MG Car Club
Washington, D.C. Centre

Distributor Basics

by Dave Michel

How many times have you completed a tune-up of your MG (adjusted valves and timing, synched carbs, adjusted idle, etc.) only to find that your car just doesn't want to run like you think it should? Perhaps you have been perplexed by the less than sparkling performance of your MG on more than one occasion. Such a circumstance will be extremely annoying when, after a "complete" engine rebuild, your engine performs in a lackluster manner upon reinstallation, despite virtually all "adjustments" being spot-on. If you have found yourself in any of these situations, perhaps you need to examine the state of your DISTRIBUTOR.

The reason is that, despite the regular replacement of points and condenser, your distributor may have received little or no other attention, including lubrication, heretofore during its lifetime. The lack of any lubrication is a primary contributor to the wear of the bushings which support the load on the distributor and maintain the rotation in a circular path. Although this wear may not be obvious when the distributor is rotated at low speeds, or when rotated by hand when the distributor has been removed from the car, it may be significant at engine speeds of 500 to 3500 rpm! In fact, bushing wear, at over ~50,000 miles, may result in your distributor rotating in an ELLIPTICAL, rather than a circular, path. This elliptical rotation may contribute to erratic ignition timing and to exceptionally poor engine performance.

Fortunately, the fix is quite simple as distributors are easily reparable. The repairs may be accomplished either by depositing the distributor with a qualified repair facility which will perform the rebuild or to do the work yourself by following the procedures outlined in the various repair manuals. Once the rebuild has been completed and the distributor has been reinstalled in your engine, including resetting the timing, the change in performance may be dramatic, if not phenomenal! Try it, you'll certainly like it!!

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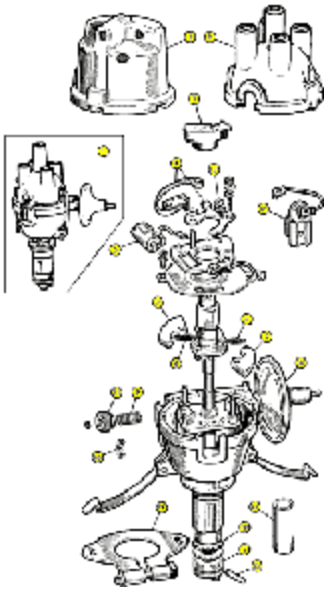
LET'S DISTRIBUTE

by Jim Lunson

One of the essentials to the starting of an automobile engine is the ignition system. This element, along with fuel makes the whole thing work. Ignition works on the principle of a coil working as a large storage cell for electrical energy. This element is wired into the car's electrical system similar to any electrical item, with a positive wire bringing current to the instrument and a negative wire to ground making the connection a complete circuit (the reverse in positive grounded cars). The coil works as an electrical storehouse, building up an enormous charge inside it. When the negative wire is suddenly disconnected: this high voltage charge surges out through a secondary outlet, the fat wire connected to the spark plugs. This current surge to the plugs causes the spark which ignites the fuel, giving our car the power to move us forward. All this happens over and over, very fast, sending out a burst of electrical current at the proper time to the spark plugs each time as the engine runs.



The coil disconnect is done in the distributor. Inside the distributor is a set of points. These points serve as the switch, disconnecting the negative wire from the coil, releasing the surge: on and off, over and over. There is a small condenser connected to these points to eliminate any spark at this switch so the points don't burn out quickly, but it is a simple circuit; the wire from the coil goes to the points and then is grounded out through the distributor body. When the points "open", this circuit is broken, causing the voltage surge noted above to occur.

A second function of the distributor is to distribute the electrical surge described above to the proper spark plug. This is done by the rotor and cap. The high current from the coil enters the distributor through the top in the center where it connects to the rotor. As the rotor spins in time with the engine, it makes contact with each spark plug wire, one at a time. The rotation of the rotor coincides with the points system so that when the circuit is broken causing the electrical surge, the rotor is connected to the proper spark plug wire, sending the current on its way to the

proper plug at just the right moment to cause the spark in that cylinder. This happens very fast and continuously.

