WAVECONTROL

Electromagnetic Radiation monitoring device

MonitEM-Lab®

USER'S MANUAL

V 2.2

WAVECONTROL
Safety, Quality, Service

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Congratulations for your acquisition of a **Wavecontrol MonitEM-Lab**.

This Manual provides you with instructions for using and handling your **MonitEM-Lab**.

Please read this Manual carefully before using your **MonitEM-Lab**.

Disclaimer

Use of the product is controlled exclusively by the Product Manual (this document) and the Product Warranty. Wavecontrol assumes no responsibility or liability of any kind for errors or omissions in the contents of this document. Although the information contained herein is correct to the best of Wavecontrol's knowledge, it is provided with no guarantees of completeness, accuracy, usefulness or timeliness and without any warranties of any kind, express or implied. Wavecontrol provides all content in this document "AS IS" and "WITH ALL FAULTS." No use of this document or its contents shall be permitted without Wavecontrol's prior consent.

Product specifications and descriptions in this document depend on the firmware version and are subject to change without notice.

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1. WARNINGS AND PRECAUTIONS

⚠ Review this manual and become familiar with all the instructions for using and handling your **MonitEM-Lab**.

⚠ Adjustment, maintenance, or repair of the equipment must be performed only by qualified personnel. Please get in touch with **Wavecontrol** or your sales contact.

⚠ Never overtighten when screwing the **MonitEM-Lab** top cover.

Environmental information

Disposal of your old product:

Your product is designed and manufactured with high quality materials and components, which can be recycled and reused.

When this crossed-out wheeled bin symbol is attached to a product, it means the product is covered by the **European Directive 2012/19/UE**.

Please get informed about the local separate collection system for electrical and electronic products.

Please act according to your local rules and do not dispose of your old products with your normal household waste. The correct disposal of your old product will help prevent potential negative consequences for the environment and human health.

2. INTRODUCTION

You have acquired a **MonitEM-Lab** electromagnetic radiation monitoring device.

MonitEM-Lab can measure the emissions of different sources of electromagnetic radiation, such as mobile telephone base stations, in real time. The device stores the measurement data and sends it via ethernet to the Control Centre responsible for collecting and managing data from the different devices making up the monitoring system.

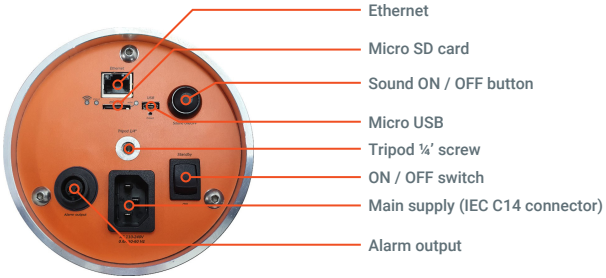
The device can also be used without a Control Centre, using the **MonitEM-Lab Reader** PC software to control and download data.

The device can also generate visual and audible alarms when it detects field values in excess of the limit established by the user and transmit them immediately to the Control Centre.

This Manual explains how to install and use the **MonitEM-Lab** device.

3. PRESENTATION OF THE DEVICE

3.1 Components



3.2 MonitEM-Lab details

Below the unit, you can find:

- IEC connector for the main power cord.
- Ethernet connector.
- Output alarm connector (internal relay up to 240 Vac or 30 Vdc, 5A current, normally closed).
- Sound button (pressed = sound on, unpressed = sound off).
- ON / OFF button (explained in more detailed in 4.3).
- Micro USB to connect to the PC.
- Reset switch.
- 1/4'' nut for tripod.
- 3 LEDs.

The 3 LEDs show the status of the device.

- The Ethernet LED is off when connection is established with the server.
- The status LED:
  - Blinks twice per second when in measurement mode.
  - Is lit continuously when connected to a computer.
  - Blinks intermittently when in communication mode.
  - Blinks rapidly for 5 seconds after initial calls (if communication is successful).
- The LED of the SD indicates that it is writing. Do not switch off the device if this LED is lit, since this could damage the SD.

3.3 Changing the probe

It is important to bear in mind that the memory of the unit is divided depending on the probe type (**WPF3**, **WPF6**, etc...). Therefore, it is very important to download all the data stored in the device before changing probes, in order to avoid losing any information.

