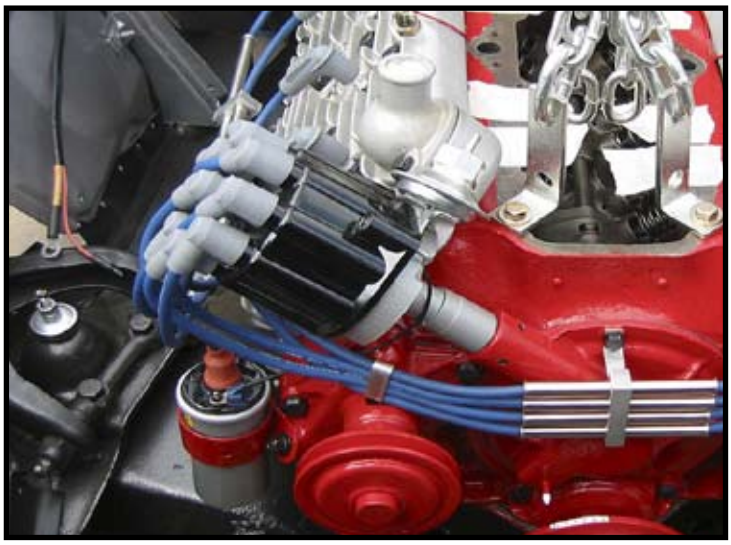
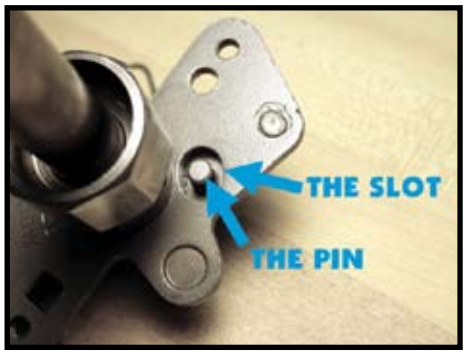
Adjusting Your GM Flathead Distributor



This paper deals only with the **mechanical advance** in an 8BA Ford flathead. If you also have vacuum advance, disconnect it and plug the rubber hose attached to the intake manifold while making these adjustments. We'll come back to it later.

How It Works. Centrifugal force acting on weights changes the rotor's position in relation to the shaft. This makes the coil fire earlier.

The travel of the pin in the slot controls the advance. The longer the travel, the greater the range of the advance. Bushings of different diameters placed on the pin limit its travel and thereby adjust the range of advance.





A Few Important Concepts and Terms

Advance Range – This is the number of degrees of advance the system can provide. It has to do with the distributor only, not the engine. The distributor has this range whether it's in the engine or on the bench.

This range is determined by the diameter of the bushing on the pin and the length of the slot. The smaller the bushing or the longer the slot, the greater the amount of change and thus the greater the advance range.

Slots have different lengths depending upon the distributor's original engine. Since the range of degrees the rotor can be repositioned by the advance mechanism is partly dictated by the length of the slot, there's no such thing as a 20° or a 24° bushing. The same bushing produces different ranges in different slots.

Maximum Timing – This is the *most* advance the engine can ever see when the mechanical advance system is wide open. It's what you set when you rotate the distributor in the engine with the mechanical advance mechanism at full advance. Since the shaft in a flathead distributor turns clockwise as you look down at it, rotating the distributor counterclockwise advances the timing; rotating it clockwise retards the timing.

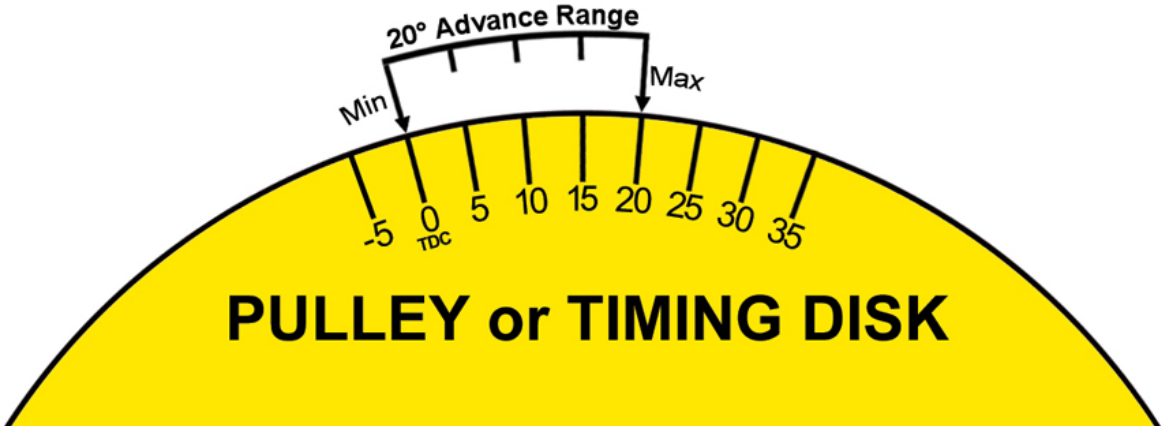
Don't confuse **advance range** and **maximum timing**. The first is an amount of increase and decrease in response to RPM changes, while the second is an unchanging finite timing limit you set.

