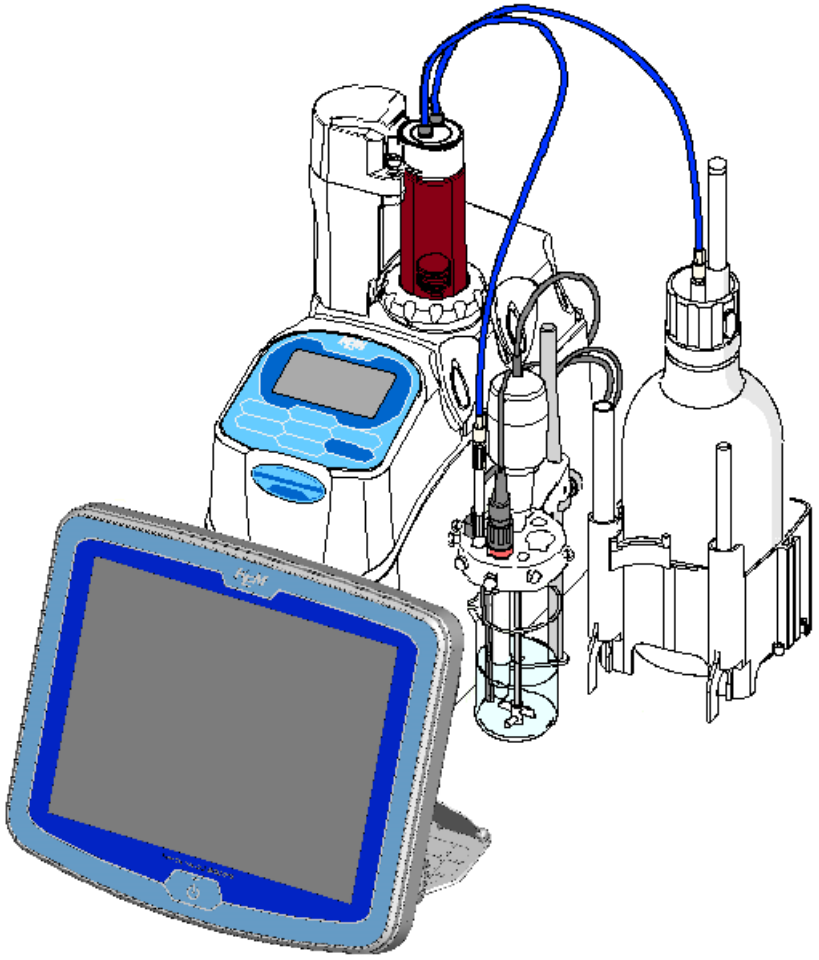
Main Control Unit

MCU-710M/S

(for use with AT-710)

Operation Manual



Please read this manual thoroughly in advance for the best performance of the equipment.

KYOTO ELECTRONICS
MANUFACTURING CO.,LTD.
http://www.kyoto-kem.com
AN 59-00419-11Ver.00

Introduction

We thank you for your continued patronage of KEM products. The AT-710 Automatic Potentiometric Titrator you have purchased is the latest titration system to determine concentration of target substance in liquids or solids, operated easily and resulting quickly with high precision and accuracy. By changing the electrode and preamplifier, those titrations like acid base, redox and photometric can be equally performed as well.

[Features]

1) **8.4 inch large color TFT-LCD with touch panel**
8.4 inch large color TFT-LCD is easy to see with excellent visibility.
The touch panel makes a key input so much easier.

2) **Four (4) measuring units can be connected (simultaneous measurements in parallel)**＜MCU-710M＞
By connecting optional expansion units (a Karl Fischer Moisture Titrator, an Automatic Potentiometric Titrator), up to 4 titrators can operate in the same way. For example, both a titration and a moisture measurement can be performed simultaneously. An installation of multiple titrators realizes space-saving.

3) **Separated touch panel and measurement unit with Bluetooth®**
＜MCU-710M＞
By connecting a wireless adapter (Bluetooth® ,a commercially available product), the touch panel operation panel can be used without connecting a cable to any titrator. As for the measurement of a sample that may produce toxic gas, you can carry it out safely by placing the titrator in a draft chamber and the operation panel outside the draft chamber.
＜MCU-710M/S＞
Furthermore, you can use it placing the operation panel on the opposite side of an aisle or handcarrying the panel connecting a battery (a commercially available product). An MCU-710 can be mounted on a monitor arm and free to fix in a desired position (the arm mount to a display meets the VESA standard (75mm x 75mm))

4) **Setting of operation permission on user group basis**
Set operation permission of various functions on user basis as requested by CSV (computer System Validation).
2 levels of permission can be set. Administration mode (all operations, with password) and Users mode (burette handling, calibration, measurement, change of method number (sample file) and viewing).

5) **New-type burette unit**
Reduce amount of residual liquid with no tube between a cylinder and a switching valve as well as with less space at the head of a cylinder. Easy reagent replacement (Compared to AT-610)

6) **All information on Titration reagent is stored in an IC chip on a burette unit.(Smart burette)**

All information of reagent is recorded in an IC chip on a burette unit. Therefore, there is no need to re-enter the information when the burette is installed on another titrator. That prevents use of reagent one does not intend.

7) **Information is stored in the electrode(Smart electrode)(option)**

By using a smart electrode cable, information on an electrode can be stored in the cable, not in a titrator. Switching electrodes does not require re-calibration of an electrode.

8) **Monitoring temperature during titration**

Monitor temperature during titration and interrupt dosing of solvent when the temperature exceeds the specified upper limit. Ensure safe titration during which the temperature is likely to be raised (c.f. By strong acid – strong base reaction).

9) **Two different potentials (pH/temperature, pH/transmittance or the like) can be simultaneously recorded**

The two potentials, e.g. pH and temperature, ph and conductivity or pH and transmittance can be plotted on single titration curve. Thereby, you can see the behavior of conductivity in relation to changing pH or the changes of color by the indicator in correlation to the actually changing pH.

10) **Titration results provided in PDF**

Measurement results are converted to PDF and stored in the USB flash memory, electric media. There is no need to print them out and that contributes to paper reduction.

11) **Burette can be selected 1 unit and 2 unit type**

AT-710 is installed 1 burette, and in addition, can be installed one more burette. 2 burettes can be used without increasing space.

12) **GLP/GMP conformed**

Conforming to GLP and GMP, Check results with standard substances and calibration records for electrodes can be recorded. Recorded results can be displayed as history. Further, AT-710 features reminders of the day for replacing reagent and piston. More enhanced support functions for GLP/GMP than traditional models, such as confirmation of the number of piston operation or electrode check function.

13) **LAN<MCU-710M>**

Can load or store measurement data with a browser that comes with a PC.

Important:

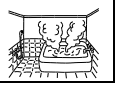
You must observe the following rules in order to prevent physical or property damage of yourself as well as of the others.

Meaning of Symbols

Warning	Danger of severe injury or possible death
Caution	Risk of physical or property damage
	This symbol means Prohibition.
	This symbol means Mandatory.

Place for Installation

Use the devices indoors, and avoid a place under any of the following conditions to avoid malfunction.

Caution		
Operation of devices with strong electric motors using common power source	Under direct sun light 	Corrosive gas atmosphere
Near strong magnetic/electric field		
Heavily loaded and fluctuated or near power source or magnetic field	Excessive range of temperature other than specified	Ambient humidity exceeding 85%RH 
Under vibration	Location with large temperature difference	

Power Source

Warning		
You must ground earth wire of power cable. Danger of electric shock if not grounded to earth. The power supply from AC adapter other than that are specific to the equipment, we cannot guarantee the safety of the product.		
Caution		
Plug out power cord in case of unit malfunction or possible lightning. Otherwise, the unit may be broken.	Power source for this unit:AC100-240V Frequency: 50Hz/60Hz	Do not share power as shown below. 
	Supply power direct from power outlet. 	Do not put any obstacle around power outlet just case of need for plugging out power cord to avoid the possible danger of the whole system in trouble.

Test Sample

Warning	
Some sample or chemical requires protective gloves, glasses and mask. Ventilate the room. Splashing chemical may injure the eyes or skin. Windpipe may be hurt if fume is inhaled.	Do not use chemical which may generate inflammable gas or work in such atmosphere. Be aware of a risk of explosion inside the system.

About place for storage

Caution		
If the unit is not used for an extended period of time, first clean the electrode and place it for storage. Also discard the regent in the burette, and clean it with pure water or methanol before storage.	It is recommended to pack the main unit in the carton box in which the instrument was first delivered 	Avoid the places for storage under inadequate ambient conditions such as extremely high/low temperature, high humidity or heavily dusty atmosphere

About Use

Caution
When a reagent etc. is spilt to Main unit or the connectors, there is a possibility of malfunction. When switching valve is got wet, there is a possibility of malfunction.
Do not give excessive forces such as falls at the main body, burette, switching valve. There is a possibility of malfunction.
When using the touch panel, just lightly touch it with a finger. Do not touch it with a sharp edge such as pen tip; otherwise the touch panel can be incapable of normal operations.
When MCU-710 is linked with AT-710 by wireless connection, the communication distance or radio interference may cause unshown measurement results or disabled operations.

About reagents

Caution
The liquid contact part on burette and reagent bottle is made of materials such as glass, ceramics or fluorocarbon polymer. Refrain from using reagents containing solid medium that may be incompatible with these materials.
Note that Precautionary statements of the reagent label. Dispose of in accordance with laws and regulations.

Other Cautions

Caution	
Do not attempt overhaul or repair the unit by unauthorized person except authorized by KEM. Danger of electric shock, fire or malfunction.	Do not use the unit in a way other than specified. Danger of fire, electric shock or malfunctioning of the unit.
Do not use such a solvent as alcohol, acetone, thinner or the like for cleaning this instrument. Doing so may adversely affect the instrument, e.g. deformation, discoloration or cracks. When cleaning this instrument, wipe it with a soft cloth or tissue paper, after applying detergent diluted with water to the soft cloth or tissue paper and adequately wringing out excess water in order not to allow water drops to fall.	
Environment This equipment shall be used under the following conditions classified in the section 1.4.1 of the CE marking (Low Voltage Directive, 2014/35/EU, EN61010-1): altitude up to 2000m; over voltage CAT II; pollution degree 2.	
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules and RE Directive. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.	

About the Manual

Read this operation manual thoroughly before use.
It describes all that are required for routine measurements.
Keep this manual beside your equipment so that you can refer to whenever necessary.

For detailed test methods, see the separate Function Description.

The following symbols indicate the important notes that raise your attention.

1. Note

Note

Unless you observe the note, you may not be able to obtain specified performance of the unit, and your unit may not be covered by warranty.

2. Hint

This symbol notes technical tips which are convenient to your measurement work.

※It is prohibited to duplicate any part or all of manual without prior consent.

※This manual has been prepared to the best of our knowledge;however, if you should find any missing or ambiguous description, please contact your nearest dealer or sale representative.

※Maker will not be liable for any loss or damage caused by use of or the result of the product.

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※This manual describes usage according to standard specification. For special version, refer to the accompanying document.

Please refer to "Function Description" for details of each function.

Table of Contents

1. Preparations for measurement

1-1. Supplied parts

Check the supplied parts referring to the following parts list. If you should find any missing or broken parts including the main unit, accessories or manual, contact your sales representative or local dealer.

＜MCU-710 Main Unit＞

Part Number	Part Description	Qty	Remarks
-	MCU-710M Main Unit	1	For M model
-	MCU-710S Main Unit		For S model
64-00643-33	USB Cable(A-A) 0.9m	1	
64-01338	DC Plug Cable 1.0m	1	
-	Stopper	1	
59-00493	Packing List	1	
-	Inspection Certificate/Warranty	1	

＜AT-710 Main Unit＞

Part Number	Part Description	Qty	Remarks
-	Main Unit	1	
12-05356	MS-710A Magnetic Stirrer	1	
12-05639	Propeller Stirrer Set		
12-05641-05 12-05641-10 12-05641-20	EBU-710 Burette Unit	1	
12-01263	Vial for Degassing (with Septum)	1	
20-06822	Seal	1	
65-00028-01	Clamp Filter	1	
64-00898	AC Adapter Type4	1	
64-00633 64-00633-01 64-00633-02 64-00633-03	Power Cord (EU,KR) with PlugC(WS-010) Power Cord (US,TW) with PlugB(WS-001) Power Cord (GB) with PlugG(WS-012A) Power Cord (CN) with PlugI(WS-015D)	1*	200-240 V 100-120 V 220-240 V 200-240 V
20-06257	Piston Removing Tool	1	
12-05700	AT-710 Operation Manual (CD-ROM)	1	With MCU-710 Operation Manual
59-00419-06	AT-710 Quick Reference	1	
59-00419-07	AT-710 Quick Reference	1	
59-00405	Safety Instructions	1	
59-00494	Packing List	1	
59-00761	Contact	1	
-	Inspection Certificate/Warranty	1	

*Make sure your country's power requirement.

Please refer to the section "8-1. Parts list" when ordering these parts.

Note

1. Preparations for measurement

— Components of MS-710A Magnetic stirrer (12-05356) —

Part Number	Part Description	Qty	Remarks
-	MS-710A Magnetic Stirrer	1	
20-06836	Stand Bar	1	
-	Stopper	1	
12-04299	Multi Electrode Holder	1	
64-01156	Connecting Cable 0.6m	1	For Stirrer
66-00125-04	Stirrer Rotor L=25	1	

— Components of Propeller Stirrer set (12-05639) —

Part Number	Part Description	Qty	Remarks
12-03566	Propeller Stirrer	1	
12-03567	Holder Unit	1	
12-04299	Multi Electrode Holder	1	

— Components of EBU-710 Burette Unit (12-05641-05, 10, 20) —

Part Number	Part Description	Qty	Remarks
-	Burette Unit	1	
12-01260-01	Desiccant Tube φ18×120 with Zeolite	1	
20-04052-00	Nozzle Cover	1	
12-03644	Connection Tube2×3 L=620 PFA (for Nozzle)	1	
12-03645	Connection Tube2×3 L=730 PFA (for Bottle)	1	
12-00169-02	Diffusion Proof Nozzle(with Degassing Tube)	1	
20-04050-00	Nozzle FEPφ3×2-0.5 L=150	1	
12-03926	Reagent Bottle Cap with Plug	1	
20-09813	Bottle stand	1	
69-00028-00	Polyethylene Bottle 1L	1	
20-06823	Bottle holder (1)	1	φ85

Please refer to the section "8-1. Parts list" when ordering these parts.

Note

Note The following parts, electrode, electrode cable, temperature compensation electrode and electrode internal solution are included when separately ordering.

When the photometric titration kit is purchased, the following parts are also included in the kit.

Part Number	Part Description	Qty	Remarks
12-00110-00	Photometric Sensor	1	
64-01018	Connection Cable (MiniDIN8P-8P)1.5m	1	
12-00112-00	Interference Filter(530nm)	1	Equipped to the photometric sensor.
12-00112-01	Interference Filter(630nm)	1	
20-07257	Shutter	1	

When the polarization titration kit is purchased, the following part is also included in the kit.

Part Number	Part Description	Qty	Remarks
12-03840	Twin Platinum Electrode(M-511)	1	

When the conductometric titration kit is purchased, the following part is also included in the kit.

Part Number	Part Description	Qty	Remarks
12-01762	Conductivity Cell(K-321)	1	

When the burette unit is purchased, the following parts are also included in the kit.

Part Number	Part Description	Qty	Remarks
-	Burette Unit	1	
12-01260-01	Desiccant Tube φ18×120 with Zeolite	1	
20-04052-00	Nozzle Cover	1	
12-03644	Connection Tube2×3 L=620 PFA (for Nozzle)	1	
12-03645	Connection Tube2×3 L=730 PFA (for Bottle)	1	
12-00169-02	Diffusion Proof Nozzle(with Degassing Tube)	1	
20-04050-00	Nozzle FEPφ3×2-0.5 L=150	1	
12-03926	Reagent Bottle Cap with Plug	1	
20-09813	Bottle Stand	1	
69-00028-00	Polyethylene Bottle 1L	1	
20-06823	Bottle holder (1)	1	φ85
12-03645-01	Connection Tube2×3 L=980 PFA (for Bottle)	1	

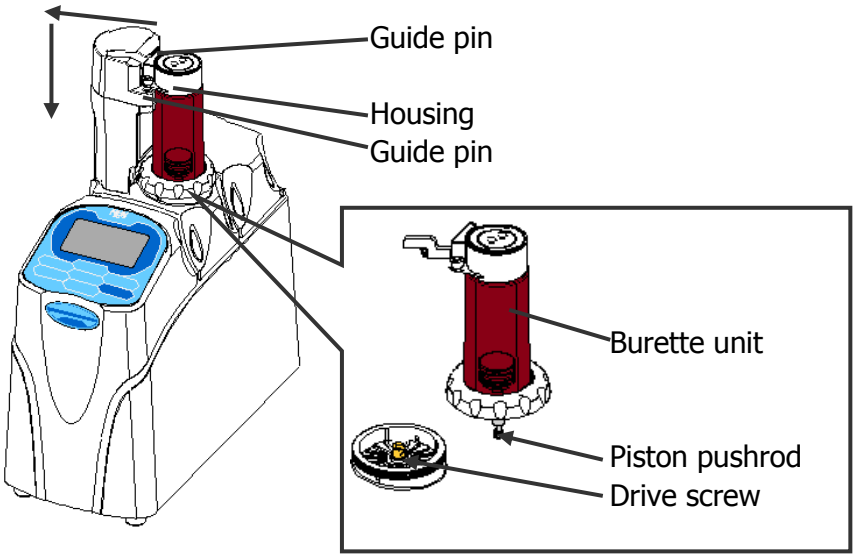
Note

Please refer to the section "8-1. Parts list" when ordering these parts.

1-2. Installation and start-up

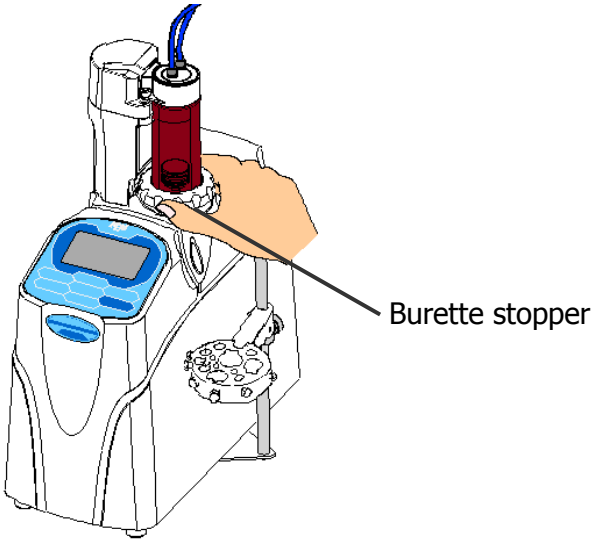
1-2-1. Installation of burette unit

1) As shown below, slide the burette unit from the right, and hitch the piston pushrod to the drive screw. If you put the housing on the guide pin and slide it, you will find it easier to adjust the height.
2) To place the burette unit, insert the hole of the housing of the burette unit into the two guide pins.



If the length of the piston pushrod out of the cylinder is too short or too long, the burette unit cannot be put to the shaft of the main unit. Refer to "3-13. Replacing burette unit" to adjust the length of the piston pushrod.

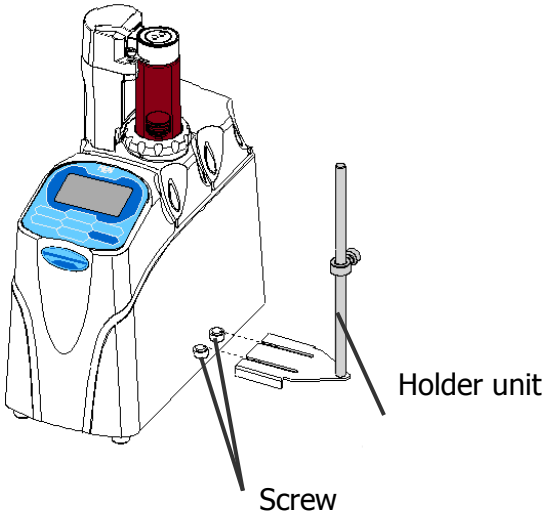
3) To fix the burette unit, hold down the top of the burette unit and tighten the burette stopper.



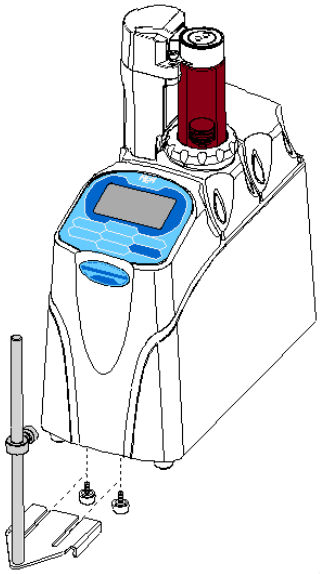
1-2-2. Assembly of magnetic stirrer

<For propeller stirrer>

1) Loosen screws of bottom in main unit. Slide the holder unit to insert to the interior, and tighten screws again.



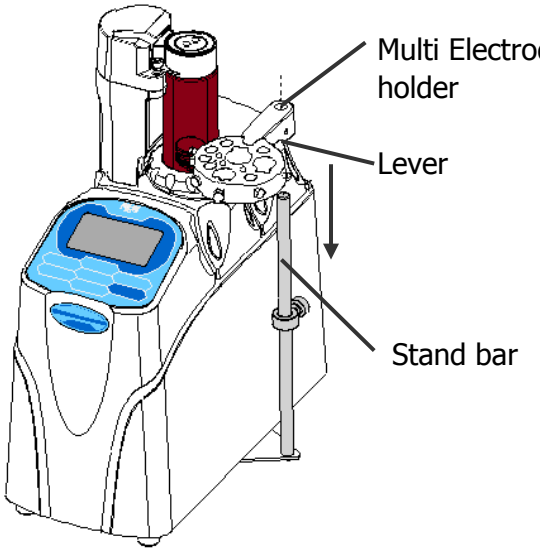
<Install to right side>



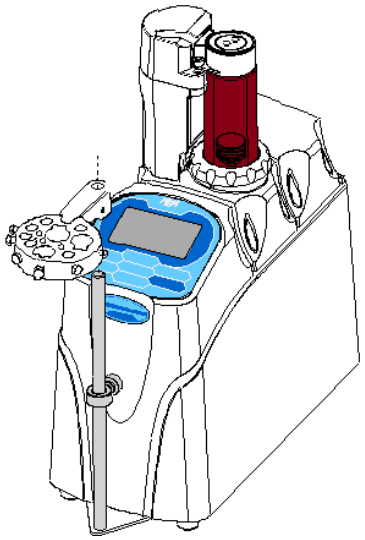
<Install to front side>

Holder unit can be installed left side or front side, not only right side by changing the position of screw. Please select it by customer's installation space and operation method.

2) Install the multi electrode holder to the stand bar. Install the electrode holder with the lever under the electrode holder.



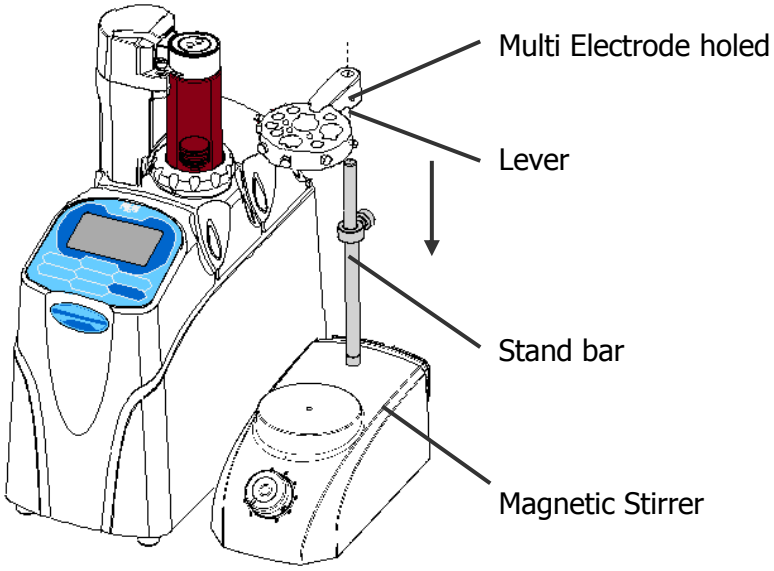
<Install to right side>



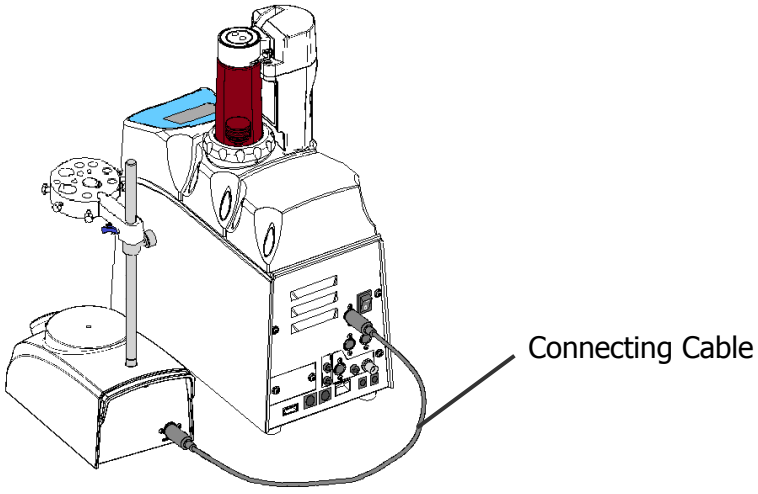
<Install to front side>

<For Magnetic stirrer>

1) Squeeze the stand bar into the Magnetic Stirrer as shown below.
2) Install the multi electrode holder to the stand bar for Magnetic Stirrer. Install the electrode holder with the lever under the electrode holder.

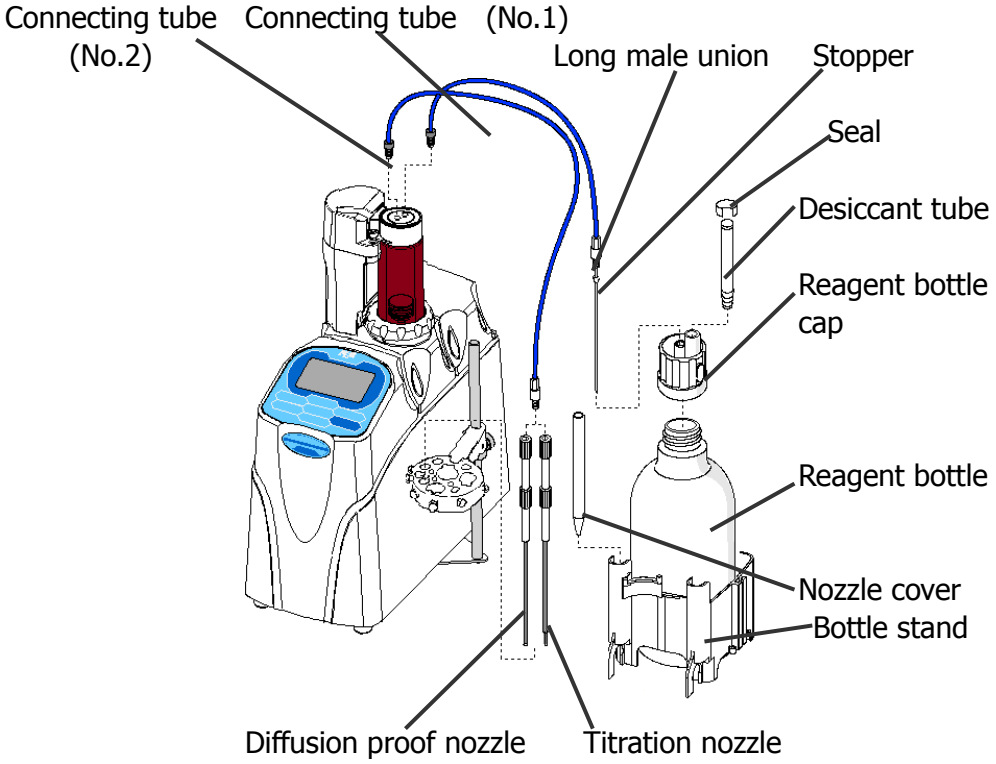


3) Connect Magnetic Stirrer and Automatic Potentiometric Titrator with the Connecting Cable as shown below.



1-2-3. Assembly of burette unit

1) Install the nozzle cover to bottle stand.
2) Tighten the connection tube (L=620mm) (No.2) to the position of No.2 of the switching valve. Tighten the diffusion proof nozzle to the tip of a reverse-side, and store it in the electrode holder. Place the diffusion proof nozzle with its discharge outlet facing outside.
   When using the titration nozzle in order to perform constant dose, change the tip of diffusion proof nozzle (12-00169-02) to the Nozzle FEPφ3×2-0.5 L=150 before connecting it with the tube. (Refer to "6-2-6. Replace titration nozzle").
3) Pass through the connection tube (L=730mm) (No.1) to the reagent bottle cap and tighten to install it (Please check that the Long male union and the stopper are attached to the tube). Match the tube to the position that reaches the bottom of the reagent bottle. Tighten the tip of a reverse-side to the position of No.1 of the switching valve.
4) Peel off the seal on Desiccant Tube φ18×120 with Zeolite, and install it onto the reagent bottle cap.



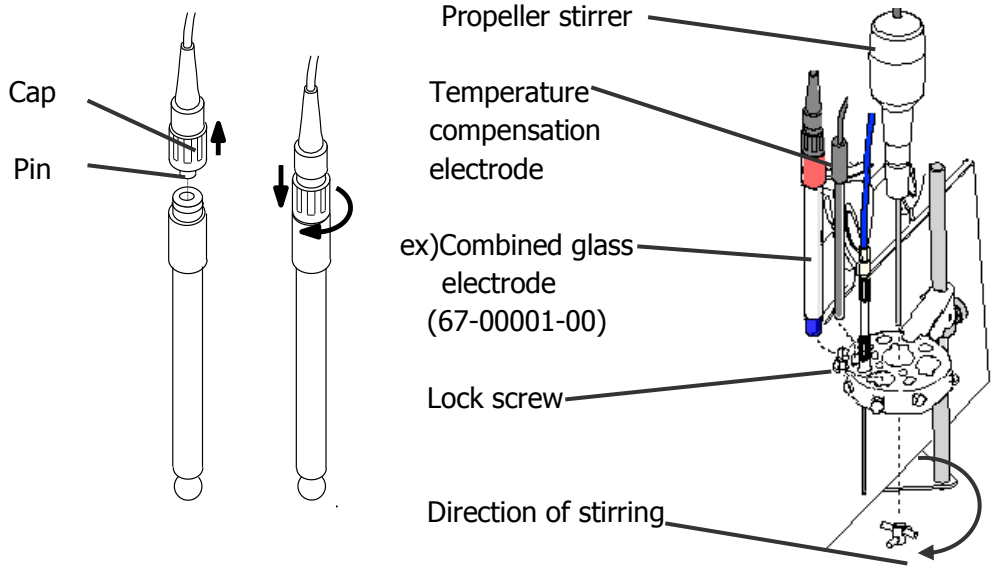
Note

Remove the seal on the Desiccant tube first.
Hold the tube not to loosen and turn only the union when installing the tube to the switching valve. Be careful not to break the tube.
A GL45 1L bottle or a 500mL container with 27mm bore can be placed to the reagent bottle screw cap. If the bore of your reagent bottle does not match the bottle stand, use the provided bottle holder.

You may remove the blue cover of the connecting tube when you use a titrant which is not affected by deterioration of a reagent.

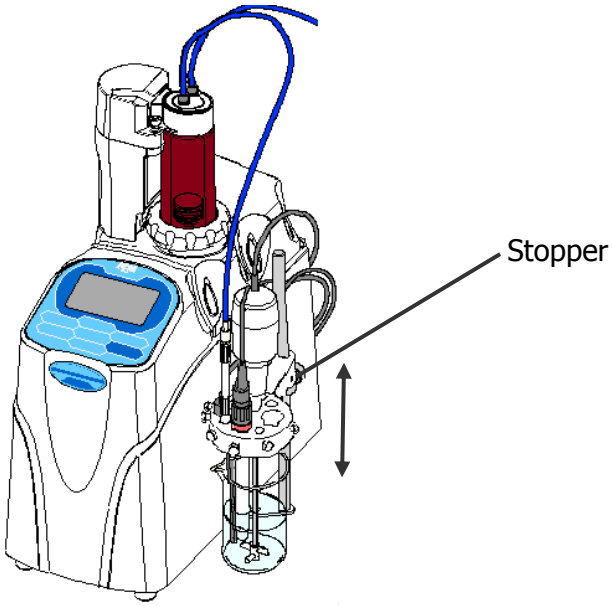
1-2-4. Installation of electrode and Stirrer

Install each electrode (option) and propeller stirrer (not required with a magnetic stirrer) to the electrode holder and fix it with the lock screws as figure below. Place an electrode farthest from the nozzle when stirring.



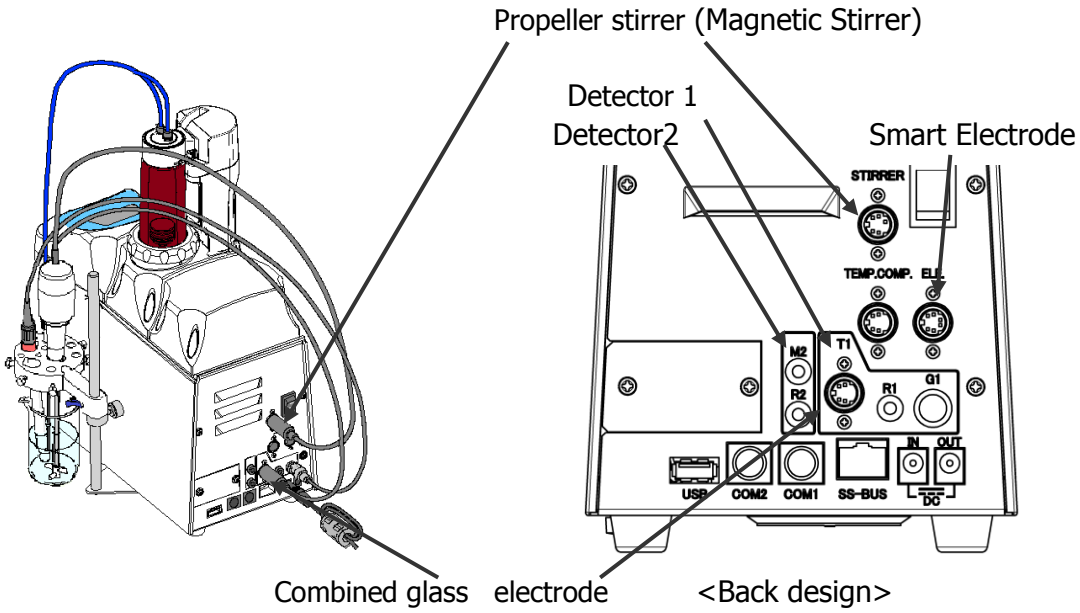
Note	The electrode cable must be securely connected to the electrode connector as figure until it clicks in, and then tighten the cap. Loose connection may result in abnormal signal detection. An electrode with the lead already connected does not require this step.

Fix the stopper at the height that the electrode does not hit a beaker even if the electrode holder goes down at the bottom. Adjust the vertical position of electrode holder with the lever under the electrode holder.



1. Preparations for measurement

Connect the electrode lead to the preamplifier in the back of main unit. Turn round and lock the terminal G1 after inserting the connector. Connect the cable (which is not an electrode lead wire) of the smart electrode to the ELE connector.Install the propeller stirrer (or Magnetic Stirrer) and the temperature combined electrode as to match the direction of the connector in the figure below.



Combination and Connecting position of electrode and electrode cable

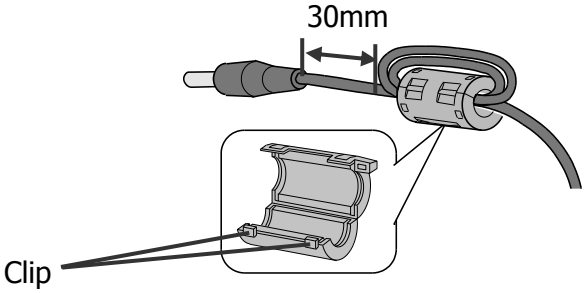
		Detector 1		Detector 2	
		G1：Glass electrode connecting terminal	R1：Reference electrode connecting terminal	M2：Metal electrode connecting terminal	R2：Reference electrode connecting terminal
Combined glass electrode	Electrode	Combined glass electrode			
	Electrode cable	64-00726-31 or 64-00726-41			
Glass electrode or Ion electrode	Electrode	pH glass electrode or ion electrode	Reference electrode		
	Electrode cable	64-00726-31 or 64-00726-41	Transparent side cable for 64-00726-33 or 64-00726-43		
Metal electrode	Electrode	Metal electrode (M-2xx) (M-3xx)	Reference electrode	Metal electrode (M-2xx) (M-3xx)	Reference electrode
	Electrode cable	64-00726-31 or 64-00726-41	Transparent side cable for 64-00726-33 or 64-00726-43	Transparent side cable for 64-00726-33 or 64-00726-43	Transparent side cable for 64-00726-33 or 64-00726-43
Combined electrode	Electrode	Combined electrode (C-2xx ,-3xx,-8xx)		Combined electrode(C-2xx ,-3xx,-8xx)	
	Electrode cable	64-00726-31 or 64-00726-41		64-00726-33 or 64-00726-43	
				Transparent side cable	Black side cable

Caution **The electrode is made of glass. If given excessive force, it may break and hurt your hand. Care should be taken when handle the electrode.**

Note Please refer to the section "8-2. Options" when ordering these parts.

