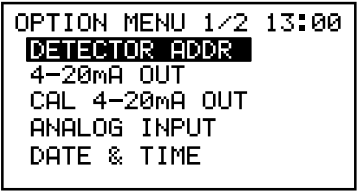
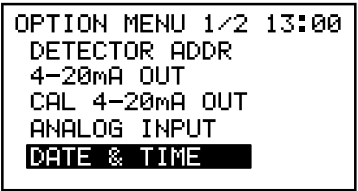
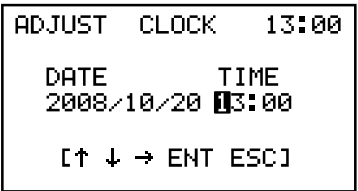
5.4 Clock Adjustment

- (a) The time displayed at the top right-hand side of the screen can be adjusted.
- (b) Automatic wash or automatic zero calibration is started in accordance with this clock.

【IMPORTANT】

- In clock adjustment, items important from the standpoint of operation are operable. Do not operate items other than the clock.
- If the product is turned off for a week or more, clock data may be initialized. In this case, set a clock to the right time by the procedure in the following table.

Operation Procedure

Procedure	Operation	Remarks
① Select the maintenance mode “ST-BY” screen.	(ST-BY/MEAS) (4 seconds or more)	>> 5.1(1) “Mode switching”
② Select the “OPTION MENU 1/2” screen. Display the “OPTION MENU 1/2” screen by performing the key operations shown at the right.	When ① maintenance mode is selected, (ESC) + (READ) (4 seconds or more)	• “DETECTOR ADDR” is reverse displayed.
		
③ Select “DATE & TIME” in the item.	(↑) or (↓) ↓ (DATA/→)	• DATE & TIME is reverse displayed by using the up and down keys. (Do not select anything other than “DATE & TIME”.) • Switches to the next time change screen at the time (DATA/→) is pressed.
		
④ Change the date.	(DATA/→) (Changing place shift) + (↑) or (↓) (Number change) ↓ (ENT/LOCK) (Confirmed)	• The tens digit of the time is reverse displayed. Move the reverse display to the place you want to change. Then perform the setting or change using the up and down keys. • After entry, the analyzer returns to the “OPTION MENU 1/2” screen of step ③.
		
⑤ Return to the maintenance mode “ST-BY” screen.	(ESC) (4 seconds or more)	

6. Maintenance

6.1 Maintenance List

(a) To operate the product correctly at all times and maintain its specified performance, it is necessary for you to thoroughly understand its function and perform maintenance periodically.

【IMPORTANT】 • Operating the product without performing maintenance periodically can result in a failure.

(b) The “Maintenance cycle” described in the table “Standard Maintenance List” is based on the standard installation condition (condition that satisfies the items in 9.1(1) “Installation site”). Depending on the condition, the maintenance cycle may differ. Modify the maintenance cycle based on the operating condition carried out more than several months.

(c) For technical services such as repairs, please call a sales representative in your area or directly contact our company. A specialist who is qualified for the technical certification system in our company or a person who has technical skills equivalent to that certification system must perform technical services.

Standard Maintenance List

No.	Subject	Contents	Maintenance Cycle						Execution method, etc
			Start	1 month	3 months	6 months	1 year	When needed	
1	Reagent solution tank	Filling of reagent solution, replacement	○	○					>> 2.1 “Preparing the Reagent Solution”
2	Reference electrode	Filling of internal solution		○					>> 6.3 “Removing the Electrodes” >> 6.5 “Filling with the Reference Electrode Internal Solution”
3	Glass electrode	Cleaning, replacement				○	Replacement		>> 6.3 “Removing the Electrodes” >> 6.4 “Cleaning the Glass Electrode”
4	Electrolysis electrodes	Inspection, cleaning	○	○					>> 6.7 “Cleaning the Electrolysis Electrodes”
5	Flow cell	Inspection, cleaning		○					>> 6.9 “Cleaning the Flow Cell”
6	Electrolysis filter	Replacement					○		>> 6.8 “Replacing the Electrolysis Filter”
7	Pump	Replacement of tube				○			>> 6.10 “Replacing the Pump Tube”

(To be continued)

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






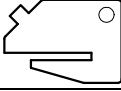
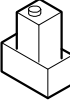
No.	Subject		Contents	Maintenance Cycle						Execution method, etc
				Start	1 month	3 months	6 months	1 year	When needed	
8	Calibration by standard solution	Without automatic calibration	Zero, span calibration		○					>> 4.1 “Preparing the Calibration Solution”
		With automatic calibration				○				
9	Solenoid valve		Inspection, replacement						○	>> 6.12 “Replacing the Solenoid Valves”
10	Piping tube		Cleaning, replacement					○		>> 9.2 “Piping”
11	Regulating tank		Cleaning			○				>> 6.11 “Regulating Tank Maintenance”

[NOTE] • Cycle is different depending on the quality of the sample water. When the sample water is noticeably dirty, use a shorter cycle.

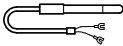

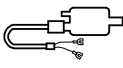
6.2 Accessories and Spare Parts

General accessories and spare parts are shown in the table below. These items differ depending on the specification and they are subject to change without notice. In addition, the instruction manual may be delivered separately from the product depending on the specification when ordered.

Accessories



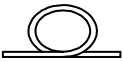

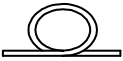
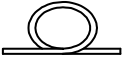







Order	Code No.	Part name	Sketch view	Q'ty	Note
1	—	Instruction manual		1	
2	—	Inspection report		1	
3	104A292	Time lag fuse 2A		2	Transmitter and detection section common
4	7168800K	Calibration solution tank assembly 2L		1	
5	136C019	Washing bottle with nozzle 500mL		1	
6	143G103	Extra pure grade anhydrous sodium sulfate 500g		2	
7	466671K	Filter assembly		1	
8	125B184	Tubing key		1	Jig for pump tube replacement
9	7178920U	30L tank unit		1	Reagent tank

Spare Parts

Order	Code No.	Part name	Sketch view	Q'ty			Replacement cycle	Note
				Consumables	Periodic replacement parts	Spare parts		
1	EL5041BF	Glass electrode			1	1	1 year	Flow cell
2	4668810S	Ceramic junction assembly			1	1	1 year	Reference electrode solution part
3	EL4084BF	Reference electrode 4084 type				1	3 years	Flow cell part












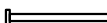



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Order	Code No.	Part name	Sketch view	Q'ty			Replacement cycle	Note
				Consumables	Periodic replacement parts	Spare parts		
4	EL2066CF	Electrolysis electrode 2066 type			2	2	1 year	Flow cell part
5	104A292	Time lag fuse 2A				2	1 year	Transmitter and detection section common
6	116D302	PFA tube $\phi 2 \times \phi 3$			1.5m		1 year	Calibration solution line
7	116D306	PFA tube $\phi 3 \times \phi 4$			0.5m		1 year	Wash water line
8	116D303	PFA tube $\phi 4 \times \phi 6$			1m		1 year	Sample water and wash water line
9	116E022	Hi-prene tube $\phi 7 \times \phi 11$			2m		1 year	Overflow line
10	116D253	Norprene tube 08NR		0.75m	0.75m		6 months	Reagent solution pump tube
11	116D251	Norprene tube 17NR		0.75m	0.75m		6 months	Sample water pump tube
12	117B001	Sleeve for Z union $\phi 3$ PP			1		1 year	For PFA tube ($\phi 2 \times \phi 3$) connection
13	117B402	Sleeve for Z union $\phi 4$ PP			2		1 year	For PFA tube ($\phi 3 \times \phi 4$) connection
14	117K041	Sleeve for Z union $\phi 6$ PP			4		1 year	For PFA tube($\phi 4 \times \phi 6$) connection
15	143A172	Silver-silver chloride electrode internal solution 3.3M KCl 500mL		1				Internal solution for reference electrode
16	143G103	Extra pure grade anhydrous sodium sulfate 500g		14				For electrolysis solution








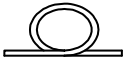
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Order	Code No.	Part name	Sketch view	Q'ty			Replacement cycle	Note
				Consumables	Periodic replacement parts	Spare parts		
17	466671K	Filter assembly			1		1 year	Filter for electrolysis solution of flow cell
18	47107200	Electrolysis electrode packing			2		1 year	For electrolysis electrodes
19	115A022	O-ring P10 NBR			2		1 year	For filter folder
20	115A474	O-ring S44 NBR			1		1 year	For manifold bottom plate
21	115A013	O-ring P7 NBR			2		1 year	Between flow cell and manifold
22	115A752	O-ring S6 FPM			3		1 year	Between regulating tank filter and regulating tank manifold
23	115A517	O-ring S5 FPM			1		1 year	Regulating tank filter
24	115A444	O-ring S34 FPM			1		1 year	Regulating tank cover
25	115A021	O-ring P10 FPM			1		1 year	Regulating tank cover
26	107A792	DC brushless motor 13H055B040				1	3 years	Flow cell stir motor
27	116E901	Joint tube				1	3 years	For flow cell stir
28	71286600	Stirring rod				1	3 years	For flow cell stir
29	71286200	Bushing				1	3 years	For flow cell stir
30	7128030U	Varistor unit			2		1 year	Transmitter and detection section common
31	7154560K	Solenoid valve assembly (2-way valve NO)				1	3 years	SV3

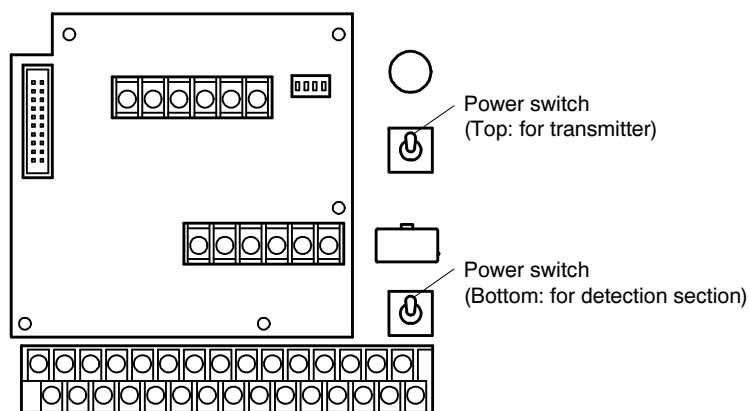
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Order	Code No.	Part name	Sketch view	Q'ty			Replacement cycle	Note
				Consumables	Periodic replacement parts	Spare parts		
32	7157100K	Solenoid valve assembly (3-way valve)				1	3 years	SV2
33	125B182	Pump head 08H				1	3 years	For Reagent solution pump
34	125B800	Pump head 17H				1	3 years	For sample water pump
35	126H189	Check valve #120CYV-3SI				3	3 years	CV1 to CV3
36	115A838	O-ring SS8 FPM				3	3 years	For CV1 to CV3 seal
37	7154550K	Solenoid valve assembly (2-way valve NC)				1	3 years	SV1 (When water wash is provided)
38	7154550K	Solenoid valve assembly (2-way valve NC)				2	3 years	SV1, 5 (When water and ozone wash are provided)
39	116D014	PTFE tube $\phi 6 \times \phi 8$			2m		2 years	Overflow line

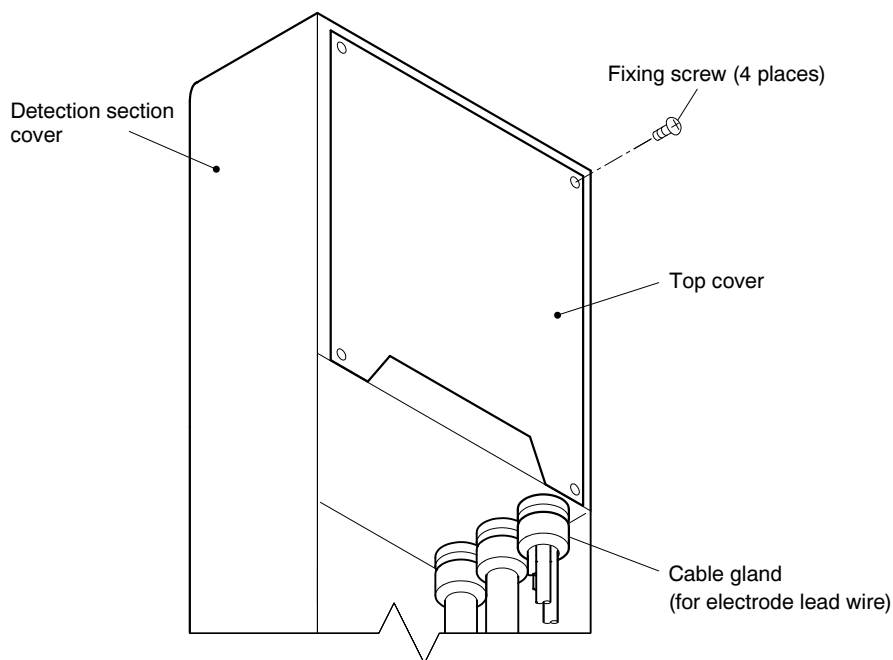
6.3 Removing the Electrodes

- ① **Turn off the power.** Turn off the transmitter power switches in the following order:
- Top switch → Bottom switch



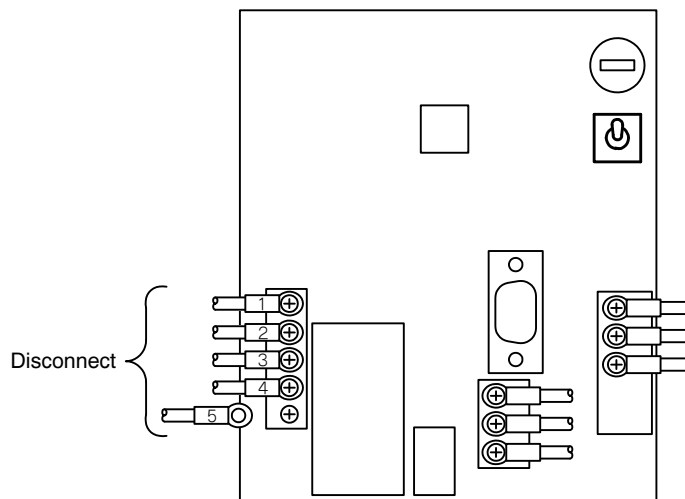
Power Switch Position

- ② **Remove the top cover.** Open the measuring section door and loosen the fixing screws (4 places) and remove the top cover.



Removing the Top Cover

- ③ **Disconnect the lead wires.** Loosen the terminal board screws and disconnect the electrolysis electrode terminals (1, 2), glass electrode terminals (3, 4) and reference electrode terminal (5) lead wires.



Disconnecting the Electrode Lead Wires

- ④ **Pull out lead wires.** Loosen the hexagon cap nut and slowly pull out each lead wire from the cable gland.
- ⑤ **Disconnect each electrode.** Disconnect each electrode as follows.
 - Glass electrode Slowly pull out tilted upward.
 - Reference electrode Slowly pull out upward.
 - Electrolysis electrode Go to 6.7 “Cleaning the Electrolysis Electrodes”

6.4 Cleaning the Glass Electrode

When the film surface of the glass electrode is dirty, the electromotive force of the glass electrode will change and its response will be slow. Therefore, periodically remove and clean the electrode.

