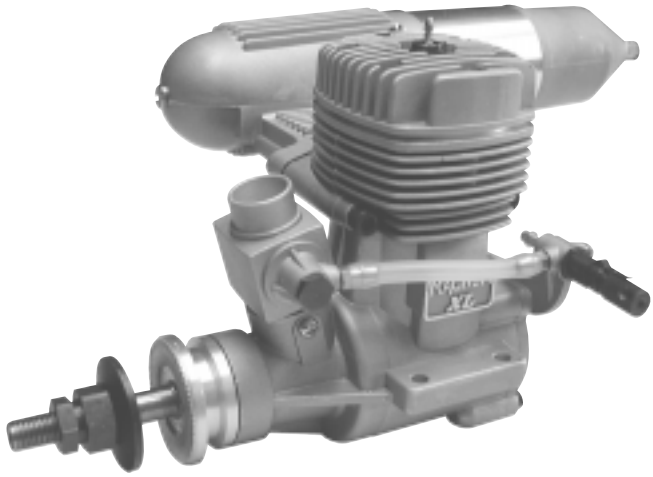
MAGNUM

XL .91ARNV ENGINE
OPERATING INSTRUCTIONS



Specifications:

- Bore: 27.7mm
- Stroke: 24.8mm
- Displacement: .91cu.in. (14.95cc)
- Practical RPM: 2,000 - 15,000
- Weight w/Muffler: 24.8oz. • w/o Muffler: 18.9oz.

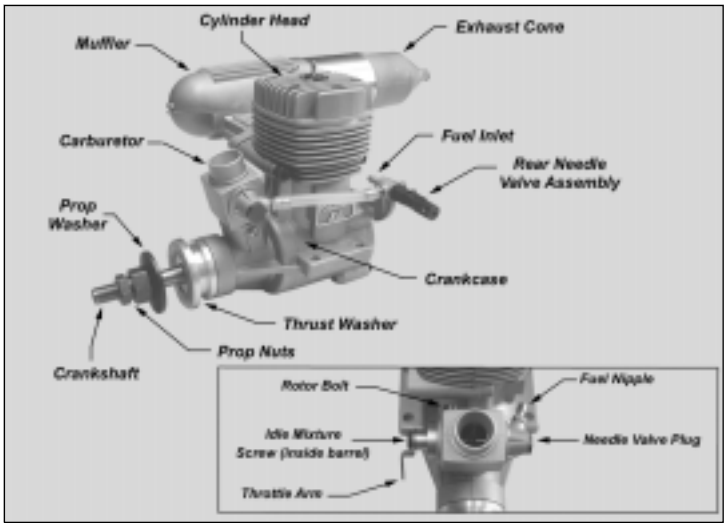
INTRODUCTION

Thank you for choosing a Magnum XL series aircraft engine. The XL .91ARNV is a single cylinder, two cycle engine incorporating ABC (Aluminum piston, Chrome plated Brass sleeve) technology for long life and easy break-in. A dual needle valve carburetor for precise fuel/airflow metering is standard. The XL .91ARNV incorporates a cast aluminum rear needle valve assembly and dual-locking propeller nuts for safety. A high-volume muffler is included to keep noise to a minimum. Your Magnum XL series engine was designed by expert engineers and built by master craftsmen using only the highest quality materials and CNC machinery. These qualities provide the long life and dependability you have come to expect from an engine of this caliber.

BECOMING FAMILIAR WITH YOUR ENGINE

If you are familiar with the operation of model engines or just can't wait to run your new engine, please read through the Quick Start Guide included. This guide will help you get started right away and also includes some good recommendations. We do recommend reading through this instruction sheet in its entirety to familiarize yourself with the features and operation of your new engine. We have also included a Trouble-shooting Guide should you encounter any problems.

Please use the photos below to familiarize yourself with the components of your new Magnum XL series engine.



CAUTION!!

Magnum XL series model airplane engines will consistently give you dependable performance and reliability and will be a source of satisfaction and pleasure if you follow these instructions as to the engine's proper and safe use. You alone are responsible for the safe operation of your engine, so act sensibly and with care at all times. This Magnum XL series model airplane engine is not a toy. It is a precision built machine whose power is capable of causing serious injury to yourself and others if abused, misused or if you fail to observe proper safety precautions while using it.

