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# ***O.S. ENGINE***

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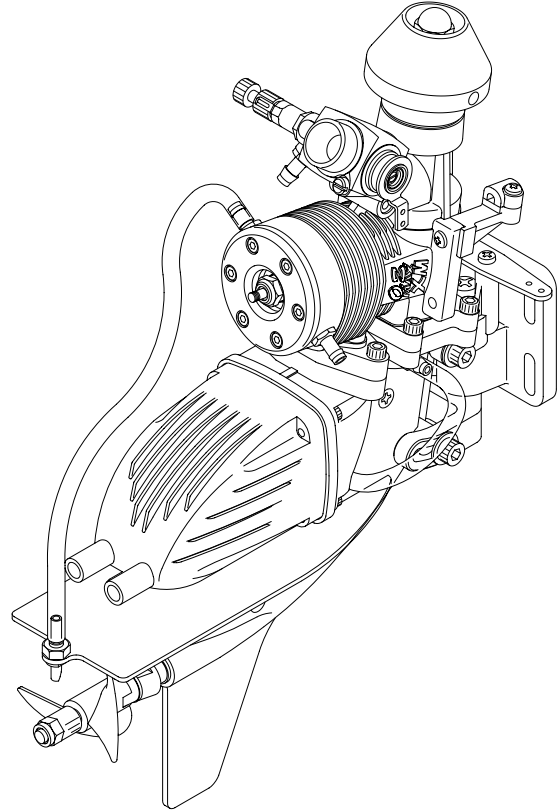
# **O.S. MAX-21XM**

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## **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 2-3 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 model 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.



## WARNINGS

- Never touch, or allow any object to come into contact with, the rotating propeller. 
- 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 an 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. 



# NOTES

- This engine was designed for model boats. 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 locknuts.
- Fit an effective silencer(muffler). Frequent close exposure to a noisy exhaust (especially in the case of the most powerful high-speed engines) may eventually impair your hearing and such noise is also likely to cause annoyance to others over a wide area.
- For their safety, keep all onlookers (especially small children) well back (at least 12 feet or 4 metres) when preparing your model for running.
- Take care that the glowplug clip or battery leads do not come into contact with the propeller or any other rotating parts. Also check the security of the linkage to the throttle arm.
- When starting your engine, use an electric starter. The wearing of safety glasses is also strongly recommended.
- When handling the boat immediately prior to launching, be especially cautious. Keep the propeller and other rotating parts away from you.
- 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.
- 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 fire if the glowplug battery is accidentally reconnected.

The O.S. MAX-21XM is a high-performance water-cooled outboard marine engine for small and medium-size radio-controlled outboard boats. It is of sturdy construction and designed for easy maintenance. It is not necessary to readjust the linkage when the installation angle to the hull is changed.

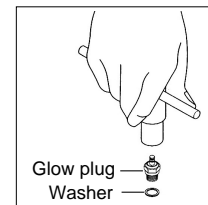
A tilt mount is supplied as standard. Also, a carbon-fibre propeller is included.

### NOTE

- This engine rotates clockwise. Do not force it to turn counter-clockwise.
- With this engine, the piston will feel tight at the top of its stroke when the engine is cold. This is normal. The piston and cylinder are designed to achieve a perfect running clearance when they reach their normal running temperatures.
- We do not recommend running your boat on the sea, or in any other saltwater environment. Under such conditions, it is difficult to prevent the engine from becoming corroded and, eventually, inoperative.

### FITTING THE GLOWPLUG

Fit washer to glowplug and insert carefully into cylinder-head, making sure that it is not cross-threaded before tightening firmly.



### INSTALLATION OF THE CARBURETTOR

As delivered, this engine has its carburettor lightly fitted into its intake boss. Secure it as follows.

