Build Your Own Distributor Test Machine for Under $100

by Joe Randolph

Many people have heard of the famous Sun distributor machine that was ubiquitous in repair shops and speed shops from the 1940s to the 1970s. These machines allowed a mechanic to remove the distributor from the engine and test it independently outside the car. Several key characteristics of the distributor could be tested, including the mechanical advance, vacuum advance, and dwell.

Fig 1: Vintage Sun distributor machine

Of these, the two parameters of most interest to engine builders are mechanical advance and vacuum advance. In addition to simply verifying that the distributor is performing as designed by the manufacturer, changes can be made to the mechanical advance and vacuum advance to better match the distributor to an engine that has been modified or to better match the engine to today's fuels.

Distributor machines became unnecessary as cars evolved to using computer-controlled ignition, and few repair shops have them today. Some speed shops and engine builders still have them, especially if these shops specialize in vintage engines. A used Sun distributor machine in good working condition typically sells for $1000 to $2000.

For owners of Corvettes that have a traditional points-type distributor, a distributor machine remains the preferred way to test or modify the advance characteristics of the distributor. However, the high cost of a Sun machine means that most Corvette owners can not afford to add one to their tool collection.

Figure 1 shows an old Sun distributor machine that I acquired a few years ago in non-working condition. My plan was to repair it so that I could have my very own working machine. I rebuilt the mechanical portion that spins the distributor at variable speeds, but some aspects of the electronics did not appear to be working properly. While contemplating how the distributor machine works and how I could check its calibration, I realized that I could probably build my own faster and cheaper than I could repair the Sun machine.

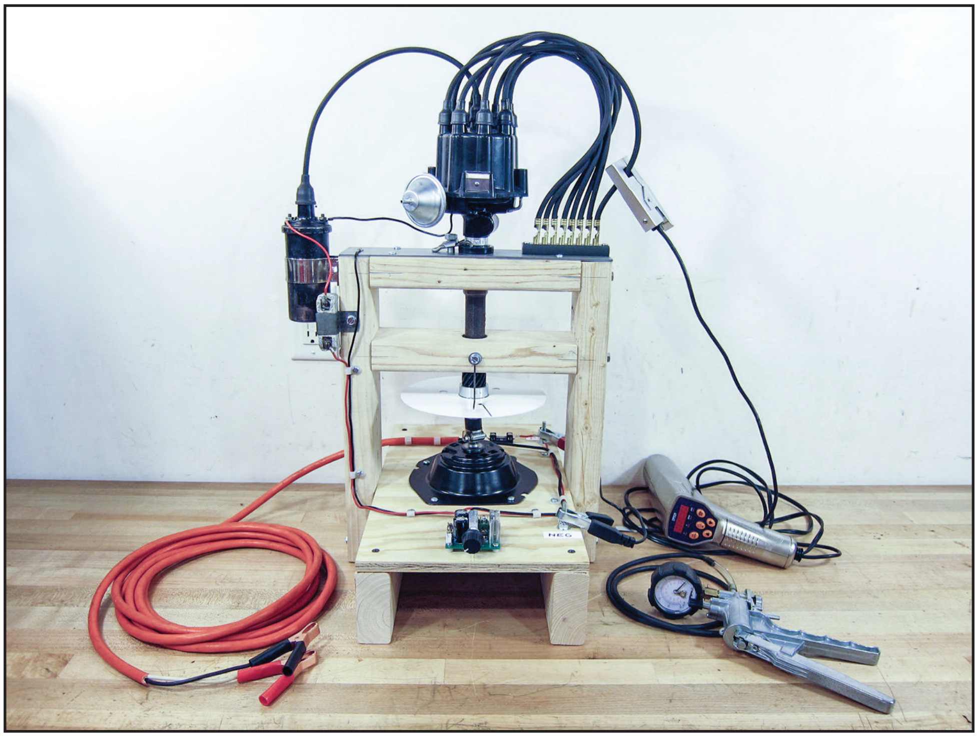

Fig. 2: Low-cost distributor machine with distributor installed

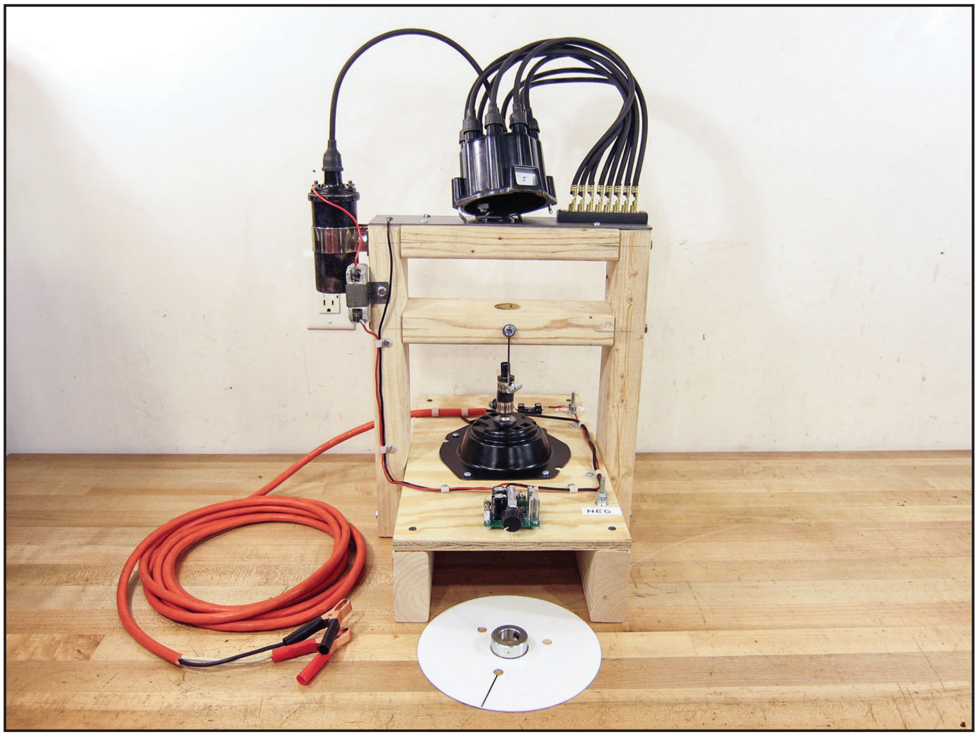

Fig. 3: Low-cost distributor machine fixture

The design of this low-cost alternative machine is the subject of this article. Just to be clear at the outset: the $100 cost mentioned in the title assumes that you already own an ignition timing light and tachometer. If you want to test the vacuum advance, you will also need a hand-operated vacuum pump. Most Corvette owners who work on their own cars already own these automotive tools. The machine described in this article is simply a fixture that is used in conjunction with these devices.

Figure 2 shows the complete test setup with a distributor installed, including the timing light with built-in tachometer and the hand-operated vacuum pump.

Figure 3 shows just the test fixture itself that can typically be built for under $100.

In addition to the above-mentioned automotive tools, the cost estimate assumes that you have available some basic building materials such as 2 x 4 lumber, some plywood, a piece of sheet metal, and an old heavy-duty extension cord that can be cut up. In refining the design for this article, I made a concerted effort to keep the design simple enough that anyone who is reasonably handy could build one of these fixtures.