- Keep spectators, especially small children, at least 20 feet away from the engine while it is running.
- Mount the engine securely in the airplane or on a suitable engine test stand to run the engine. Follow the mounting instructions in your kit's instruction manual or on the plans for individual mounting recommendations. Do not clamp the engine in a vise to test-run it.
- Use the recommended size propeller and follow the proper procedure for mounting the propeller. Use the correct size wrench to tighten the propeller nut and the safety nut. Do not use pliers.
- Inspect the spinner, propeller and propeller nuts on a regular basis, looking for any signs of nicks, cracks or loosening.
- To stop the engine, adjust the throttle linkage to completely close the throttle barrel and therefore cut off the fuel/air supply. You can also pinch the fuel line to stop the engine, but only if it is accessible. Do not throw anything into the spinning propeller or attempt to use your hands to stop the engine.
- While the engine is running stand behind the engine to make any adjustments to the needle valves. Do not reach over or around the propeller. Do not lean toward the engine. Do not wear loose clothing or allow anything to be drawn into the spinning propeller while the engine is running.
- If you need to carry your model while the engine is running, be conscious of the spinning propeller. Keep the airplane pointed away from you and others at all times.
- Do not use tight-fitting cowls over the engine. They can restrict air from flowing over the engine and result in engine damage from overheating.

ENGINE INSTALLATION

❑ Engine Orientation

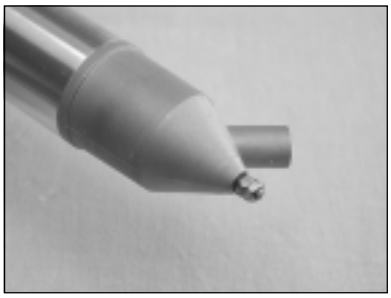
The XL .91ARNV can be orientated in any position on the firewall. Keep in mind that when the engine is mounted inverted, carburetor adjustments will need to be made differently and the fuel tank may need to be lowered. (See tank size and orientation to carburetor on next page.)

❑ Engine Bolts and Firewall Requirements

The engine should be mounted to either a heavy-duty glass-filled nylon motor mount, a machined aluminum motor mount or an integrated hardwood beam mount. Use only high quality steel cap screws and related hardware to mount the engine to the motor mount. The firewall in the airplane should be aircraft grade 5-ply plywood no less than 5/16" thick and the firewall should be reinforced to meet the torque and weight of the engine.

❑ Muffler Installation

The muffler is mounted to the engine using the two steel socket cap screws, two split washers and one of the two gaskets provided. The second gasket should be kept as a spare. Tighten both screws firmly to prevent the muffler from loosening during flight. The exhaust cone on the back of the muffler can be adjusted to better match the installation of your particular application. To adjust the exhaust cone, loosen the two retaining nuts using an adjustable wrench. Rotate the cone to the desired angle and tighten the retaining nuts completely while holding the axial bolt in place from the front of the muffler, using a flat blade screwdriver. It is important to tighten the retaining nuts firmly to prevent the exhaust cone from loosening during flight.



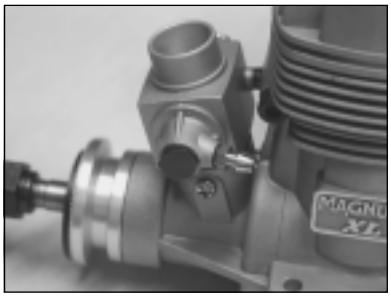
❑ Tank Size and Orientation to Carburetor

Ideally the stopper in the fuel tank should be even with the high speed needle valve or just slightly below it. Most models will only allow the fuel tank to be mounted higher than the ideal location. A fuel tank that is positioned higher than the ideal location usually doesn't pose any problem except when it is mounted excessively higher and/or is used in conjunction with an inverted mounted engine or during extreme aerobatic flight. If you mount the engine inverted we strongly suggest lowering the fuel tank so the stopper assembly is slightly below the high speed needle valve. Doing this will prevent fuel from siphoning into the engine and flooding it when the fuel tank is full. If you cannot lower the fuel tank far enough, we suggest lowering it as far as can be allowed in your particular application.

The size of the fuel tank used should be 14oz. - 16oz. depending on the model and the length of flights desired. Use of a 16oz. tank will provide between 10 - 15 minutes of run time at full throttle. Use of a fuel tank any larger than 16oz. can lead to excessive leaning of the engine during flight and is not recommended.

