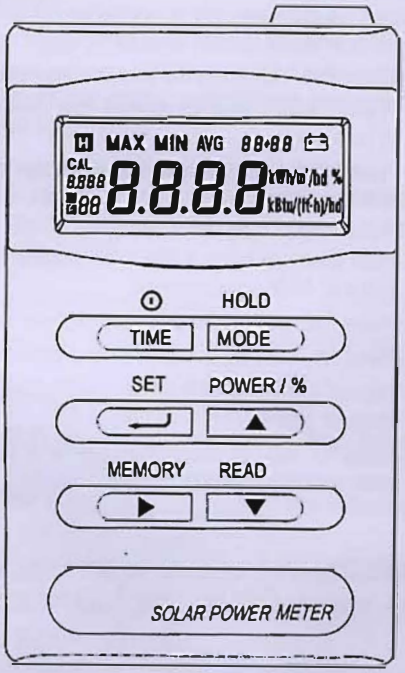
GENERAL Solar Power Meter

DBTU1300

INSTRUCTION MANUAL



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5. Construction:

To check the sun radiation at any angle and any moment, which is helpful for the installation of sheltering systems to control the indoor temperature efficiently and save energy.

Electricity can be produced by combining the building materials with the solar power panel. The meter can measure the solar power radiation to reach the high efficiency.

6. Hydrological

① When ground water on the surface is evaporated by sunshine and becomes clouds, clouds are condensed and become rainfall caused by the gravitation.

② Sunshine radiates to the ocean and the temperature difference of the ocean occurs.

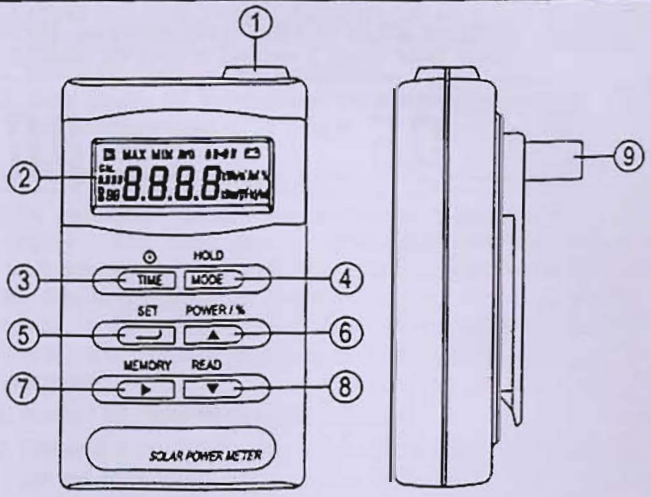
③ Sunshine radiates to the earth, as every place of the earth's surface affacted by heat is different, this causes the atmospheric convection activity and becomes wind and the waves of the ocean surface.

3. SPECIFICATIONS

- Display : LCD display, 4 digit LCD reading.
- Measuring Range : 2000 W/m^2, 634 Btu / (ft^2 x h)
- Resolution : 0.1 W/m^2, 0.1 Btu / (ft^2 x h)
- Overrange Display : LCD will show "OL" symbol.
- Spectral Response : 400~1000nm
- Accuracy : Typically within ±10 W/m^2 [±3 Btu / (ft^2 x h)] or ±5%, whichever is the greatest in sunlight ; Additional temperature induced error ±0.38 W/m^2/℃ [±0.12 Btu / (ft^2 x h)/℃] from 25℃
- Angular Accuracy : Cosine corrected <5% for angles < 60°
- Drift : < ±2% per year

- Sampling Rate : 4 times/sec.
- Photo Detector : One silicon photovoltaic detector.
- Manual Data Memory Capacity : 99 sets.
- Operating Temperature & Humidity : 0℃ to 50℃ (32°F to 122°F) & 0% to 80% RH.
- Storage Temperature and Humidity : -10℃ to 60℃ (14°F to 140°F) & 0% to 70% RH.
- Power Source : 4 pcs size AAA battery.
- Battery Life (typical) : 100 hours (carbon zinc).
- Meter Dimensions/Weight : 110Lx64Wx34H (mm)/158g
- Accessories : Instruction manual, battery, Tripod mounted screw.

4. PARTS



1. INSTRUCTION

- ❑ The digital solar power meter is a precision instrument used to measure solar radiation in the field.
- ❑ It is fully cosine corrected for the angular incidence of solar.
- ❑ The solar power meter is compact, tough and easy to handle.
- ❑ The solar sensitive component used in the meter is a very stable, long-life silicon potovoltaic detector.

