BANTE
instruments

TB100 Portable Turbidimeter

# Instruction Manual

BANTE INSTRUMENTS CO., LTD

CE

## Introduction

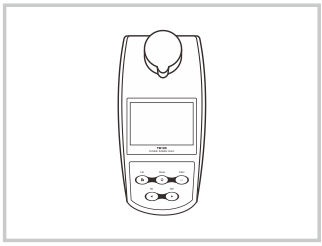
Thank you for selecting the TB100 portable turbidimeter. This manual provides a step-by-step guide to help you operate the meter, please carefully read the following instructions before use.

### Unpacking

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

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

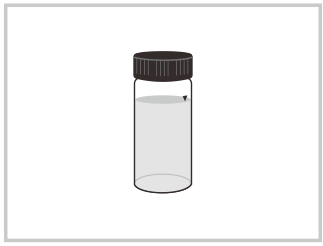
The following list describes the standard components of the meter. After the unpacking, please check all components are complete. If any are damaged or missing, please contact nearest distributor.



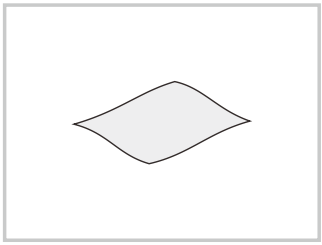
TB100 Turbidimeter



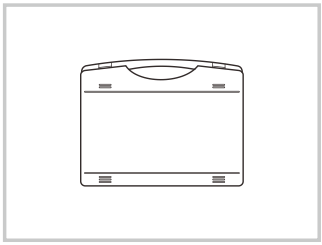
Glass Sample Vials (2 PCS)



Calibration Standards



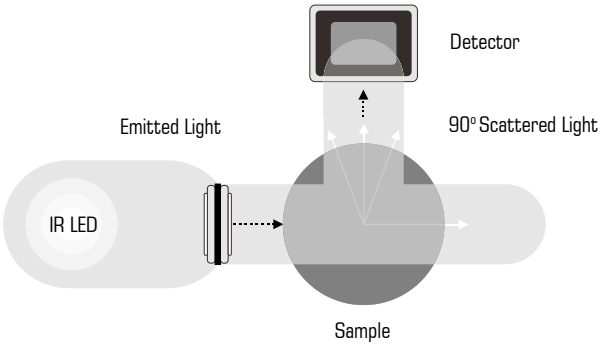
Lint-free cloth



Carrying Case

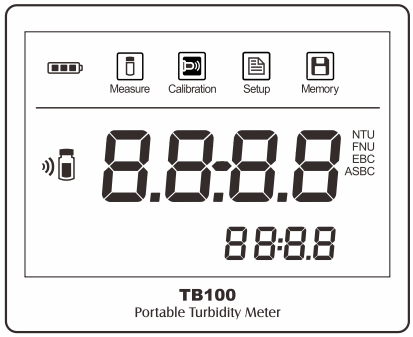
## Operating Principles

TB100 portable turbidimeter operates on the nephelometric principle of turbidity measurement and is designed to meet the criteria specified in ISO 7027. The following figure shows basic optical system of the meter. It includes a light source and a detector to monitor the light scattered at 90° with respect to the incident beam.




## Display

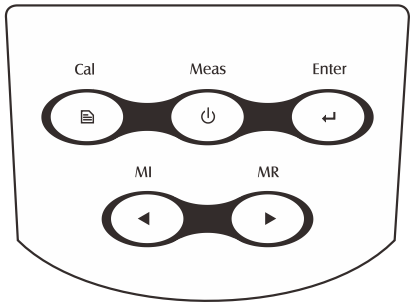
The meter is equipped with an easy-read LCD display that used to show measured values and mode indicators. The following table describes the function of each indicator.




