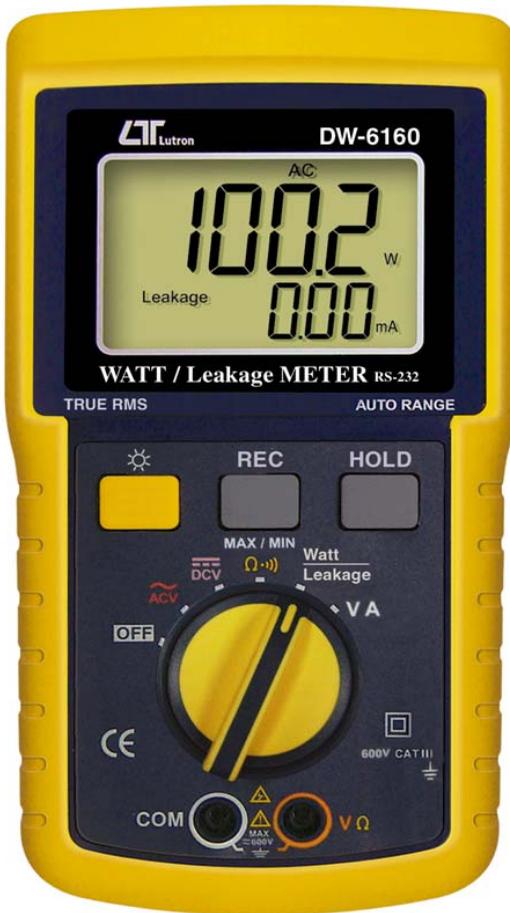


# WATT/Leakage METER

Model : DW-6160



Your purchase of this WATT/Leakage METER marks a step forward for you into the field of precision measurement. Although this WATT/Leakage METER is a complex and delicate instrument, its durable structure will allow many years of use if proper operating techniques are developed. Please read the following instructions carefully and always keep this manual within easy reach.



**OPERATION MANUAL**

## Caution Symbol



*Caution :*

- \* Risk of electric shock !



*Caution :*

- \* Do not apply the overload voltage, current to the input terminal !
- \* Remove test leads before open the battery cover !
- \* Cleaning - Only use the dry cloth to clean the plastic case !

## Environment Conditions

*\* Installation Categories II 600V.*

*\* Pollution Degree 2.*

*\* Altitude up to 2000 meters.*

*\* Indoor use.*

*\* Relative humidity 80% max.*



*Equipment protected throughout by double insulation or reinforced insulation.*

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# 1. FEATURES

- \* Professional WATT meter with Leakage current tester digital display , battery operated .
- \* LSI - circuit provides high reliability and durability .
- \* Measurement
  - WATT ( AC ) : 2500W x 0.1 W / 1 W.
  - Leakage current ( AC mA ) : 80.00 mA x 0.01 mA.
  - ACV : 600.0 V x 0.01 V / 0.1 V.
  - ACA : 10.00 A x 0.001 A / 0.01 A.
  - DCV : 600.0 V x 0.01 V / 0.1 V.
  - $\Omega$  : 20 k $\Omega$  x 0.01 k $\Omega$  / 0.001 k $\Omega$  / 1  $\Omega$  .
- \* Low Watt measurement , 999.9 Watt x 0.1 W.
- \* True Power and Wide range 0 to 2500 Watt.
- \* True RMS measurement of ACV / ACA.
- \* Leakage detect ( AC mA ) detection.
- \* Continuity beeper.
- \* Super large LCD , Dual display at same time.
- \* Full function Auto range.
- \* Memory Record ( Max. , Min. ) , Data Hold.
- \* RS232 / USB Computer interface.
- \* Built-in low battery indicator.
- \* Built-in backlight easy to readout .
- \* Power : DC 1.5V (UM-3 , AA ) x 8 PCs or DC 9V adapter in.

