

pH Meter

Cat. No. BT1203

Thanks for choosing BT Lab Systems pH Meter. This operation manual describes the function and operation of the instrument. For proper use, please read this manual carefully before operating the instrument.

IMPORTANT SAFETY INFORMATION

- This product is an indoor instrument which conforms to Standard B style- I type- GB9706.1
- These units are designed for laboratory use by people knowledgeable in safe laboratory practices.
- The operator should never open or repair the instrument. Opening or repairing the instrument will void the warranty and can cause accidents.
- Make sure the rated electrical outlet load is no lower than the demand. Power cord should be replaced with the same type if it is damaged. Make sure there is nothing else on the power line. Hold the jack when pulling out the power line. Do not pull the power line. Do not put the power line in a place where there is a tripping hazard.
- The instrument should be used in an area with low humidity, little dust, away from water and direct sunlight. Area should have strong ventilation without corrosive gases or strong magnetic fields. Keep away from stoves and all other heat sources.
- Power off when not in use. If the instrument will not be used for a long period, unplug, and cover to protect it from dust.
- In case of the following, unplug the instrument at once and contact BT Lab Systems.
 - The instrument encounters liquid.
 - The instrument gets soaked or burned.
 - The instrument emits an abnormal sound or smell.
 - The instrument is dropped or the outer shell damaged.
 - The instrument functions abnormally.

INTRODUCTION

BT Lab Systems pH Meter is used to measure the acidity or alkalinity (pH) and electrode potential (mV) of solutions. This instrument is suitable for many different fields such as research laboratories, pharmaceutical industries, chemical engineering, and environmental protection, etc.

Features

- 5-inch color touch screen for convenient navigation.
- Supports manual (MTC) and automatic temperature compensation (ATC).
- Offers measurements for pH, mV, and temperature values.
- Unit comes with an electrode support stand and ultra-thin magnetic stirrer.
- Three endpoint reading modes: manual, automatic, and timed.
- Diversified and multi-precision stability modes: strict, normal, and fast reading.
- Convenient and quick with automatic readings at timed intervals.
- Capable of connecting to printers and stirrers and has large data storage capacity.



TECHNICAL SPECIFICATIONS

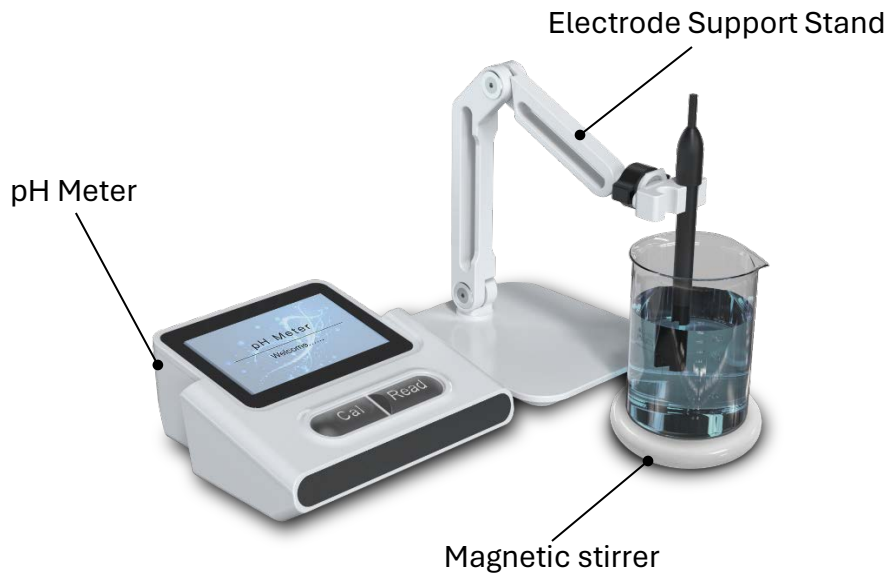
Normal Operating Conditions

- Ambient Temperature: 4°C - 45°C
 - Suggested Ambient Temperature: 15°C – 30°C.
- Relative Humidity: ≤80%
- Power: DC12V, 1A

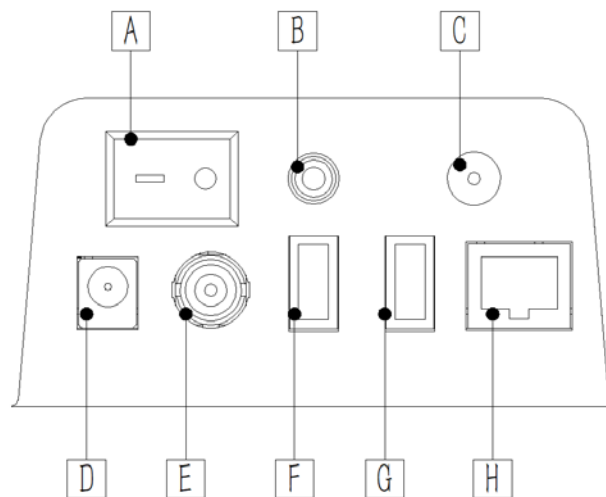
Basic Parameters

Model	BT1203
pH Measuring Range	-2 – 20pH
Temperature Measurement Range	0 – 120°C
pH Resolution	0.1/ 0.01/ 0.001pH
mV Resolution	0.1mV
Temperature Resolution	0.1°C
pH Basic Error	±0.002pH
Basic Error	±0.1mV
Temperature Basic Error	±0.2°C
Temperature Compensation	Automatic/Manual 0 – 120°C
Storage Capacity	10,000 sets of measurement data
Standard Electrode	Universal Electrode, 0-14 pH (BNC Interface)
Calibration Method	2 sets of preset buffer solutions
Display Screen	5-inch color touch screen
Power Supply	AC100-240V, 50/60Hz
Dimension (W x D x H)	175 x 165 x 70mm
Net Weight	0.7kg