The measurement device must be switched off before the probe is changed. Disconnect the power supply (mains cord) or use the switch off button. Once

the device is switched off, remove the 3 screws around the unit, pull on the radome (be careful to do it vertically to protect the probe inside) and then pull on the probe connector (not the tube) to remove it. Then attach a different probe and close the radome.

4. POWER SUPPLY (SMART POWER)

MonitEM-Lab is equipped with an intelligent controller that allows it to supply the main board and detect its working mode to make a reset in case of an emergency.

⚠ **Important:** Always disconnect the device from the mains before manipulating it, since some internal parts may be hazardous.

4.1 AC power supply

The device is powered directly from an external power connection. A regulator transforms 110- 240V AC (50-60Hz) into 12V DC.

4.2 USB mode

This power supply mode can only be used to change the parameters of the device. The USB powers the microprocessor and the SD card so that it can read and change the device's data. It is not a normal operating mode. It can be very useful as an initial connection, since in this mode the device will not make connection to the server and will allow adjustment of all the desired values before starting up in normal mode.

Note: *if the USB is connected before or just after the **MonitEM-Lab** is connected to a power supply, the system will start in USB mode, since the power supply controller takes 2–3 seconds to power up the device. To get back in normal mode you can press the restart button of the software or completely switch off the unit.*

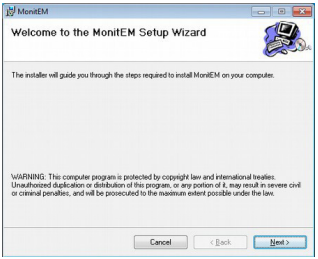
4.3 Switch ON / OFF

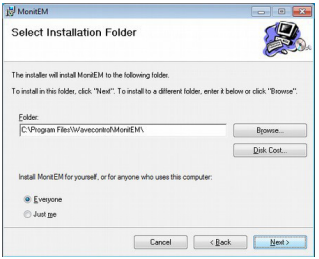
- The ON / OFF switch is a software switch.
- If the probe is connected and you switch on the unit, **MonitEM-Lab** will start to measure and send data as it was programmed before switching it off.
- When you switch off the unit, the system will do any pending tasks before entering in the off mode. It can take some seconds to switch off if **MonitEM-Lab** must terminate a communication with the server or must save some data in the SD card.
- When connected with the USB, **MonitEM-Lab** will not shut down even with the switch in OFF until you remove the USB connection with the computer.

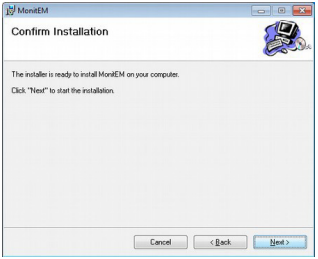
5. START-UP

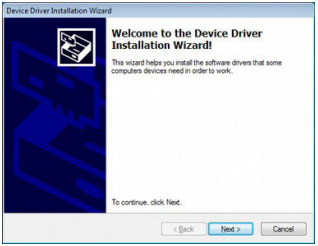
5.1 Installing the software

Insert the USB drive containing the software for the device, open the *MonitEM Setup* file and follow the instructions on the screens (it will install the software and drivers of the **MonitEM-Lab**):

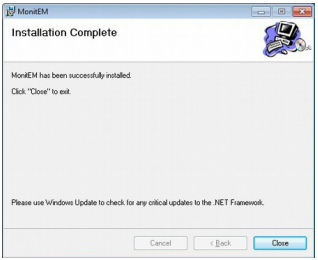








If Windows indicates that it cannot verify the digital signature for the driver, continue with the installation anyway.



Then connect the micro USB cord of the **MonitEM-Lab** to the computer. The driver should be installed automatically.
If any problems occur with installation of the driver, consult the Appendix 1: Problem with drivers Installation.

5.2 Using the software

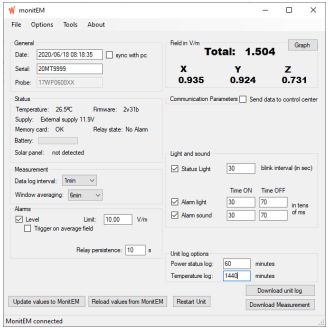
5.2.1 First connection

We highly recommend connecting the device for the first time using only the USB so that you can check the principal parameters, such as the alarm configuration.

