

# REED



## Model SD-2010

Heat Stress  
Meter and  
Datalogger

### Instruction Manual



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# Features

- Wet Bulb Globe Temperature (WBGT) considers the effects of temperature, humidity and direct or radiant sunlight
- Black Globe Temperature (TG) monitors the effects of direct solar radiation on an exposed surface
- In/Out function displays the WBGT value with or without direct sun exposure
- View individual temperatures or indices in either °F or °C
- User adjustable WBGT threshold with audible alarm if threshold is exceeded
- Real time SD memory card datalogger with a built-in clock and calendar
- Sampling time set from 1 second to 3600 seconds
- Meter can switch to a Manual Datalogging
- No extra software needed, just plug the SD card into the computer and it downloads directly to EXCEL
- SD card capacity: 1 GB to 16 GB
- Easy to read LCD with backlight
- Auto power off or manual power off
- Data hold, record max. and min. reading
- High accuracy microcomputer circuit
- Power by UM3/AA (1.5 V) x 6 batteries
- USB/RS232 Computer interface

# Specifications

Circuit:	Custom microprocessor LSI circuit
Display:	52mm x 38mm LCD with backlight
Measurements:	Indoor/Outdoor Wet Bulb Globe Temperature (WBGT), Black Globe Temperature (TG), Air Temperature (TA), Wet Bulb Temperature (WB), Humidity, Dew Point Temperature
Temperature units:	(°C, °F)
Auto Sampling Time:	1, 2, 5, 10, 30, 60, 120, 300, 600, 1800, 3600 seconds
Memory Card:	SD memory card, 1 GB to 16 GB
Sampling Time:	Approx. 1 second
Data Output:	USB/RS232 PC computer interface
Resolution:	0.1°C/0.1°F
Operating Temperature:	0-50°C (0-122°F)
Operating Humidity:	Less than 85% R.H.
Power Supply:	UM3/AA (1.5 V) x 6 batteries
Weight:	515g/1.13lb
Dimensions:	Main instrument: 177 x 68 x 45mm; Black Brass Ball: 75mm Dia.
Includes:	Black Brass Ball (with sensor) and soft carrying case
Optional accessories:	4G SD Card (SD-4GB) USB cable (USB-01) Power adapter (AP-9VA-110V) Data Acquisition Software (SW-U801-WIN) Tripod (BS-6)

Visit us at [www.reedinstruments.com](http://www.reedinstruments.com) for more information on our optional accessories, or e-mail us at [info@reedinstruments.com](mailto:info@reedinstruments.com)

**Wet Bulb Globe Temperature**

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Indoor formula:  $0.7WB + 0.3TG$   
Indoor Range:  $0^{\circ}\text{C} - 59^{\circ}\text{C}$  ( $32^{\circ}\text{F} - 138^{\circ}\text{F}$ )  
Indoor Accuracy:  $\pm 1^{\circ}\text{C}$  ( $\pm 1.8^{\circ}\text{F}$ )

Outdoor formula:  $0.7WB + 0.3TG + 0.1TA$   
Outdoor Range:  $0^{\circ}\text{C} - 56^{\circ}\text{C}$  ( $32^{\circ}\text{F} - 132^{\circ}\text{F}$ )  
Outdoor Accuracy:  $\pm 1.5^{\circ}\text{C}$  ( $\pm 2.7^{\circ}\text{F}$ )

### **Air temperature (TA)**

Range:  $0 - 50^{\circ}\text{C}$  ( $32 - 122^{\circ}\text{F}$ )  
Accuracy:  $\pm 0.8^{\circ}\text{C}$  ( $\pm 1.5^{\circ}\text{F}$ )  
Dew Point Temp. Range:  $-25.3 - 48.9^{\circ}\text{C}$  ( $-13.5$  to  $120.1^{\circ}\text{F}$ )  
Wet Bulb Temp. Range:  $-21.6 - 50.0^{\circ}\text{C}$  ( $-6.9$  to  $122.2^{\circ}\text{F}$ )

