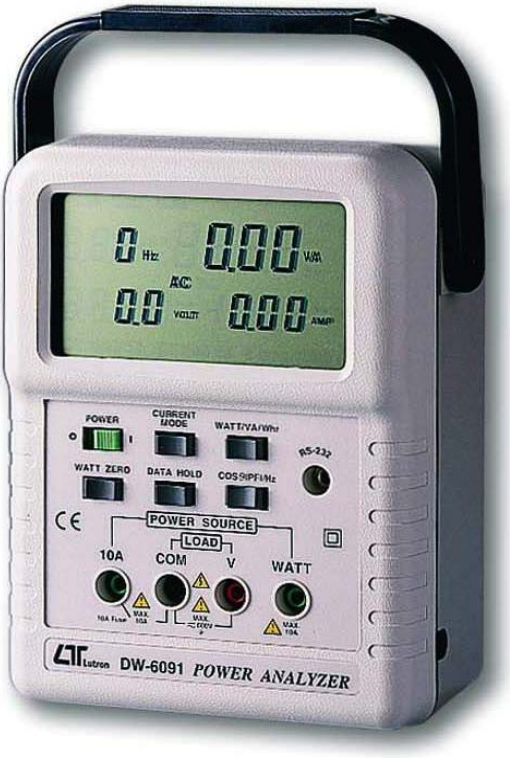
POWER ANALYZER

Model : DW-6091



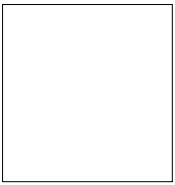
Your purchase of this POWER ANALYZER marks a step forward for you into the field of precision measurement. Although this POWER ANALYZER is a complex and delicate instrument, its durable structure will allow many years of use if proper operating techniques are developed. Please read the following instructions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

QUALITY ASSURED FIRM ISO 9001 SGS

UKAS QUALITY MANAGEMENT 005

OPERATION MANUAL

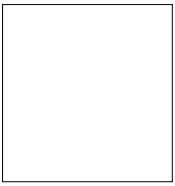
Caution Symbol



Caution :

*** Risk of electric shock !**

*** During the measurement, do not open the cabinet.**



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 .
* Pollution Degree 2.
* Altitude up to 2000 meters.
* Indoor use.
* Relative humidity 80% max.

TABLE OF CONTENTS

1. FEATURES

* Multi-functions : WATT, VA, Whr, COS (Power factor), ACV, ACA, Hz.
* True AC power(Watt) & apparent power (VA) measurement.
* True rms display for ACV, ACA.
* Supper large LCD, easy to read-out, display the Watt, Power factor, Voltage & Current value at the same time.
* Auto range.
* Built-in data hold function.
* RS-232 output interface.
* Exclusive custom exclusive design LSI circuit, provides high accuracy, reliability and durability.
* Built-in over input indication.
* Power supply by batteries.
* Built-in low battery indicator .
* Durable plastic housing case with handle.

2. SPECIFICATIONS

2-1 General Specifications

Display	* 93 mm x 52 mm large LCD (Liquid Crystal Display) display. * Multi-display unit, show Watt, Volt, Ampere, Power factor or Hz at same time.
Measurement	WATT, VA, Whr, COS (Power factor), ACV, ACA, Hz.
Zero Adjustment	*Watt :* External adjustment by push button.
	ACV, ACA : Automatic adjustment.

Over input Indication	Indication of " - - - - or " - - - - .
Data Output	RS232 serial interface.
Sampling Time	Approx. 1.5 Sec.
Operating Temp.	0 to 50 蚓 (32 to 122 蛘).
Operating Humidity	Less than 80 % R.H..
Power Supply	DC 12V, 1.5 V AA (UM-3) battery x 8 PCs.
Power Consumption	Approx. DC 30 mA
Dimension	175 x 130 x 83 mm (6.9 x 5.1 x 3.3 inch).
Weight	795 g (1.75 LB).
Standard Accessories	Test lead (red & black)..... 1 pair. Instruction Manual..... 1 PC.

2-2 Electrical Specifications (23 5 蚓)

Watt (AC, true power),
current mode from direct input

Range	Resolution	Accuracy
6,000 Watt	1 Watt	(1.5% + 5 d)

* Accuracy are specified under the following conditions :
  a) AC input current is 0.4 ACA & 10 ACA.
  b) AC input voltage is within 110 V 15 % and 220V 15%.
  c) ACA, ACV input signal is sine wave, 50/60 Hz.
  d) Power factor 0.8.

* ACA, ACV frequency response is from 40 to 400 Hz.