Figure 4 shows all the components of the test fixture except the wiring. All parts are fairly easy to fabricate.

This distributor machine is intended for use with the points-type distributor used on Chevy V8s from 1955 to 1974. The machine also works fine for points-type distributors where the owner has installed an electronic points-elimination device such as those sold by Pertronix and Lectric Limited. For the early HEI distributors that still used mechanical advance, only minor changes to the distributor connections are needed, since HEI distributors have no external coil or ballast resistor.

Ignition-Advance Terminology

For a properly running engine, the firing of the spark plug must be carefully timed so that it occurs at exactly the right moment. It turns out that this moment is not simply the point at which the piston has reached the top of the compression stroke. Since there is a finite delay between the time the plug fires and the time that the fuel burn gets fully underway, the spark plug needs to be fired at some point slightly in **advance** of the piston's arrival at the top of the compression stroke. This is what is meant by the term "ignition advance." Ignition advance is always specified in degrees of crankshaft rotation.

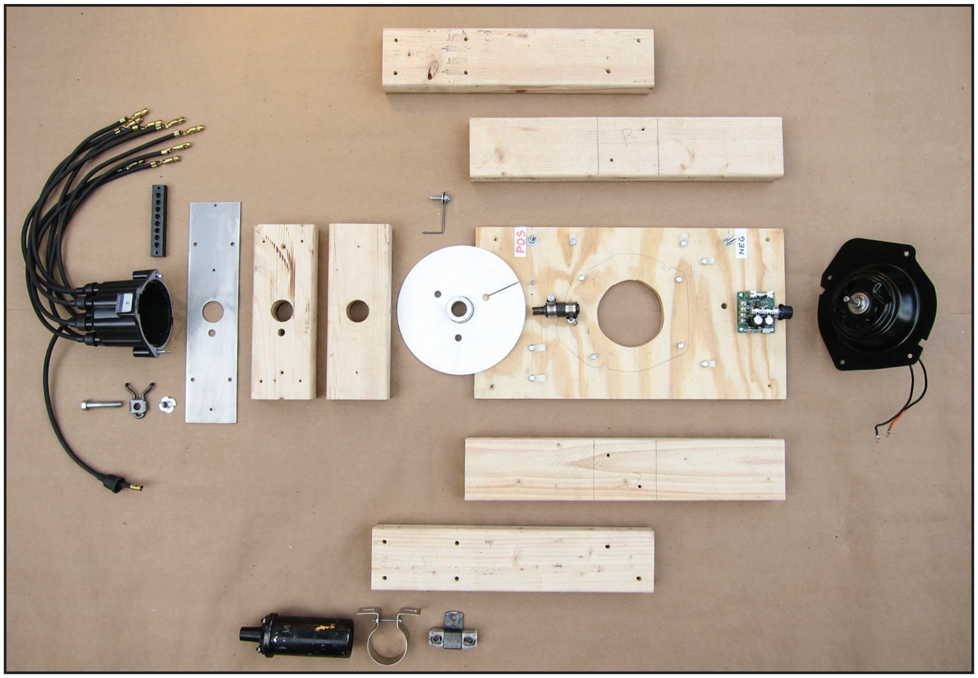

Fig. 4: Components of low-cost distributor test machine

To complicate matters, the optimum amount of advance is not a fixed number. The required advance increases as the engine speed increases, and it decreases as the load on the engine increases. So, some means must be implemented for changing the advance in response to these two factors.

When discussing ignition advance, there are three types of advance that need to be understood:

Mechanical Advance

Mechanical advance increases the ignition advance as a function of engine speed with higher engine speed corresponding to greater advance. In vintage Corvette distributors, this is done with two spring-loaded flyweights located under the rotor, shown in Figure 5. **Mechanical advance responds only to engine speed.**

Vacuum Advance

Vacuum advance increases the ignition advance when the engine is lightly loaded, such as at idle and cruising speeds. This is done with a small diaphragm that responds to intake manifold vacuum (intake manifold vacuum is highest when the engine is lightly loaded). The vacuum advance diaphragm is the familiar "can" mounted on the distributor just outside the distributor cap, shown in Figure 5. It is connected by a hose to a source of intake manifold vacuum. **Vacuum advance responds only to intake manifold vacuum.**

It should be noted that most vacuum-advance cans are connected directly to a source of intake manifold vacuum. However, some engines from the early days of emission controls use a source of "ported vacuum" that provides vacuum only when the carburetor throttle blades are open. This was used to reduce advance at idle to create higher combustion temperatures that led to lower emissions. A common fix for these engines if they run hot at idle is to change the vacuum source to direct manifold vacuum.

Initial Advance

Initial advance is the amount of advance provided without any contribution from the mechanical advance or the vacuum advance. Initial advance is the familiar parameter set with a timing light during a routine tune-up. Initial advance is set by loosening the clamp at the base of the distributor and rotating the distributor body. **Initial advance is a fixed value that does not change unless the distributor position is altered.**

When setting the initial advance, it is important to eliminate any contributions from the mechanical advance or the vacuum advance. To prevent the mechanical advance from affecting the reading, initial advance is set with the engine running at idle. At idle speeds, a properly functioning mechanical advance is not adding any advance. To prevent the vacuum advance from affecting the reading, the vacuum hose to the vacuum advance can is disconnected and plugged.

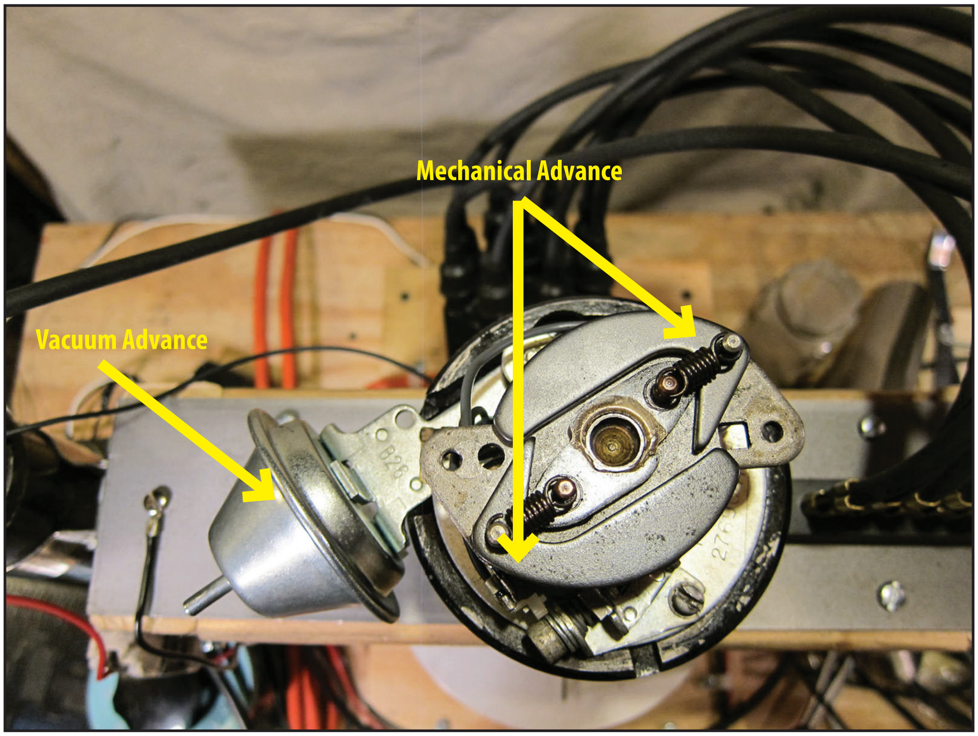

Fig. 5: Mechanical and vacuum advances

It is important to understand that when the engine is running, the actual advance the engine sees for a given combustion event is the instantaneous sum of all three of the above. In other words, Instantaneous Advance = (Initial Advance + Mechanical Advance + Vacuum Advance).

