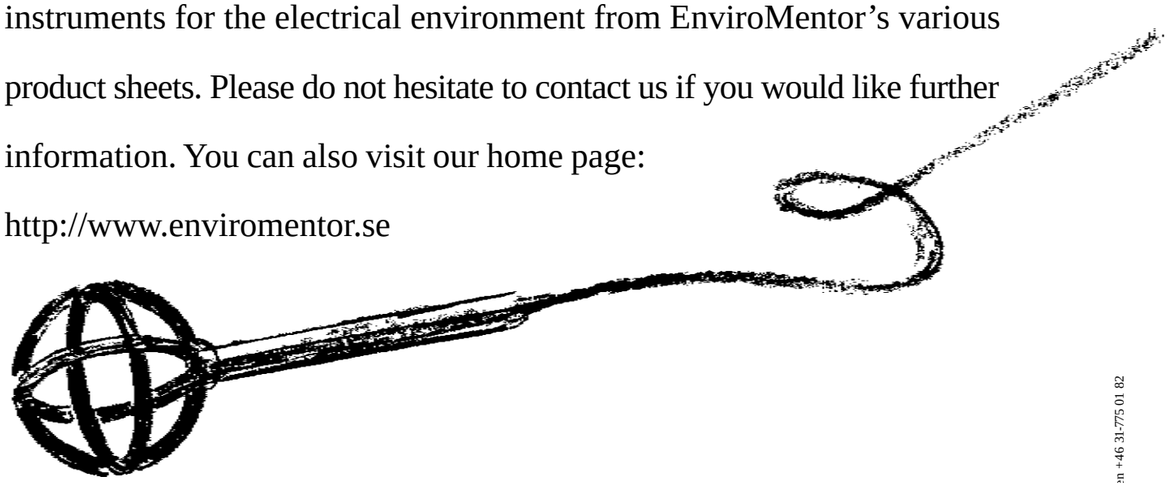
EnviroMentor has both the measuring instruments and the expertise

EnviroMentor AB is a young, skills-based company, yet is also one of the oldest in its field. All of our measuring instruments have been developed in extremely close cooperation with researchers at Chalmers Institute of Technology in Göteborg. EnviroMentor AB is wholly owned by Radians Innova AB, a company which in turn is owned by two of Sweden's most powerful financial institutions. This combination of excellent skills and good financial resources provides us with the potential to carry on continual product development, keeping pace with the latest discoveries made by researchers. You can find out all about our current range of measuring instruments for the electrical environment from EnviroMentor's various product sheets. Please do not hesitate to contact us if you would like further information. You can also visit our home page:

http://www.enviromentor.se



EnviroMentor

A Company in the Radians Innova Group

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EnviroMentor

English

Field Finder user instructions

CE

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Notes

1 Introduction

Field Finder.

Thank you for buying a Field Finder from EnviroMentor AB.

The equipment comprises:

- Field Finder electric/magnetic field meter
- User instructions
- Case
- Calibration document
- Earth cable
- Earth cable contact
- CE certificate

Field Finder measures electric or magnetic alternating fields and presents the reading on an LCD. The reading is updated every second. The instrument emits an audible signal that is proportional to the field strength measured.

Field Finder measures the electric field in the direction of the measurement surface on the instrument's front short side.

Field Finder measures an RMS value of the magnetic field in the X, Y and Z directions, irrespective of the direction in which the instrument is pointing in relation to the magnetic field.

You can use Field Finder whenever you want to measure electric fields, such as from electrical installations, power cables, VDUs, computers and other electrical equipment in the office, industrial and home environments.

Cont.

The electric fields from a piece of apparatus are influenced by the design of the instrument. Field Finder is intended to give simple, general measurements. If you want to carry out a more precise analysis of the electrical environment, you should use an instrument that has been designed in accordance with MPR II. Field Finder does not satisfy the requirements of MPR II, but the instrument has been calibrated to produce the same results when measuring electric fields at a distance of 50 cm from a VDU. Some measurement objects may emit alternating fields with frequencies beyond that which Field Finder can manage.

