AUTO ELECTRIC CORNER — Chrysler Alternator Modifications



BY MOHAMMAD SAMII

Modifying Chrysler Alternator

There have been a few threads of discussions on the ERA website and in some columns showing how to restore an alternator back to operation in the Chrysler Computerized Charging System (CCCS) when the PCM fails to do so. Most rebuilders are of course aware that CCCS has been around for many years, has gone through a lot of changes, and been modified into few versions. Each newer version is more sophisticated than the older one with more capability and diagnostic features that can initiate various DTC's (Diagnostic Trouble Codes).

Depending on the year of the vehicle the alternator is used on, some rebuilder use various methods to make the alternator work independently from the PCM. At this point I would like emphasize neither I personally nor Electrical Rebuilder Association advocates bypassing of the PCM as a matter of policy, and decision made to do so are strictly based on individual Rebuilder' choice. But considering the economic realities and the customer awareness and agreement of what is being done, Rebuilders mostly use one of these methods to accomplish their modification:

1- Use of an external Chrysler electronic voltage regulator of the past, installed and wired up to make the alternator work without the PCM control of the field current.

2- Modifying the alternator to run with the attachment of an *aftermarket* regulator kit, designed for various brands (Chrysler, Bosch, Denso,…etc.) to make a self-contained unit, energized by an ignition source, and run independently without relying on PCM.

3- Slightly modifying existing alternator (mostly Denso) by use of an appropriate brush-holder to make it to adapt to install an *aftermarket* self-exciting voltage regulator to make the system charge upon engine start-up, without relying on any alternator activation scheme.

I am saving the details of the Chrysler's Computer-controlled Charging System for the seminars during the ERA Show but suffice to say in certain versions of the system, one must be aware of the PCM's failure mode that stops the alternator from charging, while modifying the alternator to work independent of the PCM may not necessarily result in a functioning vehicle!

In the earlier systems, the source of field current (B+ to F1 post) was the ignition switch but shortly after it was the ASD (Auto Shut-Down) Relay. The ASD relay that is PCM operated would energize for about ½ of second after ignition switch was turned on to operate the fuel pump to prime the system, then it would de-energize. As soon as the engine started cranking, a Crank Position Signal (CKP) would be sensed by PCM, and it would then reactivate the ASD relay full-time. The relay of course would supply power to a few essential things like fuel pump relay, ignition coil, injectors and such, including the alternator field (+B to F1).

As the system progressed, in a later version of the system the source of field current became the PCM also. Meaning the PCM would apply the power to the F1 terminal and then

