AKTAKOM

ATT-8509

Electromagnetic Field Meter

User's Manual

TABLE OF CONTENTS

1. FEATURES

* 3 Axis probe.
* Radio frequency electromagnetic field tester.
* Wide measuring frequency ranges, 100 KHz to 3 GHz.
* EMF-839 is used for broadband devices of monitoring the wide range radio frequency electromagnetic field value.
* For precision measurement consideration, the meter is included two probes :
  EP-04L (Low frequency Probe, 100 KHz to 100 MHz)
  EP-03H (High frequency Probe, 100 MHz to 3 GHz)
* Unit : V/m, W/m^2, mW/cm^2.
* Alarm setting function can warn the user if the measuring antenna is too near the strong radiation sources, the buzzer will sound to remind the user.
* Peak hold function to latch peak value.
* Data hold function to lock the current reading.
* RS232 computer interface.
* Real time data logger, build in clock (hour-MIN-sec., year-month-date).
* Auto or manual data record, 16,000 Data logger no.
* Wide sampling time adjustment range from one second to 8 hours 59 minutes 59 seconds.
* Heavy duty hard carry case.
* Large size LCD with contrast adjustment, which can fit best viewing angle.
* Microcomputer circuit provides special function & offers high accuracy.
* Powered by 006P DC 9V battery or DC 9V adapter.

2. APPLICATIONS

This meter is specially developed for measuring or monitoring electromagnetic field, for example: cell-phone station, hospital equipment, radar , micro-wave oven, radiation work, TV antenna , Radio station , welding equipment , baking- equipment, television , computer , factory, laboratory , and other environment...etc.

3. SAFETY INSTRUCTIONS

Danger
* For worker's safety, be aware that persons with electromagnetic implant (e.g. cardiac-pacemarker) are subject to especial danger in some case.
* Particular to observe the local safety regulations of the operator of the equipment.
* Before using the device, it need to know that how to setting " alarm-limit " value (refer to page 12).

Attention
* Claims by some scientists that long term exposure to electromagnetic field may be the cause of childhood leukemia & other forms of cancer.
* Complete answers to any of these and related questions are not currently available. At the present time the most common practice is to avoid excess exposure over long period of time.

* Complete answers to any of these and related
  " Prudent Avoidance " as stated by the Environmental
  Protection Agency(EPA) USA is recommended.
* According to ICNIRP of reference levels to time-varying
  electromagnetic fields, The E-field strength levels are:

General public

Frequency range	e-field strength (V/m)
3 to 150 kHz	87
0.15 to 1 MHz	87
1 to 10 MHz	$87/f^{1/2}$
10 to 400 MHz	28
400 to 2000 MHz	$1.375 \times f^{1/2}$
2 to 300 GHz	61

Occupational

Frequency range	e-field strength (V/m)
65 to 1000 kHz	610
1 to 10 MHz	$610/f$
10 to 400 MHz	61
400 to 2000 MHz	$3 \times f^{1/2}$
2 to 300 GHz	137

4. SPECIFICATIONS

4-1 General Specifications

Circuit	Custom one-chip of microprocessor LSI circuit.	
Display	LCD size : 58 mm x 34 mm.	
Measurement Unit	V/m, mW/cm^2, W/m^2.	
Accuracy	< 2 dB.	
Probe structure	3 Axis.	
Probe Type Selection	EP-03H : 100 MHz to 3 GHz. EP-04L : 100 kHz to 100 MHz.	
Probe Input Impedance	50 OHM	
Frequency Selection Points	EP-03H: 900 MHz, 1 GHz, 1.8 GHz, 2.4 GHz, 2.45 GHz, 3 GHz.	
	EP-04L: 100kHz, 200kHz, 500kHz, 1MHz, 10MHz, 13.56MHz, 100MHz.	
Sensor Structure	Semiconductor	
Sampling Time of Data Logger	Manual	Press the data logger button once will save data one time. *Set the sampling time to 0 second*
	Auto	1 sec to 8 hour 59 min. 59 sec.
Data Hold	Freeze the display reading.	
REC Function	Record Maximum & Minimum value.	
Power off	Auto shut off saves battery life or manual off by push button. *Can default auto power off or manual power off.* *When default auto power off, power will off automatically after 10 min. if no button be pressed.*	

Peak Hold	To latch the peak measurement value.
Alarm Setting	Buzzer will sound when display over the setting value.
Sampling Time	Approx. 1 second.
Low Battery Indicator	When display show Low battery Indicator, it should change the batteries.
Data Output	RS 232 PC serial interface.
Operating Temperature	0 to 50 ℃.
Operating Humidity	Less than 80 %RH.
Power Supply	DC 9 V battery (006P) * *Heavy duty or Alkaline type.* DC 9V adapter input.
Power Current	Approx. DC 5.95 mA
Weight	523 g/ 1.16 LB.

