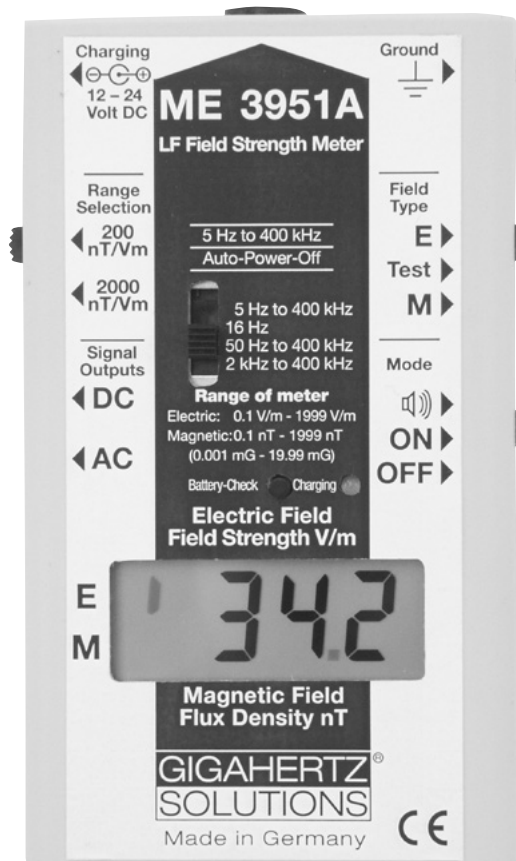


# ME 3951A

**With F1B2H31** (Frequency Filter Module: 16 Hz Band Pass/50Hz High Pass/2kHz High Pass)



## User's Guide

- **Functions & Controls**
- **Operation and Maintenance**
- **Measurement Instructions**
- **Field Theory**

It is important to read carefully the instruction manual prior to using the field meter. Important information regarding safety, use and maintenance is provided herein.

With the field meters of the ME 3 series, GIGAHERTZ SOLUTIONS<sup>®</sup> sets new standards in electromagnetic field testing. Professional measurement engineering is offered with a unique price/performance ratio - the only one of its kind worldwide. This was made possible through the consistent use of innovative integrated components, some of which have patents pending, as well as highly sophisticated production engineering.

The field meter you purchased allows a competent assessment of AC electric as well as AC magnetic field exposures according to the internationally recognized Swedish guidelines for computer monitors (TCO/MPR), covering the entire frequency range from 5 Hz up to 400 kHz.

We appreciate the confidence you showed when purchasing the ME 3951A field meter. With the confidence that your expectations will be met, we wish you great success in collecting useful information with this field meter.

## Contents

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Safety instructions .....	3
Function & controls .....	4
Getting started .....	6
Measurement instructions .....	8
Changing Batteries .....	16
Battery management .....	18

## Safety Instructions:

It is important to read carefully the instruction manual prior to using the field meter. Important information regarding safety, use and maintenance is provided herein.

The adapter is only to be used with the specified, rechargeable battery. Never try to recharge non-chargeable primary batteries (e.g. zinc-coal or alkaline batteries) with it: Explosion Hazard!

The grounding of the field meter required for the electric field measurements should be performed with the supplied grounding lead, which can be connected to bare water, gas or heating pipes. If there is none of the above-mentioned grounding options available, a licensed electrician could temporarily also make use of the grounding conductor in a grounded outlet. In this case, however, an electric shock hazard may occur when the grounding clip touches the current-carrying phase conductor.

To prevent shock hazards or the destruction of the field meter, neither the instrument itself nor the adapter should ever come into contact with water. The penetration of water into the case may lead to the destruction of the electronics inside. Field meters are not to be stored outdoors or used during rain. Clean the case only from the outside, using a slightly moist cloth. Do not use cleaners or sprays.

Prior to cleaning the field meter or opening the case, shut it off and unplug all extension cords. There are no user-serviceable parts inside the instrument.

Due to the high sensitivity level, the electronics of the field meter are very sensitive to heat, impact as well as touch. Therefore do not leave the instrument in the hot sun, on a heating element or the like. Do not let it drop nor try to manipulate its electronics inside when the case is open.

This field meter should only be used for the purposes described herein and only in combination with supplied or recommended accessories.

**Battery Charging**

Extension cord of the supplied adapter: 12-24 VDC, with (+) at the internal conductor and (-) at the external conductor. Only to be used during battery charging see pages 6, 18

**Range Selection**

**200 nT/Vm:** (fine)  
0 to 199.9 Nanotesla (nT)  
0 to 199.9 Volt per Meter (V/m)  
**2000 nT/Vm:** (coarse)  
0 to 1999 Nanotesla (nT)  
0 to 1999 Volt per Meter (V/m)  
see page 9

**DC - Signal output**

0 to -1 VDC Signal output  
Suitable for long-term monitoring with a data logger or data plotter, but also for connecting the optional external display unit (DP 3000A)  
see page 15

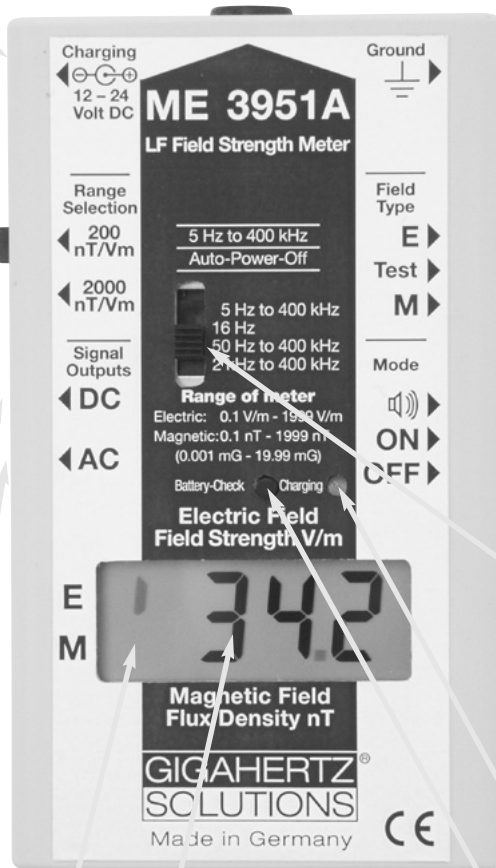
**AC - Signal output**

1 VAC at maximum display:  
Connector for a spectrum analyzer to analyze the frequency spectrum of the measured signals. At maximum display, the maximum frequency output is 30 kHz.  
see page 15

