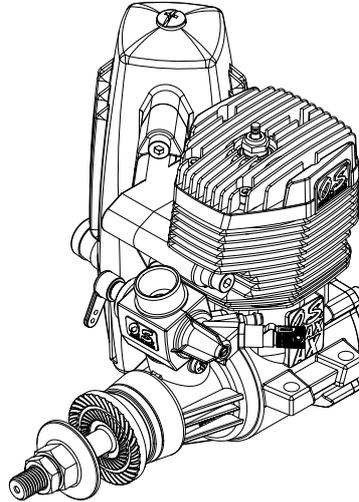


OWNER'S INSTRUCTION MANUAL

It is of vital importance, before attempting to operate your engine, to read the general **'SAFETY INSTRUCTIONS AND WARNINGS'** section on pages 2-6 of this booklet and to strictly adhere to the advice contained therein.

- Also, please study the entire contents of this instruction manual, so as to familiarize yourself with the controls and other features of the engine.
- Keep these instructions in a safe place so that you may readily refer to them whenever necessary.
- It is suggested that any instructions supplied with the aircraft, radio control equipment, etc., are accessible for checking at the same time.



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SAFETY INSTRUCTIONS AND WARNINGS ABOUT YOUR O.S. ENGINE

Remember that your engine is not a "toy", but a highly efficient internal-combustion machine whose power is capable of harming you, or others, if it is misused.

As owner, you, alone, are responsible for the safe operation of your engine, so act with discretion and care at all times.

If at some future date, your O.S. engine is acquired by another person, we would respectfully request that these instructions are also passed on to its new owner.

■ The advice which follows is grouped under two headings according to the degree of damage or danger which might arise through misuse or neglect.



WARNINGS

These cover events which might involve serious (in extreme circumstances, even fatal) injury.



NOTES

These cover the many other possibilities, generally less obvious sources of danger, but which, under certain circumstances, may also cause damage or injury.

2



WARNINGS

● Never touch, or allow any object to come into contact with, the rotating propeller and do not crouch over the engine when it is running.



● A weakened or loose propeller may disintegrate or be thrown off and, since propeller tip speeds with powerful engines may exceed 600 feet (180 metres) per second, it will be understood that such a failure could result in serious injury, (see 'NOTES' section relating to propeller safety).

● Model engine fuel is poisonous. Do not allow it to come into contact with the eyes or mouth. Always store it in a clearly marked container and out of the reach of children.



● Model engine fuel is also highly flammable. Keep it away from open flame, excessive heat, sources of sparks, or anything else which might ignite it. Do not smoke or allow anyone else to smoke, near to it.



● Never operate your engine in an enclosed space. Model engines, like automobile engines, exhaust deadly carbon-monoxide. Run your engine only in an open area.

● Model engines generate considerable heat. Do not touch any part of your engine until it has cooled. Contact with the muffler (silencer), cylinder head or exhaust header pipe, in particular, may result in a serious burn.



3



NOTES

- This engine was designed for model aircraft. Do not attempt to use it for any other purpose.
- Mount the engine in your model securely, following the manufacturers' recommendations, using appropriate screws and lock-nuts.
- Be sure to use the silencer (muffler) supplied with the engine. Frequent exposure to an open exhaust may eventually impair your hearing. Such noise is also likely to cause annoyance to others over a wide area.
- If you remove the glowplug from the engine and check its condition by connecting the battery leads to it, do not hold the plug with bare fingers. Use an appropriate tool or a folded piece of cloth.
- Install a top-quality propeller of the diameter and pitch specified for the engine and aircraft. Locate the propeller on the shaft so that the curved face of the blades faces forward-i.e. in the direction of flight. Firmly tighten the propeller nut, using the correct size wrench.



NOTES

- Always check the tightness of the propeller nut and retighten it, if necessary, before restarting the engine. Also, check the tightness of all the screws and nuts before restarting the engine.
- If you install a spinner, make sure that it is a precision made product and that the slots for the propeller blades do not cut into the blade roots and weaken them.
- Preferably, use an electric starter. The wearing of safety glasses is also strongly recommended.
- Discard any propeller which has become split, cracked, nicked or otherwise rendered unsafe. Never attempt to repair such a propeller: destroy it. Do not modify a propeller in any way, unless you are highly experienced in tuning propellers for specialized competition work such as pylon-racing.
- Take care that the glow plug clip or battery leads do not come into contact with the propeller. Also check the linkage to the throttle arm. A disconnected linkage could also foul the propeller.
- After starting the engine, carry out any needle-valve readjustments from a safe position behind the rotating propeller. Stop the engine before attempting to make other adjustments to the carburetor.



NOTES

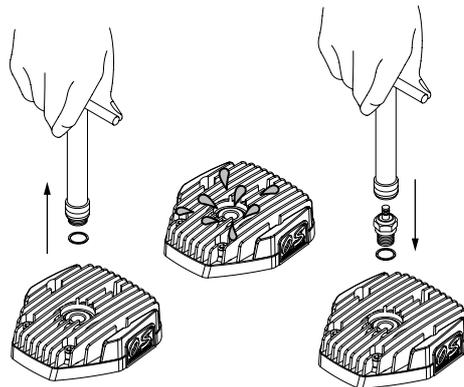
- Adjust the throttle linkage so that the engine stops when the throttle stick and trim lever on the transmitter are fully retarded. Alternatively, the engine may be stopped by cutting off the fuel supply. Never try to stop the engine physically.
- Take care that loose clothing (ties, shirt sleeves, scarves, etc.) do not come into contact with the propeller. Do not carry loose objects (such as pencils, screwdrivers, etc.) in a shirt pocket from where they could fall through the propeller arc.
- Do not start your engine in an area containing loose gravel or sand. The propeller may throw such material in your face and eyes and cause injury.
- For their safety, keep all onlookers (especially small children) well back (at least 20 feet or 6 meters) when preparing your model for flight. If you have to carry the model to the take-off point with the engine running, be especially cautious. Keep the propeller pointed away from you and walk well clear of spectators.
- Warning! Immediately after a glowplug-ignition engine has been run and is still warm, conditions sometimes exist whereby it is just possible for the engine to abruptly restart if the propeller is casually flipped over compression WITHOUT the glowplug battery being reconnected. Remember this if you wish to avoid the risk of a painfully rapped knuckle!

6

NOTES WHEN APPLYING AN ELECTRIC STARTER

Do not over-prime. This could cause a hydraulic lock and damage the engine on application of the electric starter.

If over-primed, remove glowplug, close needle-valve and apply starter to pump out surplus fuel. Cover the head with a rag to prevent pumped out fuel getting into your eyes.



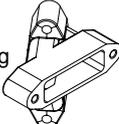
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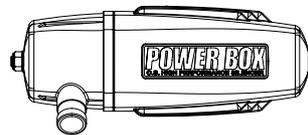
ABOUT THE ENGINE

Two versions are available, the one is without silencer, extension adaptor and 90 degree adaptor and the other is with all of them.

- This is a high performance two stroke engine designed for sport and scale models.
- Crankcase and cylinder head are of aero-shape design which give advantage of light weight, compact size.
- The new 70D carburetor needlevalve assembly has now been angled backward for safety.
- New E-5020 silencer (POWER BOX) develops very effective muffling. Also, the compact body enables it to be fit with in most cowls.
- Extension adaptor and 90 degree adaptor offer various silencer installations.

