BOLT-ON FUEL INJECTION FOR THE STREET

HOT ROD

Canada $2.50 May 1985 $2.00

BONUS BOOK!

HOW TO PAINT YOUR CAR

CHAPTER 3: PAINT PREP

Engine Swaps

- BASIC HOW-TO's
- COMPLETE KIT DIRECTORY
- CHEVY-DATSUN Z SWAP

Super Shops' Awesome street Z!

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Engine Swaps

3

By Marlan Davis

EDITOR'S NOTE: Following this chassis preparation and engine installation, upcoming issues of HOT ROD will report on the entire buildup of Super Shop's hot Z-car hybrid.

Classic good looks, quality workmanship, lightweight chassis—the Datsun Z-car has it all . . . all except real horsepower. American hot rodders could really get behind these sleek-looking cars—if only something could be done about their wimpy 6-cylinder motors and drivelines.

Harry Eberlin, owner of the ever-expanding Super Shops speedshop chain, knew that with a little Yankee *engineuity*, the Datsun could be turned into a dynamite dual-purpose street/strip machine. The secret for turning a pumpkin into a silver slipper was to dump the in-line six for a real man's motor—a blown and injected small-block Chevy backed by an equally stout drivetrain. HOT ROD got wind of the concept and agreed to follow this buildup to its completion. In keeping with this issue's "engine swaps" theme, this month we'll cover the actual driveline mods. In subsequent issues, we'll move on to the engine buildup, bodywork and paint, and finally a test of the finished results.

Naturally, to perform a swap you need a vehicle. Finding a clean-running Z-car in sunny California wasn't any big deal. We just scoured the classifieds and finally came up with a 1972 240Z model. It was running in decent shape, except for a slipping clutch and upholstery in need of work. The owner wanted $2995, but with a little dickering he took $2500. First stop for the new acquisition was the House of Z, where owner Charlie Tolbert pulled the engine and trans, then gutted the interior. It was then trailered down to Ken Thurm Enterprises. Ken, a professional chassis engineer and fabricator, was faced with the task of adapting the unibody structure to handle the vastly increased horsepower, while still retaining a full stock-type interior and normal passenger compartment accessibility—in other words, the standard full tube frame and roll cage solution a la Vega/Monza vehicles was not part of the game plan, as Harry wanted a fully streetable machine.

$2500 and California's forgiving climate brought us this straight '72 240Z. Six in a row had to go. Charlie Tolbert's House of Z crew did the honors.

Nordskog Competition's V8 swap kit is designed to mate the 350 Chevy/TH350 with a Datsun Z-car chassis. At $1800 list, the kit is one of the most complete we've ever seen.

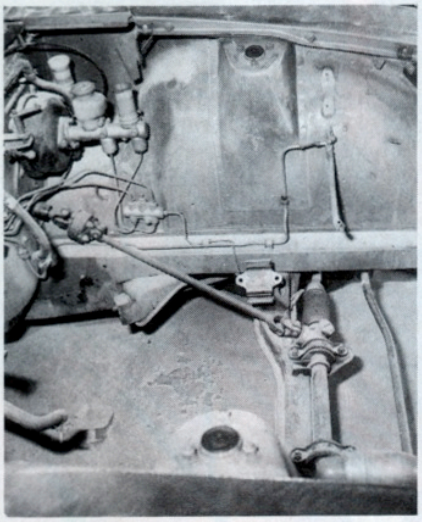
In part, Ken's task was simplified because of Nordskog Competition's swap kit, one of the most complete and comprehensive we've ever seen. Nordskog's package includes literally everything needed to install a Chevy V8 and Turbo 350 trans in a Datsun 240 or 260Z-car, from radiator all the way back to muffler clamps (280/300 Z-cars require some modifications of kit contents). This kit is so thoroughly engineered that, when a 350 engine of the same model year or newer is installed in a '71-'74 chassis according to the instructions, the swap will even meet California's stringent air quality requirements.

With this kit, setting the engine into the chassis is a cinch—just enlarge the frame bracket-to-unibody mounting holes, and bolt Nordskog's new frame brackets into place. Install the supplied factory-type block mounts and bolt the engine into place. No firewall mods, no suspension mods; no cutting, hacking, or welding required.