2. FEATURES AND APPLICATIONS

Features :

- ❑ 4 digit LCD reading.
- ❑ Wide spectral range.
- ❑ Excellent long term stability.
- ❑ Cosine corrected.
- ❑ Automatic transmission measurements.
- ❑ Select either power or transmission.
- ❑ Solar energy measurement.
- ❑ Current time setting function.
- ❑ User calibration factor setting function.
- ❑ End-mount light sensor.
- ❑ Select either W/m^2 or Btu / (ft^2 x h) units.
- ❑ Data hold/MAX/MIN/AVG modes.
- ❑ Data Memory and Read function. (99 sets)
- ❑ Auto power off function.

Applications :

The meter can measure the solar power radiated from any direction, angle or position, and can be mounted firmly on a tripod. The meter has Time Setting function, it can integrate the measured solar power of every second, calculate the average energy per hour automatically after the desired time is set up in order to get the average solar energy.

1. Solar Power Panel Industry:
Take the meter to measure the solar power at the installe place to find out the most advantageous angle ar direction for the solar power radiation before the sola panel is installed.

2. Solar Power Research:
In Taiwan, the sunshine is quite sufficient and has bee used for many kinds of applications widely recently. In th meanwhile, some related industries and academi organizations are also dedicated to the solar powe development. The meter can be used for Solar Powe research , as a tool of education and can also be used t prove the efficiency of the solar battery.

3. Agriculture:
Vegetables, flowers and plants are influenced by sunshine, especially for the plants cultivated in a greenhouse. The meter can measure the solar power efficiently and is the best tool for farmers to get the plants' growing under control

4. Solar transmission measurement:
The meter can measure the solar transmission which is applicable for glass, heat insulation papers, parasols, sunshades and so on.
For example:

① To compare the solar power radiation measured befor and after the sunshde is installed. The measure readings are helpful for recognizing whether the use material of a sunshade is good for insulating the sola power transmission.

② To check the ratio of sunshine insulation with hea insulation paper.

1. Solar sensor.

2. LCD Display : Display 4 digit displays with a maximum reading of 9999 , the measured values, unit function symbols, and decimal points etc.

3. ① TIME key :
   ① Press ① key to turn on the meter, hold it on for 3 seconds to turn off the meter.
   ② Press TIME key to switch the display of minute : second and day – hour.

4. HOLD/ MODE key :
   ① HOLD Function : Press this key momentarily to freeze or unfreeze the displayed readings.
   ② Recording Mode : Press this key for 3 seocnds to launch into Recording Mode.
   Press this key to circulate the the maximum (MAX), minimum (MIN), average (AVG) and current (MAX MIN AVG) reading.
   Hold this key for 3 seconds to quit.
   ③ Disable Auto Power Off : Press and hold this key, then turn on the meter again, the Auto Power off mark "÷" will disappear from the LCD.

5. SET ↵ key :
   ① Unit Select : Press this key to switch the unit between W/m^2 and Btu / (ft^2 x h).
   ② Real-Time Setting Mode : Press this key for 3 seconds to setting mode. There shows day digits on LCD.
   Press ▲, ▼ and ▶ keys to set the day & time.
   Press ↵ key to stored the time settings and start the integral solar energy measurement.

   ③ Calibration Factor Setting Mode : Press and hold this key, then turn on the meter again. There shows "CAL" mark and one flickering digit.
   Press ▲, ▼ and ▶ keys to set up desired calibration factor values. Press ↵ key to store and exit.

6. POWER / % ▲ key :
   ① Power and Transmission % Function Select : Press this key to select power or transmission (%) function.
   ② Power and Energy Units Select : In the integral solar energy mode, press this key to select power or energy units.
   ③ Zero Adjustment : Press and hold this key, then turn on the meter again, there shows "CAL" mark on the LCD. Cover up the solar detector then press ↵ key, LCD will show "MIN" mark to zero the reading and exit.
   ④ ▲ key : In READ mode , press this key to increase the memory location.
   In setting mode, press this key to increase the parameter.

7. MEMORY ▶ key :
   ① Memory Function : Press this key momentarily to store a measuring value.
   ② Clear the stored Data : Press and hold this key, then turn on the meter again. There shows "CLr" mark on LCD. Press ▼ key to select "YES" or "nO". to erase the memory data.
   ③ ▶ key : In setting mode, press this key to move cursor to the desired position.

8. READ ▼ key :
   ① Read Function : Press this key to READ mode, then press ▲ or ▼ key to select the desired stored number of data to read. Press ↵ key to exit.

② ▼ key : In the READ mode, press ▼ key to select decrease the memory location.

In the setting mode, press ▼ key to decrease the parameter.