STANDARD ACCESSORIES

- Glow Plug No.8 (supplied with the engine) 
- Needle Valve Extension Cable Set 
- E-5020 Silencer Extension Adapter
 - Silencer Extension Adapter
 - Retaining Screw (M4x90 2pcs.)
- E-5020 Silencer 90° Adapter
 - Silencer 90° Adapter Retaining Screw (M4x20 2pcs.)
- E-5020 Silencer Assembly
 - Silencer Retaining Screw (M4x45 2pcs.)



8

BEFORE STARTING

Tools, accessories, etc. The following items are necessary for operating the engine.

Propellers

The choice of propeller depends on the design and weight of the aircraft and the type of flying in which you will be engaged.

Determine the best size and type after practical experimentation. As a starting point, refer to the props listed in the accompanying table. Slightly larger, or even slightly smaller, props than those shown in the table may be used, but remember that speed the propeller noise will increase if blade tip is raised, due to higher rpm or if a larger-diameter/lower-pitched prop is used.

Sport	15x10-12, 16x8-10
-------	-------------------



Warning:

Make sure that the propeller is well balanced. An unbalanced propeller and/or spinner can cause serious vibration which may weaken parts of the airframe or affect the safety of the radio-controlled system.

DO NOT forget the WARNINGS and NOTES on propeller and spinner safety given on front pages.

Reminder!

 Never touch, or allow any object to come into contact with, the rotating propeller and do not crouch over the engine when it is running.

Spinner

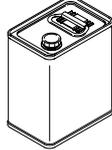
Since the 120AXRING is intended to be started with an electric starter, the addition of a spinner assembly for centering the starter sleeve is desirable. Use a heavy-duty, well balanced spinner either of metal or plastic.



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FUEL

The 120AXRING should be operated on a methanol based fuel containing not less than 18% (volumetric) castor oil, or a top quality synthetic lubricant (or a mixture of both), plus a small percentage (5-20%) of nitromethane for improved flexibility and power. (The carburetor is adjusted a little on the rich side at the factory for a fuel containing 20% lubricant and 15% nitromethane.) Some commercial fuels also contain coloring additives as an aid to fuel level visibility. In some cases, these additives have indicated slightly negative effects on the performance. We would suggest that you use such fuels only if you are satisfied that they do not adversely affect running qualities when compared with familiar standard fuels. When changing to a fuel brand or formula that is different from the one to which you are accustomed, it is a wise precaution to temporarily revert to in-flight running-in procedures, until you are sure that the engine is running entirely satisfactorily.



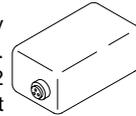
Reminder!

 **Model engine fuel is poisonous. Do not allow it to come into contact with the eyes or mouth. Always store it in a clearly marked container and out of the reach of children.**

 **Model engine fuel is also highly flammable. Keep it away from open flame, excessive heat, sources of sparks, or anything else which might ignite it. Do not smoke, or allow anyone else to smoke, near to it.**

Fuel Tank

A fuel tank of approximately 350cc capacity is suggested. This allows around 10-12 minutes flying time, dependent upon the type of fuel used, the size of propeller and on the amount of full-throttle to part-throttle operation throughout the flight.



GLOW PLUG

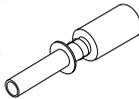
O.S. No.8 glowplug is supplied with the engine.



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GLOWPLUG IGNITER

Commercially available handy glowplug heater in which the glowplug battery and battery leads are integrated.

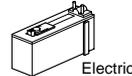


FUEL PUMP

Alternatively, one of the purpose-made manual or electric fuel pumps may be used to transfer fuel directly from your fuel container to the fuel tank.



Manual

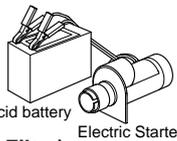


Electric

Electric Starter and Starter Battery

Required when starting the engine.

12-Volt lead-acid battery



Electric Starter

O.S. Super Filter (Fuel Can Filter)

Install a filter on the outlet tube of your refueling container to prevent entry of foreign matter into fuel tank. O.S. Super Filters (large and small) are available as optional extras.



O.S. Non-Bubble Weight

To prevent the pickup from adhering to the tank wall under suction and restricting fuel flow, slots may be filed in the end of the weight. Alternatively, O.S. Non-Bubble Weight is available as an optional extra.



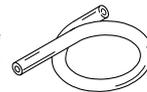
Fuel Filter

It is recommended to install a good in-line filter between the fuel tank and carburetor to prevent entry of foreign matter into the carburetor.



SILICONE FUEL LINE

Heatproof silicone tubing of approx. 5mm o.d. and 2.5mm i.d. is required for the connection between the fuel tank and engine.



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■ TOOLS

HEX Screwdriver

Necessary for engine installation.
1.5mm, 2mm, 2.5mm, 3mm



Phillips Screwdriver

No.1, No.2, etc.



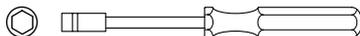
SCREWDRIVER

Necessary for carburetor adjustments.
No.1, No.2, etc



Socket Screwdriver

5.5mm, 7mm, 8mm



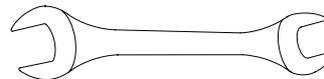
LONG SOCKET WRENCH WITH PLUG GRIP

Recommended for easy removal and replacement of the angled and recessed glowplug, the O.S.Long Socket Wrench incorporates a special grip.

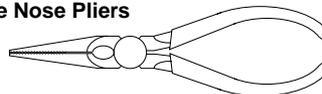


End Wrenches

8mm, 12mm, 14mm, etc.



Needle Nose Pliers



GLOWPLUG

Since the glowplug and fuel combination used may have a marked effect on performance and reliability, it would be worthwhile to experiment with different plug types. An O.S. No.8 glowplug is supplied with the engine. Recommended O.S. plugs are the No.8 and A5. Carefully install plug finger-tight, before final tightening with the correct size plug wrench.

The role of the glowplug

With a glowplug engine, ignition is initiated by the application of a 1.5-volt power source. When the battery is disconnected, the heat retained within the combustion chamber remains sufficient to keep the plug filament glowing, thereby continuing to keep the engine running. Ignition timing is 'automatic' : under reduced load, allowing higher rpm, the plug becomes hotter and, appropriately, fires the fuel/air charge earlier; conversely, at reduced rpm, the plug become cooler and ignition is retarded.

Glowplug life

Particularly in the case of very high performance engines, glowplugs must be regarded as expendable items.