So to trouble shoot a car that will not start requires an evaluation of this ignition system. If you have gas to the carburetor, this is usually the problem. Begin by

removing the wire from the coil to the distributor at the distributor end, push back the rubber boot, and wedge the exposed metal connector about 1/8" away from metal on the engine. Then, have someone crank the starter and see if a spark jumps from this connector to the engine. If the coil and points system are working, there will be a visible blue/white spark jumping very rapidly. I recommend wedging the wire to check it because there is high voltage going through this wire which will shock you if you hold it in your bare hand. It can be held, but only with thick, well insulated gloves. This is the first test to see if you have spark.

If there is no spark here, then the problem is in the points and coil system which will require more electrical testing. I'll cover this testing in the next issue. If there is spark at this spot, then the problem with the car not starting lies in the distribution (i.e., in the rotor, distributor cap, or the spark plug wires) of that spark. You now know the electrical surge is occurring and getting to the distributor.

At this point, pull off the distributor cap, using the two snap clips on either side

where it hooks onto the distributor body. First check the rotor which sits on the very top of the distributor shaft. This part takes the current entering through the center of the cap and spreads it out in a circle to the various spark plug wires. Pull it off and look for cracks where it doesn't sit properly or wobbles, and for pitting on the outboard connector where it may not make proper contact with the spark plug wire terminals. I have heard of rotors shorting out, sending the current down through the shaft instead of to the plugs too, so look inside it to see if it is clean or shows signs of sparking there. Often, either this shorting, or the loss of contact with the plug wires starts very small and only when the engine is hot, but this action creates additional heat on the plastic housing and the rotor will soon split or warp from this heat. There is a lot of wear and tear on this small plastic part as it spins and makes lots of electrical contact and is often the source of no spark. I have found it a good idea to carry a spare rotor cap, as they are inexpensive and small. And at the first sign of trouble, it is very easy to pull out the old one and stick on a new one. Then you know this is not the problem.

The next check is the distributor cap to see if the spark plug wires are secured into it and the prongs inside where the rotor touches each wire are clean and not burned. It is essential that the rotor contact be centered on the spark plug lead when the coil fires the voltage. If not, there is first a loss of voltage to the plugs (causing weaker spark and power loss), and second, there begins the cycle of sparking inside the cap, causing pitting on the connectors, further diminishing the current passage, and causing heat buildup. Like the rotor, the cap is plastic, and this heat causes it to distort, moving the connecting points and increasing the potential for the connection to be broken. Remember, this is all happening very rapidly, but must be solid for the car to start and run. These caps wear out after years of use.

I carry a spare cap as well as rotor for my specific distributor, so if the car fails to start, I simply replace it with new one. Neither part is very expensive, but hard to locate when you need one. The rotor will only go onto the distributor shaft one way, and the cap onto the distributor body one way so it is impossible to mess this up. The only tricky part is when replacing the cap; make sure the spark plug wires are reinserted in the new cap in the proper holes. I have made a small sketch of my distributor cap showing which plug wire goes into which hole, using 12 o'clock toward the engine as a reference point. I keep this sketch in the car, because it is easy to forget the sequence when you pull it all apart, especially if your car won't start when you are in a vulnerable spot, it's dark, or in a hurry and try to replace the cap rapidly.

The last items to check are the spark plug wires and the plugs themselves. These elements are generally not critical for the car to start as usually only one wire or plug goes bad at a time and the car will start and run with only three connected. I did have a problem with this once, which occurred on a very damp, foggy night. It seems my wires were many years old; the insulation was soft and saturated from the humidity. Then, all four wires shorted out to the engine block rather than at the plugs. Upon trying to start the car in the dark, there was a big blue glow as sparks jumped all over the area around the top of the plugs. I wiped down the wires with a towel to remove a lot of the moisture, and the car then started. Needless to say, the next day, those wires were all replaced.

Next issue, I will talk about what to do if there is no spark coming out of the ignition coil, and how to troubleshoot that element of the ignition system to get the car to start.

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What's the Point(s)?