1-2-5. Installation of Clamp Filter

Install the clamp filter to AC adapter as figure below. Hold the clip of the clamp filter and open as figure below, and wrap treble remaining the tip by about 30mm.

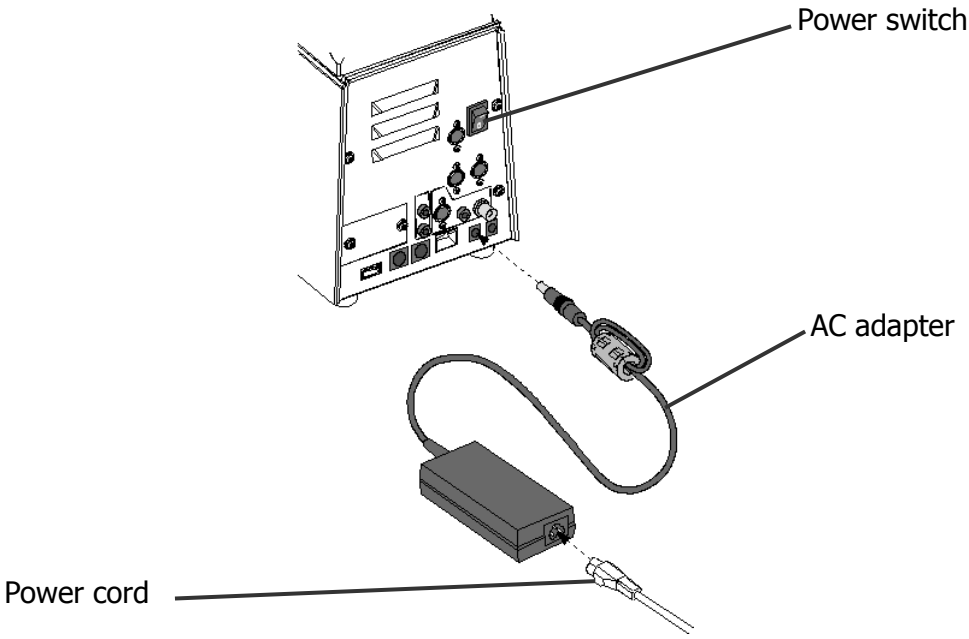


Note Installation of the clamp filter to AC adaptor is needed to satisfy the condition of EMC standard.

1-2-6.**Power cable**

1) Make sure the power switch is in Off position as figure below.

2) Install Power cord to AC adapter and plug in AC adapter on the back of main unit.

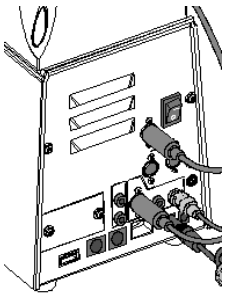


3) Connect Power cord to the power outlet.

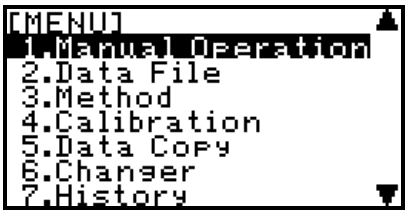
1-2-7.MCU-710 communication settings

Sets up communication settings to connect to the MCU-710.

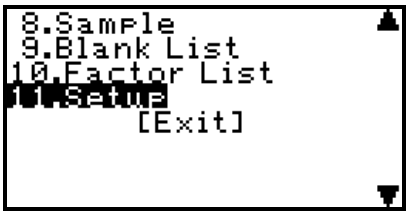
1) Turn on the measurement unit (AT-710). Its power switch is on the backside and turn it to On(-).



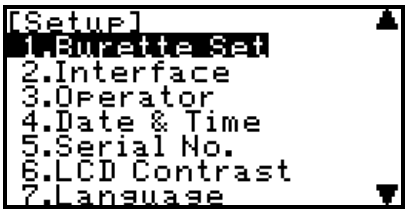
2) Press [MENU/HOME].



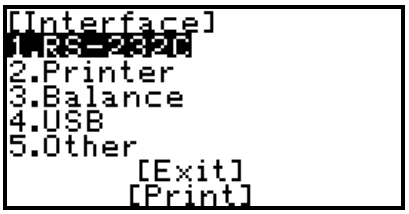
3) Press [↑] twice, select "11.Setup" and [ENTER] to confirm.



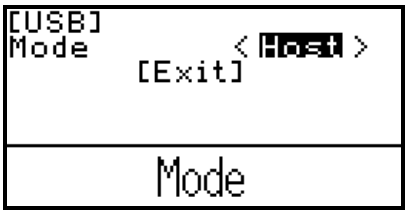
4) Press [↓], select "2.Interface" and confirm with [ENTER].



5) Press [↓] 3 times, select "4.USB" and confirm with [ENTER].



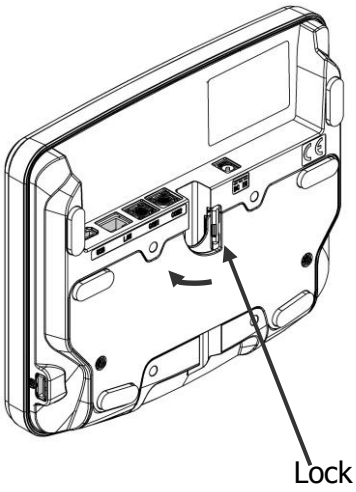
6) Select "MCU" with [←][→] keys, and press [ENTER]. When using a wireless adapter, select "Host."
7) Turn off the measurement unit (AT-710).



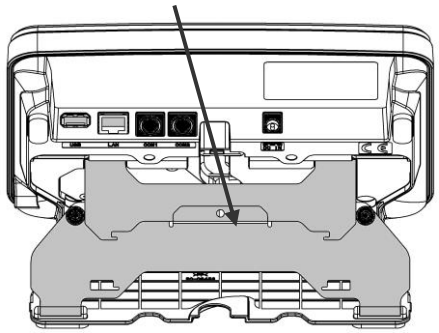
1-2-8.**Assembly of MCU-710**

The angle of the touch panel can be adjusted on three positions. Assemble the device according to your use.

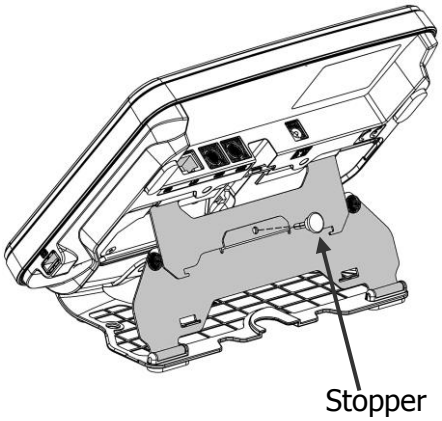
<Tilt at angle of 60°>
Installation area can be decreased because the touch panel is set at the front position of a measuring unit.
Rotate the Lock in the direction as shown in the figure.
Engage and secure the spots shown in the figure.



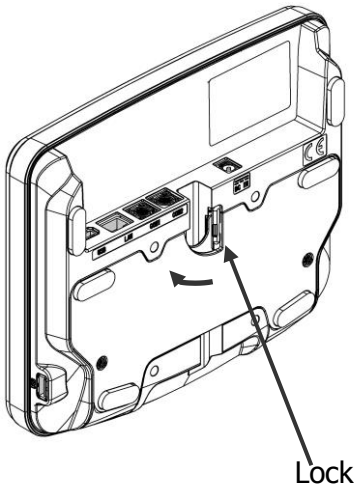
Engage and secure the spots shown in the figure.



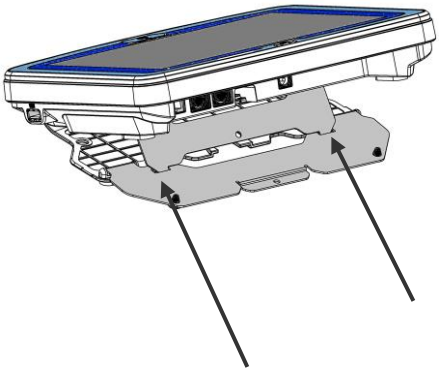
Insert the Stopper for locking the touch panel.



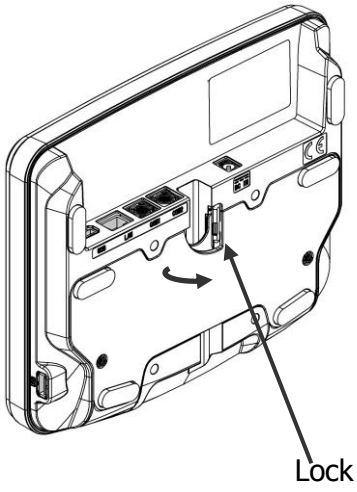
<Tilt at angle of 20°>
Tilt angle easy to operate the instrument when standing.
Rotate the Lock in the direction as shown in the figure.



Engage the two spots in the figure for securing the touch panel.

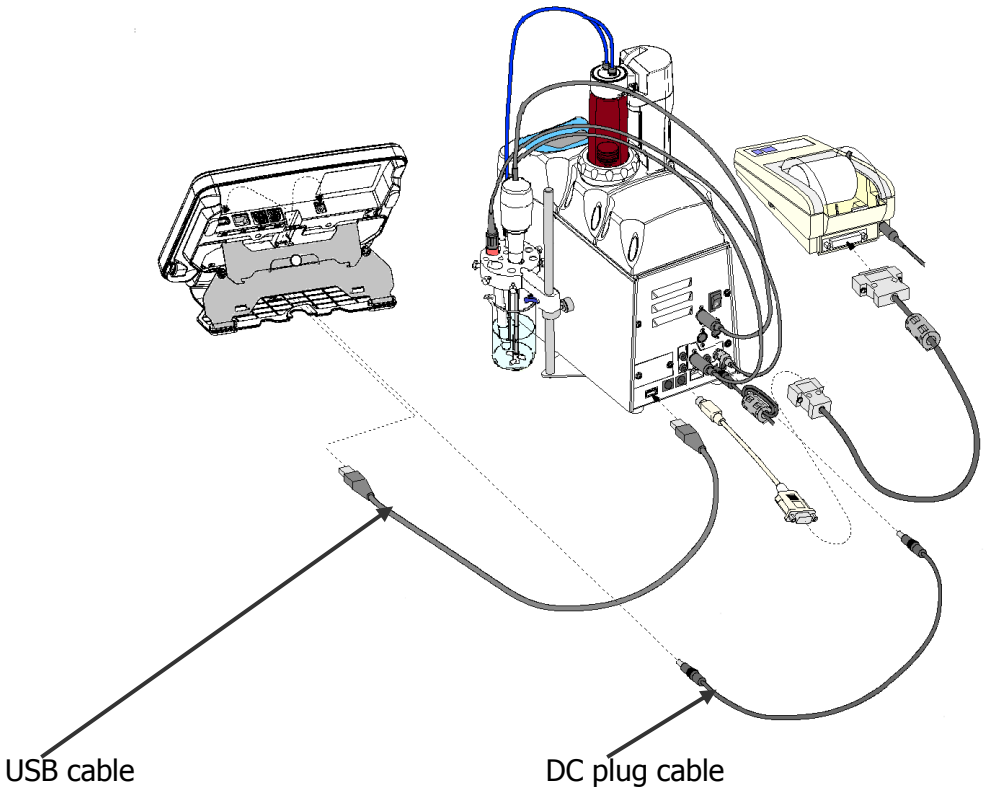


<When using the touch panel with folded back>
Applicable when hanging the instrument on the wall or the like.
Fold back the plate inward as shown in the figure.
Rotate the Lock in the direction shown in the figure for securing it.



1-2-9.Connecting cables

Connect the cables as shown below.
Connect "DC IN" of MCU-710 to "DC OUT" of AT-710 using the DC cable attached to MCU-710 as shown in the figure below.
Connect the USB port on the back side of MCU-710 to the USB port of AT-710 using the USB cable attached to MCU-710. When connecting more than one measuring unit (only MCU-710M), connect a USB hub to the USB port on the back side of MCU-710 before connecting USB cables.
Connect IDP-100 to COM1 as shown in the figure. (When printing out a plurality of units on one printer, connect the cable to COM1 on the back of MCU-710.)

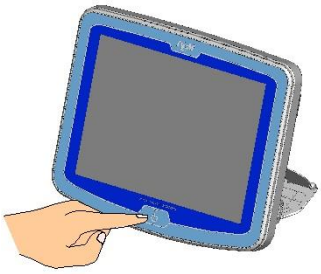


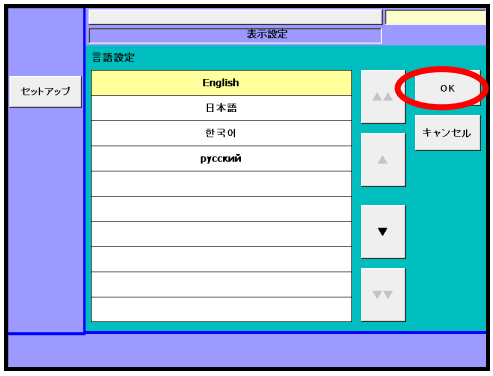
Caution **When connecting the USB cable to MCU-710, be sure to make USB setting of AT-710 to "MCU" and cycle AT-710, according to Section "1-2-7. MCU-710 communication settings." Failure to observe this caution may result in instrument damage.**

Note Use an AC adapter appropriate to the power line voltage. Make sure of the rating of the AC adapter before plug it in to avoid malfunction of the unit or breakout of a fire.

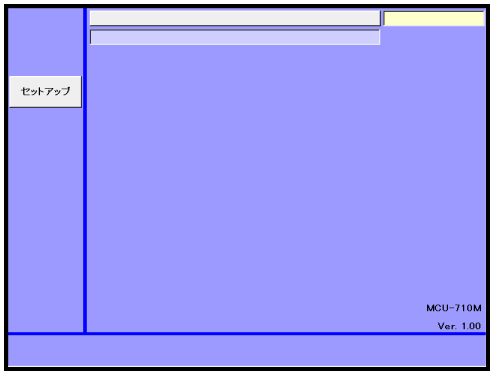
1-2-10. **Start-up**

1) Make sure the power of measuring unit (AT-710) is off, and then turn on the power of Main control unit (MCU-710).
The screen for language option will appear. Then, choose a language and press [OK] button.

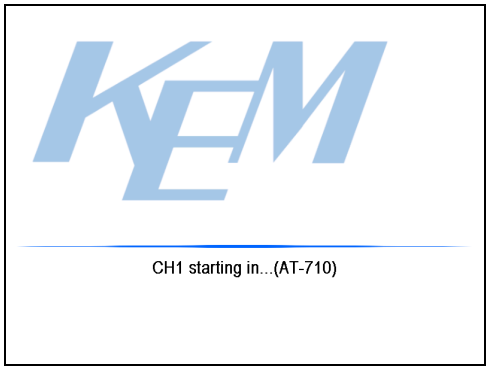


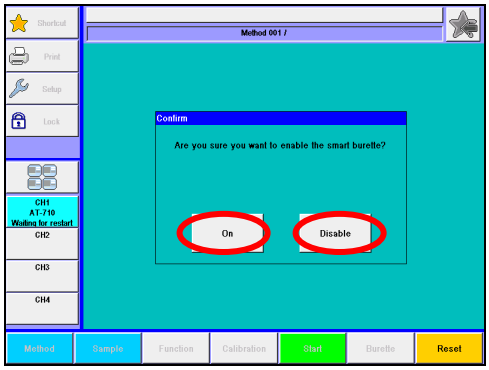


2) Choosing the language will show a screen as shown at right.

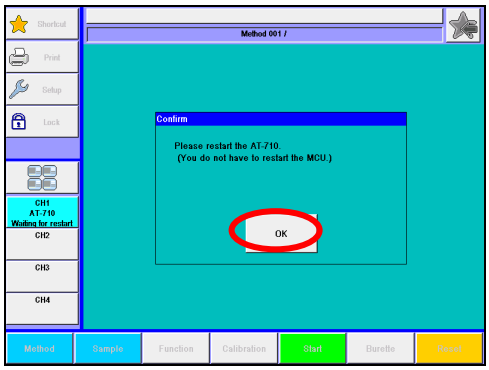


3) Turn on the power of measuring unit (AT-710). The screen of Main control unit will show the right display. Then, a confirmation message to enable/disable a smart burette function will appear. Select "Enable" or "Disable."

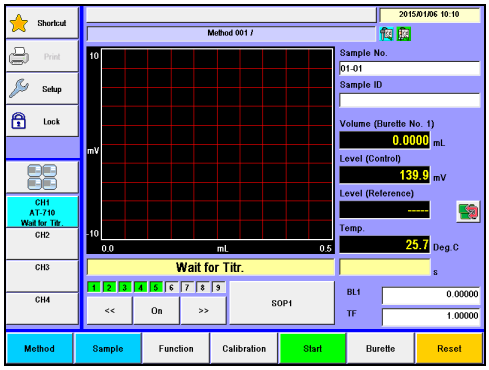




4) A screen to prompt you for restarting AT-710 will appear. Then, press [OK] button. Restore the power of AT-710.



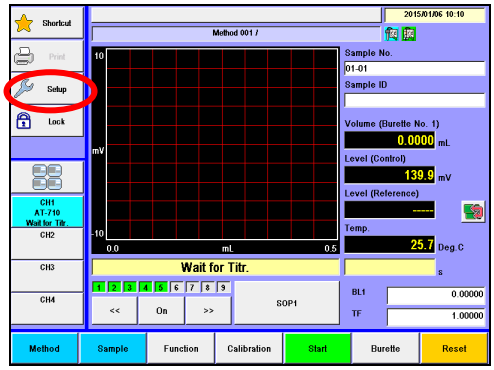
5) The screen of Main control unit will show the right display, which will first appear from the next time on.



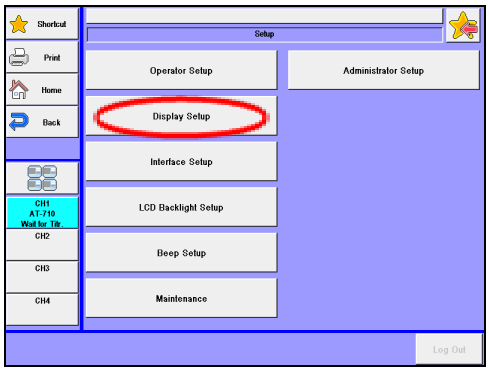
1-3. Setting date and time

Set date and time.

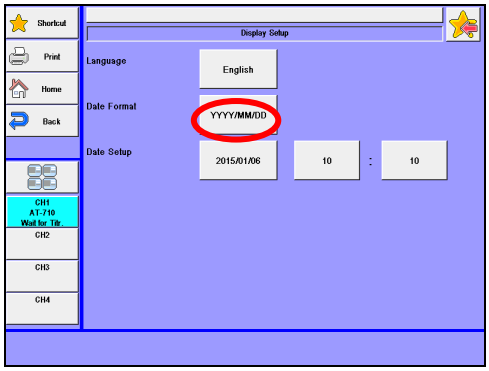
1) Press [Setup] button.



2) Press [Display Setup] button.



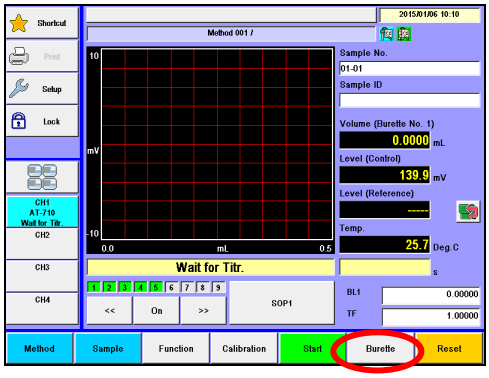
3) Press Date format button. Choose the Date format, and press [OK] button.
4) Press Date&Time button. Choose the date and time, and press [OK] button.



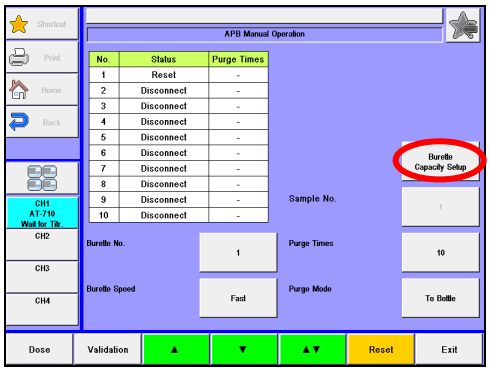
1-4. Setting Burette Volume

Set the volume of burette cylinder.

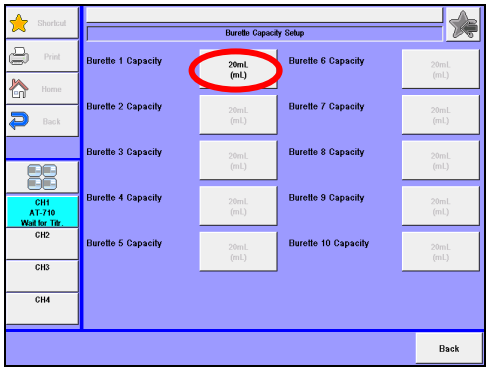
1) Press [Burette] button.



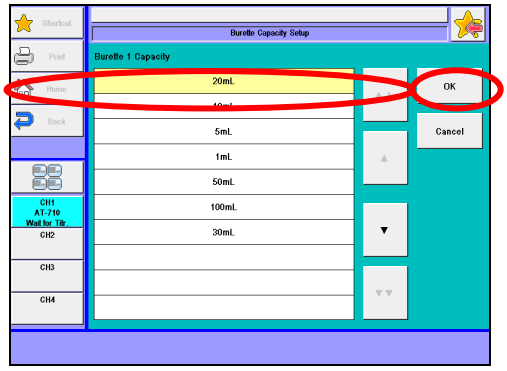
2) Press [Burette Capacity Setup] button.



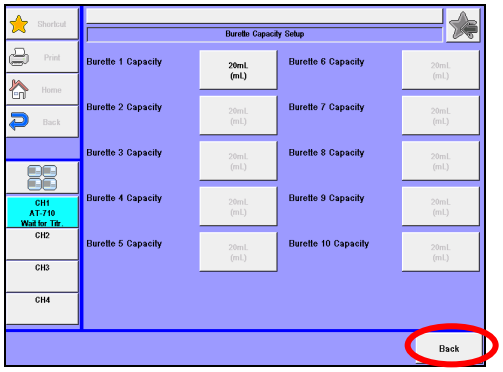
3) Press Burette 1 Capacity button.



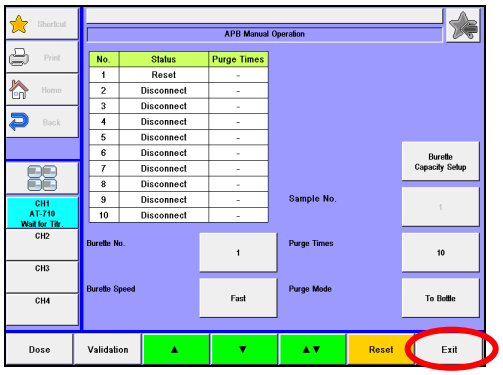
4) Select the burette volume, and press [OK] button. When pluralities of burettes are connected, repeat the same operations to set the burette volume.



5) Press [Back] button. The burette will be reset.



6) Press [Exit] button.



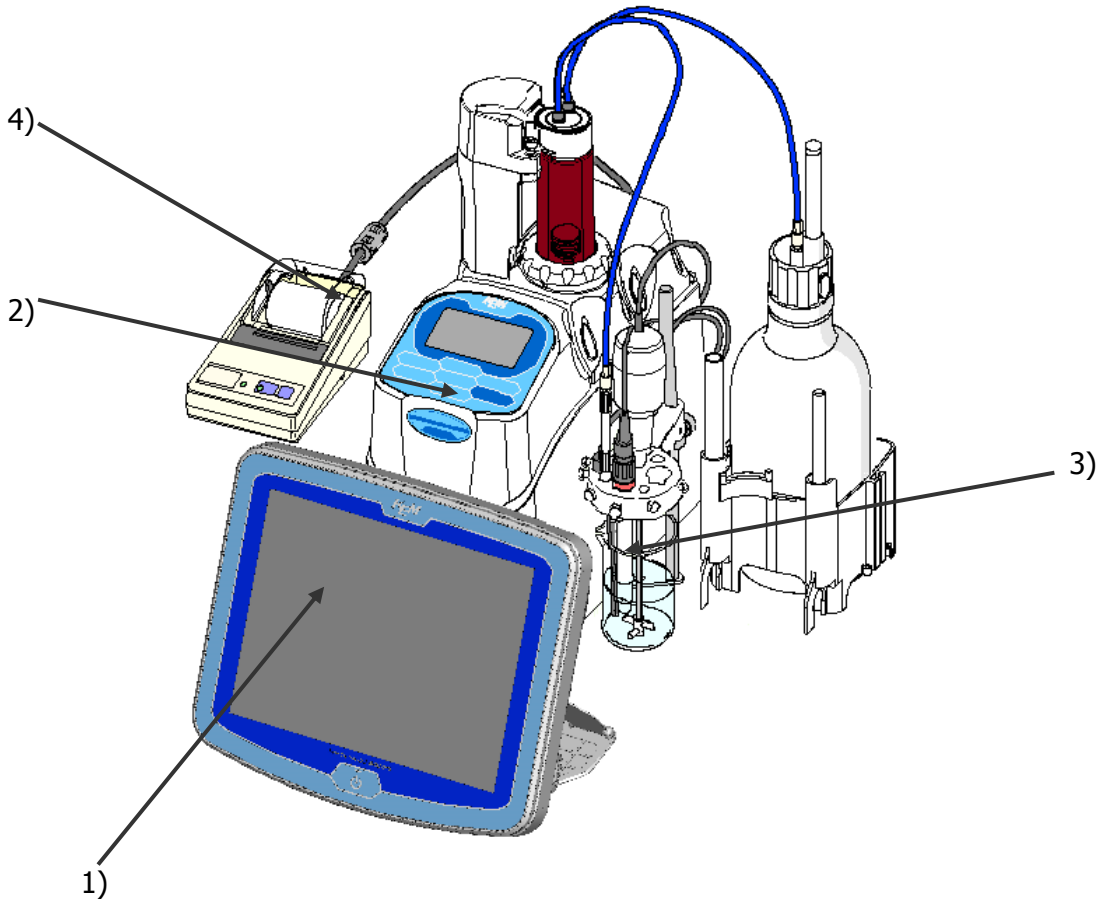
Note

The volume of burette cylinder should be set correctly, otherwise the measurement result is not correctly displayed.

2. Parts configuration and each function

2-1. Appearance and Name

2-1-1. Automatic Potentiometric Titrator



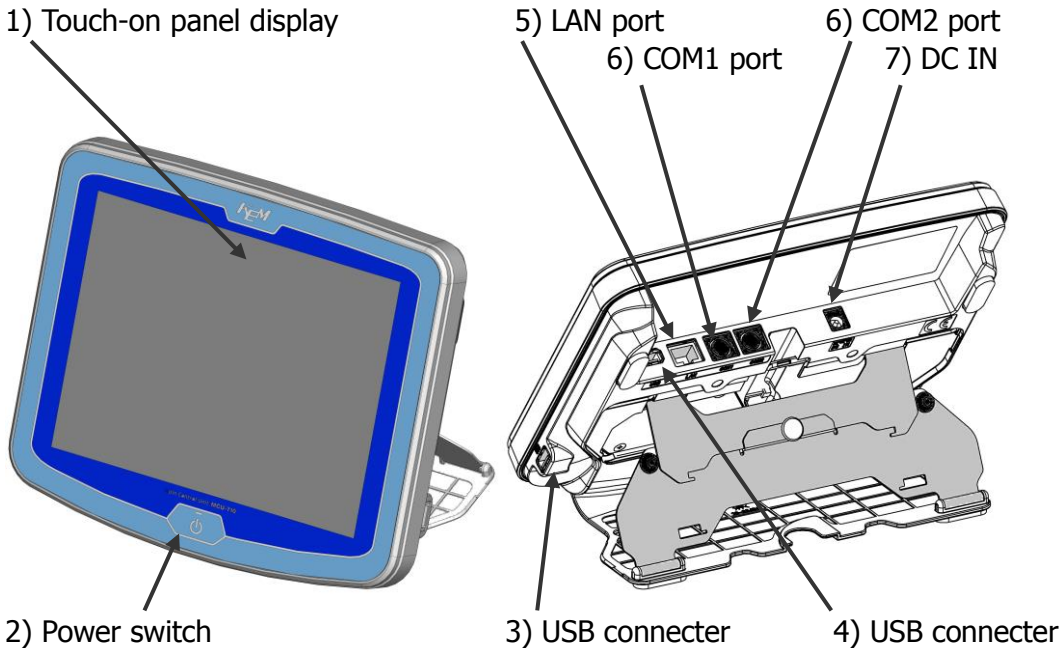
1) Main control unit (MCU-710)
   Operating unit Automatic Potentiometric Titrator.

2) Measuring unit (AT-710)
   Control unit for Automatic Potentiometric Titrator.

3) Measuring unit Stirrer
   Measuring unit for Automatic Potentiometric Titrator.

4) Impact dot printer (IDP-100)
   Print out measurement results and parameters.

2-1-2.Main control unit (MCU-710)



1) Touch-on panel display
This panel displays operating buttons and measurement results as well as configured parameters. With these buttons on screen, you can maneuver the sequence for measurement by just touching on the necessary buttons on display.

2) Power switch
This switch turns on or off the power of Main control unit. It should be noted the power must be turned on again at least 10 seconds interval.

3) USB connecter
This connects USB flash drive.

4) USB connecter
Connecting port for measuring unit.

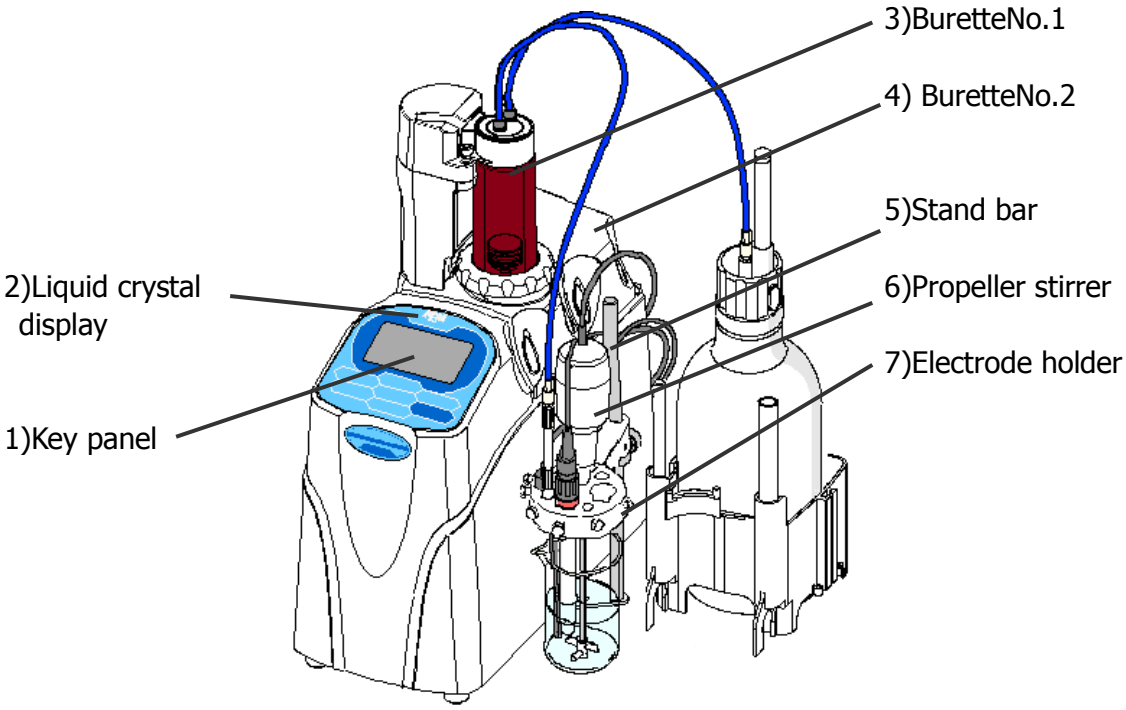
5) LAN port
A LAN connector for establishing communication with a network. A PC command can initiate measurements or the like. This feature is available only for AT-710M.

6) COM1 and COM2 port
These ports are for connections to Dot printer, Balance or PC. Connecting a printer to the COM1 port of each measuring unit allows to print measurement results on the unit basis. Dot printer can be connected only COM1 port.

7) DC IN
This is for connecting the DC cable.

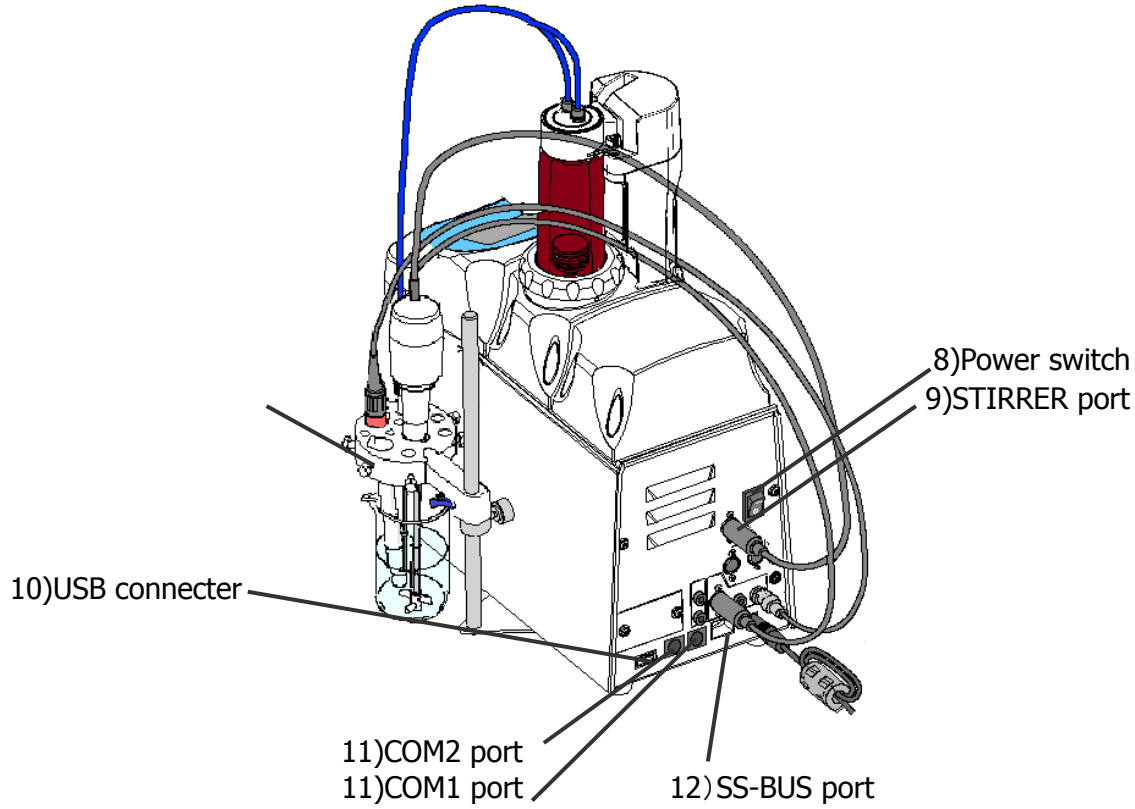
2-1-3.Measuring unit AT-710

<AT-710 Front>



1) Key panel
   This is for operation of the burette and the changer.
2) Liquid crystal display
   This displays potential, and screens of burette operation and changer operation.
3) Burette No.1
   This burette can be used when the parameter of burette No. is set "1".
4) Burette No.2
   This connects the additional burette, and can be used when the parameter of burette No. is set "2".
5) Stand bar
   Hold the electrode holder.
6) Propeller stirrer
   The stirrer spins to stir sample liquid.
7) Electrode holder
   This holder fixes the electrode and the titration nozzle.

＜AT-710 Back＞



8) Power switch
This switch turns on or off the unit. It should be noted the power must be turned on again at least 10 seconds interval.