Each of the three advance systems operates completely independently of the others, but what the engine sees is the sum of all three. When attempting to evaluate any one of these systems, it is important to keep the other two from affecting the measured results.

What a Distributor Test Machine Does

The most basic function of a distributor test machine is to allow the operator to spin the distributor at any desired speed and measure the amount of mechanical advance the distributor is generating. Mechanical advance is tested by leaving the vacuum advance disconnected and spinning the distributor over the full range of speeds at which it is designed to operate. Since the distributor turns at half of the crankshaft speed, spinning the distributor over the range of 250 to 3000 RPM is equivalent to an engine speed of 500 to 6000 RPM.

Mechanical advance increases as a function of engine speed, so the speed at which the distributor is spinning will influence the measured advance. A graph of the mechanical advance as a function of engine speed is the so-called "advance curve" that is the most frequently sought output from a distributor machine. Figure 6 shows a representative mechanical advance curve.

Vacuum advance is measured with the distributor spinning at idle speed so that the mechanical advance is not active. A calibrated source of vacuum is applied to the vacuum can and the resulting advance is measured. Figure 7 on the following page shows a representative vacuum advance curve.

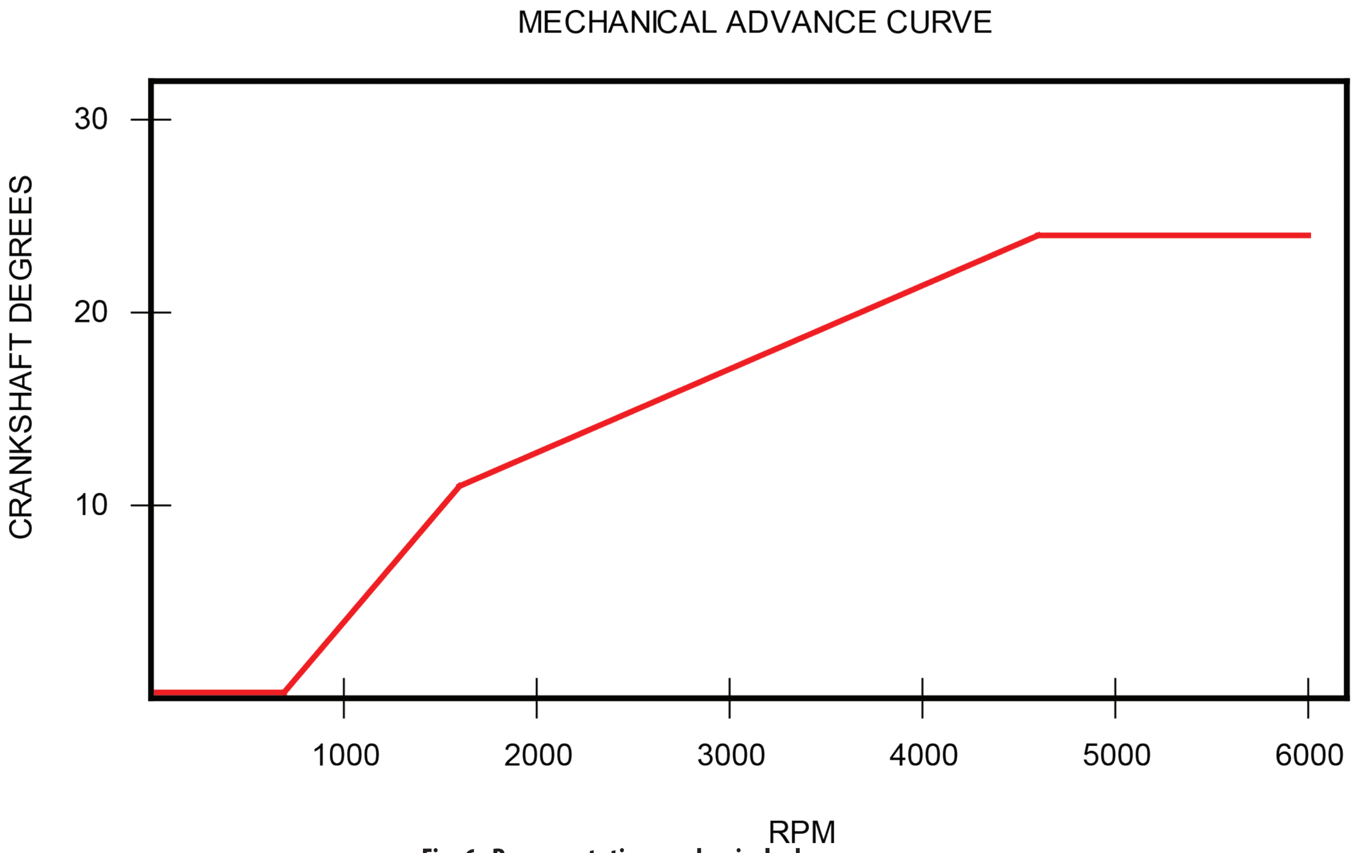

Fig. 6: Representative mechanical advance curve

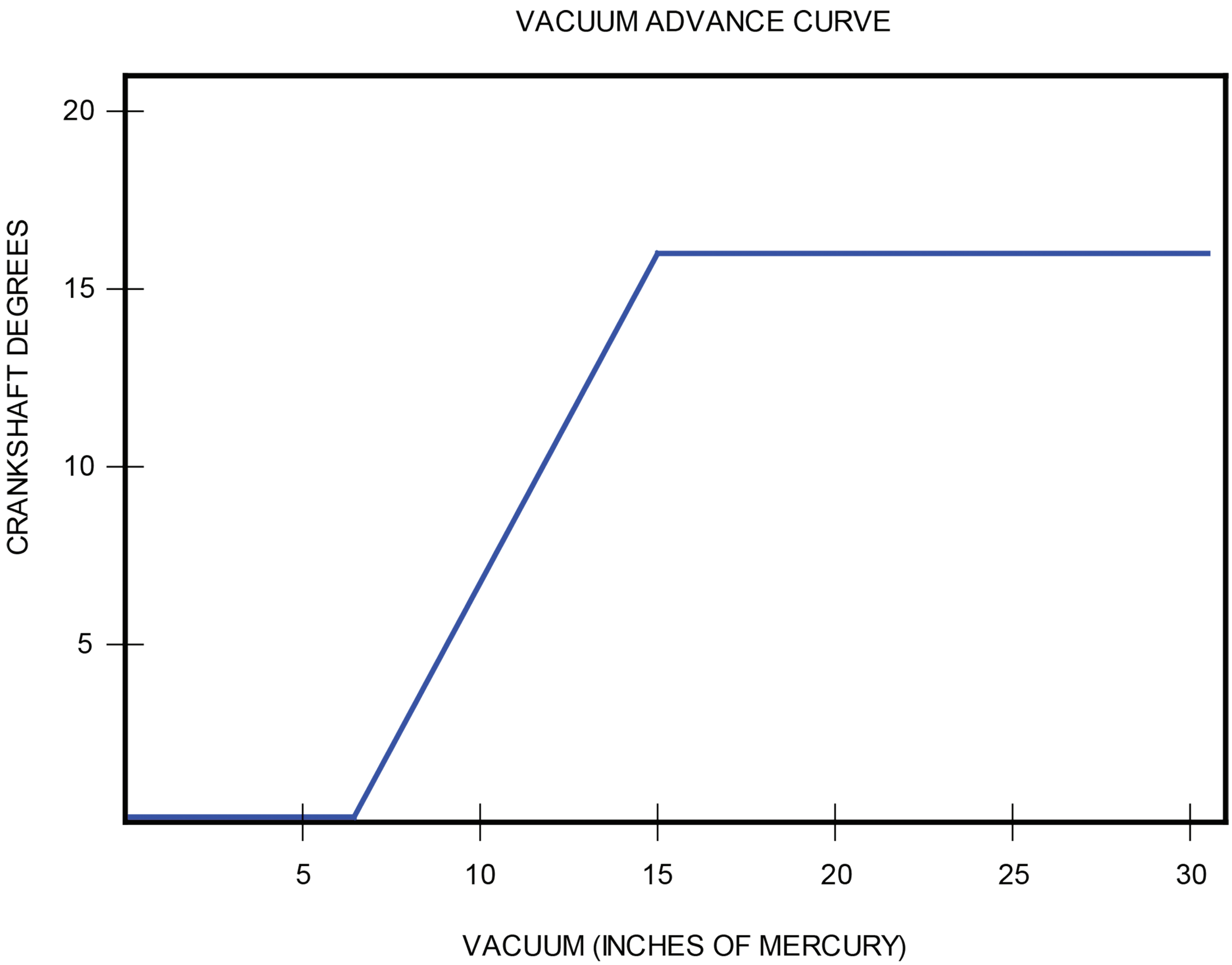

Fig. 7: Representative vacuum advance curve

Over the years Sun added various additional tests to their machines to evaluate the condition of the points and condenser. However, these are fairly minor tests and are not what the Sun machines are best known for.

So, how does the Sun machine measure the amount of advance? It does so with a strobe light that flashes on a degree wheel and the operator reads the result manually. This is pretty much the same process used during a routine engine tune-up when the initial advance is set using a timing light. The difference is that the Sun machine has a bigger degree wheel than the car's timing tab, and the Sun machine makes it easy and convenient to vary the distributor speed or the vacuum applied to the vacuum advance can.

The "Distributor Machine" You Already Have

It is worth pointing out that if your car runs, you already have a distributor machine. Your distributor machine is the car itself! By marking the harmonic damper with degree marks, such as using a pre-printed tape available from speed shops, you can use a conventional timing light to measure the instantaneous total advance at any engine speed. Better yet, using a dial-back timing light (discussed below) eliminates the need for the degree marks on the damper. By isolating the initial advance, mechanical advance, and vacuum advance as described above, you can measure all three of them using the engine itself.

This sounds very nice in principle, but the reality is less than ideal. Holding your head under the hood to use a timing light while simultaneously running the engine at various speeds up to 6000 RPM is pretty unpleasant. Having tried this, my conclusion is that this method should only be used as a quick diagnostic test to verify that the mechanical advance and vacuum advance appear to be working.

This method is not very suitable to fine-tuning the mechanical and vacuum advance, which might involve dozens of detailed sweeps of the RPM range. For any kind of extensive tuning of the mechanical and vacuum advance, it is far preferable to test the distributor off the car.

Designing an Inexpensive Distributor Machine

Based on the above description of using the car itself as a distributor test machine, it should become apparent what has to change to get the distributor off the engine while retaining the ability to use a timing light to measure advance. All that is needed are the following ingredients:

1. A method for spinning the distributor at controlled speeds from 250 RPM to 3000 RPM (equivalent to engine speeds of 500 RPM to 6000 RPM)
2. A method for generating a trigger signal for a conventional timing light
3. Some sort of rotating disc that replaces the harmonic damper as an item to watch with the timing light
4. Power supplies for the trigger signal circuit, motor speed control, and timing light

That's it. Just these four ingredients and you can test your distributor in relative comfort and quiet, rather than putting your head into a roaring engine compartment.

Sample Design for a Distributor Test Machine

There are many ways to implement the four ingredients listed above, so the method described here is just one solution. This one uses a dial-back timing light with integrated tachometer, which in my case I already owned. However, the design can be easily adapted to use a conventional timing light and separate tachometer.

To spin the distributor, I used a standard 12-volt automotive heater motor and built a fixture to couple the motor to the distributor.

To generate the trigger signal for the timing light, I set up the test fixture with a dedicated distributor cap, coil, and plug wires. All the plug wires were connected to a shorting block so that they were electrically terminated. The timing light needs a clean trigger signal, and this termination method achieves that. It is not necessary to terminate the plug wires with actual spark plugs.

For the rotating disc, I used a nine-inch degree wheel from Comp Cams. However, any reasonably balanced round disc with a precisely located center hole can be used. In fact, the degree markings on the Comp Cam wheel are not needed when using a dial-back timing light. Degree markings would be needed when using a conventional timing light, but caution is advised if using the markings on a standard degree wheel. Degree wheels are intended for measuring crankshaft degrees. When connected to a distributor that runs at half of the crankshaft speed, the markings on the degree wheel are one half of the actual advance.

I attached the degree wheel to a steel collar that has a set screw and an internal diameter that matches the smooth portion of the distributor gear. This allowed the degree wheel to be mounted directly to the distributor gear.

To power the arrangement, the simplest option is to use a 12V car battery. I cut the ends off an old heavy-duty extension cord and equipped one end with clamps to connect to a battery. The cord was long enough that I could put the distributor test fixture on my garage workbench and connect it to the battery in my Corvette about ten feet away.

To control the speed of the motor, I used a PWM (Pulse Width Modulation) motor speed controller purchased on eBay. This is the most common type of speed controller used for DC motors. A PWM controller simply turns the power on and off at a fixed rate (say, 10,000 times per second) and varies the percentage of the on/off period that the output is in the ON position. A slow speed setting might have the output turned on for only 10% of the on/off period, while a fast speed setting would have the output turned on for 90% of the on/off period. The operating principle is similar to a conventional dimmer for a light fixture.

Selecting a Motor

Most 12-volt heater motors have a maximum speed in the range of 3000 to 4000 RPM. Since a distributor speed of 3000 RPM corresponds to an engine speed of 6000 RPM, a 3000 RPM motor is adequate for the distributor machine application. Note that since virtually all mechanical advance curves are all-in below 5200 RPM, there is little need to spin a distributor faster than 2600 RPM.

The distributor machine needs a motor that turns clockwise when viewed from the shaft end. Some heater motors turn clockwise while others turn counterclockwise, so caution is advised when selecting a heater motor for the test fixture. Midyear Corvette heater motors turn clockwise, so that is one option. Ford and Chrysler heater motors typically turn clockwise, and some general-purpose heater motors are reversible.