Report form for measuring magnetic fields around an object

Magnetic field, 30 Hz–2 kHz			Measuring equipment: **Field Finder**
Object:			Model:
Address:			Room:
Measured by:			Date:
	30 cm	50 cm	Comments
0°	µT	µT	
90°	µT	µT	
180°	µT	µT	
270°	µT	µT	
Background field	µT	µT	

Notes

Report 98:3, Field Finder © EnviroMentor AB, Gothenburg, Sweden

Report form for measuring electric fields around an object

Electric field, 30 Hz–2 kHz			Measuring equipment: **Field Finder**
Object:			Model:
Address:			Room:
Measured by:			Date:
	30 cm	50 cm	Comments
0°	V/m	V/m	
90°	V/m	V/m	
180°	V/m	V/m	
270°	V/m	V/m	
Background field	V/m	V/m	

Notes

2 Technical data

Measurement range E	0–1,000 V/m
Accuracy E	±10% ± 1 V/m at 50 cm
Measurement range B	0.05 µT–100 µT
Accuracy B	±10% ± 0.05 µT
Frequency range	30 Hz–2 kHz (-3 dB)
Measurement method	RMS effective value
Dimensions, L x W x H	152 x 83 x 34 mm
Weight	260 g (incl. batteries)
Batteries	2 x 1.5 V LR6
Power consumption	25 mA during measurement
Temperature range	-10°C to +50°C
Other	Microprocessor, 10 bit A/D converter, three-dimensional sensor

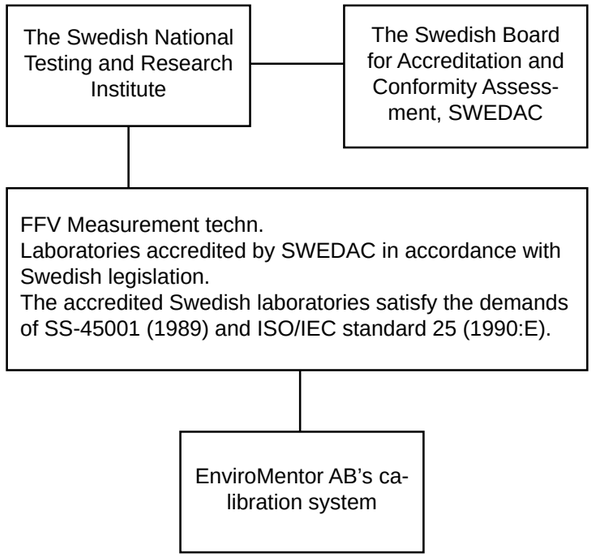
CE assurance

Our product satisfies the demands of the Low Voltage and EMC directive as well as the following EMC standards:

EN 50 081-1:1992	Emissions standard class B
EN 50 082-1	Immunity standard
Manufacturer	EnviroMentor AB Box 5124 SE-402 23 Gothenburg Sweden

Traceability

Traceability means that it should be possible to relate a measurement result to national or international standards via an unbroken chain of comparisons.



Traceability chart.

Report form B for measuring electric fields in a room

Electric field, 30 Hz–2 kHz		Measuring equipment: **Field Finder**	
Object:		Model:	
Address:		Room:	
Measured by:		Date:	
Measurement points	Measurement reading* V/m	Background field** V/m	Comments
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

* In the direction of the arrow on the sketch. 'C' stands for 'ceiling', 'F' stands for 'floor'.
**The background field does not need to be measured at all measurement points.

Notes

Report 98:1B, Field Finder © EnviroMentor AB, Gothenburg, Sweden

Report form A for measuring electric fields in a room

Sketch of the room with measurement points marked.

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3 Use

Measuring magnetic fields.

Measuring electric fields.

