BANTE
instruments

TB200 Benchtop Turbidity Meter

Instruction Manual

BANTE INSTRUMENTS LIMITED

CE

Introduction

Thank you for selecting the TB200 benchtop turbidity meter. This meter operates on the nephelometric principle of turbidity measurement and is designed to meet the criteria specified in ISO 7027. This manual provides a step-by-step guide to help you operate the meter, please carefully read the following instructions before use.

UNPACKING THE METER:

Before unpacking, ensure that the current work environment meet following conditions.

- Relative humidity is less than 80%.
- Ambient temperature is greater than 0ºC and less than 60ºC.
- No potential electromagnetic and ambient light interference.

The following list describes the standard accessories of the meter. After the unpacking, please check all accessories are complete. If any are damaged or missing, please contact nearest distributor.

ACCESSORIES:

- Glass sample vials
- Calibration standards 0.02, 10, 200 and 1000 NTU
- Lint-free cloth
- DC12V power adapter

Overview

TB200 benchtop turbidity meter measures turbidity from 0 to 2000 NTU/FNU, or 0 to 500 EBC, or 0 to 9999 ASBC. The range of Total Suspended Solids depends on the selected conversion factor. The measured value can be stored and transferred to the computer by USB interface.

Connecting the Power Adapter

Before plugging in the power adapter, ensure the its voltage matches your local main voltage.

- Insert the connector of power adapter into the power socket on the rear panel.
- Press ⏻ key to turn on the meter.
- Allow meter to warm up for at least 15 minutes.

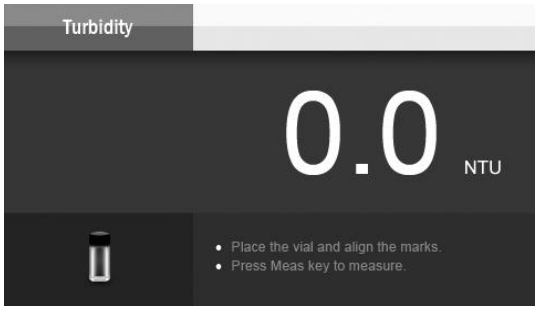
Keypad

The meter is designed with a 6 key, names and symbols describe the each function key controls.

KEY	FUNCTION
⏻ ESC	• Switching the meter On or Off. • In the calibration or setting mode, exits current mode and returns to measurement.
🗎 CAL	• Press the key to enter the calibration mode. • Press and hold the key to enter the setup menu.
◄ MI	• Press the key to store current measured value. • Press ◄ key in setting mode to scroll up through menu. • Press ◄ key in setting mode to increase the setting value.
► MR	• Press the key to view stored data. • Press ► key in setting mode to scroll down through menu. • Press ► key in setting mode to decrease the setting value.
ENTER	• Confirms the calibration, setting value or displayed option.
🔓 MEAS	• Press the key to perform a measurement. • Press the key again to lock the reading.

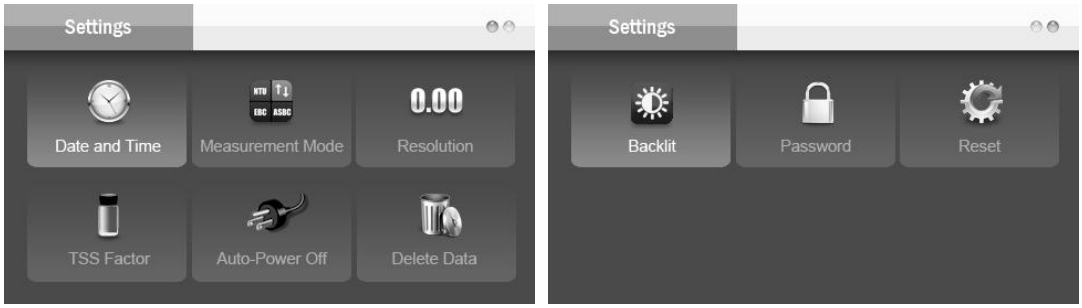
Power On/Off

- Press ⏻ key to turn on the meter, the display shows measuring value, mode icon and help message.
- Press and hold the ⏻ key for 3 seconds, the meter will turn off.



Setup Menu

TB200 benchtop turbidity meter contains an integrated setup menu that allows you to customize each displayed option to meet measurement requirements.