The program for managing the **MonitEM-Lab** is very easy to use. Start the program and connect the device's USB cord (sequence is not important). The program itself will detect the device and display the configuration screen.

5.2.2 Parameters

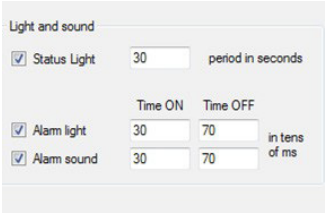
We can distinguish between different parts of the program:



- **General:** this indicates the time to which the device is set along with its serial number and the serial number of the connected probe.
- **Status:** gives information on:
  - Type of power supply.
  - Temperature of the system.
  - Firmware version.
  - Relay state.
- **Measurement:** allows definition of:
  - The interval of recording in minutes or seconds.
  - The window averaging: European recommendation is 6 minutes = 360 seconds. 0 means no average is done.

- **Alarms:**
  - Activate and define the alarms for EMF level and decide if this has to be triggered on average or instant value.
  - Define the relay persistence. (When measuring a non-continuous EMF source, like a rotating radar, you may want to define the relay persistence of the alarm output at least the time between 2 rotations).
  - Change the value for the temperature alarms (only in Online mode).
- **Field:** allows display of the total field and for each axis of the probe (does not work with USB power mode or without a probe connected).

5.2.3 Visual and audible alarms



You can define 3 parameters:

- Status light, that indicates unit is working by flashing from time to time. You can define the blink interval in seconds and you can disable this by unchecking the checkbox.
- The light and sound alarms are defined by time On and time Off in tens of milliseconds. By default these values are 30 and 70 which mean 300ms On and 700ms Off.

Note: *the alarm triggers if the field level measured is higher than the alarm level. With the checkbox "Trigger on average field", you can choose if this alarm has to be triggered on the average field level or on the instant field level.*

5.2.4 Actions

- **Update values:** When any value is modified, this field is displayed in yellow, indicating that this value has not been updated on the device. Pressing the button will update the values.
- **Restart unit:** This allows, for example, going from USB mode to normal mode when the general power supply is connected following a USB connection, or to read from a probe that has been connected after the device has been connected to the power supply.
- **Refresh values:** Reread the data for the device, e.g. time, temperature.
- **Download measurements:** Download the measurements saved in the SD when in offline mode.
- **Test Communication to server:** Allows checking to see if the communication parameters are correct with the **Wavecontrol** Control Centre web server. A new screen will open to start the check. If the check is successful, it will show that the server has accepted the communication.

5.2.5 Online mode *(not compatible with ModBus TCP/IP protocol, see 6.2)*

In this mode (checkbox "Send data to control center" ticked), the device will transmit at intervals to the server. In this mode, the device will also send warnings in the event of an alarm (for the alarms that are activated).

The measured data can be viewed directly from the Control Centre. The recording interval and the communication interval can be changed from the Control Centre. See the Manual for the Control Centre for further information.

Note: *the "online mode" is only used to connect to the Control Centre. Deactivate it when **MonitEM Reader** is used to connect with ethernet to the **MonitEM-lab**.*

5.2.6 Offline mode

In this mode (checkbox "Send data to control center" unticked), the device will not make any communication to the Control Centre or send any alarms. Visual and audible alarms still will work.

The program can be used to download the data stored in the device in TXT format (see Appendix 2). Click the "Download measurement" button. Data must be downloaded when the probe used to make the measurements is connected and it cannot be downloaded when the device is in USB power mode.

5.2.7 Malfunctions

If you have any problem with the program or the device:

- Download the device log by clicking "Download unit Log" (if you use the **MonitEM-Lab** in offline mode).
- Download the program session file by clicking the *Tools* → *Save Log* menu.
- Send these files to your technical support contact.

Note: *if the red light status (SD card) stays on all the time when the USB is connected, please disconnect the USB and restart the unit.*

5.3 MonitEM-Lab Ethernet configuration

MonitEM-Lab is configured by default to work with DHCP (automatic IP configuration). In order to know what IP the device has, you can use the **MonitEM Reader** software by going to *File > Connect through Ethernet*.