3.1 Measuring magnetic fields

Start up the instrument with the switch. The instrument always starts in magnetic field mode and displays the magnetic field's effective value in µT. This value is updated at 1 second intervals. Field Finder can be pointed in any direction in relation to the magnetic field source as it has a three-dimensional sensor.

3.2 Measuring electric fields

Start up the instrument with the switch. Change the measurement function by pressing the E-key once. Hold the instrument in the required direction. The instrument now measures the electric field in the direction in which it is currently pointing, and displays the effective value in V/m. The reading is updated at 1 second intervals.

Note that the field can be influenced by objects in the vicinity of the instrument, as well as by the person holding it. The instrument has to be held still in order to achieve a stable value. When measuring electric fields from pieces of apparatus, the instrument should be earthed. Connect the accompanying earth cable to the output.

The instrument can also be used without connecting the earth cable. In this event, hold your finger against the earth output on the left side of the instrument. The fields you then measure are those which the user of the piece of equipment is exposed to when working. These fields are dependent on the user's and the sources' connection to each other and to earth.

3.3 Audible signal

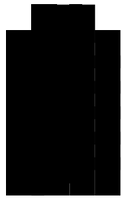
The audible signal can be turned on or off by pressing down both the function keys at the same time.

E (V/m)	B (μT)
10	0.2
20	0.4
50	1.0
99	2.0

Threshold levels.

3.4 Threshold level

The threshold level indicates the field strength at which the instrument's audible signal is first emitted. The threshold level can be selected by the user in accordance with the table. The standard settings when the instrument is switched on are 10 V/m and 0.2 μT. If you want to select a different value, hold one of the keys depressed while starting up the instrument. Then select the desired limit using the appropriate key. To exit the setting procedure, press both keys at the same time. The selected threshold level is stored as long as the instrument is switched on.

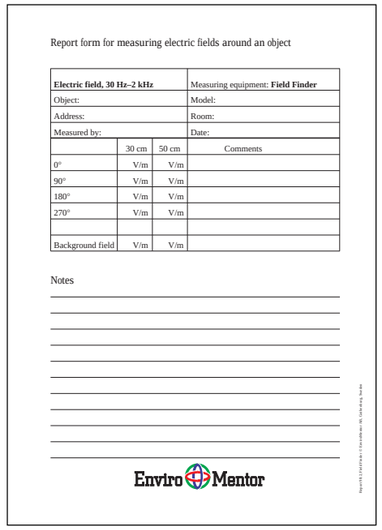


Battery symbol.

3.5 Changing the batteries

When the battery symbol is displayed to the left of the measurement reading, the batteries should be replaced immediately. Unscrew the cover on the rear of the instrument, remove the old batteries and install new ones (2 x 1.5 V LR6).

8 Report forms



Report form for measuring electric fields around an object

Electric field, 30 Hz–2 kHz			Measuring equipment: **Field Finder**
Object:			Model:
Address:			Room:
Measured by:			Date:
	30 cm	50 cm	Comments
0°	V/m	V/m	
90°	V/m	V/m	
180°	V/m	V/m	
270°	V/m	V/m	
Background field	V/m	V/m	

Notes

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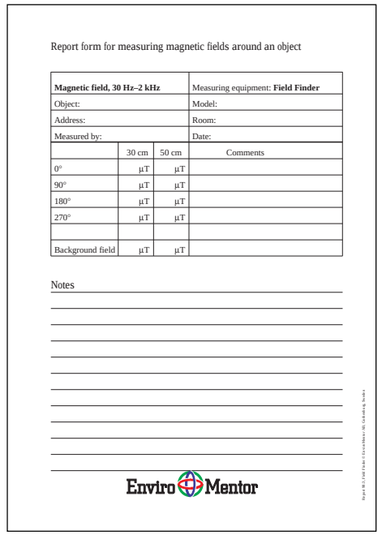
Report form for measuring electric fields.