* Max. volt & current input signal value :
  Volt input : Max. AC 600V, Current input : Max. AC 10 A

Watt (AC, true power),
current input cooperate with current transformer

Range	Resolution
9,999 Watt	1 Watt
99.99 KW	0.01 KW
999.9 KW	0.1 kW

* Accuracy will be same as the abve " Direct Current Input Mode " but plus the accuray value of Current Transformer (CT).
* Input current should obey :
  CT 100/5 A - 8 ACA.
  CT 1000/5 A - 80 ACA.

VA (AC, Apparent Power)
current mode from direct input

Range	Resolution	Accuracy
99.99 VA	0.01 VA	(2 % + 2d)
999.9 VA	0.1 VA	
6,000 VA	1 VA	

* Accuracy are specified under the following conditions :
  a) AC input current is 0.4 ACA & 10 ACA.
  b) AC input voltage is within 110 V 15 % and 220V 15%.
  c) ACA, ACV input signal is sine wave, 50/60 Hz.
* ACA, ACV frequency response is from 40 to 400 Hz.
* Max. volt & current input signal value :
  Volt input : Max. AC 600V, Current input : Max. AC 10 A

COS (POWER FACTOR)		
Range	Resolution	Accuracy
0.01 to 1.00	0.01	(1.5% + 2 d)

* Accuracy are specified under the following conditions :
  a) AC input current is 0.4 ACA & 10 ACA.
  b) AC input voltage is within 110 V 15 % and 220V 15%.
  c) ACA, ACV input signal is sine wave, 50/60 Hz.
* Max. volt & current input value :
  Volt input : AC 600V, Current input : AC 10A

AC VOLTAGE (true rms)		
Range	Resolution	Accuracy
0.5 V to 299.9 V	0.1 V	***10 V :*** (1 % + 7d)
300 V to 600 V	1 V	***11 V to 100 V :*** (1 % + 5d) ***Others :*** (1 % + 1d)

* Auto range. * Max. input voltage : AC 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.

AC CURRENT (true rms) ***current mode from direct input***		
Range	Resolution	Accuracy
0.05 A to 10.00 A	10 mA	1%+3d)

* Max. input current : AC 10 A.
* ACA accuracy is test under input signal is sine wave, 50/60 Hz.
* ACA frequency response is from 40 to 400 Hz.
* ACA is true rms.

AC CURRENT ***current mode from CT (current transformer)***	
Range	Resolution
CT 100/5A, 0.1 - 200.0 A	0.1 A
CT 1000/5A, 1 - 2000 A	1 A
* Accuracy : Meter current range (direct current mode) accuracy plus CT (current transformer) accuracy. * ACA is true rms.	

Watt Hour	
Range	Resolution
0.001 Whr to 9.999 Whr	0.001 Whr
10.00 Whr to 99.99 Whr	0.01 Whr
100.0 Whr to 999.9 Whr	0.1 Whr
1000 Whr to 9999 Whr	1 Whr
10 K Whr to 99.99 K Whr	10 Whr
100 K Whr to 999.9 K Whr	100 Whr
1000 K Whr to 9999 K Whr	1 K Whr
** Accuracy & other specification requirement same as " Watt " range exactly*	

Hz		
Range	Resolution	Accuracy
10.0 Hz to 99.9 Hz.	0.1 Hz	(1 % + 1d)
100 Hz to 999 Hz.	1 Hz	
** Auto range.* ** Frequency signal input voltage level should > 6V & 600 V.*		

Remark :
The above specification are tested under the environment RF Field Strength less than 3 V/M & frequency less than the 30 MHz only.

3. FRONT PANEL DESCRIPTION

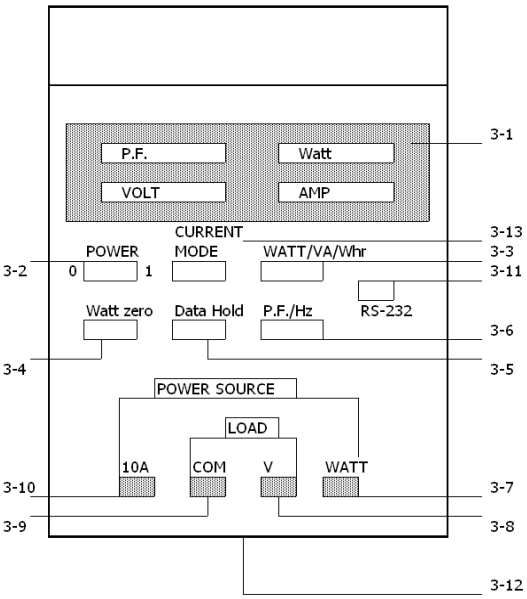


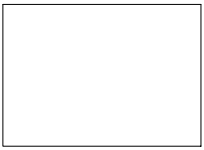
Fig. 1

3-1 LCD Display
3-2 Power Switch
On = 1, Off = 0
3-3 WATT/VA/Whr Button
3-4 WATT Zero Button
3-5 Data Hold Button
3-6 COS /Hz Button
3-7 Watt Terminal
3-8 V Terminal
3-9 COM Terminal
3-10 Current Terminal
3-11 RS-232 Output Terminal
3-12 Battery Cover/Battery Compartment
3-13 Current mode