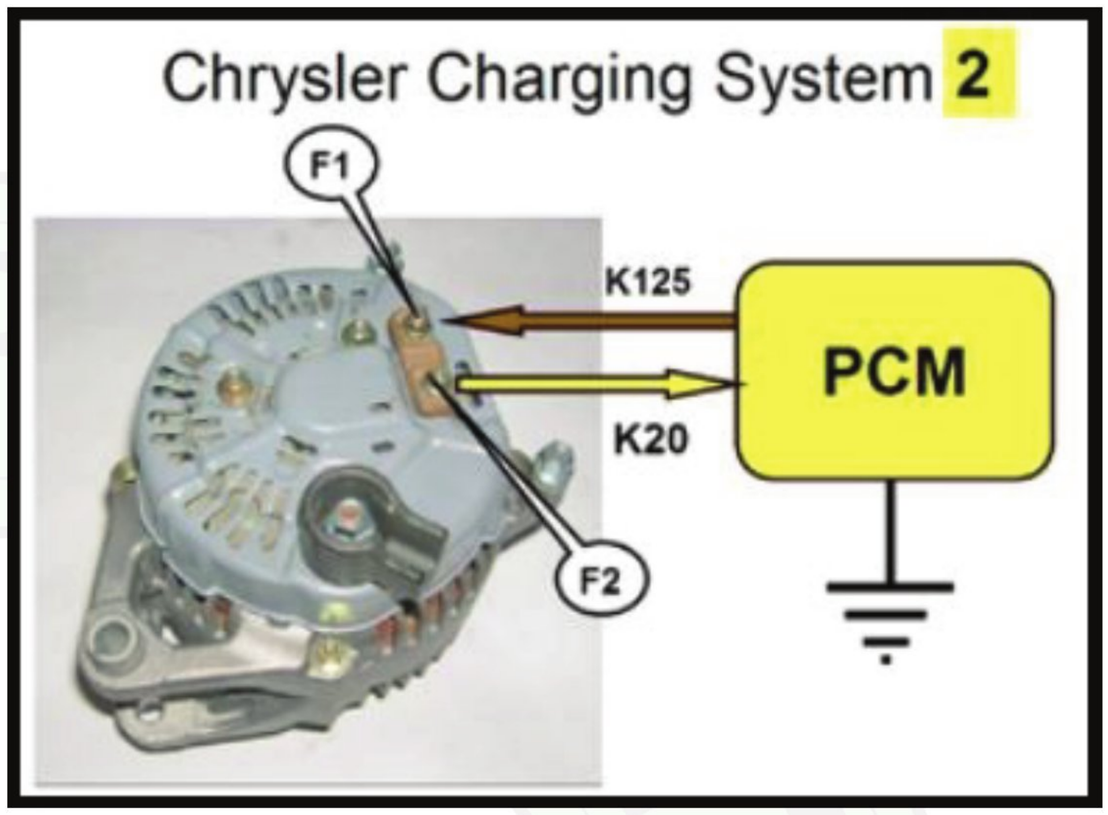


Figure 1 – Field current is applied by PCM in a later version of the system

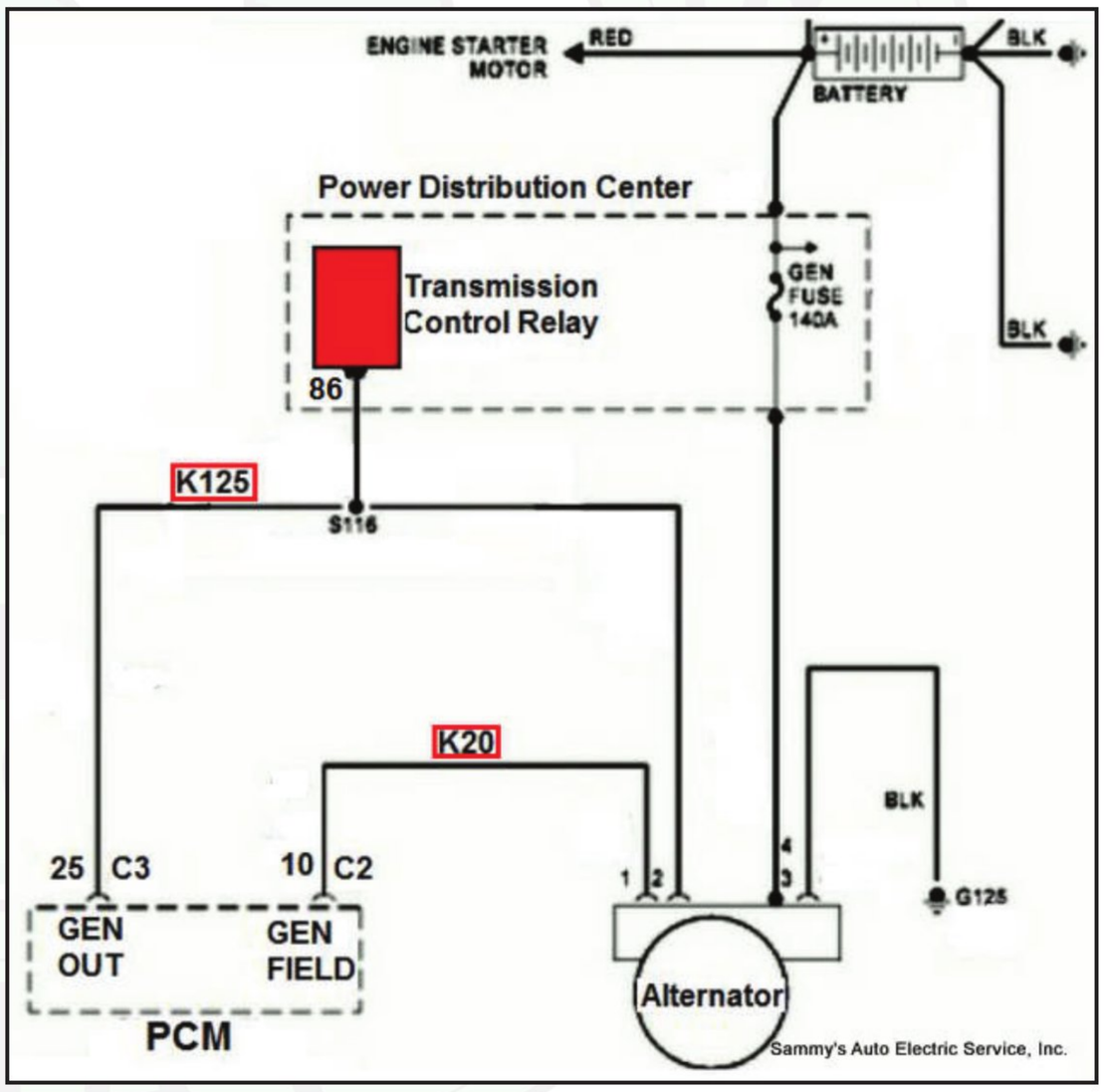


Figure 2 – K125 Circuit, feeding TCR, in addition to alternator field

toggle the F2 to ground for the output control of the alternator and the system voltage regulation. These two lines are respectively called **K125** and **K20** in Chrysler schematics (*Figure-1*). The PCM's power circuit (K125), in addition to powering up the alternator field and a few other things, it also powers up the control coil of the Transmission Control Relay (TCR). So in such vehicles (say a 2000 Dakota), a failure of K125 circuit not only disabled the charging system, but its failure would result in the transmission to go into a limp-mode, and would not shift out of the second or third gear…! (*Figure-2*).

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Now suppose upon such a failure, a rebuilder modifies the alternator to run independent from the PCM, thus getting the charging system going. But you will still have a vehicle that does not shift, thus not useable. I leave the complication of explaining to the customer whether the transmission problem has anything to do with the alternator modification or not to your imagination, but I want you be aware of this issue and know the failure mode of the PCM, and its relationship with the charging system and transmission operation. Failure of the PCM's K125 circuit is not uncommon…!

Since we are on the subject, another issue regarding the system in the mid to late 90's and early 2000 Dodge trucks with Diesel engine is worth mentioning. In these Diesel trucks, the ASD relay (mentioned above) still existed but their function was limited to supplying alternator field current as being the power source for the ignition, injectors and fuel pump is not applicable. The PCM would require a signal from a sensor called Engine Speed Sensor and not a CKP. If there