JUST THE BASICS:
Fundamentally, increasing fuel flow means installing larger jets in the carburetor. Sounds simple, doesn't it? Trust me, I've been doing it now for more than 30 years, and it really is that straightforward. Picking the right jet, now that's the hard part. Fortunately that element of the job has been made much easier by the proliferation of jet kits now available. These kits contain all of the bits and pieces you'll need plus detailed instructions, and they are available to fit nearly every current and not-so-current motorcycle I can think of. But this would be a damn short article if we lefi it at that. Rather than just show you how to install a jet kit, let me walk you through the basic steps used to jet a bike from scratch. Even though the kits greatly shortcut the jetting process, individual circumstances may dictate some finetuning from bike to bike. If you know how to evaluate jetting, you'll know what to look for and what changes need to be made. Since the most popular carburetor in use is the variable-venturi, slide-type carburetor, that's the model we'll use. For the sake of convention we'll assume you have either installed a jet kit and want to make sure the jetting is spot-on or you suspect some jetting changes need to be made. Presumably you already have some fundamental understanding of a carburetor's internal workings. If you don't, I suggest you bone up on a little theory first. Mr. Bernoulli was a pretty bright guy, and his insights are well worth discovering.

I DUNNO MAN, IT JUST AIN'T RUNNING RIGHT
Deciding where the problem lies is the first step. One of the more common mistakes the novice tuner makes is trying to jet based on engine rpm. Throttle position dictates which carburetor circuit is being used at the time, so jetting is always predicated by throttle position, never rpm. Experienced tuners and riders are pretty good at determining which carburetor circuit is at fault. If you're new to this, a visual aid may prove helpful. **A** throttle index will show you exactly which circuit is in play at any given time. Using masking tape, place a datum point on the throttle housing. Next use another piece of tape to divide your throttle into quarters. As an alternative you can mark the quarters on the housing and use a colored pin stuck into the grip to indicate the throttle's position. Your markings should indicate 1/4, 1/2, 3/4and wide-open throttle, although the last is usually pretty obvious, as is the closed position. Too often a carburetor jetting chart seems to indicate a very clear delineation among the effects of the various jets and circuits. There isn't; in fact, there is always some overlap, and bear in mind that carburetor fuel-delivery circuits are cumulative. In other words, even when we're running wide open on the main jet, the pilot jet is still supplying some fuel. For this reason we start by addressing the pilot jet first and the main jet last.

THE BEGINNER'S GUIDE TO JETTING *Pilot circuit;* 0 *to* 1/4 *throttle*
Start by bringing the engine up to operating temperature. Open the throttle slightly does the engine pick up speed smoothly? If it doesn't, the fuel-mixture screw may be out of adjustment or the pilot jet may be either too small or too large. To determine the pilot screw setting, adjust the idle-speed screw so that the engine is idling slightly fast, somewhere between 10 and 20 percent above

the recommended idle speed. Using either the manufacturer's or the jet kit's recommended pilot screw setting **as** a starting point, turn the fuel screw left or right between 1/4 and 1/2 of a turn. Select the screw position where the engine speed increase is the greatest. Readjust the idle speed to the correct level. Next, take the bike for a ride, preferably on a relatively quiet, straight section of road. Using your throttle index, run the bike at 1/4 throttle. If the pilot jetting is correct, the engine should run smoothly, and it should be easy to maintain a constant speed without varying the throttle position. If the bike surges or hunts, the pilot jet is too small (lean). Other indications that the pilot circuit is lean are popping or spitting through the carburetor when the throttle is opened and popping or backfiring through the exhaust when the throttle is shut. If the pilot circuit is rich, the engine will have a rough idle or may not return to idle without "blipping" the throttle. You may also notice a distinct smell of raw fuel and some eye irritation from the exhaust.

Lowto high-speed transition; 1/4 to 3/8 throttle

Although the throttle cutaway plays a significant role between 1/4and 3/8throttle, it is seldom changed when rejetting a streetbike, particularly a cruiser. For that reason I'll gloss over it. Basically the only time the cutaway needs changing is when the transition from the lowspeed fuel circuit (pilot jet) to the highspeed circuit (needle, needle jet and main jet) gets seriously out of whack.

