WAVECONTROL

EMF Personal Monitor
WaveMon

USER'S MANUAL

V 1.0

Congratulations for your acquisition of a **Wavecontrol WaveMon**.

This Manual provides you with instructions for using and handling your **WaveMon**.

Please read this Manual carefully before using your **WaveMon**.

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.

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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 **WaveMon**.

⚠ Your **WaveMon** is a portable apparatus with a rechargeable battery. Before taking any measurement, make sure that the battery is sufficiently charged for the time that you need for the measurement. If it is not, recharge the battery before.

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

⚠ The **WaveMon** is a professional measurement device that must be calibrated to ensure that it works properly. Check to make sure that its calibration is valid at all times.

If you are unsure or need to recalibrate, please contact your distributor or contact us at service@wavecontrol.com (see section 13.2).

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 2002/96/EC.

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

The **WaveMon** is a personal electromagnetic field monitor. Its main function is to monitor the user's exposure. For that purpose, it should be carried close to the body to provide a warning in the event of overexposure. It may also be placed in other locations to warn of high field strength in areas of special interest that we wish to monitor. The warning is given by means of audible signals (beeps), vibration and visible signals (LEDs).

The **WaveMon** can measure field strength continuously and store readings in its internal memory. It has a capacity to store up to 1,000,000 readings.

Warnings are given based on instantaneous field values. However, measurements are taken continuously and stored in memory to make it possible to check whether exposure has exceeded the permitted limits, to what extent, when and where (geographical position and altitude).

The information stored in memory can easily be downloaded to a PC via USB for later processing.

3. UNPACKING THE DEVICE

This section provides instructions for unpacking the device and inspecting it when it is delivered.

When you receive the device, please check the box to see if it is damaged in any way. Make a note of any damage detected before you sign the delivery note.

Check that you have received all the components of the **WaveMon** and its accessories as ordered.

The standard elements are:

- The **WaveMon** with its mount.
- USB cable.
- USB key.
- Elastic band to fasten the device to your arm.
- Non-elastic band to fasten the device to a harness.

If any of those components are missing, please contact your distributor or **Wavecontrol** at service@wavecontrol.com.

Compartment for accessories and/or documents (optional)

WaveMon + mount

USB cable

Non-elastic band

Elastic band

USB key

Figure 1: Case of WaveMon

4. FIRST STEPS

The **WaveMon** is an easy-to-use and very complete electromagnetic field monitor. To switch it on, press the **ON/OFF** button on the front panel. The device will switch on and go through the start-up sequence to check that all the warning systems are working properly and that the batteries are suitable to run the device.

The sequence is::
- **2 beeps**
- **vibration for 1 second**
- **all the LEDs light up.**

Mount

Fastening system

Field strength indicator from 10% to 200% of limit

USB connector

Tripod socket

Opening for securing

ON/OFF button and status indicator

Figure 2: Parts f the WaveMon

When it is switched on, the **WaveMon** will show the strength of the present electric or magnetic field by means of signal lamps. The ambient field strength is shown as a percentage of the regulated limit. The signal lamps show the maximum levels of the instantaneous electric and magnetic field, but the record of both is stored in memory.

Bear in mind as well that the average field value, based upon the instantaneous field, is stored in memory to allow analysis of your exposure in respect of international standards.

Note: *the magnetic field is not available on some models. See Section 12.*

The user can learn the field strength by observing the number of blinking lights. Field strength indication starts when it is over 10% of the established limit. A colour code is also used so that the user does not have to focus continually on the device.

If the field strength is lower than 50% of the limit, the lights showing the present field strength will blink green. If the field strength is higher than 50% but lower than 100% of the limit, the lights showing the present field strength will blink orange. When the field strength is over 100% of the limit, the lights will blink red.

To ensure that the user is aware of the presence of a strong field, the device will also give audible and vibratory warnings when the threshold defined by the user is exceeded.

5. FALL WARNING

The **WaveMon** is equipped with a fall sensor and if it detects such an event, the device will begin beeping until it is switched off. This feature makes it possible to warn others nearby instantly if someone carrying a **WaveMon** falls.

Note: *the device will continue measuring and recording the electromagnetic field even after a fall is detected.*

6. PLACING THE DEVICE

The device is supplied with a mount to which it may be attached using a quick release mechanism. The device can be released from its mount easily with one hand. This can be useful for checking a potential source of radiation before approaching it, minimising the risk of exposure. This can be done simply by holding it in your outstretched hand or using an extension attached to the tripod socket if you wish to check from farther away.

