

TENMARS

HEAT STRESS WBGT METER

TM-188/TM-188D/TM-188B

User's Manual



HB2TM1880003

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1. Introduction

The **WBGT** (Wet Bulb Globe Temperature) is a critical indicator for assessment of heat hazards when operating in high-temperature environments or engaging in outdoor activities. The meter can measure key environmental factors such as temperature, humidity, and radiant heat to calculate the WBGT value.

TM-188 :

It features manual data recording and reading function. The alarm setting feature provides instant alerts when measured values exceed preset thresholds. Additional functions include maximum/minimum value recording and an auto hold feature.

Ideal for general environmental monitoring in offices, schools, and homes, it also serves for the preliminary assessment of heat hazards.

TM-188D :

The enhanced automatic data recording function allows storage of up to 12,000 entries. Data can be easily downloaded by connecting the meter to a computer via the USB interface.

Ideal for environments that require long-term monitoring and data analysis, such as construction sites, outdoor workplaces, and laboratories. It supports more accurate heat hazard assessment and management.

TM-188B :

Featuring automatic data recording and BLE. wireless transmission, it can monitor and transmit data in real time to smartphones or tablets via a dedicated app, for in-depth analysis and advanced applications. It is ideal for environments where real-time monitoring is essential, such as sports training facilities, outdoor event venues, and

high-temperature workplaces. The system supports faster, more convenient heat hazard monitoring and provides early warning capabilities.


**WARNING**

Failure to follow the warnings and operating instructions may damage the device or its components and could cause injury to the operator.

2. Accessories

- | | | | |
|---|--|---|-----------------------------|
| 1 | WBGT Heat Stress Meter | 1 | USB Cable
(TM-188D/188B) |
| 1 | User Manual | 1 | 9V Battery |
| 1 | AC100~240V to
DC9V/0.5A Adapter
(TM-188D/188B) | 1 | Carrying Case |

3. Product Features

- High-sensitivity, fast-response capacitive humidity sensor
- Wet bulb globe temperature (WBGT), Black globe temperature (TG), Air temperature (TA), Relative Humidity (%RH), Dew point temperature (DEW), Wet bulb temperature (WET).
- Max/Min/Ave readings and Data Hold function(HOLD)
- Low battery indicator 
- LCD digital display with LED backlight
- Manual data recording (up to 50 entries) and reading
- Selectable temperature units: °C or °F
- 50 mm diameter black globe made of brass
- WBGT alarm setting
- Alarm buzzer on/off
- Auto power-off function and option to disable auto power-off
- BLE. connection for real-time heat environment monitoring (TM-188B)
- USB interface for computer connection (TM-188D/188B)
- Data memory capacity up to 12,000 entries (TM-188D/188B)
- Sampling interval: maximum 24 hours, minimum 1 second
- Users should refer to the following **international standards** for accurate WBGT measurement:
 - ISO7243: Ergonomics of the thermal environment - Assessment of heat stress using the WBGT (wet bulb globe temperature) index
 - ISO7726: Ergonomics of the thermal environment - Instruments for measuring physical quantities

4. Specifications (23°C±5°C)

Wet bulb globe temperature (WBGT)

Unit		Range	Resolution	Accuracy at 15~40°C
indoor & Outdoor without sunlight	°C	0~59.0	0.1	±1.0
	°F	32.0~138.0	0.1	±1.8
Outdoor With sunlight	°C	0~56.0	0.1	±1.5
	°F	32.0~132.0	0.1	±2.7
※ indoor & outdoor without sunlight: $WBGT = (0.7 \times WET) + (0.3 \times TG)$ Outdoor with sunlight: $WBGT = (0.7 \times WET) + (0.2 \times TG) + (0.1 \times TA)$				

Air temperature (TA)

Unit	Range	Resolution	Accuracy at 15~40°C
°C	10.0~60.0	0.1	±0.8
°F	50.0~140.0	0.1	±1.5

Black globe temperature (TG)

Unit	Range	Resolution	Accuracy at 15~40°C
°C	20~80.0	0.1	±0.6
°F	68.0~176.0	0.1	±1.1

Relative Humidity (%RH)

Measurement Range	1%~99%
Accuracy	$\pm 3.0\%RH(20\sim 80\%)$ at 25°C $\pm 5.0\%RH(<20\%, >80\%)$ at 25°C
Resolution	0.1%

Dew point temperature (DEW)

Unit	Range	Resolution
°C	-35.3~48.9	0.1
°F	-31.5~120.1	0.1



The value is calculated from the RH and Air temperature.