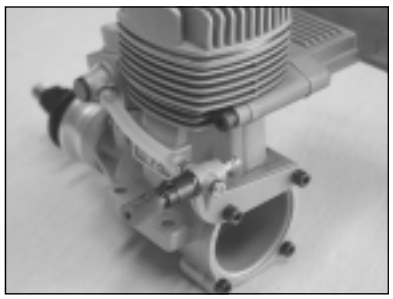
❑ Carburetor Installation

The carburetor is held in place using two machine screws. Slide the base of the carburetor into the crankcase, being careful to keep the carburetor perpendicular to the front of the engine. Using your thumb, push down firmly on the carburetor so the base of the carburetor sets completely into the crankcase. An o-ring is installed on the carburetor throat to seal the joint. While holding the carburetor in place, install and tighten the retaining screws using a # 2 phillips head screwdriver.



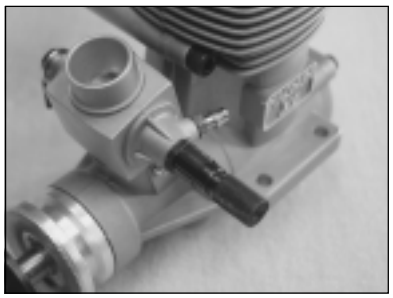
❑ Rear Needle Valve Installation

The rear needle valve assembly is held in place using the two steel socket cap screws and two split washers provided with the needle valve assembly. To mount the assembly, remove the two upper backplate screws, set the assembly in place, then install and tighten the two screws and split washers. Carefully install the length of silicon fuel line provided between the needle valve assembly and the carburetor. The fuel pick-up line from your fuel tank will connect to the larger brass nipple on the needle valve assembly.



❑ Standard-Mount Needle Valve Conversion

It is not necessary to use the rear-mounted needle valve assembly with your engine. You can easily mount the needle valve into the side of the carburetor if you wish.



Using an adjustable wrench, carefully loosen and remove the plug from the side of the carburetor. Carefully loosen and remove the needle valve assembly (including the clear gaskets) from the rear needle valve mount. Carefully thread the needle valve assembly (with the clear gaskets in place) into the side of the carburetor and tighten it securely using an adjustable wrench.

❑ Needle Valve Extension

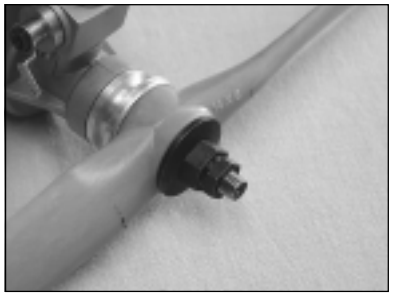
If an extension is required to adjust the high speed needle valve, use a 1.5mm diameter wire of the necessary length. Loosen the set screw in the side of the needle valve, insert the wire into the end of the needle valve and tighten the set screw firmly. If the extension is more than 3" long we recommend supporting the outer end of the extension to prevent excessive vibration.

❑ Rotor Bolt

The rotor bolt holds the throttle barrel in the carburetor body and requires no adjustment. As part of your maintenance schedule you should periodically check that the rotor bolt is tight.

❑ Propeller Installation

IMPORTANT: Before installing the propeller it must be properly balanced. Running an engine of this size using an out-of-balance propeller can lead to excessive vibration which will result in excessive stress and wear on both the engine and the airframe. Balance the propeller using the method recommended by the propeller manufacturer. Several products are available to properly balance propellers. Ask your local retailer for more information about these items.



Using a 5/16" drill bit or a prop reamer, enlarge the hole in the propeller hub to fit the crankshaft. The diameter of the crankshaft is 5/16". Slide the

propeller onto the crankshaft, up against the thrust washer. Slide the propeller washer up against the propeller and thread the prop nut into place. Tighten the prop nut firmly to secure the propeller in place. Install and tighten the safety nut up against the propeller nut. When tightening the two nuts, use a large adjustable wrench. Do not use pliers.

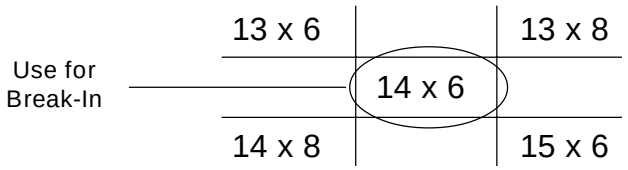
WARNING: If you are installing a spinner onto your engine the cone of the spinner must not rub against the propeller. Allowing the spinner cone to rub against the propeller could lead to propeller damage and eventual propeller failure.

PROPELLER, FUEL & GLOW PLUG

❑ Propeller Recommendation

The diameter and pitch of the propeller needed for the XL .91ARNV will vary greatly depending on the application the engine is used in. The weight, drag and the type of model and how you intend to fly it are all factors in determining the correct size propeller to use. Experimentation will be necessary to find the optimal size propeller for your particular application. Ideally you want a propeller that the engine will turn in the 10,000 - 13,000 R.P.M. range on the ground, yet power the airplane sufficiently. Using a propeller that is too small will cause the engine to run at too high an R.P.M. Using a propeller that is too large will cause the engine to run at too low an R.P.M. and cause it to lug down too much. In both instances this can lead to premature engine wear and eventual failure.