INDEX:

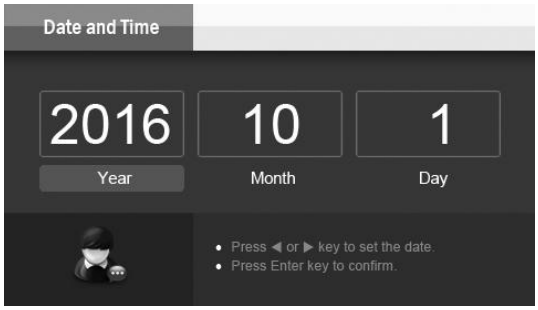
PARAMETER	OPTIONS	DESCRIPTION	DEFAULT
Date and Time	---	Sets the date and time for data log	
Measurement Mode	NTU	Nephelometric Turbidity Unit	●
	FNU	Formazin Nephelometric Unit	
	EBC	Turbidity scale of the European Brewery Commission	
	ASBC	Turbidity scale of the American Society of Brewing Chemists	
	mg/L	Total Suspended Solids Unit	
Resolution	0.1	Sets the resolution for turbidity measurement	●
	0.01		
TSS Factor	---	Sets the conversion factor for Total Suspended Solids	0.13
Auto Power-Off	2 hours	When the option is enabled, if you do not press any key within 2 hours, the meter will automatically turn off.	
	Disable		●
Delete Data	Delete all stored data	When the option is enable, all stored data will be deleted	
	Cancel		●
Backlit	---	Adjust the brightness for screen	
Password	Enable	When the option is enable, the user must enter 4-digit password to access the settings or calibration mode.	
	Disable		●
Reset	Enable	When the option is enable, all parameters will restore to factory default settings. The meter must be recalibrated.	
	Disable		●

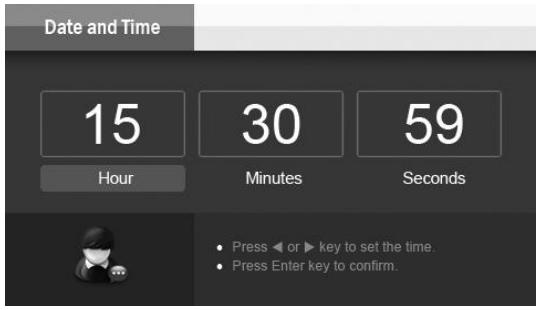
SETTING THE DATE AND TIME:

1.1 Press and hold the 🗎 key for 3 seconds to enter the setup menu, press ENTER key to confirm.

1.2 Press ◄ or ► key to set the year. Press ENTER key, the cursor moves to "Month".

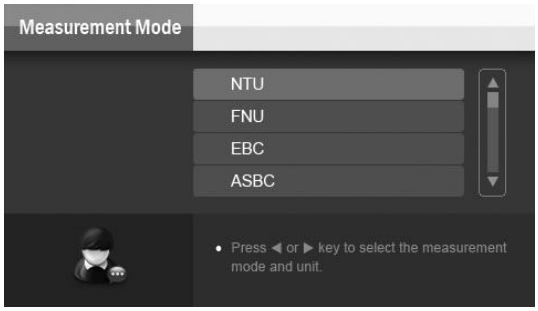
1.3 Repert the steps above to set the date and time until the setting is completed, the meter returns to measurement mode.

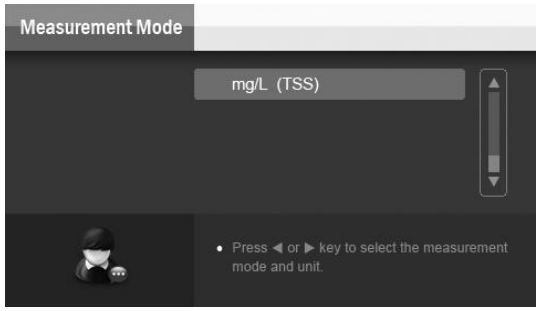




SETTING THE MEASUREMENT MODE AND UNIT:

The meter is capable of selecting the four turbidity units, including the NTU, FNU, EBC and ASBC. If the Total Suspended Solids mode is selected, the measurment unit will switch to mg/L.

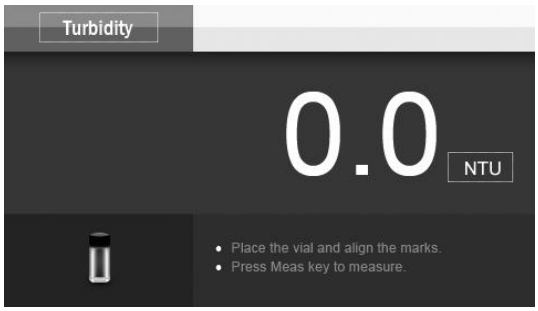


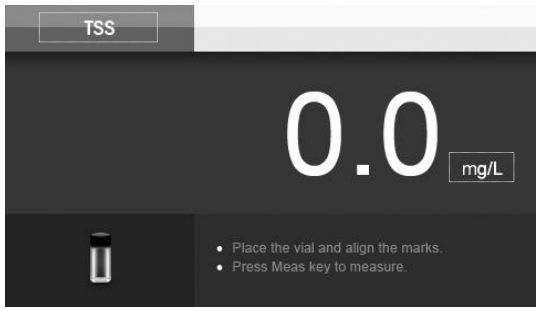


2.1 Press and hold the 🗎 key for 3 seconds to enter the setup menu.

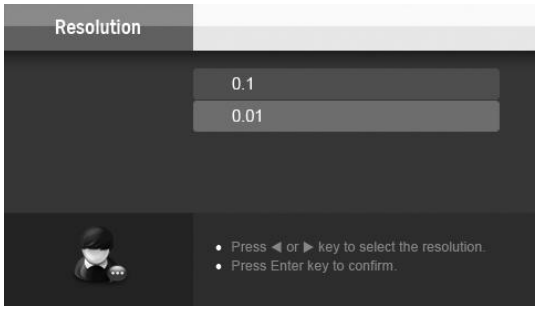
2.2 Press ◄ or ► key to select the "Measurement Mode" option, press ENTER key to confirm.

