CORNET® Microsystem Inc MD-18 Quick user's manual

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CORNET® MD18 Electrosmog meter is designed for quick measurement of high frequency (RF) Electromagnetic wave field strength and power level for living environment, excellent for individual or company with Electromagnetic wave safety concerns. It has broad bandwidth (100MHz to 8GHz), high sensitivity (-55dBm to 0dBm) and fast response time. The MD18 has build-in 2.4GHz frequency meter to measure the frequency of the detected RF signals and with internal sensing antenna.

Applications:

- High frequency (RF) Electromagnetic wave field strength and signal level measurement
- Mobile phone base station antenna radiation power density measurement
- Wireless communication applications (AM/FM, TDMA, GSM, DECT, CDMA, WiMax, 3G, 4G)
- RF power level measurement for transmitters, AC smart meter radiation from utilities company
- Wireless LAN (Wi-Fi, 2.4GHz/ 5.8GHz), Bluetooth, Ultra-wide-band detection, installation
- Spy camera, wireless bug finder
- Cellular/Cordless phone radiation safety level
- Microwave oven leakage detection
- Personal living environment EMF safety

Features:

- Broad Frequency range: **100MHz to 8GHz**
- High Dynamic range: **60 dB**
- High sensitivity: **-60dBm to +5dBm (14mv/m to 26V/m)**
- Peak power density measurement: **0.0005mw/m^2 to 1800mw/m^2**
- Field strength measurement: **0.014v/m to 26v/m**
- Frequency measurement **100MHz to 2.4GHz @-35dBm and up signal level**
- LCD digital power level, power density level, and E- field strength display with auto scale
- Moving graphic Histogram, and Bar signal level display (5dBm/segment)
- 8 high brightness color LED to display power density level with 3 safety range indications
- Continues wave (AM/FM) and high speed digital RF (GSM, TDMA, PCS, CDMA, 3G, 4G, Wi-Fi)
- Fast response time with easy reading color LED segment display (5dBm/segment)
- Ultra fast Frequency meter display for on air digital RF/burst signals
- Max. level display function and Hold mode
- LCD back light (15 seconds auto-off), manual LCD back light on/off control
- Low battery indication
- Small, compact handheld design 14cmx6.5cmx3cm
- Battery operated (3V DC) two AA size 1.5V battery, not included in the package

Usage guide:

(1) Put two1.5V battery in the MD18, push the **power-lock-button** (the white button below the ON/OFF switch) to unlock the power switch and then push the **ON/OFF** switch button to turn on/off the MD18.

(2) The **RF sensor** is located in the left hand side of the MD18, please do not cover the sensor area with hand or other objects.

(3) **MODE** button is used to switch in between (a) Field strength modes with histogram, (b) Large character Field strength mode without histogram, and (c) Frequency display mode,

(4) **HOLD** button can be used to halt the data measurement of the MD18, a " HOLD " mark will be shown on the LCD screen to indicate the "HOLD" condition. Push the "HOLD" button again, the MD18 will exit the "HOLD" condition (exit from HOLD will clear the **MAX** and **Frequency**).

(5) **UNIT** button is used to select the measured RF field strength on the LCD display between **dBm**, **mw/m^2** or **v/m**.

(6) **BL** button can be used to turn-on/turn-off the LCD backlight of the meter.

(7) **8 LED lights**. With Red, Yellow, and Green color on the right hand side of LCD window is used for quick RF signal level indications. 3 Red LEDs are used to indicate the 3 safety standard of three countries (Italy, Swiss, Russian). The power level of each LED can be found in the table below.

(8) **Histogram** of previous 30 signal level readings are recorded and shown as moving graph on the LCD display.

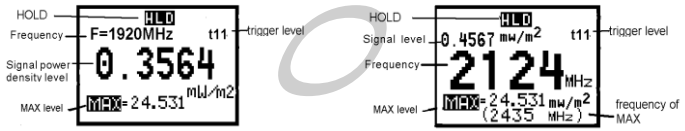
(9) **MAX:** max value of the RF field measured since the last power-on is shown on the LCD display; this can be used to record the maximum field strength level automatically in the area. Pushing the **HOLD** button on/off will reset the **MAX** value.