Wet bulb temperature (WET)

Unit	Range	Resolution
°C	-21.6~50.0	0.1
°F	-6.9~122.0	0.1

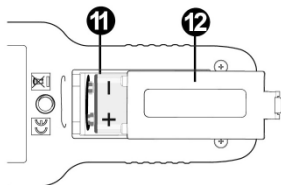
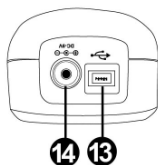
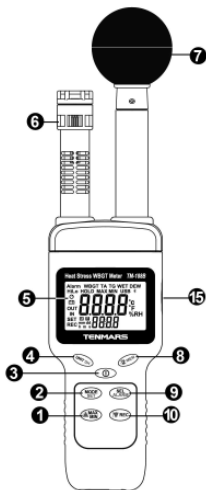
The value is calculated from the RH and Air temperature.

- Display update frequency: 1 update per second
- BLE. Core Specification v5.1 (TM-188B)
- Power supply: 006P 9V battery or AC100~240V to DC9V/0.5A (5.5 x 2.1 x 9 mm) adapter (TM-188D/188B)
- Battery life:200 hours.
- Operating Temperature & Humidity:
0°C to +50°C , <95%RH (Non-condensing)
- Storage temperature & humidity:
-10°C to +60°C , <70%RH.(Non-condensing)
- Data transmission: via USB interface to computer (TM-188D/188B)
- Display:52(W) x 36(L)mm monochrome LCD with backlight
- Dimension: 243 x 70 x 50mm(L x W x H) °
- Weight:220g. (Without batteries) °

	WARNING
	After using the meter in a high-humidity environment, please place it in a dry, high-temperature area for 24 hours.
	WARNING
	For accurate measurements, it is recommended to calibrate the meter annually.

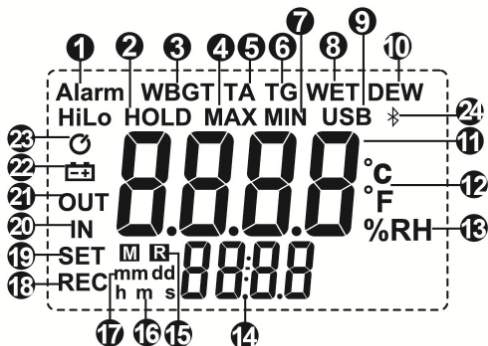
- EMC: This test was designed in accordance with EMC Standards in force and its compatibility has been tested in accordance with EN61326-1(2006).

5. Instrument Description





- | | |
|------------------------------|---|
| 1. UP/MAX/MIN | 9. SEL/Alarm |
| 2. MODE/SET | 10. Down/REC |
| 3. Power/Auto power off | 11. Battery holder |
| 4. UNIT/HOLD | 12. Battery cover |
| 5. LCD | 13. 5-pin mini USB port
(TM-188D/188B) |
| 6. Temp & humidity
sensor | 14. External power input jack
(TM-188D/188B) |
| 7. Black globe sensor | 15. BLE. power
button/switch (TM-188B) |
| 8. Backlight/MEM | |

6. LCD Description




- | | |
|----------------------|---------------------------|
| 1. Alarm symbol | 13. Relative Humidity |
| 2. HOLD symbol | 14. Secondary display |
| 3. WBGT | 15. Read & memory |
| 4. MAX symbol | 16. Time symbol |
| 5. Air temperature | 17. Date symbol |
| 6. Black globe temp | 18. Record symbol |
| 7. Min symbol | 19. SET symbol |
| 8. Wet bulb temp | 20. Indoor symbol |
| 9. USB symbol | 21. Outdoor symbol |
| (TM-188D/188B) | |
| 10. Dew point temp | 22. Low battery symbol |
| 11. Primary display | 23. Auto power off symbol |
| 12. Temperature unit | 24. BLE. symbol |
| | (TM-188B) |

7. Power On/Off

When the power is off, press , the LCD will display all segments. After releasing the button, the buzzer will sound and the firmware version will be shown, followed by powering on. When the power is on, press  for less than 1 second to turn off the power.

8. Auto Power Off


The device will auto power off after 15 minutes in standby mode if no button is pressed.

By default, the auto power-off function is enabled. Press and hold  for more than 2 seconds to disable this function, and the symbol will disappear. Press and hold for more than 2 seconds again to enable it.

