HOT ROD

How To Make Your BODY WORK

FIT THE PART

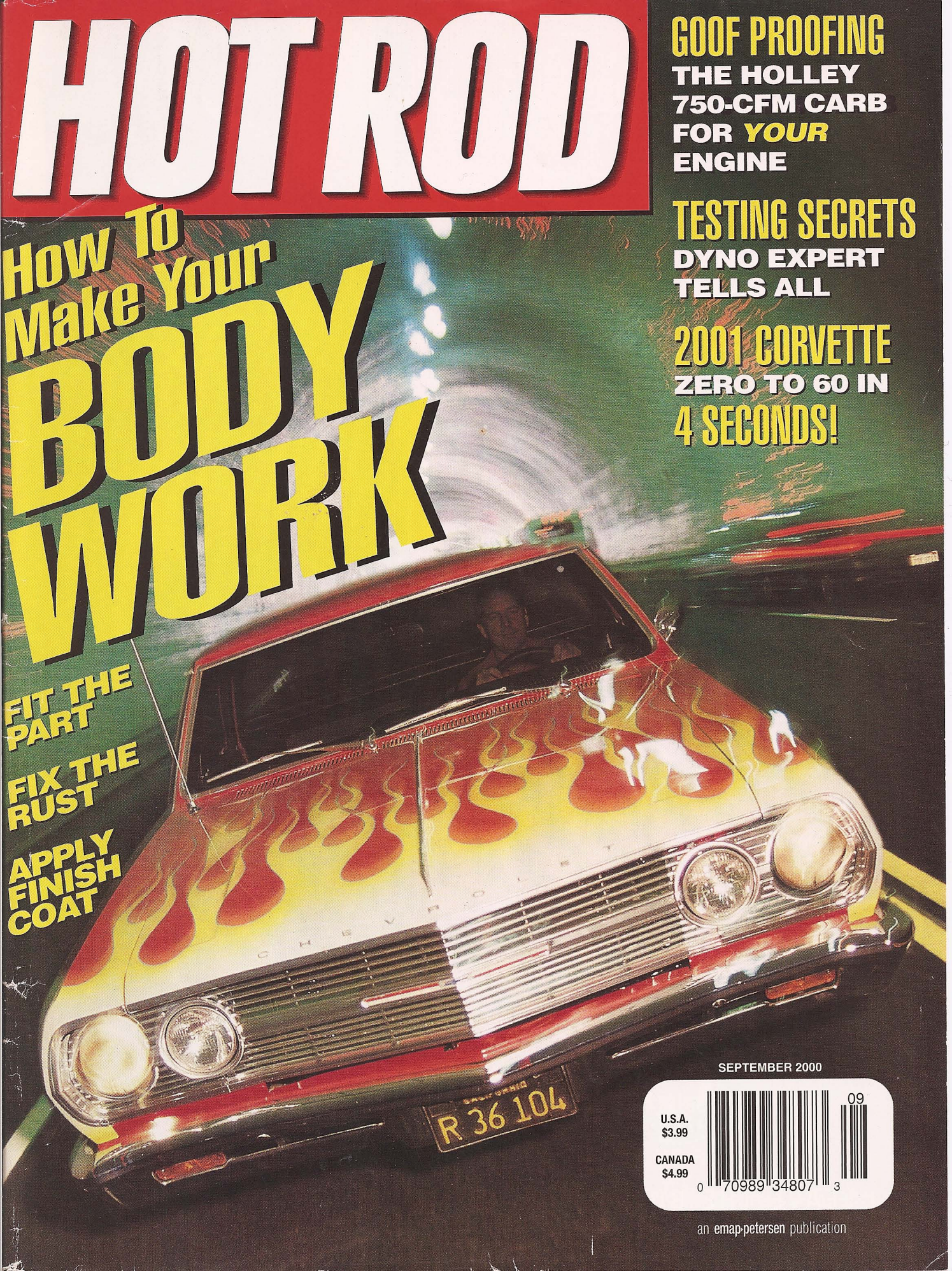
FIX THE RUST

APPLY FINISH COAT

GOOF PROOFING
THE HOLLEY 750-CFM CARB FOR *YOUR* ENGINE

TESTING SECRETS
DYNO EXPERT TELLS ALL

2001 CORVETTE
ZERO TO 60 IN 4 SECONDS!



SEPTEMBER 2000

U.S.A. $3.99

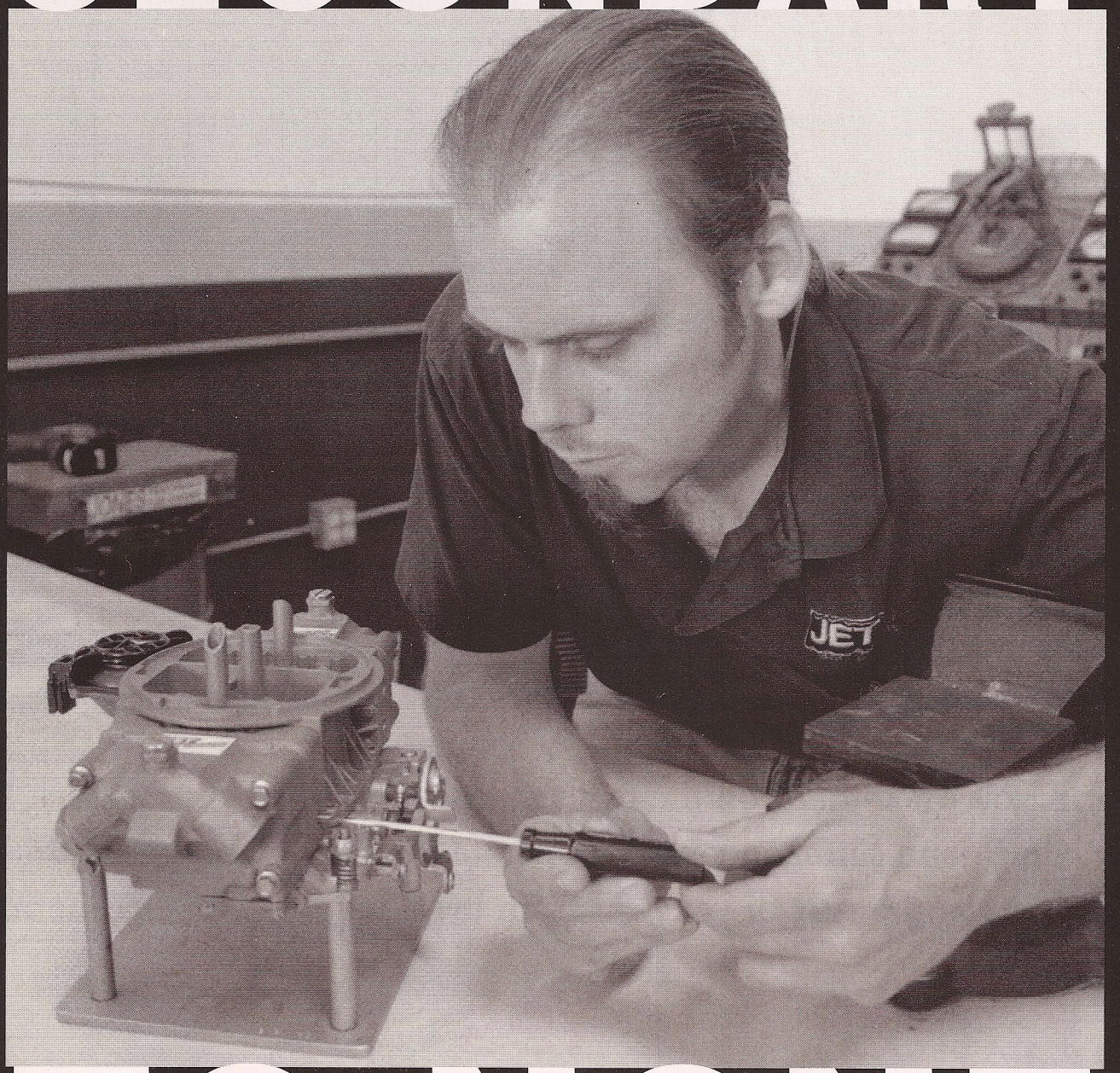
CANADA $4.99

09

0 70989 34807 3

an emap·petersen publication

SECONDARY TO NONE



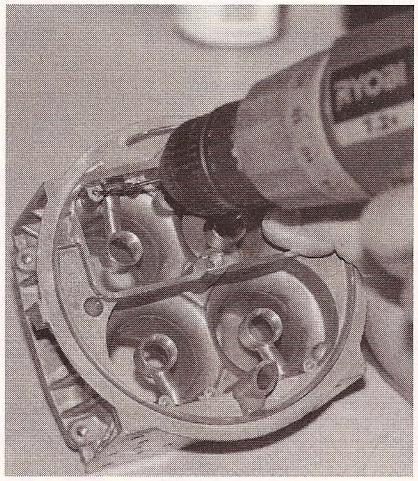
GOOF-PROOFING THE HOLLEY 3310

BY STEVE MAGNANTE

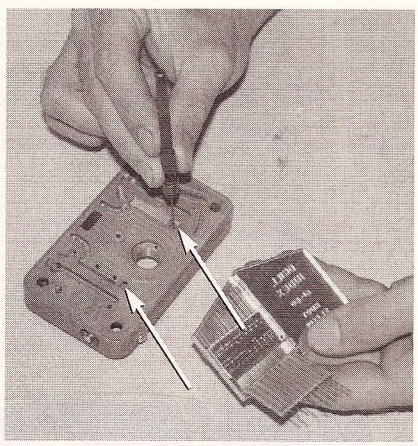
The Holley 3310 carburetor was initially offered on Chevrolet's new-for-1966 L78 375hp 396 big-block; its 780-cfm flow-rating and vacuum-operated secondary throttle plates provided an excellent blend of power and economy. Soon after making its appearance