

CORNET® ED-78S Electromog meter user's manual

CORNET Microsystem Inc., ED-78 Electromog meter is a dual mode device for quick measurement of both High frequency (RF) Electromagnetic wave field strength/power density level and Low frequency (LF) Magnetic field level(Gauss, Tesla) 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),and 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). with very fast response time.

Applications:

- High frequency RF Electromagnetic wave field strength and power density measurement
- Low frequency LF Magnetic field measurement (Gauss 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
- 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:

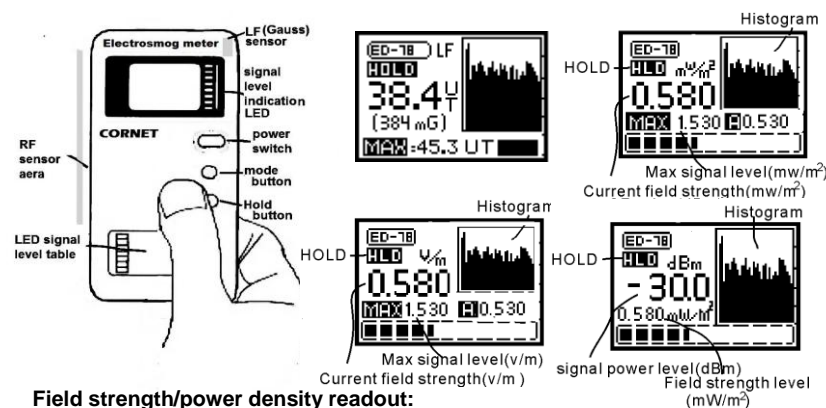
- Put the 9V battery in the ED78, Handle the unit with right hand in vertical direction, and push the power switch button to turn on the power, it will come up with RF meter mode.
- The RF sensor is located in the left hand side of the ED78; the LF sensor is located in the right hand top of the ED78, **please do not cover the sensor area with hand or other objects.**
- There are two push button below the power switch: "Mode" button and "Hold" button. "Mode" button is used to switch in between RF mode and two LF modes. The "Hold" button is used to freeze the data reading of the ED78
- 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 ED78 front panel.
- 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.
- Histogram:** previous 30 signal level readings are recorded and shown as moving graph on the LCD display for both RF and LF mode. It can be used for finding direction of signal source and recording bursts from digital RF signals such as signals from AC smart meter.
- Hold:** HOLD button can be used to halt the data measurement of the ED78, a "HOLD" mark will show on the LCD screen to indicate the "Hold" condition. Push the "Hold" button again the ED78 will exit from the "Hold" condition.
- MAX:** Maximum measured data value since the last power-on is shown on the LCD display.
- Average:** average signal value is displayed on the LCD with "A" mark. It can be used to estimate the duty cycle of the digital RF burst signals.
- Sound function & LCD backlight:** go into the "Hold mode" first, then toggle the "Mode" button in sequence to turn-on/off the LCD backlight and the Sound signature function, a "S" mark on the LCD indicates the sound mode is on. The LCD,backlight is forced off when the Sound is ON to reduce the battery current consumption. (Remember to turn-off the LCD backlight or the sound function when it is not needed). Audio Sound can be used to detect very low level RF signals (down to 0.05uw/m²) especially the modern digital RF burst signals. The Audio sound will output from bottom hole of the enclosure, (do not plug the bottom hole)

- SysSetup Menu:** can be enabled by push and hold the "HOLD" button then push the "Mode" button to get into the SysSetup menu, use the 1st button to move the cursor in the Menu and use the 2nd button to enable/disable the function. In the SysSetup menu:

 - EXIT:** exit the SysSetup menu, return to normal mode
 - RF level units select:** mw/m², v/m, or dBm
 - 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.
 - Alarm function:** ON/OFF and one of the 5 trigger levels(0, -5,-10,-15,-20 dBm) can be selected to trigger the audio Alarm. *(Alarm function is not used in LF modes).
 - RESET:** reset to factory default (mw/m²,MAX_CLEAR= "on", Alarm= "off")
 - WREEPROM:** push the 2nd button to save the changes of setup to EEPROM. **Do not power off meter, Wait until save is done! (EXIT without SAVE to EEPROM the changes will still functional, but will lost if the meter is power off)**
- 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 upto 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.
- While in LF modes (magnetic field measurement), please hold the ED78 steady to get the good stable reading, avoid fast moving of the ED78 to prevent the sudden change of the reading caused by the Earth magnetic field.
- AC Smart Meter radiates RF signal in short burst every few minutes, use MAX function and Histogram function of ED78, and wait a few minutes to capture the radiated RFsignals.



Field strength/power density readout:

ED78 use 8 high brightness LED to indicate the measured power density with 3 safety indications.

| LED color | RF Power level | RF Power density | LF600/LF30 level | Indication | Action |
|-----------|----------------|------------------------|-------------------|----------------------------------------------------|----------|
| RED3 | -5 dBm up | 0.18 w/m ² | 30uT/3uT up | Italy RF safety standard (0.1w/m ²) | Caution! |
| RED2 | -10 dBm | 0.058 w/m ² | 20uT/2uT | Swiss RF safety standard (0.04w/m ²) | Caution! |
| RED1 | -15 dBm | 0.018 w/m ² | 10uT/1uT | Russian RF safety standard (0.02w/m ²) | Caution! |
| YELLOW3 | -20 dBm | 5.8 mw/m ² | 5uT/0.5uT | | safe |
| YELLOW2 | -25 dBm | 1.8 mw/m ² | 2uT/0.2uT | | safe |
| YELLOW1 | -30 dBm | 0.58 mw/m ² | 0.5uT/0.05uT | | safe |
| GREEN3 | -35 dBm | 0.18 mw/m ² | 0.2uT/0.02uT | WiFi Wireless LAN typically in this range | safe |
| GREEN2 | -40 dBm down | 0.06 mw/m ² | 0.2uT/0.02uT down | 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 ED78 is normally used in vertical direction. For LF mode, the LF sensor is located in the top right hand of the ED78 and the meter is normally used in Horizontal position in LF mode. Please rotate the meter to find the maximum reading direction in either case. The maximum reading will also increase as you approach the source. ED78 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. ED78 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 a effective and low cost shielding material for most of RF radiations.
- ED78 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. ED78 is not a medical instrument, Please do not use it in medical, legal or other related applications.
- The "SENSOR" mark on the bottom of the back enclosure cover is not used in ED78
- ED78 is designed for home and personal use, It is not for commercial rental purpose.
- 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 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.

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) |
| 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 |
| 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: 3500/sec. Display update rate: 2/sec. |
| Error rate: | +/- 3.5dBm |
| Functions: | Hold, Max, Average, Sound signature, Alarm, |
| Sound & Alarm: | Audio Sound ON/OFF control, programmable Alarm triggering level |
| Safety standard indication: | 3 safety range indication by 3 Red LED |
| Battery used: | 9V alkaline battery, (not included) |
| 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) |

$$1\text{W/m}^2 = 1000\text{mW/m}^2, \quad 1\text{mW/m}^2 = 1000\text{uW/m}^2 = 0.1\text{uW/cm}^2$$

$$1\text{uW/m}^2 = 0.001\text{mW/m}^2, \quad 1\text{uT} = 10\text{mG}$$

