Hints & Tips:

Tips for Maintaining Winning Performance from your Rotax Max FR125.

Routine Maintenance:

From our extensive research we have found, there are only a few things that are important maintenance issues, and if not maintained, may cause loss of performance. These maintenance suggestions are to enhance those already listed in your Rotax Max FR125 Operators Manual supplied with your engine. It is not a replacement for the manual.

1. Carburettor:

Regularly strip and clean your carburettor, especially the small pilot jets and the filter. To insure you are not going to have carburettor problems, clean it between each heat/race, particularly if you think your fuel supply might be dirty or contaminated. Our normal routine would see us clean it at least once or twice each race day.

If you do this often you will probably recognise problems before they become problems, and with practice, you will be able to do it in just a few moments.

Check the float lever height (3.0-3.3mm from carburettor base to lever and equal both arms, no gasket) for the 5.2gm floats and 2.5-3.0mm for the 3.6gm floats. If you use 5.2gm floats, use size 30 pilot jet and pilot emulsion jets, and if you use 3.6gm floats, use size 60 pilot jet and pilot emulsion jets.

Make sure the carburettor is mounted vertically when installed on the engine.

Make sure the overflow tubes do not have, or get any obstruction. (Immersion into fuel in an overflow fuel container will cause problems). The carburettor must be able to breathe very freely.

It has become evident over years of testing that the carburettor breather tubes can have a large influence on performance, or should I say lack of performance. It is imperative that these tubes have no obstruction; some racing rules indicate that these tubes should have a catch device for any overflows which can make it very possible to get some obstruction. In these situations you must compare your catch device arrangement with having the tubes removed to ensure that there is no performance difference. If there is then change the arrangement and compare them again. We have always used larger diameter tubing with a very short piece of standard size tube at the carburettor end to maximise breathing, and the shorter the overall length the better. The symptoms of breather problems are varied but could be flat spots, popping or fluttering exhaust, or many other engine running irregularities.

There are five needle clip positions numbered from the top. Our testing has found that usually if you need to use the extreme top or bottom grooves, it is better to change the main jet. i.e. If you need to use groove one (lean) then change to the next leaner main jet and put the needle clip in groove 3 or 4. However the needle clip position is more related to track requirements rather than ambient conditions, and would generally be the same setting at any particular track.

You may find that the Main Jet size indicated by the calculator in some circumstances may not be the perfect jet, for example the calculator may return (168 – Rich), sometimes (generally track specific), you may gain by using a 170 jet with a lean needle setting. However if you use the jet shown your performance will be very close to best. We have found that the perfect jet is rarely richer than indicated by the calculator, but never more than one jet leaner for sprint racing.

Don't be eager to blame the tuning for lack of performance, the engine will give almost the same performance using a whole jet size either way of optimum. Look first at the other points below and the chassis for performance gains.

2. Spark Plug and Spark Plug Cover:

The spark plug is probably as important as the carburettor. A spark plug that is very slightly faulty may not even work in a Rotax Max, let alone detract from top performance. I have seen plugs that won't even fire in the Max, put into a Yamaha KT100s and perform perfectly.

Replace the spark plug frequently and only use Iridium spark plugs. Iridium plugs make the engine run much cleaner and therefore make more power and better performance. Do NOT use spark plugs made for normal kart engines.

Our choice of spark plug is “NGK Irratop9” for use in most Australian conditions; it is a protruded nose plug which is less likely to foul. Our testing has found that NGK Irratop 8 or 9 produce the most reliable performance, and some say that dyno results prove they produce slightly better performance. **When using Irratop plugs, always put a cable tie around the plug cover to keep it on, the insulator is slightly smaller than regular plugs.**

Check the spark plug cover for any metalic debris caused by vibration at the connection to the spark plug. This will cause current leakage and detract from performance.

If you need to warm your engine pre race, to avoid the plug fouling during a race, use an old plug to warm your engine, and then replace it with your race plug.

Always use an old plug for warming your engine on the stand to avoid fouling you race plug.

