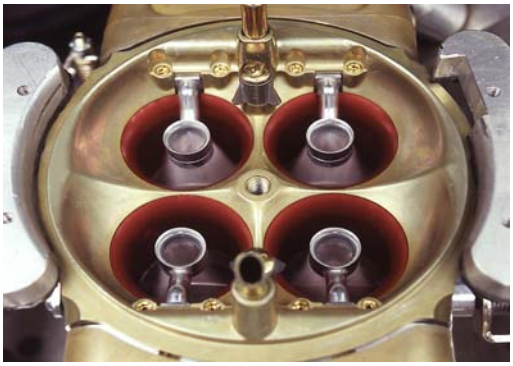
CARBURETORS! Barry Grant Answers the Most Frequently Asked Questions

By Sam Moore

Carburetor guru, *Barry Grant, a man who has done more than most to explore the boundaries of carburetion*

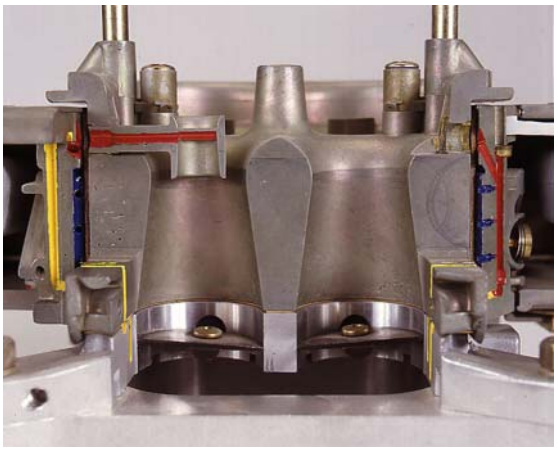
Given that a four-barrel carburetor possesses something in the order of 200 components to allow it to function correctly, it's no wonder the average enthusiast has the odd question about how it operates and why. Words and phrases like atomization, vacuum signal, fuel-metering circuits, etc. can be a little bewildering. So, here are a few of the basics with several useful illustrations to help explain. This article contains information that applies to a wide range of V8-engined machines, from street cars to tow vehicles, and from oval track racers to drag strip cars.



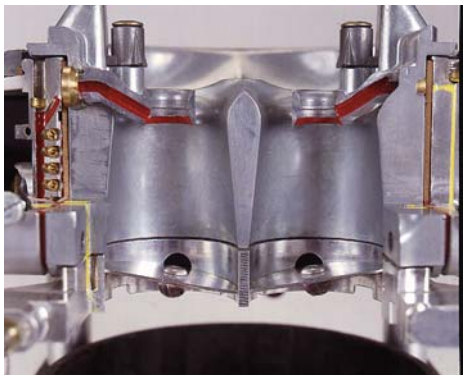
Gasoline won't burn and produce energy in liquid form; for it to ignite, gasoline needs to be emulsified (mixed with air), atomized (reduced to minute particles) and vaporized. The carburetor is responsible for emulsifying and atomizing the liquid; vaporization occurs in the intake manifold. The view above shows the fuel being atomized.

1) Q. Is air pushed or sucked into a carburetor?
   A. *With the exception of forced induction systems (centrifugal supercharger, or turbocharger - where air is forced through the carburetor), air is drawn through the carburetor by the pumping action in the engine's cylinders. This pumping action causes a depression in the intake tracts, which is used to draw the air-fuel mixture through the carburetor. In addition, the force of the atmospheric pressure above the carburetor further quickens the velocity of the incoming air.*

2) Q. What is the difference between the straight-leg, the down-leg, and the annular-discharge boost venturii? Also, when should one be used in preference to another, and how does it affect jetting?



The discharge ring of the straight-leg boost venturi is positioned slightly above the main venturi's most effective zone. The color red indicates the main fuel circuits, which connect with the emulsion holes (blue) in the metering blocks, high-speed air bleeds, main jets, and float bowls. The color yellow indicates the idle-fuel circuits, which discharge below the throttle plates and connect with the main fuel wells, idle-feed restrictors, and the idle-air bleeds. Both idle and high-speed air bleeds are located in the air entries on top of the carburetor.



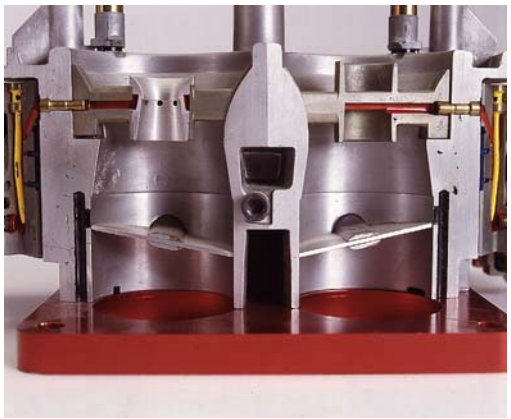
The down-leg venturi booster lowers the position of the discharge ring in the main venturi and places it in an area of higher air velocity, which draws more fuel than the straight-leg type.

A. A straight-leg boost venturi has, as its name implies, a straight leg, which protrudes from the body of the carburetor into the main venturi. Its discharge ring is situated slightly above the main venturi's most effective zone.