-
- 【IMPORTANT】**
- Do not apply strong shock or vibration to the glass electrode. Even if the outside glass is not broken, the internal electrode and internal lead wire may be damaged or broken.
 - Do not get the glass electrode lead wire terminals dirty. If laid on the ground or floor, the terminals will collect dirt and insulation performance may drop. If the terminals should get dirty, clean them with alcohol, etc. and dry them before installing.
-

- (a) For light soiling, immerse the electrode part in clean water (city water, etc.) and remove the dirt while rubbing the electrode lightly with degreased cotton, etc.
- (b) For heavy soiling, select a suitable detergent from among soapy water, neutral detergent, 0.1 mol/L hydrochloric acid, etc. and remove the dirt by rubbing the electrode with degreased cotton, etc. A neutral detergent is suitable for organic soiling such as grease and 0.1 mol/L hydrochloric acid is effective for calcium carbonate and other inorganic substances.

-
- 【IMPORTANT】**
- Always wash the electrode thoroughly with ion exchange water after using a detergent.
-

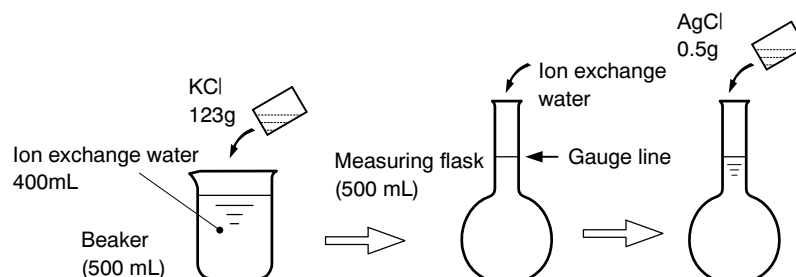


Hazardous substances

- Wear protective gear when handling the hydrochloric acid. Also always check the Material Safety Data Sheet (MSDS).
-

6.5 Filling with the Reference Electrode Internal Solution

The reference electrode internal solution slowly flows out from the ceramic part of the electrode end and the liquid surface drops. Prepare the internal solution as described below and periodically fill with the solution. The internal solution is a silver chloride saturated 3.3M potassium chloride solution.



Preparing the Internal Solution

① Prepare the solution.

- ACS grade potassium chloride (KCl, molecular weight 74.56) 123g
- ACS grade silver chloride (AgCl, molecular weight 143.32) 0.5g
- Measuring flask (500mL) 1
- Beaker (500mL) 1
- Ion exchange water Approx. 500mL

② Pour ion exchange water. Pour approx. 400mL of ion exchange water into a beaker.

③ **Dissolve.** While stirring the ion exchange water in the beaker, add 123g of ACS grade potassium chloride prepared in advance. Stir the solution until the potassium chloride is completely dissolved.

④ Determine the quantity. Pour the solution dissolved at step ③ into a measuring flask.

When the inside temperature of the measuring flask reaches almost room temperature, increase the solution to 500mL by adding ion exchange water up to the gauge line.

[NOTE] • When potassium chloride dissolves, the temperature drops.

⑤ Add silver chloride. Add 0.5g of ACS grade silver chloride and stir it thoroughly.

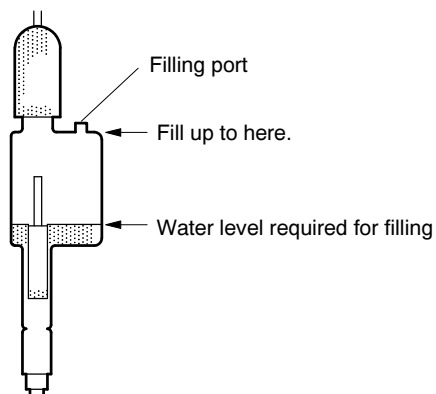
[NOTE] • Some of the silver chloride will not dissolve and will remain on the bottom.

The above makes 500mL of internal solution.

[NOTE] • Short refining method Put 123g of ACS grade potassium chloride into a beaker, etc., add 460mL (not 500mL) of ion exchange water and 0.5g of ACS grade silver chloride and stir thoroughly. Here, the increase in volume by the potassium chloride is taken into account and the amount of ion exchange water is reduced.

⑥ **Fill with internal solution.** Transfer the internal solution to a washing bottle or dropper and pour it into the filling port of the reference electrode.

[NOTE] • When the reference electrode is nearly empty, refill it with approximately 40mL of internal solution.



Reference Electrode

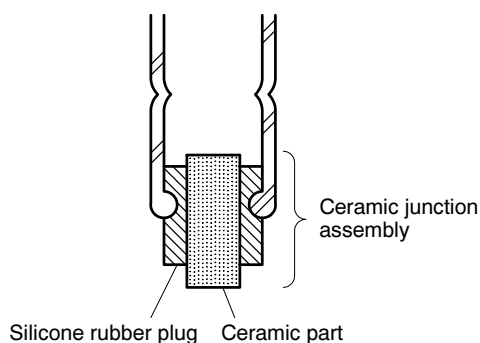
6.6 Replacing the Reference Electrode Ceramic

The ceramic at the end of the reference electrode may become clogged by the reaction of the silver chloride of the internal solution with the sample water. If the white ceramic changes color to black, replace it.

[NOTE] • The ceramic supplied is placed in a bag containing a small amount of 3.3M potassium chloride so that the ceramic is not dry. If the bag is torn, put in a small amount of internal solution and reseal it.

① **Remove.** >> 6.3 “Removing the Electrodes”

② **Drain the internal solution.** Remove the ceramic junction assembly and throw away the internal solution. If the ceramic junction assembly is difficult to remove, remove only the ceramic part first and remove the silicone rubber plug later.



End of the Reference Electrode

③ **Insert the new ceramic junction assembly** Assemble (insert) the new ceramic junction assembly to the electrode end.

④ **Fill with internal solution.** >> 6.5 “Filling with the Reference Electrode Internal Solution”

⑤ **Return to original state.** Return to their original state by the opposite procedure of step ①.

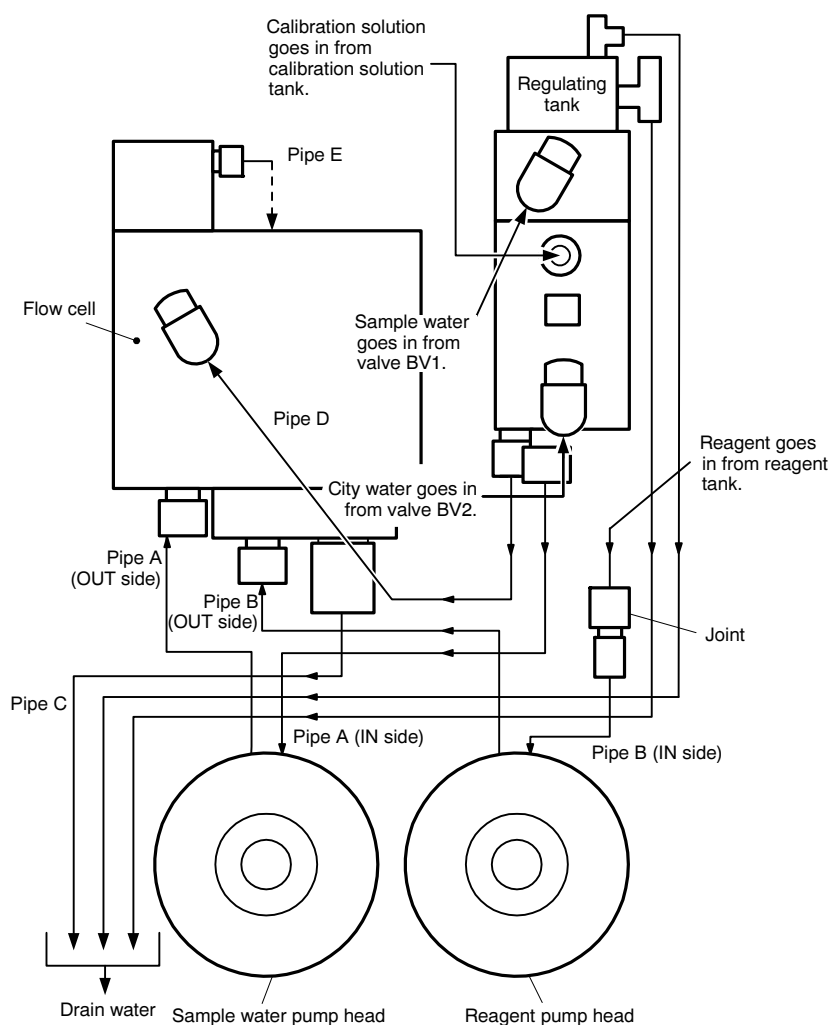
6.7 Cleaning the Electrolysis Electrodes

① **Stop the sample water and wash water.** Close valves BV1 (for sample water) and BV4 (for wash water (when wash function provided)).

② **Disconnect the electrolysis electrodes lead wires.** >> Steps ① to ④ of 6.3 “Removing the Electrodes”

③ **Disconnect the pipes.** Loosen the hexagon cap nut and disconnect the following pipes:

- Sample water pipe (hereinafter called pipe A) OUT side
- Reagent pipe (pipe B) OUT side
- Drain pipe (pipe C)
- Pipe E
- Wash water pipe flow cell side (pipe D)



Piping System

[NOTE] • The flow cell drain section cannot be emptied completely. Plug it with water absorbent paper, etc.

• IN and OUT in the figure are based on the pump head.

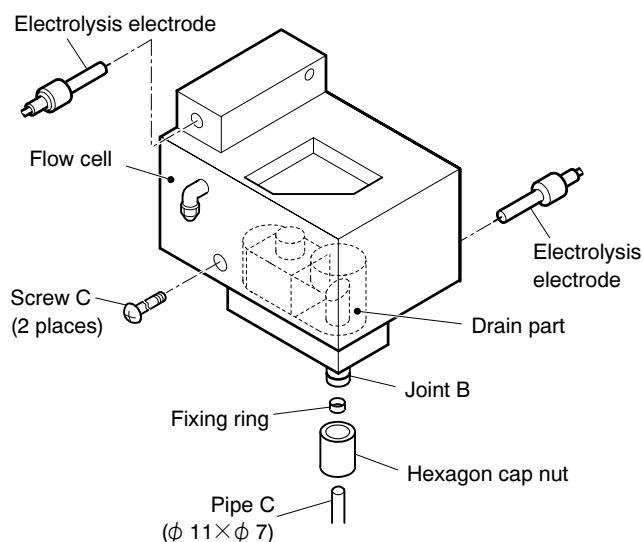
Example: Pipe in which sample water is sent from pump head ••• Pipe A (OUT side)

-
- 【IMPORTANT】** • When disconnecting the piping, the sample water and reagent remaining in the pipe may leak out or flow in the opposite direction. When disconnecting the piping, always receive this residue in a polyethylene beaker, etc. Especially handle pipe B (IN and OUT sides) and pipe C with care.
-

④ Pull up the electrode part. …… >> Step ①, ② of 2.2 “Removing the Electrode Caps”

⑤ Remove the flow cell. …… Loosen screws C (2 places) at the side of the flow cell and remove the flow cell while pulling it forward.

-
- 【IMPORTANT】** • The drain part of the flow cell cannot be emptied completely even when disconnecting pipe C. When the flow cell is removed, the remaining drain solution may leak out. Plug joint B and spread rags, etc. under the pump section.
-



Removing the Flow Cell and Electrolysis Electrodes

⑥ Remove the electrolysis electrodes. …… Loosen the fixing use hexagon cap nut (white) and slowly pull out the electrolysis electrodes at the front and rear of the flow cell.

[NOTE] • The 2 electrolysis electrodes are the same.

⑦ Wash the electrolysis electrodes. …… Immerse the electrode end into a polyethylene beaker, etc. and gently remove the dirt using degreased cotton and a soft cloth, etc.

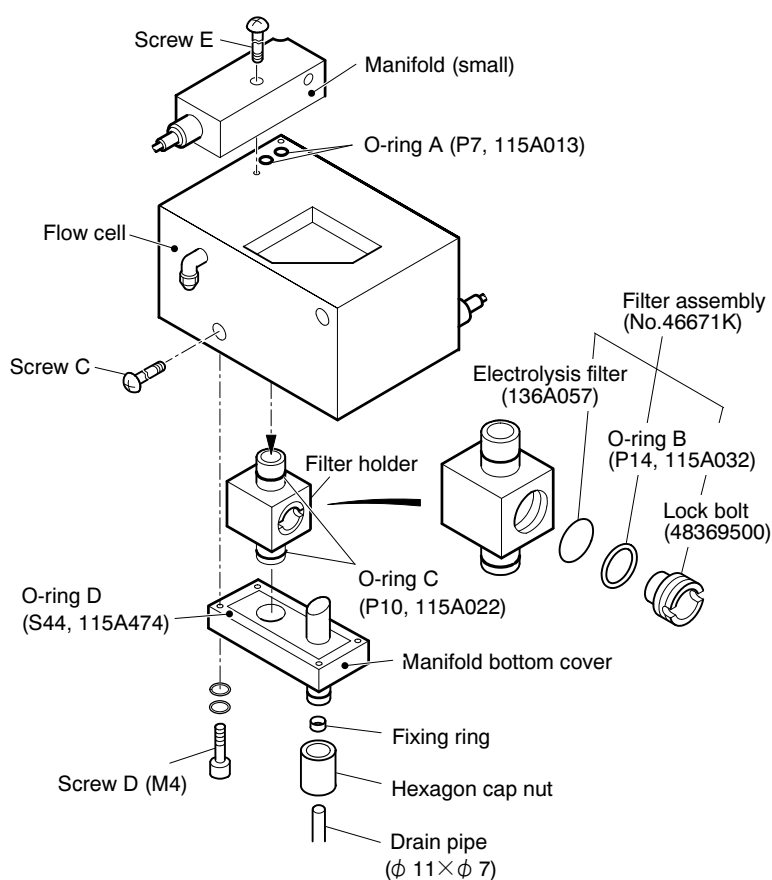
-
- 【IMPORTANT】** • If excessive force is applied to an electrolysis electrode, the end may be damaged. Wash the end with care.
-

⑧ Return to original state. …… Return to their original state by the opposite procedure of steps ① to ⑦.

-
- 【IMPORTANT】** • After reassembling, carefully check each mounting screw for looseness, the connection state of the piping, pipe fixing hexagon cap nut for looseness, electrode wiring, etc.
- Replace the electrolysis electrode packing once a year.
-

6.8 Replacing the Electrolysis Filter

- (a) The electrolysis filter is a film that separates the plus side electrolysis electrode that generates acid at the reagent side and the minus side electrolysis electrode that generates alkali at the drain solution side.
- (b) If damaged, the acid generated at the plus side will leak to the drain solution side and cause faulty indication.
- (c) Replace the electrolysis filter or filter assembly by the following procedure:
- ① **Remove the flow cell.** Steps ① to ⑤ of 6.7 “Cleaning the Electrolysis Electrodes”
 - ② **Clean the drain section, etc.** Clean them as follows.
 - Ⓐ Receive the drain solution collected at the drain section in a polyethylene beaker, etc.
 - Ⓑ Wash the part with the electrode inserted and the part that collected the drain solution using a washing bottle, etc.