INDEX:

| | | | |
|---|---|---|---|
| | Low battery alarm:<br>When the battery is depleted, the icon will disappear. | Setup | Setup mode icon:<br>Indicates the meter is in the setting mode. |
| Measure | Measurement mode icon:<br>Indicates the meter is in the measurement mode. | Memory | Memory mode icon:<br>Indicates the data is stored into memory. |
| Calibration | Calibration mode icon:<br>Indicates the meter is in the calibration mode. | | Calibration icon:<br>Indicates the meter is calibrating. |

## Keypad

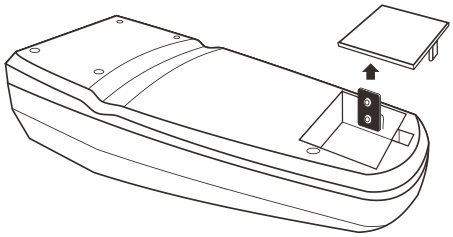



INDEX:

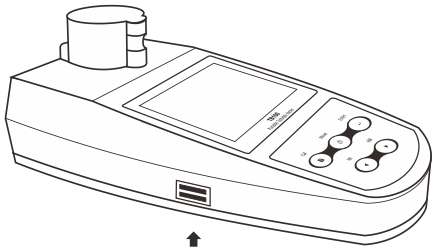
| KEY | FUNCTION |
|---|---|
| MEAS \| ⏻ | • Switches the meter ON/OFF.<br>• Press the key to perform a measurement.<br>• Exits the calibration or setting and returns to measurement. |
| CAL \| 🖹 | • Starts calibration.<br>• Enters the setup menu (Press and hold the key for 3 seconds). |
| MI \| ◄ | • Stores current reading to memory.<br>• Increase value or scroll up through the menu item. |
| MR \| ► | • Views the stored data.<br>• Decrease value or scroll down through the menu item. |
| ENTER | • Confirms the calibration, settings or displayed options. |

## Inserting the Battery

1. Remove the battery compartment cover from the backside of the meter.
2. Insert the 9V battery into the battery compartment, note polarity.
3. Replace the battery compartment cover to its original position. Installation is completed.



ⓘ When the battery is depleted, the meter allows using the 5V power adapter with USB cable for power supply.
**Note: please take out the battery.**



## Power On/Off

- Press the ⏻ key to turn on the meter, the display shows the measured value.
- Press and hold the ⏻ key for 3 seconds, the meter will turn off.

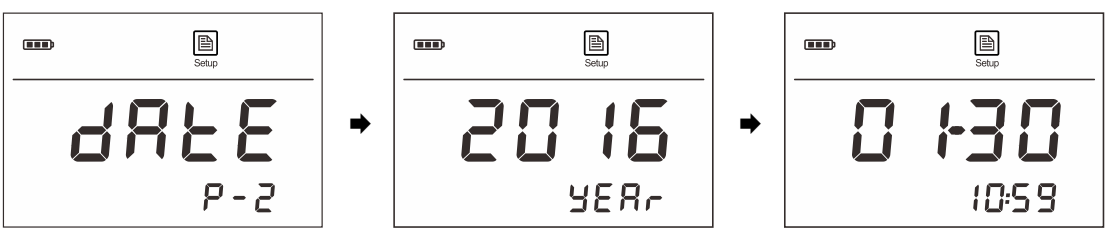
## Setup Menu

TB100 portable turbidimeter contains an integrated setup menu that is used to customize the displayed option to meet measurement requirements.

| MENU | DESCRIPTION | OPTIONS | DESCRIPTION | DEFAULT |
|---|---|---|---|---|
| CAL | Set the number of calibration points. | 2 | 2 to 5 points | 2 points |
| dAtE | Set the current date and time. | --- | Year, Month-Day, Hours-Minutes | --- |
| UNIt | Set the default turbidity unit. | NTU | Nephelometric Turbidity Unit | NTU |
| | | FNU | Formazin Nephelometric Unit | |
| | | EBC | Turbidity scale of the European Brewery Commission | |
| | | ASBC | Turbidity scale of the American Society of Brewing Chemists | |
| rESO | Set the resolution of the measurement. | 0.01 | 0.01 | 0.01 |
| | | 0.1 | 0.1 | |
| HOLd | Set the measurement mode. | YES | Single measurement | Single measurement |
| | | NO | Continuous measurements | |
| OFF | The meter will automatically turn off if no key is pressed within 15 minutes. | YES | Enable | Disable |
| | | NO | Disable | |
| CLr | Clear all stored readings in the memory. | YES | Enable | Disable |
| | | NO | Disable | |
| rSt | Reset the meter to default settings. | YES | Enable | Disable |
| | | NO | Disable | |

