Tech Tip

BATTERIES 163

BATTERY FACTS

Troubleshooting Low Voltage and Electrical Interference Symptoms

Are you up to speed on starting performance and electrical related concerns due to low battery voltage conditions? With today's systems, low battery voltage can create some nearly impossible to diagnose conditions. Unless you have been working in a shop that specializes in electronic diagnostics, you would not be familiar with some of the symptoms created due to a low voltage condition. Much of what has been learned is due to countless hours of diagnosing electrical or electronic related symptoms. And there is no magic test chart to lead you to the solution. Often, we look back following a difficult diagnosis and think…we didn't realize it could have that effect. The material contained in this writing can save you many diagnostic hours and the replacement of some expensive electronic parts and unnecessary programming.

BATTERY FAILURE

When performing an inspection on a customer's vehicle, are you checking the condition of the battery, or just cleaning the cables and waiting for the battery to fail? Many give the battery no consideration or attention until a slow-start or no-start condition occurs. The customer certainly does not give it any consideration until the vehicle fails to start, and that is usually at the most inopportune time.

Sulfation is the prime reason for battery failures, contributing to up to 80% of all battery failures. Sulfation occurs when the battery drops below its full state of charge for extended periods of time. During this low state of charge, lead sulfate crystals form on the negative plates. The presence of this deposit reduces the available surface of the battery's active material, which has a direct effect on the total capacity of the battery. In addition, the sulfation prevents the battery from accepting a full charge.

Following are conditions that promote battery sulfation:

1) A reduction in the electrolyte level of the battery due to gassing, spillage or leakage.
2) Cold weather conditions, which promote increased starter amperage draw due to a thicker oil viscosity.
3) The use of a battery designed for starting, lighting and ignition (SLI) as a deep-cycle battery. The plates in the SLI battery cannot withstand the excessive heat created during the discharging and charging cycles.
4) A battery in a low state of charge due to an electrical problem such as a defective alternator, or conditions that would promote an excessive electrical demand. This occurs often when vehicles are operated in heavy traffic conditions, short trip driven vehicles, or vehicles driven at slow speeds during periods of high electrical demand, making it impossible for the alternator to keep up.
5) Temperatures in excess of 100 degrees F can promote an increased discharge rate. This is especially a problem when considering the tight underhood quarters, high underhood temperatures, and batteries positioned out of the airflow.
6) Vehicles that are not driven on a daily basis. This includes vehicles that may sit for long periods of time on a car lot, or a collector car that is seldom driven.
7) Parasitic current drain on the battery.

In previous years we became accustomed to starting systems that would give some warning of a low voltage condition, such as a reduction in the cranking speed of the engine. With today's starting, ignition and fuel systems, little or no warning may be given until that eventual no-start condition. The customer may comment that the vehicle had been starting fine, and then suddenly it was as if the battery had been disconnected. There are several reasons for this. The number one battery killer is heat. High underhood temperatures, a 90 plus degree temperature day, and tight battery mounting quarters all contribute to overheating and premature battery failure. The extensive heat causes gassing, which results in electrolyte loss, plate corrosion and internal shorts. In extreme heat conditions, the average battery life is 36 months. Cold weather conditions require a heavy amperage draw to start a cold engine with thick oil, and a battery is less efficient at colder temperatures. To complicate these conditions, the vehicle's electrical system may have a constant electrical drain on the battery.

PARASITIC CURRENT DRAIN

Most vehicles today have a constant electrical drain on the battery, and this is referred to as a parasitic current drain. This drain is usually in the range of 30 ma maximum. Parasitic drain is defined as an electrical load or draw on the battery while the ignition switch is in the off position. During this time certain electrical devices must draw current to keep memories alive. Some of these components would include the PCM memory, memory for the radio stations, memory seats, etc. This small amount of current drain is usually not an issue, as the charging system will replenish the battery when the vehicle is driven. When a vehicle is not driven for a period of three to four weeks, the battery may become discharged to a level that a no-start condition will occur, or develop electrical glitches.

When testing for parasitic current drain, it will be necessary to allow a minimum of a 30 minute wait time to allow the on-board computers sufficient time to power-down or go to sleep. Check your TSBs, as some systems have special wait times. For example some GM trucks and SUVs equipped with Dual Zone AC require up to 4 hours for the control head to go to sleep, and this is considered a normal characteristic. This can lead to a misdiagnosis.

City or short trip driven vehicles equipped with a maze of electronics and creature comforts often encounter premature battery failure due to the battery never becoming fully charged, resulting in sulfation and premature failure. During these driving conditions, more energy is taken from the battery than the alternator can replenish. Fast charging, overcharging, deep discharges, heat and vibration all promote premature battery failure.

CONDUCTANCE TESTERS

Several methods of battery testing are available, and many technicians have their own preference as to how the battery test should be performed. No single tester solves all concerns. Some test methods require the battery to be in a full state of charge for an accurate test.