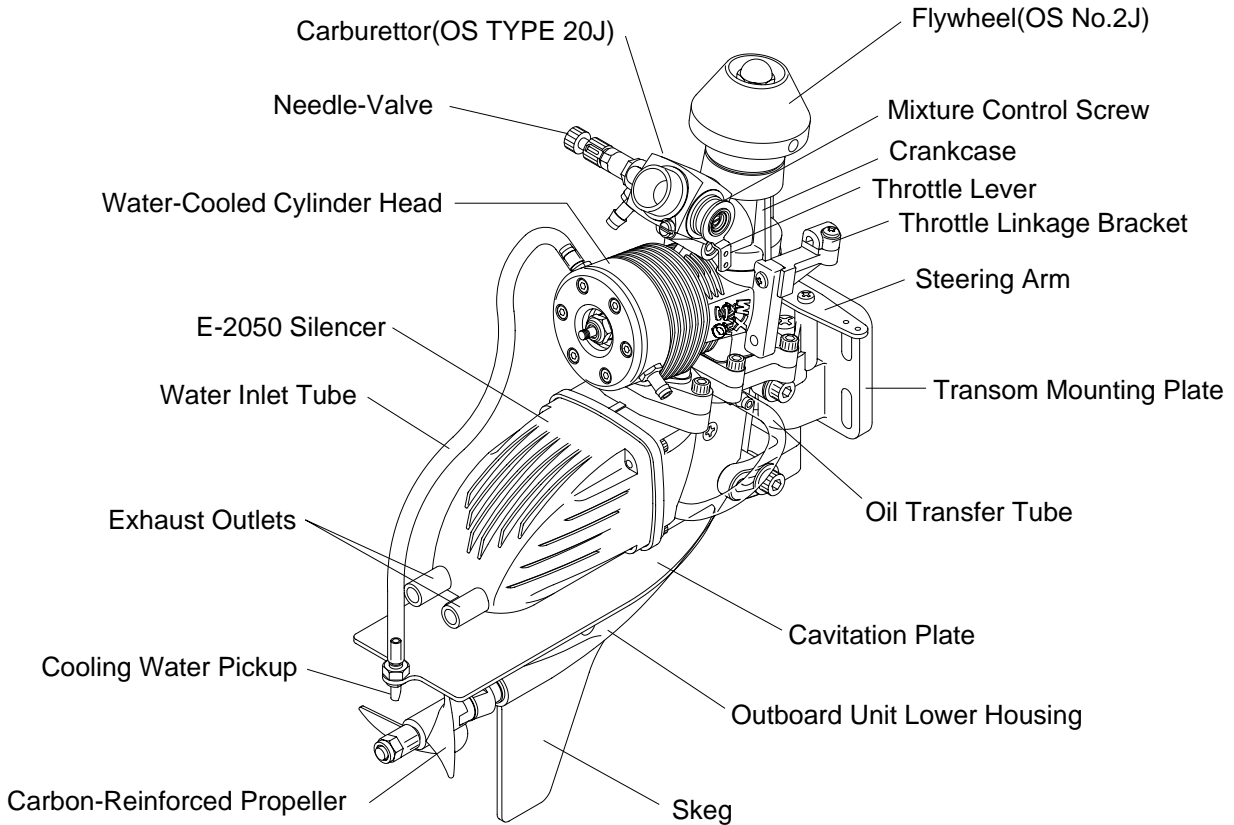
1. Loosen the retainer screw and rotate the carburettor to its proper position in the intake boss.
2. The carburettor is aligned vertically and sealed against air leaks by a heatproof rubber gasket between the carburettor body and the rim of the intake boss. Therefore, press the carburettor firmly down into the intake boss while rotating the retainer screw.

Turn the screw gently until it stops, then tighten a further 90°.

#### Note:

The two-piece retainer is designed to pinch the carburettor from both sides. Do not overtighten.

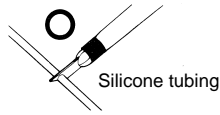
## BASIC ENGINE PARTS



## PIPING

Connect the water inlet tube (L=170mm) and oil transfer pipe (L=65mm) securely as shown on page 5. In the event of either tube becoming damaged, it should be replaced with best quality 5.5mm ODX2.5mm ID silicone tubing.

**Note :** When cutting silicone tubing.....



Use knife or razor blade.



Do not use wire cutters or pliers

If you should need to clean out silicone tubes, use methanol or glow-fuel, not gasoline.

