AUTO ELECTRIC CORNER — Honda Dual-Mode Charging, Bus Blower Motor and a '41 Packard



BY MOHAMMAD SAMII

Honda Dual-Mode Charging System

The subject of Honda's alternator/charging system, particularly when it relates to its Dual Mode feature has been discussed a few times here and there, but going by the extent of the questions and confusion that I see on many websites and forums, I believe it is time to briefly review this interesting charging system.

Honda's 2-Mode charging system had its origins in mid-80's where it was designed to enhance the fuel economy by reducing the charging system set point after a full battery charge, thus reducing the load on the alternator and the engine, to reduce fuel consumption.

The principles of the system's operation has not changed much since then, but the electronic enhancement in engine control systems and the ECM has made many changes to make the system faster and more compatible with the OBD-II (Onboard Diagnostic) system to meet the regulation mandates.

Like any system with a variable voltage setting based on the alternator's load, there must be a provision to measure the amperage coming from the alternator. Honda does this with an Electronic Load Detector or ELD. This is a device that fits inside the engine compartment's fuse box and like a magnetic current clamp constantly measures alternator output (*see Figure 1*).

The results of the ELD output measurement is fed into the PCM, and when the criteria is met, PCM commands the regulator's "C" terminal (*see Figure 2*) by pulling it down (to near ground), and by doing so, the system voltage drops to 12.6V. At this time the alternator will still be charging but not high enough to let the system voltage go above 12.6V or so. In other words,

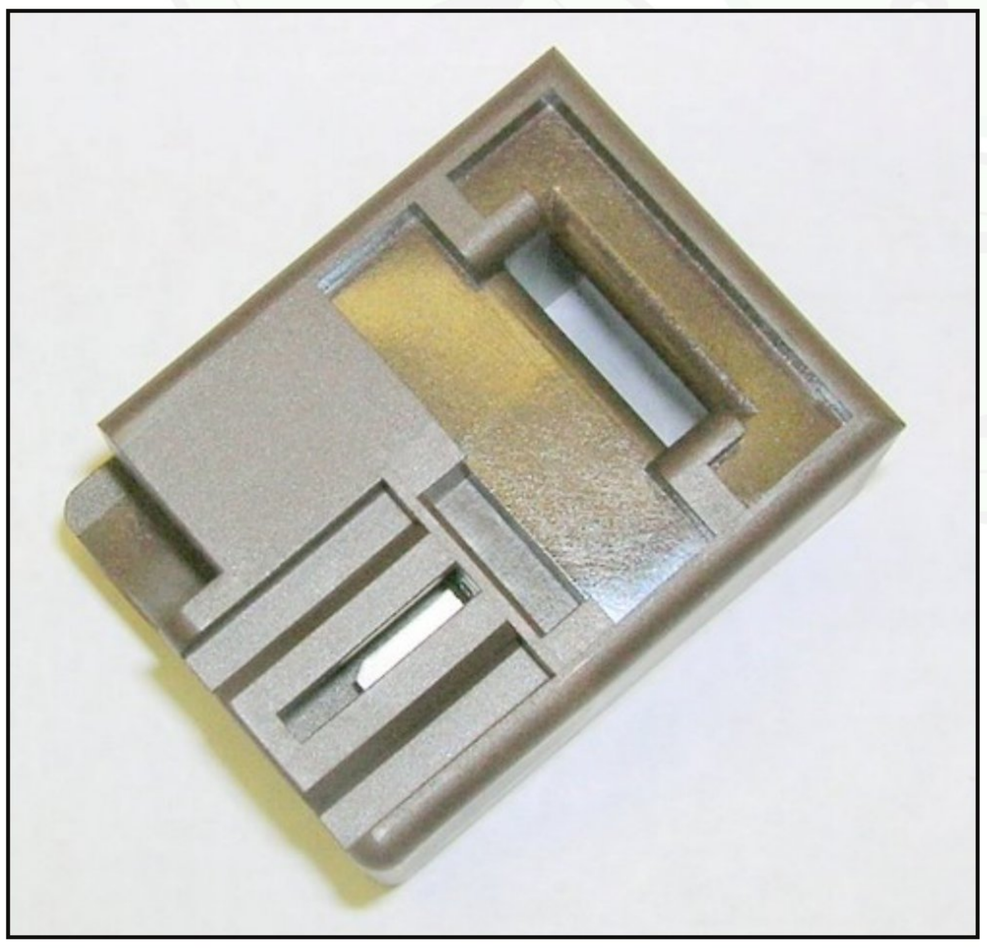

Figure 1 – Honda's ELD (Electronic Load Detector)

