

BREAK-IN PROCEDURE

IMPORTANT Your XL RFS series engine is a ringed engine. A ringed engine is designed differently from a typical ABC designed engine that you might be more familiar with; therefore you will not feel much hesitation as the piston moves through the top of the stroke. A ringed engine does not have any taper in the sleeve. Ring tension is what seals the combustion chamber. When the engine is brand new, it will not feel like it has much compression. This is because the ring has not yet been seated with the sleeve. After the engine has been broken-in, compression will increase. The break-in procedure will guide you through the steps necessary to properly break in your new XL RFS series ringed engine. Please follow the steps closely.

The break-in process allows the engine parts to perfectly fit each other and properly protect each part from premature wear. The engine should be broken in using a fuel that contains no more than 10% nitro methane and no less than 18% Castor/synthetic blend lubricant. Fuel containing only synthetic lubricants should not be used during the break-in procedure. For the break-in procedure we recommend mounting the engine into the airplane it will be used in. This way the muffler, fuel tank and throttle linkage can all be tested in combination with the engine. If your airplane uses a cowling, it should be removed during the break-in procedure.

- 1) Turn the high speed needle valve out 2-1/2 turns from the fully closed position.
- 2) If you are using an electric starter to start the engine, follow the procedure in the previous section. If you are starting the engine by hand, follow that procedure in the previous section.
- 3) Open the throttle barrel to approximately 1/4 throttle. Connect the power to the glow plug. Start the engine using an electric starter or by hand. If starting by hand you will need to vigorously flip the propeller through the compression stroke several times before the engine will start.
- 4) Once the engine starts, open the throttle barrel to about 1/2 throttle. You may need to lean the high speed needle valve in about 1/4 turn to keep the engine running at half throttle.
- 5) After the engine has been running about 1 minute, remove the power from the glow plug and slowly advance the throttle barrel to full throttle. Adjust the high speed needle valve so that the engine is running very rich. You should notice excessive white smoke coming from the exhaust. Let the engine run for approximately 10 minutes then stop the engine.
- 6) Let the engine cool for approximately 10 minutes then restart it. Set the high speed needle valve mixture to a slightly leaner setting, about 1/4 turn more in. Let the engine run for about 5 minutes at this setting, then stop the engine and let it cool for approximately 10 minutes.
- 7) Repeat the procedure in step #6, while leaning the needle valve slightly more each time. In all, you should run the engine about a total of 45 minutes of actual running time. After 45 minutes of run time the engine is ready for flight. Fly the airplane with the engine set as rich as possible, but with adequate power to fly the airplane. After each flight, lean the mixture slightly. Continue to do this for about 5 flights. At this point the engine should hold a good setting on the high speed needle valve and you can begin to fine tune the needle valve settings to increase performance.

OPTIMIZING THE MIXTURE SETTINGS

Now that your engine is broken in, you can set the high and low speed needle valves for optimum performance.

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WARNING Be careful never to lean the engine out too much. Remember that the lubricants for your engine are suspended in the fuel. If you lean out the fuel mixture too much you will also be lowering the amount of lubricant entering your engine. Less lubricant means more chance of your engine overheating and possible engine failure.

Setting the High Speed Needle Valve

- 1) Start the engine and remove the power from the glow plug. Allow the engine to warm up for about 1 minute.
- 2) After the engine has warmed up, slowly lean the high speed mixture until the engine reaches peak rpm. After reaching peak rpm, richen the mixture slightly until an audible drop in rpm is heard. If you are using a tachometer this should be between a 200 - 300 rpm drop.
- 3) With the engine running at full power, carefully lift the nose of the airplane about 45° into the air. The mixture should not become too lean, but you may hear a slight increase in rpm. If the engine sags, or loses rpm when you hold the nose up, the mixture is too lean. If this is the case, slightly richen the mixture and follow the test once more.

IMPORTANT Rpm will increase about 10% - 30% in the air. This is due to the forward motion of the aircraft as it is flying. Because of this more air is entering the carburetor, at a higher force, which causes the mixture to lean out. Additionally, as the fuel level in the fuel tank goes down, fuel draw becomes more difficult for the engine, especially during aerobatics, thus causing the mixture to go lean. It is imperative that you set the mixture rich while on the ground to compensate for the leaning tendencies that will happen in the air. Always watch the exhaust during your flight. The engine should leave a noticeable white smoke trail at all times. If there is no smoke trail, the engine is running too lean. You should land immediately and reset the mixture.