2.3 Press ◄ or ► key to select desired measurement mode and unit, press ENTER key to confirm. When the setting is completed, the measurement interface will show the corresponding mode icon and unit.





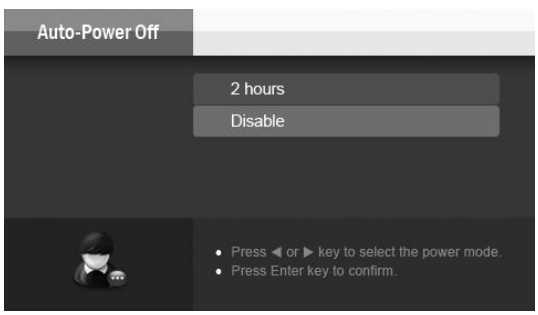
SETTING THE RESOLUTION:
TB200 turbidity meter contains two resolution options. For the high-accuracy measurement, we recommend that you select the 0.01. The default option is 0.1.



3.1 Press and hold the 🖹 key for 3 seconds to enter the setup menu.
3.2 Press ◄ or ► key to select the "Resolution" option, press ENTER key to confirm.
3.3 Press ◄ or ► key to select a suitable resolution, press ENTER key. The meter returns to measurement mode. Setting is completed.

SETTING THE TSS FACTOR:
Please refer to page 12 "Total Suspended Solids Measurement".

AUTO-POWER OFF:
The meter has an auto-power off function that can be set to 2 hours or Disable. When option is enabled, if you do not press any key within the specified time period, the meter will automatically turn off.



4.1 Press and hold the 🖹 key for 3 seconds to enter the setup menu.
4.2 Press ◄ or ► key to select the "Auto-Power Off" option, press ENTER key to confirm.
4.3 Press ◄ or ► key to select the "2 hours" or "Disable", press ENTER key. The meter returns to measurement mode. Setting is completed.

DELETE DATA:
Please refer to page 14 "Clear Stored Data".

SETTING OR REMOVING PASSWORD:

TB200 turbidity meter contains a password protection function. When the option is enable, the user must enter 4-digit password to access the settings or calibration mode. To remove the password, please select the “Disable” option.

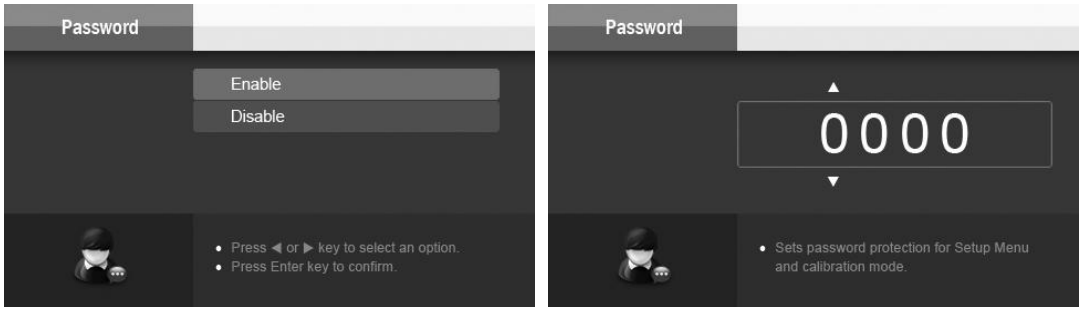
Setting the Password:

5.1 Press and hold the 🗎 key for 3 seconds to enter the setup menu.

5.2 Press ◄ or ► key to select the “Password” option, press ENTER key to confirm.

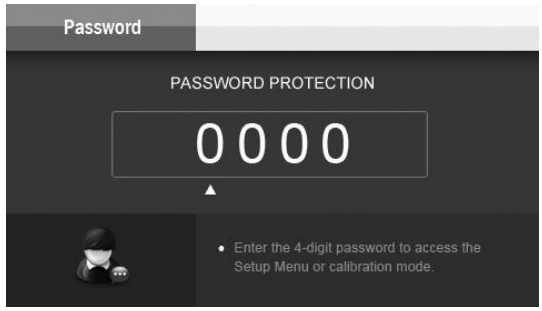
5.3 Press ◄ or ► key again to select the “Enable”, press ENTER key. The display shows 4-digit.

5.4 Press ◄ or ► key to set the password, press ENTER key until the meter returns to measurement mode. Setting is completed.