STRUCTURE



Back Panel Layout



A – Power Switch

B – 3.5mm Port: Temperature signal input

C – 2mm Port: Reference signal input

D – DC Power Port

E – BNC Port: pH/mV signal input

F – USB A Port: Only to connect stirrer

G – USB B Port: For USB disk or to connect a printer

H – Network Cable interface

ASSEMBLY

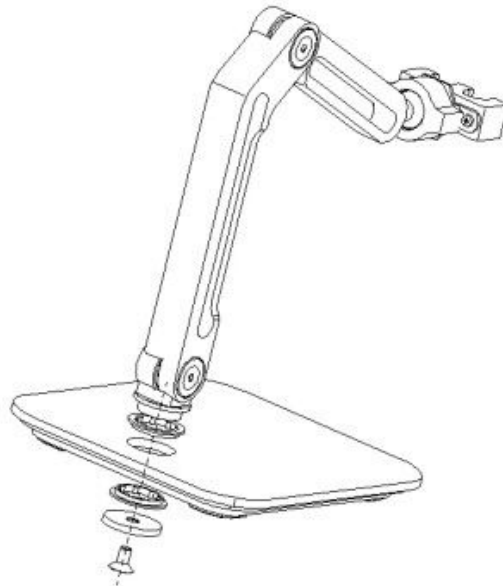
Electrode Installation

To connect the pH electrode to the instrument, follow the below steps.

1. Remove the joint nut at the BNC interface on the instrument.
2. Connect the electrode making sure the joint is rotated in place.
3. If using an electrode with a built-in temperature probe or a separate temperature probe, connect the other cable into the 3.5mm Temperature Port of the instrument.

Electrode Support Stand

Use a wrench to tighten the screws and attach the base of the support stand to the Electrode Support.



OPERATION GUIDE

This section is a basic guide on the instruments functions and on how to operate the unit.

Main Menu

Upon startup of the instrument, the screen will display the main menu. The main menu consists of 4 icons: **Read**, **Data**, **Cal**, and **System**.



Press the icon on the screen to open the specific menu interface.

Read – Starts or ends measurement. Pushing the Read button on the unit will do the same.

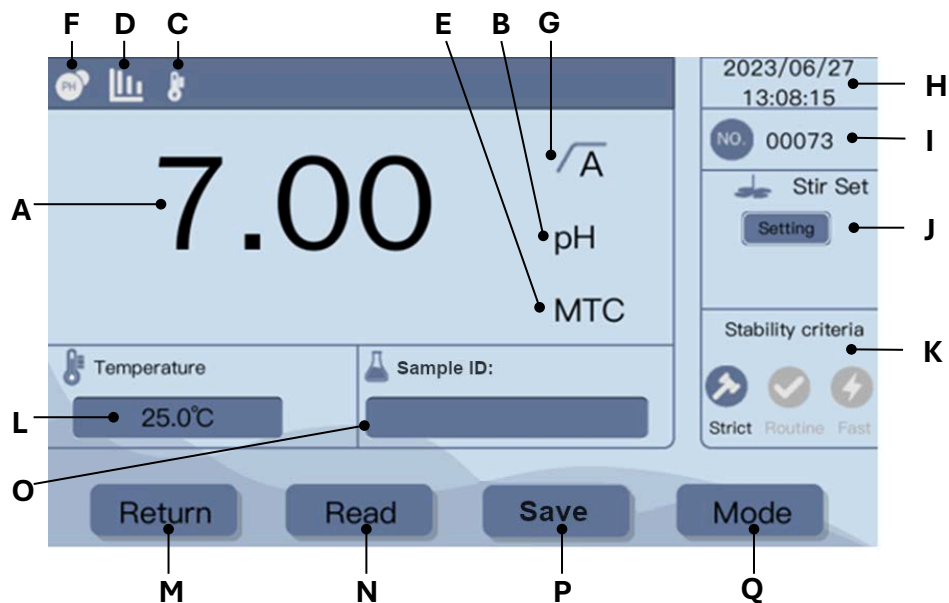
Data – Press to get to the *Data Management* Interface.




Cal – Starts calibration and navigates to the *Calibration* Interface. Pushing the Cal button on the unit will do the same.

System – Press to navigate to the *System and Measurement Settings* Interface.

Measurement Display

Key buttons and icons displayed on the calibration interface are shown below.