### Setting the Date and Time

1.1 Press and hold the 🖹 key for 3 seconds to enter the setup menu, the meter shows the menu item "CAL/P-1" (Calibration Point/Page 1).
1.2 Press the ► key, the display shows "DATE/P-2".
1.3 Press the **Enter** key, the display shows the current year.
1.4 Press the ◄ or ► key to set the year and the **Enter** key to confirm. The display shows the date and time (Format: mm-dd, hh-mm).
1.5 Press the ◄ or ► key to set the date and time, press the **Enter** key to confirm until the meter returns to the measurement mode. Setting is completed.



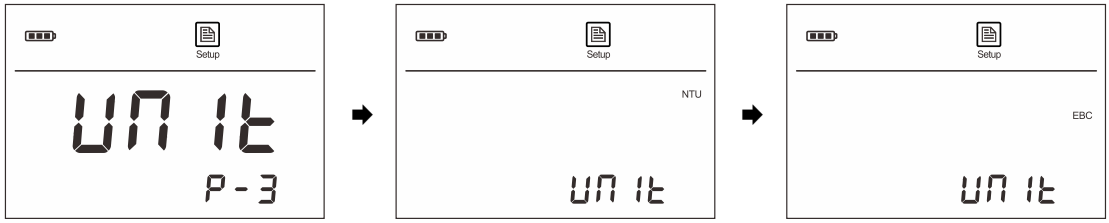
### Turbidity Unit

The meter is capable of selecting the four turbidity units for measurement, including the NTU, FNU, EBC and ASBC. The default option is NTU.

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

2.2 Press the ► key until the meter shows "UNIT/P-3", press the **Enter** key to confirm.

2.3 Press the ◄ or ► key to select the default turbidity unit, press the **Enter** key to return to the measurement mode.



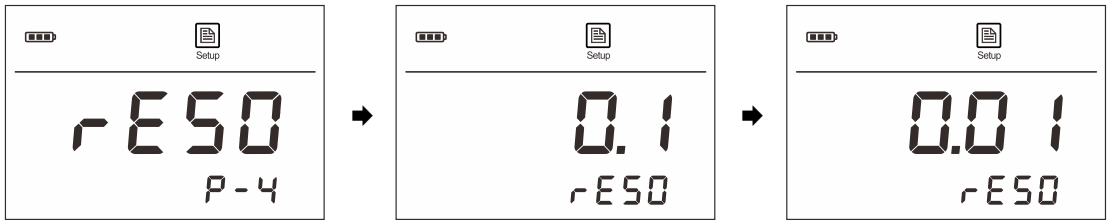

### Resolution

TB100 portable turbidimeter provides two resolution options. For the high-accuracy measurements, 0.01 is recommended.

3.1 Press and hold the ▤ key for 3 seconds to enter the setup menu.

3.2 Press the ► key until the meter shows "RESO/P-4", press the **Enter** key to confirm.

3.3 Press ◄ or ► key to select the desired resolution, press the **Enter** key to return to the measurement mode.




### Measurment Mode

The meter contains two measurement modes. In the single measurment mode, the meter will automatically recognize a stable reading. The continuous measurements can be used to index or match sample vials. For more information, please refer to chapter "Addendum 1. Indexing and Matching Sample Vials".

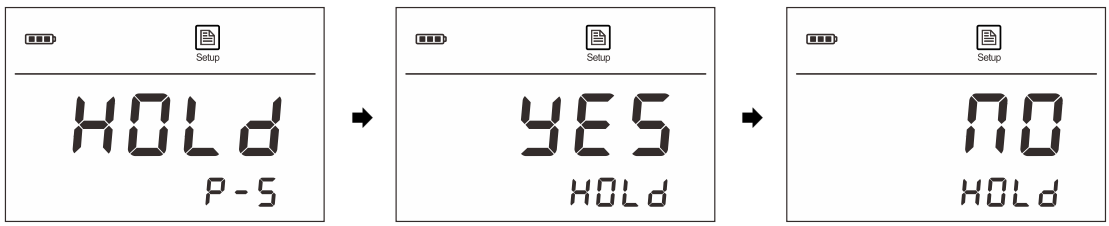
4.1 Press and hold the ▤ key for 3 seconds to enter the setup menu.

