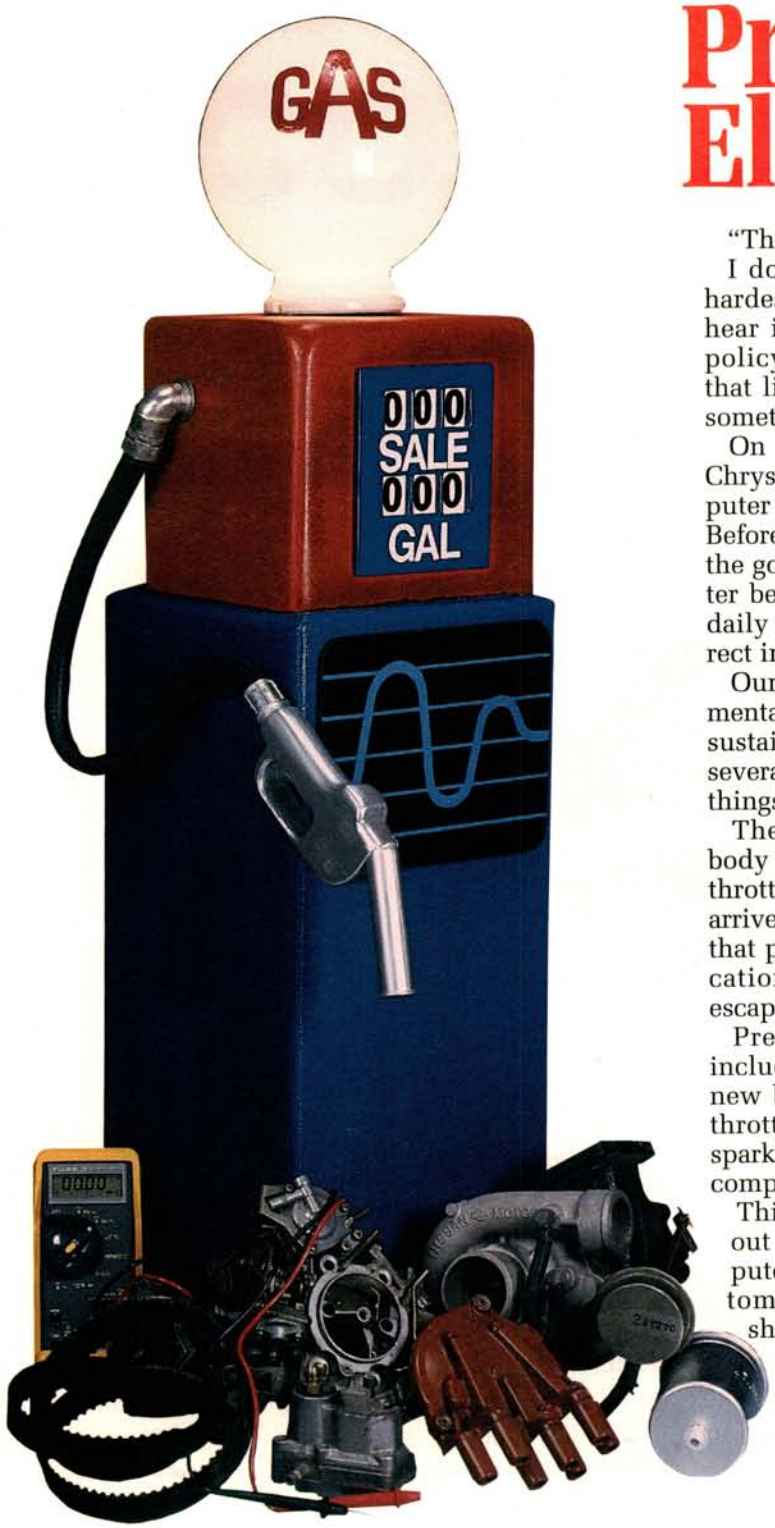
IMPORT SERVICE

Driveability Clinic

Process of Elimination



"The computer's bad."

I don't know about you, but this is always the hardest diagnosis for me to give. Nobody wants to hear it. And considering the price and no-return policy on electronic components, there's always that lingering doubt in the back of your mind that something more simple is to blame.

On some cars, like this month's Mitsubishi-built Chrysler Conquest, the self-diagnostics of the computer (actually, it's a control unit) are very limited. Before we decide to start pointing a finger of guilt at the gold box in the right front kick panel, we'd better be darned sure that it's receiving its minimum daily requirement of voltage and ground, and correct input signals.

