

# The Distribution of Power

## Distributor Basics

By John Connolly

### Choosing the Right Distributor

Aircooled VW owners have an assortment of options when choosing a distributor for their engine. If you only look on the surface it seems simple: The "obvious" choice is the Bosch .009, right? Not necessarily. Once you do a little research, you'll find a variety of stock units (including the SVDA unit), as well as the Bosch .009, .010, .019 and .050 series, and finally the Mallory, MSD and the age old Magneto. So which one is "best?"

Each of these units is excellent for the right application. In this article, the right time and application for each option available will be clarified.

### Stock Engines

We will start at the obvious place, which is the beginning. Up through the late '60s, VW supplied their engines with the stock distributor, which was a non-smog distributor (emissions were not an issue). These vacuum advance distributors do their job well and all

Distributors have a wide variety of applications.



1 Courtesy of **VW TRENDS** / APRIL 2000



The .010 Bosch Distributor eliminated the vacuum advance system and is very similar to the .009.

are dependent on a vacuum signal from the carburetor, (with the exception of some early Type IIs, which were chronically under-powered and used a centrifugal only distributor similar to the .009).

Stock units work very well when installed in stock or near-stock engines with 28 or 30 series carburetors. Most complaints are related to a defect of some sort (bad points, condenser, worn out distributor) or a problem that is giving symptoms of a bad distributor, but is actually fuel system related (not ignition).

When initial "hotrodding" changes are done, one of these two modifications are the most common:

1. The carburetor is changed to something other than stock, and it

is almost always missing a vacuum port for the vacuum advance distributor to operate properly.

2. The high performance engine does not have a proper vacuum signal due to a long duration camshaft. Cam overlap will cause a change in vacuum, and obviously, the vacuum advance won't work properly without the correct signal.

### The .010 and .019 Distributor

Bosch came to the rescue with the .010 Distributor for early hot-rodders. This distributor eliminated the vacuum advance system, and used only engine rpms to dictate the ignition timing. For high performance engines of the time, this was the perfect solution, since these engines were usually run at idle or full throttle! The .010 and .019 are basically the same as the



The ever-popular .009 distributor.

.009, with the exception of having the older style two-piece ignition points.

### The .009 Distributor

In 1971 (in the USA) the VW engines were shipped with a "smog" distributor, which had a vacuum retard in addition to the vacuum advance. The upright engines were also changed to the dual port configuration, along with a change in carburetors from the 30 PICT series to the 34 PICT series, which had the additional port for the vacuum retard. These new carbs were also lean in their operation, since they had to conform to the new tailpipe standards.

The .009 distributor was introduced, and was a very inexpensive "replacement" unit for VW engines, and it was almost a duplicate of the earlier .010 distributor, with the nicer addition of the one-piece points that were used on the stock distributors from '71 and newer. For the sake of simplicity, we are going to refer to the

.009/.010/.019 as simply the ".009," since they are all very similar in operation.

The .009 distributors were (and still are) sold by the ton. Early VW engines (pre-'71) had no problem with these being bolted on, but the smog engines (when equipped with the .009 distributors) had a pronounced and annoying "flat spot." A "flat spot" is a hesitation just off idle, and can range from being almost unnoticeable to getting broad-sided or rear-ended by approaching cars!

It is important to note that many .009/34 equipped owners mistake this flat spot for power. They don't notice the hesitation, but they do notice the kick in the back of the seat once the engine catches and it starts accelerating! They mistake this for "more power" since there is such a difference between the stumble and actually operating properly.

The vacuum advance distributors do not have this hesitation since they advance the timing when the throttle is initially opened as part of their operation. The .009 changes the ignition timing depending on rpms, and vacuum advance is eliminated. When a .009 is combined with the lean smog operation of the 34-series carb, the flat spot is the result. Past and current "solutions" are all modifications to the carburetor, which richen up the fuel delivery in various forms, whether it's the idle circuit, the main jet, and/or the accelerator pump circuit. Guess what happens to your mileage with all this extra fuel?

The error with carburetor "fixes" is that they are curing a symptom, not the problem. The problem is the lack of additional advance just off idle, not lean oper-

ation. The stock distributor/34 carbs didn't have a hesitation, so that should tell you where the problem lies! Why do you have to be a carburetor Guru to install a .009 onto your engine?

