Battery LifeTester

ELK-BLT v.2 Mhos Meter

The ***NEW* and improved ELK-BLT v.2 *Battery LifeTester*** is a compact, easy to use Mhos Meter for testing 12 Volt rechargeable batteries. Unlike ordinary testers which only measure static criteria, the ***LifeTester*** measures internal conductivity, which is the best indicator of a battery's health and life expectancy. The conductivity value, expressed in Mhos (the inverse of Ohms or resistance), is easily compared to benchmark readings from the included Mhos Chart. The chart then categorizes the battery condition as "Best, Good, Weak, or Bad". Every battery type has a characteristic Mhos value when it is brand new and fully charged.

The ***LifeTester*** is powered by the battery under test and automatically warns when the battery voltage is too low for testing.

Features

- Does not discharge or damage the battery.
- Tests 12 Volt Rechargeable Batteries.
- Display Shows Battery Voltage and Mhos.
- Warns if battery voltage is too low.
- Replaceable test leads.
- Includes padded carrying case.
- Includes self-adhesive test data labels. **
- Lifetime Limited Warranty.

Specifications

- Operating Voltage: 10.0V - 14 Volts D.C.
- Current Draw: 1.1 Amps Max., 0.0016 Ah for full test.
- Battery Leads: ~12 Inches.
- Size: 4.4" W x 3"H x 1.15"D w/o carrying case.
- Calibration: NIST traceable standards, no further calibration is required.

** To reorder a pack of 100 test data labels specify: **ELK-BLT LABELS.**

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Instructions ELK - BLT

1. Disconnect the battery from it's equipment.

2. Connect the BLACK test clip to the Negative (-) battery terminal, and the RED to the Positive (+) terminal.

"**Err**" or blank indicates battery voltage is too low for testing or a test clip connection is loose.
Try charging the battery or reconnecting the test clips.

3. The Voltage of the Battery will display briefly. A new battery, out of the box, will generally read around 12.6 Volts. A fully-charged battery should read between 12.6 Volts and 13.5 Volts.

"**- - -**" indicates test in process, please wait.

4. The Mhos (internal conductance) reading of the battery will display within 6 seconds.

5. Refer to the Mhos Chart. In the Ah column, find the battery size. Follow across the row to find the closest match to it's Mhos reading. The column heading and color code indicates the test results.

NOTE: The Mhos chart printed on the BLT is best suited for batteries under charge and at room temperatures of around 72F degrees. This covers most batteries, even in cold basements or buildings, since the battery will be kept warm by the recharging and by being inside the electronics enclosure. However, since cooler temperatures can significantly lower the Mhos reading of a battery, this instruction manual has a more extensive Mhos chart with columns for evaluating batteries that are being adversely affected by 62F, 52F, and 42F degree environments. Also see <u>How Temperature affects a Battery</u>

6. For future reference mark the battery with the Voltage, Mhos reading, and test date.

Automatic Shutdown

If the ***LifeTester*** is left connected to a battery for more than 30 seconds after the test is complete, it will automatically shutdown to conserve battery power. Disconnecting and reconnecting a test lead will restart the test procedure.

Recording Battery Readings

LifeTester measurements should be taken and recorded periodically. The popular method is to record the information onto self-adhesive labels placed directly onto the battery. A supply of these labels is included with the tester. Additional labels may be ordered in packs of 100 by specifying part number ELK-BLT LABELS. This information will be valuable in future tests for trending analysis. The recorded data should include:

A. The **Date** of the test.
B. The ***Battery Voltage*** reading. (optional)
C. The ***Mhos*** reading.

A new "fresh out of the box" battery that has not been charged should have a Mhos value in the high side of the Good column and quite possibly into the Best column. **See the Mhos chart**. If the reading is considerably lower, charge the battery for at least 24 hours and then retest.

Battery performance degrades over time due to use and abuse, and may be impacted by many factors like depth and frequency of discharge. The higher the Mhos value the more current the battery can deliver. Therefore, a new 7 amp-hour battery will have a higher Mhos value than a new 4 amp-hour battery of the similar construction.

Instructions ELK - BLT

How Temperature affects a Battery

Generally speaking, temperatures below 72F degrees tend to slow down a battery's internal activity, causing a significant decrease in the Mhos (conductivity) reading as the temperature falls. Cool temperatures (not below freezing) will tend to prolong a battery's life. Temperatures above 72F cause a battery's internal activity to accelerate, but with only a slight increase in the Mhos reading. Warm temperatures will tend to dry out and degrade a battery much faster than normal.