The optimum combination of advance range and maximum advance will give you the performance you want at wide open throttle as well as at idle.

Advance Range vs Maximum Timing

The most important setting you'll make is maximum timing. Why? Because if it's not set right, your engine could self destruct!

This graphic illustrates the relationship between the advance range in degrees and the maximum timing in degrees BTDC – before top dead center .



The small arc at the top represents the advance range, from no degrees to the greatest number of degrees the distributor's slot and bushing can provide. The yellow disk represents the engine's crankshaft pulley or timing disk showing the crankshaft degrees as they might appear.

For any chosen distributor position, the arrow at the left side of the advance range arc points to the **smallest** amount of advance your engine will see, as at idle, and the arrow at the right points to the **greatest** amount of advance your engine will see as when the advance mechanism is maxed out at high RPM.

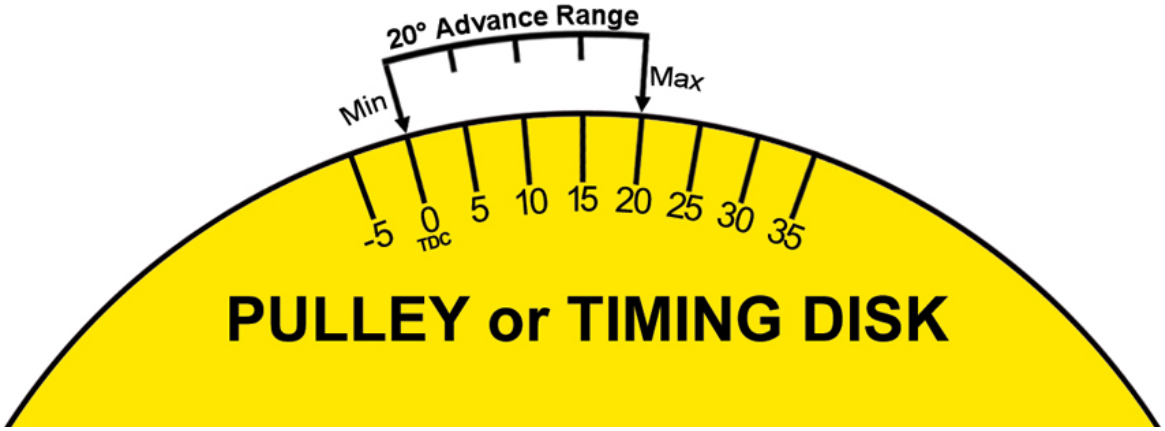
When you set the maximum timing, which is the greatest amount your engine will see, you're also setting the smallest amount your engine will see. This range is dictated by the bushing you select. This is important to understand.

To minimize confusion we'll use 20° BTDC as our maximum timing throughout this paper. Note that "20° BTDC" refers to a particular engine timing setting while just "20°" refers to a range of available variable advance.

Rotating the distributor one way or the other in the engine is like sliding the advance range arc around the yellow pulley disk, simultaneously changing both the smallest and the greatest amounts of advance your engine will see.

Let's Look at Some Variations and See What Happens

Here again is the graphic from the previous page.