Note: *First you need to switch on the **MonitEM-Lab** and connect it to the Ethernet.*

In this new window you can do a search ("SEARCH" button) of the equipment in your local network. The search can be automatic or you can define an IP range.

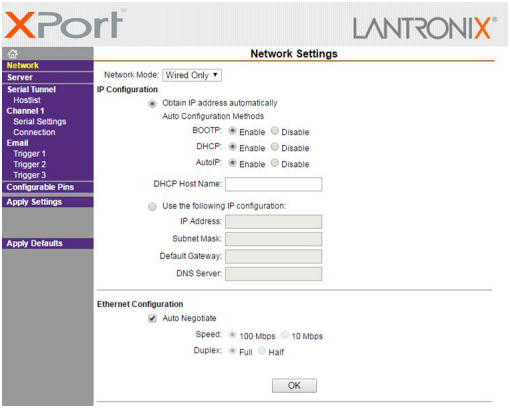
It should show one or more IP corresponding to your equipments. They can be connected by clicking on "Click to connect" from the list.

5.3.1 Changing the IP of the MonitEM-Lab

If you want to assign a fixed IP, open the Internet browser and enter the URL address: ***http://IP_obtained*** (replace IP_obtained with the IP found by the **MonitEM Reader**).

Note: *if the browser asks for a user and password, leave them blank.*

On this page, go to the "Network" menu and enable "Use the following IP configuration:", with the IP configuration that you want to assign to the device. Then click on "Apply Setting".



6. COMMUNICATION PROTOCOL BY ETHERNET

6.1 Serial

Commands may be terminated by **"\r"** (char 10) o **"\r\n"**. (char 10 and char 13).

Response is like: ***"COMMAND\r\nRESPONSE\r\n"*** (Response may use more than 1 line), A response always ends with **"\r\nOK\r\n** or **\r\nERROR\r\n"**.

In case the unit does not recognize the command (in our example ***"COMMAND_SENT"),*** response will be:

"COMMAND_SENT\r\nERROR\r\n"

Maximal command length is 1023 characters.

GET_SAMPLE[+W]\r
The unit, with external power and probe inserted, will take a measurement and send the result.
When unit is in normal mode (***"MODE+N\r"***), it will send the last automatic measurement, in setup mode ***"MODE+S\r"*** it will force a measurement.

Optional parameter +W
This parameter add information about the average windows processed by the unit. (In setup mode it will return the last average calculated in normal mode because in setup mode it does not make automatic measurement).

Examples:

GET_SAMPLE\r\n
VX;VY;VZ;FX;FY;FZ;F;T;B;V/m\r\n
OK\r\n

GET_SAMPLE\r\n (Power problem or probe not inserted)
ERROR\r\n

Example with optional parameter ***"+W"***:

GET_SAMPLE+W\r\n
VX;VY;VZ;FX;FY;FZ;F;T;B;V/m\r\n (basic information)
FW;FWM;W;V/m;Window\r\n (Average windows information)
OK\r\n

Explanation of response parameters:

- ***VX*** (Axe X voltage)
- ***VY*** (Axe Y voltage)
- ***VZ*** (Axe Z voltage)
- ***FX*** (Axe X field value)
- ***FY*** (Axe Y field value)
- ***FZ*** (Axe Z field value)
- ***F*** (Total field)
- ***T*** (Temperature)
- ***B*** (Battery level)
- ***FW*** (average field)
- ***FWM*** (Maximum average field for the current interval)
- ***W*** (Indicator if current average is valid (0 → not complete, 1 → Complete)

6.2 Modbus TCP/IP

The **MonitEM-Lab** can be used with a PLC system by activating the TCP/IP Modbus protocol. To do so, please activate by clicking on *Options* → *TCP/IP Modbus* menu.