Unlock or Reset the Password:

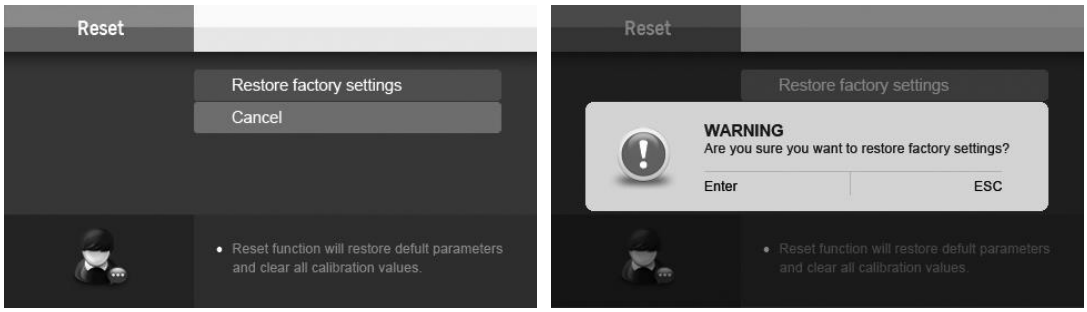
If you would like to unlock or reset the password, the meter will show the "Password Protection" and wait for entering the correct digits.



Press ◄ or ► key to input the password, press ENTER key to confirm and move to next digit. Once you have successfully entered the setup menu, please select the "Password" option, then select the "Disable". Press ENTER key to confirm, the password will be removed.

RESTORE FACTORY SETTINGS:

During the calibration, if the meter shows "ERROR" and it cannot be corrected by recalibration, you need to enable the Reset function. Note, once Reset function is enabled, all calibration values and selected parameters will be lost or reset. The meter must be recalibrated.



7.1 Press and hold the 🖹 key for 3 seconds to enter the setup menu.

7.2 Press ◄ or ► key to select the "Reset" option, press ENTER key to confirm.

7.3 Press ◄ or ► key to select "Restore factory settings", press ENTER key. The meter shows a reminder interface.

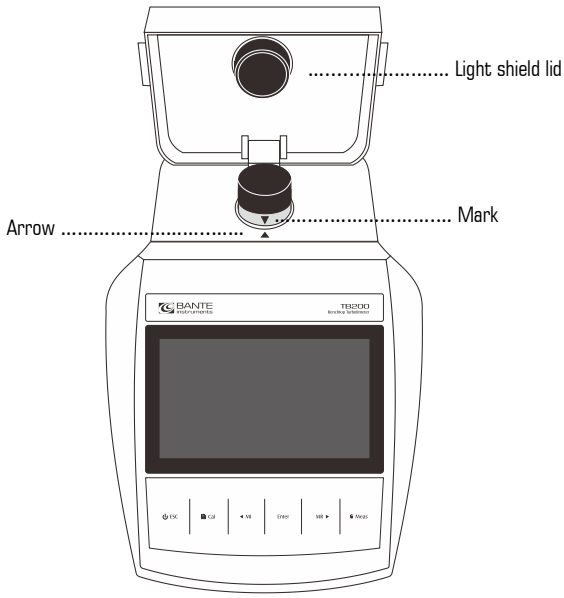
7.4 Press ENTER key again, the meter restores to factory defult settings.

EXIT THE SETUP MENU:

During the setting mode, press ESC key, the meter will return to measurement mode immediately.

Important Notes for Measurement and Calibration

- To avoid errors from ambient light interference, do not use the meter in bright sunlight. Always close the light shield lid during measurement and calibration.
- Glass vials and caps must be cleaned thoroughly with deionised water after each measurement. Minor residuals can cause errors.
- The outside of the vial must be clean and dry, before starting the test. Wipe the vial with a lint-free cloth to remove fingerprints or waterdrops.
- If the vial has minor scratches or scuffs, add a few drops of silicone oil to outside of the vial. Wipe with lint-free cloth.
- In order to get accurate readings, we recommend that you use the same vial to perform the measurement or calibration.
- Ensure that the vial is positioned in the sample chamber, the mark on the vial must be aligned with the arrow on the meter.



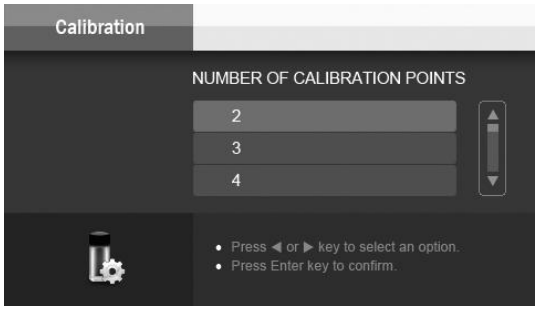
Turbidity Calibration

TB200 turbidity meter is calibrated with Formazin Standards at the factory and does not require user calibration before use. During the calibration process, DO NOT shake or agitate the calibration standard violently to prevent air bubbles. In order to get accurate measuring results, we recommend that you calibrate the meter at least once a month.