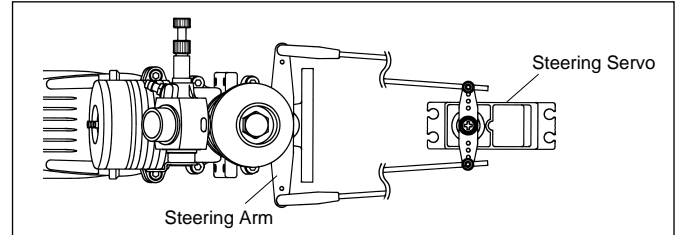
## INSTALLATION

The face of the mounting plate is precision machined flat. Make sure that the hull's transom is also flat. The adjacent hull structures should be as rigid as possible so that the engine will be able to develop its full performance. Use 4mm steel screws, such as Allen type socket head cap screws, with locknuts or lockwashers for bolting the engine to the hull. For extra security, apply LOCTITE to the screw threads to prevent nuts vibrating loose.

## LINKAGES

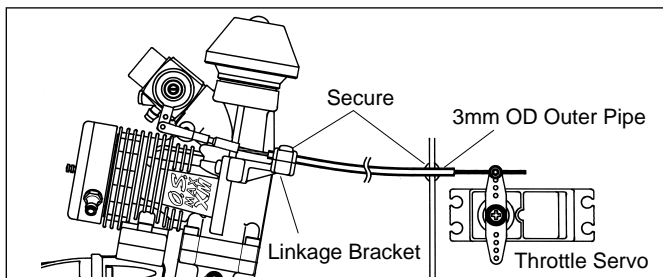
### Steering Linkage

Use a high-torque servo, preferably with dual pushrods as shown below. (A single pushrod will bend easily which results in poor steering accuracy.)



### Throttle Linkage

Use flexible 'Bowden' type cable having a 3mm OD outer sleeve. Secure one end of the sleeve to the engine, by means of the throttle linkage bracket supplied, and the other end to any appropriate part of the hull structure immediately surrounding the throttle servo. (See sketch) If the two ends are not secured in this way, steering the boat will upset throttle control. Make sure that no strain is imposed on the throttle cable when steering fully left or right. Adjust the throttle linkage so that the throttle can be fully closed to stop the engine prior to lifting the boat from the water. (If necessary, consult your R/C system handbook for setting up linkage in relation to transmitter stick movement.)



## FUEL

Use only top quality commercial model two-stroke engine fuel. For consistent performance and long engine life, it is essential to use fuel containing AT LEAST 18%(volumetric ratio)best-quality lubricant. This engine is designed to run on both low and high nitromethane content fuels, i.e. from mild mixtures containing a few percent of nitromethane, up to high-speed racing fuels containing 30%, or more, of nitromethane. Generally, power output is increased—up to a certain point—as the nitromethane content of the fuel is increased. As a starting point, we recommend a fuel containing 10% nitromethane, changing to a fuel containing more nitro if necessary. When the nitro content of the fuel is increased or the brand of fuel is changed, it is advisable to run the engine with a richer needle-valve setting, initially, so that the optimum setting for the new fuel may be rechecked as described in the RUNNING-IN paragraph.

## 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 naked 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.**

## GLOWPLUG

The O.S. No.8 glowplug is recommended and one is supplied with this engine. The MAX-21XM may not always run so well with other types of plug.

### 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 becomes 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.:



- Fit a plug suitable for the engine (e.g. OS No.8).
- Use fuel containing a moderate percentage of nitromethane unless 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 when idling.
- Starting qualities deteriorate.

## FLEXIBLE DRIVE SHAFT

If, due to accidental damage or wear, the flexible drive shaft (see p.16) should require replacement, proceed as follows. (Note: a wise precaution is to have a spare flexible shaft on hand for such emergencies.)

1. With aid of the correct sized screwdrivers and hexagon keys, separate the complete lower end (outboard unit assembly) from the power-head and remove all parts necessary to give access to the flexible drive shaft. This has squared ends that fit into the PTO shaft at the power-head and the propeller shaft at the bottom end. Note that the propeller shaft bearing has a left-hand thread.

2. Remove the flexible drive shaft and its sleeve and if any debris is found in the sleeve, wash it out with fuel or alcohol before greasing the full length of the new shaft and reinserting it into the sleeve.
3. Make sure that the ends of the new shaft fit properly into the PTO shaft and propeller shaft and that the new flexible shaft rotates smoothly.  
Then replace the curved side plate, cavitation plate, etc. and re-unite the power-head with the lower assembly. Gently turn the flywheel to check that the propeller rotates smoothly before tightening assembly screws.

