

## What's a Merge Collector?

By Matthew King

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Big cams, big carbs, big headers—the tendency to adopt a “bigger is better” approach to horsepower production can be hard to avoid. But one trick, high-tech component that bucks this trend is the merge collector, which flips the bigger is better concept on its head. Rather than open up the exhaust with a gaping, wide-open header collector (the section of the header where the individual primary tubes join together), a merge collector, also called a venturi collector, works on the opposite theory: necking down to a very small diameter before opening back up to the larger size of the exhaust system.

It may seem counterintuitive to some of us, but merge collectors are nothing new to high-end racers and engine builders; in fact, you'll likely find a set attached to virtually every Winston Cup or Pro Stock engine. It's not uncommon to see an engine making 800 to 1,000 hp flowing through an orifice that doesn't seem adequate for a Honda. Yet they work—very well.

The concept of a merge collector is similar to the theory behind a carburetor venturi, and in both cases, they work on the principle of building velocity through the venturi effect. Air passing through an hourglass-shaped venturi accelerates as it passes through the narrowest part of the venturi then slows down and expands as it emerges on the other side. This expansion creates a pressure drop, in effect siphoning air into the low-pressure side of the venturi and drawing more volume through the venturi. In a carburetor, velocity has the effect of increasing airflow and fuel atomization; in a header collector, the venturi effect improves exhaust velocity and scavenging, which has effects on cylinder filling, the intake tract, and camshaft timing.

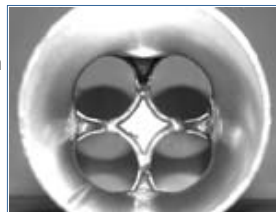
By the nature of the design of a multiple-tube header, there is a large change in area as the gasses from the primary tubes merge into the collector. This rapid reduction in area causes an equally rapid decrease in the velocity of the exhaust gas, which reduces the scavenging ability of the exhaust system. Merge collectors are designed to minimize this change in area at the transition from the primaries to the collector, which allows the gasses to maintain the greatest possible velocity. By improving the scavenging effect of the exhaust, more air/fuel mixture can be pulled into the combustion chambers. More fuel means the potential for more power as long as everything else is



Merge collectors use the venturi effect to improve exhaust scavenging, and it's not uncommon to see a 1,000hp Pro Stock engine with collectors that neck down to less than 2 inches in diameter! Even with our far milder 500hp 350, we gained more than 10 hp at the peak with a set of Dynatech merge collectors.



We tested two types of Dynatech header collectors: a standard 3-inch straight-through collector (top) and a 1.75-to-3.00-inch merge collector (bottom).



In the standard collector (top), the primary tubes are cut off flat and dump directly into the collector. In the merge collector

optimized, such as induction and cam timing.

Merge collectors are typically built on a custom, one-off basis by specialists, making them very expensive (in the neighborhood of \$1,000 or more a pair). However, at the recent SEMA show, we ran across Dynatech Headers, a small, race-oriented header builder that makes the closest thing to a mass-produced merge collector on the market. Dynatech's merge collectors, available in high-temp coated mild steel or stainless steel, are still not cheap at around \$600 for a pair, but at this price level, we felt it was worth a test to see what this technology is all about.

Dynatech doesn't claim its merge collectors to be a magic, out-of-the-box bolt-on. In fact, if a combination has been optimized with standard collectors, Dynatech cautions that it's possible to "overscavenge" the exhaust when switching to merge collectors. This is why the company suggests additional camshaft testing may be necessary to get the best results from a merge-type collector. While 20-plus-horsepower gains are common, it's also not unheard of for a merge collector to initially lose horsepower or torque if it upsets the balance between the camshaft timing and engine airflow. Stepping up to a merge collector is a process best carried out on an engine dyno.

(bottom), the primary tubes are sectioned and merge into a cone shape before the collector necks down to its minimum diameter. This design helps to shape the flow of gasses and improves the transition from the primaries to the collector, reducing the effect of the change in area on velocity.

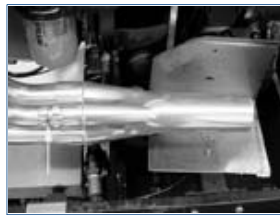


So that's what we did. Our test mule is a 350ci small-block Chevy with 11.25:1 compression, Edelbrock E-Tec 200 cylinder heads, an Edelbrock Performer RPM intake, and a Lunati solid-lifter camshaft that runs happily on 91-octane pump gas and makes peak power at about 6,200 rpm (for complete details, see "530 hp From Spare Parts," Dec. '02). For this outing, we equipped the long-block with a Mighty Demon 750-cfm carburetor and a pair of Dynatech's 15/8-to-13/4-inch step headers designed to fit '70 to '81 Camaros and Firebirds, along with two sets of Dynatech collectors—a standard 3-inch collector and a 1.75-to-3.00-inch merge collector. To keep the test simple, we ran both collector styles without mufflers to eliminate that variable, and we made no tuning changes beyond verifying that timing and carb jetting were optimized for each setup.

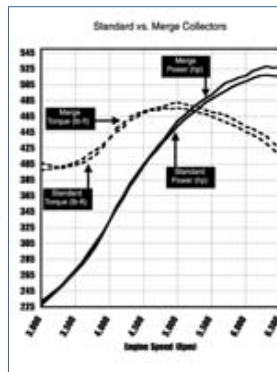
The results of our test were impressive. With the standard collectors, power peaked at 517 hp at 6,300 rpm and 475 lb-ft of torque at 5,000 rpm. With no other changes than slipping on the merge collectors, power increased to 528 hp at 6,300 rpm and 482 lb-ft at 5,000, a gain of 11 hp and 7 lb-ft of torque at the peaks, and more testing would likely improve on this. Finding more than 10 hp with a simple bolt-on in an engine already making nearly 1.5 hp per cubic inch is truly remarkable in our book. CC



Both tests were conducted with a set of Dynatech's high-temp coated 15/8-to-13/4-inch-stepped headers (PN 501-909201, \$479 jobber), which are designed to fit '70-'81 Camaros and Firebirds. Dynatech also makes a large variety of dragster and circle-track headers and is working on a version for '67-'69 Camaros and '68-'74 Novas that should be released soon.



The design of the header allows for easy slip-fit collector changes. A bolt through the provided tabs (arrow) prevents the collector from loosening up.



## SOURCES

**Dynatech Competition Exhaust Systems**  
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