

Simple\_Way\_of\_Measuring Lead-Acid Battery State-of-Charge.txt

Subject: Lead-Acid Battery State Of Charge

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After PS many will be involved with measuring batteries and concerned about the state of charge. If discharged too much one could damage one or more cells.

The discharge graphs will tell you your state of charge based on rest state (no charging or discharging) or if charging or discharging at a given rate. I think, as a simplistic general rule of thumb if a 12-volt battery gets below 12 volts in a rest state it needs charging. If it measures 12 volts then it has about 24% charge. Full charge in a rest state is about 12.6 volts. Half charge in a rest state is about 12.3 volts. If one is charging at the same time then it is higher than this. If one is discharging at the same time of the measurement then it is lower than this. Consult the graph in the above article.

If you need to make a DC Amp meter to measure charging and discharging rates, then, purchase a second digital voltmeter or use the same one used above. Measure the voltage drop across a known length of one of your Battery lead wires. If you get the distance right you can match this with 1 amp = 1 milli-volt (using ohms law .001ohms), Then you can read this off the 200 milli-volt scale (the one above measures down to .1 milli-volt) on your voltmeter directly as amps. Each different size wire has a different amount of voltage drop per unit length. If your wire is not long enough then build a reference graph that you can translate from volt to amps. The values are published in tables for example.

For example:

Gauge(AWGorB&S)	Di ameter(inches)	Di stance in feet for 1 mili -volt drop
0000	.4600	20.40
000	.4096	16.18
00	.3684	12.83
0	.3249	10.18
1	.2893	8.07
2	.2576	6.40
3	.2294	5.075
4	.2043	4.025
5	.1819	3.192
6	.1620	2.531
7	.1443	2.007
8	.1272	1.592
9	.1144	1.262
10	.1019	1.001
11	.0907	.794
12	.0808	.630
14	.0641	.396
16	.0508	.249

If you need to purchase an inexpensive digital meter check out Harbor freight Tools has several models for about \$3 on up. See <http://www.harborfreight.com/> Search for meters