Report form for measuring magnetic fields around an object

Magnetic field, 30 Hz–2 kHz			Measuring equipment: **Field Finder**
Object:			Model:
Address:			Room:
Measured by:			Date:
	30 cm	50 cm	Comments
0°	μT	μT	
90°	μT	μT	
180°	μT	μT	
270°	μT	μT	
Background field	μT	μT	

Notes

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Report form for measuring magnetic fields.

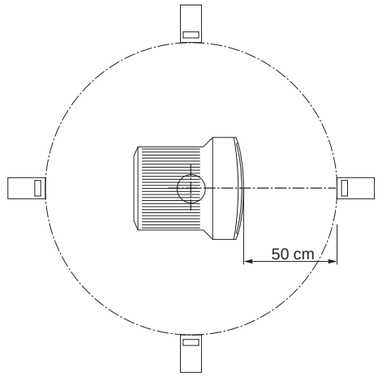
On the following pages you will find report form templates for measuring electric and magnetic fields. Copy the templates, fill them out and then file them in a folder. You can then go back and make comparisons with previous measurements.

Section 4 gives examples of how to carry out measurements, while subsection 4.3 details how to fill out the report forms.

7 References to authorities and organisations

Publication	Publisher/Author	May be ordered from
Magnetic fields and health risks based on what we know	The National Electrical Safety Board	Elsäkerhetsverket Box 1371 SE-111 93 STOCKHOLM SWEDEN Tel. +46 8-519 112 00 Fax. +46 8-519 112 01
Cancer and magnetic fields in workplace	The Swedish Trade Union Confederation	LO-distribution Strömsätragränd 10 SE- 127 35 SKÄRHOLMEN SWEDEN Tel. +46 8-796 25 00
Questions and answers about electric and magnetic fields associated with the use of electric power	National Institute of Environmental Health Sciences and U.S. Dep. of Energy	Superintendent of Documents U.S. Goverment Printing Office WASHINGTON, D.C. 20 402 USA Tel. +1 202-512-1800
A report of non-ionizing radiation	Microwave News	Microwave News Louise Slesin P.O. Box 1799 Grand Central Station NEW YORK, N.Y. 10 163 USA +1 212-517-28000 +1 212-734-0316 mwn@pobox.com

4 Measurement examples



Overhead view.

Side view.

4.1 Electric fields

Below is a suggestion as to how to measure an electric field in a room within the frequency range 30 Hz to 2,000 Hz.

1. Start by carrying out a preliminary measurement with all the pieces of electrical equipment switched on and make a rough estimate of what field sources are present in the room. Draw a sketch of the room. Then measure a number of points at 1-3 metre intervals by taking readings in all directions in a circle around you. Write down the highest value measured at each point on the sketch. Using an arrow, mark the direction in which you obtained the value you have written down. Ideally, note the field levels towards the ceiling and the floor.
2. Then carry out a measurement with all the electrical apparatus in the room switched off to get an idea of the extent of the background fields in the room. Remember that it is probably not sufficient simply to switch off the pieces of apparatus - you will usually need to unplug them in order to completely eliminate the fields. In some cases, the background fields can be as high as the fields from the apparatus in the room.
3. Connect the pieces of apparatus one at a time and measure the electric fields in the directions 0°, 90°, 180° and 270° at distances of 30 cm and 50 cm from the outer edge of the piece of apparatus in question (see figure) or in the direction the operator is facing. Summarise the measurement readings in a report form. An example of how to fill out a report form can be found on page 12. You must not subtract the background values of the electric fields from the measured values. They should always be noted as a comparison.

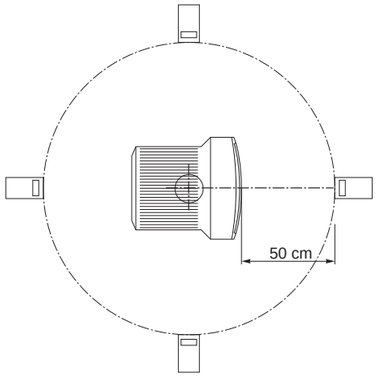
Cont.