- A. Measured Value
- B. Current measurement unit
- C. Temperature Joint Connection
- D. pH Electrode Health Status
 -  Slope 95-105%, offset ± (0-20) mV, Good Condition
 -  Slope 90-94%, offset ± (20-35) mV, needs to be cleaned
 -  Slope 85-89%, offset ± (>35) mV, Failure
- E. Temperature Compensation Mode Type
 - ATC – Automatic Temperature Compensation
 - MTC – Manual Temperature Compensation
- F. Measurement Mode Icon
- G. Endpoint Reading Mode
 - √A – Automatic
 - √M – Manual
 - √T – Timed
- H. Date and Time
- I. Measurement File Number
- J. Stirrer Setting
- K. Stability Mode
- L. Temperature display
- M. Return Key
- N. Read Key

- O. Measure Sample ID
- P. Save Key
- Q. Measurement Mode Key

Measurement Modes

Press the **Mode** key to switch between pH, mV, and Rel.mV measurements.

- pH mode displays the pH value and temperature.
- mV mode displays the mV and temperature.
- Rel.mV mode displays the relative zero mV and temperature.

pH Measurement

For pH measurement, the pH measurement mode icon should be displayed.

1. Place the electrode in the sample solution.
2. Press the READ key to start the measurement process.
3. The measurement mode icon flashing indicates the measurement is currently in progress.
4. Once reading is stable based on the selected stability criteria, the pH measurement and temperature data is displayed.
5. Measurement process is stopped based on the Endpoint Mode that is currently set.
 - Automatic mode (\sqrt{A}) – measurement will automatically stop when the stability icon appears.
 - Manual mode (\sqrt{M}) – user must press the **Read** Key to manually stop the measurement.
 - Timed mode (\sqrt{T}) – measurement stops after preset time is met.

mV Measurement

For mV measurement, switch the measurement mode by pressing the **Mode** Key, then follow the same steps used for the pH measurement.

Stability Criteria Setting

To switch the measurement data stability criteria, press on the associated icon on the measurement display.



Strict – The measured signal does not change by more than 0.03mV in 8 seconds or 0.1mV in 30 seconds.



Normal – The measured signal does not change by more than 0.1mV in 6 seconds.



Fast – The measured signal does not change more than 0.6mV in 4 seconds.

Stir Setting

BT Lab Systems Cat. # BT1203-B, pH Meter Ultra-Thin Magnetic Stirrer, can be connected to the instrument. The stirrer is powered by the unit and will automatically turn on/off according to the settings. Users can also select when the stirrer is activated.

Stir Speed

Press the + or – keys to adjust the stirring speed (100 – 1200 rpm/min).

Before Measurement Stirring

- **ON** – stirring begins for the selected amount of time (3 – 60 seconds) before the measurement starts.
- **OFF** – the stirrer does not activate before the measurement.

During Measurement Stirring

- **ON** – stirring begins when the measurement starts. When the measurement is stable and reaches the end, the stirrer will automatically switch off.
- **OFF** – there stirrer does not activate during the measurement.

Calibration

The meter can calibrate up to 3 pH values using USA (Buffer Set 1) or NIST (Buffer Set 2) standards, see table below for details.

Buffer Set 1	4.01	7.00	10.01	at 25°C
Buffer Set 2	4.00	6.86	9.18	at 25°C

Temperature tables for these buffer sets can be found in the “Appendix” section.

It is recommended to use the automatic temperature compensation (ATC) probe in tandem with the pH probe during calibration as it is automatically selected to read during calibration.

The meter can adopt 1 to 3 points of calibration. The 1st point must be using 7.00 pH (or 6.86 pH) buffer solution, and then choose other buffers to do 2nd point or 3rd point. Please refer to the table below for details.

	Buffer Set 1	Buffer Set 2	When to adopt
1-point cal.	pH 7.00	pH 6.86	Accuracy ±0.1
2-point cal.	pH 7.00→4.01	pH 6.86→4.00	Measuring pH range: < 7.00
	pH 7.00→10.01	pH 6.86→9.18	Measuring pH range: > 7.00
3-point cal.	pH 7.00→4.01→10.01	pH 6.86→4.00→9.18	Wide measuring range

1-point calibration

Prior to performing the calibration, the meter should be in pH measurement mode.

1. Place the pH electrode into the pH standard buffer.
2. Return to the main menu, then press the **CAL** key on the screen or press the **CAL** button on the unit.
3. The sensor will automatically recognize the buffer pH value, and the No. 1 pH value and temperature will appear on screen if the endpoint mode is set to **Auto**.
or
If the endpoint type is **Manual**, press **Read** to manually stop the measurement.
4. The 1-point calibration is complete. To perform a multipoint calibration, skip to the next section.
or
Press the **Save** key to save the 1-point calibration results.
or
Press **Exit** to reject the calibration and return to the measurement display.

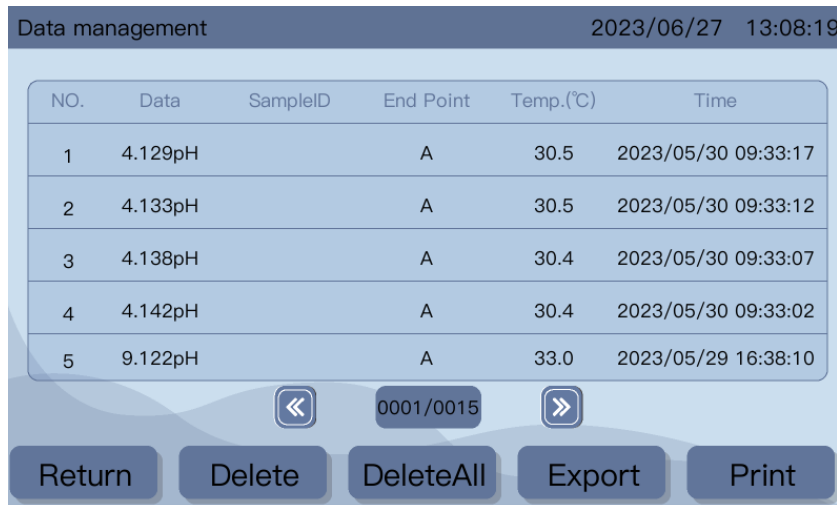
Multi-point calibration

After completing the 1-point calibration process above, continue with the next calibration by following the below steps.

