Electronic Ignition System Diagnosis

System Description

The ignition system uses individual coils for each cylinder. The engine control module (ECM) controls the charge and discharge of each coil through separate control circuits. Current flows through the primary windings of the coil when the control circuit is commanded ON, which creates a magnetic field. When the ECM determines conditions are appropriate for an ignition event, the ECM interrupts the current flow causing the magnetic field to collapse across the secondary windings inside the coil. This produces a high voltage discharge across the spark plug electrodes.

Diagnostic Tips

- Verify the vehicle battery has passed a load test and is completely charged.
- Verify there is an adequate supply of fuel in the fuel tank.
- Verify the coils are connected correctly.
- Verify the spark plugs are the correct type and gapped properly.
- Verify the proper condition and resistance of the spark plug wires.
- Test for intermittent or poor connections.

Reference Information

- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.
- Perform the Diagnostic System Check prior to using this diagnostic.
- Test for intermittent or poor connections.
- Review Schematics and Connector End Views to locate test points.

Required Tools

- Digital Multi-meter
- High Impedance Test Lamp
- Electronic Service Tool
Circuit/System Verification

WARNING! To prevent bodily injury or death, stay away from hot engine surfaces and rotating engine components.

1. Ignition ON, verify there are no SPNs present.
   - If any SPN is present, refer to the proper SPN FMI diagnostic.
   - If no SPNs are present, go to Step 2

2. Verify both fuses that supply ignition voltage to the ignition coils are good.
   - If a fuse is open, ignition OFF, disconnect the 4 ignition coils and 4 fuel injectors that are supplied by the open fuse. Replace the open fuse, ignition ON, verify the fuse is good.
     - If the fuse opens, repair the short to ground on the circuit.
     - If the fuse is good, connect each coil and fuel injector one at a time and verify the fuse is good, if the fuse opens when connecting a component, replace that component.
   - If the fuses are good, go to Step 3

3. Ignition OFF, disconnect the appropriate ignition coil electrical connector, ignition ON, verify a test lamp illuminates between the ignition coil connector terminal D and ground.
   - If the test lamp does not illuminate, repair the open/high resistance in the circuit.
   - If the test lamp illuminates, go to Step 4

4. Ignition OFF, verify a test lamp illuminates between the ignition coil connector ignition voltage circuit terminal D and ignition coil ground circuit terminal A.
If the test lamp does not illuminate, repair the open/high resistance in the ground circuit.

If the test lamp illuminates, go to Step 5

5. Inspect and measure the resistance of the spark plug wire. Verify the resistance is between 390-1400 Ω.

  - If not within the specified range, replace the spark plug wire.
  - If within the specified range, go to Step 6

NOTE: Inspect the suspect spark plug for correct type, gap, torque, or indications of mechanical concerns. If mechanical concerns are indicated, repair as necessary.

6. Exchange the misfiring cylinder spark plug with a spark plug from a non-misfiring cylinder, start and idle the engine, verify the misfire transfers to the known good cylinder.

  - If the misfire transfers, replace the suspect spark plug.
  - If the misfire does not transfer, go to step 7

7. Exchange the misfiring cylinder ignition coil with an ignition coil from a non-misfiring cylinder, start and idle the engine, verify the misfire transfers to the known good cylinder.

  - If the misfire transfers, replace the suspect ignition coil.
  - If the misfire does not transfer, replace the ECM.