However, plug life can be extended and engine performance maintained by careful use, i.e.:

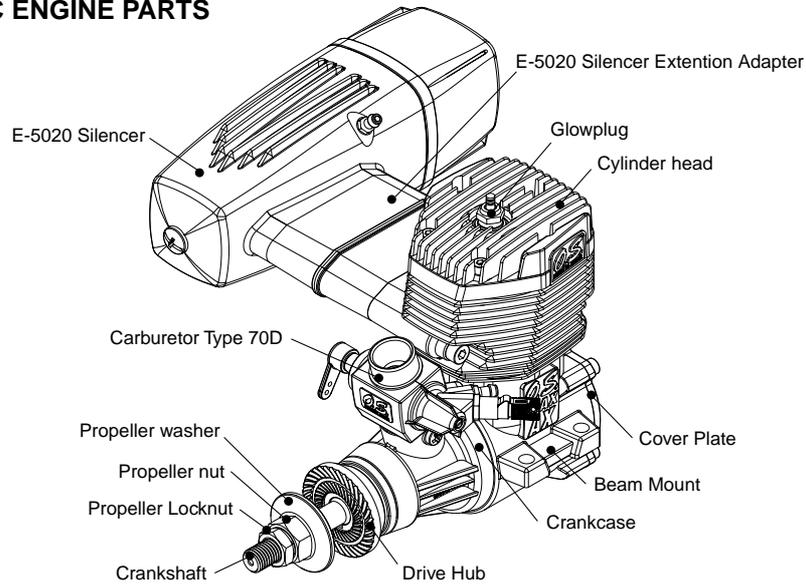
- Install a plug suitable for the engine.
- Use fuel containing a moderate percentage of nitromethane unless more is essential for racing events.
- Do not run the engine too lean and do not leave the battery connected while adjusting the needle.

When to replace the glowplug

Apart from when actually burned out, a plug may need to be replaced because it no longer delivers its best performance, such as when:

- Filament surface has roughened and turned white.
- Filament coil has become distorted.
- Foreign matter has adhered to filament or plug body has corroded.
- Engine tends to cut out when idling.
- Starting qualities deteriorate.

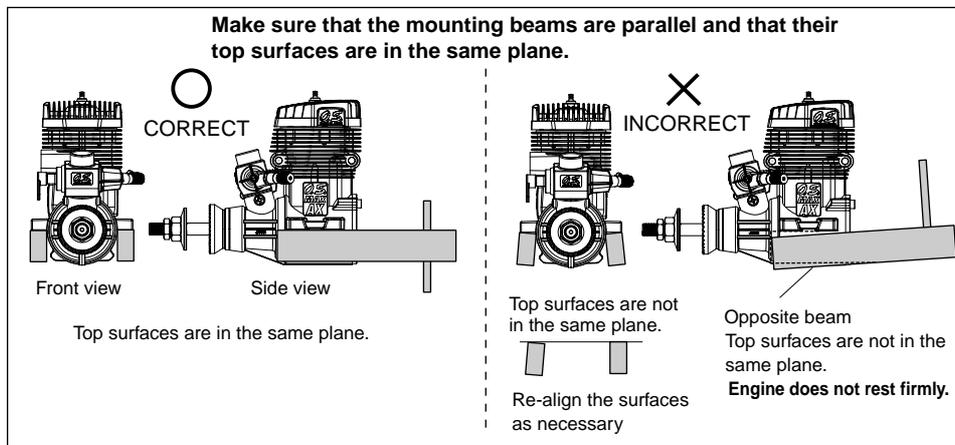
BASIC ENGINE PARTS



14

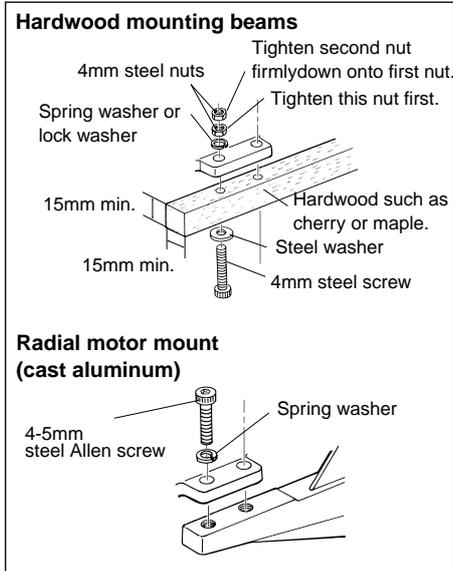
INSTALLATION

Because the 120AXRING is a powerful, large-displacement, single-cylinder engine, it is essential to use very substantial engine mounting. Conventional wooden mounting beams should be of rigid hardwood and of at least 15mm or 5/8-in square section. Use at least 4mm steel screws, such as Allen type, with locknuts, for bolting the engine to the bearers.

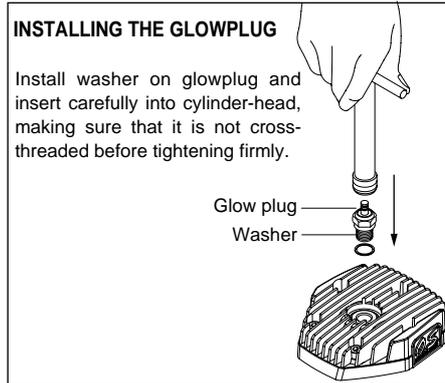


15

How to fasten the mounting screws.



Make sure that these mounting beams are accurately aligned and firmly integrated with the airframe, reinforcing the adjacent structure to absorb vibration. Use 4mm or larger steel screws, preferably Allen type hexagon socket head cap screws, with washers and locknuts, for bolting the engine to the bearers.



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INSTALLATION OF SILENCER AND ADAPTORS

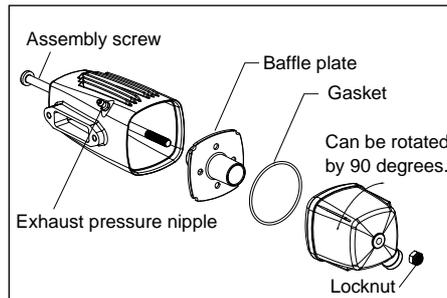
■ E-5020

Secure the silencer to the engine by means of two retaining screws supplied after the engine is securely mounted to a test bench or a model.

The exhaust outlet of the silencer can be rotated by 90 degrees the following manner:

- 1) Loosen the locknut and assembly screw.
- 2) Set the exhaust outlet at the required position by rotating the rear part of the silencer.
- 3) Re-tighten the assembly screw, followed by the locknut.

It is recommended to seal the fitting faces of engine exhaust and silencer with silicone sealant.



Reminder!

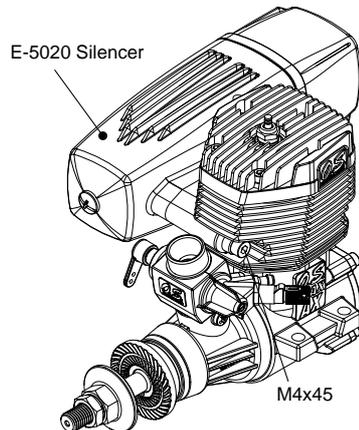
Model engines generate considerable heat. Do not touch any part of your engine until it has cooled. Contact with the muffler (silencer), cylinder head or exhaust header pipe, in particular, may result in a serious burn. Keep your hands and face away from exhaust gas or you will suffer a burn.