When the auto power-off function is enabled, any button press will reset the standby time to 15 minutes.


※ **This function cannot be used when setting mode, USB, BLE., or alarm function are enabled.**

9. Alarm On/Off


Press and hold  for more than 2 seconds to toggle the alarm function on or off.

※ **This function will be disabled in HOLD, Setting Mode, or Memory Read Mode.**

10. LED Backlight

By default, the LED Backlight is off. Press  for less than 1 second to turn it on, then press again to turn it off. Once on, the LED Backlight will automatically turn off after 15 seconds.

11. Unit Switch (UNIT)


By default, the unit is set to Celsius ($^{\circ}\text{C}$). Press  for less than 1 second to switch to Fahrenheit ($^{\circ}\text{F}$), then press again to switch back to Celsius ($^{\circ}\text{C}$).


The mode prior to powering off will be saved as the default mode for the next startup.

※ **When the Data Hold function is activated, this feature will be disabled.**

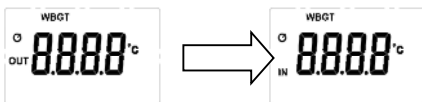
12. Mode Switch (MODE)

Display the values for IN/OUT WBGT, TA, %RH, TG, WET, and DEW. The mode prior to powering off will be saved as the default mode for the next startup.

Press  for less than 1 second to switch the display from IN/OUT&WBGT => TA => %RH => TG => WET => DEW.

When displaying IN/OUT&WBGT, press  for less than 1 second to switch the display from OUT => IN.


EX:



※ **When Data Hold function is activated or in Setting Mode, this feature will be disabled**

13. Data Hold Function (HOLD)

At startup, the reading is locked and the HOLD symbol is displayed..

By default, the function is disable. Press and hold  for more than 2 seconds to enable it, and press and hold for more than 2 seconds again to disable it.


Ex:



※This function will be disabled in Setting Mode.

14. Manual Record Function (REC)

Records all measured values.


Press  for less than 1 second to record a single entry. While recording, "REC" and "R" appear on the LCD.

※ When Data Hold function is activated or in Setting Mode or Manual Read Mode, this feature will be disabled

15. Manual Read Function (MEM)

Read recorded data.

By default, this function is disable.

Press and hold  for more than 2 seconds to activate or deactivate the MEM function.








Ex: TM-188



TM-188D/188B



In Manual Read Mode:


-  : Press and hold  for more than 2 seconds to exit MEM mode, press for less than 1 second to toggle the backlight on/off.
-  : Increment the record entry number for selection.
-  : Decrement the record entry number for selection.
-  : Select the mode for IN/OUT WBGT, TA, %RH, TG, WET, DEW.
-  : Select the display for year, month, day, hour, and minute (TM-188D/188B).
-  : Select the temperature unit (°C or °F).

※ **When Data Hold function is activated or in Setting Mode, this feature will be disabled**

16. Automatic Record Function (TM-188D/188B)

Records all measured values and the corresponding time.

By default, this function is disable.

Press and hold  for more than 2 seconds to activate the Automatic Record, then press and hold for more than 2 seconds again to deactivate it.

When activated, "REC" and "**R**" appear on the LCD.

When deactivated, "REC" and "**R**" disappear.

While the Automatic Record is active, if the Manual Read or Data Hold functions are enabled, the Automatic Record will be temporarily turned off. It will resume once Manual Read or Data Hold is disabled.

※ **When Data Hold function is activated or in Setting Mode or Manual Read Mode, this feature will be disabled.**

17. Max/Min Value Recording (MAX/MIN)

MAX: Record and display the maximum values of temperature and humidity.


MIN: Record and display the minimum values of temperature and humidity.

By default, both functions are disabled. Press and hold



for more than 2 seconds to display the **MAX**. Press



for less than 1 second to toggle between the **MAX** and **MIN** values. Press and hold  for more than 2 seconds to exit this function.


※ **When Data Hold function is activated or in Setting Mode or Manual Read Mode, this feature will be disabled.**


18. USB Connection (TM-188D/188B)

When an USB cable is connected, the LCD will display "USB," and the low voltage detection function will be disabled.

※ **The USB and BLE. connections cannot be used simultaneously. Only one function can be selected at a time.**






19. Setting and Calibration Mode (SET)

In normal mode, press and hold  for more than 2 seconds to enter the setting mode.

In setting mode, press and hold  for more than 2 seconds to exit the setting mode.