4. Analyse the measurement readings and assess the need for remedial action, such as rearranging the furniture in the room and/or moving pieces of electrical apparatus. The sources of the electric fields may be located in adjacent rooms. Certain materials, not only metals, can also function as antennas as they capture fields and increase their spread. Plasterboard and chipboard can have this effect.

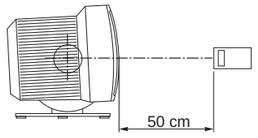
4.2 Magnetic fields

Below is a suggestion as to how to measure a magnetic field in a room within the frequency range 30 Hz to 2,000 Hz.

1. Start by carrying out a preliminary measurement with all the pieces of electrical equipment switched on and make a rough estimate of what field sources are present in the room. Draw a sketch of the room. Then measure a number of points at 1–3 metre intervals and write down the values measured on the sketch. Measure the magnetic field at floor level as well as 0.8 and 2 metres above the floor.
2. Then carry out a measurement with all the electrical apparatus in the room switched off to get an idea of the extent of the background fields in the room. Remember that it is probably not sufficient simply to switch off the pieces of apparatus - you will usually need to unplug them in order to completely eliminate the fields. In some cases, the background magnetic fields can be more powerful than the magnetic fields from the apparatus in the room.



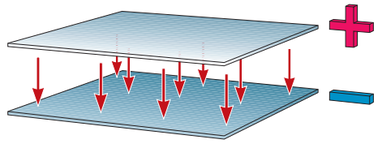
Overhead view.



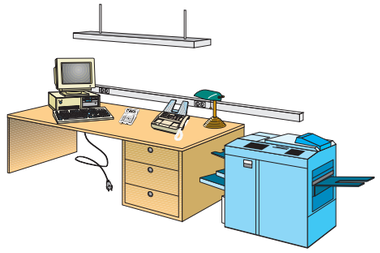
Side view.

Cont.

6 How electric fields arise



Electric field.



Electric fields from our surroundings.

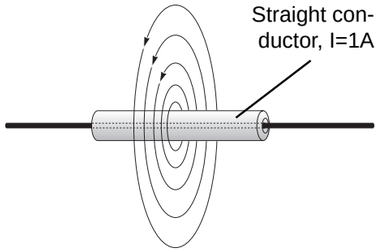
An electric field arises between two objects with different electric potentials. If two plates made of electrically conductive material are connected to a voltage source, one of the plates will have a positive charge while the other will have a negative charge. A voltage arises between the plates and thereby an electric field. The strength of the field depends on how high the voltage is and the distance between the objects.

In a similar way, we are continually exposed to electric fields from pieces of apparatus and electrical installations in our surroundings. The size of the fields around us are difficult to predict as they depend on the connection between the sources of the fields, the people and earthing. There are often a number of different sources of varying strengths in a single room.

Objects that are not connected to electricity can also be affected by electric fields. A metal object can be capacitively charged by nearby cabling or other objects connected to electricity. In simple terms, the metal object functions as an antenna, capturing the electric field and helping it to grow. Examples of such objects include desk frames and electrical devices with non-earthed metal casings. Some types of building material (plasterboard walls, chipboard) can also capture electric fields and increase their spread. When measuring fields in a room which has plasterboard walls, it can sometimes be seen that the fields spread out along an entire wall surface with the highest readings being concentrated around sockets and switches.

Electric fields can be reduced through screening and earthing. It is possible to use shielded cabling or to place screening material around the object that is to be screened off. In order for the screening to be effective, it is important for the screening material to be properly earthed. If this is not the case, screening can have the opposite effect – the fields increase in size.

5 How magnetic fields arise



At 1 m from the conductor, the magnetic flux density is 0.2 µT.