Replacing the Electrolysis Filter

- ③ **Remove the bottom cover from the flow cell.** Remove screw D (4 places), and remove the bottom cover from the flow cell.
- ④ **Pull out the filter holder.** Remove the filter holder from the bottom cover.
- ⑤ **Exchange.** Remove the old electrolysis filter from the filter holder and install one new filter.

[NOTE] • When O-ring B (P14) and the lock bolt have deteriorated, replace the entire filter assembly.

⑥ **Return to original state.** Return to their original state by the opposite procedure of steps ① to ④.

【IMPORTANT】 • Check that the O-rings are not deformed.
• Replace the O-rings once a year.

6.9 Cleaning the Flow Cell

When the flow cell is noticeably dirty, spray it with wash water from a washing bottle, etc. If this does not remove the dirt, wash it with acid by the following procedure.

[NOTE] • Use ion exchange water, etc. as the wash water.

① **Prepare the dilute hydrochloric acid.** Prepare 100mL of dilute hydrochloric acid (hydrochloric acid 1 + ion exchange water 10) in a polyethylene beaker, washing bottling, etc.

WARNING

Hazardous substances

- Wear protective gear when handling the hydrochloric acid. Also always check the Material Safety Data Sheet (MSDS).

② **Pull up the reference electrode.** Pull up the reference electrode so that the end is not immersed in the sample water in the flow cell.

③ **Clean.** Pour the dilute hydrochloric acid of step ① into the flow cell and let it stand for about 10 minutes.

④ **Rinse off the acid.** Fill a washing bottle with wash water and rinse off the acid by spraying the wash water into the flow cell.

⑤ **Return to original state.** After returning the reference electrode to its original state, return the analyzer to the measurement state.

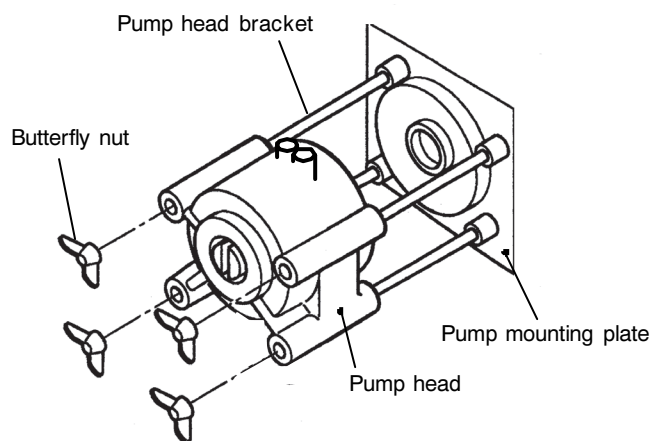
【IMPORTANT】 • When the indication is zero or a low value even though measurement has started, there may be dilute hydrochloric acid remaining in the flow cell. At this time, repeat step ④.

6.10 Replacing the Pump Tube

- ① **Turn off the power switch.** Turn off the transmitter power switch in the following order.
 • Top switch → Bottom switch
- ② **Remove the piping tube.** Remove the piping tube by the following procedure:
 >> Figure at step ③ of 6.7 “Cleaning the Electrolysis Electrodes”
 - ① Close valve BV1 (for sample water) and BV4 (for wash water) and stop the supply of sample water and wash water.
 - ② Next, operate the analyzer for about 10 minutes and drain the sample water from inside the regulating tank.
 - ③ Loosen the hexagon cap nuts of the joints connecting to the pump tubes of the sample water and the reagent and remove the tube.

【IMPORTANT】 • At this time, sample water and reagent may leak from the tube and the piping inside the flow cell. Therefore, spread rags, etc. under the connection section and receive the leakage in a small polyethylene beaker, etc.

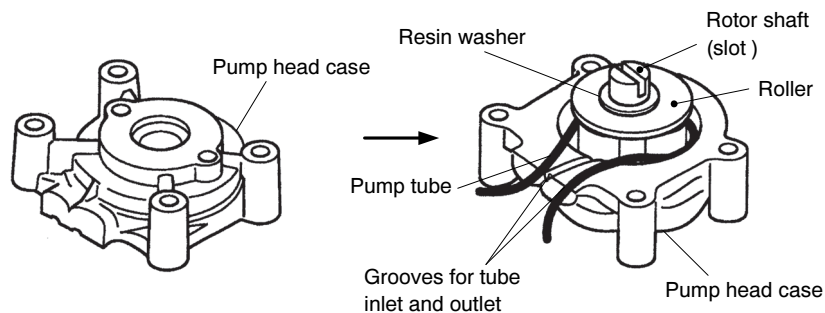
- ③ **Remove the pump head.** Loosen the butterfly nuts (4 places each) and remove the 2 pump heads by pulling them forward.



Removing the Pump Head

- ④ **Disassemble the pump head.** Disassemble the pump head whose tube is to be replaced into an upper part and lower part and remove the used pump tube.

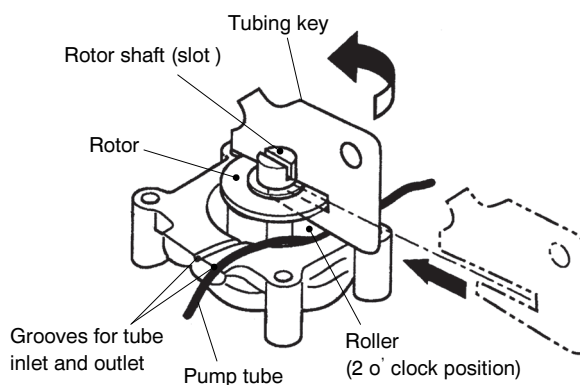
【IMPORTANT】 • At this time, be sure not to drop the resin washer on the rotor.



Disassembling the Pump Head into 2 Parts

⑤ **Install the tube.** Install the new pump tube to the pump head.

- For reagent Thin tube (Norprene tube $\text{\textcircled{R}}$ 08NR)
- For sample water Thick tube (Norprene tube $\text{\textcircled{R}}$ 17NR)



Install the New Pump Tube

- ① Set the rotor. Set it by the following procedure:
- Raise the slot part of the rotor shaft and hold it with your hand.
 - Turn the rotor so that one of the 3 rollers is at the center between the grooves for tube inlet and outlet.
- ② Insert the tube. Insert it by the following procedure:
- Prepare a new tube cut to the same length as the tube removed at step ②.
 - Press the tube with your thumb so that a length of half of one end of the tube sticks out from the grooves for tube inlet and outlet.
 - Insert the tube between the rotor and case from the roller at the grooves for tube inlet and outlet up to the 2nd roller in the counterclockwise direction.
- ③ Insert the tubing key. While making sure that the tube is not protruding, insert the accessory tubing key between the rotor shaft and roller at a 2 o'clock position.
- ④ Install the tube. With one end of the tube pressed with your thumb, turn the inserted tubing key counterclockwise while forcefully pressing it against the rotor.
- ⑤ Pull out the tubing key. Stretch both ends of the installed tube slightly to remove any slack. While pressing both ends of the tube with your thumb so that the tube will not come loose,

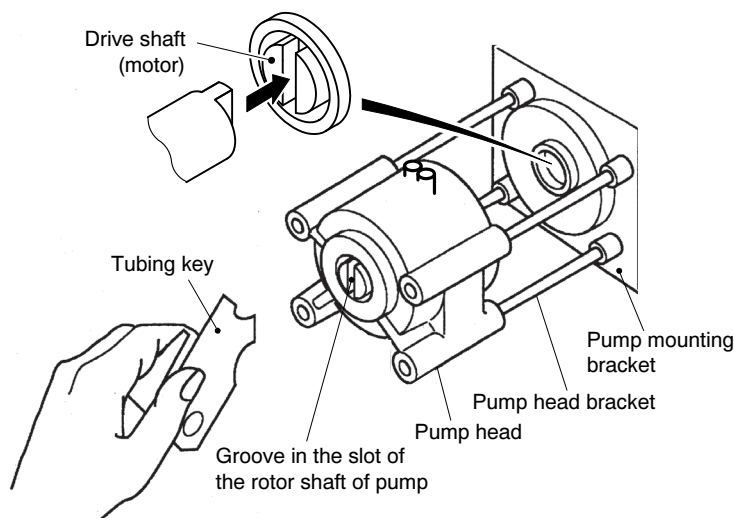
slowly pull out the tubing key.

- ⑥ Cover the pump head. …… Cover one side of the pump head previously removed.

【IMPORTANT】 • At this time set so as not to generate gap so that the tube is not pinched between the top and bottom of the pump head.

- ⑥ **Install the two pump heads.** …… Install them by the following procedure:

- (a) Install the pump head in the pump head brackets (4 pieces).
 (b) Turn the groove in the slot of the rotor shaft of pump head while pressing it by tubing key and connect the opposite convex part of the rotor shaft to the slot of the shaft in the pump drive section.



Installing the Pump Head

- ⑦ **Tighten the butterfly nuts.** …… Check that the shaft is coupled and there is no gap with the case and fix by sequentially tightening the butterfly nuts (4 places) finger tight in the diagonal line direction.

【IMPORTANT】 • When tightening the butterfly nuts, do not use a tool. If torque outside the allowable range is applied, the drive section and pump head may be damaged. Always tighten the butterfly nuts with your fingers.

- ⑧ **Return the pipe to original state.** …… Connect both ends of the reagent and sample water tubes by the following procedure:

- (a) Pass the tube through the hexagon cap nut removed at step ②.

[NOTE] • Two kinds of tube fixing hexagon cap nuts are used according to the tube. Use the white hexagon cap nut with the thin tube (for reagent) and the grey hexagon cap nut with the thick tube (for sampling water).

- (b) Insert the tube so that the joint end section is covered.

[NOTE] • The joint end is tapered. Insert the tube up to the place where it is widest.

- (c) While holding the tube with your finger so that it will not be twisted, tighten the hexagon cap nut.

⑨ **Turn on the power switch.** Turn on the power switch. Operate the solution feed pump.

⑩ **Fill with reagent.** Fill by the following procedure:

① Stop the sample water pump. >> 5.3(22) “Sampling pump ON/OFF”

② Apply pump fast feed control and fast feed the pump for about 10 minutes. >> 5.3(21) “Pump control”

③ Return the pump speed to its original speed and restore operation of the sample water pump.

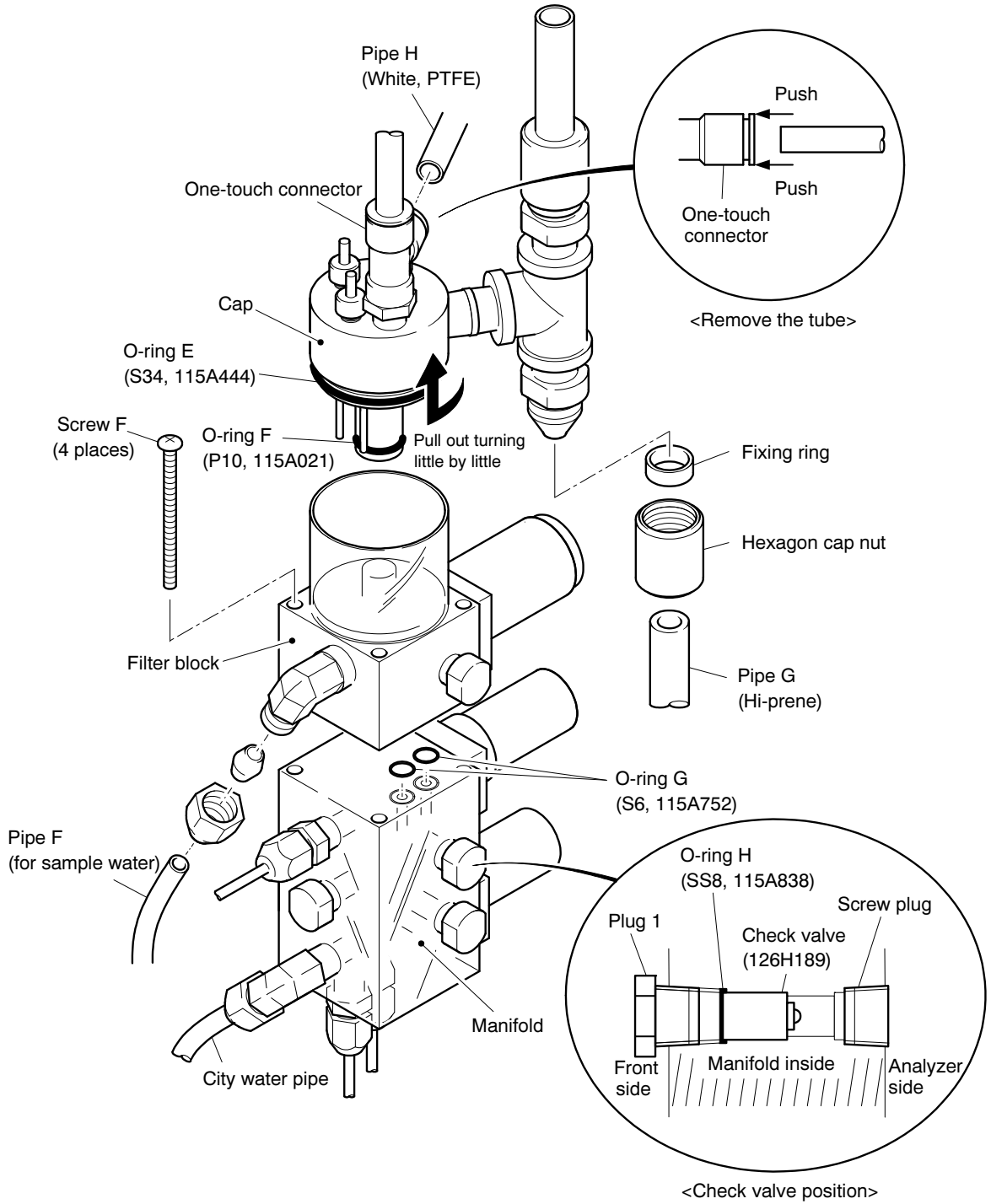
⑪ **Flow the sample water.** Open valve BV1 and valve BV4 and check the following:

- Sample water overflows in the regulating tank.
- There is no leaking from the piping.

⑫ **Control the sample water flow.** After setting the analyzer to the maintenance mode by pressing **ST-BY/MEAS** one time, press **ST-BY/MEAS** again. The analyzer returns to the measurement mode and the sample water flow is automatically controlled by adjusting the solution feed pump speed.