### The SVDA Distributor

Aircooled.net sells a rebuilt production VW distributor with the .009 advance curve (close enough), and a vacuum advance unit! Believe it or not, there is an additional advantage to the vacuum advance (on engines that have the proper vacuum port such as 34 PICT-Series carbs), and that is the gain of four mpg improvement over the .009 distributor! Having your cake and eating it with the same performance, four mph improved mileage, and no flat spot. The driveability of the SVDA/34 carb has to be experienced! The engine can be lugged or shifted early, and it pulls smoothly (just like grandma wanted). Most people that try it can't believe the difference and will never go back.

The MSD is used mostly with custom ignitions.





The .009 is best in stock rod-ratio engines.

However, the SVDA is not for all applications. The 28- and 30-Series carbs can not effectively use the SVDA distributor since the vacuum signal from these carbs are not correct. The result is that the vacuum advance will not be activated fully on the small canned SVDA (note that early distributors use larger vacuum cans than later distributors because the vacuum signal is smaller). On early engines, the stock vacuum only distributor works very well, and the .009 is okay for the leadfoots.

### Modified Engines

When the carburetor is changed to something larger than stock, the proper vacuum signal is lost, so the centrifugal advance units are the proper distributor for this application (since vacuum advance no longer works). Now you are lost in a multitude of choices: .009, .010, .019, .050, Mallory, MSD and Magneto. Which one to use?

Your engine runs best when

you ignition timing is set about four degrees retarded from the point where detonation occurs. This timing setting means the flame front of combustion will meet the piston at the top, maximizing cylinder pressure and the time (crank degrees) to push the piston down, making the most power. If you ignite the charge too late, the pressure doesn't build until the crank has rotated past TDC, and you lose precious crank degrees (horsepower and torque) of work. If the ignition is started too early, the flame front will hit the piston on the way up, and this is a sure-fire way to destroy your engine quickly.

Ideally, you would find the timing point at every rpm point where the engine is around four degrees retarded from detonation under full throttle, since this is the "ideal" time for our spark to occur. Obviously, you would leave yourself a safety zone of three-four degrees of timing at all points in case of bad fuel, clogged main jet, vacuum leak, abnormally hot engine, etc.

The power difference between

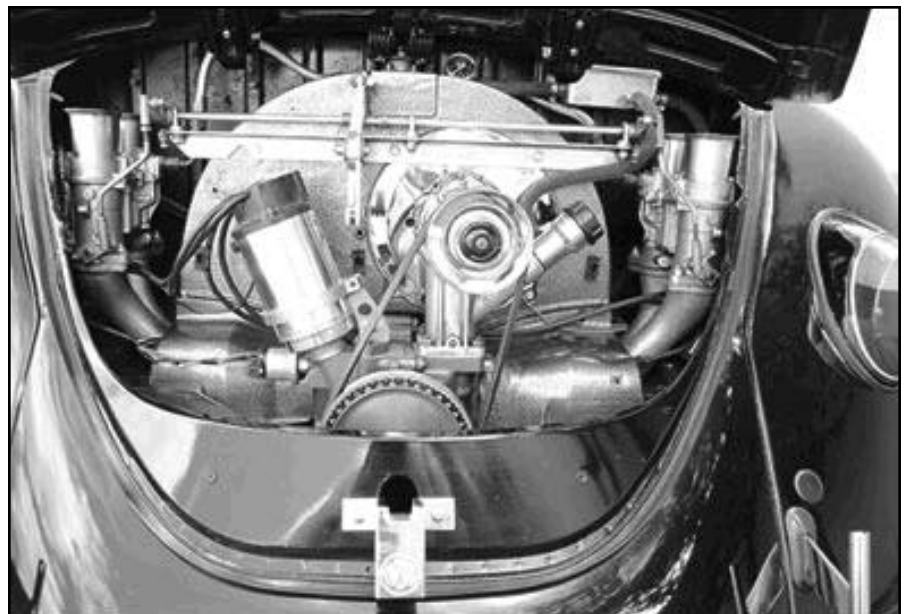
detonation and three-four degrees retarded from this point is minimal, so riding the ragged edge of timing is not worth the risk. Many people are not aware that detonation does not have to be audible for it to turn your expensive mechanical marvel into junk in short order.