Dimension	*Main instrument :*
	   200.0 x 76.2 x 36.8 mm
	 Probe :
	   70 mm (diameter) x 290 mm (length)

Accessories Included	Instruction manual..........................1 PC EP-03H Probe.............................. 1 PC EP-04L Probe.................................1 PC Memory card for EP-03H.................1 PC Memory card for EP-04L.................1 PC Hard carrying case.................. 1 PC DC 9V power adapter.....................1 PC
Optional Accessories	RS232 cable, UPCB-02. USB cable, USB-01. Data Acquisition software, SW-U801-WIN.

4-2 Electrical Specifications（23 ± 5 ℃）

Strength Range	Resolution	Effective Value
0 to 200.00 V/m	0.01 V/m	> 1 V/m
0 to 99.999 W/m^2	0.001 W/m^2	> 0.03 W/m^2
0 to 9.9999 mW/cm^2	0.0001 mW/cm^2	> 0.0003 mW/cm^2

Frequency Range	Accuracy	Test Point	Probe NO.
400 KHz to 100 MHz	< 2 dB	30 V/m	EP-04L
50 MHz to 2.5 GHz	< 2 dB	60 V/m	EP-03H

Remark:
* Measurement under other frequency range (below 400 KHz and over 2.5 GHz), the reading value just for reference only.
* For precision measurement consideration, it should select the " Frequency Team point " near the frequency value of measuring object.
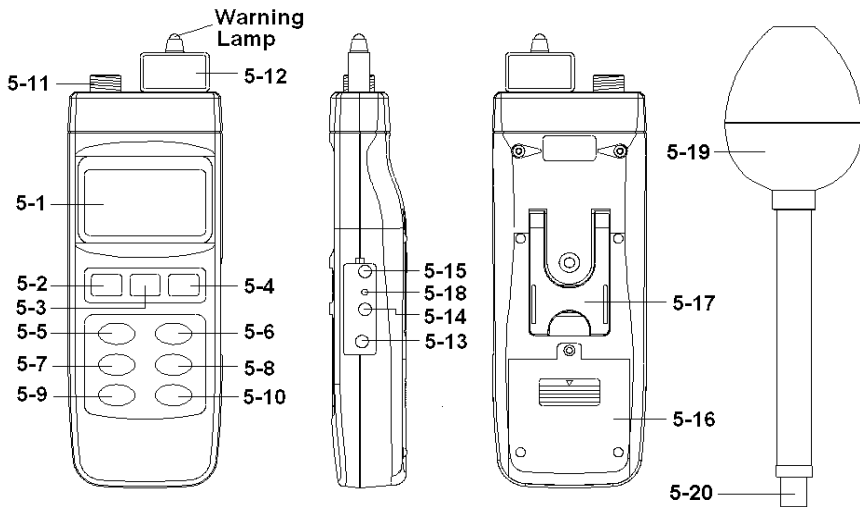
5. FRONT PANEL DESCRIPTION

Fig. 1

5-1   Display
5-2   Power Button
5-3   Hold / Esc Button
5-4   REC / Enter Button
5-5   Freq. Team Select Button
5-6   Unit Button
5-7   Peak Hold Button
5-8   Alarm Set / Start Button
5-9   Time / Send Button
5-10 Logger / Set Button

5-11 Probe Input Socket
5-12 Probe Memory Card
5-13 DC Adapter Input Socket
5-14 RS-232 Output Terminal
5-15 LCD contrast adj.
5-16 Battery Cover
5-17 Stand
5-18 Reset Button
5-19 Probe Sensing Head
5-20 Probe Plug

6. MEASUREMENT CONSIDERATION

1) According to the measuring object's frequency to select the right probe :

    EP-03H probe : 100 MHz to 3 GHz.
    EP-04L probe : 100 kHz to 100 MHz.

2) After select convenient the probe, then plug in the exclusive " Probe Memory Card " (5-12, Fig. 1) into the front end socket of meter.