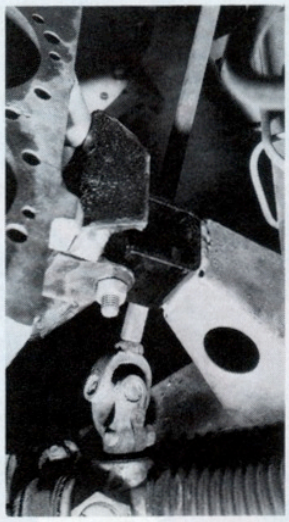
The same goes for the trans crossmember—Nordskog's bracket bolts into the stock mounting location and ac-

Photography: Gray Baskerville, Marlan Davis, and Brian Waingrow/PPC Photographic

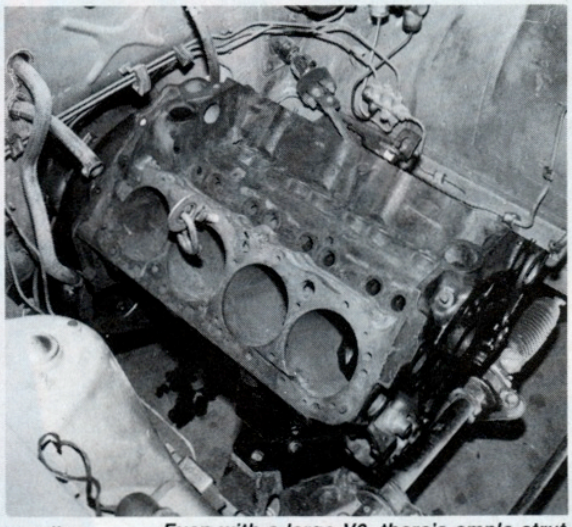
DROPPING A BLOWN, INJECTED SMALL-BLOCK CHEVY INTO THE NEW HOT ROD/SUPER SHOPS PROJECT 240Z



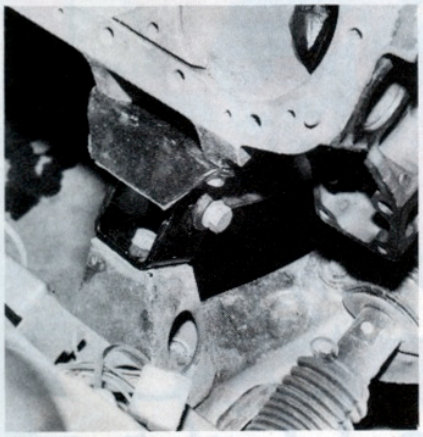
Rack-and-pinion steering allows plenty of room for a larger engine.



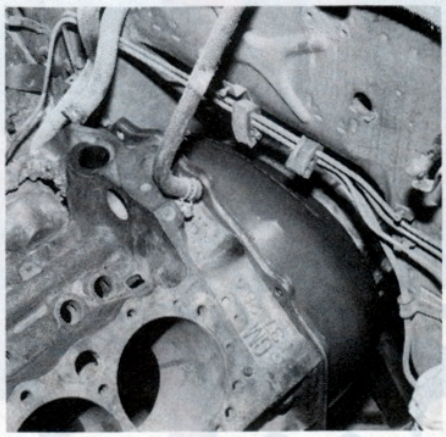
The stock Datsun steering column slips inside the left-hand mount.



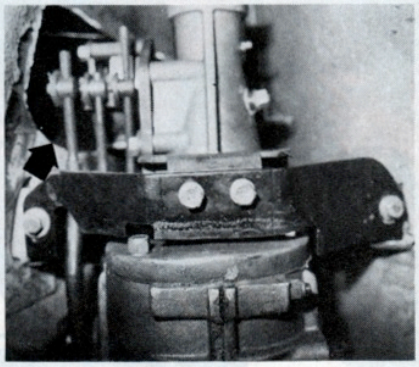
Even with a large V8, there's ample strut tower clearance.



Engine installation is practically a bolt-in. Nordskog's frame bracket bolts to the stock Datsun mounting location.



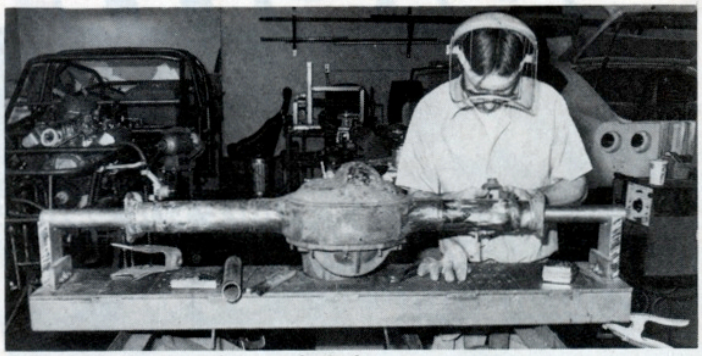
There is no bellhousing-to-firewall interference, either.