By Jim Lunson, tech committee

I talked last time about troubleshooting the electrical ignition system of a car that won't start. I went into what to do if you have current into the big wire from the coil to the distributor but no spark at the plugs. Now let's look at what to do if there is no juice coming out of the coil. Remember, to get a car started, you need the spark in addition to the gasoline in the cylinder and the spark is caused by electrical current emanating from the wire in the center of the coil.

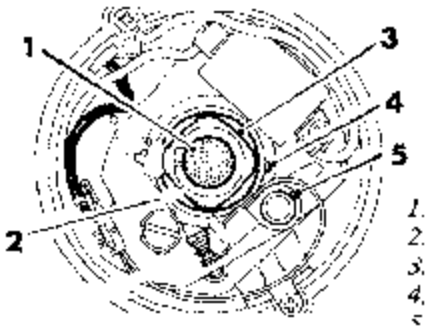
The ignition coil providing the juice works just like any electrical device in the car as it requires voltage to the hot side and a ground wire on the other side. So the first check is to look at all the connections to the coil (both sides) to make sure the electric current is flowing. Corroded terminals and wires broken right at the junction with the connector are usually the culprit. Plus the coil terminals have either a thumb screw or spade connector that can also work loose very easily. A disconnect anywhere here will disable the coil resulting in no spark at the plugs.

Next, see if the 12 volt DC current from the cars electrical system is reaching the coil. This is done by checking the positive lead on the coil (or negative lead if your car has positive ground) with either a volt meter or test light (most coils have a + and - marked on the plastic top). Check between the incoming wire to the coil and suitable ground. If there is no power here, the problem is somewhere back up the line toward the dashboard ignition switch or relay. A quick way to remedy this temporarily is to use a jumper wire with alligator clips on both ends and hook it up directly from a good power source such as in the fuse box directly to the ignition coil terminal. This bypasses everything that could go wrong and insures proper power is reaching the coil. Then see if it starts.

One note on using this jumper wire: the last 4 years of the MGB lifespan used a six volt coil instead of the customary twelve. The jumper wire noted above will work and get a car started, but is not recommended for a long duration as it will shorten the life of this coil. So be careful if this jumper works to find the source of the power gap quickly so the coil can be reconnected as required by the factory.

If this jumper wire does not do the trick, the problem has to be in the points. The points form the switch inside the distributor that rapidly connects and disconnects

the coil from its ground, sending the power surge to the plugs. These points open and close as the distributor shaft rotates. The fault with the points is that they have to be set a proper distance apart to work properly. If they are too close, the switch stays open too long and there is not enough time connected for the coil to build up the voltage required for the plugs to fire. If they are too far apart, they don't open long enough to let the coil send electrical power go to the plugs. Generally, these points erode away as they open and close so many times during driving plus the rub point against the distributor shaft wears down. Wear in either spot changes the gap, reducing the power to the plugs, eventually to the point where there is not enough voltage for the plugs to spark. This generally shows itself as the car becomes harder and harder to start over time to where it eventually won't start at all, although they could slip on the screw and change overnight.



1. *Cam spindle*
2. *Centrifugal weights*
3. *Cam surface*
4. *Base plate bearing*
5. *Pivot post*

Distributor lubrication points (45D4 type distributor shown)

The goal here is to check the gap between the points and make sure it matches the specification for the car. To do this, remove the distributor cap and rotor, rotate the engine until the points open on the cam and then check the gap with a feeler gauge. The gap varies for each car, but is available by checking the specs for the individual car. The gap is set by loosening the screw that holds it and rotating the assembly slightly along the slot provided. Reset this gap correctly and see if the car now starts. Another check is to make sure the points are connected properly to the distributor body. Often grease or dust can get under the points and destroy the ground linkage connection for them to work. There is also a condenser attached to the points, but this device only serves to eliminate any spark between the points and has little effect other than helping to extend their lifespan.

If still no starting, it is necessary to test if the points are working at all. Connect a test light between both the coil connections. This light should flash on and off when the car is cranked, indicating the points are connected and opening as they should. If this light does not flash, then there is a bad wire or connection between the coil and the points inside the distributor. Check this and the car should now start.