was no speed sensor signal, the PCM would not reactivate the ASD relay, thus the alternator would not charge (no field current) but the engine would keep on running. A dead giveaway was if the vehicle tachometer (of course not all models had one) and the charging system quit at the same time or shortly after, you could almost bet the engine speed sensor was out. Installing a new sensor would restore the operation without expensive PCM replacement that would not produce any results, or an alternator modification that was not necessary. More about these during the 2018 ERA Show…!

Generator failure…!

Proving a customer wrong is not necessarily something that I enjoy, but I reserve the right to do so when he insists the generator he bought from a part store is something we have rebuilt for him…!

That was exactly the case when the customer who is the owner of a couple of old cars laid the generator on my counter and said this unit that we had rebuilt had failed in a short while after installation. He was gone after we inspected the unit (A Ford 5848 generator for 1962 Falcon), finding out it came from a part store, with the tag attached to it intact, showing the manufacturers name and part number. Once he was called and told this unit has nothing to do with us, he remembered the unit we had rebuilt was for a 1949 Ford car (his other car) but this one was purchased from a national part store chain. Nevertheless, he wanted it fixed.

Once torn down, you could easily see the heavy trace of solder sprayed out of the commutator on the inside of the field case (*Figure-3*). This obviously had happened due to overcharging right before the armature gave up and a bar flew out of its commutator (*Figure-4*).

An estimate was given with the caveat that we have to see and run the regulator before any warranty is given. Surprisingly he showed up with a new US-made Ford regulator with the blue cap that are a lot more reliable than other cheaper versions.