**Display of the Field Type in Use**

**Dash at the top:** Electric field strength is displayed  
**Dash at the bottom:** Magnetic flux density is displayed  
**Two Dashes:** Self-diagnostics

**LC-Display:** 3.5-digit display of the measurement value (mean value)  
see page 19



**Ground**

Connection of the grounding lead (for electric field testing) see page 9

**Field type**

**E:** Electric Field  
**M:** Magnetic Field  
**Test:** Offset Display  
see pages 7, 10, 11

**Operation**

"Speaker Icon": Speaker turned on  
**On:** Field meter turned on  
**Off:** Field meter turned off  
see pages 7, 11, 18

**Frequency Filter F1B2H31**

16 Hz Band pass, 50 Hz High pass, 2 kHz Highpass, for building biology assessments to identify railway systems, electric power grid as well as harmonics of higher frequencies  
see pages 11, 12, 14

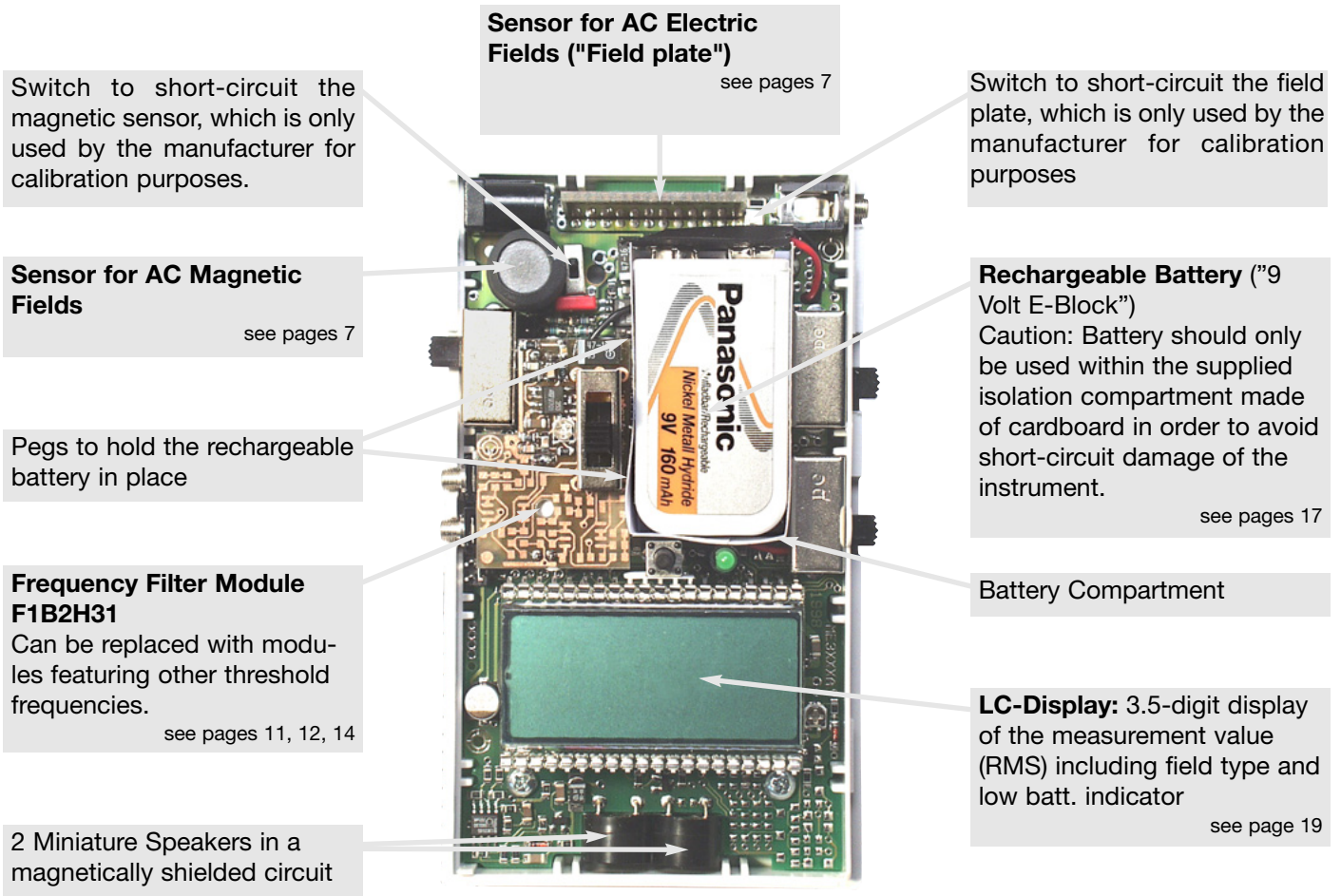
**Light diode:**

comes on while battery is being charged  
see page 18

**Button**

to be pressed for the display of the battery status as well as the display check  
see page 19

Picture 01



**Sensor for AC Electric Fields ("Field plate")**  
see pages 7

Switch to short-circuit the field plate, which is only used by the manufacturer for calibration purposes

Switch to short-circuit the magnetic sensor, which is only used by the manufacturer for calibration purposes.