Another check to make is if the points have been replaced by an electronic type point system such as Petronix or Crane. These systems do away with the points and make the connection electronically so there are no moving parts. The best way to test these is to disconnect this system completely at the distributor so as to not damage the sensitive electronics inside it. Then set the big wire from the coil center

to allow it to spark against the engine block. Set up a jumper wire connected to the side of the coil going to the distributor. Turn on the ignition and tap this wire to a ground such as the engine block. Each tap (or tap release) should produce a spark. If this test gives a spark, then the electronic system has failed and needs to be replaced. There is no service that can be done to it other than to insure all the wires are connected properly.

The last thing that could be eliminating electrical power to the spark plugs is a bad coil. I saved this until last because coils are very simple, sturdily made, and very rarely fail. They tend to get hot during the running of the engine and most have an oil jacket on them to dissipate this heat. It is only very gradually that the coil windings inside short out internally reducing the voltage sent out to the plugs. This is so slow that it is hard to notice, and only by replacing the coil with a new one, will you feel any performance difference due to a hotter spark (from a higher voltage). The coil's lifespan is very long and should only be replaced as a last resort if everything else checks out.

I hope these testing procedures will get your car started. Remember, it's fuel and spark and your baby should run. There may be timing, valve and carburetor problems that prevent the car from running very well, but it should start and sputter along with these two elements. One last note: lots of people ask me about the conversion from the points system to the electronic type I mentioned above. This system change is pretty complicated to explain so I will discuss the reasons and methods, as well as the pros and cons in a later article.

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Electronic Ignition For ALL

"By Jim Lunson, tech committee

Last time I covered the points system and how this switching makes the coil work. One of the biggest improvements in the distributor function since almost the invention of the engine is the use of electronic ignition modules to replace the old points setup. These systems came into the picture in the mid 1970's, long before the sophisticated computer systems we see today. They were basically an assembly of resistors, diodes, and capacitors put together to accomplish the same function as the points had done for so many years. What they did was provide the same "on/off" function without any moving parts.

This electronic "points" ignition was necessitated by the ever tightening EPA emission requirements imposed on the car manufacturers during the 1970's. These new systems provided two advantages: first they would automatically adjust the time the points were open and closed to make the coil produce the absolute highest voltage possible, and secondly the timing would never vary out of adjustment. This meant the spark plugs would always function at their optimum potential, insuring the least emissions; and by maintaining this without changing; the car's emissions would never rise due to wear and tear on this element. As soon as these systems came out, there was a noticeable increase in performance and aftermarket manufacturers began offering replacement kits to upgrade cars with the old style points. This is where the MG systems came into play.

British Leyland came out with their electronic system in 1975 in California and 1977 everywhere else. Their system consisted of a ballast resistor to obtain a steady 6 volt power supply and a small metal box built onto the side of the distributor to house the electronic components and relay the switching back to the coil (distributor #45DE). The system worked very well, but as usual with British auto manufacturing, was not properly tested. It seems that since the distributor was very close to the engine block and the engines ran on the hot side, heat soon destroyed the components in the little box and the system failed. In 1980, MGs relocated the box to mount it between the coil and the fender which solved the problem (distributor #45DM). With the rapid failure of the 1975 to 1979 models, an aftermarket system was a necessity and soon on the market. Today, a conversion kit is available for every MG made. These systems are all similar, but with special brackets to make an exact fit inside the distributor where the points used to fit.

These systems work on one of two methods, either a rotating magnet attached to the distributor shaft with a sensor beside it to signal the switching as it moves past, or a flat disc on the distributor shaft with slots in it and a photo cell to shine a light through the slot as the disc rotates. Both systems work very well. These systems contain a component to mount inside the distributor and a small box mounted somewhere remotely in the engine compartment to contain the electronic switching equipment, plus various wires between the two elements, as well as back to the coil.

