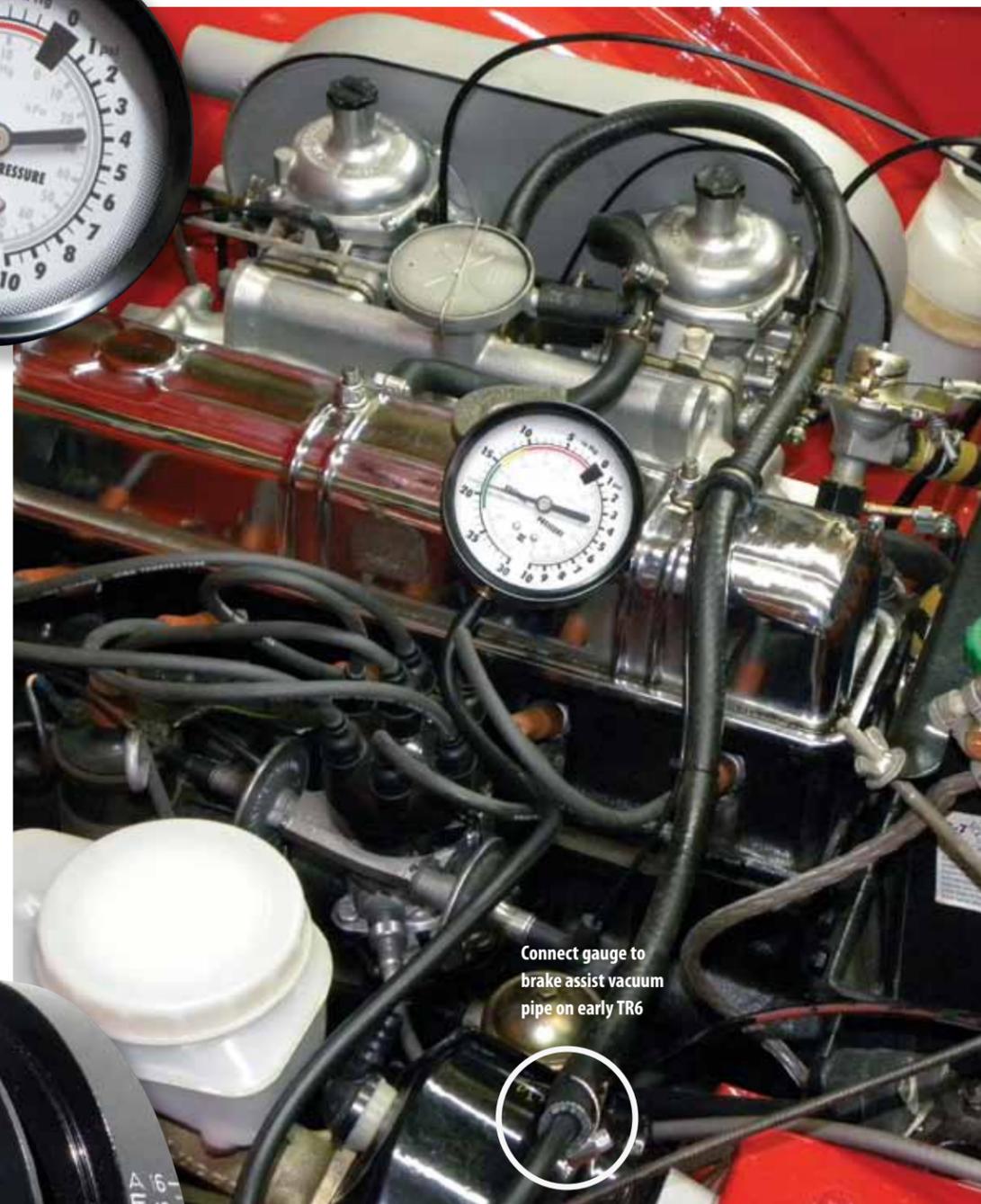


Vacuum reading  
19" of mercury



Connect gauge to  
brake assist vacuum  
pipe on early TR6



# Perfect Timing

*Finding Your 'Sweet Spot'*

BY KEN DALHONDE - 6PACK

First let me say that this is not an argument against ignition timing for the TR6 being between 10 and 14 degrees BTDC at idle. It may well be that your engine's sweet spot lays within that range. But how do you know when you are in that range?

Most people will say "by using a timing light and observing the timing marks on the crankshaft damper", but therein lies the problem. While the timing marks were considered accurate when the engine was fresh and new, time has taken its toll on the components that control the damper marks' relationship to the pointer. If you've ridden a bicycle or used a chain saw, you already know that chains stretch and sprockets wear. Same applies to our timing chain and sprockets. We all know that a gear set wears, such as in our transmissions and differentials. So too the camshaft and oil pump gear sets. I think it should also come as no surprise

that the distributor's driving dog's relationship to the distributor's drive gear, becomes more spacious from the constant pressure of the spinning, especially at start-up.

The consequences of all this, plus the possibility of deterioration of the actual damper's bonded components, leads to a cumulative effect, which affects the accuracy of the timing marks.

