

The Preventive Maintenance Series

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Diagnosing An Engine Misfire

As we all know, diagnosis can be the most difficult part of repair work. New cars will give you video or audio diagnosis that will pinpoint problems and even spell out the replacement or repair needed. However, our Corvairs will do their best to give us hints if we pay attention. Using basic tools we can get to the bottom of problems just as quick as if we hooked up a high dollar scanner. Keep in mind that a running engine must have each cylinder supplied with compression, fuel, spark, and all at the proper time. Any deviation from the requirements for those four items causes one or more cylinders to reduce engine performance.

The following information is to help with mechanical or electrical problems; another article will address fuel related running problems.

The first consideration is an engine misfire caused by lack of compression. You would have low power and a definite putt, putt, putt syndrome; sometimes described as rumbling as the engine accelerates. The first quick diagnostic tool is a compression check by ear which takes about one minute. With the engine off, pull the coil wire out of the distributor cap and ground it securely so the engine will not start. Then crank the engine and listen to the sound of the starter. It should make a rhythmic sound as it cranks the engine. If you have low or no compression in one cylinder you will hear a definite break in the rhythm when the starter speeds up as it passes the bad cylinder. If necessary, listen to a known good engine crank for comparison and then if you hear that definite break in the cranking rhythm you need to next determine which cylinder. With the engine on a fast idle, use insulated pliers or gloves to remove plug wires one at a time from the cap and check for RPM drop. When you pull the bad cylinder, there will be little or no drop in RPM. If you determine that there is a compression problem, the following are your choices.

Valve Seat Out: you would have zero compression and possibly noise from a valve hitting a piston. This probably would be a suddenly occurring event, usually at a startup following a hot shut down. Also, the rocker arm could be loose with the zero cylinder on top dead center.

Broken Rocker Arm or a Very Loose Nut or Backed out Rocker Stud : this would be obvious from the noise and you would spot the culprit when you removed the valve cover. A valve that could not open or could not open completely could cause either no compression or an erratic compression reading depending on whether it was an intake or exhaust valve. Also check the pushrod if you have a broken rocker arm, and if the pushrod is bent be sure it did not rub a hole in the tube.

Broken Valve Spring: the break will be visible unless it is the bottom coil in the head. Also a broken spring would easily rotate with your fingers when the piston in that cylinder is at top dead center – compare the suspect spring with its neighbors. If you

have a broken spring, it can be replaced with the head on the car by using a special valve spring compressor that is readily available.

Broken Rings or Hole in a Piston: with the engine running and the oil filler cap off, you would hear the loss of compression and see excessive blow-by coming out of the filler tube. Oil usually comes out of the dipstick and vent due to excessive crankcase pressure.

Valve Problem: You could have a burned valve but that occurs slowly. A bent valve or a stuck valve (rusted) will leave the rocker arm loose but those usually occur from starting an engine that has been sitting for a long period of time. A really bad exhaust valve guide will make an almost metallic clicking noise as the exhaust gas fires into the valve cover; it mimics a lifter out of adjustment and can cause erratic compression readings.

Head Gaskets: A loose head (usually caused by overheating) will allow combustion gas to blow past the head gaskets, making an audible spitting noise and making the heater unusable. The original 60-63 and some early 64 engines had copper head gaskets that would flow sideways and burn through. They were replaced with stainless steel in 64, so that is hardly ever a problem unless the head is loose. The heater issue would be a major item before there was enough compression loss to cause a running problem.

The second consideration is an engine misfire caused by lack of spark. If your engine has the putt, putt, putt syndrome under acceleration and you have none of the above problems, then you have an electrical problem. Run the engine on fast idle, pull individual wires and note the RPM drop. When you locate the problem cylinder, you next need to determine if the problem is a plug, the plug wire or possibly the distributor cap. A visual inspection of the plug will usually show things like ash buildup, oil, a broken electrode or incorrect gap. If you suspect a wire may be arcing, use an ice pick with a grounded wire clipped to it. Move it along the plug wire with the engine running and watch (and listen) for arcing. Brittle or cracked plug wire boots are sure to cause misfire in cold wet weather and old plugs with wide gaps are misfire candidates when starting in cold damp days.

The following are examples of misfires that need to be considered if you have trouble pinpointing the problem.

1. If the point gap is too small (42+ degrees of dwell), you will start to lose one cylinder at a time as the points cannot open enough to discharge the coil causing individual misfires depending on which distributor cam lobe has the most wear. Some times wobble in the shaft creates the same situation when accompanied by a high dwell reading.
2. Moisture in the distributor cap can cause a carbon track to form which will cause misfire in two adjacent cylinders and sometimes from the center to one cylinder. This usually happens after overnight rain or car wash visit. You can see the black-on-black track on the plastic.

3. A 140 engine can have a secondary carburetor sticking open or leaking enough air past the throttle valve to cause a misfire at idle (and off idle) that clears up at high speeds. It gives the impression of a single misfire at idle. With the engine at idle, clamp your hand over the secondary carburetors and check for suction. Or spray a light mist of Gumout in to the throat and see if the idle picks up. There is no idle circuit in the secondary so any vacuum leak leans out the closest cylinder.
4. If you have a bad condenser (capacitor), it can cause a weak spark that causes multiple misfires. Instead of the putt, putt, putt, you have an inconsistent jerking sensation, sometimes accompanied by backfires. The contact points will be light gray on one side and purple or black on the other side from overheating. This same discoloration can be caused by dirt leading to high resistance.
5. A bad coil will act similar to a bad condenser; it can cause jerking under load, or just quit but that is not very common. Coils mounted horizontally can leak oil out of the tower and coils with their bottom resting on the sheet metal can develop a hole from vibration. Loss of oil causes overheating.
6. An individual camshaft lobe worn down will cause an individual misfire but is a very rare occurrence in stock Corvairs due the camshaft bathed in return oil.
7. Depending on age and carbon content, vacuum lines such as the vacuum advance can cause a short to ground at the coil tower if it is close, or it can arc to a plug wire which has poor insulation.
8. If you are helping someone, never overlook the possibility that the plug wires are not installed according to the firing order, and last but not least, keep in mind that just because a part was recently installed does not mean it was the correct part or that it works – trust your own diagnosis!