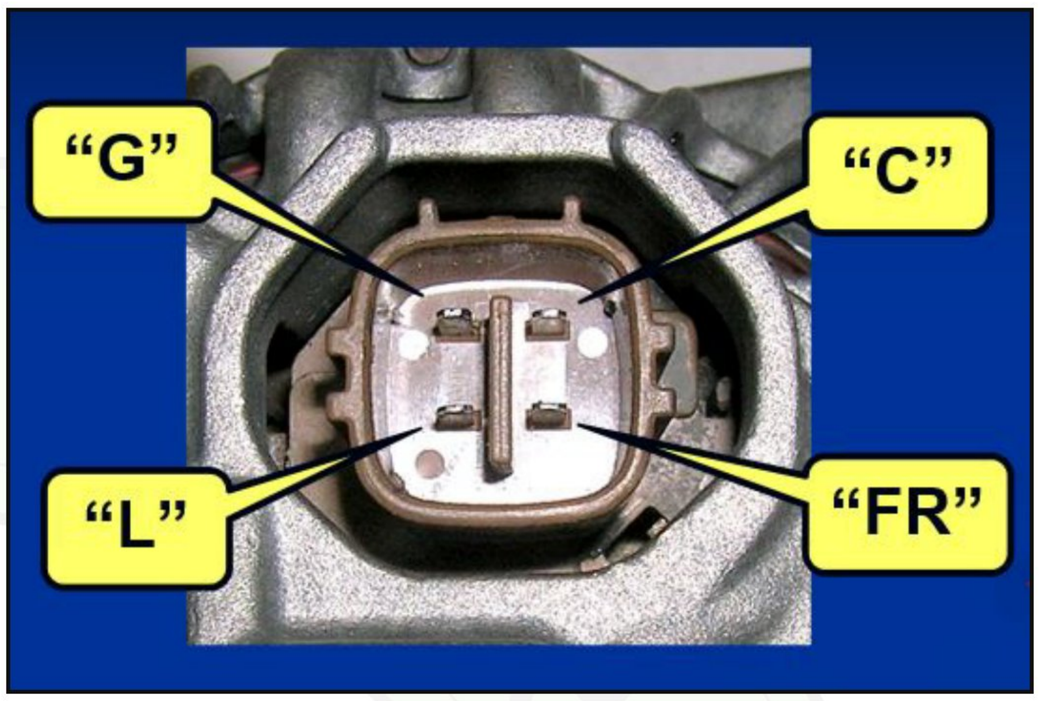

Figure 2 – 13649 Honda Alternator "C" terminal

grounding of the "C" terminal turns the alternator into a battery trickle charger and no more. It will resume normal operation anytime the load is increased, even when the brake pedal is depressed.

In earlier days, the PCM's signal to the regulator's "C" terminal was purely analog but with the newer ECM's, this has changed into a pulse-train. When the pulses are wide, the average voltage on the signal is relatively high (close to battery voltage), and when PCM tries to apply its voltage reduction feature, the pulses narrow, so the average value of the signal will be relatively close to ground (negative), which is interpreted by the regulator's "C" terminal as being grounded, thus the regulator lowers the system voltage.

Any malfunction in the ELD circuit will invariably have some effect on the charging system such as, low or high voltage setting or erratic voltage fluctuation. The good news is that problems with ELD have diagnostic trouble codes (DTC) that will be stored in the PCM and can be retrieved by capable scan tools, meaning the scan tools that are a couple levels up from the cheap code readers.

Diagnosing a defective alternator is a straight-forward process and the diagnosis is not that complicated. So a defective alternator can be easily identified and replaced. But on the trouble cars with repeated alternator failures (real or imagined), voltage fluctuation, and other intermittent problems, we start by scanning the PCM and look for codes P1297 and P1298 to get a better picture of partly what is going on within the system before any alternator change. These codes represent the ELD reading being low or high, and thus the issue needs to be addressed before any alternator change to eliminate additional problems down the road or repeated alternator failures, resulting in preventable warranty claims, and the hassles of dealing with an irate customer.

