

There's a chilling time in the world of engine rebuilding, a time when all the money in parts and machine work are on the line, the macho ego is at risk, and a question - Did I do it right? - lurks in the mind of the builder. That chilling time is when the key is turned, the starter labors, and the engine roars to life. You pray you won't hear sounds like ball bearings rattling in a coffee can, or see fluids pouring out of a corner of the engine that backs to the firewall.

I can't take responsibility for an incorrectly assembled motor, but I can give you several tips for firing and engine for the first time. Whether you're a seasoned expert or a first-time rebuilder, here are some tips that can make the first cranking of the engine a success.

**Tip 1.** Timing is critical to ensuring the spark will be properly timed at the first start-up. Before turning a cam, make sure that when the harmonic balancer indicates top dead center, it's an accurate registering of the No. 1 cylinder position. If the degrees on the balancer aren't in sync with the piston's position in the cylinder, the timing will be off, and ignition timing becomes a guessing game. Once TDC is correct, turn the engine two more revolutions, stopping at 12 degrees BTDC on the last one instead of going all the way back to zero. This will set the static timing and make the distributor easier to install.

**Tip 2.** Check that the valves are properly set. There are numerous ways to lash valves in an engine. I prefer the firing order method because it works with any camshaft type. The firing order method allows you to lash the valves on an engine stand or with the engine in the vehicle and not have to readjust them again. To adjust, follow the steps below:

### **SBC firing order: 1-8-4-3-6-5-7-2**

#### **STEP #1**

##### Find top dead center for piston #1:

Many people think that if the timing pointer lines up with the TDC balancer mark that this is TDC on the compression stroke for #1. That mark could be TDC #6. This is because there are 720 degrees crankshaft rotation in one complete firing sequence. There are two ways to find TDC #1 first is by pulling the #1 spark plug, holding your finger over the hole and turning the crankshaft until it tries to blow your finger away, then once the timing mark comes up this will be TDC #1. The other method requires the valve cover or intake to be off. You can look at the lifters or rockers of #1 and #6 cylinders. When #1 is at TDC, #6 will have both valves open slightly. If you move the balancer timing mark to each side of the timing pointer, you should see both lifters or rockers of #6 moving up and down and #1 should remain stationary. If it is vice versa then you are on TDC #6 and need to move the crankshaft 360 degrees or one full turn.

#### **STEP #2**

##### Adjust the the lash of #1 cylinder:

While you turn the nut down jiggle the pushrod up and down. When the play just stops go 1/2 turn more. You need to make sure to stop when the pushrod just quits moving up and down, then 1/2 turn more on both the exhaust and intake valves. When the pushrod up and down movement just quits, there should be a slight resistance when you try and spin the rod.

#### **STEP #3**

##### Turn the crankshaft clockwise 90 degrees:

The easiest way to tell if you have went 90 degrees is with a balancer with timing marks. You can make your own marks if the balancer is off the engine. Just use a cloth tape measure and measure the circumference of the balancer

(i.e. around the outside) and divide it by 4. Then you can lay it off and file some marks at the distance you came up with. You can also buy some timing tape and install it but the only thing is it won't stay on for very long. A total waste of money to me. Anyway, turn the crankshaft 90 degrees to the next mark on the balancer for the cylinder in the firing order, #8. Repeat Step #2.

#### **STEP #4**

##### Continue adjusting:

Keep turning the crank in 90 degree increments and lashing the valves for each cylinder until all cylinders have been adjusted. When finished with the last cylinder, you should have to turn the crank one more 90 degree turn and you will be back on #1 TDC. But instead of going all the way back to zero, stop at 12 degrees BTDC as outlined in **Tip 1** above.

**Tip 3.** Pressure-lube the engine with a drill motor and a priming tool. I highly recommend not skipping this tip. The distributor drives the oil pump, so a handy trick is to use an old distributor housing and shaft with the cam gear removed. Hook up an oil pressure gauge and spin the pump clockwise; when the motor has pressure and oil appears on the rocker arms, you're done. Using an old distributor body for this not only supports the oil pump shaft but also channels oil to the lifter galleys. Without the distributor body in place, no oil will reach the lifters or pushrods. They make priming tools that have a piece on them that is the same shape as the distributor, but they are fairly expensive. You can probably buy an old distributor at a junk yard for 5 or 10 bucks. Either way, after all the valves are adjusted, install the intake manifold.

**Tip 4.** Since the No. 1 piston is already at 12 degrees, as outlined in **Tip 1** above, mark the distributor housing at the No. 1 tower. Remove the cap and line up the rotor with your mark. The engine timing should be exact when you use this method, which will eliminate excessive cranking with no oil pressure. Low-pressure cranking will wipe the lube off the cam and starve other oil-dependent parts.

**Tip 5.** The next step is to get the carb ready to go. Use a small funnel to fill the float bowls on the carb. If the pump is electric, switch it on until the carb bowls are full. When the accelerator pump squirts fuel into the venturis, the carb is primed. Next, be sure the idle mixture screws are adjusted-1-1/2 to 2 turns out is a good rule of thumb. Make sure the throttle linkage doesn't bind and the throttle springs are in place and working. Plug all the vacuum ports on the carb and the intake manifold and disconnect the vacuum advance.

**Tip 6.** Check to see if there are 12 volts at the distributor with the key in the Start-and-Run position and make sure the battery is charged. Before starting the new engine check obvious stuff like the fuel lines, oil level, and firing order and give the manifold and carb bolts the once-over.

**Tip 7.** Using only water during the break-in is a good idea for a couple of reasons. If a hose blows or something springs a leak, water is easy to clean up. I prefer to use distilled water instead of tap water. Distilled water has all the minerals removed so you won't end up with a clogged engine later on down the road. Remove a manifold plug to burp out the air. Add water to the system until water flows freely from the hole. Keep an eye on the temp gauge after you start the engine for the first time. Hook up a tach and timing light before starting the engine.

**Tip 8.** If everything is right, the engine will fire within a few revolutions. Vary the break-in rpm between 2,000 and 2,500 for the first 15-20 minutes. Do not let the engine idle until the cam is broken in. Above idle-engine speeds, splash oil on the new cam. This is important because the cam is lubricated only by splashed oil, so it requires initial high speed to ensure it breaks in properly. Check the total timing when it is started. Hold the engine at 3,000 rpm and set the total timing to 34-36 degrees. This

is where timing tape or an adjustable timing light pays off. After the engine has run for 20 minutes, set the idle speed and the timing to your normal specs. I like 12-14 degrees initial timing, but you may need something different. You may need to adjust the mixture screws on the carb if the initial setting is not correct. Check for fuel leaks at the carb, on top of the engine and under the truck for signs of oil or water.

**Tip 9.** After the break-in period. Shut down the engine and let it cool. While it is cooling down check things to make sure everything is still OK. Hook up all the vacuum lines and anything else you may have forgot. After the engine is cool enough to work on, change the oil and filter. This will clean out all the break-in dust and cam lube.

**Tip 10.** Get out on a road that's clear of traffic and give her a test drive. For the first 500 miles resist the temptation of full-throttle high-rpm driving. Vary the engine speed and road speed during this time. After 500 miles, change the oil and filter again. From then on, change it at normal intervals. I change mine every 3,000 miles, which I recommend you doing. Now go have some fun.