on the L78, a 750-cfm variant of the 3310 became available over-the-counter and has since become a sweet combination of street manners and strip tenacity. But there are some classic pitfalls that can spoil the entire experience if you aren't clued in first. Sean Murphy of JET Performance offered the following tips for the almighty 3310. Beyond that, if your Holley carburetor needs rehabbing or if you want to purchase a pre-calibrated Holley for your specific application, JET be the place.

Photography: Steve Magnante

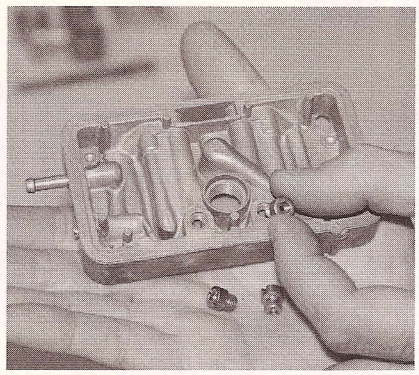
SECONDARY TO NONE



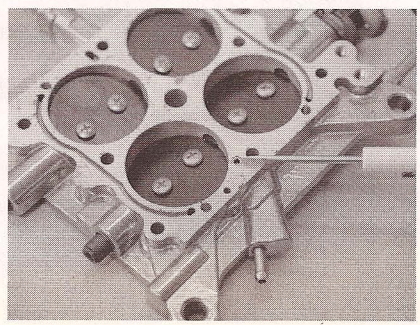
Because the 3310 was designed and tuned for the Chevy 396, it tends to run rich on a mild small-block, and despite numerous upgrades and design changes, this problem still haunts many users. The solution is to enlarge (drill out) the bleeds to admit more air during the emulsion process and make the idle mixture leaner. The increased air bleed area also reduces the idle circuit vacuum signal for leaner operation during idle and the off-idle transition and also improves mid-range response and part-throttle fuel economy. The stock air bleed diameter is 0.067- to 0.070-inch. Using a drill index, select the next largest drill size and enlarge the bleeds in the smallest steps possible. Drill through the brass inserts, not into the carburetor body. The objective is to get where the idle mixture adjustment screws are most effective at 1½ turns out from the fully seated position. If the idle quality is best at ½ turn out, then the air bleeds need further enlargement.