Never use a plug gap greater than 0.55mm (0.022”) with the old ignition system. The new ignition system is said to be slightly higher voltage so it may tolerate a slightly larger gap which may produce better performance, but until I know for sure, I recommend the above as the maximum gap.

3. Power Valve:

The power valve requires routine maintenance between race meetings. The following is for the green bellows now supplied by Rotax. Inspect the bellows, visually for leaks of unburnt fuel, and by applying a very small rotational force to the piston. If it can be turned very easily it means that unburnt fuel has penetrated the seal between the PV body or the piston and the bellows, and is time to renew the bellows.

With the PV in your hand, depress the piston fully and check to see if the shoulder of the valve is protruding beyond the sealing gasket. It must be protruding for the power valve to fully close; if it does not fully close it will result in loss of low end performance. If this is the case then you need to either replace the valve or repair it in a manner that resolves the problem. It is normally caused by the stud becoming loose in the valve and when tightened it screws in further and is then not long enough. I have repaired many by inserting a small piece of rod of the correct length into the tapped hole so that the stud cannot screw beyond the correct position, using a good loctite to prevent it ever coming unscrewed. Once the stud has been ‘Loctited’ into the valve it should **never** be required to be undone.

Check the gasket for damage that may affect sealing, and if all these things are OK then just clean with a soft rag, decarbonise the valve and refit.

Do not disassemble the bellows or rotate the piston unnecessarily unless you are going to replace the bellows. Once the seal is broken it will only become looser and will eventually allow the piston to rotate with the vibration and the valve will unscrew and not be able to fully open.

If you need to change the bellows, disassemble all the components except the stud from the valve, and clean thoroughly.

Assemble the power valve according to the Rotax Max Manual, and make sure that the valve slide has full travel. The shoulder of the valve slide should stop against the machined cylinder face; you will hear a metallic sound if you depress the valve quickly until it stops.

The valve slide chamfer should be parallel to and level with the roof of the exhaust port when fully open.

When assembled the plastic piston should not turn in the bellows, if it turns easily it may unscrew during operation, Rotax now provide a stronger spring band to hold the bellows tight on the piston which has solved most of the previous problems. Use the hooked end of the spring that holds the PV cap in place, to fit the stronger spring band. A thin tie wire is a good emergency cure.

When fitting the power valve to the engine, make sure that the valve moves very freely after the screws are tightened.

For series 1 and early series 2 engines measure the coil spring for length; it should be 42mm to 43mm long (42.5mm ideal) for use of standard settings. (i.e. most tracks 2 turns out) If the spring is shorter or longer you would have to adjust the power valve to suit the difference.

The new replacement springs now seem to be shorter (approx 40mm); this suits the later series 2 and series 3 engines better because they have a little better bottom end power. **Do not stretch the springs,** screw the adjuster in or out to compensate. If you stretch the spring it changes the spring characteristics, then you are only guessing. The power valve spring can cause huge losses of power if not set correctly.

We have recently found that in some rare cases the springs vary in spring rate from average, and cause a problem finding the right settings. We believe that a spring with a bigger difference in rate between the closed length, and the open length, will give you a better spread of power. The settings for a spring like this may be screwed in fully to get bottom end, but because the spring is weaker when in the valve open position, you still get good top end.

The most common symptoms caused by the power valve are:

Lack of bottom end power: either the valve is stuck open, or the spring is too short or weak for the setting you are using. Check for correct operation, or screw the adjuster in to suit.

Lack of top end power: the bellows is leaking, the valve is stuck closed, or the adjuster is screwed too far in.

If your engine has been popping, check that the bellows has not blown off the piston. The sudden rise in exhaust pressure caused by the popping (exploding of unburned fuel in the pipe) may be sufficient to blow the bellows off. This may cause the power valve to not open fully and will result in loss of top end performance.

4. Reed Block:

The reed block assembly does not require very much maintenance at all; however, you need to check the reeds for dirt after any off track excursions. When renewing the petals, make sure that they are installed right side up. Make

sure that the stops have at least 21.5mm between them when the reed block is installed on the engine. Many engines have smaller reed block openings in the casting, and cause the stops to be squeezed together when the reed block is fitted. To overcome this problem you may be permitted to fit more gaskets, or a spacer, between the reed block and the cylinder (in Australia, up to 4mm) so that the block does not insert as far and keeps the stops clear of the casting.