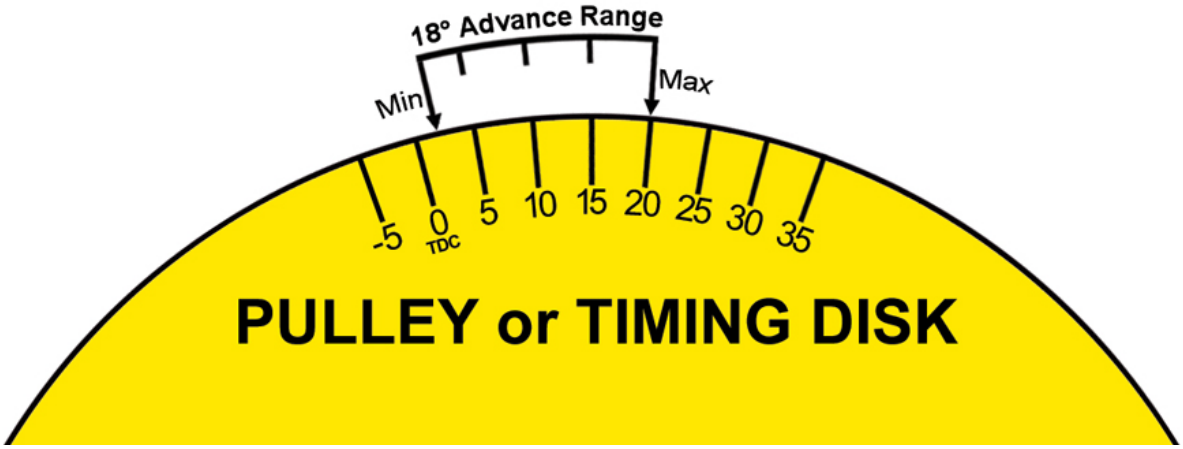


This setup has an advance range of 20°, a maximum timing of 20° BTDC, and a resulting idle advance of 0° BTDC. This engine would idle at 0° BTDC and reach a maximum of 20° BTDC at high RPM.

NOTE: Even at idle RPM, most springs that would work well in a flathead conversion will produce at least a few degrees of advance. This amount is called Initial Advance and we'll talk about it later. Our graphic is ignoring it for clarity sake.

But let's say you want an advance range of 18° instead of 20°, but you still want to keep the maximum timing at 20° BTDC. To achieve this you first replace the bushing that produces 20° of advance with one that produces 18°.

Now you readjust the distributor to once again set the maximum timing at 20° BTDC. Now the setup looks like this:



The maximum timing will be 20° BTDC while the minimum amount of advance your engine will see, as at idle, will be raised to 2° BTDC. This would be a little healthier idle.

No two flatheads are alike, so the numbers and settings presented here only to help understand the various terms and their relationships. Only by experimenting can you determine the best setup for your engine.

Other Measurements

There are two more types of advance that can be useful to measure, especially if you're trying to prepare a special curve for your engine. They're **Static Advance** and **Initial Advance**. Some consider them the same thing, but they are not.

Static Advance – Static advance is set with the engine NOT running, thus the name static. This is handy for rough-tuning points distributors in stock engines when you don't have a timing light. Your crank pulley must have degree markings on it or a mark for factory static advance or at least TDC.

Initial Advance – This is those few degrees produced by the weights and springs when the engine is at idle RPM. Without vacuum advance, this merits some consideration. Idling at too low an initial advance can lead to overheating and poor idle fuel economy.

About the Weights and Springs

Mechanical advance is also called centrifugal advance because it uses centrifugal force to advance the timing. As the distributor shaft spins, centrifugal force tries to pull the weights out away from their starting positions. The farther out the weights

are pulled, the more the rotor is advanced in relation to the shaft, and thus the more the timing is advanced.

Without the springs, the weights would fly all the way out which would advance the timing to maximum even at idle RPM. The springs work to hold the weights in at their starting positions, countering the centrifugal force pulling on them. The more RPM, the more centrifugal force, the more the holding power of the springs is overcome, and the more the timing is advanced. The amount of spring tension dictates how much the timing is advanced at any given RPM. It's a balancing act.

The Basic Tuning Procedure

This part assumes your distributor has in it the bushing, springs, and weights you want. You also must have a **degree strip** attached to your crank pulley.

For this you'll need a timing light. Buy a good one. It doesn't have to be fancy.

Setting the Maximum Timing – As an example we'll use an advance range of 20° and set the maximum timing at 20° BTDC.

With the ignition OFF, rotate the crankshaft until #1 piston is near the top of a compression stroke. Line up the pointer with the TDC mark on the crank pulley.

If your distributor isn't installed, first decide which spark plug wire post on the cap you want to connect to the #1 plug. On the outside of the distributor housing just below that post put a little piece of masking tape. Now remove the cap.

Slide the distributor into the timing cover tube with the rotor pointing at your masking tape marker. If you have a vacuum advance canister on your distributor, make sure it's situated so you have room to rotate the distributor back and forth.



Make sure your plug wires are attached so they follow the correct flathead firing order. Any post can be #1.

Don't connect the thin distributor wire to the coil yet. Instead, connect one lead of a test light and the other lead to battery voltage. You don't really need a auto store test light. Just a 6- or 12-volt bulb will do just fine.