An eBay search for "12-volt blower motor" turns up hundreds of brand new heater motors at prices ranging from $3 to $80. Many of the low-cost options are brand name motors that for some reason are being sold at low prices. I was able to buy several candidate motors for less than $15 each.

It is my impression that motors used in A/C applications may be more powerful than motors used for just a heater, but I have not been able to confirm this. It is also my impression that motors that are physically larger, in terms of diameter and length, are likely to be more powerful. I focused on motors that are at least 3 inches in diameter and 4 inches long.

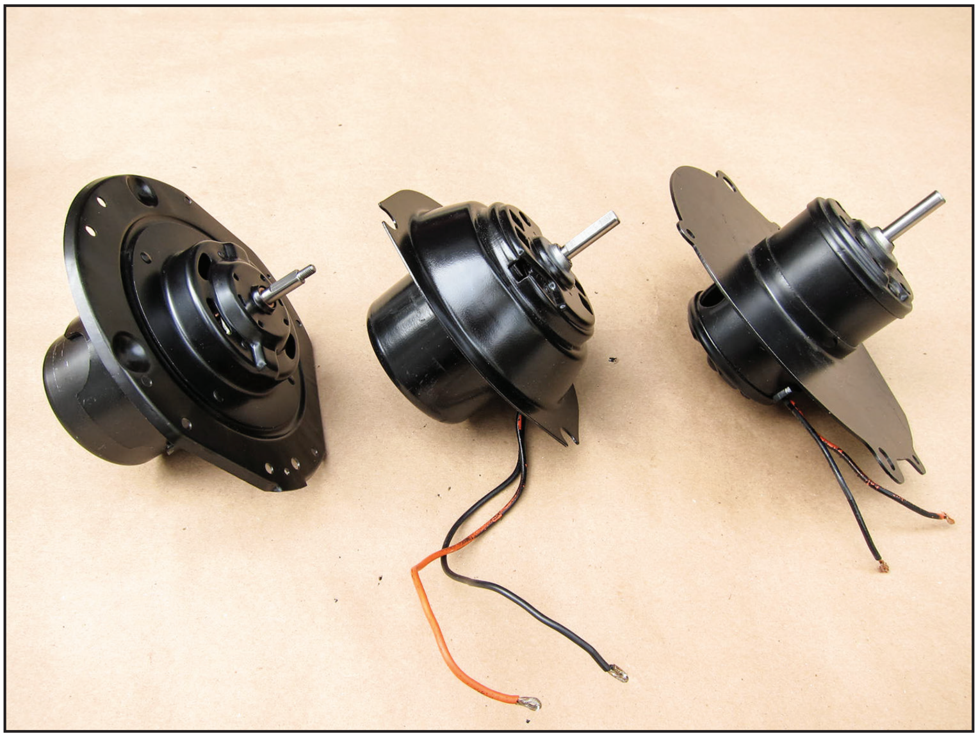

Fig. 8: Examples of suitable Siemens/VDO motors (PM102, PM241, PM3328X, left to right)

Unfortunately, I have not been able to find good vendor information that includes the power outputs and speeds of various motors, so at this time I can not suggest a best motor to use. However, in my tests of new and used blower motors, all of them appeared to be adequate for this application. Figure 8 shows three such motors.

Using a Dial-Back Timing Light

A conventional timing light flashes a strobe light at the exact moment it senses current in the spark plug wire. If the timing light is connected to the plug wire for cylinder number one and the engine has zero degrees of total advance, the timing mark on the harmonic damper will line up exactly with the zero-degree mark on the timing cover. If the engine has eight degrees of total advance, the timing mark on the harmonic damper will line up with the eight-degree advance mark on the timing tab.

With a conventional timing light, care must be taken to correctly count the number of marks on the timing tab that represent the amount of advance and to make sure that the number of degrees per mark is known (typically two degrees per mark). In addition, the maximum advance that can be measured is limited by the size of the timing tab unless steps are taken to put degree markings on the damper.

A dial-back timing light uses electronics to overcome these limitations of the standard timing light. The dial-back timing light contains a dial (or button) that delays the firing of the strobe light by an adjustable number of crankshaft degrees. The user adjusts the dial until the mark on the damper lines up with the zero-degree mark on the timing tab. Once the dial is adjusted to make these marks line up, the amount of advance is read from the dial or from a display on the timing light.

In other words, when using a dial-back timing light to measure advance, the goal is always to line up the mark on the damper with the zero degree mark on the timing tab, so that it **appears** that the engine has zero advance. The actual advance is read from the dial or from a display on the timing light. Some dial-back timing lights also contain a tachometer function, which eliminates the need for a separate tachometer.

For simplicity, the distributor machine described here uses a dial-back timing light with built-in tachometer. It is also possible to use a conventional timing light, but this requires using a separate tachometer and also requires placing calibrated degree markings on the machine's rotating disc. When using a dial-back timing light, no degree markings are needed. A single mark on the rotating disc is all that is necessary.

