ALPHALAB INC.

AC Milligauss Meter Model UHS2 Instructions

Short Instructions:

Turn the knob to the 1st position (3-AXIS ELF + VLF). This will read the 3-axis magnitude of the magnetic field in milligauss (RMS equivalent). Avoid rapidly rotating or rapidly tipping the meter; this causes some additional signal to be picked up from the earth's magnetic field. The additional signal will be gone as soon as you stop moving the meter. This effect will be obvious once you start using the meter.

If the knob is set to 3-AXIS VLF, the meter will generally read much lower, or zero; this setting reads only the higher-frequency magnetic fields (1,000Hz - 75,000 Hz), and not the full bandwidth (13 Hz - 75,000 Hz) that is read in the "3-AXIS ELF + VLF" setting. The third position of the knob is 1-axis only, but at full bandwidth (13 Hz - 75,000 Hz). It measures magnetic field only in one axis: the direction that corresponds to the thin dimension of the meter.

LOW BATT will appear on the display when approximately one hour of battery life remains. To replace the battery, press down on the back door (near the center of the back of the meter) and slide this door outward (downward) to separate it from the meter body. Then change the battery.

Detailed Instructions:

This meter is designed to do precise measurements of AC magnetic field in a wide frequency range of 13 Hz to 75 kHz (75,000 Hz). The frequencies include most ELF (that is, frequencies below 1 kHz) and VLF (above 1 kHz) magnetic fields. The meter measures the true 3-axis magnitude of the AC field. Two other more specialized measurements can also be performed: 3-axis VLF-only (1kHz – 75 kHz) to measure the strength of higher-frequency fields, and 1-axis full bandwidth (13 Hz – 75 kHz) to determine the principal direction of the AC magnetic field.

With the knob at the left-most position, you'll notice that if you suddenly rotate the meter or tap it, the display will read higher for a fraction of a second. This is caused by the Earth magnetic field, which is about 500 milligauss DC. Normally a DC (non-oscillating) field will not be detected by this meter; however, any motion (tipping the meter or tapping it) will modulate this DC field, creating a temporarily-changing field, which will be detected. To avoid this false signal, keep the meter body stable and always oriented the same way in space as you walk along making measurements. For example, if the meter is vertical and the right side of the meter is pointing, let's say, northwest, then you should keep the meter always vertical with the right side pointing northwest, as you walk along. While rotating or changing orientation of the meter, the reading will usually be higher than it should be, but the reading will return to the correct value as soon as you stop rotating it. The meter will also read a higher level if it's being moved near magnetized metal.

If the switch is set to its center (2nd) position, the meter will read 3-axis VLF fields (at frequencies of 1 kHz and higher). Generally in video displays and fluorescent lights a large percentage of the fields are at these higher frequencies. Please note two factors when measuring these higher frequencies: 1) These VLF measurements should be less than (or at most the same as) the measurement obtained when the knob is set on its left-most position of "3-AXIS ELF + VLF". In most areas, the VLF (with knob set in center) will be very low or zero; at most it will never be more than the reading obtained when the knob is switched to "3-AXIS ELF + VLF". 2) The center position of that knob is slightly sensitive to 60 Hz fields, even though it is supposed to reject frequencies below 1 kHz. The rejection is 400:1. That is, if there is a field of 400 milligauss that is exclusively at 60 Hz, the VLF (center) position of the knob will yield a (false) reading of 1.0 milligauss. Similarly a 200 milligauss field at 60 Hz will yield a false VLF field of 0.5 milligauss. When the switch is set to the 1-AXIS position (3rd position), the meter reads ELF + VLF but in only one axis. The direction of this 1-AXIS is the same as the “thickness” dimension of the meter (as opposed to the left-right “width” or up-down “height” that are the conventional definitions of width and height, with respect to the writing on the front label). This 1-axis sensor is just behind the center of the black panel that’s on the top surface (the black surface closest to the display). The 1-AXIS measurement can be used to determine the direction in which the field is strongest; unfortunately, this does not exactly correspond to the direction (or the position relative to the meter) of the field source. The direction of strongest field can give you some information about the direction of the field source, as per the convention developed by Edward Leeper (see www.silencingthefields.com).