## 2. SPECIFICATIONS

### 2-1 General Specifications

Circuit	Custom one-chip of microprocessor LSI circuit.	
Display	Large LCD display Max. reading 9999. LCD size :90.5 x 64.5 mm. Dual value display with backlight.	
Measurement	ACV	0 to 600.0 V
	DCV	0 to 600.0 V
	$\Omega$	0 $\Omega$ to 20.00 k $\Omega$
	WATT	0.1 W to 2500 W
	Leakage current	0.01 m A to 80.00 m A
	ACA	0.01 A to 10.00 A
Over input	" - - - - " mark indication .	
Polarity	Automatic switching , "-" indicates reverse polarity.	
Zero Adjustment	Automatic adjustment.	
Sampling Time	Approx. 1.5 second.	
Data Hold	Freeze the display reading.	
Memory Recall	Maximum & Minimum value.	
Data output	RS232 / USB PC Computer interface . * Connect the optional RS232 cable UPCB - 02 will get the RS232 plug . * Connect the optional USB cable USB - 01 will get the USB plug .	
Operation Temperature	0°C to 50°C (32°F to 122°F) .	
Operation Humidity	Less than 80% RH.	

Power Supply	Alkaline or heavy duty DC 1.5 V battery ( UM3, AA ) x 8 PCs, or equivalent.
	* DC 9V adapter input. ( AC/DC power adapter is optional ).
Power Consumption	Approx. DC 33 mA
Weight	883 g / 1.95 LB
Dimension	224 x 125 x 65 mm ( 8.8x 4.8 x 2.5 inch )
Standard Accessories Included	Instruction manual.....1 PC Test lead ( Red & Black ).....1 pair
Optional Accessories	* AC/DC 9V adapter, AP-9VA. * USB cable , USB - 01. * RS232 cable , UPCB - 02. * Data Acquisition software, SW-U801-WIN. * Hard carrying case , CA-08.

## ***2-2 Electrical specifications (23± 5°C )***

### **AC / DC VOLTAGE**

Range	Range 1	0.01V to 99.99V
	Range 2	100 V to 600V
Resolution	Range 1	0.01 V
	Range 2	0.1 V
Accuracy	ACV	± (1 % + 5d)
	DCV	± (0.8 % + 5d)
<p>* Measuring Signals come from the front panel terminals.  * Auto range.  * Max. input voltage : AC 600 V, DC 600 V.  * ACV accuracy is test under input signal is sine wave, 50/60 Hz  * ACV frequency response is from 40 to 400 Hz.  * ACV is true rms measurement..</p>		

### **OHMS ( Resistance )**

<i>Range</i>	<i>Resolution</i>	<i>Accuracy</i>
0 to 999 $\Omega$	1 $\Omega$	$\pm (1 \% + 1d)$
1.000 to 9.999 K $\Omega$	0.001 K $\Omega$	$\pm (1 \% + 1d)$
10 to 20 K $\Omega$	0.01 K $\Omega$	$\pm (1 \% + 1d)$

\* Auto range.  
\* Continuity beeper : < 4  $\Omega$  .  
\* Overload Rating : AC / DC 600V at 20 second Max

### **WATT ( true power )**

<i>Range</i>	<i>Resolution</i>	<i>Accuracy</i>
1000 W	0.1 W	$\pm (1.5 \% + 5d)$
1001 to 2500 W	1 W	$\pm (1.5 \% + 5d)$

\* 0.1 W resolution : Input voltage < 120 ACV or  
Input current < 1 ACA.  
Beyond above input, the resolution will still be 1 W.  
\* Measuring Signals come from the top power plug input..  
\* Accuracy is test under input signal is sine wave, 50/60 Hz  
\* ACV, ACA frequency response is from 40 to 400 Hz.  
\* Max. input voltage : AC voltage 250 V, AC current : 10 A.

### **Leakage ( AC mA )**

<i>Range</i>	<i>Resolution</i>	<i>Accuracy</i>
0 to 80 mA	0.01 mA	$\pm (1 \% + 5d)$

\* The leakage current that sense between the " Hot line " and the " Earth " of the measuring installation that connect to the output " Power plug "