100 F degrees = 105 % of normal Mhos (conductivity)
72 F degrees = 0 % no adjustment
62 F degrees = 92 % of normal Mhos (conductivity)
52 F degrees = 87 % of normal Mhos (conductivity)
42 F degrees = 82 % of normal Mhos (conductivity)
32 F degrees = 76 % of normal Mhos (conductivity)

Battery Mhos Chart

for various Temperature Environments

	~72F Degree Environment Ideal Conditions				~62F Degree (Cool) Environment -8% degrade				~52F Degree (Cold) Environment -13% degrade				~42F Degree (Cold) Environment -18% degrade			
Ah Size	**Bad**	**Weak**	**Good**	**Best**	**Bad**	**Weak**	**Good**	**Best**	**Bad**	**Weak**	**Good**	**Best**	**Bad**	**Weak**	**Good**	**Best**
.8 Ah	0 - 19	20 - 21	22 - 24	25 +	0 - 17	18 - 20	21 - 22	23 +	0 - 16	17 - 18	19 - 21	22 +	0 - 15	16 - 17	18 - 20	21 +
1.3 Ah	0 - 24	25 - 28	29 - 31	32 +	0 - 22	23 - 25	26 - 29	30 +	0 - 21	22 - 24	25 - 27	28 +	0 - 20	21 - 23	24 - 26	27 +
2.3 Ah	0 - 40	41 - 45	46 - 51	52 +	0 - 36	37 - 42	43 - 47	48 +	0 - 34	35 - 39	40 - 44	45 +	0 - 32	33 - 37	38 - 42	43 +
2.6 Ah	0 - 44	45 - 50	51 - 57	58 +	0 - 40	41 - 46	47 - 52	53 +	0 - 38	39 - 44	45 - 49	50 +	0 - 36	37 - 41	42 - 46	47 +
3.0 Ah	0 - 48	49 - 55	56 - 62	63 +	0 - 44	45 - 51	52 - 57	58 +	0 - 42	43 -48	49 - 54	55 +	0 - 39	40 - 45	46 - 51	52 +
3.3 Ah	0 - 49	50 - 57	58 - 64	65 +	0 - 45	46 - 52	53 - 59	60 +	0 - 43	44 - 49	50 - 55	56 +	0 - 40	41 - 46	47 - 52	53 +
4.0 Ah	0 - 64	65 - 73	74 - 83	84 +	0 - 59	60 - 67	68 - 76	77 +	0 - 56	57 - 64	65 - 72	73 +	0 - 52	53 - 60	61 - 68	69 +
4.5 Ah	0 - 73	74 - 83	84 - 94	95 +	0 - 67	68 - 76	77 - 86	87 +	0 - 63	64 -72	73 - 81	82 +	0 - 59	60 - 68	69 - 76	77 +
5.0 Ah	0 - 76	77 - 87	88 - 98	99 +	0 - 70	71 - 80	81 - 90	91 +	0 - 66	67 - 76	77 - 85	86 +	0 - 62	63 - 71	72 - 80	81 +
7.0 Ah	0 - 139	140 - 159	160 - 179	180+	0 - 128	129 - 146	147 - 165	166+	0 - 121	122 - 138	139 - 156	157+	0 - 114	115 - 130	131 - 147	148+
7.5 Ah	0 - 153	154 - 175	176 - 197	198+	0 - 141	142 - 161	162 - 181	182+	0 - 133	134 - 152	153 - 171	172+	0 - 125	126 - 143	144 - 161	162+
8.0 Ah	0 - 157	158 - 179	180 - 202	203+	0 - 144	145 - 165	166 - 185	186+	0 - 136	137 - 156	157 - 175	176+	0 - 128	129 - 147	148 - 165	166+
10.0 Ah	0 - 185	186 - 211	212 - 238	239+	0 - 170	171 - 194	195 - 218	219+	0 - 160	161 - 183	184 - 206	207+	0 - 151	152 - 173	174 - 195	196+
12.0 Ah	0 - 192	193 - 219	220 - 247	248+	0 - 176	177 - 201	202 - 227	228+	0 - 166	167 - 190	191 - 214	215+	0 - 157	158 - 179	180 - 202	203+
17.0 Ah	0 - 265	266 - 303	304 - 341	342+	0 - 244	245 - 279	280 - 314	315+	0 - 230	231 - 263	264 - 297	298+	0 - 217	218 - 248	249 - 279	280+
18.0 Ah	0 - 279	280 - 319	320 - 359	360+	0 - 257	258 - 293	294 - 330	331+	0 - 243	244 - 277	278 - 312	313+	0 - 229	230 - 261	262 - 294	295+
24.0 Ah	0 - 321	322 - 367	368 - 413	414+	0 -295	296 - 338	339 - 380	381+	0 - 279	280 - 319	320 - 359	360+	0 - 263	264 - 301	302 - 338	339+
25.0 Ah	0 - 328	329 - 375	376 - 422	423+	0 - 302	303 - 345	346 - 388	389+	0 - 285	286 - 326	327 - 367	368+	0 - 269	270 - 307	308 - 346	347+
26.0 Ah	0 - 335	336 - 383	384 - 431	432+	0 - 308	309 - 352	353 - 396	397+	0 - 291	292 - 333	334 - 375	376+	0 - 275	276 - 314	315 - 353	354+

Bad =	Replace immediately.
Weak =	Nearing end of life, replace soon.
Good =	Adequate standby power.
Best =	Battery is fresh and well charged.

