

How to Make Your Classic Car's Charging System Dependable - Part 2 by Rob Siegel (2 May 2017)

(<https://www.hagerty.com/articles-videos/articles/2017/05/02/reliable-charging-system-pt2>)

In our last column exploring The Big Six things likely to cause a vintage car to die and leave you in the lurch (ignition, fuel delivery, cooling, charging, belts, and ball joint issues), we discussed the [charging system](#). I told you that, to health-check your charging system, you should:

- Make sure your battery isn't ancient, cracked, or bulging, and that the battery terminals and cables aren't corroded.
- Verify that the wire to the big terminal on the back of the alternator isn't frayed. If the car has an external voltage regulator, verify that the three wires and their terminals connecting the alternator and regulator are all intact.
- Using a multimeter or a cigarette lighter voltmeter, verify that the battery's resting voltage is about 12.6V.
- Verify that the charging voltage is about a volt higher (in the 13.2 to 14.2 volt range) and that it doesn't vary much with engine RPM or electrical load.

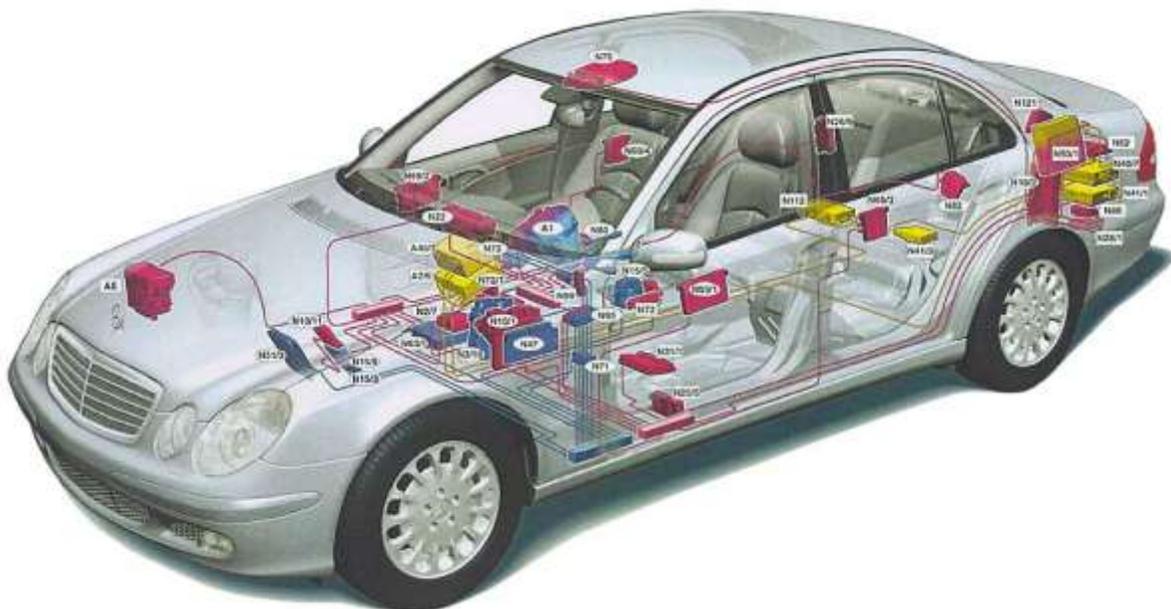
However, there are some additional important aspects about the charging system that you should understand. Last week, I said that, if your car's battery is dead, it's crucial that, after you jump-start the car, you verify that the alternator is charging the battery, because if it isn't, the car will just die half a mile down the road. Let's talk about dead batteries and alternators in more detail.

How Dead Is Your Battery? You need to understand two things. First, the alternator in a car is designed to keep a healthy battery fully charged. It is *not* designed to recharge a dead battery. Second, car batteries are what are called "starting batteries." They are designed to deliver short bursts of power to spin the starter motor, and then to be continuously recharged by the alternator. They are not "deep-discharge batteries" such as the ones used for trolling motors, golf carts, and wheelchairs. Thus, any time you jump-start a car with a dead battery and drive the car, you are putting both the battery *and* the alternator in a situation they were not designed for.



If your battery is bulged or cracked, it's done. Do *not* try and recharge it. (*atbatt*)

And How Old Is Your Car? Because of the above point, there are limits to what you can get away with when you jump-start a car with a dead battery and drive off. The limits depend on the age of the car and its level of electrical complexity. A carbureted car with no electronic control modules is very forgiving, but the electronic control modules in cars built after OBD-II emission control self-diagnostic systems were adopted in 1996 are very sensitive to voltage levels. The car may do some very strange things if the alternator is working hard to try and recharge a dead battery.



The myriad of control modules in modern cars are very sensitive to voltage levels.

