Parasitic Draw Savvy Bolsters Business

by Paul Rupp

Have you ever had to jump-start your car after letting it sit for the weekend, not once, but time and time again? And the frustration builds because you know your battery and alternator are in good shape. It can happen at the most inconvenient times, like in the airport long-term parking lot after returning from a trip. If this has happened, you may be the victim of parasitic draw.

In this article I will explain parasitic draw, list some common causes, describe the methods and the common tools we use at our shop, tell a few case stories and summarize with how to market this type of work. You will be surprised how easy it can be when you break it down into steps.

Parasitic Draw Defined

Parasite as defined by "Merriam-Webster" is the dependence on something else for existence or support without making a useful or adequate return. A very selfish existence indeed! Parasitic draw as it relates to a vehicle's electrical system is an unusual or unexpected amount of electricity leaving the storage of a battery at an unexpected time which can occur constantly or intermittently. The draw is dependent on the battery to sustain life until there is no more life to give.

The time it takes to experience a dead battery is dependent on the rate at which parasitic draw occurs. Other factors include the condition of a battery and the amount of the draw. Parasitic draw is measured in amperes (amp). Ohm's Law reads V=IR, or volts equals amps times resistance. Rearranging the equation as I=V/R, reveals one amp of current equals one volt of electricity applied across one ohm of resistance. One amp also equals 1000 milliamps (ma). The draw (or load) is the resistance.

Most vehicles have a normal key off rate of 40 to 50 ma draw. An excessive amount of draw would be anything more than 50 ma. On modern vehicles it's not unusual to see up to a 300 to 500 ma draw for five to 10 minutes just after keying off the vehicle. This is due to various control modules powering down and going to sleep until the vehicle is started again.

Let's see how long it takes to run down your battery if you leave your headlights on. A car battery is rated in Capacity (amp x hour) among other things. A typical battery, rated at 60 amp x hours would supply 60 amps for one hour, or six amps for 10 hours. Say your headlights draw 12 amps when left on, then 60 amp x hour divided by 12 amps equals five hours. Your battery would be dead after five hours.

In another example, if the parasitic draw were 250 ma, it would take 10 days to kill a battery. Surprisingly, many vehicles actually do have excessive draw, but they are driven often enough to allow the alternator to recharge the system. Occasionally we will acquire a new customer who states they have had to replace their battery and/or alternator every year or so. In these cases we will find excessive draw, only the vehicle is started and used often enough, the battery never drops far enough down to need a jumpstart. The alternator always has to play catch-up each time the vehicle is started, which can shorten its life from overworking it.

Sources of Draw

Most vehicles are designed well and do not just "get" parasitic draw. Usually we find something and/or someone has inadvertently caused it. Some of the most common sources of parasitic draw are aftermarket alarm systems and stereos along with various control modules which have been damaged.

The first question I have for customers in suspect cases is "Did you recently have any aftermarket accessories added to your vehicle?" Most answers are "yes." Power wiring that shorts to ground is another common source. When you take a piece of wire in your hand and bend it back and forth enough times it will finally break. On vehicle wiring, first the insulation breaks through and exposes the bare wire to potential grounds.

Common locations for these types of faults are whereever something moves, like door jambs, truck lids, tilt wheels, shifters and seats. Broken motor mounts allow an engine to move back and forth as well. We find the lesser quality vehicles have more sharp corners for the wiring to get around.

Methods and Tools

The logic in finding the source of a draw is to think about the entire system. The battery is the starting point and the device which needs electricity to operate is the end. There are fuses in between designed to protect circuits, and relays to protect the devices. Somewhere in the middle of all this is the problem.

The initial step is to ensure the vehicle has a proper battery and alternator with a starting and charging system test. A battery needs to be able to maintain 12.6 volts after a charge and not drop approximately 9.4 volts when applying a load of half the CCA for 15 seconds. The alternator needs to be able to supply its rated amperage output when load is applied and the diodes must be in good shape.