6.11 Regulating Tank Maintenance

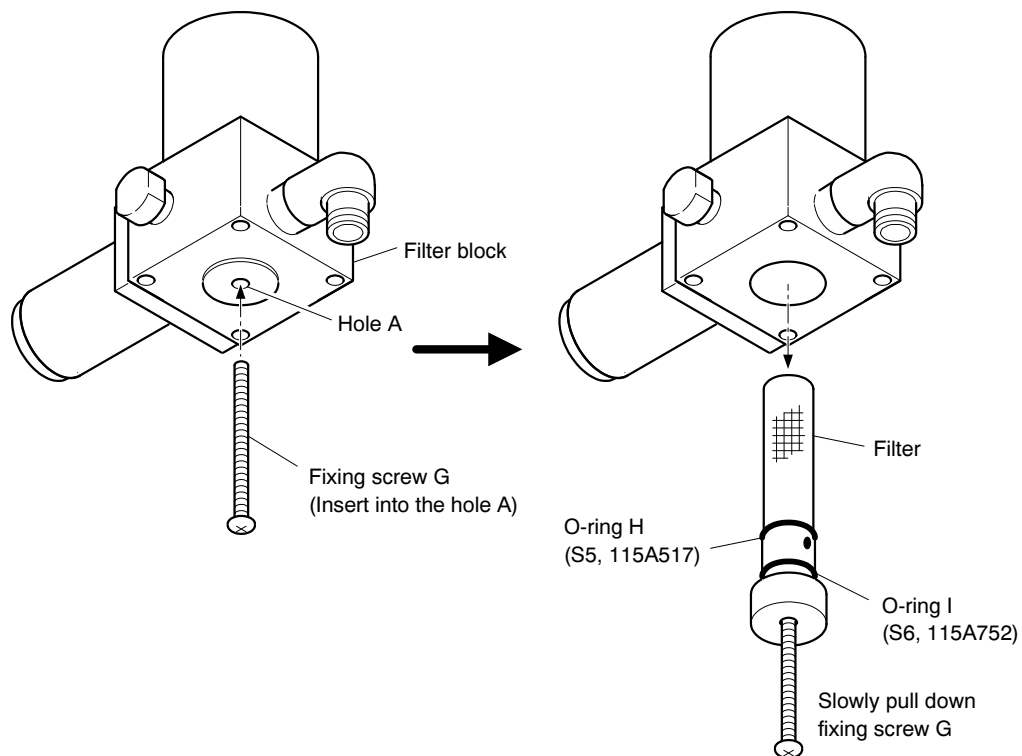
- ① **Stop the supply of sample water and wash water.** Close valve BV1 (for sampling water) and valve BV4 (for wash water). Operate the analyzer in this state and feed the all sample water in the regulating tank to the flow cell side (about 10 to 15 minutes).
- ② **Turn off the power switches.** Turn off the transmitter power switches in the following order:
 - Top switch → Bottom switch
- ③ **Disconnect the pipes.** Disconnect the following pipes:
 - Sample water pipe (hereinafter called pipe F) • Sample water overflow pipe (pipe G)
 - Filter water overflow pipe (pipe H)



Disassembling the Regulating Tank

- [NOTE]
- When the ring and tube are difficult to remove after loosening and removing the white hexagon cap nut of pipe G, remove them while shifting them with radio pliers, etc.
 - Pipe H is connected to a one-touch connector. While pushing the ring of the tube insertion section, pull the tube (white, PTFE tube).

- ④ **Remove the cap.** While turning the cap slightly, pull it off upward.
- ⑤ **Clean.** Remove the dirt inside the cover and inside the pipe and on the level electrode using clean rags and a brush and rinse with a washing bottle.
- ⑥ **Replace O-ring.** Replace O-rings E and F with new rings.
- ⑦ **Remove the filter block.** Remove the fixing screws (4 places) and remove the filter block from the manifold.
- ⑧ **Replace O-ring.** Replace O-rings G (2 places) with new rings.
- ⑨ **Rinse the filter block.** Remove the dirt on the filter block using a brush and rags and rinse with a washing bottle, etc.
- ⑩ **Remove the filter.** Remove the filter by the following procedure:
 - Ⓐ Insert fixing screw G removed at step ⑦ into hole A in the bottom of the filter block.
 - Ⓑ Slowly pull fixing screw G and pull out the filter.



Removing the Filter

⑪ Replace O-ring. Replace O-rings H and I with new rings.

⑫ Return to original state. Return to their original state by the opposite procedure of steps ① to ⑪ with careful attention to the followings.

- Correctly install the O-ring at the manifold side.
- Equally tighten the 4 screws removed at step ⑦.

[NOTE] • Tightening the 4 screws eccentrically will cause leaking.

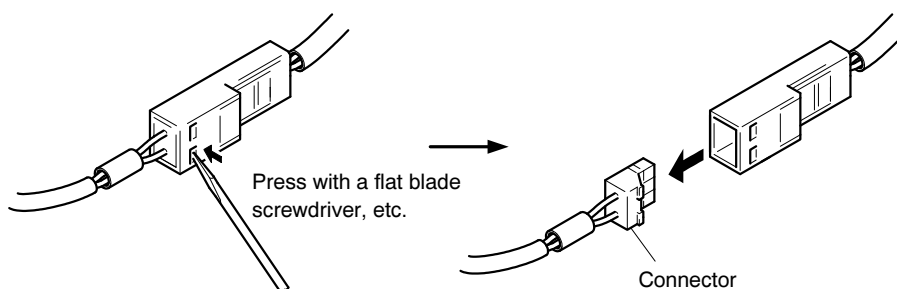
- Insert the cap and connect pipes F, G, and H securely.

【IMPORTANT】 • Check that the O-rings are not deformed.

- Replace the O-rings once a year.
-

6.12 Replacing the Solenoid Valves

- ① **Clean the regulating tank.** >> Steps ① to ⑦ of 6.11 “Regulating Tank Maintenance”
- ② **Disconnect the solenoid valve connector.** Disconnect the solenoid valve connector by the following procedure:
 - ④ Press the claw section of the connector with a small flat blade screwdriver, etc. and disengage the claw.
 - ⑤ Hold both ends of the connector and remove the connection section.

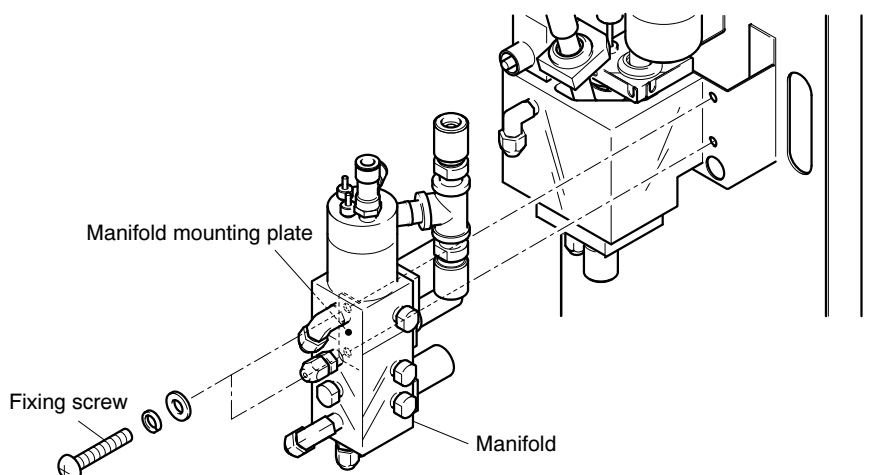


Disconnecting the Connector

- ③ **Remove the tube.** Loosen the hexagon cap nuts and remove the regulating tank and manifold tube not removed at step ①.

【IMPORTANT】 • Sample water remaining in the pipe may leak out. Spread rags at the top of the pump as a water leakage countermeasure.

- ④ **Remove the manifold.** Remove the fixing screws (2 places) and remove the manifold.

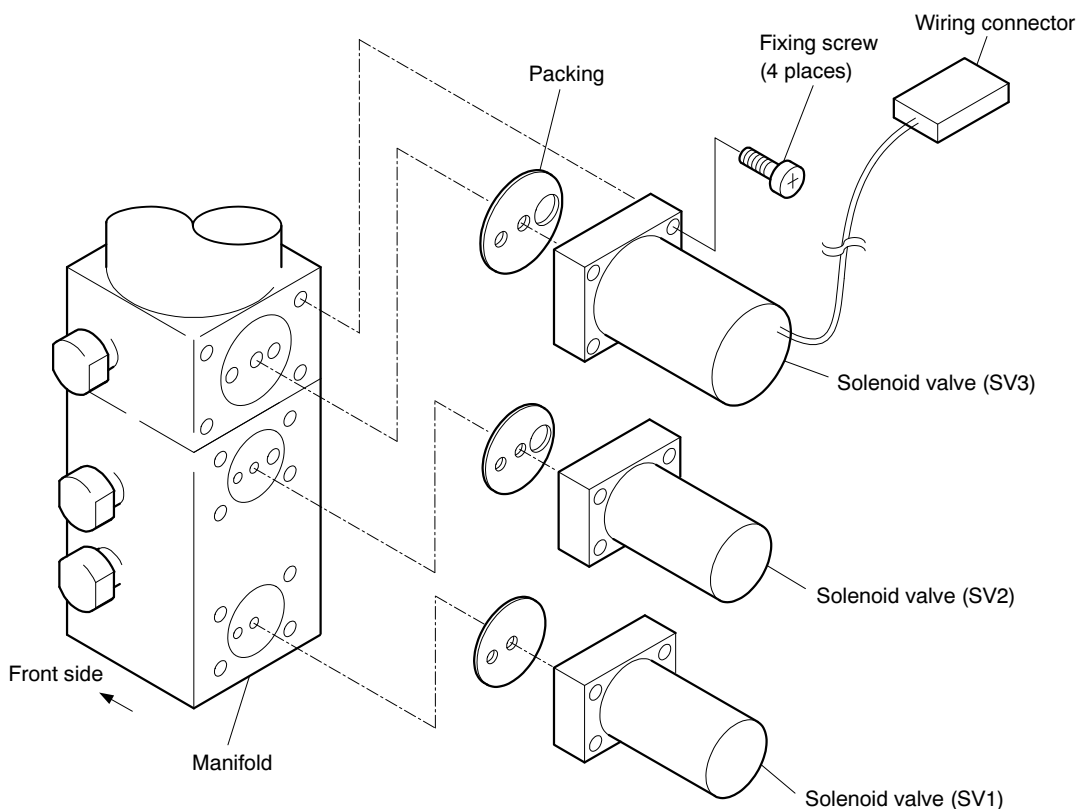


Removing the Manifold

【IMPORTANT】 • At this time be careful that the solenoid valve lead wire and connector are not caught on the flow cell.

⑤ Replace the solenoid valve. Loosen the fixing screws (4 places) of each solenoid valve and replace the solenoid valve with a new valve.

-
- 【IMPORTANT】**
- When installing the solenoid valve and packing, check the direction. (Install so that they are matched to the manifold side hole position.)
 - Equally tighten the 4 fixing screws. Eccentric tightening will cause eccentricity at the packing and solution leakage.
-



Replacing the Solenoid Valve

⑥ Return to original state. Return to their original state by the opposite procedure of steps ① to ⑤.

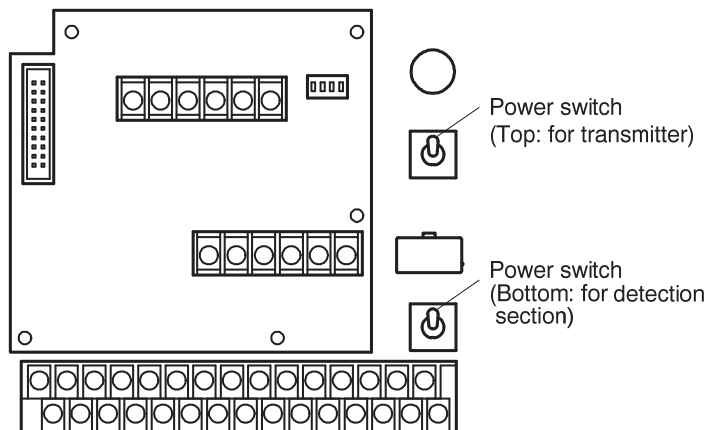
-
- 【IMPORTANT】**
- Thoroughly check for overlooked wiring and piping connection and joint looseness, etc.
 - Immediately after restarting, be alert for leakage, etc.
 - If an abnormality is confirmed, immediately stop the analyzer.
-

6.13 Replacing the Varistor Unit

Replace the varistor unit approximately 1 year in the procedure below:

① **Turn off the power.** Turn off the transmitter power switches in the following order:

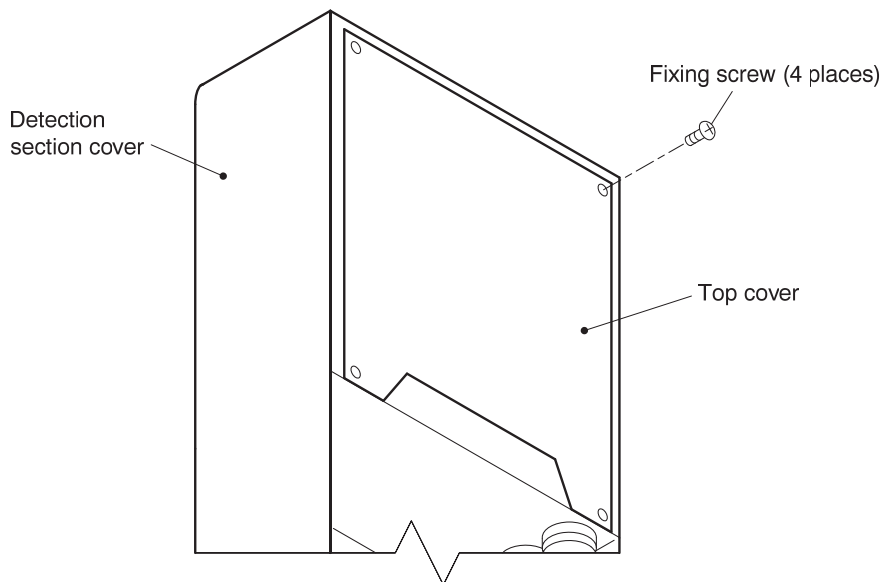
- Top switch → Bottom switch



Power Switch Position

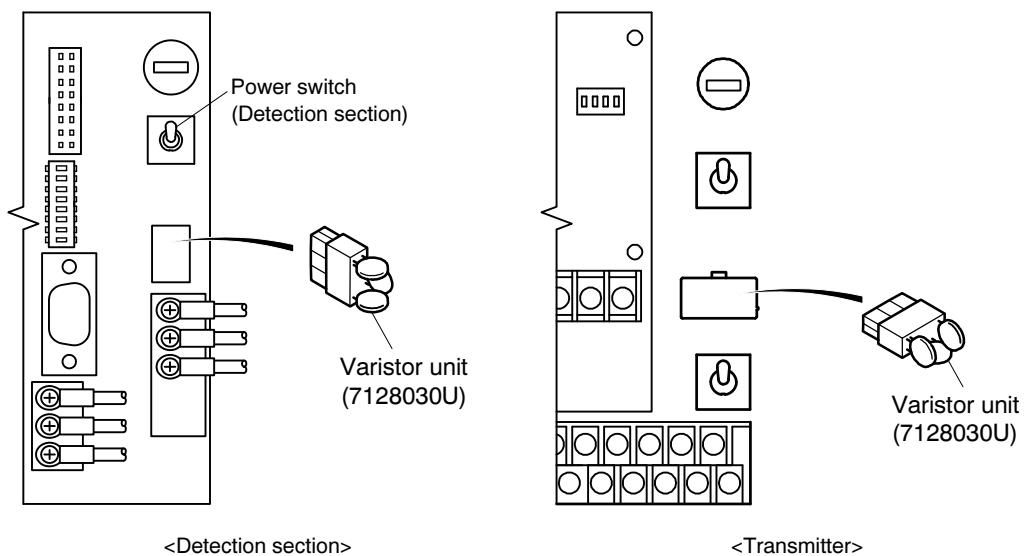
② **Stop the supply of power.** Stop the supply of power to the transmitter.

