Automatic Potentiometric Titrator

AT-510

Operation Manual

Please read this manual thoroughly before actual use of the instrument.

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1.General

1-1.Abstract

The instrument you have purchased is Model AT-510 Automatic Potentiometric Titrator which determines concentration of sample liquid or solid by titration method. It determines sample concentration quickly and precisely by easy operation. By changing the electrode and preamplifier, various measurements including acid-base titration, redox and photometric titration.

[Features]

• User friendly operation

Operation is easy by just pressing [Start] key for routine measurement.

• Various titrations

By changing the preamplifier, various measurements including acid-base, redox, photometric, polarization titration and conductivity measurement.

• All interfaces are standard equipped

The RS-232C interface each for PC, Balance and Printer is now standard.

• Memory card

The external memory card provides unlimited space for data storage.

• Maximum 9 burettes can be connected

Up to nine power burettes can be connected so that pre-treatment can be automated.

• Karl Fischer volumetric moisture titration

The standard methods include volumetric moisture measurement by Karl Fischer method. By connecting the optional KF unit, moisture titration is now available.

1-2. Cautions on this manual

Operate the apparatus with this Manual kept by your side at all times.

You will find some descriptions marked as shown below. They are intended to call your careful attention.

1. Possible danger such as human body injury or death:



Accidents such as injury to human body or death are possible unless the warning is strictly observed.

2. Possible danger such as loss of property:



Property may be damaged unless the caution is strictly observed.

3. Failure of performance

Note!

Product may not perform in full performance to the specification unless the note is observed.

- It is prohibited to copy or make use of a part or all of this Manual.
- We will not be held responsible for any failure or damage or loss arising from measurement results by the instrument.
- This Manual is based on the apparatus of standard specification. For details of those of special specification, see its manual.

1-3. ASafety symbols

Always observe these sings and instructions.

You must observe cautionary messages and warnings in order to protect yourself as well as prevent others from physical injury or property damages.



Warning

This symbol means "Danger of severe injury or possible death".



Caution

This symbol means "Danger of injury or property damage".



This symbol means prohibition of an act.



This symbol means mandatory.



WARNING!

You must ground earth wire of power cable.



Ground the green wire of adapter if power tap is 2-pin outlet.

3-pin plug has earth line to ground by itself when plugged in.



Danger of electric shock if not grounded to earth.



WARNING!

Use the same type and rating of fuse. Be sure to plug out power cord before replace the fuse.





Danger of fire if a wrong fuse is loaded.



WARNING!

Do not use volatile chemical or work in flammable gas.



Danger of explosion inside the instrument.



WARNING!

Wear safety glasses, gloves or protective mask if necessary, and well ventilate the room.



Danger of injury on your skin or in the eyes by splashing chemical. Also your windpipe may get hurt if toxic gas is breathed in.



⚠ CAUTION!

Do not operate in a way other than specified in the manual.



Danger of fire, electric shock or damage to the instrument.



CAUTION!

Do not open housing case or overhaul the unit for repair except by an authorized service person.



Danger of fire, shock or malfunctioning of the unit.

Installation location

Avoid the following environmental influences.

- Powerful vibration
- Direct sunlight
- · Corrosive gas
- Power source of large load fluctuation or where powerful electric or magnetic field.
- Operating temperature beyond the specified range (5-35°C)
- Ambient humidity above 85%RH.

Power source

- Power source that can be used is AC100 to 240V of 50/60Hz.
- Connect directly to power source outlet.
- Do not use power source from a receptacle already connected to many other devices.

Storage

- If the instrument is not going to be used for a long period of time, clean the electrode before stored. It is recommended to use the carton box in which it was first delivered.
- For storage, avoid a place of high or too low temperature and humidity, and duty area.

Reagent

• The liquid contact parts of burette or reagent bottle are made of glass, ceramics and Teflon. It is prohibited to use reagent of solid which may corrode these materials.

Other caution

• 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.

2.Before you use the instrument

2-1. Supplied parts

The carton box that has been delivered contains the AT-510 main unit and accessories and operation manual. Please check the supplied parts referring to the below check list. In case any part or parts should be found broken or missing, contact your local dealer.

-AT-510 Main unit-

Part name	Part code	Qty	Sketch
Main unit	AT-510	1 unit	
Magnetic stirrer	984300018A	1 unit	
Stand rod	985500041	1 pce.	
Electrode holder	984305007	1 pce.	
pH combined glass electrode	98100C171	1 pce.	
Connecting cable	984290012	1 pce.	
Temperature compensation electrode	98100T111	1 pce.	
Internal solution (3.33M-KCl)	988115001	1 pce.	

Part name	Part code	Qty	Sketch
Power code	983203198 (for AC 100/120V) 983203461 (for AC220/230/240V) 983204199 (for UK AC 230/240V) 64000180048	1 pce.	
Adapter for power connector	(for China AC 220V) 983203199 (for 100V)	1 pce.	
Ground wire	984333331 (for 100V)	1 pce.	520
Stirrer cable	980300006	1 pce.	
Stirrer roter 25mm	985003141	1 pce.	
Piston extention rod	985515002	1 pce.	
Wrench 8mm	985143339	1 pce.	5
Operation manual	985950189	1 сору	Operation manual

Burette unit (APB-510-20B)-

Part name	Part code	Qty	Sketch
20mL burette unit	APB-510-20B	1 unit	
Degas vial (with septum)	987220003	1 pce.	

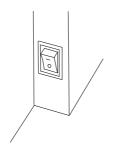
-Printer (IDP-100)-

Part name	Part code	Qty	Sketch
Impact dot printer	IDP-100	1 unit	

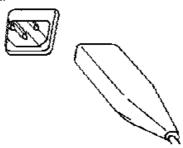
2-2.Installation

2-2-1. Operating voltage check

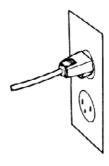
1) Make sure that the power switch is in the "OFF" position.



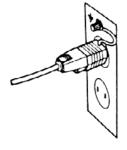
2) Connect the power cord to the unit.



3) Put in the power cord to an electrical outlet.







<2-pin outlet>

3-pin plug automatically grounds the earth line.

Be sure to ground the earth wire of AC-3P adapter.



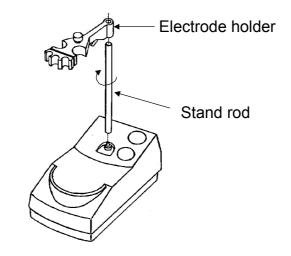
You must ground earth wire of power cable.

Danger of electric shock if not grounded to earth.

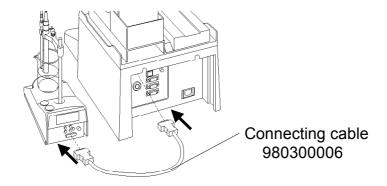
2-2-2. Assembly of Magnetic stirrer

Assemble magnetic stirrer before it is connected to Main unit.

- 1) Squeeze the rod securely into the hole.
- 2) Attach the electric holder to the rod.



3) Connect the magnetic stirrer to Main unit by stirrer cable (980300006).

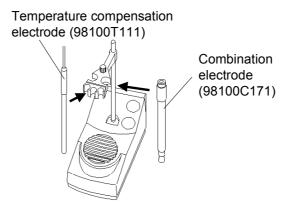




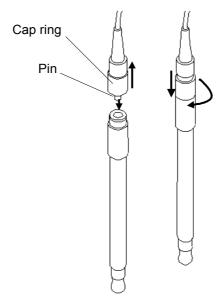
Always turn OFF the Main unit before connect/disconnect the stirrer cable. Otherwise, the unit may malfunction with power switch in ON position.

2-2-3.Installation of electrode

1) Install the electrode as illustrated.



2) Connect the cable to pH combination glass electrode. Pull up the cap ring until shown the pin, and insert the pin until it clicks in the electrode connector. Then, tighten the cap. If you use an electrode with lead, you do not need to follow these steps.



Note!

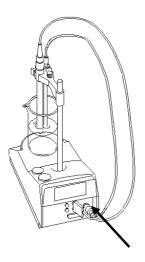
The electrode cable must be securely connected to the electrode connector until it clicks in, and then tighten the cap. Loose connection may result in abnormal signal detection.



If you give excessive force to the electrode, it may break. Slowly turn the electrode to connect the holder to it.

- 3) Make sure the power switch is in OFF position.
- 4) Connect the electrode lead to preamplifier.

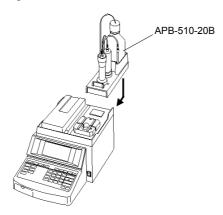
Connect Temperature compensation electrode (98100T111) to Terminal (T1) and Combined glass electrode (98100C171) to Terminal (G1).



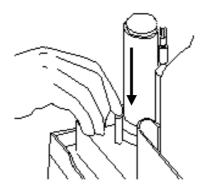
The electrode is made of glass. If given excessive force, it may break and hurt your hand. Care should be taken when handle the electrode.

2-2-4.Installation of the burette

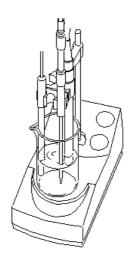
1) Place the burette unit on top and pull it backward to sit in.



2) Insert the lock pin to lock the burette unit.

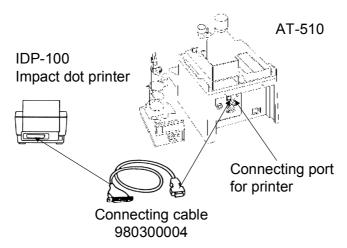


3) Install the burette nozzle to the electrode holder on stirrer.



2-2-5. Connect the printer (IDP-100)

1) Connect the printer and the titrator by the connecting cable (980300004).



- 2) Connect the AC adapter to the printer.
- 3) After confirming the printer power is OFF, plug in AC adapter to power outlet.

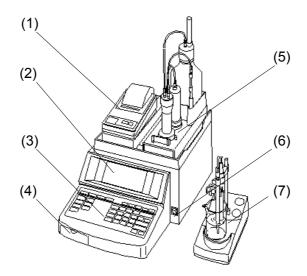


AC adapter is specified by power voltage to use. Make sure of the rating voltage of the adapter to see it fits the line voltage. If wrong voltage is connected, the adapter and connected instrument may break and even cause a fire.

2-3. Parts configuration and functions

2-3-1. General view and parts name

<Front view>



1) Printer (IDP-100)

It prints out measurement results and parameters.

2) Liquid cryistal display

It displays measurement results and parameters.

3) Key panel

Operating keys to enter or select parameters.

4) Card slot

Insert the optional card (application card, pH temperature compensation table card) or memory card into the slot.

5) Burette unit

This unit contains the dispensing burette, line switching valve and reagent bottle on it.

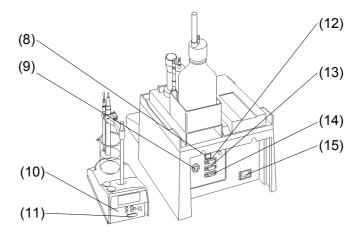
6) Power switch

This switch turns ON/OFF the power.

7) Stirrer

The sample and solution is stirred by the stir motor.

<Rear view>



8) S-BUS connector

This port connects the external burette or multiple sample changer.

9) Connector for titration solution temperature compensation sensor

This port connects the optional sensor to correct temperature of solution.

10) Preamplifier

This is the detector to measure potential of sample solution.

Select an appropriate preamplifier depending on the sample.

It has the connecting port for the cable to the stirrer.

11) Connector for Main unit

The port connects the cable from stirrer to Main unit.

12) Connector for printer

This port connects the printer to print out measurement results.

13) Connector for balance

This port connects the balance. By connecting a balance, sample size can be input automatically for sampling and burette precision check.

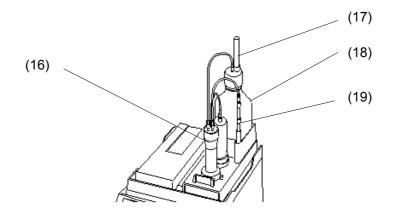
14) RS-232C connector

The port connects the RS232C cable to PC, which enables data control or data communication. (the optional data acquisition software "SOFT-CAP" is necessary).

15) Power receptacle

The power cable is plugged in this receptacle.

<Burette unit>



16) Switching valve

This is the valve to change over titration liquid line.

17) Zeolite tube

It contains molecular sieves (5A) to reduce dissolution of carbonated gas.

18) Reagent bottle

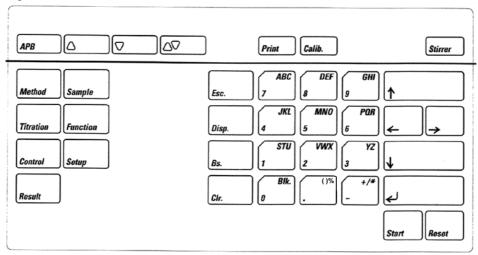
It contains reagent for titration.

19) Titration nozzle

This nozzle supplies reagent into the titration vessel.

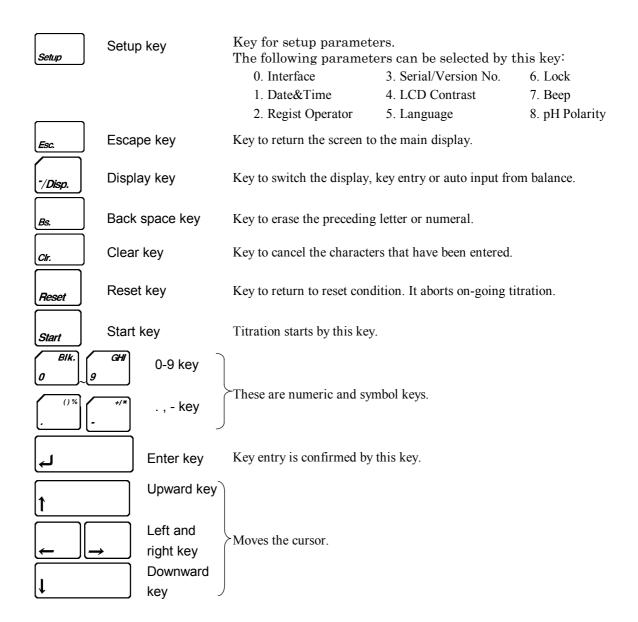
2-3-2.Key functions (general)

Each key is positioned as shown below:



Description of each key:

Description	or each ney.			
APB	APB key	Enters reagent factor, sets purge mode or fixed volume of the burette.		
Δ	Up key	This key dispenses	s titration reagent.	
abla	Down key	This key delivers t	titration reagent. This	s key is also used when changing the
		burette unit.		
△▽	Purge key	This key purges ti	tration reagent.	
Print	Print key	Prints out preset p	arameters or measure	ement results.
Calib.	Calibration key	Calibrates pH or p	reamplifier.	
[Stirrer]	Stirrer key	Turns ON/OFF sti	rrer or set stir speed.	When pressed more than 2 seconds,
		the display turns t	o speed setting.	
Method	Method key	Key to select the method.		
Titration	Titration key	Key to set up titration parameters.		
Control	Control key	Key to set up control parameters.		
Result	Result key	Key to set up calculation or print format.		
Sample	Sample key	Key to set up the number of measurements, sample size or Parameters.		
5	Function key	The following parameters can be selected by this key:		
Function		0. Method File	5. Check Titr.	10. Auto Statis.
		1. Data File	6. Set Check	11. Common Blank
		2. Sample File	7. Periodic	12. pH Cal.Table
		3. Changer	8. Buret Check	13. Card Utility
		4. Re-Titr.	9. Auto Start	14. Memory Clear



2-3-3. Basic key operation

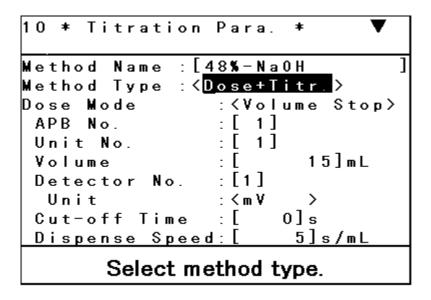
<Select the menu>

Menu display appears when a key like [Function] or [Setup] is pressed. To select an item on the menu, move the cursor by $\uparrow \uparrow$, $\downarrow \downarrow$ key and confirm by $\downarrow \downarrow \downarrow$ key.

```
Function
               10. Auto Statis.
              11.Common Blank
1.Data
         File
2.Sample File 12.pH Cal. Table
3.Changer
               13.Card Utility
4.Re-Titr.
               14. Memory Clear
5.Check Titr.
6.Set Check
7.Pericdic
8.Buret Check
9.Auto Start
          Select item.
```

<Parameter selection>

To move over parameters, use $[\uparrow]$, $[\downarrow]$ key. When an item on display is shown by <****> parenthesized or ***** underlined, it must be selected by key entry. To show item for selection, use $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



<Entry of parameter and characters>

Parameters shown by [*****] in parenthesis are entered by numeric key. If letters can be entered, the character like "A", "a" or "1" appears at upper right corner of display.

Characters can be entered as follows:

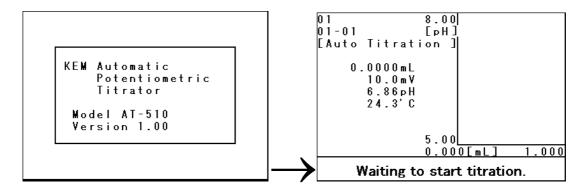
- 1) Press [Disp.] key and select entry mode. Each time [Disp.] key is pressed, the entry mode changes from "Capital letter—small letter—numeral—Capital letter".
- 2) The letter to be entered changes each time the key is pressed. When entry is finished, confirm by [→] key. For example: To enter [C], select Capital mode and press [7^{ABC}] 3 times. To enter [2], select Numeric mode and press [2^{RST}] once.

Chart 2-3-3

IZ	N	Cit-11-#1-	C 11 1 - 44 4 -
Key	Numeric mode	Capital letter mode	Small letter mode
$0^{ m Blk}$	0	Space	Space
1 STU	1	$S \rightarrow T \rightarrow U \rightarrow S$	$s \rightarrow t \rightarrow u \rightarrow s$
$2^{\text{ VWX}}$	2	$V \rightarrow W \rightarrow X \rightarrow V$	$V \rightarrow W \rightarrow X \rightarrow V$
3 YZ	3	$Y \rightarrow Z \rightarrow Y$	$y \rightarrow z \rightarrow y$
$4^{ m JKL}$	4	$J\rightarrow K\rightarrow L\rightarrow J$	$j\rightarrow k\rightarrow l\rightarrow j$
5 MNO	5	$M \rightarrow N \rightarrow O \rightarrow M$	$m \rightarrow n \rightarrow o \rightarrow m$
6 PQR	6	$P \rightarrow Q \rightarrow R \rightarrow P$	$p \rightarrow q \rightarrow r \rightarrow p$
7 ABC	7	$A \rightarrow B \rightarrow C \rightarrow A$	$a \rightarrow b \rightarrow c \rightarrow a$
8 DEF	8	$D \rightarrow E \rightarrow F \rightarrow D$	$d \rightarrow e \rightarrow f \rightarrow d$
9 ^{GHI}	9	$G \rightarrow H \rightarrow I \rightarrow G$	$g \rightarrow h \rightarrow i \rightarrow g$
. ()%		$(\rightarrow)\rightarrow\%\rightarrow($	$(\rightarrow)\rightarrow\%\rightarrow($
_ +/×	_	$+ \rightarrow / \rightarrow \times \rightarrow +$	$+ \rightarrow / \rightarrow \times \rightarrow +$

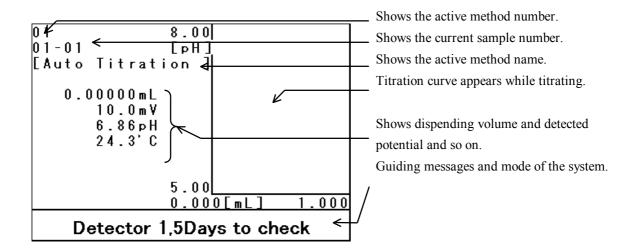
2-3-4. Description of display messages

When the power is turned on, the initial displays appear one after another as follows:



When Main display appears, it is the standby mode ready for titration.

<Main display>

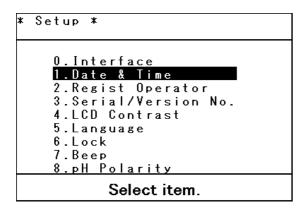


Note!

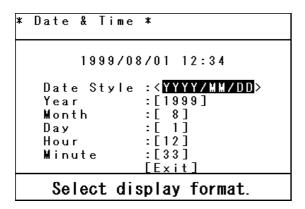
When the alarm for periodic check date is set to "Set", the above message appears when the power is turned on.

2-4. Setting date and time (Setup1)

Press [Setup] key to select Date and Time.



The display changes to the above menu showing "Date & Time".



To enter date and time, use numeric key for "Year", "Month", "Day", "Hour", and "Minute", and confirm by [→] key.

Select how the date is shown by Date Style.

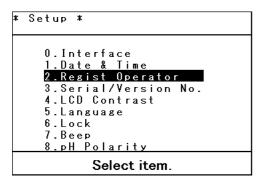
Note!

After "Minute" is entered and $[\time]$ key is pressed, the clock function starts. If periodic check and alarm for reagent are preset prior to date and time setting, each time interval must be changed accordingly.

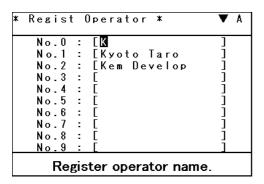
2-5. Registration of operator's name (Setup 2)

Up to ten operator names can be registered. The operator's name can be printed out together with measurement results.

Press [Setup] key.



The display changes as above to register operator's name.



The display changes as above. Select a number by $[\uparrow]$, $[\downarrow]$ key and fill operator name or code. See 2-3-3 Basic key operation for how to enter characters.

3.Basic operation

3-1. Sequence of measurement

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

I. Preparation of electrode	Install pH combination glass electrode and Temperature compensation electrode.
	* Provide an appropriate electrode or sensor and preamplifier.
\downarrow	
II. Calibration of electrode	Calibrate the electrode and preamplifier with pH Standard (pH7/pH4).
	* Calibration method differs from preamplifier, electrode or sensor.
\downarrow	
III. Titration solution	Prepare 0.1mol/L-HCl.
	* See 7-5. Manual operation of burette for how to fill solution.
\downarrow	
IV. Measurement condition	Check and confirm measurement conditions.
	* Set up methods for different samples so that measurement can be started
	immediately by changing the method only. The contents of method is
	protected by lock function.
\downarrow	
V. Sample preparation	Prepare a sample for measurement.
' 	* Sample conditions can be filed in Sample File and stored in PC card. By this
! ! !	presetting, measurement can be started by sample size input only.
↓	
VI. Start titration	Dip the electrode in the sample and solvent and press [Start] key.
↓	
VII. After titration	Clean the electrode and dip it in pure water.

Note!

The job process within the dotted line is the daily routine work. Other events depend on necessity from time to time.

3-2. Calibration of preamplifier (pH calibration)

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

Press [Calib.] key.

```
* Calibration *

Detector No. :[1]
Calib.Method : (Auto )
Temp. of STD :[ 25.00]°C
Calib.Table : (Standrad)
Calib.Buffer : (pH7/pH4 )

[Calibration]
[Exit]

Enter detector No. for calibration.
```

The display changes as above. Set up "Detector No." and "Calib. Method". For calibration procedure and setting items, refer to each section.

Setup item	Description	
Detector No.	Enter the detector number (1/3) for calibration.	
	No.1 : equipped commonly to all preamplifiers.	
	Mainly connected to pH electrode.	
	No.3 : equipped to optional preamplifier.	
	Calibration method differs from preamplifier. For details, see manual for	
	each preamplifier.	
Calib. Method	Set up calibration mode (Auto/Manual) for pH calibration.	
	Auto : calibrates automatically from the table of pH and temperature.	
	Max. 3 points calibration is available.	
	Manual : manual calibration to input pH. Max. 3 points calibration.	

Note!

The STD preamplifier automatically shows calibration of pH electrode. PH electrode calibration is necessary when acid/base titration is performed using Detector No.1 of all kinds of preamplifier and No.3 of TET-510 preamplifier.

For other preamplifier, see 4-1-3. Kinds of preamplifier.

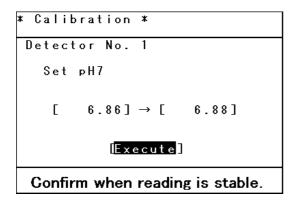
3-2-1.pH calibration when Calib.Method is "Auto"

This mode automatically sets calibration value using the temperature compensation table selected on "Function" or pH temperature compensation table pre-installed or installed by PC card. See parameters in chart 3-2-1:

Chart 3-2-1

Parameter	Description
(Temp. of STD)	When 98100T111 temperature compensation electrode is connected, this parameter
	is not displayed.
	Set up liquid temperature of standard. When 98100T111 temperature compensation
	electrode is connected, it reads temperature automatically.
Calib. Table	Select (Standard/User) temperature compensation table of standard.
	Standard: uses temperature compensation table of standard pH7, pH4, pH9 built-in or installed by PC card.
	User : uses pH temperature compensation table selected on Function.
Calib. Buffer	Select combination of standard liquids for calibration. The display differs from
	selected Calib. Table.
	Standard: shows pH7/pH4/pH9, pH7/pH4, pH7/pH9, pH4/pH9
	User : Buffer2/1/3, Buffer2/1, Buffer2/3, Buffer1/3

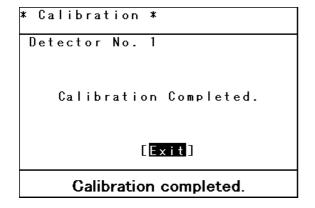
After setup, point the cursor to [Calibration] and confirm by $[\ \]$ key.

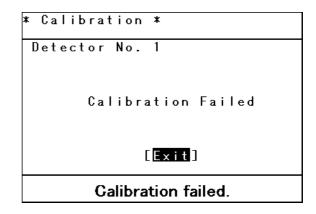


The display changes as above. Dip the electrode in calibration liquid shown on display. When both values are stable, press $[\ \]$ key. On the left, the electrode reading is shown, and on the right, calibration value is shown. Proceed calibration one after another following the messages on display.

Note!

Before the electrode is dipped in a different standard, 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.





When calibration is finished, the display changes as shown on the left. When it fails, the display changes as shown on the right. If calibration was not completed, refer to 9. Troubleshooting. Calibration record can be checked on "Periodic" of "Function".

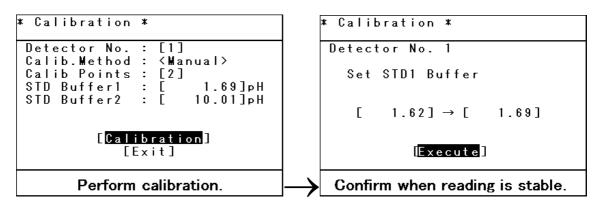
3-2-2.pH calibration when Calib.Method is "Manual"

Use this mode when calibrating by desired calibration solution. See parameters on chart 3-2-2.

Chart 3-2-2

Parameter	Description
Calib. Points	Select a number of calibration point (2/3).
	2: 2-point calibration 3: 3-point calibration
STD Buffer1	Enter standard pH $(0.00 \sim 14.00)$ for first calibration point.
(STD Buffer2)	Enter standard pH $(0.00 \sim 14.00)$ for second calibration point.
(STD Buffer3)	Enter standard pH $(0.00 \sim 14.00)$ for third calibration point.
	* Displays when Calib.Points is 3

After setup, point the cursor on [Calibration] and confirm by [4] key.



The display changes as above. Dip the electrode in calibration liquid shown on display.

When both values are stable, press $[\ \]$ key. On the left, the electrode reading is shown, and on the right, calibration value is shown. Proceed calibration one after another following the messages on display.

Note!

Before the electrode is dipped in a different standard, 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. * Calibration *

Detector No. 1

Calibration Completed.

[Exit]

Calibration completed.

When calibration is finished, the display changes as above.

Note!

Manual mode does not verify calibration result. Calibration history records OK only.

Use Auto mode in order to check the electrode.

3-3. Basic operating procedure

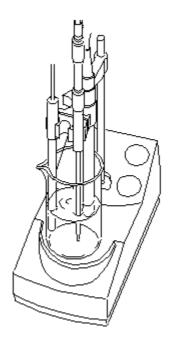
For easy understanding actual measurement, let us determine concentration of sodium hydroxide (ppm) using hydrochloric acid.

Equipment and materials to be prepared:

Potentiometric titrator	AT-510	1 unit
Combination glass electrode	98100C171	1 pce.
Electrode cable	984290012	1 pce.
Temp. compensation electrode	98100T111	1 pce.
0.1mol/L-HCl (known concentration)	500mL	1 pce.
0.1mol/L-Sodium hydroxide	500mL	1 pce.
Wash bottle (with water in it)	500mL	1 pce.
200mL beaker		2-3 pcs.
Pipette (5mL)		1 pce.
Dripping pipette		1 pce.
Tissue paper		

<Electrode connection>

- 1) Connect the cable to the combination glass electrode, and the cable connector to Terminal (G1) of detector.
- 2) Connect temperature compensation electrode (98100T111) to Terminal (T1).
- 3) Install the electrodes and nozzle to the holder as illustrated below.
- 4) Keep the electrodes and nozzle dipped in water in a beaker.



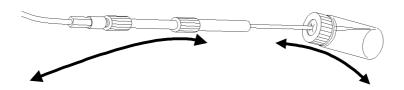
<Filling titration solution>

- 1) Fill the reagent bottle with 0.1mol/L-HCl.
- 2) Press [APB] key and select "1. Manual Operation".
- 3) Following 7-5. Operating the burette manually, set purge mode to "to Bottle" and purge times to "10".

Note!

Purge mode is preset to "to Bottle" in plant. If it is set to "to Nozzle", press [APB] key to change it to "to Bottle".

- 4) Press $[\triangle \nabla]$ key to purge titration solution. The piston moves vertically to dispense and deliver reagent in the burette by "to Bottle".
- 5) Remove the nozzle from the holder, and put the nozzle tip into the degas bottle.
- 6) Lean the nozzle tip and the degas bottle as illustrated, and press $[\triangle]$ key.
- 7) When no air bubble is observed in the nozzle, press [Reset] key and remove the degas bottle.
- 8) Install the nozzle to the electrode holder.





Wear a pair of protective glasses.

In case the tube is disconnected, reagent may splash and hurt the eyes.

<Confirmation of titration method>

- a) Method setup
 - 1) Press [Method] key.
 - 2) Press [0], [1], $[\ \]$ key and confirm the Method is 01 (auto).
- b) Titration parameter
 - 1) Press [Titration] key.
 - 2) Scroll over the display using $[\uparrow]$, $[\downarrow]$ key, and set up as shown in below.

Item	Setup value	Remarks
Method Name	(Auto Titration)	
Method Type	(Titration)	
Titration Mode	(Auto Titr.)	
Form	EP Stop	
APB No.	1	
Unit No.	1	
Detector No.	1	
Unit	pН	
Max. Volume	20.000	
Wait Time	0	
Direction	Auto	

c) Control parameter

- 1) Press [Control] key.
- 2) Scroll over the display using $[\uparrow]$, $[\downarrow]$ key, and set up as shown in below.

Item	Setup value	Remarks
End Point No.	1	
End Sense	Auto	
End Point Area	Off	
Separation	Off	
Over Titr. Vol.	0.0mL	
Gain	1	
Data Samp. Pot.	4.0mV	
Data Samp. Vol.	0.5mL	
Control Speed	Medium	

- d) Calculation parameter
 - 1) Press [Result] key.
 - 2) Select "Calculation" and confirm by [→] key.
 - 3) Scroll over the display using $[\uparrow]$, $[\downarrow]$ key, and set up as shown in below.