If the light is on, the points are closed. If not, rotate the distributor clockwise until the light comes on, then several degrees more. Now very slowly rotate the distributor

counterclockwise until the light *just* goes out. This means the points have just opened which is when the #1 spark plug fires. This is your starting place. Snug up the hold-down bolt just a bit.

Put back the cap, reconnect the wire, and start the engine. Let it warm up at idle; three or four minutes is enough. Now shut it down again.

Temporarily remove the springs from the mechanical advance mechanism but leave the weights and rotor. This will allow the mechanical advance to go to maximum at idle; no need to rev your the engine while setting the timing.

Using your timing light, rotate the distributor and align the 20° mark on the crank pulley degree strip with the engine's TDC pointer. That sets your maximum timing where it should be. Stop the engine and put back the springs.

If you want to verify the minimum advance which should be 0°, tape the weights so they can't swing out. You can leave the springs in place.

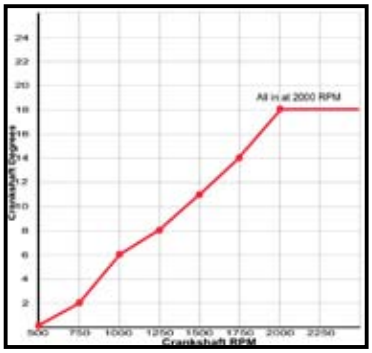


Run the engine at idle and read the advance. Don't forget to untape the weights.

Idle RPM and Initial Advance – Using a tach or your ears, set the idle RPM where you want it. Shine your timing light again. You should see the 0° minimum **plus** whatever additional advance your weights and springs are producing, typically about 5° total.

If these settings are OK with you, stop the engine, tighten the distributor hold-down, and take your best friend for a ride!

Advance Curves – An advance curve is a line drawn through several points on an X/Y graph that relates RPM to degrees of advance. This line often ends up being curved, thus the name. When someone says he's "setting his advance curve" he's talking about finding the best combination of advance range and maximum timing by trying different bushings, weights, and springs.



No two flatheads are alike; there's no one-size-fits-all curve. Lots of different weights and springs and advance-limiting bushings are available from several sources. The possible combinations are many. Feel free to experiment.

Adding Vacuum Advance

It's important to understand that a curve that's good for an engine without vacuum advance may not be suitable for an engine with vacuum advance.

Lots of flathead hot rodders run without vacuum advance. It's not essential, but the advantages of vacuum advance are cooler running at idle, smoother running at cruise, and better fuel economy. However, every flathead is unique so the benefits of vacuum advance may be more noticeable in one than in another. It's up to you.

Our testing has shown that an *adjustable* vacuum canister set to add 8°of advance when activated by *manifold vacuum* is pretty much ideal. As the vacuum increases, it progressively activates the vacuum canister up to its 8° limit. As the manifold vacuum decreases, the advance added by the canister drops back down to none.

High manifold vacuum occurs at idle and at easy cruise. It drops out under heavy acceleration and wide-open throttle to protect the engine from damaging pinging.

Let's Take a Ride With and Without Vacuum Advance

Here's how your engine is set up:
Advance Range of 20°
Maximum Timing set for 20° BTDC; minimum timing is 0°

No vacuum canister advance:
Initial advance from springs & weights = 5° --- not great
Maximum timing at wide-open throttle = 20°--- ideal
Advance at cruise = 20° --- not great
Fuel economy at cruise --- not great

Same ride but this time with 8° of vacuum advance:
Initial advance from springs & weights = 13° --- better (5+8)
Maximum timing at wide-open throttle = 20° --- ideal
Advance at cruise = 28° --- optimum (20+8)
Fuel economy at cruise --- better

Now you're cruising along with 28° of combined advance, getting improved fuel economy and better overall performance. Your engine is happy. The instant you punch the throttle to blow off that pesky Corvette, the vacuum drops out and you're back at 20° at WOT, melting asphalt. It's pretty much the best of both worlds.

If you hear pinging while accelerating moderately at cruise, you may have too much vacuum advance. If you hear pinging at wide open throttle, you may have too much maximum timing.

You may have to back off either the amount of vacuum advance or the maximum timing. Higher-octane gas might help, as well. There are several possible causes of pinging besides ignition timing.

Detritus

All of the numbers used in this paper are based upon actual road testing. My own mildly ferocious 276 has been running with the vacuum example above for a couple of years now and the setup seems ideal for my engine/car combination. You'll have to spend some time testing to find your own ideal combination.

The flathead is NOT a plug-and-play engine! Each new component you add must be adapted, tweaked, and massaged to get greatest performance from it.

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