Our poor Conquest also has a long list of fundamental problems, some as a result of wear, tear, and sustained neglect. Other problems were created by several haphazard repair attempts which only made things worse.

The Conquest's ECI fuel injection is a throttle body injection system which uses two injectors in a throttle body "mixer." The car idles badly when it arrives, and really breaks up at about 3,000 RPM. At that point it starts spewing black smoke as an indication that a lot of precious petrochemicals are escaping the tailpipe unburned.

Previous efforts to remedy the situation have included the installation of a new air flow sensor, new battery cables, a new pressure sensor, a new throttle position sensor, a new ignition coil, new spark plugs, and a new control unit. That's right, the computer has already been replaced once.

This makes our diagnosis all the tougher to spit out since we know replacement of a "new" computer will be a bitter pill to swallow for the customer who has already suggested that the car should be heavily insured and torched.

We feel that most, if not all of the car's problems, were originally caused by a failure to first repair the car's basic electrical system.

Some people will always step over a dollar to pick up a dime.

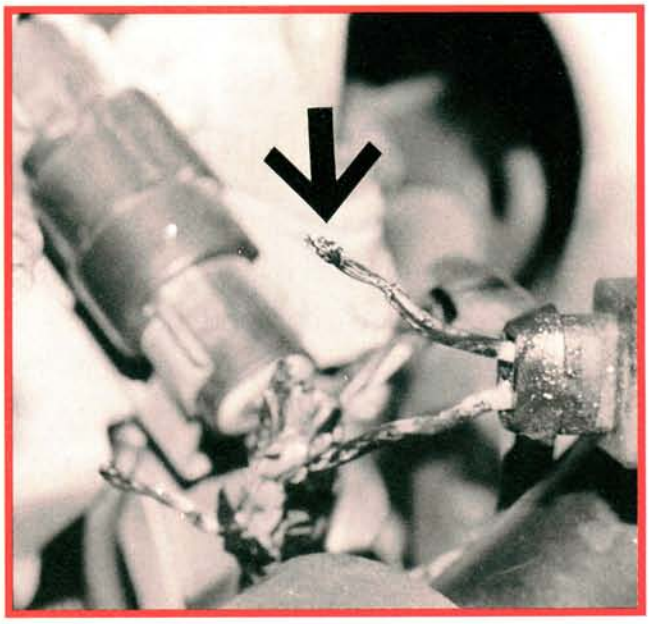
—By Ralph Birnbaum

DRIVEABILITY CLINIC

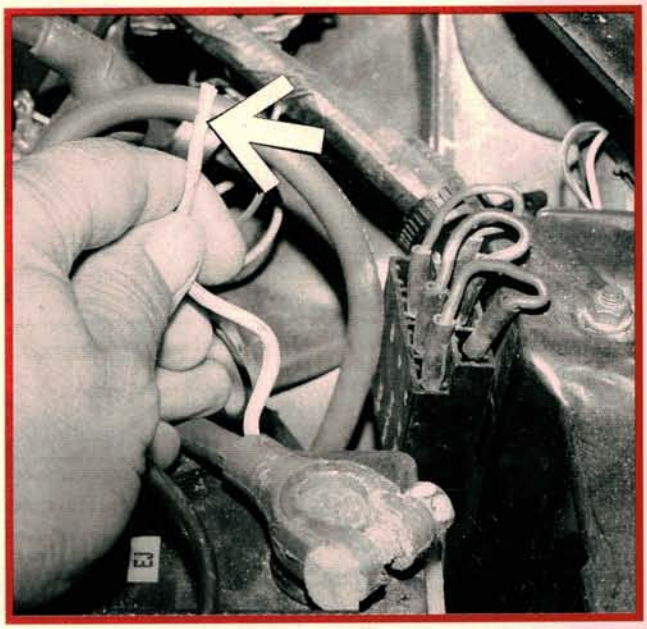
1 We know the car is breaking up under load. But what about its tailpipe emissions at idle? A four gas analyzer test gives a quick indication that things are rich, rich, rich. Both CO and HC are very high. O_2 is uncharacteristically high for a car with a rich mixture. We check, but can't find any vacuum or exhaust leaks.

2 Looks like the mixture is so rich that it's causing a miss, resulting in our high O_2 levels. We go to the injector mixing body and check running and rest pressures. The fuel pressure is within specs, and residual pressures don't drop when the engine is OFF. High fuel pressure and leaking injectors aren't our problem.