## PROPELLER

The MAX-21XM's special carbon-fibre propeller has a diameter of 42mm and a P/D ratio of 1.2. If any other propeller is substituted, make sure that it is properly balanced.



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.

## BEFORE STARTING THE ENGINE

- The rapid changes of hull attitude that occur when a fast boat is operating in choppy water, especially when the fuel tank is located at some distance from the carburettor, means that fuel "head" at the carburettor jet can vary quite considerably, causing the engine to run erratically or stop. Therefore, it is advisable to use a moderately pressurized fuel system.

- Before starting the engine for the first run of the day, remove the glowplug and check the engine by rotating the flywheel by hand. It should rotate smoothly. Now turn the engine with an electric starter until fuel is drawn into the carburettor. At first, rotation may feel 'sticky' due to oily residue remaining within the engine. The engine should rotate freely after fresh mixture has been drawn into the working parts.
- Check the glowplug. If the plug element is distorted, off-center, or has a white appearance, engine performance may be below par. Replace the plug if necessary.
- When re-starting the engine, turn the flywheel by hand, as before (but without removing the glowplug) to make sure that there is nothing unusual, before energizing the glowplug and applying the starter.

#### WARNING!

Never attempt to turn the engine with the starter if the engine is over-primed with fuel or flooded with corrosion-inhibiting oil. To do so is likely to seriously damage the working parts.

## ADJUSTING THE CARBURETTOR

Two adjustable controls are provided on this carburettor.

- **The Needle-Valve:**

For adjusting the mixture strength when the throttle is fully open.

- **The Mixture Control Screw:**

For adjusting the mixture strength at idling speeds, to obtain steady idling and smooth acceleration to mid speeds.

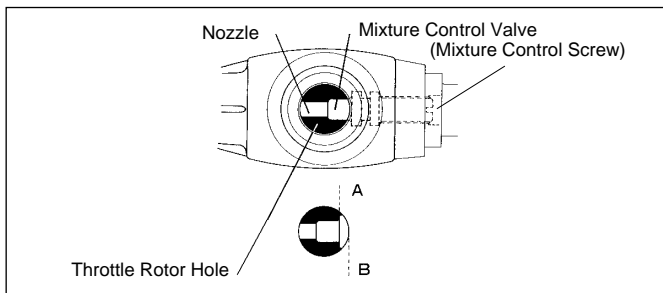
## REALIGNMENT OF MIXTURE CONTROL VALVE

In the course of making carburettor 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. (Refer to sketch, p.10, top left.)

Its basic setting can be reestablished as follows:

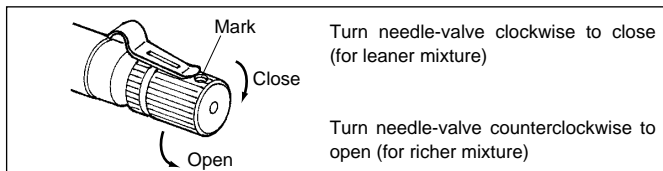
The basic (factory) setting is as shown in the main sketch, i.e. with the shoulder portion 'A' exactly at a tangent to the throttle rotor hole.

To return the Mixture Control Valve to its original position, first screw in the Mixture Control Valve, while looking into the rotor hole. Then gradually unscrew the Mixture Control Valve until 'A' is precisely tangential to the rotor hole (i.e. so that 'A' and 'B' are superimposed) as in the main sketch.

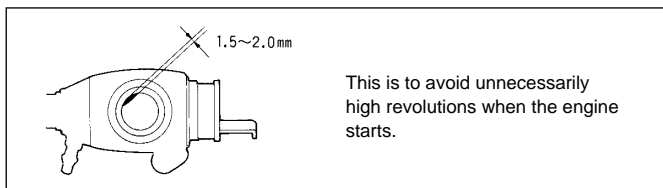


## STARTING

- ◆ Set the needle-valve. Turn the needle clockwise slowly, without forcing, until it stops. Then, reopen the needle-valve 2-1/2 turns counterclockwise.



