

DIAGNOSTIC PROCEDURES

1. ENGINE

1-A. Engine Starting Problems

Gasoline Engines

1. Engine turns over, but will not start

- a. Check fuel level in fuel tank, add fuel if empty.
- b. Check battery condition and state of charge. If voltage and load test below specification, charge or replace battery.
- c. Check battery terminal and cable condition and tightness. Clean terminals and replace damaged, worn or corroded cables.
- d. Check fuel delivery system. If fuel is not reaching the fuel injectors, check for a loose electrical connector or defective fuse, relay or fuel pump and replace as necessary.
- e. Engine may have excessive wear or mechanical damage such as low cylinder cranking pressure, a broken camshaft drive system, insufficient valve clearance or bent valves.
- f. Check for fuel contamination such as water in the fuel. During winter months, the water may freeze and cause a fuel restriction. Adding a fuel additive may help, however the fuel system may require draining and purging with fresh fuel.
- g. Check for ignition system failure. Check for loose or shorted wires or damaged ignition system components. Check the spark plugs for excessive wear or incorrect electrode gap. If the problem is worse in wet weather, check for shorts between the spark plugs and the ignition coils.
- h. Check the engine management system for a failed sensor or control module.

2. Engine does not turn over when attempting to start

- a. Check the battery state of charge and condition. If the dash lights are not visible or very dim when turning the ignition key on, the battery has either failed internally or discharged, the battery cables are loose, excessively corroded or damaged, or the alternator has failed or internally shorted, discharging the battery. Charge or replace the battery, clean or replace the battery cables, and check the alternator output.
- b. Check the operation of the neutral safety switch. On automatic transmission vehicles, try starting the vehicle in both Park and Neutral. On manual transmission vehicles, depress the clutch pedal and attempt to start. On some vehicles, these switches can be adjusted. Make sure the switches or wire connectors are not loose or damaged. Replace or adjust the switches as necessary.
- c. Check the starter motor, starter solenoid or relay, and starter motor cables and wires. Check the ground from the engine to the chassis. Make sure the wires are not loose, damaged, or corroded. If battery voltage is present at the starter relay, try using a remote starter to start the vehicle for test purposes only. Replace any damaged or corroded cables, in addition to replacing any failed components.
- d. Check the engine for seizure. If the engine has not been started for a long period of time, internal parts such as the rings may have rusted to the cylinder walls. The engine may have suffered

internal damage, or could be hydro-locked from ingesting water. Remove the spark plugs and carefully attempt to rotate the engine using a suitable breaker bar and socket on the crankshaft pulley. If the engine is resistant to moving, or moves slightly and then binds, do not force the engine any further before determining the problem.

3. Engine stalls immediately when started

- a. Check the ignition switch condition and operation. The electrical contacts in the run position may be worn or damaged. Try restarting the engine with all electrical accessories in the off position. Sometimes turning the key on an off will help in emergency situations, however once the switch has shown signs of failure, it should be replaced as soon as possible.
- b. Check for loose, corroded, damaged or shorted wires for the ignition system and repair or replace.
- c. Check for manifold vacuum leaks or vacuum hose leakage and repair or replace parts as necessary.
- d. Measure the fuel pump delivery volume and pressure. Low fuel pump pressure can also be noticed as a lack of power when accelerating. Make sure the fuel pump lines are not restricted. The fuel pump output is not adjustable and requires fuel pump replacement to repair.
- e. Check the engine fuel and ignition management system. Inspect the sensor wiring and electrical connectors. A dirty, loose or damaged sensor or control module wire can simulate a failed component.
- f. Check the exhaust system for internal restrictions.

4. Starter motor spins, but does not engage

- a. Check the starter motor for a seized or binding pinion gear.
- b. Remove the flywheel inspection plate and check for a damaged ring gear.

5. Engine is difficult to start when cold

- a. Check the battery condition, battery state of charge and starter motor current draw. Replace the battery if marginal and the starter motor if the current draw is beyond specification.
- b. Check the battery cable condition. Clean the battery terminals and replace corroded or damaged cables.
- c. Check the fuel system for proper operation. A fuel pump with insufficient fuel pressure or clogged injectors should be replaced.
- d. Check the engine's tune-up status. Note the tune-up specifications and check for items such as severely worn spark plugs; adjust or replace as needed. On vehicles with manually adjusted valve clearances, check for tight valves and adjust to specification.
- e. Check for a failed coolant temperature sensor, and replace if out of specification.
- f. Check the operation of the engine management systems for fuel and ignition; repair or replace failed components as necessary.