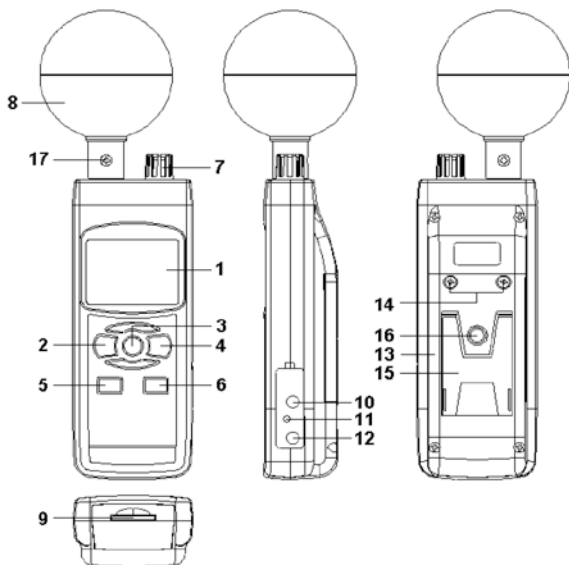
### **Black globe temperature (TG)**

Range:  $0 - 80^{\circ}\text{C}$  ( $32 - 176^{\circ}\text{F}$ )  
Accuracy:  $\pm 0.6^{\circ}\text{C}$  ( $\pm 1.1^{\circ}\text{F}$ )

### **Humidity**

Range:  $5\% - 95\% \text{ RH}$   
Resolution:  $0.1\% \text{ RH}$   
Accuracy:  $\geq 70\% \text{ RH: } \pm (3\% \text{ reading} + 1\% \text{ RH})$   
 $< 70\% \text{ RH: } \pm 3\% \text{ RH.}$

## **Instrument Description**



- |  |   |
|--|---|
| 1. Display   | 10. USB/RS232 Output                    |
| 2. Power, ESC, & Backlight Button                  | 11. Reset Button                        |
| 3. Hold, Function, & Next Button                   | 12. AC/DC 9V Power Adapter Input Socket |
| 4. REC, Enter, & In/Outdoor Button                 | 13. Battery Compartment/Cover           |
| 5. SET, Down, & Time Check Button                  | 14. Battery Cover Screws                |
| 6. Logger, Up, & Sampling Time Check Button        | 15. Stand                               |
| 7. Humidity and Air Temperature Sensor (TA Sensor) | 16. Tripod Fix Nut                      |
| 8. Black Ball (TG Sensor)                          | 17. Black Ball Fix Screw                |
| 9. SD card slot                                    |   |

## Operating Instructions

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## *Function selection*

- 1) Turn on the meter by pressing the Power Button. To turn the meter off, hold the Power Button for over 2 seconds.
- 2) The meter has 5 measuring functions to choose from: WBGT, WB, Dew Point, measurements, TG, Humidity measurements, Air Temperature. When the meter is on, press and hold the Function Button. The display will flash “\_bgt” for WBGT measurements, “\_b” for WB measurements, “dP” for Dew Point measurements, “tg” for TG measurements, “rH” for Humidity measurements, and “tA” for Air Temperature measurements. Release the Function Button to choose the displayed function.

## *WBGT Measurement*

- 1) Turn on the meter by pressing the Power Button. To turn the meter off, hold the Power Button for over 2 seconds.
- 2) Function select to “\_bgt”. The upper Display will show the WBGT value. The lower Display will show the text “\_bgt in” for indoors, or “-bgt out” for outdoors. While taking a measurement, press and hold the In/Outdoor Button to scroll between Indoor or Outdoor measuring. Release the IN/Outdoor Button to make your selection.
- 3) To set the WBGT alarm, please see the Advanced Settings section.

## *WB Measurement*

- 1) Turn on the meter by pressing the Power Button.
- 2) Function select to “\_b”. The upper Display will show the WB value. The lower Display will show the text “\_b”.

## *Dew Point Temperature Measurement*

- 1) Turn on the meter by pressing the Power Button.

- 2) Function select to “dP”. The upper Display will show the Dew Point Temperature value. The lower Display will show the text “dP”.

## *TG Measurement*

- 1) Turn on the meter by pressing the Power Button.
- 2) Function select to “tg”. The upper Display will show the TG value. The lower Display will show the text “tg”.

## *Humidity and TA Measurement*

- 1) Turn on the meter by pressing the Power Button.
- 2) Function select to “rH”. The upper Display will show the Humidity value. The lower Display will show the TA value.

## *Data Hold*

While taking a measurement, press the Hold Button once and the measured value will hold on the screen, and a HOLD symbol will appear. Press the Hold Button once again will release the data hold function.

## *Data Record (Max., Min. reading)*

The data record function records the maximum and minimum readings. Press the REC Button once to start the Data Record function and a “REC” symbol will appear on the display. With the “REC” symbol on the display:

- 1) Press the REC Button once, and a “REC. MAX.” symbol along with the maximum value will appear on the display. To delete the maximum value, press the Hold Button once and the display will show a “REC.” symbol only and execute the memory function continuously.
- 2) Press the REC Button again, and a “REC. MIN.” symbol along with the minimum value will appear on the display.

To delete the minimum value, press the Hold Button once, and the display will show a “REC.” symbol only and execute the memory function continuously.

