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Instructions for the "Acousticom"

(Model: Acousticom-2 Broad Spectrum RF Test Meter)

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A. Important Note about the Battery!

When the Acousticom is on, the small LED right above the On/Off button should always be green. This means that the battery is good. If this LED is red, this means that the battery needs to be replaced. (Of course if the batteries are completely dead, nothing will happen when you try to turn the meter on.)

To install a new battery, slide down the cover at the lower back of the meter. Insert a fresh 9 Volt battery. Be careful to install the new battery with the correct "+" and "-" positions.

Note: It is always good to turn off the meter when not in use, to help save battery life. To turn it off, hold the On/Off button down for several seconds (until the meter turns off). As an added feature, the test meter will also turn itself off after a few minutes to save battery life.

B. Introduction to the Acousticom-2 RF Test Meter…

The Acousticom is a very sensitive test instrument for measuring the approximate strength of the radio frequency (RF) fields, a special type of electromagnetic field (EMF). There are two main ways to use the Acousticom:

(a) Watch the colored LEDs that light up along the vertical column. These LEDs will indicate the relative strength of the RF field.

(b) Listen to the audio output from the speaker. This helps to indicate the type of RF field that is being sensed, as well as its relative strength.

The manufacturer's instructions for the Acousticom are minimal. These supplemental instructions will give further information about the meter and how to use it properly.

C. Simple Instructions for the Beginning User…

Turn on the Acousticom by pressing the On/Off button. The green LED above the On/Off button should be lit up green. This indicates that the battery is good and the meter is on.

You will also see the entire column of colored LEDs light up for a moment when the meter is first turned on. This is normal, and it shows you that the LEDs are working properly.

Hold the Acousticom by the bottom end of the meter, keeping your fingers away from the top end where the RF sensor/antenna is located. This helps to keep your own hand from interfering with the measurements.

The RF fields can vary greatly, even in the same room. Begin your measurements by slowly moving your meter through the entire room, noticing which LEDs are lighting up.

As you are doing this, slowly tilt the body of the meter around in different orientations/angles to help detect the strongest “direction” of the field. For example, first try holding the meter flat horizontally, then vertically with the back facing away from you, then again vertically with the back facing to the left or the right.

The LEDs show you the approximate strength of the RF field in units of “volts per meter”, which is often abbreviated as “V/m”. There are many possible units of measure for radio frequencies, and the attached chart can help you convert to other units if you wish. To keep it simple for now, simply use the "volts per meter" measurements shown next to the colored LEDs.

Finally, I recommend that you write down your measurements with a pen and paper, along with the unit of measure, time and location for each test. And because the RF levels can vary, for example at different times of the day, it may be important to take repeated measurements.

D. How to Use the "Audio" Function…

One of the most helpful features of the Acousticom is the audio function. This special feature can help you determine (1) what specific kind of RF field/source is being detected and also (2) exactly when it is being emitted. For example, by listening to the distinctive sound output, you can tell the difference between a cell tower source and a Wi-Fi router, or you can detect the moment when a smart meter is emitting an RF pulse.

When you first turn the Acousticom on, the audio function is off. To turn the audio on, press the On/Off button again. After that, each repeated press of the On/Off button simply toggles the audio function from on to off, or off to on. (Note: to turn the entire meter off, keep holding the On/Off button for several seconds.)

Most modern RF sources will generate distinctive sound patterns on the Acousticom. With personal experience, you will learn to recognize the different types of sounds associated with the different RF sources. (You can hear a few of the most common RF signals at http://www.emfields-solutions.com/detectors/acousticom-2.asp.)

If you hear a distinctive sound on the Acousticom near a Wi-Fi router, try unplugging the power to the router and see if the signal/sound goes away. If it does, you know that the router is the source. If the sound does not go away, continue unplugging or removing devices until you find the particular device that is making that sound/signal.

To learn the distinctive sound of the RF microwaves emitted from cell towers, try using your Acousticom near a known and obvious cell tower antenna site. The distinctive sound pattern of the cellular antennas will usually be loud and obvious.

The sound function is actually very sensitive, in that it can detect even lower RF levels than the colored LEDs will show. If none of the measurement LEDs are lit up, you may still hear a distinctive sound of some remaining RF source in the background. If you are a highly sensitive person, this may actually be very helpful, and you may want to pay attention to the sounds you hear on the Acousticom even at these relatively low levels.