On a post-1996 car:

- If the battery is recent but the charge is slightly low (around 12 volts) because, for example, the radio was left on for a few hours, you may be fine with a jump, as long as once it's jumped, the battery shows charging voltage.
- If the battery is recent but the charge is very low (less than about 11 volts) because, for example, the car sat for weeks, you may jump-start it, but even if the battery shows charging voltage once the car is running, the car may have drivability issues, perhaps substantial ones. It's common to jump-start a modern car, have it start as if nothing's wrong, but then, when you begin to drive it, have the dashboard warning lights flash and the car buck and stall.
- If the battery is old and flat-lined (single volts) from sitting for months or years or from having a deep-discharge event such as the lights left on overnight, replace it. As a rule of thumb, on my wife's and children's cars, if a newish battery on a newish car runs down once, I'll recharge it and put it back in service, but if it happens a second time, I'll replace it before it strands them.

On a vintage carbureted car with no electronic control modules, you're still advised not to jump it if the battery is truly flat-lined, but because a vintage car has nothing computerized that's sensitive to small changes in voltage levels, if there's any life left in the battery at all, the car will usually run fine after a jump-start, providing the alternator shows charging voltage.

On a fuel-injected pre-OBD-II car (mid-1970s to mid-1990s), you're in a gray area. It depends on the car and the level of electronics. I once bought a 1991 BMW 525i with a dead battery, jump-started it, and barely made it home due to bucking and stalling. The problems all went away when I replaced the battery with a new fully-charged one.

How to Test a Battery: How do you know unequivocally if a battery is good or bad? There are a few ways.

1. You can recharge it with a high-quality three-stage charger and see what happens. Sometimes it won't take a charge, in which case you're done. Sometimes it *will* take a charge, but when you re-install it, it'll run down quickly again.
2. You can recharge the battery and then test it with a carbon pile load tester. An auto parts store will usually do this for free.
3. You can test it with a battery analyzer. These used to be quite pricey, but inexpensive battery analyzers have recently come on the market that directly measure the degree of sulfation of the plates and give you a resistance reading that's fairly representative of battery health. I have the \$70 Harbor Freight Cen-Tech "digital battery analyzer," and it works pretty well; you can find some nice videos on Youtube of it being used.



Inexpensive battery analyzers such as this one do a pretty good job of telling you overall battery health.

But, whatever the test says, if your starter motor and battery cables are fine and you put the battery back in and get only a few cranks out of it before it's run down again, it's toast.

Which Battery Should I Buy? If you own a computer-laden car from the mid-2000s or later, when you replace the battery, you should replicate the original battery very closely. If the original battery is absorbent glass mat (AGM) with a capacity of 750 Cold Cranking Amps (CCA), that's what you should replace it with. But on an older car, pretty much any battery will work, as long as it physically fits into the battery tray with zero risk of the terminals touching metal, can be held down securely, and has at least as high a CCA rating as the original battery. What, you think you're doing something different when you jump-start a car with another battery?

Don't Ever Disconnect a Battery While the Car is Running! Old-school car guys sometimes see if the alternator is working by starting the car, then disconnecting the negative battery terminal. The idea is that, if the car doesn't die, it's running off the alternator, and therefore, the alternator must be working. **Don't do it!** If the alternator *was* good, odds are it ain't any more; disconnecting a battery in this way is likely to blow diodes in the alternator. Check the charging voltage instead.

If the Alternator Isn't Charging the Battery: The problem could be the alternator, the regulator, or both. If the car has an external voltage regulator, there's a test you can do called "full-fielding the alternator." You unplug the regulator and jumper across two of the connectors. You need to look up which two on an enthusiast forum, as the connectors are not completely standardized (on vintage European cars, it's D+ and DF). Then, connect a voltmeter across the battery, start the car *briefly* and measure the voltage. If you see high charging voltage—and it may be 16 or 17 volts—then the alternator is working fine and the problem is in the voltage regulator or the wiring. If you *don't* see charging voltage, the alternator should be replaced or rebuilt.

On a car with an internal regulator, the regulator and brush pack are a unit. Unscrew it and examine it. If the brushes are worn down to nubs like pencil erasers, try replacing the regulator and brush pack. If not, you're advised to replace the alternator and regulator together.

(Next week: The belts.)

Rob Siegel has been writing the column *The Hack Mechanic*[™] for BMW CCA Roundel Magazine for 30 years. He is the author of *Memoirs of a Hack Mechanic* and *The Hack Mechanic*[™] *Guide to European Automotive Electrical Systems*. Both are available from [Bentley Publishers](#) and [Amazon](#). Or you can order personally inscribed copies through Rob's website: www.robsiegel.com. Look for his upcoming book *Ran When Parked: How I Road-Tripped a Decade-Dead BMW 2002tii a Thousand Miles Back Home, and How You Can, Too*.