Item	Setup value	Remarks
Calculation Type	Sample	
Conc.1	Set	
Formula	EP1×TF×C1×K1/SIZE	TF is automatically adopted from Unit File.
Unit	ppm	
EP No.	1	
Conc.2	Off	
Conc.3	Off	
Conc.4	Off	
Conc.5	Off	
Temp. Comp.	Off	

- 4) Select "Constant" and confirm by [→] key.
- 5) Scroll over the display using $[\uparrow]$, $[\downarrow]$ key, and set up as shown in below.

	Item	Setup value	Remarks
C1		Change 1→4.00	
K1			Convert to ppm.

e) Print parameter

- 1) Press [Result] key.
- 2) Display "Report".

Item	Setup value	Remarks
Report Format	Short	
Titration Curve	Yes	
Data List	Off	

f) Information on reagent

- 1) Press [APB] key.
- 2) Select "Unit File" and press [] key, and set up as shown in below.

Item	Setup value	Remarks	
APB Unit File	Skip		
APB Unit No.	1		
Reagent Name	0.1M-HCl		
Factor	1.000	Automatically taken for TF.	
Concentration	Change $1 \rightarrow 0.1$	This item can be used in calculation formula.	
Molecular Weight	Change $1\rightarrow 36.5$		
Equiv. Number	1		
Unit Type	20mL		
Alarm	Off		
Permit. Err.	0.02mL		

<Pre><Preparation of sample>

a) Sample

- 1) Attach the dripping pipette to 5mL whole pipette.
- 2) Sample small amount of 0.1 mol/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) Put a spinner in the stirrer and add 100mL water.
- 5) Rinse the electrode with water, and wipe off water around the electrode by tissue.
- 6) Place the beaker with sample in it on stirrer, and dip the electrode in the sample.

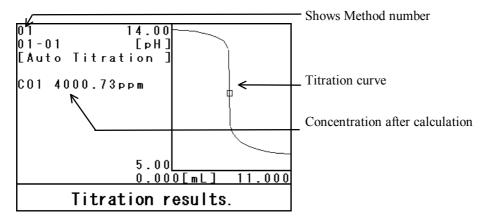
b) Sample parameter

- 1) Press [Function] key.
- 2) Display "Sample File".
- 3) Set "Sample File" to "No".
- 4) Press [Sample] key.
- 5) Scroll over the display using $[\uparrow]$, $[\downarrow]$ key, and set up as shown in below.

Item	Setup value	Remarks
Sample No.	01-01	
Sample ID	(none)	
Sample Unit	Change g→mL	
Sample Size	5.000mL	
Molecular Weight	40.0	
Equiv. Number	1	
Operator	< >	

<Start titration>

- 1) Press [Start] key.
- 2) When titration is finished by reaching an endpoint, the results will be shown on display.



<Cleaning after titration>

- 1) Remove the beaker with sample liquid in it. Place an empty beaker under the electrode. Rinse the electrode with water in the wash bottle.
- 2) Wipe off water around the electrode with tissue paper.
- 3) Keep the electrode dipped in pure water.

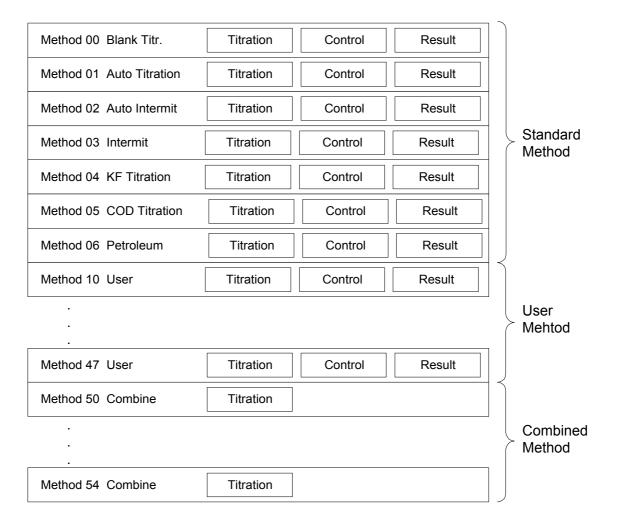
4. Measurement under optimum condition for a sample

For precise measurement within the shortest possible time, it is necessary to select the appropriate titration method and set up optimum conditions for the sample.

Such information including measuring conditions and calculation formula is called Method File.

4-1. Summary of Method File

This instrument is equipped with 50 files as Method File. Each file can be identified by individual name. Method File consists of Titration parameter, Control parameter and Result parameter, and is divided into Standard Method (No.00-06), User Method (No.10-47) and Combined Method (No.50-54). User Method is copied from Standard Method and used for user defined sample. To copy a Method, see 4-2-2 Copy measurement conditions.



4-1-1. Method and mode

Method can be classified by titration control mode (Titration mode).

Titration control modes are allocated to each standard method (00-06) as shown below.

Each titration control mode has available titration forms. Titration control modes and titration forms are summarized in Chart 4-1-1-1. Details of titration control modes and forms are explained in Chart 4-1-1-2 and 4-1-2 respectively.

Chart 4-1-1-1

Method No.	Titration mode	Titration forms available
00	Blank titration	Full, EP, Level, Intersect, Level & Stop, Learn
	(Blank Titr.)	
01	Auto control titration	Full, EP, Level, Intersect, Level & Stop, Learn
	(Auto Titr.)	
02	Auto intermittent titration	Full, EP, Level, Intersect, Level & Stop, Learn
	(Auto Intermit)	
03	Intermittent or	Full, EP, Level, Intersect, Level & Stop, Stat
	Continuous constant-speed titration	
	(Intermit)	
04	Karl-Fischer titration	Level
	(K.F.Titration)	
05	COD titration	Level
	(COD Titration)	
06	Petroleum product neutralization	Full, EP, Level, Intersect, Level & Stop, Learn
	titraion (Petroleum)	
10-47	Copied Method No.00-06 or changed	Depends on setting range of the original method.
*1	titration mode of those copied Mehtod.	
50-54	Combined titration in which a	Depends on setting range of the combined Method.
*2	maximum of five Methods (Method	
	00-47) can be combined.	

Note!

- *1: This Method can copy Method 00-47(except 07-09). When Method is copied, parameters including titration, control, calculation and print parameters are copied simultaneously. You can add variations in setting control parameter, level stop setup or fixed volume dose by copying Standard Method 00-06.
- *2: This Method is for combined titration only, and maximum five different methods from Method 00-47 (except 07-09) can be combined. When Methods of the same burette, potential unit, detector and preamplifier gain are combined, the measure results show the same graphic display. For details, refer to 7-14. Combined method.

Chart 4-1-1-2

Titration control mode	Description		
Blank titration	This mode is programmed to perform blank measurement and uses auto control		
(Blank Titration)	intermittent titration to deliver titrant intermittently by checking stability of		
	potential.		
Auto speed control	This mode provides auto speed control titration mode in which titration is		
titration	controlled by the titration control speed parameter "Control Speed". The control is		
(Auto Titration)	performed so that titration speed is fast where potential change is small and the		
	speed decreases as the potential changes becomes greater.		
Auto intermittent titration	This mode provides the auto control intermittent measuremnet of samples that		
(Auto Intermit)	gives slow reaction and therfore takes time for potential to stabilize after deliverry		
	of titratnt. Titrant is intermittently delivered by checking stability of potential. The		
	deliverly volume is automatically determined by using potential slope.		
Continuous constant-speed	This mode provides the titration mode for intermittent titration or continuous		
or Intermittent titration	constant-speed titration. Continuous constant-speed titration is selected by zero		
(Intermit)	setting to the control parameter "Cut off Time". Intermittent titration is the		
	titration in which each Unit Volume is delivered after each wait time. Start titration		
	is avalable by this mode only.		
Karl Fischer titration	This mode is only for KF moisture titration and requires optional KF titration kit		
(KF Titration)	KF-510.		
COD titration	This mode is designed for measurement of Chemical Oxygen		
(COD Titration)	Demand (COD) specified by JIS K0102 (Testing Method for Plant Sewage). This		
	mode requires optional unit COD-510.		
Petroleum product	This mode provides the titration mode for petroleum product neutralization		
neutralization titration	titration per JIS K2501 or ASTM D-664. When the potential difference checked for		
(Petroleum Titr.)	the potential read time (Integral Time) is smaller than the preset value (dE/dmL),		
	the potential is determined to be stable, data is sampled, and titrant is delivered. The		
	setting of the deliverly volume of titrant will be changed from 1st Volume to 2nd		
	Volume if the potential defference between the addition of titrant exceeds the preset		
	value (dE; 1st \rightarrow 2nd).		

4-1-2. Titration form

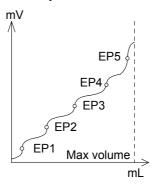
The below chart shows the different titration forms. For relation of Method number and titration mode and form, see Chart 4-1-1 Method and Mode.

Chart 4-1-2

Titration form	Description		
Full	In this titration form, the titration ends when the preset maximum titration volume is reached. This titration form uses the automatic endpoint detection feature and can automatically detect up to 5 endpoints.		
EP Stop	The titration ends when the number of detectd endpoints has reached the preset number. Even before the preset number of endpoint is reached, titration will terminate if the preset mawimum titration volume is reached. Up to 5 endpoints can be reached by this form. Potential separation level can be preset as an endpoint in between EP-1 and EP-2 so thaht the preset endpoint can be taken as the first endpoint in case of failure of automatic endpoint detection.		
Level Stop	Titration ends when it reaches preset number of endpoints (up to 2 EP levels). Titration also ends when it reaches max. titration volume during titration.		
Level & EP	Titration ends when it reaches max. number of endpoints (max. 2 sets: up to 2 Auto EP and 2 EP levels) Titration also ends when it reaches max. titration volume. Priority endpoint can be selected in calculation.		
Intersect	Titration ends when it reaches preset number of endpoints (up to 2 EPs). Titration also ends when it reaches max. titration volume. When the titration curve changes more than preset angle, it detects automatically intersection point of two lines.		
Stat	Titration doses to maintain stat control potential until it reaches max. titration volume. The data is sampled at intervals. Measurement results print titration volume per time.		
Learn	Learn titration is to select control mode and parameter appropriate for a given sample. Titration continues until it reaches max. volume.		

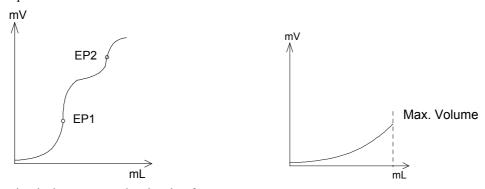
<Full titration>

Titration is performed till the preset maximum titration volume is reached. This titration from provides automatic detection of endpoints and can detect up to five endpoints.



<EP Stop>

Titration stops after the preset number of endpoints have been detected. Titration will also stop if the preset maximum titration volume is reached. This titration form provides automatic detection of endpoints and can detect up to fine endpoints.

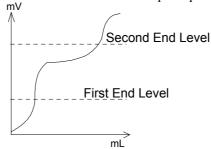


EP Stop titration is the most popular titration form.

In this titration form, the maximum inflection point is detected as an endpoint. Because there is little possibility of being affected by titration conditions, results with good reproducibility can be obtained. In the case of an unclear inflection point, however, Level Stop titration is recommended.

<Level Stop>

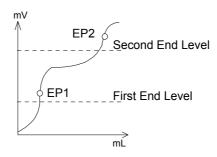
Titration stops when the preset endpoint potential level (2nd-EP Level) is detected. Titration will also stop when the preset maximum titration volume is reached. A maximum of 2 endpoint potential levels can be set.



Level Stop titration form is used for titration of known endpoint potential level such as neutralization titration of petroleum products by nonaqueous buffer solution method, and measurements of M alkaline, P alkaline, etc. This titration form takes the titration volume at the preset potential as an endpoint and should be considered for titration in which inflection points are unclear.

<Level & EP>

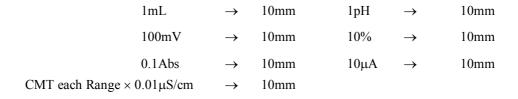
This titration form performs Auto EP Stop and Level Stop titration at the same time, and detect both endpoints as a set. Titration ends when it reaches max. volume.



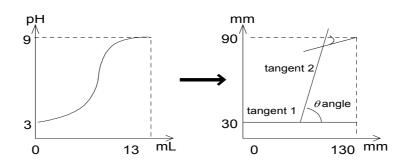
<Intersect>

Titration stops after the present number of endpoints have been detected. It will also stop when the preset maximum titration volume is reached. This form is used for titration like diazotation, conductivity and photometry.

Titration stops after the titration curve has changed the preset angle, and detects the intersection point of the two lines automatically. (This angle determined by converting titration volume and potential value into length dimensions as shown below.)

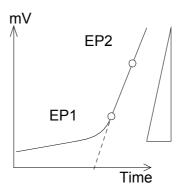


For example;



<Stat>

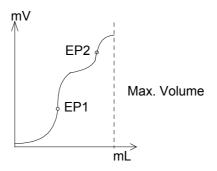
Titration is performed so as to retain the preset Stat potential and stops when the maximum titration volume or the Maximum measuring limit time is reached. Data is samples at each lag time, and the relationship between potential and titration volume at each sampling is printed out.



<Learn>

This titration is to select control mode and parameter appropriate for a given sample. Titration continues until it reaches max. volume and set the appropriate parameter automatically.

But the appropriate parameter connot be obtained for using special sample which reaction is too slow, potential change is too small, and so on. And the results are not set automatically when the endpoints as set are not detected.



4-1-3. Titration, electrode and preamplifier

For correct titration, it is important to know the characteristics of reagent and reaction of solutions, and then to select appropriate titration control, detection electrode and preamplifier. The below chart shows the relations of titration, electrode, preamplifier and control.

7	Γitration	Control	Remark	Electrode/Preamplifier
Blank titration of r	reagent	Blank Titr. (00)	For titration less than 0.3mL	·
Strong acid – Stron HCl – NaOH H ₂ SO ₄ – NaOH	ng base	Auto.Titr.(01)	Increase control speed when reaction is fast.	Combination glass electrode 98100C171 or 98100C172 STD preamplifier
Weak acid – Stron Strong acid – Wea Weak acid – Weak Benzoic acid – KO HCl – Na ₂ CO ₃ HClO ₄ –Potassium	k base k base	Auto.Titr.(01)	Slow down control speed if reaction is slow with less than 1/100mol/L. Also use A. Int (02)	Combination glass electrode 98100C171, 98100C172 or Combination double junction electrode 98100C173 STD preamplifier
titration	AgNO ₃ - I ⁻ Br ⁻ Cl ⁻ CN ⁻ S ²⁻ SCN ⁻ Pb(Cl O) ₂ - SO ₄ ²⁻	Auto.Titr. (01)	Slow down control speed if reaction is slow with less than 1/100mol/L. Also use A. Int (02)	Silver electrode 98100M371 Ref. electrode 98100R272 For non-aqueous: Silver electrode 98100M371 Glass electrode 98100H171 STD preamplifier
titration I	$egin{array}{lll} Na_2S_2O_3 & & -I_2 \\ KMnO_4 & & -Fe^{2+} \\ I_2 & & -As_2O_3 \end{array}$	Auto.Titr. (01)	Use Auto Int.(02) if reaction is slow and potential comes back.	Combination Pt electrode 98100C272 If inner solution affect; Silver electrode 98100M271 and Ref.electrode 98100R173 STD preamplifier
neutralization Mattration A	Acid value of fats/oil Nutralizatyion of fatty acid Acid number of petroleum products Base number of petroleum products	Fats and oil acid Auto Int. (02) Petroleum (06)	Use Petroleum(06) for standard analysis. For quick measurement, use Auto Int.(02).	Combination glass electrode 98100C171, 98100C172 when noisy, use: Glass electrode 98100H171 Ref.electrode 98100R115 STD preamplifier
	EDTA – Zn^{2+} EDTA – Ca^{2+}	Auto Titr.(01)	Use ionic electrode for detection	For Zn ²⁺ – Cu-EDTA, use copper ionic electrode. For Ca ²⁺ , use calcium ionic electrode STD preamplifier
titration by I	EDTA – Ca^{2+} , Mg^{2+} EDTA – Zn^{2+} EDTA – Ni^{2+}	Auto Int.(02)	Use preamplifier for photometric titration	Ca^{2+} , Mg^{2+} , Zn^{2+} –EBT indicator λ =630nm Ni^{2+} – MX indicator λ =530nm PTA preamplifier
titration E	KBr, KBrO ₃ – Olefin Back titration Na ₂ S ₂ O ₃ – Petroleum resin	Auto Int. (02) Back titration, use Auto Titr.(01)	Use preamplifier for polarization titration	Twin Pt electrode 98100M511 For low current flucturation: 98100M512 POT preamplifier
Diazotation N titration	NaNO ₂ – Sulfonamide acid, Aromatic promary amine	Auto Int.(02) Intermit (03)	Use preamplifier for polarization or redox titration Use STD. for redox.	Twin Pt electrode 98100M511 For low current flucturation: 98100M512 POT preamplifier

4-1-4. Kinds of preamplifiers

There are five different kinds of preamplifier as shown in Chart 4-1-4. Select the preamplifier appropriate for your intended titration. For how to connect a preamplifier, see 4-1-5. Replacement of preamplifier.

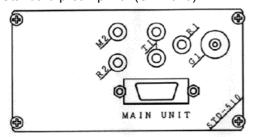
\sim	ha	rt	4-	1	1
ι.	112		4-		-4

Shart 4 1 4					
Detector No.	1	2	3	Remarks	
Type of preamp					
Standard	рН			Detector 1:	
Preamplifier	/	mV	_	Min. 0.01pH or 0.1mV Range: 0-14pH or 0-±2000mV	
(STD-510)	mV			Detector 2:	
·				Min. 0.1mV Range: 0-±2000mV	
Photometric	pН		%T	Detector 1 & Detector 2: Same as STD	
preamplifier	/	mV	/	Detector 3: Min. 0.1%T (0.001Abs) Range: 0-120%T	
(PTA-510)	mV		Abs		
Polarization	рН		μΑ	Detector 1 & Detector 2: Same as STD	
preamplifier	/	mV	/	Detector 3:	
(POT-510)	mV		mV	Measure volt 0-2V Min. display 0.1mV	
				Measure current 0-100μA Min. display 0.01μA	
				Load currnt 0-20µA Load volt 0-500mV	
Conductivity	pН			Detector 1 & Detector 2: Same as STD	
preamplifier	/	mV	μS/cm	Detector 3: Min. display F.S.0.01%	
(CMT-510)	mV			Range 0-100,1000,10000μS/cm	
pH2 dual input	pН		pН	Detector 1 & Detector 2: Same as STD	
preamplifier	/	mV	/	Detector 3: Same as Detector 1	
(TET-510)	mV		mV		

Note!

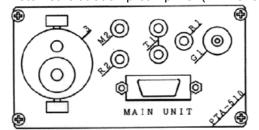
PTA-510, POT-510, CMT-510 and TET-510 are options.

Standard preamplifier (STD-510)



Preamplifier for pH acid base titration, redox titration, chelatometric titration with ionic electrode and precipitation titration.

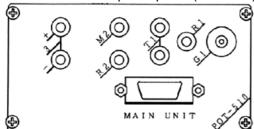
Photometric titration preamplifier (PTA-510)



Preamplifier for photometric titration by light transmission method. It can be used for chelatometric

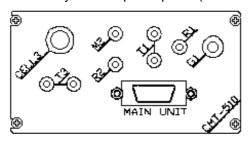
Titration with indicator, acid base and redox titration.

Polarization titration preamplifier (POT-510)



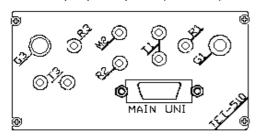
Preamplifier for polarization titration at constant current (Max. $20\mu A$) or voltage (applied voltage: Max. 500mV). It can be used for bromine number titration, diazotation titration, etc.

Conductivity titration preamplifier (CMT-510)



Preamplifier for conductivity titration.

PH dual input preamplifier (TET-510)



Similar to the STD-510, this unit allows for an additional electrode system to be installed.

Preamplifier for pH acid base titration, redox titration, chelatometric titration with ionic electrode and precipitation titration.

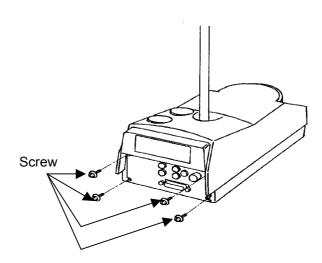
Note!

Detector 1 and 2 of each preamplifier has the same function as STD-510.

4-1-5. Replacement of preamplifier

Turn off the power of Main unit before replacing the preamplifier. If the preamplifier is replaced without power shut down, it may cause electrical damage on Main unit, stirrer and preamplifier.

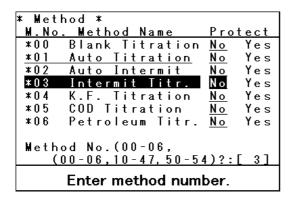
- 1) Undo 4 screws of preamplifier.
- 2) Pull out the preamplifier from the stirrer unit.
- 3) Slide in another preamplifier along the guide rails into the stirrer unit.
- 4) Fasten the 4 screws.



4-2.Method file

4-2-1. Select Method file

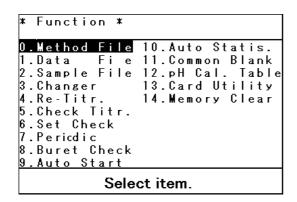
Press [Method] key.



The display changes as above. Point the cursor on desired method using $[\uparrow]$, $[\downarrow]$ key or numeric key. If you wish to protect the Method, select Yes/No on "Protect" by $[\leftarrow]$, $[\rightarrow]$ key (once protected, you cannot change parameters for Method: titration, control and calculation parameters)

4-2-2. Copy measurement conditions (Function 0)

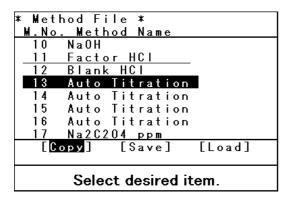
Press [Function] key.



The display changes as above. Point the cursor on "Method file" using $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.

*	Met	hod Fi	le *		
	M.No	. Meth	od Nam	е	
	10	NaOH			
	11	Facto	r HCl		
	12	Blank	HCI		_
	13	Auto	Titrat	ion	
	14	Auto	Titrat	ion	
	15	Auto	Titrat	ion	
	16	Auto	Titrat	ion	
L			04 ppm		
	[C	ору]	[Save]	[Load]
L					
	Select desired item.				

The display changes as above. Point the cursor on the method to be copied using $[\uparrow]$, $[\downarrow]$ key or numeric key. Point the cursor on "Copy" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\leftarrow]$ key.



The display changes as above. Point the cursor on the method to copy using $[\uparrow]$, $[\downarrow]$ key or numeric key, and confirm by $[\downarrow]$ key.

Note!

After copied, the method switches to the method where the copy is overwritten.

For other transactions, see chart 4-2-2.

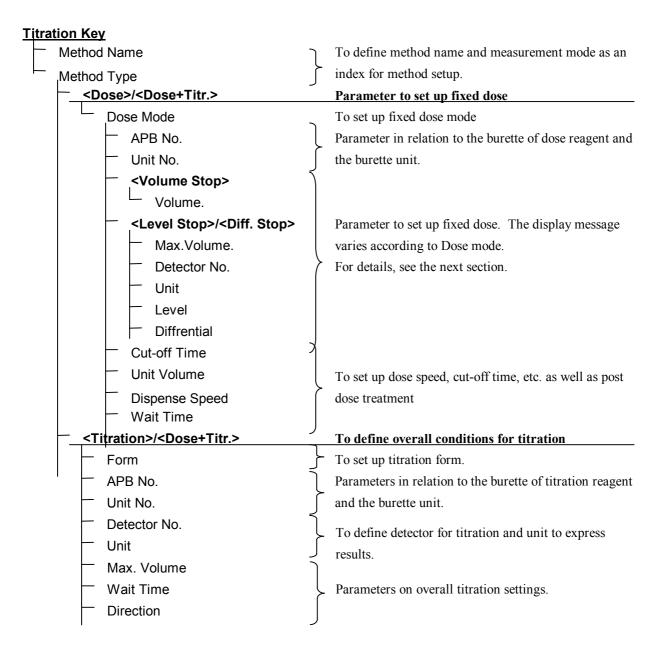
Chart 4-2-2

Transaction	Description			
Сору	Copy a method to a user method.			
Load	Copy measuring conditions from PC card it to a user method.			
	For details, see 7-12-3 Read/store measurement conditions.			
Save	Save measuring conditions to PC card.			
	For details, see 7-12-3 Read/store measurement conditions.			

4-3. Titration parameter setup

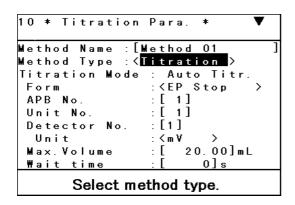
4-3-1. Outline of titration parameter

Titration parameter defines Method name, Method type, Titration form and Detector number, etc. Titration parameter consists of the following parameters:



4-3-2. Setting Method name and type

Press [Titration] key.



The display changes as above. Enter "Method Name" by alphanumeric key and confirm by $[\ \]$ key. Then select "Method Type" by $[\ \]$, $[\ \]$ key and confirm by $[\ \]$ key.

For function of parameter and its contents, see Chart 4-3-2.

Chart 4-3-2

Titration parameter	Description				
Method Name	Desired Method name can be entered.				
	For key entry, see 2-3-3. Basic key operation.				
Method Type	Select Method type (Titration/Dose+Titr./Dose).				
	Titration : Set up only for titration.				
	Dose : Set up only for fixed dose.				
	Dose+Titr. : Set up for titration after fixed dose.				
	Method 00-06 fixes Titration. You can change in Method 10-47.				

Note!

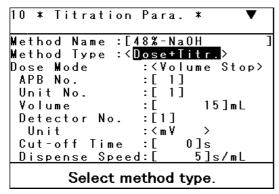
Display messages change by Method Type.

<Titration> : See 4-3-4. Titration parameter setup <Dose> : See 4-3-3. Fixed dose parameter setup

<Dose+Titr.> : See 4-3-3 and 4-4-4.

4-3-3. Fixed dose parameter setup

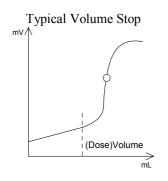
Select <Dose> or <Dose+Titr.> on 4-3-2 Method type.

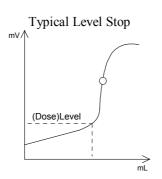


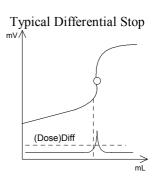
The display changes as above. Set up Dose mode referring to Chart 4-3-3-1. Select by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\leftarrow]$ key.

Chart 4-3-3-1

Dose Mode	Description			
Volume Stop	Set up amount of reagent is dosed. When potential fluctuation is small, measurement time			
	can be reduced by this mode. For setting parameters, see 4-3-3-2 and 4-3-3-3.			
Level Stop	Dosing reagent continues until it reaches preset potential level.			
	When potential at inflection point is table, measuring time can be saved. For setting			
	parameters, see 4-3-3-2 and 4-3-3-3.			
Diff. Stop	Dosing continues until it detects preset differential value (potential difference against			
	micro amount of titration).			
	When potential difference of titration curve is stable, measuring time can be saved by this			
	mode. For parameters, see 4-3-3-2 and 4-3-3-3.			







Note!

Fixed dose cannot be set up on Standard method (00-06). Use a copied Method (4-2-2. copy measurement conditions). Also a copied Karl Fischer method (04) and COD method (05) cannot set up fixed dose.

Chart 4-3-3-2

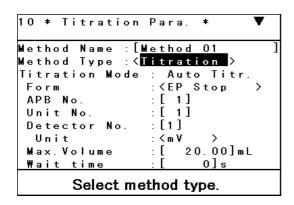
Parameter	Description					
APB No.	Select APB number (No. 1-10) for fixed dose.					
Unit No.	Select APB Unit File (No	. 1-20) for fixed d	lose.			
(Volume)	Enter reagent volume (0-	9999mL) for fixe	d dose.			
	This appears on "Volume	Stop".				
(Max Volume)	Set up max. dose volume	(0-9999mL) for t	the burette to	dose.		
	When it reaches max. dos	se volume, it stops	s dosing regar	dless of p	preset potential.	
	However, when APB No.	for fixed dose is t	the same as A	PB No. fo	or titration,the "Max	
	volume" turns into the "N	/lax volume" setuj	p by titration	paramete	r.	
	The display appears on "I	Level Stop" and "	Diff. Stop".			
	The range of fixed dose a	nd max dose depe	ends on burett	e unit.		
	Burette unit	range	Burette	unit	range	
	APB-510-01B	0-1000mL	APB-510-20)B	0-9999mL	
	APB-510-05B	0-5000mL	APB-510-50)B	0-9999mL	
	APB-510-10B 0-9999mL					
Detector No.	Select Detector number (1/2/3) to detect potential.					
Unit	Set up potential unit. The potential unit that can be selected depends on preamplifier:					
	Preamplifier Detector 1 Detector 2 Detector 3					
	STD-510			_		
	PTA-510			%T, A	bs	
	POT-510	PH, mV	mV	μA, m	V	
	CMT-510			μS/cn	n	
	TET-510 pH, mV					
(CMT Range)	Select detection range (10	00/1000/10000µS) of conductiv	ity.		
	This appears when CMT-510 preamplifier is connected and Detector 3 is chosen.					
(CMT Temp. Co.)	Set up temperature compe	ensation coefficies	nt (0-9999) o	f the cell	for conductivity	
	measurement. This appear	ars when CMT-51	10 preamplifie	er is conn	ected and Detector 3 is	
	chosen.					
·						

Chart 4-3-3-3

Parameter		Description					
(Dose Level)	Set up dose potential (0	Set up dose potential (0~±99999).					
	This appears on "Level	Stop".					
	It stops dosing when it	reaches preset poten	tial.				
(Differential)	Set up dose differential	value (0~±9999).					
	This appears on "Diff.S	Stop".					
	It stops dosing when it	reaches preset differ	ential value.				
Cut-off Time	Set up intermittent tim	e (0/1~9999s).					
	It does intermittently.						
	0(s) setting means cont	0(s) setting means continuous dosing.					
(Unit Volume)	Set up dose volume for one time during cut-off dose (0~9999mL).						
	This does not appear when cut-off time is 0 s.						
Dispense Speed	Set up reagent dose spe	eed (0~9999s/mL).					
	Dose speed range depends on burette unit as follows:						
	Burette unit	Range	Burette unit	Range			
	APB-510-01B	20 - 9999s/mL	APB-510-20B	1- 9999s/mL			
	APB-510-05B 4 - 9999s/mL APB-510-50B 1- 3000s/mL						
	APB-510-10B 2 – 9999s/mL						
Wait Time	Set up wait time before dosing starts. (0~9999s).						
	Use wait time for a vise	cous sample or a san	nple hard to dissolve.				

4-3-4. Titration parameter setup

Select "Titration" or "Dose+Titr." on 4-3-2. "Method type".



The display changes as above. Set up conditions for titration. Set up or select the desired item by pointing the cursor using $[\uparrow]$, $[\downarrow]$ key. For each parameter, see Chart 4-3-4-1 and Chart 4-3-4-2.