And finally, if you are testing in a very "clean" environment – one that is relatively free of any radio frequency fields – all you will hear from the Acousticom sound function is a soft and almost soothing "white noise" sound in the background. In modern environments, this is becoming relatively rare and difficult to find.

E. How to Disable the Alarm Function…

The Acousticom has an alarm function. It makes a warning sound to alert you when very high RF levels are detected. You will hear it as a loud and constant clicking sound. To stop the alarm, turn the meter off and then back on again.

You can disable the alarm function, but only temporarily. To do this, keep the On/Off button pressed down for a few seconds when you first turn on the meter, until

the LED lights have finished their startup sequence. The alarm is now disabled until you restart the meter again.

F. Tips for Better Accuracy…

1. Hold the Acousticom at the bottom and point the back of the meter away from you, toward the RF source. The sensor/antenna is located at the top end of the test meter and towards the back. Try to keep your hands away from that part of the meter to avoid shielding the antenna with your own hand.

2. As much as possible, hold the Acousticom with your arm extended out and away from your body. Again, this will help to reduce any shielding or interference effects from your own body.

3. To measure a specific RF source, like a Wi-Fi router or cordless telephone base, make sure that there are no objects or parts of your own body located between the RF source and the test meter. Typically, you will point the back side of the test meter toward the RF source.

4. RF fields can be directional (stronger in one direction than another), and the Acousticom's sensor is sensitive to directional placement. To make sure that you detect and measure the strongest direction of the field, slowly rotate the body of the meter around into various orientations. For example this would include holding the meter (1) horizontally flat, (2) upright with the display facing towards you, and (3) upright with the display facing to the right or left side.

5. The RF levels can also vary dramatically from one place to another – even within the same room. The actual levels will depend on exactly how the various RF fields are reflected and/or absorbed by walls, furniture and building materials, as well as the location of windows and sources. Take measurements at various locations within each room.

6. In some cases the RF levels in the same location can vary from one time to another. For example, the levels may depend on what particular RF sources are on and being used at the moment, or exactly when intermittent RF sources like smart meters are sending their data. The levels may also be influenced by how busy nearby cell antennas are at different times of the day and week. Thus it is a good idea to take measurements at different times of the day for each location.

7. Whenever you are moving the Acousticom, static electric charges in your surroundings can sometimes be detected as a false reading on the meter. To get the most accurate measurement, hold the test meter completely still for a moment before you read the final value on the measurement LEDs.

8. Remember that your own body can absorb, scatter, reflect or even amplify the RF fields, thus influencing your measurements! So for even greater

accuracy, you can tape the Acousticom to the end of a short wooden pole or plastic stick to help keep it even further away from your body.

9. For future reference, it is very helpful to keep written records of all your measurements. On a sheet of paper or our special data form, write down the number for each measurement (in volts per meter) as shown next to the colored LEDs, noting also the date, time and location.

G. How to Convert "Volts per Meter" to Other Measurement Units…

There are many different units of measure that can be used to describe the strength of RF fields. It is similar to how we have more than one way to measure temperature. Some people will measure the temperature with units called "degrees Fahrenheit", and others will use "degrees centigrade". They are all valid.

To avoid confusion, it is important that you always are clear exactly which unit of measure you are using when talking to others about your RF measurements, or when comparing your measurements to the safety standards.

The Acousticom measures the strength of the RF field in units called "volts per meter" (abbreviated V/m). If you want to convert from "volts per meter" to another unit of measure, there is a handy *"Radio Frequency Measurement Conversion Chart"* included at the end of these instructions.

And if you are wondering how your own measurements with the Acousticom compare to the some of the common RF safety guidelines, the *"Radio Frequency Measurement Conversion Chart"* at the end of these instructions also shows several of the RF safety standards that you may want to consider.

Sometimes you will see a unit of measure called "millivolts per meter" (abbreviated mV/m), which equals one-thousandth of a volt per meter. In the United States, two common units you may see include "microwatts per centimeter squared" (abbreviated µW/cm²) and "milliwatts per centimeter squared" (mW/cm²). In Europe you will often see "microwatts per meter squared" (µW/m²) and "milliwatts per meter squared" (mW/m²).