4. PRECAUTIONS & PREPARATIONS FOR MEASUREMENT

1) Ensure that the batteries is connected correctly to its snap terminal and placed in the battery compartment.
2) Select & push the correct Switch & button before marking measurements
3) Place the Test Lead into the proper input terminal before marking measurements.
4) Remove either of the test leads from the circuit under test while changing the measurement function.
5) Operate the instrument only in the ambient temperature range of 32蚌 - 122蚌 (0蚓 - 50 蚓) and less than 80% Relative humidity.
6) Do not exceed the maximum rated voltage of each range and input terminal.
7) Always switch the power to its " Off " position when the instrument is not in use. Remove the batteries if not intend to use the instrument for a long period of time.

5. MEASURING PROCEDURE



Caution :

*** Do not apply the overload voltage, current to the input terminal !**

5-1 AC Watt/V/A/PF/Hz Measurement

1) Slide the " Power switch " (3-2, Fig. 1) to " On " position.

On = 1, Off = 0

2) Push the " WATT/VA/Whr Button " (3-3, Fig. 1) until the unit of the up right LCD show " Watt ".

3) **Power off the " Power Source " of the measured installation.**

Make the wire connection and connect the test leads into terminals (3-7, 3-8, 3-9, 3-10) as the Fig. 2

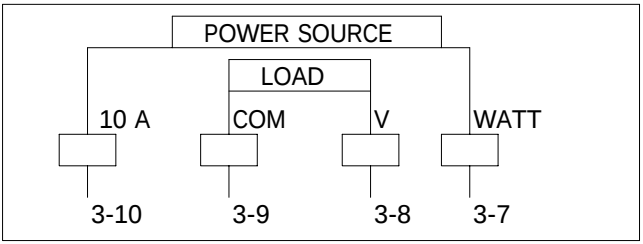


Fig. 2

For example : The wire connection for measuring the power of " Electrical Bulb "

4) *** Connect the " LOAD " to the terminals of 3-8, 3-9, refer Fig. 2.**

*** Connect the " POWER SOURCE " to the terminals of 3-7, 3-10, refer Fig. 2.**

Remark :
If the load current is > 10 Amp, then should cooperate with the CT (current transformer), 100/5 A or 1000/5 A. Please refer page 11, 5-5.

5) Push the " WATT Zero Button " (3-4, Fig. 1) once, then the " Watt display " will show " 0 "

6) **Power on the " Power Source " of the measured installation.**

The " LCD display " (3-1, Fig. 1) will show the Watt, Voltage, Current, COS (Power Factor) at the same time.

** Watt function is the true power (V x A x PF) measurement.*

** Voltage & Current function is the true rms measurement.*

** For the Watt measurement, the max. input current should less than ACA 10A.*

7) **Line frequency (Hz) measurement :**

During the Watt measurement, push the " COS /Hz Button " (3-6, Fig. 1) once, will show Line frequency value instead of the COS value.

** Push the " COS /Hz Button " again, the Hz value will disappear & the PF value will display again.*

5-2 AC VA/V/A/PF/Hz Measurement

All the measuring procedures are same as the above " 5-1 AC Watt/V/A/PF/Hz Measurement " except should push the " WATT/VA/Whr Button " (3-3, Fig. 1) once until the unit of the up right LCD show " VA ". Then the display will show the VA, voltage, current, Hz at the same time.

** The VA function is the apparent power (V x A) measurement.*

** During the VA measurement, the LCD will show VA, Voltage, Current & Hz, it can not show the value of COS (Power Factor).*

5-3 AC Watt Hour (Whr) Measurement

All the measuring procedures are same as the above " 5-1 AC Watt/V/A/PF/Hz Measurement " except should push the " WATT/VA/Whr Button " (3-3, Fig. 1) twice, then the LCD show the Whr value along with the elapsed time (Hour & Minute).

** The Whr (Watt Hour) is the value of Watt x hour.*
** The Whr measurement will start at the moment after the " Whr " unit is displayed on the LCD display.*
** The display of Whr measurement will stop (hold) when push the " Data Hold Button " (3-5, Fig. 1) once. Push the " Data Hold Button " once again will continue the Whr function.*

5-4 AC Voltage, AC Current Measurement

1) Select the " Power switch " (3-2, Fig. 1) to " On " position.

