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1964-1971 CORVETTE TRANSISTOR IGNITION

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BACKGROUND & OPERATION

In 1962 the Delco-Remy Division of General Motors began the task of designing an ignition system that overcame the limitations of the conventional breaker-point system. The overall objective of the new Delcotronic Transistor-Controlled Magnetic Pulse-Type Ignition System (the official name) was to provide long life, high reliability, and require no periodic maintenance during the life of the vehicle.

A brief review of the limitations of the conventional breaker-point system are:

1. The available voltage to fire a spark plug cannot be increased due to the limited current carrying capabilities of the points.
2. Periodic ignition system service is required due to rubbing block wear and point erosion.
3. Distributor point bounce places a practical limit on the engine speed of which satisfactory ignition performance can be maintained.

Delco-Remy was successful in designing and manufacturing an ignition system that was superior to the conventional system and it continued to be superior for almost two decades. To quote a Society of Automotive Engineers paper dated 1963 (after the system was developed): "*The new Delcotronic Transistor Controlled magnetic pulse-type ignition system provides long maintenance-free life and high reliability which have been sought for many years. It accomplishes this end by totally eliminating the components which traditionally have been most subject to inaccuracy, wear, and deterioration.*"

The accomplishment of Delco-Remy's goals were made possible largely by the elimination of the familiar contact point set and substituting a magnetic triggering device. This solid-state device composed of a stationary magnetic pickup assembly and a rotating pole piece, provided an excellent signal to trigger the Transistor Ignition (TI) system.

In order to fire each spark plug, it is necessary to induce a high voltage in the ignition coil secondary winding by opening the circuit to the coil primary winding. In conventional systems, this is accomplished by opening the distributor contact points. In the TI system, this is accomplished by inducing a voltage pulse in the distributor pickup coil which is conducted to the pulse amplifier where it signals a "triggering" transistor to turn off a "switching" transistor. This action interrupts ignition primary current flow, inducing high voltage in the secondary ignition circuit. The pulse amplifier does this opening of the circuit in a more efficient manner, which in part explains the improved performance of the TI system. In addition, while contact point deterioration problems limit primary current in the conventional system to about 4.5 amps, the TI system can operate as high as 8 amps which further enhances the performance of the system.

The Deltronic ignition system (now more commonly referred to as Transistor Ignition or TI) overcomes all of the previously mentioned limitations of the conventional system because TI:

1. Will yield higher spark plug voltage.
2. Will operate at extremely high speeds without losing ignition performance.
3. Is essentially maintenance free.

An example of the TI system superiority can be seen when looking at the output voltage at the spark plug versus the speed of the vehicle. At 10 mph a conventional system is developing 24,000 volts versus 25,000 for the TI. However, at 100 mph the conventional system is down to 17,000 volts and the TI is at 24,000, which is 40% more voltage to fire the fuel/air mixture under high load conditions. In addition to this, the system will still function properly at speeds exceeding 9,000 rpm.

COMPONENTS

The three major components that make up a TI system are a magnetic pulse distributor, an ignition pulse amplifier, and a special ignition coil. Two resistance wires are also used in the circuit; one as ballast between the coil negative terminal and ground, while the other resistance wire provides a voltage drop for the "engine run" circuit and is bypassed at cranking. The other components of the

ignition system -- the spark plugs, plug wires, distributor cap and rotor -- are the same components used in a conventional system.

TROUBLESHOOTING

Most of the problems associated with the TI system can be traced to the pulse amplifier. When this system was developed, Germanium transistors were "state-of-the-art" in electronic technology. This type of transistor had many limitations (especially by today's standards) and many amplifier failures can be traced to these transistors.

Other problems that lead to amplifier failure are water from a faulty cover seal, and high voltage spikes. Moisture trapped inside the amplifier will cause corrosion to the extent it will rust electrical component leads and destroy copper tracks on the printed circuit board, thus leading to failure. High voltage spikes induced by a malfunctioning alternator or voltage regulator will fail the circuit protection device mounted on the circuit board. However, the amplifier is constructed so it can be serviced. Faulty components can be identified and replaced since the circuit board is easily accessible through the rear cover plate.

As an alternative to repairing the original circuit board there is currently available a replacement circuit board that takes advantage of today's current "state-of-the-art" technology. This "drop-in" module uses silicon transistors and is more reliable than the original circuit board.

Aside from the pulse amplifier, there are other potential problem areas. The next, in order of occurrence, is the distributor magnetic pickup assembly. The problem here is either in the lead out wires or the wire-wound coil located inside the assembly. The lead out wires have a tendency to fail from repeated flexure and sometimes this will occur inside the insulation with no evidence on the outside. A resistance check (500 to 700 ohms) should detect this problem. If there is a problem with the wire-wound coil, usually appearing as an erratic engine miss or surge, it is due to an intermittent in the windings and is usually evident only when the engine is hot. Replacement of the magnetic pickup assembly is required in this case.

Last on the list of problem areas is the ignition coil. This can fail in two modes. The first is an intermittent or break in the windings that make up the heart of the coil. The other is a cracked tower which allows the secondary voltage to be misdirected, usually jumping to one of the primary terminals. In either case, replacement of the coil is in order.

SUMMARY

Transistor Ignition is a very unique performance option that works well, when it works. When it doesn't, it can be very frustrating. As previously mentioned, most problems can be traced to the amplifier or to the distributor pickup coil. If your car was originally equipped with TI, it is probably in your best interest from an originality and performance standpoint to retain the TI system.

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