4.2 Press the ► key until the display shows "HOLD/P-5".

4.3 Press the **Enter** key, the display shows "YES/HOLD" indicating that the single measurment mode is selected.

4.4 Press the ◄ or ► key again, the display shows "NO/HOLD" indicating that the continuous measurement mode is selected.

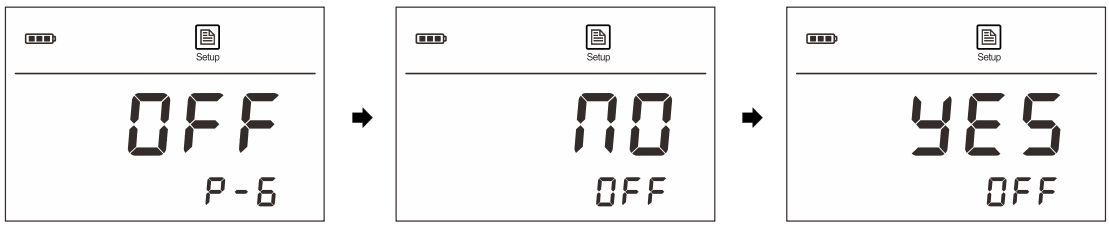
4.5 Select the desired measurement mode, press the **Enter** key to confirm. Setting is completed.



### Auto-Power Off

TB100 portable turbidimeter provides an Auto-Power Off function that can be set to 15 minutes or OFF. When the option is enabled, if you do not press any key within the specified time period, the meter will automatically turn off.

5.1 Press and hold the ▤ key for 3 seconds to enter the setup menu.
5.2 Press the ◄ or ► key until the display shows "OFF/P-6".
5.3 Press the **Enter** key, the display shows "NO/OFF" indicating that the Auto-Power Off function is disabled.
5.4 Press the ◄ or ► key to enable or disable this function, press the **Enter** key to return to the measurement mode.



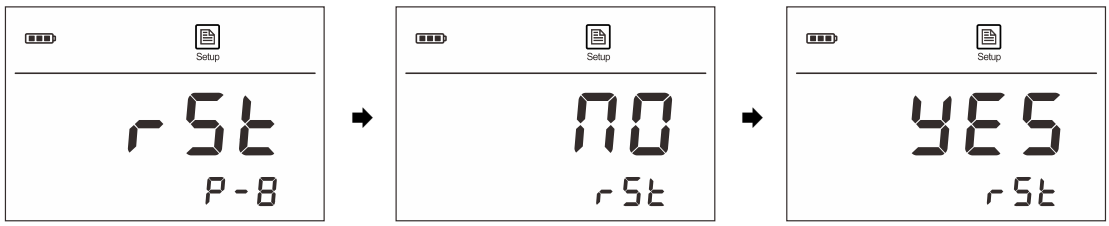

### Clear the Data

Please refer to page 12 "Clear Stored Data".

### Restore Factory Settings

The Factory Reset is used to restore the meter back to factory default settings. If enabled, all of the calibration data and selected options will be lost or reset, the meter must be recalibrated.

6.1 Press and hold the ▤ key for 3 seconds to enter the setup menu.
6.2 Press the ◄ key, the display shows "RST/P-8".
6.3 Press the **Enter** key, the display shows "NO/RST" indicating that do not reset the meter.
6.4 Press the ◄ or ► key to enable or disable this function, press the **Enter** key to confirm. Setting is completed.