Propeller Size Recommendations



❑ Glow Plug Recommendation

Glow plugs can make a big difference in the performance of your engine. We recommend using a hot heat-range glow plug intended specifically for two-cycle engines. Do not use a cold heat-range plug. This can lead to erratic engine runs and eventual engine wear and failure.

❑ Fuel Recommendation

Fuel can make a big difference in the way your engine performs. We recommend using two types of fuel with the XL .91ARNV. For the break-in period you must use a fuel containing no more than 10% nitro methane and no less than 20% Castor Oil lubricant. Use of fuel containing more than the recommended percentage of nitro methane or any synthetic lubricants will cause the engine to run too hot and result in excessive wear and engine failure in a very short period of time. Once the engine has been adequately broken in (about 1/2 gallon of the recommended break-in fuel), a fuel containing up to, but no more than, 15% nitro methane and no less than 16% Castor Oil and synthetic lubricant blended fuel can be used.

WARNING: We do not recommend using fuels that contain only synthetic lubricants. Synthetic lubricants have a much lower flash point than Castor Oil lubricants. Flash point is the point at which the lubricant begins to actually burn and loss its lubricating qualities. Using fuels containing a blend of Castor Oil and synthetic lubricants results in an engine that runs cooler and lasts longer. One lean run using a fuel containing only synthetic lubricants can cause engine failure. Using fuels with a Castor Oil and synthetic blend of lubricants greatly reduces this chance.

HIGH & LOW SPEED NEEDLE VALVES

❑ High Speed Needle Valve

The high speed needle valve is used to meter the air/fuel mixture at full throttle. Turn the needle clockwise to lean the mixture or turn the needle counterclockwise to richen the mixture. When you start the engine for the very first time the needle valve should be turned in completely, then backed out 2-1/2 turns. When you start the engine after that, leave the needle valve in the same position it was in when you shut down the engine.

❑ Low Speed Needle Valve

The low speed needle valve regulates the air/fuel mixture at idle and during transition from idle to full throttle. Turn the idle mixture screw clockwise to lean the mixture. Turn it counterclockwise to richen the mixture. The idle mixture screw is preset from the factory, but minor adjustments may need to be made. To reset the mixture screw to the factory setting open the carburetor barrel completely. While holding the barrel open, turn the mixture screw in until it stops. From this point, turn the mixture screw out 1/2 turn. This is the factory setting.

STARTING PROCEDURE

The XL .91ARNV can be started using an electric starter or it can be started by hand. For safety and ease of starting, especially when the engine is new, we recommend using an electric starter. The following two procedures should be done with the power to the glow plug off.

❑ Starting with an Electric Starter

When using an electric starter it is not necessary to prime the engine. The starter turns the engine over fast enough that the engine draws fuel on its own. Priming the engine prior to using an electric starter can cause the engine to "hydro-lock" or flood. This is a result of too much fuel in the engine before it actually fires. Turning the engine over with an electric starter while the engine is flooded can cause extreme damage to the engine and/or cause the propeller assembly to come loose. Turn the propeller through the compression stroke one time by hand to check for a hydro-locked state before applying the starter.

❑ Starting by Hand

When starting the engine by hand always use a chicken stick or a heavy leather glove. Never just use your bare hand or serious injury could result. To make the engine easier to start by hand it should first be primed. This is done by opening the carburetor completely and choking the engine by putting your finger over the carburetor opening. With the carburetor choked, "pull" the propeller through the compression stroke 2 - 3 times. This will draw fuel into the engine. Remove your finger and pull the propeller through the compression stroke once to check for a hydro-locked condition.

BREAK-IN PROCEDURE

IMPORTANT: The XL .91ARNV is an ABC engine. The cylinder sleeve is tapered at the top, causing severe resistance when the piston moves through the top of the stroke. This is normal. When the engine heats up to operating temperature, this resistance will decrease and the proper clearance will be achieved. The break-in procedure will guide you through the steps necessary to properly break in your new ABC engine. Please follow the steps closely.

The break-in process allows the engine parts to perfectly fit to 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 20% Castor Oil lubricant. Synthetic lubricant fuels 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 30 minutes of actual running time. After 30 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.