The device can be attached to your body in several different ways.

a. Using the mount
   - With the elastic band to fasten it to your arm.

- With the non-elastic band to fasten it to a safety harness.

- With a belt passed through the mount.

b. In a pocket, detached from the mount.

Important: *When working at heights, the opening on the bottom of the WaveMon can be used to fasten it to a harness. This is particularly advisable to keep it from being dropped if the device is to be used without its mount as mentioned above.*

The device can also be attached to a tripod or a non-conductive extension arm using the ¼ inch socket to detect leakage without having to approach the potential source.

7. LOG INTERVAL AND AVERAGE

The log interval defines how often a measurement is stored in memory. This interval does not affect how the measurement is taken or the warnings given to the user. The device will always measure and calculate the average every second, regardless of the log interval value.

Two different log intervals may be defined. This allows you to define a different interval for when the field strength is low and when the field strength is high. Where the field strength is low, we do not need to memorise so much negligible information, saving memory space and battery life. Where the field strength is high, however, we can define a shorter log interval to have more relevant information for later processing.

8. GPS AND ALTIMETER OPTION

As optional features, the **WaveMon** can have an internal GPS receiver and an altimeter so that each reading can be automatically associated with a geographical position. The altimeter allows determination of the relative altitude in respect of the position where the device was initially switched on.

9. SOFTWARE PC

The WaveMon software is an easy-to-use tool, with two main functions:

- Displaying and downloading recorded measurements.
- Configuring the device.

9.1 Installation
The software is available in the USB key in the box. You can also find the latest version on the **Wavecontrol** intranet (exclusive service for registered customers, see Section 9 and Appendix 1).

Before connecting the **WaveMon** to your PC, install the **WaveMon Reader** software by running the "WaveMon_Setup.msi" file. This will install the software with the necessary drivers. When the installation is complete, connect the **WaveMon**. Your PC will recognise the **WaveMon** and finish installing the drivers automatically.

System requirements:
- Microsoft Windows 7 or later.
- Microsoft .NET Framework 4 (4.5 recommended).
- At least 2 GB RAM.

9.2 Displaying information
The first step is to run the "**WaveMon Reader"** program. The main screen will show a picture of the **WaveMon** and prompt you to connect it to your PC via the USB port.


Connecting. Please wait.

Connect the **WaveMon** USB to the PC. The program will detect and start the connection process as shown below.

**Note:** *You do not need to turn on the device before connecting the USB.*

Connect WaveMon to the USB

With the device connected, the list of measurements taken by the **WaveMon** appears on the screen. Each measurement contains the list of measurement points.
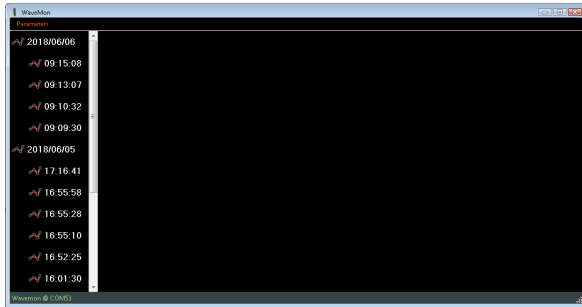
When you click on a measurement, the measurement points are downloaded and the graph is displayed. You can zoom into the information by clicking on the graph and selecting a square.
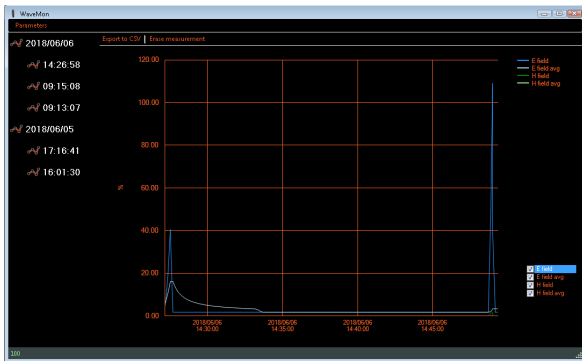

When a register is fully downloaded to the computer, it will be available for future consultation. If you wish to download the same register again, the software will check whether the files in the **WaveMon** and in the computer are identical before downloading it again.

These files are available in the Windows user's folder, in /Wavecontrol/WaveMon_Reader.