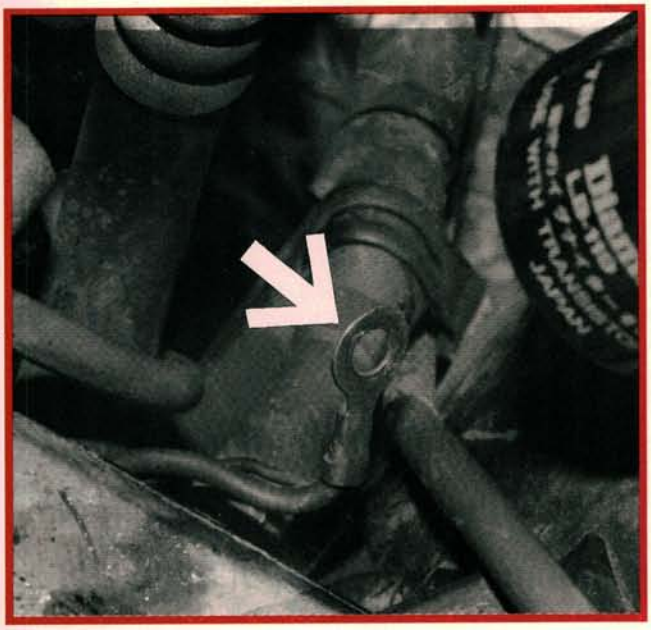
3 Looks like the problem stems from the injectors staying ON too long. A test of the pulse width with an oscilloscope shows that the injectors are being held open way too long. But the signal to the second injector seems to be intermittent. We wiggle the harness to the injector and the signal disappears completely.



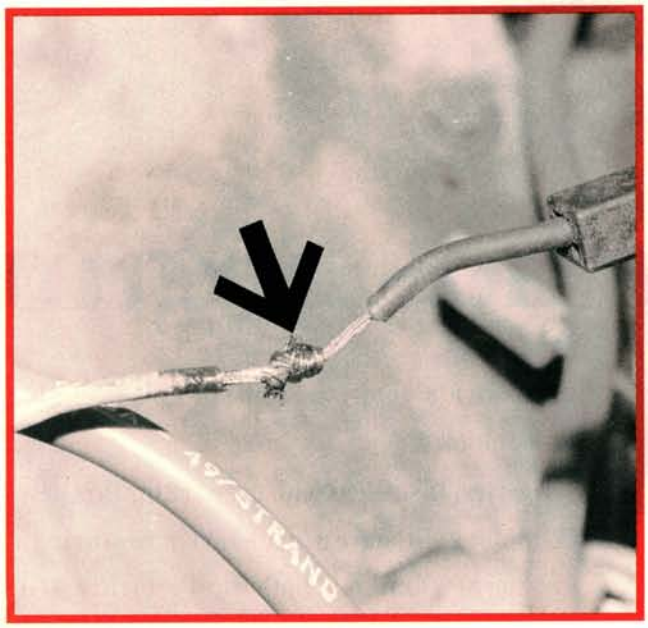
4 The black tape around one injector harness looks very suspicious. Sure enough, when we unravel the tape, we find that one of the wires has been cut and its wire ends bared. The two ends of the wire weren't even twisted together. They're just laying side by side, surrounded by a black, gooey mess of old tape.



5 The injector harness convinces us that it's time to do a really thorough check of the car's electrical system before we go any farther. Good idea. The battery has no reserve at all, and is better suited for use as a paper weight. Someone has installed new battery cables, but the chassis ground connection wire on the negative cable end is dangling in mid air.



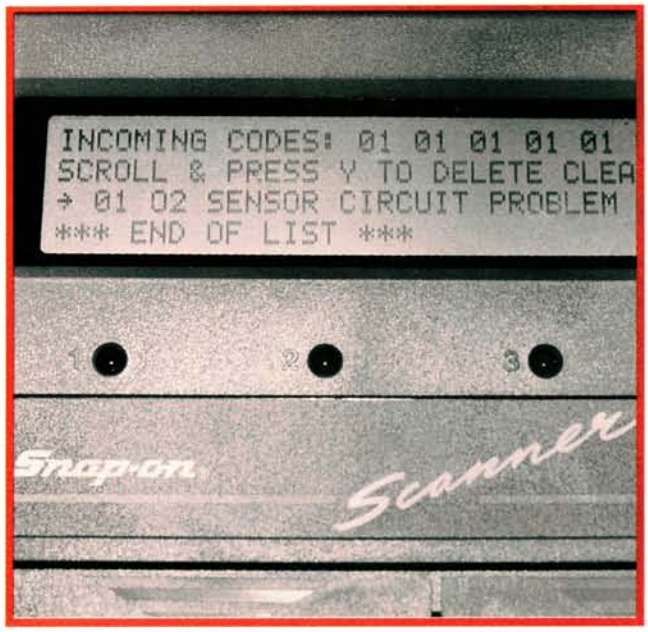
6 When we remove the old battery, we find another ground eyelet dangling next to the battery tray. The only thing it's connected to is atmospheric pressure! We add a length of wire to the chassis ground wire at the negative terminal, and reconnect the chassis grounds. Then we check both the chassis and engine grounds.