The advantages of these systems are as noted above: absolute highest voltage possible to the spark plugs providing maximum spark for easier starting, increased power, longer spark plug life, better spark plug wire performance and better coil lifespan. All this, as well as no moving parts to either wear out or need constant adjustment. Instant noticeable improvement will be felt in performance and reliability at every turn, even over a brand new points system perfectly adjusted. MG expert John Twist estimates they provide 2-3 additional horsepower instantly.

There are however, some downsides to these systems. First, when they fail, there is no warning or erosion of performance like a points system; they just quit when the electronics fail and the car stops running on the spot. Secondly, when it comes to maintaining originality in an old car such as the MG, there is now a huge flaw as a stray black box appears, mounted somewhere in the engine compartment with lots of additional wires coming out of it running to the coil and distributor. It is obvious something has been added that was not there in the original car.

Reliability: A good point system will last a couple of years provided it is kept in top adjustment. No one knows the lifespan of the electronic systems as they continue to last and last. My 1979 MGB was fitted with a Piranha brand (forerunner to the "Luminition" and "Crane" systems) sometime in the early 1980s when the original system failed. This was an early version appearing when the problems noted above started to occur. I replaced it in 2005 after several people told me that although it was a good system and still working as good as new, after over 20 years, I was probably living on borrowed time. Failures have been rare as these systems contain no moving parts and are sturdily built to last and last.

The problem is that each system is designed to fit a specific distributor where the old points were mounted and there is no "one size fits all". Being an all electronic assembly, there is no repair possible, only replace it. So if it does fail, a replacement for an MG distributor is hard to find except through the parts mail order companies. The only protection against failure is to carry a backup system for your specific

distributor. This runs up the cost as they are not cheap ($100+ vs. $10 for a points set). Or just hope they last and last like mine has and not worry about it.

The other option is to carry a set of the old points along and be prepared to make the conversion back if there is ever a problem. This takes some doing as all the wiring has to be changed back, but will insure a backup in case of a failure. Personally, I carry an old distributor with the points already installed as an emergency kit. I think it is easier to swap distributors than redo the points system inside. This is in spite of the fact that the old system in my car lasted over 20 years without being touched.

Originality: In the last several years, "Pertronix" brand has come out with a system that fits entirely within the distributor (they now even make a whole distributor with the system mounted inside). From the outside, there is no difference in the original look of the car with the exception of one additional wire going into the distributor. For all practical purposes, this solves the appearance problem yet provides all the benefits. My only concern with this system is that it goes back to the problem with the original MG system: perhaps too close to the engine block and the potential for damage from heat. I have had this system on my car since 2005 without trouble, so I am pretty sure it is more durable than the original MG system, although it is only 5 years old at this point. My previous system had the black box mounted on the fender.

So the conversion is available for virtually every MG, the cost is higher than points and there is an additional wire to the distributor, but the performance improvement is good, all wear is eliminated, and the reliability seems to be good at this point. The conversion is available for every MG. The decision is yours.

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FIRE UP YOUR IGNITION

by Jim Lunson

One of the more difficult electrical items to understand on our MGs is the starting and ignition system. This system does two things: first, it modifies the entire electrical system during the starting mode to put every ounce of battery juice available onto the starter motor, and secondly, it provides the electrical current to the spark plugs which need to fire in order to ignite the gasoline in the cylinders. Everything else electrical in the car is secondary to providing these functions: starting and running the engine. These other systems accomplish many different functions, and depending on the age of the cars, they vary greatly in their complexity. But the starting and ignition systems function about the same in all MGs, regardless of age.

The electrical function of starting the engine is accomplished by use of a relay. A relay is a type of switch that, when low amperage current is supplied to one side, it opens or closes a separate secondary switch that contains a much higher electrical current. In the starting system, in order to provide the starter motor with as much current as possible, this secondary circuit uses very heavy wire and thus requires a very heavy switch to connect it. It is so heavy that the item is called a solenoid instead of a relay, but functions the same. When a low amperage current (#16 or #18 gauge wire) flows from the ignition switch (key on or button) on the dashboard, it closes this heavy duty solenoid switch and sends a large current directly from the battery via the big fat wire (#4 gauge) to the starter. This heavy wire and switch get all the power possible from the battery directly to the starter to spin the engine fast enough to start. The starter motor has to be very powerful to spin the engine fast enough to start and it draws more current than anything else in the car. That is why it requires such a heavy wire and this heavy wire requires the big solenoid switch to make the contact.