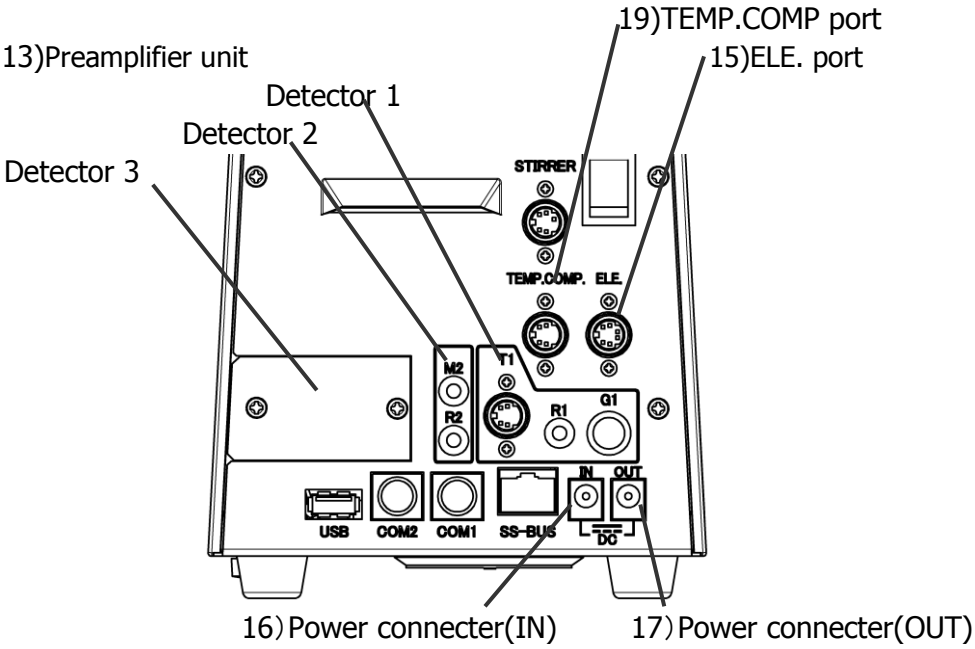
9) STIRRER port
This connects the propeller stirrer or the stirrer to stir sample solution.

10) USB connecter
This connects to the MCU-710.

11) COM1 and COM2 port
These ports are for connections to Dot printer. A dot matrix printer can be connected to COM1.

12) SS-BUS port
This is for connection of options such as changer.

2. Parts configuration and each function



13) Preamplifier unit
This is the detector to detect potential of sample solution.
5 kinds of preamplifiers are prepared including the option.
Detector 1
G1: For connecting with the glass electrode
R1: For connecting with the reference electrode
T1: For connecting with the compensation electrode
Detector 2
M2: For connecting with the metal electrode
R2: For connecting with the reference electrode
Detector 3
Refer to "4-1. Use Preamplifier other than STD" for details.

14) TEMP.COMP. port
This is the connector to connect with the titrant temperature compensation sensor for the burette No.1.

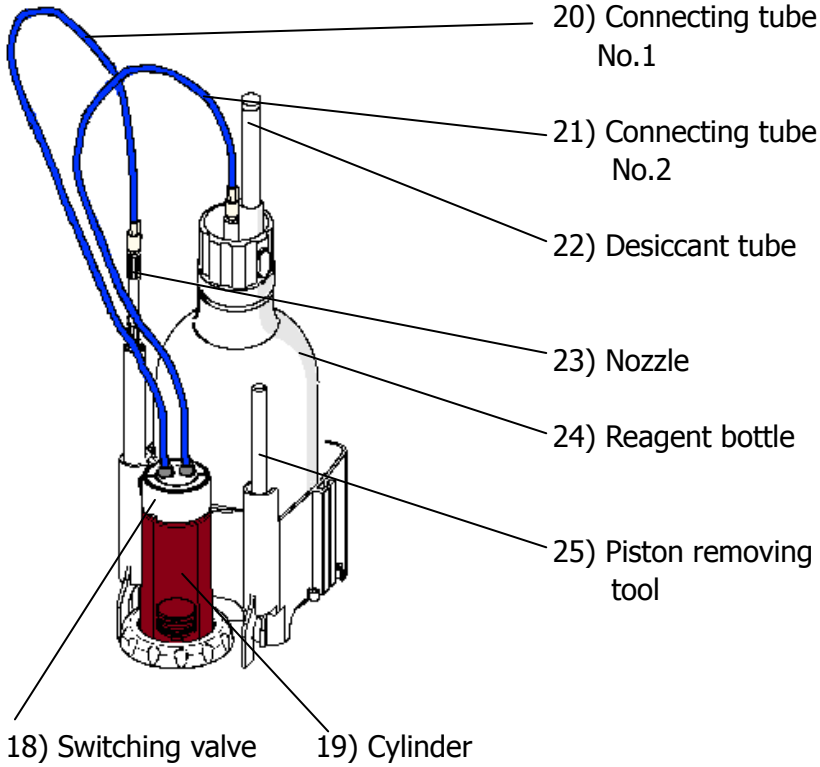
15) ELE. port
This is for connecting the Smart electrode.

16) Power connecter (IN)
This is for connecting the power cable.

17) Power connecter (OUT)
This is for connecting the power cable for MCU-710.

<Burette Unit : (Ex. EBU-710-20)>

A titrant-injecting burette, a switching valve and a titration reagent bottle are included in this burette unit.



18) Switching valve
This is the cock switching the line between cylinder ↔ reagent bottle, cylinder ↔ titration nozzle.

19) Cylinder
The glass cylinder contains Karl Fischer reagent supplied in it.

20) Connecting tube No.1
Transmit titrant solution from the reagent bottle to the cylinder.

21) Connecting tubeNo.2
Transmit titrant solution from the cylinder to the reagent nozzle.

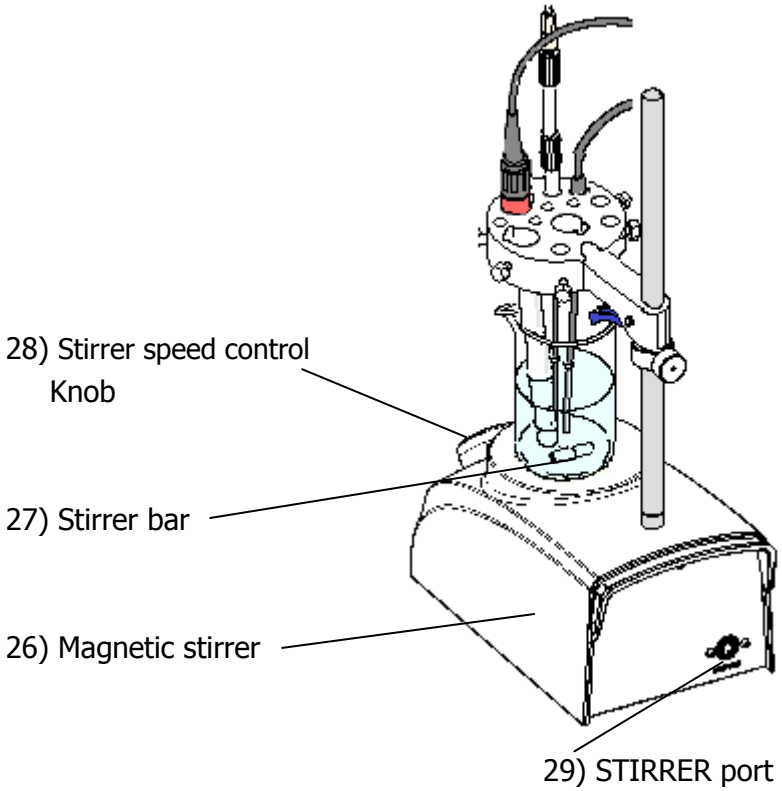
22) Desiccant tube
This tube with zeolite (molecular sieves (5A)) reduces dissolved gas like carbon dioxide that affects titrant.

23) Nozzle
This is the titration nozzle.

24) Reagent bottle
It contains reagent for titration.

25) Piston removing tool
Use this tool to manually operate the piston head of the burette.

<Stirrer>



26) Magnetic stirrer
The stirrer spins to stir sample liquid.
27) Stirrer bar
The stirrer bar spins to stir sample liquid.
28) Stirrer speed control Knob
Use this knob to adjust the stirrer rotating speed of the magnetic stirrer. Stirrer speed is adjusted by the set value of method of the titrator; however, stirrer speed can be adjusted with the stirrer speed control knob while measurement is in progress.
29) STIRRER port
This is the connector to which the cable from the stirrer to the main unit is connected.

2-2. Displays and operating buttons

2-2-1.Main screen

Short cut

Call the set short cut.

Operator button

Operators name or code is changed here with the button showing currently active operator in charge.
⇒Please refer to <Function Description.>

Date and time

The built-in clock shows the present time and date here.
⇒Please refer to <Function Description.>

Print

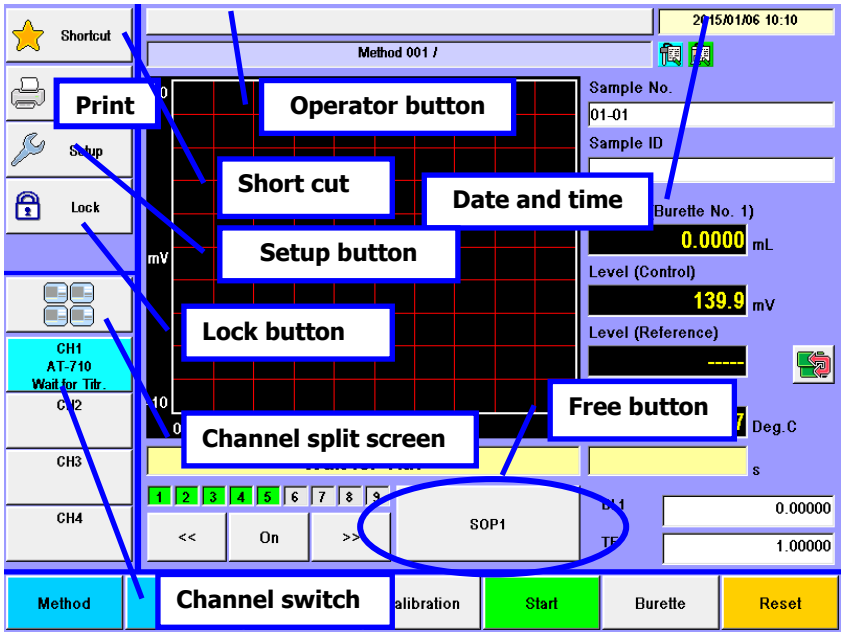
This button is for printing the parameters shown on main channel area.

Setup button

Setup functions are selected.
⇒Please refer to <Function Description.>

Lock

Locks operation of the screen. ⇒Please refer to <Function Description.>



Channel split screen

When 2 or more-channel instrument is connected, all channels can be displayed by splitting the screen. For 2-channel, the screen will be divided by two; for 3 or more-channel instrument, it will be divided by 4.

Channel switch

System configuration for channel will be displayed. The screen currently displayed will be colored. Pressing channel button will lead to switching the channel.

Free button (Short cut)

The most frequently-used button can be set here.

Display title

The title of currently displayed screen is shown here. It shows currently significant Method number and its name.

Function icon

When the smart electrode (left) or the smart burette (right) is enabled, the icon will be colored.

Sample

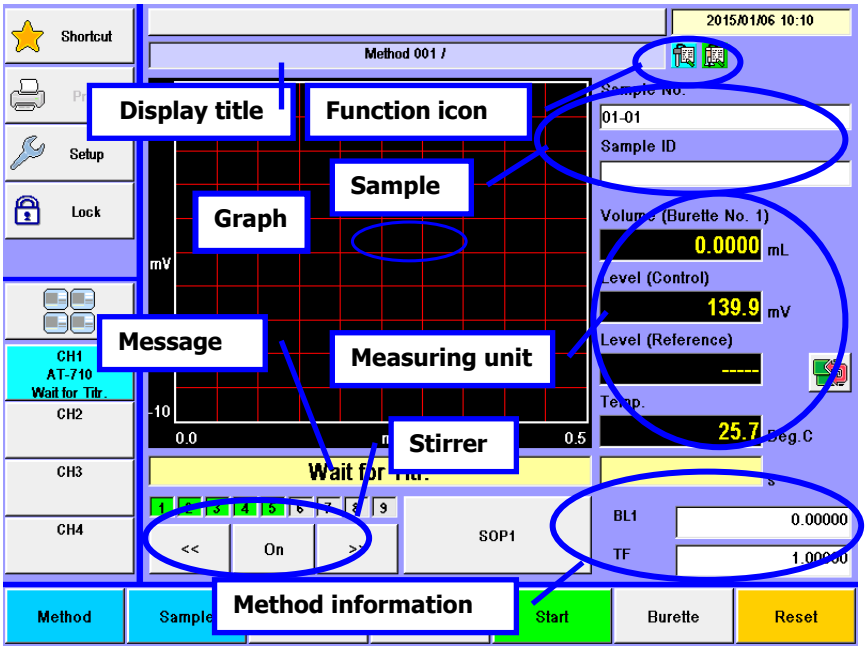
Sample number and its ID preset on sample setup are shown here.
⇒Please refer to <Function Description.

Graph

The graphic curve is plotted in real time during titration.

Message

This shows the status of measuring unit connected to main channel.



Stirrer

This button controls stirrer speed of the stirrer connected to the measuring unit

[⟨⟨] : Speed slows down by one step

[⟩⟩] : Speed goes up by one step

[On], [Off] : Turns on or off the stirrer

Method information

When a blank or a factor is set on the calculation of the current method, a blank value or a factor value will be displayed.

Measuring unit

This box shows the volume and potential etc. relayed from the measuring unit. Potential (for reference) and calculation result can be switched by button. During measurement, calculation of from titration volume to calculation 1 is used, and results will be displayed in real time.

Sample button

Sample is configured here with this button.
⇒Please refer to
<Function Description.>

Function button

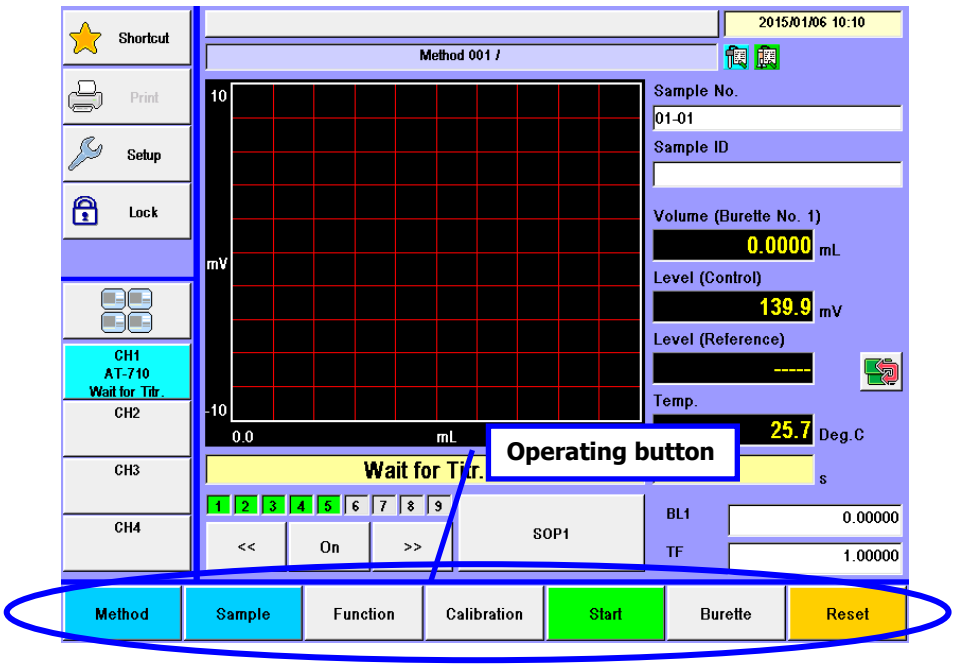
Function provides the following settings. During titration, it turns to [Titration Result] to view the data.
⇒Please refer to
<Function Description.>

Method button

Here you work on Method like create, edit or copy a method, and can change Method. During titration, it turns to [Max. Volume] and can change maximum volume of titration by the method.
⇒Please refer to <Function Description.>

Calibration button

Here you edit calibration condition for the electrode and preamplifier, change calibration method and calibrate.
⇒Please refer to
<Function Description.>



Start button

Titration starts with [Start] button. When "Wait time" for titration is set up, pressing [Start] button again after starting titration will lead to skipping the execution of "Wait time". During titration, it turns to [Pause On] to halt titration. While pausing, it turns to [Pause Off] button to resume titration.

Burette button

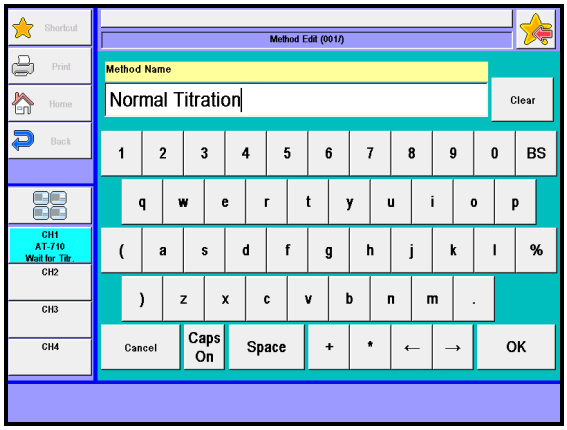
The burette activates with this button.
⇒ Please refer to <Function Description.>

Reset button

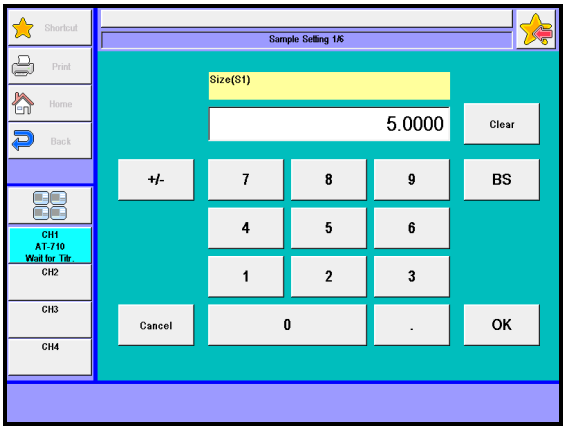
This button stops aborts measurement underway.

2-2-2.Description of how to input characters and numbers, date

Character input screen



Number input screen



[BS] button
This button erases the preceding one character.

[Cancel] button
The entered characters can be canceled with this button.

[Caps On] or [Caps Off] button
This button switches capital letter or small and [–], [/] or [+], [*] button.

[Space] button
Space is inserted with this button.

[←], [→] button
This button moves the cursor position on display.

[–], [/] or [+], [*] button
These symbols can be selected with [Caps On] or [Caps Off] button.

[OK] button
This button confirms the input that you have entered on key board display.

[Clear] button
This button clears key entries. When pressed again, the display returns to the screen before cleared.

Date

[Today] button
This button updates the date to the present day as of today.

Year button
Display where you enter the year.

- 2010～2099 year

Month button
Display where you enter the month

- 1 (January) ~ 12 (December)

[1] ~ [31] button
This button enters the day of the month. This date will be displayed as calendar by inputting a year and a month.

[Cancel] button
This button cancels already entered configuration.

3. Basic operation

Here is the description on basic measurement sequence using pH electrode for acid/base titration.

3-1. Sequence of measurement

For remembering a basic operation, here is an example of the measurement which the concentration (ppm) of sodium hydroxide is obtained with the hydrochloric acid.

1. Preparation of electrodes
Install a combination glass electrode and temperature compensation electrode.
* Prepare an electrode or sensor and preamplifier appropriate for the titration.

↓

2. Calibrate the electrode or sensor
Calibrate the electrode and preamplifier with pH standard solution (pH7/pH4).
* Calibration method differs depending on preamplifier type and the electrode or sensor.

↓

3. Check titration condition
Confirm preset conditions.
* Once titration methods are preset for individual samples, all you have to do is to change the method, and can start titration right away.

↓

4. Fill titration solution
Fill the burette with 0.1 mol/L-hydrochloric acid.
* For filling procedure, refer to Function Description "5-1. Manual Operation."

↓

5. Purge titration solution
Purge the titration solution.

↓

6. Preparation of a sample
Prepare the sample for titration.
* Sample conditions can be stored in USB as a sample file. Once stored in advance, all you need to enter is the sample size.

▪

7. Start titration
Dip the electrode in the sample in vessel, and press [Start].

▪

8. After titration
Clean the electrode and keep it in pure water dipped.

Note

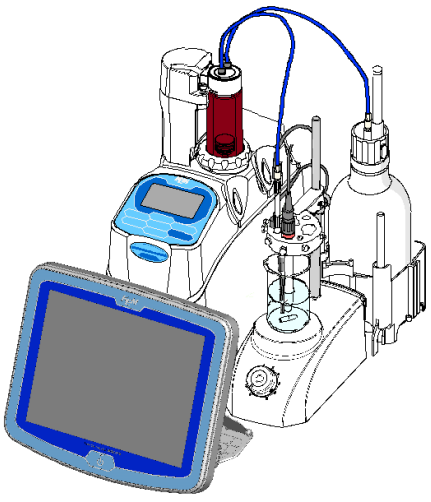
The steps within the dotted line box are daily procedures.
Other steps are optional when necessary.

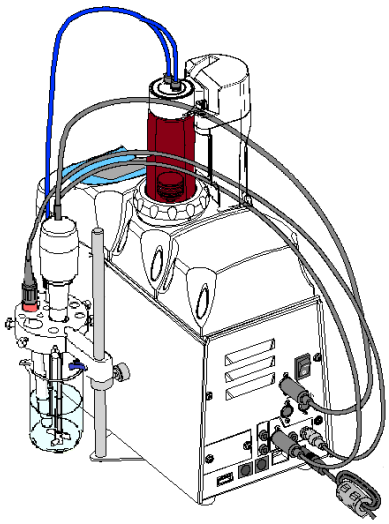
＜Preparation＞

Automatic Potentiometric Titrator	AT-710M/S	1unit
Combined glass electrode（C-171）		1pc
Electrode cable		1pc
Temperature compensation electrode（T-171）		1pc
0.1 mol/L-hydrochloric acid（given concentration）	500mL	1pc
0.1mol/L- sodium hydroxide	500mL	1pc
Rinse bottle（include water）	500mL	1pc
200mL beaker		2 - 3pcs
Whole pipette (volume 5mL)		1pc
Safety pipette		1pc
Tissue		
pH7 standard solution		
pH4 standard solution		

3-2. Preparation of the electrode

1) Connect the cable to the combination glass electrode and plug its connector into the connector (G1).
2) Connect the temperature compensation electrode T-171 to the connector (T1).
3) Install the electrodes and titration nozzle to the electrode holder and fix it with the lock screws as shown below.
4) Keep each electrode and burette nozzle in a beaker filled with pure water.
   Open the rubber plug of the refill hole of the combined glass electrode so that the reference fill can flow out.
5) Check that the electrode holder fixation metal is at the height that the electrode does not hit a beaker even if the electrode holder goes down at the bottom.

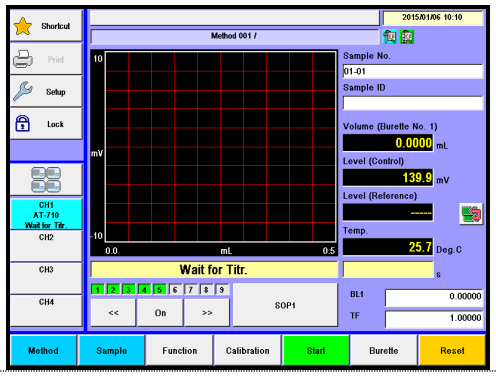




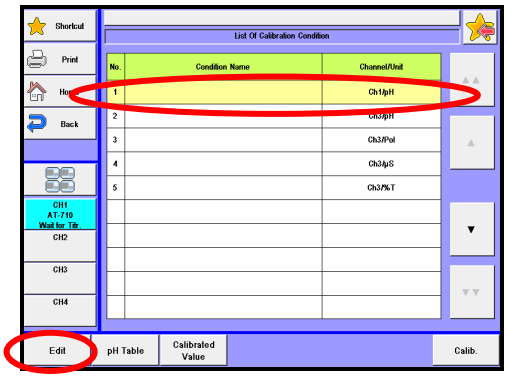
3-3. Calibration of preamplifier (pH calibration)

For precise measurement results by potentiometric titration, it is necessary to calibrate the preamplifier and electrode. Here is the description on basic pH calibration.

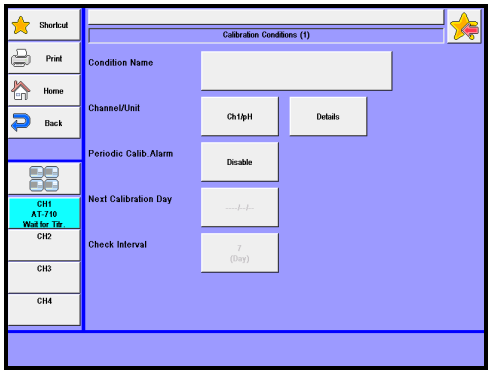
1 Press [Reset] button.
Make sure the message "Wait for Titr." appears.
Press [Calibration] button.



2 Now you see "List of Calibration Condition" on display. Choose the method for calibration with [▲], [▼] key. Ensure "Channel/Unit" is either "Ch1/pH" or "Ch3/pH" (when TET- preamplifier for pH dual input is connected and calibrate with detector 3).
Press [Edit] button.



3 Set the calibration mode (Auto/Manual) of pH calibration. The calibration procedure and setting items differ depending on setting of calibration mode. Refer to"3-3-1" for Auto, and "3-3-2" for Manual.



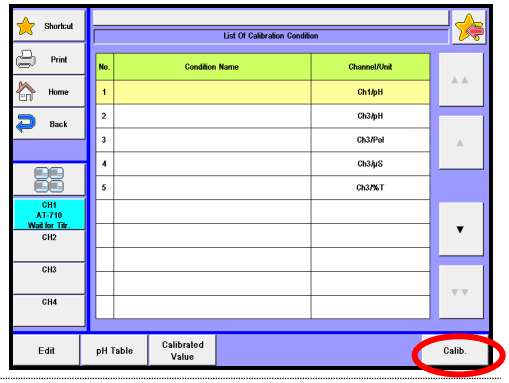
Note
Refer to Function Description "4. Calibration" for setting the calibration condition.
pH electrode is calibrated when neutralization titration is operated. The calibration method of detector Ch3 differs depending on connected preamplifier. Refer to "4-1. Use Preamplifier other than STD."

3-3-1.pH calibration when Calib. Method is "Auto"

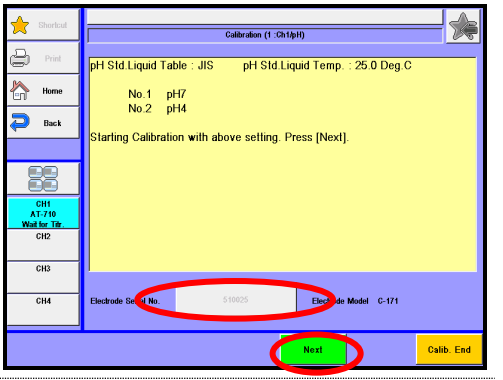
This mode automatically sets calibration value using pH temperature compensation table pre-installed or the temperature compensation table selected on "Calibration"-"pH Table"-"User."

1 Set the parameter referring to Function Description "4. Calibration."

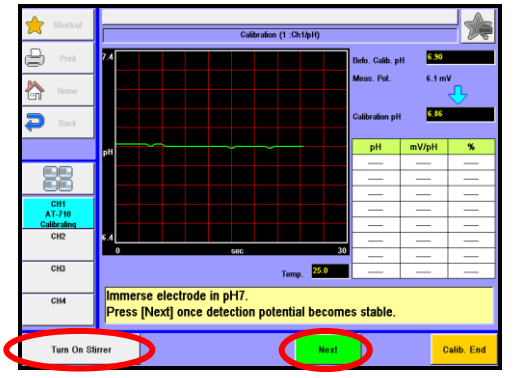
Press [Calib.] button.



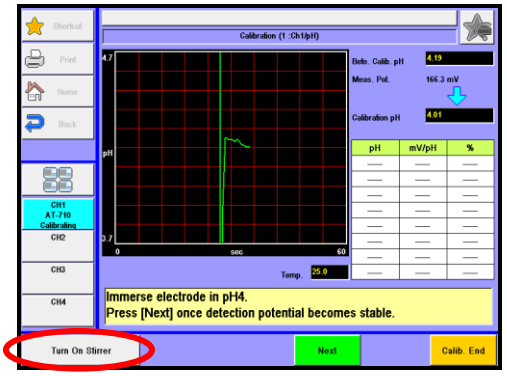
2 Select an Electrode Serial No. of the electrode you wish to use for calibration. (When a smart electrode is connected, this setting is automatically made.)
Press [Next.] button.



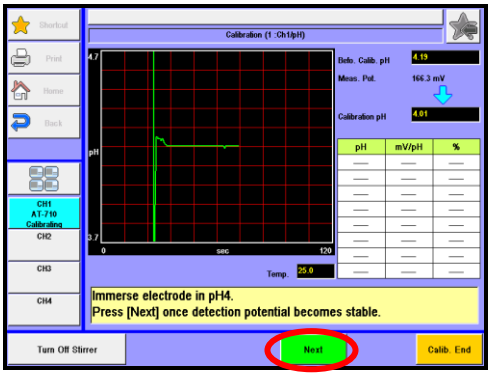
3 Example: when "Calibration point" for calibration method is "pH7/4"
Now the screen for pH7 calibration appears on display.
Dip the electrode in pH7 standard liquid.
Press [Turn On Stirrer] button.
On the up, the electrode reading is displayed.
On the down, the calibration value is displayed.
Press [Next] when the up and down values are stable.



4 pH4 calibration is displayed after pH7 calibration. When using the propeller stirrer, press [Turn Off Stirrer] to stop the stirrer once, then rinse the electrode with pure water and wipe off water around the electrode by tissue.



5 Dip the electrode in pH4 standard solution. When using the propeller stirrer, press [Turn On Stirrer] to turn the stirrer. Press [Next] when the up and down values are stable.
Start the calibration according to the setting conditions.

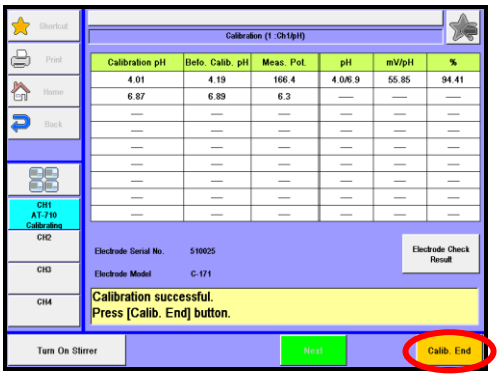


Note

Press [Off] for stirrer to stop the stirrer once before changing the standard solution when using the propeller stirrer. Be careful that spray disperses when the solution is replaced with the propeller stirrer operated.
Before the electrode is dipped in a different standard solution, rinse it with pure water and wipe off with tissue paper. If you neglect this process, calibration value will deviate and correct measurement cannot be expected.

6 As shown on the right, a potential difference and a slope value per pH are displayed once a calibration is done. When it fails, "Calibration Failed" is displayed. If calibration was not completed, refer to "7. Troubleshooting."
Calibration record can be checked on "Function"-"GLP Management-"History."

Press [Calib. End] button.



Press [Calib. End] when the calibration is discontinued on the way.

Note

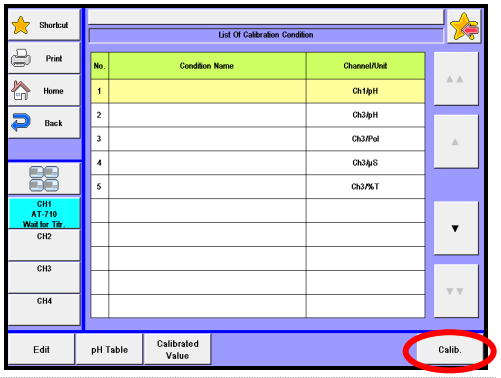
The pH displayed on the left side of the screen at the calibration is a peculiar value of the electrode. The change in the state of the electrode can be checked by recording the value of this pH.

3-3-2.pH calibration when Calib. Method is "Manual"

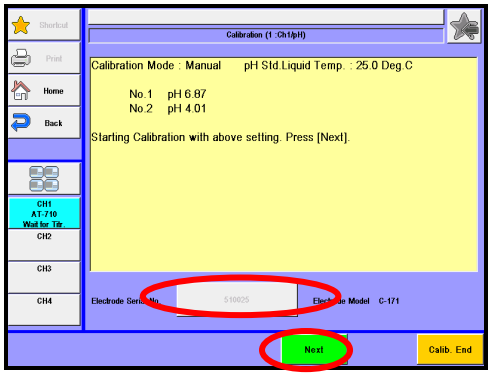
Use this mode when calibrating by desired calibration solution.

1 Set the parameter referring to Function Description "4. Calibration."

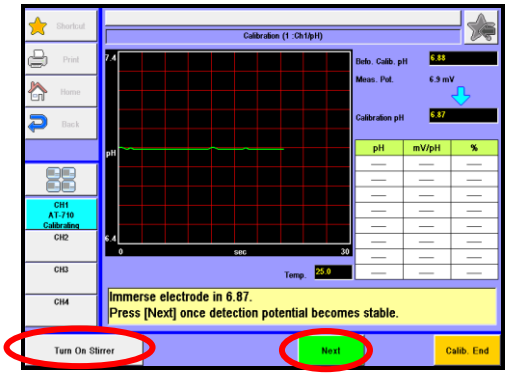
Press [Calib.] button.



2 Select an Electrode Serial No. of the electrode you wish to use for calibration. (When a smart electrode is connected, this setting is automatically made.)
Press [Next.] button.

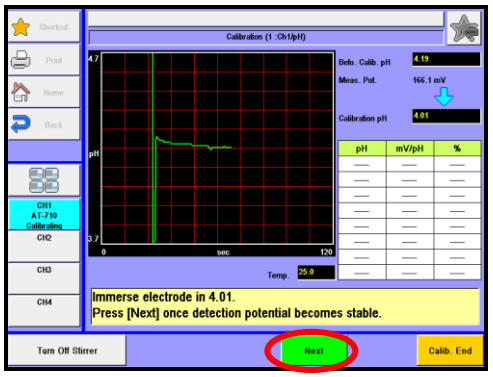


3 "first calibration point pH value" is displayed.
Dip the electrode in the displayed standard solution.
Press [Turn On Stirrer] button.
On the up, the electrode reading is displayed.
On the down, the calibration value is displayed.
Press [Next] when the up and down values are stable.



4 "second calibration point pH value" is displayed after "first calibration point pH value" calibration. When using the propeller stirrer, press [Turn Off Stirrer] to stop the stirrer once, then rinse the electrode with pure water and wipe off water around the electrode by tissue.

5 Dip the electrode in the displayed standard solution.
When using the propeller stirrer, press [Turn On Stirrer] to turn the stirrer.
Press [Next] when the up and down values are stable.
Start the calibration according to the setting conditions.

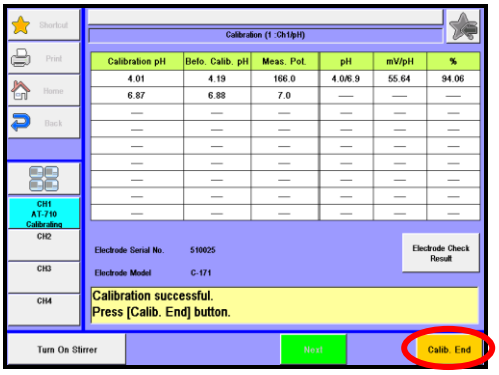


Note

Press [Off] for stirrer to stop the stirrer once before changing the standard solution when using the propeller stirrer. Be careful that spray disperses when the solution is replaced with the propeller stirrer operated.
Before the electrode is dipped in a different standard solution, rinse it with pure water and wipe off with tissue paper. If you neglect this process, calibration value will deviate and correct measurement cannot be expected.

6 As shown on the right, a potential difference and a slope value per pH are displayed once a calibration is done. When it fails, "Calibration Failed" is displayed. If calibration was not completed, refer to "7. Troubleshooting."
Calibration record can be checked on "Function"-"GLP Management-"History."

Press [Calib. End] button.



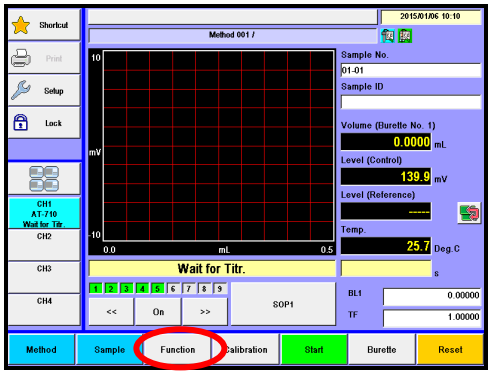
Note

Press [Calib. End] when the calibration is discontinued on the way.