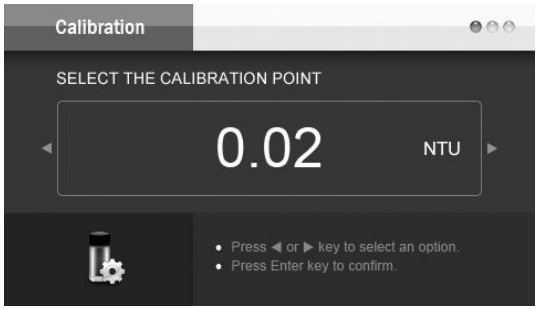
The meter supports turbidity calibration up to 7 points with minimum of 2 points, the default calibration points include the 0.02, 10.00, 200, 500, 1000, 1500 and 2000 NTU. You are able to modify calibration point or calibration value during the calibration.

CALIBRATE THE METER:

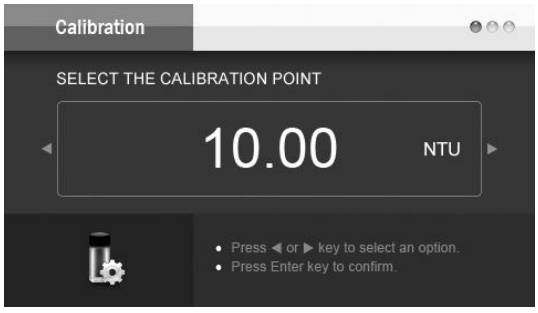
1. Press and hold CAL key for 3 seconds to enter the calibration mode, the meter prompts to select the "Number of Calibration Points".



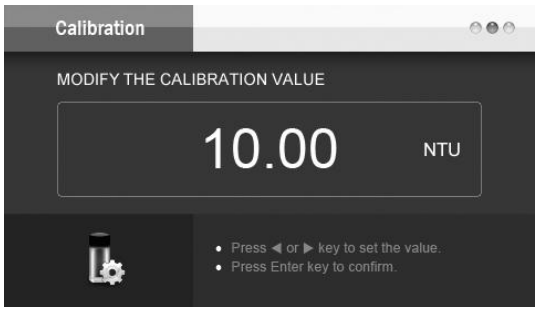
2. Press ◄ or ► key to select the suitable option (2 to 7 points). Press ENTER key to confirm, the display shows "0.02 NTU".



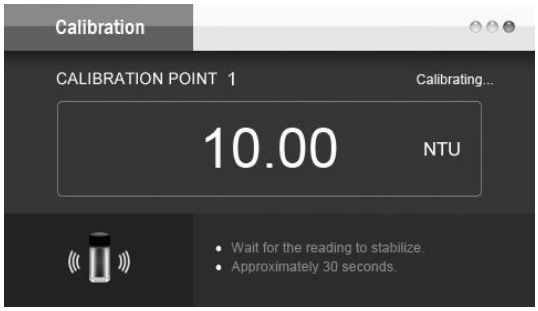
3. If necessary, press ◄ or ► key to select desired calibration point (e.g., 10.00 NTU).



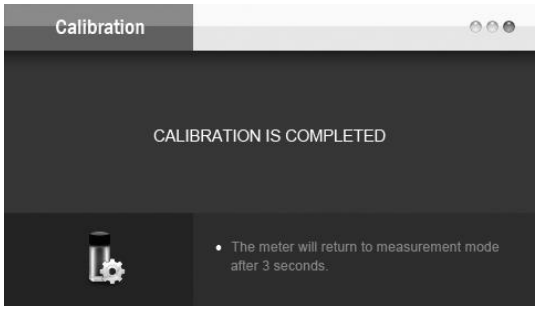
4. Insert the corresponding standard into the sample chamber, ensure that the mark on the vial cap always aligns with the arrow on the meter. Close the light shield lid.
5. Press ENTER key, the meter prompts to modify the calibration value.



6. If necessary, press ◄ or ► key to modify the value.
7. Press ENTER key to confirm, the meter begins the calibration. The "Calibrating…" icon shows in the upper right corner of screen.



8. Wait for the measured value to stabilize, the display shows next calibration point (e,g., 200 NTU). If necessary, press ◄ or ► key to select desired calibration point.
9. Repeat steps 4 to 8 above until the display shows "Calibration is Completed". The meter returns to measurement mode. Calibration is completed.



EXIT THE CALIBRATION:
During the calibration process, press ESC key, the meter will return to measurement mode immediately.

Turbidity Measurement

An accurate turbidity measurement depends on good measurement techniques. Factors such as clean sample vials, positioning of vial in the sample chamber, covering the vial with the light shield lid, meter calibration, removal of bubbles, etc. For more information, please refer to page 8 "Important Notes for Measurement and Calibration".

MEASUREMENT - LOW TURBIDITY SAMPLES:

For the low turbidity samples, we recommend that you use the same vial to perform the measurement and calibration.