Medium throttle opening; 1/4***to*** 3/4***throttle***

The fuel delivery at this stage is controlled by the jet needle and the needle jet. At one time all carburetors came with adjustable jet needles. Once the smog Nazis got involved, fixed-position needles became the standard. Jet kits will usually include new needles that can be raised or lowered to suit or, less often, shims to change the height of your stock needles. To evaluate the needle/needle-jet performance, run the motorcycle in second or third gear. Roll the throttle on from 1/4 to 1/2throttle only. The engine should accelerate cleanly without sputtering or bogging. If it does, you're **all** done with the midrange; if it doesn't, you'll need to do some experimenting to determine if the needle position is too rich or too lean. Assuming you've installed adjustable needles from the kit, begin your experiments by trying some alternative ,needle-clip positions, perhaps a step richer to begin with. If that makes the situation worse, try ***a*** step leaner. If the jetting is stock and problems crop up, it's time to order the appropriate jet kit.

Top end; 3/4 ***to wide open***

At this stage of the game, the majority of the fuel flow is controlled by the main jet (remember some fuel is still flowing through the pilot jet). The time-honored method of determining main-jet size is via a plug chop. If you've never done one, a plug chop is pretty simple. Start with new spark plugs. Run the bike flat out (full throttle), in as high a gear as possible, for eight to 10seconds (don't hold the bike at the rev limiter, as it'll give you a false reading). Without cutting the throttle or slowing down, simultaneously pull in the clutch and hit the kill switch. Coast the bike, with the clutch still in, onto the shoulder and pull the plug(s). The plug

insulator should be tan to grayish-white. **A** white plug indicates a lean mixture; a dark gray or black one means it's rich. You then select the main-jet size accordingly. Unfortunately, plug chops present a few problems. Some bikes require an inordinate amount of work to remove the plugs-at least more than you want to do on the side of the road with a smoking-hot bike. And in most parts of the country, the law takes a very dim view of banzai runs down the main drag followed by an impromptu tuning session on the side of the road. The alternative, and the method I personally prefer, is to use a dyno. It's certainly a lot easier and arguably more accurate, but it may not be convenient.

IS SHE LEAN OR RICH?

One of the reasons I'm so stoked on jet kits is because they remove 95 percent of the guesswork. Be that as it may, even the best kits require some fine-tuning. Essentially a jetting problem can always be reduced to one of **two** choices: Is it lean or is it rich? To determine if the bike is lean at any given throttle opening, partially cover the air-filter intake with a piece of duct tape; if the carburetion improves, it's running lean. If you suspect the bike is running rich, remove the airbox top or the air cleaner; if the changes are for the better, the bike was running too rich. If your bike is equipped with a manual fuel shut-off (or you're clever enough to disconnect and plug the fuel lines), take the bike for a ride with the fuel turned off. If it runs worse as the float bowl drains, it's lean. If it gets betteryou guessed it-it's rich.

TROUBLESHOOTING

A lean condition is the end result of too little fuel and too much air. Slightly lean conditions create drivability problems. Worst-case scenario: Lean conditions can and do destroy engines. Holes in the pistons, burnt valves and trashed main bearings are the direct result of lean mixtures.

Typical Lean Conditions

Poor acceleration; the engine feels flat. The engine won't respond when the throttle is snapped open, but it picks up speed as the throttle is closed. **(A** too-large main jet **also** mimics this symptom.) The engine runs hot, knocks, pings and overheats. The engine surges or hunts when cruising at part-throttle. Popping or spitting through the carb occurs when the throttle is opened. Or popping and spitting occurs through the pipe on deceleration with a closed throttle. The engine runs better in warm weather, worse in cool. Performance gets worse when the air filter is removed. Rich mixtures are the end result of too much fuel and too little air. Rich mixtures waste fuel, contribute to carbon buildup and pollute the air.

Typical Rich Conditions

Engine acceleration is flat and uneven and loses that "crisp feel. The engine "eight-strokes" as it loads up and skips combustion cycles. The engine's idle is rough or lumpy, and the engine won't return to idle without "blipping" the throttle. The throttle needs to be open continuously to maintain acceleration. Black, sooty

plugs, a sooty exhaust pipe and black smoke from the tailpipe that stinks of unburned fuel. Poor fuel economy. The engine works better when cold. Performance falls off as it warms up or the ambient temperature rises. Engine performance improves when the air cleaner is removed.