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- 3) To exit the memory record function, press the REC button for 2 seconds. The display will revert to the current reading.

## *Backlight ON/OFF*

After powering the meter ON, the LCD Backlight will turn on automatically. While taking measurements, press the Backlight Button and the LCD Backlight will turn off. Press the Backlight Button once again to turn the LCD Backlight back ON.

## *Datalogger*

Preparation Before Executing the Datalogger Function:

- 1) Insert the optional SD card into the SD card socket.
- 2) Before you use an SD card with this meter for the first time, it is recommend to format the SD card. See Advanced Settings section of this manual for instructions.
- 3) If this is the first time the meter is used you need to adjust the clock. See Advanced Settings section of this manual for instructions.
- 4) Now you need to set the decimal format. The numerical data structure downloaded to the SD card is defaulted used the “.” as the decimal, for example “20.6” “1000.53”. But in certain countries the “,” is used as the decimal point, for example “20, 6” “1000,53”. See Advanced Settings section of this manual for instructions on how to change the Decimal Character.

## *Auto Datalogger (Set sampling time $\geq 1$ second)*

- 1) Start Datalogging; press the REC Button, and the “REC” symbol will appear on the LCD screen, then press the Logger Button, the “REC” symbol will flash while the measuring data and time information is being saved in memory.

To set the sampling time, and to toggle the beeper sound on or off, refer to the Advanced Settings section of this manual.

- 2) Pause the Datalogging; while Datalogging, if press the Logger But-

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ton once. While paused, the “REC” symbol will stop flashing. Press the Logger Button again to resume Datalogging, and the “REC” symbol will begin to flash again.

- 3) Stop Datalogging; while the Datalogger function is paused, press the REC Button for 2 seconds. The “REC” symbol will disappear indicating the Datalogging function has stopped.

### *Manual Datalogger (Set sampling time = 0 seconds)*

- 1) Set sampling time is to 0 second; Press the REC Button, and the “REC” symbol will appear on the LCD screen. Press the Logger Button, and the “REC” symbol will flash once and one Beep will sound, at the same time the measuring data along the time information will be saved in memory. The lower Display will show the Position (record) number, which is saved as well.
- 2) To Change the Position Number; press the Down Button and the lower position number will flash on the display. Press the Up or Down Buttons to set the Position Number (1 to 99) to help identify the measurement location. The lower Display will show P x (x = 1 to 99). After the position number is selected, press the Enter Button to confirm.
- 3) Stop Datalogging; press the REC Button for 2 seconds, and the “REC” symbol will disappear indicating the Datalogging function has stopped.

### *Checking the Time*

During normal functions (not Datalogging), press the Time Check Button and the lower LCD display will show the Year, Month/Date, Hour/Minute.

### *Check Sampling Time Information*

During normal functions (not Datalogging), press the Sampling Button and the lower LCD display will show the Sampling Time Information.

### *SD Card Data Structure*

- 1) The first time the SD card is used in the meter, the SD card will generate a folder: WBA01

- 2) The first time you use the Datalogger, in the folder WBA01, a new file name WBA01001.XLS will be created. The Datalogger will use this file until the Data has reached to 30,000 rows. The meter will then will generate a new file with a subsequent number, for example WBA01002.XLS.
- 3) The folder WBA01 can hold 99 .XLS files. When that number has been reached, the meter will then will generate a new folder with a subsequent number, for example WBA02. Max number of WBA-- folders is 10.

### *Data Transfer from SD card to Computer (EXCEL Software)*

- 1) After Datalogging, remove the SD card from the SD card slot.
- 2) Plug in the SD card into the Computer's SD card slot or insert the SD card into the optional SD card adapter and connect to your Computer. Turn your computer on and a folder will appear on your desktop representing you SD card.
- 3) Open "Microsoft EXCEL". Download the EXCEL files from the SD Card to the computer by opening up the SD folder and selecting the desired EXCEL files, and drag-and-drop them onto your Computer. Open the files with EXCEL (File – Open).
- 4) The EXCEL file will have the following column headers in this order: Place (Position Number), Date (Year/Month/Day), Time (in 24h clock), Value, and Unit.

## **Advanced Settings**

During normal functions (not Datalogging), press and hold the SET Button for 2 seconds to enter the "Advanced Setting" mode. Press the Next But-

ton scroll through eight main functions, shown on the lower display:

**dAtE** Set clock time (Year/Month/Date, Hour/Minute/Second)

**AL** SET WBGT Alarm Value

**dEC** Set SD card Decimal character

**PoFF** Auto power OFF management

**bEEP** Set beeper sound ON/OFF

**t-CF** Select the temperature unit to °C or °F

**SP-t** Set sampling time (Hour/Minute/Second)

**Sd F** SD memory card Format

While in the “Advanced Setting” function, press the Esc Button to exit and to return to normal functioning.

