

## CHAPTER 1



# CARBURETORS VS. FUEL INJECTION

The debate in recent years throughout the performance community over whether or not carburetors are as good as EFI has been a heated one at times, but a close look at the capabilities of the



*In recent years, electronic fuel injection has become increasingly popular with the street-rodder sect because it allows the use of radical intake manifold configurations, yet still provides very docile engine operation for street driving.*

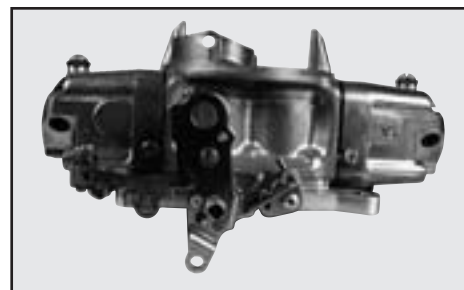
two systems will reveal many shortcomings of the carburetor that can be easily overcome with computer control.

EFI and carburetors have been tested against each other many times and in many different configurations to see which one makes more power, but in my opinion, few of these tests have been properly performed. This may sound whiny at first, but know that I completely understand the difficulties involved in making any testing program accurate and consistent. Facing the challenges involved in trying to accurately compare two such diverse animals is a monumental, if not impossible task.

The problem is that the two are not designed to do the same things, yet we always want to try and make them compete in an arena they were not intended to be in. For instance, a manifold that was originally designed for a carburetor must deal with complex issues of a wet-flow environment where air and fuel must exist together before they reach the combustion chamber. On the other hand, a manifold designed for the air-only requirements of EFI can have a very different shape that is much more inclined to maintain high air velocity without sacrificing volume of flow. The two are not the same, and are required to perform entirely different functions, and therefore it is difficult to compare them on an even playing field. When carbure-



*The carburetor is the traditional method for delivering air and fuel into internal combustion engines. This model is a 750-cfm 4-barrel Road Demon manufactured by Demon Carburetion.*



tors and fuel injectors are tested on the same kind of intake manifold, one or the other would always have an advantage. This because each system is designed to make the most efficient use of a certain type of manifold, and testing either sys-



**Complex manifold shapes are possible in the air-only environment of an EFI system. Carbureted manifold systems must deal with air and fuel mixed together. In this environment, fuel can sometimes puddle in the intake causing uneven fuel distribution to the cylinders. This happens because fuel is heavier than air.**

tem on any other manifold would skew any results heavily to one side.

As an example, say we took a mid-1980s Chevrolet 350-ci engine and placed it on the dynamometer and tested two systems on the same engine: a carburetor on top of a manifold designed for flowing air and wet fuel, and a fuel injection system with a dry type manifold designed for flowing only air.

Theoretically, if both engines were tuned properly and both could have the same amount of airflow at a given engine speed, they would produce similar power outputs. The problem arises when we try and test both systems on the same manifold. Imagine if we took the carburetor and placed it on top of a long-runner Chevy tuned-port manifold. The manifold was never designed with shapes and sizes in mind for flowing fuel through it. The fuel would easily fall out of the air-stream and form puddles, which would greatly affect the fuel distribution at low engine speeds.

Conversely, if we test a fuel-injection system on a wet-style manifold, we would be giving up the low-speed torque advantage these systems are

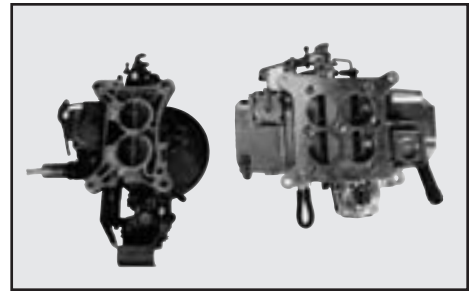
designed for because of the fact that their manifolds were designed specifically to have good fuel distribution and very high-speed airflow to each cylinder at low engine speeds. In the end, if either system were tested on the other's manifold type, the results would be heavily in favor of one or the other.

However, an engine is ultimately an air pump, and its power output is generally dictated by the amount of airflow that can be obtained at a given engine speed. Therefore either system can be capable of quite comparable peak power outputs.

I believe though, that regardless of peak output numbers, the fuel-injected engine will outperform the carbureted engine in overall power due to the fact that it can be tuned to correctly control the engine's fuel curve over a vastly wider power band than the carburetor can. Let's take a look at why this is true.

### CARBURETOR OPERATION

Hopefully by this stage in your engine-tuning career, you have a basic understanding of what an engine needs



**Typically, manufacturers have used 4-barrel carburetors (right) in applications requiring higher power, and 2-barrel carburetors (left) when fuel efficiency is the primary goal.**



**This early model Holley carburetor shows just how simple of a device the carburetor was in the beginning. It was designed mostly through trial and error to achieve the correct ratio of fuel and air delivery over a very narrow range of engine speed. It may look crude, but it got the job done!**

to perform. In fact, you may have successfully tuned one or many carburetors to accomplish this task.

Having said that, it is assumed that you already know how a carburetor works, but at the risk of seeming rather academic, I'll briefly explain the basic operation.

A carburetor uses a round tube, which is narrower in the middle than at the ends. This tube is called a venturi. Being narrower in the middle creates a restriction as air tries to pass through this section of the tube. Bernoulli's law dictates that as air flows through this venturi, it must pick up speed, and also, that there is a corresponding drop in pressure at that same point. This drop in pressure can be viewed as a vacuum.