

# Check That Compression

by Bill Bell

One of the best available methods to check ring and valve conditions is the compression test. The results of this fairly simple test can give a lot of incite as to the internal condition of an engine. If one were purchasing a classic, a cylinder by cylinder compression reading should be a must. With engine rebuilds expensive as they are, a person should certainly know what they are buying. It is not uncommon to give a classic a road test with an engine that seems to preform adequately; however, a compression test can point out some real potential problems. A V-12, V-16, or 8 cylinder engine can still run smoothly inspite of a few burned valves. A compression test will give you information that can't be obtained by observation alone.

On the other hand, does a compression test tell all? Not really, you will still have to preform other tests to check the lower end(crankcase, bearings, rods, etc.). Here is a list of problems which can frequently be pin-pointed by conducting a compression test.

1. The condition of the piston rings.
2. The presence of warped, burned and sticking valves or worn valve seats.
3. The cause of oil burning-rings or valves.

4. Combustion chamber carbon build up.
5. The presence of cracked or warped heads, blown head gaskets or modified heads.

Alright, let's check the compression of that "mint" condition classic that is for sale by a fellow enthusiast. How is it done? Many of the uninformed(and I admit to having been one) would have done the following to check out the compression.

1. Pull a spark plug.
2. Place in the compression tester.
3. Crank the engine over a few times, writing down the highest reading.
4. Put back the spark plug and move to the next cylcinder.
5. Recheck the low readings.

Now, all you classic mechanics out there, what was done wrong?---e--- You might ask, what was done right? Very little as the next few paragraphs will show. So given the same car how does one check the compression correctly? I have listed four references and summarized their recommendations into a list that might be handy engine-side references. Here's how to do it right.

1. Make sure the battery is fully charged. A poorly charged battery will give low compression readings because of reduced cranking speeds.
2. Warm up the engine to operating temperature to produce metal expansion and reduce oil drag.



8. On all low readings, retake and if still low, inject 15 cc's 30 weight oil into the compression chamber; this is called a wet compression reading.
9. Check the spark plug on all cylinders with abnormally low or high readings. Look for carbon build up or oil deposits.
10. Replace the plugs and tighten to specifications.

#### How to Evaluate Your Compression Readings

If the gauge pumps up slowly such as 35, 50, 70, 90, 110 p.s.i. to an almost normal reading, you probably have ring problems. A general rule is that a maximum reading should occur after two strokes. If oil is added to a low reading and the pressure improves, this confirms worn rings. A persistent low reading generally indicates valve problems in the form of warped, burned, or sticking, exhaust valves.

In addition, a compression test will probably help pin-point the source of oil burning. As we states, worn rings give a characteristic reading; however, oil being lost through worn valve guides or seals will not appreciably influence a compression test. (Assuming there are good rings.) Low readings can also be caused by a warped head and occasionally two adjacent cylinders will be very low which can be the result of a "blown" head gasket. The key to remember is that the addition of oil to the combustion chamber, will not improve the compression readings if you have burned, warped, or stuck valves, a warped head or a blown head gasket. Elevated compression readings can be caused by carbon build up on the inner surfaces of the compression chamber. Also, a head may have been

A cold engine usually gives low readings.

3. Shut off the engine and loosen all plugs one turn. Restart at a fast idle for 5 seconds. This removes carbon debris from around the spark plug. You don't want this material blown into the innards of a delicate pressure gauge.
4. Shut off and remove all the plugs, noting which came from what cylinder. This labeling will help if it becomes necessary to look back at the plug because of a cylinder problem.
5. Remove the air cleaner and block open both the choke and throttle valves. If this isn't done, a low reading may result because a partial vacuum is being created.
6. Carefully place the compression gauge into the plug hole, using a threaded insert or the rubber cone adapter. Using the starter, turn the engine through five compression strokes; incidentally, this is known as a dry compression test. For modern iron, it is necessary to ground out the ignition when engaging the starter. Off hand I can't think of any classics that have a starter-ignition combination.
7. Make note of the readings. What was their pattern? Does the gauge pump up or is the maximum reading obtained only after five strokes?



modified to increase h.p. or whatever and this will show up on a compression test.

There seems to be a general consensus that 10 to 15 lbs p.s.i. variation between cylinders is acceptable but always check the original specifications for this number. It would seem that an equal compression pressure is needed to have a smooth running engine but such is not always the case. It has been found that if a cylinder in only 70% of normal, it will still run smoothly. Furthermore, the experts tell us, that manufacturers specification usually list a bottom line acceptable pressure and a good engine will by and large read 20 to 30 p.s.i. over the acceptable reading.

A parting word of advice, don't try and rush through the compression check. If you have a V-12 or V-16, it's going to take awhile so sit back and take your time this all important check. That's part of the fun of having a classic, you can work at a leisurely pace and enjoy being a real craftsman.

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