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 R.P.M. After reaching peak R.P.M. richen the mixture slightly until an audible drop in R.P.M. is heard. If you are using a tachometer this should be between a 200 - 300 R.P.M. drop.

❑ 3) With the engine running at full power, carefully lift the nose of the airplane about 45º into the air. The mixture should not become too lean, but you may hear a slight increase in R.P.M. If the engine sags, or loses R.P.M. 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: R.P.M. 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, and 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.

MAINTENANCE

- Avoid running the engine under dusty conditions. If you are in a dusty environment we suggest using an air filter over the carburetor.
- At the end of every flying day, purge the engine of fuel by disconnecting the fuel line and allowing the engine to run dry of fuel.
- Use a high quality after run oil in the engine after you have purged the engine of fuel. Inject the oil into the engine through the carburetor and through the glow plug hole. Rotate the crankshaft several times to distribute the oil throughout the engine.
- Wipe the outside of the engine dry using a soft cloth.
- Use a fuel filter between the fuel tank and the carburetor.
- Periodically check to make sure all of the engine bolts are tight.

Information about returning your engine for warranty service can be found on the separate parts list packaged with these operating instructions.

MAGNUM

XL .91ARNV ENGINE QUICK-START AND TROUBLESHOOTING GUIDE

The following information is provided to get your new Magnum XL .91ARNV engine running right away with minimal effort. We have listed our recommendations for fuel, propeller, starting procedures and other recommended accessories. Also included is general information about the accessories needed for the engine that we hope you will find helpful.

This Quick-Start Guide should not be used as a replacement to the Operating Instructions included; rather, it should be used along with the Operating Instructions. We highly recommend reading through the Operating Instructions to familiarize yourself with each part of the engine, along with the proper procedures for engine break-in, tuning, care and maintenance.

OUR RECOMMENDATIONS

The following items are recommended for use with the XL .91ARNV engine. These items are recommended for initial start-up and running. Please read through the Operating Instructions for further details.

- Fuel: We suggest Power Master 10% 2-Stroke Blend (P/N 275180) for break-in.

  We suggest Power Master 15% 2-Stroke Blend (P/N 275198) for normal use.

We suggest using Power Master brand fuels. Power Master fuel comes in 10 % and 15% nitromethane contents that can be used in the XL .91ARNV engine. Power Master fuels are blended using only high quality nitromethane, methanol, Castor Oil and synthetic lubricants to provide high power output along with easy starting and unmatched lubricating and heat dissipation qualities. For the extra lubrication necessary for break-in, use 10% 2-stroke blend. After break-in, for extra performance, use 15% 2-stroke blend.

- Fuel Tank: Dubro 14oz. Fuel Tank (P/N 568543)

The Dubro 14oz. fuel tank is a perfect match for the XL .91ARNV. It is large enough to give you about 10-15 minutes of run-time at full throttle, and is possibly the easiest fuel tank to assemble and maintain.

- Glow Plug: Thunderbolt # 3 (P/N 115559)

The Thunderbolt # 3 glow plug is designed to be used in high performance engines using fuels containing 10% - 20% nitro content and in any environment. It is a "hot" type of glow plug for easy starting, excellent transition and incredible top end. The glow plug is also very durable and able to withstand repeated use, day after day.

- Propeller: APC 14 x 6 Propeller (P/N 609560)

We have found that the engine runs at its best using APC brand props. They are designed to be very efficient, run quiet at high R.P.M.'s, and they are also durable. Use this size prop to break in your engine, then change to the prop that best suits your application. Use the guide in the Operating Instructions to help you find the right size propeller.

- Glow Driver: Magnum Glow Starter w/Meter (P/N 237438)

The Magnum glow starter is an excellent choice for heating the glow plug. It uses a Sub-C Nicad, includes a meter to determine the quality of your glow plug and also includes a charger to recharge the battery. It's a very economical product to purchase and can be used with any engine that uses a glow plug.

- Motor Mount: Dave Brown Motor Mount (P/N 218170)

The Dave Brown motor mount is a glass-filled type that mounts to a plywood firewall in the model. It is easy to install and rugged, yet in the event of a crash, will break away to minimize damage to the engine and/or airframe.

QUICK STARTING PROCEDURES

Engine Preparation

❑ 1) Mount the engine to the recommended motor mount. A wood beam mount built into the airframe would also be sufficient.

❑ 2) Install the muffler to the engine using the hardware provided. The muffler cone can be rotated to better suit the installation in your model. Be sure to tighten the two nuts securely to prevent the muffler cone from loosening.

❑ 3) Using a 5/16" drill bit, drill out the center hub in the propeller. Install the propeller to the engine using the propeller nuts and washer provided. Tighten the nuts securely using an adjustable wrench.

