

CORNET Microsystem Inc., ED-88Plus Electromog meter is a **Tri-mode device** for quick measurement of both High frequency (RF) Electromagnetic wave field strength/power density level, Low frequency (LF) Magnetic field level(Gauss, Tesla), and Low frequency (ELF) Electric Field(V/m) for living environments. It is an excellent device for individual or company with Electromagnetic wave safety concerns. It has RF bandwidth of 100MHz to 8GHz with high sensitivity (0.5uW/m² to 1.8w/m²), LF bandwidth of 50Hz to 10KHz (or 50Hz to 1KHz) with sensitivity of 0.1uT to 60uT(1mG-600mG) or 0.01uT to 1uT(0.1mG to 10mG), and E-field bandwidth of 50Hz-50KHz with sensitivity of 10v/m to 1000v/m. The RF Frequency display function (100MHz-2.7GHz) can detect very short burst of digital RF down to 100usec. Data Logging function is also included.

Applications:

- High frequency RF Electromagnetic wave field strength, power density and frequency measurement
- Low frequency LF Magnetic field measurement (Gauss meter function)
- Low frequency ELF Electric field measurement (E-field meter function)
- Mobile phone base station antenna radiation power density measurement
- Wireless communications, Analog & Digital RF (AM/FM, TDMA, GSM, DECT, CDMA,3G,4G)
- RF power measurement for transmitters
- Wireless LAN (Wi-Fi), Bluetooth, Ultra-wide-band detection, installation, optimization
- Spy camera, wireless bug finder, IOT devices
- Cellular/Cordless phone radiation safety level, Electrical Utilities SMART METER radiation level
- AC power line, High voltage tower, power Transformer, motors and small appliance EMF
- Microwave oven leakage detection
- Personal living environment EMF safety evaluation

Usage guide:

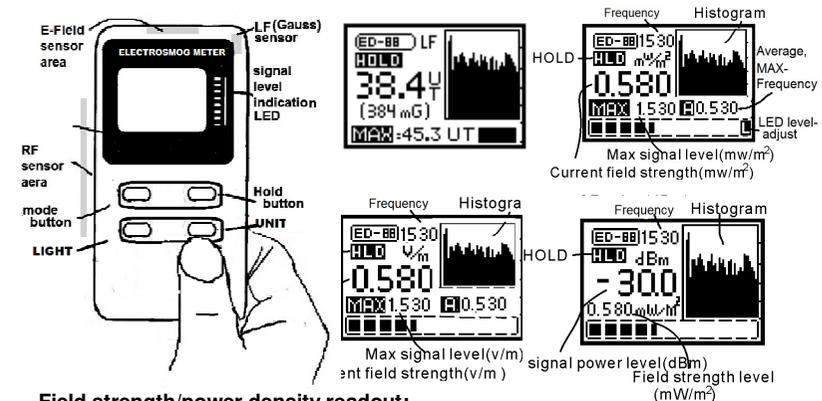
- (1) Put the 9V battery in the ED88Plus, Handle the unit with right hand in vertical direction, and turn on the volume/power switch to turn on the power, it will come up with RF meter mode.
- (2) The RF sensor is located in the left hand side of the ED88Plus; the LF sensor is located in the right hand top side of the ED88Plus, the E-field sensor is located in the middle top side of the ED88Plus, **please do not cover the sensor area with hand or other objects.**
- (3) There are 4 push button on the ED88Plus: "Mode", "Hold", "LIGHT", and "UNIT" button, "MODE" button is used to switch in between RF mode, two LF modes, and E-field mode. The "Hold" button is used to freeze the data reading of the ED88Plus.
- (4) **RF mode:** measured RF field strength/power density is shown on the digital LCD display (with dBm, v/m, or mw/m²). 8 LED lights with Red, Yellow, and Green color on the right hand side of LCD window are used for quick RF signal level indications. 3 Red LEDs are used to indicate the 3 safety ranges. The power level of each LED can be found in the table on the ED88Plus back panel. Frequency of signal detected is displayed on the LCD display.
- (5) **LF mode:** measured LF magnetic field strength is shown on the digital LCD display (with uT and mGauss). Two LF modes can be selected by "Mode" button: (a) **LF30mode** (0.1mG-10mG) and (b) **LF600 mode** (1mG-600mG). 8 color LED lights are also available to show the relative strength of the magnetic field.
- (6) **E-field mode:** measured ELF electric field strength is shown on the digital LCD display with V/m.
- (7) **Histogram:** previous 30 signal level readings are recorded and shown as moving graph on the LCD display for RF, LF, and E-field modes. It can be used for finding direction of signal source and recording bursts from digital RF signals such as signals from AC smart meter.
- (8) **Hold & UNIT:** HOLD button can be used to halt the data measurement of the ED88Plus, a "HOLD" Mark will shown on the LCD screen to indicate the "Hold" condition. Push the "HOLD" button again the ED88Plus will exit from the "Hold" condition. "UNIT" button can select the mw/m²,v/m, or dBm unit.
- (9) **MAX:** Maximum measured data value since the last power-on is shown on the LCD display.
- (10) **Average:** average or peak average value is displayed on the LCD with "A" or "P" mark. It can be used to estimate the duty cycle of the digital RF burst signals or the average of peak signal level.
- (11) **Sound function & LCD backlight:** Toggling the "LIGHT" button can turn-on/off the LCD back light and the Audio Sound function, (a "S" mark on the LCD indicates the sound mode is on). Wheel Volume control can be used to adjust the sound level. Audio Sound can be used to detect very low level RF signals (down to 0.05uW/m²) especially for the modern digital RF burst signals. In order to reduce the battery current consumption please remember to turn-off the LCD back light or the sound when it is not needed.
- (12) **Data Logging menu:** Push and hold the "UNIT" button then click the "MODE" button to go into LoggerSetup menu. Please see the "ED88TPlus Data Logging user Guide" from www.cornetmicro.com for details of the Data Logging functions.

