HEI NO-SPARK BLUES

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Got the HEI No-Spark Blues?

Don't worry, be happy. HEIs are as easy as pie to fix. You don't even need kilobuck 'scopes, module testers, or computer interfaces.

The Usual Legal Disclaimers And Stuff.

This is NOT the official factory diagnostic procedure. This is shorter and simpler. It requires fewer special tools. It is a little less thorough, but a lot faster. This is not designed to locate everything that could possibly go wrong with an HEI. It will locate the common problems.

General Assumptions:

You "know which end of a screwdriver to hold onto". You've even replaced a distributor cap and rotor and timed an engine at some point in your life, and the engine ran good after you completed the job. You have basic hand tools.

You have a non-computer controlled HEI (the module has only four terminals) with the coil built into the cap. If you have a separate ignition coil, the basics are the same, but the details are a little different.

You don't have a pacemaker, 'cause we are dealing with 50,000 volts and I don't want anyone to have their ticker "vapor lock", if you know what I mean. You do not want to "catch a spark" even if you're completely healthy. It hurts, especially if you are leaning over the fender and the spark grounds through your pants zipper.

Whenever I tell you to crank the engine, I'm assuming the ignition is ON and the car has the park brake engaged and the transmission is in "Park" or "Neutral". Your necktie should not be wrapped around the fan blades.

Special Tools:

The most important special tool is a fully functional brain. Be sure yours is completely engaged. If the clutch plates of your mind are slipping, press "BACK" on your browser.

Spark tester: K-D tools 2756 (also available from Snap-On), A-C Delco ST-125, Mac ET 760H, or equivalent. Cost is about twelve dollars. Available at any well stocked auto parts store. This looks like a spark plug with an alligator clip soldered to it. Avoid the temptation to make your own. The real deal has a calibrated spark gap that will properly load the coil.

A straight spark plug boot: You'll cut it so that when you slip it over your spark tester, it extends about ½ inch beyond the tester.

Jumper wire: Plain old 14 gauge primary wire about three feet long, with alligator clips on each end.

12 Volt test light: A cheap one is OK, but test it every time you use it. If the wire is connected to ground, (the usual arrangement) touch the probe to a power source and make sure it lights up. HINT: Use the alternator positive terminal if it is easier to reach than the battery positive terminal. On those occasions that the wire is connected to a power source, touch the probe to ground and make sure it lights up. It's very frustrating to have to re-do an hour's work because the bulb in the test light burned out and has been giving you false readings.

10 MEGOHM (or greater) input impedance multimeter: This is required for module testing. These are getting to be very common. If your meter has a digital readout, you probably have a 10 megohm compatible meter. No harm in verifying that, though.

DIAGNOSING HEI COMPONENTS

Optional Tools:

Soldering gun rated at 450 watts: Yup, that's a big 'un.

Remote starter switch: (or a buddy to crank the engine while you're inspecting parts from over the fender) If you use a remote starter switch, be sure the ignition is ON when you're cranking during testing. You'll waste a lot of time if you crank the engine with the ignition off.

Photo 7. *The tools you need to diagnose an HEI that has a 4-terminal module. (cranking buddy not shown—see "Victoria's Secret" catalog models for suggestions for a helper.)*

Photo 9. *Spark testers have calibrated spark gaps. HEI tester has larger gap due to recessed electrode, and requires greater voltage to fire than standard tester.*

Photo 10. *HEI Spark tester and cut-off spark plug boot used as a support tool.*

Photo 8. *Spark testers: HEI on left, points-style or Chrysler electronic on right. HEI style preferred but not absolutely required.*

DIAGNOSING HEI COMPONENTS

Let's begin:

You have an engine that won't run properly, or won't run at all. When you look down the carb throat and work the linkage, you can see fuel squirt out of the accelerator pump nozzle. The engine cranks at its usual speed, indicating both a fully-charged battery and no sudden decrease in cranking compression.

STEP ONE: Verify No-Spark.

Select the easiest to reach plug wire and remove it from the plug. Connect it to the spark tester and ground the tester to any convenient chunk of nearby iron, such as a header bolt or the alternator bracket. Hint: face the sparking end of the tester so you can see it from the driver's seat.