ELK Products is not responsible for misprints or errors. These Mhos values are benchmark averages, created from fresh samples of major brand batteries. If you find consistent, minor variations in readings from multiple samples of a battery, it's likely due to manufacturing differences. However, if the readings are excessively low, the battery is not as good as the benchmark average. If this chart does not include the battery you are testing, it may be necessary to generate the values using the procedure below.

Adding to the Battery Mhos Chart

If the battery you are trying to test is not included in the **Battery Mhos Chart** it may be necessary to research and generate the data on your own. The following procedure will help with this task.

Start with 2 or 3 fresh new batteries out of the box. The battery voltage should be around 12.6 Volts or higher. Place the batteries in service (on charge) for 24 hours. Remove them from charge and measure the Mhos reading of each one. Average the readings together. This will be the baseline number from which the Best, Good, Weak, and Bad columns are calculated. The "Best" column will be 90% of the baseline number. The first and second numbers in the "Good" column are 80% and 89% of the baseline. The first and second numbers in the "Weak" column are 70% and 79% of the baseline. The "Bad" column is 0% and 69% of the baseline.

Accumulating Trend Analysis over a Period of Years

Trending of periodic Mhos measurements can yield valuable insights for estimating the remaining life of the battery. Suppose that a 4.0 Ah battery has been in service for three years and that the ***LifeTester*** measurements after the first year was 90 Mhos, 85 Mhos after the second year, and 80 Mhos after the third year. Since the battery is still at 80 Mhos and is dropping an average of 5 Mhos per year, it is highly likely that this battery will not need replacing before the end of the fourth year. On the other hand, suppose that the readings were 90 Mhos after the first year, 82 Mhos after the second year, and 70 Mhos after the third year. The rate of decay has increased from 8 Mhos to 12 Mhos per year. This indicates that although the battery is still serviceable, it is degrading more and more rapidly. It is unlikely that this battery will be serviceable for another year. Under these circumstances, either the battery should be replaced early or the service interval should be shortened to catch this battery before a system failure.

Why Mhos instead of Amp Hour

The ***LifeTester*** measures the Mhos (conductance) of a battery using an AC impedance measurement algorithm. Every battery manufacturing process produces a slightly different conductance value for a given battery size. Elk Products elected to display consistent, accurate Mhos (conductance) values, rather than just estimated Amp Hour values. The only accurate method for measuring a battery's Amp-hour capacity is with a long discharge test, which actually decreases the life of the battery. Estimation of Amp-hour capacity without a discharge test is a complex error-prone process involving the conductance value, the battery state-of-charge, the voltage, the temperature, and the many varying design and production variables for each battery type. Ordinary testers which measure static criteria or Amp-hour are inherently inaccurate across varying battery designs. In contrast, extensive testing has proven that when the conductance of a charged battery is tested and has declined to approximately 70% of its full-capacity reference, the battery is unlikely to deliver its rated capacity and should be replaced.

Is Mhos relational to Cold Cranking Amp

The ***LifeTester*** is designed to measure the conductance of a battery at frequencies indicative of the capacity of a battery in Amp-hour. Conductance measurements for estimating the Cold Cranking Amps for starter type batteries are at a much higher frequency. Although the measurement techniques are similar, there is little correlation between the Cold Cranking Amps measurement of a battery and the Mhos reading of the ***LifeTester***, or vice-versa.

Using Mhos to Estimate Battery Life

The Mhos reading of a new battery out of the box, will generally not be the same as that of a fully charged battery. This is due to the plates not being totally formed during manufacturing. Once the battery has been on charge for some time the plates will finish forming and the peak Mhos reading will normalize. For standby batteries, peak capacity is normally reached after about three months on a float charging system. For cyclic use batteries, full capacity may not be reached until after ten to thirty cycles, depending upon the depth of discharge and the charging method.

If a new battery has been in storage for an extended period, say over six months without being charged, plate oxidation from self-discharge will occur, causing a decrease in the Mhos reading. Plate oxidation also occurs in standby batteries during a power failure, particularly if a battery remains in a highly discharged state for an extended time period. Plate oxidation is unhealthy and can destroy a battery's capacity. Once a battery is weakened by plate oxidation, it is difficult to recover full capacity without special charging or conditioning methods. In some cases a battery will recover and pass a test after being recharged. However, a second test should be performed a few days later after recovery to accurately assess the overall life of the battery.

The average life cycle of a sealed lead-acid battery in standby use on a float charge is 3 to 5 years. A battery with a Mhos reading of less than 70% of its original capacity is no longer considered serviceable and should be replaced.