So what's the solution; how, with the inevitable inaccuracy, do you find your engine's sweet spot for the ignition timing?

Well, if you've spent anytime on the 6-PACK forums, you've probably seen topics on using a vacuum

gauge as a visual aid to finding that spot. Why a Vacuum Gauge?

The answer is, in order to eliminate or ignore, if you will, the inherent inaccuracy of the timing marks on an older engine's damper.

How does timing relate to a vacuum gauge reading?

An internal combustion engine has been described as an "Air Pump" and whether or not we like that characterization, we can't deny that without air the engine will not function, no matter how much fuel or spark we feed it. Air is sucked in and pushed out and by measuring the air sucked in, we can judge the engine's efficiency in 'breathing'.

We use the volume of air in relation to the volume of fuel to evaluate the efficiency of carburetors or injectors and the quality of the combustion, and we use the manifold vacuum to evaluate the efficiency of the engine's ability to digest the fuel/air mixture. By 'digest' I mean determining if combustion was complete enough so that the combustion chamber could be nearly evacuated by the exhaust cycle and empty enough to accept an adequate supply of fresh fuel and air mixture. The vacuum present in the intake manifold reflects this ability to inhale and the optimum timing of combustion within the chamber (cylinder) that enables it.

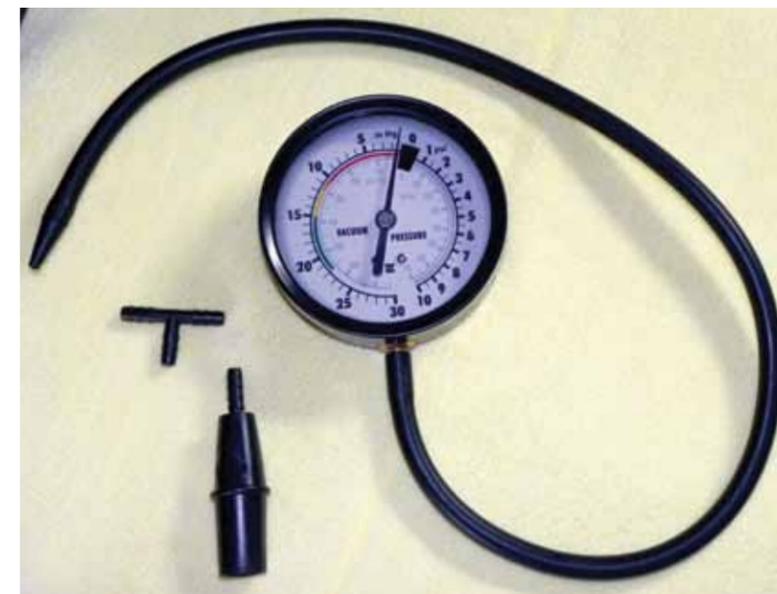
Most internal combustion engines at sea level are designed to operate with a manifold vacuum of 17 to 21 inches of mercury, at idle speed.

Exceptions would be due to a cam whose intake and exhaust valves overlap in open duration or high altitudes, where atmospheric pressure affects vacuum.

Now, I'd like to bring up some points specific to our stock TR6 engines.

Do not strive for the maximum vacuum reading. If the distributor is oriented properly, the tachometer cable will probably restrict the clockwise rotation (advance) of the distributor. With the tach cable disconnected, I have been able to advance the timing to the point where the Vacuum Gauge reads in the low 20s, which is over advanced in anybody's book.

Remember that the vacuum gauge is a 'visual aid' and if the engine sounds rough, uneven, or the valves rattle (ping or pink,



A vacuum gauge like this can be bought for under \$35. This example also reads fuel pressure

depending on which side of the pond you're from) upon hard acceleration, the timing is not right, regardless of the reading on the gauge.

Another thing to remember is that with a change in timing, idle speed will change. Maintain your desired idle speed by making equal adjustments to your throttle stop screws. Also, leave all vacuum connections in place on the distributor, just as they will be as you drive normally. Specifically the vacuum retard and advance, if that's the way you run.

While on the subject of vacuum lines, the question may have occurred to you as to where to connect your vacuum gauge?

If your car was equipped with an Anti Run-On Valve (ARV) you would have a banjo fitting on the intake manifold with one nipple for the ARV and another for the brake servo. Disconnect the hose on the nipple for the ARV and make your connection there. Don't worry about plugging the hose to the ARV.

If your engine did not use the ARV (69-72), use the vacuum gauge adaptor on the vacuum pipe for the servo; no need to plug the servo either (see top photo page 25).

Let the engine warm up before evaluating the vacuum gauge readings and if the needle is anything more than a quiver, then you have other problems, assuming a stock cam, and refer to the link provided for help in diagnosing the problem. The vacuum gauge is an invaluable tool for diagnosing certain engine problems.

Go find your engine's 'Sweet Spot', but just keep it out of the 20s!

**RAGTOP**

Links: [www.secondchancegarage.com/public/186.cfm](http://www.secondchancegarage.com/public/186.cfm)  
<http://automotivemileposts.com/garage/v2n8.html>