**V, A ( true rms )**

<i>Range</i>	<i>Resolution</i>	<i>Accuracy</i>
ACV 250 V	0.01 V/0.1 V	$\pm (1 \% + 5d)$
ACA 10 A	0.001 A/0.01A	$\pm (1 \% + 3d)$
<p>* ACV, 0.01 V resolution is valid from 0.01 V to 99.99 V. ACV, 0.1 V resolution is valid from &gt; 100.0 V.</p> <p>* ACA, 0.001 A resolution is valid from 0.001 A to 1.200 A. ACA, 0.01 A resolution is valid from &gt; 1.2 A.</p> <p>* Measuring signals come from the top power plug input ( power source ).</p> <p>* Auto range.</p> <p>* ACV, ACA accuracy is test under input signal is sine wave, 50/60 Hz</p> <p>* ACV, ACA frequency response is from 40 to 400 Hz.</p> <p>* ACV, ACA is true rms measurement..</p> <p>* Max. input voltage : AC voltage 250 V, AC current : 10 A.</p>		

## 3. FRONT PANEL DESCRIPTION

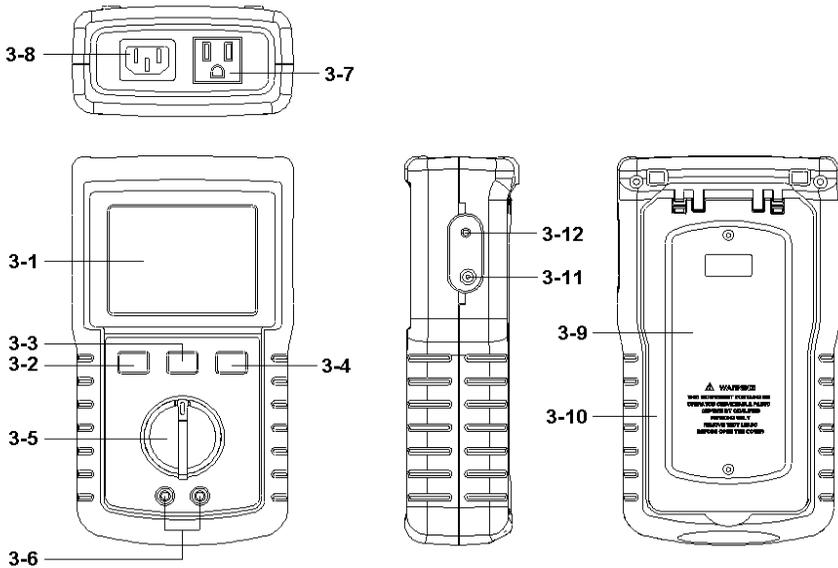


Fig. 1

- 3-1 Display
- 3-2 Backlight button
- 3-3 Record button ( MAX. / MIN. )
- 3-4 Data hold button
- 3-5 Power & function rotary switch
- 3-6 ACV / DCV &  $\Omega$  input terminal
- 3-7 Load terminal
- 3-8 Power source terminal
- 3-9 Battery Cover / Compartment
- 3-10 Stand
- 3-11 RS-232 output terminal
- 3-12 DC 9V power adapter input socket

## 4. MEASURING PROCEDURE

### ***4-1 ACV measurement procedure***

- 1) Rotate the function switch to the " ACV " position and Power ON the meter.
- 2) Connect Red test lead to the " V  $\Omega$  " input terminal and Black test lead to " COM " input terminal.
- 3) Use the test lead measurement unknown AC voltage.
- 4) Read the Display. The show value will correspond to the position selected. If the Display shows " ---- ", it indicates an out-of-range measurement.

### ***4-2 DCV measurement procedure***

- 1) Rotate the function switch to the " DCV " position and Power ON the meter.
- 2) Connect Red test lead to the " V  $\Omega$  " input terminal and Black test lead to " COM " input terminal .
- 3) Use the test lead measurement unknown DC voltage.
- 4) Read the display . The show value will correspond to the position selected. If the Display shows " ---- " it indicates an out-of-range measurement.

*Remark :*

*\* Observe polarity when measuring DC voltage.*

### ***4-3 Resistance measurement procedure***

- 1) Rotate the function switch to the  $\Omega$  position and Power ON the meter.
- 2) Connect red test lead to the " V  $\Omega$  " input terminal and black test lead to " COM " input terminal .  
Connect test lead to the resistance.