**Sensor for AC Magnetic Fields**  
see pages 7

**Rechargeable Battery ("9 Volt E-Block")**  
Caution: Battery should only be used within the supplied isolation compartment made of cardboard in order to avoid short-circuit damage of the instrument.  
see pages 17

Pegs to hold the rechargeable battery in place

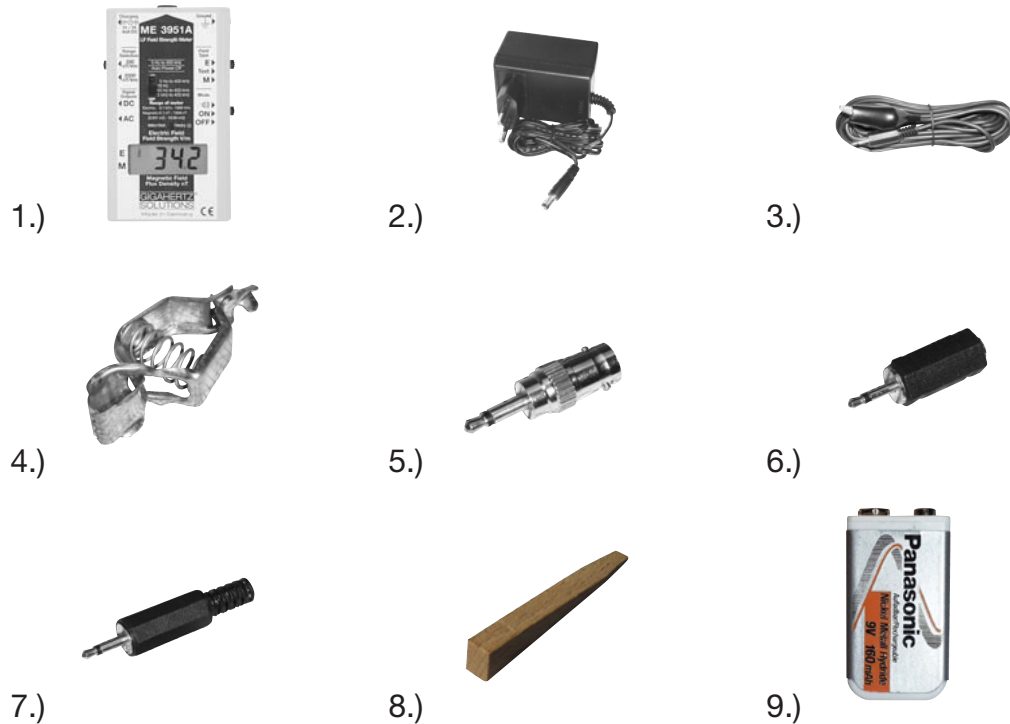
Battery Compartment

**Frequency Filter Module F1B2H31**  
Can be replaced with modules featuring other threshold frequencies.  
see pages 11, 12, 14

**LC-Display:** 3.5-digit display of the measurement value (RMS) including field type and low batt. indicator  
see page 19

2 Miniature Speakers in a magnetically shielded circuit

Picture 02

**Instrument Contents:**

- 1.) Field meter
- 2.) Adapter with external voltage jack (2.0 mm)
- 3.) Grounding lead (5 m) with jack plugs (2.5 mm, mono) and alligator clip
- 4.) Grounding clip
- 5.) BNC measurement adapter on jack plug (3.5 mm, mono)
- 6.) Measurement jack adapter (3.5 mm, mono) on jack plug (2.5 mm, mono)
- 7.) Jack plug (2.5 mm, mono) for creating your own measurement adapter
- 8.) Wedge for opening the case to change batteries or frequency filter modules
- 9.) Rechargeable battery with 9 V nominal voltage (Depending on shipping conditions, it is sometimes already inserted into the field meter).

**Getting Started****Turning On**

If no display is activated, insert rechargeable battery. (See section "Changing Battery").

**Charging**

If display shows low-batt. indicator, charge battery or insert a fully charged battery. (See section "Battery Management").

## Function Testing - Display of Magnetic Flux Density:



Picture 03

1. Display:  
Field Type = "M", Measurement Range = "200 nT/Vm", Frequency Range = "5 Hz - 400 kHz", Operation = "Speaker Icon"
2. Move the field meter in fast and short movements around its longitudinal axis back and forth, as shown in picture 03.

As a result, the static geomagnetic field is turned into a "quasi alternating field." The faster and greater the movements, the stronger the induced alternating field will be. This will be reflected in the higher measurement values on the display and the faster "rattling" noise from the speaker, which is proportional to the field strength.

## Function Testing - Display of Electric Field Strength:

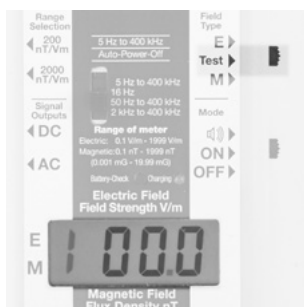


Picture 04

1. Display:  
Field Type = "E", Measurement Range = "200 nT/Vm", Frequency Range = "5 Hz - 400 kHz", Operation = "Speaker Icon"
2. Keep the field meter steady while tapping the front of the case with your fingers, as shown in picture 04.

Due to your fingers' mass potential a "quasi AC electric field" is created whose strengths is reflected through higher measurement values on the display and the faster "rattling" noise from the speaker.

## Defining the Offset:



Picture 05

Turn on the instrument and set the switch "field type" to the "test" position. On the left-hand side of the display a "1" (as icon for the test mode) will appear and on the right-hand side either "00.0" or "000", depending on the selected measurement range.

If instead of "000" or "00.0" a higher measurement value is displayed, this value would reflect the current deviation from zero.

Such a situation can occur because of current environmental conditions (e.g. temperature, air humidity, etc.) The tolerance of the subsequent electric and magnetic field measurements will be increased by this deviation value.