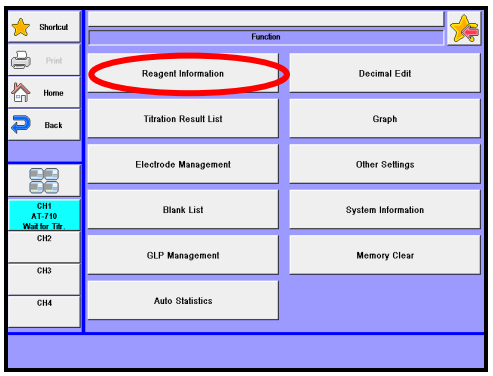
The pH displayed on the left side of the screen at the calibration is a peculiar value of the electrode. The change in the state of the electrode can be checked by recording the value of this pH.

3-4. **Setting information on reagent**

1 Press [Function] button.

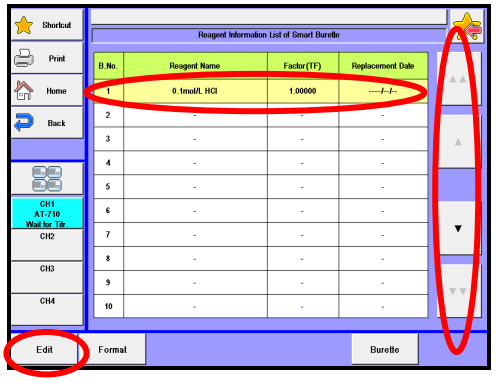


2 Press [Reagent Information] button.

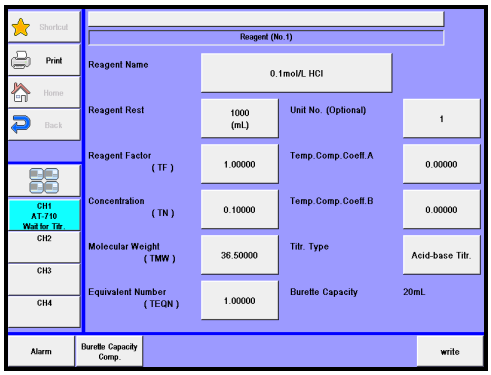


<When Smart burette is "On">

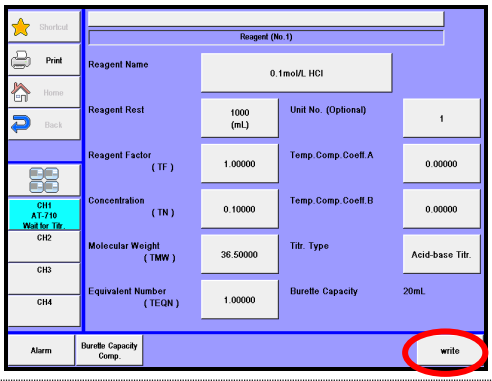
3 "Reagent Information List of Smart Burette" appears on display. Choose B.No.1 with [▲], [▼] button.
Press [Edit] button.



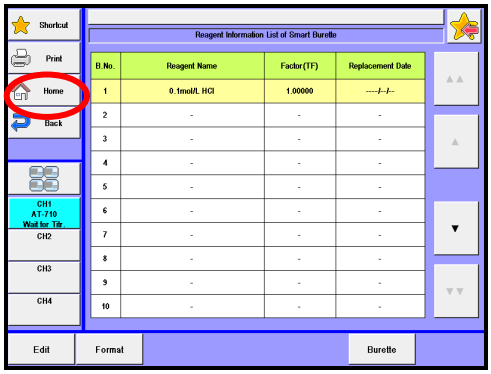
4 "Reagent (No.1)" appears on display.
Here you enter the reagent name, factor value, concentration, molecular weight, equivalent number. (For 0.1mol/L-HCl, enter "0.1" for concentration (TN), "36.5" for molecular weight (TMW) and "1" for equivalent number (TEQN).)



5 Press [Write] button.

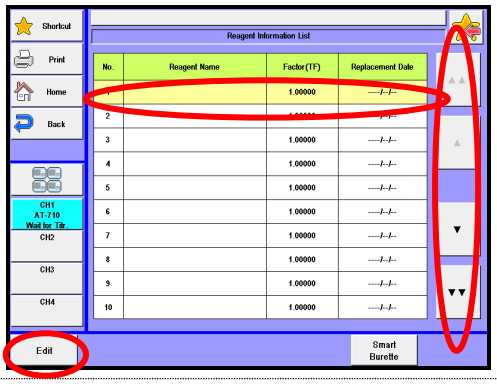


6 Press [Home] button.



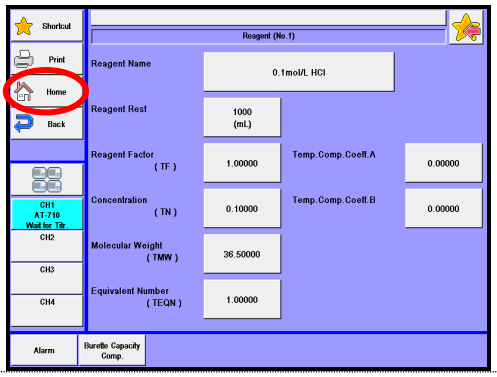
＜When Smart burette is"Off"＞

3 "Reagent Information List" appears on display. Choose No.1 with [▲], [▼] button.
Press [Edit] button.



4 "Reagent (No.1)" appears on display.
Here you enter the reagent name, factor value, concentration, molecular weight, equivalent number. (For 0.1mol/L-HCl, enter "0.1" for concentration (TN), "36.5" for molecular weight (TMW) and "1" for equivalent number (TEQN).)

Press [Home] button.



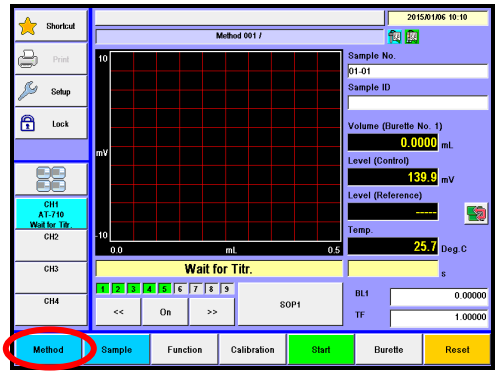
Note Refer to Function Description "3-2. Reagent Information" for setting the reagent information.

3-5. Confirmation of titration method

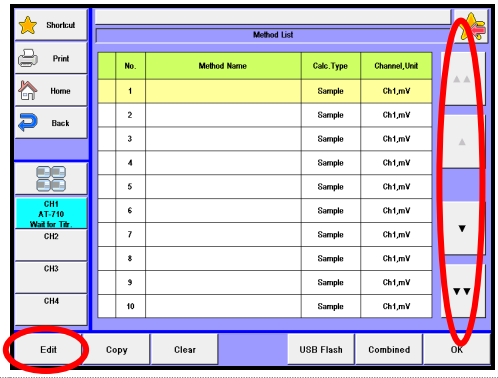
1 Press [Reset] button.

Ensure the display shows "Wait for Titr.".

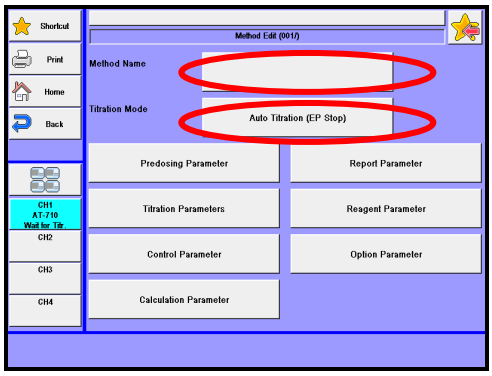
Press [Method] button.



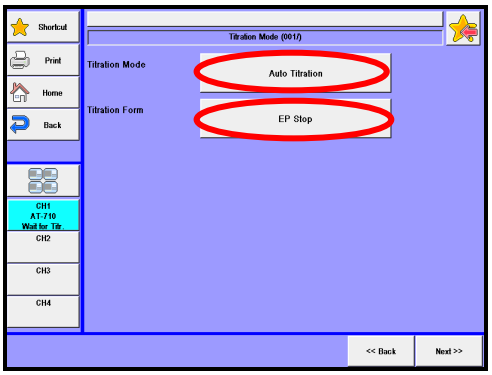
2 "Method List" appears on display. Choose the method for titration you intend with [▲] [▼], [▲▲], [▼▼] buttons.
Press [Edit] button.



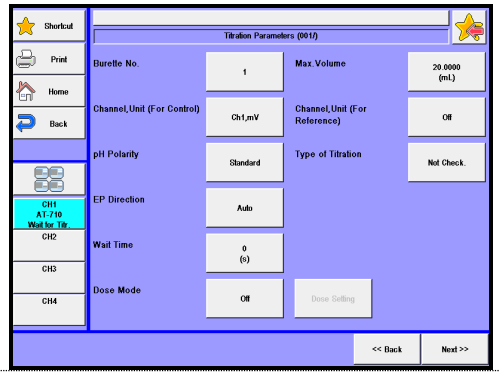
3 Press Method Name button and enter the name.
Press Titration Mode button.



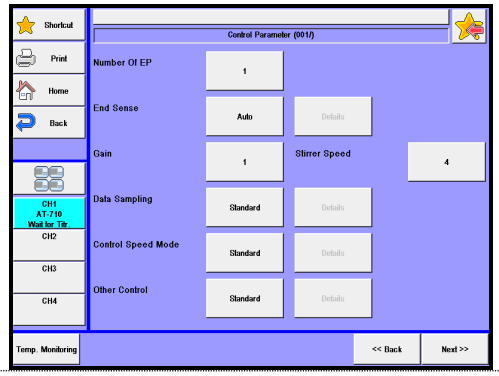
4 "Titration mode, Titration form" appears on display.
Set "Titration mode" to "Auto titration" and "Titration form" to "EP stop"
Press [Back] button.



5 Press [Titration Parameters] button.
Configure titration parameters as shown right, and you can change the settings if you will.



6 Press [Next] button. Configure control parameters as shown right.
Change the settings as shown right when otherwise set.

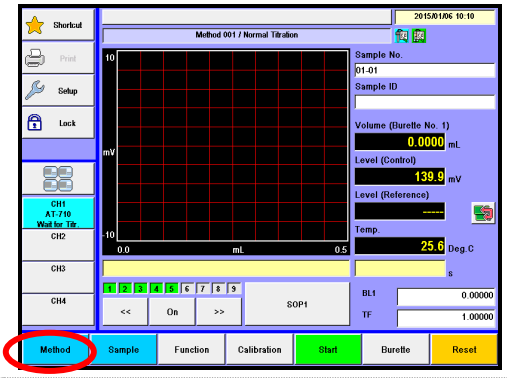


3-6. Selection of Method (measurement parameters and conditions)

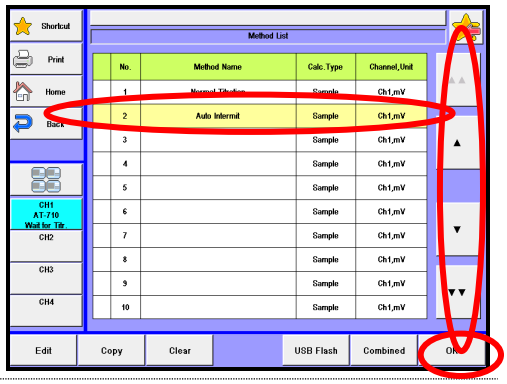
1 Press [Reset] button.

Ensure the display shows "Wait for Titr.".

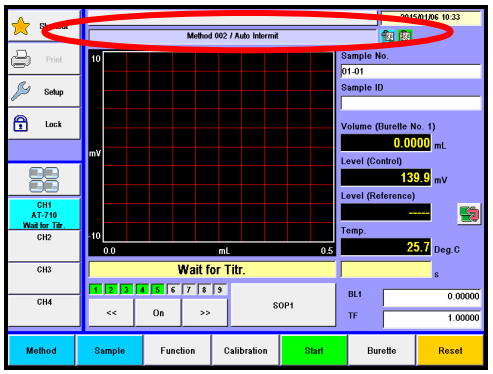
Press [Method] button.



2 When "Method list" dialog box appears select your desired Method for measurement with [▲] [▼], [▲▲] [▼▼] buttons. You can choose a Method directly with numeric buttons.
Press [OK] button. You can choose a Method directly with numeric buttons.



3 The Method display changes to Main display (standby mode), where currently active Method is shown on the screen.



Note

Method cannot be changed during measurement in progress.
To change Method, press [Reset] button to set in "Wait for Titr." mode.

3-7. **Filling titration solution**

1 Fill the reagent bottle with 0.1mol/L-HCl.

2 Press [Burette] button on Main display.

3 "APB Manual Operation" will appear on display.

4 Select a burette number (Burette No.) to use.

5 Set "Burette speed" to "Slow" or "Middium".

6 Set purge mode to "To nozzle".

7 Allow the tip of the titration nozzle to move into a beaker or the like.

8 Press [▲▼] button.

Caution **Move the tip of the titration nozzle into a vessel like a beaker to prevent reagent from dispersing.**

9 When the air inside the burette is pushed out to a beaker and the reagent starts dripping from nozzle tip, press [▲▼] button to stop piston movement.

Caution **Wear a protective pair of glass in order to avoid splashing reagent in case the tube union is loosened or disconnected.**

3-8. Purge the reagent

Purging is necessary to eliminate the difference in concentration between the reagent in burette and in reagent bottle.

1 Press [Burette] button on Main display. "APB manual operation" will appear on display.

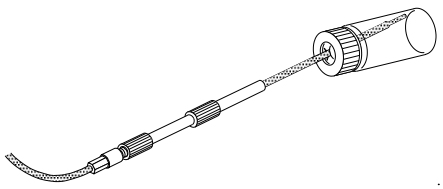
2 Select the burette number and the purge times you want to set.

3 Set the purge mode to "To bottle".

4 Press [▲▼] button to start purging. After purging for the preset number of cycles, it stops into standby mode.

5 Remove the titration nozzle from the holder, and insert its tip into the supplied defoaming bottle.

6 Hold the bottle and nozzle slightly upward as shown, and press [▲] button.



7 After air bubbles in the nozzle are removed, press [Reset] button and remove the defoaming bottle.

8 Install the titration nozzle onto the holder.

⚠ Caution **Wear a protective pair of glass in order to avoid splashing reagent in case the tube union is loosened or disconnected.**

3-9. Preparation of sample

3-9-1.Sample

1 Attach the safety pipette to 5mL whole pipette.

2 Sample small amount of 0.1mol/L-sodium hydroxide, and self clean the inside wall of whole pipette.

3 Sample 5mL of 0.1mol/L-sodium hydroxide by the pipette, and transfer it to a 200mL beaker.

4 Add 100mL water.

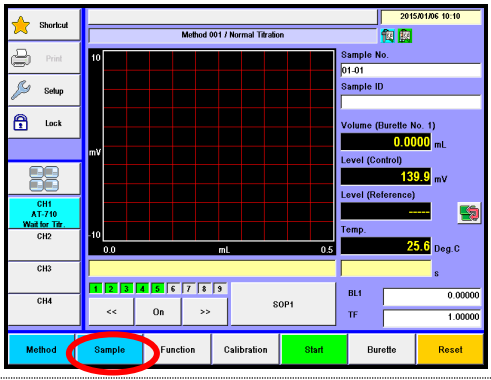
5 Put a stirrer rotor in the beaker when you use a magnetic stirrer.

6 Place an empty beaker under the electrode. Rinse the electrode with water, and wipe off water around the electrode by tissue paper.

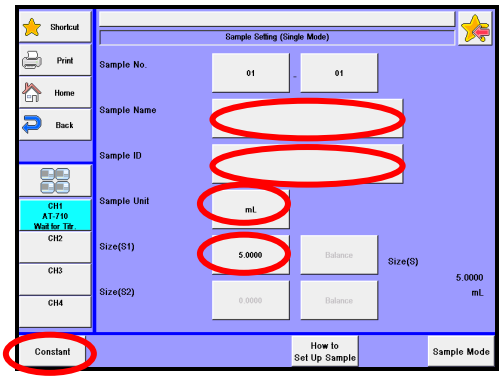
7 Place a beaker with sample in it on stirrer, and dip the electrode in the sample.

3-9-2.**Sample parameter**

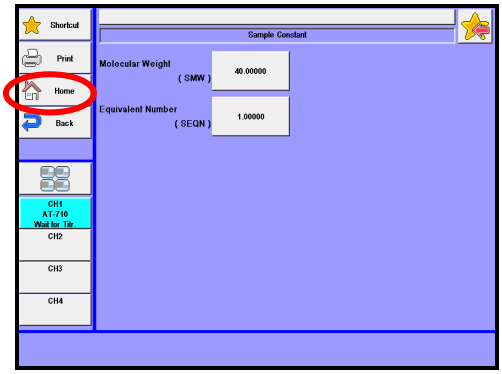
1 Press [Sample] button.



2 The display shows "Sample setting (single Mode)". (When "Sample Mode" selected by [Sample Mode] is set to "Single Mode")
Enter the sample Name and ID.
Enter "mL" for "Sample Unit".
Press Size (S1) button for sample size.
With numeric characters displayed, enter the sample volume put in the Step 3-9-1.
The sample size (Size(S)) equals to
| [Size (S1)] - [Size (S2)] |.
Press [Constant] button.

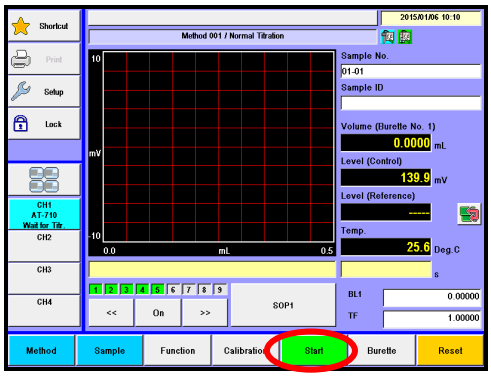


3 When "Sample Constant" appears, enter the reagent's Molecular Weight (SMW) and reagent Equivalent Number (SEQN). (On NaOH, enter "40.0" for "SMW" and "1" for "SEQN".)
Pressing [Home] button will turn the screen display to the Main screen.

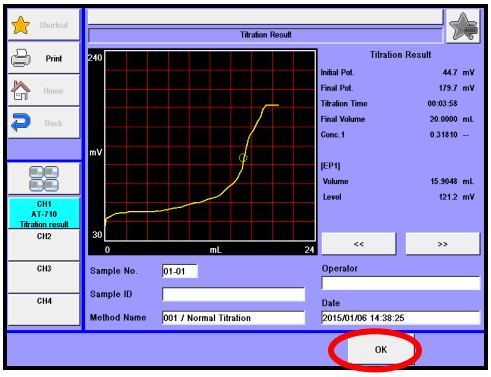


3-10. **Start titration**

1 Press [Start] button. Titration will start and plot a titration curve. Press [Reset] button if you want to about the titration.



2 When the titration is completed, the results are calculated with the preset sample size on 'Size (S1)' and displayed. When the printer is connected with AT-710, the results are printed out according to the print parameter preset on Method.
Press [OK] button to return to the Main screen display. When the time limit for resulting display preset in [Function] – [Other Settings], the display will automatically returns to the Main screen display when the preset time elapses.



Note When "Before titration" in [Sample] – [How to Set Up Sample] is set to "On", the display for Sample Setting will appear with [Start] button. When the screen display shows "Sample setting", titration will not start.

3-11. **Cleaning after titration**

1 Remove a beaker with sample in it from stirrer. Place an empty beaker under the electrode. Rinse the electrode with water in the cleaning bottle.

2 Keep the electrode dipped in pure water.
In the case of the next sample measurement, wipe off water around the electrode with tissue paper.

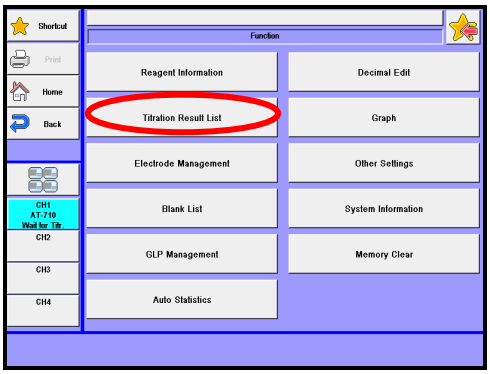
Note

Refer to "6-2-1 Storage of the instrument" for details of storage when not to use for a long term.

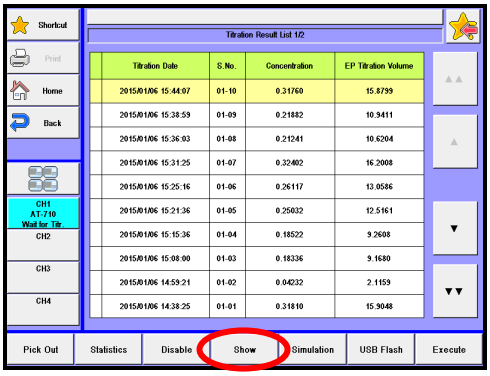
3-12. **Re-calculate titration data**

Result parameter and print format can be changed.

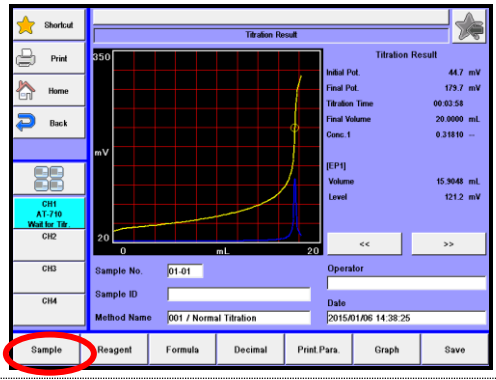
1 Press [Function] button on Main display.
Press [Titration Result List] button.



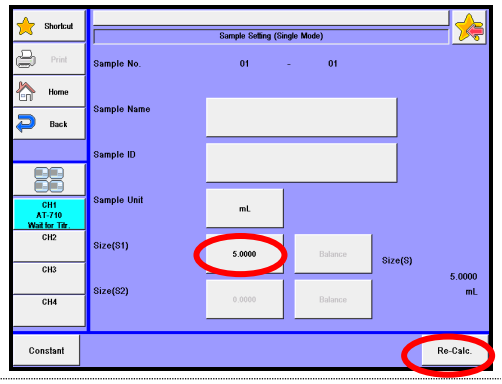
2 When "Titration Result List" appears, point the cursor on the results data for recalculation.
Use [▲][▼], [▲▲][▼▼] buttons to move the cursor or you can choose the desired data directly by pressing the data on list.
Press [Show] button.



3 The results of measurements will appear, and press the items for recalculation accordingly.
Example: Press [Sample] button.

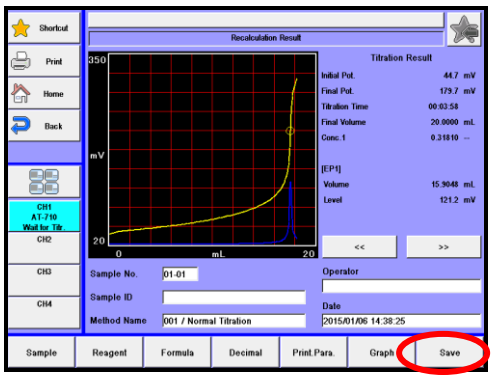


4 When "Sample setting" is displayed, press [Size (S1)] button. Enter the amount in volume or weight.
Press [Re-Calc.] button.



5 The screen display will turn "Recalculation Result" dialog box. Then, press [Save] button.

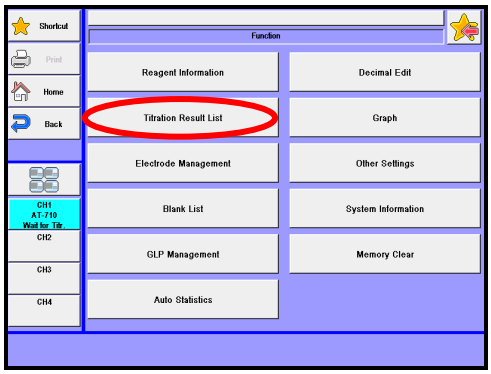
The screen for entering your comments will appear. Then, enter comments as needed and press [Save] button.



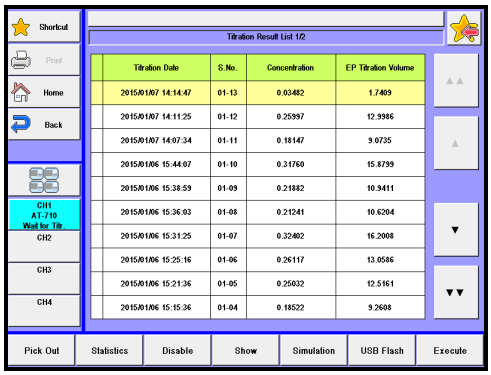
3-13. Batch processing of titration data

Batch the calculated data on the list. The batch calculation determines Mean value, Standard deviation (SD) and Relative standard deviation (RSD).

1 Press [Function] button on Main display.
Press [Titration Result List] button.

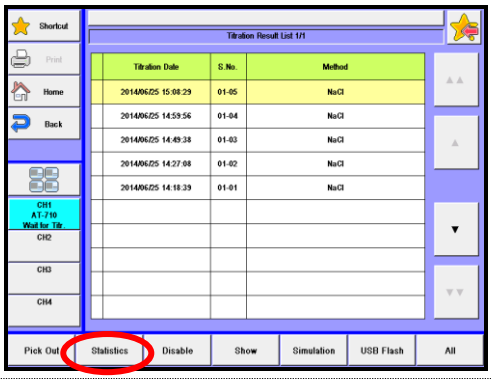


2 Press [Pick Out] button. Here you sort out the data for batch calculation.



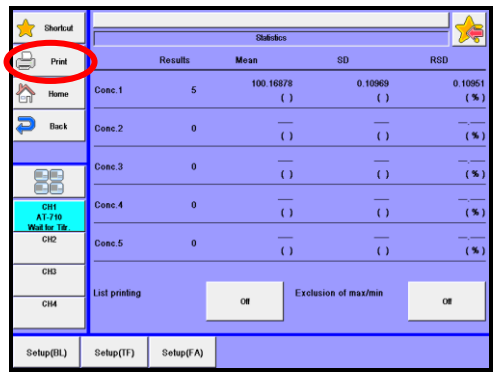
3 When "Pick out" display appears, configure parameters for selection of data, and press [Execute] button.
Example: Take data using "Titration Date" as key parameter.
Make "Titration Date" active ("On"), followed by setting the date.

4 Only those data thus selected appear on the Titration Result List, and then, execute batch processing by pressing [Statistics] button. If you want to view all of the results, press [All] button.



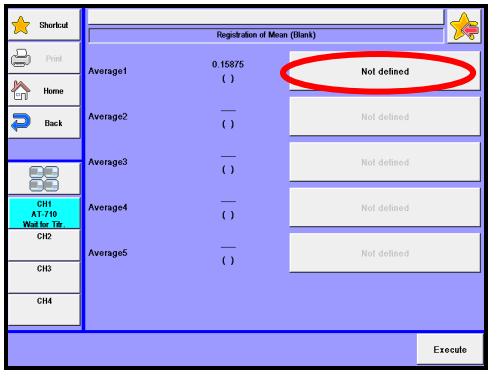
5 The screen on the right will appear. The batch calculated results will be printed out when [Print] button is pressed.

To return to Main display, press [Home] button.



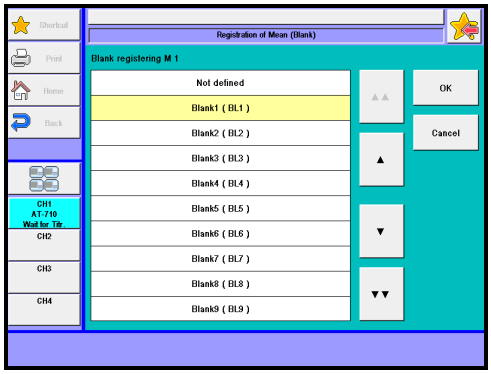
< When statistical calculation results are registered as Blank values >

1 When you want to set the average of statistical calculation results 1 of bath calculation as Blank level, press [Setup (BL)] button on the "Statistics" screen display. Then, when "Registration of Mean (Blank)" screen appears, press Average 1 button.

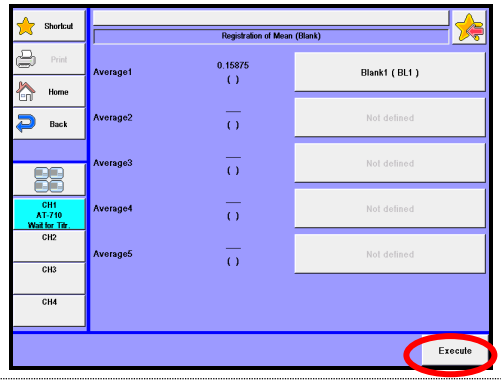


2 Point the cursor on "Blank1 (BL1)" with [▲], [▼], [▲▲] or [▼▼] button or directly press a blank value No. in the menu list.

Press [OK] button.



3 Press [Execute] button.



4 The average value "Average 1" will be registered as Blank 1 on "Function" – "Blank List".

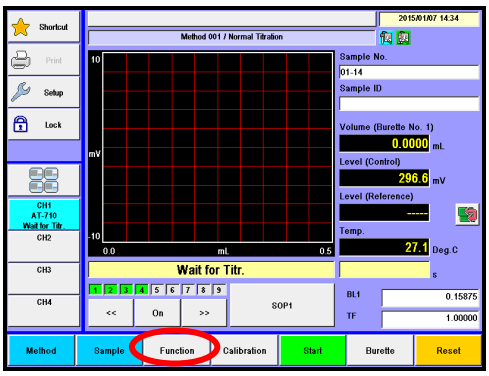
Note **For details of batch calculation, refer to Function discription"3-3-2. [Statistics]."**

The result can be excluded from the batch calculation by pressing [Disable] on the result list. "*" is displayed ahead of the exclude result.

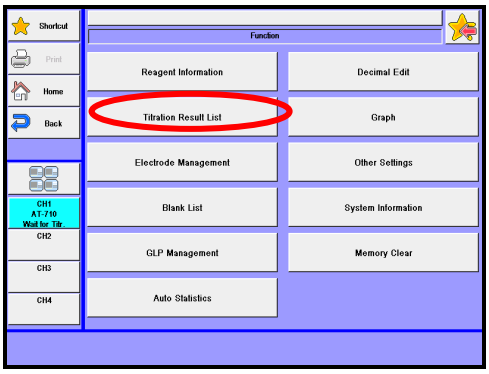
3-14. **Read Data, Store in USB Flash Drive**

Store the result data in USB and can be used on PC.

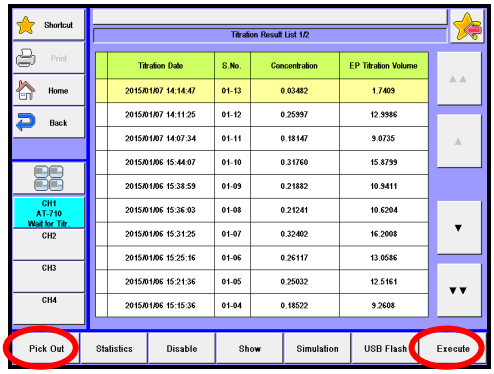
1 Press [Function] button on Main display.



2 Press [Titration Result List] button.

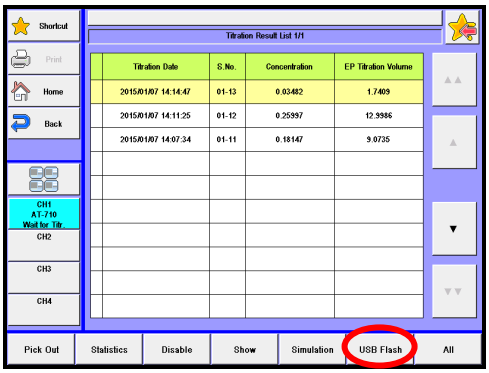


3 Picks up data you wish to save in a USB flash drive.
Press the [Pick Out] button. Set up pickup conditions, and press the [Execute] button.



4 Insert USB to the USB connecter.

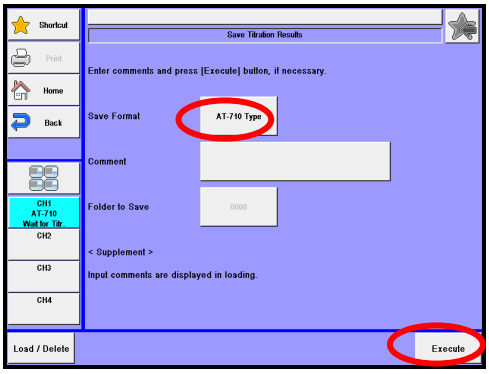
5 Press [USB Flash] button.



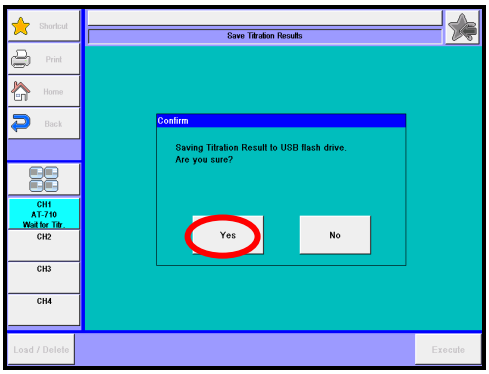
6 Select the file format to save.

There are four file formats available, "AT-710 Type" , "PDF Type" , CSV Type"and "CSV Type(list)."

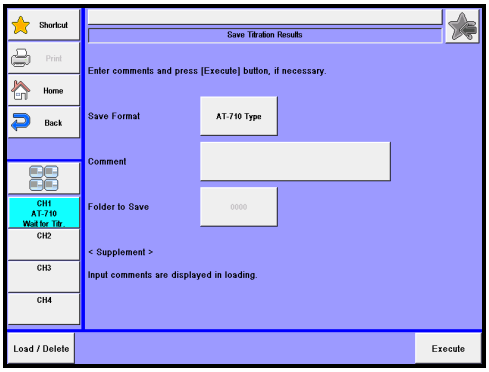
If you want to enter your comment regarding the titration results to be stored, press the comment column on display.
When saving in a CSV format, enter the folder name (input range: 0000 - 9999).
Press [Execute] button on the "Save titration results" screen display.



7 Then, the confirmation screen will be displayed and press [Yes] button.



8 When the screen display returns to "Save Titration Results" after storing them in the USB flash drive, pull out the USB flash drive.



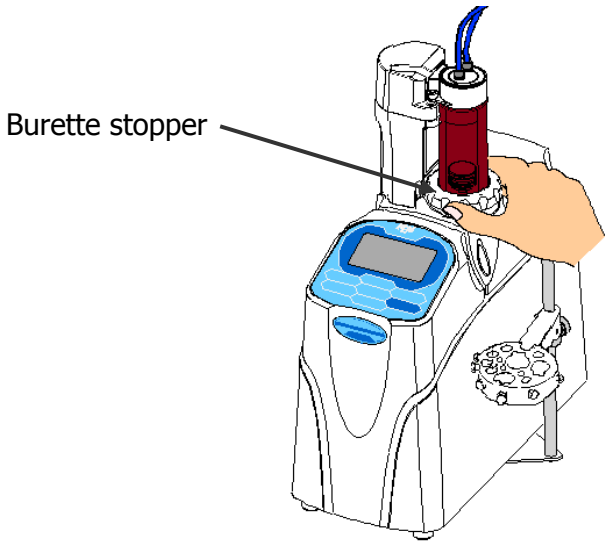
Note

USB of FAT16 and FAT32 format can be used. However all operation of USB is not guaranteed.
Remove USB only after saving data is complete.
When data reading is underway, all buttons stop functioning.
Never remove it halfway. Otherwise, it may be broken.
There is no guarantee of data stored in USB flash memory regardless of any failure source. Make sure to backup data routinely as necessary with your responsibility.

3-15. Replacing burette unit

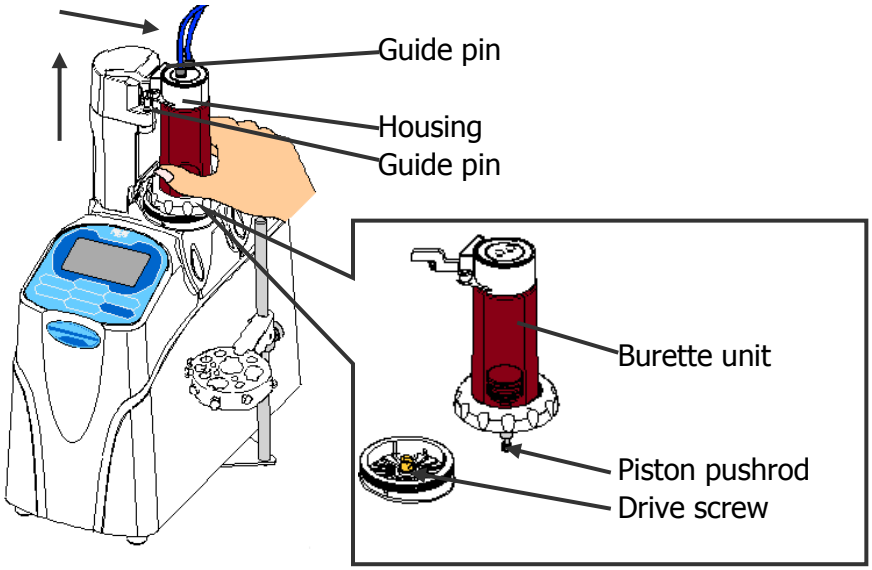
<How to remove the burette unit>

1) Turn on the equipment.
2) Press [Burette] button, then press [Reset] button to make sure that "Reset" appears on "Status" screen.
3) Turn the burette stopper to loosen.