You can also go online and use one of the common RF unit conversion websites that are available.

H. What RF Level is Safe?

There is a great on-going debate about the potential health effects related to radio frequency (RF) fields and the recommended safety limits for human exposure. Please refer to the proper health authorities and the scientific research literature to decide for yourself what RF level to consider safe. To assist, I also offer the following information, some of which is anecdotal.

International researchers have reported important biological effects at relatively low levels of exposure – levels well below the current FCC standards for human safety in the United States. For further information on these potential low-exposure health effects, go to the BioInitiative Report (www.bioinitiative.org). In particular, the "RF Color Charts" give a helpful summary of many of the studies and the observed health effects (www.bioinitiative.org/rf-color-charts/).

In the US, the official FCC safety limits depend on the frequency, and are set to protect humans from potential thermal heat effects. For example, for the 860 MHz frequency used by many cell towers, the FCC limit for the public is 573 microwatts per centimeter squared (abbreviated $\mu W/cm^2$). And for all the RF frequencies greater than 1500 MHz (including Wi-Fi and many other sources), the FCC limit is even higher at 1,000 $\mu W/cm^2$ – which is equivalent to 61.4 V/m on the Acousticom!

In sharp contrast, the safe exposure limit recommended by independent EMF researchers in the 2012 BioInitiative Report (go to www.bioinitiative.org) is much lower because it addresses concerns about the potential "non-thermal" effects that are being reported in an increasing number of RF studies. The BioInitiative scientists' recommendation is for a safety limit of 0.0003 $\mu W/cm^2$ – which is equivalent to 0.034 V/m on the Acousticom!

In my professional work with individuals who report serious symptoms and sensitivity related to EMFs – as well as clients with serious health issues such as cancer, Lyme disease, chronic fatigue and chemical sensitivity – we generally try to reduce exposures down to 0.0001 $\mu W/cm^2$ or less, if possible. On the Acousticom, this is equivalent to 0.02 V/m, the second lowest LED on the meter.

And some highly sensitive individuals have reported symptoms even at exposure levels below 0.02 V/m. Thus it may be prudent and necessary for sensitive individuals to remove all possible sources of RF fields from the home and office, even if the levels measure relatively low. And some may find it helpful to install special RF shielding materials to reduce exposures even further.

For further information on several of the possible safety standards that you might want to consider and compare to your own measurements, please refer to the bottom section of the *"Radio Frequency Measurement Conversion Chart"* included at the end of these instructions.

I. What Types of RF Fields Are Being Detected?

The Acousticom measures radio frequency (RF) fields in the frequency range from as low as 200 megahertz (MHz) up to 8.0 gigahertz (GHz). This includes the common RF frequencies emitted from cell towers, smart phones, cordless phones, wireless computers, routers, Wi-Fi, Bluetooth, baby monitors, smart meters, microwave ovens, GPS satellites, and US broadcast TV channels 12 and up.

However, the frequency range of this test meter does not include detection of RF frequencies below 200 MHz, such as AM and FM radio broadcasting and US broadcast

TV channels 2 through 11. The Acousticom also does not detect frequencies greater than 8.0 GHz, which includes some of the microwave dish and satellite communication frequencies.

Perhaps of greatest importance, the Acousticom is particularly good at measuring digital RF fields. The meter senses the relatively difficult to detect "peak" (sometimes also called "instantaneous") RF levels emitted from pulsed digital microwave signals. And like most RF meters, it also picks up the older technology analog RF signals as well.

J. "Peak" vs "Average" Measurements…

Digital RF signals are pulsed on and then off many times each second. A "peak" measurement is the attempt to detect the highest level or "peak" value of the RF field right at the particular "instant" when it is pulsed on.

In contrast, an "average" measurement is the average level over a longer period of time – including the times when the signal is actually pulsed off. Thus for modern digital RF signals, the "peak" measurement can be much greater than the "average" measurement.

Why is the average level used for most official safety standards? The average value gives a direct measurement of the RF field's ability to carry thermal energy and thus heat up biological tissues – similar to the way that a microwave oven heats up food. The current government safety limits for humans are all "thermal" standards, based on "average" types of measurement which show the ability of the RF fields to heat the body.