1. Clean the electrode tip with distilled water and allow it to dry or wipe off with low lint wipes.
2. Place the electrode in the next calibration buffer/standard, then press the **CAL** button.
3. The No. 2 pH value will appear on the display and the measurement will automatically stop once reading is stable if **Auto** endpoint mode is set.
or
If the endpoint type is **Manual**, press **Read** to manually stop the measurement.
4. To perform a 3-point calibration, repeat steps 1 to 3.
or
Press the **Save** key to save the results.
or
Press **Exit** to reject the calibration and return to measurement display.

Data Management

The pH meter can store up to 10,000 measurements. The file reports can be located and managed on the data management interface.



The screenshot shows the 'Data management' screen with a date and time of 2023/06/27 13:08:19. It features a table with the following data:

NO.	Data	SampleID	End Point	Temp.(°C)	Time
1	4.129pH		A	30.5	2023/05/30 09:33:17
2	4.133pH		A	30.5	2023/05/30 09:33:12
3	4.138pH		A	30.4	2023/05/30 09:33:07
4	4.142pH		A	30.4	2023/05/30 09:33:02
5	9.122pH		A	33.0	2023/05/29 16:38:10

Below the table, there are navigation arrows, a page indicator '0001/0015', and five action buttons: Return, Delete, DeleteAll, Export, and Print.

Storage and Deletion

Stored data files in the memory of the unit are displayed in sequential order. When the memory storage is full, the system will automatically start to delete the oldest files first.

Data can also be manually deleted. Simply select the data file, then press **Delete**. Users will be prompted to confirm by pressing **OK**.

Data Export and Print

Data can be transferred to a connected and running PC or exported to a USB disk.

Users may send the data to a connected printer for printing.
The printed information is formatted like the below example.

=====2=====

Time : 2022/11/11 09:09:09

Data : 8.555pH

Temp. : 25.6 ATC

Stability type : Strict

End mode : Manual

=====

System Settings

From the main menu screen, press the **System** icon to navigate to the system settings interface. Here, users can update the software settings and modify the measurement settings.

Time and Date Setting

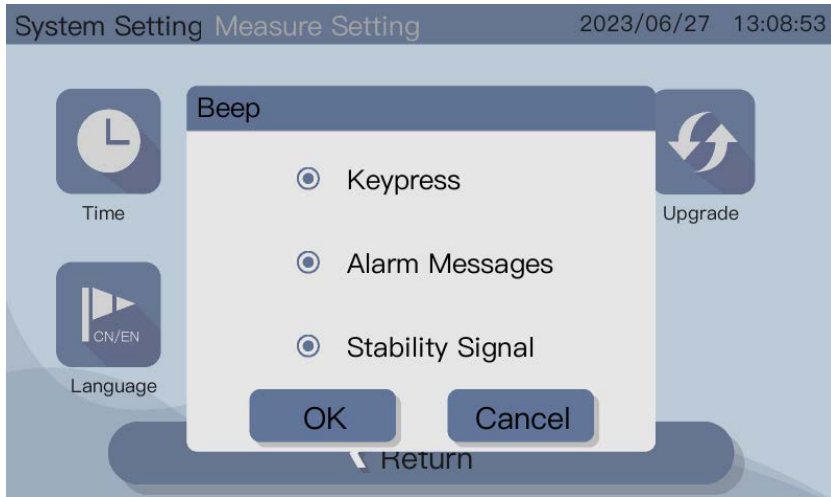
To modify the date and time of the instrument, press the **Time** icon.
The format is YYYY-MM-DD for date and HH:MM:SS for time.



Beep Setting

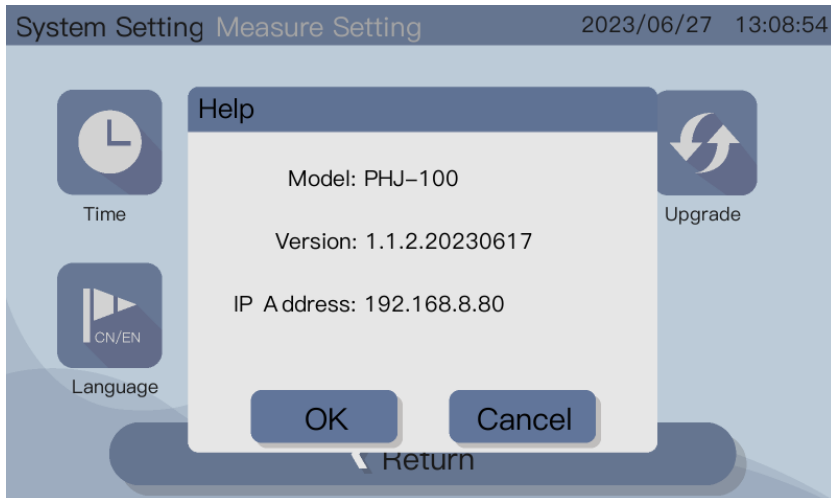
Press the **Beep** icon to modify the settings for the system sounds.