1.1. Rinse the vial with approximately 10 ml of the sample, capping the vial with the screw cap and gently inverting it several times. Discard the used sample and repeat the rinsing procedure two more times.
1.2. Fill the vial with the sample. Cap the vial.
1.3 Allow the vial to stand undisturbed for 1 minute so that bubbles can disappear.
1.4 Wipe the vial with the lint-free cloth to remove waterdrops and fingerprints. Ensure that the outside of the vial is dry and clean.
1.5 Place the vial in the sample chamber. Align the mark on the vial with the arrow on the meter.
1.6 Close the light shield lid. Press MEAS key to start the measurement.
1.7 During the measurement process, press 🔓 key. The measured value will be locked. Press the key again, the meter resumes measurement.

MEASUREMENT - HIGH TURBIDITY SAMPLES:

The high turbidity samples (>2000 NTU) must be diluted before measurement. The dilution water can be obtained by filtering deionized water through a <0.45 μm filter membrane.

2.1 Repeat steps 1.1 to 1.6 above and record the measured value.
2.2 Calculate the true turbidity of the original sample using the following formula:

$$T = \frac{T_d (V_s + V_d)}{V_s}$$

Where:
T = Ture turbidity of the original sample
T_d= Measured value
V_s= Volume of the original sample (mL)
V_d= Volume of the dilution water (mL)

Total Suspended Solids Measurement

TB200 turbidity meter contains the Total Suspended Solids measurement mode. You need to input the correct TSS conversion factor before measurement.

CALCULATE THE TSS FACTOR:

1. Rinse the filter disk with distilled water to remove any solids that may remain.
2. Put the filter disk in a watch glass and dry them in a 104°C drying oven for 1 hour.
3. Remove the filter disk and watch glass and put in a desiccator. Immediately cover the desiccator. Wait for them decrease to room temperature.
4. Weigh the filter disk and watch glass and record the mg value as B.
5. Filter the 100 mL of sample through pre-weighed filter disk.
6. Put the filter disk and watch glass in a 104°C drying oven for 1 hour.
7. Remove the filter disk and watch glass and put in a desiccator. Immediately cover the desiccator. Wait for them decrease to room temperature.
8. Weigh the filter disk and watch glass and record the mg value as A.
9. Calculate the TSS value:

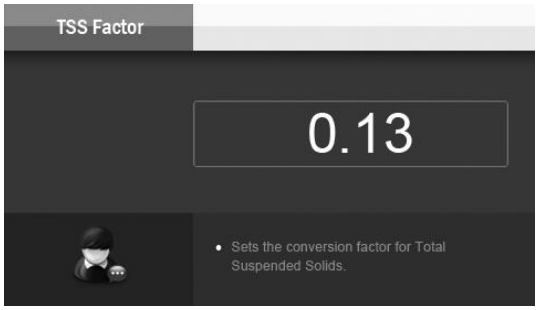
$$\text{TSS (mg/L)} = \frac{(A - B)}{0.1}$$

10. Fill the vial with the sample.
11. Repeat the turbidity measurement steps 1.1 to 1.6 above and record the NTU value.
12. Calculate the TSS conversion factor:

$$\text{Factor} = \frac{\text{NTU}}{\text{TSS (mg/L)}}$$

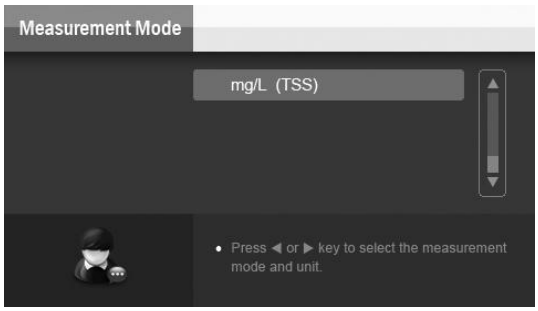
SET THE TSS CONVERSION FACTOR:

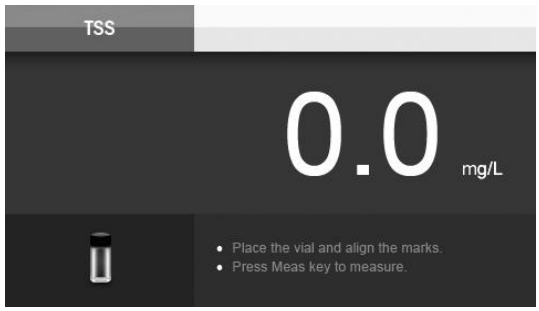
1. Press and hold the 🖹 key for 3 seconds to enter the setup menu.
2. Press ◄ or ► key to select the "TSS Factor" option, press ENTER key to confirm.
3. Press ◄ or ► key to set the conversion factor, press ENTER key. The meter returns to measurement mode. Setting is completed.



SELECT THE TSS MEASUREMENT MODE:

1. Press and hold the 🖹 key for 3 seconds to enter the setup menu.
2. Press ◄ or ► key to select the "Measurement Mode" option, press ENTER key to confirm.
3. Press ◄ or ► key to select "mg/L (TSS)" option, press ENTER key. The meter enters the Total Suspended Solids measurement mode.





