

Understanding Distributor Vacuum Units

We're often surprised to hear mechanics or other suppliers say, "The vacuum advance unit can be disconnected." Or, they'll say, "Any unit will do." They are partly right, as you'll feel no difference in performance when under load, during wide-open throttle or heavy acceleration. But under light load, it's a different story. A proper – and properly functioning – vacuum unit actually has a major influence on performance and mileage.



The lack of knowledge is surprising. But remember that for the first 10 to 20 years, the vacuum unit on most vehicles operated perfectly fine. There was little need for a mechanic to address the vacuum unit or learn more about them. But some of our British cars are now 60 years old, so it's almost a sure bet the vacuum advance unit is bad. The diaphragm is probably dry and stiff, filled with condensed fuel vapor or leaking – or all three.

Starting in about 1968, the distributor went from enhancing maximum performance and mileage to emission control. With initial timing often set retarded for emissions, the distributor mechanical advance increased in degrees to play catch up at higher RPMs. Without this built-in over-advance, there would be little or no performance. Retarded timing created heat that helped to lower pollution, but it also cooked our engines. On most of these later distributors, the vacuum unit is used for retarding timing and/or partial advance.

Let's focus on pre-emission-control distributors and vacuum advance units, which were manufactured for optimum performance and mileage through the late 1960s. Each distributor was manufactured for a particular vehicle depending on engine size, performance specifications, vehicle weight, gear ratios, etc. Lucas and vehicle manufacturers worked closely to carefully tailor the distributor to each vehicle. The goal was to have the fuel ignite and expand as the piston was starting its way down on the power stroke. The mechanical advance mechanism within the distributor controls optimum spark up through the RPM range for maximum cylinder pressure as the fuel burns under load. The vacuum advance unit, on the other hand, greatly enhanced overall performance under light load when the fuel mixture is leaner and takes longer to ignite and expand.

Vacuum units are not interchangeable unless they carry the same identification number, as each unit is made up to suit a particular engine. Additional control of the spark timing is brought about by the vacuum unit. As the unit is connected to the engine intake manifold, its operation depends on the vacuum present in the manifold, so the vacuum effect varies with the engine load. The vacuum unit produces additional advance when the engine revs are high, but mainly when the load is light. At full throttle the vacuum unit becomes wholly or partly inoperative. The general effect of the vacuum unit is to increase the liveliness and performance of the engine and improve fuel economy.

Proper vacuum advance function also depends on a tight vacuum line. The advance unit will not operate if the connector pipe is cracked or a union is loose.

Often unnecessary and expensive engine modifications are made to enhance power and performance when all that's needed to restore original performance is a fresh vacuum advance unit. When tested on an Allen distributor machine, we've found many units to be leaking and so-called "good" units are operating far out of specification. It only makes sense that after 30-plus years of operation that the diaphragm has dried out and cracked.

Most vacuum gauges are calibrated in mercury, so for the sake of simplicity we will refer to movement in lbs of vacuum. Next to the unit part number is the vacuum code. The first number in the three-digit code indicates the lbs of vacuum where the unit starts to advance. The second number indicates lbs of vacuum to reach total advance; the last number is the total degree of unit ignition advance. Please note that the last number of degrees is twice the spark advance at the crankshaft, because the distributor turns at half the speed of the crankshaft. Vehicles with unit advance codes above 3 degrees would most likely suffer the most performance loss when the vacuum advance unit is disconnected or in poor condition. A vacuum unit with a 7-18-12 code, for instance, has an additional 24 degrees of vacuum advance at the crankshaft when operating properly. Installing a 7-18-12 unit on a vehicle that called for, say, a 5 8 3 would absolutely have negative effects. Timing would advance later and over-advance by 18 degrees.

Most likely anyone detecting engine pre-ignition or pinging with the wrong vacuum advance unit would attempt a cure by retarding the distributor timing. This may stop the pre ignition, but in doing so would kill performance under load when only the distributor mechanical advance comes into play. This would cause a significant loss in power, build-up heat and decrease fuel mileage.

Vacuum units are matched to distributor numbers. It's important to purchase and install the proper, original-specification, unit from a supplier who offers vacuum units with original part numbers and code specs. Over the years, many vacuum units were superseded to parts that were "close" to original specifications or even to a one-size-fits-all part. XKs Unlimited now offers virtually every vacuum unit ever fitted to a Jaguar.

All British car owners should make it a part of normal maintenance to check that the distributor is oiled, that the advance moves freely and that the vacuum advance is in good working order. A new vacuum unit usually results in an unexpected increase in performance and drivability. We then often find that an incorrect replacement vacuum unit had been fitted.

Every distributor serviced with a new vacuum unit has resulted in customer comments such as "not the same car," or "now at highway speeds, it runs so smooth" or "I can't believe the difference in power." The vacuum advance unit is not a miracle part, but it's a key component of the ignition system with a large impact on power and performance.