Nordskog's trans mounting bracket is designed for a TH350, but with a little trimming, it worked just fine with our Nash 5-speed. Slight tunnel trim (arrow) was required for shifter rod clearance.

cepts the normal GM rubber biscuit. However, in our case we were going with an aftermarket Doug Nash 5-speed manual trans. To accommodate it, Ken had to elongate the Nordskog mounting bracket's bolt holes and trim the bracket itself slightly to clear the beefier trans.

Nordskog's kit is designed to retain the stock Datsun rearend—that's why an automatic is specified. Our mighty Mouse and manual trans demanded something beefier—a nearly indestructible 9-inch Ford rearend. Ken narrowed it to 44 inches and installed custom-made billet Mark Williams axles. Meanwhile, his talented fabrication crew was cutting out most of the rear unibo-



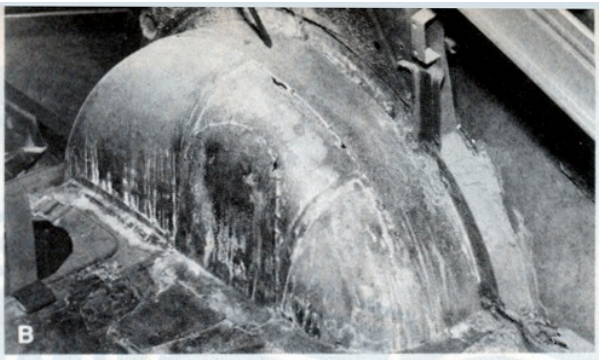
A Ford 9-inch rearend was selected based on its ability to withstand our potent powerplant. It was narrowed to 44 inches by Ken Thurm. He used special jigs and angle finders to ensure it was straight and that all suspension brackets were correctly located.

dy floor in preparation for mounting the new rearend.

Two new rear crossmembers were tied into and gussetted to the overall unibody structure. The front crossmember anchors the Thurm-designed and fabricated four-link rear suspension. Patterned after similar successful street rod setups, its geometry was selected by Ken to offer pleasant ride characteristics, keep the large rearend properly centered and placed in the chassis, and provide gradual tire hookup to ease unibody shock loading. Positively locating the rearend in this manner also eliminates the need for rear sway bars, panhard rods, or Watts links on this relatively lightweight chassis.

The second rear crossmember is required to anchor the adjustable Koni coil-over shocks. It mounts approximately where the now-discarded stock independent rear suspension carrier support crossmember used to reside.

The narrow rearend in turn demanded reworked rear wheel tubs. Ken's crew cut out the stock tubs, widened them about 3 inches, then welded them back together. With the preliminary driveline installation complete, it was off to the body and paint shop. Meanwhile, a street blower engine was in its final assembly stages. Stay tuned next month, when we bring you Part 2, which follows the custom bodywork on our hot hybrid! **HR**



***To make way for the new rearend, the spare tire carrier portion of the floorpan was cut out and discarded. A new section was fabricated to take its place. To accommodate the narrowed rearend and its big rubber, the stock wheel tubs were removed** (A), **widened 3 inches, and reinstalled** (B).*

Ken fabricated a whole new four-link rear suspension to support the beefy Ford rearend. First, though, the stock Datsun rear crossmember required torching.

SOURCES:

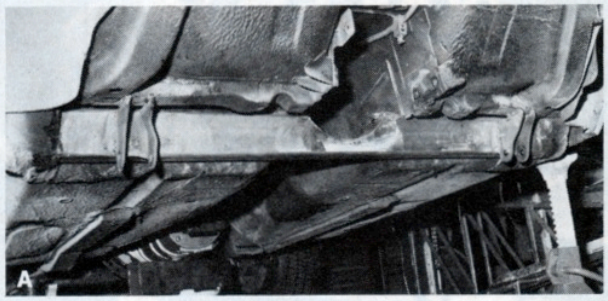
HOUSE OF Z
15314 Dickens St.
Sherman Oaks, CA 91403
(818) 990-6622

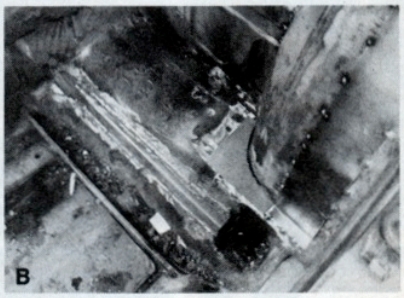
DOUG NASH ENGINEERING
111 Century Ct.
Franklin, TN 37064
(615) 377-6100

