Adjusting Idle Mixture on CV carbs, using throttle response method

Introduction

With so many people now performing their own carb rebuilds, especially if they now have an aftermarket exhaust or altered intake, I felt it was time to revisit the method of adjusting the idle mixture.

The “standard” procedure involves setting each idle mixture screw one at a time to the point of best/smoothest idle, then adjusting idle speed if needed. This is impractical for bikes with CV carbs, since the effects of the needed ¼ to ½ turn adjustments to one idle mixture screw are imperceptible to ordinary mortals.

In this procedure, we instead pay careful attention to the behavior of the bike as it transitions off idle and then returns to idle, and adjust all idle mixture screws to the same setting.

We will assume that you are starting with correctly cleaned carbs, jetting spot-on, float levels set perfectly, and the engine in good condition, with good compression, correct valve clearances, fresh clean spark plugs, and a properly operating and timed ignition system. Setting the idle mixture in this way falls under the category of final fine-tuning -- it does not affect jetting, and cannot be used to compensate for other deficiencies.

Objective

The pilot air/fuel screws (a.k.a. fuel mixture screws, hereafter, for brevity, referred to as screws) are used to adjust the ratio of fuel to air at idle in the CV fuel system. Too little fuel and the mixture will be too lean. Characteristics of a lean condition are a hanging idle (slow to return to idle), high idle, idling at higher RPM as the engine warms up, and a “racing idle” -- difficulty returning to the pre-set idle level. You may also need to leave the choke on for an extended time (more than one to two minutes) to keep the engine running or to be able to ride the bike safely.

Too much fuel and the mixture will be too rich. Characteristics of a rich condition are an inability to stay at the pre-set idle level, dropping off of idle level and dying at idle. If the bike starts to die at idle after a few miles, a too-rich idle mixture may be fouling the plugs. You may even be able to start the engine cold without using the choke.

If you have correct air to fuel levels at idle the engine will return to the pre-set idle level easily and the engine will neither race nor die at idle. The engine will require choke to start, but can be safely ridden away immediately with the choke partially engaged, and will idle normally with the choke off within a minute. Once the choke is off, idle speed will not increase as the engine warms further.

This procedure is also written so that all pilot air/fuel screws will be at about the same setting. Thus one cylinder will not be doing any more work relative to any other cylinder. This is the objective, and correct execution of this procedure will obtain this setting.

Tools needed

Box fan of some sort to cool the engine while the adjustments are being made
On some bikes, you can prop the rear of the tank up a bit and access the screws with a short screwdriver.
On other bikes, you'll need a fuel reservoir, a cap or plug for the vacuum line, and a long skinny flat blade screwdriver for turning the screws.
Open area, such as the driveway, carport or an open garage.

Definitions

Pilot air/fuel screw - This is the idle adjustment screw the factory hid under a metal cap. It is now accessible and will be used to set the idle mixture.
Richen the mixture - rotate the pilot air/fuel screw counter-clockwise
Lean out the mixture - rotate the pilot air/fuel screw clockwise.
Blipping the throttle - a quick application of the throttle, revving the engine to 3,000 - 5,000 rpm, by quickly opening the throttle to ⅓ to ½, then releasing the throttle immediately. (If the throttle does not snap back immediately, fix the problem with the mechanism before proceeding.)
Hanging idle - when you blip the throttle, the revs stay high and come down slowly.
High Idle - the idle increases, or after blipping the throttle they settle down at a higher number, such as 2000 rpm instead of 1300 rpm.

Setup

Put the motorcycle on its center stand. If not available, stand it up straight with a track stand, trusted friend, or yourself. This levels the fuel in the fuel bowls so as to obtain accurate results.
Turn all the screws to the same setting, usually 2 - 2½ turns counter-clockwise from being lightly seated. If you have increased the pilot jet size by one size or the idle has been running rich already, you may need to start at 1½ or 2 turns
Connect the fuel reservoir and place it at a level approximately the same height as the fuel tank when installed. Pour an appropriate amount of fuel into the reservoir.
Place the box fan in front of the engine and turn it to high.

Performing the adjustment on the center stand

Start then engine and let it warm up enough so that it runs without the choke.
Set the rpm to around 1,300.
Blip the throttle and observe its response.
If it returns to the original speed quickly, but dips below that (or dies) before returning to normal idle speed, the mixture is too rich. Rotate the screws clockwise ½ turn.

If it stays at higher rpms, and/or takes too long to drop back down to idle, the mixture is too lean. Rotate the screws counter-clockwise ½ turn.
Repeat until the engine does not hang or stay at high idle and does not dip below the pre-set idle speed. It should rev up and drop back down in a reasonable time.

Once this is accomplished, you are ready for a road test. You must road test because the work you have done was not under real world conditions. For example, the engine may have gotten too hot. This would simulate an over-lean condition and cause you to add too much fuel. It this occurred, when you get out on the street it will run too rich and die or sputter when the throttle is released. Other errors may have been introduced; you will not know until you ride it in the real world.

Road testing and fine tuning
Put everything back together and take a ride. Observe the behavior.
Does it try to stall or even die? Lean it out ½ turn and try again.
Does it take too long to drop back to idle? Richen it ½ turn and try again.
It may be necessary to use ¼ turns if it is on again off again. Once you make any adjustment, you must perform another road test. Repeat until riding in the real world yields correct results.

During road testing, it's common to find that you need to richen the idle mixture by ¼ to ½ turn in order to smooth the off-idle transition and eliminate a very slight stumble.

The valid adjustment range of the idle mixture screws is approximately ¾ turn to 3 ½ turns. If you find that you're outside or near the edges of this range, you may need to install the next size larger or smaller pilot jet. Even with aftermarket intake and exhaust, you may find that the stock pilot jets work best.

At the end of the road testing and fine tuning you should be good to go.

Notes
You may have to turn the idle up or down a bit during the testing phases. This is normal and is no indication of any type of failure to execute the process correctly. During the adjustments on the center stand, the engine may get too hot even though a fan is blowing on it. This may cause the readings to be slightly off, but should not disallow adjustments from being made.

Test Bed 1	Test Bed 2	Test Bed 3
1983 GPz 750	1983 GS750E	1983 GS850G
Wiseco 810cc kit	4-1 Exhaust	Bone Stock
K&N pods	1 over main jet	
Kerker 4-1 exhaust	1 over pilot jet	
DynoJet Stage III kit		

Written by George Burroughs (koolaid_kid)
Proofread and modified by Brian Wringer (bwringer)