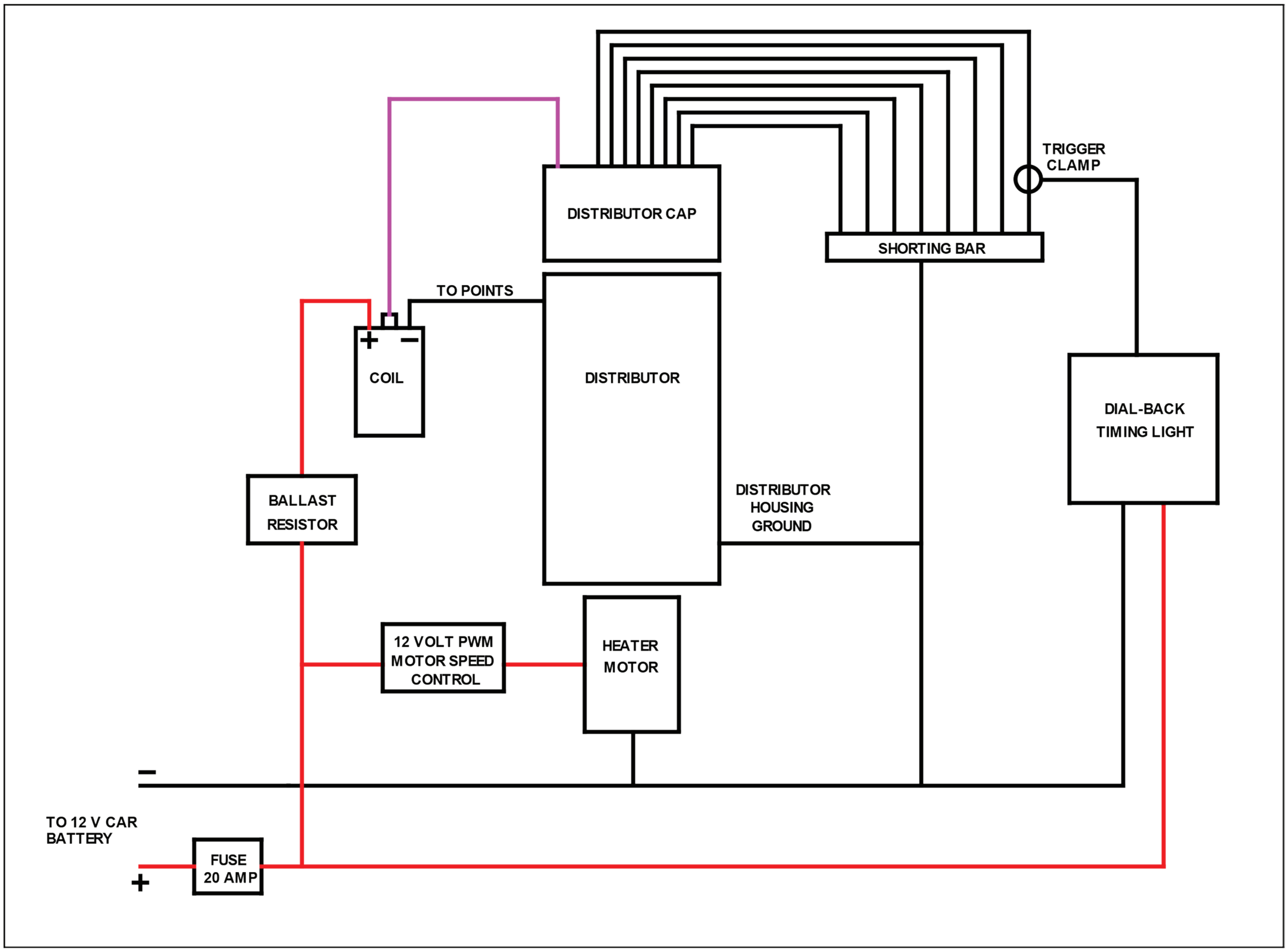

Fig. 9: Schematic of distributor test fixture

Construction Details

Few aspects of the design of the low-cost distributor machine are critical, and a suitable machine can be built by simple inspection of the photos. However, following are some helpful hints:

1. Figure 9 shows the electrical schematic for the test fixture. If your coil was intended to be used with a ballast resistor or a resistor wire, this resistance should be included in the power connection to the coil. My understanding is that except for the transistorized ignition system, all Corvette coils from 1955 to 1974 were designed to have some resistance in the 12V supply lead to the coil. Without this resistance, the voltage applied to the coil will be too high and both the coil and the points will be stressed while the fixture is running. I do not know the typical resistance of the resistor wire that GM substituted for the ballast resistor starting in 1968, but for coils designed to work with a resistance wire, it's probably adequate to simply use the 1.8 ohm ballast resistor that GM used in midyear Corvettes with standard ignition (GM number 1957154, NAPA number ECH ICR13).

2. For proper operation of the ignition circuit (which in turn triggers the timing light), the distributor housing and the ignition wire shorting block need to be reliably connected to the negative side of the 12-volt supply. There are lots of ways to accomplish this, but I chose to use a metal top plate as shown in the photos. This requires making a 1.25-inch hole in the top plate. I made the hole with a Greenlee chassis punch that makes a nice clean hole in sheet metal up to 1/8-inch thick. If you don't have a suitable Greenlee punch, other methods for making the 1.25-inch hole can be considered, such as a combination of drilling and grinding.

3. When attaching the steel collar to the rotating disc, it is important to get it centered on the disc and securely attached. I scraped paint off the disc where

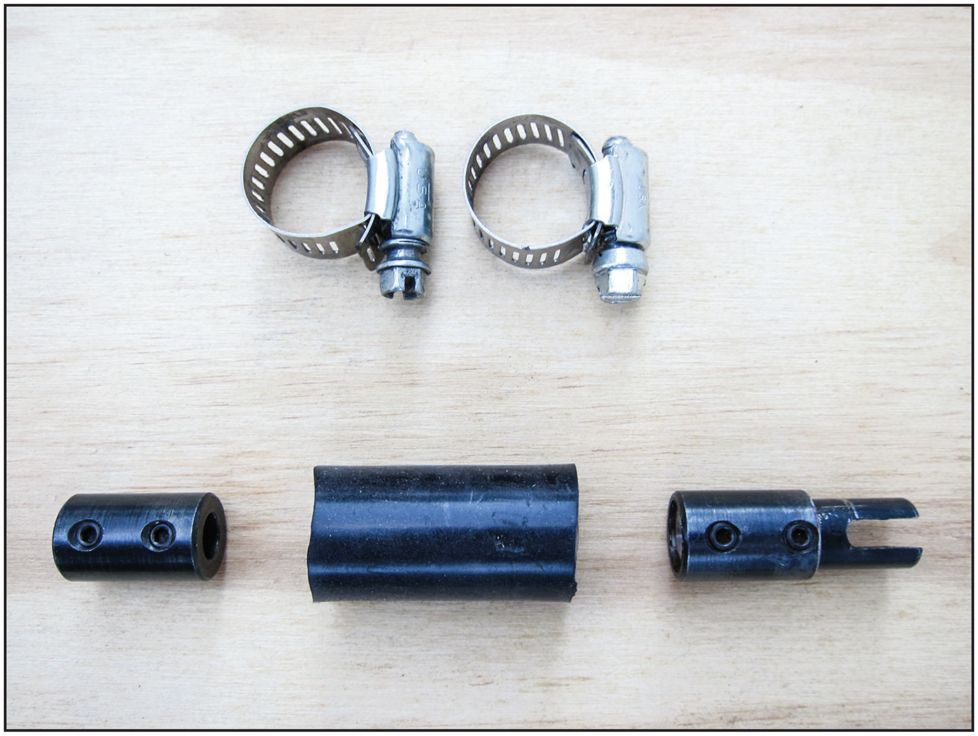

Fig. 10: Components of flexible coupler

the collar would attach and set the collar in place with some JB Weld glue. Before the glue hardened, I visually aligned the collar with the center hole in the disc. After the glue set up, I drilled and tapped holes for a pair of screws to mechanically attach the disc to the collar. Doing it in this order held the collar firmly in place while the holes were drilled for the screws.

4. To make up for minor misalignment between the motor and distributor, a flexible coupling made from 5/8-inch hose is extremely helpful. I found that common heater hose was too stiff, but a soft silicone hose worked very well. Figure 10 shows the components of the flexible coupler. The motor end is simply a standard shaft coupler that matches the 5/16-inch diameter of the motor shaft and also matches the 5/8-inch inside diameter of the silicone