TSS MEASUREMENT:

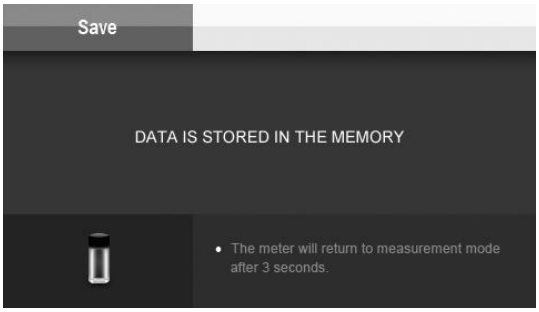
The measurement methods is the same as turbidity. Please refer to page 11 "Turbidity Measurement".

Storing and Recalling Data from Memory

TB200 turbidity meter allows up to 200 data sets to be stored and recalled.

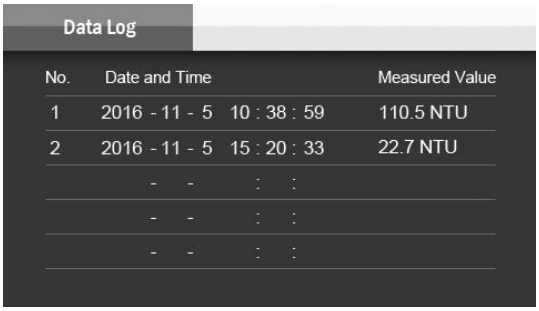
MEMORY INPUT:

During the measurement process, press MI key to input measured value into the memory. The display will show "Data is stored in memory" .



MEMORY RECALL:

1. Press MR key in the measurement mode, the meter shows the stored data.

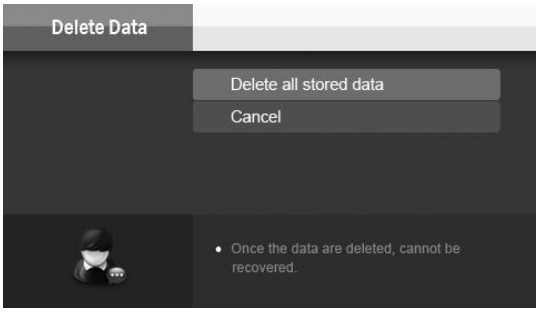


2. If necessary, press ◄ or ► key to view data log.
3. Press ESC key, the meter returns to measurement mode.

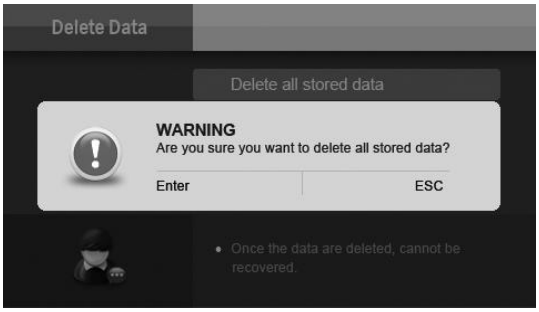
Clear Stored Data

When the meter memory is full, the display will show reminder interface if you press the MI key. To delete all stored data, please follow the steps below.

1. Press and hold the 🗎 key for 3 seconds to enter the setup menu.
2. Press ◄ or ► key to select the "Delete Data" option, press ENTER key to confirm.
3. Press ◄ or ► key to select the "Delete all stored data".



4. Press ENTER key to confirm, the meter shows "WARNING".



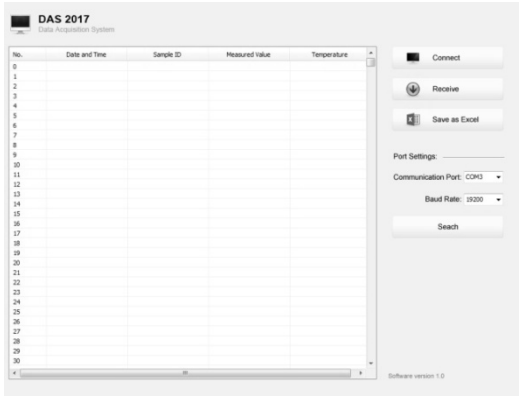
5. If you are sure you want to delete all stored data, press ENTER key again. The data is deleted.

Communication

Bante Instruments provides a free Data Acquisition System that can be used to transfer data, receive the measuring values or import the data to Excel. Before using, ensure that Windows 7/8/10 operating system has been installed on your computer.

RECEIVING DATA:

- Connect the USB cable to meter and computer. Click the DAS icon, the system will automatically scan an available communication port and show the message box " Found a port on your computer".
- Click the OK button, the application starts.



- Click the "Connect" button, the screen shows "Port is connected" indicate that communication between the meter and the computer has been established.
- Click the OK button to confirm.
- Click the Receive button, the stored data in meter will automatically send to computer.