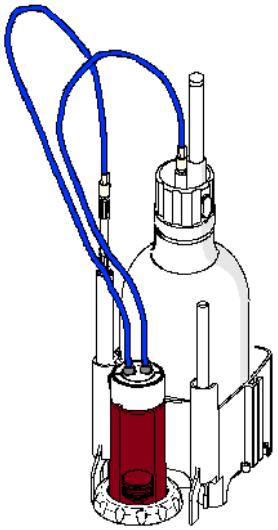


Caution **Do not manually uplift the burette when the burette stopper is not fixed. Doing so may break the burette.**

4) Uplift the burette and once the burette is removed from the two guide pins, slide the burette to the right to take it away.

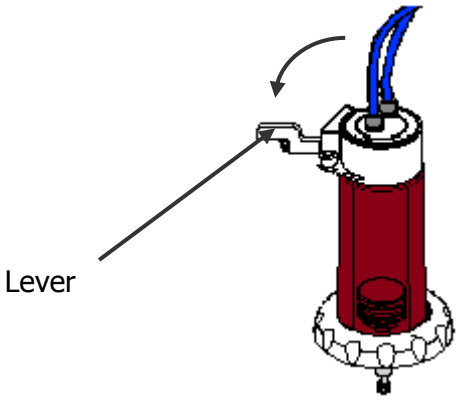


5) As shown below, hitch the removed burette to the bottle stand to store.

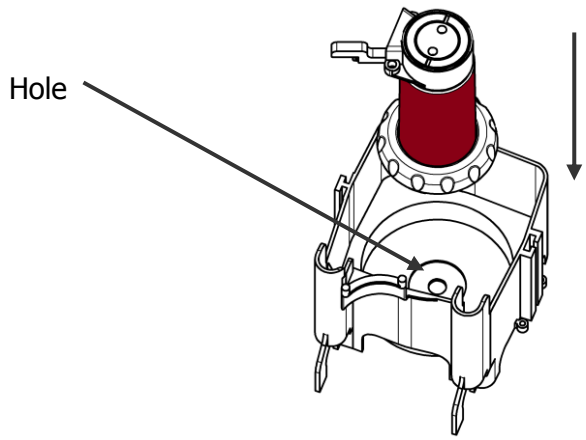


<How to install the burette unit>

1) As shown, turn the lever counterclockwise.

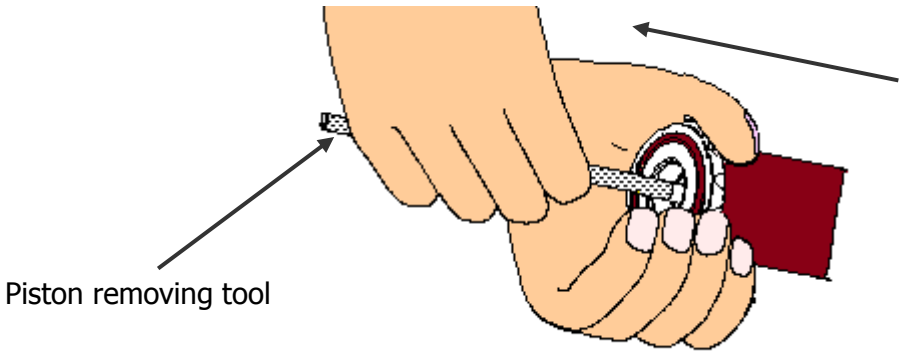


2) Adjust the height of the Piston pushrod of the burette.
<When the burette is viewed from right beside and the scribe line of the Piston pushrod can be seen>
Place the burette on the center hole of the bottle stand and push down, and push the Piston removing tool into the glass cylinder.

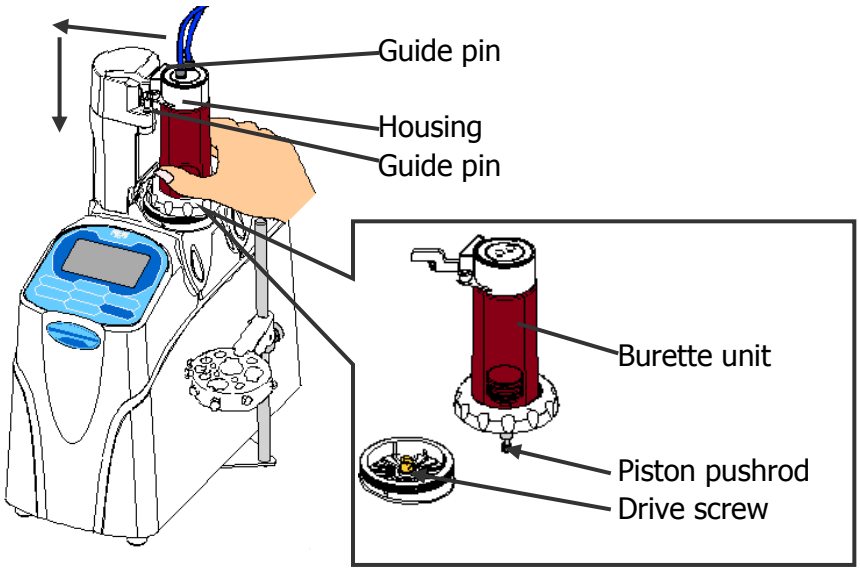


⚠ **Caution**	**Wear a protective pair of glass in order to avoid splashing reagent in case the tube union is loosened or disconnected. When the piston pushrod of the burette is pushed in, reagent will move to the tubing on the reagent bottle side. Put a reagent bottle to the tip of the tubing on the reagent bottle side. Reagent may spatter and splash in your eyes.**

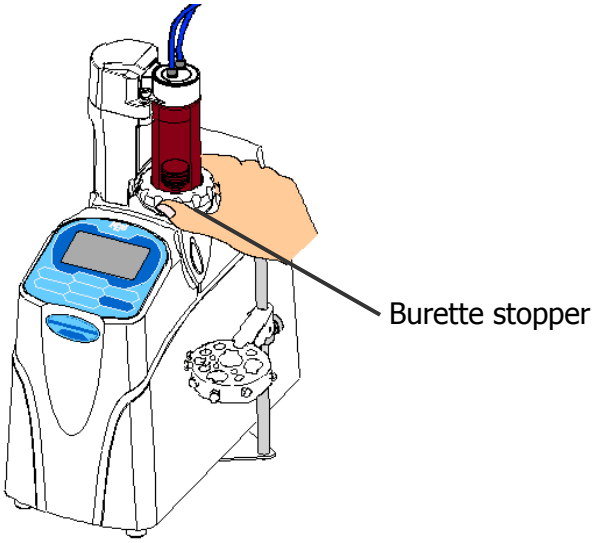
<When the burette is viewed from right beside and the scribe line of the Piston pushrod cannot be seen>
Put the piston removing tool to the Piston pushrod and pull out the Piston pushrod until scribe line of the Piston pushrod can be seen. Then place the burette on the center hole of the bottle stand and push down, and push the Piston pushrod into the glass cylinder.



3) As shown below, slide the burette unit from the right, and hitch the piston pushrod to the drive screw. If you put the housing on the guide pin and slide it, you will find it easier to adjust the height.
4) To place the burette unit, insert the hole of the housing of the burette unit into the two guide pins.



5) To fix the burette unit, hold down the top of the burette unit and tighten the burette stopper.
6) Press [Reset] button.



Caution **Do not manually uplift the burette when the burette stopper is not fixed. Doing so may break the burette.**

7) If the volume of the replaced burette unit is different from that of the previous one, refer to "1-4. Setting Burette Volume" to set up the burette volume.

4. Others

4-1. Use Preamplifier other than STD

Shall explain a procedure to calibrate channel 3 of the preamplifier.

4-1-1.Preamplifier for photometric titration (PTA)

Photometric titration

This method detects endpoint by color tone or color depth of titrated solution. However, if the sample is turbid, it may not detect correct endpoint. Photometric titration is widely used in chelatometric titration with indicators.

It is recommended to have a full understanding of the characteristics of the reacting metals the selection of metal indicators, titration conditions such as pH, titration procedures and others.

The week point of this method is the difficulty of receiving optical signal correctly is the Sample is turbid.

In this case, remove the turbid substance in the sample by filtering.

○Metal Indicator

Chelatometric titration on the photometric titration detects endpoint by the change of color with the indicator. This indicator is called a metal indicator since it changes its color responding to metal ions.

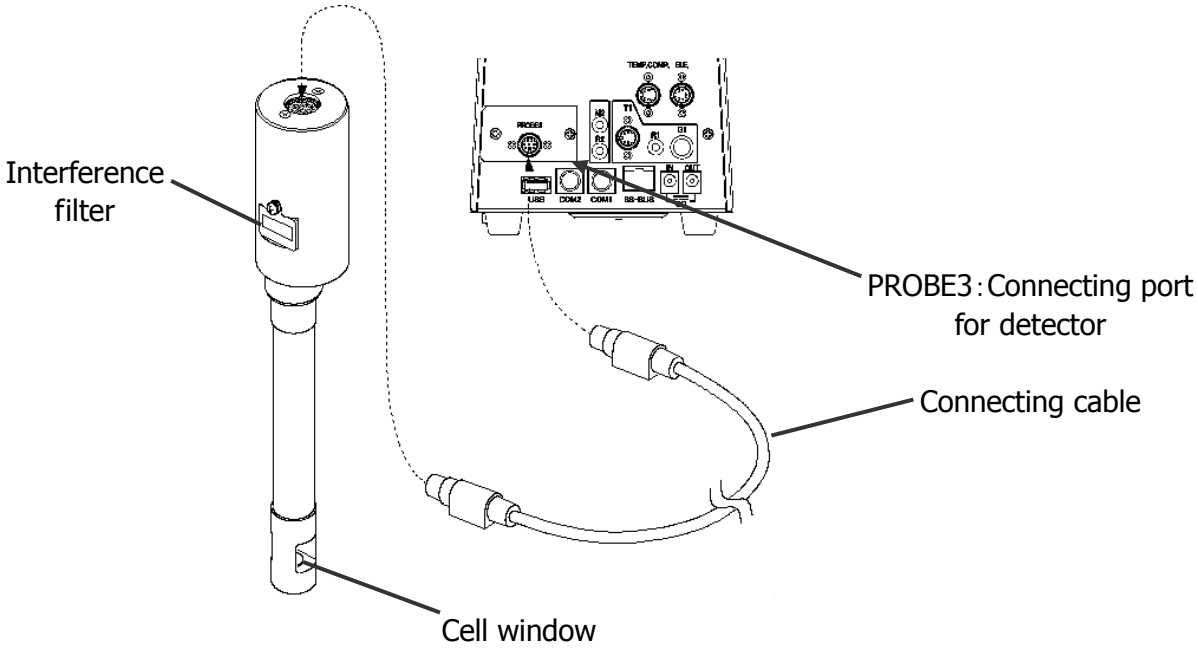
○Buffer solution in chelatometric titration

In chelatometric titration, buffer solution must be added in order to control the pH of titrated solution depending on the sorts of reacting metals.

4. Others

<Parts name and installation>

1) Install an interference filter with suitable wave length for the titration.
2) Connect the photometric sensor and the connecting port for detector with the connecting cable.
3) After change an electrode holder to a supplied multi electrode holder, attach the photometric sensor to the electrode holder.



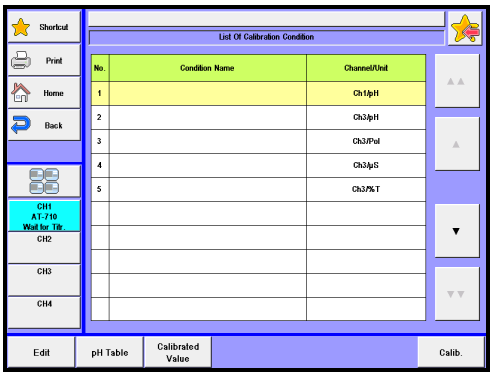
<Preparation for measurement>

1) Ensure the interference filter is inserted in the photometric sensor. The relation of the interference filter to use titration and liquid color are shown below.

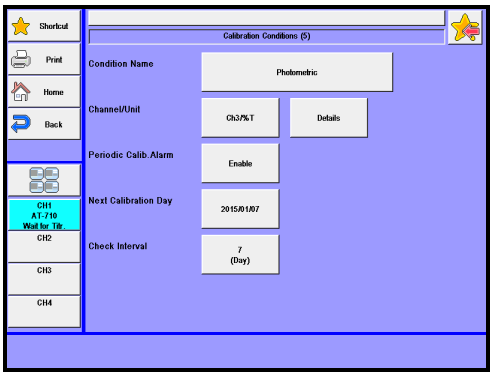
Color change from to				Wave length of filter
Yellow	← →	Red	:	530nm
Clear	← →	Red	:	530nm
Yellow	← →	Blue	:	630nm
Clear	← →	Blue	:	630nm
Blue	← →	Red	:	530nm or 630nm

2) Ensure no dirt or stains around the cell window of photometric sensor. (To remove the dirt or stains, carefully wipe the cell window with gauze soaked in methanol or cleanse it with detergent)
3) Dip the cell window completely into the solution. At this point, be careful not to generate any air bubbles around the cell window by stirring or otherwise.
4) Here you calibrate the preamplifier. Press [Calibration] on the main screen.

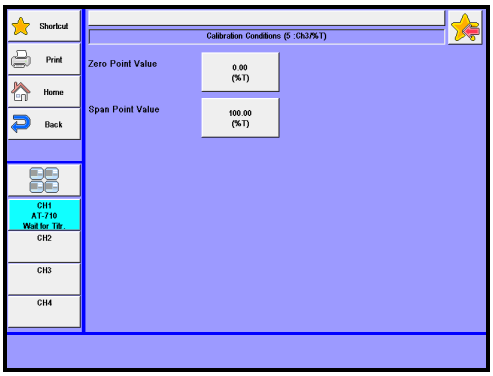
5) When "List Of Calibration Condition" appears, select calibration conditions for use, and press [Edit] button.



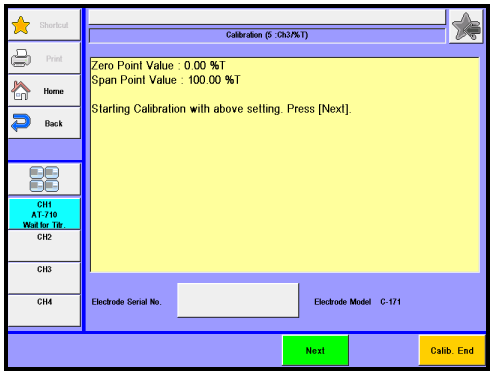
6) Select "Ch3/%T" for Channel/Unit and press [OK] button.
7) Press [Details] button.



8) Enter zero point value, and press [OK] button. (Typically, enter zero '0')
9) Enter span point value, and press [OK] button. (Typically, enter '100')
10) Press [Back] button twice to return to "List of Calibration Condition".

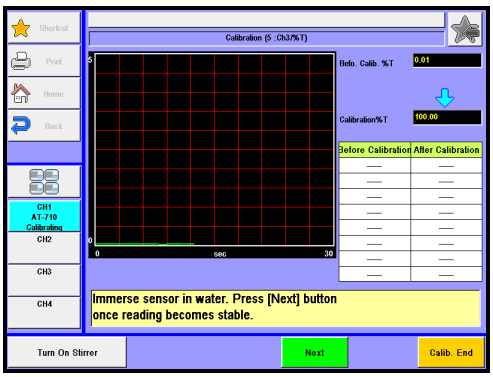


11) Press [Calib.] button.
12) Select an Electrode Serial No. of the electrode you wish to use for calibration.
13) Press [Next] button.

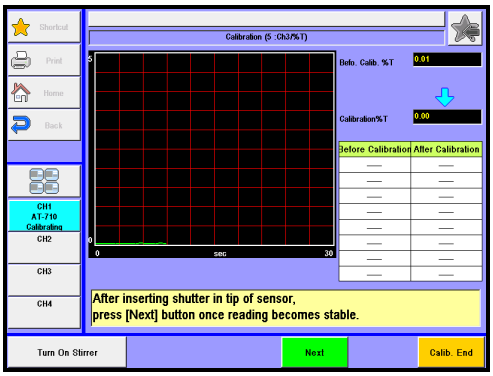


4. Others

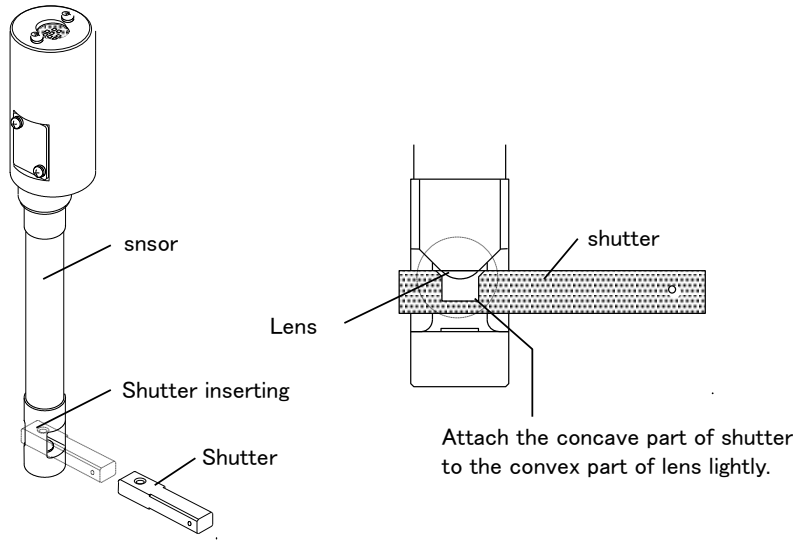
14) Here you perform 100%T calibration. When the %T displayed on the up is stable, press [Next] button.



15) Now you perform 0%T calibration. Lift the photo sensor out of the liquid, and insert the shutter into the cell window. When the %T shown on the up is stable, press [Next] button.



16) Press [Calib. End] button.



Shutter operation manual

<How to titrate>

1) Parameter setup on the measuring unit
   For photometric titration, use "Auto Intermit" mode and "Ch3/%T" for Channel, Unit (Channel/Unit) as titration parameter.
2) Operation
   Dip the photometric sensor in sample solution deep enough, and press [Start] to start titration.

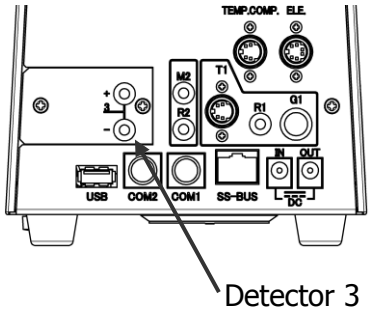
4-1-2.Preamplifier for polarization titration (POT)

Polarization titration

There are two methods in polarization titration; one is called, "Amperometric titration method at constant voltage", which determines endpoint by measuring the current change in applying very low voltage between the two electrodes after submerging the twin platinum electrodes into the titration solution, and another method is called, "Potentiometric titration method at constant current", which determines endpoint by measuring the potential between the two electrodes in applying constant current of very low ampere.

These methods feature distinctive change in potential or current because the phenomena, polarization converting to depolarization or vice versa, are observed at the end point.

<Part description>



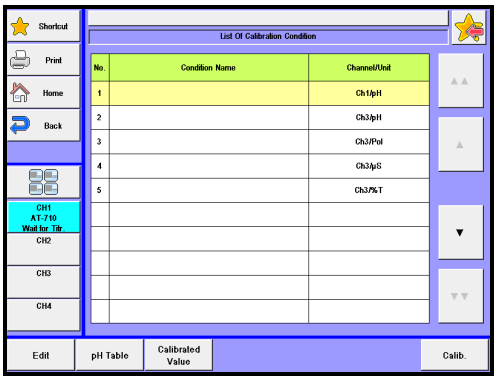
+ ,– : Connecting terminal for Twin platinum electrode

Note When a twin platinum electrode is connected to Detector 3, do NOT dip it into the solution where electrodes connected to Detectors 1 & 2 are immersed.

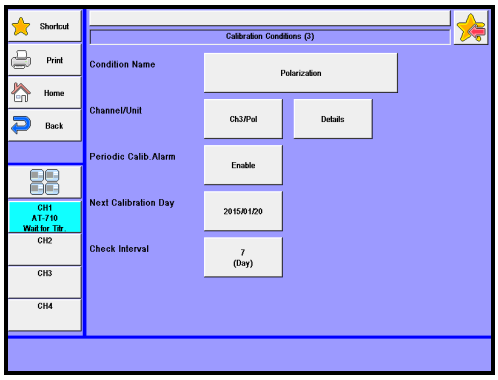
4. Others

<Preparation for measurements>

1) Fix the twin Pt. electrode (M-511) onto the holder.
2) Insert the cable from the electrode into the + – terminal of POT- preamplifier.
3) Here you set up a configuration for the preamplifier. Press [Calibration] on the main screen.
4) When "List of Calibration Condition" appears, select the conditions to be used, and press [Edit] button.

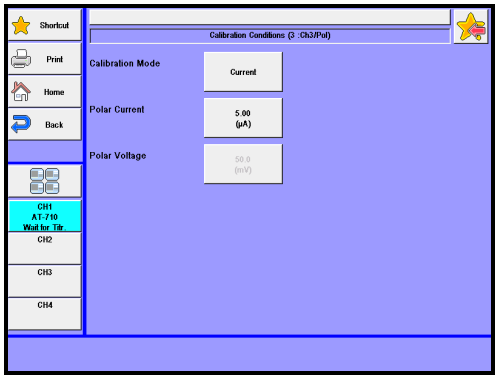


5) Select "Ch3/Pol" for Channel/Unit, and press [OK] button.
6) Press [Details] button.

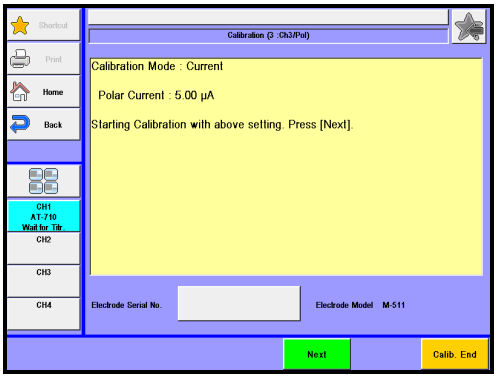


7) Set up parameters for calibration.

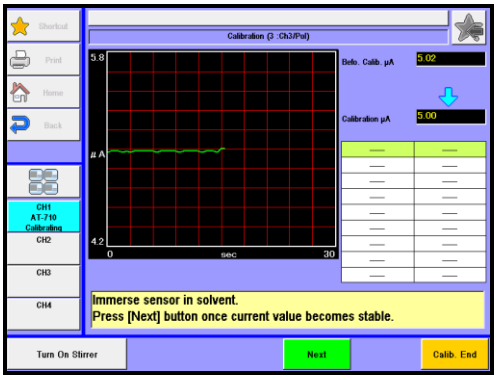
a) [Constant current polarization]
Select "Current" for calibration mode, and press [OK] button. Enter the polar current and press [OK] button. Press [Back] button twice to return to "List of Calibration Condition."
Press [Calib.] button.



Select an Electrode Serial No. of the electrode you wish to use for calibration.
Press [Next] button.

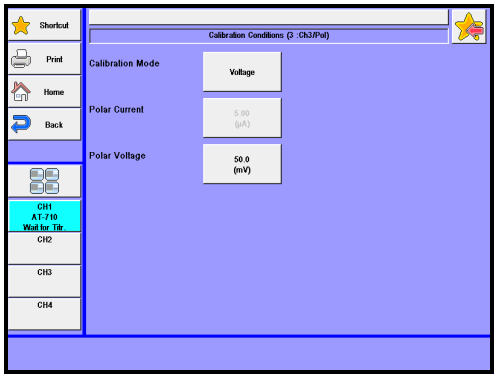


After dipping the Twin Pt. electrode in the solvent to be used and confirming that the current level on the up and down agrees, press [Next] button.

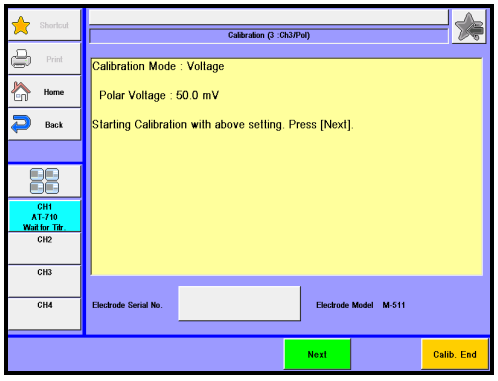


b) [Constant voltage polarization]

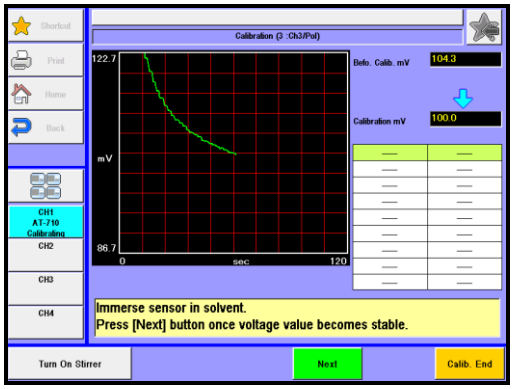
Select "Voltage" for calibration mode, and press [OK] button. For polar voltage, enter the constant voltage of the standard solution at time of calibration, and press [OK] button.
Press [Back] button twice to return to "List of Calibration Condition."
Press [Calib.] button.



Select an Electrode Serial No. of the electrode you wish to use for calibration.
Press [Next] button.



Dip the Twin Pt. electrode in the solvent to be used. After confirming that the potential level on the up and down agrees, press [Next] button.



8) Press [Calib. End] button.

<How to titrate>

1) Parameter setup on the measuring unit
For constant current polar potential titration, set Channel, Unit (Channel/Unit) to "Ch3, mV" as titration parameter. For constant voltage polar current titration, set Channel, Unit (Channel/Unit) to "Ch3, μA" as titration parameter.

2) Operation
Dip the platinum of the electrode in a sample solution well and then press [Start] to start a titration.

4-1-3.Preamplifier for conductometric titration (CMT)

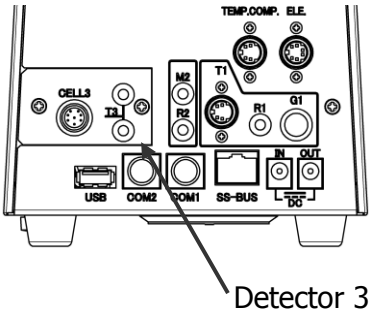
Conductometric titration

This method detects an equivalence point on the titration curve of "titer VS.Conductivity", making use of the change in concentration of the related ions in the solution during titration.

In this form, an endpoint is determined by an Automatic Intersection Detection.

Note The electric conductivity sensor does not guarantee conductivity values as the sensor is designed to quickly respond to a change of the conductivity at the time of titration. Just for your information, measurement errors of ±10%, ±20% and ±30% are seen at around 1000uS/cm, 10000uS/cm and 100uS/cm, respectively.

<Part description>



CELL3 :Conductivity cell terminal

T3 :This is not necessary when K-321 conductivity cell is going to be used. (This terminal is for connecting temperature compensation electrode when a conductivity detection sensor without built-in thermistor for temperature compensation is used. Temperature compensation electrode use T-111.)

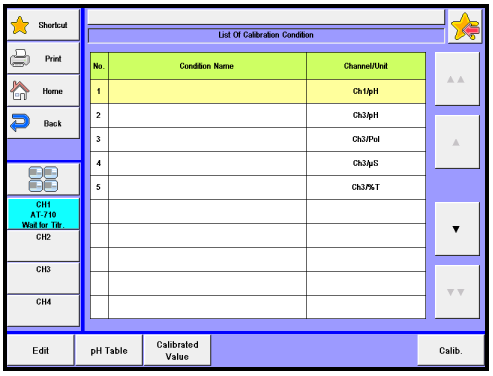
[Note] Be careful not to use both electrodes at the same time, that is, an electrode for conductivity with built-in thermistor for temperature compensation and an electrode for temperature compensation.

4. Others

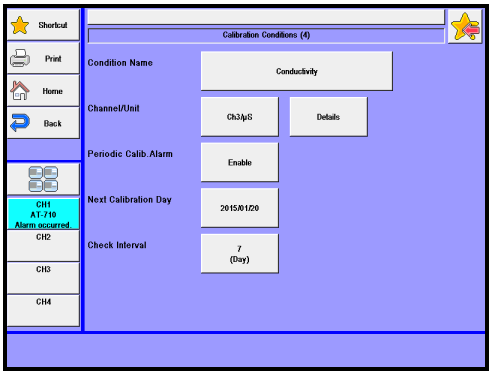
<Preparation for measurement>

1) Fix the conductivity cell onto the electrode holder.
2) Insert the cable from conductivity cell into CELL3 terminal of CMT- preamplifier.
3) Here you set up a configuration for the preamplifier. Press [Calibration] on the main screen.

4) When "List of Calibration Condition" appears, select the conditions to be used, and press [Edit] button.



5) Select "Ch3/μS" for Channel/Unit, and press [OK] button.
6) Press [Details] button.



7) Set up parameters for calibration.

[Cell constant] – when standard solution is not used

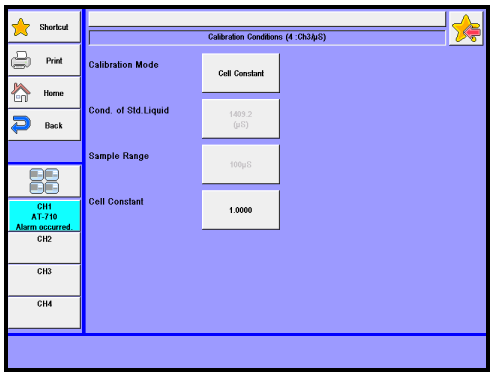
Enter the cell constant that has been validated in the plant at the time of shipment (labeled on the cell cap) or the constant validated with a reference of known conductivity.

Select "Cell constant" for calibration mode, and press [OK] button.

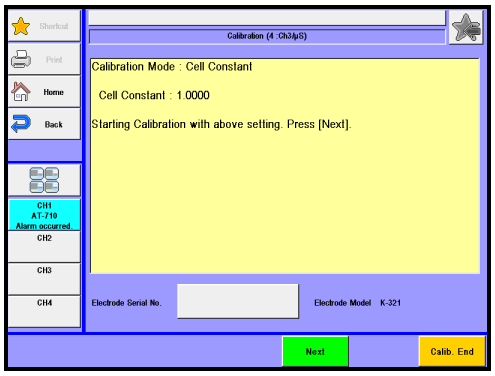
Enter the "Cell Constant" labeled on the cell or the constant of which conductivity is known, and press [OK] button.

Press [Back] button twice to return to "List of Calibration Condition."

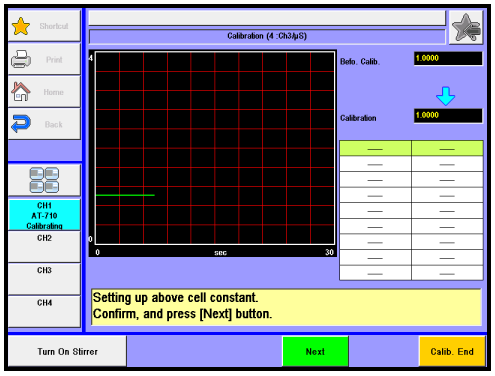
Press [Calib.] button.



Select an Electrode Serial No. of the electrode you wish to use for calibration. Press [Next] button.



When the constant displayed on the right agrees with the cell constant of the sensor, press [Next] button.



b) [Calibration with a reference solution]

The conductivity cell changes its cell constant as time goes by. When precision is required in measurement, you need to calibrate with conductivity standard solution, specified in JIS or of which conductivity is known (usually potassium chloride is used). See the Section "Conductivity standard solutions" for how to prepare standard solution and the conductivity at varying temperatures.

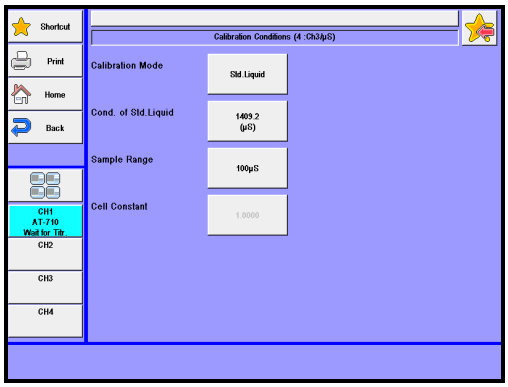
Set the calibration mode to "Std.liquid", and press [OK] button.

Enter the conductivity of the standard liquid at time of calibration for "Cond. of Std.liquid", and press [OK] button.

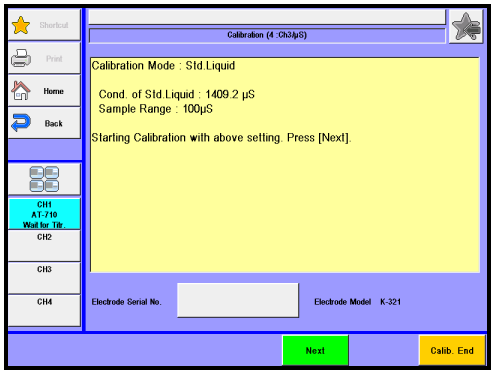
Select "Sample range" to the standard range, and press [OK] button. (Select 10000µS for more than 1000µS standard conductivity, and 1000µS or 10000µs for more than 100µS)

Press [Back] button twice to return to "List of Calibration Condition".

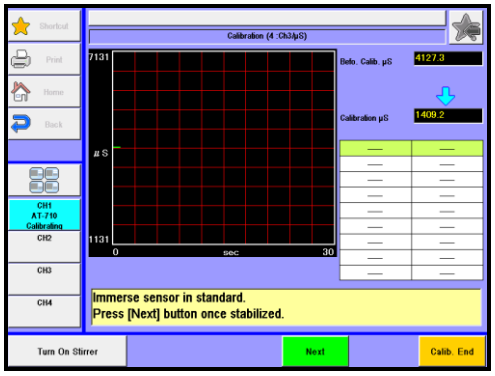
Press [Calib.] button.



Select an Electrode Serial No. of the electrode you wish to use for calibration. Press [Next] button.



Dip the conductivity sensor in the standard solution. When the conductivity on the up on display stable, press [Next] button.



8) Press [Calib. End] button.

Note When dipping the electric conductivity sensor in a solution, make sure to allow 5mm or more between the sensor head and the bottom of a beaker. Measurement will not be performed properly when the sensor is obstructed.

<How to titrate>

1) Parameter setup on the measuring unit
   For conductivity titration, select "Intermit" titration mode and set "Form" to "Intersect," and perform measurement up to maximum titration volume. Set Channel, Unit (Channel/Unit) to "Ch3/μS" as titration parameter. (Select sample range to measurement range)
2) Operations
   Dip the conductivity cell in sample solution and press [Start] to start titration.

Note When dipping the electric conductivity sensor in a solution, make sure to allow 5mm or more between the sensor head and the bottom of a beaker. Measurement will not be performed properly when the sensor is obstructed.

<Conductivity standard solution>

Preparation for conductivity standard solution can be made according to JIS K0130 General rules for electric conductivity measuring method as described below. Also, see the appendix for conductivity at varying temperature.

※Preparation of conductivity standard solution (JIS K0130 General rules for electric conductivity measuring method)

Dry potassium chloride (KCl) at 500 C for 4 hours, and dissolve 0.74552g KCl in 1000.00g pure water of which conductivity is less than 0.2mS/m at 25 C. Store the solution in a polyethylene or hard glass bottle after sealed.

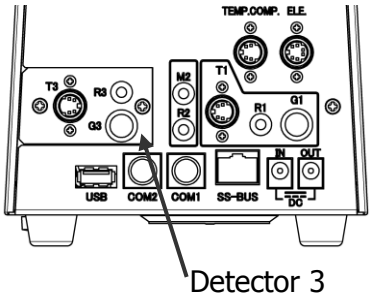
Conductivity of standard solution

Temperature (°C)	Conductivity (mS/m)	Conductivity (μS/cm)
0	77.292	772.92
5	89.096	890.96
10	101.395	1013.95
15	114.145	1141.45
18	121.993	1219.93
20	127.303	1273.03
25	140.823	1408.23
30	154.663	1546.63
35	168.779	1687.79
40	183.127	1831.27
45	197.662	1976.62
50	212.343	2123.43

4-1-4.**Preamplifier for pH dual input (TET)**

pH-calibration values should be individually stored on each detector.