(10) **LEFT, RIGHT, UP, DOWN** (blue buttons) can be used to move the cursor in the selection menu. or to increase/decrease the trigger level of the frequency meter function.

(11) **Field strength modes with histogram**:
RF signal level, frequency, MAX and the Histogram are shown on the LCD display, use **UNIT** button to select RF signal level unit (dBm, mw/m2, or v/m).

(12) **Large character Field strength mode without histogram**:
RF signal level is shown with large character, frequency and MAX value are also shown on the LCD display, use **UNIT** button to select RF signal level unit (dBm, mw/m2, or v/m).

(13) **Frequency display mode:**
Frequency is display with large character, signal level, MAX value and frequency at the MAX, value is also displayed.

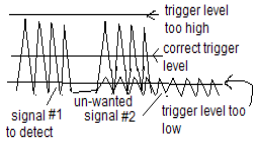


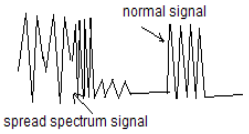
(14) **Frequency meter function:**

MD18 frequency meter funcrion can detect ultra fast on the air digital RF burst signals from GSM, DECT, WiFi, bluetooth, 3G,4G and wireless devices, it covers frequency from 100MHz to 2.4GHz It uses direct counting technology to capture the very short bursts of the on the air RF signals down to 100usec.

(a) Signal level requeirments: to insure the correct frequency measurement, the minimum RF input signal level should be in between -35dBm and 0dBm. Signal lower than -35dBm will not have enough sensitivity to do the correct counting, and higher than the 0dBm will overload the pre-amplifier of the frequency meter.

(b) Trigger level: Since typical on air RF signal is a mixture of signals from several different sources and is very complicated, Adjusting the trigger threshold level of the meter will imporve the frequency counting process, the default value of the triggering level is **t11**, (a " **t11**" mark is shown on the LCD display), use the blue **UP** and **DOWN** button to increase or decrese the trigger level until the meter show f=0000MHz (so the signal floor is just below the trigger level). When the signal burst is detected and is over the trigger level the meter will start counting and show the frequency (f=xxxxMHz), the typical trigger level is in between **t10** to **t12**. Depend on the trigger level setting, the stronger signal will be selected by the meter for the frequency measurement.





(c) Spread spectrum signals: the spread spectrum RF signals (OFDM, frequency hopping…) used in the WiFi, or DVB broadcast spread the signal over very wide frequency range, (some even with time dividion modulations), the WiFi access point/router also constant swithing between several frequency channels for slave stations. Because of the constant changing of frequency of these type of signals, it is difficult to do the correct frequency measurement. The frequency meter function of MD18 typically will have error of 100MHz to 200MHz for these type of signals. this is normal because the signal frequency is not constant. Adjusting the trigger level and move the meter near or far away from the signal source can reduce the error rate.

(d) Gating time: In order to detect very short digital RF bursts (100usec), the MD18 frequency counter function has very short Gating time (less than 100usec), this limits the resolution of the low frequency signal measurement (the number of signal pulse is not enough within the short gating time for the low frequency signals), the MD18 frequency meter function is intended to show the frequency information of the detected on air RF signal from the typical mobile phone or Wifi applications. For high accurate frequency measurement with high resolution for low frequency signals you should use the standalone professional frequency counter with adjustable long Gating time and trigger level functions to get the better result.

(15) **Low battery indication**: a **BAT** sign will be shown on the screen when the battery level is below 2V. Replace the two AA size 1.5V Alkaline battery when battery level is low.

LED table and Field strength/power density readout:

-- MD18 use 8 high brightness LED to indicate the measured power and power density. With 3 safety range indications.
-- The power level and power density level conversion in the table is calculated based on the MD18 internal antenna. and is valid for MD18 only.