> **Remark :**
> *** Probe memory card is saved the Probe's character into the internal memory circuit.**
> *** EP-03H and EP-04L has its own exclusive " Probe Memory card ", do not plug the wrong card, otherwise the accuracy will exist the deviation.**

  * Make sure to use the " Frequency Team Button " (5-5, Fig. 1) to select the convenient frequency value of measuring object.
However if you don't know the exact information, the meter will default to 1 GHz (EP-03H probe) or 1 MHz (EP-04L probe) after power on.

3) The meter is build in the 3 axis (X, Y, Z) EMF sensors, the circuit measure each X, Y, Z sensor's EMF value, then the CPU will calculate the total EMF value according the following formula :

$$\sqrt{X^2 + Y^2 + Z^2}$$

    X : The EMF value that sensing from the X direction.
    Y : The EMF value that sensing from the Y direction.
    Z : The EMF value that sensing from the Z direction.

8

7. MEASURING PROCEDURE

7 -1 Buttons instructions

Buttons	Function
Power Button	Press this key to power on or off.
Hold Button	Press this key to freeze the reading value.
ESC Button	When operate " SET " or " Data logger " functions, press this key to escape..
REC Button	Press this key to record maximum or minimum value.
Enter Button	When operate " SET " or " Data logger " functions, press this key to enter value.
Freq. Team Button	Press this key to select the convenient object's frequency value.
Unit Button	Press this key to select V/m, W/m^2, mW/cm^2 of strength units.
Peak Hold Button	Press this key to latch peak value during the measurement.
Alarm Set /Start Button	Press this key to setting alarm high/low limit or start alarm function.
Send Button	After operate " Data Logger " function, press this key to send data out.
Logger Set Button	Under " REC " function, press this key to execute data logger.
	Press this key to indicate date and time.

7 -2 Symbols & units of display

Symbol & Unit	Function
V/m	Electric field strength
W/m^2	Power density
mW/cm^2	Power density
100kHz....... ....3GHz	Frequency team indicates.
PEAK HOLD	Appears on the " PEAK HOLD " function. It will latch the peak value.
REC	Appears on the " REC " function, it will record maximum and minimum value.
HOLD	Appears on the " HOLD " function, it will freeze the present reading.
Alarm setting low limit	Appear on the " Alarm setting Low limit " function.
Alarm setting High limit	Appears on the "Alarm setting High limit" function.
Alarm setting hysteresis	Appears on the "Alarm setting hysteresis " function.
Sample time	Appears on the " Sample time" function, It indicate sample time that already be set.
Flash unit on the display	Appears on the " START " function, it indicate the ALARM FUNCTION has starting.

7-3 Unit Selection
After inserting the " Probe card " (5-12, Fig. 1) and
connecting probe's plug into the " Probe Input Socket "
(5-11, Fig. 1), use " Unit Button " (5-6, Fig. 1) to
select the " V/m, W/m^2, mW/cm^2 ".

7-4 Frequency Teams Selection
1) Use the " Freq. Team Button " (5-5, Fig. 1) to select
   the approx. measuring object frequency value.

   EP-03H probe, frequency select points :
      900 MHz, 1 GHz, 1.8 GHz,
      2.4 GHz, 2.45 GHz, 3 GHz.

   EP-04L probe, frequency select points :
      100 KHz, 200 KHz, 500 KHz, 1 MHz,
      10 MHz, 13.56 MHz, 100 MHz.

2) Make sure to use the " Frequency Team Button " (5-5,
   Fig. 1) to select the convenient frequency value of
   measuring object. However if you don't know the exact
   information, the meter will default to 1 GHz (EP-03H
   probe) or 1 MHz (EP-04L probe) after power on.

7-5 To see the individual axis' measuring EMF value
Typical the meter is to present the total EMF value of XYZ
direction (refer to page 8), however if intend to see the
individual EMF value of X, Y, Z direction, the procedures are :
1) Power off the meter, use two fingers to press the
   " Alarm Button " (5-8, Fig. 1) and the " Logger Button "
   (5-10, Fig. 1) together continuously, then power on the
   meter by press the " Power Button " (5-2, Fig. 1).
   After power on, release all the fingers.
2) * Press the " Unit Button " (5-6, Fig. 1) continuously and
      > 2 seconds, the bottom display will show X_axis , then
      release the button, the upper display will show the EMF
      value of X direction.

* Press the " Unit Button " (5-6, Fig. 1) continuously and
  > 2 seconds, the bottom display will show X_axis , then
  release the button, the upper display will show the EMF
  value of X direction.
* Press the " Unit Button " (5-6, Fig. 1) continuously and
  > 2 seconds, the bottom display will show X_axis , then
  release the button, the upper display will show the EMF
  value of X direction.
* Press the " Unit Button " (5-6, Fig. 1) continuously and
  > 2 seconds, the bottom display will show " V/m " , then
  release the button, the upper display will show the total
  EMF value of XYZ direction (refer page 8).