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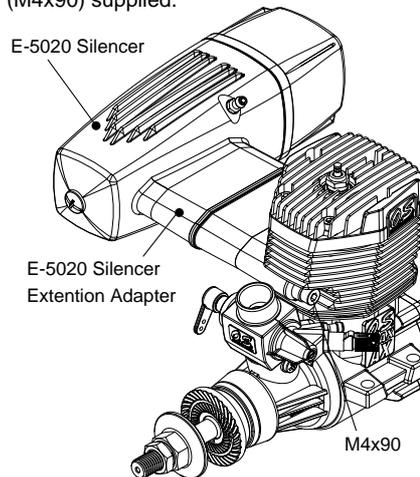
■ **In case of installing the silencer direct to the engine**

After the engine is securely mounted to a model or a test bench, secure the silencer to the engine by means of two retaining screws (M4x45) supplied.



■ **In case of installing the silencer with the extension adaptor to the engine**

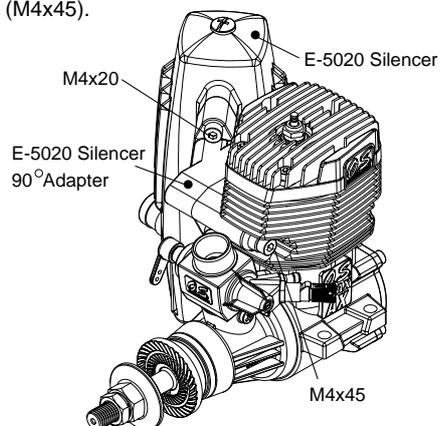
Secure the silencer and the extension adaptor to the engine by means of two retaining screws (M4x90) supplied.



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■ **In case of installing the silencer with the 90 degree adaptor to the engine**

First secure the silencer to the 90 degree adaptor by means of two retaining screws (M4x20). Then, secure the assembly to the engine by means of two retaining screws (M4x45).



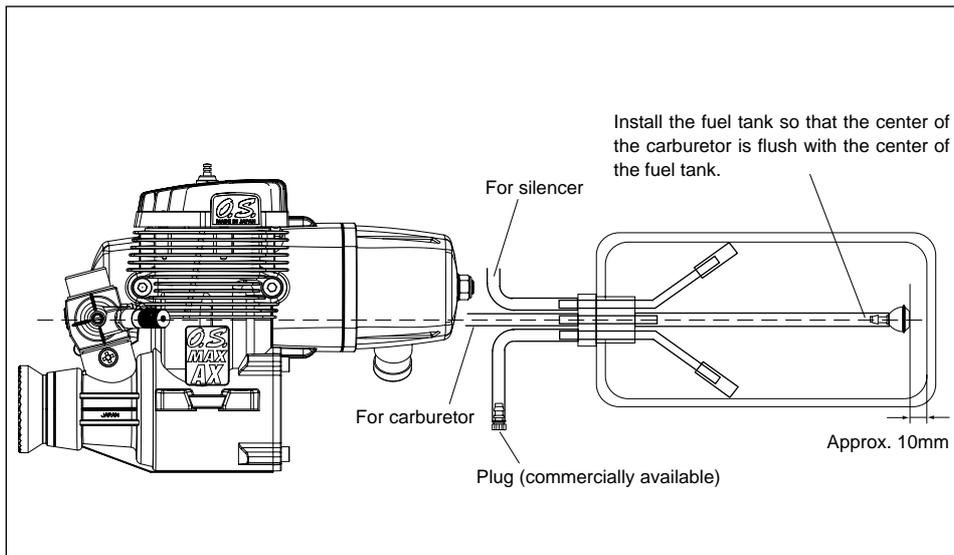
19

FUEL TANK LOCATION

- Suggested fuel tank capacity is approx 350cc. This will allow 10-12 minute flights.
- Make sure that the tank is well rinsed out with methanol or glow fuel before installation and that the pickup weight is well clear of the bottom of the tank when held vertically.
- Use a suitable length of best quality 5mm OD x 2.5mm ID silicone tubing for fuel tubing.
- Fuel plumb end should be 10mm away from the tank bottom.
- Locate the fuel tank so that the center of the carburetor is flush with the center of the fuel tank.
- Be sure to use a pressurized fuel system by connecting the muffler pressure nipple to the vent-pipe of the fuel tank.

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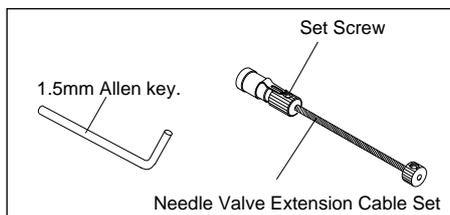
Attention to tank height



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NEEDLE-VALVE EXTENSION

The needle-valve supplied with this engine is designed to incorporate an extension so that, when the engine is enclosed within the fuselage, the needle-valve may be adjusted from the outside. For this purpose, Needle Valve Extension Cable Set is supplied with the engine. If a longer extension is required, cut a commercially available rod to the required length, bend one end to an L shape, insert it into needle's center hole and secure it by tightening the set-screw in the needle-valve knob with 1.5mm Allen key.



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THROTTLE LINKAGE

Before connecting the throttle to its servo, make sure that the throttle arm and linkage safely clear any adjacent part of the airframe structure, etc., as the throttle is opened and closed. Connect the linkage so that the throttle is fully closed when the transmitter throttle stick and its trim lever are at their lowest settings and fully open when the throttle stick is in its fully-open position. Carefully align the appropriate holes in the throttle arm and servo horn so that they move symmetrically and smoothly through their full travel.

PROPELLER & SPINNER ATTACHMENT

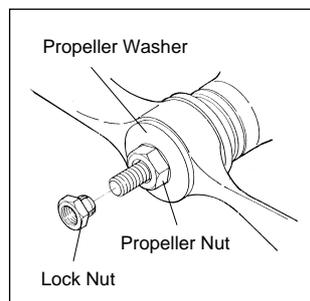
There is a risk, particularly with powerful larger engines, of the propeller flying off if the prop nut loosens due to detonation ("knocking") in the combustion chamber when the engine is operated too lean, or under an excessively heavy load.

Obviously, this can be very hazardous. To eliminate such dangers, the O.S. Locknut Assembly was devised.

Install this as follows:

1. Ream the propeller shaft hole to 8.1mm bore with an appropriate reamer, checking that the hole is exactly centered.
2. Install the prop to the engine shaft, followed by retaining washer and prop nut lightly. Turn the prop counter-clockwise slowly to locate the position where compression is felt. At this position, fit the prop horizontally and tighten firmly the prop nut with a 14mm wrench.

3. Add the specially tapered and slotted locknut and secure with a 12mm wrench while holding the prop nut with the 14mm wrench.



4. Install a spinner assembly to start the engine with an electric starter.

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Note:

Some spinners without a removable nose cone cannot be used with the prop locknut supplied with the engine. In this case, optional locknut sets are available from O.S. – Propeller Locknut Set for Spinner (Code No.45910200) and Propeller Locknut Set for 4C Spinner (Code No.45910300).

IMPORTANT

Regardless of the type of propeller used, make a habit of always checking the tightness before starting the engine. Remember that, especially with wooden propellers, there is a tendency for the material to shrink, or for it to be reduced by the serrated face of the drive hub.