The reed stops being too close may cause lack of top end power.

5. Fuel Pump, Filter & Fuel Lines:

For sprint kart use the fuel pump is more than capable of pumping enough fuel providing that the fuel level is not too low, (relative to the engine) and there are minimal restrictions to the fuel flow. Fuel filters should be regularly replaced and fuel hoses should not be too long, should not have kinks or sharp bends and should fit tightly over all connections to tank, pump, and carburettor to avoid air leaks. A very small air leak in the fuel line may cause the fuel pump to give inadequate supply to the engine, causing flat spots on acceleration. Fuel tank pick-up should swing freely across the tank base so that the possibility of sucking air on fast turns is minimal.

The fuel pump should be fitted as low as possible, it will pump fuel up OK but will not suck fuel very well. Pump diaphragms should probably be replaced when you rebuild the engine.

Pulse line should not have kinks or sharp bends that may cause obstructions and should be as short as possible, and free from air leaks.

6. Exhaust System:

Regular inspection of the muffler core tube and sound insulating mat, and replacement if necessary, will avoid loss of performance due to broken core tube or burnt out mat. Broken core tube seems to be a common problem and I would suggest regular replacement. Rotax now supply a redesigned core tube that has hopefully overcome this problem.

Check pipe and all mounting points for wear and crack's, and replace pipe or brackets as required.

7. Battery:

Never let your battery go less than half charge, with this type of battery the most common failure is because they have been allowed to go completely flat. Recharge battery at the completion of each days racing or more often if necessary.

If possible, mount your battery at the front end of your kart. This has two advantages, first it helps with weight distribution on the kart, and second, the vibration at the front of the kart is much less than at the rear, vibration being the next most common cause for failure of these batteries.

8. Wiring Loom:

Ensure your wiring loom does not move at connection points (switches etc.) with movement of steering or any other kart components. Connections will eventually become loose and fail.

When disconnecting joints never pull them apart by the wires, always pull on the connectors, the wires can easily pull out from some of the connectors particularly on the starter motor wire.

Symptoms and Cures:

Symptoms and Cures for Getting Good Performance for your Rotax Max FR125.

Lack of Bottom End Power, (sluggish off corners).

Engine:

Check the Power Valve Spring and operation. (Refer maintenance sheet)

Check the spark plug. (Refer maintenance sheet)

Set the fuel mixture a little richer by moving the needle to the next richer position or fitting a slightly bigger pilot jet may help with some track conditions.

A drop in bottom end power will occur if your engine water temperature reaches 70°C or more during racing. To gain a little more power early in a race do not warm your engine pre race except in very cold conditions and first start for the day, it will reach sufficient operating temperature with the usual couple of warm up laps. The optimum operating water temperature is 55°c, at 65°c the torque starts to drop off and by 70°c it is quite noticeable.

Always use an old spark plug for warming up, and fit your good one for racing. When running the engine on the stand it will run very rich and will foul the spark plug in time.

Never over rev your engine on the stand, and keep a little load on it with the brake; this is the cause of many engine failures.

Check the exhaust system. (Refer maintenance sheet)

Chassis:

Check your kart manual for factory settings for the Rotax Max.

Set the chassis to be a little loose at the rear, move the centre of mass forward until it is obviously too far, and then move it back until it performs best.

Sometimes you need the chassis quite loose at the rear, very carefully feeding the power on slowly to get the best results. A chassis set-up that produces a lot of rear grip will always kill an engine around corners, and as a result, many drivers think their engine is inadequate.

Older tyres may not be working as good as new ones.

Lack of Top End Power:

Engine:

Check the spark plug and plug cover, this problem is usually associated with some slight misfiring or engine not running smooth. (Refer maintenance sheet)

Check the reed block stop opening. (This is usually only applicable if you have never or rarely achieved good top end or have replaced the reed petals) (Refer Maintenance sheet)

Check the reed petals seal.