③ **Remove the top cover.** Open the detection section cover and loosen the fixing screws (4 places) and remove the top cover.



Removing the Top Cover

④ **Replace the varistor unit (transmitter and detection section)** Remove the old varistor unit from the base and replace it with a new varistor unit.



Replacing the Varistor Unit

⑤ **Return to original state.** Return to their original state by the opposite procedure of steps ① to ④.

7. Troubleshooting

7.1 Errors and Corrective Actions

- (a) If an error occurs during measurement mode (measurement in progress), an error indication shown in the following table blinks on the above of the screen.
- (b) If an error occurs in the measurement mode, contact is closed at the already set output terminal. Contact signal is not output in the mode other than the measurement mode (maintenance mode and calibration mode).
- Output terminal setting ... >> 5.3(24) “Output signal”
- (c) If the measured value is unusual, first of all check whether an error is indicated or not.
- (d) For the error items constantly monitored such as sample water shut off, reagent solution shut off, and other errors, even if an error display is released, as long as the cause is not removed, the error display lights again when the analyzer returns to the measurement mode. Conversely, when the generation cause is removed, the display is automatically released.
- (e) The transmission output at the time of “Sample water shut off” (E-6) depends on the output type setting.
- >> 5.3(18) “Output type”

-
- 【IMPORTANT】**
- The error blinking display on the above of the screen is the newest error contents. However, the currently generated errors can be sequentially displayed by pressing the **(READ)** key and selecting the error with **(↑)** and **(↓)** keys in this measurement state. If an error occurs during the measurement, check the error contents in the measurement mode state.
 - In the maintenance mode, the error display and external contact output signals can be released.
 - When switching from the measurement mode to the maintenance mode is attempted, the currently generated error contents are not displayed. When an error was generated, always check the error contents in the measurement mode and then switch to the maintenance mode.
-

Kinds of Errors

Error indication	Error name	Error removing method	
		Mode	Operation key
NONE	No errors	—	—
E-1: NOT STABILIZED	Stability check failure	Maintenance, Calibration	Press (ESC) for 1 second or more.
		Measurement	Press (ST-BY/MEAS) for 4 seconds or more. (Select the maintenance mode first)
E-2: CAL-ZERO FAILURE	Zero calibration failure	Maintenance, Calibration	Press (ESC) for 1 second or more.

(To be continued)

(Continued from previous page)

Error indication	Error name	Error removing method	
		Mode	Operation key
E-3: CAL-SPAN FAILURE	Span calibration failure	Maintenance, Calibration	Press (ESC) for 1 second or more.
		Measurement	Press (ST-BY/MEAS) for 4 seconds or more. (Select the maintenance mode first)
E-6: NO SAMPLE FLOW	Sample water shut off	Measurement	Press (ST-BY/MEAS) for 4 seconds or more. (Select the maintenance mode first)
E-7: NO REAGENT	Reagent solution shut off	Measurement	Press (ST-BY/MEAS) for 4 seconds or more. (Select the maintenance mode first)
E-8: ILLEGAL FLOW RATE	Flow rate failure	Maintenance, Calibration	Press (ESC) for 1 second or more.
		Measurement	Press (ST-BY/MEAS) for 4 seconds or more. (Select the maintenance mode first)
E-9: NO COMMUNICATION	Communication error	—	Turn the power off.
E-10: HARDWARE FAULT	Hardware fault	—	Turn the power off.
E-11: ILLEGAL SETTINGS	Setting error	—	Turn the power off.

(a) “E-1” – Stability check failure

[Indication conditions]

- Indicated when the measured value did not stabilize within 20 minutes during manual zero calibration, or manual and automatic span calibration.

[Analyzer status]

- Does not update the calibration data (calibrated value) and continues measurement using the last calibrated value.

[Main cause of failure]

- Deterioration of response characteristic

[Corrective action]

- Cleaning of electrode and inspection of pump >> 7.3 “Detector Troubleshooting”
- Contact DKK-TOA if the failure is not resolved.

(b) “E-2” – Zero calibration failure

[Indication conditions]

- Indicated when electrolytic current value was outside the 0.0 to 4.0mA range during zero calibration.

[Analyzer status]

- Does not update the calibration data (calibrated value) and continues measurement using the last calibrated value.

[Main cause of failure]

- Detector abnormal
- Prepared calibration solution abnormal

[Corrective action]

- Inspection of detector >> 7.3 “Detector Troubleshooting”
- Contact DKK-TOA if the failure is not resolved.

(c) “E-3” – Span calibration failure

[Indication conditions]

- Indicated when span coefficient value was outside the 0.5 to 2.0mA range during span calibration. (Normally, span coefficient is approx. 0.9 to 1.0.)

[Analyzer status]

- Does not update the calibration data (calibrated value) and continues measurement using the last calibrated value.

[Main cause of failure]

- Detector abnormal
- Deterioration of response characteristic
- Prepared calibration solution abnormal (Standard solution concentration abnormal and span calibrated value setting mistake, etc.)

[Corrective action]

- Inspection of detector >> 7.3 “Detector Troubleshooting”
- Contact DKK-TOA if the failure is not resolved.

(d) “E-6” – Sample water shut off

[Indication conditions]

- Indicated when the amount of water in the regulating tank decreased and no conductivity between the level electrodes installed in the tank continued for 1 minute or more.

[Analyzer status]

- Continues the measurement and outputs the measured value (transmission output value) in the set output type. >> 5.3(18) “Output type”

[Main cause of failure]

- Sample water pressure or flow is lacking.
- Clogging of filter in the regulating tank

[Corrective action]

- Check of the sample water pressure or flow. >> 8.1 “Specifications”
- Cleaning of regulating tank and internal filter
>> 6.11 “Regulating Tank Maintenance”
- When the amount of water in the regulating tank recovers, the indication disappears after 1 minute and the analyzer returns to the measurement state.
- Contact DKK-TOA if the failure is not resolved. (Transmitter trouble)

(e) “E-7” – Reagent solution shut off

[Indication conditions]

- Indicated when the amount of reagent solution in the reagent tank decreased and the level sensor (float switch) off state has continued for 1 minute or more.

[Analyzer status]

- Continues the measurement and outputs the measured value (transmission output value) in the set output type. >> 5.3(18) “Output type”

[Main cause of failure]

- Reagent solution is lacking.
- Level sensor of reagent tank abnormal

[Corrective action]

- Check the reagent solution amount and replace it.
- Contact DKK-TOA if the failure is not resolved.

(f) “E-8” – Flow rate error

[Indication conditions]

- Indicated when the sample water flow rate was not set to 3.7mL/min ± 0.07mL.

[Analyzer status]

- Continues the measurement operation by the sample water flow rate before error.

[Main cause of failure]

- Deterioration of tube for solution feed pump
- Solution feed pump or solenoid valve at flow controlling abnormal
- Level detection in the regulating tank faulty (Dirt of level electrode)
- Clogging of filter in the regulating tank

[Corrective action]

- Replace the tube of solution feed pump.
- Check the sample water pressure or flow. >> 8.1 “Specifications”
- Clean the regulating tank and internal filter.
>> 6.11 “Regulating Tank Maintenance”
- Contact DKK-TOA if the failure is not resolved.

(g) “E-9” – Communication error

[Indication conditions]

- Indicated when a communication error between transmitter and detection section was generated.

[Analyzer status]

- Continues the measurement, but stops the output signals to the outside such as transmission output.

[Main cause of failure]

- Transmitter or detection section trouble

[Corrective action]

- Turn on the power again. If the communication becomes normal, the error disappears.
- Contact DKK-TOA if the failure is not resolved. (Transmitter or detection section trouble, or wiring abnormal)

(h) “E-10” – Hardware fault

[Indication conditions]

- Indicated when there was an error during memory check when the power was turned on.

[Analyzer status]

- Stops the operation and output of analyzer.

[Main cause of failure]

- Set values are outside the given range.

[Corrective action]

- Turn on the power again. If the hardware becomes normal, the indication disappears.
- Contact DKK-TOA if the failure is not resolved. (Transmitter or detection section trouble)

(i) “E-11” – Setting error

[Indication conditions]

- Indicated when the detection section DIP switch is a combination that must not be set.

[Analyzer status]

- Stops the operation and output of analyzer.

[Main cause of failure]

- Setting of DIP switch abnormal

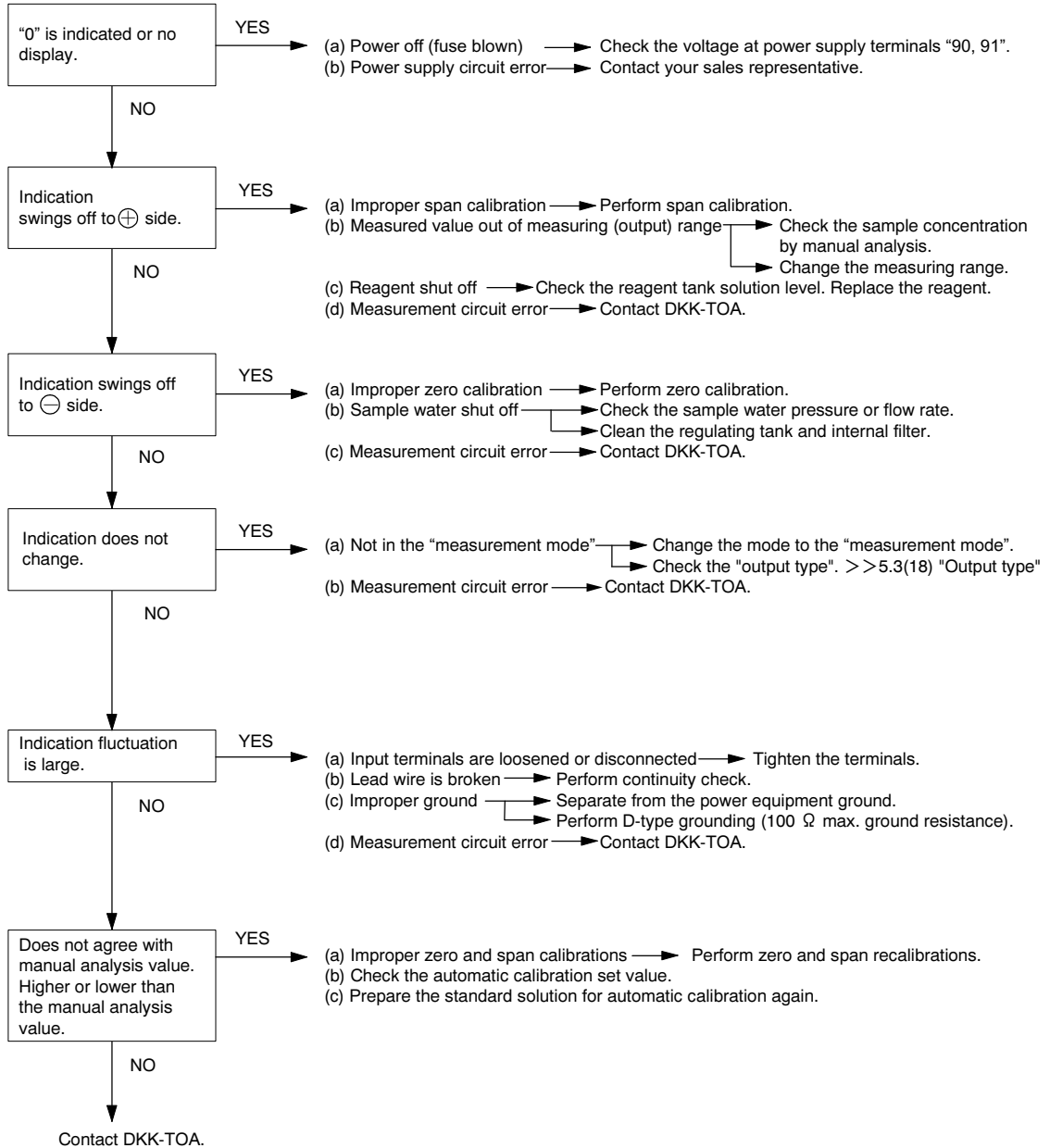
[Corrective action]

- Set the DIP switch suitably and turn on the power again. If the setting becomes normal, the indication disappears.
- Contact DKK-TOA if the failure is not resolved. (Transmitter trouble)

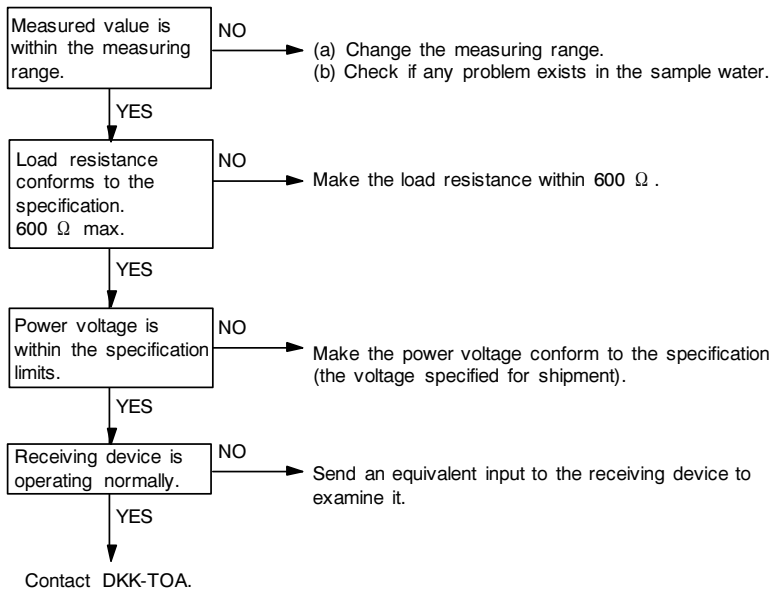
7.2 Transmitter Troubleshooting

If an error is found in the measured value, check the transmitter in the following procedure.