7-6 Alarm limit setting and Alarm start

1) Press the "Alarm Button " (5-8, Fig. 1) once to start
   the alarm function, while the " units " symbol will
   flash on the display.
2) Press the " Alarm Button " (5-8, Fig. 1) once again
   to stop the alarm function.
3) Press the " Alarm Button " (5-8, Fig. 1)
   continuously and over 2 seconds, the "Alarm low
   limit value " will indicate on the lower display, use
   the " ▼, ▲ Buttons " to adjust the desiring
   low limit value.
4) Press the " Enter Button " (5-4, Fig. 1) will save the
   low limit value and going to adjust the " High limit
   value, procedures will similar as above.
5) After finish the " High limit value " adjustment,
   press the " Enter Button " (5-4, Fig. 1) will save the
   high limit value and going to adjust the alarm
   Hysteresis value, procedures will similar as above.
   Upon finish the alarm " Hysteresis value " adjustment,
   press the " Enter Button " (5-4, Fig. 1) will save the data.
6) Press the " ESC Button " (5-3, Fig. 1) to finish
   alarm setting procedures.

7-7 Data hold

During the measurement, press the " Hold Button " (5-3, Fig. 1) once will hold the measured value & the LCD will indicate a " HOLD " symbol.

Press the " Hold Button " once again will release the data hold function.

7-8 Data Record (Max., Min. reading)

*   The data record function records the maximum and minimum readings. Press the " REC Button " (5-4, Fig. 1) once to start the Data Record function and it will be a " REC " symbol on the display.
*   When the " REC " symbol on the display :
    a) Press the " REC Button " (5-4, Fig. 1) once, the " REC MAX " symbol along with the maximum value will appear on the display.
    Press the " REC Button " (5-4, Fig. 1) once again, the " REC MIN " symbol along with the minimum value. If intend to delete the maximum (Minimum) value, just press the " Hold Button " (5-3, Fig. 1) once, then the display will show the " REC " symbol only & execute the memory function continuously.
    b) To exit the memory record function, just press the " REC Button " 5-4, Fig. 1) 2 seconds continuously at least. The display will revert to the current reading.

7-9 Peak Hold

Press the " Peak Hold Button " (5-7, Fig. 1) once to latch peak value on the display , press once again to defect.

7-10 Data Logger

The data logger function can save 16,000 measuring data with the clock time (Real time data logger), build in clock (hour-min.-sec., year-month-date).

www.tmatlantic.com

7-10-1 How to recording data

a) If press the Logger Button " (5-10, Fig. 1) once will show the sampling time value on the bottom left display then disappeared.

b) Press the " REC Button " (5-4, Fig. 1) once to start the Data Record function and it will be a " REC " symbol on the display.

c) **Auto Data Logger (Sampling time set from 1 second to 8 hours 59 minutes 59 seconds)**
Press the " Logger Button " (5-10, Fig. 1) once to start the Auto Data Logger function, at the same the bottom right display will show the indicator " Recording…. ", now the Data Logger function is executed. The upper display will show " DATA " indicator along with " REC " marker.

d) **Manual Data Logger (Sampling time set to 0 second)**
Press the " Logger Button " (5-10, Fig. 1) once will save the data one time into the memory, at the same time the bottom right display will show the indicator " Recording…. " a while. Now the Data logger function is executed. The upper display will show " DATA " indicator along with " REC " marker.

e) **Memory full**
   Under execute the data logger, if the bottom right
   display show the " Full ", it indicate the memory data
   already over 16,000 no. and the memory is full.
f) **Stop the Data Logger**
   During the Data Logger function is executed, press
   the " Logger Button " (5-10 Fig. 1) once will stop to
   execute the data logger function, the " DATA " indicator
   will be disappeared.
   If press the " Logger Button " (5-10, Fig. 1) once
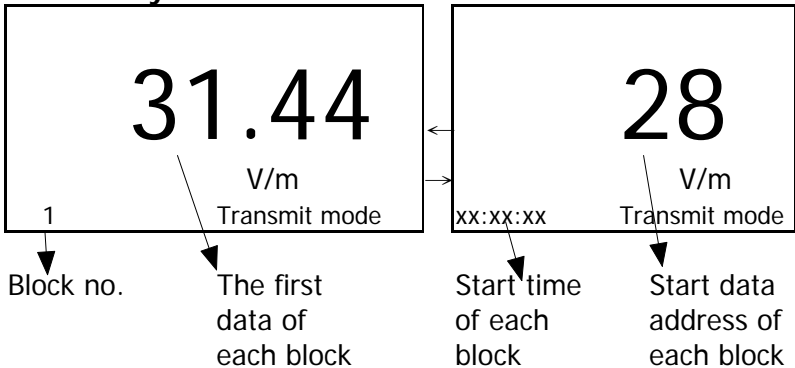   again will continue the Data Logger function.