## Measurement Instructions

### Introduction to the Properties of AC Electric and Magnetic Fields

Generally speaking, the sensory organs of the human body cannot perceive alternating electric and magnetic fields. These fields are "simply there" and expand into three-dimensional space, following rather complex physical laws. For measurement practice, the following properties of alternating electric and magnetic fields are very important:

1. Any measurement is always determined by position as well as direction. The slightest change in position or direction of the field meter can have substantial consequences for the measurement value, especially in AC magnetic fields.
2. Electric as well as magnetic fields not only penetrate into solid materials including walls, glass or the like, but also pass right through them. This holds especially true for magnetic fields, whose shielding is rather costly.
3. AC electric fields occur whenever an alternating voltage is applied. In residential situations, for example, all plugged-in extension cords and appliances including switches are surrounded by alternating electric fields. This even holds true when the appliance is turned off! As soon as an appliance is turned on, there is current flow and an AC magnetic field is added.
4. Beside the field strength, AC electric or magnetic fields are also characterized by their frequency. We distinguish between the low frequencies of the ELF and VLF range between 5 Hz and 400 kHz as defined by the MPR/TCO guidelines for the assessment of computer monitors as well as all the higher frequencies including radio waves and microwaves. Furthermore there are also static magnetic and electrostatic fields, each of which requires a totally different approach to testing just like RF radiation.

### Introduction to Measurement Instructions

In order to obtain meaningful testing results, the Ökotest magazine (6/96) demands the following minimum requirements for testing equipment of electric and magnetic fields in the ELF and VLF range:

1. Separate measurements of AC electric fields (with ground reference) and AC magnetic fields.
2. Reproducible, high accuracy.
3. Flat frequency response across the entire specified frequency range, which should at least cover the railway frequency 16.67 Hz all the way through to the kilohertz range (only in Europe).
4. High sensitivity: 10 nT or 1 V/m, or better.

The field meters by GIGAHERTZ SOLUTIONS<sup>®</sup> meet all the above requirements.



## Preparations Prior to Testing

1. Check the field meter according to the instructions laid out under "Getting Started".
2. First of all take measurements of AC electric and magnetic fields outdoors to get a feel for the background radiation. If the field meter registers more than 5 V/m or 5 nT (0.05 mG), this will give you an idea of the background exposure. By means of turning off the circuit breakers in the main panel, it is possible to determine which of the fields are caused from inside the house and which ones from outside such as high-tension power lines, railway trails, pole-mounted or surface transformers as well as neighboring houses/apartments. If external fields are suspected, their sources can be traced by moving the field meter into the direction of the highest readings.
3. When performing an EMR survey in homes or at workplaces, all typical electric appliances and electronic devices should be turned on, also including those that come on only temporarily such as refrigerators or storage space heaters (e.g. in adjoining rooms). By turning the various appliances off and on, it is possible to locate the most important field sources.
4. A sketch of the area to be measured that shows the corresponding test results and allows for a later analysis of the situation. Thus appropriate remediation strategies can be assigned.
5. Start with the measurement range "200 nT/Vm." Only if the display goes in overload because of rather high ambient field strengths, switch to the higher range "2000 nT/Vm".
6. Ideally, all measurements are to be repeated during various times of the day and on different days of the week in order to identify fluctuations.
7. The additional sound signal that is proportional to the field strength makes the detection of field sources easy.

## Measurement Instructions - AC Electric Fields

### 1. Grounding the Field Meter and the Person Performing the Testing

According to relevant guidelines (TCO, MPR II, TÜV), prior to any electric field testing the field meter needs to be connected to ground potential through the supplied grounding lead in order to obtain reliable, reproducible testing results. Without a proper connection to ground potential no reliable statements on AC electric fields can be made.



Picture 06

Unvarnished, metal piping for water, gas or heating can be used to connect the grounding lead with its grounding clip. As an alternative, a licensed electrician could also use an alligator clip to establish a grounding connection through the grounding conductor in a grounded outlet. Warning: In case the phase conductor is touched, an electric shock hazard may result.

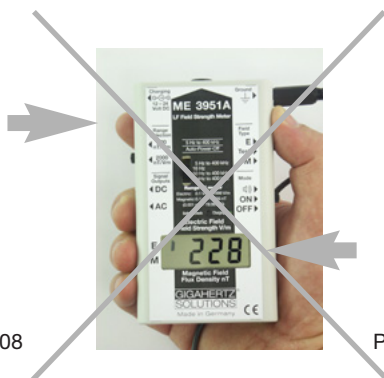
Insert the jack plug of the grounding lead into the dedicated socket ("ground", "ground icon") and at the same time run the grounding lead alongside the case to the back. Touch the "AC" or "DC" socket with your finger in order to bring your own body to ground potential. Picture 07



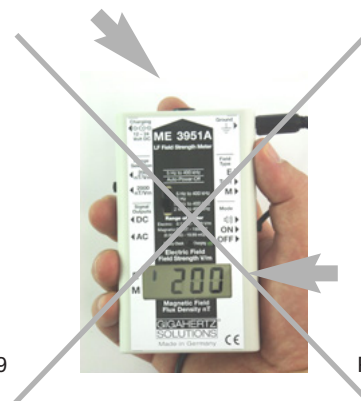
Picture 07



Picture 08



Picture 09



Picture 10

**Caution:** In case the grounding lead runs in front of the instrument case or a finger is between the DC socket and the front of the instrument case, testing results will become distorted. (See also footnote 1)

**2. Positioning of the Field Meter for AC Electric Field Testing**

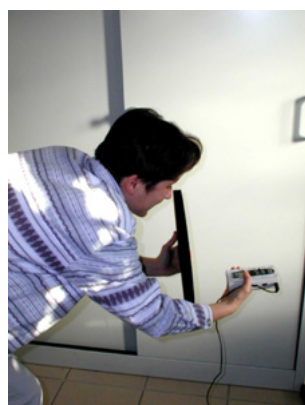
The field meter is calibrated for measurements taken in close proximity to the body (Picture 11). The field sources located behind the field meter are shielded through the body. Therefore misleading concentrations of field lines onto the electric field sensor are avoided. Therefore try to avoid taking measurements with a stretched-out arm. In general, this would lead to higher testing results (Picture 12). This type of distortions can be reduced or avoided by placing a conductive surface behind the field meter. (Picture 13, see also footnote 1)).



