MG Car Club
Washington, D.C. Centre

Timing is Everything - Part 1

by Jim Lunson

In viewing several recent car shows, I noticed a wide variety of arrangements used to regulate the ignition timing on our MGs. Some are exactly stock, some are rather neat upgrades, and some appear to be really hurting power and efficiency. This variation led me to a discussion on ignition timing and the options available.

Ignition timing is the instant in the cycle of a running engine when the spark plug fires. For complicated reasons, this timing of the spark plug firing must vary in conjunction with the speed of the engine (RPMs) and load imposed as it propels the car. Otherwise the engine would run very poorly and without nearly its potential power. In cars with conventional set-ups (non-computer controlled) such as our MGs, this ignition timing is varied by small rotations of the distributor body. This rotation changes the instant of firing in its internal spin in relation to the position of the pistons, valves and the rest of the engine function and provides the timing variation needed to make an engine run properly.

There are two main methods for creating this distributor rotation, vacuum and mechanical. Vacuum timing control operates off the vacuum created in the intake manifold as the engine runs. It works through a round diaphragm disc connected to the manifold by a long tube. When the manifold vacuum increases, this pulls on a diaphragm inside the disc which moves in or out, turning the distributor slightly as it moves. Mechanical timing control works off of a set of small weights and springs inside the distributor that spin with the distributor shafts rotation, and due to centrifugal force, move outward as the spin increases, turning the distributor body slightly as it moves. Each system has advantages and disadvantages. Most cars should have both systems for proper operation at all speeds and conditions found on the road.

Vacuum vs. Mechanical Control - Each system as its advantages and disadvantages. Vacuum advance is a proactive system while mechanical advance is more reactive. Vacuum advance dies out at higher speeds. Here's how they work. Vacuum (negative pressure) is greatest inside the intake manifold when the engine is at idle (such as at a stop sign). The pistons are sucking in the air/fuel mixture as they go up and down in the cylinder, yet the throttle valves on the carburetors are almost closed so very little gas gets to the engine. These valves seal off the ability to intake air to offset the withdrawal caused by the pistons; hence the negative pressure. This pressure is transmitted by the hose noted above to the distributor where it pulls a

disc its farthest, increasing the timing. As the engine accelerates from an idle, the vacuum decreases as the throttle valves open (more air/fuel mixture can enter the manifold). As the engine speed increases further, the suction continues to drop (the throttle valves are open pretty wide at this point), yet there the timing stays advanced because, as the RPMs increase, the mechanical advance takes over, maintaining the advance and then increasing it further as RPMs increase further. This is why most cars utilize both systems to provide the advance. Vacuum advance gets going and then mechanical advance works after the engine attains the higher RPMs moving the weights and springs. This means that vacuum advance gives the engine additional pep when first accelerating from idle, while mechanical advance give a steadier and more accurate timing advance at higher sustained speeds.

Some system of carburetion and distributors do not use vacuum advance at all. These manifold and carburetors often have no port to connect the hose required to run to the distributor. And certain distributors do not have the round diaphragm system to make it rotate. This is often true with Weber carburetor set-ups, especially side draft types, as well as with certain distributors. This elimination of the vacuum advance is generally best used in racing operations only. Remember, mechanical timing advance is reactive, only increasing the timing after the engine RPMs have increased enough for the weights and springs to take action. Only after more RPMs are added, more timing advance follows. This is perfect for racing type arrangements that do not need great acceleration from idle and the primary function is to strictly maintain higher speed for long durations. One way to tell if a carburetor or distributor is designed for racing only is that they will advertise that they have only mechanical advance systems and no provision for vacuum advance. Think about what application you need.

Distributor Advance Curves - Another factor in the ignition timing set-up is the called the distributor advance curve. This refers to the mechanical advance system inside the distributor and concerns with how far the timing is advanced mechanically in relation to the RPMs of the engine. This is controlled by the size of the weights and springs responsible for the internal rotation. Heavier weights and/or weaker springs will move the advance forward more at less RPMs, affecting the performance of the engine. It is important to match the advance to the engine application. Some distributors come with several sets of weights and springs so they can be adjusted to change performance depending on usage of the car. This advance curve also ties to the camshaft installed in the engine, as the shape of the cam lobes affects how fast and how far the valves open. All these factors affect the performance of the engine, depending on what use it is going to get (normal street driving, interstate cruising, or race applications. Most distributors originally sold for our MGs come with a set

advance curve. Therefore, it is important to watch which distributor is installed in which engine, as the curve interacts with the vacuum advance, the carburetor, and the cam shaft, all affecting performance. It all ties together.

During the original design and production, the MG factory spent a lot of effort analyzing the interrelationships between vacuum and mechanical advance, and the curves required, and the intended application. They ended up basically designing the best combination they could at the time for the car they produced. We have MGs produced over a period of almost 40 years, a period when huge technological advances were made in engine design. With these changes constantly occurring, plus all the modifications available today due to further advances in technology, we now have a lot of options to improve performance of our cars. We need to be very careful, however, on the combination of carburetor, distributor, camshaft as they relate to the timing advance mechanisms installed in our cars. The systems have to work together as one engine. So take a minute to look at what you have under your hood, study all the equipment in the engine and see if what you are using is the best.

I'll go into this subject further next month with some more details on ignition timing. This will include how timing is set, what settings to use, effects of modern ethanol in gas, ported vacuum vs. manifold vacuum, and some of the pitfalls to avoid.