Users can enable/disable the sound settings for Keypress, Alarm Messages, and Stability Signal.



Help Information

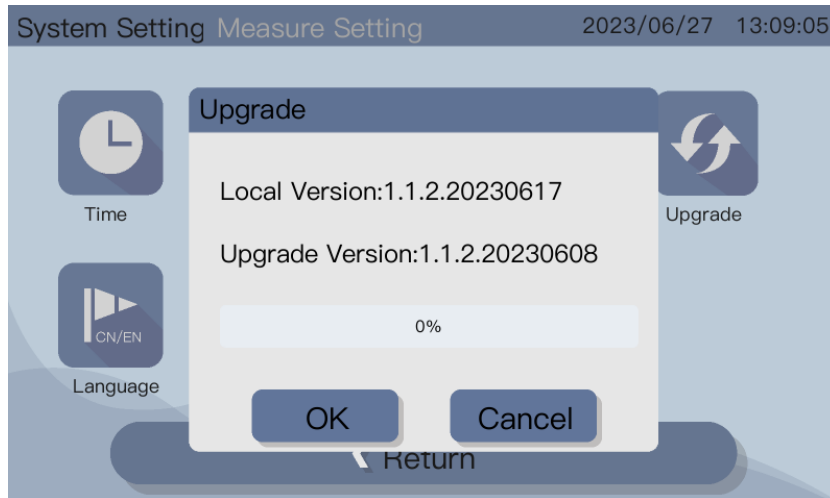
The **Help** icon will bring up the device information.



System Upgrade

Users can perform a system software update using a USB disk.

1. Insert the USB disk into the instrument.
2. Press the **Upgrade** icon and the system will start the update. A message box will appear showing the progress of the upgrade.
3. Once complete, press **OK** and restart the device.



Language Setting

Users can choose between Chinese or English for the system language.

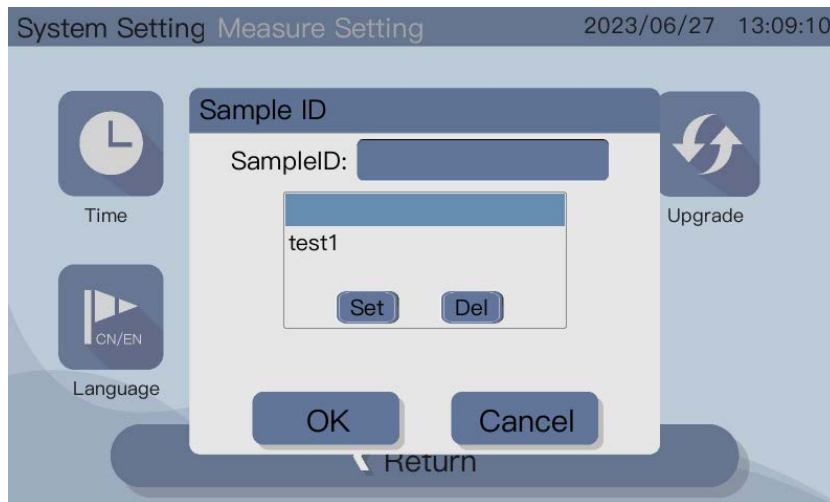


Sample ID Setting

The ID names are managed under the Sample ID Settings.

1. To create a new ID, enter an ID name using the alpha-numeric system.
It is recommended to assign a number at the end of the name, if planning to use the auto-increment settings.
2. Set the auto-increment for this ID to ON or OFF.
 - **ON** – the sample ID automatically increments by 1 for each reading.
 - **OFF** – the sample ID does not automatically increment.

An existing sample ID can be selected and set for use or deleted.

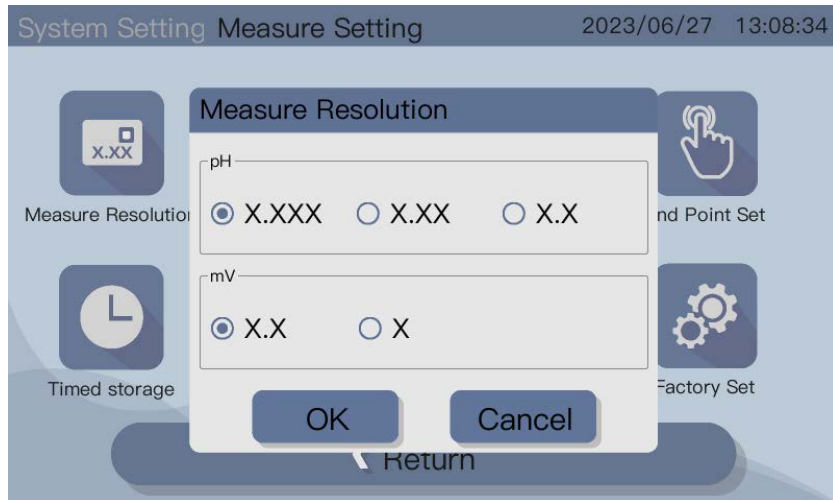


Measurement Settings

From the system settings, press the **Measure** icon to enter the measurement settings interface.