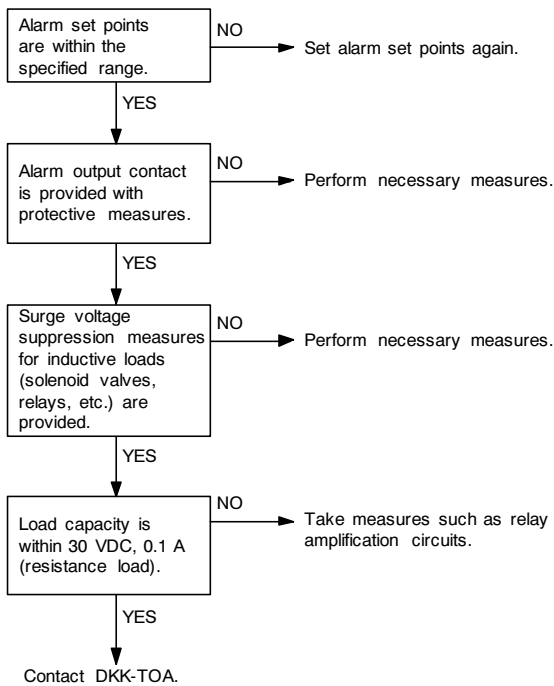
(1) Measured value error



(2) Measured value output error

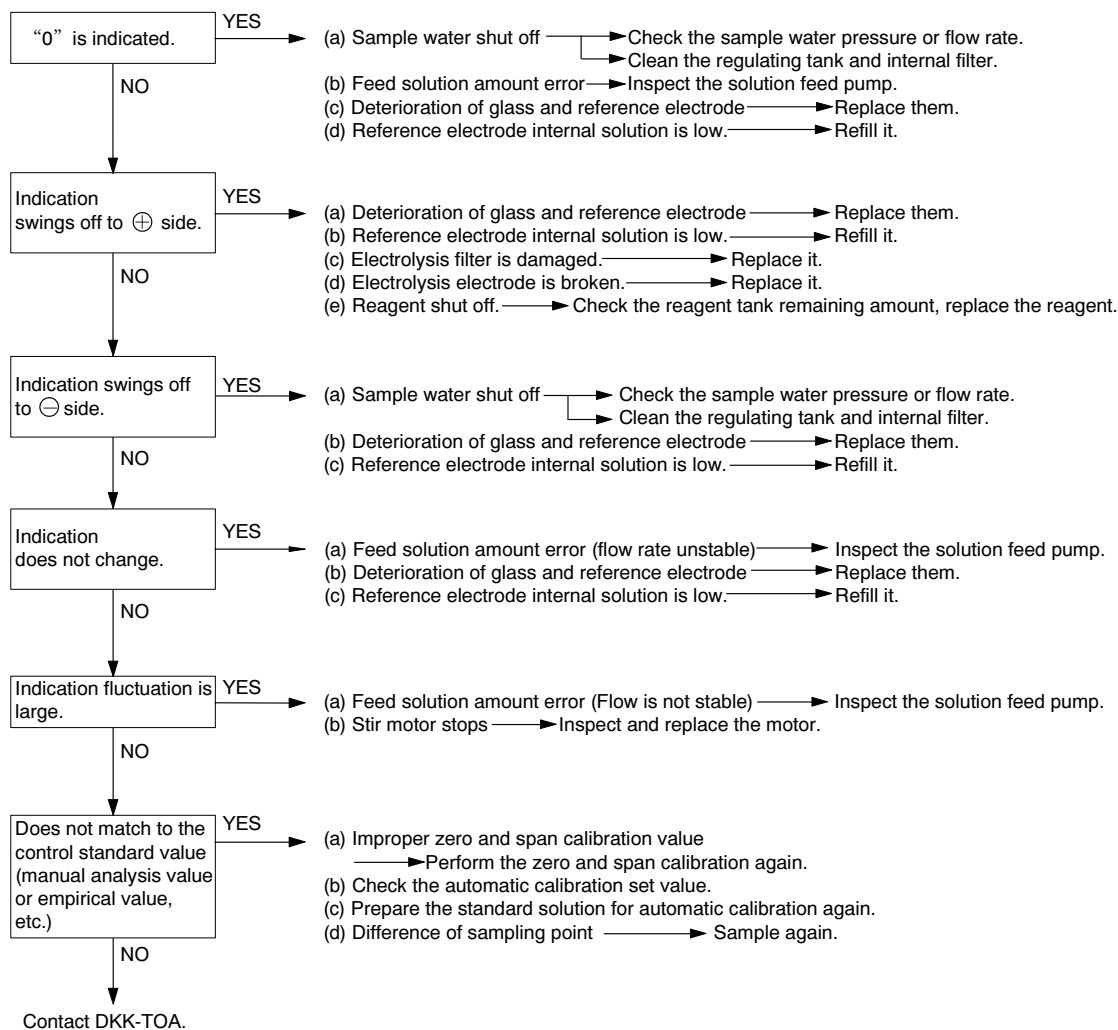


(3) Concentration alarm output error



7.3 Detector Troubleshooting

If an error is found in the measured value, check the detector in the following procedure.

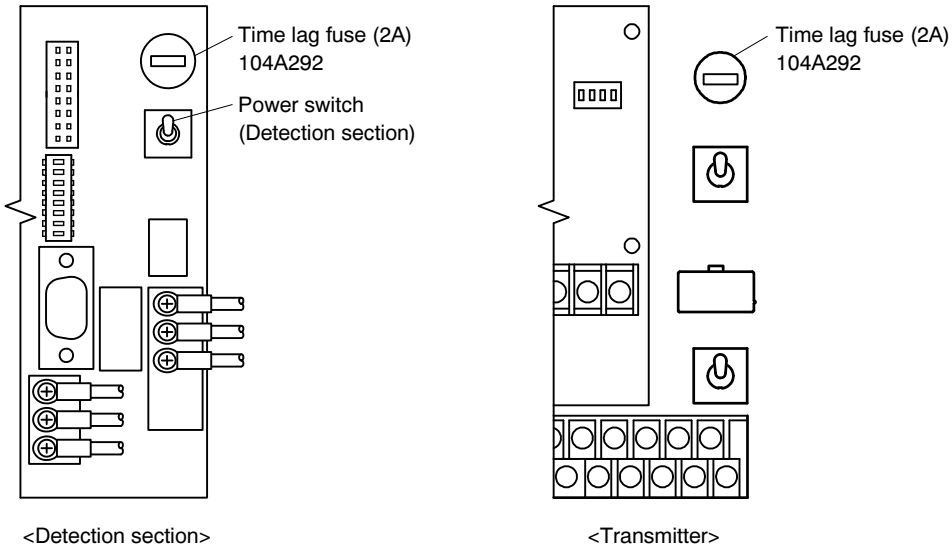


7.4 Replacing the Fuse

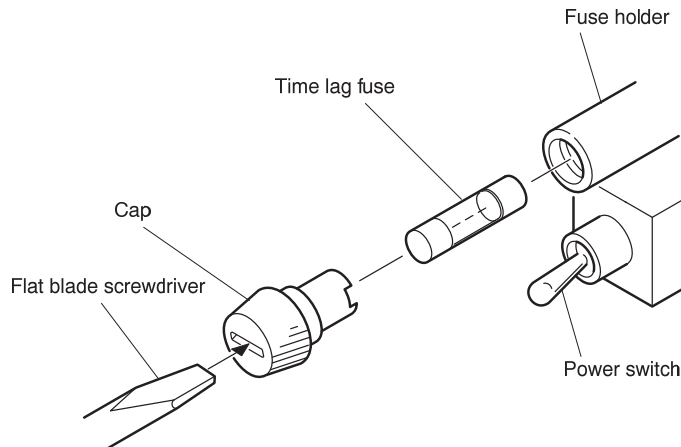
If the fuse is blown, replace it as follows.

① **Remove the top cover.** >> Step ① to ③ of 6.13 “Replacing the Varistor Unit”

② **Remove the fuse.** Turn the cap counterclockwise to remove it with the blown fuse.



Fuse Position



Removing and Installing the Fuse

③ **Replace the fuse.** Replace the blown fuse with a new one.

④ **Return to original state.** Return to their original state by the opposite procedure of steps ① to ②. If the fuse blows again, remove the cause of the problem.

●Repair contact

If a repair is required, please contact your sales representative, our sales office, or our service department. In this case, let us know the following information on the product nameplate:

Model name (MODEL)

Serial number (SER. No.)

Manufacturing date (DATE)

8. Specifications and Operational Explanation

8.1 Specifications

(1) Standard specifications

Product name	: Alkalinity analyzer
Model	: ALF-1600
Measuring object	: Alkalinity (CaCO ₃ conversion) of city water and wash water
Measurement method	: Coulometric titration method (neutralization titration)
Display	: LCD digital display (Minimum display 0.1)
Detector	: Glass electrode Model 5041 Reference electrode Model 4084 Electrolysis electrode... Model 2066 (2 pcs)
Measuring range	: 0 to 50/0 to 100 2-range unit, either of mg/L or ppm
Measured value output range	: 4 to 20 mADC is output corresponding to the specified range 0 to FS (Full scale).
Range switching method	: 2-range Manual/remote switching
Repeatability	: Within ±2 %FS (by standard solution)
Linearity	: Within ±3 %FS (by standard solution)
Stability	: Zero drift Within ±3 %FS/month (Zero calibration solution) Span drift Within ±3 %FS/month (Span calibration solution)
Response speed	: Within 8 minutes for 90 % response (from standard solution port)
Stabilization time	: Approx. 1 hour after power and water supplied
Condition of sample water	: Temperature 0 to 40 °C (No freezing) Pressure 0.02 to 0.3 MPa Flow rate 1 to 3L/min (Measured cell inflow amount: Approx. 4mL/min)
Ambient temperature range	: -5 to +50 °C
Ambient humidity range	: 85 %RH or less
Output signal	: Measured value 4 to 20 mADC, isolated output, load resistance 600Ω or less, number of outputs: 2 points (only 1 point is used) Contact Selected and allocated to 6 contacts from the following items (OR of 3 items possible) Range indication, maintenance in progress, high concentration alarm, low concentration alarm, analyzer error ^(*1) , calibration in progress ^(*2) , power off ^(*3) *1 Analyzer error (flow rate error, communication error, hardware fault,

		setting error, sample water shut-off, reagent shut-off, zero calibration failure, span calibration failure ^(*2) , stability check failure ^(*2)
		*2 When automatic span calibration function provided
		*3 Power off is fixed to contact output 1.
		Number of contacts: 6 (NO contacts 5, CO contacts 1)
		Capacity: 30 VDC 0.1 A, resistive load
Input signal	: Contact	Selected and allocated to 3 contacts from the following items: Range switching command ... Range 2 (high side) by reception of closed contact signal Intermittent/continuous switching command ... Continuous measurement by reception of closed contact signal Wash start ^(*1) ... Started by reception of closed contact signal (width 100 ms or more) Automatic span calibration start ^(*1) ... Started by reception of closed contact signal (width 100 ms or more)
		*1 When automatic wash or automatic calibration function provided
		Number of contacts: 3
		No-voltage contact input: ON, resistive load within 50Ω, max. short circuit current 10 mA, open voltage 24 VDC
	4 to 20 mADC	4 to 20 mADC input converted to concentration corresponding to preset scale
		Number of inputs: 1
		Concentration conversion: 4 significant digits, decimal point position arbitrarily fixed
External output port	: RS-485 1 (max. cable length 100 m)	
	Protocol	MODBUS/RTU
	Address	8×n (n=1 to 30) 3 continuous addresses used
	Terminal block	2 sets (for parallel connection)
Power supply	: 100 to 240 VAC ±10%, 50/60Hz	
Power consumption	: Approx. 40 VA (standard), approx. 60 VA (max.)	
Cable port	: Cable gland for cables of 6 to 12 mm in outside diameter (G1/2 conduit connection screw when the cable gland is removed)	
Piping connection	: Sample inlet	Socket nominal dia. 16
	Drain outlet	Socket nominal dia. 25
	Wash water inlet	Socket nominal dia. 16 (For the specifications

	with option)
Structure	: Indoor wall mounted system Transmitter IP65 (When outdoors, must be housed in a cubicle)
Main materials and finish	: Indicated transmitter Aluminum die cast, metallic silver finish Detector cover Aluminum plate, metallic silver finish
Materials of wetted parts	: Acryl resin, hard PVC, PTFE tube, norprene tube
Mass	: Approx. 20kg (standard) Approx. 35kg (rack mounting)
External dimensions	: Approx. 303W×211D×1220H (wall mounted type) Approx. 380W×521D×1502H (rack mounting)
Standard accessories	: 1 set/analyzer

(2) Automatic wash (option)

Wash method	: Water or water + ozone wash
Wash start mode	: Automatic Sets the wash interval (by internal timer) Remote Inputs a signal from the outside (when wash interval is set to 0h) Manual Immediately performed by key operation (for performance check)
Wash interval	: 1 to 24 hours variable (Factory setting 12h)
Wash time	: Water wash .. 2 min fixed Ozone wash .. 8 min fixed
Wait time after wash	: 0 to 30 min variable (Factory setting 20 min) Wait time is common with calibration wait time.
Output held time during wash	: Wash time + Wait time
Water wash condition	Water quality ... City water or equivalent (Turbidity 2° or less, Color 5° or less) Temperature 2 to 30°C Pressure 0.2 to 0.7MPa Consumption.... Approx. 2L/times

(3) Automatic calibration (options set with automatic wash)

- Calibration method : Zero calibration..... None
 - Span calibration Span standard solution is periodically introduced to the flow cell from the calibration solution tank and calibrated.
- Calibration start mode : Automatic Sets the calibration interval (by internal timer)
 - Remote Inputs a signal from the outside (when calibration interval is set to 0 day)
 - Manual..... Immediately performed by key operation (for performance check)
- Calibration interval : 1 to 31 days variable (Factory setting 10 days)
- Calibration time : Approx. 20 min
- Wait time after Calibration : 0 to 30 min variable (Factory setting 20 min)
 - Wait time is common with wash wait time.
- Output held time during Calibration : Wash time + Calibration time + Wait time

8.2 Operational Explanation

(1) Principle of measurement

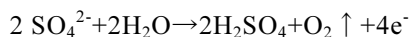
This analyzer automatically performs the neutralization titration by coulometric titration, and features acquisition of the titrant used in titration by electrolysis. The current needed by electrolysis corresponds to the concentration of the measurement target substance. Normal neutralization titration is performed with a titrant of a known concentration.

Coulometric titration creates the titrant by electrolysis under 100% current efficiency conditions. This titrant reacts with the sample water and the concentration is decided based on Faraday's law according to the current needed to reach the equivalence point of the reaction.

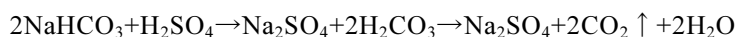
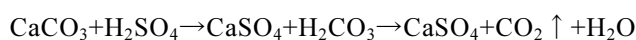
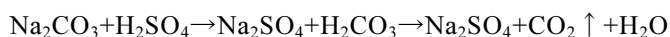
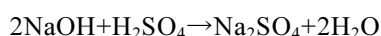
This analyzer performs the above coulometric titration continuously. The titrant (sulfuric acid) created by electrolysis is reacted with the sample water and is introduced to a flow cell and the pH in the flow cell is measured. Since the amount of the titrant created is proportional to the electrolysis current, the measured value is indicated by current value needed to maintain the equivalence point in neutralization titration.

Electrolysis reaction is as follows:

Sodium sulfate dissolves to become SO_4^{2-} and the reaction is as follows at the plus electrode of the electrolysis electrodes.



