Saito Tuning,

Final tuning, after engine has been run rich for break-in

1. START the engine at low throttle and let it warm up for a minute or two. When starting, the throttle (carb opening) should be set somewhere from slightly above idle setting to not more than about 1/4 throttle. After the engine starts set the throttle trim (on the transmitter) for a low reliable idle speed (about 2200-2500 rpm or the lowest reliable rpm you can get) when the transmitter throttle stick is all the way back at the lowest throttle setting. Do not attempt to adjust the low-speed mixture needle (step 3 below) until you have set the high-speed full-throttle mixture (step 2 below)

2. HIGH SPEED ADJUSTMENT

(a) Leave the glow driver on. Set full throttle (move transmitter stick all the way forward) and adjust the main high-speed mixture needle adjustment for maximum rpm by slowly turning in clockwise to lean the mixture. The maximum rpm is difficult to hear by ear and a tachometer is usually necessary. As you slowly lean the mixture (turning needle in - clockwise) the rpm will increase; you will find a point where the rpm is fairly constant as you lean the mixture, then further leaning will make the engine rpm drop, or the engine will stop, or it might backfire. At the point where the rpm starts to become relatively constant, stop leaning the mixture. Then richen the mixture a little by turning out from the peak rpm setting; ideally this point should be about 200-300 rpm slower than the maximum rpm. Do not lean the mixture too far past the maximum rpm point; doing so will make the engine stop, and possibly backfire and throw the prop off. If in doubt keep a slightly rich setting. FOR SAFETY REASONS ALWAYS GET BEHIND THE ENGINE WHEN TESTING FULL THROTTLE.
At this time the engine should run without the glow igniter so remove it. Then re-check the high-speed mixture setting at full throttle because it may be a little different with the glow-plug igniter off.

3. LOW SPEED AND MID-RANGE ADJUSTMENT

The low-speed throttle mixture is controlled by the low-speed needle in the center of the throttle arm (except for Saito-30 that has the low-speed mixture adjustment screw elsewhere - see picture above). Do not touch the high-speed needle setting at this time. This low-speed mixture adjustment affects the the low-range throttle mixture; it has minimal effect on the mixture for about 1/2 speed throttle and higher full-throttle mixture. You want the leanest possible low-speed mixture setting so that the engine does not die when the throttle stick is quickly advanced from lowest to full throttle. To accomplish this, first (using the throttle trim on your transmitter) set the idle rpm (keeping the throttle stick full back) to the lowest rpm that the engine will reliably run with low throttle (ideally about 2300-2500 rpm but initially you may not get much lower than 3000 rpm or so). Then quickly advance the transmitter throttle stick to 1/2 throttle; then try repeating from idle to full throttle; the mixture should be a bit rich at this time and the engine

should probably hesitate a bit as it picks up rpm. (If it instantly dies the mixture is too lean, then richen up the mixture by opening one turn and start again).

Assuming you are starting with an overly rich mixture (needle top near flush with top of throttle arm) lean the mixture by turning in clockwise 1/8 turn, then try advancing the throttle again. Keep doing this in steps of 1/8 turn in (leaner) until the engine quits when you rapidly advance the throttle stick; then richen (turn out counter-clockwise) 1/8 turn. The initial low-speed needle for a new engine is typically quite rich, so expect to turn it in about a turn or so, but do it in steps of 1/8 turn at a time. *Note:* for the Saito-30 the same procedure applies except you turn the screw counter-clockwise to make the low-speed mixture leaner. On new engines the low-speed mixture is set fairly rich, so it may take a fairly large number of 1/8 turns in to get to the best setting.

You will notice that as you lean the low-speed needle mixture the low speed idle rpm will increase, so the throttle trim on your transmitter should be reset as necessary for a lowest rpm value of about 2200 - 2500 -- or whatever is a reliable lowest rpm value that the engine won't quit. Don't try to get the idle rpm below about 2200-2400 for a new engine.

<u>The objective is to get the leanest possible low-speed needle setting such that the engine does not quit when you quickly advance from lowest throttle idle to about 1/2 throttle, and also will not quit when quickly advanced from idle to full throttle.</u> Remember - you are adjusting the fuel mixture setting with the low-speed needle to get reliable operation - you must <u>not</u> consider adjusting the low speed needle to set the low-speed rpm. The value of the idle rpm is set with the throttle stick on your transmitter full back and then adjusting the throttle trim on your transmitter - initially don't try setting this too low or else the engine may quit because the engine is getting too little of the fuel-air mixture and not because the mixture is wrong. Set the transmitter trim for about 2200-2400 idle rpm speed for a new engine (or whatever value you feel is reliable). After about 40 minutes time on a new engine I can usually get a good reliable idle of about 2100-2300 rpm with some variation between engines; this is enough time on a new engine to carefully begin flying. After 2 or 3 gallons of fuel you should be able to get a new engine to run reliably a bit lower rpm in the 2000 rpm range and still accelerate to full throttle without quitting. However, the throttle and idle performance will depend on your prop, fuel, and how carefully you set it up the needles. Most models will land quite well with an idle rpm in the range 2200-2500 so don't get too ambitious trying to for a super low idle speed.

It will not be easy to set the low-speed needle setting properly if the high-speed needle is not first set correctly because the mid-range mixture will be incorrect and as you advance the throttle from idle to full power and you are likely to get confused. You should follow the above procedure by first setting the high-speed mixture with a rich low-speed mixture.

Most "engine problems" for new users are not really problems with the engine itself but with the operator and a misunderstanding about how to properly set up the low-speed needle.

The amount of smoke coming from the muffler tells you nothing about whether you have the correct fuel.mixtures. Usually there will be a puff of smoke when the throttle is advanced rapidly.

Low-Speed Mixture Too Rich Symptom: Engine idles OK for a while, say 30-40 seconds, then just quits. Also, you will note that when you advance the throttle quickly from idle the engine hesitates, may blow out lots of smoke, and does not accelerate quickly from idle. Solution - lean the low-speed needle 1/8 turn and try again.

Low-Speed Mixture Too Lean Symptom: Engine idles fine for extended period, then quits when throttle is rapidly advanced. Solution - richen low-speed needle1/8 turn and try again.

4. REPEAT

When you have the low speed mixture setting set to your liking, go back to repeat step 2. again.

5. NOW DON'T MESS WITH IT ANY MORE

After the two carb mixture adjustments are set up it is rarely necessary to ever touch the low-speed needle. The high speed needle may occasionally need minor adjusting (+/- 2 or 3 clicks) if the weather (temperature and/or humidity) changes greatly. If the engine is new you may like to should recheck these mixture settings after 10 - 20 flights. Each time you go to fly, there should be no reason to touch the adjustments.

Keep the main high-speed needle mixture setting slightly richer than the peak rpm setting. If the engine suddenly quits, particularly when the throttle is suddenly advanced from idle, the problem is a too-lean low-speed setting; richen it by 1/8 turn if this is an occasional problem. If the engine quits in flight when you are flying around at half to full throttle it is likely that your main high-speed needle mixture is too lean. (this assumes there is nothing else wrong with your setup like air bubbles in fuel line, dirt in carb, etc)