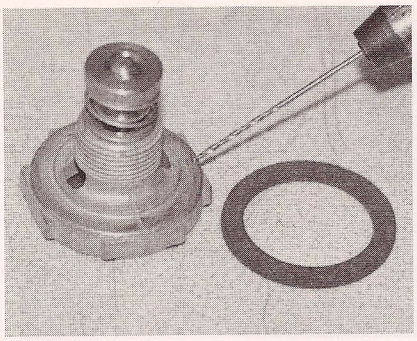
Just as mild small-blocks may find the 3310's stock idle calibration too rich, hotter motors and big-blocks will benefit from further idle circuit enrichment. To fatten things up, use a pin drill to enlarge the idle feed restrictors (*arrows*). You can take them beyond their stock 0.033 to 0.034 id (inside diameter) to increase the idle circuit fuel volume. But these orifices are very sensitive, so you must work (by hand) in 0.001 increments. Most tool supply stores carry indexes containing the pin drills you need for this operation (typically 0.00135- through 0.039-inch). Unlike jets, the idle feed restrictors are not dependent on entry contour and are not sensitive to blemishes left by drilling.



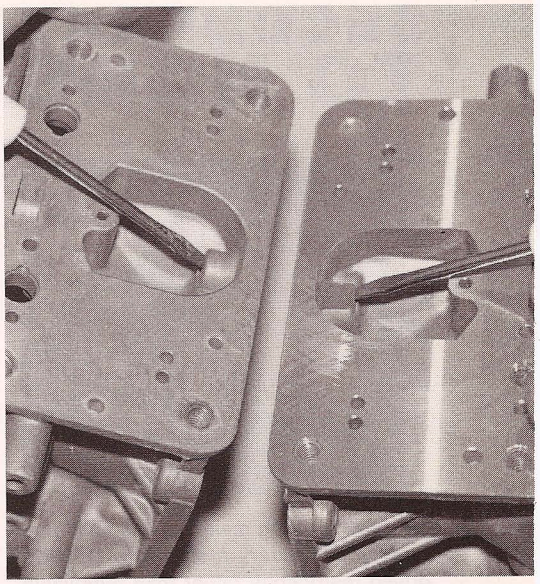
Standard out-of-the-box primary jetting on the 3310 carburetor is a big-block friendly #72. Combined with the power valve circuitry, it causes the small-block to run rich. Reducing the primary jet size to a friendlier #70 or #71 ensures crisper throttle response and increased fuel economy.

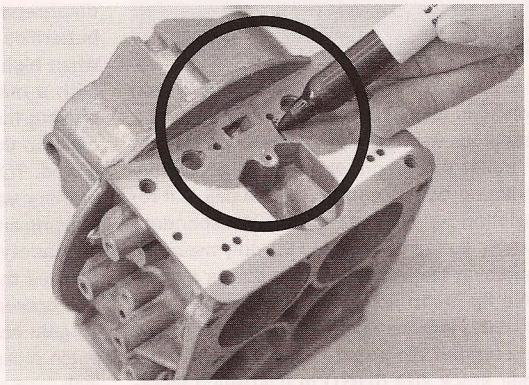


Under high load conditions, the power valve supplements the main metering circuit with additional fuel. This temporary enrichment is achieved by opening two additional metered passages to the main circuit. The power valve is controlled by manifold vacuum that draws against the diaphragm in the power valve and closes the power valve against its preset spring tension. When engine load increases, manifold vacuum drops, and the power valve spring forces the valve open to admit more fuel, so you can use the power valve as a tuning aid. For instance, if you feel a slight hesitation at ¾ throttle, this may be an indication that you need to go to a higher-rated power valve so that it opens quicker to provide enrichment faster. You might go from the stock 6.5 to an 8.5, or as high as 10.5. Remember, though, the power valve only affects the timing of the enrichment, not the amount. Except for the original L78 carbs, 3310s only have power valves on the primary side.



A classic power valve goof-up involves the gasket. The pointer indicates the flat face of the power valve and where the gasket seals. Note that the shoulder area that keeps the gasket centered during tightening is minimal, so if the gasket slips, it creates a vacuum leak. If you reuse this gasket, be cautious about the impressions on the mating surfaces that can lead to vacuum leaks. Apply a light coat of WD40 to the threads during tightening. Despite the unusual appearance, power valves do not require special wrenches for R&R—a 1-inch open-end wrench will do nicely.