This H_2SO_4 is proportional to the electrolysis current, and reacts with the sample water as follows:



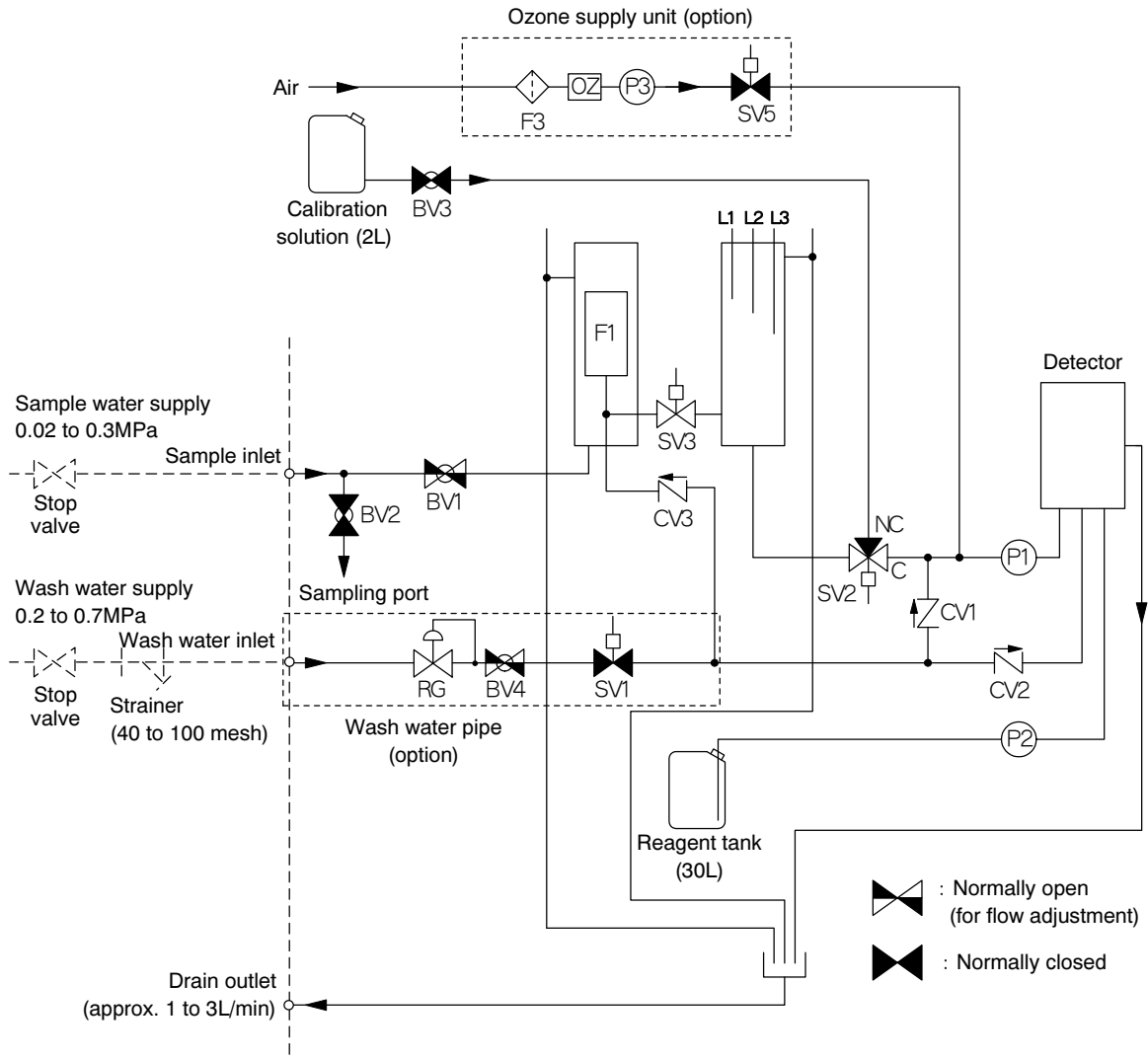
(2) Measurement system of standard specifications

Sample water enters the flow cell of detector through the sample inlet, valve BV1 (for sample water), regulating tank, and pump. At the regulating tank, solenoid valves open and close at a fixed period to measure the sample water flow and control the rotating speed of a pump so that the sample water flow is kept a fixed value (3.7mL/min) depending on the result.

Then, the sample water (approximately 3.7mL/min) and the reagent (approximately 0.5mL/min) fed by a solution feed pump react and are measured in the flow cell and discharged.

(3) Measurement system with wash (Option)

When the water wash system is provided, solenoid valves and other wash water piping are added to the standard specifications. When the ozone + water wash system is provided, an ozone supply unit and air piping are added in addition to the wash water piping.



Measurement System with Wash

Symbol	Name	Symbol	Name
SV1	Wash water supply solenoid valve	F3	Filter
SV2	Calibration solution supply solenoid valve	RG	Pressure reducing valve
SV3	Sample water supply solenoid valve	BV1	Sample water flow control valve
SV5	Ozone supply solenoid valve	BV2	Sample water sampling valve
P1	Sample water feed pump	BV3	Calibration solution flow control valve
P2	Reagent solution feed pump	BV4	Wash water flow control valve
P3	Air pump (for ozone)	CV1 to 3	Check valve
OZ	Ozone generator	L1 to 3	Level electrode
F1	Sample water filter		

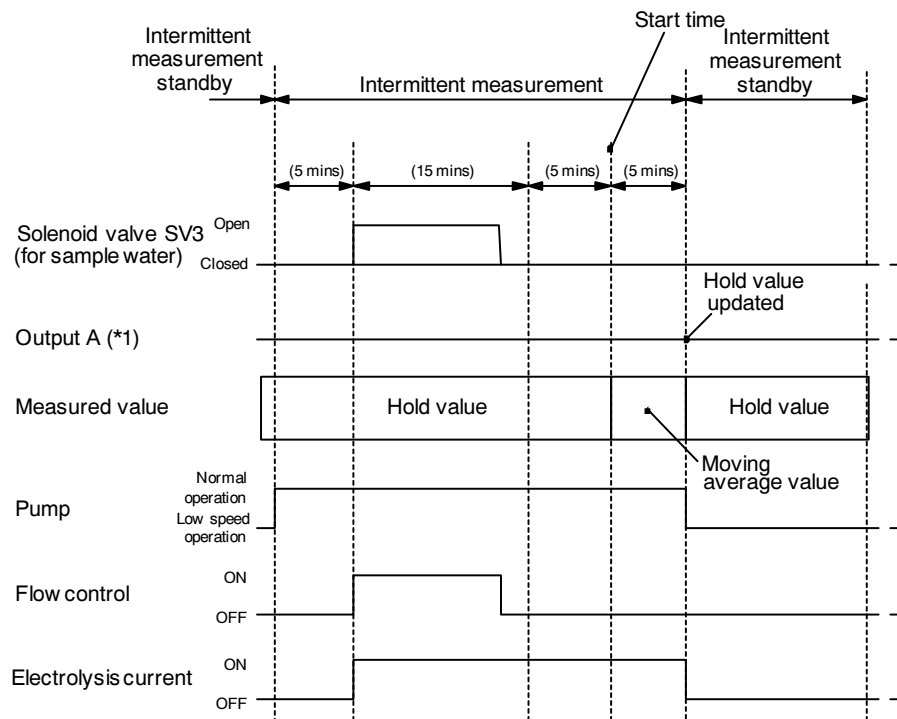
(4) Intermittent measurement

This analyzer can perform intermittent measurement in addition to normal continuous measurement. Continuous measurement keeps the sample water and reagent flow constant at all times and measures continuously. On the other hand, intermittent measurement is a standby state in which the reagent consumption is reduced by cutting the sample water and reagent flow by approximately 1/2 and starts operation and measures at a preset interval (batch measurement). The 2 measurement systems can be switched by external input signal. Specific intermittent measurement operation is as follows.

The analyzer perform a series of operation (hereinafter called measurement operation) such as the warm-up operation for sample water measurement and flow control, etc. from 25 minutes before the preset measurement start time. Next, the measured results for 5 minutes from the measurement start time are moving averaged and the measurement result is decided. The analyzer outputs the measurement result and reduces the solution feed pump speed to approximately 1/2 and enters the standby state.

For example, when the measurement start time is 12:00 and the measurement interval is 4H, at 11:35 the sample water and the reagent are returned to the specified flow and the measurement operation is started. Next, the data for the 5 minutes from 12:00 to 12:05 is moving averaged and the measurement result is output. Together with this the sample water and reagent flow is dropped to 1/2 and the analyzer enters the standby state.

The next measurement operation is started 4 hours later at 15:35 and the next measurement results are output at 16:05. Thereafter intermittent measurement is repeated at the start time for measurement interval such as 20:00, 24:00, and 4:00.



*1... A: Held measured value output >> 5.3 (18) "Output type"

Intermittent Measurement Process

- [NOTE] • If flow control does not end in 15 minutes, the pump is operated at the control value of the previous measurement and measurement is continued and error E-8 is output.
>> 7.1 "Errors and Corrective Actions".

9. Installation

9.1 Installation

(1) Installation site

Install the analyzer in a location which conforms to the specifications and satisfies the following conditions.

- (a) A location where installation and maintenance work can be performed.
- (b) A location where the ambient temperature and humidity are within the specifications, and where direct sunshine does not strike and a sudden change of temperature does not occur, and temperature does not change locally.
- (c) A location where equipment that generates electrical noise does not exist nearby.
- (d) A location where sea water or chemicals are not sprinkled.
- (e) A location where no vibration occurs.
- (f) A location where there is a drain trench for waste solution processing and a concrete floor invulnerable to spilling of solution
- (g) A location where the ion exchange water, etc. for reagent preparations are available.

WARNING

Hazardous Gasses

- Do not use the product in an area where explosive gas or flammable gas exists. Using the product in any of these areas can cause explosion or fire.
-

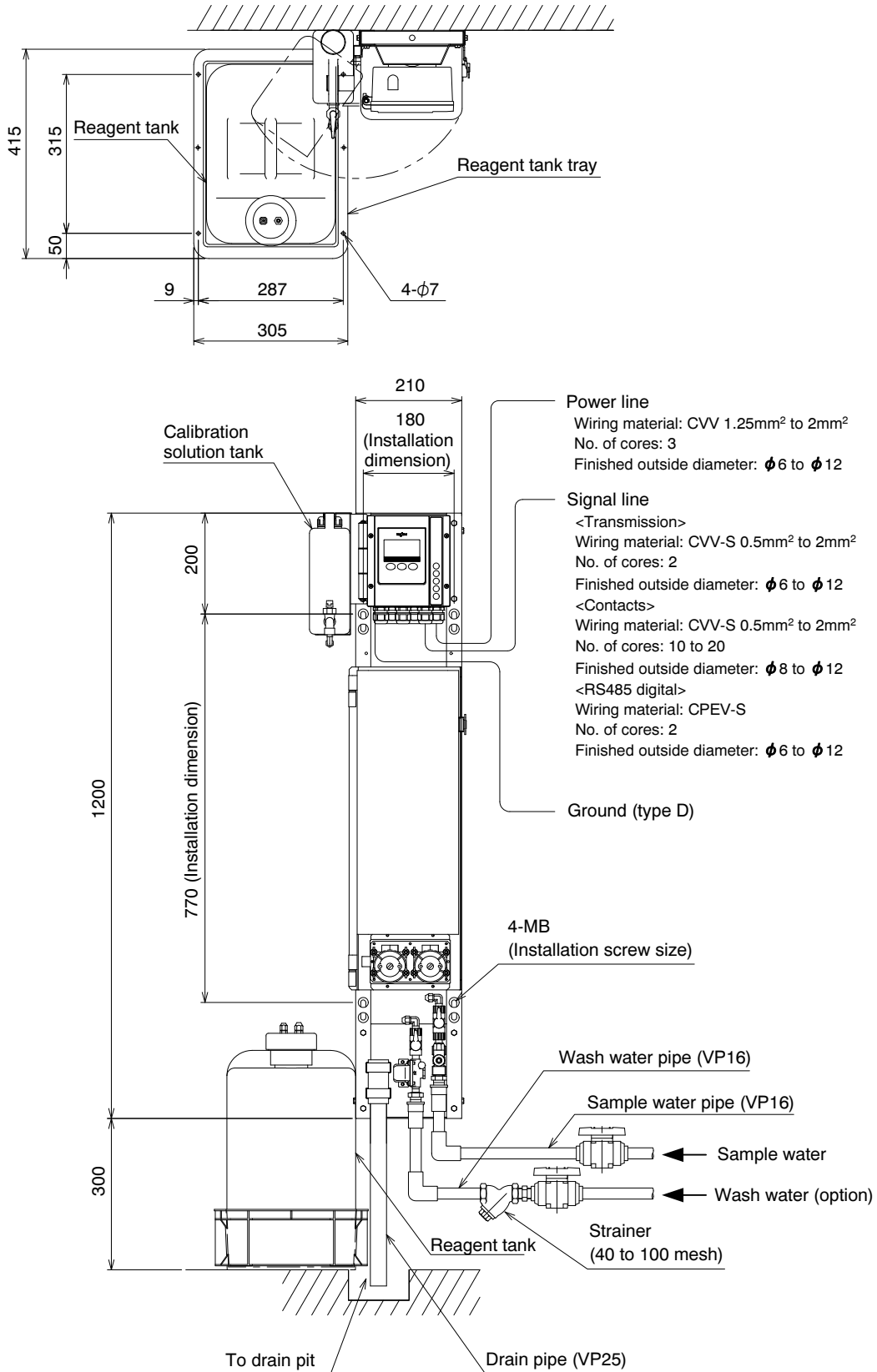
(2) Outdoor installation and an installation in cold climates

If the analyzer needs to be installed outdoors, installation in an enclosure is necessary. In cold climates where an accident may occur caused by freezing, we recommend you install the analyzer in an enclosure where temperature is kept constant.

