

FOUR-STROKE JETTING TRICKS – TUNING YOUR WAY TO THE TOP

(Reprint from Dirt Bike Magazine, May 1998)

YOUR BASIC THUMPER CARB

Your engine is basically an air pump, and your carb meters how much air and fuel are sucked into that pump. Even though they may differ wildly in size, shape and design, all four-stroke carburetors have the same basic parts or circuits. Your slide cutaway (or throttle valve) needle and needle jet will all affect your bike's acceleration from one-quarter to three-quarters throttle, and this is the most important area for off-road riders, since we spend the most time at these throttle settings. Due to the hassle of making changes to these circuits, these are the most neglected areas of tuning. Too rich jetting (too much cutaway, needle positions too high, too large a needle jet) can make your bike lunge and hard to control. If it's too lean in this area, the bike will feel really flat and down on power, but will respond quickly to changes in throttle position. It may detonate (ping) under a load too. Pinging can also be caused by too little octane or winterized fuel (oxygenated, blended with additives), so keep in mind any fuel changes if your bike suddenly starts detonating in otherwise "normal" conditions.

Your main jet is probably the most talked-about circuit, and it's as critical to get it right on a four-stroke as with a two-stroke. The main kicks in at half throttle and takes over metering duties as you hit full throttle. If your main is too rich, the bike will sputter and surge as it tries to burn all of that fuel. Too lean, and the bike will run flat or have a flat spot in the powerband. A severely lean main will cause your bike to seize just like a two-stroke. It's better to be slightly rich on the main than slightly lean, because it will run cooler.

Yamaha's new 400s have an accelerator-pump circuit. This system squirts a stream of raw fuel into the carb venturi every time you wick the throttle. Think of it as the four-stroke's PowerJet carb - it richens the mixture to run best at lower engine speeds, yet allows a leaner top for more over-revs. If you radically modify your engine (flowed head, hot cam, etc.), you may have to richen this circuit slightly, but it's otherwise not something you mess with for mere weather or altitude changes.

Your pilot jet (or slow jet) controls the idle circuit, or from zero to one-quarter throttle opening. The pilot jet and airscrew control the amount of fuel and air going into the engine at slow engine speeds. It's very important to tune these circuits because they control throttle response and starting. The pilot circuit has a major affect on how well your four-stroke starts -or refuses to start - after a fall. At every event we attend, there is always some four-stroke rider who comes into the pits with his bike revving wildly. Invariably, this rider will say that his bike is hard to restart after a stall, so he turns up the idle adjuster so it won't die.

That's like jumping from the frying pan in to the fire. Thumpers are only hard to start when they are jetted poorly or when the wrong technique is used. The rider who turns up his idle is only perpetuating the myth about thumpers being hard to start. Most manuals (and this magazine) tell you that you should not touch the throttle when you kick a thumper. Well, turning the idle up is mechanically opening the throttle, right? You will make, your bike even harder to start. You have to fix the problem, not the symptoms of the problem!

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GENERAL JETTING TRICKS

Your bike's owner's manual is a great source for recommended jetting and tuning tips. If you bought your thumper used and don't have a manual, get one. Set the idle speed as per your manual. If it won't start easily using the manual's technique, your pilot jet is the likely culprit.

Whether your bike is air or water cooled, you should start it and get it up to race temperature before tuning the pilot circuit. A hotter engine will run leaner than an old one, so failure to properly warm the bike will result in a too-rich setting. With the bike up to temp, adjust the airscrew so that the bike runs and responds best to slight throttle movements. Now, kill the motor and see how many turns out you have on the airscrew. Less than one, and your pilot is too lean. More than two, and it's too rich. Install the next-size pilot and repeat the test.

Most off-road bikes are jetted lean to meet emissions standards, so you will likely want to richen these circuits, especially if you have gone to an after-market pipe, air filter or even removed OEM baffles (pipe and/or airbox). If you remove the muffler diffuser, you should toss the airbox stuffer too, or the airbox won't be able to draw enough air to feed the engine. Most aftermarket companies will give you recommended jetting, so use this as a baseline.

Under most conditions, about the only time you will need to go leaner on an EPA-legal four-stroke is because of altitude. Air is thinner at higher altitudes, so it contains less oxygen, and your jetting will be too rich. You will want to go down a size on the pilot, one or two on the main and lower the needle a position (raise the clip).

Cold air is denser than warm air, so it holds more oxygen. On cold mornings, your jetting will be slightly rich, but thumpers are less susceptible to changes than two-strokes. Where you might change the pilot on a two-stroke when it's really cold, an airscrew adjustment will suffice on a thumper.

The same is true for barometric pressure. As the barometer rises, the pressure compresses the air, and your jetting will be slightly lean. A falling barometer causes a rich condition, but thumpers don't care about the weather as much as two-strokes.

THUMPER TROUBLESHOOTING

Overall, the Yamaha YZ400F is jetted almost perfectly from the factory; however, it is very picky about its air filter. Do not over-oil the filter, and do not expect it to start immediately after oiling the filter. Let it sit overnight (not in the cold) to allow the carriers to evaporate. Better yet, keep spare filters in a plastic bag so that you never put a freshly oiled filter in the bike on race day. Modifications throw stock jetting out the window, so this troubleshooting guide will apply to the 400F as much as any other four-stroke.

BIKE WON'T START AFTER A CRASH

- Pilot too lean
- Idle set too high
- Improper starting procedure
- Bike wants hot-start button (KTM's and 400F's)

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BIKE RUNS ON OR WONT IDLE DOWN WHEN THROTTLE IS CHOPPED

- Idle set too high
- Air leak in intake or engine
- Pilot too rich (when bike is hot)

BIKE WONT START WHEN COLD OUTSIDE

- Pilot jet too lean
- Air filter over-oiled
- Motor oil too thick for temperature

BIKE SPUTTERS/WONT CLEAN OUT AT HIGH RPM

- Main jet too rich
- Air filter over-oiled
- Spark plug has debris on electrode

BIKE COUGHS & STALLS IN SLOW TURNS

- Pilot jet too lean
- Idle set too low
- Valves set too tight
- Decompressor is set too tight, so turning the bars engages release slightly

BIKE HESITATES OR BOGS OVER DEEP WHOOPS OR G-OUTS

- Float level too low
- Carb vent tubes blocked
- Main jet splash shield not installed
- Float level too high, gas is trapped in vent tubes (install T-vents)

BIKE STARTS BUT WONT TAKE THROTTLE WITHOUT SPUTTERING

- Pilot jet too rich
- Water in fuel
- Debris in main jet

BIKE SUDDENTLY STARTS SPUTTERING/GAS FLOWS FROM VENT TUBES

- Stuck float check valve
- Debris in gas or carb

BIKE RUNS HOT/FEELS SLOW & FLAT ON STRAIGHTS

- Main jet too lean
- Fuel octane too low, causing detonation

BIKE COUGHS & STALLS WHEN YOU WICK OPEN THROTTLE

- Needle too lean
- Slide cutaway too lean
- Pumper circuit blocked or too lean