NORDSKOG COMPETITION CENTER
15917 Strathern
Van Nuys, CA 91406
(818) 787-7890

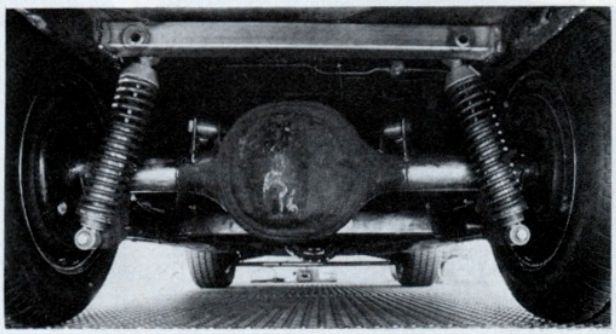
SUPER SHOPS
610 Newport Center Dr.
Suite 1310
Newport Beach, CA 92660
(714) 644-9900

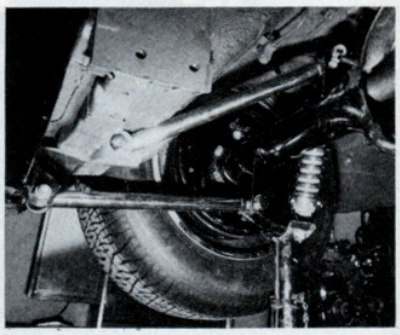
KEN THURM ENTERPRISES
717 S. State College, Unit K
Fullerton, CA 92631
(714) 680-4005





***Two new rear crossmembers were added. The forwardmost one locates the triangulated four-link suspension** (A), **and is thoroughly tied into the floorpan** (B).*

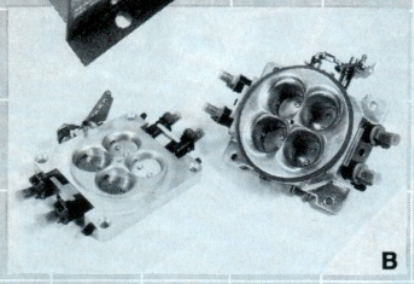




The rear crossmember is similarly tied in, and supports Koni coil-over shocks. The four-link's geometry is designed to provide a comfortable street ride, and gradually hook-up the suspension to prevent excessive shocks to the relatively fragile unibody.

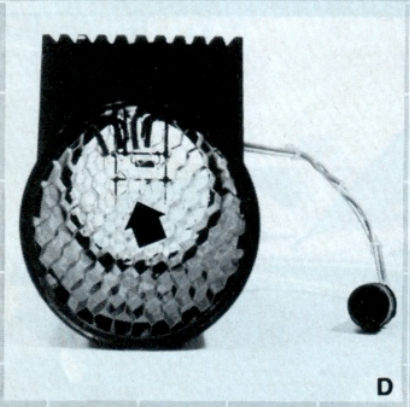
SU

A



B

C



D

A ***Basics of the Superjection system include the mass airflow sensor tube, computer module, and four-injector throttle body. Adjustable fuel pressure regulator (upper right) feeds approximately 39 psi to injector nozzles from high-pressure fuel pump (not shown).***

B,C ***Current throttle bodies use four Bosch-type electronic injectors and fit 4-barrel manifolds. B&M blower model is extremely low-profile; naturally-aspirated version places nozzles above butterflies, at more of an angle (prototype unit shown).***

D ***The hot wire in the MAF is smaller than a human hair. Grating at tube ends helps keep airflow laminar. Diameter of tube must be sized to match air demands of engine.***

An anemometer measures how much the wind blows. Big deal, you say, you can figure that out by licking your finger and holding it in the breeze.

Well, it's not that simple. The question is how much is how much? Are we talking *velocity*, or *volume*, or *mass*? In actual fact, a true anemometer measures wind velocity, or speed, and usually resembles a windmill of some sort.

What's this have to do with cars and engines? Plenty. You probably thought your engine runs on gasoline, but it doesn't. It runs on *air*. It's the expansion of air, heated by combustion, that moves the pistons. The fuel is added to make a fire to heat the air. The more *air* you can get into an engine, the more expansion force you will have, and the more power it will make. You put more, or bigger, carburetors on an engine to get more air in; if you can increase the air intake, *then* you can add more fuel to it in the proper ratio.