Picture 11



Picture 12



Picture 13

1) The electric field strength measured with ground reference always depends on the geometry of the field source and the sensor, the distance between sensor and field source as well as ambient potentials. Following TCO guidelines, the ME 3951A is calibrated according to the TCO-calibrated field meter "Radians Innova - Enviromtor EMM-4 (Serial. No. 4348)" at a distance of 50 cm from a 4-sqm large copper plate operating at 50 Hz and 270 V. Instead of a person, which is also grounded during testing in the field, a grounded, square copper plate measuring 50 cm (ca. 20") on its sides is placed behind the field meter during calibration. The same procedure is recommended for reproducible tripod measurements. Testing results of the ME 3951A can only be expected to correspond with those of an original TCO sensor when the distance from the field plate is greater than 30 cm (12"). The measured field strength represents a spatial integral across the testing equipment, whose simplification "measurement value in the direction of the highest display = resultant field strength" is a good approximation for practical purposes.

## 3. AC Electric Field Testing



Picture 14

Turn on the field meter and set the switch "Field Type" to "E" for AC electric field. (Picture 14)

Set the switch for the frequency filter to "50 Hz to 400 kHz". Thus self-inductions due to micromovements (shaking of hand) will be suppressed. (Picture 14)

During testing always ensure that the grounding lead runs to the back of the case and that the person performing the survey as well as anybody else present are located behind the field meter.

Keep the field meter close to your body. The further away you hold the instrument or if it is even put down, the falsely higher the testing results tend to become. Either point to the suspected field source or - if no such concrete source is known - check the space systematically. Proceed as follows:

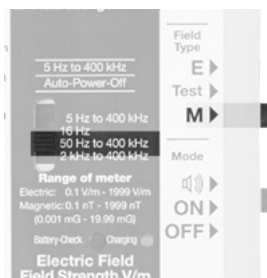
- First of all, move slowly through the room to be measured.
- Stop frequently and take measurements pointing to the back, to the left, to the right and to the ceiling. Always keep in mind to have the grounding lead run to the back of the instrument.
- Follow into the direction of the highest reading in order to identify the field source.
- In areas where people spend substantial amounts of time such as in bed or at a workplace, check all directions as mentioned above and make note of the orientation of the field meter at maximum readings. In such a position, a reference measurement of the absolute value should be taken as close to the body as possible.
- After having checked all directions, the maximum measurement value can be used as a first approximation of the resultant field strength.(See footnote 1))

When the field meter is placed on a tripod or on a table, it is necessary to also place a person 5 cm (2") behind the instrument to obtain accurate measurements. For reproducible measurements, a metal plate (50 cm x 50 cm) is required to be orthogonal and centered 5 cm behind the instrument.

An EMR survey of sleeping areas should also include measurements under "sleep conditions," that is bedside lamp turned off. Under certain circumstances the electric field can even increase after something was turned off.

**Recommended Exposure Limit up to 2 kHz:  
Below 10 V/m, better yet below 1 V/m.  
(For frequencies above 2 kHz always below 1 V/m)**

**AC Magnetic Field Testing:**



Picture 15

Turn on the field meter and set the switch "Field Type" to "M" for AC magnetic field. (Picture 15)

Set the switch for the frequency filter to "50 Hz to 400 kHz". Thus self-inductions due to micromovements (shaking of hand) will be suppressed. (Picture 15)

For reliable measurements of AC magnetic fields, neither the field meter nor the person performing the measurements need to be grounded. Other persons or mass potentials in the vicinity of the field meter do not affect the testing results.

If a field source is suspected, point into that direction. Otherwise check the space systematically. Proceed as follows:

- First of all, move slowly through the room to be measured. The magnetic sensor is positioned in such a way in the instrument that most typical field sources in residential settings are detected as long as the field meter is held horizontally. In addition, all three dimensions should be checked from time to time as shown in the pictures 16 through 18.
- In practice, the identification of a field source has proven to be most effective by locating the direction of the highest reading first. Then you follow the direction, which continues to show increasing measurement values. Simply keep the field meter aligned in the direction of the maximum readings. For an accurate measurement, however, hold the instrument very steady or put it down at a relevant measurement point.
- In the important places where we work, sit or sleep, all three dimensions of AC magnetic fields should be checked each time. Proceed as follows.

**Accurate Measurement of the Magnetic Field Strength in the Presence of Several Field Sources**

In this event, it is necessary to take three separate measurements and write the readings down. The field meter should be held as shown in the pictures: point to the front (Picture 16), to the ceiling (Picture 17) and to the side so that it is perpendicular to the front axis (Picture 18).

In order to estimate the resultant, that is the actual AC-magnetic-field exposure, the following rules of thumb can be applied.