Crank the engine with the car in "Park" or "Neutral". If you have a good spark, check the other plug wires. The HEI is OK, but perhaps your distributor cap, rotor, or some of your plug wires are defective, or your spark plugs are fouled. Repair or replace the cap, rotor, plug wires and/or spark plugs as needed. If you have no spark, test a couple other plug wires. Still have no spark? Reconnect the plug wires and go to step 2.

STEP TWO: Verify power supply to HEI.

Disconnect the power wire to the ignition coil. If the coil is built into the distributor cap, this wire will plug into the cap, at the "BAT" or "B+" terminal. Probe the connector on the power wire with the test light, or use the voltmeter set to the lowest scale that accommodates 15 volts. With the ignition ON, but not cranking, you should have within one volt of battery voltage, or a very bright test light. With the engine cranking, you should still have within one volt of battery voltage—but that voltage will be reduced due to the current draw of the starter motor. You should have a minimum of eight volts on the voltmeter or a medium brightness on the test light when cranking. Poor voltage? Repair wiring from ignition switch. If you have good voltage, reconnect power wire. Go to step three.

STEP THREE: Exploratory Surgery

If you have a coil-in-cap distributor, remove the distributor cap and rotor from the distributor. If it makes it easier to remove the cap, you can first label and remove the spark plug wires from the cap, but leave the three small wires on the side of the cap connected, and leave the power wire connected! Flip the cap upside down. Push the "Special tool" plug boot over the spark tester, and then push the open end of the plug boot over the center post of the distributor cap. This is the post with the carbon button that rubs on the top of the rotor. The tip of the spark tester will be touching the carbon button, held in place by the cut-down rubber plug boot. Use your jumper wire to connect the spark tester to a good ground.

Photo 11. *Spark tester connected to carbon button. Tester grounded with jumper cable.*

If you have a separate ignition coil (inline six or four cylinder) remove the cap and rotor, but install the spark tester in the coil in place of the coil wire. Use the jumper wire to connect the tester to ground.

Make sure the advance mechanism of the distributor will clear the upside down cap. Crank the engine with the ignition ON. (Watch the distributor so you know it turns when the engine cranks—if the distributor doesn't turn, you have mechanical problems inside the engine.) This is a repeat of step one, but without the plug wires, rotor and cap in the circuit. If you now have spark, start looking at the wires, rotor and cap. Repair/replace the wires, rotor, and/or cap as needed, put everything back together, and go cruising. If you have no spark, LEAVE THE SPARK TESTER IN PLACE and go to step four or five.

DIAGNOSING HEI COMPONENTS

STEP FOUR: (Optional—only if you have the big soldering gun)

YOU ARE NOT TRYING TO SOLDER ANYTHING! IF YOU DO THIS RIGHT, THE TIP OF THE SOLDERING GUN WON'T EVEN GET HOT.

Plug in the soldering gun, and with the ignition ON, hold the body of the soldering gun as close to the pickup coil as you can. Keep your arm away from the spark tester. Pull the trigger on the gun. (One second is enough!) Look for sparks at the spark tester. This is a repeat of Step three, but with the pole piece (reluctor) out of the equation. The alternating magnetic field in the body of the soldering gun will induce voltage in the pickup coil, which should trigger the module, which should trigger the ignition coil. If the soldering gun is not big enough, or is held too far from the pickup coil, you won't induce voltage in the pickup coil and the test is invalid. (I suggest you try this on a known good system, to give you some experience with the procedure—It's a real time-saver! Then, if you have problems later with an HEI, you're familiar with the procedure, and know what to expect.) If you're sure you've done this right, and you get no spark, LEAVE THE SPARK TESTER IN PLACE and go to step five. If you get spark here and you didn't in step three, the pickup coil is defective in a way that is not common. Re-do step three to be sure.

Photo 12. *Using soldering gun to induce voltage into pickup coil.*

STEP FIVE: Eliminate the pickup coil.