- (13) **SysSetup Menu:** Push and hold the "UNIT" button then push the "HOLD" button to get into the SysSetup menu. Use the ">" button to move the cursor in the Menu and use the "<" button to enable/disable the functions in the SysSetup menu:
 - (a) **EXIT:** exit the SysSetup menu, return to normal mode
 - (b) **RF level Unit select:** select default mw/m², v/m, or dBm mode when meter is powered on.
 - (c) **LED Level:** used to adjust the color LED segment display level for custom safety standards OFF, -5, -10, -15, or -20dB. (use -20dB for "SBM2008 Building Biology Testing Methods")
 - (d) **Average/Frequency:** select Peak average, All average, or Frequency of **MAX** value display.
 - (e) **MAX_Clear** bit: If the **MAX_Clear** is "ON" the **MAX** value can be cleared by toggling the "HOLD" button. If it is "OFF" the **MAX** value can be cleared only by power-off the meter.
 - (f) **Alarm:** ON/OFF or one of the 8 trigger levels(0, -5,-10,-15,-20,-25,-30,-35dBm) can be selected to trigger the audio Alarm. *(Alarm function is used in RF mode only). reset to default (mw/m²,LED Level OFF, MAX_CLEAR ON, Alarm OFF,PeakAvg).
 - (e) **RESET:**
 - (g) **SAVE:** push the "<" button to save the changes of setup to EEPROM memory. **Do not power off meter, Wait until save is done!** (EXIT without **SAVE** to memory the changes will still functional, but it will lost if the meter is power-off).
- (14) The **LF30 mode:** has high sensitivity (0.1mG-10mG), but with lower frequency range (50Hz – 1KHz) to reduce the high frequency noise. (The Histogram and LED segment display can go up to 30mG)

The **LF600 mode:** with sensitivity (1mG-600mG), has higher frequency coverage (50Hz -10KHz).