<Part description>



G3:Port for Glass electrode
R3:Port for Reference electrode
T3:Port for Temperature compensation electrode

< Preparation for measurement >

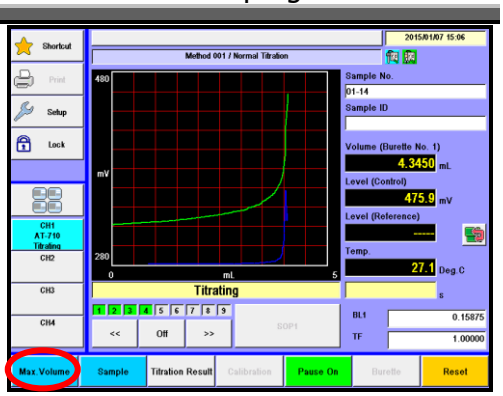
1) Mount the glass combination electrode (or glass electrode and reference electrode) and temperature compensation electrode onto the electrode holder.
2) Plug each electrode cable terminal into Detector 3 of TET- preamplifier.
3) Press [Calibration] button to calibrate the preamplifier.

Note About the calibration method, see the chapter "3-3. Calibration of preamplifier (pH calibration)."

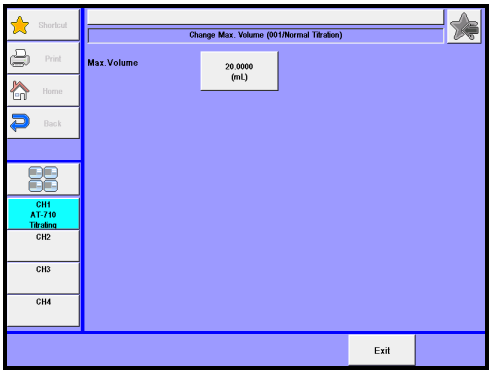
4-2. Change maximum titration volume

The maximum titration volume can be changed while a titration is in progress.

1) Press [Max. volume] button while performing a titration.



2) When "Change Max. Volume" screen display appears, press [Exit] button after changing the value of Max. volume.



Note The changed values will be reflected in the method parameters you are currently using for measurement.

5. Function Tools

To start with, let us learn about Menu window itself.

Please refer to <Function Description.>

5-1. Method

In order to run a precise and timely measurement, it is necessary to preset conditions appropriate for the sample and titration method. Those conditions for measurement and concentration calculation are called a Method.

Item	Description
[Method Name]	Edit the name of the method.
[Titration Mode]	Set a titration mode to determine how to dose titrant.
[Titration Form]	Set a titration form mainly used to find endpoints.
[Predosing Parameter]	Predosing conditions on a sample before measurements is set. Samples can be previously dispensed with up to 10 burettes.
[Titration Parameters]	Settings for general titration.
[Control Parameter]	Set for your intended titration including titrant dose speed, data sampling mode, EP detection method and its conditions.
[Calculation Parameter]	Equation for concentration calculation is set.
[Report Parameter]	Settings for printing contents.
[Reagent Parameter]	Select a burette to be used in titration and fixed dose.
[Option Parameter]	The option parameter is necessary for user sequence when a multiple sample changer is used.

5-2. **Sample**

Setting for the sample parameters.

Item	Description
[Sample No.]	Here you select a number for the sample. The numbers consist of High order number and Low order number, and the samples when grouped are numbered with High order number. Lower number represents individual sample identification. • 00 - 99
[Sample Name]	Here each sample can be named with characters up to 20 letters.
[Sample ID]	The samples can be identified with ID or Lot number with up to 20 characters.
[Sample Unit]	Here enter the unit of sample weight. Up to 10 characters can be entered.
[Size (S1)]	Input "Tare + Sample weight". • -99999.99999999 - 99999.99999999g
[Size (S2)]	Input Tare weight after injecting a sample. • -99999.99999999 - 99999.99999999g
[Balance]	Here you can enter the weight direct from an electronic balance.
[Constant]	Here see the display for sample constant where you configure those constants like reagent molecular weight and equivalent number particular to the sample.
[How to Set UP Sample]	You define sample settings.
[Sample Mode]	You define sample mode.

5-3. Function

Function window is a convenient tool to practice exciting features of the unit.
Setting for the Function parameters.

Item	Description
[Reagent Information]	Here you set in the information on reagents including their names, reagent factor, replacement date, etc.
[Titration Result List]	You can view the list of measurement results where you can re-calculate or batch-calculate them.
[Electrode Management]	Sets up electrode information.
[Blank list]	This is the list of blank values including 99 different ones you can store.
[GLP Management]	Here you set up functions to meet with GLP requirements including periodic check, advance notice of check date at intervals, etc.
[Auto Statistics]	The series of measurements performed under the same conditions (Method) can be automatically printed out by this function.
[Decimal Edit]	This function includes setting the number of decimal places for a sample size, Statistics, Blank and Factor when printed out or displayed on screen as well as how to round off in calculation.
[Graph]	Set parameters for graphing the results. Can draw graphs by plotting "Titr. volume vs Pot.", first-derivative values and the like.
[Other Settings]	This includes the auto input of averaged values and the alarm function, etc.
[System Information]	You can view the list of equipment presently connected to the channels in work as well as the information on software version.
[Memory Clear]	With this function, you can erase measurement results, methods or sample parameters selectively by individual sample.

5-4. Calibration

Calibration is performed.

Item	Description
[Edit]	Can set "Calibration condition name" and calibration conditions.
[pH Table]	AT-710 is equipped with the table for temperature compensation at pH7/pH4/pH9 based on the JIS standard.
[Calibrated Value]	You can view the present calibration record.
[Calib.]	Calibration is performed according to the present calibration conditions.

5-5. Burette

The burette can be operated manually.

Item	Description
[Manual]	APB manual operation.
[Dose]	Dispense the fixed amount of reagent.
[Validation]	Check the capacity of the burette.

5-6. Setup

You can configure system setup using the function of Setup.

Item	Description
[Operator Setup]	Here the operator is defined for identification.
[Display Setup]	Languages, date and clock time can be set.
[Interface Setup]	Here you configure settings for your printer, output to a PC, the balance, a LAN and Bluetooth.
[LCD Backlight Setup]	Here the backlight of LCD can be adjusted.
[Beep Setup]	Beep tone for alarm can be selected on this display.
[Maintenance]	Deletes information of the instrument connected to CH1-CH4 or clears all memories. Also calibrates the touchscreen.
[Administrator Setup]	Sets up the functionality of hierarchical management for operation menus by user ID or password.

6. Maintenance

6-1. Daily Maintenance

In order to maintain the system in good conditions for a long period of time, it is important to observe the following instructions.

6-1-1.Check the instrument

Make sure the instrument is not dirty or stained by visual check. If any dirt is found, wipe it off with clean gauze. Do not use solvent but use water only.

6-1-2.Check the electrode

Make sure the electrode is not dirty, stained or short of inner solution.
Replace the electrode if it is broken.
If dirty, wipe it off with tissue paper.
Fill the inner solution if it is not enough.

6-1-3.Check the cable

Make sure by visual check all the cables including power cord, various cables and electrode lead to see if any dent or bent is found. Replace the cable if it is dent or bent.

6-1-4.Check the connectors

Make sure the connectors are not dusty or rusted. If dusty clean it by a vacuum cleaner. If rusted, repair is necessary.

6-1-5.Check any leaking

Make sure there is no leaking from the nozzle, tube lines, switching valve or unions. If any leaking is found, tighten the unions. If it does not improve, replace with new one.

6-1-6.Check burette performance

Press [Burette] button. Press [▼], [▲], [▲▼] key to make sure the burette works properly. If it does not work properly, correct it by referring to "7. Troubleshooting."

6-1-7.Check stirrer performance

Make sure the stirrer works properly. If it does not, correct it by referring to "7. Troubleshooting."

6-1-8.Check the nozzle

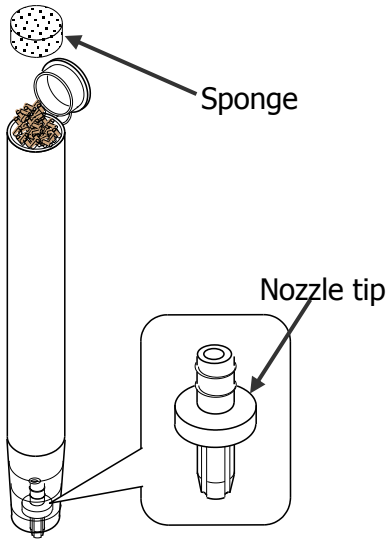
Check the nozzle to see any damage or clogging. If it is broken, replace it with new one. If it is clogged, remove the clogging article by a thin wire or with hot water.

6-1-9.Preamplifier

Calibrate the preamplifier if necessary. (See "3-3. Calibration of preamplifiers (pH calibration).")

6-1-10.Replacement of Zeolite (molecular sieves)

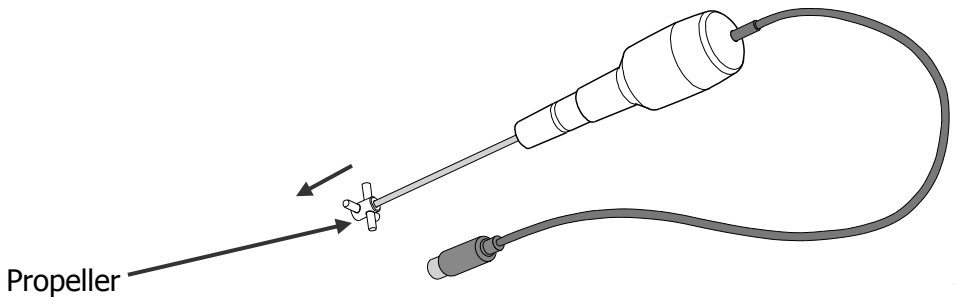
Detach the Desiccant tube from the reagent bottle.
Replace the molecular sieves with Zeolite sold under 5A.



Note If the nozzle chip slips from the desiccant tube when replacing the zeolite, ensure that you return the nozzle chip in the tube with its trenches downward as shown above.

6-1-11.How to clean the propeller stirrer

Remove the tip of propeller stirrer and clean the tip of propeller stirrer and the propeller respectively.

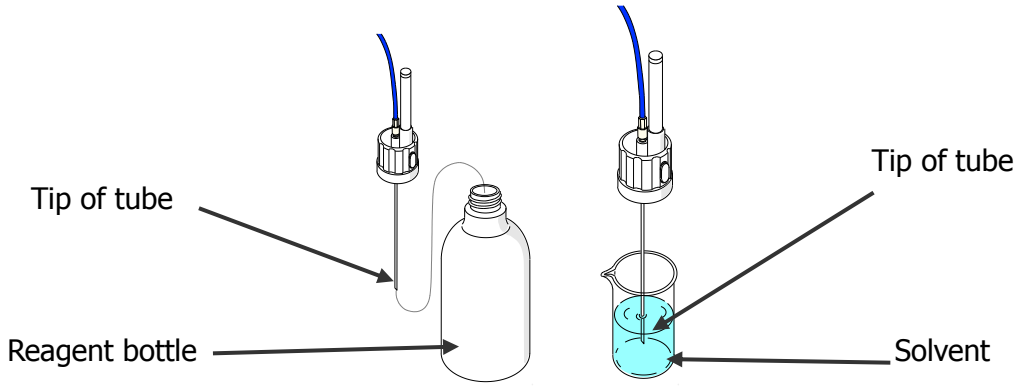


6-1-12. How to clean the burette and how to replace the reagent

<Drain the reagent>

1) Remove the tip of the tube inserted in the reagent bottle (hereinafter: the tip of the tube).
2) Ensure the titration nozzle is in a beaker.
3) Press [Burette] button to show "APB Manual Operation" on display.
4) Set "Burette No." to the number of the burette you wish to clean. Set "Purge Type" to "to Nozzle."
5) Press [▲▼] button to drain the reagent in the burette cylinder to a beaker. After the reagent comes out of the tube, press [▲▼] button to stop it again.

<Drain the reagent> <Clean>



<Clean>

6) Prepare the solvent (pure water or ethanol) in a beaker. Insert the tip of the tube into a beaker to prevent it from splashing reagent.
7) Press [▲▼] button to fill the solvent in the burette cylinder and drain it to a beaker from titration nozzle. Repeat this operation several times to replace inside of the burette to the solvent.
8) Remove the tip of the tube from the solvent, press [▲▼] button to drain the solvent. After the solvent comes out of the tube, press [▲▼] button to again.

<Fill the solvent>

9) Prepare the reagent to fill and insert the tip of the tube into the reagent bottle.
10) Press [▲▼] button to suck the reagent, and press [▲▼] button again after filling the reagent.
11) Remove the tip of the tube from the reagent bottle. Press [▲▼] button to come out the reagent. After the reagent comes out of the tube, press [▲▼] button again.
12) Set the reagent to fill again, and Press [▲▼] button to suck the reagent, and press [▲▼] button again after filling the reagent.

Note When next setting reagent that gives an influence to solvent, follow "6-2-3. How to remove and assemble the burette unit" to remove piston burette and clean/dry cylinder, tube, piston head and switching valve after procedure 8).

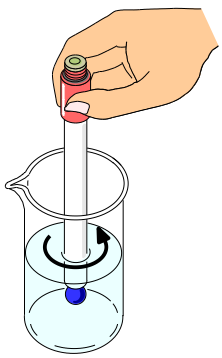
6-2. Other Maintenance

6-2-1.Storage of the instrument

Store the instrument, if it is not going to be operated for a long period of time in a place where there is no direct sunlight or under no vibration, and the place is dry, not humid. It is recommended to pack it in the carton box in which the instrument was first delivered.
Keep the rinsed electrodes detached from the titrator.

6-2-2.Cleaning the electrode

Glass electrode and reference electrode have to be rinsed with pure water at least three times and then wiped with clean filter paper or absorbent cotton. If it is stained, rinse with 0.1mol/L-hydrochloric acid, detergent water or other solvent in a short time, and then rinse well with pure water. In case an electrode is not in use for a long period, dip it in pure water and only use it when it reaches equilibrium. If any foreign article exists in junction of a reference electrode, it may cause abnormal potential reading. In this case clean the junction part with pure water. If you use an electrode of other makes than KEM, refer to the manual of its manufacturer.
After the electrode is rinsed, clean its tip with pure water and ten wipe it with clean filter paper or absorbent cotton. Connect the glass electrode, reference electrode and temperature compensation electrode to the preamplifier, and dip the electrode in pH7 standard solution. Slowly move a beaker with standard solution in it so that equilibrium can be reached faster.



6-2-3.How to remove and assemble the burette unit

When drying completely in the cylinder or replacing the cylinder, disassemble the burette unit.

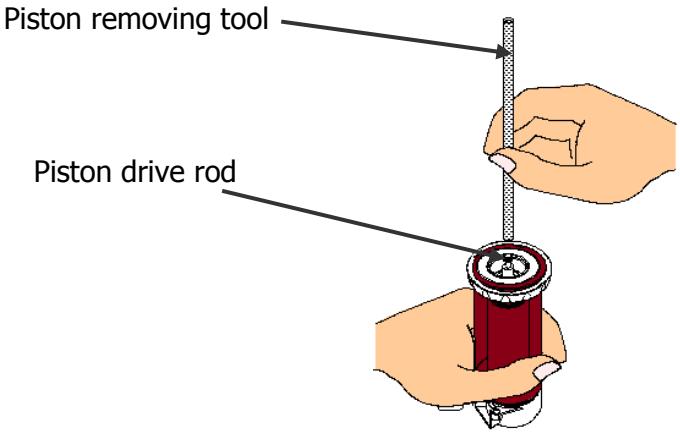
Remove each part according to the following procedure.

<How to remove the burette unit>

1) Turn on the equipment.
2) Follow "6-1-12 How to clean the burette and how to replace the reagent" to remove solution in the cylinder.
3) Follow "3-15.Replacing burette unit" to remove the tube.

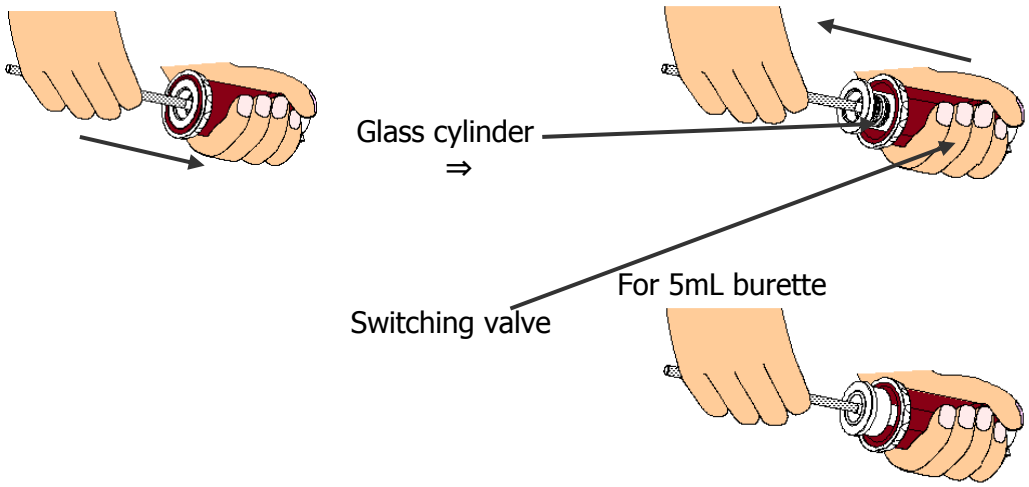
<How to remove the glass cylinder>

1) Turn the burette upside down with the tubing attached, and screw the piston removing tool into the piston drive rod.



Note Do not tighten piston removing tool too much otherwise it cannot be loosed.

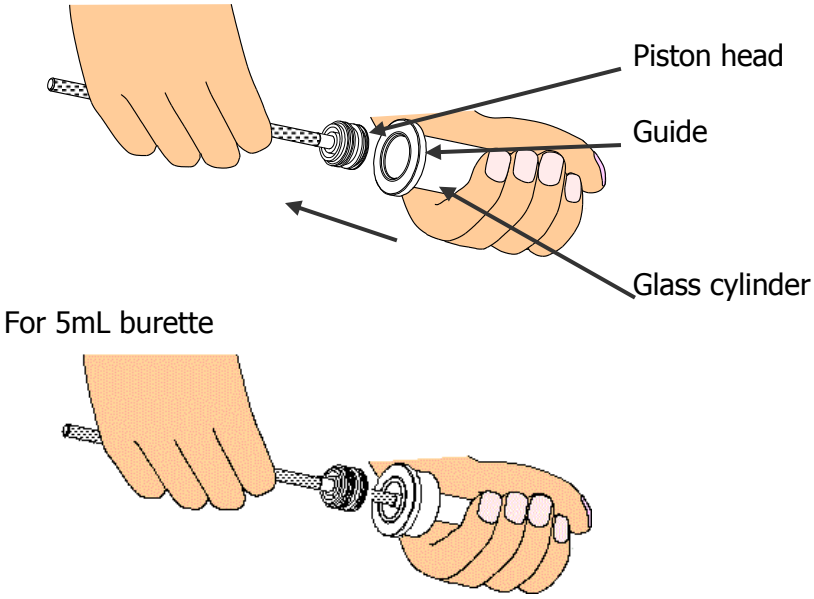
2) Push the piston head into the cylinder to remove the remaining reagent from the burette.
3) Pull out the glass cylinder and the piston head together from the switching valve.



Caution **Wear a protective pair of glass (and appropriate protector) in order to avoid splashing reagent in case the tube union is loosened or disconnected.**

<How to remove the piston head>

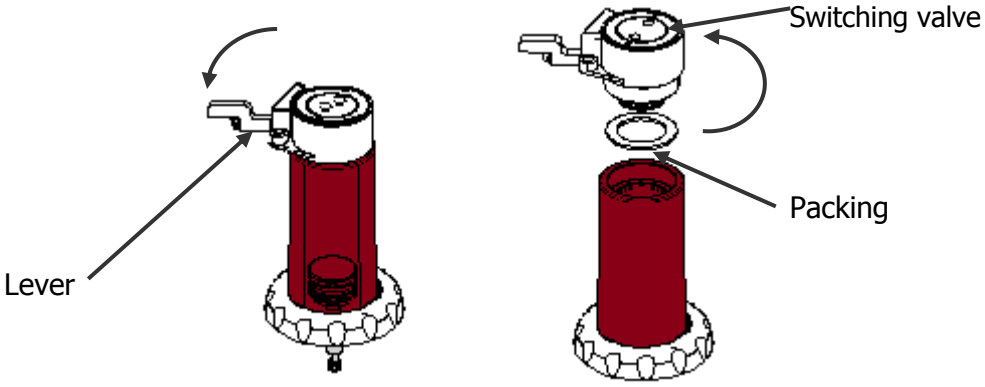
1) Pull out the piston head from the glass cylinder.
2) Remove the piston removing tool from the piston head.
3) Remove the guide.



Caution **When piston head and glass cylinder are washed, care should be taken not to cause wound or dent at their surface, otherwise it might cause a leak.**
Do not hold the glass cylinder too tight. Doing so may break the glass.

<How to remove the switching valve>

You will need to remove the switching valve when the piston head alone is pulled out while removing the glass cylinder. Turn the lever counterclockwise. Hold the lower part to prevent the glass cylinder from falling down, and then take away the switching valve and the packing from the burette cover.

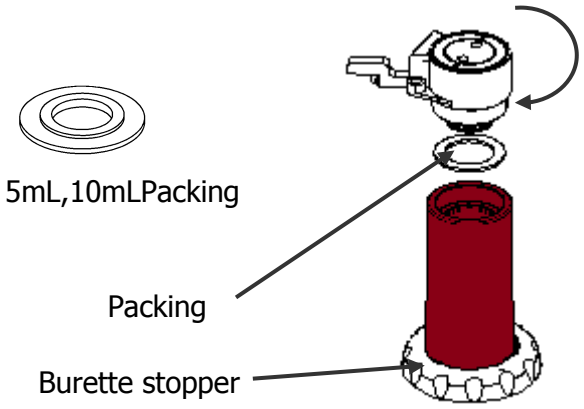


⚠ **Caution**	**Be reminded that the glass cylinder goes out from the opposite side of the switching valve once the switching valve is removed from the burette cover.**

⚠ **Caution**	**Wear a protective pair of glass in order to avoid splashing reagent in case the tube union is loosened or disconnected.**

<How to replace the switching valve>

1) Attach the burette packing to the burette cover.
2) Attach the packing to the switching valve. Attach the packing for 5mL and 10mL as shown in the figure.
3) Screw the switch cock of 2) into the burette cover clockwise.

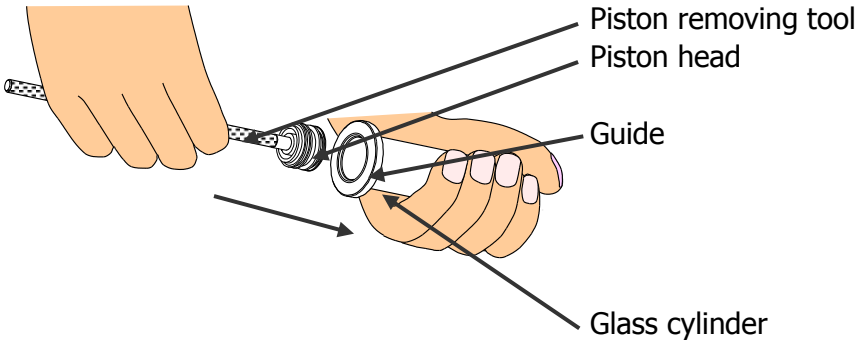


<How to remove the piston head>

1) Install the guide to the groove side of glass cylinder.
2) Screw the piston removing tool into the piston drive rod

Note Do not tighten piston removing tool too much otherwise it cannot be loosed.

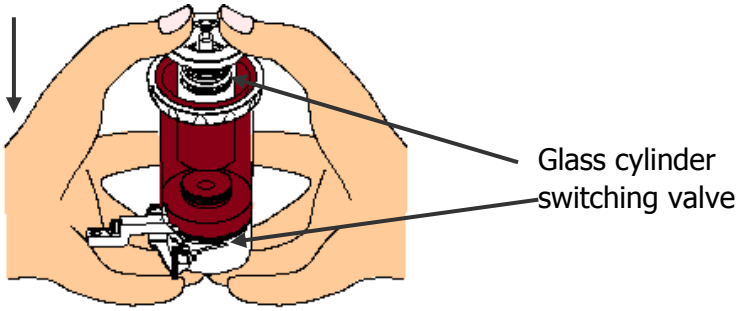
3) Push the piston head to the glass cylinder with opposite operation of removing.



Caution **Take utmost care not to damage the piston head, and insert the head by keeping the piston screw in parallel with the burette wall.**
Do not hold the glass cylinder too tight. Doing so may break the glass.

<How to install the switching valve>

1) Remove the extraction rod from the glass cylinder installed the piston head.
2) Push the glass cylinder and the piston head to the head holder together.

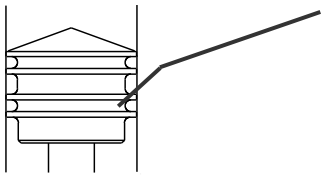


< Fitting the burette unit>

Refer to "3-15. Replacing burette unit" to attach the burette unit.

6-2-4.**Replacement of piston head**

The piston head is subject to wear due to abrasion during the course of an extended period of use, thus causing eventual leak. If it leaks, replace it with a new head (both the cylinder and the piston head). It is time to replace it if the reagent permeates down to the level indicated in the figure below after a few cycles of movement with the burette cleaned up, dried and refilled with reagent.

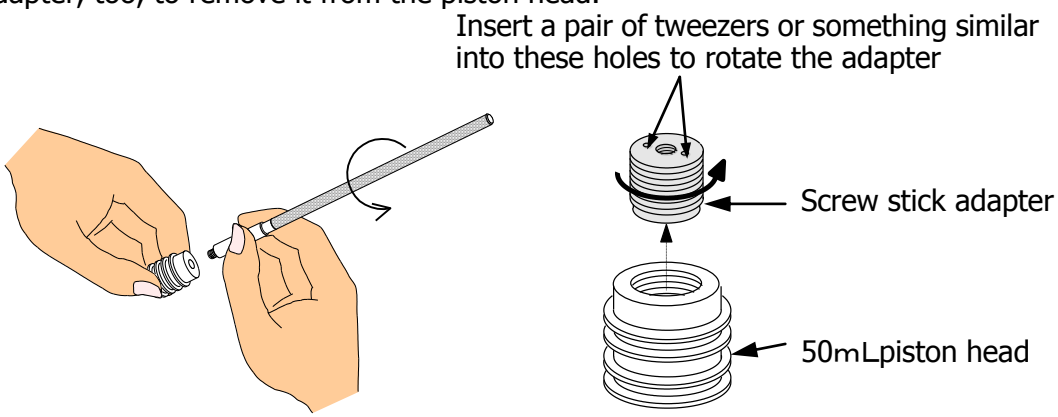


It is time to replace it if the reagent permeates down to the level indicated in the figure.

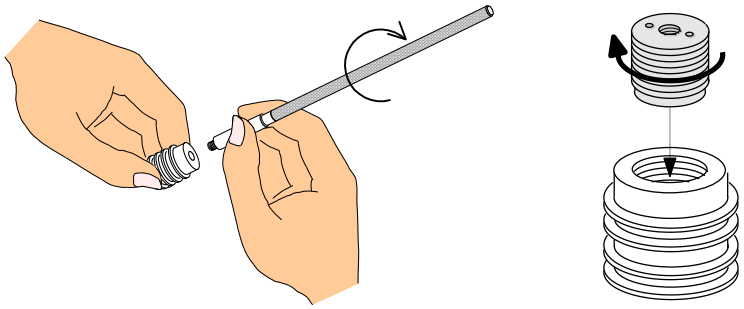
Operate to remove the glass cylinder up to「6-2-3. How to remove and assemble the burette unit」<How to remove the glass cylinder>.
Replace the guide to the new glass cylinder, and assemble according to since「6-2-3. How to remove and assemble the burette unit」<How to remove the glass cylinder>.

<Replacement of piston head for Auto dispenser>

1) Rotate the piston screw to remove it from the old piston head. Rotate the screw adapter, too, to remove it from the piston head.



2) Attach the screw adapter to the new piston head before screwing the piston screw there.



3) Push the new piston head into the burette.

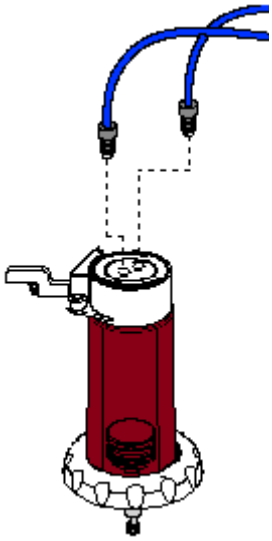
⚠ **Caution**	**Take utmost care not to damage the piston head, and insert the head by keeping the piston screw in parallel with the burette wall.**

6-2-5.Change switching valve

Replace the switching valve if it leaks due to crystallization or after use for an extended period of time.

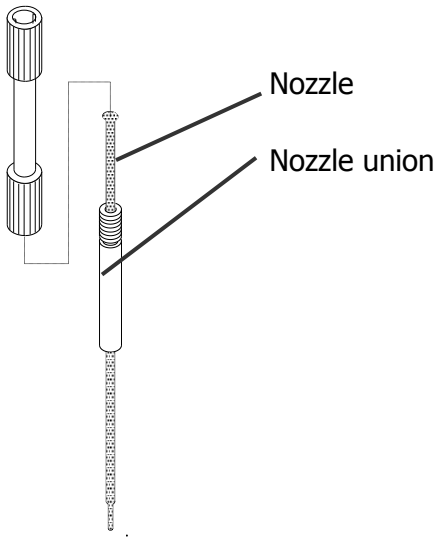
Replace the guide to the new glass cylinder, and assemble according to since「6-2-3. How to remove and assemble the burette unit」<How to remove the glass cylinder>.

1) Operate to remove the Burette unit up to「6-2-3. How to remove and assemble the burette unit」<How to remove the burette unit>.
2) Remove the tube.
3) Operate to remove the switching valve up to「6-2-3. How to remove and assemble the burette unit」<How to remove the switching valve>.
4) Refer to <How to install the switching valve> of "How to remove and assemble the burette unit" to attach the switching valve.
5) Reconnect the tube lines.



6-2-6.Replace titration nozzle

1) Detach the Degassing tube and the nozzle union.
2) Pull out nozzle from the nozzle union.
3) Squeeze a new nozzle into the nozzle union.
4) Attach the nozzle union and Degassing tube again.



⚠ **Caution**	**Wear safety glasses and protective gloves during operation.** **There is a danger that reagents can contact your hands or the like.** **In addition, reagents can fly into your eyes.**

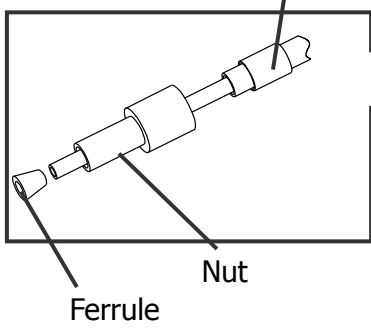
6-2-7.**Replace tube**

Replace the tube if it is bent or leaks in the connection portion.

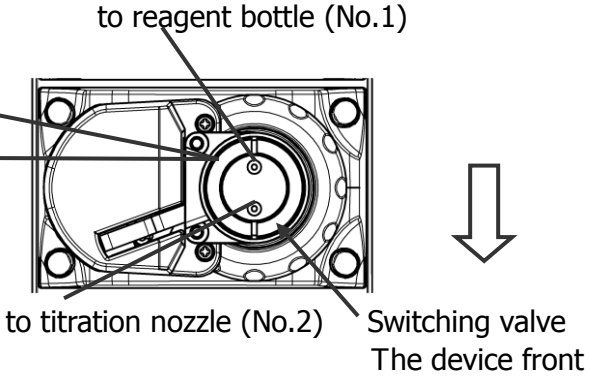
⚠ **Caution**	**When replacing the tube, connect it facing union surface vertically straight. Keep dust or dirt away from the union surface.** **Failure may cause a leakage.**

The assembly of tube end is as shown below.

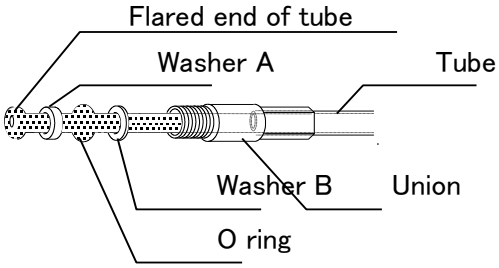
<The assembly of switching valve>



<The plan view in the device>

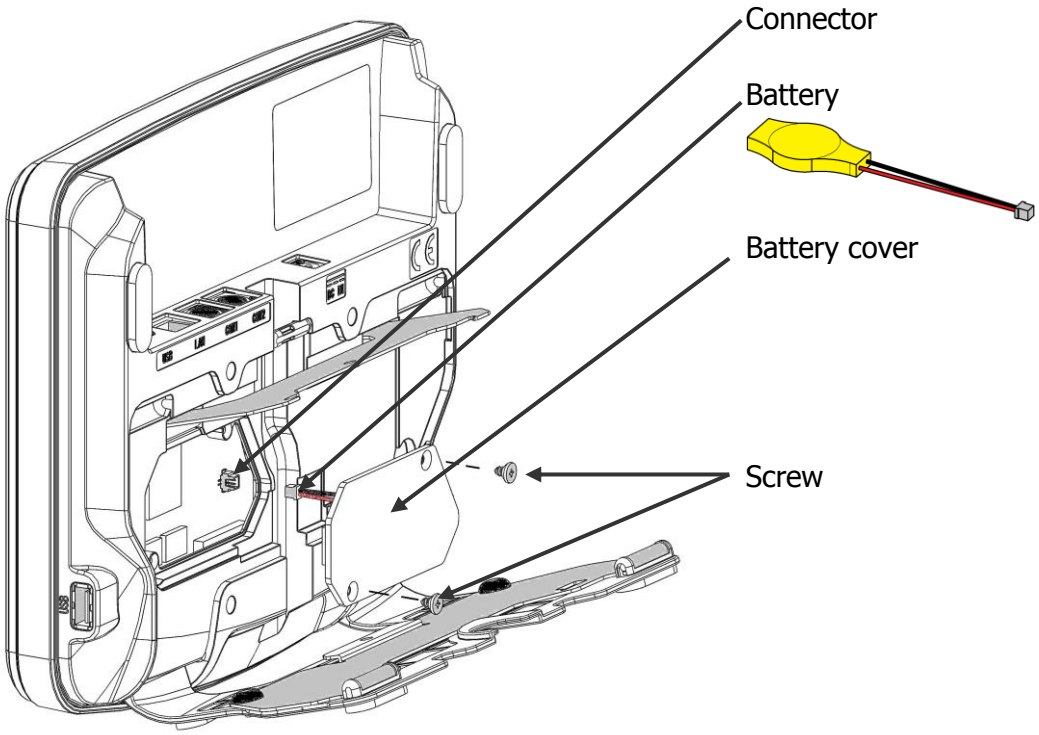


<The assembly of titration nozzle>



6-2-8.Replacing the clock battery

If the clock does not function correctly, the inside battery needs to be replaced with new one.



Remove the battery cover on the backside of the main unit with a Phillips-head screw driver.
Remove the connector of the old battery.
Peel off the battery from the battery cover.
Attach a new battery (W15 leaded CR2032) to the battery cover, and attach a connector.
Place the battery cover.

Caution **Be sure to turn off the instrument before replacing batteries.**

Caution **Follow your national, regional and local regulations for disposal of batteries.**

7. Troubleshooting

7-1. Error messages and alarm messages

7-1-1.Error messages and remedies

＜Error messages on AT-710＞

Error message	Trouble	Remedies
Burette cock error	・Valve drive motor does not stop within 10 seconds. (time out for valve)	・Cock is fixed and does not operate. Refer to "7-3. When valve of switching valve stops at irregular positions" for what to do. ・ Valve monitor sensor may be defective. (Contact your local dealer)
Burette memory error	・Burette error.	・ Malfunction of burette memory possible. Contact your local dealer.
EBU error ↑ ↓ Check connections	・ Burette unit not connected.	・Attach burette unit. Then press [Reset] button to reset error.
	・Valve of burette unit not on initial position.	・Turn on the instrument (AT-710) while pressing [↑] and [ENTER] keys at a time.
Reset time-out occurred.	・ Communication failure between AT-710 and MCU-710	・ Check on connection with connecting cable. ・Replace the connecting cable
Burette capacity compensation error	・Volume correction error.	・Enter correct value in parameter of volume correction.
Communication time out	・ Communication failure on the device other than MCU-710 main unit.	・Check and see the connection of connectors and cables on the measuring devices, followed by touching [Reset] button. (If touching [Reset] button does not lead to the solution, i.e. the error message still stays, then) ・Reboot the system. ・After backing up titration results or parameters on USB flash drive, initialize all parameters stored on the system by selecting [Function] – [Memory Clear] – [All Parameters].