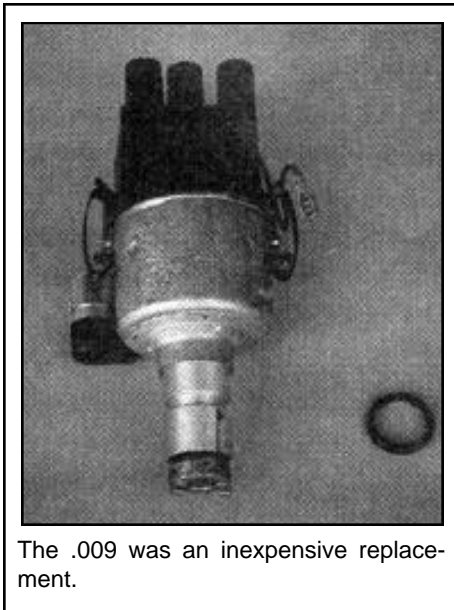
### Finding the Advance Curve on Custom Engines

Ideally, you would remove all centrifugal advance from the distributor, and run a locked timing. You then put the engine on a dyno, and experiment with the timing at all rpm points from idle to redline at full throttle (finding the timing where you are four degrees from detonation) and then you chart it. Next, remove the locked timing from the distributor, set your initial timing to match what you found was best at idle. Match the distributor's curve to match what you found to be best on the dyno (by changing weights and springs in the distributor) and you are set.

If you have the patience and time to set up this custom curve, and have a heavily modified engine, your patience will be

A nice example of Magneto.





The .009 was an inexpensive replacement.

rewarded! just get yourself a Mallory or MSD distributor (Aircooled.net and other "Trends" advertisers sell these units). You will find they are very adjustable, and all the parts and instructions to do the adjustments are included with these distributors when you purchase one. The easiest method to follow is very straightforward, and was outlined above. Find the max advance point your engine tolerates (usually between 30-40 degrees BTDC above 3000rpm. Now find the place where it responds best at idle (this may be 15-24 degrees BTDC). You may find this much advance causes starting difficulties when the engine is hot, so be sure to check this out! (Ignition before top dead center causes "negative torque" and that's what suddenly stops your engine from cranking. Avoid this, or use a retard that is activated during cranking.)

Now you know the fun advance and idle timing settings, which are the two critical points in your advance curve. Now you simply need to figure out how fast you want the advance to come in. I rec-

ommend being conservative, and adjust the advance to come in sooner and sooner (it requires distributor disassembly) and see how the engine responds. Keep adjusting until you detect detonation. Retard it about four degrees from the point of detonation, and you are done.

The .009/.010/.019 is best used for stock rod ratio engines, when you do not want to do the detailed custom ignition curve work. Let me first say that I'm not a fan of the .050. The .050 has a different advance curve than the .009 (the advance comes in quicker), and so it is better suited for short rod engines (like the Type IV), or engines with a bigger crank and shorter rod (78 stroke with Porsche length rods, etc).

If you are using an out of the box distributor (.009/.010/.019/.050), you have to set the timing as advanced as you can so it doesn't detonate at full throttle (full throttle is where you would detect detonation with a centrifugal only distributor). Usually this setting is around four eight degrees BTDC at idle. The problem with using a non-customized curve is that you are setting the whole curve based on the max timing at one rpm point. This in itself is significant.

You are finding the point in the rpm range where you can't advance any more, even though at many (all) other rpm points you are too retarded! This is exactly why setting up a custom distributor advance curve is the ideal solution, but not everyone has the time/patience to set it up. A fully adjustable ignition curve like a programmable Haltech makes this very easy on a dyno. With these you just tap a few keys on the laptop and you are on your way.

Modifying distributor advance curves require spring and weight swapping in the distributor (which requires distributor removal and disassembly) each time you have to make a change.

### The Magneto

The last option for a "distributor" is the Magneto. A Magneto is basically a generator, coil, and distributor in one unit. Watch out, they're heavy! Since magnetos "produce" their own electricity, they can be very tough on the brass distributor drive gear on the crank. These are wonderful products, but they have a very limited application. In my opinion, a Magneto should only be used in applications that do not have a battery, or that are required to have self supporting ignition systems (aviation?). Having a Magneto and a battery/generator/alternator is redundant, in my opinion. If the vehicle has no battery, and is externally started, the Magneto is the obvious choice. Magnetos offer huge weight savings since there is no starter or battery. Some people like the retro high performance look of a magneto, even when they have a charging system!

### Distributor Application Summary

**Stock Distributor** - For stock engines.

**SVDA Distributor** - For 34 PICT-equipped engines.

**.009/.010/.019** - For modified engines, where no ignition curve fine-tuning is desired.

**.050** - For engines with a relatively short connecting rod and low rod-ratio.

**Mallory** - For modified engines where the owner/builder wants to customize the ignition curve.

**MSD**-For modified engines with a custom ignition curve, magnetic pickup, and that can be easily connected to a MSD ignition unit (5, 6AL, 7AL2/3, etc).

**Haltech/Electromotive** - For the computer/high tech junkie that wants infinite adjustability in their ignition timing.

**Magneto** - For engines with no battery or source of electricity(generator/alternator).