Setting the Low Speed Needle Valve

- 1) Start the engine and lean out the high speed needle valve as per the previous steps. Close the throttle until the slowest **reliable** idle is reached. Allow the engine to idle for about 30 seconds.
- 2) Quickly advance the throttle to full. If the engine just stops running as soon as the throttle is advanced, the idle mixture is too lean. With the engine stopped, richen the idle mixture about 1/8 of a turn.
- 3) Repeat steps # 1 and # 2 until the engine will transition from idle to full throttle smoothly. Minor hesitation in the transition is normal.
- 4) If you quickly advance the throttle from idle to full and the engine seems to be very rich during transition (i.e., lots of smoke coming from the exhaust), the mixture is too rich. With the engine stopped, lean the idle mixture about 1/8 of a turn.
- 5) Repeat steps # 1 and # 4 until the engine will transition from idle to full throttle smoothly. Minor hesitation in the transition is normal.

Information about engine maintenance, including adjusting the valves and returning your engine for warranty service can be found on the separate sheets packaged with these Operating Instructions.



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This troubleshooting guide has been provided to help you diagnose and solve most problems that you may encounter with your XL RFS series engine. Most problems encountered can be solved by carefully following the problem-cause-solution sections below. If you cannot solve the problem using this troubleshooting guide, please feel free to contact us at the address or phone number listed below.

PROBLEM	CAUSE	SOLUTION
1) Engine does not start	A) Failed glow plug B) Glow starter not charged and/or faulty C) Engine not being turned over fast enough D) Low speed needle valve set too lean E) Old or contaminated fuel F) Engine flooded with too much fuel G) Faulty fuel tank and/or stopper assembly H) Air leak in fuel system and/or engine I) Valves out of adjustment	A) Replace glow plug with new one B) Fully charge glow starter and/or replace C) Use an electric starter to start engine D) Reset low speed needle valve to factory setting E) Replace with new fuel F) Remove glow plug and expel fuel from cylinder G) Check and/or replace fuel tank assembly H) Replace fuel lines and/or tighten all engine bolts I) Readjust valves to proper setting
2) Engine does not draw fuel	A) Air leak in fuel system and/or engine B) High speed needle valve fully closed C) Low speed needle valve set too lean D) Fuel lines kinked E) Defective fuel tank	A) Replace fuel lines and/or tighten all engine bolts B) Reset high speed needle valve to factory setting C) Reset low speed needle valve to factory setting D) Check and straighten fuel lines E) Replace fuel tank
3) Engine vibrates excessively	A) Propeller out of balance B) Engine and/or engine mount loose	A) Balance propeller B) Tighten engine mounting bolts
4) Engine does not transition	A) Failed and/or wrong type glow plug B) Old and/or wrong type fuel C) High speed needle valve set too rich D) Low speed needle valve set too lean E) Low speed needle valve set too rich F) Air leak in fuel system and/or engine G) Propeller too large H) Valves out of adjustment	A) Replace with new recommended glow plug B) Replace with new recommended fuel C) Set high speed needle valve to leaner setting D) Set low speed needle valve richer E) Set low speed needle valve leaner F) Replace fuel lines and/or tighten all engine bolts G) Replace with one size smaller propeller H) Readjust valves to proper setting
5) Throttle barrel does not close completely	A) Throttle servo linkage out of adjustment B) Idle stop screw out of adjustment	A) Adjust throttle linkage to close throttle barrel completely B) Readjust idle stop screw to allow throttle to close
6) Engine overheats	A) Engine running too lean B) Cowl too restrictive C) Wrong type of fuel used D) Engine not fully broken in	A) Richen high speed needle valve B) Open larger vents in cowl to allow air to exit C) Use fuel with recommended oil content D) Allow engine further break-in time
7) Engine stops abruptly	A) Engine running too lean B) Piston & sleeve out of tolerances C) Engine Overheating	A) Richen high speed needle valve B) Return engine to Global Services C) See # 6 above

RETURNING YOUR ENGINE FOR WARRANTY SERVICE

All Magnum engines returned for warranty service must be within the warranty terms as stated on the warranty card provided with your engine. Do not return the engine to the place of purchase. They are not authorized or equipped to perform warranty work on Magnum products. When requesting warranty service, please observe the following guidelines:

- Always send the complete engine including the carburetor and muffler. The engine must be removed from the model.
- Include a note detailing the problem or service you are requesting. Service cannot be provided without this information. Include your daytime phone number in the event we need more details pertaining to the service requested.
- You may request an estimate of services at the time you return your engine for service. An omission of this request implies permission for the Magnum Service Center to service your engine at our discretion.
- Include a method of payment for any service charges. If not specified, the unit will be returned to you C.O.D.
- Send the engine to us by United Parcel Service, Federal Express or by Insured Mail. Postage is not refundable. Send to:

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