Conductance testers have become the tester of choice for many technicians, as it is a quick and simple test that can determine the condition of the battery without requiring the battery to be fully charged, which can require 8–24 hours of charging. The conductance tester produces a signal that is passed through the battery and then measures a portion of the AC current response. This test determines the available plate surface in the battery, which is an indication of how much power the battery can provide. Some testers are fitted with printers, which can provide a written report on the condition of the battery that can be given to the customer. Identifying a marginal battery before it encounters total failure can save the customer the cost of a service call or tow, both of which can exceed the cost of a new battery. Make battery testing a part of your routine inspection.

LOW VOLTAGE AND ELECTRICAL INTERFERENCE

In addition to a no-start condition, a low voltage condition and electrical interference can create some major challenges with the vehicle's electronics and electrical accessories.

Imagine a customer with a high-end vehicle such as a Cadillac, Corvette or Buick LaCrosse and being unable to enter their vehicle, or having a "No Fob Detected" message displayed on the dash and a no-start condition. The system is referred to as a Keyless Access System, which allows vehicle entry and starting with the fob still concealed in a purse, briefcase, or pocket. When the driver approaches the vehicle, they simply squeeze the door handle switch. If a known fob is recognized, the door will unlock and open. Once the driver is inside the vehicle, they can start the engine by depressing the brake pedal and pushing the start button, assuming the fob is recognized. The system functions via several antennas, radio frequency signals, a remote control door lock receiver module (RCDLR), ECM and BCM. When using a complex radio frequency system, there are certain limitations and challenges that may arise affecting how the system functions, often leaving the customer locked out of the vehicle or unable to start the engine.

NO FOB DETECTED MESSAGE

When the "No Fob Detected" message is displayed, some basic tests should be performed prior to getting too deep into the diagnostics or re-programming computers. Those tests should include:

1) The first consideration should be the voltage level of the fob battery. A "Low Fob Battery" message should be displayed on the dash if the voltage drops below 2.6 volts for 3 consecutive ignition cycles. Fob testers are available.
2) The voltage of the starting, lighting and ignition battery (SLI) must be above 10 volts for the system to accurately detect the fob. Battery voltage near the 10 volt range can prevent entry to the vehicle. The condition of the SLI battery is almost never considered. They assume that since it had been starting the vehicle it must be OK and the problem must be with the electronics. A lot can happen to the battery since the last start, as we have all experienced that catastrophic failure. Remember, sulfation is slowly degrading the strength of the battery and parasitic current drain is compounding the problem. Make the condition of the battery one of your first checks.
3) Should the battery voltage drop to 9 volts, or if the system voltage exceeds 16 volts, both the driver and passenger door module codes will be set and stored in memory. The technician reading the codes assumes the worst and replaces the expensive modules, needlessly.

LOW BATTERY VOLTAGE

It is not uncommon to receive "No Fob Detected" complaints from vehicle owners who do not drive their vehicle on a daily basis. For example, vehicles parked for a period of 2–3 weeks often encounter a low battery voltage condition due to parasitic current drain. This condition can be the result of normal drains to keep accessory memories alive or the inability of the computers to power down or go to sleep. Never leave the key fob within 25 feet of the vehicle when parked. Doing so can result in the system detecting the fob's presence, preventing the computers from going to sleep, resulting in a parasitic current drain and a discharged battery. Some vehicle owners have a habit of leaving their fob on the console when parked in their garage, keeping the computers awake. Another situation involves a spouse's vehicle parked next to the vehicle in question, with a second fob to the vehicle in their console or glove box. Same scenario, the computers do not go to sleep. If you deem it necessary to keep the fob in close proximity to the vehicle, place the fob in a metal box outside of the vehicle. That will prevent the system from recognizing the presence of the fob.

In the case of a Corvette with a manual transmission, the shifter must be placed in reverse during engine shut-down. If you fail to do this, the engine will shut off, but the ignition switch will remain in the accessory mode and the computers will remain awake, promoting battery drain. Further, vehicles left in this state can be started without the presence of the fob. This is a one-time start, and once the engine is shut off it cannot be restarted without the presence of a fob. The computers on automatic transmission equipped vehicles will power down in 10 minutes following engine shut-down.

ELECTRICAL INTERFERENCE

When using a complex radio frequency system to determine the fob proximity, certain limitations and conditions may occur, affecting the performance of the system. For example, the system may not recognize a fob placed too close to a door switch, or may require moving the fob to different locations in the passenger compartment to start the engine when interference conditions occur. Following are some radio frequency interference (RFI) conditions that can affect system operation: RFI created by devices such as radar detectors, 2-way radios, cellphones and chargers (regardless of whether the cell phone is plugged in or not), computers and other electronic devices, fluorescent lighting, aftermarket accessories, high RFI traffic areas such as pay-at-the-pump gas stations, or devices from another vehicle in close proximity. Charging devices for MP3 players, GPS units, and DVD players are also a consideration. These are real world conditions that can affect the system operation that you must be prepared to deal with.

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