## *Set Clock Time*

- 1) When the lower display shows “dAtE”, press the Enter Button. Use the Up and Down Buttons to adjust the Year. After the desired value is set, press the Enter Button to adjust the Month, Date, Hour, Minute, and Second values.
- 2) After all the time values have been set the screen will jump to “SD card Decimal character” setting screen. To exit “Advanced Settings”, press the Esc Button.

**Note:** After the time value is set, the internal clock will run even when the power is off, if the battery is under normal conditions.

## *Set WBGT Alarm Value*

- 1) When the lower display shows “AL”, use the Up or Down Buttons adjust the WBGT Alarm value. If the WBGT measurement is above the alarm setting, a buzzer will sound.

- 2) Press the Enter Button to save the setting as the default. To exit “Advanced Settings”, press the Esc Button.

### *Setting the Decimal point on the SD Card*

- 1) When the lower display shows “dEC”, use the Up or Down Buttons to toggle between “bASIC” (“.” Decimal Point) or “Euro” (“,” Decimal Point).
- 2) After the Decimal point character has been selected, press the Enter Button to save the setting as the default. To exit “Advanced Settings”, press the Esc Button.

### *Auto power OFF management*

- 1) When the lower display shows “PoFF”, use the Up or Down Buttons to select the value “yES” (Enable Auto Power Off) or “no” (Disable Auto Power Off).
- 2) After selecting “yES” or “no”, press the Enter Button to save the setting as the default. To exit “Advanced Settings”, press the Esc Button.

### *Set Beeper Sound ON/OFF*

- 1) When the lower display shows “bEEP”, use the Up or Down Buttons to select “yES” (Beeper Sound is ON) or “no” (Beeper Sound is OFF).
- 2) After selecting “yES” or “no”, press the Enter Button to save the setting as the default. To exit “Advanced Settings”, press the Esc Button.

### *Select the Temperature unit to °C or °F*

- 1) When the lower display shows “t-CF”, use the Up or Down Buttons to select “C” (for °C) or “F” (for °F).
- 2) After selecting “C” or “F”, press the Enter Button to save the set-

ting as the default. To exit “Advanced Settings”, press the Esc Button.

### *Set sampling time*

- 1) When the lower display shows “SP-t”, use the Up or Down Buttons to adjust the value to either 0, 1, 2, 5, 10, 30, 60, 120, 300, 600, 1800, or 3600 seconds.
- 2) After the Sampling value is selected, press the Enter Button to save the setting as the default. To exit “Advanced Settings”, press the Esc Button.

### *SD memory card Format*

**Please Note:** Formatting the SD card erases all data from that SD card.

- 1) When the lower display shows “Sd F”, use the Up or Down Buttons to select “yES” (format the SD card) or “no” (do not format the SD card).
- 2) To format your SD card, select “yES” and press the Enter Button. The Display will show “yES Enter”, to confirm. Press the Enter Button to confirm.

## **PC Serial Interface**

The instrument features an PC output via 3.5 mm terminal. The connector output is a 16 digit data stream which can be utilized to the user’s specific application. An USB RS232 lead with the following connection will be

required to link the instrument with the PC serial input.

Meter (3.5mm Jack Plug)	PC (9W “D” Connector)
Center Pin	Pin 2
Ground/Shield	Pin 5


The 16 digit data stream will be displayed in the following format:  
D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0

D0	End Word
D1 to D4	Upper Display reading, D1= LSD, D4= MSB
D5 to D8	D5=? D6=? D7=? D8=?
D9	Decimal Point ( DP) for display 0 = No DP, 1 = 1 DP, 2 = 2 DP, 3 = 3 DP
D10	D10 = 0
D11	D11 = 0
D12	D12 = 0
D13	D13 = 0
D14	D14 = 0
D15	Start Word

## System Reset

If an error occurs, press the Reset Button with a Pin. If the Reset Button does not fix the error, please send in the unit to our Calibration Lab for repair. E-mail [info@reedinstruments.com](mailto:info@reedinstruments.com) for more information.

# Battery Replacement

- 1) When the left corner of LCD display shows , it is necessary to replace the battery
- 2) Loosen the screws of the Battery Cover and remove
- 3) Remove the batteries and replace with Six DC 1.5 V batteries (UM3, AA, Alkaline/heavy duty)
- 4) Make sure the battery cover is properly secured after changing the battery

For service on this or any other REED product or information on other REED products, contact REED Instruments at [info@reedinstruments.com](mailto:info@reedinstruments.com)

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