In my business like many other small rebuilder, we do not imply any warranty unless the regulator has been run with the generator and adjusted appropriately. So we did exactly the same and delivered the work. He could have saved himself a lot of money had he come to us first. So hopefully he has learned a lesson for the next time.

Until I see you again, keep up the good work.



Figure 3 – Sprayed solder inside the generator field case

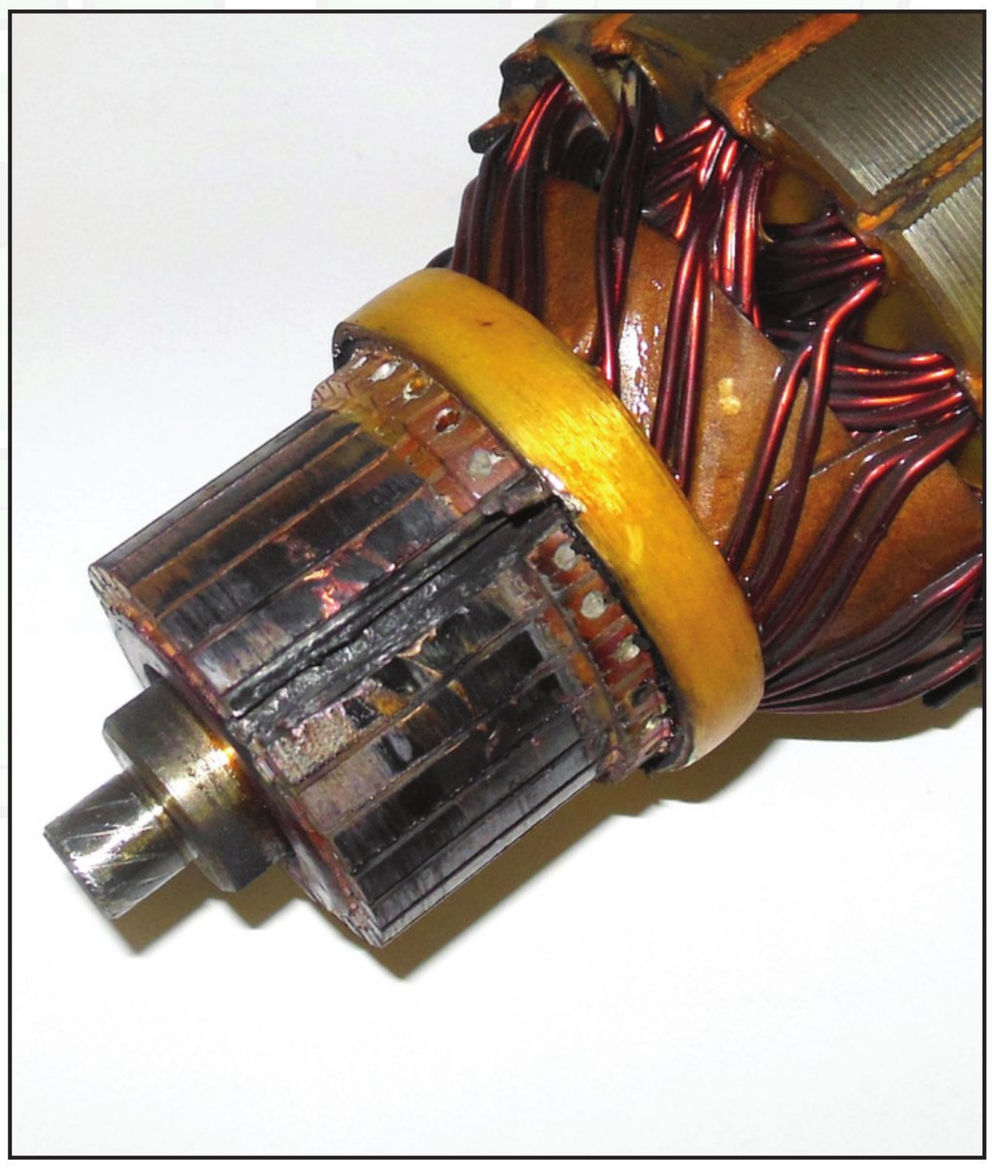


Figure 4 – Blown commutator bar due to over-charging

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