LED color	Power level	Power density	Indication		Action
RED3	-5 dBm ↑	180m w/m^2	Safety range#3	Italy standard (100mw/m^2)	Caution!
RED2	-10 dBm	58 mw/m^2	Safety range#2	Swiss standard (40mw/m^2)	Caution!
RED1	-15 dBm	18 mw/m^2	Safety range#1	Russian standard (20mw/m^2)	Caution!
YELLOW3	-20 dBm	5.8 mw/m^2			safe
YELLOW2	-25 dBm	1.8 mw/m^2			safe
YELLOW1	-30 dBm	0.58 mw/m^2			safe
GREEN3	-35 dBm	0.18 mw/m^2	Wireless LAN, WiFi typically in this range		safe
GREEN2	-40 dBm dwn	0.06 mw/m^2	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 MD18 is normally used in vertical direction. Please rotate the meter to find themaximum reading direction in either case. The maximum reading will also increase as you approach the source. MD18 can be used to find the location of signal source .**
- **Most of modern communication devices (Mobile phone, Wireless LAN, WiFi, 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. MD18 measures the peak powerdensity 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 formost of RF radiations .**
- **MD18 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. MD18 is not a medical instrument, Please do not use it in medical, legal orother related applications.**
- **MD18 is designed for home and personal use, It is not for commercial rental purpose.**

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)

		900MHz	1850MHz
International	Council Recommendation 1999/519/EC	42 V/m (4750mW/m^2)	59 V/m (9250W/m^2)
International	ICNIRP Guidelines, April 1998	42 V/m (4750W/m^2)	59 V/m (9250mW/m^2)
Austria	ÖNORM S1120	49 V/m (6330mW/m^2)	61 V/m (10000W/m^2)
Belgium	Belgisch Staatsblad F.2001-1365	21 V/m (1180mW/m^2)	30 V/m (2310W/m^2)
Germany	26. Deutsche Verordnung	42 V/m (4750mW/m^2)	59 V/m (9250mW/m^2)
Italy	Decreto n. 381, 1998	6 V/m (100mW/m^2) 20 V/m (1000mW/m^2)	6 V/m (100mW/m^2) 20 V/m (1000mW/m^2)
The Netherlands	Health Council	51 V/m (6920mW/m^2)	83 V/m (18000mW/m^2)
Switzerland	Verordnung 1999	4 V/m (40mW/m^2)	6 V/m (100mW/m^2)
United States	IEEE C95.1	49 V/m (6330mW/m^2)	68 V/m (12000mW/m^2)
China	Draft: National Quality Technology Monitoring Bureau	49 V/m (6330mW/m^2)	61 V/m (10000mW/m^2)
Japan	Radio-Radiation Protection Guidelines, 1990	49 V/m (6330mW/m^2)	61 V/m (10000mW/m^2)

Specification:

Sensor type:	Electric field sensor with internal sensing antenna
Frequency range:	100MHz to 8GHz
Sensitivity:	-60dBm to +5dBm
Dynamic range:	60 dB
Peak power measurement:	0.0005 mw/m² to 1800mw/m²
Field strength measurement:	0.014v/m to 26 v/m
Frequency measurement	100MHz to 2.4GHz (at -35dBm to 0dBm signal level)
Display type:	Digital LCD display & LED color segment display
Unit of measurements:	dBm, mw/m², or v/m
Display error rate:	± 3 dBm
LCD back light:	12- 15 seconds auto-off, manual on/off control
Display of data:	LCD 3 to 5 digit, 8 LED color segment, Histogram of 30 reading, LCD Bar segment (5 dBm/segment)
Safety standard indication:	3 safety range indication by 3 Red LED
Battery used:	3V (two AA size 1.5V alkaline or rechargable NiMH battery), (not included)
Battery life:	>20 hours
Internal Antenna:	build-in antenna