MIXTURE CONTROLS

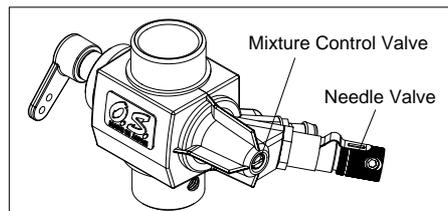
Two mixture controls are provided on this Carburetor.

- **The Needle Valve**

When set to produce maximum power at full throttle, this establishes the basic fuel/air mixture strength. The correct mixture is then maintained by the carburetor's built-in automatic mixture control system to cover the engine's requirements at reduced throttle settings.

- **The Mixture Control Valve**

This meters fuel flow at part-throttle and idling speeds to ensure reliable operation as the throttle is opened and closed. The Mixture Control Valve is factory set for the approximate best result. First run the engine as received and readjust the Mixture Control Screw only if necessary.



Mixture Control Valve of the carburetor is set at basic position (a little on the rich side) at the factory. However, minor readjustment will be required for a fuel used, atmospheric conditions and a model. When a good result is not obtained with the factory setting, readjust it according to the MIXTURE CONTROL VALVE ADJUSTMENT section. Please note during a running-in period flights should be made with a slightly rich needle setting. Therefore, during a running-in period proper carburetor responses will not be obtained. Adjust it at optimum position after the running-in is completed.

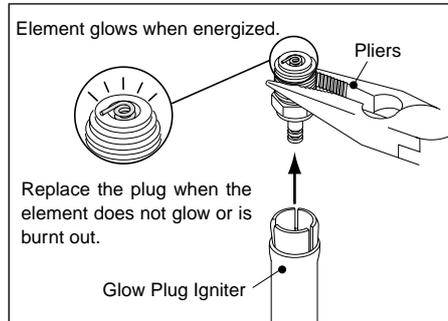
STARTING

Be sure to use an electric starter to start the engine.

 Never fail to check the tightness of screws and nuts, especially engine mounting and moving parts (e.g. throttle lever).

Starting procedure is as follows:

1. Fill the fuel tank with fuel. When filled, prevent fuel flowing into the carburetor with a commercially available fuel stopper, etc. Release the stopper before starting the engine.
2. Make sure that plug element glows red, and install the plug in the cylinder head.

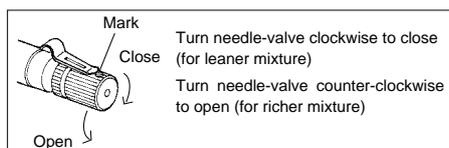


WARNING

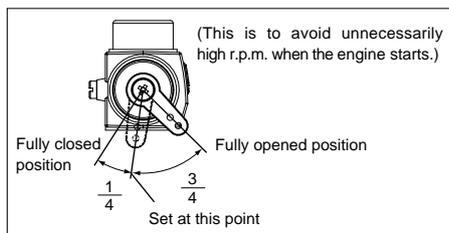
When checking the plug element hold the plug with tools, such as pliers, etc. Do not hold near your face or the fuel remaining in the filament may burn you.

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3. Check that the needle-valve is closed. (Do not overtighten.) Now open the needle-valve counter-clockwise 2.5-3 turns to the starting setting.



4. Open the throttle approx. one-quarter.



5. Apply the starter and press the starter switch for 5-6 seconds to prime the engine.
6. Connect battery leads to glowplug.
7. Bring electric starter into contact with spinner-nut or spinner and depress starter switch for one or two seconds. Repeat if necessary. When the engine starts, withdraw the starter immediately.

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Attention :

Do not choke the carburetor air intake when applying the starter. This could cause an excessive amount of fuel to be drawn into the cylinder which may initiate an hydraulic lock and damage the engine.

If the engine does not start within 10 repeat applications of the starter, remove the glow-plug, check that it glows brightly and that the cylinder is not flooded with fuel. (To eject excess fuel, close needle-valve and apply starter with glowplug removed.) Then try again.

VERY IMPORTANT!

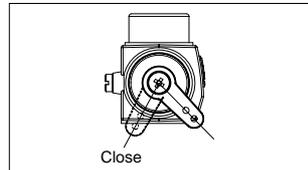
Before being operated at full power (i.e. at full-throttle and with the needle-valve closed to its optimum setting) the engine must be adequately run-in, otherwise there is a danger of it becoming overheated and damaged.

How to stop the engine

Pull down the throttle lever and trim lever on the transmitter fully.

Note:

Make sure that the throttle linkage is made so that the throttle is fully closed when the throttle lever as well as trim lever on the transmitter are fully pulled down.



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RUNNING-IN ("Breaking-in")

All internal-combustion engines benefit from extra care when they are run for the first few times known as running-in or breaking-in.

This allows the working parts to mate together under load at operating temperature. Therefore, it is vitally important to complete the break-in before allowing the engine to run continuously at high speed and before finalizing carburetor adjustments.

However, because O.S. engines are produced with the aid of the finest modern precision machinery and from the best and most suitable materials, only a short and simple running-in procedure is called for and can be carried out with the engine installed in the model.

The process is as follows.

1. Install the engine with the propeller intended for your model. Open the needle-valve to the advised starting setting and start the engine. If the engine stops when the glow plug battery is disconnected, open the needle-valve to the point where the engine does not stop. Run the engine for one minute with the throttle fully open, but with the needle-valve adjusted for rich, slow "four-cycle" operation.
2. Now close the needle-valve until the engine speeds up to "two-cycle" operation and allow it to run for about 10 seconds, then reopen the needle-valve to bring the engine back to "four-cycle" operation and run it for another 10 seconds. Repeat this procedure until the fuel tank is empty.
3. Re-start and adjust the needle-valve so that the engine just breaks into "two-cycle" from "four-cycle" operation, then make three or four flights, avoiding successive "nose-up" flights.

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4. During subsequent flights, the needle-valve can be gradually closed to give more power. However, if the engine shows signs of running too lean, the next flight should be set rich. After a total of ten flights, the engine should run continuously, on its optimum needle-valve setting, without loss of power as it warms up.
5. After the completion of the running-in adjust the carburetor at optimum setting referring to MIXTURE CONTROL VALVE ADJUSTMENT section and SUBSEQUENT READJUSTMENT section.

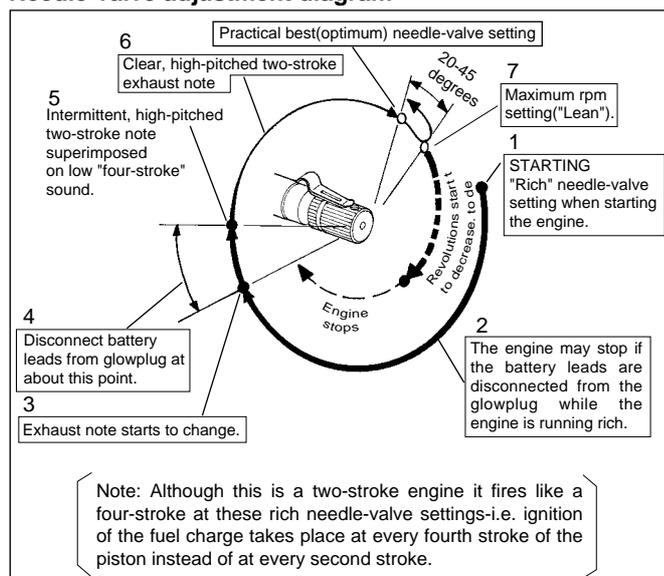
Optimum needle setting(1)

Slowly advance the throttle to its fully open position, then gradually close the needle-valve until the exhaust note begins to change. (4-cycle to 2-cycle)

Optimum needle setting(2)

As the needle-valve is closed slowly and gradually, the engine r.p.m. will increase and a continuous high-pitched exhaust note, only, will be heard. Close the needle-valve 10-15 degrees and wait for the change of r.p.m. After the engine r.p.m. increases turn the needle-valve another 10-15 degrees and wait for the next change of r.p.m. As the speed of the engine does not instantly change with needle-valve readjustment, small movements, with pauses between, are necessary to arrive at the optimum setting.