Measurement Resolution

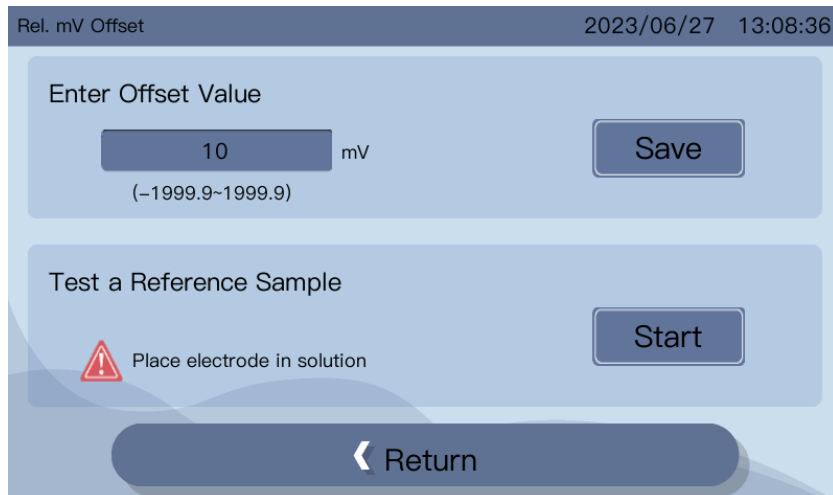
Different options of pH and mV resolutions can be selected. The default pH resolution is two decimal places.



Rel. mV Offset

In the rel. mV mode, the offset is subtracted from the measured value. The offset value can be entered or determined by testing the mV of a reference sample.

Enter an offset value in the range of -1999.9mV – 1999.9mv, then press **Save**.



Test a Reference Sample

1. Place an electrode into the sample solution.
2. Press **Start**, then wait for the reading to stabilize and measurement display to freeze or press the **Read** button to manually end the measurement.
3. Press **Save** to have the measured mV value set as the offset.

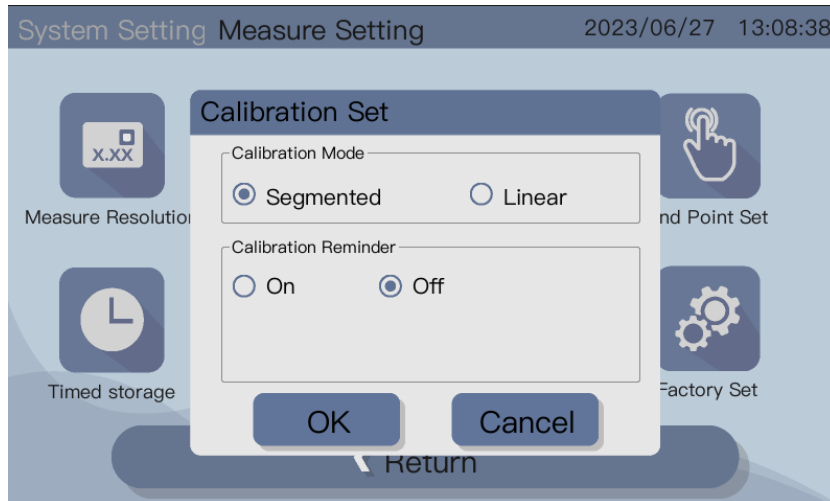
Calibration Setting

Define the calibration method.

- **Segmented** – The calibration curve consists of linear segments connecting individual calibration points. Segmented mode is recommended if high accuracy is required.
- **Linear** – The calibration curve is determined using linear regression. Linear mode is recommended for samples with large pH variations.

Calibration reminders can be turned on or off.

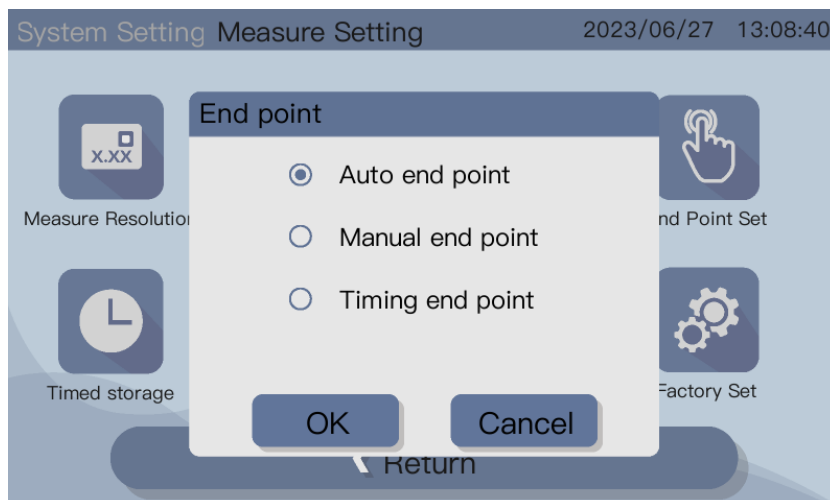
ON – a reminder will alert the user to perform a calibration after a set time. An interval of 1-1999 hours can be set.