Disconnect the two very fine wires (green and white) from the module. Connect the wire on your test light to a voltage source such as the alternator POSITIVE terminal. Touch the probe of the test light to the module terminal labeled "G". (Its the smaller of the two terminals that you disconnected the pickup coil wires from), and it's the one that had the green wire on it. (The test light will not light up on this test.) If you get no spark when you REMOVE the test light probe from the "G" terminal, go to step six or seven. If you get a spark each time you REMOVE the test light from the module, but got no sparks in the other tests, your pickup coil is defective. Replace it; connect the pickup coil wires to the module and repeat step three. If step three produces spark, the problem is fixed. Put it all back together and go cruising.

Photo 13. *Using test light to trigger module.*

STEP SIX: Coil primary voltage test

Unplug the connector from the "TACH" terminal on the distributor cap, if there is a connector there. Usually there isn't. Set your voltmeter to lowest voltage scale that will accommodate 15 volts DC. Connect the positive voltmeter lead to the "TACH" terminal on the distributor cap (or to the – terminal of a separate coil) Connect the negative lead to ground. With ignition ON, repeat step five, except watch the voltmeter not the spark tester. The voltage reading should read high, but spike downward when you remove the test light from the module terminal. If it does, replace the ignition coil and repeat step three. If it does not, replace module and repeat step three. If you get sparks in step three, the problem is fixed. Put it all back together and go cruising. This "should" be the end of your no-spark condition—but just in case, there's step 7.

DIAGNOSING HEI COMPONENTS

STEP SEVEN: test ignition coil.

Coil-in-cap: Remove the spark tester and all wires from distributor cap. Lift the entire cap out of the engine compartment for testing. You don't need to remove the coil from the cap.

First test: Use ohmmeter set on a "low ohms" scale. Connect between "BAT" ("B+") terminal and "TACH" (C-) terminal. (The OUTSIDE two terminals of the three parallel blades in the distributor cap.) Resistance should be very low—generally less than one ohm. If not, replace coil. If you perform this test on a coil that isn't installed in a distributor cap, you're connecting to the red wire, and to either a yellow or a white wire depending on which color your coil has.

Photo 14. *Labeling of terminals. C- and TACH are connected together inside; B+ and BAT are connected together inside.*

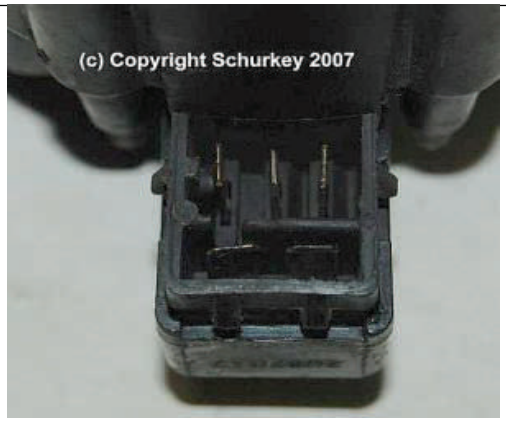

Photo 15. *Three parallel blades on distributor cap. Because cap is now upside down, the three terminals from left to right are B+, GRD, and C-.*

Photo 16. *Testing B+ to C- (coil primary) continuity. Meter shows 0.6 ohms.*

Second test—done in two parts: Use ohmmeter set to "high ohms" scale.

Part 1: Connect ohmmeter between BAT or B+ terminal and the carbon button in the middle of the cap. Read ohmmeter and remember the reading. You are looking for "some resistance"—continuity, (The actual amount doesn't matter much—but it's likely to be well over 10,000 ohms.) or "No continuity—infinite resistance". Put another way—you'll either have "some" amount of resistance; or you'll have an open circuit.

If you perform this test on a coil that isn't installed in a distributor cap, use the red wire and the terminal that would connect to the carbon button. You might expect somewhere between 5000 and 10,000 ohms of resistance (but the actual meter reading doesn't matter), or you'll have an open circuit.

Photo 17. *B+ to Carbon Button. Meter shows "Open Loop" (open circuit—no continuity) (Some coils may have continuity—that's ok too.)*

DIAGNOSING HEI COMPONENTS

Photo 18. *Middle blade to carbon button. Meter shows 101.7 Megohms—very high resistance. Some coils will have NO continuity—open circuit. That can be OK.*

Part 2: Connect ohmmeter between ground terminal (the MIDDLE one of the three parallel blades in the distributor cap) and the carbon button. Read ohmmeter (again, you're looking for "some" continuity—likely over 10,000 ohms of resistance, but the actual reading doesn't matter much—versus "no continuity—open circuit") and compare to result in Part 1.