**Rules of Thumb for Estimating the Total Magnetic Field Strength**

Measurement Value:

Corresponding Total Magnetic Field :

- |                            |  |
|----------------------------|--|
| - One high, two low values | ~ Highest value                                    |
| - Two high, one low value  | ~ Highest value + half of the second highest value |
| - Three similar values     | ~ One and a half times of the highest              |



Picture 16



Picture 17



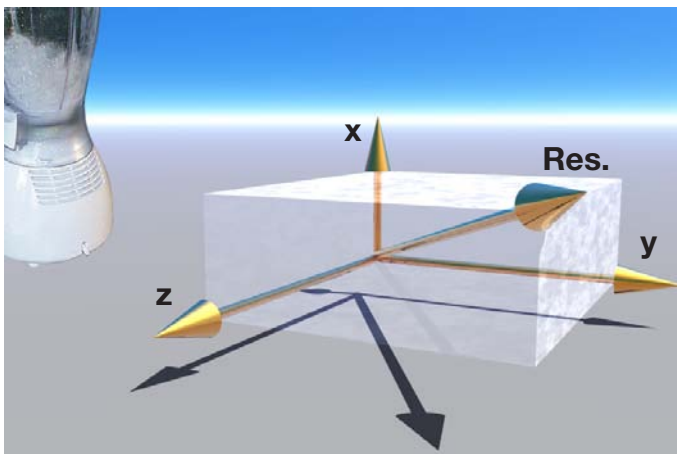
Picture 18

**Recommended Exposure Limit up to 2 kHz:  
Below 200 nT, better yet below 20 nT.  
(For frequencies above 2 kHz below 20 nT, better yet below 2 nT)**

The resultant, total magnetic field strength (the sum of the single field strengths, 3-D Measurement) can be accurately calculated according to the following equation:

$$\text{Resultant Field Strength} = \text{Square Root}(x^2 + y^2 + z^2)$$

Picture 19 illustrates the direction of the resultant field, which is also called "substitute field." The photos for pictures 16 through 18, showing the single measurements of the three dimensions, as well as picture 20 were taken in a kitchen during a typical testing session. If you would insert the display values in the above equation, the result would come very close to the value, which is displayed in picture 20. There the field meter is held perpendicular to the resultant field.



Picture 19



Picture 20

## Frequency Analysis (AC Electric and Magnetic Fields)

An AC electric or magnetic field is not only defined by its field strength, but also by the frequency with which the polarity of the field changes. We encounter various common frequencies:

- Overhead railway wires operate at 16.7 Hz (only in Europe).
- The electric power grid (home wiring, high-tension power lines) operates at a 60-Hz frequency in North America and at a 50-Hz frequency in Europe. So-called natural harmonics are the multiples of the respective fundamental frequency (50 Hz or 60 Hz).
- In addition, various electronic devices are used in our homes that generate a variety of fields with higher frequencies in the kHz range (artificial harmonics) such as switch-mode power adapters ("transformers"), ballasts of fluorescent tubing and energy saving lamps as well as dimmer switches with so-called switch mode technology and the like.

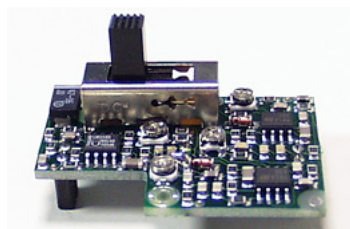
For the assessment of a certain area and especially with regards to appropriate remediation strategies, it is very useful to know how many of the different frequencies contribute to the total exposure. An exposure caused by overhead railway wires, for example, cannot be remedied by installations of the homeowner. However, it is possible to avoid certain signals of the kHz range by choosing devices without such emissions (e.g. incandescent lamp instead of fluorescent tubing) (only in Europe).

The ME 3951A field meter offers you different options to analyze frequencies:

## Frequency Analysis with Frequency Filter Module F1B2H31



Picture 21



Picture 22

Depending on the testing situation, GIGAHERTZ SOLUTIONS<sup>®</sup> offers several different frequency filter modules for the ME 3951A. The Frequency Filter Module F1B2H31 (Picture 21/22) already supplied with the field meter is specifically designed for building biology needs. The following frequencies can be selected:

- 1) 5 Hz to 400 kHz = Entire TCO frequency range, best suited for tripod measurements
- 2) 16.7 Hz = 4th order band pass filter with Q-Factor 10 for the frequency of overhead railway wires (only in Europe)
- 3) 50 Hz to 400 kHz = 5th order high pass filter for the electric power grid and its harmonics
- 4) 2 kHz to 400 kHz = 5th order high pass filter for so-called artificial harmonics above 2 kHz. This frequency range corresponds with band 2 of the Swedish TCO guidelines.

In order to measure fields of overhead railway wires or harmonics, first the respective filter in the

field meter needs to be activated. Generally speaking, the testing follows the same principles as described in the section "Measurement Instructions" for the fields of the power grid system. There are only two points, which deserve special mention here:

- Usually the source of the railway currents is located outside of a house. It is recommended, nonetheless, that the entire house is roughly checked anyway because sometimes railway frequencies can also be found on, for example, water or gas piping as well as the electric wiring system due to coupling effects. If a house to be tested is closer than 2 to 3 km to an electric railway track, such potential sources should be checked to be on the safe side.
- "Artificial" harmonics usually are less energetic than power or railway frequencies and therefore show lower testing results. For this frequency band, however, all renowned institutes recommend exposure limits that are 10 times lower than those for power frequency fields. Therefore the frequency range "200 nT/Vm" is usually sufficient.

**Note:** Due to  $1/f$  higher and white noise, filter tolerances, micromovements of the instrument and frequencies beyond the filtered frequency bands, the testing results of the position "5 Hz to 400 kHz" can deviate from the sum of the filtered values.

## Frequency Analysis via AC Output

Even in a "normal" work and living environment it is possible to encounter a great variety of frequencies in addition to the power frequency 60 Hz or 50 Hz, respectively. For a more detailed analysis of the different frequencies, a spectrum analyzer can be connected directly to the AC output of the field meter by means of the supplied adapter. At the AC output a DC offset of maximum 50 mV is applied. It is standard in oscilloscopes and spectrum analyzers that this DC offset is usually suppressed by a capacitive coupling. In case the peripheral analysis instruments are connected to the power grid including grounding conductor, the grounding of the field meter should not be connected in order to avoid ground loops!

