Perform a cylinder leakage test

A cylinder leakage test can identify what part of the cylinder leaks compressed air.

The leakage test is usually done after one or more cylinders have been shown to have low compression. A leakage test can be done on all cylinders but is often done only on the cylinder(s) with low compression.

For the cylinder leakage test to be valid the engine must be close to operating temperature and the cylinder being checked must be at Top Dead Center (TDC) of the compression stroke.

#1 Find which direction to rotate the crankshaft using hand tools. Some engines turn clockwise and others turn counter clockwise. If you check how to route the timing belt (use ShopKey Pro or All-Data) you can quickly decide which direction to turn the engine. You can also see which direction the drive belts move when cranking the engine.

#2 Rotate the engine so the cylinder is at Top Dead Center (TDC) with both valves closed.

Screw your leak tester hose into the cylinder and use a compression whistle or feel for compressed air to determine that you are on compression and not exhaust.

You can place a long plastic straw in the open spark plug hole to help find TDC. NEVER place any metal object inside the cylinder! (Resist the temptation to use a long screwdriver or any other metal probe as it can scratch the cylinder wall causing more leakage!)

#3 Connect shop air to the tester – adjust the left gauge to read 100 psi

#4 Connect the Leakage Gauge to the cylinder. (verify the piston has not moved.)

It is common for the air pressure of the leak tester force the piston down. When this happens the piston will travel until the intake or exhaust valve just begins to opens. This will show excessive leakage past whichever valve just opened!

**The piston MUST REMAIN at TDC.** If the crankshaft moves when you hook up the tester, rotate the engine back to TDC.
#5  Figure out where the leak is happening.

This is sometimes easier to say than to do. ALL engines have a small leakage past the piston ring end gaps. As every engine wears the leakage slowly increases.

Under 20% leakage is considered normal.

#6  Restrictions cylinder breathing shows low compression with normal cylinder leakage.

Cylinder breathing (how much air gets in or out) breaths is called Volumetric Efficiency. Any valve that does not open far enough (flat cam lobe) or any intake valve with excessive carbon deposits can restrict how much air/fuel is sucked into the cylinder. A visual bore scope inserted into the spark plug hole can help identify restriction. A running compression test identifies cylinders with low compression due to low volumetric efficiency.

#7  IF leakage is excessive, listen and look for the source of the leak

A stethoscope with the solid tip removed will allow faint air hissing sounds to be transferred up the hose to the ear pieces of this tool.

Hearing air escaping at the throttle body indicates air is leaking past the intake.

Removing the radiator cap and looking for bubbles in the engine coolant indicates a head gasket leak (or sometimes a cracked cylinder head)

Air escaping at the oil fill cap indicates leakage past rings. Remember it is normal for some air to leak past rings so do not blame ALL leakage on the rings until you have checked for sealed valves and head gasket.

Hearing air escaping to the exhaust manifold indicates a leaking exhaust valve. It is often difficult to access the air stream of the exhaust manifold. On some engines you can drop the exhaust and on others you can remove the Oxygen Sensor. This is often quite difficult and you might not need to check for exhaust leak if you have already found leakage.

When you find a leak, be careful to not decide that is the only part of the engine needing repair.

On older, high mileage engines, a complete engine rebuild (or replacement) is often cheaper and more reliable in the long run compared to fixing each part of the engine as it fails.