To use with a PLC, please use the following configuration:

- **Port:** 10001
- **Slave ID:** 17
- **Function code:** 3

Registers to read the EMF field in V/m:

- **Address:** 50512 (Hex: 0xC550)
- **Length:** 2 (the EMF field value is sent with 2 registers of 16 bits = 32 bits)

Note: *the **MonitEM-Lab** does not comply fully the TCP/IP modbus protocol but has been tested with several system like Siemens under real condition.*

7. MAINTENANCE

7.1 Unit

No special maintenance needs to be done. If the radome is dusty, clean it with a humid dust-cloth. Do not use chemical product on it.

7.2 Calibration

Wavecontrol recommends to calibrate the unit and probe every 2 year.

7.3 Update firmware

If you have received a new firmware for the **MonitEM-Lab**, with the PC software go to *Tools* → *Firmware update* menu.

A new window will open. Click on "Update" and indicate the new firmware (hex file). This procedure can last some minutes.

8. WARRANTY

Wavecontrol warrants that this product is free from defects in materials and workmanship for a period of two years from the date of shipment. If any such product proves defective during this warranty period, **Wavecontrol**, at its discretion, will either repair the defective product without charge for parts and labour, or provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, the customer must notify **Wavecontrol** (or one of its distributors) of the defect before the expiration of the warranty period, by sending a Failure Report including:

- Defect Report.
- Equipment data (model, serial number, purchase date).
- Contact data (company name and complete contact details).

This warranty shall not apply to any defect, failure or damage caused by improper use, or improper or inadequate maintenance and care. **Wavecontrol** shall not be obligated to provide service under warranty to repair damage resulting from attempts by personnel other than Wavecontrol personnel to repair or service the product.

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APPENDIX 1. Problem with drivers installation

If you have any problems installing the drivers, they can be installed following the steps given by Windows when the USB is connected:

1. Connect the USB cord to the PC and the **MonitEM-Lab**, respectively. Windows will automatically detect the new device. (Otherwise, go to Control *Panel / System / Hardware / Device Manager*, which should show an incorrectly installed device; right click on that device and update the driver by clicking right).

2. Do not allow Windows to find the driver automatically.

3. Select "Install from a list or specific location".

4. Select *D: / Drivers* as the location, where "D" is the letter for the USB drive containing the software.

5. Wait until the driver has been correctly installed. Accept it if warns that it is not a certified driver.

6. If the driver is correctly installed and the device is connected to a computer, the list of COM ports will show the port associated with the **SMP** with the name "USB Serial Port" (see *Start / Control Panel / System / Hardware / Device Manager / Ports (COM & LTP)*).

APPENDIX 2. Log format

From the PC program you can download the measurement data in TXT format when the device is in offline mode (See, 5.2.6). Below, you can see an example:

Wavecontrol MonitEM-Lab Data
Date: 10/14/2020 13:11:20
MonitEM Serial: 20MT0825
Probe serial: 18WP040767
Frequencies: 100kHz-8GHz
Units: V/m
Date: Time, Max Average value, Max Instant value
2020/10/07, 12:56:00, 8.71,81.17
2020/10/07, 12:57:00, 8.72,3.22

DECLARATION OF CONFORMITY (DOC)

Manufacturer: Wavecontrol, S.L.
C/ Pallars, 65-71. 08018 Barcelona (Spain)

Object of the declaration:

MonitEM-Lab

The above mentioned product complies with the essential requirements, which are specified in the directive 2014/108/EU on the approximation of the laws of the Member States relating to electromagnetic compatibility.

The product of the declaration described above is in conformity with the requirements of the following specifications:

Documents-No. and description:

UNE-EN 61326-1:2006
Electrical equipment for measurement, control and laboratory use.
UNE-EN 55011:2011 + A1:2011
Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement.
UNE-EN 61000-3-3:2009
Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection.
UNE-EN 61000-4-2:2010
Testing and measurement techniques - Electrostatic discharge immunity test.
UNE-EN 61000-4-3:2007 + A1:2008 + A2:2011
Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test.
UNE-EN 61000-4-4:2005 + CORR:2010 + A1:2010
Testing and measurement techniques - Electrical fast transient/burst immunity test.

UNE-EN 61000-4-5:2007 + CORR:2010
Testing and measurement techniques - Surge immunity test.
UNE-EN 61000-4-6:2009
Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.
UNE-EN 61000-4-11:2005
Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests.

Barcelona, 4th of February 2013 Ernest Cid - CEO

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