Check the main jet size with the one calculated by Jet-Plus.

Balance shaft out of timing may be the cause, sometimes the teeth on the plastic gears break and get out of timing, but this is usually associated with abnormal vibration.

Check the power valve bellows condition, settings, and that the bellows has not blown off the piston.

Chassis:

Check your kart manual for factory settings for the Rotax Max.

Check the gear ratio, sometimes reducing the driven sprocket by a tooth or even several teeth may give the desired result, but sometimes adding a tooth or two will do the job.

The engine produces good power between 7,500 and 12,500 RPM, so try to keep the bulk of you lap time in this range.

Lack of Straight Line Speed:

The ignition timing curve takes a sharp dive to 20° after TDC at about 12,500 RPM and acceleration from then on only diminishes. If you are coming out of a corner above 12.500 RPM and you are not already accelerating you will not get any faster, this is the situation where reducing the driven sprocket by 1 or 2 teeth will definitely help. The more acceleration (not speed) you have when you reach 12,500 RPM the more likely you are to reach high speeds.

Engine is Popping:

To new Rotax Max owners, this seems to be a major problem, but if you use the correct jet, and keep up the maintenance, it is very rare.

Check the spark plug. (Refer maintenance sheet)

Check the carburettor, if using the jet calculated by this program, popping is very rare but an occasional pop sometimes indicates the mixture may be too rich, or in very rare cases, too lean. Blocked jets etc. may cause popping. (Refer maintenance sheet) Moving the needle to the next leaner position may help.

If the fuel mixture is too rich the popping is caused by fuel exploding in the expansion chamber and is quite distinct.

If the fuel mixture is too lean the popping is caused by irregular pressure in the expansion chamber and usually sounds a bit fluttery.

Check the power valve, it may be sticking, bellows too weak, or spring too strong. (Refer maintenance sheet)

It can also be contributed to driving habits of some new drivers.

Engine will not start:

Check the spark plug; if it is dry your problem will be lack of fuel. If it is wet, then your problem may be electrical, or simply the spark plug fouled.

If the plug is wet, then fit a new/clean plug, but before you do, turn the engine over several times with the throttle full open, to allow air to flow through and help clear the oversupply of fuel and check for spark.

Check all wiring connections, especially the ones on the ignition switch and start button.

Check the battery condition, it may have enough charge to turn the engine, but not enough to fire the ignition spark, or it breaks down with vibration.

If the plug is dry then check that there is fuel in the carburettor, if you have just cleaned it you will need to prime it by pressurising your fuel tank to force the fuel into the carburettor.

Check fuel lines for possible air leaks.

If necessary use the choke but only for a few engine revs, it allows a lot of fuel to pass through and don't forget to turn it off when the engine starts.

General Chassis Set-up:

How DPR looks at chassis set-up:

This is a suggestion only, do your own thing to work out the settings that work for you.

We follow a few basic principles to set-up the chassis as follows;

1. Set the scrub radius as small as possible. (Front wheel track narrow)
2. Experiment with rear wheel track until you get the best result (Usually on the Arrow for 180kg class at around 1380-1395mm overall on a good track)
3. Adjust tyre pressures to get best results.
4. Adjust weight balance to get best results (If carrying ballast shift some forward or backward to find which direction produces the better result)
5. Adjust steering geometry to get best results.
6. Try different combinations of the above until you have the best results.
7. If the kart is understeering, an increase in positive camber will probably help, but try to distinguish which part of the corner it is understeering, (entry, mid, exit) and refer to your kart manual for factory recommendations.
8. If the kart still understeers after trying every other possibility, widen the front track. As you widen the front track you gain more release on the inside rear wheel, but you also increase the scrub, which slows the kart when turning.
9. We try to achieve as little turn of the steering wheel as possible, with the least amount of understeer as possible, without losing the rear, tending towards a loose rear if necessary.

Hope this helps you achieve your goals, and remember; the end result relies on the amount and quality of the input.

Add your own notes etc. here.