On = 1, Off = 0

2) Push the " WATT/VA/Whr Button " (3-3, Fig. 1) until the unit of the up right LCD show " Watt ".
3) **AC Voltage measurement**
   a. Connect red test lead to " V Terminal " (3-8, Fig. 1) and black test lead to " COM Terminal " (3-9, Fig. 1).
   b. Connect test lead probes into circuit under test.
   c. The display will show the AC voltage directly.

4) **AC Current measurement**

a. Connect red test lead to " 10 A Terminal " (3-10, Fig. 1) and black test lead to " COM Terminal " (3-9, Fig. 1).
b. Open the circuit in which current is to be measured. Now securely connect test leads in series with the load which the current is be measured.
c. The display will show the AC current directly.
** The max. AC current input value should less than 10 Ampere.*

5-5 AC Watt, VA, Whr measurement, current input cooperate with CT (current transformer)

Other measurement procedures are same as the 5-1, 5-2, except :

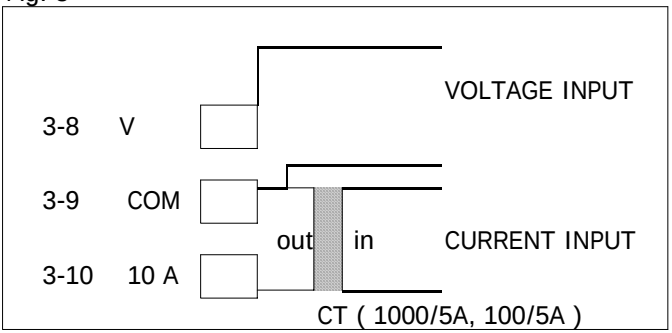
1) Wire connection as following, ref. Fig. 3

Voltage :
" V Terminal " (3-8, Fig. 2) & " COM terminal " (3-9, Fig. 2)

Current :
Current transformer output connect to the " 10A Terminal " (3-10, Fig. 2) & " COM terminal " (3-9, Fig. 2)

2) Select the CT type, 100/5A or 1000/5A by push the " Current Mode Button " (3-13, Fig. 1). The LCD will show the marker " CT 100/5A ", " CT 1000/5A " when the CT type is selected.

Fig. 3



5-6 Data Hold

During the measurement, Push the " Data Hold Button " (3-5, Fig. 1) will hold the display values & LCD will show the " HOLD " marker.

** Push the "Data Hold Button" again will release the DATA HOLD function.*

6. MAINTENANCE

Caution :

*** Risk of electric shock !**

*** Remove power cord before open the battery cover !**

6-1 Battery Replacement

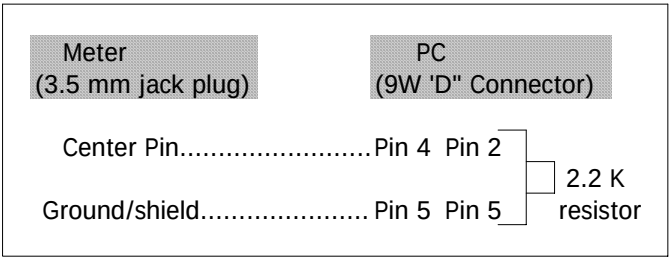
1) When the LCD display show the " BAT " marker, it is necessary to replace the batteries. However, in-spec. measurement may still be made for several hours after appear low battery indicator.
2) Loose the screw, slide the Battery Cover (3-12, Fig. 1), away from the instrument and remove the batteries.
3) Replace the 1.5 V AA (UM-3) battery x 8 PCs and reinstate the cover.

6-2 Cleaning

*** Cleaning - Only use the dry cloth to clean the plastic case !**

7. RS232 PC SERIAL INTERFACE

The instrument features an RS232 output via 3.5 mm Terminal (3-11, Fig. 1).
The connector output is a 16 digit data stream which can be utilized to the user's specific application.
An RS232 lead with the following connection will be required to link the instrument with the PC serial input.

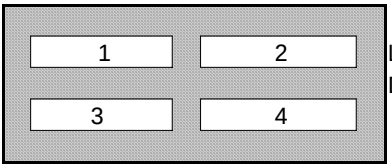


The 16 digit data stream will be displayed in the following format :

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0

Each digit indicate 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), positision fron right to the left
	0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP
D10	Polarity
	0 = Positive 1 = Negative

D11 & D12	Anunuciator for Display		
	Hz = 31	DCV = 34	DCA = 36
	ohm = 38	K ohm = 39	Watt = 47
	Hour = 61	VA = 63	kw/hr = 65
	Power factor = 54		
D13	1 = Top left display	2 = Top right display	
	3 = Bottom left display	4 = Bottom right display	
to show display position			
D14	4		
D15	Start Word		

7. THE ADDRESS OF AFTER SERVICE CENTER