But anecdotal evidence as well as recent scientific studies suggest that the "peak" measurements of the RF fields may actually be more closely linked to the various health symptoms that people report than the "average" levels. Thus for the purpose of protecting your health, the Acousticom measures the "peak" levels of the RF fields, not the "average" levels.

K. Why Measure the Radio Frequency Fields?

In our modern world, human exposure to RF/microwave energy is increasing at a very rapid pace. While there is still great controversy, a growing number of research studies have reported that radio frequency fields may be linked to important biological changes and adverse health effects.

For an extensive review of the scientific studies and findings that have linked RF exposures to adverse health effects, you can go to www.bioinitiative.org for detailed information.

Common sources of RF exposure include smart phones, tablets, cordless phones, microwave ovens, Wi-Fi, wireless routers, computers and other personal

devices, as well as nearby cell towers, radio and TV broadcast towers and smart meters.

There is a rapidly growing number of wireless devices and systems that we are being exposed to in our modern environment. The Acousticom can help you monitor, reduce and even prevent many of the common RF exposures in today's world.

L. How to Reduce the RF Fields…

In many homes and offices, certain locations will have higher RF levels, while other areas will be lower. Using your Acousticom meter, you can arrange your environment to avoid the highest RF fields. For example, you can place beds, couches and chairs in the lowest RF areas, and perhaps use the highest RF locations for storage.

You can often determine quickly what is causing the RF fields, because the strongest sources are often very close – the devices you use in your own home such as cell phones, cordless telephones, Wi-Fi and wireless computer hardware. The best way to reduce these exposures is to (#1) completely eliminate the wireless equipment, (#2) unplug it, or (#3) turn it off when not in use (especially at night).

Whenever possible, use corded (land line) telephones and hard-wired computer cables (e.g., Ethernet cables, airplane mode) to avoid all wireless. Try to avoid any products that have wireless capabilities. In many cases, even if the software is turned off, the wireless hardware will continue to emit RF signals.

One of the most important things to check regularly is whether the wireless of your computer system is indeed turned off and not emitting RF. Also test all cordless phones and cordless phone base stations because many will emit RF even when not being used.

In the long term, an important way to reduce your RF exposure would be to use your test meter to pretest new homes or apartments before you buy or rent them. You can also use it to pretest new cars before you purchase them, and check on new computer systems after you install them.

If needed, special RF shielding materials can be installed to help reduce the levels, but placement, geometry and grounding of the shield material can be critical. Remember that most RF shield materials act like "mirrors" and reflect the RF fields away from you. This means that they can also reflect some of the RF back to you.

For further technical assistance with your RF shielding needs, please call my office to schedule a telephone consultation or on-site shielding appointment.

M. How Does the Special Audio Function Work?

The Acousticom's audio function works similar to the AM/FM radio in your car. But instead of tuning into one particular RF frequency and amplifying it greatly (like your car radio does with each radio station), the Acousticom receives a very wide range of RF frequencies and amplifies them all just a little bit.

As a result, you may hear many different kinds of sounds. Some may be familiar, like a nearby radio station. But most will be more unnatural sounds, like the pulsed frequency patterns of Wi-Fi, cell towers and cordless phones.

The frequencies used by modern digital RF sources such as cell towers and Wi-Fi are actually much too high in pitch for our human ears to hear. However, most of these wireless signals are "modulated" – they are pulsed on/off many times each second. And these modulated frequencies are often within our hearing range, so that is what you actually hear on the Acoustimeter.

N. Need Professional Assistance?

If necessary, I provide telephone consultations to assist you in testing and reducing the RF fields. In northern California, I can also provide on-site testing and shielding services, as well as the design of special Low-EMF electrical wiring.

If you need further assistance, please contact my office at 1-800-638-3781 or 707-578-1645 to set up an appointment.