Chart 4-3-4-1

Chart 4-3-4-1						
Titration parameter	Description					
Titration Mode	Titration control mode	appears. You ca	an change by sv	vitching Method	•	
Form	Select titration form. S	ee various titrat	ion forms by M	ethod on Chart 4	-1-1-1 and	
	Chart 4-1-2 for details	of each form.				
APB No.	Set up the power burett	e number (No.1	-10).			
	The built-in burette is I	No.1.				
Unit No.	Enter APB Unit File nu	umber (No.1-20).			
	The information on the	unit is automati	cally adopted in	calculation (fac	tor, molecular	
	weight, equivalent number, concentration). For APB Unit File, see 4-7. Infromation					
	on reagent.					
Detector No.	Select Detector number (1/2/3).					
Unit	Select potential unit for	r detection.				
	The unit that can be set	lected depends of	on preamplifier	as follows:		
	Preamplifier	Detector 1	Detector 2	Detector 3		
	STD-510					
	PTA-510			%T, Abs		
	POT-510 PH, mV mV μA, mV					
	CMT-510 μS/cm					
	TET-510			pH, mV		

Chart 4-3-4-2

Titration parameter	Description						
(CMT Range)	Select detection range (100/1000/10000μS) for conductivity. This appears when CMT-510 is connected and Detector 3 is selected.						
(CMT Temp. Co.)	Set up cell temperature compensation coefficient (0–9999) in conductivity measurement. This appears when CMT-510 is connected and Detector 3 is selected.						
Max Volume	Set up max titration volume (0–9999). When it reaches the preset volume, titration ends regardless of EP. The input range depends on burette unit as follows:						
	Burette unit	Setup range	Burette unit	Setup range			
	APB-510-01B	0-1000mL	APB-510-20B	0-9999mL			
	APB-510-05B	0-5000mL	APB-510-50B	0-9999mL			
	APB-510-10B	0-9999mL					
Wait Time	Set up wait time before titration starts. (0–9999s)						
	Titration starts only after th	•					
	Use wait time for a sample hard to dissolve or when it take time to reach stable potential.						
Direction	Select titration direction (Positive/Negative/Auto).						
	Auto : It detects A and B endpoint. It detects endpoint regardless of potential direction.						
	Positive : It detects endpoint A when potential changes to positive direction.						
	Negative: It detects endpoint B when potential changes to negative direction.						
	mV A B mL						

Chart 4-3-4-3

Titration parameter	Description
(EP Stop Mode)	Both : Two endpoints (A and B) are found at intersections of tangent lines. Positive : It detects intersection (A) of two counterclockwise tangent lines to be the endpoint. Negative : It detects intersection (B) of two clockwise tangent lines to be the endpoint.
	MV Negative Positive A mL

Note!

When <Dose+Titr> is chosen for Method type, it appears after fixed dose parameter is set up.

4-3-5. Titration parameters and default values

Setup range of parameters and the default values are shown in Chart 4-3-5-1, Chart 4-3-5-2, Chart 4-3-5-3.

Chart 4-3-5-1

Parameter	Setup range	Default value	
Method Name	Alphanumeric, symbols within 14	_	
	characters		
Method Type	Titration/Dose/Dose+Titr.	Titration	

Note!

Method 00-06 cannot select Dose or Dose+Titr for Method type. This can be selected by a user defined method which copies the method.

Chart 4-3-5-2

Parameter	Setup range	Default value
Dose Mode	Volume Stop/Level Stop/Diff. Stop	Volume Stop
APB No.	1–10	1
Unit No.	1–20	1
Volume	0–9999(mL)	0
Max Volume	0-9999(mL)	20.0000
Detector No.	1-3	1
Unit	pH/mV/%T/Abs/μA/μS	mV
CMT Range	100μS /1000μS /10000μS	100μS
CMT Temp.Co.	0–9999	2.0
Level	0–9999	20.0
Differential	0–9999	20.0
Cut-off Time	0–9999(s)	0
Unit Volume	0-9999(mL)	0.05
Dispense Speed	0-9999(s/mL)	5
Wait Time	0-9999(s)	0

Note!

Some parameters may not appear during setting up since the setup range depends on the related values.

Chart 4-3-5-3

Parameter	Setup range	Default value
Form	EP Stop/Level Stop/	EP Stop
	Level & EP/Full/Learn/Intersect	
APB No.	1–10	1
Unit No.	1–20	1
Detector No.	1–3	1
Unit	pH/mV/%T/Abs/μA/μS	mV
CMT Range	100μS /1000μS /10000μS	100μS
CMT Temp. Co.	0–9999	2.0
Max Volume	0-9999(mL)	20.000
		(Method 00=2.0000)
Wait Time	0–9999(s)	0
Direction	Auto/Negative/Positive	Auto
EP Stop Mode	Both/Positive/Negative	Both

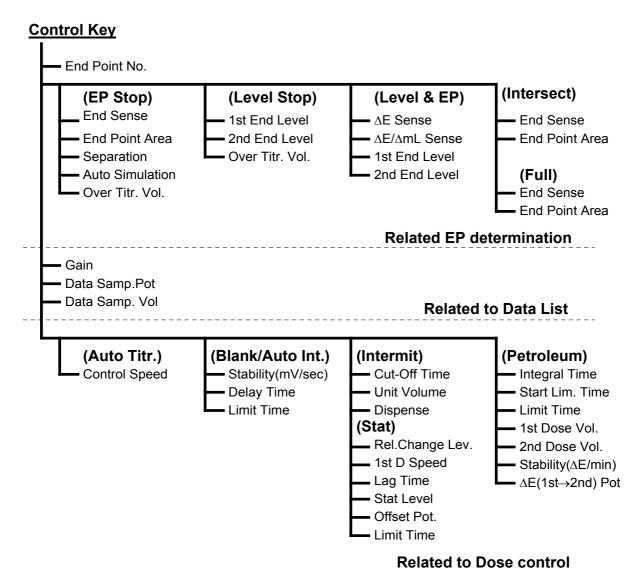
Note!

Some parameters may not appear during setting up since the setup range depends on the related values.

4-4. Control parameter setup

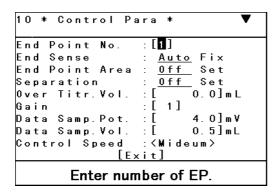
4-4-1. Outline of control parameter

Control parameters define dose speed, data sampling method, EP detection condition and EP sense, etc. Control parameters depend on Method and titration form. Below chart shows the elements of control parameter.



4-4-2. Endpoint determination setup

Press [Control] key.



The display changes as above. Move the cursor by $[\uparrow]$, $[\downarrow]$ key and select by $[\leftarrow]$, $[\rightarrow]$ key or enter by alphanumeric keys for parameter setup. Parameters depend on titration form. Refer to the below chart for each form and corresponding chart.

Titration form	Corresponding chart
EP Stop titration	Chart 4-4-2-1 and 4-4-2-2
Level Stop titration	Chart 4-4-2-3
Level & EP titration	Chart 4-4-2-4
Intersect titration	Chart 4-4-2-5
Learn titration	Chart 4-4-2-6
Full titration	Chart 4-4-2-7

Chart 4-4-2-1

Parameter	Description	
End Point No.	Endpoint number	
	Set up a number of endpoint (1-5).	
	Titration ends when it detects preset number of EP.	
End Sense	Auto : automatically determines EP sense value. It starts EP sense by default value and then automatically changes EP sense if an endpoint is not found. The changed EP sense is stored as Fix, and therefore, choose Fix from second measurement onward.	
	Fix : determines an endpoint by preset EP sense(ΔE , $\Delta E/\Delta mL$).	
	When both values are satisfied, it determines the point as EP.	
(ΔE Sense)	Set up potential difference (0-999999) of normalization potential to determine the endpoint. The difference comes from the different positions between E2 normalization potential where max differential value was found and E1 normalization potential where minimum differential value was found. Any inflection point can be a possible endpoint if more changes than preset sense value are found.	
$(\Delta E/\Delta mL Sense)$	Set up differential difference (0-999999) of normalization potential to determine the	
	endpoint. The difference comes from max differential value ($\Delta E2/\Delta mL$) and min	
	$(\Delta E/\Delta mL)$. When it changes more than preset value, the point is considered to be an	
	$\begin{array}{c} mV \\ \hline E2 \\ \hline E1 \\ \hline \end{array}$	
	This parameter appears when "End Sense" is "Fix".	
End Point Area	Set up EP detection range. (Set/Off) The endpoint is detected within the preset range. This is useful to avoid influence of incoming noise or carbon dioxide gas.	
(Lower Volume)	Set up lower limit for detection range. (0–9999mL)	
(Upper Volume)	Set up upper limit for detection range. (0–9999mL)	
(Lower Level)	Set up lower limit potential for detection range (0-±999999)	
(Upper Level)	Set up upper limit potential for detection range (0-±99999)	
	Upper Level Lower Level Lower Volume Upper Volume	

Chart 4-4-2-2

Parameter	Description	
Separation	Set up separation potential function. (Set/Off)	
(Level)	Set up separation potential (0-±999999).	
(Level Stop)	Set up function for level stop for the first endpoint. (Set/Off)	
(End Level)	Set up potential for the first endpoint. (0-±999999)	
	Separation function detects EP2 if an inflection point exceeds the preset level regardless of	
	the inflection point at the beginning of titration. Be separation, titration can end up with	
	preset End Level when any inflection pint is not found.	
	mV ₊ mV ₊	
	Above left : EP1 is detected before it reaches Level. Above right : Preset end level is determined to be EP1 since no inflection point is found.	
Auto Simulation	Select (Set/Off) for auto simulation.	
	After titration, this function simulates titration to redetect EP.	
	This appears when "End Sense" is Fix.	
Over Titr. Vol.	Set up over titration volume (0–9999mL).	
	Titration continues even after the endpoint is found.	
	Titration ends it reaches the preset volume of titration.	

Chart 4-4-2-3

Parameter	Description	
End Point No.	Set up a number of endpoints (1/2).	
	Titration ends when it reaches the present number of EP.	
1st End Level	Set up the first EP potential. (0–±999999).	
(2nd End Level)	Set up the second EP potential. (0–±999999)	
	This appears when End Point No. is 2.	
	Determination of endpoint changes according to titration direction:	
	Auto : All inflections points could be endpoints if potential changes like the graphic	
	curve, however, the range between EP1 and EP2 is default potential, EP2 is	
	found but EP1 is regarded as 0mL regardless of titration direction.	
	Negative : All the inflection points can be endpoints since titration direction is negative.	
	If the initial potential exists between EP1 and EP2, EP1 is regarded as 0mL.	
	Positive : Since titration direction is positive, if the initial potential is larger than EP1	
	and EP2, EP1=EP2=0mL. If the default potential exists between preset	
	potential (EP1 and EP2), titration continues until it reaches max volume	
	without finding any endpoint.	
	EP1 1st End Level EP1=0mL EP2 2nd End Level EP2 mL mL	
Over Titr.Vol.	Set up over titration volume. (0–9999mL)	
	After the last endpoint is detected, titration continues for present volume. Titration ends if	
	it reaches preset volume even before EP is found.	

Note!

When the same value is set for 1st End Level and 2nd End Level, only EP1 is found and output for printing and data file.

Chart 4-4-2-4

Parameter	Description	
End Point No.		
End Point No.	Set up a number of endpoints (1/2) Titration ends when it reaches preset number of EP.	
	Set up endpoints as a set from Auto Stop and Level Stop.	
ΔE Sense	Set up potential difference (0-999999) of normalization potential to determine the	
AL Sense	endpoint. The difference comes from the different positions between E2 normalization	
	potential where max differential value was found and E1 normalization potential where	
	minimum differential value was found. Any inflection point can be a possible endpoint if	
	more changes than preset sense value are found.	
$\Delta E/\Delta mL$ Sense	Set up differential difference (0-999999) of normalization potential to determine the	
	endpoint. The difference comes from max differential value ($\Delta E2/\Delta mL$) and min	
	$(\Delta E/\Delta mL)$. When it changes more than preset value, the point is considered to be an	
	endpoint.	
	mV_{\bullet} mV_{\bullet}	
	E2	
	$\int_{\Gamma} \int_{\Gamma} \Delta E 2/\Delta m L$	
	E1	
	∫	
	mL mL	
1st End Level	Set up the first EP potential. (0–±999999).	
(2nd End Level)	Set up the second EP potential. (0–±999999)	
	This appears when End Point No. is 2.	
	Determination of endpoint changes according to titration direction:	
	Auto : All inflections points could be endpoints if potential changes like the graphic	
	curve, however, the range between EP1 and EP2 is default potential, EP2 is	
	found but EP1 is regarded as 0mL regardless of titration direction.	
	Negative : All the inflection points can be endpoints since titration direction is negative.	
	If the initial potential exists between EP1 and EP2, EP1 is regarded as 0mL. Positive : Since titration direction is positive, if the initial potential is larger than EP1	
	and EP2, EP1=EP2=0mL. If the default potential exists between preset	
	potential (EP1 and EP2), titration continues until it reaches max volume	
	without finding any endpoint.	
	mV _A	
	115 11 21 574 221	
	EP1) 1st End Level EP1=0mL	
	Spot Spot Food Lovel 500	
	EP2 2nd End Level EP2	
	mL mL	

Note!

When preset number of endpoints are not found by Auto EP or End Level (1st and 2nd end level), titration continues to the max volume.

<Titration form: Intersect>

Chart 4-4-2-5

Parameter	Description
End Point No.	Set up a number of endpoints (1/2) Titration ends when it reaches preset number of EP.
End Sense	Set up EP detection method (Auto/Fix). Auto : Automatically determines end sense value. Titration starts from default value for end sense and changes end sense if EP is not found. The changed value is stored as Fix, and choose Fix from the next measurement onward. Fix : Endpoint is determined by the preset end sense value (ΔDeg). When the end sense value is satisfied, the value is determined to be the endpoint.
ΔDeg Sense	Set up the difference (normalization) of angle by the tangents. When the angle of two tangents on titration curve changes more than preset end sense value, it is determined to be the endpoint. PH

<Titration form: Learn>

Chart 4-4-2-6

Parameter	Description
End Point No.	Set up a number of endpoints. (1-5)

Chart 4-4-2-7

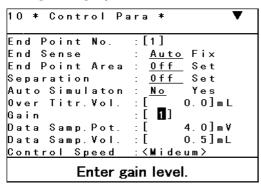
Parameter	Description
End Sense	Set up EP detection method (Auto/Fix).
	Auto : Automatically determines end sense value. Titration starts from default value
	for end sense and changes end sense if EP is not found. The changed value is
	stored as Fix, and choose Fix from the next measurement onward.
	Fix : Endpoint is determined by the preset end sense value ($\Delta E, \Delta E/\Delta mL$). When
	both sense values are satisfied, the value is determined to be the endpoint.
$(\Delta E \text{ Sense})$	Set up potential difference (0–999999) of normalization potential to determine the
	endpoint. The difference comes from the different positions between E2 normalization
	potential where max differential value was found and E1 normalization potential where
	minimum differential value was found. Any inflection point can be a possible endpoint if
	more changes than preset sense value are found.
$(\Delta E/\Delta mL Sense)$	Set up differential difference (0–999999) of normalization potential to determine the
	endpoint. The difference comes from max differential value ($\Delta E2/\Delta mL$) and min
	$(\Delta E/\Delta mL)$. When it changes more than preset value, the point is considered to be an
	endpoint.
	$\int_{-\infty}^{\infty} \frac{E2}{\Lambda} \int_{-\infty}^{\infty} \Delta E \frac{2}{\Delta m} L$
	E1 1
	ΔΕ1/ΔmL
	mL mL
	This parameter appears when "End Sense" is "Fix".
End Point Area	Set up EP detection range. (Set/Off)
	The endpoint is detected within the preset range. This is useful to avoid influence of
	incoming noise or carbon dioxide gas.
(Lower Volume)	Set up lower limit for detection range. (0–9999mL)
(Upper Volume)	Set up upper limit for detection range. (0–9999mL)
(Lower Level)	Set up lower limit potential for detection range (0-±999999)
(Upper Level)	Set up upper limit potential for detection range (0-±999999)
	mV_
	. <u>Upper Level</u>
	Lower Level E1Q
	Lower Volume Upper Volume
Auto Simulation	Select (Set/Off) for auto simulation.
ruto ominatation	After titration, this function simulates titration to redetect EP. This appears when "End
	Sense" is Fix.
	When EP is detected, this function is not performed.
	1 When 21 is detected, this function is not performed.

Note!

In Full titration, it continues to the max volume regardless of the number of detected EPs. The maximum number of endpoints is 5.

4-4-3. Data list setup

Press [Control] key.



Select the desired item by moving the cursor with $[\uparrow]$, $[\downarrow]$ key. Parameters for sampling detection signal are shown in chart 4-4-3.

Chart 4-4-3

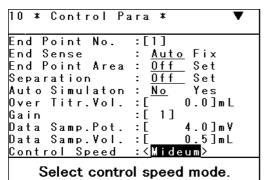
Parameter	Description		
Gain	Select sensitivity (1–10) of detection signal. Typically select 1. Select a larger amount when potential fluctuation is small and difficult to find an endpoint.		
Data Samp.Pot.	Set up potential change (0.1–10000mV) for signal sampling. To increase data density near EP, decrease this parameter (1–2mV). Data sampling starts when potential deviation against previous data exceeds present value.		
Data Samp.Vol.	Set up titration volume (0–9999mL) for signal sampling. When potential change near inflection point is small, lower this parameter (0.1–0.2mL). Data sampling starts when deviation of titration volume against previous data exceeds preset value.		
	Data Samp. Vol. Data Samp. Level mV mV mV mt		

Note!

Data Samp. Pot and Data Samp. Vol do not appear when titration form is Stat. If setting Data Samp. Pot and Data Samp. Vol is too small, data memory (max 256 points) overflows, and consequently titration curve and redetection EP cannot be performed correctly. Maximum titration volume and potential change need to be taken into consideration.

4-4-4. Dose control setup

Press [Control] key.



Example: when titration mode is Auto Titr.

The display changes as above. Use $[\uparrow]$, $[\downarrow]$ key to move the cursor for setup. Setting dose titration solution differs from titration form. See below chart for details.

Standard Method	Control mode	Chart for details	
00	Blank titration	See Chart 4-4-4-2	
01	Auto titration	See Chart 4-4-4-1	
02	Auto intermittent titration	See Chart 4-4-4-2	
03	Intermittent titration	See Chart 4-4-4-3 and 4-4-4-4	
06	Petroleum nuetralization	See Chart 4-4-4-5	

<Titration control mode (Method): Auto Titration>

Chart 4-4-4-1

Parameter	Description				
Control Speed	Select control speed (Fast, Medium, slow, Set)				
	ast : for fast reaction like strong acid-strong base				
	Medium : for reaction of weak acid-weak base/strong acid-weak base. This speed is				
	appropriate for general purposes.				
	Slow : for slow reaction where titration solution is thin (e.g, less than 0.01mol/L).				
	Set : manually speed can be controlled.				
(Set Speed)	Control speed is selected. (0–10)				
	This appears when Control Speed is Set.				
	The smaller setting, the slower the speed and the larger, the faster.				
	Control speed is adjusted by potential stability.				
	Control speed: Fast=4.0, Medium=2.0, Slow 0.5				

<Titration control mode (Method): Blank Titr. or Auto Intermit.>

Chart 4-4-4-2

Parameter	Description					
Stability (mV/s)	Set up stability sense value (0–10000mV/s).					
	When potential difference per unit time (1 s) goes below preset value, it starts dosing					
	titration solution.					
Delay Time	Set up delay time (0–9999s) before stability check.					
	For slow reaction, set to 0-30 (s).					
Limit Time	Set up limit time (0–9999s) for stability sense.					
	With this parameter, even when potential difference is not below preset "Stability", it starts					
	dosing titration solution.					

<Titration control mode (Method): Intermit>

Chart 4-4-4-3

Parameter	Description			
Cut off Time	et up cut-off time (0–9999s).			
	t dose titration solution at selected time.			
	0 (s) setting means continuous same speed titration.			
(Unit Volume)	Set up dose volume for one time (0.01–50mL).			
When "Cut-off Time" is 0 (s), it does not appear on display.				
Dispense Speed	Set up dispense speed (1–9999s/mL).			

When titration form is Stat, additional items are shown on display as follows:

Chart 4-4-4-4

	Chart 4-4-4			
Parameter	Description			
Rel.Change Lev.	Set up relative potential to switch dose speed (0–999999).			
-	Dispense speed can be changed by this parameter.			
	mV ♠			
	Rel.Change Lev.			
	Offset Level			
1st D. Speed	Set up dose speed (1–9999s/mL) until it reaches switching relative potential.			
Lag Time	Set up interval (0–9999s) for data sampling.			
	In Stat titration, data (titration volume, potential, time) is stored at every selected time.			
Stat Level	Set up potential $(0-\pm 999999)$ for stat control.			
Offset Potential	Set up offset level (0–999999).			
	Even when deviation exists between control potential and detection potential, if it is within			
	offset level, it stops dosing.			
	Offset level is the potential relative to control potential.			
Limit Time	Set up limit time (0–9999s) for titration.			
	Titration ends when the limit time elapses.			

<Titration control mode (Method): Petroleum>

Chart 4-4-4-5

Parameter	Description				
Integral Time	Set up time (0–999999s) to read potential for stability sense.				
integral Time	Potential reading time is for petroleum neutralization number.				
	When 60 s is selected, stability is sensed by potential fluctuation every 60 seconds.				
	JIS K-2501 and ASTM D664 specifies the time setting for 60 s.				
Start Limit					
Start Limit	Set up limit time (0–999999s) for stability sense at start of titration.				
	Potential is read for this time length in the beginning of titration.				
T: '.' (T)'	0 s means no limit time.				
Limit Time	Set up time (0–999999s) to limit stability sense.				
	When the time elapses, it starts data sampling and dispensing.				
1st Dose Vol.	Enter the first dose volume (0.05–0.02mL).				
	When potential change after dosed is smaller than dose switching potential ($\Delta E(1st\rightarrow 2nd)$),				
	it dispenses preset amount of solution.				
2nd Dose Vol.	Enter the second dose volume (0.05–0.02mL).				
	When potential change after dosed is larger than dose switching potential ($\Delta E(1st \rightarrow 2nd)$),				
	it dispenses preset amount of solution.				
	Typically set smaller amount for second dose than the first.				
Stability($\Delta E/\Delta min$)	Set up stability sense value (0–999999).				
	JIS K-2501 and ASTM D664 specifies 5.0(mV/min) for setting.				
	Titrant is dosed when potential change in a minute is within 5.0mV. Even if potential				
	reading time is less than 60 s, set up value converted to 60 seconds.				
$\Delta E(1st\rightarrow 2nd)$	Set up potential $(0-\pm (999999))$ to change dose volume.				
	When potential change becomes larger by reaction and potential difference after dosed				
	becomes greater than preset value, the volume for one time changes from the first volume to				
	second.				
	mV ♠ 2nd Doce Vel				
	2nd Dose Vol.				
	1at Daga Val				
	1st Dose Vol.				
	∫ ΩE(1st→2nd)				
	mL [*]				

4-4-5. Control parameters and default value

<Method 00 (Blank Titration) and 02 (Auto Intermit)>

- Netriod to (Blank Titla)		Titration form and default					
Parameter	Setup range	EP	Full	Level	Lev.&EP	Intersect	Learn *2
End Pont No.	1~5	1	_	_	_	_	1
	1~2	_	_	1	1	1	_
*1 End Sense	Auto/Fix	Auto	Auto		_	Auto	_
ΔE Sense	0~999999	50	50		50		
ΔE/ΔmL Sense	0~999999	100	100		100		
ΔDeg Sense	0~180	_			_	30	
End Point Area	Off/Set	Off	Off		_		
Lower Volume	0~9999	0	0		_		
Upper Volume	0~9999	0	0		_		
Lower Level	0~±9999.9	0	0	_	_	_	_
Upper Level	0~±9999.9	0	0	_	_	_	_
Separation	Off/Set	Off	_	_	_	_	_
Level	0~±9999.9	0	_	_	_	_	_
Level Stop	Off/Set	Off			_		
End Level	0~±9999.9	0	_	_	_	_	_
1st End Level	0~±9999.9	_	_	0	0	_	_
2nd End Level	0~±9999.9	_	_	0	0	_	_
* Auto Simulation	No/Yes	No	No	_	_	No	_
Over Titr.Vol.	0~9999.9	0		0	_		
Gain	1~10	1	1	1	1	1	_
Stability (mV/s)	0~9999.9	0.5	0.5	0.5	0.5	0.5	_
Delay Time	0~9999	1	1	1	1	1	_
Limit Time	0~9999	30	30	30	30	30	
Data Samp. Pot.	0~9999.9	4.0	4.0	4.0	4.0	4.0	_
Data Samp. Vol. (M00)	0~9999.9	0.1	0.1	0.1	0.1	0.1	_
(M03)	0~9999.9	0.5	0.5	0.5	0.5	0.5	_

^{*1} This parameter is not displayed by Blank titration.

^{*2 &}quot;Learn" cannot be selected for the titration form by Blank titration.

<Method01(Auto Titration)>

<method01(auto th="" titrat<=""><th></th><th colspan="4">Titration form and default</th></method01(auto>		Titration form and default					
Parameter	Setup range	EP	Full	Level	Lev.&EP	Intersect	Learn *1
End Pont No.	1~5	1	_	_	_	_	1
	1~2		_	1	1	1	_
End Sense	Auto/Fix	Auto	Auto	_	_	Auto	_
ΔE Sense	0~999999	50	50		50		
ΔΕΔmL Sense	0~999999	100	100	_	100	_	_
ΔDeg Sense	0~180	_	_	_	_	30	_
End Point Area	Off/Set	Off	Off	_	_	_	_
Lower Volume	0~9999.9	0	0	_	_	_	
Upper Volume	0~9999.9	0	0		_		
Lower Level	0~±9999.9	0	0		_		
Upper Level	0~±9999.9	0	0	_	_	_	_
Separation	Off/Set	Off	_	_	_	_	_
Level	0~±9999.9	0	_	_	_	_	_
Level Stop	Off/Set	Off	_		_		
End Level	0~±9999.9	0	_	_	_	_	_
1st End Level	0~±9999.9	_	_	0	0	_	_
2nd End Level	0~±9999.9	_	_	0	0	_	_
Auto Simulation	No/Yes	No	No	_	_	No	_
Over Titr. Vol.	0~9999.9	0	_	0	_		
Gain	1-10	1	1	1	1	1	
Control Speed	Fast/Medium /Slow/Set	Medium	Medium	Medium	Medium	Medium	_
Set Speed	0-10	2.0	2.0	2.0	2.0	2.0	_
Data Samp. Pot.	0~±9999.9	4.0	4.0	4.0	4.0	4.0	
Data Samp. Vol.	0~9999.9	0.5	0.5	0.5	0.5	0.5	

^{*1} Method 01 cannot select "Learn" for titration form. This can be selected by a user defined method which copies method 01.

<Method 03 (Intermit) - 1: Other titration form than Stat>

		Titration form and default				
Parameter	Seup range	EP	Full	Level	Lev.&EP	Intersect
End Pont No.	1~5	1	_	_	_	_
	1~2	_	_	1	1	1
End Sense	Auto/Fix	Auto	Auto		_	Auto
ΔE Sense	0~999999	50	50		50	
ΔE/ΔmL Sense	0~999999	100	100		100	
ΔDeg Sense	0~180				_	30
End Point Area	Off/Set	Off	Off		_	_
Lower Volume	0~9999.9	0	0	_	_	
Upper Volume	0~9999.9	0	0	_	_	_
Lower Level	0~±9999.9	0	0		_	_
Upper Level	0~±9999.9	0	0		_	_
Separation	Off/Set	Off	_		_	_
Level	0~±9999.9	0	_		_	_
Level Stop	Off/Set	Off	_	_	_	_
End Level	0~±9999.9	0	_		_	_
1st End Level	0~±9999.9	_	_	0	0	_
2nd End Level	0~±9999.9	_	_	0	0	_
Auto Simulation	No/Yes	No	No		_	No
Over Titr. Vol.	0~9999.9	0	_	0	_	_
Gain	1-10	1	1	1	1	1
Cut-off Time	0~9999	0	0	0	0	0
Unit Volume	0~9999.9	0.05	0.05	0.05	0.05	0.05
Dispense Speed	1~999	100	100	100	100	100
Data Samp. Pot.	0~±9999.9	4.0	4.0	4.0	4.0	4.0
Data Samp. Vol.	0~9999.9	0.5	0.5	0.5	0.5	0.5

<Method 03 (Intermit) - 2: Titration form is Stat>

		Titration form and default		
Parameter	Setup range	Stat		
Gain	1~10	1		
Cut-off Time	0~9999	0		
Unit Volume	0~9999.9	0.05		
Dispense Speed	1~100	100		
Rel. Change Lev.	0~9999.9	0		
1st D. Speed	1~999	50		
Lag Time	0~9999	30		
Stat Level	0~±9999.9	0		
Limit Time	0~9999	0		
Offset Potential	0~±9999.9	0		

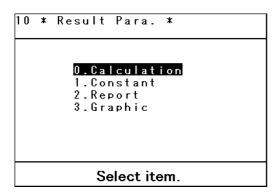
<Method06 (Petroleum Titr.)>

			Titratio	on form and	d default	
Parameter	Setup range	EP	Full	Level	Lev.&EP	Intersect
End Pont No.	1~5	1	_	_	_	_
	1~2	_	_	1	1	1
End Sense	Auto/Fix	Auto	Auto			Auto
ΔE Sense	0~999999	50	50		50	_
ΔE/ΔmL Sense	0~999999	100	100		100	
ΔDeg Sense	0~180		_			30
End Point Area	Off/Set	Off	Off			_
Lower Volume	0~9999.9	0	0			_
Upper Volume	0~9999.9	0	0			_
Lower Level	0~±9999.9	0	0			_
Upper Level	0~±9999.9	0	0			_
Separation	Off/Set	Off	_	_	_	_
Level	0~±9999.9	0	_	_	_	_
Level Stop	Set/Off	Off	_			_
End Level	0~±9999.9	0	_			_
1st End Level	0~±9999.9	_	_	0	0	_
2nd End Level	0~±9999.9	_	_	0	0	_
Auto Simulation	No/Yes	No	No	_	_	No
Over Titr.Vol.	0~9999.9	0	_	0		_
Gain	1~10	1	1	1	1	1
Integral Time	0~9999	60	60	60	60	60
Start Limit	0~9999	0	0	0	0	0
Limit Time	0~9999	0	0	0	0	0
1st Dose Vol.	0.05~0.2	0.1	0.1	0.1	0.1	0.1
2nd Dose Vol.	0.05~0.2	0.05	0.05	0.05	0.05	0.05
Stability(ΔE/min)	0~9999.9	5.0	5.0	5.0	5.0	5.0
$\Delta E(1st\rightarrow 2nd)$	0~±9999.9	30	30	30	30	30
Data Samp. Pot.	0~±9999.9	4.0	4.0	4.0	4.0	4.0
Data Samp. Vol.	0~9999.9	0.5	0.5	0.5	0.5	0.5

4-5.[Result] parameter setup

4-5-1.Outline of [Result]

Press [Result] key.



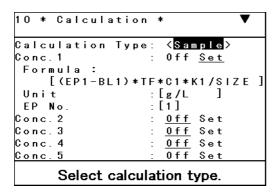
Display changes as above. Select the item by cursor using $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key. Below chart shows the description of each item.

Chart 4-5-1

	0.10.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.		
Parameter	Description		
Calculation	Set up calculation formula for concentration.		
	Up to five formulas can be set up freely.		
Constant	Set up constant for concentration calculation like concentration conversion coefficient, unit		
	conversion coefficient, etc.		
Report	Set up print format.		
Graphic	Set up conditions for titration graph like range of graphic curve.		

4-5-2. Calculation formula (Result 0) setup

Press [Result] key, and select "Calculation".



The display changes as above. Select the item by cursor using $[\uparrow]$, $[\downarrow]$ key. For details of each parameter, see the following chart 4-5-2-1, 4-5-2-2 and 4-5-2-3.