Following convention, the technical specifications of the field meter refer to the maximum values given on the display, according to which the bandwidth of the AC output is limited to 30 kHz. If, however, the measurement value is less than  $1/20$  of the maximum reading (e.g. in the measurement range 2000 nT this would equal 100 nT), there is still a sinusoidal input signal up to 400 kHz with a non-linearity  $< 1\%$  provided at the AC output. Since the field strengths in home and workplace settings often are in this range and not that much higher, this output can actually be used up to 400 kHz then.

With a mono headset (adjustable volume is recommended) plugged into the AC socket, it is possible to perform a rough acoustic frequency analysis across the audible frequency range (ca. 16 Hz to 20 kHz). If needed, use adapter plug. The headset LS0002 is available as an accessory from GIGAHERTZ SOLUTIONS®.

## Data Logging via DC Output

The field strength of a given point in space often changes over a longer period of time. For a complete assessment, it is recommended to monitor the field strengths (DC values), for instance, for 24 hours. Therefore the field meter comes equipped with outputs where data logging and analy-

sis equipment can be connected. In general, the DC output (direct current output) is used for long-term monitoring with, for example, data loggers or data plotters.

Across the DC output a DC signal is applied, which is proportional to the measurement values. It equals minus 0.5 mV per digit. That would, for example, translate into minus 1 Volt at a maximum reading "2000 nT/Vm" or "200 nT/Vm". The negative signal was preferred over the positive signal because it clearly offered better linearity and correspondence with the display value. Most analysis instruments can internally convert the input signal into the appropriate absolute value. If this is not the case, simply reverse the polarity of the plug of the analysis instrument in order to display positive values. When using the BNC adapter, the shielding of the testing lead is connected to mass potential. Even though the maximum values of the display show either 2000 nT or 2000 V/m, the DC signal at the DC output is actually still quite linear up to 5000 nT or 5000 V/m, respectively. The technical specifications of the field meter refer to the values shown as maximum values on the display. As long as a jack plug is plugged into the DC socket, the "Auto-Power-Off" function is deactivated in order to accommodate long-term data logging.

Caution: If during data logging the battery runs so low that "low Batt." is displayed, the "Auto-Power-Off" function will be activated in order to prevent the battery from becoming completely discharged, which otherwise might destroy the rechargeable battery.

24-hour data logging can be supported through a connection to the electric power system via the adapter or a 12 V battery. In the event a power outage occurs during data logging, the rechargeable battery in the instrument will take over automatically. As soon as electric power comes back on, the instrument will automatically switch back to the adapter. Place the adapter as far away from the field meter as possible in order to keep the detection of its emissions as low as possible. By making note of the field strength with and without having the adapter plugged into the outlet, it is possible to calculate the correction value, which of course should be subtracted from the total measurement values.

## Changing Batteries

### Opening the Case



Picture 23

Turn off the field meter and disconnect all extension cords plugged into it. Having the labeled side facing up toward you, hold the field meter in your hand or put it down on a table.

Use the supplied wedge to open the case.



Picture 24

1. While opening the case, hold the instrument firmly in one hand and with the other insert the wedge into the notch on the side, about 1 cm (1/2") below the upper corner, and press the wedge down on its thick end. There the lid will then lift slightly. Picture 23.





Picture 25

2. The same procedure shall be repeated on the same side, but this time about 1 cm (1/2") above the lower corner. Picture 24

Now the cover is open on one side.



Picture 26

3. Points 1 through 2 will also have to be repeated on the opposite side. Pictures 25 and 26

Now the cover can be easily lifted off.

## Closing the Case



Picture 27

Place the cover flush with the open field meter. Ensure that the battery check button, the light diode and the frequency filter button all fit snugly into their designated openings in the cover. Using thumbs and pointing fingers of both hands, press down on the cover with a steady and gentle pressure. As a result, the cover will snap into its place on both sides. Picture 27

## Removing Batteries

Change batteries only while the instrument is turned off!



Picture 28

After having opened the cover, the rechargeable battery including its clip can be removed or lifted out sideways.

In order to remove the battery clip from the rechargeable battery, slip the small end of the wedge as far up between both contacts as possible, then move the wide end of the wedge up and down. Thus the clip can be easily detached. Picture 28

**Under no circumstances ever pull at the leads or the plastic clip of the contacts; otherwise they can easily be damaged or broken.**

## Inserting Batteries

Attach the new rechargeable battery to the battery clip and place it back into the battery compartment. While putting the battery back into the compartment, ensure that none of the battery

leads will get trapped between the battery and some protruding part from the circuit board. In this case you would be unable to slide the cover back properly.

In order to replace the supplied frequency filter with another one from GIGAHERTZ SOLUTIONS<sup>®</sup>, please follow the instructions enclosed with the new frequency filter.

## Battery Management

### Operating Time:

Immediately after having recharged the supplied battery for a total of 11 continuous hours, it can be operated continuously for about 8 hours.

### Battery Charging:

First, plug the supplied or a similar power adapter into an outlet. Insert the low-voltage jack of the power adapter into the designated socket (upper left).

**Caution:** Take great care that the polarity of the adapter ((+) internal conductor and (-) external conductor) as well as the corresponding voltage (12-24 VDC) are correct!

In order to start charging the battery, turn on field meter and then off just once. After that leave it turned off.

The green light of the diode will shine during the charging. After about 11 hours the charging mode will be turned off automatically.

### Low Batt.:



Picture 29

1. When the field meter is turned on and the two dots appear in the display (low batt.), the battery is in a low state. Using the meter in this condition will cause measuring errors. Picture 29

But even before the low-battery indicator comes on, you can find out the charge status of the battery with the "Batt. Check" by pressing the respective button.

### Auto-Power-Off

This function conserves energy and extends the total operating time.

1. In case you forgot to turn off the field meter or it was accidentally turned on during transport, it will be automatically shut off after 40 minutes of continuous use.

- When two dots appear in the center of the display (low batt.), the field meter will be turned off after 3 min in order to protect the rechargeable battery from becoming completely discharged, which would cause damage.