(3) Installation particulars

Install the analyzer by paying careful attention to the following points:

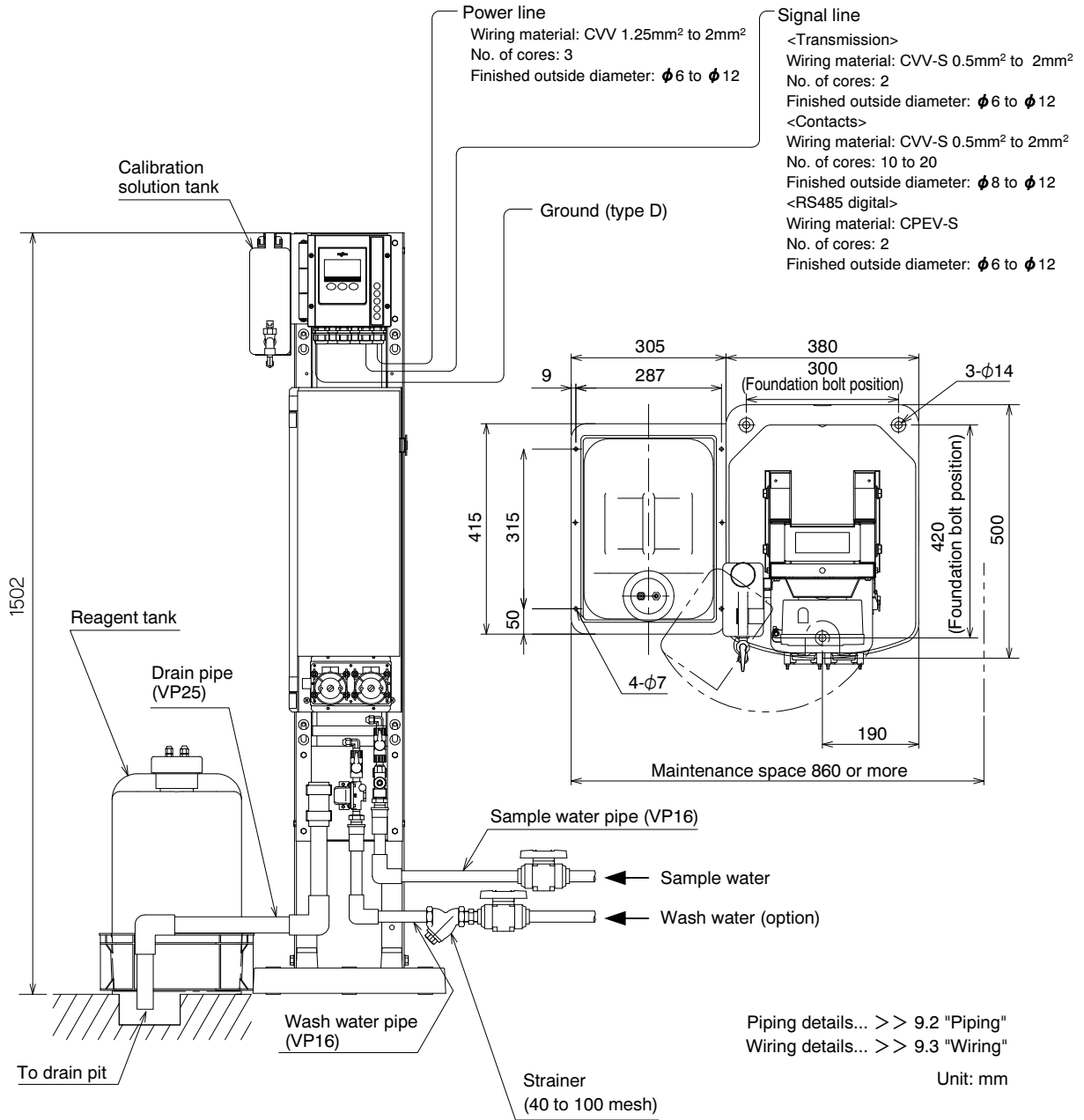
- Standard (wall mounting) Make the side of the product perpendicular to the mounting surface.
- Rack mounting Make the top of the product level with the mounting surface.



Piping details... >> 9.2 "Piping"
 Wiring details... >> 9.3 "Wiring"

Unit: mm

Installation Example (standard specifications)



Installation Example (rack mounting specifications)

9.2 Piping

Use 13 to 25A rigid PVC pipe, and pipe it to the connection port on the back of the analyzer.

(1) Sample water piping

- (a) Use VP13 to 16 rigid PVC pipe.
- (b) Insert a union so that the inside of the piping from the sampling point to near the analyzer can be blow cleaned and provide a means of removal.
- (c) Make the introduction amount within the 1 to 3L/min range.
- (d) When the SS (Suspended Substance) part of the sample water is large, add the wash function.

Depending on the situation, install separate filtering equipment as a preprocess.

(2) Drain piping

- (a) Use rigid PVC pipe of VP25 or more and pipe the drain with a downward slope.
- (b) Provide a way to remove the rigid PVC piping, the same as section (1) (b).

(3) Wash water piping

- (a) Use PV13 to 16 rigid PVC or tetoron braided hose, etc.
- (b) When freezing is predicted in the winter, heat the piping.
- (c) When city water is used as the wash water, connecting the city water to the analyzer is prohibited. Install a city water receiving tank and pressure pump. City water pressurization equipment combining these is available commercially.

【IMPORTANT】 • Before connecting the wash water to the analyzer, remove the dirt inside the piping and remove burrs and pipe debris.

9.3 Wiring

WARNING

Electric Shock

- Do not touch the terminals inside the product while power is applied. Touching the terminals may cause electric shock.

(1) Cables used

Observe the following items when installing cables.

(a) Use the cables specified in the following table or equivalent.

Wiring and Materials

Wiring location	Wiring material	No. of cores	Finished outside diameter	Note
Power line Terminals “90,91, and E1” within 100 m	CVV 1.25 mm ² to 2 mm ²	3	φ6 to φ12	Connect cables to the transmitter.
Transmitter output signal line Terminals “70 to 73”	CVV-S 0.5 mm ² to 2 mm ²	2	φ6 to φ12	
Maintenance in progress and other output signals Terminals “30 to 43”	CVV-S 0.5 mm ² to 2 mm ²	10 to 20	φ8 to φ12	
Measuring range switching and other input signals Terminals “50 to 55”	CVV-S 0.5 mm ² to 2 mm ²	10 to 20	φ8 to φ12	
Digital signals (RS485) Terminals “74 to 79”	CPEV-S	2	φ6 to φ12	Twisted pair cable (with shield)
Connection to detection section Terminals “60 to 62, 92, 93, and E2”	Use a dedicated cable.			

(b) The ground terminal at the lower section of the transmitter must be grounded with D-type grounding (100 Ω max. ground resistance). If it is not possible to ground the terminal at the transmitter, use a 3-core power cable and connect its ground wire to the ground terminal “E” in the transmitter and ground the other end of the wire at the power distribution panel. Make sure to install an independent ground separated from that of power equipment.

(c) Use terminals corresponding to the following crimp terminals at the end of the cable.

- 2-MS3
- 0.5-3
- 1.25-MS3
(All made by J. S. T. Mfg. Co., Ltd.)

⚠ WARNING

Electric Shock

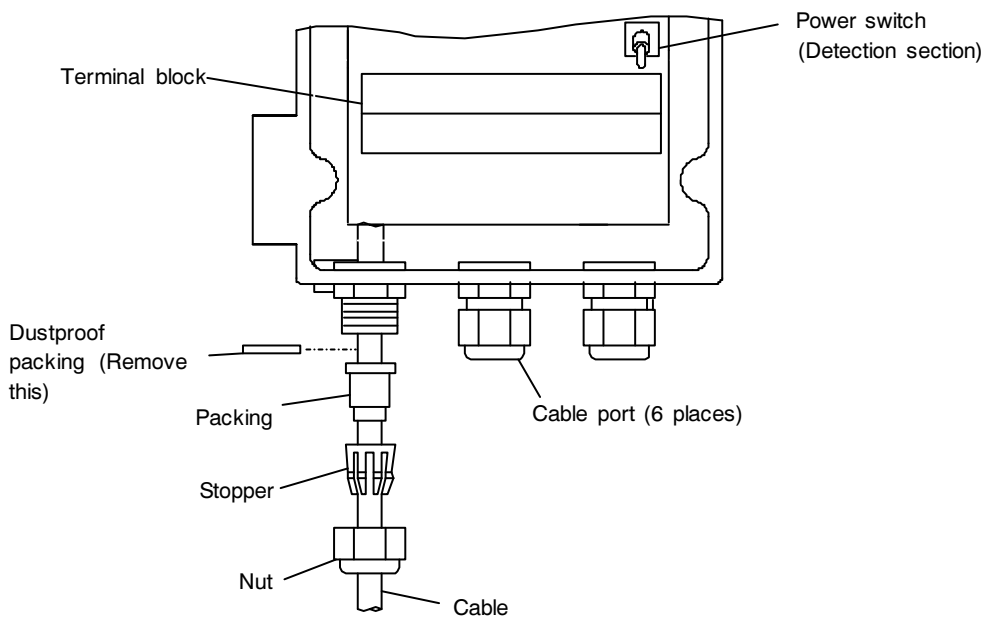
- The ground terminal must always be grounded. If the terminal is not grounded and a problem occurs in the power supply system, electric shock may result.

(d) Output signal lines must be separated from power lines and other noise source.

(2) Wiring port

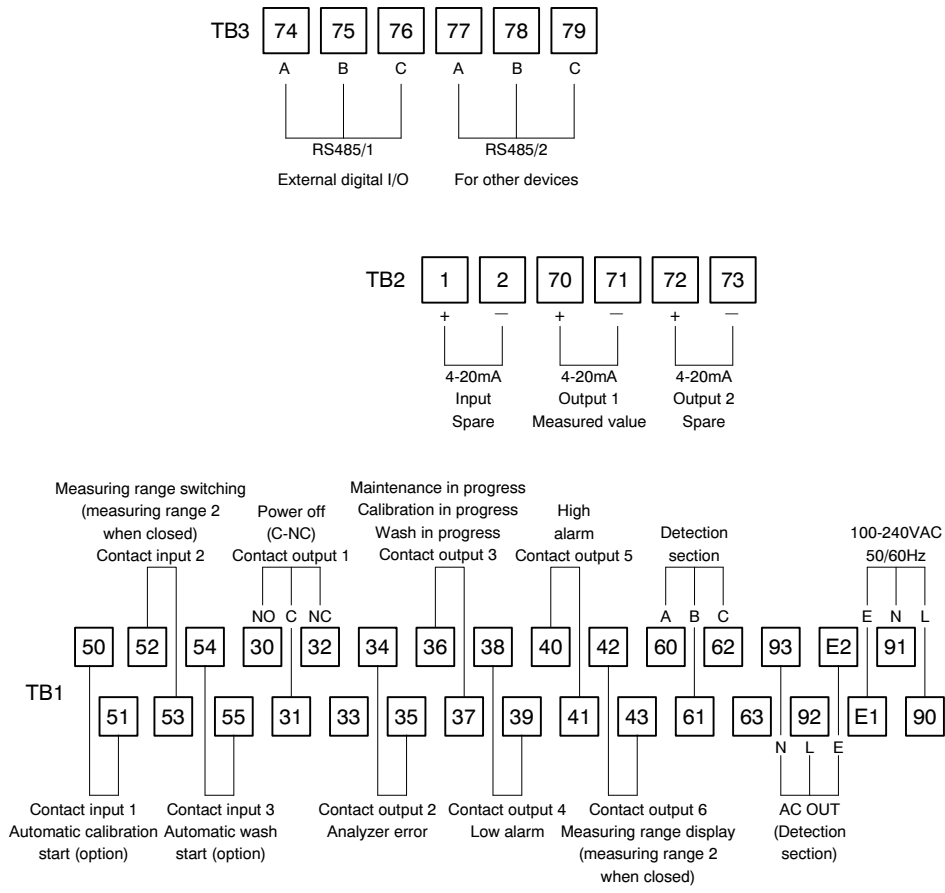
Pass the cables through the wiring port (for $\phi 6$ to 12 cables) and assemble to the inside of the transmitter.

-
- 【IMPORTANT】**
- Use cable having an outside diameter appropriate for the wiring port. If the outside diameter is inappropriate, air tightness inside the transmitter will not be maintained and the humidity inside the transmitter will rise causing an insulation drop.
 - To maintain air tightness, tighten all the nuts after wiring. In addition, do not remove the dustproof packing of unused wiring ports.
-



Wiring Port

(3) Terminals



*Allocation of this contact I/O signal is set at the factory.

Terminal Connection Diagram

- 【IMPORTANT】**
- Use crimp terminals as the cable terminals, especially at the end of the power cable, and wire so that there is no falling off or short circuit.
 - Do not make any wiring mistakes. They will cause trouble.

(a)“50 to 55” …… Contact input signal terminals (DI1 to 3)

Action: Can be changed, as required. >> 5.3(23) “Input signal”

No voltage contacts input: ON resistance within 50Ω, max. short-circuit current 10mA, open voltage 24VDC, contacts closed 100ms or longer.

The allocated function is performed by “closing” the contact to this terminal.

(b)“30 to 43” …… Contact output signal terminals (DO1 to 6)

Action: Can be changed, as required. (Power off is fixed to contact output 1.)

>> 5.3(24) “Output signal”

Contact capacity: 30VDC, 0.1A (resistive load)

When the set function turns ON, the contacts are “closed”.

Contact output 1 has “closed contact” and “open contact”. When allocated “power off”, the contacts can be “closed” when the power is interrupted. When “power off” and other functions are allocated to “31 to 32”, the contacts can be “closed” when the power is interrupted or the set function is turned ON.

(c)“70 to 73” …… Transmitter output signal terminals

Rating: 4 to 20 mADC, load resistance 600 Ω or less, isolated output (not isolated between channels)

Measured value, etc. can be allocated to 2 channel transmitter output terminals by setting.

(d)“1, 2” Analog input signal terminals

Action: 4-20 mA signal can be input.

Digital signal can be taken from this transmitter by connecting these terminals to a device not having a digital output. Full scale corresponding to 4-20 mA can be set.

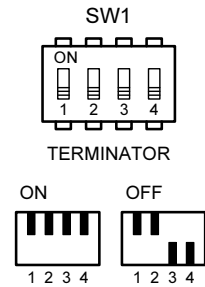
(e)“74 to 79” Digital signal terminals

Rating: RS485 (modbus)

RS485/1 and RS485/2 are connected in parallel internally.

When connecting other devices in cascade, use the “RS485/2” terminals.

When connecting other devices, set the terminator to OFF. The terminator setting switch is located at the right-hand side of the terminals.



Terminator Setting

(f) “60 to 62, 92, 93, E2” Detection section connection terminals

Connect these terminals to the detection section using a dedicated cable. Connect so that the numbers on the cable match the numbers of the terminals.

Terminals 60 to 62 connect to the signal lines and terminals 92, 93, E2 are the power connections.

Incorrect connection will cause trouble. Make the connections carefully.

(g)“90, 91” Power supply input terminals

Rating: 100 to 240 VAC±10%, 50/60Hz

-
- 【IMPORTANT】**
- For safety reasons, do not supply power to the analyzer before performing operations described in 3.1 “Starting Operation”
 - Do not connect power supply other than 100 to 240 VAC±10%, 50/60Hz to the power supply input terminals 90 and 91. Connecting power supply other than 100 to 240 VAC±10%, 50/60Hz can result in fire.
-

(h)“E1” Ground terminal

If the ground terminal at the lower section of the transmitter is not grounded, use this “E1” terminal to ground the transmitter.

Rating: Ground must conform to D-type ground (100Ω max. ground resistance).

-
- 【IMPORTANT】**
- Separate this ground from that of power equipment.
-

⚠ WARNING

Electric Shock

- The ground terminal must always be grounded. If the terminal is not grounded and a problem occurs in the power supply system, electric shock may result.

Revision History

Instruction Manual No. ALF-IB50603E	12/02/2011 (JJ)	New Version in English (RW1 Kitahama, DEC Kuribayashi)
ALF-IB50604E	13/09/2013 (JJ)	 (RW1 Takahashi, DEC Kuribayashi)

YTD



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