Thank you,

Michael R. Neuert

"Radio Frequency Measurement Conversion Chart" for the Acousticom

By Michael R. Neuert, MA, BSME, Neuert Electromagnetic Services, ©2015

Unit of RF measure:	**Acousticom Units in Volts per meter**	**Millivolts per meter**	**Microwatts per centimeter squared**	**Microwatts per meter squared**	**Milliwatts per meter squared**
Abbreviation:	**V/m**	**mV/m**	**µW/cm²**	**µW/m²**	**mW/m²**
	International Units	International Units	American Units	European Units	European Units
	6.00	6,000	9.5	95,000	95
	3.00	3,000	2.4	24,000	24
	1.00	1,000	0.27	2,700	2.7
	0.30	300	0.024	240	0.24
	0.10	100	0.0027	27	0.027
	0.05	50	0.00066	6.6	0.0066
	0.02	20	0.00011	1.1	0.0011
	0.01	10	0.00003	0.3	0.0003
Possible RF Safety Levels[1] for Consideration…					
Average Level in US Homes [note 2]	0.019 to 1.4	19 to 1,400	0.0001 to 0.5	1.0 to 5,000	0.001 to 5.0
Lowest Level Linked to Cancer[3]	0.87	870	0.2	2,000	2.0
BioInitiative 2007 Report [4]	0.61	610	0.1	1,000	1.0
Precautionary Safety Level [5]	0.19	190	0.01	100	0.1
Building Biology Severe Concern [6]	0.061	61	0.001	10	0.01
BioInitiative 2012 Update [4]	0.034	34	0.0003	3.0	0.003
Hypersensitivity Health Advice [7]	0.020 or less	20 or less	0.0001 or less	1 or less	0.001 or less
FCC Safety Limit (Thermal) [8, 9]	61.4 [note 9]	61,400 [note 9]	1,000 [note 9]	10,000,000 [9]	10,000 [note 9]

Notes on Possible RF Safety Levels for Consideration

[1] The following information on safety limits is given as information to help you make your own decisions regarding your health. I am engineer, not a medical doctor, and thus I cannot diagnose or treat any EMF-related medical issues. Please consult with your own doctor or other health professional regarding medical treatment and exposure guidelines.

[2] The Average Level in US Homes is the typical range of RF exposures that I encounter in my professional EMF testing of homes and offices in the San Francisco Bay area. Average RF exposure levels have increased substantially in recent years, mostly due to the use of wireless technologies inside buildings.

[3] The Lowest Level Linked to Cancer: Two studies of radio/TV broadcasting towers in Sydney, Australia have reported increased childhood leukemia at exposure levels as low as 0.2 microwatts/cm². The first study (Hocking, 1996) found that leukemia death rates were more than doubled for exposed children. A follow-up study (Hocking, 2000) found that children recovering from leukemia were about two times more likely to survive their cancer if they lived in a less exposed home.

[4] The BioInitiative Report Recommendations are from the 2007 "BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields". In 2012, the recommended RF safety limits were lowered due to mounting evidence from almost 2,000 new studies. (For more information, go to www.bioinitiative.org and for specific information on documented health effects and exposure levels, go to the BioInitiative RF Color Charts at www.bioinitiative.org/report/wp-content/uploads/pdfs/BioInitiativeReport-RF-Color-Charts.pdf.)

[5] The Precautionary Safety Level of 0.01 microwatt/cm² is my own offering to concerned clients – *to provide for a margin of safety below the cancer link level* – for people who are generally healthy but wish to be proactive and protect their health.

[6] The Building Biology Severe Concern level is from the "Standard of Building Biology Testing Methods" published by the Institute for Baubiology. (Go to www.hbelc.org/pdf/standards/sbm2008.pdf.) 6

[7] The EMF Hypersensitivity Advisory is based on anecdotal experience by EMF professionals like myself who often find it necessary to reduce EMF exposures below these levels for sensitive individuals to report relief of their symptoms. However, there is no guarantee that these levels will be low enough for any particular person – especially with RF exposure – as some people report symptoms at surprisingly low levels.

[8] The FCC Safety Limit is the current US standard for "Maximum Permissible Exposure" for the general public. It is a thermal safety standard, based on the ICNIRP guidelines, as found in FCC/OET Bulletin #56 (http://www.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet56/oet56e4.pdf). The ICNIRP Guidelines are the commonly cited 1998 publication by the International Commission on Non-Ionizing Radiation Protection (www.icnirp.de/documents/emfgdl.pdf).

[9] The value of the FCC Maximum Exposure Limit depends on the frequency of the RF. The value shown here is for RF frequencies of 1500 MHz (1.5 GHz) or higher, such as for devices like Wi-Fi routers and microwave ovens. (For frequencies below 1500 MHz, refer to the formulas on page 15 of Bulletin #56, http://www.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet56/oet56e4.pdf.)