CREATE THE EXCEL FILE:

When the transfer is completed, click the "Save as Excel" button, the measured values in the data sheet will automatically convert to Excel file.

WARNING:

Once the software is closed, all received data will be lost and can not be recovered.

Specifications

Model	TB200
Measurement Method	ISO 7027 nephelometric method (90°)
Measurement Range	0～2000 NTU/FNU, 0～500 EBC, 0～9999 ASBC, TSS range deponds on conversion factor
Resolution	0.01 (0～100 NTU), 0.1 (100～999 NTU), 1 (999～2000 NTU)
Accuracy	±2% (0～500 NTU), ±3% (501～2000 NTU)
Default Calibration Standards	0.02 NTU, 10.00 NTU, 200 NTU, 500 NTU, 1000 NUT, 1500 NTU, 2000 NTU or User-Defined
Light Source	Infrared-emitting diode (850 nm wavelength)
Detector	Silicon Photodiode
Stray Light	<0.02 NTU
Sample Vials	60(H)×25(Dia)mm
Power Off	Manual or Automatic (2 hours after last key pressed)
Reset Function	Yes
Memory	Stores up to 200 data sets
Output	USB Communication Interface
Operating Temperature	0～60°C
Power Requirements	DC12V/2A Power Adapter
Dimensions	250(L)×177(W)×96(H)mm
Weight	1.2 Kg

Addendum 1. Indexing and Matching Sample Vials

The United States Environmental Protection Agency (U.S. EPA) recommends that vials used for turbidimeter calibration or sample measurement be indexed. Its purpose is obtain a position which provides the lowest turbidity reading. The indexing methods are as follows.

1. Fill the vial using the distilled water (<0.5 NTU). Cap the vial.
2. Wipe the vial with the lint-free cloth to remove waterdrops and fingerprints.
3. Let the vial stand undisturbed for 5 minutes.
4. Place the vial in the sample chamber. Align the mark on the vial with the arrow on the meter.
5. Press MEAS key to begin the measurement.
6. Slowly rotate the vial approximately 45 degrees. Close the light shield lid and record the measured value.
7. Repeat step 6 until the lowest turbidity reading is shown.
8. Mark this position on the vial.

MATCH SAMPLE VIALS:

For the best accuracy and repeatability of turbidity measurement, using one indexed vial is best choice. If you need to use a few vials, match these vials are necessary.

1. Repeat the steps above for each vial and record the measured values.
2. Find the closest position of these vials measuring value and mark it.

Addendum 2. Preparation of Standard Formazin Solutions

1. Preparation of turbidity-free water:
   Turbidity-free water is used for preparation of turbidity standards and is prepared by filtering deionized water through a 0.45μm or smaller pore-sized membrane.

2. Preparation of turbidity standards:

- 4000 NTU:
  Dissolve 1 gram hydrazine sulfate [$(NH_2)_2 \cdot H_2SO_4$] in filtered water and dilute to 100 mL in a volumetric flask.
  Dissolve 10 grams hexamethylenetetramine [$(CH_2)_6N_4$] in filtered water and dilute to 100 mL in a volumetric flask.
  Mix 5.0 mL of hydrazine sulfate and 5.0 mL of hexamethylenetetramine solutions in a 100 mL volumetric flask and let stand 24 hours at 25($\pm$3°C).

- 2000 NTU:
  Mix 50mL of 4000 NTU standard in a 100 mL flask, dilute to the mark.

- 1500 NTU:
  Mix 37.5mL of 4000 NTU standard in a 100 mL flask, dilute to the mark.

- 1000 NTU:
  Mix 25 mL of 4000 NTU standard in a 100 mL flask, dilute to the mark.

- 500 NTU:
  Mix 12.5 mL of 4000 NTU standard in a 100 mL flask, dilute to the mark.

- 200 NTU:
  Mix 10.0 mL of 4000 NTU standard in a 100 mL flask, dilute to the mark. Mix 50.0 mL of above standard in a 100 mL flask, dilute to the mark.

- 10 NTU:
  Mix 10.0 mL of 4000 NTU standard in a 100 mL flask, dilute to the mark. Mix 2.5 mL of above standard in a 100 mL flask, dilute to the mark.

Hazardous Substance Statement

Bante Instruments Limited is committed to the reduction and eventual elimination of all hazardous substances in both the manufacturing process and finished products we supply. We have an active manufacturing and procurement program to minimize and eliminate the use of harmful heavy metals such as cadmium, lead, mercury and the like. New technologies and design parameters are also promoting these efforts and we expect to have little or no such materials in our product in the coming years. We welcome our customer suggestions on how to speed up these efforts.

Warranty

The warranty period for meter is one year from the date of shipment. Above warranty does not cover the calibration standards. Out of warranty products will be repaired on a charged basis. The warranty on your meter shall not apply to defects resulting from:

- Improper or inadequate maintenance by customer.
- Unauthorized modification or misuse.
- Operation outside of the environment specifications of the products.

For more information, please contact the nearest authorized distributor.

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