Next we simply test for draw with all the electrical accessories off with a low amp current probe and digital volt ohm meter (DVOM). The readings are in milliamps.

Then we locate the main fuse/relay panel usually located under the hood. You can simply remove relays and fuses one at a time and watch the DVOM for the draw to disappear therefore identifying the problem circuit. If nothing happens here, we go to the underdash fuse panel and pull fuses one at a time.

At this point we try to get lucky. For example, if the suspect circuit is for the air conditioner, we go to the end of the circuit and unplug the a/c compressor to see what happens. We only get lucky a small percentage of the time, by the way.

Once we have pinpointed the circuit, it's time for the wiring diagram. I cannot say enough for an accurate wiring diagram. We use Alldata online for most of our technical info. Alldata is a collection of the most commonly needed vehicle repair information supplied by manufacturers. We are fortunate to have most

Asian import paper manuals. Most all manufacturers who offer for-fee online technical info include OE wiring diagrams which are needed in some cases. (Start at nastf.org for a list.)

A wiring diagram is a great roadmap for finding your way around a vehicle. AESwave offers a course where I learned to color code wiring diagrams to help me see where I was going. A red felt marker means power all the time, green for ground all the time, orange for power when circuit is complete and yellow for ground when circuit is complete. It is amazing how clear it becomes when viewed in color. Relays finally make sense.

We next look for obvious tampering or movement like a door jamb. It is best at this point to start at the end of the circuit and work backwards since more than likely the problem will be in an exposed area rather than tapped up in the middle of a wiring harness.

Always watch the DVOM as you disconnect devices. I will usually disconnect one thing at a time and mark them off the wiring diagram as I go. Once the fault has been located it is very important to test the circuit and all its devices upstream of the fault. The potentially excessive amperage has had to travel though the entire circuit to get to the draw. For example, if you have a faulty starter solenoid at the "S" terminal, the excessive amperage must travel through the ignition switch, PRNDL switch and possibly a relay or two just to get there.

There have been cases where we discover a blown fuse, only to find the fuse will blow again a week later. In these cases we will use what we call a "fuse on a wire" where we insert a fuse with a short piece of wire in each leg into the fuse panel just so we can get an amp probe around it and then begin to wiggle wiring until it blows. You can also use a circuit breaker for the same thing if you do not want to keep going through expensive high amp fuses.

Another nifty trick is to use a Snap-On Vantage handheld scope for very intermittent faults. The tool has a built-in recorder you can hook up to an amp probe, turn it on, note the time and come back the next day to see what time the draw occurred. The tools work great for finding intermittent draws where you have to spend time wiggling the wiring.

Cases

Case 1: 1993 Cadillac Sedan Deville. This vehicle had a pass key type ignition system. Someone attempted to steal the vehicle and the original steering column was hacked up. The customer installed a used steering column himself and the engine would not crank. This is the point we acquired the vehicle for repair. The pass key system has a resistor pellet embedded in the key. When you put the key in the ignition, the resistor completes a circuit and sends a specific voltage to the pass key module under the dash. The module recognizes the voltage and allows the ECU to activate the starter relay, which in turn sends voltage to the starter solenoid "S" terminal, allowing the starter to work.

First, the resistor in the used key did not match the module. We simply tried a few different resistors acquired from Radio Shack until we hit it right. A locksmith made the correct key. Still no start. Using the method above we found an excessive draw in the key pass system and the circuit fuse would blow intermittently. We used a circuit breaker on a wire and began the wiggle test. The breaker would blow every time we repositioned the tilt wheel.

Finally, we bypassed the two wire circuit for the key and inserted the resistor from before at the base of the steering column. The car started right up. Upon removal and disassembly of the column, we found the key resistor wiring damaged deep inside the column where the tilt wheel moved. We soldered in two new wires here and the system worked well.