Chart 4-5-2-1

Parameter		Descri	ntion			
Calculation Type	-	Set up a kind of formula (Sample/Factor/Blank). This is for use of statistics and auto input of factor and blank.				
Conc-1	Set up formul	a 1 (Off/Set).				
(Formula)	are [] () and BL1- BL20 EP1 - EP5 C1 - C5 K1 - K5 CO1 - CO5 D TF TN TMW TEQN	ion formula. This appears when a l+, -, ×, ÷, and the following co : Blank value : Titration volume : Concentration converted value : Unit conversion coefficient : Previous concentration : Fixed dose volume : Titrant factor value : concentration of titration solution : Molecular weight : Equivalent number	size smw seqn mw eqn r dri pk1 - pk5 n1 - n5 dmw	to 50 characters can be used. : Sample size : Sample molecular weight : Sample equivalent number : Molecular weight : Equivalent number : Constant : Drift level (Karl Fischer) : Acid dissociation constant : Concentration : Molecular weight of fixed dose		
	DF DN	: Factor of fixed dose : Concentation of fixed dose	DEQN	: Equivalent number of fixed dose		
(Unit)	-	express calculation results.				
(EP No.)	Enter EP num	ber to execute the calculation.				

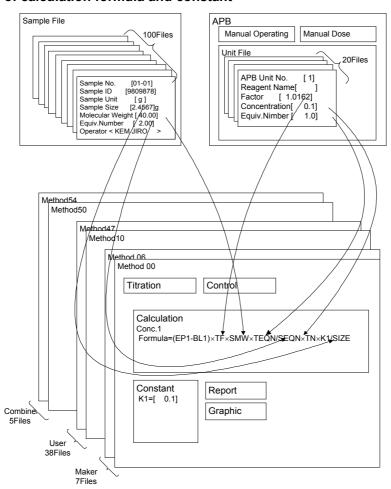
Chart 4-5-2-2

Parameter	Description				
(Level or EP)	Select priority order of endpoints (EP/Level)				
	This appears when titration form is Level & EP.				
	EP : The endpoint by Auto Stop has priority for calculation. If an endpoint is not found by Auto Stop till it reaches max volume, the Level is adopted as EP for calculation.				
	Level : The endpoint by End Level has priority for calculation. If it does not reach the level				
	till max volume, the endpoint by Auto Stop is adopted as EP for calculation.				
(Blank Replace)	Set up auto entry of blank value (1-20).				
	This appears when Calculation type is blank.				
Conc-2~Conc-5	The same as Conc-1 appears.				
Temp. Comp.	Select temperature compensation of titration solution (Auto/Manual/Off).				
	Manual: manual temperature compensation				
	Auto: automatic compensation by optional temperature sensor (984305350)				
	Off: not perform temperature compensation				
(Titrant Temp.)	Set temperature (0–100°C) of titration solution				
	This appears when Temp. Comp is "Manual".				
(Correct Temp.)	Set compensated temperature (0–100°C).				
(A Parameter)	Set conversion coefficient A (0–±999999).				
(B Parameter)	Set conversion coefficient B (0–±999999).				
	Temperature compensation formula is as follows:				
	$V=V_0\times(1+A\times\Delta T\times 10^{-3}+B\times\Delta T^2\times 10^{-6})$				
	V(mL) : titration volume after compensation				
	$V_0(mL)$: titration volume				
	ΔT (°C) : compensated temperature – temperature of solution				
	A, B : conversion coefficient				

Chart 4-5-2-3

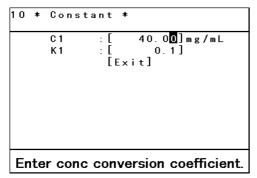
Calculation Type			Example of calculation formula		
Sample	When fixed volume is	Normal $(EP_n-BL_n)\times TF\times C_n\times K_n/SIZE$			
	not included	titration	$(EP_n-EP_{n-1})\times TF\times C_n\times K_n/SIZE$		
		Back	$(BL_n-EP_n)\times TF\times C_n\times K_n/SIZE$		
		titration			
	When fixed volume is	Normal	$((EP_n – BL_n) \times TF \times C_n + D \times DF \times C_{n+1} \times K_n) / SIZE$		
	included	titration	$((EP_n - EP_{n-1}) \times TF \times C_n + D \times DF \times C_{n+1} \times K_n) / SIZE$		
	Hydroxyl value		$((EP_n - BL_n) \times TF \times C_n \times K_n + SIZE \times K_{n+1}) / ((EP_n - BL_n) \times TF \times C_n \times K_n + SIZE \times K_{n+1}) / ((EP_n - BL_n) \times TF \times C_n \times K_n + SIZE \times K_{n+1}) / ((EP_n - BL_n) \times TF \times C_n \times K_n + SIZE \times K_{n+1}) / ((EP_n - BL_n) \times TF \times C_n \times K_n + SIZE \times K_{n+1}) / ((EP_n - BL_n) \times TF \times C_n \times K_n + SIZE \times K$		
			K_{n+2} +SIZE× K_{n+3})+R		
	Dessociation		PK_n		
	Constant of acid	The dissociation constant of acid is defined as follows.			
			pKa=pH-log <u>[B]</u> [HB [*]]		
		BH⁺ , B+H [⁺]			
		From this Eq., [B]=[HB+], that is, half neutralized pH shows pKa.			
		More precisely, approximately [B]=[HB+] at half equivalent point,			
		however, due to little error at pKa3-11, the pH at half equivalent point			
		is regarded	as pKa.		
Factor	Factor	Normal titra	ation $(SIZE \times R \times K_n)/((EP_n - BL_n) \times C_n)$		
		Back titration	on $(SIZE \times R \times K_n)/((BL_n - EP_n) \times C_n)$		

<Relation of calculation formula and constant>



4-5-3. Calculation constant setup (Result 1)

Select "Constant" by [Result] key.



The display changes as above. Select the item by cursor using $[\uparrow]$, $[\downarrow]$ key. For details of each parameter, see Chart 4-5-3.

Chart 4-5-3

Constant	Description		
C1~C5	Enter concentration conversion value (00-999999mg/mL).		
	For example, when NaOH is titrated with 1mol/L-HCl:		
	The reaction formula is HCl+NaOH \rightarrow NaCl+H ₂ O, and the reaction is 1:1.		
	That is, since molecular weight of NaOH is 40.00, 40.00mg NaOH is consumed per		
	1mL of 1mol/L-HCl. That means C1=40.00mg/mL.		
K1~K5	Enter unit conversion coefficient (0-999999) for unit like % or ppm. For example, For		
	calculation in % unit of titration results of NaOH with 1mol/L-HCl, the concentration		
	formula is:		
	NaOH(%)=(EP1-BL1)×TF×C1×K1/S		
	EP1:10(mL), BL1=0.02(mL), TF=1.006, C1=40.00(mg/mL)		
	For S: 5.0000(g), enter K1=0.1. For results in ppm, enter K1=1000		
MW, TMW, DMW	Enter molecular weight. TMW, DMW appears in recalculation.		
EQN, TEQN, DEQN	Enter equivalent number. TEQN, DEQN appears in recalculation.		
N1~N5, TN,DN	Enter reagent concentration. TN, DN appears in recalculation.		
R	Set up a constant.		
DRI	Drift level (Karl Fischer)		
D	Fixed dose volume		
BL1~BL20	Blank level appears in recalculation.		
TF	Set up factor of titration solution which appears in recalculation.		
DF	Factor value of reagent used in fixed dose, which appears in recalculation.		

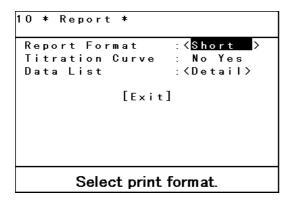
Note!

The constants set by [Sample], [APB] key appear only in recalculation.

4-5-4. Print parameter (Result 2)

Measurement results are printed in the format and contents by this parameter entry.

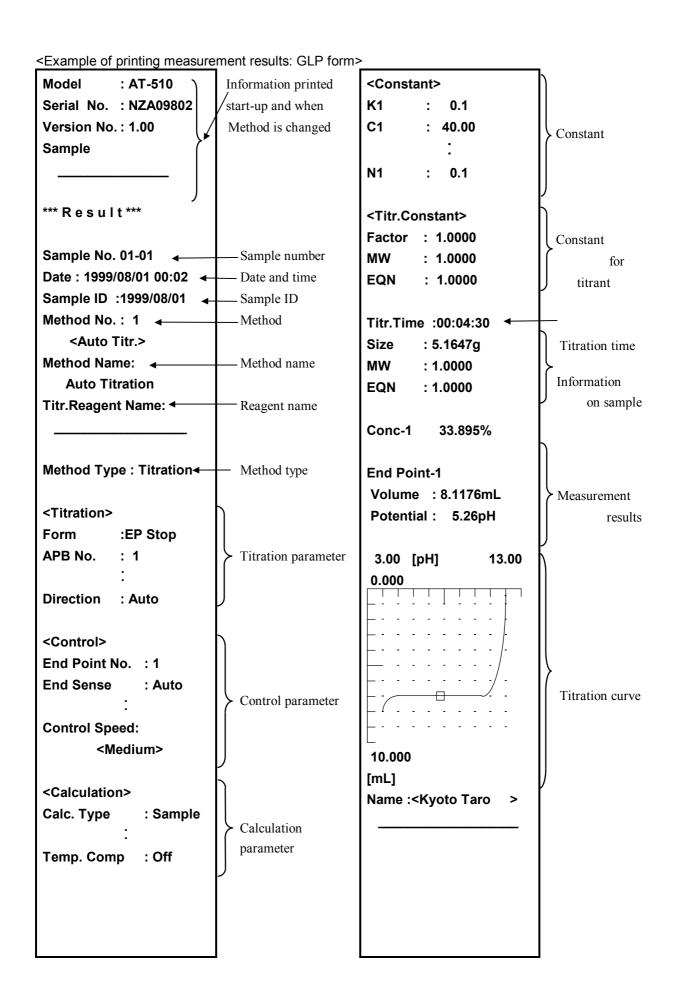
Press [Result] key, and point "Report" by the cursor and confirm by $[\ \]$ key.

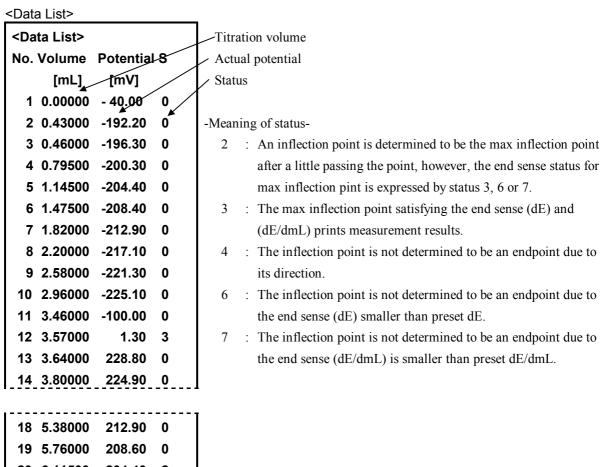


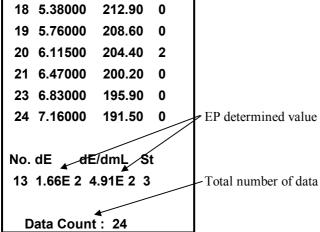
The display changes as above. Select the item by cursor using $[\uparrow]$, $[\downarrow]$ key and select by $[\leftarrow]$, $[\rightarrow]$ key. For details of setup, see Chart 4-5-4.

Chart 4-5-4

Item	Description				
Report	Select print format (Off/GLP/Short/Variable)				
	Off : no printing				
	GLP : all items required by GLP are printed.				
	Short : minimum necessary items are printed.				
	Variable : desired items are printed.				
Titration Curve	Select Yes or No to print titration curve.				
	Yes : prints out titration curve. The range of the curve depends on Result-Graphic				
	setting.				
	No : no printing the curve.				
Data List	Select printing data list of measurement results (Off/Short/Detail)				
	Off : no printing the list.				
	Short : prints the endpoint, data number, potential difference and differential				
	difference				
	Detail : prints Data list and Short form.				





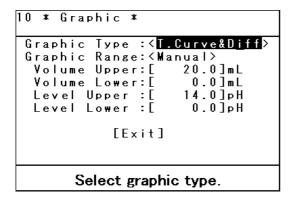


Note!

Data lists of all measurement results are stored, however, those data lists are not printed where learn titration was performed or no titration was performed.

4-5-5. Graphic setup (Result 3)

Press [Result] key and select "Graphic".



The display changes as above. Point the cursor on the item by $[\uparrow]$, $[\downarrow]$ key. For details of each item, see Chart 4-5-5.

Chart 4-5-5

Item	Description					
Graphic Type	Select a type of titration curve (Titration Curve/Titr.Curve+Diff.)					
	Titration Curve : displays titration curve only.					
	Titr.Curve +Diff. : displays titration curve and differential curve.					
Graphic Range	Select range mode (Auto/Fix) for titration curve:					
	Auto : changes the range according to the titration curve.					
	Fix : displays the curve within the range of titration volume and potential.					
(Volume Upper)	Set up upper limit (0–9999mL) of titration.					
	Displays when Graphic Range is Fix.					
(Volume Lower)	Set up lower limit (0–9999mL) of titration.					
	Displays when Graphic Range is Fix.					
(Level Upper)	Set up upper limit (0-±999999) of potential.					
	Displays when Graphic Range is Fix.					
(Level Lower)	Set up lower limit (0–±999999) of potential.					
	Displays when Graphic Range is Fix.					
(Time Upper)	Set up upper limit (0–9999s) of titration time.					
	Displays when Graphic Range is Fix and titration form is Stat.					
(Time Lower)	Set up lower limit (0–9999s) of titration time.					
	Displays when Graphic Range is Fix and titration form is Stat.					

4-6. Sample parameter setup

4-6-1. Outline of sample condition

Sample condition consists of sample number, sample ID, sample unit, sample size, etc.

This section describes sample conditions when the unit is used singly.

When optional peripheral like auto sampler is connected, refer to 6. Options.

4-6-2. Sample condition setup (Sample)

When [Function] key is pressed to show "Sample File" and if "No" is selected, the following description appears. For "Yes" on "Sample File", see 6-1-4 Sample condition setup.

Press [Sample] key.

```
* Sample *
 Sample
        Nο.
                     [01-01]
                       99080101]
 Sample
        I D
                     <g >
[1.2567]g
 Sample Unit
 Sample Size
                     [ 40.00]
 Molecular Weight:
 Equiv. Number
 Operator
            :<Kyoto Taro
            [Exit]
        Enter sample size.
```

The display changes as above. Point the item by cursor using $[\uparrow]$, $[\downarrow]$ key and set up by $[\leftarrow]$, $[\rightarrow]$ key or alphanumeric keys. For details, see Chart 4-6-2.

Chart 4-6-2

Item	Description
Sample No.	The individual number of a sample. The number consists of [high order No. – low order
	No.] $(00-00 \sim 99-99)$, and the low order number increments by measurement until the
	high order number is changed.
	When a different sample is measured, use a different high order number for statistical
-	processing.
Sample ID	Name a sample by a lot number or individual sample name.
Molecular Weight	Set up molecular weight (0–999999) of a sample for measurement.
	SMW in formula stands for this parameter.
Equiv. Number	Set up equivalent number (0–999999) of a sample for measurement.
	SEQN in formula stands for this parameter.
Sample Unit	Select a unit for sample (g/mg/mL).
Sample Size	Enter the amount of a sample (0.0000–999999).
Operator	Select the operator.
	Register the operator name or code on "Regist Operator" of "Setup".

Note!

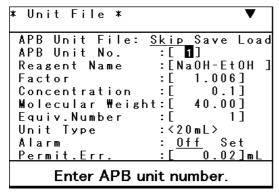
Only Size can be set up when Size Only is selected on Sample File of Function.

4-7.Information on reagent (APB2)

Unit File is a file collecting information on the burette unit including reagent (reagent name, its concentration, factor, calculation constant) and precision check record, etc.

The unit file is built-in and 20 of them are available, and when used in titration, the calculation formula automatically uses its factor and other constant.

Press [APB] key to show "Unit File".



The display changes as above. Point the cursor on the item for setting. Foe details see Chart 4-7.

Chart 4-7

Item	Description
APB Unit File	Operates APB unit file (Skip/Save/Load).
APB Unit No.	Enter a number for APB unit file (1-20).
Reagent Name	Enter the reagent name
Factor	Enter reagent factor (0–999999).
	When factor measurement is performed, it is automatically entered. When "7-13 auto
	input function of statisties and factor/blank is setup, the average value of the factor
	measured continuously is inputted automaticaly. In calculation formula, TF(titration
-	solution) or DF(fixed dose solution) stands for this parameter.
Concentration	Enter reagent concentration (0–999999).
	In calculation formula, TN (titration solution) and DN(fixed dose solution) stand for this.
Molecular Weight	Enter reagent molecular weight (0–999999).
	In calculation formula, TMW,DMW stands for this parameter.
Equiv. Number	Enter equivalent number (0–999999) of reagent.
	In calculation formula, TEQN,DEQN stands for this parameter.
Unit Type	Select a burette of different capacity (1mL/5mL/10mL/20mL/50mL)
	This can be the parameter to check precision of the burette.
Alarm	Select Yes or No to set up alarm for remaining reagent (Off/Set).
(Volume)	Enter total reagent volume when the reagent is changed.
(Lower Volume)	Set up the lower limit of remaining reagent for alarm.
(Next Replace)	Set up a date for replacing reagent.
Permit. Err.	Set up tolerance (0–9999) for precision check of a burette.

Note!

To display alarm message, Alarm setup has to be made by setting Lower Volume and Next Replace.

5. Measurement results (Function 1)

5-1. Outline of measurement results

Measurement results are stored in data file one after another. This section describes various functions using the data. See Chart 5-1.

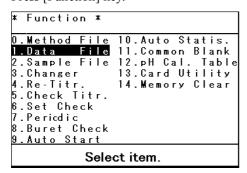
Chart 5-1

Function	Description
Statistics	The data can be edited into statistical data (Mean, SD, RSD).
	By defining titration conditions, sample numbers, method name and calculation, statistics
	can be obtained for a defined group.
Re-Calculation	Recalculation of a data file can be performed by changing calculation constant or sample
	size.
Data Simulation	Re-detection of an endpoint can be performed when inflection point was too small in ratio
	to determine an endpoint. The results of combined titration cannot be used for the
	simulation of endpoints.
Load	Data file in PC card is read and stored in Main unit.
	For details, see "Read/store of data in PC card".
Save	Data file can be stored in PC card.
	For details, see "Read/store of data in PC card".

Note!

Maximum number of measurements that can be stored is 100. If it exceed 100, the oldest data are erased and replaced by new ones.

Press [Function] key.



The display changes as above. Point the cursor to "Data File" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.

* Da	ata	File	*			
No.I	1. No	o. Me	t h o d	Name	S.No.	T
0.1	12	Fact	or N	a 0 H	01-01	F
02	12	Fact	or N	a 0 H	01-02	F
*03	12	Fact	or N	a 0 H	01-03	F
0 4	13	Blan	k Ac	idity	02-01	В
05	3	Blank	k Ac	idity	02-02	В
*06	13	Blanl	k Ac	idity	02-03	В
0.7	20	Acid	ity	apple	05-01	S
0.8	20	Acid	ity	apple	05-02	S
Dat	ta S	Simul:	atio	n] [St	atistics	s]
[Re	Сa	l cula:	<u>tion</u>] [Sav	e] [Load	1]
	Select desired item.					

The display changes as above. Select by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.

If a data needs to be deleted from statistical calculation, point the data by cursor and press [Disp.] key. The (*) mark appears to the next of the data number, and the data will be included in the statistics. To cancel, press [Disp.] key again. The (*) mark disappears.

<Remarks of Data file>

	Training of Burn III.					
* Da	ta	File	*			
No.M	1. No	o. Met	hod	Name	<u> S.No.</u>	T
0.1	12	Facto	r Na	a 0 H	01-01	F
02	12	Facto	r Na	a 0 H	01-02	F
*03	12	Facto	r Na	a 0 H	01-03	F
0.4	13	Blank	Аc	idity	02-01	В
0.5	3	Blank	Аc	idity	02-02	В
*06	13	Blank	Аc	idity	02-03	В
0.7	20	Acidi	ty :	apple	05-01	S
0.8	20	Acidi	ty a	apple	05-02	S
[Data Simulation] [Statistics]						
					ive] [Loa	
Select desired item.						

M.No. : Method No. used for measurementsMethod Name : Method name used for measurements

S.No. : Sample number
T : Calculation type

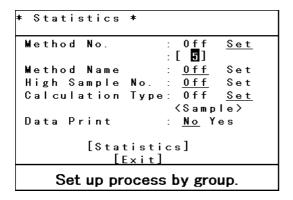
F Measurement results on Factor
 B Measurement results on Blank
 S Measurement results on Sample

Note!

Calculation type will not be indicated for the results of combined titration.

5-2. Statistics

Press [Function] key to show "Data File" and select "Statistics".



The display changes as above. Use $[\uparrow]$, $[\downarrow]$ key to move the cursor to the desired item, and select the parameter by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\rightarrow]$ key. For details of statistical setting, see Chart 5-2.

Chart 5-2

Item	Description
Method No.	Statistical computation for a group of data is performed on those data of defined method numbers (00-06, 10-47, 50-54).
Method Name	Statistical computation for a group of data with specified name.
Sample No.	Statistical computation for a group of data of high order sample number.
Calc. Type	Statistical computation for a group of data of defined calculation type (Blank/Sample/Factor).
Data Print	Prints out statistical results after calculation.

Note!

Statistical calculation is complete when all the selected items are satisfied. When selection of Method number is not "Set", calculation is performed for Method 00-47. For statistical computation for data of Method 50-54, Method number must be specified.

Point the cursor on "Statistics" and confirm by [] key, then computation will start.

```
* Statistics *

Titration Type : Normal Conc. No. : 1 2 3 4 5

Results: 5
Mean : 48.052%
SD : 0.0111%
RSD : 0.0231%
[Exit]

Select concentration number.
```

The display changes as above. The display shows the results of statistics for calculation formula 1. When there is a plural number of concentration calculation formula, No.2 and onward formulas can be shown by $[\leftarrow]$, $[\rightarrow]$ key. The results of statistical computation (all calculation formulas) can be printed out by [Print] key.

Point "Exit" by cursor and press [→] key to return to previous display.

<Statistical calculation>

The statistical calculation results with Mean (mean value), SD (standard deviation) and RSD (relative standard deviation). RSD is the same as CV (coefficient variance).

Mean, SD and RSD are calculated as follows:

Where n number of data: X1, X2,Xn;

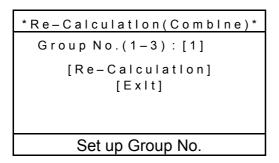
Mean
$$(\overline{X})$$
 = $\frac{(X1 + X2 + \Lambda + Xn)}{n}$
 SD = $\sqrt{\frac{\sum_{i=1}^{n} (Xi - \overline{X})^{2}}{n-1}}$
 RSD = $\frac{SD}{\overline{X}} \times 100(\%)$

Note!

When Mean value is zero, RSD does not come to zero but the display screen and printing will become blank (space).

5-3.Re-Calculation

In case of Standard Method (No.00-06) or User defined Method (No.10-47), the results of re-calculation appear as shown below to the left. On the other hand, Combined Method (No.50-54) shows the message prompting entry of group numbers of the combined Method for executing re-calculation. Enter group numbers and confirm with $[\ \]$ key. After the group numbers are confirmed, point the cursor on "Re-Calculation" with $[\ \]$ key, and confirm with $[\ \]$ key.



The display changes as above. For details, see Chart 5-3.

Chart 5-3

Item that can be changed	Description	
Sample size	Press [Sample] key to change "Size".	
	Point "Exit" by cursor and press [→] key. The results of recalculation will appear.	
Calculation formula	Press [Result] key to select "Calculation" and change concentration formula.	
	For details, see "4-5-2. Calculation formula setup".	
	When [Esc] key is pressed. The results of recalculation will appear.	
Constant	Press [Result] key to select "Constant" and change each constant.	
	When [Esc] key is pressed. The results of recalculation will appear.	
Print format	Press [Result] key to select "Report" and change print format.	
	When [Esc] key is pressed. The results of recalculation will appear.	
Reprint	Press [Print] key. (#) mark appears to sample number after printed.	

<Example of printout>

Model : AT-510 Serial No. : NZA09802 [Re-Calculation]

Sample No. : 01-01 (#)
Date : 1999/08/05 00:24
Sample ID : 99080501

Method No. : 10 <Auto Titr.>

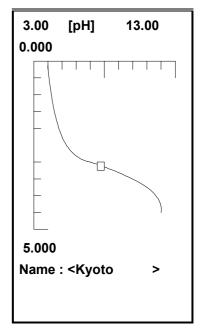
Method Name: Juice

Titr.Time :00:00:55

Size : 5.0000mL MW : 1.0000 EQ : 1.0000 Conc-1 0.8227

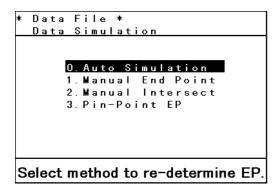
End Point-1

Volume : 2.2234mL Potential : 8.3pH



5-4. Data Simulation

Simulation is used to re-detect the endpoint when inflection on titration curve is too small to find an endpoint. Press [Function] key to show "Data File" and point the cursor on a data for EP re-detection using $[\uparrow]$, $[\downarrow]$ key. Point the cursor on "Data Simulation" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\dashv]$ key.



The display changes as above. Point the cursor on the re-detection method by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key. Four methods are available for simulation as shown in Chart 5-4.

Chart 5-4

EP re-detection method	Description	
Auto Simulation	When an endpoint is not found, it automatically sets EP sense and detects preset number of endpoints. This method is applicable to EP Stop, Full and Intersect titration forms.	
Manual End Point	An endpoint is determined where the preset end sense is satisfied. This method is applicable to EP Stop and Intersect titration form.	
Manual Intersect	An endpoint is determined where desired two lines cross a point. This method is applicable to all titration forms except Stat.	
Pin-Point EP	Any desired point on titration curve can be an endpoint. This method is applicable to all titration forms except Stat.	

Note!

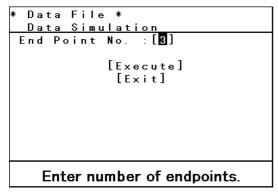
When simulation is executed, end sense parameters (potential difference, differential difference or angle difference) for the Method are automatically adjusted.

Simulation does not apply to the results of Learn titration and Combined titration.

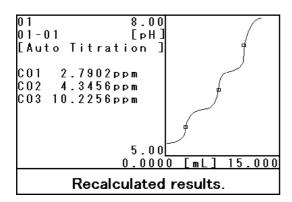
5-4-1. Auto Simulation

Press [Function] key to show "Data file", and select the data for simulation by cursor using $[\uparrow]$, $[\downarrow]$ key. Point the cursor on "Data Simulation" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\rightarrow]$ key.

Select "Auto Simulation".



The display changes as above. Enter the number of endpoint and confirm by $[\ \]$ key.

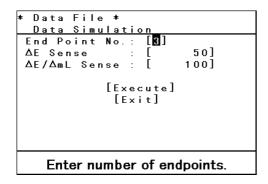


When simulation is finished, the display changes as above. Press [Print] to print out the results to the format selected on "Report". (#) mark will appear to the sample number to show that it is simulated.

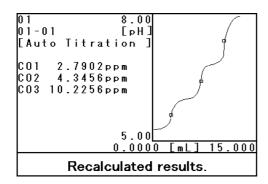
5-4-2. Manual End Point

Press [Function] key to show "Data file", and select the data for simulation by cursor using $[\uparrow]$, $[\downarrow]$ key. Point the cursor on "Data Simulation" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\rightarrow]$ key.

Select "Manual End Point".



The display changes as above. Enter the number of endpoint and end sense value confirm by $[\bot]$ key.

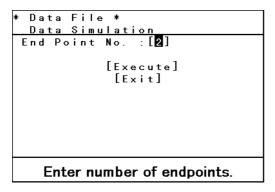


When simulation is finished, the display changes as above. Press [Print] to print out the results to the format selected on "Report". (#) mark will appear to the sample number to show that it is simulated.

5-4-3.EP re-detection by Manual Intersect

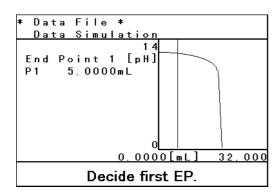
Press [Function] key to show "Data file", and select the data for simulation by cursor using $[\uparrow]$, $[\downarrow]$ key. Point the cursor on "Data Simulation" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\rightarrow]$ key.

Select "Manual Intersect".



The display changes as above.

Enter the number of EP (max 2 points) and confirm by $[\bot]$ key.



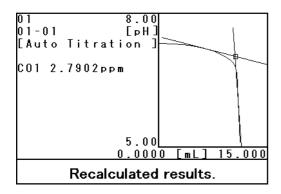
The display changes as above. Move the cursor line to the start point of first tangent using $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\rightarrow]$ key.

Then, move the cursor line to the end of first tangent and confirm by $[\downarrow]$ key.

Continue these steps to decide the second tangent.

The crossing point of first and second tangent is the EP1.

If the number of endpoint is two, the second EP is decided by following the same steps.



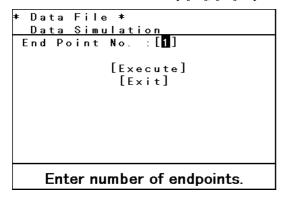
When EP re-detection is finished, the display changes as above. Press [Print] to print out the results to the format selected on "Report". (#) mark will appear to the sample number to show that it is simulated.

Note!

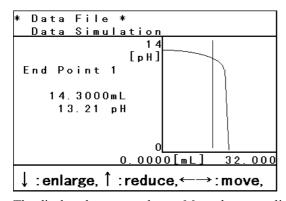
The results of Manual Intersect will be cleared when other method of EP re-detection is executed.

5-4-4.Pin-Point EP detection

Press [Function] key to show "Data file", and select the data for simulation by cursor using $[\uparrow]$, $[\downarrow]$ key. Point the cursor on "Data Simulation" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\rightarrow]$ key.



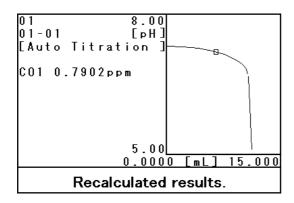
Enter the number of endpoints and confirm by [→] key.



The display changes as above. Move the cursor line to the vicinity of endpoint by $[\leftarrow]$, $[\rightarrow]$ key. The titration volume and EP potential at a point of cursor appear.

When $[\uparrow]$ key is pressed, the vicinity of cursor line is enlarged, and when $[\downarrow]$ is pressed, the enlarged area is reduced to the original size.

When $[\ \]$ key is pressed, the endpoint is decided. Continue this step for the preset number of endpoints.



When the last endpoint is decided, the display changes as above. Press [Print] to print out the results to the format selected on "Report". (#) mark will appear to the sample number to show that it is simulated.

6.Options

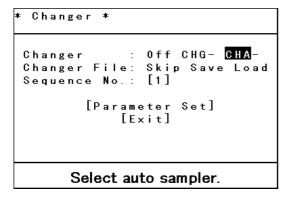
6-1. Multiple Sample Changer (Function 3)

When the unit is connected to the auto sampler, continuous measurements of the same sample can be automated or a different type of sample can be repeated continuously.

The auto sampler also performs pre-dose, electrode cleaning or drain the waste in beaker automatically. For details, refer to the manual of the sampler.

6-1-1. Select a sample changer

Press [Function] key. Point the cursor on "Changer" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Select the sampler to connect by $[\leftarrow]$, $[\rightarrow]$ key.

Chart 6-1-1

Item to select	Auto sampleler that can be connected:
Off	When auto sampler is not connected
CHA-	When CHA-500-12 or CHA-500-18 is connected
CHG-	When CHG-310 or CHG-510 is connected

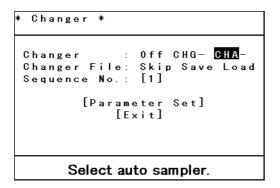
Note

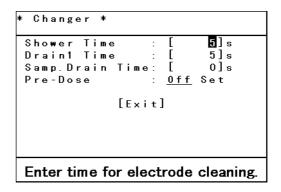
For details of connecting and usin the auto sampler, refer to its operation manual.