Endpoint Setting

The endpoint mode is the reading standard after data stabilization during measurement. Users can select the endpoint type.

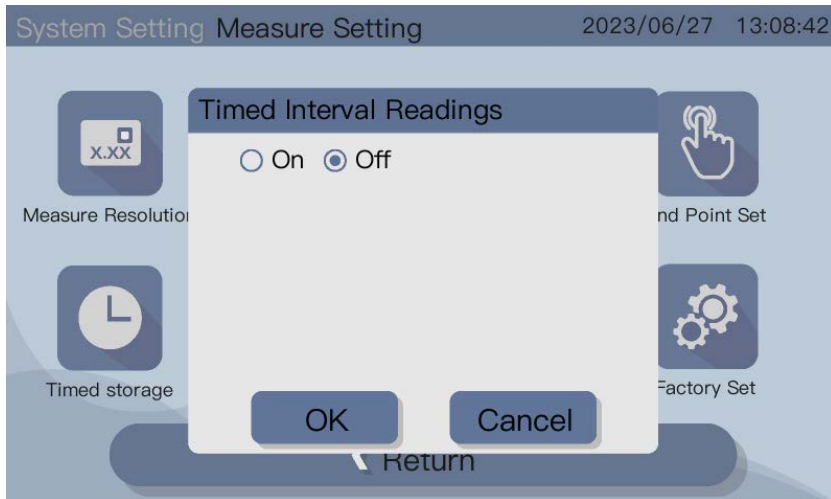
- **Auto Endpoint** – measurement automatically stops based on the set stability criteria.
- **Manual Endpoint** – User is required to stop measurement manually by pressing **Read**.
- **Timing Endpoint** – measurement stops after the preset time is reached. Time range is from 5-999 seconds.



Timed Storage

Set the function of timed interval readings to ON or OFF. Optional data transfer to memory and/or USB disk.

When **ON**, the measurement points are stopped according to the endpoint type selected. Enter a time interval between measurement points ranging from 1 – 2400 seconds.

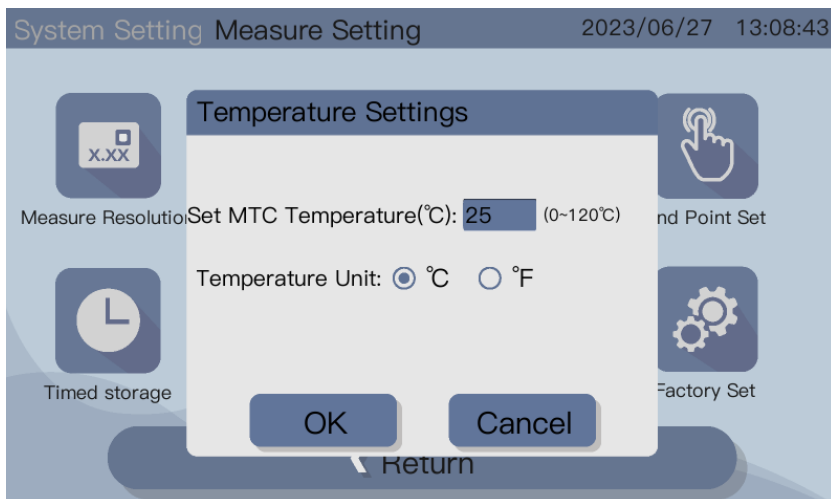


Temperature Settings

For better accuracy, it is recommended to use a built-in or separate temperature electrode. The pH electrode that is supplied with the instrument comes with a temperature probe, which does not need to be set.

If the meter does not detect a temperature probe, a message of no temperature probe detection will appear. The instrument will automatically switch to Manual Temperature Compensation (MTC) mode. With this, the MTC temperature should be manually set.

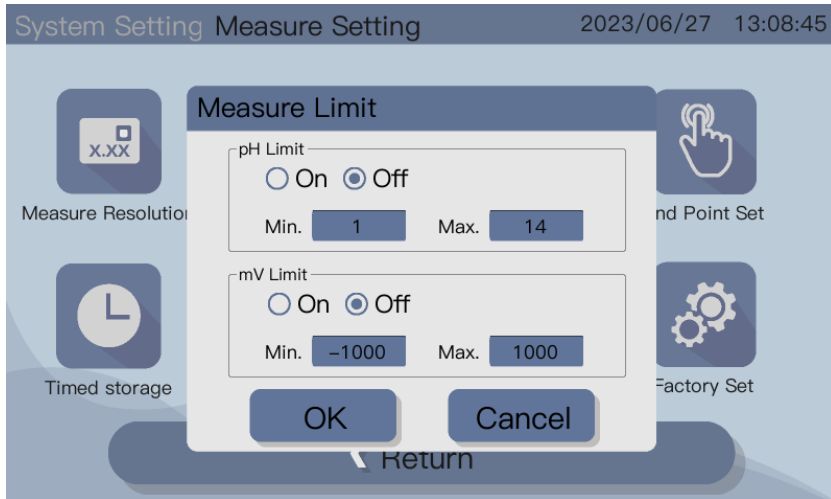
1. Enter the MTC Temperature value, ranging from 0 - 120°C.
2. Select the temperature unit for measurements.