Error message	Trouble	Remedies
Disconnected ↑ ↓ Check connections	・Communication failure between AT-710 and MCU-710.	・ Check on connection with connecting cable between AT-710 and MCU-710. ・When using wireless connection, ensure that there is no shielding between AT-710 and MCU-710. Also, when communication distance is long, bring AT-710 close to MCU-710.
Preamp not connected	・ AT-710 cannot recognize preamp.	・Contact your local dealer.
Burette and Titr Type are mismatched.	・ Different setups between method and smart burette.	・Check if electrode type of method you are using and setup of smart burette titration type are same.
Method and electrode are mismatched.	・ Different setups between method and smart electrode.	・Check if electrode type of method you are using and setup of smart electrode type are same.
Smart burette can not be found	・Defect on smart burette reading substrate of AT-710.	・Probable cause is failure of smart burette reading substrate of AT-710. Contact your local dealer.
Smart burette IC error	・Defect on IC chip of smart burette.	・Probable cause is failure of smart burette reading substrate of AT-710 or defect on IC chip of smart burette. Contact your local dealer.
Smart burette collation error		
Smart electrode Preamp mismatch	・Preamp set up by smart electrode and preamp of instrument are different.	・ Initialize with the present instrument.
Smart electrode uninitialized	・ This error message appears when used first time.・Failure occurs in information written in smart electrode.	・ Initialize. (Function - Electrode -Initialize) ・Contact your local dealer when recurring

Error message	Trouble	Remedies
Smart electrode write error	・Failure in writing into memory after calibration of smart electrode. ・Failure in initialization of smart electrode.	<Start of measurement> ・Check if electrode type of method you are using and setup of smart electrode type are same. ・Turn off power and check insertion of connector of smart electrode cable. Then turn on power again. <Calibration, initialization> ・ Turn off power and check insertion of connector of smart electrode cable. Then turn on power again. Then check smart electrode. (Function – Other Setting - Smart Electrode Check) Contact your local distributor if "NG" appears when checking smart electrode. When "OK" with smart electrode check, perform calibration or initialization once again. ・ Contact your local dealer when recurring.
Smart electrode checksum error	・ Content of smart electrode cannot be read correctly.	・Turn off power and check insertion of connector of smart electrode cable. Then turn on power again. Initialize when recurring. (Function – Electrode - Initialize) ・Contact your local distributor when recurring.

< Parameter errors on AT-710>

Error message	Trouble	Remedies
Parameter Err ↑↓ Please press [Reset]	・ The currently used parameters are not adaptive to the method	・When parameter error occurs, it is specified in dialog box on side. Correct the parameter accordingly.

Sub-message	Trouble	Remedies
Method** Burette No. setup error (titration parameter)	・ The burette is not connected. ・The burette number is wrong.	・Select the correct burette number for Method** predosing parameter or titration parameter. The built-in burette number is "1". ・ Connect the burette as is numbered for Method** predosing parameter or titration parameter.
Method** Combined method not set up.	・A combined method is not constructed.	・Configure method on Method ** for combined method.
Method** Channel,Unit (control) setup error (titr. parameter)	・Titration is started by selecting an unit not available for the connected preamplifier on the method preset on sample file.	・Select a correct "Channel/Unit" for Method** titration parameter.
Method** Channel,Unit (reference) setup error (titr. parameter)		
Method** Channel,Unit setup error (pre-treat No. **)	・Titration is started by selecting an unit not available for the connected preamplifier on the method preset on sample file.	・Select a correct "Channel/Unit" for Method** predosing parameter.

＜Error messages on CHA-600 (appear on the display of MCU-710)＞

Error message	Trouble	Remedies
Turntable malfunctions ↑↓ Please check the changer	The turntable does not finish a turn-round event within a given time (step-turn; 20s, home coming turn; 36s(12 vials), 54s (18 vials)	Press [Reset] button on MCU-710 to stop the changer. Press [Step] key to turn the table. If the error message appears again, contact your local dealer.
Operating error ↑↓ Please check the changer	The multiple sample changer does not finish the event within a given time or does not work.	Press [Stop] key on sampler to cancel the error.
Elevator malfunctions ↑↓ Please check the changer	The elevator does not finish its vertical movement within a given time (20 second).	Press [Reset] button on MCU-710 to stop the changer. Press [Up] or [Down] key to move it upward or downward. If the error message appears again, contact your local dealer.
The behavior is the failure of the swing mechanism ↑↓ Please check the changer	The swinging arm does not finish its motion within a given time (20 second).	Press [Reset] button on MCU-710 to stop the sampler. Press [Rinse] or [Titration] key to swing the arm. If the error message appears again, contact your local dealer.
Swing position is incorrect ↑↓ Please check the changer	The elevator does not go down due to the swing arm positioned somewhere other than at rinse bath or titration.	Press [Reset] button on MCU-710 to stop the changer. Press [Rinse] or [Titration] key to swing the arm. Then, press [Down] key on changer. If the error message appears again, contact your local dealer.
Elevator position is not correct ↑↓ Please check the changer	The turntable does not turn since the elevator is not at upper most position.	Press [Reset] key on MCU-710 to cancel the error. Press [Up] key on changer to lift the elevator. Then, press [Step] key on changer. If the error message appears again, contact your local dealer.

Error message	Trouble	Remedies
Unable to recognize changer.	·Communication failure with The multiple sample changer. · A multiple sample changer is not connected.	·Check that the power source of the multiple sample changer becomes "On." ·Check on the connecting cable to see if it is disconnected. ·Replace the connecting cable. · If the error message appears again, contact your local dealer.
Communication time out	· Communication with The multiple sample changer runs out of time.	
Beaker under calibration not detected. ↑ ↓ Set and calibrate once again.	· No beakers for calibration available during pH auto calibration.	·Put beakers for calibration in place.
Sample mode reconfirmation ↑ ↓ Changer connected with current sample mode cannot be used.	·Obsolete sample mode, incompatible with current changers, is set.	· Change the setting of [Sample]-[Sample Mode] to "File Mode."

＜Error messages on CHA-700 (appear on the display of MCU-710)＞

Error message	Trouble	Remedies
Unable to recognize changer.	·The multiple sample changer does not finish the event within a given time.	·Check that the power source of the multiple sample changer becomes "On." ·Check on the connecting cable to see if it is disconnected. ·If the error message appears again, contact your local dealer.
RinseErr.	·Unable to rinse due to estimation of no beaker on original position.	·Place beaker on original position. Then press [Reset] button. ·When beaker is on original position, make sure that beaker pushes beaker sensor.
Sample mode reconfirmation ↑ ↓ Changer connected with current sample mode cannot be used.	·Obsolete sample mode, incompatible with current changers, is set.	· Change the setting of [Sample]-[Sample Mode] to "CHA-7XX Changer Mode."

Error message	Trouble	Remedies
Operating error ↑↓ Please check the changer	Operation of pressing [Start] button at error state.	Turn on CHA-700 and AT-710 again to cancel error.
Elevator malfunctions ↑↓ Please check the changer	Updown move of table not finishing within sixty (60) seconds.	Turn on CHA-700 and AT-710 again to cancel error. Press [↑] or [↓] on manual operation of AT-710 to move up/down the table. If the error message appears again, contact your local dealer.
The behavior is the failure of the swing mechanism ↑↓ Please check the changer	Operation of rotating arm not finishing within the period below: (Step rotation: 21 seconds (6 samples),36 seconds (11 samples))	Turn on CHA-700 and AT-710 again to cancel error. Press [←] or [→] on manual operation of AT-710 to operate the arm. If the error message appears again, contact your local dealer.
Swing position is incorrect ↑↓ Please check the changer	Position of rotating arm outside the movement range	Turn on CHA-700 and AT-710 again to cancel error. Press [←] or [→] on manual operation of AT-710 to operate the arm. If the error message appears again, contact your local dealer.
Turntable malfunctions ↑↓ Please check the changer	Updown move of table unable to be done due to no table.	Check conditions of equipment. Turn on CHA-700 and AT-710 again to cancel error. Press [↑] or [↓] on manual operation of AT-710 to move up/down the table. If the error message appears again, contact your local dealer.

7-1-2.Alarm message and remedies

Alarm message	Reason	Remedies
Reagent vol. low limit, No.n ↑↓ Replace reagent	The reagent of burette No. n goes down to the preset lowest amount.	Supply reagent, and change the setting of regent amount on reagent information to the present volume.
Replace reagent, No.n ↑↓ Replace reagent	Change reagent of burette No. n is due.	Replace reagent, and clear reagent change day setting.
Reagent replace. overdue, No.n ↑↓ Replace reagent	Replace reagent of burette No. n is past due after the preset alarm day.	Replace reagent, and clear reagent change day setting.
Replace reagent in xx days, No.n	Replace reagent of burette No. n is due in XX days.	Continue measurements as planned, or change reagent and clear the reagent change day.
Periodic check date ↑↓ Make a periodic check	Periodic check is due as preset on alarm.	Perform periodic check accordingly.
Periodic check date overdue ↑↓ Make a periodic check	Periodic check is past due after the alarm day.	Perform periodic check accordingly.
Periodic check in xx days	Periodic check is due in XX days before alarm.	Continue measurements as planned, or perform periodic check accordingly.
Periodic calib. day (No.n) ↑↓ Make periodic calibration	Periodic calibration for No. n is due.	Perform periodic calibration.
Periodic calib. overdue (No.n) ↑↓ Make periodic calibration	Periodic calibration for No. n is past due.	Perform periodic calibration.
Periodic calib. in xx days (No.n)	Periodic calibration is due in XX days before alarm.	Continue measurements as planned, or perform periodic calibration accordingly.
Replace piston, No.n ↑↓ Replace piston head	Replace piston for burette unit No. n is due.	Replace the piston head, and set another change day.
Piston replacement overdue, No.n ↑↓ Replace piston head	Replace piston for burette unit No. n is past due.	Replace the piston head, and set another change day.
Replace piston in %d days, No.n	Replace piston for burette unit No. n is due in XX days.	Continue measurements as planned, and when the piston head is changed, set another change day.

Alarm message	Reason	Remedies
Upper limit is piston stroke number(B.No.n) ↑ ↓ Replace piston head	Upper limit of piston stroke No. n is due.	Replace piston head, and clear piston stroke count setting.
Replace Cylinder today.(B.No.n) ↑ ↓ Replace cylinder.	Replace piston cylinder for burette unit No. n is due.	Replace the piston cylinder, and set another change day.
Cylinder replacement overdue (B.No.n) ↑ ↓ Replace cylinder.	Replace piston cylinder for burette unit No. n is past due.	Replace the piston cylinder, and set another change day.
Cylinder replacement in xx days. (B.No.n)	Replace piston cylinder for burette unit No. n is due in XX days.	Continue measurements as planned, and when the piston cylinder is changed, set another change day.
Upper limit is cylinder stroke number(B.No.n) ↑ ↓ Replace cylinder.	Upper limit of cylinder stroke No. n is due.	Replace cylinder, and clear cylinder count setting.
Replace electrode today.(No.n) ↑ ↓ Replace electrodes.	Replace electrode for electrode unit No. n is due.	Replace the electrode, and set another change day.
Electrode replacement overdue (No.n) ↑ ↓ Replace electrodes.	Replace electrode for electrode No. n is past due.	Replace the electrode, and set another change day.
Electrode replacement in XX days. (No.n)	Replace electrode for electrode No. n is due in XX days.	Continue measurements as planned, and when the electrode is changed, set another change day.
Check electrode today.(No.n) ↑ ↓ Perform periodic check of electrode.	Periodic check for electrode is due as preset on alarm.	Perform periodic check for electrode accordingly.
Check date of electrode overdue. (No.n) ↑ ↓ Perform periodic check of electrode.	Periodic check for electrode is past due after the alarm day.	Perform periodic check for electrode accordingly.
Electrode check in XX days.(No.n)	Periodic check for electrode is due in XX days before alarm.	Continue measurements as planned, or perform periodic check for electrode accordingly.

Alarm message	Reason	Remedies
Replace Inner solution today.(No.n) ↑ ↓ Replace Inner solution.	Replace inner solution for electrode unit No. n is due.	Replace the inner solution, and set another change day.
Inner solution replacement overdue (No.n) ↑ ↓ Replace Inner solution.	Replace inner solution for electrode No. n is past due.	Replace the inner solution, and set another change day.
Inner solution replacement in XX days.(No.n)	Replace inner solution for inner solution for electrode No. n is due in XX days.	Continue measurements as planned, and when the inner solution is changed, set another change day.
Replace smart electrode today. ↑ ↓ Replace electrodes.	Replace smart electrode for electrode unit No. n is due.	Replace the electrode, and Initialize. (Function - Electrode -Initialize) Or set another change day and turn on MCU-710 and AT-710 again.
Smart electrode replacement overdue. ↑ ↓ Replace electrodes.	Replace smart electrode for electrode No. n is past due.	Replace the electrode, and Initialize. (Function - Electrode -Initialize) Or set another change day and turn on MCU-710 and AT-710 again.
Smart electrode replacement in XX days.	Replace smart electrode for electrode No. n is due in XX days.	Continue measurements as planned. Or Replace the electrode, and Initialize. (Function - Electrode -Initialize)
Check smart electrode today. ↑ ↓ Perform periodic check of electrode.	Periodic check for smart electrode is due as preset on alarm.	Perform periodic check for smart electrode accordingly.
Smart electrode check overdue. ↑ ↓ Perform periodic check of electrode.	Periodic check for smart electrode is past due after the alarm day.	Perform periodic check for smart electrode accordingly.
Smart electrode check in XX days.	Periodic check for smart electrode is due in XX days before alarm.	Continue measurements as planned, or perform periodic check for smart electrode accordingly.

Note When alarm message appears, press [Reset] button and implement adequate countermeasures. Pressing [Start] button again, while alarm message is displayed, leads to carrying out titration.

7-2. Clogging of titration nozzle or switching valve

Some reagents may be crystallized as the time goes by, and such crystallization may cause clogging or stains inside titration nozzle or switching valve. Follow the below steps for cleaning:

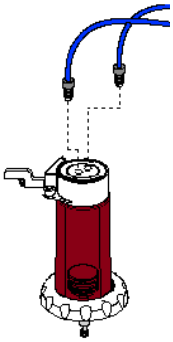
< When titration nozzle (diffusion proof nozzle) is clogged >

1) Remove the titration nozzle.
2) Dissolve the reagent by dipping it in the solvent. (An ultrasonic cleaning is effective.)
3) Then, rinse well by pure water.
4) Connect the titration nozzle to the tube.
5) Fill titration reagent up to the tip of nozzle.

⚠ **Caution**	**A diffusion type titration nozzle may be clogged easily. Fill the nozzle pocket with pure water to keep its tip from being dried.**

< When the switching valve is clogged or stained >

1) Remove all the connecting including titration nozzle, burette, and the tube. If reagent flows out, wipe it off with waste cloth.



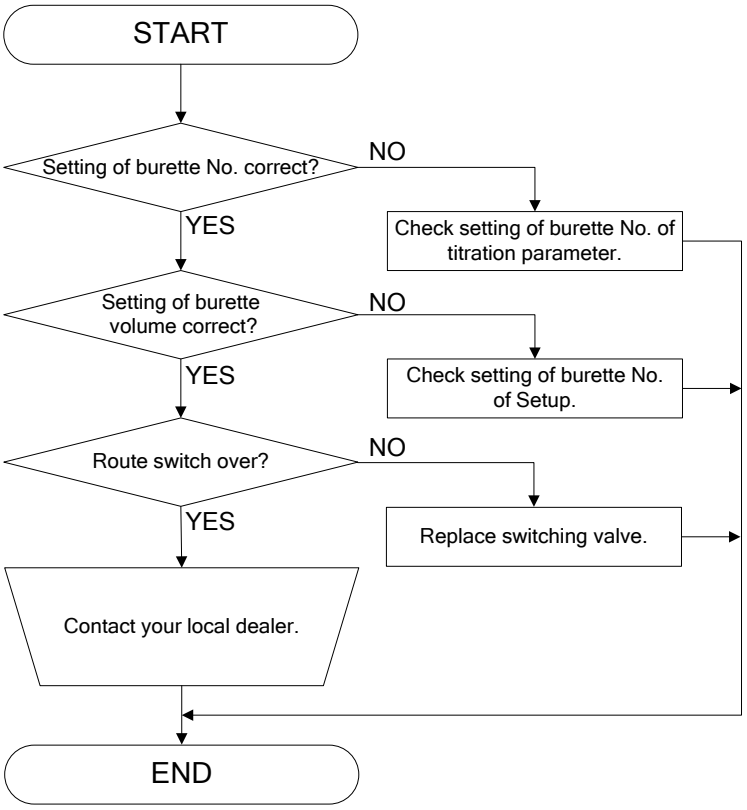
2) Fill the cock with solvent to dissolve the reagent using a dripping pipette.
3) Suck out the fluid in the switching valve with a dropping pipette or the like, followed by cleaning the valve with waste or the like.
4) Repeat step 2) and 3) if necessary.
5) Reassemble all the connections.

⚠ **Caution**	**If a reagent bottle is left unused for more than a week, make sure to check any crystallization in it. If any should be found, perform cleaning as above.** **Dispensing without cleaning may cause leaking.**

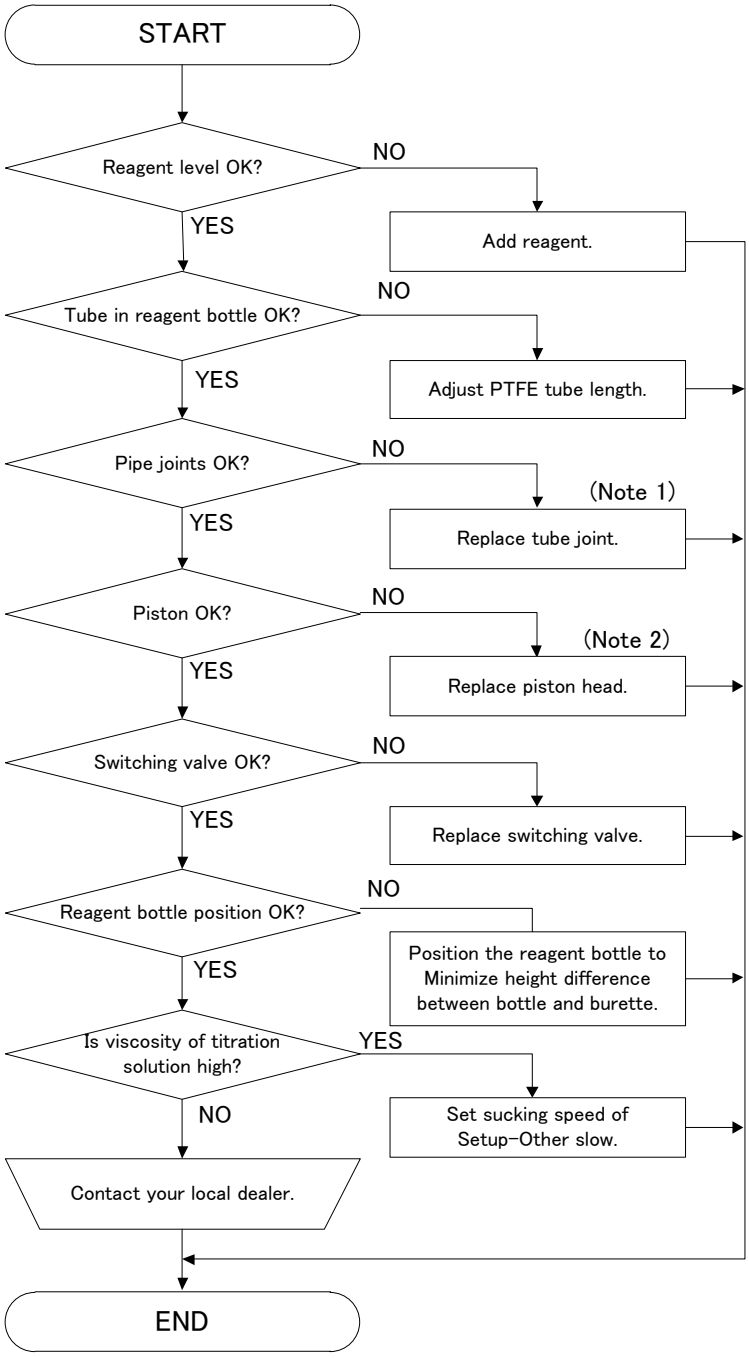
7-3. When valve of switching valve stops at irregular positions

When the switching valve clogs or is fixed, the valve may stop at an irregular position or become unable to operate (Burette Err03). In this case, refer to "7-2.Clogging of titration nozzle or switching valve" and rinse the switching valve. Then turn on the instrument while pressing [↑] and [ENTER] keys at a time. The lever of the burette unit will start to operate.

7-4. Piston burette does not work properly

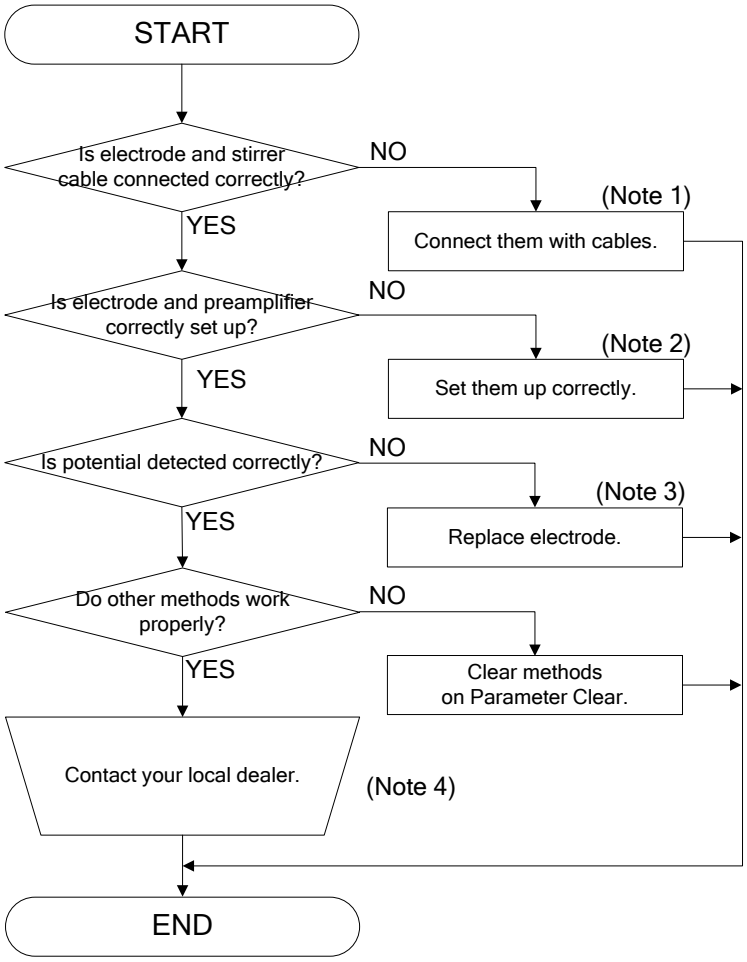


7-5. Air bubbles are trapped in the piston burette



(Note 1) Refer to "6-2-7. Replace tube" in this manual.
(Note 2) Refer to "6-2-4. Replacement of piston head" in this manual.

7-6. Titration is not controlled properly



(Note 1) Potential level does not vary due to loose contact by broken cable. Replace the cable.

(Note 2) Configuration of Burette No. and Channel No. are wrong.

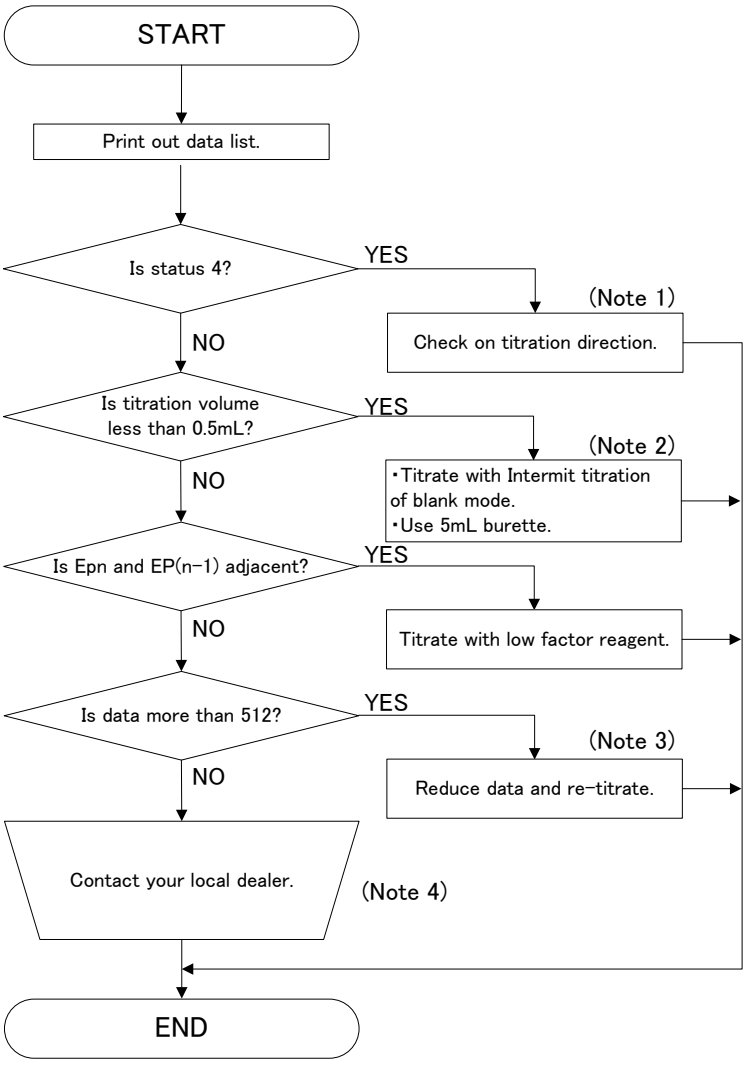
(Note 3) Unstable potential may be caused by deteriorated electrode or clogged liquid junction. If the junction in electrode is clogged, replace the electrode to a combination of pH glass electrode (H-171) and sleeve type (R-173).

If potential is unstable even after the electrode is replaced or changed to new one, the preamplifier may be malfunctioning. Contact your local dealer in such a situation.

(Note 4) For analysis and cause investigation by our specialists, send the titration curve, parameters of your method and the data list to us by fax.

7-7. Endpoint is not detected by EP Stop or Full titration

When the inflection points can be seen visually:



(Note 1) Titration direction setup for titration parameter is wrong.

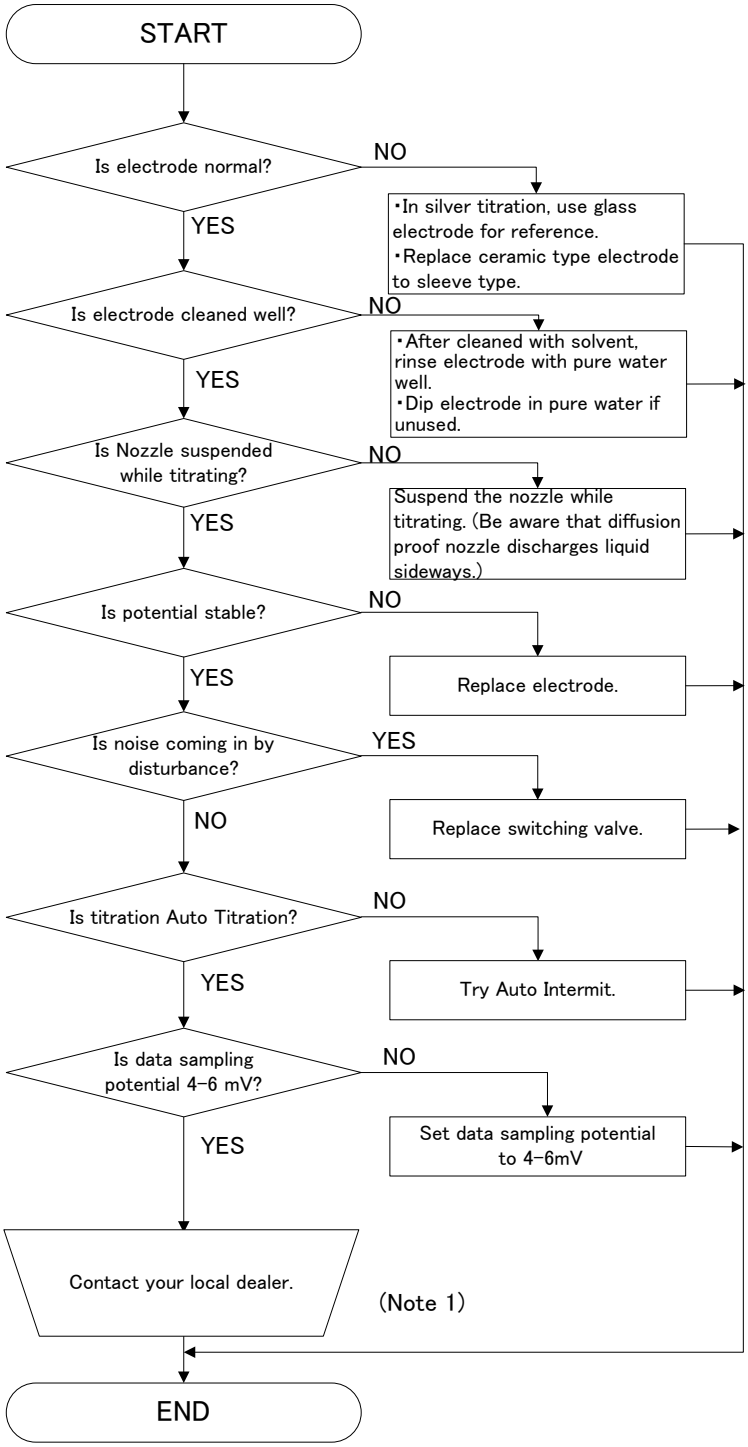
(Note 2) For a small amount of titration volume to reach the inflection point, try blank mode of Auto intermit or Intermit titration. Use of 5mL burette will increase precision.

(Note 3) To reduce the amount of data, start titration after fixed dosed. When the amount of data exceeds 512, the data will not be sampled without detecting the endpoint.

(Note 4) For analysis and cause investigation by our specialists, send the titration curve, parameters of your method and the data list to us by fax.

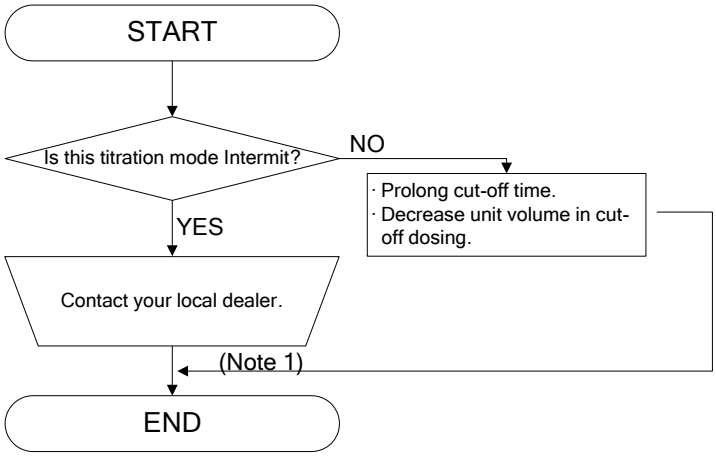
7-8. Erroneous endpoint is detected in Full or EP Stop titration

1) When the electrodes noise is found to be EP due to unstable potential in non-aqueous titration



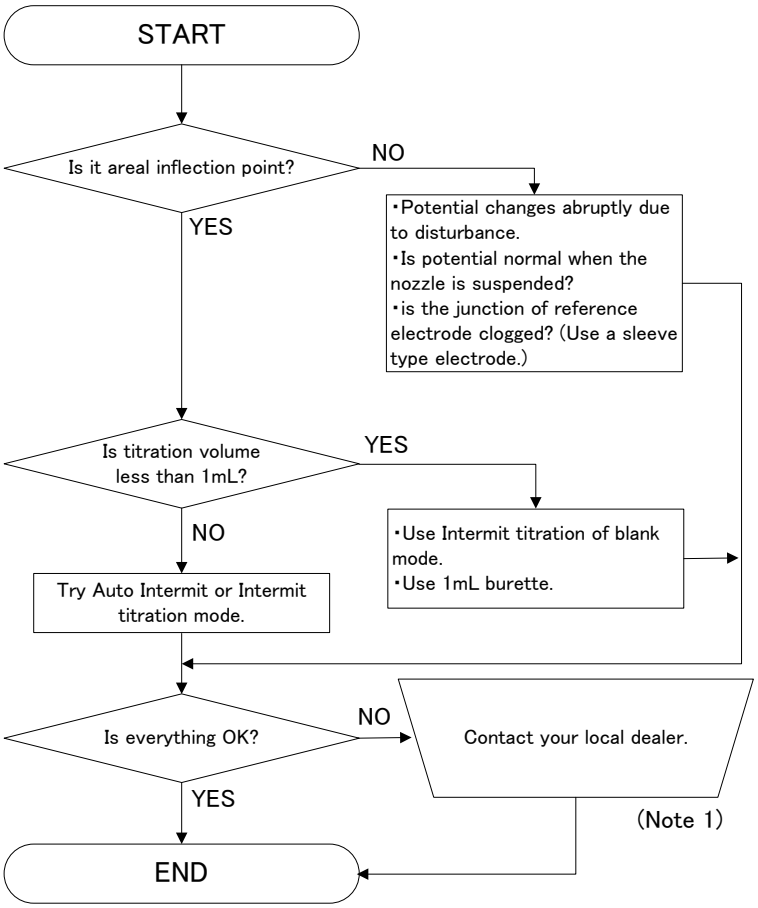
(Note 1) For analysis and cause investigation by our specialists, send the titration curve, parameters of your method and the data list to us by fax.

2) When reaction is so slow that it takes more than 10 seconds until potential stabilizes after dosing titrant. Use Auto Intermit or Intermit titration mode.



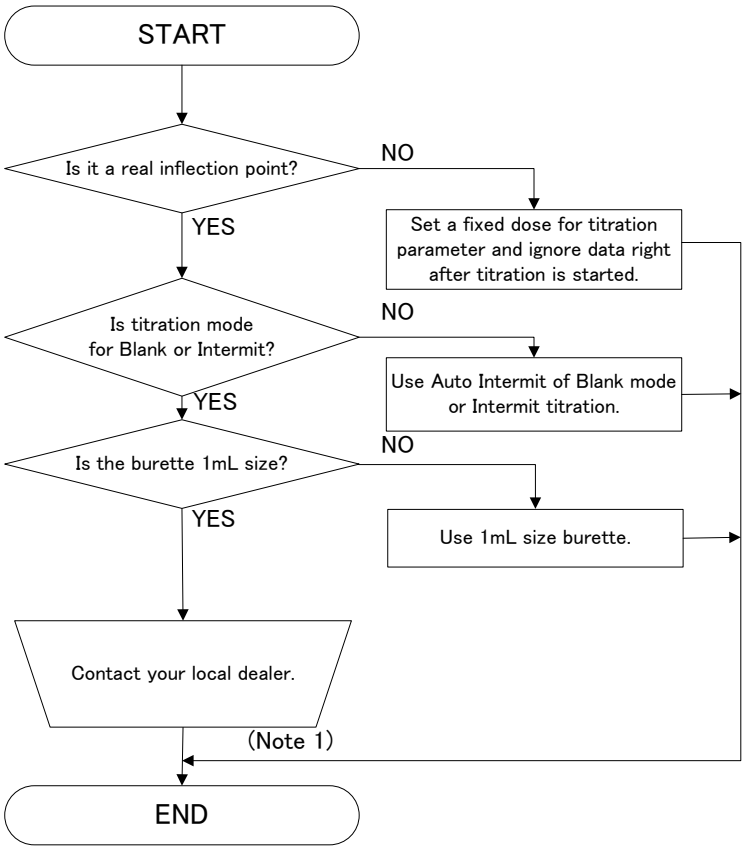
(Note 1) For analysis and cause investigation by our specialists, send the titration curve, parameters of your method and the data list to us by fax.

3) When potential changes sharply so that an endpoint is picked up abruptly.



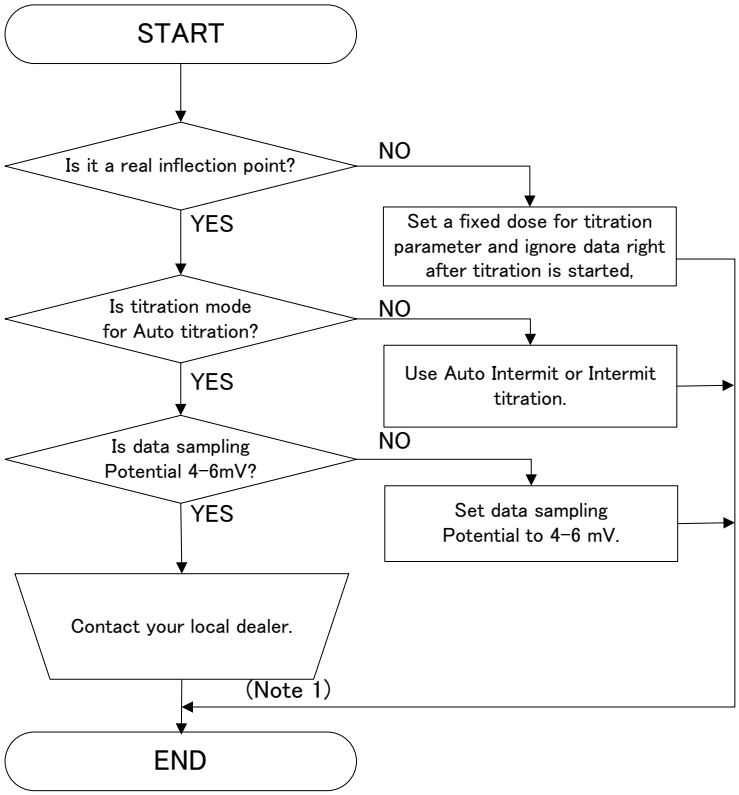
(Note 1) For analysis and cause investigation by our specialists, send the titration curve, parameters of your method and the data list to us by fax.

