How to Test Your Car Battery

Does your car battery contain enough power to start your engine during cold weather? The only way to know if your battery is fully charged or not is to measure the battery's state of charge with a voltmeter. You can use an analog or digital voltmeter, but a digital meter is easier to read and will give you a more accurate reading.

First, make sure the ignition key is OFF, and all the vehicle's lights are OFF.

To check your battery's state of charge, connect the RED or POSITIVE voltmeter test lead to your battery POSITIVE terminal. The positive terminal will be marked with a PLUS symbol (+), and the battery cable that is connected to the positive terminal is often color coded RED.

Connect the BLACK or NEGATIVE voltmeter test lead to your battery NEGATIVE terminal. The negative terminal will be marked with a minus symbol (-), and the battery cable that is connected to the negative terminal is often color coded BLACK.

Note the reading on your voltmeter and refer to the chart below:

Battery Voltage and State of Charge:

12.66v 100%
12.45v 75%
12.24v 50%
12.06v 25%
11.89v 0%

(NOTE: these readings are at 80 degrees F. Battery voltage readings will drop with temperature roughly 0.01 volts for every 10 degrees F.)
(At 30 degrees F. a fully charged battery will measure about 12.588 volts, and at zero degrees F it will measure about 12.516 volts.)

Is Your Battery Low?

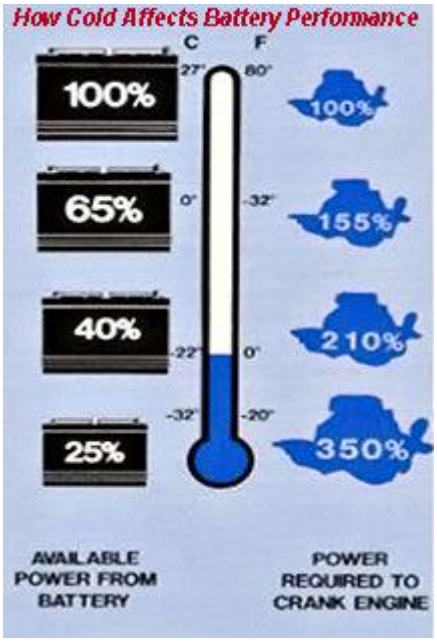
If your battery voltage is less than 12.45 volts (75 percent charged), it is low and should be recharged. This can be done by connecting a portable battery charger to your battery, or by driving your car for 15 to 20 minutes at 40 mph or faster.

Automotive lead-acid batteries should be maintained at a 75 percent charge level or higher for best performance and life. If the battery is allowed to run down and is not brought back up to 75 percent or higher charge within a few days, the battery may be permanently damaged. Sulfation can prevent the cell plates inside the battery from accepting a full charge. Over time, this will lead to diminished battery performance and life.

Why You Need a Good Battery for Reliable Cold Weather Starting

A good battery is essential for reliable starting, especially during cold weather because cold weather increases the cranking load on the battery. Oil gets thicker at low temperatures so it

takes more amps to crank a cold engine when you try to start it. At 0 degrees F, the number of cranking amps it takes to start a cold engine may increase as much as 2X. At minus 15 degrees below zero F, it can take 3X or more amps to crank the engine depending on the viscosity of the oil in the crankcase. The thicker the oil, the harder is it to crank the engine.



At the same time, cold temperatures also sap the battery's ability to supply amps. At 0 degrees F, most batteries can only deliver about 65% of their normal cranking amps. At -20 degrees, battery power is cut in half!

Warning: *Do NOT attempt to recharge your battery if it has run down and the liquid inside is frozen. This may cause the battery to explode! Remove the battery and take it inside so it can thaw before recharging or testing it.*

Is Your Battery Good or Bad?

A GOOD battery is one that will accept and hold a charge, and is capable of producing close to its rated amperage output. A BAD battery is one that will NOT accept or hold a charge, or cannot produce adequate cranking amps. A GOOD battery can be recharged and returned to service but a BAD battery needs to be replaced.

Most car batteries only last about 4 to 5 years, so if your battery is 4 or more years older and is not holding a charge (keeps running down), or it does not seem to crank your engine a normal speed, you probably need a new battery.

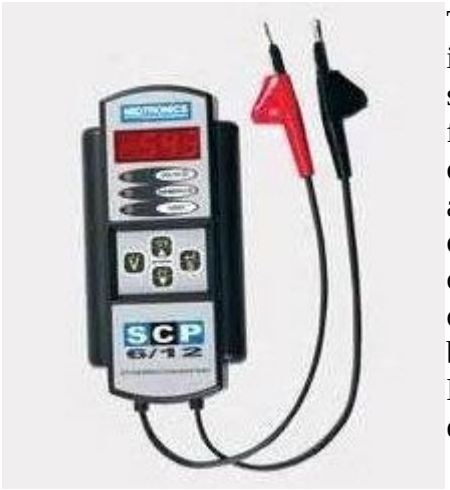
A low or dead battery does not mean your battery has failed, or that it needs to be replaced. A good battery can run down for any number of reasons: somebody left the lights on, you haven't been driving your vehicle enough to keep the battery fully charged, your vehicle has been sitting for a long period of time without being started, there is a problem with the charging system or alternator, or an electrical problem is draining power from the battery when your car is off.