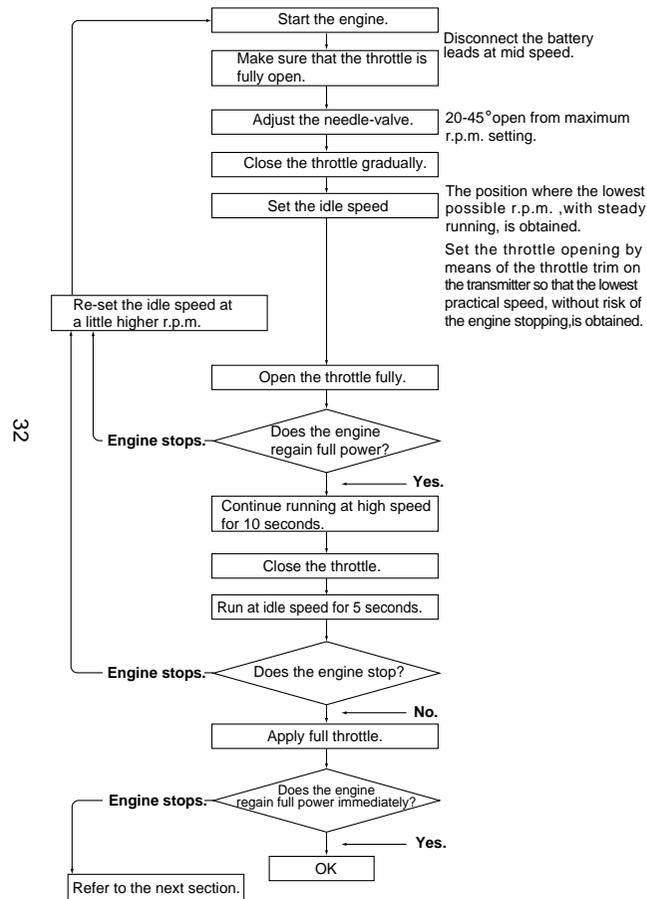
Needle-valve adjustment diagram



Note :

This diagram is for reference purposes only. Actual needle positions may differ from those shown.

IDLING ADJUSTMENT CHART



MIXTURE CONTROL VALVE ADJUSTMENT

With the engine running, close the throttle and allow it to idle for about five seconds, then open the throttle fully. If, at this point, the engine is slow to pick up and produces an excess of exhaust smoke, the mixture is too rich. Correct this condition by turning the Mixture Control Screw clockwise 15-30 degrees. If the mixture is excessively rich, engine rpm will become unstable: opening the throttle will produce a great deal of smoke and rpm may drop suddenly or the engine may stop. This condition may also be initiated by excessively prolonged idling. If, on the other hand, the mixture is too lean, this will be indicated by a marked lack of exhaust smoke and a tendency for the engine to cut out when the throttle is opened. In this case, turn the Mixture Control Screw counter-clockwise 90 degrees to positively enrich the idle mixture, then turn the screw clockwise gradually until the engine regains full power cleanly when the

throttle is reopened. Carry out adjustments patiently until the engine responds quickly and positively to the throttle control.

Note: Mixture Control Valve adjustments should be made in steps of 15-30° initially, carefully checking the effect, on throttle response, of each small adjustment.

REALIGNMENT OF MIXTURE CONTROL VALVE

In the course of making carburetor adjustments, it is just possible that the Mixture Control Valve may be inadvertently screwed in or out too far and thereby moved beyond its effective adjustment range. Its basic setting can be re-established as follows:

Close the throttle rotor gradually from the fully opened position until it is just fully closed. (Do not turn further.) Then, screw in the Mixture Control Screw until it stops. Now unscrew the Mixture Control Screw approx. 3/4 turn. This is the basic position.

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SUBSEQUENT STARTING PROCEDURE

Once the optimum needle-valve setting has been established (see page 31, Needle-valve adjustment diagram) the procedure for starting may be simplified as follows.

1. Open the needle-valve one half-turn (180 degrees) from the optimum setting.
2. Set the throttle one-quarter open from the fully closed position, energize the glowplug and apply the electric starter. When the engine starts, re-open the throttle and re-adjust the needle-valve to the optimum setting.

Note:

When re-starting the engine on the same day, provided that atmospheric conditions have not changed significantly, it may be practicable to re-start the engine on its optimum (running) setting.

SUBSEQUENT READJUSTMENT

Once the engine has been run-in and the controls properly set up, it should be unnecessary to alter the mixture settings; except to make minor adjustments to the Needle-Valve occasionally, to take account of variations in climatic conditions. The use of a different fuel, however, particularly one containing more, or less, nitromethane and/or a different type or proportion of lubricating oil, is likely to call for some readjustment of the Needle-Valve. Remember that, as a safety measure, it is advisable to increase the Needle-Valve opening by an extra half-turn counter-clockwise, prior to establishing a new setting. The same applies if the silencer type is changed. A different silencer may alter the exhaust pressure applied to the fuel feed and call for a revised Needle-Valve setting. The use of a different glowplug may also require compensating carburetor readjustments.

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CARBURETOR CLEANLINESS

The correct functioning of the carburetor depends on its small fuel orifices remaining clear. The minute particles of foreign matter that are present in any fuel, can easily partially obstruct these orifices and upset mixture strength so that engine performance becomes erratic and unreliable.

O.S.'Super-Filters'(large and small) are available, as optional extras, to deal with this problem. One of these filters, installed on the outlet tube inside your refueling container, will prevent the entry of foreign material into the fuel tank. It is also recommended that a good in-line filter be installed between the tank and needle-valve. Do not forget to clean the filters regularly to remove dirt and lint that accumulate on the filter screen.

Also, clean the carburetor itself occasionally.

TROUBLE SHOOTING WHEN THE ENGINE FAILS TO START

Four key points

For quick, reliable starting, the following four conditions are required.

- ① **Good compression.** ② **Adequate "glow" at glowplug.** ③ **Correct mixture.**
 ④ **Sufficient electric starter rotating speed.**

If the engine fails to start, or does not keep running after being started, check symptoms against the following chart and take necessary corrective action.

Note: The most common causes of trouble are marked with three asterisks, the less common problems with one or two asterisks.