Case 2: 1989 Honda Prelude. This car kept killing batteries after one week. The problem began after repairs were made to the transmission ECM circuit. Initially, the vehicle speed sensor (VSS) had a pinched wire causing the shifter light to blink. At first we did not know what the trans ECM had to do with the parasitic draw. The draw was 300 ma which explains why it took a week to kill the battery. The battery and alternator tested good (not bad for an original alternator).

After starting the car and trying all the accessories, suddenly the car died. One of the main 80 amp fuses blew. The wiring diagram showed the fuse supplied power to about half the car. I next installed a fuse on a wire and started the car again. The 80 amp fuses are quite expensive, so two 40 amp fuses in parallel work the same and cost less. The fuse would blow when I engaged the a/c. The wiring diagram showed me the location of all the easy-to-get-to a/c components. However, unplugging the compressor and pulling the fan relays made no difference.

Next step was to get under the dash and pull the fuse there where I found the a/c signal fuse on the suspect circuit. Following the diagram and working my way backwards I finally traced the draw to the a/c control ECM located way up under the dash behind the glove box. This a/c ECM basically senses what is going on in the car and then grounds a couple of relays to engage the a/c system. I located the power supply to the a/c ECM, disconnected it, and no more draw.

Next, I found a slight amount of voltage on each relay grounds coming out of the a/c ECM with the relays disconnected. This condemned the a/c ECM. The customer wished to disconnect the a/c ECM and stop there; however, I suspect the a/c compressor or possibly one of the relays did the initial damage.

Case 3: 2002 Chevy Impala. What a mess! This car came from a used car lot with no history of what happened. The air bags had gone off, the dash was partially removed and the ignition switch had been drilled through! There was no body damage to cause the air bags to blow. The problem was parasitic draw and no crank. A new battery would run down in an hour.

Pulling fuses quickly revealed the body control module (BCM) pulling the juice. Since the ignition switch had an eighth-inch hole drilled though the side of the housing, guess what, the wiring diagram shows the ignition switch wired to the BCM. Disconnecting the ignition switch got rid of the draw. This vehicle uses a regular key. As the key rotates in the tumbler housing, a magnet passes by a Hall Effect switch which sends a specific voltage to the BCM. If the BCM gets the correct voltage, it

sends a password (yes, a password) to the engine control module (ECM). If all is good, the BCM allows you to crank the engine and ECM gives it fuel to start.

The fix here was to reprogram the BCM and the ECM using a Vetronix Tech 2 scan tool. But wait, if you try the wrong key too many times in a row, the BCM locks out and you have to come back the next day and try again. I suppose GM made it this complicated so the cars would be harder to steal. The system definitely works and makes you jump through enough hoops to discourage any professional thief.

The type of work described above is definitely specialized and does require patience and the right tools and information. There is a market for it and I have always believed where there is a market, there is an opportunity. We have acquired this type of work through normal means of advertising and calling on other repair shops. Stereo shops are good sources, as well as performance shops and off-road truck shops. Sources include pretty much any place that installs aftermarket electronic equipment, but does not offer specialized diagnostic work.

I know some shops may shy away from this type of work thinking it may be too time consuming and not profitable. However as you can see from the above cases, most technicians already have the equipment needed, and the information like wiring diagrams can be purchased online for a one time fee instead of subscribing to a year long service.

We sell information to our customers just like we sell parts and labor. I have battled with the worry of not being able to fix this problem for the customer. Well, I have found that if I spend quality time up front with the customer, get as much detailed information as possible and promise to update along the way, it is an easy sell.

Most problems are simple, once you find the culprit. It is easier for a customer to understand the job is a process which may take two or three steps. I remind my customers they can stop on any step along the way. Fortunately, we have followed through to the end in most every case and resulted with a happy, loyal customer.

(On the Net: Snapon.com, IATN.net, Alldata.com, Aeswave.com, Vetronix.com.)

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