Measurement Limits Setting

Users can define the upper and lower limits of the measurement data. Turn on or off the pH and mV limits to set their measurement ranges.

The pH setting range is -2 – 20 and the mV setting range is -1999 – 1999



MAINTENANCE

Do not open or disassemble the housing of the instrument. Except for the occasional need to clean the instrument, no additional maintenance is required.

Instrument Maintenance

- Use a dampened cloth with water and a mild detergent to clean the instrument.
- The shell is made of acrylonitrile butadiene styrene/polycarbonate (ABS/PC), which is sensitive to some organic solvents such as toluene, butanone, xylene, etc.
- If liquid spills into the housing of the instrument, this may cause damage.
- Wipe any spills immediately.

Electrode Maintenance

- Make sure the electrode tip is always stored in the appropriate storage solution.
- For maximum accuracy, residue or solidified storage solution attached to the outside of the electrode should be removed with distilled water.
- Always store the electrode according to the manufacturer's instructions and do not let it dry out.
- If the electrode slope drops rapidly or if the response is slow, the following steps may help resolve it, depending on the sample.

Issue	Recommended Action
Grease build-up	Rinse tip with soapy water or acetone. When rinsed with an organic solvent, place the tip in 0.1M HCl overnight.
Electrode storage solution dried up	Immerse the electrode in 0.1M HCl overnight.
Protein accumulation on electrode	Soak the electrode in a HCl/pepsin solution to remove deposits.
Electrode contaminated with Silver Sulfide	Soak the electrode in a thiourea solution to remove deposits.

Recalibrate the electrode after performing treatment.

Note: Dispose of the cleaning or storage solution according to the safety data sheet and regulations when handling toxic or corrosive substances.

TROUBLESHOOTING

Error	Unacceptable Range	Possible cause and solutions
Measurement out of range	pH: < -2.00 or > 20.00	Check electrodes are placed correctly into the solution to be measured.
	mV: < -2000.0 or > 2000.0	Check electrodes are connected properly.
Buffer temperature out of range	T°C: < 5 or > 45	Keep the buffer temperature within the specified range of 5 - 45°C.
Offset out of range	> 60mV	Confirm the correct buffer is used and within the expiration date. Clean or replace the electrodes.
Slope out of range	> 60mV/pH	Confirm the correct buffer is used and within the expiration date. Clean or replace the electrodes.
Buffer not recognized	< 10mV	Confirm the correct buffer is used and within the expiration date. Clean or replace the electrodes. Buffer Type is checked in calibration interface.

SOLUTIONS AND ACCESSORIES

G-Biosciences pH Solutions

Cat. #	Description
BTNM-0060	pH Buffer, Blue, pH 10.0, 500 mL
BTNM-0061	pH Buffer, Red pH 4.0, 500 mL
BTNM-0062	pH Buffer, Yellow, pH 7.0, 500 mL

Accessories and Parts

BT Lab Systems Cat. #	Description
BT1203-A	pH Meter Mini Printer
BT1203-B	pH Meter Ultra-Thin Magnetic Stirrer
BT1203-C	pH Meter Standard Universal Electrode, 0-14 pH
BT1203-D	pH Meter Electrode Support

The instrument is supplied with 1 x Ultra-Thin Magnetic Stirrer, Standard Electrode, and Electrode Support. The pH Meter Mini Printer is not included. Accessories and replacement parts listed above may be purchased separately.

APPENDIX

Buffer Solution Sets

USA (Ref. Buffer Set 1 @ 25°C)

Temp (°C)	4.01	7.00	10.01
5	4.00	7.09	10.25
10	4.00	7.06	10.18
15	4.00	7.04	10.12
20	4.00	7.02	10.06
25	4.01	7.00	10.01
30	4.01	6.99	9.97
35	4.02	6.98	9.93
40	4.03	6.97	9.89
45	4.04	6.97	9.86

NIST (Ref. Buffer Set 2 @ 25°C)

Temp (°C)	4.008	6.865	9.184
5	4.004	6.950	9.392
10	4.001	6.922	9.331
15	4.001	6.900	9.277
20	4.003	6.880	9.228
25	4.008	6.865	9.184
30	4.015	6.853	9.144
35	4.026	6.845	9.110
40	4.036	6.837	9.076
45	4.049	6.834	9.046

WARRANTY

Our company guarantees that this unit is warranted against defective material and workmanship for a period of one year from the date of shipment. We will repair or replace the defective equipment returned during the warranty period free if the equipment has been used under normal laboratory conditions and in accordance with the instruction in this manual. The following defects are specifically excluded:

1. Damage caused by accident, misuse, or abuse.
2. Damage caused by disaster.
3. Repair or modification by anyone else without our authorization.
4. Corrosion due to the use of improper solvent or sample.
5. Defects caused by improper operation.
6. Use of fittings or other spare parts supplied by different manufacturers.

This warranty does not apply to platinum wire and all the accessories.

A return authorization must be obtained from us before returning any product for repair on a freight prepaid basis.

For any inquiry or request for repair service, please contact BT Lab Systems via the email below.

E-Mail: info@BTLabSystems.com

TECHNICAL SUPPORT

BT Lab Systems offers technical support for all its products. If you have any questions about the product's use or operation, please contact BT Lab Systems at the following info.

E-Mail: info@BTLabSystems.com