※ **When Data Hold or Manual Read are activated, this feature will be disabled.**



Setting Mode Operations:

-  : Selection button
-  : Up button
-  : Down button
-  : Confirm button
-  : Temperature unit button

Entering Mode Settings:

A. WBGT High Alarm Value Setting

As shown in Figure a.

Press  to start the setting. The LCD display will flash. Press  to toggle the temperature unit.

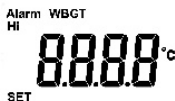





Figure a

Press  and  to increment or decrement the value. After confirming, press  to save the value.

B. WBGT Low Alarm Value Setting

Press **SEL ALARM**, as shown in Figure b.

Press **MODE SET** to start the setting, and the digits on the screen will flash, allowing for adjustments.

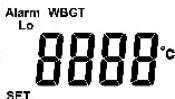


Figure b

Press **MAX MIN** and **REC** to increment or decrement the value. After confirming, press **MODE SET** to save the value.

C. Year Setting

Press **SEL ALARM**, as shown in Figure c.

Press **MODE SET** to start the setting, and the digits on the screen will flash, allowing for adjustments.

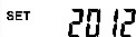


Figure c

Press **MAX MIN** and **REC** to increment or decrement the year. After confirming, press **MODE SET** to save the value.

D. Month and Day Setting

Press **SEL ALARM**, as shown in Figure d.

Press **MODE SET** to start the setting, and the digits on the screen will flash. Press **SEL ALARM** to select the position for month or day adjustment.





Figure d

Press **MAX MIN** and **REC** to increment or decrement the month or day. After confirming, press **MODE SET** to save the value.



E. Hour and Minute Setting

Press , as shown in Figure e.

Press  to start the setting. The digits on the screen will flash. Press  to select the hour or minute digit to adjust.

SET h m 8888

Figure e

Press  and  to increment or decrement the values.


Hour: Maximum 23, minimum 00

Minute: Maximum 59, minimum 00

After confirming, press  to save the value.



F. Second Setting

Press , as shown in Figure f.

Press  to start the setting. The digits on the screen will flash, allowing for adjustment.

SET s 88

Figure f

Press  and  to increment or decrement the seconds value.

Maximum: 59

Minimum: 00


After confirming, press  to save the value.

G. Sampling Interval Hour and Minute Setting (TM-188D/188B)

Press , as shown in



Figure g.

Press  to start the setting. The digits on the

screen will flash. Press  to select the hour or minute digit to adjust.

SET
REC h m 8888

Figure g

Press  and  to increment or decrement the values.

Hour: Maximum 24, minimum 00

Minute: Maximum 59, minimum 00

After confirming, press  to save the value.

H. Sampling Interval Seconds Setting (TM-188D/188B)

Press , as shown in



Figure h.

Press  to start the setting. The digits on the

screen will flash, allowing for adjustment.

SET
REC s 88

Figure h

Press  and  to increment or decrement the seconds value.

Maximum: 59

Minimum: 01

After confirming, press  to save the value.

I. Clear Recorded Data

Press **SEL ALARM**, as shown in Figure i.

Press **MODE SET** to start the setting. Press **MAX MIN** and **▼REC** to select NO or YES. After confirming, press

MODE SET.

If YES is selected and the **MODE SET** button is pressed, "CLr" will flash on the screen.

Once the flashing stops, it indicates that all data has been successfully cleared.

Ex:

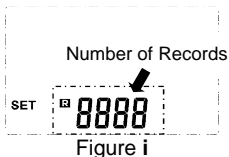


Figure i

J. Dry Bulb Temperature Offset Calibration

Press **SEL ALARM**, as shown in Figure j.

Press **MODE SET** to start the setting. The digits on the screen will flash, allowing for adjustment.

Press **MAX MIN** and **▼REC** to increment or decrement the value.

Maximum: +9.9

Minimum: -9.9

Press **UNIT DH** to switch the temperature unit.


After confirming, press **MODE SET** to save the value.



Figure j



K. Humidity Offset Calibration

Press , as shown in Figure k.

Press  to start the setting. The digits on the screen will flash, allowing for adjustment.

 %RH
SET

Figure k

Press  and  to increment or decrement the value.


Maximum: +9.9

Minimum: -9.9

After confirming, press  to save the value.

L. Black Globe Temperature Offset Calibration

Press , as shown in Figure l.

Press  to start the setting. The digits on the screen will flash, allowing for adjustment.





TG
 °C
SET

Figure l

Press  and  to increment or decrement the value.