9.3 Parameters

You will find the Parameters menu at the top on the left (with the **WaveMon** connected). Clicking here will open a new window offering access to 4 sections:
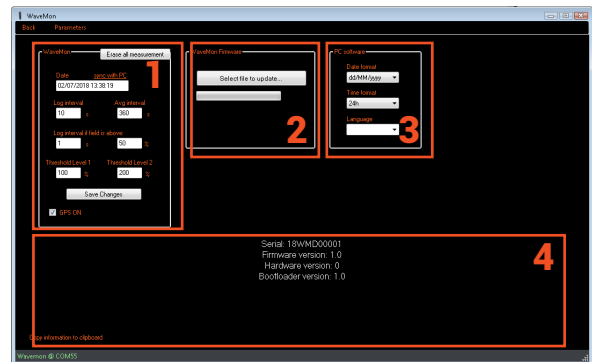
First section: Parameters of the device:

- **Date of the device:** can be synchronised with the PC by clicking on "sync. with PC"
- **Log interval:** defines the time interval in seconds when a reading is stored in memory
- **Average interval:** time interval in seconds for calculating an average. Value between 1 and 360 seconds.
- **Log interval for high-strength fields:** defines the time interval when a reading is stored in memory if the field measured higher than a given field value in %.
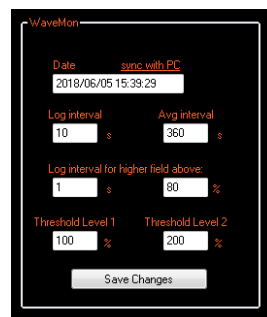
Note: *This value must be higher than 25% and lower than alarm level 1.*

The device will give an alarm when the field value reaches a given level. Two alarm thresholds can be defined:

· **Alarm level 1**
· **Alarm level 2**

Alarm level 2 must be higher than Alarm level 1.

Note: *The device vibrates and beeps more noticeably when Alarm level 2 is reached.*

Second section: Updating the firmware for the device

· Select the .bin file of the new firmware and wait for the device to be updated. Do not switch the device off while the firmware is being updated and make sure that the device has sufficient battery charge before starting the update.
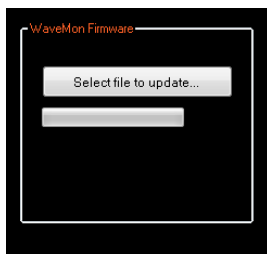
Third section: Program parameters

· Date format: used to select the day/month/year format
· Time format: 12 or 24 hours
· Language: used to select the language. The program must be rebooted to apply the changes made.
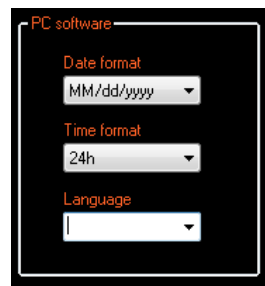
Fourth section: System information. You can check the device's serial number, firmware version, etc. You can also click on "Copy information to clipboard" to save all the system information and send it to your support contact if necessary.

9.4 Registration

When the software is run and the **WaveMon** is connected for the first time, a pop-up window will appear allowing you to register with the **Wavecontrol** intranet. We strongly recommend registering, since it will allow you access to support documents and you will need it for obtaining free software and firmware updates (see Section 9 on updates and Appendix 1 on the intranet).

10. BATTERIES

10.1 Use

The **WaveMon** uses 2 rechargeable AA Ni-Mh batteries. When it is switched on, the device indicates the battery charge level: blinking white means the batteries are charged, blinking red means the batteries need to be recharged.

If you do not have enough time to recharge the batteries or if they are defective, they can easily be replaced by removing the two screws at the bottom of the device. You will need a cross-head screwdriver for this.

We recommend replacing the batteries every 2 or 3 years to ensure that the device will work properly.

Important: Alkaline batteries may be used in the event of a problem with the rechargeable batteries, but they can only be used temporarily until new rechargeable batteries are available. If you use alkaline batteries, make sure that you do not put the **WaveMon** in charge mode, to avoid possible damage to the batteries and to the device.

10.2 Charging

To charge the **WaveMon** battery, connect the **WaveMon** cable to a USB charger or a computer. A full charge takes approximately 4 to 5 hours. The charge takes place in two stages:

- Charge: the **WaveMon** shows the level indicators in blue while the batteries are charging.
- End of charge: the **WaveMon** shows the level indicator in green.

Note: *We recommend making a full charge at least once a month to extend the useful life of the batteries.*

Note 2: *When connected to a computer, the **WaveMon** cannot be running the program and charging at the same time. The procedure is as follows: when it is connected to a computer, the **WaveMon** waits for 3 minutes before going to charge mode, in case the user wishes to connect the **WaveMon** to the computer program and download measurements. After 3 minutes without detecting the PC program, the **WaveMon** switches to battery charge mode. If the device is in charge mode and you wish to connect the **WaveMon** to the computer program, you will need to disconnect it and then reconnect the USB to have the program recognise it.*

11. SOFTWARE AND FIRMWARE UPDATES

11.1 Updating the WaveMon Reader (Software for PC)

You can download the most recent version of the software from the private area (intranet) of **Wavecontrol's** web page.