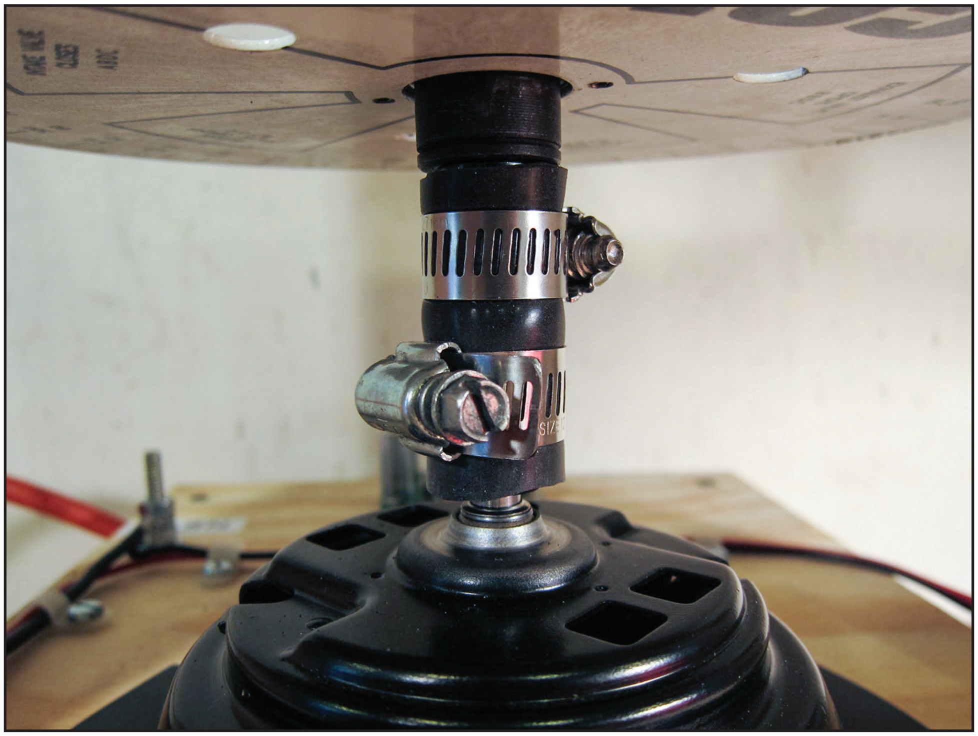

Fig. 11: Flexible coupler installed

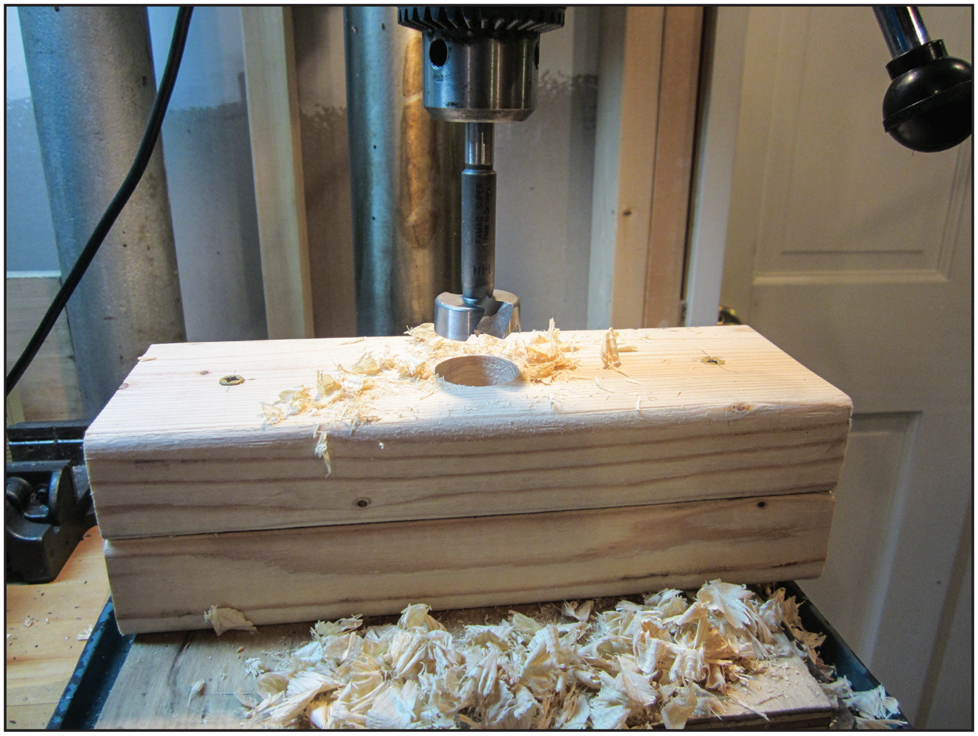

Fig. 12: Drilling both distributor holes with a Forstner bit

hose. The distributor end of the coupler is made by cutting off one end of an oil pump intermediate shaft that normally fits inside the bottom of the distributor. A second shaft coupler is used to obtain the correct 5/8-inch inside diameter for the silicon hose. In this case, the hole in the shaft coupler has to be enlarged to match the diameter of the oil pump intermediate shaft. Figure 11 shows the coupler installed in the fixture between the motor and distributor.

The coupler remains installed in the fixture at all times. The point of engagement with the distributor is the slotted shaft on the end of the coupler, which is exactly the way that the distributor engages the oil pump intermediate shaft when the distributor is installed in the engine (recall that this portion of the coupler was made by cutting off the end of an intermediate shaft).

5. Perhaps the only critical aspect of the design is to get good alignment between the distributor and the motor. If the alignment is good, the motor and distributor will spin very smoothly with remarkably little noise or vibration. If the alignment is poor, there will be increased noise and vibration. One helpful step for good alignment is to drill both holes for the distributor with the same drilling operation, as shown in Figure 12. The two pieces of wood are temporarily screwed together and trimmed on a table saw to make them exactly the same length. Then, a Forstner bit is used to drill a clean 1.25" hole through both pieces at once. Another helpful step is to finalize the alignment of the motor to the distributor by carefully running the fixture before the motor is screwed down. Hold the motor down by hand and move it laterally to obtain the smoothest operation, then mark the position with a pencil. Use screws to permanently attach the motor in that position.

Making Measurements with the Distributor Machine

Try not to leave the coil powered for long periods when the distributor is not turning. This is equivalent to leaving the ignition switch on while the engine is not running. If the points happen to be closed at the position at which the distributor stopped, the coil may overheat.

Establishing a Zero-Advance Reference Point

Before any measurements of advance can be made, a zero-advance reference point must be established with the timing light. Interestingly, this reference point can be at any position on the rotating disc because all we are measuring is the relative change from the zero point. Furthermore, any of the eight plug wires can be used as the trigger wire, since all we are interested in is the relative change from the zero point.

The recommended procedure is to use a single mark on the rotating disc and a moveable pointer constructed from a piece of bent wire. The sequence for establishing the zero-reference point is as follows:

1. To avoid activating the vacuum advance, disconnect the vacuum advance can from any source of vacuum.

2. To avoid activating the mechanical advance, run the distributor at about 500 RPM as indicated by the tachometer. This is actually just 250 RPM for the distributor itself, but for this discussion we will use the corresponding engine RPM as indicated by the tachometer.

3. Set the timing light for zero dial-back advance and connect the trigger to an arbitrary plug wire. Chances are the mark on the rotating disc will not be anywhere close to the bent-wire indicator. Move the timing light trigger to successive plug wires until the mark on the rotating disc is close to the wire indicator.

4. To fine tune the alignment, either bend the wire or rotate the distributor housing until the wire indicator lines up exactly with the mark on the rotating disc; then make sure the distributor is adequately clamped down so that it can not rotate by accident.

The distributor test arrangement is now set at the zero-advance point, and you are ready to make precision measurements of the effects of either the mechanical advance or the vacuum advance.

Measuring Mechanical Advance

1. Confirm that there is no vacuum applied to the vacuum-advance can. The vacuum advance must always be disabled when measuring mechanical advance.

2. Confirm that the mark on the rotating disc is lined up with the wire indicator at a tachometer speed of 500 RPM and that the marks remain aligned at speeds below 500 RPM. The goal is to confirm that the mechanical advance is not active at these low speeds. If it is active at these low speeds, something is wrong with the mechanical advance.