When measuring the high frequency digital/pulse type of signals.(such as switching power supply) the LF30 mode might have lower reading than the LF600 mode, this is due to the lower frequency coverage range of the LF30 mode.

- (15) While in LF (magnetic/electric field measurement) or E-field mode, please hold the ED88 steady to get the good stable reading, avoid fast moving of the ED88 to prevent the sudden change of the reading caused by the Earth magnetic field or the induced electric field of nearby objects.
- (16) AC Smart Meter radiates RF signal in short burst every few minutes, use MAX function and LED Histogram function of ED88, and wait a few minutes to capture the RF signals from smart meter.



Field strength/power density readout:

ED88Plus use 8 high brightness LED to indicate the measured power density with 3 safety indications of three countries. *Action is reference to ICNIRP (for reference only).

LED color	RF Power level	RF Power density	LF600/LF30 level	E-field level	Indication	Action
RED3	-5 dBm up	0.18 w/m ²	30uT/3uT up	500 v/m	Italy RF safety standard (0.1w/m ²)	Caution!
RED2	-10 dBm	0.058 w/m ²	20uT/2uT	200 v/m	Swiss RF safety standard (0.04w/m ²)	Caution!
RED1	-15 dBm	0.018 w/m ²	10uT/1uT	100 v/m	Russian RF safety standard (0.02w/m ²)	Caution!
YELLOW3	-20 dBm	5.8 mw/m ²	5uT/0.5uT	75 v/m		Safe*
YELLOW2	-25 dBm	1.8 mw/m ²	2uT/0.2uT	50 v/m		Safe*
YELLOW1	-30 dBm	0.58 mw/m ²	0.5uT/0.05uT	30 v/m		Safe*
GREEN3	-35 dBm	0.18 mw/m ²	0.2uT/0.02uT	20 v/m	WiFi Wireless LAN typically in this range	Safe*
GREEN2	-40 dBm down	0.06 mw/m ²	0.2uT/0.02uT down	10vm	Some signal source around	Safe*

NOTE:

- Most high frequency RF antenna such as Mobile phone base station is vertical polarized (in vertical direction), therefore while in RF mode, the ED88 is normally used in vertical direction. For LF mode, the LF sensor is located in the top right hand of the ED88 and the meter is normally used in Horizontal position in LF mode. For E-field mode, the E-field sensor is located in the top middle of the meter, point the sensor to the ELF source. Please rotate the meter to find the maximum reading direction in either case. The maximum reading will also increase as you approach the source. ED88 can be used to find the location of signal source.
- Most of modern communication devices (Mobile phone, Wireless LAN, Wi-Fi, etc.,) use digital RF burst signals. When measuring this type of signals, several LED lights will blinking at the same time, this is normal and it can be used as an indication of burst type of RF signals. For continues waves (AM/FM) signals, the LED light will be stable. ED88 measures the peak power density of the signal with very fast sampling time. It is more accurate than the needle style of readout which only shown the average value of signal power most of the time.
- Electromagnetic wave field strength/power density reduces very fast with distance (distance square), keep a good distance from the high frequency RF signal source can reduce the high frequency radiation effect. Alumina foil or window sun reflector film (silver color) can be used as an effective and low cost shielding material for most of RF radiations.
- ED88 is designed for quick living environment RF radiation evaluation and is for reference use only. Official RF safety radiation measurement procedure is complicate and should be handled by trained technical person with lab instruments. Safety range standard listed below is for reference only. ED88 is not a medical instrument, Please do not use it in medical, legal, commercial rental purpose or other related applications.. (for personal use only)
- Turn the volume control to minimum first before plug in the earphone to the ED88 to avoid damage to your ear by accident from high level audio sound produced by digital RF signals.
- The audio sound output of the sound function is the demodulated RF signal, it is good for AM and modern digital RF signals (pulse/burst) detection, it is not for FM or constant amplitude RF signals or LF/ELF modes. it is an excellent tool for RF signal type indication. (different RF signal such as Wifi, GSM, DECT,etc., all has different sound frequency signature of the demodulated RF signal) and for very low level signal detection.
- When in E-field mode, the electric field induced by human body or large objects nearby can affect the measurement results, hold the ED88 by hand on the lower right side of the meter, do not cover the E-field sensor area (top of the meter) by hand or other objects, keep away from large metal door or objects. Point the top of the ED88 to the high voltage AC power line (with ED88 at least 1 meter above the ground) when measuring the VLF/ELF E-field radiation from AC power lines or towers. Average value is displayed in E-field mode to reduce background noise, Reading will be lower for narrow spike type of E-field radiation such as from FL lamp.