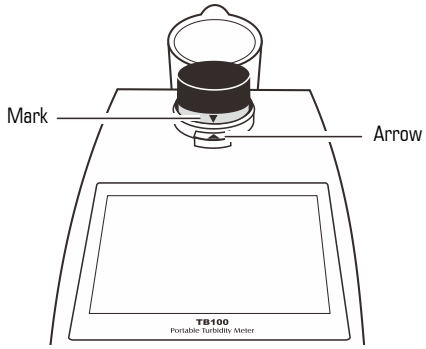



### Exit the Setting

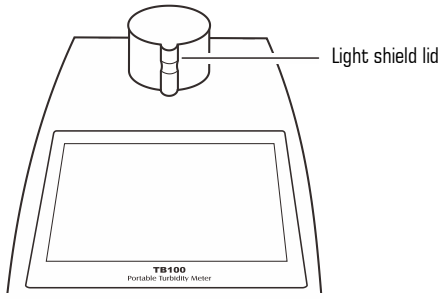
During the setting process, press the **Meas** key, the meter will exit the setting and return to the measurement mode.

## Important Notes for Measurement and Calibration

- Do not hold the meter in the hand during the 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.
- For the low turbidity samples (<200 NTU), we recommend using 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.




- To avoid errors from ambient light interference, do not use the meter in bright sunlight. Always close the light shield lid during the measurement and calibration.



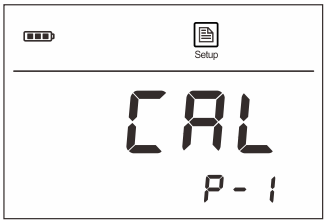

- Avoid spillage of water in the sample chamber. It may cause damage the meter.

## Turbidity Calibration

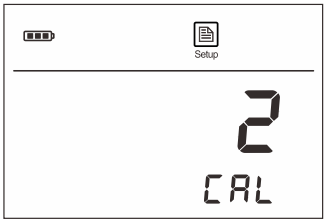
TB100 portable turbidimeter is calibrated with Formazin Standards at the factory and does not require user calibration prior to use. Do not shake or agitate the calibration standard violently to prevent air bubbles. In order to get accurate measuring results, we recommend calibrating the meter at least once a month.

The meter allows turbidity calibration up to 5 points with minimum of 2 points, the default calibration points include the 0.02, 10.00, 200, 500 and 1000 NTU. To ensure higher accuracy, we recommend that you select a standard value close to the sample value you are measuring.

### Setting the Number of Calibration Points

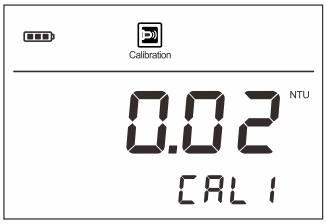



1.1 Press and hold the 🖹 key for 3 seconds to enter the setup menu, the meter shows "CAL/P-1".

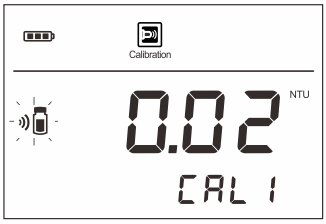



1.2 Press the **Enter** key, the display shows "2/CAL" (2 points calibration).
1.3 If necessary, press the ◄ or ► key to select the number of calibration points.
1.4 Press the **Enter** key to confirm. Setting is completed.

### Calibrating the Meter



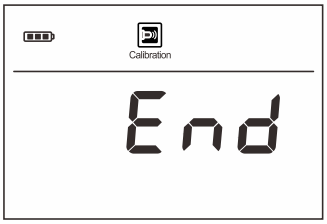

2.1 Press the **Cal** key to enter the calibration mode, the display shows "0.02NTU/CAL1". If necessary, press the ◄ or ► key to select the desired calibration point.




2.2 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.
2.3 Press the **Enter** key, the meter begins the calibration. The calibration icon will continuously flashing.




2.4 Wait for the reading to stabilize, the display automatically shows the next calibration point (e.g., 10.00NTU).




2.5 Repeat the steps 2.2 and 2.3 above until the meter shows "END". Calibration is completed.

ⓘ During the calibration process, press the **Meas** key, the meter will exit the calibration and return to the measurement mode.