B. A down-leg or drop-leg boost venturi drops the discharge ring lower in the carburetor's main venturi where it operates in air of higher velocity; consequently, the down-leg-style draws more fuel than its straight-leg counterpart.

C. The annular-discharge boost venturi has a larger ring with multiple discharge holes rather than the single outlet of the straight-leg or down-leg style. This has the effect of creating greater vacuum than either the straight- or down-leg varieties and draws even more fuel.

D. In conclusion, the pros and cons of each style of booster are based largely upon its application. However, if each style is tested in the same carburetor with all else being equal, the down-leg booster will require smaller jets to flow the same amount of fuel as a straight-leg booster. And the annular-discharge booster will require



The annular discharge venturi booster (shown in the left venturi of the accompanying illustration) has a larger ring with multiply discharge holes rather than the single outlet of the straight- or down-leg booster. Of the three styles of boost venturii, the annular provides the greater vacuum draw.

even smaller jets to flow the same amount of fuel as the down-leg type.

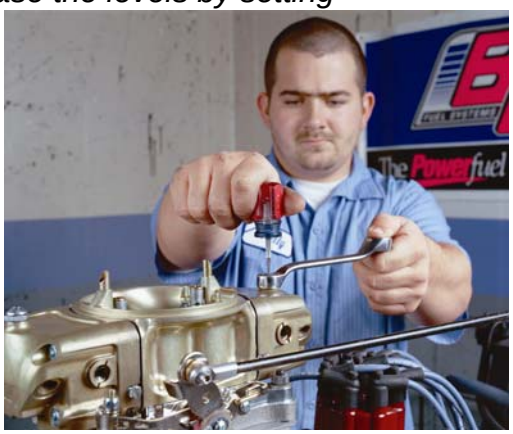
3) Q. Mechanical secondary or vacuum secondary, which style of carburetor should I use and why?

   A. Generally, a mechanical secondary carburetor is preferred on vehicles with manual transmissions and on automatic transmissions with 3000+ RPM stall-speed converters. For automatics with less than 3000-RPM stall-speed converters, the vacuum-secondary carburetor is usually the better choice.

The Race Demon with mechanically operated secondary throttle plates is designed for smooth drivability on dirt or asphalt, and has customized fuel-metering circuits developed for rapid throttle response and strong mid-range and top-end power.

4) Q. How do I set the float levels and what effect do they have?

   A. On Demon carburetors in street-driven applications, begin by setting the float levels at ¼ distance of the sight window. On race applications, increase the levels by setting them between ½ and ¾ distance in the sight window. On Holley carburetors, remove the level plug and adjust the float level until fuel trickles from the open port. Changing the float levels alters the amount of fuel in the bowl (reservoir) and the carburetor's ability to feed the main jets. By raising the float level the engine's response is quickened. This is an adjustment frequently used to eradicate a lean stumble. By lowering the float levels, the activation of the main metering circuit is delayed and consequently produces a leaner mixture coming off idle. For street applications the latter condition is more economical.



Set the float levels by adjusting the internal floats with a screwdriver and wrench and viewing the levels through the sight glasses. Perform this operation with the engine running.

For versatility, use a Demon RS when one carburetor is needed for different applications or changing conditions, i.e. when the engine size changes, or the type of fuel changes, or the track changes, or the weather changes. The venturi sleeves pictured alter the Demon RS (removable sleeves) from 675 cfm to 1050.

5) Q. Does a bigger carb make more power? What's the limit?
   A. *A larger carburetor can produce more power on a dynamometer, but under normal operating conditions can result in slower acceleration and lower efficiency of fuel atomization. Select the smaller carburetor, especially if you're undecided about sizes. The smaller diameter venturii increases the velocity of the air-fuel mixture. As a consequence, it usually provides better acceleration and proves to be more efficient.*

The fuel pressure regulator or bypass should be located as closely as possible to the carburetor. Here, pictured with its mating belt-drive fuel pump, the bypass is integrated in the fuel log.

6) Q. Where should the fuel-pressure regulator be located and what type should I use?
   A. *The fuel-pressure regulator should be mounted close to the object (carburetor, nitrous system, etc.) that is being fed with fuel. The further away the regulator is placed, the greater the delay in its response (its opening and closing). A slower response causes fluctuations (spikes) in the fuel pressure. Regarding the selection of a regulator, specific vehicle requirements, especially the type of fuel pump already in use, dictates the type of fuel-pressure regulator required. For example, combine a block-mounted 15-psi pump with a throttle bypass; a belt-driven pump with a diaphragm bypass; a BG280 electric pump with a two-port regulator and a BG400 with a four-port regulator.*

Use a jet plate kit to protect and to store spare jets. Also, keep a carburetor rebuild kit in the toolbox. They're inexpensive and good ones (like those from Barry Grant) are supplied with every gasket and seal necessary, they even contain a power valve and detailed instructions.

7) Q. How does weather and altitude affect carb jetting?

   A. *The more oxygen there is in the air, the more fuel the engine will demand. For example, as the weather becomes colder (winter) or the altitude lower (closer to sea level), the air will contain more oxygen and the engine will require a larger jet size. In contrast, as the weather becomes warmer (summer) or the altitude higher (mountainous) the jet size needs to be reduced.*