The second thing this solenoid does is disconnect almost all other electrical current in the car. This is why the radio comes on when the ignition switch is in the run mode, but cuts off when the start mode is activated. Same for the blower, wipers, and just about everything else electrical in the car except the headlights. The

idea, again, is to get as much power to the starter as possible, this time by cutting out everything else electrical that might suck current away from this effort. And it's the reason you should not try to start the car with the lights on.

Have you ever turned the key or pushed the start button to start the engine and instead of the familiar whirr of the engine cranking, all you hear is a rapid clicking sound? This sound is the solenoid trying to engage the heavy duty switch to connect the starter, but due to a weak battery, gets just enough current to activate the solenoid but not enough to throw the heavy switch inside. Just enough electrical current to keep trying over and over: hence the clicking, but no contact and no starting. There is usually enough power still in the battery to run the radio, lights and most other electrical items, so the battery seems to be fine, but that starter motor requires so much juice that the switch just can't close to get the power through.

One possible solution when you hear this clicking sound short of getting a new battery is to check the connections on the battery and solenoid. Because this starting mode requires so much current, the connections are very large, providing a wide connection surface for lots of juice to flow through. If any of these connections gets loose or corroded, electrical current to run the car will still flow, but not when every ounce is required for that starter. So, when the clicking sound is heard, first check and clean these connections. This includes connections on the battery, the battery to frame ground, connection to the solenoid, to the starter and the engine block to frame. If that doesn't do it, then get a jump from an outside source and see about a new battery. I once had a battery that worked fine, until Ann and I stopped at an overlook in Shenandoah Park. A cloud rolled in on us while we were there (very pretty) and the sudden moisture from it was enough to weaken the connections. When ready to leave, the solenoid started clicking instead of starting. Fortunately, we were able to roll downhill far and fast enough to jump start the car. Once, down the mountain and out of the cloud, everything was fine again. The moisture brought in by that cloud was just enough to weaken those big connections enough so there was not enough current. You'd better believe I cleaned and tightened those connections first chance I had.

I also recently saw an MG where the starter motor mysteriously burned out. In checking we found a faulty ground from the engine block to the frame. Adequate electric current got to the starter just fine, but it was unable to flow back to the ground and instead melted the coils in the starter. So be sure to check that connection also if there is trouble. It is usually way out of the way under the car by the transmission mounts, but is also a heavy wire and a crucial link in getting the starter to crank.

One item to note on car batteries these days too: new modern auto battery construction utilizes alkaline chemicals in lieu of the old acid types. This change permitted the sealed tops (maintenance free!) which eliminated the little removable screw caps that needing checking and occasional filling with distilled water (remember them?). In addition deleting this maintenance step, the newer construction lasts much longer. Warranties of 7, 8 or even 10 years are now not uncommon, whereas before 3 years was about the maximum you could get. So there has been great progress in this area of automotive science; however, one downside to this change is that the newer batteries tend to fail all at once rather than gradually losing starting power. You can start the car with almost full battery power, drive to the store, and find the battery completely dead when you get ready to return home. No warning, no weak starting, and no reviving - just dead, and often so dead it won't even provide the clicking sound described above.

So it pays more than ever to keep an eye on the age of your battery, not waiting for it to show signs of weakening before replacing it. And, if you wish to do a little easy preventative maintenance on your battery, check your paperwork to see how long you have had it and how long it is rated to last. Chances are if it is past the rated lifetime, you may be in for a surprise one time when you go to start your engine. It's easy to check and a replacement now may save a lot of headache.

I'll go over the ignition system in the next issue as to how the electrical juice gets from the battery to the spark plugs to get the engine firing. It's another system that is vital to the running of our cars and one that is often not understood. It involves coils, distributors, points and other exciting parts of our cars. How they all work together and what can go wrong.