## 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 chapter "Important Notes for Measurement and Calibration".

### Single Measurement - Low Turbidity Samples

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

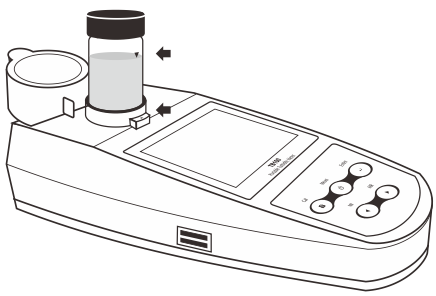
1.1. Rinse the vial with approximately 10ml of the sample, capping the vial with the screw cap and gently inverting it several times. Discard the used sample and repeat the rinsing procedure two more times.

1.2. Fill the vial with the sample. Cap the vial.

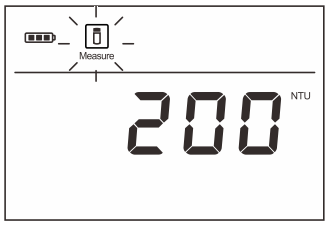
1.3 Allow the vial to stand undisturbed for 1 minute so that bubbles can disappear.

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 the **Meas** key, the Measure icon begins flashing.




1.7 Wait for the measured value to stabilize, the Measure icon will stop flashing.

### Single Measurement - High Turbidity Samples

2.1 The high turbidity samples (>1100 NTU) must be diluted prior to measurement.
2.2 The dilution water can be obtained by filtering deionized water through a <0.45$\mu$m filter membrane.
2.3 Repeat steps 1.1 to 1.7 above and record the measured value.
2.4 Calculate the true turbidity of the original sample use 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)

### Continuous Measurements

3.1 Select the continuous measurement mode in the setup menu (Refer to page 6 “Measurement Mode”).
3.2 Fill the vial with the sample. Cap the vial.
3.3 Gently invert the vial several times to mix the sample.
3.4 Wipe the vial with the lint-free cloth to remove waterdrops and fingerprints. Ensure that the outside of the vial is dry and clean.
3.5 Place the vial in the sample chamber. Align the mark on the vial with the arrow on the meter.
3.6 Close the light shield lid. Press the **Meas** key, the Measure icon begins flashing, the meter continuously measures the sample.

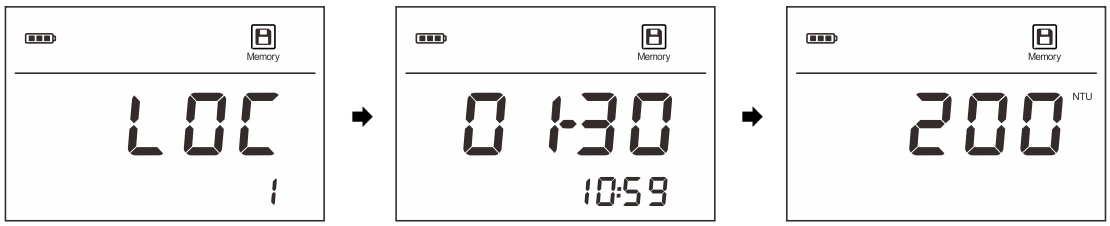
Stop the Continuous Measurements:
During the measurement process, press the **Meas** key, the meter will stop the measurements. Press the key again to resume measuring.

## Storing and Recalling Data from Memory

TB100 portable turbidimeter allows up to 100 data sets to be stored and recalled. During the measurement process, press the **MI** key to save the measured value into the memory, the Memory icon appears on the display.

### Memory Recall

1. Press the **MR** key in the measurement mode, the meter shows the latest stored data, e.g., LOC/1 (Data Log/1).
2. Press the ► key, the display shows date and time of the stored data (Format: mm-dd, hh-mm).
3. Press ► key again, the display shows the stored data.
4. Press the **Meas** key, the meter returns to the measurement mode.

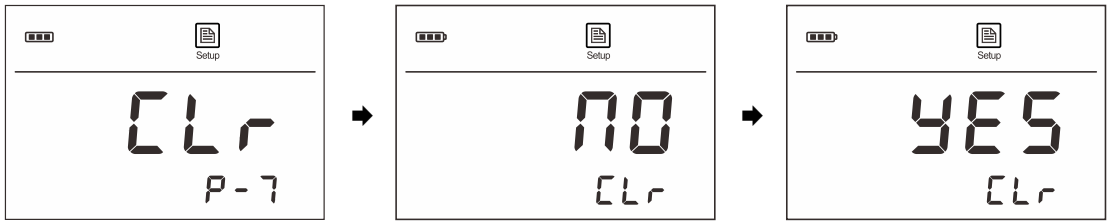



ⓘ If there has not any stored data in the memory, the meter will show "----".