6-1-2. Standard sequence

For automatic rinsing in CHA-500, the rinse sequence has to be set up on AT-510. Five types of difference sequence are provided: standard sequence (1 to 4) and user defined sequence (5). In this section, standard sequence is explained.

Press [Function] key to select "Changer". Select CHA- on Changer. Sequence 1 to 4 can be selected. Point [Parameter Set] by cursor and confirm by [4] key.





The display changes as above. See Chart 6-1-2 for more details.

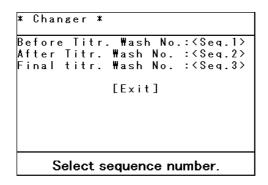
Chart 6-1-2

Setup item	Description	
Shower Time	Set up showering time (0-9999s) for electrode in rinse bath.	
Rinse Time Set up dispensing time (0-9999s) of solvent to the electrode rinse bath.		
Drain1 Time	Set up draining time (0-9999s) after shower in the bath.	
Drain2 Time	Set up draining time (0-9999s) of solvent from the bath.	
Wait Time	Set up time (0-9999s) for dipping or regenerating the electrode in the bath.	
Sample Drain Time	Set up time (0-9999s) to drain out the sample liquid.	
	This is set up when optional post treatment is connected.	
Pre-Dose	Select fixed dose for pretreatment (Off/Set).	
(Dose APB)	Select Yes/No of fixed dose using APB-510.	
	This appears when Pre-dose is Set.	
(Pump Time)	Set up time (0-9999s) for fixed dose by pump.	
	This appears when Pre-Dose is Set.	
	This is set up when the fixed dose pump is connected.	
(Dose Wait Time)	Set up time (0-9999s) to wait after fixed dose at pretreatment.	
	This appears when Pre-Dose is Set.	
	This time delay is useful for a sample to dissolve or to react after fixed dosed.	

6-1-3.User sequence

For automatic rinsing in CHA-500, the rinse sequence has to be set up on AT-510. Five types of difference sequence are provided: standard sequence (1 to 4) and user defined sequence (5). In this section, user sequence is explained.

Press [Function] key to select "Changer". Select CHA- on Changer. Select sequence 5. Point [User Sequence] by cursor and confirm by [4] key.



The display changes as above. User sequence has three types of setting. See chart 6-1-3-1 for details.

Chart 6-1-3-1

Type of setting	Description
Before Titr.Wash No.	Set up rinse sequence at start-up of auto sampler.
	Up to 5 sets of rinse sequence can be stored.
After Titr. Wash No.	Set up rinse sequence after titration is over.
	Up to 10 sets of rinse sequence can be stored.
Final Titr. Wash No.	Set up rinse sequence after all measurements are over.
	Up to 5 sets of rinse sequence can be stored.

Select sequence number to edit and show individual file.

* Changer *	:	▼	
1. Showe	r > 2.<	Rinse1 >	
3.<₩.Stir.	$0n \rightarrow 4.<_{-}$	Shower >	
5. < Drain	1 > 6.<	>	
7.<	- > 8.<	>	
9.<	- >10.<	>	
11.<	- >12.<	>	
13. <	- >14.<	>	
15.<	- >16.<	>	
17.<	- >18.<	>	
19.<	- >20.<	>	
Select desired event.			

The display changes as above. Select the event command by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key. Up to 20 sets of event command can be set.

The meaning of each command is described in Chart 6-1-3-2.

Chart 6-1-3-2

Command	Description		
Shower	Washing by shower in the rinse bath.		
Rinse	Delivery of rinse solvent into the bath.		
	Active time is set by Rinse Time.		
Drain1	Drain the shower solvent from the bath.		
	Active time is set by Drain 1 Time.		
Drain2	Drain the solvent from optional pump.		
	Active time is set by Drain 2 time.		
Wait	Dip the electrode in the rinse bath.		
	Use this command to regenerate the electrode after non-aqueous titration.		
W.Stir.On	Turn On the stirrer at rinse position.		
W.Stir.Off	Turn Off the stirrer at rinse position.		
T.Stir.On	Turn On the stirrer at titration position.		
T.Stir.Off	Turn Off the stirrer at titration position.		
	Set up closing the sequence.		

For time setting of each event, see Chart 6-1-2 Standard Sequence.



User defined sequence is specified by individual user, and we are not liable for any unexpected measurement results caused by the sequence.

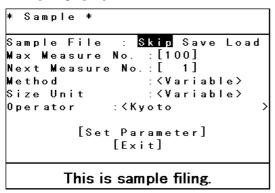
For example:

Prolonged measurement due to unstable potential caused by insufficient regeneration of electrode after non-aqueous titration or unexpected gas generated by mixing different solutions due to insufficient Drain 1Time/Darin 2 Time in separate draining.

6-1-4. Sample condition setup (Sample)

If a multiple sample changer is connected, show "Sample File" of "Function". Confirm the "Sample File" is "Yes", and then confirm the setting of "Size only".

Press [Sample] key.



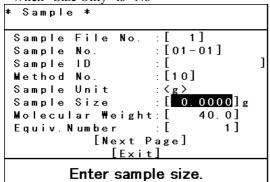
The display changes as above. For each parameter setting see chart 6-1-4-1 below.

Chart 6-1-4-1

Type of setting	Description		
Sample File	Set up operating PC card (Skip/Save/Load).		
	Skip: Sample File stored in Main unit is used.		
	Save: Saple File in Main unit is copied to PC card.		
	Load: Sample File in PC card to Main unit.		
Max Measure No.	Set up the number of samples (1-100) in Sample File.		
	* Set up the number of samples on the rack of auto sampler.		
Next Measure No.	Set up the conditional number (1-100) in Sample File for the next measurement.		
	This number is not the number on the carousel. This is a conditional table number.		
	<in 3="" case="" measure="" next="" no.="" of=""></in>		
	Max Measure No.=100		
	1 · 2 · 3 · 4 · 5 · · · 98 · 99 · 100 Next Measure No.=3		
	3 · 4 · 5 · · · 98 · 99 · 100		
	Number of samples=(Max Measure No.)-(Next Measure No.)+1 = 98 measurements		
Method	Select Variable or Current for measuring condition for each sample. This cannot be		
	chosen when "Size Only" is "Yes".		
Size Unit	Select Variable or Current for sample size unit.		
	This cannot be chosen when "Size Only" is "Yes".		
Operator	Enter the operator's name.		
	This cannot be chosen when "Size Only" is "Yes".		

For sample parameter setup, point [Set Parameter] by cursor, and then confrim by $[\ \]$ key.

<u><When "Size Only"</u> is "No">



Sample S. No Sample 5.0 00] 01 - 01990901 2 01-02 4.9802] 990901 01-03 3 5.0123] 990901 02-01 4.9902] 990803 02-02 4.9891] 99080302 - 034.9625] 990803 03 - 014.9837] 990456 03-02 4.9378] 990456 9 03-03 4.9589] 990456

Enter sample size.

<When "Size Only" is "Yes">

The display changes as above. The contents differ from how "Size Only" is selected. For each parameter, see Chart 6-1-4-2.

Chart 4-6-2

Item	Description			
Sample File No.	Enter the number of Sample File.			
	It is available to set only unmeasured sample file.			
Sample No.	The individual number of a sample. The number consists of [high order No. – low order			
	No.] $(00-00 \sim 99-99)$, and the low order number increments by measurement until the			
	high order number is changed.			
	When a different sample is measured, use a different high order number for statistical			
	processing.			
Sample ID	Name a sample by a lot number or individual sample name.			
Sample Unit	Set up a unit for sample (g/mg/mL).			
Sample Size	Enter the amount of a sample (0.0000~999999).			
Molecular Weight	Set up molecular weight (0~999999) of a sample for measurement.			
	SMW in formula stands for this parameter.			
Equiv. Number	Set up equivalent number (0~999999) of a sample for measurement.			
	SEQN in formula stands for this parameter.			

Note!

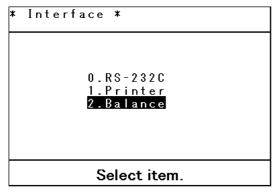
When "Size Only" is "Yes", the display shows as above (right). Setting item is only "Size".

6-2. Using a balance

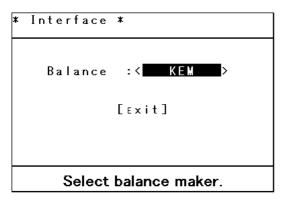
6-2-1. Selecting a balance (Setup 0)

A balance can be connected to this unit for automatic transfer of sample weight or burette precision check. It is important to connect a balance correctly.

Press [Setup] key and select "Interface" by cursor using $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Select "Balance" by cursor using $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Select your balance out of KEM/Mettler/A&D/Shimadzu/Satorius, and confirm by $[\hdot]$ key.



Not all of the balances commercially sold cannot be connected to this unit. Some balance cannot be connected. Check with our dealer or sales rep to see if your balance can be connected.

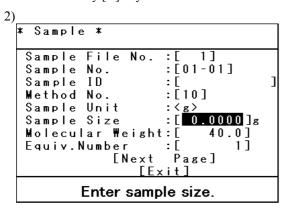
Note!

For balance setting, refer to the manual of the balance.

Use default value for communication between the balance and the unit. Set the balance to send the data continuously to match digital configuration with the unit.

6-2-2. Automatic transfer of sample weight from a balance

1) Press [Sample] key. If Sample File of Function is "Yes", point the cursor on "Set Parameter" using $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



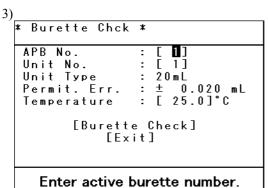
The display changes as above. Point the cursor on "Sample Size" by $[\uparrow]$, $[\downarrow]$ key and press [Disp.] key.

- 3) Place a piece of wax paper or a beaker in the balance to cancel tare. The display of Sample Size on the unit will show 0.0000g.
- 4) Load a sample in the balance.
- 5) "Sample Size" column will show the weight, and when the reading is stable, press [] key. The sample weight is transferred and input in AT-510 at this point.

6-2-3. Automatic transfer of data for precision check

Burette precision is checked by filling the burette with pure water. The AT-510 with a balance connected can read the weight of delivered water automatically.

- 1) Press [Function] key.
- 2) Point the cursor on "Burette Check" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. According to 7-2. Check method of burette precision, set up parameters by $[\uparrow]$, $[\downarrow]$ key

4) Point the cursor to [Burette check] and press [4] key.

* Burette Check * APB No. (20mL) 10 0.02 mL 25.0 °C Permit. Err. Temperature 20.000 mL 19.9874]g No.1[0]g 0 No.2[m L No.3[0]g 0 шL Ave. m L g Aspirate by Start key.

The display changes as above. Press [Disp.] key while the cursor stays on the first weight entry.

- 6) Place a beaker in the balance and cancel the tare. The reading will become 0.0000g.
- 7) Press [Start] key to activate the burette, which delivers water into the beaker.
- 8) The display will show the delivered weight, and after it is stable, press [→] key. The delivered weight is now input.
- 9) The cursor moves to the second weight entry. Press [Disp.] key and repeat the same steps.

6-3. Connecting other printer

6-3-1. Outline of printer connection

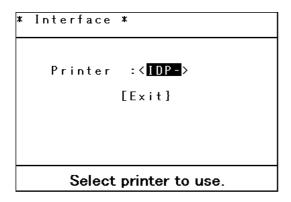
Other than IDP-100 printer, the unit can be connected to other printers listed in Chart 6-3. Match the digital configuration of the printer and the unit.

Chart 6-3

Chart 6-3				
Printer	Connecting cable	Setup on titrator	Printer protocol	
Seiko DPU-414	Connecing cable 980300007	Printer DP-	Set the dip switch as below:	
Citizen CBM-910	Connecing cable 980300004	Printer IDP-	ON Parity: None Data Bits: 8 Stop Bits: 1	
Citizen CBM-270	Connecing cable 980300004	Printer Other	Does not print titration curve. Match digital configuration of printer and titrator.	
Canon BJC-85	Converter (With Connecing cable) 980200017	Printer A4	Prints our on letter size. Set the digital configuration of converter as below. 1 2 3 4 5 6 7 8 Dip SW-1 OFF ON OFF OFF OFF OFF ON ON Dip SW-2 ON OFF ON ON ON ON ON ON ON Dip SW-3 ON ON ON ON ON OFF OFF Baud Rate : 4800 Parity : None Data Bits : 8 Stop Bits : 1	

6-3-2.Set up a printer (Setup 0)

Press [Setup] key and select "Interface" by cursor to show "Printer".



The display changes as above. Point the item by cursor using $[\uparrow]$, $[\downarrow]$ key and select the protocol by $[\leftarrow]$, $[\rightarrow]$ key. See Chart 6-3-2 for protocol setting.

Chart 6-3-2

Prorocol	Description		
Printer	Select a printer (IDP-/DP-/Other/A4).		
	See Chart 6-3-1 for details.		
Baud Rate	Select communication speed (300/600/1200/2400/4800/9600).		
	This appears when "Printer" is "Other".		
Parity	Select parity (None/Even/Odd).		
	This appears when "Printer" is "Other".		
Stop Bit	Select stop bit (1/2).		
	This appears when "Printer" is "Other".		
Data Bit	Select data bit (7/8).		
	This appears when "Printer" is "Other".		

Note!

To print correctly, both digital configuration of printer and titrator must be matched. If not, it may not print or stops printing. For protocol on printer, see its manual.

6-4. Download the data to a personal computer

6-4-1. Data acquisition software (SOFT-CAP)

The optional software SOFT-CAP is Windows 95/98 compatible and can download the measurement data to Microsoft Excel or store in CSV format through RS232C port.

By this software, starting titration or reset can be commanded by the computer.

<Receiving data>

The SOFFT-CAP software can export the measurement results as follows:

- 1) It transfers the data to Microsoft Excel workbook.
- 2) It stores the data in CSV format so that Lotus 1-2-3 spreadsheet can be used.

<Sending data>

The personal computer can send commands including titration start and reset.

Note!

For details, see the operation manual for Data Acquisition Software (SOFT-CAP).

6-4-2.RS-232C output

<Outline of RS2332C>

This instrument is equipped with RS232C interface which is the standard bit serial data communication.

The RS232C interface is proved to correct communication between modem and terminal (peripheral).

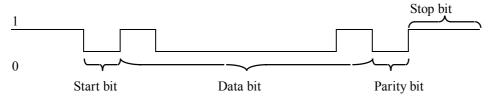
This unit is set to terminal mode as a peripheral of computer. Most of the existing personal computers are equipped with RS232C interface and set to terminal mode.

However, even between the peripherals, data communication is possible by way of appropriate configuration. (some computers can switch modem from/to terminal mode)

<Signal level>

It conforms to JIS X5101.

Logics	Signal level
1	-3 ~ −15[V]
0	+3 ~ +15[V]



The above pattern shows the letter "A" (ASCII code 41H).

<Connector>

The connector conforms to JIS X5101 and male type 9 pins, and its configuration is as follows:

Pine number	Signal	Direction
2	RXD (Receving Data)	IN
3	TXD (Sending Data)	OUT
4	DTR (Data terminal Ready)	OUT
5	SG (Signal Ground)	
6	DSR (Data Set Ready)	IN
7	RTS (Request To Send)	OUT
8	CTS (Clear To Send)	IN

[Caution]

The data signals for TXD and RXD are negative logic, and the control signals for RTS, DSR and DTR are positive logic.

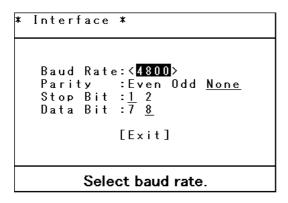
<RS232C data input/output>

For details of command and data format for input and output by RS232C, refer to the manual for RS232C.

6-4-3. Communication protocol with personal computer

This instrument can export data to an external computer via RS232C or controlled by the computer. The digital configuration must be matched. In this section, the protocol on the titrator is explained.

Press [Setup] key, and point "Interface" by cursor by $[\uparrow]$, $[\downarrow]$ key and press $[\, \, \downarrow]$ key. Then, point "RS232C" by cursor by $[\, \, \uparrow]$, $[\, \, \downarrow]$ key and confirm by $[\, \, \, \downarrow]$ key.



The display changes as above. Set up communication protocol. See Chart 6-4-3.

Chart 6-4-3

Protocol	Description		
Baud Rate	Set up communication speed (300/600/1200/2400/4800/9600).		
Parity	Select parity (None/Even/Odd).		
Stop Bit	Select stop bit (1/2).		
Data Bit	Select data bit (7/8).		

Note!

Communication protocol between the computer and the titrator must be matched.

If not, data is distorted or the communication stops halfway.

6-5.pH temperature compensation table card (984340175)

6-5-1. Outline of the optional temperature compensation table card

This instrument can install the temperature compensation table of pH standard of ASTM, DIN, BS, NF and JIS. With this table intalled, pH value can be automatically calibrated. In this unit, JIS pH temperature compensation table is pre-installed.

For other pH standard liquids, see Chart 6-5.

Chart 6-5

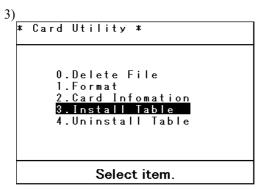
Standard	pH liquid	Spec. No.	Standard components	
JIS	pH4	JIS K0019	0.05mol/L-Potassium hydrogen phthalate	
	рН7	JIS K0023	0.025mol/ L-Potassium hydrogenphosphate –	
			0.025mol/L-Sodium hydrogenphosphate	
	рН9	JIS K0021	0.01mol/L-Sodium tetraborate	
ASTM	pH4		0.05mol/kg-Potassium hydrogen phthalate	
	рН7	E70-97	0.025mol/kg-Potassium hydrogenphosphate –	
			0.025mol/kg-Sodium hydrogenphosphate	
	рН9		0.01mol/kg-Sodium tetraborate	
DIN	pH4		Dissolve 10.21g (KHC ₈ H ₄ O ₄) in 1000mL (25°C) water.	
	рН7	19 266 Dissolve 3.38g (KH ₂ PO ₄)+3.53g (Na ₂ HPO ₄) in 1000mL (25°C) water.		
	рН9		Dissolve 3.814g (Na ₂ B ₄ O ₇ ·10H ₂ O) in 1000mL (25°C) water.	
BS	pH4		Dissolve 10.21g (KHC ₈ H ₄ O ₄) in 1000mL (20°C) water.	
	рН7	1647	Dissolve 3.39g (KH ₂ PO ₄)+3.54g (Na ₂ HPO ₄) in 1000mL(20°C) water.	
	рН9		Dissolve 3.80g (Na ₂ B ₄ O ₇ ·10H ₂ O) in 1000mL (20°C) water.	
NF	pH4	Dissolve 10.21g (KHC ₈ H ₄ O ₄) in 1000mL water.		
	pH7	T90-008	Dissolve $3.402g (KH_2PO_4) + 3.549g (Na_2HPO_4)$ in $1000mL$ water.	
	рН9		Dissolve 3.81g (Na ₂ B ₄ O ₇ ·10H ₂ O) in 1000mL water.	

Note!

The option card can be used only in the instrument where the card is installed. For use in other instrument, the installed temperature compensation table has to be uninstalled by the option card. For more details on how to use the card, refer to the manual of the optional card.

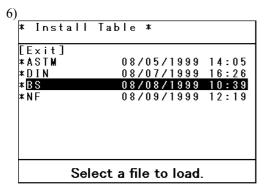
6-5-2.Installation of option card (Function 13)

- 1) Press [Function] key.
- 2) Point the cursor on "Card Utility" by $[\uparrow]$, $[\downarrow]$ key and press $[\downarrow]$ key.



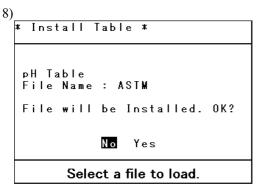
The display changes as above.

- 4) Insert the option card (984340175) into the slot of the unit.
- 5) Point "Install Table" by cursor and press [→] key.



The display changes as above.

7) Select the temperature compensation table to be installed by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Point the cursor on "Yes" and confirm by $[\ \]$ key.

- 9) After installation is finished, press [Esc] key.
- 10) When the display returns to reset condition, remove the card from the slot. This the end of card installation



While the card is being installed, do not remove it. It will not only give damage on the unit but also the data in the card may be destroyed.

6-5-3. Uninstallation of option card

- 1) Press [Function] key.
- 2) Point the cursor on "Card Utility" by $[\uparrow]$, $[\downarrow]$ key and press $[\downarrow]$ key.

* Card Utility *

0.Delete File
1.Format
2.Card Infomation
3.Install Table
4.Uninstall Table

Select item.

The display changes as above.

- 4) Install the card into the slot.
- 5) Point the cursor on "Uninstall Table" and press [→] key.
- 6) Follow the message on display to uninstall.
- 7) After uninstallation is finished, press [Esc] key.
- 8) When the display returns to reset condition, remove the card from the slot. This is the end of uninstallation.

Note!

After uninstalled, the JIS temperature compensation table is automatically set in.

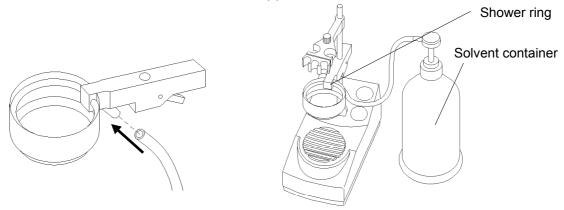


While the card table is uninstalled, do not remove the card. It will not only give damage on the unit but also the data in the card may be destroyed.

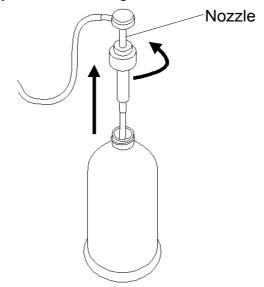
6-6. Optional electrode cleaning unit (MW-510)

6-6-1. Connecting the electrode cleaning unit

- 1) Insert the tube end of manual pump (985090008) into the solvent inlet of shower ring (985500050) of the electrode cleaning unit.
- 2) Remove the electrode holder from the stand rod.
- 3) Install the shower rind to the stand rod.
- 4) Connect the other end of pump tube to the manual pump.
- 5) Install the electrode holder which was once removed (2).



- 6) Remove the nozzle of solvent container.
- 7) Fill the container with 1L pure water for cleaning.





The solvent container is made of polyethylene and the tube is of silicone material.

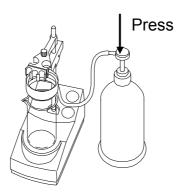
Do not use organic solvent or acid/alkali solvent. It will cause the eventual leaking.

6-6-2. Cleaning the electrode

1) Place a beaker to receive the solvent dripping.



- 2) Lift the electrode holder a little higher than the present position.
- 3) Push down the pump head.

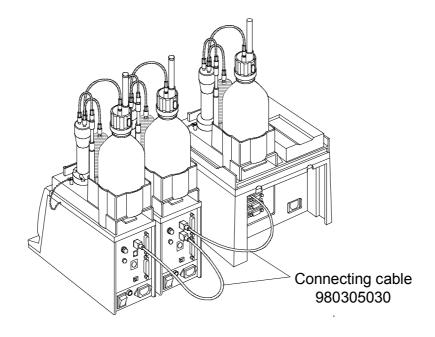




If the pump head is pushed too hard, the solvent may splash out. Care should be taken in pressing down.

6-7. Connecting the external burette

This unit can connect maximum 9 external burettes and control them. Use APB connecting cable (980305030) as illustrated.



Note!

To control an external burette, digital address has to be set up on the burette.

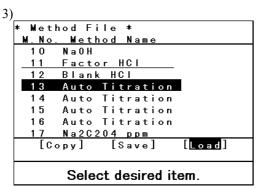
See the manual for external burette for address setting.

For how to operate the unit, see 7-5. Operating the burette manually.

6-8. Application card (984340173)

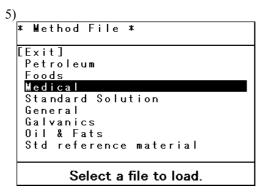
The optional application card contains examples of various measurements. These exemplified settings can be downloaded to users method (Method 10 - 47).

- 1) Insert the application card into the slot in front of the main unit.
- 2) Press [Function] key and point the cursor to "Method File" by $[\uparrow]$, $[\downarrow]$ key and confirm $[\downarrow]$ key.



The display changes as above. Point the cursor to the Method to copy the application by $[\uparrow]$, $[\downarrow]$ key.

4) Point the bottom cursor to "Load" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Select the folder by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.

6) Point the cursor to the application to read and press $[\ \]$ key.

Note!

When a Method is read in, the previously stored Method is erased. It is recommended to copy an important Method to another Method or store it in the memory card.

For optional memory card, refer to its manual.

6-9.Karl Fischer moisture titration unit (KF-510)

This instrument can perform volumetric moisture titration by using optional KF unit.

6-9-1.Installation of the option

1) Make sure the power switch is in OFF position as shown.

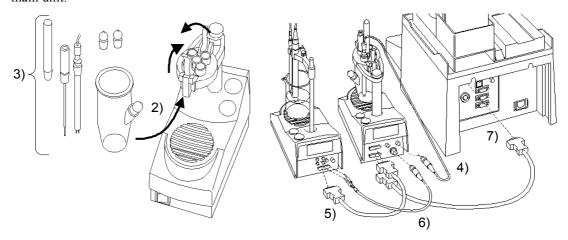


- 2) Install the KF measuring cell (987403001).
- 3) Install M-714 electrode, desiccant tube, ball stopper and titration nozzle.

Note!

Before the electrode and desiccant tube are installed, apply the supplied KF grease (984333138) to the sliding area.

- 4) Connect the cable of M-714 electrode to "DETECTION ELECTRODE" on the rear of the optional unit.
- 5) Connect the cable (980300006) of optional unit to "MAIN UNIT" of preamplifier in the supplied stirrer.
- 6) Connect the cable of optional unit to "PREAMP" of its rear, and the other end to Detector No. 2 (R1, M1) of preamplifier in the stirrer. The black lead is for R1 jack and the red lead for M1 jack.
- 7) Connect the cable (980300006) to "MAIN UNIT" of the optional unit and to the stirrer connector of AT-510 main unit.

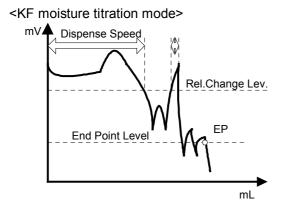


6-9-2. Parameter setting for KF titration

Measurement conditions have to be set up for moisture measurement. This instrument is equipped with Method 04: KF Titration designed for moisture titration. Use Method 04 or copy it to users method (Method 10 - 47) for actual moisture measurement.

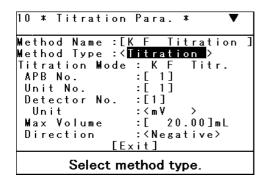
Note!

Refer to 4-2. Method file for setup and for how to copy a method.



- When potential is lower than Rel. Change Lev., titration solution is continuously dispensed according to Dispense Speed. When it exceeds Rel. Change Lev., titration changes to one second cut-off mode until it reaches End Point Level.
- When the potential returns to more than Rel.
 Change Lev., titration solution is dispensed according to Dispense Speed.
- End point is determined after End Time and above End Point Level.

Change the Method to 04 or copied from Method 04. Press [Titration] key.

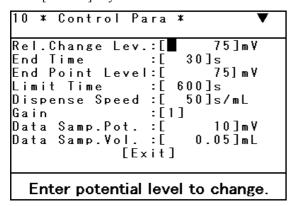


The display changes as above. Point the cursor to the item by $[\uparrow]$, $[\downarrow]$ key and select by $[\leftarrow]$, $[\rightarrow]$ key. Enter by alphanumeric key and confirm by $[\downarrow]$ key. For each setup, see Chart 6-9-2-1 and 6-9-2-2.

Chart 6-9-2-1

Setup item	Description		
Method Name	Set up method name.		
Method Type	Method type is displayed. It is Titration Fixed.		
Titration Mode	Current control mode is displayed.		
APB No.	Select the burette number (1 - 10) for titration.		
Unit No.	Select the burette unit number (1 - 20) for titration.		
Detector No.	Select the detector number. (1 - 3) for titration. In this case, "1" is selected.		
Unit	Select potential unit. In this case, "mV" is selected.		
Max Volume	Set up maximum titration volume (0-9999s).		
Direction	Select titration direction. Set it to "Negative" for this titration.		

Press [Control] key.



The display changes as above. Point the cursor to the item by $[\uparrow]$, $[\downarrow]$ key and select by $[\leftarrow]$, $[\rightarrow]$ key. Enter by alphanumeric key and confirm by $[\downarrow]$ key. For setup, see Chart 6-9-2-2.

Chart 6-9-2-2

Setup item	Description		
Rel. Change Lev.	Set up relative potential (0~±2000) to switch continuous isokinetic dose and intermittent		
	titration. The potential is relative to End Point Level. Typically set to 75mV.		
End Time	Set up the end sense time $(0\sim9999s)$. When time elapses over the end level, the end point		
	is determined. Typically 30 seconds is set for the end sense time in KF titration.		
End Point Level	Set up the end level ($0\sim\pm2000$). Typically 75mV is set for the end level in KF titration.		
Limit Time	Set up the limit time (0~9999s) for titration.		
Dispense Speed	Set up dispense speed (0~9999s/mL) in continuous isokinetic dose titration.		
Gain	Set Gain of potential. Typically set to 1.		
Data Samp. Pot.	Set up the data sampling potential (0~10000).		
	Since potential of KF titration fluctuates sharply, set larger potential (10~100mV) for data		
	sampling.		
Data Samp. Vol.	Set up titration volume (0~9999mL) for data sampling.		

6-9-3. Calculation formula

In KF titration, it is necessary to set up calculation formula for moisture content. Refer to 4. Measurement under optimum condition for a sample, and also refer to Chart 6-9-3 for typical formulas.

Chart 6-9-3

Chart 0 0 0				
Application	Calculation Formula	Constant		
Calculation of water content	Sample:			
(mgH ₂ O)	(EP1–BL1) ×TF			
Titration by weighing liquid	Sample:	K1=1000		
or solid sample	(EP1-BL1) ×TF×K1/SIZE			
Dissolve sample in advance	Sample:	$K1 = \left(\frac{B + Wt0}{Wt0}\right) \times 1000 - \left(\frac{A \times B}{Wt0}\right)$		
and titrate a part of the	(EP1-BL1) ×TF)/SIZE×K1	Wt0 $Wt0$		
dissolve d sample		A (ppm) : moisture of extracted solvent B (g) : extracted solvent Wt0 (g) : Sample size into extract solvent		
Factor measurement	Factor:	K1=10		
	(C1×SIZE) ×K1/(EP1–BL1)			

6-9-4. Setting knob for extract solvent

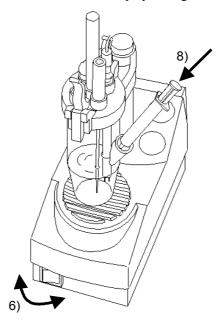
For KF titration the setting knob is provided on the rear panel of KF unit so that it can be changed depending on the kind of extract solvent used in KF titration. See Chart 6-9-4.

Chart 6-9-4

	Riedel-de Haen	Mitsubishi	Knob setting
For general	ML,MI,MS	MS,GE,GEX	1
	Solvent Oil		
For oil	CM	CM,OL,OLII	2
	Solvent Oil		
For sucrose	FM,FM-II	FM,SU	1
For Kethone	CE	CP,KT	1
	Working Medium Keto		

6-9-5. Measurement operating

- 1) Change the method to KF moisture titration.
- 2) Set up titration parameter, control parameter and calculation formula.
- 3) Fill the titration cell with extract solvent and seal it.
- 4) Fill the burette with titration reagent.
- 5) Set the rear knob according to the kind of solvent to be used.
- 6) Turn on the switch in front of the option unit.
- 7) Press [Start] key for pre-titration.
- 8) After pre-titration is over, the results are shown on display. Weight the sample and inject it into the cell.



9) Press [Start] key to start titration.