Engine Starting

❑ 1) Carefully turn the high speed needle valve in completely until it stops, then turn the needle valve out 2-1/2 turns. This is the mixture setting for initial starting.

❑ 2) If hand starting, prime the engine by opening the throttle barrel completely, placing your finger over the carburetor opening and flipping the prop through compression 2 -3 times. If you will be using an electric starter, do not prime the engine. The starter will turn the engine over fast enough to draw fuel on its own.

❑ 3) Connect the glow starter to the glow plug. Open the carburetor barrel to about 1/4 throttle and start the engine. If you are starting the engine by hand, you will need to vigorously flip the prop several times before the engine will start. Once the engine begins running, immediately turn the high speed needle valve in about 1/4 turn to keep the engine running.

❑ 4) Advance the throttle to full while turning the high speed needle valve in to keep the engine running. The engine should be producing a very noticeable white exhaust from the muffler and sound like it is running rough. Allow the engine to run only for about 5 minutes, then shut the engine off.

❑ 5) Now that you have started your engine it must be properly broken in. Proper break-in will seat all of the moving parts, particularly the piston and cylinder. This procedure takes about 30 minutes of run-time and is highly recommended. An engine that is properly broken in will produce more power, be more user-friendly and last much longer than an engine that does not receive a break-in period. For this reason we highly recommend following the break-in procedure detailed in the Operating Instructions before you run the engine further.

TROUBLESHOOTING GUIDE

This troubleshooting guide has been provided to help you diagnose and solve most problems that you may encounter with your Magnum XL .91ARNV 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) Idle mixture screw 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	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 idle mixture 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
2) Engine does not draw fuel	A) Air leak in fuel system and/or engine B) High Speed Needle Valve fully closed C) Idle mixture screw 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 idle mixture 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 motor mount loose	A) Balance propeller B) Tighten motor 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) Idle mixture set too lean E) Idle mixture set too rich F) Air leak in fuel system and/or engine G) Propeller too large	A) Replace with new recommended glow plug B) Replace with new recommended fuel C) Reset high speed needle valve to leaner setting D) Set idle mixture richer E) Set idle mixture leaner F) Replace fuel lines and/or tighten all engine bolts G) Replace with one size smaller propeller
5) Throttle barrel does not close completely	A) Throttle servo linkage out of adjustment	A) Adjust throttle linkage to close throttle barrel completely
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 cowling 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	A) Richen high speed needle valve B) Return engine to Magnum Engine Service Center

RETURNING 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:

- 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:

Magnum Service Center ● 18480 Bandilier Circle ● Fountain Valley, CA 92728
Phone (714) 963-0329 ● Fax (714) 964-6236 ● Email: service@globalhobby.com