Symptom	Factor	Cause	Corrective action
Engine fails to fire.	①	* Sluggish rotation	Recharge the electric starter battery.
	②	** Glowplug battery discharged.	Recharge lead-acid cell or replace dry battery. (Note: An unused, or almost unused, dry battery may sometimes be of insufficient capacity if it is "old stock".)
		* Glowplug element is burned out	Replace glowplug. Check that applied voltage is not too high.
		* Something wrong with battery leads.	Check glowplug heating using other leads.
	③	** Engine "flooded" due to excessive priming.	Close needle-valve fully and remove glowplug, then flip propeller to pump out excess fuel. (Invert engine, if possible, while pumping out excess). Restart engine. (Priming is not necessary at this time.)
		* Insufficient priming.	Repeat priming procedure referring to Priming.

Symptom	Factor	Cause	Corrective action
Engine fires intermittently but does not run.	② — ★★	Incorrect heating of glowplug.	Voltage too high or too low. Re-check and readjust referring to "BEFORE STARTING" . Continue applying an electric starter. If the engine does not start after more than 4 tries, disconnect the current to the glowplug and leave for a few minutes., then re-energize plug and apply starter. If the engine still does not start, remove glowplug and pump out excess fuel by applying the starter. Then re-start. (Priming is not necessary.) Recharge the electric starter battery.
	③ — ★★	Over priming.	
	① — ★	Sluggish rotation.	
Engine fires once or twice, then fails to fire.	② — ★★	Glowplug battery discharged.	Recharge lead-acid cell or replace dry battery. (Note: An unused, or almost unused, dry battery may sometimes be of insufficient capacity if it is "old stock".)
Engine starts but rpm decreases and engine eventually stops.	③ — ★★	Insufficient priming.	Repeat priming procedure referring to Priming.
Engine starts, rpm increases and engine cuts out.	-③ — ★★★	Mixture too rich.	Close needle-valve half turn (180°) and wait for several minutes then re-start.(Priming is not necessary.)
Engine stops when the current to the glowplug is disconnected after starting.	-③ — ★	Fuel not reaching the engine.	Make sure that tank is filled with fuel. Check that there is not something wrong with the fuel line (kinked or split). Check that carburettor is not clogged with dirt.
	③ — ★★	Mixture too rich.	Close the needle-valve a little before disconnecting current to the glowplug.
	② — ★	Mismatch of glow plug and fuel.	Change fuel or glowplug.

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CARE AND MAINTENANCE

Please pay attention to the matters described below to ensure that your engine serves you well in regard to performance, reliability and long life.

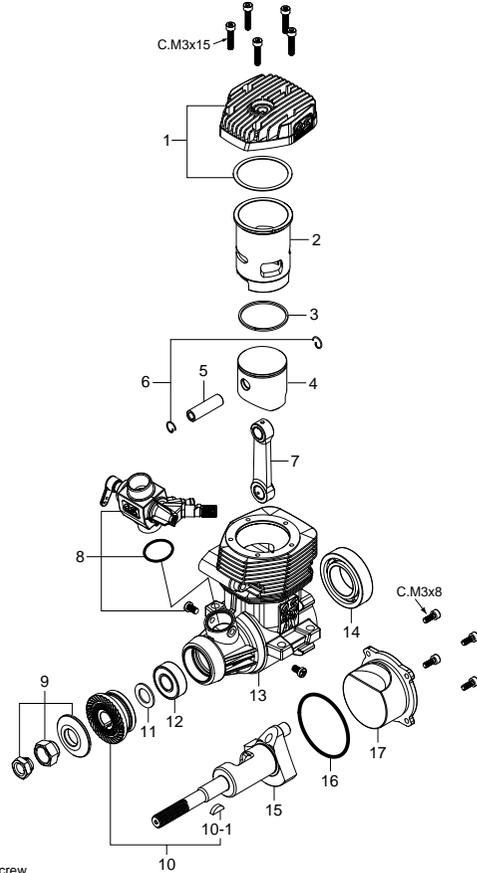
- As previously mentioned, it is vitally important to avoid operating the engine in conditions where dust, disturbed by the propeller, may be deposited on the engine and enter its working parts.
- Remember to keep your fuel container closed to prevent foreign matter from contaminating the fuel.
- Install a fuel filter to prevent dirt and dust in the fuel container from entering the fuel tank. O.S. Super Filters (L) and (S) are available as optional extras.

- Install an in-line fuel filter between the tank and carburetor to prevent dirt and dust in the tank from entering the carburetor.
- Clean these filters periodically.
- If these precautions are neglected, restriction of fuel flow may cause the engine to cut out, or the fuel/air mixture to become too lean causing the engine to overheat.
- The use of modern high-performance alcohol based model engine fuels, while promoting cooler running, improved anti-detonation combustion and increased power, have the disadvantage of causing corrosion due to the acid by-products of combustion. The use of nitromethane in the fuel can also contribute to the problem.

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- Do not close the needlevalve and mixture control valve too far as this will cause a lean setting and over heating of the engine. This can, in turn, create nitromethane oxide leading to internal rusting of the engine. Always adjust the needlevalve slightly on the rich side of peak rpm.
- Do not leave unused fuel in the engine at the conclusion of a day's flying. Accepted practice is to cut off the fuel supply while the engine is still running at full throttle, then expel as much fuel residue as possible by turning the engine over 5-10 seconds with the electric starter. Finally, inject some after-run oil through the glowplug hole and turn the engine over several times by hand.
- When the engine is not to be used for some months (for example, as between flying seasons), a worthwhile precaution is to remove it from the airframe and, after washing off the exterior with alcohol (not gasoline nor kerosene), remove carefully the carburetor with intake pipe, glow plug and all silicone tubing and put them safely aside. Then, immerse the engine in a container of alcohol. Rotate the crankshaft while the engine is immersed. If foreign matter is visible in the alcohol, rinse the engine again in clean alcohol. Finally, shake off and dry the alcohol, and inject some after-run oil in the glowplug hole and rotate the crankshaft several times by hand. Reinstall the carburetor with intake pipe and glowplug on the engine and keep it in a dry place after putting in a vinyl bag.

ENGINE EXPLODED VIEW



* Type of screw

C...Cap Screw B...Binding Head Screw M...Oval Fillister-Head Screw
F...Flat Head Screw N...Round Head Screw S...Set Screw

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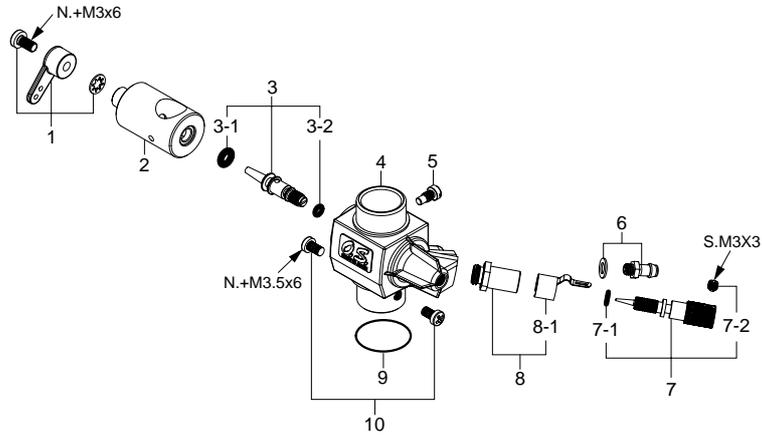
ENGINEN PARTS LIST