Magnetic fields are caused by electrical currents and always occur in continuous closed paths around the currents that cause them. A live conductor gives rise to a magnetic field, the strength of which is always proportional to the current in the conductor. Magnetic fields are usually depicted with the aid of field lines. The strength of the magnetic field is constant along the conductor in closed paths around the live conductor. In the event of other sources, magnetic fields tend to have a complicated appearance which usually cannot be calculated but have to be measured instead. The unit used to measure the magnetic flux density is called the tesla [T]. Magnetic fields can be caused by electrical devices and installation cables. In certain cases, stray currents can give rise to magnetic fields. In Sweden, for example, the electricity systems generally entail four conductors leading to each building, which can result in major problems with currents of this type. The decay current can pass through the neutral conductor as intended, but it can also pass through the earth conductor and into the plumbing pipework to the transformer's earth point. This increases the magnetic field both along the path of the stray current and along the supply cable. It is also commonplace for stray currents to exist in computer networks. As well as causing magnetic fields, they can also lead to communication problems. In industrial environments, common sources include welding equipment, electric motors and cable clusters.

3. Connect the pieces of apparatus one at a time and measure the magnetic fields in the directions 0°, 90°, 180° and 270° at distances of 30 cm and 50 cm from the outer edge of the piece of apparatus in question (see figure) or in the direction the operator is facing. Summarise the measurement readings in a report form. An example of how to fill out a report form can be found on page 12. You must not subtract the background values of the magnetic fields from the measured values. They should always be noted as a comparison.
4. Analyse the measurement readings and assess the need for remedial action, such as rearranging the furniture in the room and/or moving pieces of electrical apparatus. The sources of the magnetic fields may be located some distance away, and magnetic fields can penetrate almost all building materials.

4.3 Example of report form for measuring magnetic fields

When you measure magnetic fields, you should produce a report form which can act as a basis for any remedial action. Below is an example of a completed report form. Report form templates which you can copy can be found at the back of these user instructions. Once you have filled out the forms, they should be filed in a folder. You can then go back and make comparisons with previous measurements.

Report form for measuring electric fields around an object

Electric field, 30 Hz–2 kHz			Measuring equipment: **Field Finder**
Object: Photocopier			Model: FT 30
Address: 1 North Street			Room: Porter's office
Measured by: J. Smith			Date: 10 March 1995
	30 cm	50 cm	Comments
0°	20 V/m	10 V/m	During copying
90°	30 V/m	10 V/m	
180°	40 V/m	20 V/m	
270°	30 V/m	10 V/m	
Background field	3 V/m	3 V/m	

Notes
The background fields are OK, but perhaps we should screen off the copier or rearrange the furniture.

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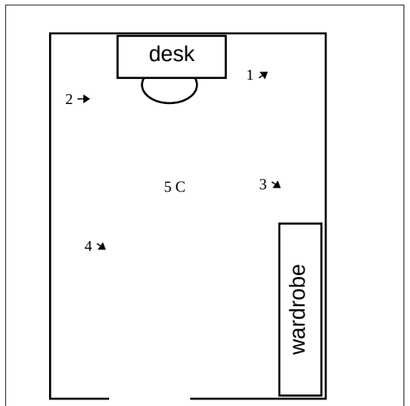
Example of a completed report form for measuring electric fields around an object.

Report form A for measuring electric fields in a room



Sketch of the room with measurement points marked.

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Report form B for measuring electric fields in a room

Electric field, 30 Hz–2 kHz		Measuring equipment: **Field Finder**	
Object:		Model:	
Address: 3 High Street		Room: 123	
Measured by: P. Jones		Date: 13 May 1998	
Measurement points	Measurement reading* V/m	Background field** V/m	Comments
1	14		
2	18		
3	21		
4	7		
5	5		Fluorescent-tube in the ceiling
6			
7			
8			
9			
10			
11			
12			

* In the direction of the arrow on the sketch. 'C' stands for 'ceiling', 'F' stands for 'floor'.
**The background field does not need to be measured at all measurement points.

Notes

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Example of a completed report form for measuring electric fields in a room.