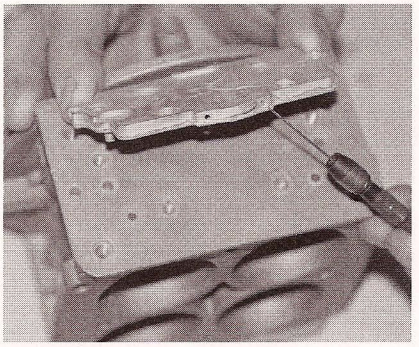




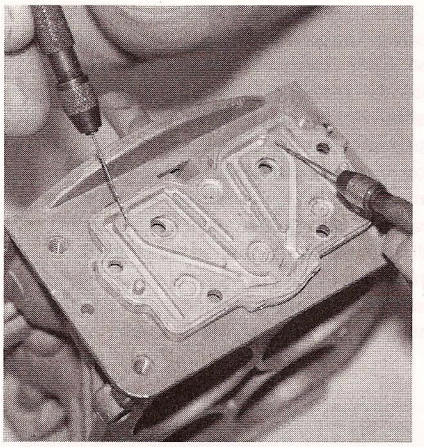
Although mass production helps keep the 3310 affordable, one drawback is that critical surfaces can sometimes emerge from the casting process with significant warping. JET assembles its blueprinted carburetors from new Holley parts, but takes precautions to ensure against warped castings. Note the sizable low spot on the metering block face of this brand-new body (*circle*). Measurable warping can range from 0.005- to 0.035-inch. The ink marker traces possible path of a vacuum leak running between the high-speed air bleed circuit and the power valve vacuum chamber that can result in poor idle quality and poor throttle response. JET's Sean Murphy says a classic warp symptom is a carburetor rebuild that only lasts a few days before it becomes erratic. Even though the fresh gaskets "pillow" the uneven surfaces, the leak will return as normal shrinkage begins.

When machining is required to eliminate warping from the metering block mating surface, check to make sure the rounded baseplate fastener boss does not contact the power valve. If it does, the power valve diaphragm retainer can be crushed, and the metering block can be distorted during assembly. A simple machining operation removes part of the intrusive boss and restores clearance. Pointers indicate an unmachined boss (*left*) and a clearanced boss (*right*) inside the power valve vacuum chamber.

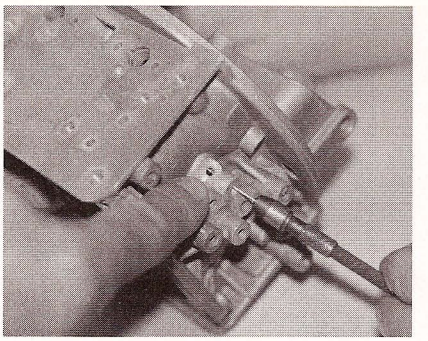
SECONDARY TO NONE



As a cost-cutting measure, the 3310 features a secondary metering plate with drilled restrictions rather than removable secondary jets. The secondary main metering restrictions (*pointer*) are equivalent to a pair of 0.076 jets, well tailored to a wide variety of high-performance applications. Interestingly, the primary side of a box-stock 3310 is richer than the secondary side. The combined effect of the 0.072-inch primaries and the power valve channel restriction orifice is like having 0.078 jets in place. If secondary enrichment is necessary, drill the metering restrictions oversize or replace them to allow increased fuel flow.

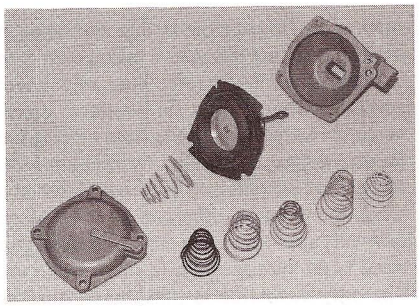


It is possible to encounter a momentary lean condition (stumble) when tuning the opening rate of the vacuum operated secondaries with a lighter diaphragm spring. The secondary metering body incorporates a small idle restriction hole that enriches the secondary barrels during tip-in and is the only means of enriching the secondary side during aggressive tip-in. To achieve better performance from this less-than-optimum transition circuit, drill out the idle speed restriction holes from their stock size (0.031) in 0.001-inch increments until the stumble is eliminated. Pin drill vises indicate holes to be drilled. An alternative to this is a secondary metering block conversion kit with removable jets to ease trial-and-error tuning.