In other words, dumping fuel into a motor isn't going to make it go fast; it'll only make it rich. Within a narrow margin of variance, you always want a certain *proportion* of fuel added to the amount of air that is entering the engine at any given instant. This proportion, for most driving situations, is one part of gasoline for every 14.7 parts of air—also known as a stoichiometric air/fuel ratio.

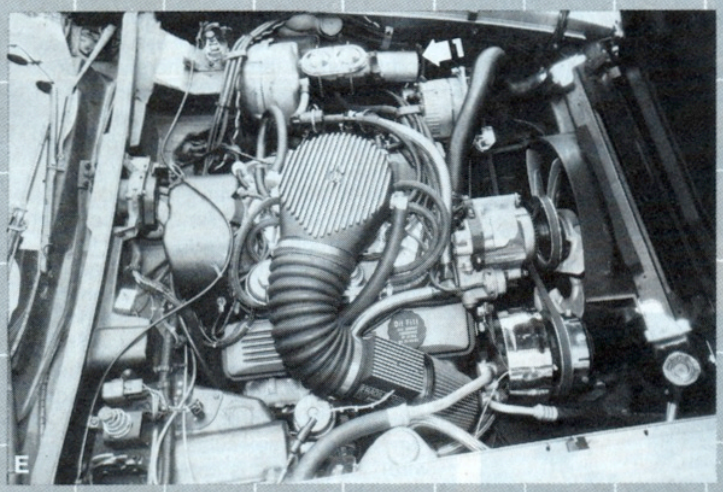
But the question remains, how much is how much? Gasoline, a liquid, is not readily compressible. Therefore, its mass (or weight) is proportional to its volume. But air, a gas, is very compressible—it's elastic. You can take a given amount of air (a certain weight, or mass, or number of molecules—all the same thing) and squeeze it into a tiny volume or let it expand into a big one. So here's our point: you can't accurately measure the mass flow of air by measuring its velocity or its volume passing through an orifice. But that's what a carburetor tries to do.

Now let's talk computers for a second. A computer can count. A computer can calculate. If you tell a computer to add one part of fuel to every 14.7 parts of air passing through a throttle body, it can do it. That is, given a signal telling it how much air is passing through at an instant, it can figure out how much fuel should be added, and send a signal to a fuel injector to act accordingly. *But*, a computer can't measure. It must rely on accurate sensors to feed it the proper information before it can compute accurate "answers." As programmers always say, "Garbage in, garbage out," and vice versa.

PERJECTION

B&M's HOT WIRE INJECTION

By Pat Ganahl



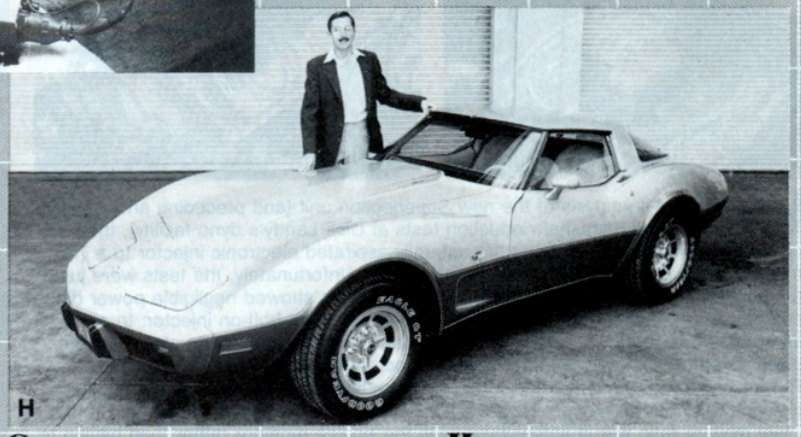
E

F

G

E,F *This prototype, naturally-aspirated installation features a machined-aluminum throttle body, which in this case happens to be mounted on a plate adapted to a 'Vette Cross-Fire manifold. The airflow sensor is sealed to the throttle body with an air hat. An 80 psi electric fuel pump (1) mounts to a fenderwell; an idle air bleed (2) increases idle speed when engine is cold; and on this car all smog equipment is retained, including Evap solenoid (3). It meets emission levels. Is it legal? We don't know.*

So how do you accurately, and instantaneously, measure *mass* airflow into an engine? So far, the best device appears to be a hot wire sensor. It's amazingly simple, and it works much like licking your finger and sticking it in