Maximum: +9.9

Minimum: -9.9

Press  to switch the temperature unit.

After confirming, press  to save the value.

20. Thermal hazard prevention standards

- Screening Criteria for Heat Stress Exposure (WBGT values in °C)

	Acclimatized				Not acclimatized			
Work (%)	100%	75%	50%	25%	100%	75%	50%	25%
Rest (%)	0%	25%	50%	75%	0%	25%	50%	75%
Light	29.5	30.5	31.5	32.5	27.5	29.0	30.0	31.0
Moderate	27.5	28.0	29.5	31.0	25.0	26.5	28.0	29.0
Heavy	26.0	27.5	28.5	30.0	22.5	24.5	26.5	28.0
Very Heavy	-	-	27.5	29.5	-	-	25.0	26.5

- Example of activities within Metabolic Rate Categories

Categories	Examples Activities
Resting	Sitting quietly
	Sitting with moderate arm movements
Light	Sitting with moderate arm and leg movements
	Standing with light work at machine or bench while using mostly arms
	Using a table saw
	Standing with light or moderate work at machine or bench and some walking about
Moderate	Scrubbing in a standing position
	Walking about with moderate lifting or pushing
	Walking on level at 6 Km/hr while carrying 3 Kg weight load
Heavy	Carpenter sawing by hand
	Shoveling dry sand
	Heavy assembly work on a non-continuous basis
	Intermittent heavy lifting with pushing or pulling (e.g., pick-and-shovel work)
Very heavy	Shoveling wet sand

According to the American Conference of Governmental Industrial Hygienists.[ACGIH](2005)

21. Precautions

- Avoid placing the device near machines or equipment that emit electromagnetic waves, as this may cause unstable readings.
- Do not touch the black globe during measurement, as it may lead to inaccurate results.
- If the black globe is deformed due to impact, it may result in incorrect measurement values.

22. Software installation (TM-188D/188B)


1. Link website <https://www.tenmars.com/> or scan below QR code:





2. Search TM-188D or TM-188B.
3. Tap the TM-188D or TM-188B photo.
4. Click File Download, then select **Software Download.**
5. Download and unzip the software.
6. For the latest software information and installation procedures, Please download the **Installation Guide.**
7. For software usage instructions, please download the **software User Manual.**

23. BLE.Connection & App Function Tutorial (TM-188B)

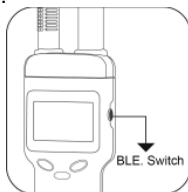



Please search for “WBGT TM ” in the App Store (iOS) or Google Play Store (Android) to download and install the application.

(iOS supports version 14.0 and above, Android supports version 8.0 and above)

Android	iOS
	

- Please press the power button to turn on the device. The BLE. switch is located on the right side of the unit. Please ensure it is turned on.




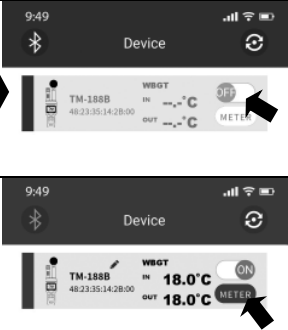


- After installing the app, tap the start screen to proceed.
- Once the app is opened, the default language is set to English. To change the language, tap  to access the language settings.

BLE. Connection Notes

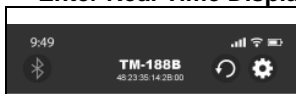



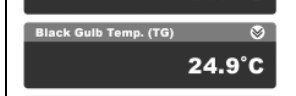

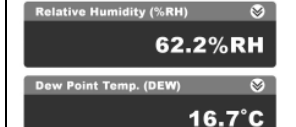

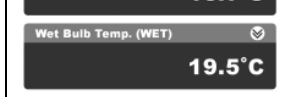

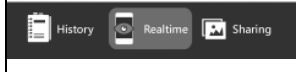

If the BLE. connection is not established, please turn off the BLE.to reduce power consumption.

If the BLE. connection fails, ensure that the location service on your phone or tablet is turned on.