Intranet: www.wavecontrol.com, Home → Log-in.

Step 1: Registration

You can register in either of the two following ways:

* from www.wavecontrol.com (Home -> Create an account), or
* when you connect the WaveMon to the software for the first time (follow the instructions on the screen, see <u>section 9.4</u>)

Step 2: Downloading and installation

When you have registered, go to www.wavecontrol.com → Inicio → login, and enter your login and password. You will be redirected to the download area.

When you reach the downloads page, click on **WaveMon → WaveMon software.** Download and install the WaveMon_software.zip file.

11.2 Updating the WaveMon firmware
Follow these steps:

1. Update the WaveMon Reader (see <u>previous point</u>).
2. Run the WaveMon Reader software.
3. Connect the **WaveMon** to the PC using the USB cable.

The **WaveMon Reader** will automatically detect whether a more recent version of the **WaveMon** firmware is available.

4. Click on "Update".

If the most recent version of the firmware was delivered to you as a separate file, you can update it as follows:

* Follow steps 1 to 3,
* then go to Parameters → Update firmware and
* select the firmware file that you received.

12. MODELS

Part number	Model	Description
WWM0001	WaveMon Broadband 8-ICN	1 MHz-8 GHz ICNIRP 1998 occupational
WWM0002	WaveMon Broadband 8-FCC	3 MHz-8 GHz FCC occupational
WWM0003	WaveMon Broadband 8-SC6	10 MHz-8 GHz SC6 2015 occupational
WWM0004	WaveMon Broadband 8-EUD	1 MHz-8 GHz EMF Directive 2013/35/EU

13. Maintenance

The **WaveMon** requires very little maintenance, although it should be handled with care, as with any professional measurement equipment.

Maintenance by the user is limited to the outside of the device, its connections and management of regular calibrations. Any maintenance or repair for which the device needs to be opened must be carried out by Wavecontrol to avoid invalidating the warranty.

To recalibrate your equipment, please contact your local distributor or Wavecontrol at service@wavecontrol.com. Wavecontrol offers ISO 17025 accredited calibrations at its LabCal Wavecontrol laboratory.

We are aware of the importance of recalibration to the management of your operations. We strive to offer you the best service in terms of quality, price and delivery time. If you have a special need, we will do our best to help you.

13.1 Cleaning the device
To avoid damaging the surface, use a soft antistatic cloth to clean the device.

13.2 Regular recalibration
Wavecontrol recommends that the **WaveMon** should be recalibrated every 2 years. This is strictly a recommendation and it is up to the owner of the device to decide how often to recalibrate. That decision may depend on a number of factors. For example, if the device is used very frequently, it may be advisable to recalibrate it more often, as would also be the case if the device has had any accident that might make its accuracy questionable, or where specific regulations require a stipulated regularity for recalibration, or simply at the request of the organisation or client for which the device is being used, among other circumstances.

14. Technical specs

Sensor type	Isotropic, RMS diode technology
Response	Shaped (occupational ICNIRP 1998, FCC, SC6 or European Directive)
Interface	1 button on/off, status and low battery LED
Indicators	6 LEDs + Audio + Vibration
Alarm threshold	2 limits adjustable by user
Connectivity	Waterproof USB
Fall detection	Yes
Autonomy	> 1 months (typical working hours)
Data logger	> 1 000 000 events
Logging interval	1 sec to 6 min (adjustable by user)
Averaging interval	1 sec to 6 min (adjustable by user)
Battery Type	2 x AA NiMH battery rechargeable by USB
Protection	IP 54
Temperature	-20 / +50 ºC (-4 / +122 ºF)
Size	174 x 42.5 x 33 mm (6.8 x 1.7 x 1.3 '')
Weight	190 g (6.7 oz.)
Option	GPS and altimeter