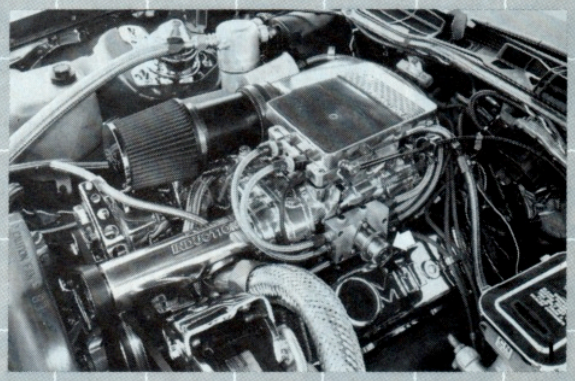


H

G *The real beauty of Superjection is that it's fully adjustable from inside the car. You can adjust overall A/F ratio with one screw, or cold, load, idle, and acceleration modes separately. Unit can mount under dash, under seat, etc.*

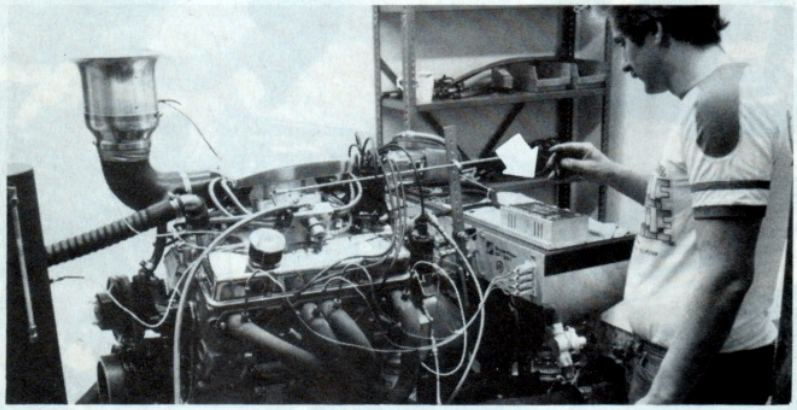
H *Dr. Bill Guentzler of San Diego State University has been testing Superjection on his '78 Corvette fitted with an L-82 350, Doug Nash 5-speed, and tall 2.72 rear. It runs smooth and strong.*

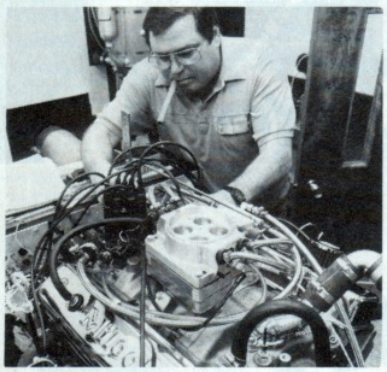
SUPERJECTION

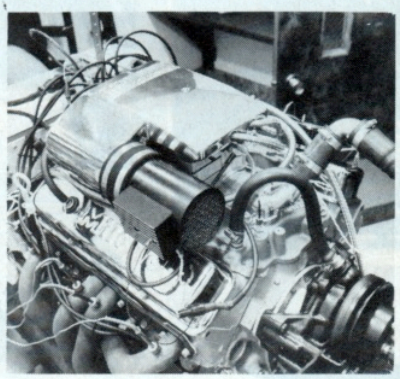


B&M's low-profile blower model is amazingly compact, with MAF mounting directly to air bonnet (a lower-restriction model now supercedes this prototype). Fuel pressure regulator and delivery block (arrow) mounts to one side.

SUPERJECTION TEST







As part of B&M's analysis of the new Superjection unit (and preceding an extensive series of blower/camshaft/induction tests at Dick Landy's dyno facility), they ran back-to-back dyno runs comparing the naturally-aspirated electronic injector to a 750-cfm Holley 4-barrel on a 350 Chevy marine engine. Unfortunately, the tests were just getting underway as we went to press, but initial results showed negligible power differences between the two. This was the intended goal for the bolt-on injector: to make comparable horsepower to a good-sized carburetor. Similar dyno tests at AirSensors showed equal horsepower, with an 8-percent increase in torque for the injector.

The injector's real advantages—increased driveability, throttle response, and mileage—don't read out on a dyno. However, one of its other attributes, being able to set the fuel mixture ratio with a screwdriver (with the engine running) rather than having to stop and change jets, was immediately apparent. In these photos you can also see B&M's new air hat, which will be used on supercharger models. The two large spacers seen under the injector were necessary to let the air sensor and air hat clear the valve cover. A new air hat/air sensor configuration will be designed shortly for naturally-aspirated B&M Superjection units.