No.	Code No.	Description
1	29124000	Cylinder Head
2	29123100	Cylinder Liner
3	29123400	Piston Ring
4	29123200	Piston
5	29206000	Piston Pin
6	28117000	Piston Pin Retainer (2pcs.)
7	29125000	Connecting Rod
8	29182000	Carburetor Complete (Type 70D)
9	45910100	Locknut Set
10	29128000	Drive Hub
10-1	29008219	Woodruff Key
11	46120000	Thrust Washer
12	26731010	Crankshaft Ball Bearing (F)
13	29121000	Crankcase
14	46030008	Crankshaft Ball Bearing (R)
15	29122000	Crankshaft
16	29121400	Gasket Set
17	29127000	Cover Plate
	71608001	Glow Plug No.8
	72200080	Needle Valve Extension Cable Set
	29122500	E-5020 Silencer Assembly
	29122540	Gasket
	29122530	Assembly Screw
	22681957	Pressure Nipple (No.7)
	29122520	Silencer Retaining Screw (C.M4x45 2pcs.)
	29122600	E-5020 Silencer Extension Adapter
	29122610	Extention Adapter Retaining Screw (M4x90 2pcs.)
	29122700	E-5020 Silencer 90° Adapter
	29122510	90° Adapter Retaining Screw (M4x20 2pcs.)

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The specifications are subject to alteration for improvement without notice.

CARBURETOR EXPLODED VIEW



* Type of screw

C...Cap Screw B...Binding Head Screw M...Oval Fillister-Head Screw
F...Flat Head Screw N...Round Head Screw S...Set Screw

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CARBURETOR PARTS LIST

No.	Code No.	Description
1	27881400	Throttle Lever Assembly
2	29182200	Carburetor Rotor
3	29181620	Mixture Control Valve Assembly
3-1	46066319	"O" Ring (L) (2pcs.)
3-2	22781800	"O" Ring (S) (2pcs.)
4	29182100	Carburetor Body
5	45581820	Roter Guide Screw
6	22681953	Fuel Inlet (No.1)
7	22681980	Needle-valve Assembly
7-1	24981837	"O" Ring (2pcs.)
7-2	26381501	Set Screw
8	27381940	Needle-valve Holder Assembly
8-1	26711305	Ratchet Spring
9	29015019	Carburetor Rubber Gasket
10	25081700	Carburetor Retaining Screw

Specifications are subject to alteration for improvement without notice.

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O.S. GENUINE PARTS & ACCESSORIES

■ O.S.GLOW PLUG

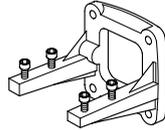
No.8
(71608001)



A5
(71605100)

■ RADIAL MOTOR MOUNT

For FS-120S III /FS-120S-E
(71904200)



■ PROPELLER LOCKNUT SET FOR 4C SPINNER

5/16"-M5 (45910300)

■ PROPELLER LOCKNUT SET

(45910100)

(For Spinner)
(45910200)

■ NON-BUBBLE WEIGHT

(71531000)



■ LOCK WASHER

(10sets)

M5 (55500004)



■ CAP SCREW SETS

(10pcs./sets)

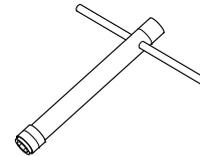
M3x8 (79871110)

M3x15 (79871150)



■ LONG SOCKET WRENCH WITH PLUG GRIP

(71521000)



■ SUPER FILTER (L)

(72403050)



■ BLIND NUT

M5
(79870050)



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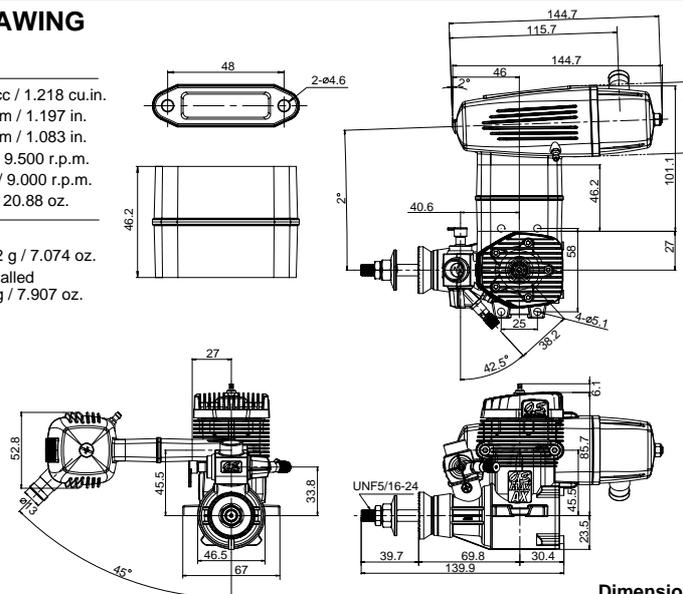
THREE VIEW DRAWING

Specification

Displacement	19.96 cc / 1.218 cu.in.
Bore	30.4 mm / 1.197 in.
Stroke	27.5 mm / 1.083 in.
Practical R.P.M.	1.800 - 9.500 r.p.m.
Power output	3.1 ps / 9.000 r.p.m.
Weight	647 g / 20.88 oz.

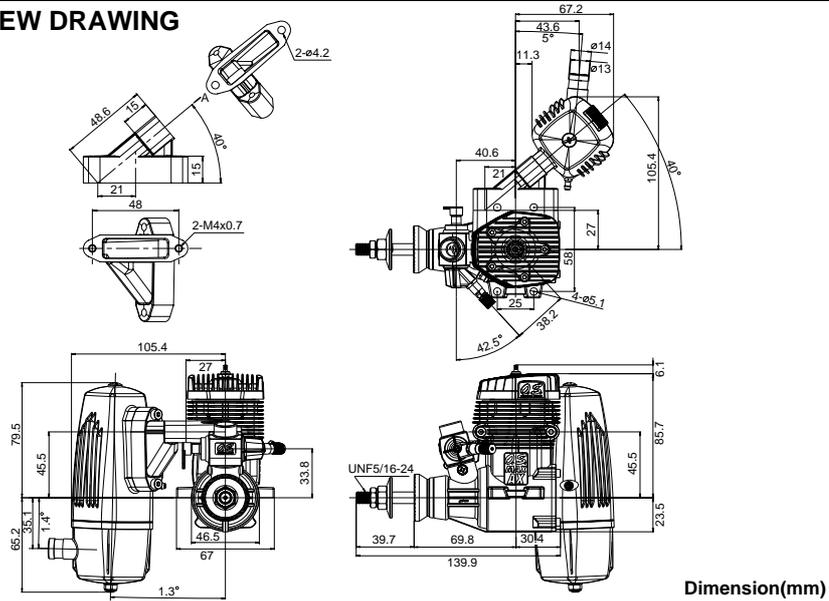
When 90° adaptor is installed
219.2 g / 7.074 oz.

When Extension adaptor is installed
245 g / 7.907 oz.



Dimension(mm)

THREE VIEW DRAWING



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