Specification

Sensor type:	Electric field sensor and Magnetic field sensor
Frequency range & Sensitivity:	RF: 100MHz to 8GHz (-60dBm to +5dBm),(0.5uw/m ² to 1.8w/m ²), (14mv/m to 26.2v/m) LF1: 50Hz to 10KHz (0.1uT to 60uT)/(1mG to 600mG) LF2: 50Hz to 1KHz (0.01uT to 1uT)/(0.1mG to 10mG) E-field/ELF: 50Hz to 50KHz (10v/m to 1000v/m) Frequency display: for RF mode only, 100MHz-2.7GHz, -35dBm minimum signal input required
RF Peak power measurement:	0.5uw/m ² to 1.8w/m ²
Display type:	digital LCD graphic display
Unit of measurements:	dBm, mw/m ² , v/m, uT, mG, MHz
LCD back light:	15 seconds auto-off and manual on/off control
Display of data:	LCD 4 and 5 digit, 8 LED color segment, Moving Histogram (level/time) of previous 30 recorded data, Analog segment bar
Data update rate:	Sampling rate: 10000/sec. Display update rate: 2/sec.
Error rate:	RF: +/- 3.5dBm, LF: 20%, E-field: 25%
Functions:	Hold, Max, Average, Sound signature, Alarm, Frequency
Sound & Alarm:	Sound on/off/volume control, programmable Alarm triggering level
Safety standard indication:	3 safety range indication by 3 Red LED, adjustable LED level
Data Logging:	1000 data storage point memory for logging/recording measured RF signal level
Battery used:	9V alkaline battery or external power supply through USB port (5V)
Battery life:	>20 hours

The European Community provided general guidelines in its Council Recommendation of July 1999.1 ICNIRP published similar guidelines in April 1998.2 Table I gives a sampling of the international and national field-strength limit values for the general public and continuous exposure (for Reference only !)

		950Mhz	1850Mhz
International	Council Recommendation 1999/519/EC	42 V/m (4.75W/m ²)	59 V/m (9.25W/m ²)
International	ICNIRP Guidelines, April 1998	42 V/m (4.75W/m ²)	59 V/m (9.25W/m ²)
Austria	ÖNORM S1120	49 V/m (6.33W/m ²)	61 V/m (10W/m ²)
Belgium	Belgisch Staatsblad F.2001-1365	21 V/m (1.18W/m ²)	30 V/m (2.31W/m ²)
Germany	26. Deutsche Verordnung	42 V/m (4.75W/m ²)	59 V/m (9.25W/m ²)
Italy	Decreto n. 381, 1998	6 V/m (0.1W/m ²) 20 V/m (1W/m ²)	6 V/m (0.1W/m ²) 20 V/m (1W/m ²)
The Netherlands	Health Council	51 V/m (6.92W/m ²)	83 V/m (18W/m ²)
Switzerland	Verordnung 1999	4 V/m (0.04W/m ²)	6 V/m (0.1W/m ²)
United States	IEEE C95.1	49 V/m (6.33W/m ²)	68 V/m (12W/m ²)
China	Draft: National Quality Technology Monitoring Bureau	49 V/m (6.33W/m ²)	61 V/m (10W/m ²)
Japan	Radio-Radiation Protection Guidelines, 1990	49 V/m (6.33W/m ²)	61 V/m (10W/m ²)