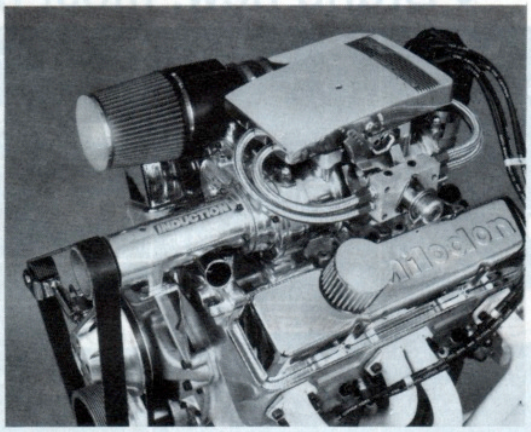
the wind. We described hot wire mass airflow sensors, and their use by Buick and Chevrolet (among others), in our February '85 issue ("Computer Class"). Basically it is a tube through which flows all the air entering the engine. In the middle of this tube is a very thin strand of platinum wire stretched between two terminals. An electric current is run through the wire to heat it to a specific temperature (about 250 degrees F). But when air blows through the tube, it cools off the wire. Surprisingly, the amount the "wind" cools the hot wire is exactly proportional to the mass of air passing by it (the cooling effect is actually proportional to the number of air molecules striking the wire). As the wire is cooled, however, an analog circuit on the tube immediately increases the current across the wire to keep its temperature constant, and sends a signal to a computer mounted in the car, telling it how much this current draw is at all times. A small temperature sensor is also located inside the tube to constantly monitor ambient air temperature, since the computer must take changes in air temp into consideration when calculating the net cooling effect on the wire.

So if you have a device which can really measure the *mass* airflow into an engine (which we now do), a computer can easily regulate an electronic fuel-injection system to deliver gasoline into that airstream in the correct proportion. (If you're not familiar with Bosch-type electronic fuel injectors, we must refer you back to our February '85 article—we warned you that it was mandatory reading.) In our "Computer Hot" article last February, we briefly described the aftermarket hot wire mass airflow (MAF) system developed by AirSensors, Inc. of Seattle, Washington, which is now being marketed for all performance automotive applications by B&M Automotive under the brand "Superjection."

The amazing thing about Superjection, unlike factory MAF units which incorporate a throttle-position sensor, manifold pressure sensor, and feedback loop exhaust gas O_2 sensor, is that it relies almost solely on the mass airflow sensor to operate. The B&M system

(continued on page 140)

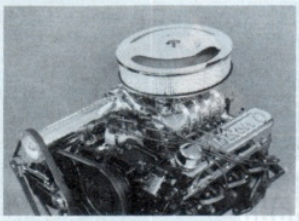
Bolt-on performance ...from B&M



Incredible Superjection EFI

B&M's revolutionary aftermarket electronic fuel injection system utilizes the state-of-the-art air mass sensor to measure the incoming air and provide a perfect fuel/air ratio at all speeds, altitudes, and air density conditions. Never change jets again! Designed specifically for the B&M Supercharger the Superjection may be used on any supercharger that accepts a 4-bbl carburetor on engines up to 370 cubic inches with not more than 8 pounds of boost. Fits under the stock hood on most any vehicle using a B&M blower.

Supercharger or Superjection not legal for sale or use on pollution controlled vehicles in California.



289/302 Ford V-8

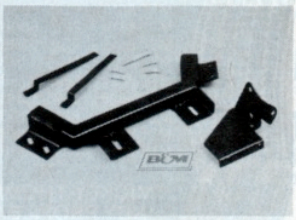
B&M's unique new Ford blower utilizes an offset input shaft to clear the distributor. This is the lowest blower made for a Ford using a stock distributor. Clears all stock accessories, even the AC. B&M also has a similar new blower for S-10 Chevy and S-15 Jimmy with 2.8 Liter V-6.

MegaShifter

The hottest automatic shifter of the 80's, the B&M MegaShifter combines the fantastic look of a four speed with the precision operation of our tried and true ratchet action shifters. Models for most domestic 3 and 4-speed transmissions plus Camaro and Firebird up to 1985.

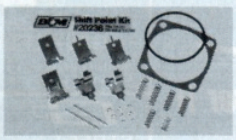
TH-700 Transpak

GM's new TH-700R4 leaves a lot to be desired by most enthusiast's standards. Our easily installed kit improves shift feel substantially, raises shift points, and also raises point at which converter lockup occurs. Dramatically improves overall driveability of this transmission in any vehicle.