Another issue prominent in the Honda Civic's using

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the 13649 alternator was that the wiring loom leading to the regulator will rub against a support bracket under the intake (*see Figure 3*) and ground out. Now depending which wire touches ground, each will affect the charging system in a different way. This and other issues with "C" terminal operation are the subjects I am planning to talk more about in classroom setting at the ERA Show, as a detailed discussion about the subject is too much to be written about in this column.

Special Units…!

I occasionally point out services that can be provided by a qualified electrical rebuilder, while the possibility of a large production rebuilder doing the same is nearly impossible. Here are a couple cases that might be of interest to my colleagues.

(1) The Bus Blower Motors

We repair these units for our local mass transit outfit that runs both conventional and hybrid buses throughout the city. These HVAC blower assemblies require a new 24V blower motor that is incidentally available at J&N, and practically nowhere else, not even from big national truck parts and HVAC suppliers.

This 24V blower motor, a twin shaft, 2-wire, insulated ground DC motor (VDO brand, PM386) that is 3 inches in diameter needs to be carefully taken out of the case after its removal. A set screw holds the fans to each shaft and then the motor can be replaced with the new one (*see Figure 4*). This job can be done in about an hour or so but when completed, it can turn into a good invoice item. The bus company was buying the complete unit as a whole and pay big dollars. Having a new motor installed and making the whole assembly functional again makes for a good invoice with a large margin for profit, which is still far less than the amount for a whole new assembly from the bus manufacturer.

(2) 1941 Packard Starter…!

A customer of ours who owns a few mortuaries in a nearby county is the owner of one of the largest collections of Packard Automobiles. Their fleet of 15 vehicles, 2 or 3 from each decade that this automobile was built constitutes every selection such as lead car, hearse, limousine, sedans, or anything necessary to run an entire funeral procession in style and in Packard's…!

We have been taking care of this fleet for the last 30 years. Their latest acquisition was a 1941 Packard LeBaron Limousine, from which we received their 6V positive ground starter and generator to rebuild. Rebuilding the old Auto-Lite generator (GEA-4802A) was a straight–forward job, requiring some clean-up, insulating the fields, replacing the bearing and installing a set of old R-59 brushes that we somehow had a few left in a dusty old box from by-gone years!

The starter was a lot more complicated. This early Auto-Lite MAX-4014 (*see Figure 5*) reduction gear starter needed some rework and a starter drive. The drive, a key needed item was beautifully rebuilt by The Drive Doctor whose quality of work comes as no surprise to many rebuilders, as they have supplied us with many such hard-to find items in the past (*see Figure 6*).

The shift-lever is supported with a strong return spring, located and centered uniquely over a pin in the shift-lever housing (*see Figure 7*). The solenoid contained an isolated internal relay, fed from the starter's battery post, and supplied ground by the ignition switch to activate it and crank (*see Figure 8*).

The design and craftsmanship of the unit indicates the engineering effort behind it, which in its days some