9. Tripod mounted screw.

5. OPERATIONS

❑ The meter uses a silicon photovoltaic detector mounted in a cosine-corrected head to provide solar radiation measurements for solar, agricultural, meteorological, and hydrological applications.

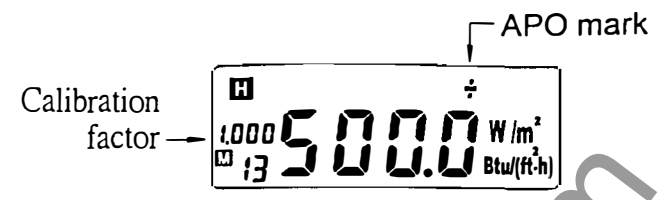
❑ The meter accurately measures sun plus sky radiation for the spectral range of 400 to 1100nm. Sensors calibrated to this spectral range should not be used for vegetation or under artificial lights.

5-1 Solar Power Measurement

In power mode, the meter measures the power of solar radiation.

1. Press " ⏻ " key to turn on the meter.
2. Press "SET" key to select the desired W/m² or Btu / (ft² x h) unit.
3. Position the meter with the solar sensor facing the sun directly.
4. Read the solar power value from the LCD display.
5. Press "HOLD" key, if the displayed value needs to be held.

   Press that key again to exit.

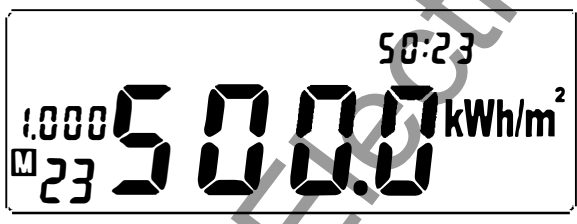


5-2 Using the MAX MIN Recording Mode for Solar Power Measurement

1. Press the " ⏻ " key to turn on the meter.
2. Press "SET" key to select the desired W/m² or Btu / (ft² x h) unit.
3. Position the meter with the solar sensor facing the sun directly.
4. Press "MODE" key for 3 seconds to MAX MIN Recording mode. The maximum, minimum, and average values are then reset to the present reading, LCD shows "MAX" mark and the auto power off feature is disabled.
5. Press "MODE" key to cycle the maximum (MAX), minimum (MIN). average (AVG), and present (MAX MIN AVG) readings, which indicate what value is being displayed. The average reading is the average of the last 4 times present values.
6. Press "MODE" key for 3 seconds to exit.

9. Press "POWER / %" key to select solar power or integral solar energy units.
10. Press "TIME" key to switch between day-hour and minute : second real-time display.

    In this mode, the "HOLD MODE" key is disable.
11. Press and hold " ⏻ " key for 3 seconds to exit and turn off the meter.



5-5 Manual Data Memory and Read Mode

1. Clear the manual memorized data

   ① Press " ⏻ " key to turn off the meter.

   ② Press and hold "MEMORY" key, then turn on the meter again, LCD shows "CLr YES" mark.

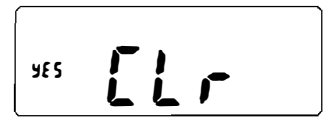
   ③ Press "▼" key to select "YES" or "NO" then press "↵" to confirm.
2. Manual data memory

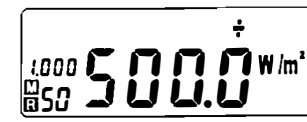
   Press "MEMORY" key momentarily to store current LCD reading to the memory. Total memory size is 99 sets.
3. Manual memory data READ

   ① Press "READ" key to read manual recorded data. The LCD then shows " R " mark.

② Press "▲" or "▼" key to select the desired memory address number data for display.

③ Press "↵" key to exit.





5-6 Disable Auto Power off Function

The meter will turn off automatically if no key pressed for 10 minutes.

Disable auto power off function :

1. Press " ⏻ " key to turn off the meter.
2. Press and hold "HOLD" key then turn on the meter again, the auto power off function will be disabled. The auto power off mark "÷" will disappear.
3. Auto power off function will be actuated every time you turn on the meter.

5-7 Setting the Calibration Function (CAL)

The calibration factor CAL serves to calibrate the result display. The solar power value measured internally is multiplied by the value of CAL that has been entered and the resulting value is displayed or stored. The CAL setting range is from 0.000 to 9.999. The calibration factor adjustment method needs a standard solar meter as a reference.

1. Press " ⏻ " key to turn off the meter.
2. Preee & hold "SET" key, then turn on the meter again to set up calibration factor, LCD then shows "CAL" mark and the first digit stars flicking which can be changed.