TH-700/400 Kit

If the engine in your 1982 and later Camaro or Firebird puts out any power at all your stock transmission probably won't handle it. Yank out that whimpy TH-200 or TH-700 and drop in a bulletproof TH-400. This special kit makes it a breeze. Kit does not include transmission. Driveshaft modification required.

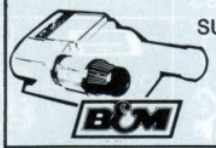


Shift Point Kit

Easily adjust shift points on any TH-350, TH-400, or TH-700 transmission. Springs and weights will provide full or part throttle shifts where you want them. Easy to install.

B&M

See Product Descriptions Above For These Super B&M Values!!



SUPERJECTION EF1

Polished Air Inlet Chamber.....$1095.00
Painted $995.00

SHIFT POINT KIT

Tailor your shift points to occur anywhere from 3000-6000 RPM. For TH-350, 400 & 700R4 GM Automatics.

BMM-20236 .....$20.95

TH-700 Transpak 2 Stage Kit

Select RV/Heavy Duty for sharp shift Street/Strip for tire-chirping shift TH-700 Transpak
BMM-70235 .....$34.50

TH-700 Super Transpak. Same features as transpak but allows ability to lock out converter lockup feature.
BMM-70236 .....$111.50

MEGA SHIFTER From B&M

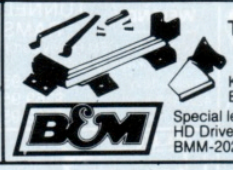
GM TH-400, TH-350, TH-250, TH-200. All Ford C-4 and C-6, All Chrysler '66 & later. Torqueflite A-727 & A-904 AMC '72 and later with Torque Command
BMM-80690 .....$98.95

Powerglide '62-'73 with aluminum case
BMM-80691 .....$98.95

• CONSOLE MODELS •

'73-'81 Camaro and '70-'81 Firebird
BMM-80694 $78.95

'82 and later Camaro/Firebird
BMM-80692 $98.95



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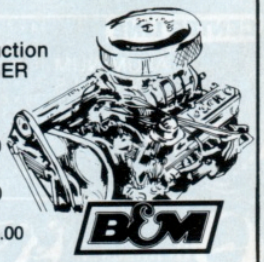

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SUPERJECTION

(continued from page 58)

does incorporate an engine speed sensor (tach signal), and one spark plug firing sensor (to determine firing order for sequential injector firing), and an engine temperature sensor (to richen the mixture ratio when the engine is cold, like a choke does, because less gasoline will vaporize). But other than that, it's simply the intake air sensor that "runs" the injectors.

Designing such a "simple" system wasn't easy, but AirSensors wanted a unit that could be quickly and easily installed by aftermarket customers. The major components include a four-injector throttle body which bolts to a regular intake manifold in place of a 4-barrel carb, a high-pressure fuel pump and regulator, the airflow sensor with a tube and hat to seal it to the throttle body, and the computer module which mounts in the driver's compartment. The computer is a complicated, three-board, combination analog/digital unit that is highly user-adjustable by means of five trimpots. Instead of changing jets and modifying circuits in a carb, you can fully tailor your mixture ratio and fuel curve with the turn of a screwdriver, even while you're driving.

What if the air sensor breaks? The system has a built-in "drive home" mode which operates the injectors just by the rpm sensor, and the module even has a sixth trimpot to let you adjust this cycle (though a failure is very rare).

B&M first became interested in the AirSensors unit when they were looking for an extremely low-profile injector to mount atop their superchargers. In the blower unit, fuel sequencing is obviously not important. However, the naturally-aspirated model is computerized to fire the four injectors, under most driving conditions, in a sequence timed to cylinder firing (each injector is essentially aimed at one pair of manifold runners). Under acceleration, however, the unit can switch to synchronous firing of all four injectors. Current bolt-on units can feed engines of up to 300 hp or more. Greater power figures can be obtained by installing higher-flow injectors, increasing fuel pressure, or installing a dual system (two throttle bodies and MAF's). For complete information, contact B&M Automotive, 9152 Independence Ave., Chatsworth, CA 91311, (213) 882-6422.

Does it work? You betcha! Even in naturally-aspirated form, it completely eliminates bog, burp, and stumble, even when the engine is dead cold. Power is crisp, smooth, and instantaneous. Mileage is maximized. And you can tune it from the driver's seat. The only way to get more is by magic. **HR**