AlphaLab Inc.

Battery Impedance Meter Model BIM Instructions

Turn the unit on to the type of measurement you want to make: conductance in siemens or resistance in mΩ (milliohms). Touch the red probe to the positive terminal of the battery and the black to negative. If you do *not* press down (so that only the longer spring-loaded contacts are touching the battery) the voltage will be displayed. If the probes are connected with the opposite polarity, the displayed voltage will have a negative sign, and the display will indicate wrong polarity. (This will not harm the meter, even if all four contacts are fully pressed down with wrong polarity, but the siemens/mΩ test will only work properly when the polarity is correct.) If connected with proper polarity, press so that both contacts of both probes are touching the battery and hold at least four seconds while the meter makes a clicking sound. Once the measurement is valid, the number of siemens or mΩ will display and will continue to be displayed even after the probes are removed from the battery contacts. You can now repeatedly switch between siemens and mΩ; both readings will be valid for the last battery tested. For best results, the probes should be applied directly on the battery posts, not on hardware such as the contact clamps attached to the battery. If not connected directly to the battery posts, the siemens will read too low, and the mΩ will read too high. Also make sure to scrape off any corrosion at the test area before testing. The test can be done while the battery is in service, whether it is being charged or being loaded (discharged). The test can also be done if the battery is disconnected from its circuit. The number of siemens or mΩ is essentially independent of the state of charge of the battery if the charge is between 20% and 100%. The number of siemens will read slightly low if the battery is either overcharged or below 20% charge (and mΩ will read slightly high).

The display will only reset when the two long contacts are touched (with correct polarity) to another battery. The impedance and voltage of any battery between 1.00 and 59.99 volts can be read. Because of the wide range of voltages, even single low-voltage cells, such as NiMH, can be measured. The manufacturers of some batteries specify impedance in mΩ while other specify in siemens (one divided by the resistance in ohms). This meter will display both types of impedance for any given battery. Note that the number of siemens of a given battery is 1000 divided by he number of mΩ.

After a battery has been in service for an extended time, the impedance will begin to change. If it has changed by 20% or more (depending on battery class) from its original value, the battery should be replaced. (The number of milliohms will increase and the number of siemens will decrease.) If a 50 AH battery had measured 200 siemens when new, it should be replaced by the time it reads 160 siemens or less. Similar guidelines apply to other battery chemistries. A typical small 12 volt lead acid battery has a conductance of 3 to 4 siemens per amp hour (AH) of capacity -- this relationship is valid up to about 1000 AH. (At higher capacity, contact resistance decreases the conductance to a number somewhat below this range.) For a small single lead acid cell (2 volts), the conductance is typically between 18 and 24 siemens per AH of capacity. The resistance is the inverse of conductance. For example, a 50 AH 12 volt lead acid battery might have an initial conductance of typically 200 siemens, which corresponds to a resistance of 5.000 mΩ. If two identical batteries are connected in series, the voltage doubles but the conductance becomes 100 siemens, which is half of what

it was for either single battery. (Also, the resistance doubles to 10.000 mΩ.) An example of this series-wiring rule is the 50 AH battery mentioned above. It is made from six cells (each 2 volts) wired in series. Each cell should have a initial conductance 1200 siemens (resistance of 0.833 mΩ). Because the six cells are wired in series, the resulting 12 volt battery has a conductance of 1200/6 = 200 siemens and a resistance of 0.833x6 = 5 mΩ. Some brands of battery conductance meter require the user to enter the battery voltage. If measuring a 12 volt battery, these meters typically measure the conductance and then display a number that is 6x the conductance. That is, those meters will display the estimated conductance *per 2 volt cell*, not the measured conductance of the whole 12 volt battery. There are some published tables of battery conductance that are listed this way. If the battery listed is a single 2 volt cell, the listed conductance is correct. However 12 volt batteries may be listed with an exaggerated conductance. To correct this, divide the listed conductance by 6 to get the correct conductance of the battery (this is what the Battery Impedance Meter measures). Many battery manufacturers list the internal resistance of their batteries (in mΩ). These numbers are usually correct regardless of the number of cells in the battery, and the Battery Impedance Meter should read the same number of mΩ.

For a given battery chemistry, the impedance may change slightly with temperature. The Battery Impedance Meter also displays temperature so that the baseline conductance or resistance can be corrected for temperature if necessary. A hot lead acid battery generally has slightly higher conductance (lower resistance) than the same battery when cold. In the 0-50 °C range, the change is generally less than 0.3% per °C, although it can be as high as 0.7% per °C for some batteries.

SPECIFICATIONS: Battery Impedance Meter 0°C (32°F) to 43°C (109°F)	
Resistance Range/Resolution:	99.999 mΩ/ 0.001 mΩ
Conductance Range/Resolution:	10-20,000 siemens in steps of 1 siemen
Voltage:	1 to 59.99 V
Accuracy:	+/- 2% of reading +/- .030 mΩ
Probes:	Spring loaded. Meter operates automatically when battery is connected. 6.64 x 1.07 in; 168.6 x 27.2 mm
Time/Sample:	4 seconds. Then display is held.
Display:	Backlit screen 2.76 x 1.44 in; 70 x 36.5 mm
Meter Size:	7.7 x 3.9 x 1.7 in; 194.8 x 100.6 x 45.2 mm
Weight:	17.9 ounces; 508 grams
Battery:	(3) AA batteries (~ 25 hour life) ~90ma drain “Low Battery" indicator.

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

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