■ Search for Device and Pair

 <p>9:49 Searching Device</p>	 <p>9:49 Device</p> <p>WBGT TM-188B 48.23:35:14:28:00</p> <p>IN --.°C OUT --.°C</p> <p>OFF METER</p>
<p>Open the APP. Tap Search for Device.</p>	<p>Slide the button at the top right to turn it on.</p> <p>The  symbol at the top left will turn blue.</p> <p>WBGT data will display, indicating that the connection is established successfully.</p> <p>Tap  to change the device name.</p> <p>Tap Meter to access the real-time display.</p>


■ Enter Real-Time Display

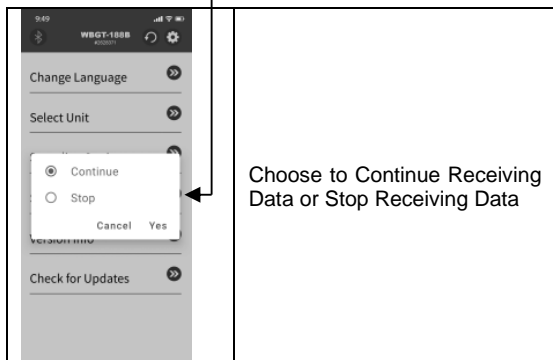
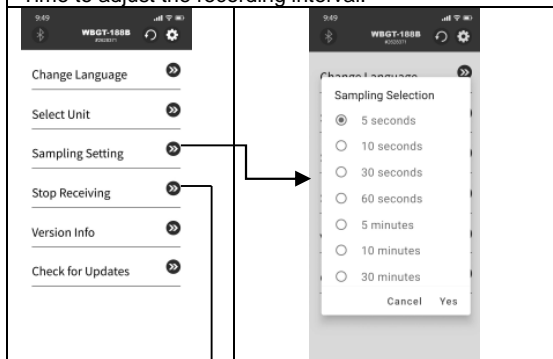
	<p>Tap  to go to the previous page.</p>
	<p>Tap  to enter the settings menu. You can select to change the language, switch units, and view version information.</p>
	<p>Tap  to hide the data display.</p>
	<p>Tap the Calendar  to view the maximum values of past dates and the current day's data.</p>
	<p>Tap  to send the current screen via email or messaging apps.</p>
	<p>Tap  to view past records.</p>

■ Sampling Time Settings

When the APP is first launched, the default sampling time is set to record every 5 seconds.

To change the recording time, follow these steps:

Tap  to enter the settings menu. Tap Sampling Time to adjust the recording interval.



■ Viewing Historical Records

Historical Record Page

History list

Date	Time	In	Out
2025-03-06	09:48:18	21.2°C	21.1°C
2025-03-06	09:48:14	21.2°C	21.1°C
2025-03-06	09:47:14	21.1°C	21.1°C
2025-02-19	09:07:06	18.2°C	18.2°C
2025-02-19	09:06:06	18.2°C	18.2°C
2025-02-19	09:05:06	18.2°C	18.2°C
2025-02-19	09:04:06	18.2°C	18.2°C
2025-02-19	09:03:36	18.2°C	18.2°C
2025-02-19	09:03:06	18.2°C	18.2°C
2025-02-19	09:02:36	18.1°C	18.1°C
2025-02-19	09:02:06	18.2°C	18.1°C
2025-02-19	09:01:36	18.2°C	18.1°C
2025-02-19	09:01:06	18.2°C	18.1°C

Historical Graph Page

History graph

The graph shows a sharp drop in temperature from approximately 21°C to 18°C between 09:48 and 09:07 on 03/05.

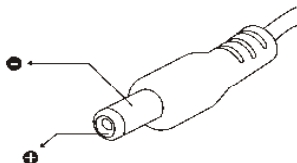
Tap each individual record **WBGT** **TA** **TG** **%RH** **DEW** **WET** to view data recorded at specific times.

24. External Power Supply (TM-188D/188B)

External AC to DC Adapter: Voltage 9VDC. Please ensure the polarity.

Plug: the center connector is positive, and the outer casing is negative.



Outer diameter: 5.5mm, Inner diameter: 2.1mm.



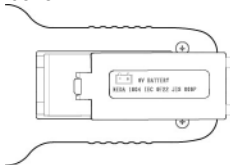
25.Safety and maintenance standards

- Do not operate in environments with flammable gases or high humidity.
- Operating altitude: Below 2000 meters above sea level.

26.Battery replacement

	WARNING
	<p>1.If the LCD displays “”symbol, please replace the battery immediately.</p> <p>2.If not used for a long time or more than 1 month, please remove the battery to prevent battery leakage and corroding the internal components.</p>

- Turn off the power.
- Open the battery cover under the thermometer and remove the battery.
- Please install a new 9V battery with the direction of positive and negative polarity.
- Close the battery cover.



27.End of life



Caution: This symbol indicates that equipment and its accessories shall be subject to a separate collection and correct disposal.

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