- 3) Read the display . The show value will indicate correspond to the position selected. If the display shows " ---- " it indicates an out-of-range measurement.
- 4) When resistance  $< 4\Omega$  the buzzer will continuity beeper .

#### ***4-4 Watt measurement procedure***

- 1) Rotate the function switch to the " WATT/Leakage " position.
- 2) Make sure your equipment work voltage, such as 110 V or 220 V.
- 3) Plug in the power source to " AC POWER INPUT " terminal, it locate the left position of Top Panel.
- 4) Plug in the equipment power line to the " LOAD " Terminal, it locate the right position of Top Panel.
- 5) Turn on the equipment power switch.
- 6) It can read the Power Consumption value on the top LCD Display. At the same time. If your equipment exist current leakage. It will show the leakage current value on the bottom LCD Display.

#### ***4-5 V ( voltage ) A ( current ) measurement procedures***

*When your equipment is on working. You can rotate the function switch to V A Position. The upper value will show working voltage. The bottom value will show the current consumption value.*

## **5. MAINTENANCE**

- 1) The meter is intended for measuring the TRUE RMS POWER VALUE, at the same time it also can measure the leakage current value to verify if the measurement equipment is under safety condition or not.
- 2) When measuring POWER VALUE, the working voltage of measurement equipment must be checked before turn on the equipment.

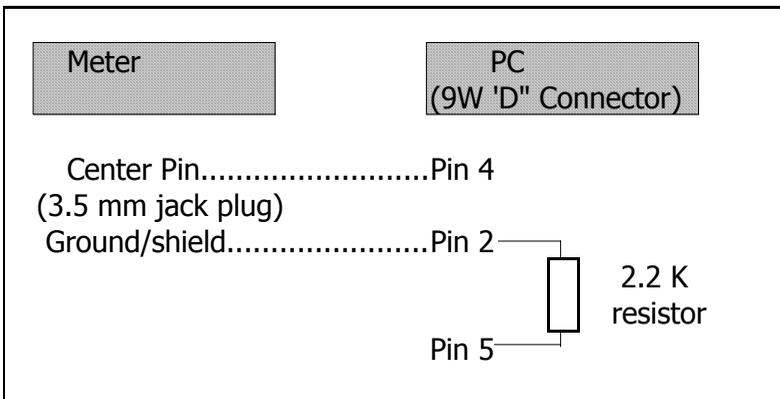
- 3) Instruments used in dusty environments should be stripped and cleaned periodically.
- 4) Do not leave the instrument exposed to direct heat from the sun for long periods.
- 5) Before removing the battery compartment cover, ensure that the instrument is disconnect from any circuit and the power switch is on the OFF position.

## 6. RS232 PC SERIAL INTERFACE

The instrument has RS232 PC serial interface via a 3.5 mm terminal ( 3-11, Fig. 1 ).

The data output is a 16 digit stream which can be utilized for user's specific application.

A RS232 lead with the following connection will be required to link the instrument with the PC serial port.



The 16 digits 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

**Each digit indicates the following status :**

D0	End Word		
D1 & D8	Display reading, D1 = LSD, D8 = MSD For example : If the display reading is 1234, then D8 to D1 is : 00001234		
D9	Decimal Point(DP), position from right to the left 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP		
D10	Polarity 0 = Positive 1 = Negative		
D11 & D12	Annunciator for Display		
	ACV = 50	DCV = 34	KΩ = 39
	Ω = 38	W = 47	m A = 53
	ACA = 52		
D13	When send the upper display data = 1 When send the lower display data = 2		
D14	4		
D15	Start Word		

**RS232 FORMAT : 9600, N, 8, 1**

Baud rate	9600
Parity	No parity
Data bit no.	8 Data bits
Stop bit	1 Stop bit

## 7. BATTERY REPLACEMENT

1)When the left corner of LCD display show "  , it is necessary to replace the battery, However in -spec. measurement may still be made for several hours after Low Battery Indicator appears before the instrument become inaccurate.

- 2) Open the screw of "Battery Cover "by screwdriver, then move the batteries.
- 3) Replace with 1.5V x 8 PCs batteries and reinstate the cover.

## **8. THE ADDRESS OF AFTER SERVICE CENTER**