3. A quick sweep of increased tachometer speeds should show the line on the rotating disc moving away from the wire indicator as the mechanical advance begins to operate.

4. To measure the advance curve of the mechanical advance, you will measure the amount of mechanical advance at several RPM levels over the full range of engine speeds. For example, you may decide to measure the advance at every engine speed from 500 RPM to 6000 RPM in increments of 200 RPM. Each of these data points will be acquired with the following steps:

   - Adjust the motor speed control to obtain the desired tachometer RPM
   - Adjust the dial-back timing light to make the mark on the rotating disc align with the wire indicator
   - Read the measured advance from the timing light

Referring again to the representative mechanical advance in Figure 6, we see that this curve shows the advance beginning at 750 RPM and maxing out at 25 degrees at 4500 RPM. If you are testing a stock distributor, compare your measurements to the specifications in the car's shop manual.

If you are planning to recurve the distributor to a non-factory curve, your measured results are the starting point for that process. Changing the springs and/or the weights in the mechanical advance will affect the shape of this curve. Changing the bushing on the limiting pin in the mechanical advance will alter the maximum amount of mechanical advance.

A discussion of how to optimize the mechanical advance curve for a particular engine is beyond the scope of this article, but in general, most hotrodders want to see the mechanical advance "all-in" (at its maximum value) by around 3000 RPM. Some builders also claim that reducing the amount of mechanical advance is advantageous for today's fuels. They use less mechanical advance combined with more initial advance to end up with a similar amount of total advance (in this case, total advance refers to the sum of the initial advance plus the maximum added mechanical advance). The nice thing about having a distributor machine is that you can easily measure and tune your mechanical advance to match a desired advance curve.

Measuring Vacuum Advance

1. Confirm that the mark on the rotating disc is lined up with the wire indicator at a tachometer speed of 500 RPM and that the marks remain aligned at speeds below 500 RPM. The goal is to confirm that the mechanical advance is not active. Measurements of vacuum advance are made at 500 RPM to ensure that the mechanical advance does not affect the measurements. Note that vacuum advance can actually be measured at any RPM, provided that the distributor speed is held constant so that the mechanical advance does not change. However, keeping the distributor at 500 RPM eliminates measurement errors caused by slight variations in RPM.

2. Use a Mityvac hand-operated vacuum pump or other controlled vacuum source to apply increasing amounts of vacuum, up to 20 inches of mercury, to the vacuum advance can. This should cause the line on the rotating disc to move away from the wire indicator as the vacuum advance begins to operate and then level off at high applied vacuum.

3. For any given level of applied vacuum for which you want to know the amount of advance created, adjust the dial-back timing light to make the line on the rotating disc align with the wire indicator and then read the measured amount of advance from the timing light.

4. Vacuum advance cans are usually specified at only two or three levels of vacuum. At a minimum, there should be a specification on the vacuum level at which the vacuum advance starts to operate, the vacuum level at which the vacuum advance maxes out, and the number of degrees of advance at that maximum. Sometimes additional data points are specified.

Referring again to the representative vacuum advance curve shown in Figure 7, we see that this particular curve creates no advance for vacuum levels below 6 inches of mercury and is all-in with 16 degrees advance at 15 inches of mercury. Optimizing the vacuum advance for a particular engine is beyond the scope of this article, but at least one common problem can be noted. As originally designed, the vacuum advance for a given engine is intended to be all-in at normal idle speeds. So, if the idle vacuum is 20 inches, the vacuum can may have been designed by the manufacturer to be all-in at 17 inches. If an owner subsequently changes the camshaft to a more aggressive grind that generates only 12 inches of idle vacuum, the vacuum-advance system will not be all-in at idle. The engine will run rougher and hotter, and the idle speed will be less stable because the amount of vacuum advance varies in response to minor fluctuations in engine vacuum. The solution is to substitute a vacuum can that is all-in at a vacuum level at least two inches below the level of the normal idle vacuum.

Cost to Build the Distributor Test Machine

To build the distributor test machine described here, the actual cost will depend on how many of the components you already have on hand. In my case, I already owned a dial-back timing light and a Mityvac vacuum pump. I also had on hand a spare distributor cap, plug wires, ballast resistor, coil, and some basic building materials and fasteners. So in my case, these were all no-cost items.

The major components I had to purchase were the heater motor, speed controller, degree wheel, and various hardware items to mount the degree wheel and construct the flexible coupling.

Table 1 provides information on sourcing the key components that you might need to purchase. If you need to buy the timing light and Mityvac your total cost will exceed $100, but if you already have these in your tool collection (as I did), the cost will be much lower. In my case, the total expenditure was about $50. If you do need to purchase the timing light and Mityvac, keep in mind that these are general-purpose automotive tools that have other uses and are good to have in your tool collection.

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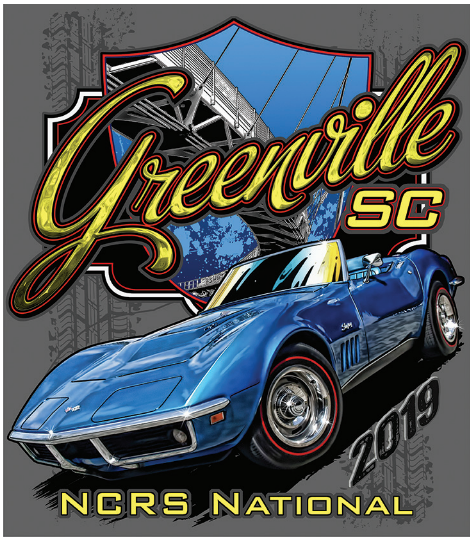

Description	Source	Cost ($)
Heater motor, Siemens/VDO part PM241	ebay	15
PWM motor speed controller, 12V, 20A, 13 KHz	ebay	12
Degree wheel, 9 inch, Comp Cams 4790	Summit Racing, part CCA-4790	16
Shaft collar, 7/8” ID, to attach to degree wheel	McMaster-Carr, part 6432K23	2
Shaft couplers (2), 5/16” ID, 5/8” OD	McMaster-Carr, part 6412K12	14
Very flexible silicone hose, 5/8” ID	McMaster-Carr, part 5236K49	7
Oil pump intermediate shaft	NAPA, Sealed Power 224-6146	7
Coil Bracket, Pertronix 10001	Summit Racing, part PNX-10001	8
Dial-back timing light, Actron CP7529	Amazon	80
Hand-operated vacuum pump, Mityvac MV8000	Amazon	29

Table 1: Parts information

Summary

The inexpensive distributor test machine described here can be used on any 1955 to 1974 Chevy V8 distributor. Early HEI distributors that still used mechanical advance can also be tested with some minor modifications to the test fixture since HEI distributors have no external coil or ballast resistor.

The operating principle of the test fixture is very simple. You substitute this fixture for a running engine, which allows you to use the dial-back timing light and vacuum pump exactly the way you would use them with the distributor installed on a running engine. The fixture is very quiet and smooth in operation, making it much more comfortable (and safe) than holding your head in the engine compartment with the engine roaring at speeds up to 6000 RPM.

I have used my test fixture for literally hundreds of test runs as I optimized the mechanical and vacuum advance for my modified 1967 Corvette distributor. With the direct digital readouts of RPM and advance on the dial-back timing light, I think this fixture is even easier to use and more accurate than a vintage Sun machine.

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