MG Car Club
Washington, D.C. Centre

Timing, Timing, Timing
Or
Timing is Everything - Part 2

by Jim Lunson

Where to set the timing? Following up last month's discussion, let's set the timing. I won't go into the basics, but look at the specifications for your car and it will say something varying between 10-15° BTDC at 600-1,000 rpm, with vacuum hose removed and plugged. This is a good place to start, but after many years of car changes and improvements, to gain maximum performance from the engine, some fine tuning is usually necessary. The final setting also depends on modifications (carbs, distributor, points, advance curve, etc.) on the car and the primary use of the car. Timing is set by rotating the distributor in relation to the position of the pistons (clockwise to advance and counterclockwise to retard).

For most of us MG drivers, street and highway driving is where we want optimum conditions. One good method to obtain the best setting for this use is to take the specified setting noted above and then advance the idle timing 3-4° more by again loosening the pinch bolt on the distributor housing and rotating the distributor slightly clockwise. Relock the bolt and run the car at 40 mph up a long fairly steep steady grade. If there is no pinging from the engine during this run, advance the distributor another 3-4° and try again. Keep repeating this step until pinging occurs, then back off to the previous setting and you're done. This system is not too precise but works pretty well as it finely adjusts the timing to match the carburetor and cam as well as the gasoline grade being used and the engine compression to provide a good setting for average driving conditions. The idea is to get the timing optimal where it is at the driving conditions most often encountered.

Another idea put forth by John Twist, renowned MG expert, is to simply adjust the distributor to 32° advance at 4,000 rpm. Again, this setting is fairly easy to obtain and will give good performance at average driving conditions. This is a setting that he has found to be very good for average driving conditions and again totally does away with trying to set it at idle.

One trick in using this method is in getting this reading using a standard timing light. With the engine off, rotate the crankshaft pulley by hand until the timing mark aligns at the 20° mark. Then place a second scratch on the pulley back at the zero point. Once this mark is made, run the engine and set the timing as you would

usually, only rev the engine to 4000 rpm and use the second mark to set the timing at 12°. This then yields a setting of 32° (20° + 12°) which is what we are looking for.

Both these methods work well and take into account all the factors involved. Plus they give a good setting at the main usage the car normally gets. It may not be the best at idle, but that is not the goal. Of course, if racing or lots of high speed interstate driving is anticipated, changes need to be made, following the same principles noted above.

Manifold vs. ported vacuum Advance. As noted last month, most MGs require both vacuum and mechanical advance. This vacuum advance difference occurs where the little vacuum hose (or tube) to the distributor connects to the engine. Manifold advance obviously connects to the manifold, sometimes through the gulp valve, sometimes directly off the center pipe that connects the two carburetors feeding the engine. Ported advance on the other hand connects to a small port on one of the carburetors (usually the rear one). The difference is which side of the carburetor throttle plates the hose connects. There is much debate as to which system is best.

Up to about 1967, all MGs used a ported vacuum advance. This provides no vacuum advance to the distributor when the engine is at idle, slightly reducing the engines efficiency. Then, when the accelerator is pushed (such as when starting from a stop light), the throttle plates open, giving a surge of vacuum inside the carburetor. This surge then goes directly to the distributor, instantly boosting the advance. This increases engine performance just as you need it to accelerate. Idle is slightly weaker but initial acceleration is better.

Starting around 1967 (in the middle of MGB production) emission controls started to come into play. One of the early methods to improve exhaust emissions was to relocate the vacuum hose to feed directly off the manifold. This advanced the timing at idle which improved idle operation and reduced emissions, but sacrificed that first burst of acceleration. Some say this hurt the MGB performance while others say the improved idle compensated for the loss. Two further changes to manifold vacuum advance were made later as emission requirements tightened. First was the gulp valve addition which adjusted the manifold vacuum with the air pump. This valve reduced the vacuum pressure depending on acceleration needs of the engine, further reducing the vacuum advance available to the distributor. And lastly, with the introduction of the single carburetor on the MGB, an electric switch/solenoid Transmission Control Spark Advance (TCSA) was inserted in the vacuum line, cutting off all vacuum advance to the distributor except in forth gear. These changes hurt engine acceleration as the use of vacuum advance was greatly restricted and the

distributor had to rely much more on the mechanical advance system to maintain performance (more reactive and slower - remember last month).

Some MG owners removed the TCSA switch and run the hose line directly to the distributor giving vacuum advance in all gears. And some have tapped the hose directly off the manifold to bypass the gulp valve, also increasing vacuum advance. These changes get into modified cars as opposed to keeping everything exactly stock, but they improve performance. It is difficult to switch to ported vacuum advance unless you change carburetors to get one with the port built in.

One problem I encountered in fine tuning the timing on my car concerned the pinch bolt and clamp. On the MGB, this bolt is way down beside the engine block. My idea when fine tuning was to get a wrench with an extra-long handle. Then I could loosen and tighten this bolt without reaching down next to a hot block. This worked great until one day on a Sunday drive, suddenly the engine started running very rough and would hardly idle. Upon checking under the hood for the problem, I reached for the distributor. It came completely off in my hand. Seems that with the longer wrench, I was really tightening this pinch bolt to where it squeezed the clamp so hard it forced the distributor up and out of the clamp. So, when setting the timing, tighten the bolt to hold the distributor where you want it, but don't over tighten it or you may lose all your timing work.

There are many other ideas and tips on setting the ignition timing on our cars, but this gives a few of the latest ideas on what goes on and how to get the most from our MGs. So keep the cars running, and perfect your timing as you roll along.