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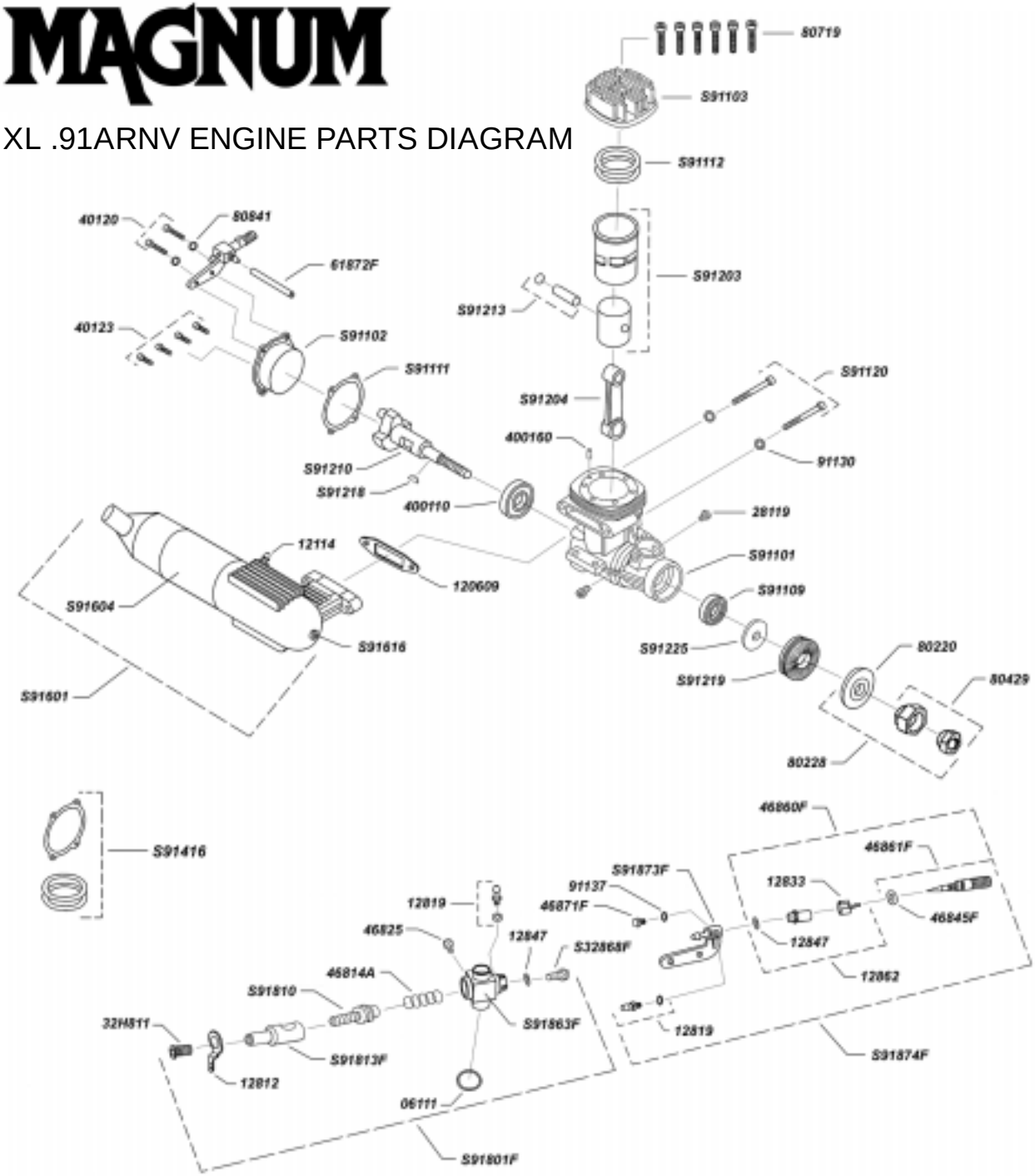
XL .91ARNV ENGINE PARTS DIAGRAM



06111	Carburetor Base O-Ring
12114	Pressure Nipple
12812	Throttle Arm
12819	Fuel Nipple with Gasket
12833	Detent Spring
12847	Needle Valve Housing Gasket Set
12862	Needle Valve Housing Set
28119	Carburetor Hold-Down Screws
32H811	Throttle Arm Retaining Nut
40120	Rear Needle Valve Mounting Bolt Set
40123	Backplate Bolt Set
46825	Rotor Bolt
80220	Propeller Washer
80228	Propeller Washer & Nut Set
80429	Propeller Nut Set
80719	Cylinder Head Screw Set
80841	Split Washers for 40120
91130	Split Washers for Muffler Bolts
91137	Fiber Gasket
120609	Muffler Gasket Set (2)
400110	Rear Ball Bearing
400160	Cylinder Alignment Pin
46814A	Carburetor Barrel Spring
46845F	Needle Valve O-Ring Only
46860F	Needle Valve Assembly
46861F	Needle Valve with O-Ring
46871F	Remote Needle Valve Fuel Plug
61872F	Fuel Tubing
S32868F	Needle Valve Plug
S91101	Crankcase
S91102	Backplate
S91103	Cylinder Head
S91109	Front Ball Bearing
S91111	Backplate Gasket
S91112	Head Gasket Set
S91120	Muffler Bolt Set
S91203	Piston & Cylinder Set
S91204	Connecting Rod
S91210	Crankshaft
S91213	Wrist Pin & E-Ring Set
S91218	Woodruff Key
S91219	Thrust Washer
S91225	Thrust Spacer
S91416	Gasket Set - Includes S91112(2) & S91111(1)
S91601	Muffler Assembly - Complete
S91604	Muffler Center Assembly
S91616	Muffler Axial Bolt Set
S91801F	Carburetor Assembly - Complete
S91810	Idle Needle Valve with O-Ring
S91813F	Carburetor Barrel
S91863F	Carburetor Body Only
S91873F	Remote Needle Valve Mount Only
S91874F	Remote Needle Valve Assembly - Complete