For your reference, the other two magnetic sensors are 1) on the extreme right side of the meter’s “roof” (This is the position of the sensor pointing in the long dimension of the meter), and 2) the extreme left side under the “roof” (The position of the sensor pointing left-right). Generally, if you are very close to a field source, these three sensors will be at three different distances from the field source, and as a result, the reading will be strongly dependent on the angle at which you hold the meter. For field measurements more than about two feet from the source, this angle dependence is minimal.

Accuracy: This meter has a typical error of +/-3% of the reading in the frequency range 45 Hz to 5 kHz. At certain measurement angles and certain frequencies in the 3-AXIS modes, the error may be as high as +/-7%. That is, a reading of 10.00 milligauss means the field is as high as 10.70 or as low as 9.30, but most of the time the actual field will be between 10.30 and 9.70 (this is in RMS units). Note that this accuracy specification is for sine waves in the very wide frequency range of 45 Hz to 5 kHz. Other manufacturers of digital 3-axis meters only specify the accuracy for 60 Hz sine waves. (Those types of meter will generally have significant additional error above 100 Hz; typically there is 5-10% additional error due to change in sensitivity at other frequencies, making a total error that exceeds 10% above 100 Hz. Because of advanced high-frequency detection circuitry, the model UHS does not have this problem). If you're measuring a signal that is simultaneously stronger than 100 milligauss and higher frequency than 10 KHz, some additional inaccuracy may occur. (It may read either too high or too low). An unusual generator with both a high frequency and high power output is required in order to produce this type of magnetic field. You'll know that this is a problem if, as you approach the strong field source, it eventually exceeds 1000 milligauss both on ELF + VLF and on VLF. The meter works by measuring the absolute value of the AC field strength in 3 axes (or 1 axis), and then finding the time-average of that absolute value. That time-average is then scaled so that a sine wave reads in RMS units. Sensitivity is down to ½ at the frequency limits 13 Hz and 75 kHz. In the 3-AXIS 1 kHz - 75 kHz (VLF) setting, maximum error is +/-7% of the reading at 5 kHz, and half sensitivity is 1 kHz and 75 kHz. A table of typical accuracy vs. sensitivity follows.

Add +/- 1 count to all readings to account for total possible error (below 10 kHz). Above 10 kHz, this count error is higher.

(See table on the following page.)

Table of Typical Frequency Response of Model UHS

Frequency (Hz)	13 Hz- 75 kHz	To correct multiply by:	Then Add this many counts:	Relative Sensitivity on 3-Axis VLF
13	-50	2	0	.0001
20	-16	1.19	0	.0002
30	-5.5	1.06	0	.0006
40	-4	1.04	0	.0011
50	-1	1.01	0	.0018
60	0	1	0	.0025
70	+1	.99	0	.004
80	+1	.99	0	.005
100	+1	.99	0	.008
120	+.5	.995	0	.011
150	+.5	.995	0	.016
200	+.5	.995	0	.027
300	+.5	.995	0	.057
500	+.5	.995	0	.14
700	0	1	0	.25
1k	-.5	1.005	0	.4
2k	-1.5	1.015	0	.75
3k	-2	1.02	0	.93
5k	-3	1.03	0	1
7k	-4	1.04	0	1
10k	-5.5	1.06	0	1
20k	-10.5	1.12	0	1
30k	-16.5	1.2	1	1
50k	-30	1.43	2	1
70k	-43	1.75	4	1
100k	-55	2.22	6	1
200k	-72	3.57	13	1
300k	-80	5.00	17	1

Example: If you read 52.5 milligauss on the 1st position (3-AXIS ELF +VLF), and you know that it is a 50 kHz signal, multiply by 1.43 to get 75.1 milligauss. Then add 2 “counts” to raise it to 75.3, which is the correct reading. If you were to switch over to the VLF only setting, it would still read 52.5 (see the 1X multiplier in the lower right of the table) if the wave is actually 50 kHz. Also, if you’re measuring pure 60 Hz, and it reads 13.62 milligauss on the ELF + VLF, then it will only read .0025 x 13.62 = .03 milligauss on the VLF only setting. These calculations require that you know the frequency.

Battery Information:

The alkaline 9V battery lasts about 20 hours. Low Battery: LOW BATT will appear on the display when approximately one hour of battery life remains. To replace the battery, press down on the back door (near the center of the back of the meter) and slide this door outward (downward) to separate it from the meter body. Then change the battery.

The warranty period for this meter is one year from the date of delivery.

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