Firing on All Cylinders?

Running Compression Test is a Great Tool for Diagnosing Density Misfires

The ALLDATA Tech-Assist Diagnostic Team

When you perform a static compression or cylinder leak-down test, you're checking the sealing capability of each cylinder. A vacuum test is a great way to determine an engine's overall breathing capabilities but does not provide results for individual cylinders. The advantage of a running compression test is that it gives you an idea of the volumetric efficiency of each cylinder. In other words, how efficiently each cylinder is pulling air in, retaining it for the correct amount of time, then releasing it into the exhaust. If a cylinder cannot perform these functions properly, the result can be a loss of volumetric efficiency or a density misfire.

How to Perform the Test

1. Create a chart similar to this example to record your test readings.

CYL	STATIC	IDLE	SNAP
1			
2			
3			
4			

2. Begin with a normal ("static") compression test on a warm engine to eliminate obvious problems such as badly worn rings, burnt or bent valves or holes in pistons. If you have a diagnostic trouble code, you may know which cylinder is misfiring, but it's a good idea to test the compression of all the cylinders in that bank to get a good comparison. Record your static compression readings.
3. Install all of the spark plugs except the one for the suspected cylinder.

   WARNING: GROUND THAT PLUG WIRE TO PREVENT MODULE DAMAGE, OR WHEN EQUIPPED WITH A COIL-ON-PLUG IGNITION, SIMPLY DISCONNECT THE COIL HARNESS PLUG.
4. Disconnect the injector for that cylinder on a port fuel injection system.
5. Install your compression tester in the suspected cylinder. The test can be done with the Schrader valve removed, but most techs recommend leaving the valve in the gauge and "burping" the gauge every 5-6 "puffs".
6. Start the engine and take an "Idle" reading. Be sure the idle speed is a consistent 1200 rpm. Record the results.
7. Now, from 1200 rpm, snap the throttle to 2500 rpm and release quickly. Reading should rise. Record the results.

   NOTE: Don't use the gas pedal for this snap acceleration. The idea is to manually open then close throttle as fast as possible, forcing the engine to take a "gulp" of air.

EXAMPLES

Example Test Readings

Comparing measurements between cylinders is important. Running compression at idle should be 50-75 PSI (about half cranking compression). Snap throttle compression should be about 80% of cranking compression. Let's analyze the results from the following sample test readings.

EXAMPLE 1			
CYL	**STATIC**	**IDLE**	**SNAP**
1	150	75	85
2	175	80	130
3	160	75	120
4	160	80	120

In **Example 1**, cylinder #1 has a snap test reading that is much lower than the other cylinders. If a snap reading is low (much less than 80% cranking compression), look for air intake problems such as severe carbon deposits on intake valves, worn cam lobe,worn valve guides and springs, rocker or push rod problems, or "shutter valve" miss-positioned in the runners of a variable runner intake system.

EXAMPLE 2			
CYL	**STATIC**	**IDLE**	**SNAP**
1	150	75	130
2	175	80	130
3	160	75	120
4	160	80	175

In **Example 2**, cylinder #4 has a higher than normal snap test reading. If a Snap measurement is significantly higher (over 80% of cranking compression), it means the air is not leaving the cylinder efficiently. Look for problems on the exhaust side of that cylinder such as worn cam lobe, bent push rod or collapsed lifter. If the snap readings are all high, look for exhaust restrictions such as a clogged catalytic converter or muffler.

EXAMPLE 3			
CYL	**STATIC**	**IDLE**	**SNAP**
1	150	75	130
2	175	40	90
3	160	75	120
4	160	80	175

In **Example 3**, cylinder #2 has a low Idle and snap test reading. These types of numbers indicate that the cylinder is not holding compression efficiently. Look for issues such as slightly bent or burned valves, excessive carbon build-up on valves or seats, worn valve guides and springs, scored cylinder wall, or a leaking head gasket.

As you can see, information gathered from a running compression test can be very helpful when diagnosing misfires and tuning for total engine performance. It's a great test to add to your diagnostic arsenal.