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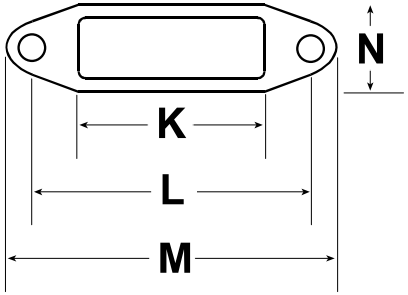
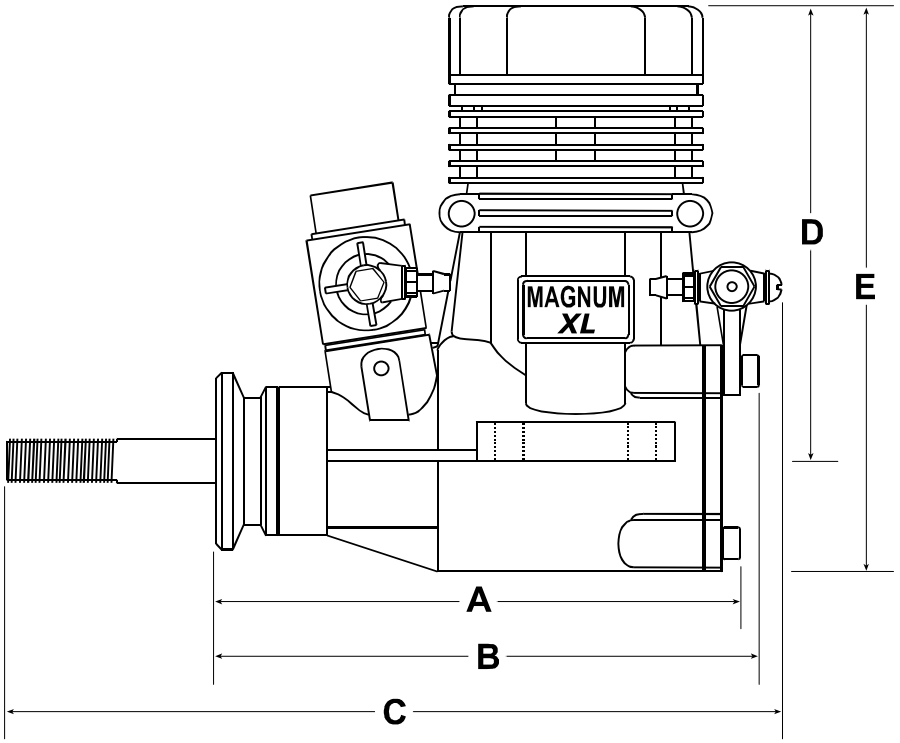
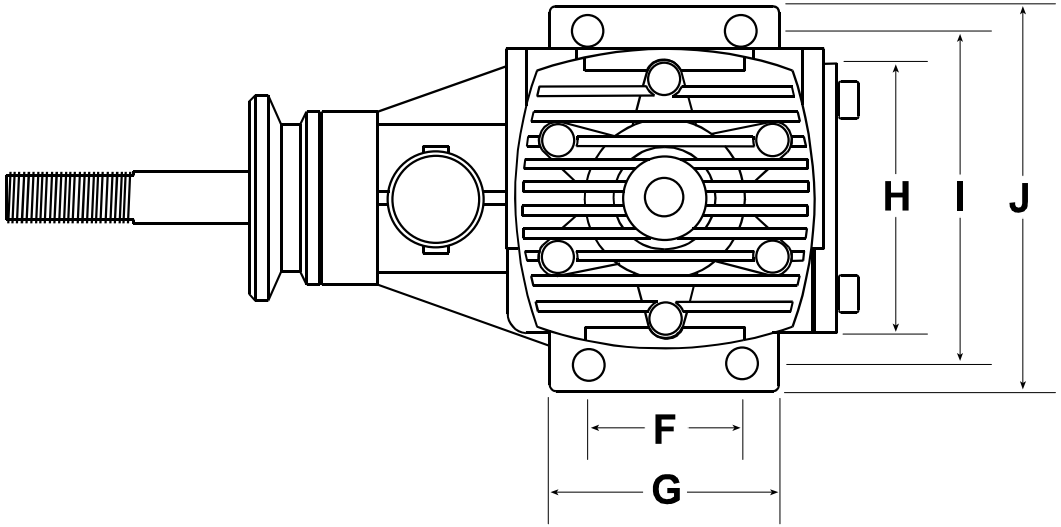
XL .91ARNV ENGINE DIMENSIONS







DIMENSIONS			
A	3-3/4"	H	1-5/8"
B	3-7/8"	I	2"
C	4"	J	2-3/8"
D	3-3/16"	K	1-1/16"
E	4"	L	1-5/8"
F	15/16"	M	1-15/16"
G	1-7/16"	N	1/2"