Note!

Inject the sample as quickly as possible and seal the titration cell.

Permeating ambient moisture will cause measurement error. Pre-titration is recommended when the titration would last long. The same procedure is applied to factor measurement.

For more details, refer to the manual for KF-510.

6-10.COD unit (COD-510)

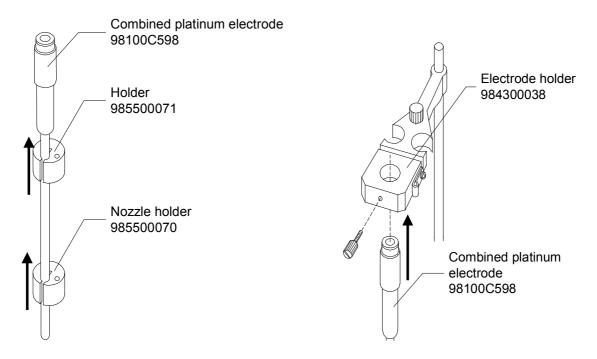
By connecting the COD unit, measurement of consumption of potassium permanganate at 100°C in accordance to JIS K0102 can be performed.

6-10-1. Connecting the COD unit

- 1) Remove the stand rod.
- 2) Place Base (984390052) on the magnet stirrer.
- 3) Install Extension shaft (985500053) to the COD unit.
- 4) Attach the stand rod to the extension shaft.



- 5) Fix Nozzle holder (985500070) and Holder (985500071) to Combined platinum electrode (98100C598).
- 6) Install Electrode holder (984300038) onto Extention shaft.
- 7) Install combined platinum electrode onto its holder.

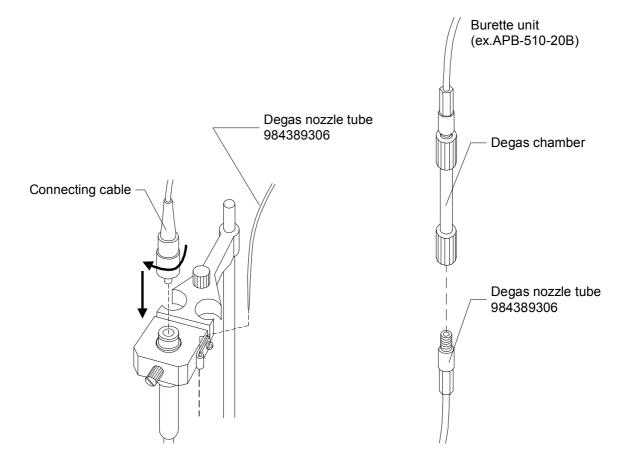


- 8) Install Degas nozzle tube (984389306) onto the electrode holder.
- 9) Put the tube of step 8 through the nozzle holder and the holder of step 5.
- 10) Hook the electrode cable to the combined platinum electrode.

Note!

For the electrode cable, use the one supplied with the titrator.

- 11) Connect the other end of tube (step 8) to the degas chamber from burette unit (e.g. APB-510-20B).
- 12) Connect the other end of cable to G1 terminal of preamplifier in the rear of magnetic stirrer.

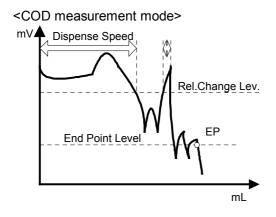


6-10-2. Parameter setup

Necessary setup must be made to perform COD measurement. For this purpose, Method 05: COD Titration is preinstalled. Use this Method 05 or copy it to users Method 10-47.

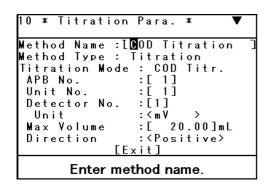
Note!

Refer to 4-2. Method file for setup and for how to copy a method.



- When potential is lower than Rel. Change Lev., titration solution is continuously dispensed according to Dispense Speed. When it exceeds Rel. Change Lev., titration changes to one second cut-off mode until it reaches End Point Level.
- When the potential returns to more than Rel. Change Lev., titration solution is dispensed according to Dispense Speed.
- End point is determined after End Time and above End Point Level.

Change the Method to 05 or copied from Method 05. Press [Titration] key.

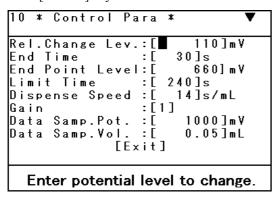


The display changes as above. Point the cursor to the item by $[\uparrow]$, $[\downarrow]$ key and select by $[\leftarrow]$, $[\rightarrow]$ key. Enter by alphanumeric key and confirm by $[\downarrow]$ key. For each setup, see Chart 6-10-2-1 and 6-10-2-2.

Chart 6-10-2-1

Setup item	Description
Method Name	Set up method name.
Method Type	Method type is displayed. It is Titration Fixed.
Titration Mode	Current control mode is displayed.
APB No.	Select the burette number $(1-10)$ for titration.
Unit No.	Select the burette unit number $(1-20)$ for titration.
Detector No.	Select the Detector number $(1/2/3)$ for titration. In this case, "1" is selected.
Unit	Select potential unit. In this case, "mV" is selected.
Max Volume	Set up maximum titration volume (0-9999s).
Direction	Select titration direction. Set it to "Positive" for this titration.

Press [Control] key.



The display changes as above. Point the cursor to the item by $[\uparrow]$, $[\downarrow]$ key and select by $[\leftarrow]$, $[\rightarrow]$ key. Enter by alphanumeric key and confirm by $[\, \downarrow]$ key. For setup, see Chart 6-10-2-2.

Chart 6-10-2-2

Setup item	Description
Rel.Change Lev.	Set up relative potential (0~±2000) to switch continuous isokinetic dose and intermittent titration.
End Time	Set up the end sense time (0~9999s). When time elapses over the end level, the end point is determined. Typically 30 seconds is set for the end sense time in COD titration.
End Point Level	Set up the end level (0~±2000). Typically 660mV is set for the end level in COD titration.
Limit Time	Set up the limit time (0~9999s) for titration.
Dispense Speed	Set up dispense speed (0~9999s/mL) in continuous isokinetic dose titration.
Gain	Set Gain of potential. Typically set to 1.
Data Samp. Pot.	Set up the data sampling potential (0~±10000). Since potential of COD titration fluctuates sharply, set larger potential (1000mV) for data sampling.
Data Samp. Vol.	Set up titration volume (0~9999mL) for data sampling.

6-10-3. Calculation setup

In COD measurement, it is necessary to set up concentration calculation. Set up according to 4. Measurement under optimum condition for a sample. Typical calculation formulas are shown in Chart 6-10-3.

Chart 6-10-3

Application	Calculation Form	Constant
Blank (mL)	Blank: BL1	
Factor	Factor:	Kn=Sodium oxalate purity (%)
	(SIZE×Kn)/(EP1×C1)	Cn=1.6756 (mg/mL)
Sample (ppm)	Sample:	Kn=1000
	(EP1-BL1) ×TF×Cn×Kn/SIZE	Cn=0.2 (mg/mL)

6-10-4. Measurement operation

1) According to JIS K0102 "Consumption of Potassium Permanganate at 100°C", prepare the sample, which is pre-treated in 300mL conical flask.

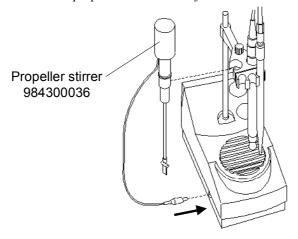
<Pre-treatment>

- I. Transfer the prepare 100mL sample solution to 300mL conical flask.
- II. Add 10mL sulfuric acid (1+2) to the sample, and add silver nitrate solution equivalent to chloride ion masking+1g.
- III. Add 10mL of 5m mol/L-potassium permanganate solution.
- IV. Put the sample in boiling water and heat it for 30 minutes.
- V. Cool down to room temperature, and add 10mL of 12.5mmol/L-sodium oxalate solution.
- VI. Heat the sample up to about 60°C, and wait until the sample liquid turns to transparent after the reaction of sodium oxalic added at step V.
- 2) Heat the sample up to about 70°C.
- 3) Put a 25mm stir bar in the sample liquid and insert the electrode.
- 4) Press [Start] key of titrator to start measurement.

6-11. Propeller stirrer (984300036)

The optional propeller stirrer can be used with this unit. By using the propeller stirrer, the stir bar is no more necessary.

- 1) Turn off the power of the titrator.
- 2) Install the propeller stirrer to the electrode holder.
- 3) Remove the rubber stopper on the left of magnet stirrer.
- 4) Attach the packing to the magnet stirrer for a rubber stopper.
- 5) Plug in the power cord of propeller stirrer to the jack.



Installation is finished by the above steps. On/Off the propeller stirrer can be controlled by [Stirrer] key. To control the speed, refer to 7-9. Stir speed setup.



Do not take out the propeller stirrer while it is spinning. It must be stopped first.

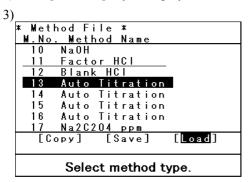
Care should be taken when strong acid or alkali solution is stirred.

6-12.pH measurement card (984340174)

With the optional pH measurement card, periodic potential measurement of electrode can be performed.

6-12-1.Installation of pH measurement card

- 1) Insert the pH card into the card slot of the unit.
- 2) Press [Function] key to display "Method File".



The display changes as above. Point the cursor to the Method number to install by $[\uparrow]$, $[\downarrow]$ key and move the bottom cursor to "Load" by $[\leftarrow]$, $[\rightarrow]$ key. Press $[\, \, \downarrow]$ key.

4) When the display to read the card appears, point the cursor to "Yes" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.

6-12-2.pH measurement parameter setup

Press [Titration] key on the Method where the option card is installed.

Point "Wait Time" by cursor using $[\uparrow]$, $[\downarrow]$ key and set up the wait time. The "Wait Time" equals to the time length while the electrode sets in to be stable in the sample.

6-12-3. Measurement time setup (Function 9)

Press [Function] key.

```
* Function *

0. Method File 10. Auto Statis.
1. Data File 11. Common Blank
2. Sample File 12. pH Cal. Table
3. Changer 13. Card Utility
4. Re-Titr. 14. Memory Clear
5. Check Titr.
6. Set Check
7. Pericdic
8. Buret Check
9. Auto Start

Select item.
```

The display changes as above. Point the cursor to "Auto Start" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.

```
* Auto Start *

Method No. :[10]
Interval Time :[ 12]min
Times :[99]

[Execute]
        [Exit]

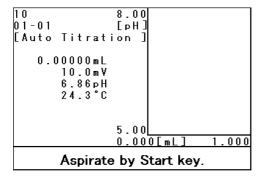
Enter method number.
```

The display changes as above. Set up parameters referring to Chart 6-12-3.

Chart 6-12-3

Setup item	Description
Method No.	Set up Method number (10-47).
Interval Time	Set up interval time to start measurement (1-99min).
Times	Set up a number of measurement times (0-99times).

Point the cursor to "Execute" and press [→] key.



The display changes as above. Press [Start] key for automatic activation.

Note!

Auto Start function starts measurement for preset interval.

This function works only for pH measurement method. Other methods do not apply.

7. For better usage

7-1. Precision check by standard substance

7-1-1. Setting precision criterion (Function 6)

Set up theoretical value and tolerance of standard substance.

Press [Function] key. Point the cursor to "Set Check" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.

```
* Set Check *

Check Mode : Daily Periodic
Detector No. : 1 2 3
Standard Name : [ Std 002 ]
Standard Value: [ 1000]
Permit. Err. : [ 10]

[Exit]

Select check mode.
```

The display changes as above. See Chart 7-1-1 for parameters and setup.

Chart 7-1-1

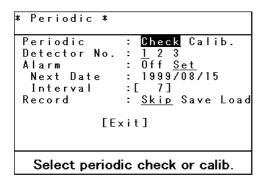
Setup item	Description
Check Mode	Select Daily or Periodic for check frequency.
Detector No.	Select the detector number (1/2/3) to measure standard substance.
Standard Name	Enter the name of standard substance.
(Enter each for daily and	See 2-3-3 Basic key operation for how to enter characters.
periodic)	
Standard Value	Enter theoretical value of standard substance. (-999999-99999)
(Enter each for daily and	
periodic)	
Permit. Err.	Enter permissible error (0~999999) to standard substance.
(Enter each for daily and	
periodic)	

Note!

Check results in Daily mode are not recorded in history. For setup and default, see 9-5 Function and default.

7-1-2. Setting periodic check interval and record (Function 7)

Set up periodic check interval for standard substance and confirmation of check record. Press [Function] key. Point the cursor to "Periodic" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. See Chart 7-1-2 for setup item and description.

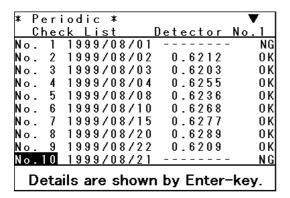
Chart 7-1-2

	0.10.17.7.2
Setup item	Description
Periodic	Select Check or Calibration for periodic check.
	Calib.: setup on sensor calibration for detector and electrode
	Check: setup for measurement of standard substance.
Detector No.	Select the detector number (1/2/3).
Alarm	Select Set or Off for periodic check/calibration alarm.
(Enter each for daily and	Set: periodic check/calibration date is alarmed by interval.
periodic)	Off: no periodic alarm is set. All check results are on daily basis.
Next Date	The display of the next check/calibration date.
	/ appears until periodic check is performed.
Interval	Set up periodic check/calibration interval (0-999days).
Record	Set up use of PC card (Skip/Load/Save) for periodic check/ calibration record.
	Skip: Displays on Show List the stored record in the unit.
	Load: Read past record of periodic check on PC card and displays on Show List.
	Save: Copy the check record in the unit and save it in PC card.
Show List	Displays the past record of periodic check/calibration results. This appears on
(Enter each for daily and	Calib./Check. Up to 10 results are stored. Check list appears when [→] key is
periodic)	pressed on this item.

Note!

Periodic notice of next check/calibration date starts from zero hour in the morning of the day. For setup of each parameter and default, see 9-5. Function and default.

Point the cursor to "Show List" and press [→] key.



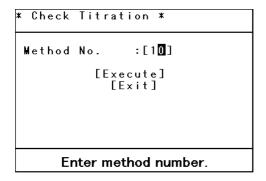
The display changes as above. Details are shown by [→] key. Print by [Print] key.

Note!

All the contents in the List are read/saved in PC card. When "Loaded", the contents in the list are overwritten. It is recommended to save the list in PC card in advance.

7-1-3. Check method by standard substance (Function 5)

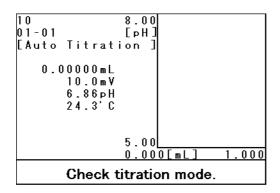
Press [Function] key to display "Check Titration".



The display changes as above. Enter method number (00-06, 10-47) for check measurement and press [→] key.

Note!

The above display appears when Sample File is No. For parameter setup and default, see 9-5. Function and default.



The display changes as above. Check measurement condition for standard substance (titration parameter, control parameter, results parameter) and press [Sample] key to enter "Size". Set the sample and press [Start] key for measurement.

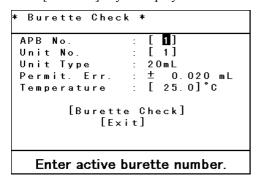
Note!

When Sample File is Yes and Check Titr. is executed, the first sample measurement of Sample file is recorded as a check measurement result. Check measurement cannot be made by combined method (Method 50-54).

7-2. Check method of burette precision (Function 8)

Fill the burette with pure water.

Press [Function] key to display "Buret Check".



The display changes as above. For setup item and description, see Chart 7-2.

Chart 7-2

0.10.7.1	
Setup item	Description
APB No.	Set up a burette connection (No. 1-10) to check precision.
Unit File	Set up File number (No.1-20) for the burette to be checked.
Unit Type	Displays APB Unit type currently set up.
	This item is set up on Unit File for APB.
Permit. Err.	Displays permissible error of precision.
	This item is set up on Unit File for APB.
Temperature	Set up temperature (0-100°C) of water in the reagent bottle.

Note!

When optional temperature sensor (984305350) for compensating titration solution is connected, compensation is made not by entered liquid temperature but by the sensor reading. The precision of the sensor reading is $\pm 1^{\circ}$ C. For correct checking, a thermometer of $\pm 0.1^{\circ}$ C precision is necessary.

Point the cursor to [Burette Check] and press $[\ \]$ key.

Put the burette nozzle tip in a previously weighed container and press [Start] key.

Burette nozzle delivers all of the water.

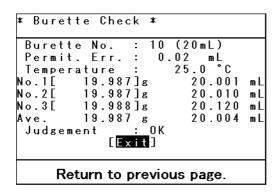
Weight the dispensed water by a balance and enter the first whole weight, and confirm by $[\ \]$ key.

Note!

When a balance is connected, the mode will change to automatic entry when [Disp.] key is pressed. When the weight reading is stable, confirm by $[\bot]$ key. For more precise checking, $\pm 0.0002g$ precision is necessary.

```
Burette Check *
APB No. : 10 (20mL)
Permit. Err. : 0.02 mL
Temperature : 25.0 °C
         19.9874]g
                              20.000 mL
No.1[
No.2[
                    0]g
                                     0
                                       m L
No.3[
                    0]g
                                     0
                                       шL
                    0 g
Ave.
                                        шL
        Aspirate by Start key.
```

The display changes as above. Likewise, perform the second and third measurement.



After the third measurement is finished, the display changes as above. Evaluation will be made based on previously set up Permit Err, and the results are stored in "Unit File" of [APB] key. To return to Main, press [Esc] key.

Note!

Conversion from weight to volume is made by converting to water of 20°C under 1013.25hPa at 25°C.

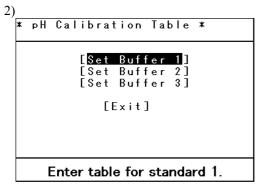
Precision check by this function is made on customer's responsibility. The resulting precision is only covered within the range of manufacturer's quality system. KEM provides servicing precision check of burette capacity on customer's behalf. For details of the service, contact your local dealer or sales representative.

7-3. Auto pH temperature compensation table (Function 12)

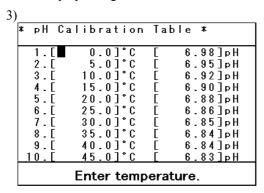
This instrument contains pH7/pH4/pH9 temperature compensation table according to JIS. For other pH standard liquid, by setting temperature and pH value on "pH Calib. Table", calibration can be performed by automatic temperature compensation.

In this section how to set up temperature compensation table is explained.

1) Press [Function] key to display "pH Calib. Table".



The display changes as above. Point the cursor on [Set Buffer 1] and press $[\ \ \]$ key.



The display changes as above. Enter temperature of Buffer 1 and pH value. Then, enter temperature and pH of Buffer 2 and Buffer 3.

Note!

For entry of the table, start with lower pH table from Buffer 1, Buffer 2 and Buffer 3.

Calibration is performed centering Buffer 2.

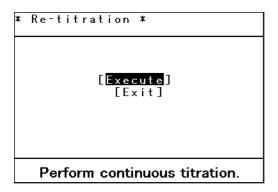
Example: pH4→Buffer1, pH7→Buffer2, pH9→Buffer3

This table is significant when Calib. Table (3-2-1. When Calib. Method is "Auto") is set to User.

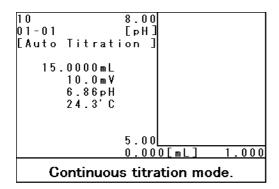
7-4. Continuous titration (Function 4)

When titration form is EP Stop or Full, this function can be used when it reaches maximum volume and terminates titration.

When titration is finished, press [Function] key and select "Re-titration".



The display changes as above. Point the cursor to "Re-Titr." by $[\uparrow]$, $[\downarrow]$ key or by alphanumeric key and press $[\, \downarrow]$ key.



The display changes as above. Press [Titration] to reset "Max Volume" and press [↓] key. Press [Start] key to continue titration.

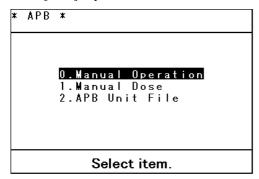
Note!

When a titration is continued, the titration is regarded as Full titration. Titration cannot be continued in case: when Method is changed, when titration form is other than EP Stop or Full, when the burette is changed, when a combined method is used and when check measurement is intended.

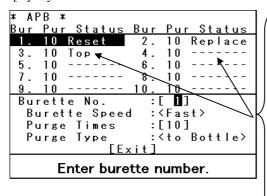
7-5. Operating the burette manually

7-5-1. Filling reagent (APB 0)

Press [APB] key.



The display changes as above. Point the cursor on "Manual Operation" by $[\uparrow]$, $[\downarrow]$ key or [1] key and confirm by $[\downarrow]$ key.



Shows the mode of each burette:

Reset : Piston stays at the bottom.

Top : Piston stays at the top position.

Replace : The unit can be replaced.

Up : Piston is moving upward for delivery.

Down : Piston is moving downward for suction.

Stop : Piston stays halfway.

Purge : Piston is moving to purge.

: Not connected.

The display changes as above. Enter "Burette No." and press $[\Delta]$ key. Enter parameters. For parameters, see Chart 7-5-1. For delivery of reagent, press $[\nabla]$ key, for resent position, press $[\Delta\nabla]$ key and for purge action, press $[\Delta]$ key.

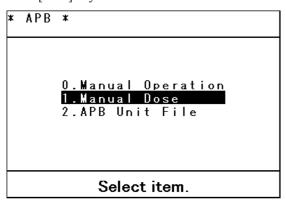
Chart 7-5-1

Parameter	Description			
Burette No.	Select burette number (No. 1-10).			
Burette Speed	Select speed. (Fast/Medium/Slow)			
	Fast : use for low temperature dependency liquid			
	Medium : for general use			
	Slow : use for solution which may easily generate air bubbles.			
Purge Times	Set up a number of purge times (0/1-99). 0 means endless times.			
Purge Mode	Select purge direction (To bottle/To Nozzle)			
	To Bottle : use to degas the burette and homogenize reagent. The reagent moves between			
	reagent bottle and the burette.			
	To Nozzle: use to degas the nozzle and discard reagent. It moves in the same way as			
	delivery of reagent. It can be automated for a desired number of times by			
	setting Purge Times.			

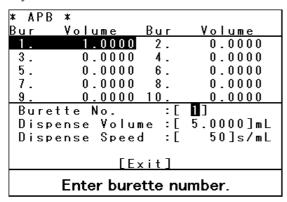
The movement by [\triangle][∇] and [$\triangle \nabla$] key depends on Burette speed. Care should be taken when delivery through the nozzle by [\triangle] or [$\triangle \nabla$] key may splash reagent for its tip.

7-5-2. Fixed dose of reagent (APB 1)

Press [APB] key.



The display changes as above. Point the cursor on "Manual Dose" by $[\uparrow]$, $[\downarrow]$ key or [1] key and confirm by $[\downarrow]$ key.



The display changes as above. See Chart 7-5-2 for setup. Press [Start] key to start.

Chart 7-5-2

Setup item	Description	
Burette No.	Set up a burette number (No.1–10).	
Dispense Volume	Set up dispensing volume (0–9999mL).	
Dispense Speed	Set up dispensing speed (0–9999s/mL).	
	The larger the amount is selected, the slower the speed goes.	



When the dispensing speed is too fast, the reagent splashes out and becomes dangerous. Slow down the "Dispense Speed" ($50\sim100s/mL$).

7-6.Beep indicating the end of measurement (Setup 7)

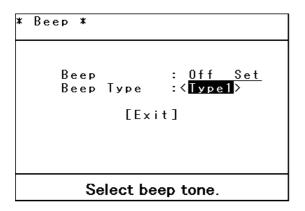
Press [Setup] key.

```
* Setup *

0.Interface
1.Date & Time
2.Regist Operator
3.Serial/Version No.
4.LCD Contrast
5.Language
6.Lock
7.Beep
8.pH Polarity

Select item.
```

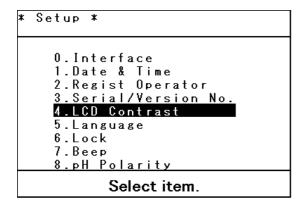
The display changes as above. Point the cursor to "Beep" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



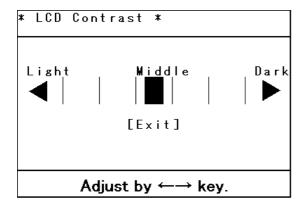
The display changes as above. To set up the beep, point "Beep" to "Set" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key. "Beep Type" shows the kinds of beep sound (Type1/2/3/4) and select a desired type and confirm by $[\downarrow]$ key. When confirmed, the selected beep sounds.

7-7. Adjustment of contrast of display (Setup 4)

Press [Setup] key.



The display changes as above. Point the cursor to "LCD Contrast" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Adjust contrast of LCD by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.

7-8.Inhibit change of measurement condition (Setup 6)

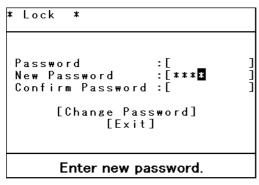
Press [Setup] key.

```
* Setup *

0. Interface
1. Date & Time
2. Regist Operator
3. Serial/Version No.
4. LCD Contrast
5. Language
6. Lock
7. Beep
8. pH Polarity

Select item.
```

The display changes as above. Point the cursor to "Lock" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Move the cursor to "New Password" by $[\uparrow]$, $[\downarrow]$ key and enter a password by numeric key. For confirmation, enter the same password in "Confirm".

Point the cursor to [Change Password] and confirm by [→] key.

Note!

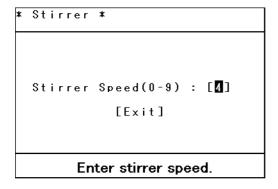
When Lock is executed by a password, it is inhibited to change [Titration], [Control], [Result], [Function] and [Setup].

To cancel the lock, display Lock again, and enter the current password in "Password". Then, press [Clr.] key on "New Password" and "Confirm". Point the cursor to [Change Password] and confirm by [↓] key.

7-9.Stir speed setup (Stirrer)

Each time [Stirrer] key is pressed, On/Off stirrer is alternated.

To adjust stir speed, press [Stirrer] key for more than 2 seconds.



The display changes as above. Select desired speed by numeric key. 0 means the stirrer stops.

Typically set to 4. When the solution is dense, set 6 to 8 speed. When propeller stirrer is used, set 7 to 9 speed.



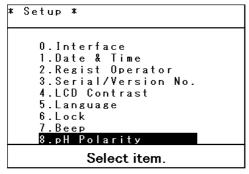
When stir speed is too high, the stir bar may spin out and break the electrode.

Set the speed to 4 to 6 for normal use.

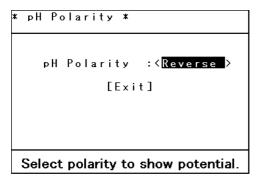
7-10.Use pH glass electrode as a reference electrode (Setup 8)

When measurement results are affected by flow-out of inner solution of reference electrode (e.g., chlorine analysis by non-aqueous titration), use the pH glass electrode for reference. In this case, the input polarity of electrode potential must be inversed.

Press [Setup] key.



The display changes as above. Point the cursor to "pH Polarity" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Set "pH Polarity" to "Reverse" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\rightarrow]$ key. The input electrode polarity is now inversed.

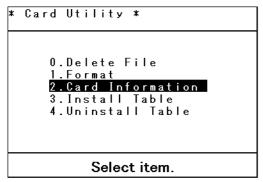
Note!

For titration with other electrode, set this parameter to "Standard". If it is titrated in "Reverse" mode, all the graphic data and data list are recorded in reversed mode.

7-11. Display of information on memory card (Function 13)

Insert the memory card into the slot in front.

Press [Function] key. Point the cursor to "Card Utility" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Point the cursor to "Card Information" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.

* Card Informat	ion	*			
Sample File Check File Calib.File APB Unit File	: : : : : : : :	Capacity 958 Files 109 Files 196 Files 958 Files 645 Files 26 Files			
Return to previous page.					

Method File : 958 measurement condition files can be

stored.

Data File : 109 measurement results can be stored.

Sample File : 196 sample files can be stored.

Check File : 958 files (1 file consists of 10 periodic check

by standard)

Calib. File : 645 files (1 file consists of 10 calibration

records)

APB Unit File : 28 files (1 file consists of 20 kinds reagent

information)

The above number of files can be stored as data saved in memory.

7-12.Read/store of data in PC card

The optional memory card (984340039) can store measurement data, calibration record and check results. The memory card is 1MB SRAM (static random-access memory) card.

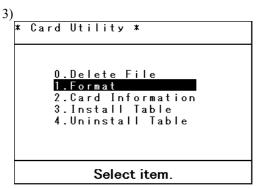
Note!

- When the card battery runs down, the stored data in the card will disappear.
 It is recommended to back up the card data by saving in FD (floppy diskette) or HD (hard disk) of your personal computer using the optional software SOFT-PCR.
- · Do not remove the card while data is being transferred.

7-12-1.Initialization of PC card (Function 13)

The memory card must be initialized first before it is in use. Follow the below steps:

- 1) Insert the memory card into the slot.
- 2) Press [Function] key. Point the cursor to "Card Utility" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Point the cursor to "Format" by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.

4) The display shows the message for initialization. Point the cursor to "Yes" and confirm by [↓] key.

Note!

If the memory card is write-protected, it cannot be initialized unless the protection is canceled. For details of write-protection, see the manual of memory card.

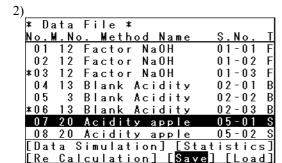
5) When initialization is finished, the message of that effect appears. Remove the card by pressing EJECT button on the card slot.

7-12-2.Read/store measurement results (Function 1)

The measurement results can be stored in the optional memory card. The data in the card can recalled for re-calculation or re-detection of endpoint.

<Store measurement results>

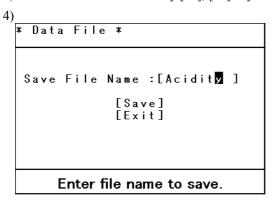
1) Press [Function] key. Point the cursor to "Data File" and confirm by $[\times]$ key.



Select desired item.

The display changes as above. Point the cursor to the data for saving by $[\uparrow]$, $[\downarrow]$ key.

3) Move the cursor to "Save" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\ \]$ key.



The display changes as above. Enter the file name by alphanumeric key and point the cursor to [Save] and press $[\ \]$ key.

Note!

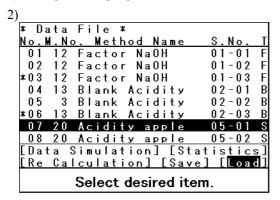
Two data of the same file name cannot be stored, and later saved file is overwritten. Change the file name.

Up to 8 characters can be used for a file name.

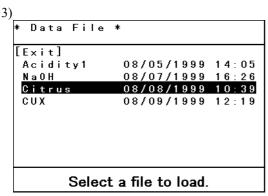
And measurement results by combined titration cannot be stored.

<Read measurement results>

1) Press [Function] key. Point the cursor to "Data File" and confirm by [Enter] key.



The display changes as above. Move the cursor to "Load" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Point the cursor to the data to recall by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.

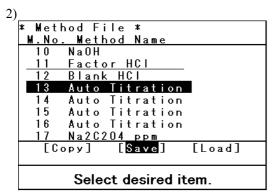
Note!

The recalled data is stored as the latest data in Data File.

7-12-3. Read/store measurement conditions (Function 0)

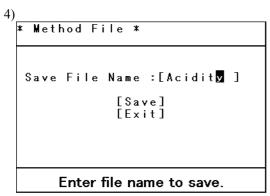
The optional memory card can save measurement conditions, which can be recalled and used for actual measurement.

- <Saving measurement conditions>
- 1) Press [Function] key. Point the cursor to "Method File" and confirm by $[\time \time]$ key.



The display changes as above. Pint the cursor to the data to save by $[\uparrow]$, $[\downarrow]$ key.