Remark :
1) If intend to change the data logger sampling time,
   please refer to chapter 8-4., page 21.
2) If intend to know the space of balance data numbers
   into the memory IC, please refer to chapter 8-1, page 19.
3) If intend to clear the saving data from the memory
   please refer to chapter 8-2, page 20.

7-10-2 How to send data

If intend to send the data out from the meter, it
should cancel the " Hold function " and the " Record
function " first. The display will not show the " HOLD "
and the " REC " marker.
Press the " SEND Button " (5-9, Fig. 1) at least 2
seconds until the bottom right display show
" Transmit mode ", then release the button.

LCD display will show the fowling screen alternately.

	31.44		28
	V/m		V/m
1	Transmit mode	xx:xx:xx	Transmit mode

Block no.　　The first　　　　Start time　　Start data
　　　　　　 data of　　　　　of each　　　address of
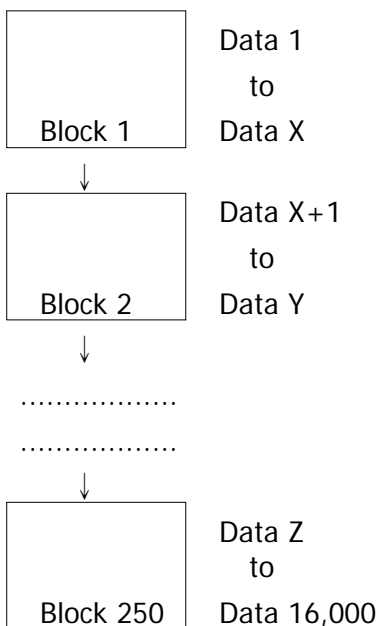　　　　　　 each block　　　　block　　　　each block

Use ▲ Up Button, ▼ Down Button to select the different data memory block no. (1 to 250).
If intend to clear the saving data from the memory please refer to chapter 8-2, page 20.

The meter can save 16,000 data max. , those data will saved into 250 memory block max.
* The data that save into one routine Data Logger procedures (Press " REC " button , following press the " Logger " button to save the data, the display will show the " REC " and " DATA " . After save the data, press the " Logger " button, following press the " REC " button will exit the Data Logger function. The " REC " and " DATA " indicator of LCD will be disappeared).

www.tmatlantic.com

```
┌─────────────┐        Data 1
│             │           to
│  Block 1    │        Data X
└─────────────┘
      ↓
┌─────────────┐        Data X+1
│             │           to
│  Block 2    │        Data Y
└─────────────┘
      ↓
………………
………………
      ↓
┌─────────────┐        Data Z
│             │           to
│  Block 250  │        Data 16,000
└─────────────┘
```

* Until the desired Memory Block no. be selected.
  Press the " Send Button " (5-9, Fig. 1) once, the
  data in the Memory Block will send out.
  During the data send out, the bottom right display will
  show the " Sending Data " indicator. When data
  already send out completely, the bottom right display
  will show the " Transmit mode " indicator again.
* Press the " ESC Button " (5-3, Fig. 1) will exit
  the data sending function and return to the normal
  display.

Remarks :
 * If intend up load the data to the computer,
   then should connect the RS232 cable
   (optional, model : UPCB-02) and apply the
   Data Logger software (optional, Model :
   SW-DL2005).
 * When sending the data, each time just can
   send one Memory Block data out. for example
   block 1 data, block 2 data... or block 250 data.

7-10-3 How to show sample time

Press the " Logger Button " (5-10, Fig. 1) once then display
will appear sample time.

7-10-4 How to show date and time

Press the " 🕐 button " (5-9, Fig. 1) once to indicate
date and time.