|	Standard (occupational)	E Field	H field
Frequency range (frequency response)	ICNIRP 1998 EMF Directive 2013/35/EU	1 MHz - 8 GHz (±3,5 dB)	25 MHz - 1 GHz (±1 dB (30 MHz - 700 MHz) +0 dB/-2,5 dB (700 MHz - 850 MHz) +0 dB/-5 dB (850 MHz - 1 GHz))
	FCC (Federal Communications Commission)	3 MHz-8 GHz (±3,5 dB)	3 MHz - 1 GHz (±1 dB (3 MHz - 400 MHz) ±2 dB (400 MHz - 850 MHz) +0 dB/-4 dB (500 MHz - 1 GHz))
	Safety Code 6 (2015)	10 MHz - 8 GHz (±3,5 dB)	25 MHz - 1 GHz (±2 dB (30 MHz - 800 MHz) +0 dB/-5 dB (800 MHz - 1 GHz))
Dynamic range		1-300 %	2 - 300 %
Linearity		0,5 dB (2% - 200%)	± 1 dB (5% - 200%)
Isotopic deviation		±1 dB @ 1 GHz	±1 dB @ 400 MHz

Appendix 1. Wavecontrol intranet

Wavecontrol provides an exclusive intranet space for its customers with pertinent information on its products, such as specification sheets, application notes, etc.

One of the important things that you can do via the intranet is keep your **WaveMon** device always up to date. Wavecontrol offers you regular updates of the **WaveMon** firmware and the **WaveMon Reader** software, free of charge. Those updates may contain:

• Error corrections.
• Operating improvements.
• New features.

You can enter the intranet through the **Wavecontrol** web page. You will have to register with the system through the Home menu:
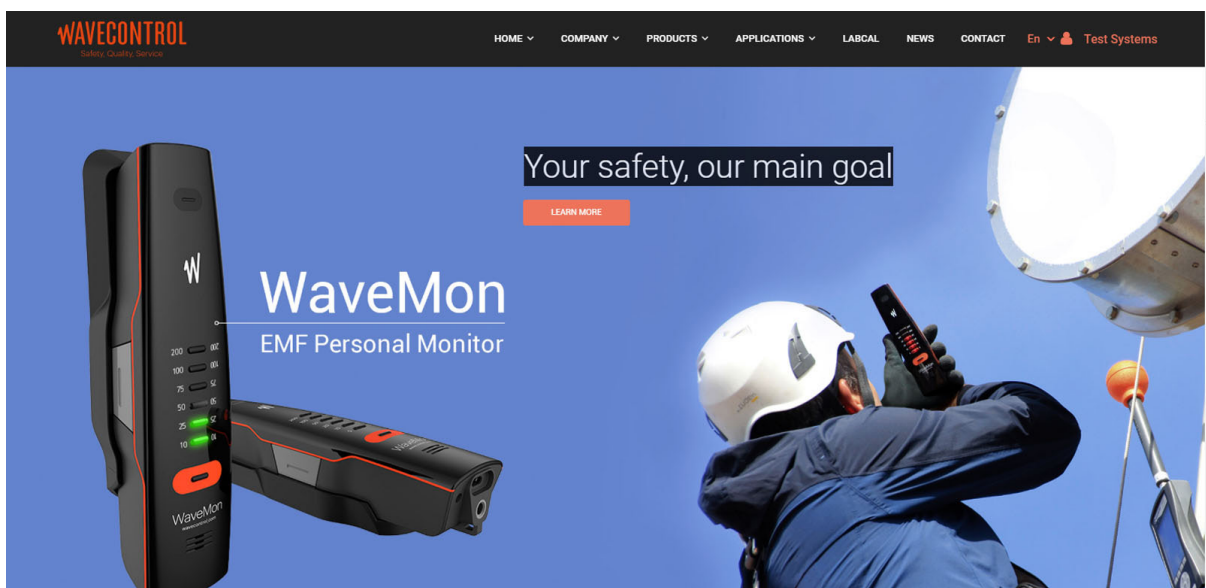
DECLARATION OF CONFORMITY (DoC)

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

Object of the declaration:
WaveMon Broadband (Personal EMF Monitor)

The above mentioned product complies with the essential requirements, which are specified in the directive 2014/30/EU on the harmonisation 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:
IEC-EN 61326-1:2013
Electrical equipment for measurement, control and laboratory use.
EN 55011:2016 + A1:2017
Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement.
IEC-EN 61000-4-2:2010
Testing and measurement techniques - Electrostatic discharge immunity test.
IEC-EN 61000-4-3:2007 + A1:2008 + A2:2011
Testing and measurement techniques- Radiated, radio-frequency, electromagnetic field immunity test.
IEC-EN 61000-4-8:2011
Electromagnetic compatibility (EMC) -- Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test.

Barcelona 30th of April 2018
Ernest Cid - CEO

WAVECONTROL

Safety, Quality, Service