Battery Testing

The only way to know if your battery is GOOD or BAD is to test it. Many auto parts stores will test your battery for free. If your vehicle is drivable or you can get it going with a jump start, drive to a nearby auto parts store that offers free testing and have them test your battery and charging system. If you can't get your car started, remove the battery and get a friend to give you a ride to the auto parts store so you can have the battery tested. Many repair shops will also test your battery and charging system, but they usually charge a fee for this service (some will test your battery for free or offer to apply their diagnostic fee towards the cost of repair).

CAUTION: *Conventional wet cell car batteries are filled with a mixture of water and sulfuric acid. Wear gloves and handle the battery with care so no liquid spills on your skin or clothing. Battery acid can cause severe burns. If a spill does occur, wash with plenty of water and neutralize the acid by applying baking soda.*

There are essentially two ways to test a battery. The "old fashioned way" is to use a Load Tester. For accurate results with a load tester, the battery must first be recharged before it is tested. The tester applies a calibrated load to the battery (typically half the battery cold cranking amp [CCA] capacity or three times its amp/hour rating). While the load is applied, the tester monitors battery voltage. If the battery voltage drops below 9.6 volts during the test, the battery is BAD and needs to be replaced. If the voltage remains about 9.6 volts, the battery is GOOD and can be returned to service.



The other (and must faster) method for testing your battery is to use an electronic "conductance" tester like the one shown here. A conductance tester sends a alternating frequency signal through the battery to determine the condition of the cell plates inside the battery. As a battery ages, its internal conductance declines. Shorts, opens and other cell defects also reduce conductance, so measuring conductance gives an accurate indication of battery condition. The best feature of this type of test is that the battery does NOT have to be recharged prior to testing. Most conductance testers will give an accurate reading even if the battery is almost dead.

Some electronic battery testers can also analyze the battery's CCA capacity, which can be used to estimate the battery's remaining service life. Some testers can also measure the amps drawn by the starter while cranking the engine, and analyze charging system output under load once the engine is running. Some testers even provide a built-in voltmeter for checking connections.

Bad Battery Connections

If an electronic tester can calculate the battery/s CCA rating, it can also be used to diagnose bad ground connections. First the CCA capacity is tested at the battery terminal connections, then again using a ground point on the engine or elsewhere. More than a 25 percent difference in the CCA readings between the two tests indicates a bad ground connection.

Diagnostic Tip: You also can use a digital voltmeter to check for voltage drop across all circuit connections, too. Ideally, you should see less than 0.1 volt drop across a good

connection. More than 0.4 volts drop indicates high resistance and a dirty or loose connection.

Recharge Battery

Whether your battery tests GOOD or BAD, make sure the battery is fully recharged before returning it to service. The alternator is designed to maintain a battery charge, not to recharge a dead battery. Overloading the charging system with a dead battery can tax it to the point of where it may damage the alternator.

Diagnostic Tip: If the alternator on your car has failed, it might mean your battery is not building up normal resistance as it accepts a charge. This, in turn, makes the alternator keep charging the battery at a higher than normal rate. This can overload the charging system and lead to premature alternator failure. The battery charging output should jump about two volts after starting the engine (14.5 volts or higher), then gradually decrease after the engine has been running for several minutes (unless the battery is really low). The charging current should likewise taper off to less than 10 amps at idle (with no lights or accessories on) after five minutes of running. If a fully-charged battery is still pulling 20 or more amps after five minutes of idling, the battery is defective and needs to be replaced.

Replacement Car Batteries

Gel-type batteries don't use liquid electrolytes and can't spill. Even so, they wear out the same as liquid lead-acid batteries. Testing is essentially the same.

A replacement battery must have the same post configuration as the original (top post or side post), and fit the battery tray. Your first order of business, therefore, is to figure out the correct "group size" for the vehicle.

Next, you have to figure out how many CCAs the vehicle needs for reliable cold weather starting. The replacement battery should have the same or higher CCA rating as the original battery. Bigger is usually better, but keep in mind that some batteries sacrifice "reserve capacity" to achieve higher CCA numbers.

Another number that is important is the months of prorated warranty coverage provided by the battery manufacturer. As a rule, the higher the warranty months on the battery, the higher the battery CCA rating and the better the battery. So consider upgrading from a basic 36-month replacement battery to a premium 72-month battery.

There are also differences in battery technology and design. Though all automotive batteries today are still based on lead-acid chemistry, redesigned grids, thinner plates and new connectors allow more amps to be packaged into smaller cases. Some new batteries use a "spiral wound" cell configuration instead of flat plates to achieve a higher packaging density, more power output and increased durability.

Some batteries also use a "gel" electrolyte or "recombination" technology that replaces the liquid acid. Some have "absorbent glass mat" (AGM) separators between the plates that hold the acid much like a paper towel soaks up water, making the battery "spill-proof" even if the

case is punctured. AGM technology also makes batteries more resistant to vibration damage and helps extend battery service life.