8. INTERIOR SETTING MODE

Press the " SET button " (5-10, Fig. 1) continuously and over two seconds, the display will show :

```
XXXXX       Memory space
```
Press " SET button " once again

```
            Clear memory
   XX       ESC:N Enter:Y
```
Press " SET button " once again

```
            Date/Time set
XX:XX:XX   ^,v Enter ( > )
```
Press " SET button " once again

```
            Sample Time
XX:XX:XX   ^,v Enter ( > )
```
Press " SET button " once again

```
            Autopower OFF
XXXXX       1:ON, 0:OFF
```
Press " SET button " once again

```
            ECS > Finish
```

Press " ESC " to finish.
or Press " SET button " again to quit.

8-1 Check Memory Space

To check the balance data numbers that exist into the memory (allow memorize data no.).

```
┌─────────────────────────────────┐
│                                 │
│                                 │
│                                 │
│  XXXXX        Memory Space      │
└─────────────────────────────────┘
```

* XXXXX is the balance data numbers, for example XXXXX=15417.

8-2 Clear Memory

* To delete the existing save data numbers from the memory.
* Press ENTER Button once, then press ENTER Button to confirm.
* Press the ESC Button once to quit and return to the main measurement manual.

8-3 Date/Time Setting

* Use ▲ Up Button, ▼ Down Button and Enter (→) Button to select the expect Date (year-month-date) and the time (HOUR-MIN.-SEC.).
* After finish the Date/Time adjustment, Press the " Enter Button " , then press the " ESC Button " will quit and save the clock data into the memory.

8-4 Sample Time Setting

* Use ▲ Up Button, ▼ Down Button and Enter (→)
  Button to select the expect Sample Time (HOUR-MIN.
  -SEC.).
* After finish the Sample Time adjustment,
  Press the " Enter Button " once , then press the " ESC Button "
  will quit and save the clock data into the memory.

8-5 Auto Power Off Default Setting

* Use ▲ Up Button, ▼ Down Button to select " 1 " or
  " 0 ".

> 1 = Auto power off
>
> 0 = Manual power off

* Press the " Enter Button " once , then press the " ESC
  Button " to quit.

8-6 Escape from the SETTING function

Press the " ESC Button " once a while will quit and
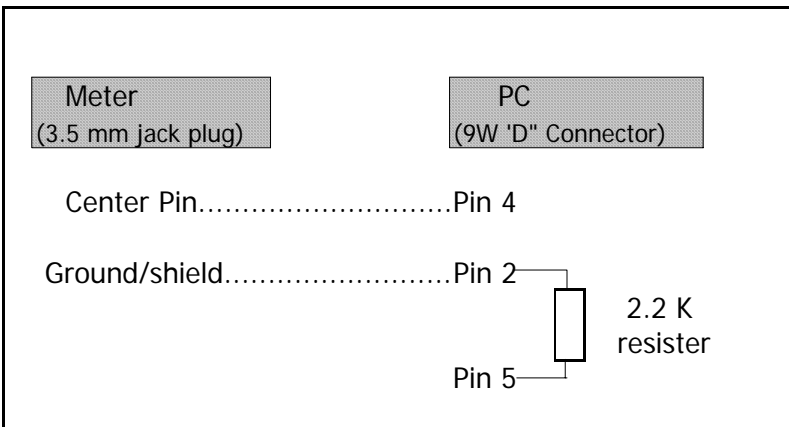return to the normal measurement display.

9. RS232 PC SERIAL INTERFACE

The instrument has RS232 PC serial interface via a 3.5 mm terminal (5-14, 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.

Meter	PC
(3.5 mm jack plug)	(9W 'D" Connector)

Center Pin……………………….Pin 4

Ground/shield………………….Pin 2

Pin 5

2.2 K resister

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 = 0D

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 <table><tr><td>W/m^2=A9</td><td>mW/cm^2 = A8</td><td>V/m = A7</td></tr></table>
D13	When send the upper display data = 1 When send the lower display data = 2
D14	4
D15	Start Word = 02

RS232 setting

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

www.tmatlantic.com

10. BATTERY REPLACEMENT

When the left corner of LCD display show " ⊏▬◣ ", it
is necessary to replace the batteries (006P).
1) Slide the " Battery Cover " (5-16, Fig. 1) away from the
   instrument and remove the battery.
2) Replace with batteries (006P) and reinstate the cover.
3) Make sure the battery cover is secured after changing
   the battery.

11. SYSTEM RESET

If the meter happen the troubles such as :

   *CPU system is garbled (for example, the key button can
   not be operated.....).*

Then make the system RESET will fix the problem.
The system RESET procedures will be either following
method :

**During the Power On, used a pin tool to push
the " System Reset " button (5-18, Fig. 1) once.**