3) Move the cursor to "Save" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\rightarrow]$ key.



The display changes as above. Enter the file name by alphanumeric key and move the cursor to [Save] and press $[\ \]$ key.

Note!

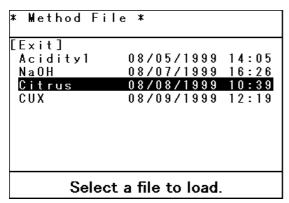
Two data of the same file name cannot be stored, and later saved file is overwritten. Change the file name.

Up to 8 characters can be used for a file name.

<Recall measurement conditions>

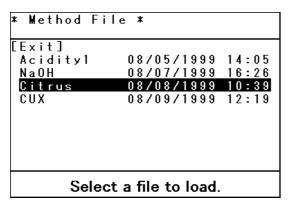
1) Press [Function] key. Move the cursor to "Method File" and confirm by [] key. \(\)

2)



The display changes as above. Move the cursor to the Method number by $[\uparrow]$, $[\downarrow]$ key and move the cursor to "Load" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.

3)



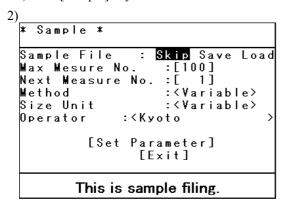
The display changes as above. Move the cursor to the measurement conditions to read by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.

7-12-4. Read/store sample conditions (Sample)

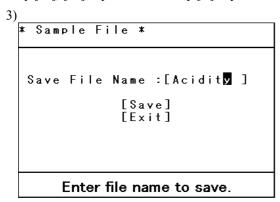
The optional memory card can save sample conditions, which can be recalled and used for actual measurement. Sample conditions can be stored/read when "Sample File" is "Yes" of "Function".

<Saving sample conditions>

1)Press [Sample] key.



The display changes as above.. Move the cursor to "Sample File" by $[\uparrow]$, $[\downarrow]$ key and move the cursor to "Save" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Enter the file name by alphanumeric key and move the cursor to [Save] and press $[\hfill \hfill]$ key.

Note!

Two data of the same file name cannot be stored, and later saved file is overwritten. Change the file name.

Up to 8 characters can be used for a file name.

100 data is treated as one file in Sample File.

<Recall sample conditions>

1) Press [Sample] key.

2)

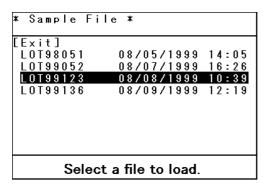
* Sample *

Sample File : Skip Save Load Max Mesure No. :[100]
Next Measure No. :[1]
Method :< Variable >
Size Unit :< Variable >
Operator :< Kyoto >

[Set Parameter]
[Exit]

This is sample filing.

The display changes as above. Move the cursor to "Sample File" by $[\uparrow]$, $[\downarrow]$ key, and move the cursor to "Load" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Move the cursor to the file to recall by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.

Note!

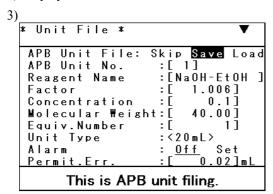
100 data is treated as one file in Sample File. Once a data is loaded, the previously recorded data is erased. Store such data in memory card or keep it in hard copy if necessary.

7-12-5. Store/read APB Unit File (APB 2)

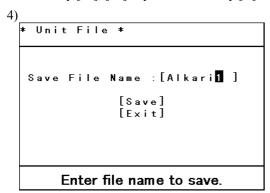
The APB Unit File consists of various information on reagent for pre-dosing or titration (reagent name, factor, molecular weight, equivalent number, remaining titrant counter, burette check record, etc.) Up to 20 files of APB Unit File can be used in the main unit as well as total 20 files can be stored in memory card.

<Saving APB Unit File>

- 1) Press [APB] key.
- 2) Display "Unit File".



The display changes as above. Move the cursor to "APB Unit File" by $[\uparrow]$, $[\downarrow]$ key, and move the cursor to "Save" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\rightarrow]$ key.



The display changes as above. Enter the file name by alphanumeric key, and move the cursor to [Save] and press $[\ \]$ key.

Note!

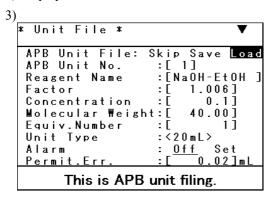
Two data of the same file name cannot be stored, and later saved file is overwritten. Change the file name.

Up to 8 characters can be used for a file name.

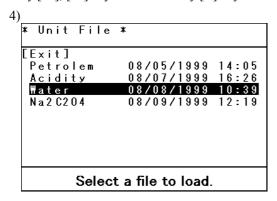
20 sets of data are treated as one file in APB Unit File.

<Recall APB Unit File>

- 1) Press [APB] key.
- 2) Display Unit File.



The display changes as above. Move the cursor to "APB Unit File" by $[\uparrow]$, $[\downarrow]$ key, and move the cursor to "Load" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\rightarrow]$ key.



The display changes as above. Move the cursor to the file to recall by $[\uparrow]$, $[\downarrow]$ key, and confirm by $[\downarrow]$ key.

Note!

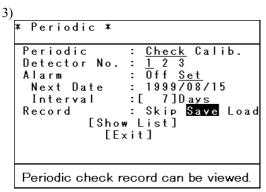
20 sets of data are treated as one file in APB Unit File. Once a data is loaded, the previously recorded data is erased. Store such data in memory card or keep it in hard copy if necessary.

7-12-6. Store/recall periodic check record (Function 7)

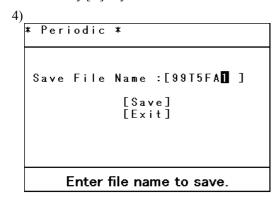
The periodic check record by standard substance can be stored in the memory card as well as recalled and displayed on the main unit.

<Saving periodic check record>

- 1) Press [Function] key to display "Periodic".
- 2) Move the cursor to "Periodic" and "Check" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Move the cursor to "Record" by $[\uparrow]$, $[\downarrow]$ key, and "Save" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Enter the file name by alphanumeric key and point the cursor to [Save] and confirm by $[\bot]$ key.

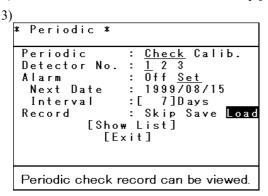
Note!

Data of the same file name cannot be stored, and later saved file is overwritten. Change the file name.

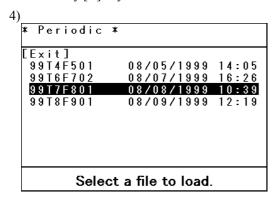
10 periodic check records are treated as one file.

<Recall periodic check record>

- 1) Press [Function] key to display "Periodic".
- 2) Move the cursor to Periodic and "Check" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Move the cursor to "Record" by $[\uparrow]$, $[\downarrow]$ key, and "Load" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Point the cursor to the file to recall by $[\uparrow]$, $[\downarrow]$ key, and confirm by $[\downarrow]$ key.

Note!

10 periodic check records are treated as one file. Once a data is loaded, the previously recorded data is erased. Store such data in memory card or keep it in hard copy if necessary.

7-12-7. Store/recall electrode calibration record (Function 7)

The electrode calibration record can be stored in the memory card, and can be displayed on the main unit used for calibration.

<Saving calibration record>

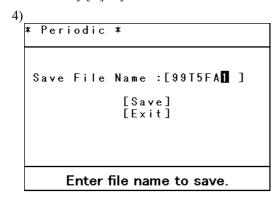
- 1) Press [Function] key to display "Periodic".
- 2) Move the cursor to Periodic and "Calib." by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.

```
Periodic *

Periodic : Check Calib.
Detector No. : 1 3
Alarm : Off Set
Next Date : 1999/08/15
Interval : [ 7]Days
Record : Skip Save Load
[Show List]
[Exit]

Periodic check record can be viewed.
```

The display changes as above. Move the cursor to "Record" by $[\uparrow]$, $[\downarrow]$ key, and "Save" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



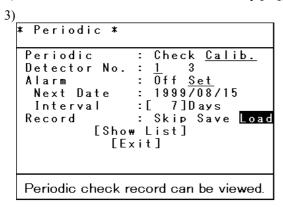
The display changes as above. Enter the file name by alphanumeric key and point the cursor to [Save] and confirm by $[\bot]$ key.

Note!

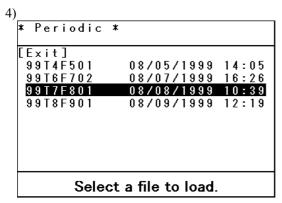
A file name consists of max 8 characters. Data of the same file name cannot be stored. The file name needs to be changed. 10 calibration records are treated as one file.

<Recall calibration record>

- 1) Press [Function] key to display "Periodic".
- 2) Move the cursor to Periodic and "Calib." by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Move the cursor to "Record" by $[\uparrow]$, $[\downarrow]$ key, and "Load" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Point the cursor to the file to recall by $[\uparrow]$, $[\downarrow]$ key, and confirm by $[\downarrow]$ key.

Note!

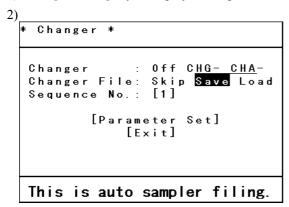
10 calibration records are treated as one file. Once loaded, the previously recorded calibration record is erased. Store such data in memory card or keep it in hard copy if necessary.

7-12-8. Store/recall changer file (Function 3)

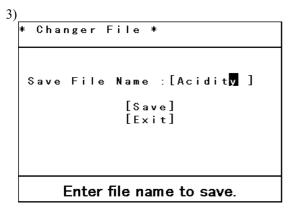
Parameters setup in Mulyiple sample changer (CHA-500) can be stored in the memory card and called "Cahnger File".

<Saving Changer File>

1) Press [Function] key to display "Changer".



The display changes as above. Move the cursor to "Changer File" by $[\uparrow]$, $[\downarrow]$ key, and "Save" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\, \downarrow]$ key.



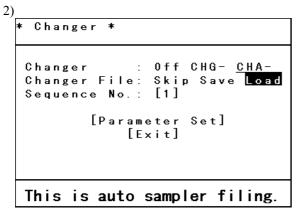
The display changes as above. Enter the file name by alphanumeric key and point the cursor to "Save" and confirm by $[\ \]$ key.

Note!

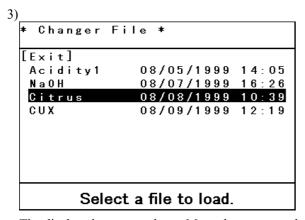
A file name consists of max 8 characters. Data of the same file name cannot be stored, and later saved file is overwritten. The file name needs to be changed.

<Recall Changer File>

1) Press [Function] key to display "Changer".



Move the cursor to "Changer File" by $[\uparrow]$, $[\downarrow]$ key, and "Load" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.



The display changes as above. Move the cursor to the file to recall by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key.

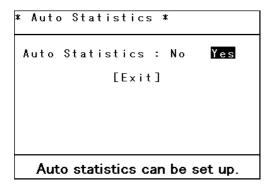
Note!

Once loaded, the previously recorded calibration record is erased. Store such data in memory card or keep it in hard copy if necessary.

7-13. Auto input function of statistics and factor/blank (Function 10)

The measured factor and blank level can be automatically input in APB Unit File or in Common Blank, and statistical processing is automated after sample measurement is over.

Press [Function] key to display "Auto Statistics".



The display changes as above. Move the cursor to "Yes" by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\downarrow]$ key.

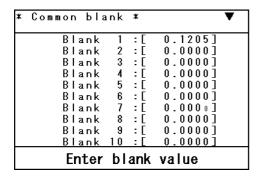
Note!

Auto statistics calculation will be performed if a method is changed. The statistics for factor/blank are processed for a group of the same method number, sample high order number and equal calculation type. (Statistics for sample measurement are processed for a group of the same method number and sample high order number)

7-14. Setting of blank values (Function 11)

Blank values can be set directly on AT-510. Up to 20 blank values (Blank1 to Blank20) can be stored. The blank values (Blank1 to Blank20) can also be used for BL1 to BL20 in the calculation accordingly.

Press [Function] key. Display "Common Blank".



The screen display will be produced as shown above. Move the cursor with $[\uparrow]$ or $[\downarrow]$ key to the Blank item to be set and enter the blank value.

7-15. Combined Method (Combined titration)

Up to five Methods out of Method $00\sim06$ and $10\sim47$ can be connected and used for measurement. The combined Method is defined to any of Method $50\sim54$.

- 1) Press [Method] key to show methods (00~06, 10~47) to be combined.
- 2) Set up titration parameter and control parameter. For the first Method, also set up calculation and print parameter.
- 3) Press [Method] key and select any of Method 50~54.
- 4) Press [Titration] key.

The display changes as above. After the number of methods to be connected is defined, set up Method number for combination.

- 5) Press [Sample] key to set up sample conditions including ample size.
- 6) Prepare the sample. Press [Start] key for measurement.

Note!

- Measurement results are printed on single graphic data if all of titration parameter (APB number, Unit number and Detector number) and control parameter (Gain) of combined methods are the same.
- · Up to five endpoints are detected on the same graphic curve.
- The calculation formula and print format of the first method are used in the results of the combined methods shown on the same graphics.
- · For combined titration, continuous titration (Function: Re-Titration) cannot be used.
- Learn titration, COD titration and KF titration cannot be combined. (if combined, alarm message appears)

8. Maintenance

8-1. Daily maintenance

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

(1) Check the instrument

Make sure the instrument is not dirty nor stained by visual check. If any dirt is found, wipe it off with clean gauze. Do not use solvent but use water only.

(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.

(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.

(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.

(5) Check any leaking

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

(6) Check burette performance

Press [APB] key. Select "Manual Operating" and press $[\nabla]$, $[\Delta]$, $[\Delta\nabla]$ key to make sure the burette works properly. If it does not work properly, correct it by referring to 9-2. Troubleshooting.

(7) Check stirrer performance

Make sure the stirrer works properly. If it does not, correct it by referring to 9-2. Troubleshooting.

(8) Check the piston burette

Perform visual check on piston head to see any deterioration by friction. Replace the head if the solution permeates down to the arrow ◀ line.



(9) 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.

(10) Preamplifier

Calibrate the preamplifier if necessary. (See 3-2. Calibration of preamplifier)

(11) Replacement of Zeolite (molecular sieves)

Replace the molecular sieves with Zeolite sold under 5A.

8-2.Other maintenance

8-2-1. Memory backup battery

This instrument has in it a memory backup battery to store preset methods or measurement data. Those data are stored in memory even while the instrument is turned off, it is recommended to keep them recorded on separate sheets of paper.

The life of the battery cell is 5 years, however, if setup parameters or data are changed to default values during the power off, ask your local dealer to replace the battery.

8-2-2. Cleaning the electrode

so that equilibrium can be reached faster.

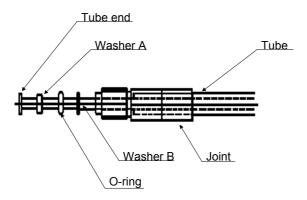
Glass electrode and reference electrode have to be rinsed with pure water at least three times and then wiped with clean filter paper or absorbent cotton. If it is stained, rinse with 0.1mol/L-hydrochloric acid, detergent water or other solvent in a short time, and then rinse well with pure water. In 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 the beaker with standard liquid in it



8-2-3. Tube joint

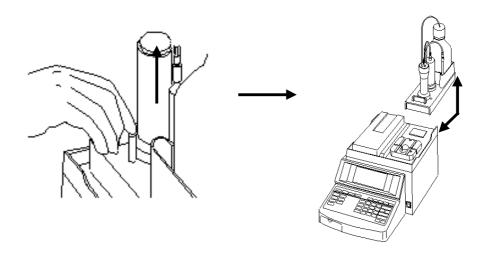
The exploded view of tube joint is shown below. Each part needs to be tightened when necessary.



8-2-4. Replacement of burette unit

Let the burette go down according to 7-5. Operating the burette manually. Select the burette number on display to show "Replace".

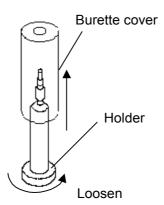
- 1) Remove the lock pin of the burette unit.
- 2) Push the unit and lift it off.
- 3) Place another burette unit and pull it towards you.
- 4) Insert the lock pin.
- 5) Press [Reset] key.



8-2-5. Replacement of piston head of the burette

<How to remove the burette>

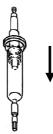
- 1) Lift the tube end dipped in reagent bottle off the surface.
- 2) Push out the reagent in the burette through the nozzle by $[\triangle]$ and $[\nabla]$ key.
- 3) Lower the burette to the bottom by $[\nabla]$ key.
- 4) Lift the burette cover and loosen the holder.



- 5) While holding the burette, raise the burette by $[\triangle]$ key.
- 6) When the burette comes up to off position, press $[\triangle]$ key again to stop the burette, and take off the burette with piston rod.

<How to remove the piston head>

- 1) Hold the burette upside down, and apply the piston tool to the piston screw rod.
- 2) Push in and out the piston head for a few times to drain out the remaining reagent in the burette through the nozzle.



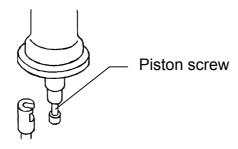
3) Pull out the piston head.

<Replacement of piston head>

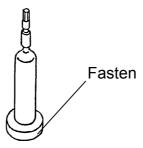
- 1) Remove the piston screw from the head.
- 2) Screw in the piston rod into the new head.
- 3) Insert the head into the burette. Taken should be taken not to scratch the head.
- 4) Slowly squeeze in the head while paying attention to the burette and piston rod in parallel.



<How to fix the burette>



- 1) Apply the piston screw to the drive rod.
- 2) Carefully push in the burette vertically while paying attention to the piston screw and rod are straight on line.
- 3) Press $[\nabla]$ key to lower the head.
- 4) Fasten the holding metal to fix the burette.



At this point, do not fasten the holder all the way but fasten tentatively. Move the head up and down by $[\triangle]$ $[\nabla]$ key to make sure the piston screw and drive rod are on the same axis, and then fasten the ring completely.

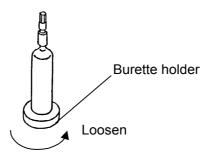
Note!

While replacing the head or fixing the burette, do not scratch inside wall of burette by the rod in order to avoid leaking.

8-2-6. Cleaning the piston burette

<How to remove the burette>

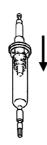
- 1) Lift the tube end dipped in reagent bottle off the surface.
- 2) Push out the reagent in the burette through the nozzle by $[\Delta]$ and $[\nabla]$ key.
- 3) Lower the burette to the bottom by $[\nabla]$ key.
- 4) Loosen the holding ring.



- 5) While holding the burette, raise the burette by $[\triangle]$ key.
- 6) When the burette comes up to off position, press $[\triangle]$ key again to stop the burette, and take off the burette with piston rod.

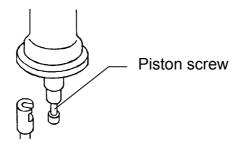
<How to remove the reagent>

- 1) Hold the burette upside down, and apply the piston tool to the piston screw rod.
- 2) Push in and out the piston head for a few times to drain out the remaining reagent in the burette through the nozzle.

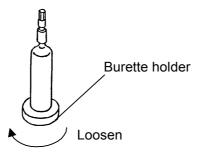


<How to fix the burette>

1) Apply the piston screw to the drive rod.



- 2) Carefully push in the burette vertically while paying attention to the piston screw and rod are straight on line.
- 3) Press $[\nabla]$ key to lower the head.
- 4) Fasten the holding metal to fix the burette.



At this point, do not fasten the holder all the way but fasten tentatively. Move the head up and down by $[\triangle][\nabla]$ key to make sure the piston screw and drive rod are on the same axis, and then fasten the ring completely.

Note!

While replacing the head or fixing the burette, do not scratch inside wall of burette by the rod in order to avoid leaking.

<How to clean the burette>

- 1) Fill the reagent bottle with water.
- 2) Dip the tube end in the water.
- 3) Clean the burette by $[\triangle]$ and $[\nabla]$ key.
- 4) Repeat step 1 to 3.

8-2-7. Clogged nozzle or switching valve

Some reagents crystallize as the time goes by. Such crystallization causes clogging of titration nozzle or the cock. When clogging is observed, follow the below steps:

<When titration nozzle is clogged>

- 1) Remove the titration nozzle.
- 2) Dip the clogged nozzle into the solvent which dissolves reagent. (An ultrasonic cleaner is most efficient)
- 3) After crystallized reagent is removed, rinse the nozzle with pure water.
- 4) Connect the titration nozzle and tube.
- 5) Fill reagent up to the nozzle tip.



The titration nozzle is sometimes clogged when used diffusion proof nozzle. Dip the nozzle into pure water, etc. in nozzle pocket not to dry the nozzle tip.

<When the cock is clogged>

- 1) Remove the tubes connected to the nozzle, burette and reagent bottle. Wipe off drained out reagent.
- 2) Use a dripping pipette and fill the cock with solvent which dissolves the reagent, and leave it for more than 3 minutes.
- 3) Suck the solvent in the cock by the pipette and wipe off residue.
- 4) Repeat step 2 and 3.
- 5) Reassemble the cock with tubes.

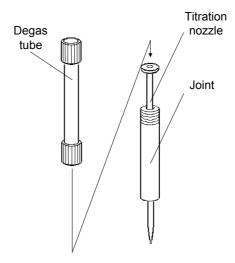
ACaution!

When the system is left unused for more than a week with reagent filled, check to see any crystallization in and around the system. If any is found, clean it.

If attempted to push it out without cleaning, it will cause leaking.

8-2-8. Replacement of titration nozzle

- 1) Remove the joint and degas tube.
- 2) Pull out the nozzle from the joint.
- 3) Insert a new nozzle into the joint.
- 4) Attach the joint and degas tube.





Wear the safety glasses and gloves.

Splashed reagent is dangerous to the eyes and your hands.

9. Troubleshooting

9-1.Error messages and remedies

When the system is operated erroneously or causes instrumental error, the error message appears with beep.

<Error messages on AT-510>

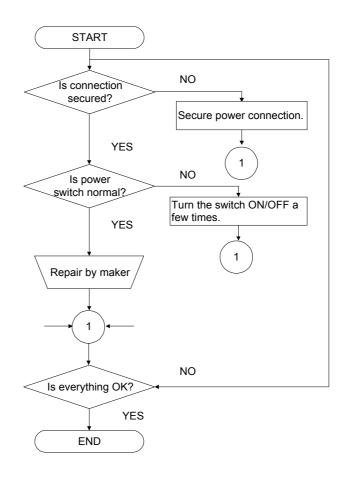
Message	Trouble	Remedies
Priamplifier is not connect!	Titrate without connecting preamp or Stirrer.	Connect the unit and cable if detached.
	Titrate with unit not defined for connected preamp.	Set appropriate unit for the preamp.
Titrant form is not correct!	Learn, KF or COD titration is set on combined Method.	Change the titration form for combined Method.
Burette is not connect!	Communication with burette fails at start.	Check buret number for titration and fixed dose. Select 1 for built-in buret. Set 2-10 for external buret. Check connection of AT-510 with external buret.
Method is not appropriate!	Auto Start function is used when multiple sample changer is connected.	Set "Off" for "Cahnger" in Function.
Titrant reagent is short!	Remaining reagent for titration reaches bottom line set on APB unit file.	Fill reagent.
Fixed dose titrant is short!	Remaining reagent for fixed dose reaches bottom line set on APB unit file.	Fill reagent.
Card battery error!	Memory card battery runs down.	Replace the battery. See manual for the battery.
System error!	Error made while the card is handled.	Check the trouble and contact your local dealer.

<Error messages on CHA-500 (appear on the display of AT-510)>

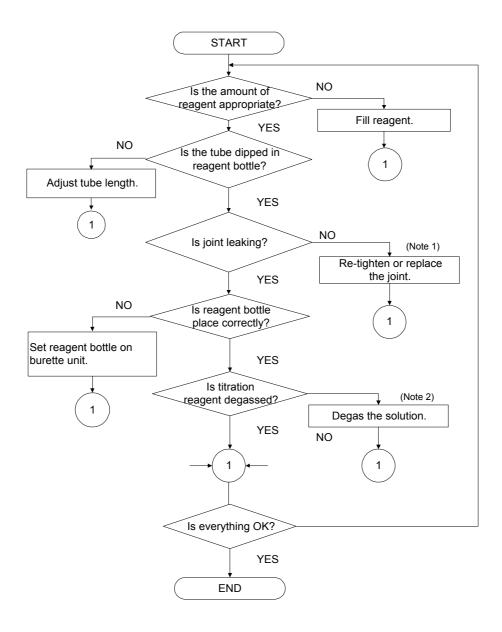
Message	Trouble	Remedies
Beaker is not in place	Sample beaker is not placed on sample changer.	Press [Reset] key on AT-510 and stop Auto sample. Place the sample on carousel.
	Beaker sensor does not detect a beaker.	There are sample on carouser.
Sampler mulfunctions	Turntable does not finish one round in time.	Press [Reset] key on AT-510 and stop Auto sample.
	(Step move: 20s, Home turn: 36s (12 samples), 54s (18 samples)	Press [Step] key to turn. If it does not improve, contact your local dealer.
Cancel error	Attempted to start with error.	Press [Stop] on sampler and cancel the error.
Vertical mechanism malfunctions	Elevator does not finish its move in time (20s).	Press [Reset] key on AT-510 and stop Auto sample.
		Press [Up] or [Down] key on elevator to move. If it does not improve, contact your local dealer.
Arm swing malfunctions	Swinging arm does not finish its move in time (20s).	Press [Reset] key on AT-510 and stop Auto sample. Press [Rinse] or [Titration] key on sampler to swing. If it does not improve, contact your local dealer.
Arm head position is unstable	Elevator does not go down since the arm is not at rinse bath or titration position.	Press [Reset] key on AT-510 to stop sampler. Press [Rinse] or [Titration] key on sampler to swing the arm. Press [Down] key on sampler. If it does not improve, contact your local dealer.
Elevator position is unstable	Turntable does not move since the elevator is not at the top position.	Press [Reset] key on AT-510 to cancel the error. Press [Up] key on sampler to ascend elevator. Press [Step] key on sampler. If it does not improve, contact your local dealer.
Changer is not connected	Communication with auto sample fails in time.	Check power of auto sampler and connection. If it does not improve, contact your local dealer.

9-2. Troubleshooting

9-2-1. Power does not turn on even when the power switch is in ON position



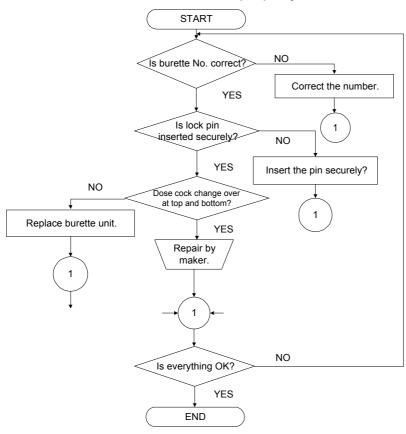
9-2-2. Air bubble exixts in the burette



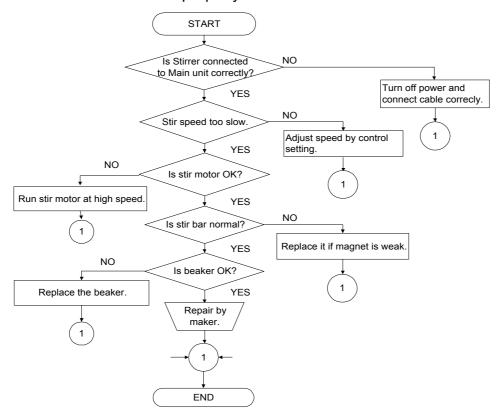
Note 1: Refer to the instructions for each tube connection.

Note 2: Pump reagent bottle by reduced pressure, and degas by placing it in ultrasonic cleaner.

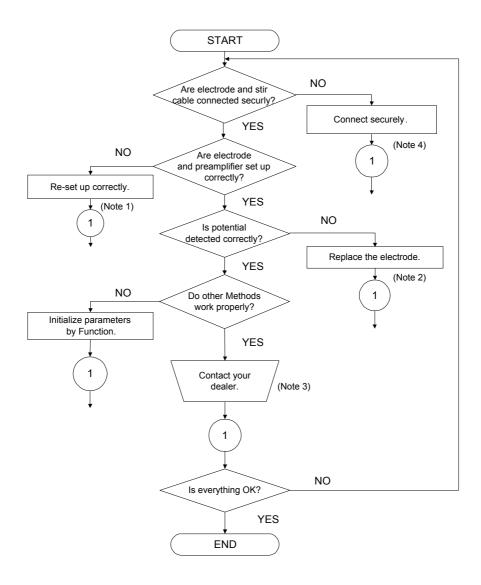
9-2-3. Piston burette does not move properly



9-2-4. Stirrer does not work properly



9-2-5. Titration control does not work properly



Note 1 : Wrong setting on burette number or detector number.

Note 2 : When potential is unstable, it is caused by deteriorated electrode or clogged junction of the electrode. If junction is clogged, change the combination of electrode to pH glass electrode (98100H171) and sleeve type (98100R172) or cork type (98100R115).

If potential is still unstable after the electrode is exchanged, preamplifier is the problem.

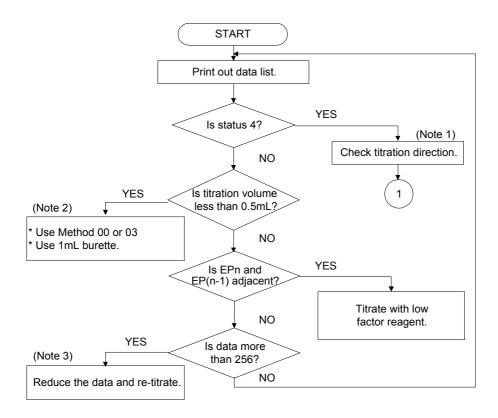
In this case, contact your local dealer.

Note 3 : Fax send information including titration curve, your Method used, parameters and data list so that our specialist can review and correct the problem.

Note 4 : When potential does not change, the connection between electrode and cable is improper. Replace the connecting cable.

9-2-6. Endpoint is not detected in Full or EP Stop titration

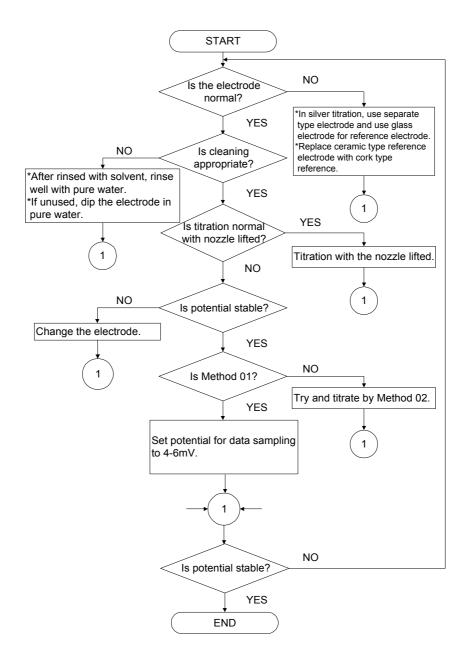
When inflection points can be seen on graphic curve.



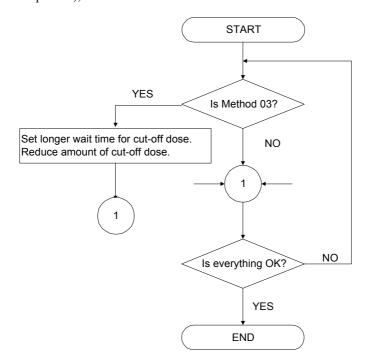
- Note 1 : Wrong parameter setting on titration direction.
- Note 2 : Since titration volume up to the inflection point is too small, try Method 00 or 03. By using 1mL burette, precision will be improved.
- Note 3 : To reduce the number of data, perform titration after fixed dosed. When the number of data exceeds 256, it fails in data sampling and does not detect endpoint.