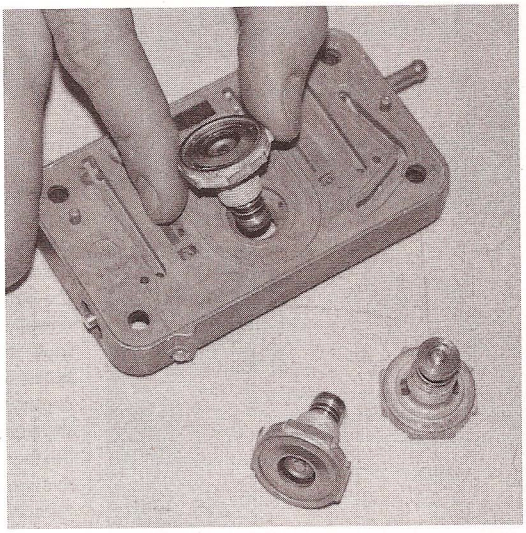
Changing to a lighter spring in the vacuum diaphragm housing allows the secondary butterflies to open sooner. But sometimes when high numeric axle gearing is coupled with a manual transmission and a fast-revving motor, springs alone won't do the trick, so the vacuum feed port must be enlarged. This drilled passage runs from the primary venturi to the vacuum diaphragm housing and is responsible for activating the secondary vacuum motor. Enlarging it increases the strength of the vacuum signal and opens the secondary butterflies faster. To gain access, remove the lead plug and begin drilling the channel oversize in 0.003-inch increments. After each procedure, reinstall the lead plug in the passage, but be careful not to drive it in too deep (less than 1/16-inch), or it will interrupt an intersecting bleed channel that runs to the secondaries. This modification will restore the effective-

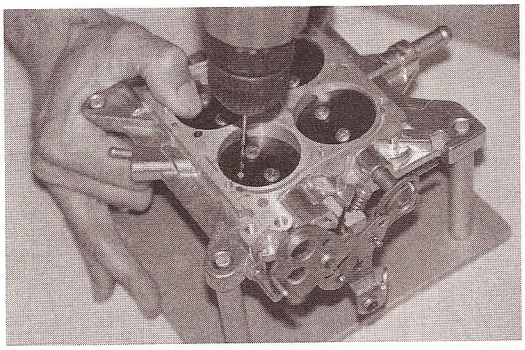
ness realized from diaphragm spring changes. The finger points to the hole to be drilled oversize while a pin drill has been inserted to demonstrate the secondary bleed hole location—see the tip of the pin drill intersecting the feed port? Be sure to follow all changes with a thorough cleaning to eliminate chips.



Holley has plenty of vacuum diaphragm springs to modulate the opening rate of the secondary butterflies. When using the lightest springs, it is important that the secondary throttle shaft does not stick, and that spring pressure is sufficient to close the blades completely. A Holley quick-change kit (PN 20-59) replaces the stock diaphragm cover with a two-piece cover with an access opening to make diaphragm spring tuning easier. The springs can be changed without disturbing the delicate diaphragm or removing the housing from the carburetor.

Backfire is one of the power valve's worst enemies. The negative pressure pulse hammers the power valve and can rupture its diaphragm, causing raw fuel to leak into the intake manifold during engine operation. About 10 years ago, Holley began fitting all 3310 carburetors with anti-backfire protection valves to prevent this. Earlier Holleys can be retrofitted with a backfire valve in the base plate at the location shown. The JET anti-backfire valve kit consists of a check ball, spring, and brass retaining collar.