## Clear Stored Data

When the memory is full, the meter will automatically show "FULL" if the **MI** key is pressed. 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 the ◄ or ► key until the display shows "CLR/P-7".
3. Press the **Enter** key, the meter shows "NO/CLR".
4. Press the ◄ or ► key to select the "YES/CLR".
5. Press the **Enter** key to confirm, the stored data will be deleted.

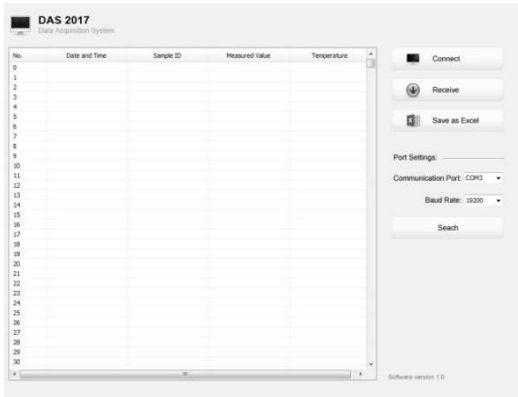


## Communication

Bante Instruments provides a Data Acquisition System that can be used to transfer data, receive the measuring values or import the data to Excel. You are able to download this software from our official website at www.bante-china.com. Before installation, 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 | TB100 |
| Measurement Method | ISO 7027 nephelometric method (90°) |
| Measurement Range | 0～1100 NTU/FNU, 0～275 EBC, 0～9999 ASBC |
| Resolution | 0.01 (0～100 NTU), 0.1 (100～999 NTU), 1 (999～1100 NTU) |
| Accuracy | ±2% (0～500 NTU), ±3% (501～1100 NTU) |
| Calibration Standards | 0.02, 10.00, 200, 500, 1000 NTU |
| Light Source | Infrared-emitting diode (850 nm wavelength) |
| Detector | Silicon Photodiode |
| Stray Light | ＜0.02 NTU |
| Sample Vials | 60(H)×25(Dia)mm |
| Memory | Stores up to 100 data sets |
| Output | USB Communication Interface |
| Operating Temperature | 0～60°C |
| Power Requirements | 1×9V battery |
| Dimensions | 180(L)×85(W)×70(H)mm |
| Weight | 300g |

## 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.

1.1 Fill the vial using the distilled water (＜0.5 NTU). Cap the vial.
1.2 Wipe the vial with the lint-free cloth to remove waterdrops and fingerprints.
1.3 Let the vial stand undisturbed for 5 minutes.
1.4 Place the vial in the sample chamber. Align the mark on the vial with the arrow on the meter.
1.5 Press the **Meas** key to begin the measurement.
1.6 Slowly rotate the vial approximately 45 degrees. Close the light shield lid and record the measured value.
1.7 Repeat step 6 until the lowest turbidity reading is shown.
1.8 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.

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

## Addendum 2. Preparation of Standard Formazin Solutions

### Preparation of turbidity-free water

Turbidity-free water is used for preparation of turbidity standards and is prepared by filtering deionized water through a 0.45$\mu$m or smaller pore-sized membrane.

### Preparation of turbidity standards

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

- 1000 NTU: mix 25ml of 4000 NTU standard in a 100ml flask, dilute to the mark.
- 500 NTU: mix 12.5ml of 4000 NTU standard in a 100ml flask, dilute to the mark.
- 200 NTU: mix 10.0ml of 4000 NTU standard in a 100ml flask, dilute to the mark. Mix 50.0ml of above standard in a 100ml flask, dilute to the mark.
- 10 NTU: mix 10.0ml of 4000 NTU standard in a 100ml flask, dilute to the mark. Mix 2.5ml of above standard in a 100ml flask, dilute to the mark.

## Hazardous Substance Statement

Bante Instruments 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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