4) When endpoint is detected right after start of titration.



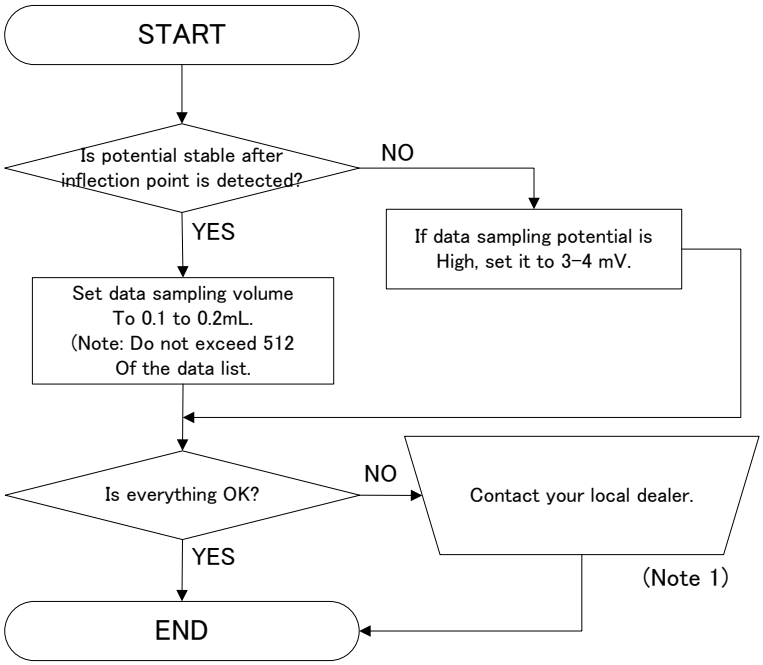
(Note 1) For analysis and cause investigation by our specialists, send the titration curve, parameters of your method and the data list to us by fax.

5) When endpoint is detected while potential angle is constant on titration curve.



(Note 1) For analysis and cause investigation by our specialists, send the titration curve, parameters of your method and the data list to us by fax.

6) When endpoint is not detected unless over-titrated (2 - 5mL).



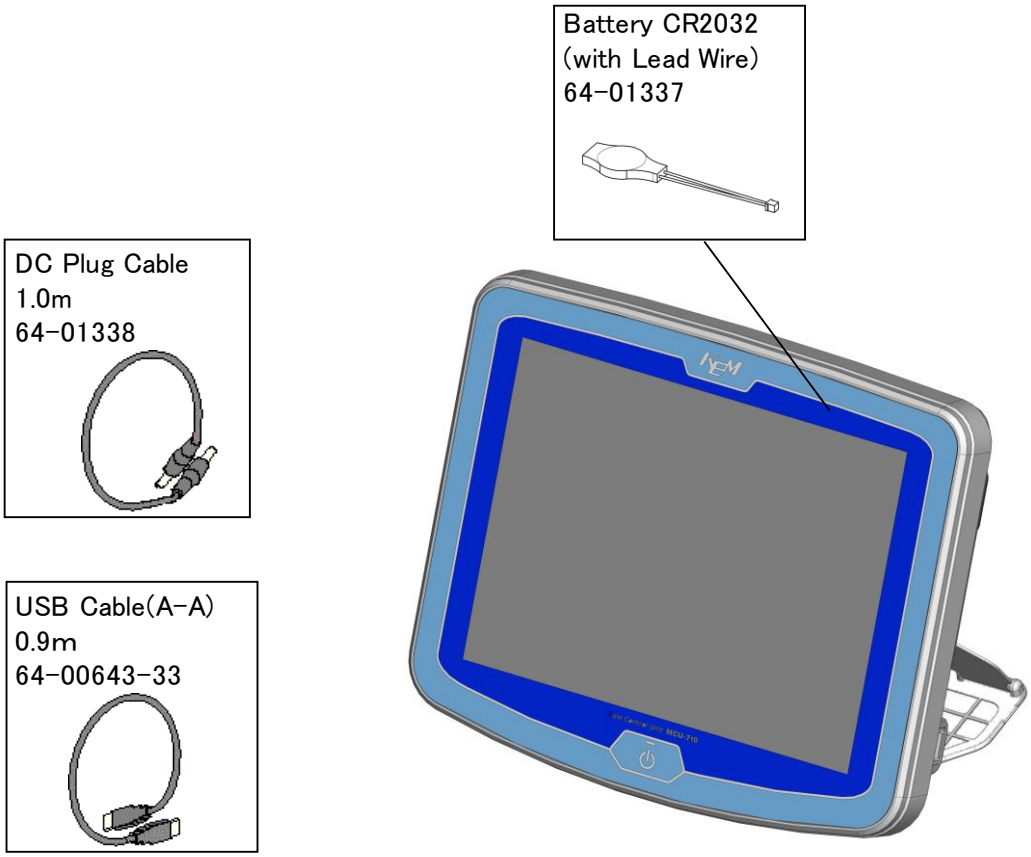
(Note 1) For analysis and cause investigation by our specialists, send the titration curve, parameters of your method and the data list to us by fax.

8. Others

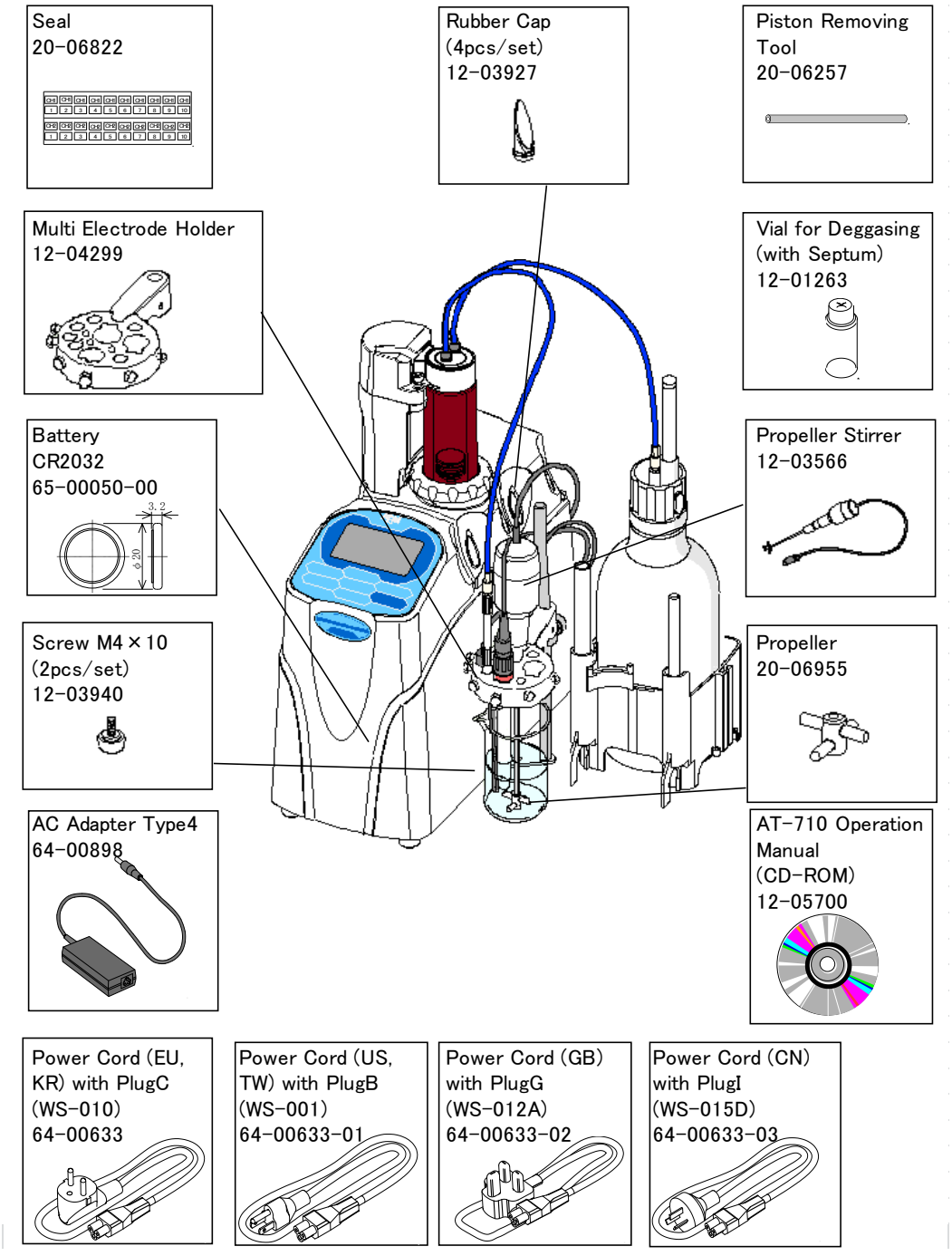
8-1. Parts list

The supplied parts, consumable parts and optional components are shown in the following lists, and you can obtain any of these parts at your dealer or from sales representative.

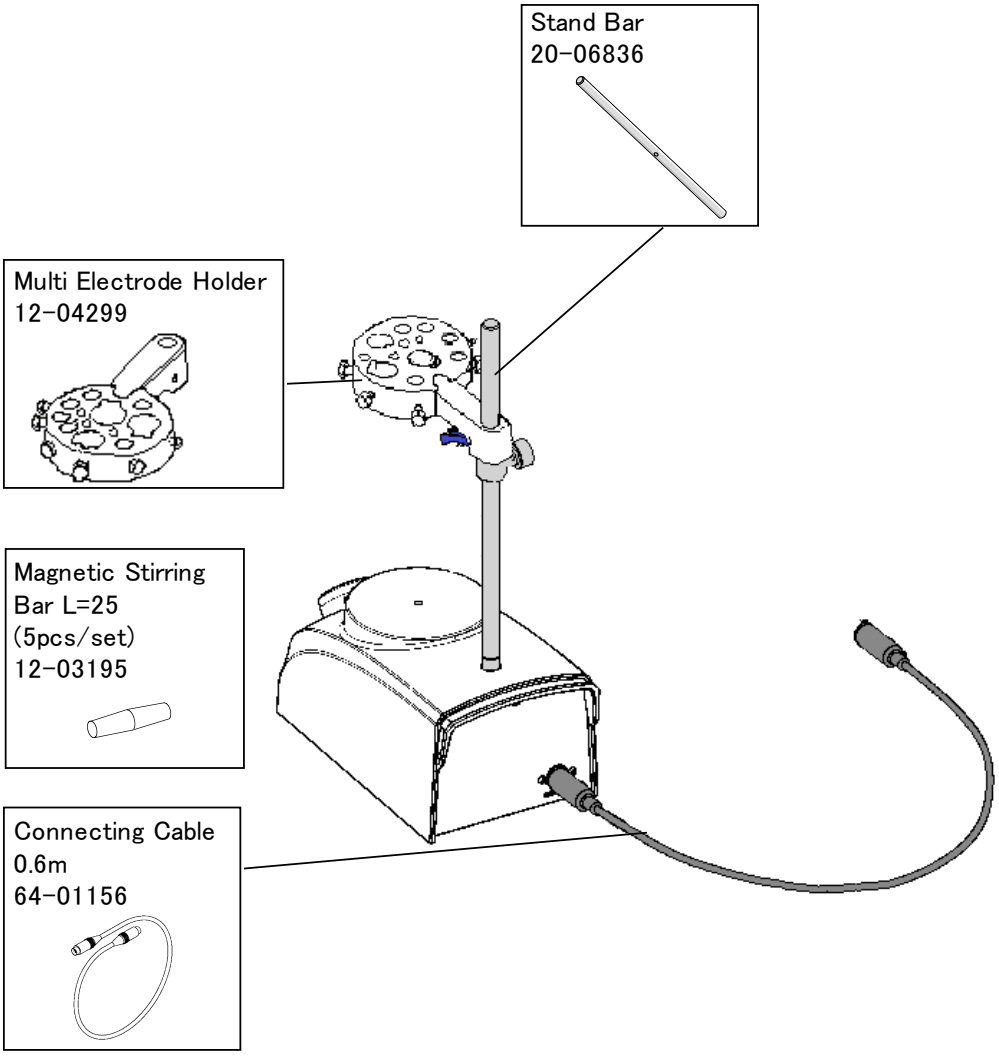
MCU-710



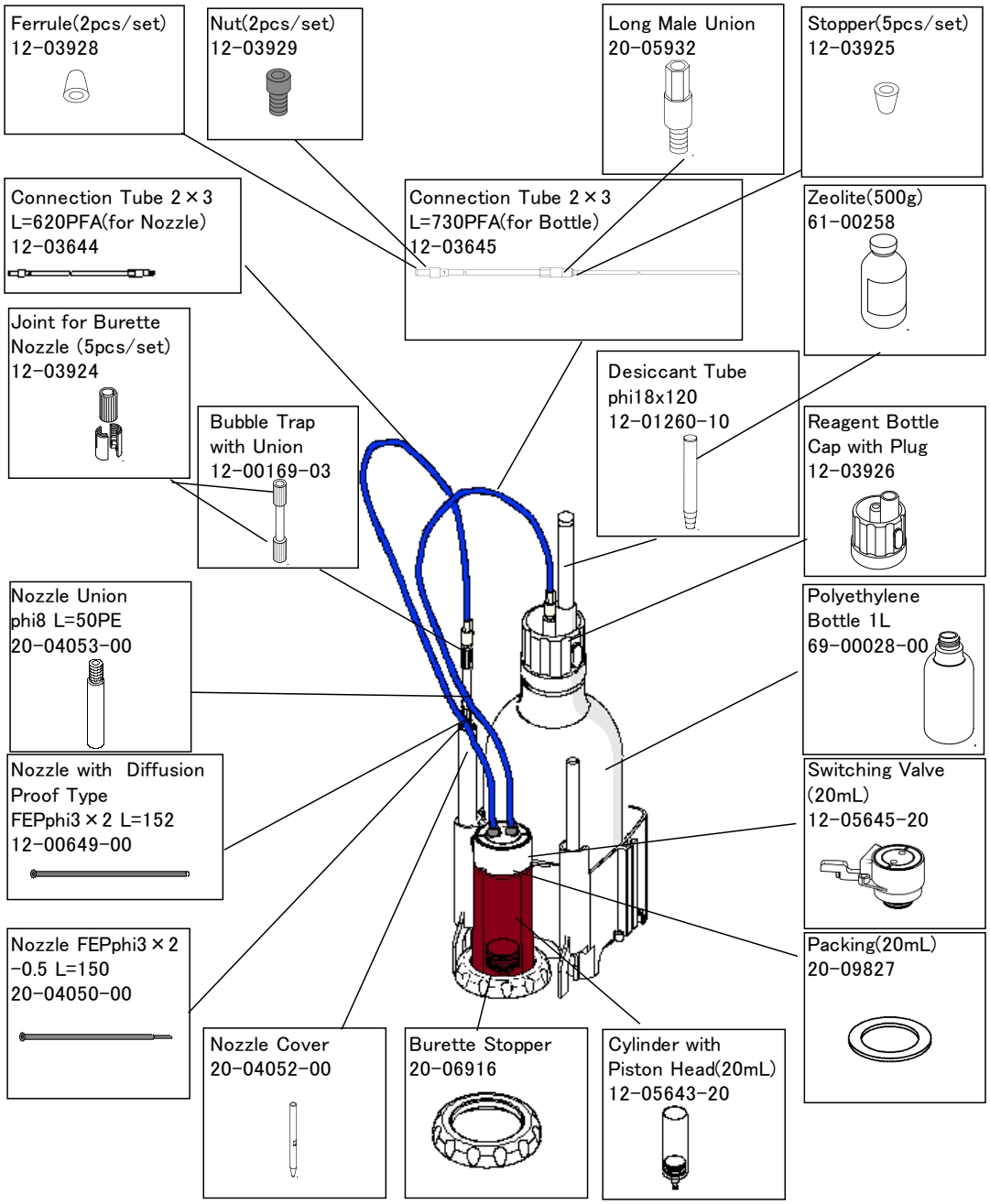
AT-710


Seal
20-06822
Rubber Cap
(4pcs/set)
12-03927
Piston Removing
Tool
20-06257
Multi Electrode Holder
12-04299
Vial for Deggasing
(with Septum)
12-01263
Battery
CR2032
65-00050-00
Propeller Stirrer
12-03566
Screw M4×10
(2pcs/set)
12-03940
Propeller
20-06955
AC Adapter Type4
64-00898
AT-710 Operation
Manual
(CD-ROM)
12-05700
Power Cord (EU,
KR) with PlugC
(WS-010)
64-00633
Power Cord (US,
TW) with PlugB
(WS-001)
64-00633-01
Power Cord (GB)
with PlugG
(WS-012A)
64-00633-02
Power Cord (CN)
with PlugI
(WS-015D)
64-00633-03

MS-710A


Stand Bar
20-06836
Multi Electrode Holder
12-04299
Magnetic Stirring
Bar L=25
(5pcs/set)
12-03195
Connecting Cable
0.6m
64-01156

EBU-710-20B

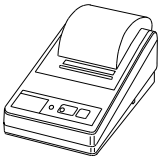
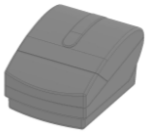
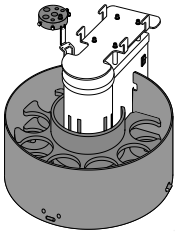
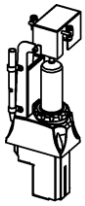
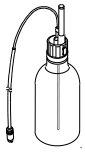

Ferrule(2pcs/set)
12-03928
Nut(2pcs/set)
12-03929
Long Male Union
20-05932
Stopper(5pcs/set)
12-03925
Connection Tube 2×3
L=620PFA(for Nozzle)
12-03644
Connection Tube 2×3
L=730PFA(for Bottle)
12-03645
Zeolite(500g)
61-00258
Joint for Burette
Nozzle (5pcs/set)
12-03924
Desiccant Tube
phi18x120
12-01260-10
Bubble Trap
with Union
12-00169-03
Reagent Bottle
Cap with Plug
12-03926
Nozzle Union
phi8 L=50PE
20-04053-00
Polyethylene
Bottle 1L
69-00028-00
Nozzle with Diffusion
Proof Type
FEPphi3×2 L=152
12-00649-00
Switching Valve
(20mL)
12-05645-20
Nozzle FEPphi3×2
-0.5 L=150
20-04050-00
Packing(20mL)
20-09827
Nozzle Cover
20-04052-00
Burette Stopper
20-06916
Cylinder with
Piston Head(20mL)
12-05643-20

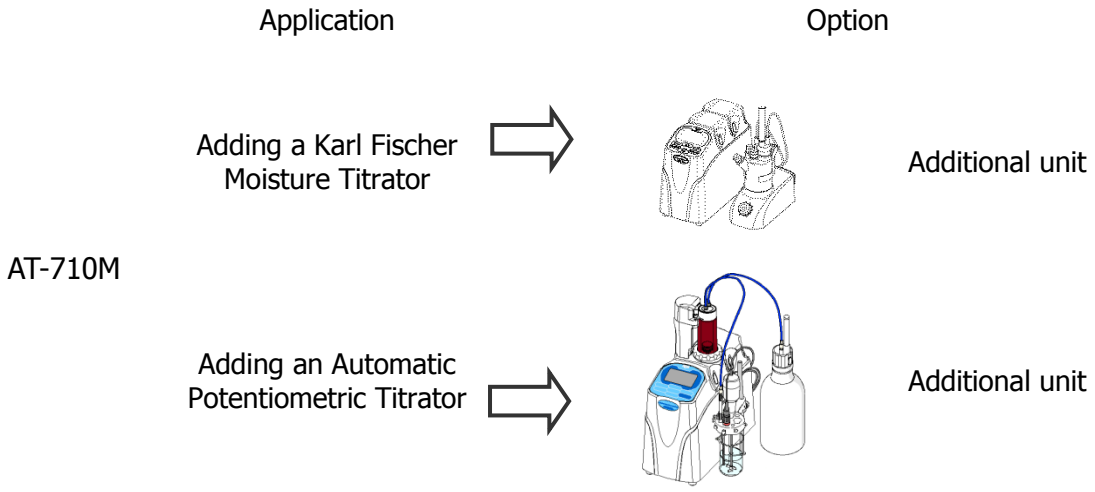
Part Number	Part Name	Remarks
12-05643-05	Cylinder with Piston Head(5mL)	
12-0 5643-10	Cylinder with Piston Head (10mL)	
12-05645-05	Switching valve(with O-ring) (5mL)	
12-05645-10	Switching valve(with O-ring) (10mL)	
20-09825	Packing (5mL)	
20-09826	Packing (10mL)	
20-08715	Cylinder for Auto Dispenser(50mL)	For Auto dispenser
20-04058-01	Piston Head(50mL)	For Auto dispenser

8-2. **Options**

Various convenient peripherals are available as shown below. These options can be purchased from KEM. Contact your local dealer or sales representative

AT-710M/S

Application	Option	
Print out of measurement results		Dot Matrix Printer IDP-100
		Thermal Printer DP-600
Automated measurement		Multiple Sample Changer CHA-600 CHA-700
Date capture into your PC		SOFT-CAP Date Acquisition Software
Dispensing solvent		Auto Dispenser
Affect titration temperature to result		Thermo Sensor for Titration Solution



Option

Part Number	Part Name	Remarks
12-01636 12-01636-01 12-01636-02 12-01636-03 12-01636-04	Multiple Sample Changer(12samples)	For TW For US For EU,KR ForGB For CN
12-01636-05 12-01636-06 12-01636-07 12-01636-08 12-01636-09	Multiple Sample Changer(18samples)	For TW For US For EU,KR ForGB For CN
12-03613-10	Multiple Sample Changer(6samples)	
12-03613-11	Multiple Sample Changer(11samples)	
12-05633-10	AT-710	Connecting Cable (USB Cable (A-A) (64-00643-33)) required.
12-05200-01	MKV-710	
12-05179-01	MKC-710	
12-00166-00	Thermo Sensor for Titration Solution	
12-02028-01	Dot Matrix Printer (AC 120V)	for AC 110-120V w/ Connecting Cable IDP-100
12-02028-02	Dot Matrix Printer (AC 230V)	for AC 220-240V w/ Connecting Cable IDP-100
12-02618-01	Thermal Printer for Europe (AC 200-240V)	for AC 200-240V w/ Connecting Cable DP-600
12-02618-02	Thermal Printer for U.K. (AC 220-240V)	for AC 220-240V w/ Connecting Cable DP-600
12-02618-03	Thermal Printer for U.S.A. (AC 100-120V)	for AC 100-120V w/ Connecting Cable DP-600
12-02618-04	Thermal Printer for China (AC 200-240V)	for AC 200-240V w/ Connecting Cable DP-600

8. Others

Part Number	Part Name	Remarks
12-03265	SOFT-CAP Data Acquisition Software	Connecting cable required.
12-02012	RS-232C Connecting Cable (9P-9P) 2m	To connect with SOFT-CAP. Connecting Cable (MiniDIN8P-DSUB9PM) required.
64-00625	Connecting Cable (MiniDIN8P-DSUB9PM)160mm	
12-05641-05	EBU-710-05B Burette Unit(5mL)	
12-05641-10	EBU-710-10B Burette Unit(10mL)	
12-05641-20	EBU-710-20B Burette Unit(20mL)	
12-05640-05	Additional Burette (5mL)	With EBU-710-05B Burette Unit(5mL)
12-05640-10	Additional Burette (10mL)	With EBU-710-10B Burette Unit(10mL)
12-05640-20	Additional Burette (20mL)	With EBU-710-20B Burette Unit(20mL)
12-04591	Auto Dispenser (50mL)	
12-02009	APB-600-AT Automatic Piston Burette	
12-02010	APB-610 Automatic Piston Burette	
12-03645-01	Connection Tube2×3 L=980 PFA (for Bottle)	
20-03997-00	Brown Cover for Degassing Tube	for precipitation titration
66-00059-00	Square Bottle(Brown) 1L	
20-04051-00	Nozzle FEPφ3×2-0.5 L=85	
12-05193	PP 70mLCup (20pcs/set)	for Microquantity titration
20-09079	Propeller(for Microquantity)	for Microquantity titration
12-00277-00	Thermo Sensor	for Microquantity titration
12-00110-00	Photometric Sensor	for Photometric titration
64-01018	Connection Cable (MiniDIN8P-8P) 1.5m	for Photometric titration
12-00112-00	Interference Filter (530nm)	for Photometric titration
12-00112-01	Interference Filter (630nm)	for Photometric titration
12-00112-02	Interference Filter (650nm)	for Photometric titration
20-07257	Shutter	for Photometric titration
12-03840	Twin Platinum Electrode (M-511)	for Polarization titration
12-01762	Conductivity Cell (K-321)	for Conductometric titration
SCU-118	SCU-118 Sealed Cell Unit	
MTA-118-1	MTA-118-1 Micro Titration Cell Unit(1mL)	
MTA-118-5	MTA-118-5 Micro Titration Cell Unit(5mL)	
MTA-118-50	MTA-118-50 Micro Titration Cell Unit(50mL)	
12-00661-12	Stirrer Rotor L=35 (5pcs/set)	

Option（Electrode Cable、Internal Solution）

Part Number	Part Name	Remarks
64-00726-31	Connection Cable BNC 90cm	
64-00726-33	Connecting Cable pin 90cm	
64-00726-41	Connection Cable BNC 210cm	
64-00726-43	Connecting Cable pin 210cm	
12-05647	Smart Electrode Cable BNC, 90cm	
12-05647-01	Smart Electrode Cable pin, 90cm	
12-05647-02	Smart Electrode Cable BNC, 210cm	
12-05647-03	Smart Electrode Cable pin, 210cm	
12-00911	Internal Solution for Reference Electrode(KCl)	3.3mol/L
12-00911-01	Internal Solution for Mercury Sulfate 250mL (K_2SO_4)	for precipitation titration
12-00911-02	Internal Solution for Electrode 250mL(KNO_3)	1mol/L / for precipitation titration
61-00081-00	Internal Solution(LiCl in CH_3COOH)	1mol/L / for non-aqueous titration
61-00081-01	Internal Solution(LiCl in EtOH)	1mol/L / for non-aqueous titration

8-3. **Specification**

Specification	Contents	
Type	Automatic Potentiometric Titrator Model AT-710M	Automatic Potentiometric Titrator Model AT-710S
Detection range	1) Potentiometric : -2000mV to +2000mV 2) pH : -20.000 to 20.00pH 3) Temperature : 0 to 100°C	
Titration mode	Auto Titration, Auto Intermit, Intermit, Petroleum Titration, COD, Stat	
Method	Standard method 120, Combined method 10 (Max 5 methods can be linked)	
Kinds of titration	Potentiometric (acid/base, redox, precipitation), Photometric, Polarization, Conductivity	
Titration form	Full titration (Auto EP detection), EP Stop, Level Stop, Intersect, EP Stop/Level Stop	
Special application	Measurement of electrode potential (pH, potential), Acid dissociation constant (pKa) , Learn Simultaneous recording of 2-way input potential (e.g. Titer vs. pH+%T, Titer vs. pH+μS)	
Key operation	Touch panel	
Displays	1) 8.4-inch color LCD 800 × 600 dots 2) English / Japanese / Mandarin Chinese / Korean / Russian / Spanish / German / French	
	3) Simultaneous 4-channel display (Can also display Karl Fischer Moisture titrator simultaneously)	3) 1-channel display
Calculation	Concentration of content, statistics data processing (mean, SD and RSD) and automatic averaging of blank and factor value	
Data storage	500 samples	
GLP conformance	Registration of operator / User group administration Titrant: Reminder of date of factor measurement / Alarm to indicate remaining reagent / Reminder of piston replacement date / Reminder of reagent replacement date / History of factor measurement Check performance: Reminder of scheduled check date / Record of check results Management of electrode: Reminder of calibration date / Record of calibration history / Electrode check / History of electrode check Verification of burette capacity: Verification / Record of verification results Management of conduction time: Display of operating time	
Burette size	20mL glass burette with brown cover (Standard) Optional burette units: 10mL, 5mL, or 1mL	
Burette accuracy	50mL burette(Auto dispenser) ± 0.5mL 20mL burette ± 0.02mL; reproducibility ± 0.01mL 10mL burette ± 0.015mL; reproducibility ± 0.005mL 5mL burette ± 0.01mL; reproducibility ± 0.003mL 1mL burette ± 0.005mL; reproducibility ± 0.001mL	

項　目	内　　容	
Preamplifier	1) STD : pH (mV) and mV, 2 inputs (Standard) 2) PTA : pH (mV), mV and photometric, 3 inputs 3) POT : pH (mV), mV and polar, 3 inputs 4) CMT : pH (mV), mV and conductivity, 3 inputs (factory setting required) 5) TET : pH (mV) 2 ways and mV, 3 inputs (factory setting required)	
External I/O	RS-232C(MCU)×2 : for Dot matrix printer /Electronic balance / Data Acquisition Software (SOFT-CAP) RS-232C(AT)×1 : for Dot matrix printer SS-BUS×1 : for Multiple sample changer, APB ELE.×1 : for Smart electrode TEMP.COMP.×1 : Input terminal for temperature sensor to correct reagent volume, sensor Pt100, temperature reading accuracy: ±0.5℃ (burette 1 only) USB(MCU)×1 : for USB flash drive, Thermal printer,A4 printer, Keyboard, Barcode reader, Foot switch, USB HUB	
	USB(MCU)×1 : for Measuring unit, Bluetooth adapter, USB HUB(4ch) USB(AT)×1 : for MCU , Bluetooth adapter LAN×1 : for Personal computer (PC)	USB(MCU)×1 : for Measuring unit, USB(AT)×1 : for MCU
Extensibility	Measuring instrument : Automatic Potentiometric Titrator (AT-710), Karl Fischer Moisture Titrator (MKV-710/MKC-710); Three of these instruments can be added.	
	Automatic piston burette : Can control max 10 burette drives (Including two built-in burette drives) Multiple sample changer :CHA-600, CHA-700	
Ambient condition	Temperature : 5 to 35℃ Humidity : 85%RH or below (no condensation)	
Power source	DC24V 1.9A(Main unit) AC100-240V±10% 50Hz/60Hz(AC Adapter) DC7V 1.6A(Printer) AC100V±10% 50Hz/60Hz(AC Adapter)	
Power consumption	Main unit : Approx. 30W Printer : Approx. 7W	
Dimensions	Touch panel controller : 225(W) × 190(D) × 42(H)mm Titration unit : 141(W) × 296(D) × 367(H)mm (not incl. tubing) Stirrer(MS-710A) : 107(W) × 206(D) × 331(H) mm Printer : 106(W) × 180(D) × 88(H) mm	
Weight	Touch-on panel controller : Approx. 1.5kg Titration unit : Approx. 4.0kg Stirrer(MS-710A) : Approx. 2kg Printer : Approx. 0.4kg	
Conformity standard	CE marking EMC: EN61326-1 LVD: EN61010-1 RE Directive Burette unit EBU FCC Part15 SubpartC FCC ID: 2ABSVEBU01	

8-4. International standards

List of supported standards

Standard		Country
ASTM D94-07	Standard Test Methods for Saponification Number of Petroleum Products	U.S.A.
ASTM D 664-11a	Standard Test Method for Base Number of Petroleum Products by Potentiometric Perchloric Acid Titration	U.S.A.
ASTM D974-12	Standard Test Method for Acid and Base Number by Color-Indicator Titration	U.S.A.
ASTM D1159-07	Standard Test Method for Bromine Numbers of Petroleum Distillates and Commercial Aliphatic Olefins by Electrometric Titration	U.S.A.
ASTM D1832-04	Standard Test Method for Peroxide Number of Petroleum Wax	U.S.A.
ASTM D2710-09	Standard Test Method for Bromine Index of Petroleum Hydrocarbons by Electrometric Titration	U.S.A.
ASTM D 2896-11	Standard Test Method for Water in Crude Oils by Coulometric Karl Fischer Titration	U.S.A.
ASTM D 3227-04 a	Standard Test Method for (Thiol Mercaptan) Sulfur in Gasoline, Kerosine, Aviation Turbine, and Distillate Fuels (Potentiometric Method)	U.S.A.
ASTM D3242-11	Standard Test Method for Acidity in Aviation Turbine Fuel	U.S.A.
ASTM D3339-11	Standard Test Method for Acid Number of Petroleum Products by Semi-Micro Color Indicator Titration	U.S.A.
ASTM D 4739-11	Standard Test Method for Base Number Determination by Potentiometric Titration	U.S.A.
ASTM D4929-07	Standard Test Methods for Water in Crude Oils by Coulometric Karl Fischer Titration	U.S.A.
ASTM D 6470-99	Standard Test Method for Salt in Crude Oils (Potentiometric Method)	U.S.A.
ASTM D 1067-11	Standard Test Methods for Acidity or Alkalinity of Water	U.S.A.
ASTM D1121-11	Standard Test Method for Reserve Alkalinity of Engine Coolants and Antirusts	U.S.A.
ASTM D1126-12	Standard Test Method for Hardness in Water	U.S.A.
ASTM D 1426-08	Standard Test Methods for Ammonia Nitrogen In Water	U.S.A.
ASTM D4251-89	Standard Test Method for Active Matter in Anionic Surfactants by Potentiometric Titration	U.S.A.

Standard		Country
ASTM D 4658-09	Standard Test Method for Sulfide Ion in Water	U.S.A.
ASTM D5776-07e1	Standard Test Method for Bromine Index of Aromatic Hydrocarbons by Electrometric Titration	U.S.A.
ASTM E1899-08	Standard Test Method for Hydroxyl Groups Using Reaction with p-Toluenesulfonyl Isocyanate (TSI) and Potentiometric Titration with Tetrabutylammonium Hydroxide	U.S.A.
ISO 3771		International
ISO 6619		International

9. Warranty and After-sales Service

1. Warranty Period

Three (3) years from the date of receipt of this product or the date of installation by KEM service personnel or by authorized personnel.

2. Warranty Details, After-sales Service

This product passed the strict inspections of KEM and, except for consumables, KEM warrants this product, under normal use, for three (3) years from the date of receipt of this product or the date of installation by KEM service personnel or by authorized personnel. (Parts and consumables will be supplied for at least seven (7) years after discontinuation of this product.)
Should an initial failure occur during the warranty period, KEM will decide whether to replace the product or to correct defects.
This product can be repaired at user's site by KEM service personnel or by authorized personnel. Note that secondhand or pre-owned products are not covered by warranty.

3. Exclusion

Warranty shall be void where:

- any part is replaced or any repair or remodeling is performed by unauthorized personnel;
- unauthorized service parts, spare parts and/or consumables are used;
- the user does not follow the instructions for installation, correct use, maintenance and/or storage, resulting in malfunction;
- the user does not follow the ranges and/or conditions stated in the product brochure, flyer or specifications;
- periodic checks and/or maintenance is not performed;
- breakage and/or malfunction is caused by careless handling such as, but not limited to, exposing to or submerging in water, or dropping down;
- breakage and/or malfunction is caused by excessive force applied to glassware or plastics;
- malfunction or leakage is caused by sample properties (corrosively, solid materials, etc.);
- malfunction is caused by any device, part and/or chemical other than those supplied by KEM;
- overuse has led to fatigue or wear of parts;
- items are consumables or wearing parts;
- this product has been moved or transported to another place once accepted and installed;
- breakage and/or malfunction is caused by conditions beyond control of KEM including, but not limited to Acts of God such as fire, earthquake, lightning strike, flood, etc.;
- parts including, but not limited to the touch screen LCD, are broken due to improper or inadequate handling such as spilling chemicals;
- items are consumables, accessories or wearing parts, or parts which are in direct contact with samples and/or reagents and are considered consumables due to normal wear.

KEM is also unable to offer warranty and related services of repairs and maintenance checks of any kind once specifications, capability, features and/or functions of this product as well as its parts are changed, altered or remodeled by unauthorized personnel.

4. Disclaimer

KEM is not held liable, during or after the warranty period, regardless of whether loss or damage is caused by any event beyond control of KEM, or it is the user's opportunity loss and/or lost earnings caused by failure or malfunction of KEM products, or with or without predictability of KEM, for loss or damage resulting from a particular reason, secondary loss or damage, accident compensation, damage to products other than those supplied by KEM, and any other incidental compensation.
KEM is also not held liable for physical and/or economic loss or damage resulting from the use of KEM products, or loss of stored data during repair or servicing of such product.