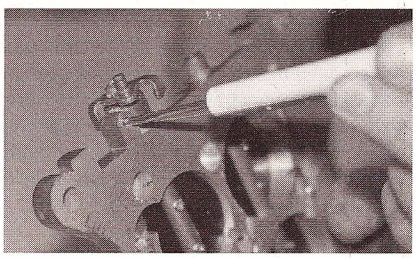




Racing camshafts are incapable of creating sufficient manifold vacuum to properly signal the carburetor idle circuit, so it is necessary to source additional air to make the engine run faster and improve the vacuum signal. The most obvious solution would seem to be a simple idle screw adjustment. The problem is that the exaggerated movement required of the butterflies exposes part (or all) of the idle transition

SECONDARY TO NONE

slot that controls fuel feed in the initial stages of throttle tip-in; therefore, its ability to trigger enrichment off-idle is compromised significantly and usually results in a hesitation. Also, the idle becomes overly rich because the carburetor is supplying fuel from the idle circuit as well as the transition circuit and fouls the spark plugs. Drill small holes in the butterflies that allow extra air to bleed into the engine without unnecessarily compromising the transfer slots. Use a center punch to peen the location. Start small. An 0.080-inch drill bit is a safe beginning, and the rule of thumb is "the bigger the motor and the bigger the camshaft, the bigger the holes should be." On carburetors with four corner idle circuits, drill each butterfly. On others, drill only the primaries. Beware as the hole size approaches 0.150; from here, the massive air bleeds can trigger nozzle drip, where raw fuel is drawn out of the boosters. If you see this, you've gone too far. Replacement throttle blades are available from JET.



Another way to get more air into the engine to achieve a decent idle with a racing cam is to use the secondary throttle stop adjustment screw, as shown here. As intended, it prevents the secondary blades from closing too far and getting stuck shut by vacuum lock. But if small adjustments are made (⅛ turn at a time), the threaded stop can be used as an extra idle speed screw in cases where all you need is an increase of a few hundred rpm. The only downside is that the carburetor must be removed to gain access. This method is effective only if the adjustments expose none of the secondary transfer slot.

Source

JET Performance Fuel Systems
Dept. HR09, 17491 Apex Cir., Huntington Beach, CA 92647;
714/848-5500

Why Vacuum Secondaries?

It is valid to envision a carburetor as having two distinct personalities, like Jekyll and Hyde. In the civilized Jekyll mode, all the carburetor has to do is supply the engine with useable amounts of atomized fuel mixture to support start-up, clean idling, slight enrichment during throttle tip-in for smooth around-town characteristics, and reasonable part-throttle fuel efficiency at highway speeds. But when base instincts prevail and your foot goes flat to the floor, Hyde explodes onto the scene. With the sudden application of WOT, the secondary butterflies are poised to admit a huge quantity of additional fuel mixture. In cases where a carburetor with mechanically activated secondaries is used in conjunction with a heavy car, low-numeric final drive ratios, a tight torque converter, or small engine displacement, the additional volume of air reduces the carburetor's ability to accurately respond to the vacuum signal generated by the pistons. This disrupts the critical air/fuel ratio, and power falls until sufficient intake tract air speed and a healthy vacuum signal are restored. The net effect is a bog that kills power and loses races.

But if the secondaries are opened gradually, intake tract airflow velocity remains high, providing the carburetor with a strong vacuum signal so it can meter the right volume of raw fuel to support maximum power output, and this is how the Holley vacuum secondary system works. As the primary throttle blades are opened, the primary venturi vacuum increases, and a portion of this vacuum is routed to an external vacuum motor on the passenger side of the carburetor. Within this vacuum motor is a spring-loaded diaphragm that is linked to the secondary throttle blades. Once the vacuum signal sent by the primary barrels reaches a predetermined point (established by the resistance level of the internal spring), the diaphragm begins to open the secondary butterflies to a point equal to or less than the primaries. The marvelous feature of this system is that it is self-correcting. If the secondaries open too quickly, the vacuum signal through the primary barrels decreases instantly, as does the amount of vacuum available to overcome the resistance of the diaphragm spring. This either closes or reduces the opening of the secondaries to restore balance and prevent bogging. In essence, a vacuum-operated secondary circuit admits only as much air and fuel as the engine can effectively use, rather than the force-feeding administered by mechanical-secondary designs. **HR**