In order to turn on the field meter after an Auto-Power-Off, simply turn it off and on again.

**Caution:** If the DC signal output is connected, the normal Auto-Power-Off function is disabled. This way it becomes possible to perform data logging supported by the rechargeable battery, up to 8 hours. The low-battery shut-off, however, will kick in after 3 min just the same in order to protect the rechargeable battery from the damages of a complete (deep) discharge.

With an alkaline battery, it is possible to perform 24-hour data logging.

**Caution:** If an alkaline battery is being used, under no circumstances ever should the power adapter be connected at the same time. Otherwise the battery may explode.

## Checking Battery Status and Display-Check



Picture 30

Since the integrated rechargeable battery is not always charged completely, it is possible to find out the remaining operating time as well as the proper functioning of all display segments by pressing the "Batt.-Check" button.

- In order to check the battery status, simply turn on the field meter, press the button and continue to keep it pressed. If the display shows "1999" or "1888," the instrument is optimally supplied with power and all display elements function accurately. Picture 30.



Picture 31

- When the instrument is turned on and the low battery button is pressed, "low batt." in the center of the display indicate that under normal conditions the operating time will be less than 1 hour. Picture 31

If need should be, recharge battery or turn off field meter.

## Contact:

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# ME 3951A mit F1B2H31

**Professional Dual Function - Gauss/Tesla meter for AC electric and AC magnetic fields 5 Hz to 400 kHz with integrated Frequency Filter Module**

## Technical data

	magnetic flux density one dimension in nT/mG		electric field strength against ground potential in V/m	
Frequency Range	5 Hz to 400 kHz (-1 dB limit)		5 Hz to 400 kHz (-1 dB limit)	
Range Selection	200,0 nT	2000 nT	200,0 V/m	2000 V/m
Resolution*	0,1 nT	1 nT	0,1 V/m	1 V/m
basic tolerance* (50 Hz traceable calibrated normal)	± 2 %	± 2 %	± 2 %	± 2 %
Linearity Deviation* (at 50 Hz)	± 0,3 nT	± 3 nT	± 0,2 V/m	± 0,2 V/m
Offset* (at 50 Hz)	± 0,4 nT	± 4 nT	± 0,4 V/m	± 0,4 V/m
Power Supply	15 - 20 mA, according to the mode of operation			

\* At 20°C and 45% of the relative air humidity

Measuring procedures according to the international. Recognized standards of workstations (TCO and MPR).

Dimensions 74 x 122 x 31 mm, weight appr. 196 grams.

## Further functions and equipment

3.5-digit LCD easy to read display, indication of field type being measured and low Batt.

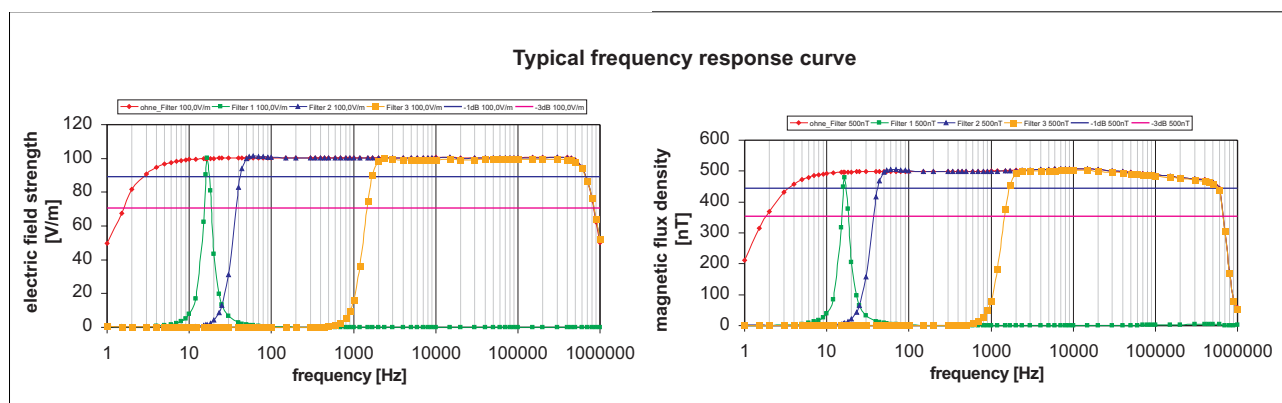
Tone signal proportional to field strength.

Signal outputs for AC-signals up to 30 kHz and DC-signals. To connect for ex. data loggings, plotters or head phones for acoustic frequency analysis.

Test mode to correct Offset.

Instrument Contents:

- 16 Hz band pass filter 4th order, Q-Factor 10, be selected
- 50 Hz high pass filter 5th order, be selected
- 2 kHz high pass filter 5th order, be selected
- High flexible grounding lead (5 m) to measure electric field strength.
- BNC measurement adapter to connect with a spectru analyzer
- Detailed spezifications and user's guide



## Power Supply

Integrated rechargeable battery with a soft **battery charge management**, to protect from becoming completely discharged or overcharged.

Operating time 8 hours according to the mode of operation.

**Battery low indicator** and **auto power off** function (auto power off is not active when data logging).

12 VDC adapter to charge the rechargeable battery included.

## Optional Accessories

**Calibrating Certificate** ( calibration periode: 1 year).

Stable plastic box with protectors.

External **extra rechargeable battery** with high capacity for data loggings (> 48 hours)

Extra, **external Display Meter** to measure in areas with difficult or no entries or for observation the measurement by a 2nd person.

Retrofitable **Frequency Filter Modul** with extra switchable limiting frequencies.

## Guaranteed Quality

Innovative electronics, patented technology.

Durable precession through **self calibrating circuit elements**.

Made in Germany, state of the art SMD

Manufacturing process.

High end components, FR4 material and reproducible manufacturing methods.

2 Years Warranty on manufacturing defects.