7 Why should the positive cable be in any better shape? Sure enough, the auxiliary battery hot wire was installed by the same someone. This time he twisted the wire ends together before taping them. Once again, the connection is loose and corroded. We wonder how many more connections there are in this shape.

8 Next, we grab a wiring diagram and drop the control unit down. We check all voltage supplies and ground terminals by backprobing at the control unit connections. We're really suspicious of the ground circuits by now, and run a long jumper wire directly to the negative battery post to check the grounds.

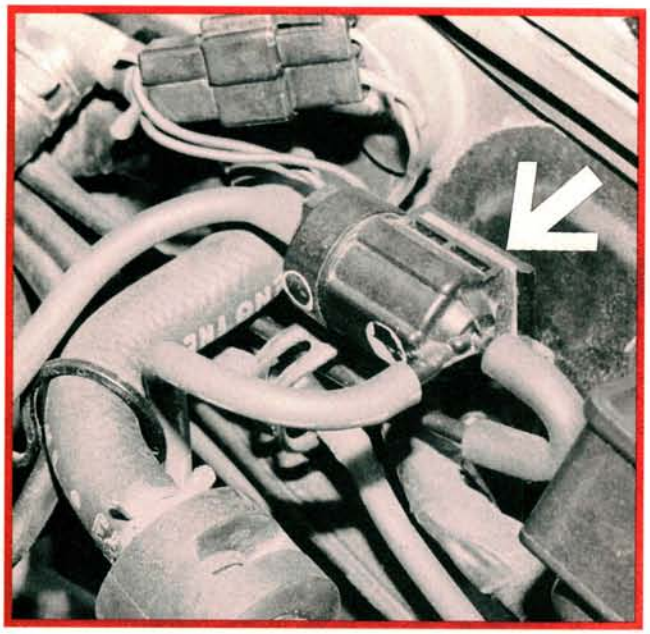
9 Since there's a good chance that the new control unit has been ruined by a poor ground or shorted circuit, we continue with our tests for ground and voltage both with the key ON/engine OFF, and also with the engine running. These tests are conducted first with the engine cold, and also when it gets hot.



10 Satisfied that we've corrected the ground and voltage supply problems, we decide to see if there are any codes stored. Our only code indicates that the oxygen sensor circuit is out of limits. When we backprobe the oxygen sensor terminal at the control unit, we find that the bias voltage signal is missing.

11 The oxygen sensor wire from the control unit is shielded, and the shielding is grounded to the chassis. We've already found enough damaged wiring for one day, and don't want to smoke a new control unit, so we are careful to check for a possible short to ground at the oxygen sensor wire. There isn't any continuity to ground, so we proceed.

12 We're pretty sure the control unit is bad, but we continue to test at the other main (yellow) plug at the control unit which contains the input and output terminals. We're especially concerned with any inputs which would alter the fuel mixture, like temp sensors, tach, throttle position, air flow meter, and pressure sensor signals.



13 Everything else tests okay until we get to the terminal controlling the boost sensor switching solenoid. This solenoid is supposed to switch the vacuum source to the pressure sensor back and forth between atmospheric pressure and manifold pressure every few minutes. The switching circuit in the control unit is open-circuited.

14 We go back to the wiring diagram and find the voltage supply circuit to the solenoid. One circuit supplies voltage to the injector ballast resistors, the pressure sensor, and the vacuum switching solenoid. While we're out under the hood, we check the ballast resistors and resistance across the injector windings when they're hot, just to be safe.

15 It's time to plug in a new control unit. We know that all inputs are correct. We have corrected the problems caused by the chainsaw massacre of the wiring harness. At this point, we have a code stored and two missing outputs from the control unit. By process of elimination, we've determined that the control unit is bad — new or not.

16 With the new control unit installed, the car starts and runs properly. Exhaust emissions come down to normal levels once the fuel-soaked plugs and exhaust system warm up. For a more detailed look at scope testing for similar problems, see this month's Part One of Vince Fischelli's article, Trace Elements.