Figure 3 – Honda Civic Intake Support Bracket

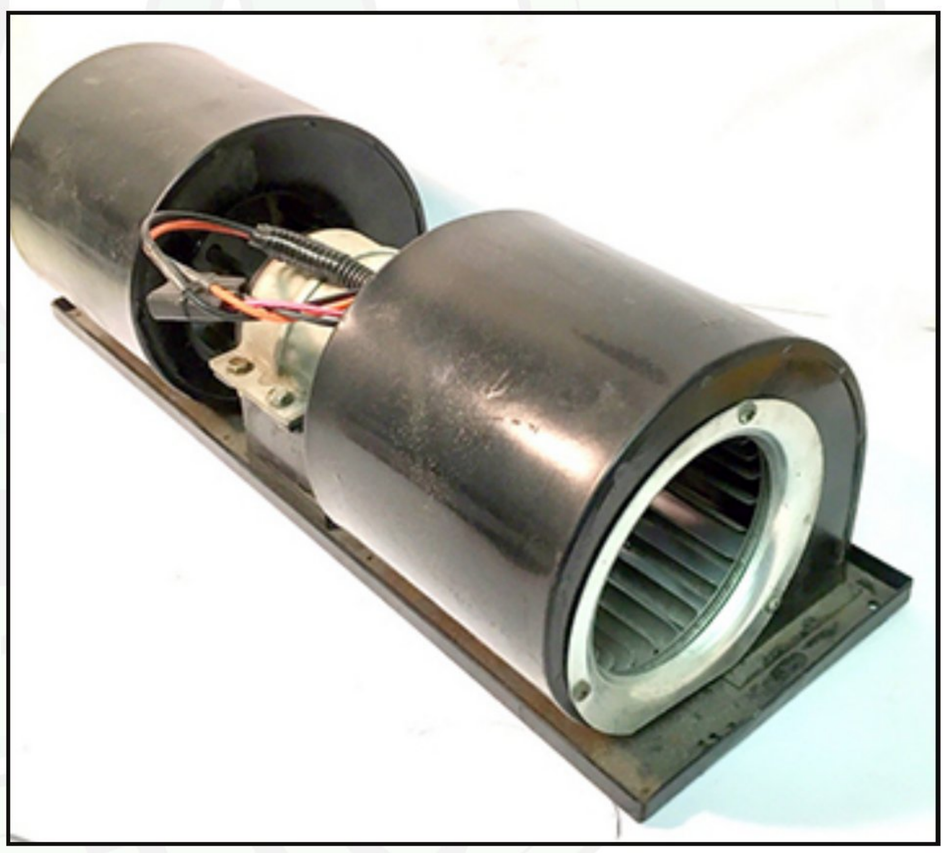

Figure 4 – Dual Shaft Bus Blower Assembly

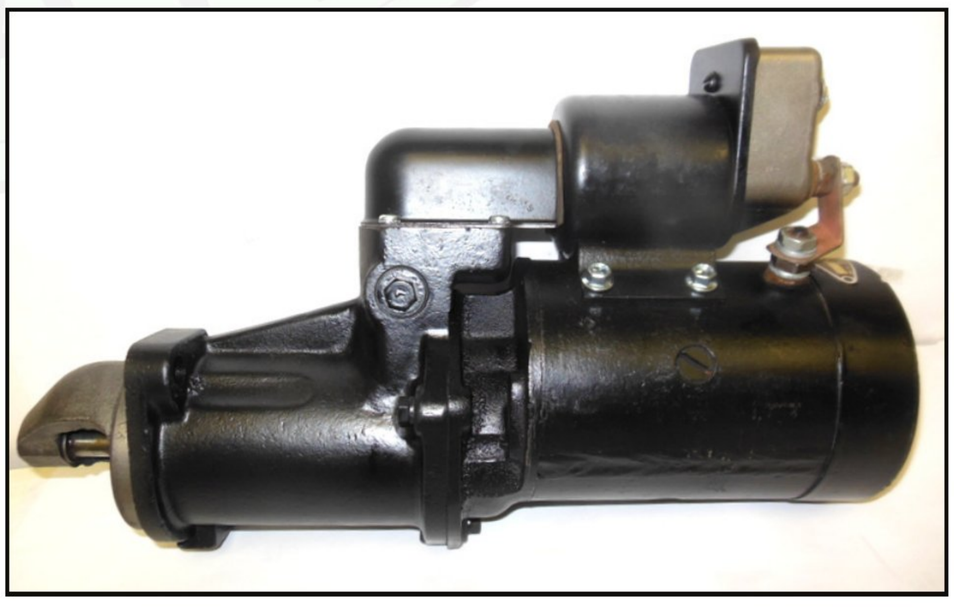

Figure 5 – A 1941 Packard Limo Starter (MAX-4041)

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80 years ago was perhaps a far out achievement. Servicing such units as shown above is still in the hands of custom rebuilders as the production rebuilders and mass-merchandisers do not have the ability to service such units. This kind of work not only makes the daily routine interesting, but the lack of competitive pricing can also make it highly profitable if you charge for the value of your work.

I am looking forward to see many of you at the ERA Show in Springfield, MO. Until then, keep up the good work.

You can reach me by calling the ERA Tech Help Line at 636-584-8324 or at: sammyselectric@sbcglobal.net