9-2-7. Abnormal endpoint is detected in Full or EP Stop titration

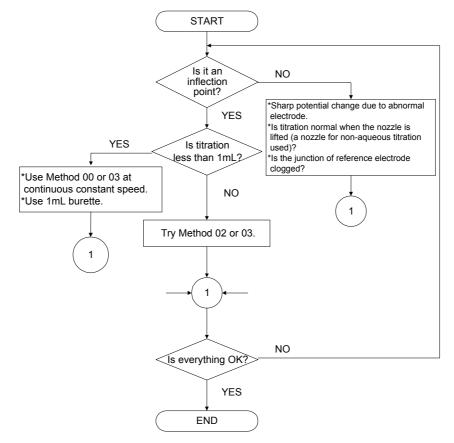
(1) When electrode potential is unstable in non-aqueous titration and the noise of electrode is picked up for an endpoint:



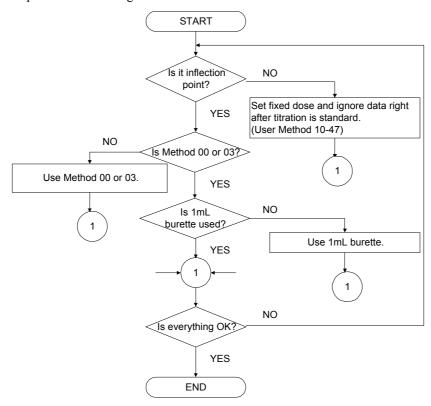
(2) When reaction is very slow (it takes more than 10 seconds until it reaches stable potential after titration solution is dispensed), use Method 02 or 03.



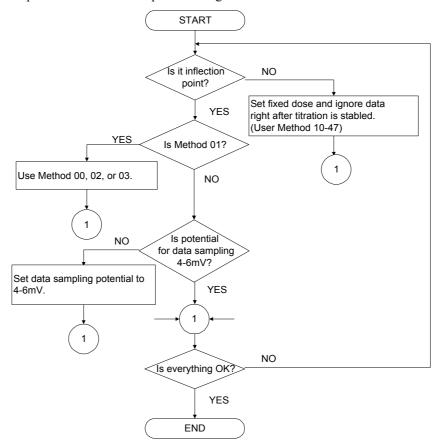
(3) When potential changes sharply so that an endpoint is picked up abruptly.



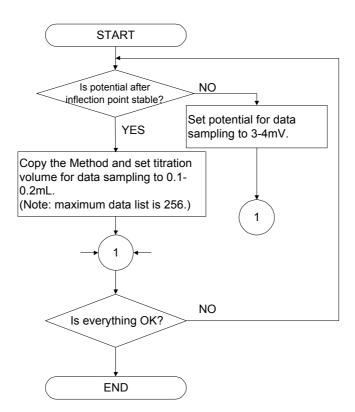
(4) When endpoint is detected right after start of titration.



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



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

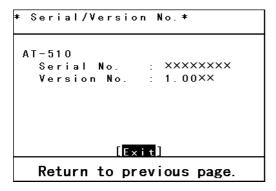


9-3. Production number and version number (Setup 3)

Each unit has individual production number together with software version number.

Those numbers can be checked by the following steps.

Press [Setup] key to display "Serial/Ver.No.".



The display changes as above. When a multiple sample changer is connected, the version number of the auto sampler as well as information on Main unit is also displayed.

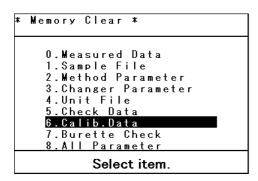
Note!

The individual production number and version number are necessary in case of repair.

9-4.Initialization to default (Function 14)

It is necessary to initialize preset parameters and settings in order to reset the system to default value. In this instrument, partial initialization (measurement data only, sample file only, etc.) is possible.

Press [Function] key to display "Memory Clear".



The display changes as above. Select the item to initialize by $[\uparrow]$, $[\downarrow]$ key and confirm by $[\downarrow]$ key. See items that can be initialized in Chart 9-4.

Chart 9-4

Item to initialize	Description	
Measured Data	Erase all measurement results data stored in Data File.	
Sample File	Initialize all sample conditions stored in Sample File.	
Method Parameter	Initialize parameters (Titration, Control, Result) of each Method.	
Changer Parameter	Initialize all the settings and user sequence for the auto sampler.	
Unit File	Initialize information on titration solution (reagent name, factor, etc.)	
Check Data	Initialize all the records of periodic check by standard substance.	
Calib. Data	Erase all the calibration records.	
Burette Check	Initialize all the records of burette capacity precision check.	
All Parameter	Initialize all of the above items once for all.	

When initialization is chosen, the confirming message appears. Select Yes/No by $[\leftarrow]$, $[\rightarrow]$ key and confirm by $[\rightarrow]$ key.

9-5. Function and default

Function	Item	Description ([] range to select)	Default
0.Method File		[Copy/Save/Load]	Сору
		Copy Method, PC card	
1.Data File		[Save/Load/Simulation/Re-Calculation/Statistics] Re-Calcula	
		Measurement results and PC card	
2.Sample File	Sample File	[Off/ Set]	Off
		Samples condition setup	
	Size Only	[Off/ Set]: Sizr setup only	Off
3.Changer File	Changer	[Off/CHA/CHG]: Slect changer type	Off
	Sequence	[1/2/3/4/5]: Select sequence for auto sampler	1
	Shower Time	[0-9999]: Showering time	10
	Rinse Time	[0-9999]: Rinsing time	10
	Drain1 Time	[0-9999]: Drain 1 time	30
	Drain2 Time	[0-9999]: Drain 2 time	30
	Wait Time	[0-9999]: Wait time for during rinsing	20
	Samp. Drain Time	[0-9999]: Smaple drain time	30
	Pre-Dose	[Off/ Set]: Pre-dose setup	Off
	Dose APB	[Off/ Set]: Select power burette	Set
	Pump Time	[0-9999]: Pumping time	0
	Dose Wait Time	[0-9999]: Wait time after pre-dose	30
4.Re-Titr.		Execute continuous titration	
5.Check Titr.	Method No.	[10-48]: Method No. setup for check measuremenet	10
6.Set Check	Check Mode	[Daily/Periodic]: Slect check mode	Periodic
	Detector No.	[1/2/3]: Detector No. for check	1
	Standard Name	[10characters]: Name of substance	Standard
	Standard Value	[0-999999]: value of standard substance	0
	Permit. Err.	[0-999999]: Tolerance	0
7.Periodic	Periodic	[Check/Calib.]: Select check or calibration	Calib.
	Detector No.	[1/2/3]: Detector No. for check	1
	Alarm	[Off/Set]: Set alarm for check date	Off
	Next Date	Display of next check date	/
	Interval	[0-99]: Periodic check interval	0
	Record	[Skip/Save/Load]	Skip
		: Select Skip, Save, or load for check list	
	Show List	Display of check list	

Function	Item	Description ([] range to select) Defa	
8.Buret Check	APB No.	[1-10]: burette No. for precision check	
	Unit No.	[1-20]: burette unit No. for precision check	1
	Permit. Err.	[0-999999]: Tolerance	0
	Temperature	[0-100]: water temperature setup	25
9.Auto Start	Method No.	[10-47]: set up Method No. for pH	10
	Interval Time	[1-99]: set up interval for auto start	1
	Times	[1-99]: number of times for auto start	
10.Auto Statis.	Auto Statistics	[No/Yes]: auto statistics setup No	
11.Common Blank		[0-999999]: blank level setup	0.0000
12.pH Calib Table	[]°C	[0-100]: input temperature for pH	
		(17 points/3 sets)	
	[]pH	[0-14]: pH value input (17 points/3 sets)	
13.Card Utility	_	_	_
14.Memory Clear	_	-	_

9-6.Setup and default

Function	Item	Description ([] range to select)	Default
0.Interface	RS-232C		
	Baud Rate	[300/600/900/1800/2400/4800/9600]	4800
		: communication speed	
	Parity	[None/Odd/Even]: parity setup	None
	Stop Bit	[1Bit/2Bits]: stop bit setup	1Bit
	Data Length	[7Bits/8Bits]: data length setup	8Bits
	Printer		
	Printer	[IDP/DP/Other/A4]: select printer	IDP
	Baud Rate	[300/600/900/1800/2400/4800/9600]	4800
		: communication speed	
	Parity	[None/Odd/Even]: parity setup	None
	Stop Bit	[1Bit/2Bits]: stop bit setup	1Bit
	Data Bit	[7Bits/8Bits]: data length setup	8Bits
	Balance		
	Balance	[KEM/Mettler/A&D/Shimadzu/Sartrius]	KEM
		: select a balance	
	Baud Rate	[300/600/900/1800/2400/4800/9600]	4800
		: communication speed	
	Parity	[None/Odd/Even]: parity setup	None
	Stop Bit	[1Bit/2Bits]: stop bit setup	1Bit
Data Bit [7Bits/8Bits]: da		[7Bits/8Bits]: data length setup	8Bits
1.Date & Time	Years	[1999-2098]: calendar year setup	
	Month	[1-12]: calendar month setup	
	Day	[1-31]: calendar day setup	
	Hour	[0-23]: present time setup	
	Minute	[0-59]: present minute setup	
	Date Type	[yyyy/mm/dd / dd/mm/yyyy / mm/dd/yyyy]	yyyy/mm/dd
		: present minute setup	
2.Regist Operator	_	_	_
3.Serial/Ver. No.	AT		
	Serial No.	Display of S/R number of titrator	
	Version No.	Display of software version of titrator	
	СНА		
	Version No.	Display of software version of auto sampler	

Function	Item	Description ([] range to select) Defa	
4.LCD Contrast	_	[Dark↔Light]: adjust brightness of LCD Middl	
5.Language	Language	[Japanese/English]: select a language	English
6.Lock	Password	[8 characters]	_
		: password to inhibit change of parameter	
	New Password	[8 characters]: change password –	
-	Confirm	[8 characters]: confirm password –	
7.Beep	Beep	[Off/Set]: beep setup	
	Веер Туре	[Off/Type1/Type2/Type3/Type4] Type1 : select tone of beep	
8.pH Potential	Polarity	[Standard/Reverse] : select mode of pH potential	Standard

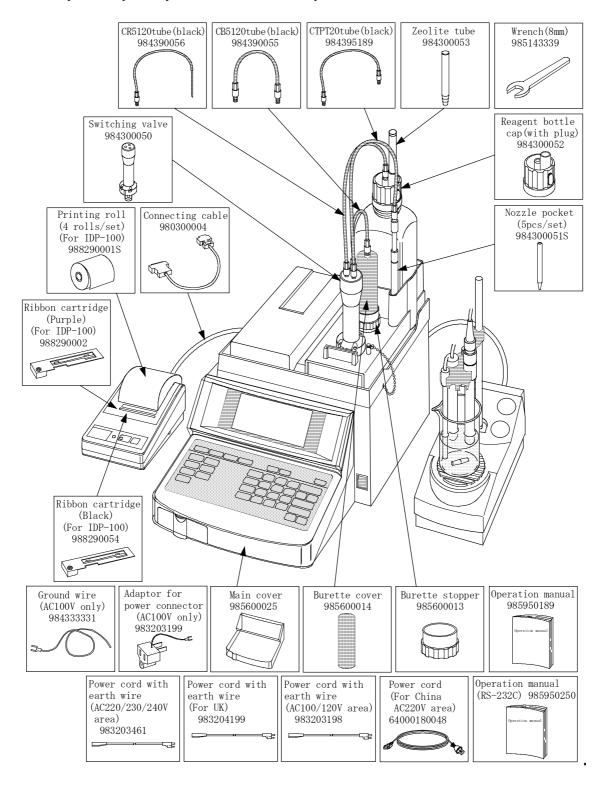
Note!

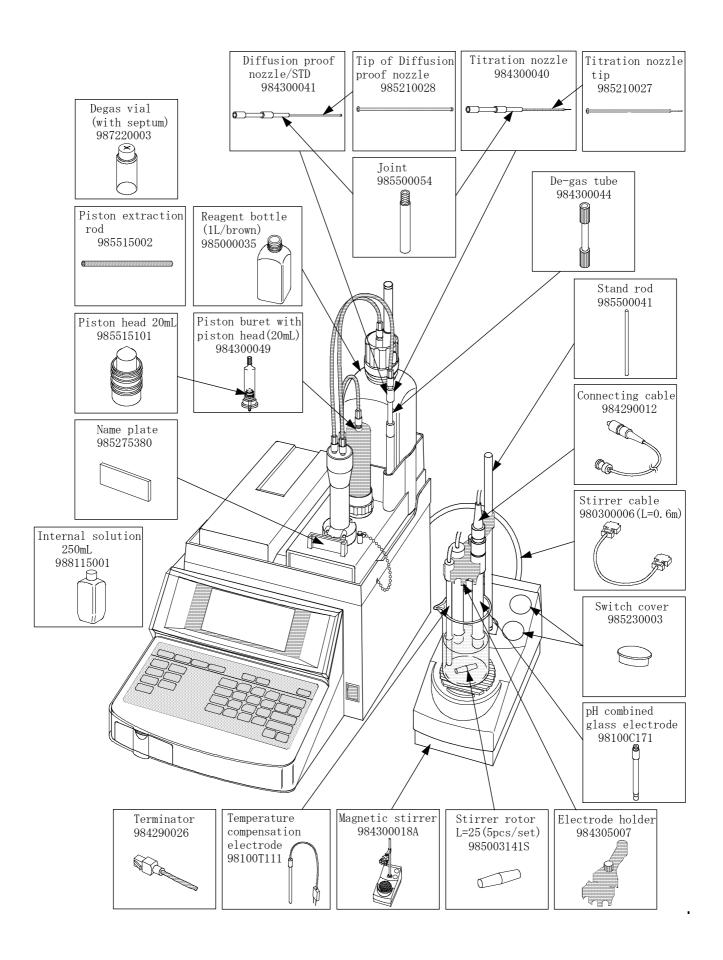
When Lock is Set, password message appears when any key of the followings is press: Titration, Control, Result, Function, Setup. Unless the password is entered, parameters cannot be changed.

10.Others

10-1.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.





Parts for APB-510-01B, 05B, 10B, 50B

Part code	Part name	Remark	Sketch
984390053	CB5101 tube (black)	Cock – burette For 1mL burette	270
984395167	CRPT01 tube (black)	Cock – reagent bottle For 1mL burette	650
984395191	CTPT01 tube (black)	Cock – nozzle For 1mL burette	500
985505342	Piston head for 50mL		₹ 1
985515206	Piston head for 10mL		\$16.37 A 24
985505341	Piston head for 5mL		φ11.63 Δ 27
985505340	Piston head for 1mL		φ 5.8 Ψ Ψ Ψ
984305335	Buret 1mL		<u>Ø10</u> <u>∞</u> <u>Ø</u> 19
984305339	Buret 50mL		φ40 φ48
984300048	Cylinder with piston (10mL/transparant)		φ 19.2 φ 36
984300047	Cylinder with piston (5mL/transparant)		φ 15.5 φ 36

Option

Part code	Part name	Remark	Sketch
PTA-510	Photometric titration adapter		MAIN UNIT JUNE
POT-510	Polarization titration adapter		MAIN UNIT STIE
CMT-510	Conductometric titration adapter		MAIN UNIT HIS
TET-510	Multiple preamplifier		MAIN UNI
CHA-500-12	Multiple sample		
СНА-500-18	changer (for 12 samples) Multiple sample changer (for 18 samples)		
APB-510-01B	Burette unit 1mL		
APB-510-05B	Burette unit 5mL		
APB-510-10B	Burette unit 10mL		
APB-510-50B	Burette unit 50mL		
AE-118DR	Balance	983500001 connector is necessary to use AE-118DR.	

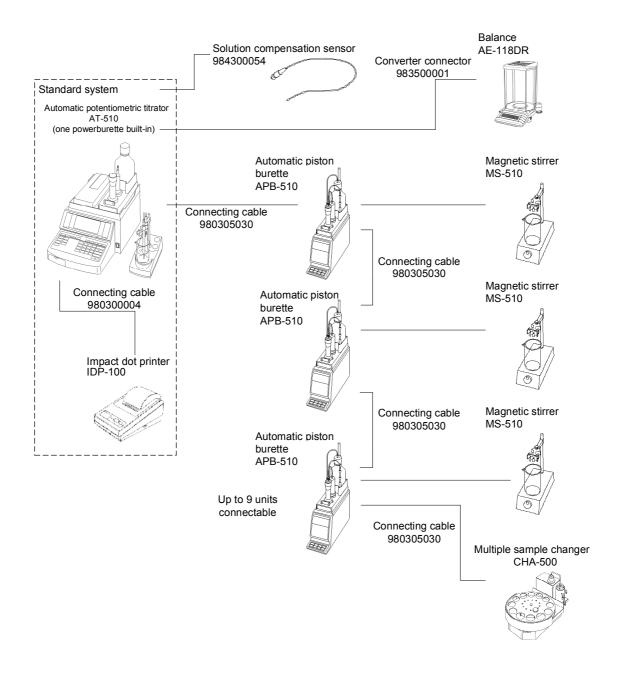
Part code	Part name	Remark	Sketch
980300002	PC connecting cable (for IBM-PC)	For IBM-PC 9 pin– 9 pin	
SOFT-CAP	Data capture software		
SOFT-PCR	PC CARD Read Software		
984340175	pH Table Card		
984340174	pH Measurement crad		
984340173	Application card		
984340039	Memory card	IMB SRAM card	
KF-510	Karl Fischer Titration Unit		
COD-510	COD Titration Unit		
984300036	Propeller stirrer		
MW-510	Manual washing unit		

Part code	Part name	Remark	Sketch
SCU-118	Sealed cell flask assembly		
MTA-118-1 MTA-118-5 MTA-118-50	Micro titration unit		
APB-510	Auto Piston burette		
984300054	Titrant temperature compensation sensor		

Electrode list

Part code	Part name	Remark
98100C171	Combination glass electrode (standard type)	Glass electrode and reference electrode in one
98100C172	Combination glass electrode	unit.
		$(OD\phi 12, length: 135mm)$
98100T111	Temperature compensation	For general use
	electrode (standard type)	
98100C678	Combination glass electrode	For vial
	(micro titration)	(dip area: OD ϕ 6, length: 135mm)
98100C272	Combination Pt electrode	Pt electrode and reference electrode in one unit
		$(OD\phi 12, length: 135mm)$
98100H171	pH glass electrode (standard type)	For general use
98100R171	Ceramic type reference electrode	For general use
98100R172	Sleeve type reference electrode	For sample coating junction
98100R173	Double junction reference electrode	For sample contaminating inner solution
98100R115	Cork type reference electrode	For non-aqueous titration
98100R272	Mercury sulfate type reference electrode	For silver titration
98100M271	Platinum electrode (standard type)	For redox potentiometric titration
98100M511	Twin Pt electrode	For polarization titration
98100M371	Silver electrode (standard type)	For silver titration
98101K321	Conductivity cell	For conductivity titration
988115001	Inner solution (250mL)	3.33M-KCl solution
988110026	Inner solution (250mL)	1M-KNO ₃ solution

10-2. System components



Message or symbol	Description
1st D. Speed	Select dose speed.
1st Dose Volume	Select the first dose volume.
1st End Level	Set up the first endpoint potential.
2nd Dose Volume	Select the second dose volume.
2nd End Level	Set up the second endpoint level.
After Titr. Sequence	Set up sequence number for cleaning after titration.
After Titr. Wash	Set up sequence number for cleaning after titration.
Alarm	Set alarm for remaining reagent and check date.
APB No.	Select burette number.
APB No.	APB number used for titration
Auto Simulation	Set auto EP re-detection.
Auto Start	Select continuous titration mode using pH measurement card.
Auto Statistics	Set up auto statistical calculation.
Balance	Set up balance weighing.
Baud Rate	Electronic communication speed.
Before Titr. Sequence	Select sequence number for cleaning before titration.
Before Wash No.	Select sequence number for cleaning before titration.
Blank Replace	Set up blank number for auto input in statistics.
Blank1-Blank20	Blank level
Burette No.	Select burette number.
Calculation Para.	Calculation parameter
Calculation Type	Select Sample/Factor/Blank as a result of calculation.
Calculation Type	Set up data group for statistics.
Calib Method	Calibration method for pH
Calib. Buffer	Selection of standard buffer solution
Calib. Points	Set up a number of pH calibration point.
Calib. Table	Temperature compensation table for pH calibration
Cell Constant	Set up cell constant of conductivity sensor.
Changer Chank Made	Set up a multiple sample changer.
Check Mode	Select calibration or periodic check.
CMT Range	Set up conductivity range.
CMT Temp. Co.	Temperature compensation coefficient for conductivity measurement
Cn(1-5)mg/mL	Concentration conversion coefficient for calculation
Combine Data	Combined data
Conc.1–Conc.5	Concentration formula 1 to 5
Concentration	Concentration of reagent
Constant Para.	Calculation constant
Control Para.	Control parameter
Control Speed	Control speed mode in auto control titration
Correct Temp.	Compensated temperature of titration solution
Current Mathad	Constant current loaded in polarization titration
Current Method	Fixed Method is set up.
Current No.	Select sequence file mode for cleaning after titration.
Current Unit	Fixed sampling unit is set up.
Cut-off Time	Set up time interval for cut-off dose.
Darin2 Time	Set up time for draining.
Data Bit	Data bit setup
Data List	Data list
Data Print	Printout of statistics data
Data Samp. Pot.	Set up data sampling potential.
Data Samp. Vol.	Set up data sampling volume.

Message or symbol	Description
Date	Date
Date of Replace	Set up a date to replace reagent.
Delay Time	Set up delay time in data sampling.
Detector No.	Set up the detector number.
DF	Symbol of calculation to express factor of dose solution
Differential	Set up differential of fixed dose.
Direction	Titration direction
Dispense Speed	Set up dispense speed.
Dose Mode	Select dose mode.
Dose Unit	Potential unit in fixed dose
Dose Unit No.	Burette unit number for fixed dose
Dose Volume	The amount in volume of fixed dose
Drain1 Time	Draining time with auto sampler connected
DRI	The symbol to express drift level in KF titration
End Level	Endpoint level of the first EP
End Point	Total number of endpoints in simulation
End Point Area	Set up endpoint area.
End point Data	Select printout of endpoint data
End Point Level	First EP level of Method 04, 06(including coped method)
End Point No.	Input total number of endpoints.
End Sense	Set up end sense mode.
End Time	Set up time for end sense.
EP No.	Define endpoint to execute concentration calculation.
EP Stop Mode	Set up EP changing direction in auto intersect.
EQN	Symbol of calculation to express gram equivalence number.
Equiv. Number	Gram equivalence number
Factor	Reagent factor
Final level	Select printout of final level.
Final Titr. Sequence	Sequence setup for cleaning after last titration
Final Volume	Final titration volume
Final Wash No.	Sequence number setup for cleaning after last titration
Form	Titration form
Formula	Calculation formula for concentration
Gain	Gain of detection sensor
Graphic Curve	Titration curve
Graphic Range	Selection of range mode of graphic display
Graphic Type	Selection of type of graphic curve on display
High Sample No.	Selection of data group in statistics
Initial Level	Initial level
Initial Temp.	Initial temperature
Integral Time	Time for reading potential
Interval	Setting interval for periodic check/calibration date
Interval Time	Interval of measurements
K1-K5	Symbol of calculation formula to express unit conversion coefficient
Lag Time	Data sampling time
Last Volume	Titration volume of previous measurement
Level	Setting stop level of fixed dose
Level	Separation level by Separation function
Level Lower	Lower limit of display level
Level or EP	Priority order of endpoint in calculation formula
Level Stop	Setting EP level mode by Separation function
Level Upper	Upper limit of display level

Message or symbol	Description
Limit Time	Limit time for titration by Method 04, 06 (including copied method)
Lower Level	Lower lever of endpoint area
Lower Volume	Lower level of titration in endpoint area
Lower Volume	Lower level of reagent alarm
Max Measure No.	Maximum number of samples for measurement
Max Volume	Maximum dose volume
Max Volume	Maximum titration volume
Memory Clear	Clear stored data
Method	Method
Method Name	Method name
Method No.	Method number
Method Type	Method type to select
Model/Serial	Type of model and serial number
Molecular Weight	Molecular weight
MW	Symbol used in calculation formula to express molecular weight
N1-N5	Symbol to express normal degree in concentration calculation
Next Date	Forthcoming date for check or calibration
Next Measure No.	Enter sample number for next measurement
Offset Potential	Offset potential in stat titration
Operator	Operator of the instrument
Operator Name	Operator's name
Over Titr. Vol.	Over-titration volume
Parameter A	Temperature compensation coefficient (A) of titration solution
Parameter B	Temperature compensation coefficient (A) of titration solution
Parameter Set	Setting cleaning parameter by multiple sample changer
Parity	Parity in digital configuration
Periodic	Periodic check mode
Permit. Err.	Permissible error in check measurement
Pre-Dose	Pre-dose function of multiple sample changer
Printer	Printer setup
Pump Time	Pumping time
Purge Times	A number of purge times by burette
Purge Type	Purge mode by burette
Reagent Name	A name of reagent solution
Record	History of check records
Rel. Change Lev.	Relative change level to switch dose volume
Report Format	Report format by printing
REQN	Symbol to express gram equivalence number of titration solution
Result	Result of concentration calculation
Rinse Time	Electrode dipping time when auto sampler is used
RMW	Symbol used in calculation to express molecular weight of solution
Samp. Drain Time	Sample drain time when auto sampler is used
Sample File	Sample File
Sample ID	Sample identification
Sample No.	Sample number
Sample Size	Sample size
Separation Separation	Endpoint separation
SEQN	Symbol to express sample gram equivalence number
Sequence No []	Sequence number for cleaning by multiple sample changer
Set Speed	Setting control speed
Show List	Display of check record
Shower Time	Electrode cleaning time when auto sampler is used.
OHOWOI TIIIIC	Licential circumity time when auto sampler is used.

Message or symbol	Description
Size	Sample size
Size Only	Sample size entry mode
Size Unit	Sample unit
SMW	Symbol in calculation to express molecular weight of sample
Stability	Input limit time for stability sense.
Stability(mV/min)	Stability sense time for Method 06 (including copied)
Stability(mV/s)	Input stability sense value for method 02 (including copied)
Standard Name	The name of a standard substance
Standard Value	The value of s standard substance
Start Limit	Limit time to start titration
Stat Level	Stat level
STD Buffer X	Enter pH value of standard solution X
STD Solution	Enter the value of standard solution
Stirrer Speed	Stir speed
Stop Bit	Stop bit of digital configuration
Temp	Temperature
Temp. Comp.	Temperature compensation of titration solution
Temp. of STD	Temperature of standard solution
Temperature	Temperature of pure water
TF	Symbol in calculation to express factor of titration solution
Time Lower	Lower limit of graph for stat titration
Time Upper	Upper limit of graph for stat titration
Times	A number of measurement times
Titr. Time	Titration time length
Titrant Temp.	Titrant temperature in temperature compensation
Titration Mode	Titration control mode
Titration Para.	Titration parameter
Unit	Unit
Unit No.	Burette unit number for titration
Unit No.	Entry of burette unit number
Unit Type	Unit type
Unit Volume	Unit volume in cut-off dose
Upper Level	Upper level of endpoint sense area
Upper Volume	Upper limit of titration in endpoint sense area
User Sequence	Setting user defined sequence
Voltage	Constant voltage of polarization titration
Volume	Setting fixed volume to dispense
Volume	Titrant volume of a burette unit
Volume Lower	Lower limit of titration in graphic display
Volume Upper	Upper limit of titration in graphic display
Wait Time	Wait time
Wait Time	Wait time
Δ Deg Sense	Setting angle difference to determine endpoint
ΔE Sense	Setting potential difference to determine endpoint
Δ E/ Δ mL Sense	Setting differential difference to determine endpoint
Δ E(1st->2nd)Pot.	Setting dose switching potential

10-4. Technical data

Model name	AT-510 Automatic Potentiometric Titrator		
Detection range	1) Potentiometric : -2000mV~+2000mV		
, and the second	2) pH : 0.00~14.00pH		
	3) Temperature : 0~100°C		
Titration mode	Blank, Auto control, Auto cut-off, Cut-off/Constant speed, Petroleum products neutralization		
	number, KF, COD, total 7 modes		
Method	Standard 7, User defined 38, Combined methods 5		
Kinds of titration	Potentiometric (acid/base, redox, precipitation)		
	Photometric, Polarization, Conductivity		
Titration form	1) Full titration (Auto EP detection) Full		
	2) EP Stop Ep		
	3) Level Stop Level		
	4) Auto Intermit Intersect		
	5) EP Stop/Level Stop Level & Ep		
	6) Stat control Stat		
	7) Learn titration Learn		
Special application	Measurement of electrode potential (pH, potential)		
Display	30 digits by 13 lines, LCD with back light		
Display contents	Potential, titration volume, Results, Parameters		
Endpoint indication	By beep (4 tones) and display of concentration calculation results		
Error messages	Wrong key entry, error in calculation input, instrumental error		
Calculation function	Concentration, statistics (mean, standard deviation, RSD)		
Power burette	One built-in unit and up to 9 external units		
Burette precision	20mL (standard) : ±0.02 mL, Reproducibility ±0.01 mL		
•	1mL (option) : ±0.005 mL, Reproducibility ±0.001 mL		
	5mL (option) : ±0.01 mL, Reproducibility ±0.003 mL		
	10mL (option) : ±0.015 mL, Reproducibility ±0.005 mL		
	50mL (option) : ±0.05 mL, Reproducibility ±0.02 mL		
Preamplifier	1) STD-510 : pH (mV) and mV, 2 inputs (standard)		
	2) PTA-510 : pH (mV), mV and photometric, 3 inputs (option)		
	3) POT-510 : pH (mV), mV and polar, 3 inputs (option)		
	4) CMT-510 : pH (mV), mV and conductivity, 3 inputs (option)		
	5) TET-510 : pH (mV) 2 ways and mV, 3 inputs (option)		
Multiple sample changer	Optional CHA-500		
External content	Standard 3 channels interface (balance, printer and RS-232C)		
Printer	External impact dot printer model IDP-100		
Ambient condition	Temperature : 5~35°C		
	Humidity : less than 85%RH (no condensation)		
Power source	AC100~120/200~240V 50/60Hz		
Power consumption	Approx. 30W		
Dimension	Main unit : $288(W) \times 468(D) \times 481(H)$ mm		
	Stand : $118(W) \times 225(D) \times 336(H)$ mm		
Weight	10kg		

10-5. Warranty and after-sale service

- 1. The product you have purchased passed standard test and inspection in plant before shipment. Quality of the product is covered by one-year warranty except consumable parts.
 - Some conditions or performance in use may not be covered even when the product is in the warranty period.
- For repair or maintenance servicing, please contact your local dealer or distributor where you purchased the product.
- 3. Before you call the dealer, read the manual ("8. Maintenance" and "9. Troubleshooting") and recheck the trouble

When you contact your dealer, please notify:

Production No. of your instrument Details of the trouble Person to contact

- 4. Parts and consumables can be purchased from your dealer. Parts for discontinued model will be supplied for further seven years.
- 5. This warranty does not cover claims caused by any of the followings:
 - (1) Modification by unauthorized person
 - (2) Splashed by or dipped in water (the product is not waterproof.)
 - (3) Use under condition or range other than specified
 - (4) Operated in other method than specified in the manual
 - (5) Dropped or given physical shock
 - (6) Erroneous handling or misuse
 - (7) Use under extraordinary environmental condition
 - (8) Caused by fire, earthquake, lightning or Act of God
 - 6. The manufacturer, dealer or distributor of the product will not be responsible for any loss or damage, whether economical or physical, related directly or indirectly in use of the product.