5-3 Solar Power Transmission Measurement

In transmission mode, the meter is able to calculate the solar transmission percentage associated with a given material such as glass, film or other transparent materials.

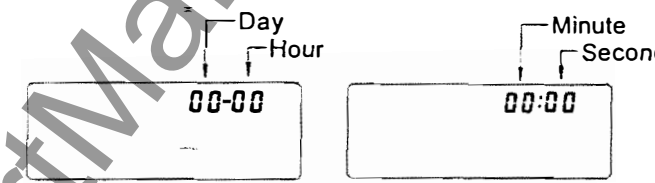
1. Press the " ⏻ " key to turn on the meter.
2. Press "SET" key to select the desired W/m^2 or Btu / (ft^2 x h) unit.
3. Position the meter with the solar sensor facing the sun directly.
4. Press "POWER / %" key to transmission mode, LCD then shows " % " mark.
5. Press "↵" key to store the solar power measured value as a reference, LCD then shows "100.0%".
6. Put the glass or film material between the solar source and the meter solar sensor.
7. Read the LCD display.
8. Press "HOLD" key, if the displayed value needs to be held.

   Press "HOLD" key again to exit data hold mode.
9. Remove the sample material and confirm the meter returns to 100.0%. If the meter does not display 100.0% with the sample removed, then forget the reading and begin the test process again.
10. Press "POWER / %" key to exit.

5-4 Integral Solar Energy Measurement

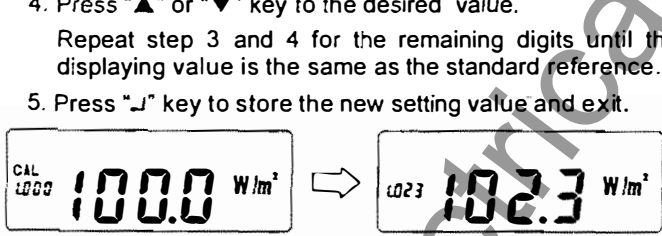
Measure the amount of sunlight available at your sit When sunlight reaches to the Earth, it is distribute unevenly in different regions. Sunlight varies with th seasons, as the rotational axis of the Earth shifts lengthen and shorten days with changing seasons. Th quantity of sunlight reaching any region is also effected b the time of day, the climate (especially the cloud cove which scatters the sun's rays), and the air pollution in th region. Likewise, these climatic factors affect the amou of solar energy that is available to PV systems.

1. Press the " ⏻ " key to tum on the meter.
2. Press "SET" key to select the desired W/m^2 or Btu / (ft^2 x h) unit.
3. Position the meter with the solar sensor facing the sun directly.
4. Press "SET" key for 3 seconds to enter the real-time (now time) setting, LCD then shows the " □□-□□ " mark and the flicking numbers.
5. Press "▲" or "▼" key to set desired value.
6. Press "▶" key and move to the other two flicking digits.
7. Repeat step 5 and 6 to complete Day-Hour and Minute Second (Real-Time)settings.
8. Press "↵" key to store the real-time and start integral solar energy measurement.



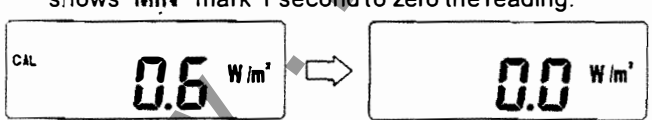
3. Press "▶" key to select the desired flicking digit.
4. Press "▲" or "▼" key to the desired value.

   Repeat step 3 and 4 for the remaining digits until the displaying value is the same as the standard reference.
5. Press "↵" key to store the new setting value and exit.



5-8 Zero Reading Adjustment

1. Press & hold "POWER / %" key then tum on the meter again to zero reading adjustment, LCD then shows "CAL" mark.
2. Cover up the solar sensor, and press "↵" key LCD then shows "MIN" mark 1 second to zero the reading.



6. BATTERIES

1. As the battery power is not sufficient, LCD will display " 🔋 " : battery replacement of standard AAA-size 4 pcs 1.5V batteries is required.
2. Unscrews the big screw on the back of the meter and remove the carrying clip.
3. Disconnect the batteries from the instrument and replace them with standard AAA-size 4 pcs 1.5V batteries and replace the cover.

Note : Make sure the battery polarity is installed as indicated.

7. MAINTENANCE

1. The white plastic plate on the top of the meter should be cleaned with a damp cloth when necessary.
2. Do not put the instrument in a place where temperature or humidity is excessively high.
3. The calibration interval for the solar sensor will vary according to operational conditions, but generally the sensitivity decreases in direct proportion to the product of solar light intensity by the operational time. In order to maintain the basic accuracy of the instrument, periodic calibration is recommended.

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