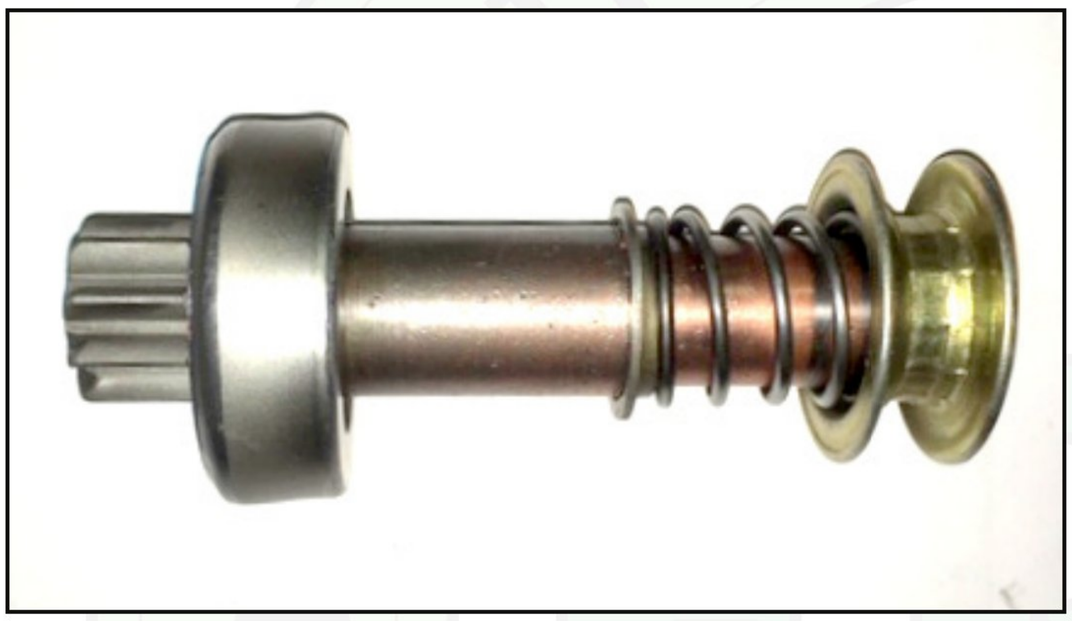

Figure 6 – Packard Starter Drive Rebuilt by The Drive Doctor

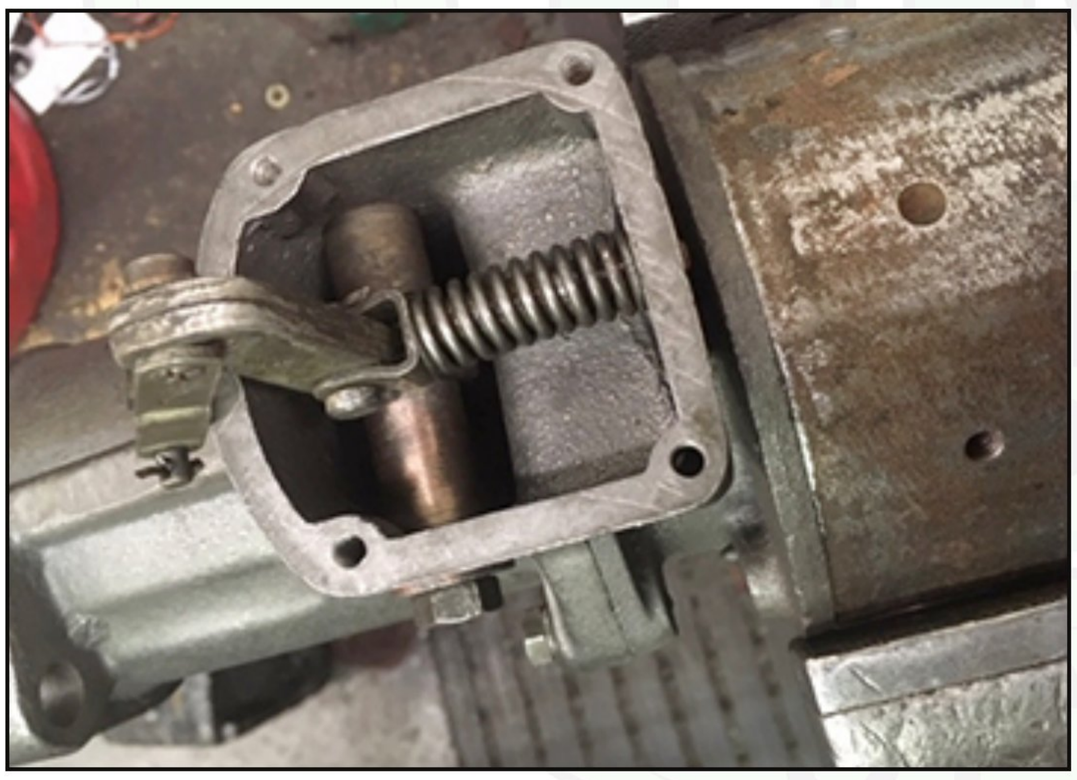

Figure 7 – Plunger Return Assist Spring



Figure 8 – MAX-4041 Starter Solenoid

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