If you perform this test on a coil that isn't installed in a distributor cap, you are connecting to the BLACK wire and the terminal that would connect to the carbon button. You may see somewhere between 5000 and 10,000 ohms but the actual meter reading doesn't matter very much.

VERY EARLY (Mid '75 and OLDER) HEI in-cap coils may not have a black wire, and you CANNOT do this part of the test on those coils—but you MUST have continuity in Part 1 if there is NO black wire. If BOTH of the readings in the second test, Part 1 and Part 2 are infinite (indicating an open circuit on BOTH Part 1 and Part 2) replace coil. It is ENTIRELY acceptable to have ONE reading—either in Part 1 or in Part 2—that shows infinite resistance—open circuit.

Separate coil: Remove spark tester and all wires from the coil.

First test: Ohmmeter set to "low ohms" scale. Connect between "BAT" ("B+" or +) terminal and "TACH" (C- or -) terminal. Resistance should be very low—generally less than one ohm. If not, replace coil.

Second test: Ohmmeter set to "high ohms" scale. Connect between the big terminal where the coil wire would go, and either the "BAT" ("B+" or +) terminal or the "TACH" (C- or -) terminal. If this test results in an "infinite" reading, (open circuit) replace coil)

If you replace the coil, repeat step five. If the coil passes both of these resistance tests, replace module and repeat step five.

Step five should produce spark, and the problem is fixed. Put it all back together and go cruising. If not, go cruising in your buddy's car to clear your head, then start from Step Two and re-check all your work, making sure you have good connections at the spark tester, test light and volt/ohmmeter. Then verify that the wiring harness that connects the module to the coil is sound.

If you're ABSOLUTELY sure that everything tests good, and you still have no spark, replace the module and retest.

In the Next Issue of Chevy Punch

Schurkey concludes with:

Common HEI Problems

Coil Interchange Guide

DIAGNOSING HEI COMPONENTS

Helpful part numbers for HEI distributors:

GM/Delco part numbers

01894379 ZZ4 distributor main shaft assembly w/ rotor.
Includes centrifugal advance. The previous number was the same but did not begin with "0" so try both numbers.
93440806 Complete "ZZ4" style HEI distributor
12167658 Connector used to connect TACH and B+ to distributor .
10456413 Melonized distributor gear for GM roller cams—standard diameter hole.
(supplied on distributor 93440806)
1950569 Distributor housing grease reservoir plastic seal
1837617 Distributor shaft washers for adjusting main shaft end play (pack of five)
D1906 Delco 4-pin module

NAPA and other aftermarket part numbers

DP109 HEI weight pins for distributors that use plastic bushings on weights
DP112 HEI oem-style plastic bushings for weights
DP114 HEI weight "stamped 106"
DP115 HEI weight "stamped 139"
DP126 HEI weight "stamped 105"
MP100 (GP Sorensen EL315) HEI yellow color code (Chevy, Caddy except Seville, Olds Toronado) V-8 pickup coil
MP101 (GP Sorensen EL310) HEI Blue (or black) color code (Olds except Toro, Buick, Caddy Seville) V-8 pickup coil
MP102 (GP Sorensen EL359) HEI clear color code (Pontiac) V-8 pickup coil
(My source for the GP Sorensen pickup coils sells them for about $16 instead of NAPA's $40. The GP-S ones I bought are even made in the USA!)
RR201 Coil frame ground—wire style
RR204 Coil frame ground—Stamped steel strap
RR202 Plug wire retainer ring—8 cyl.
RR230 HEI Capacitor and Harness from module to side of cap 6 ½"
RR231 HEI Capacitor and Harness from module to side of cap 10 ¾
RR233 HEI Harness from module to cap 3 ½
RR234 HEI Capacitor and Harness from module to side of cap 8 ¾
TPL45 Heat sink compound for HEI modules—10 small tubes

Provided by Schurkey