- ◆ Open the throttle very slightly:



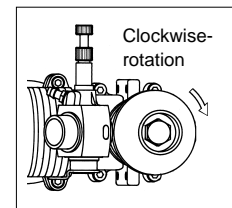
- ◆ Heat the glowplug by connecting the battery leads.

- ◆ Make sure that the direction of rotation of the electric starter is correct, namely, clockwise.

If necessary, reverse leads on battery to provide clockwise rotation.

- ◆ Bring the starter into contact with the flywheel and depress the starter switch for one or two seconds.

Repeat if necessary. When the engine fires, withdraw the starter immediately.



### Warning:

**Do not apply the starter to a flooded engine and never place your finger over the carburettor intake when using the starter. This may cause an hydraulic lock and bend the connecting-rod.**

- ◆ Adjusting the needle-valve: adjust the needle-valve to its optimum setting only while actually running your boat on the water.
- ◆ To stop the engine, fully close the throttle to cut off air supply.

## RUNNING-IN ("Breaking-in")

For long life and high-performance, every engine needs to be properly 'run-in' or 'broken-in'. There are several running-in methods, but the following is suitable for use with the MAX-21XM.

1. Turn the Needle-Valve clockwise slowly and gently until it stops. This is the fully closed position. Do not use force to turn the Needle-Valve beyond this point. Now reopen the Needle two-and-one-half turns. (The set-screw on the Needle-Valve knob may be used as a reference mark.)
2. Set the throttle at the starting position, (i.e. very slightly opened from idling position) and start the engine.



**The propeller blades are extremely sharp. 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. Do not touch any part of the power-head until it has cooled. Contact with the muffler (silencer) or cylinder, also, may result in a serious burn.**

### **WARNING!**

It is vitally important to set the throttle at the correct starting position before starting the engine. If the engine is allowed to run under 'no-load' conditions, it will speed up to extremely high revolutions — even at part-throttle settings — which may result in serious damage.

Be careful not to put excessive load on the steering servo when starting the engine with an electric starter. It is advisable to set the steering fully left before applying an electric starter.

3. It is necessary to warm up the engine by running it at around the idling setting for a while after starting, as with the engine of a full size boat. High r.p.m. operation without warming up will shorten engine life or damage it.
4. Leaving the Needle-Valve set at the starting setting of 2-1/2 turns open, run the boat several times with the throttle fully open until at least three full tanks of fuel have been consumed. (It should be noted that, at this stage, it may not be possible for the engine to idle reliably because of the over-rich setting of the Needle-Valve.)
5. This completes the initial running-in stage.  
For the remaining period of running-in, refer to the adjustment procedures detailed later.  
The boat will need to be run for about 10 tanks of fuel to complete the running-in period.

### **Note!**

**If as a result of your boat being capsized, the engine takes in water, remove the glowplug, invert the engine and eject water by carefully turning the flywheel, first by hand and then with the electric starter. Make every effort to ensure that no water remains in the engine before attempting to restart it, or it may be damaged by an hydraulic lock.**

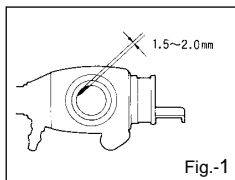
**To ensure that any traces of water (which may also cause internal rusting if not dealt with) are flushed out, use an appropriate water-displacing spray lubricant.**

## ADJUSTMENT

### WARNING :

**Running the engine with the boat out of the water, without load and without cooling water, will seriously damage it, due to overheating. Therefore, always lower the boat into the water immediately after the engine has been started, so as to prevent over-speeding and to allow cooling water to be forced up to the cylinder-head. Having carried out the initial running-in ("breaking-in") procedure as described before, complete the running-in as follows:**

1. Open the throttle slightly from the idling position and start the engine, following the procedure described previously.
2. Lower the boat into the water, gradually open the throttle and run the boat straight ahead for 20 to 30 metres at full throttle. Now return the model and close the needle-valve 20 to 30°. Repeat the run, taking note of the improvement in speed.
3. Continue with further runs, gradually closing the needle-valve (20 to 30° at a time) until no further increase in speed is obtained.
4. If the needle-valve is closed beyond the optimum setting, the model will slow down, accompanied by visibly diminished exhaust smoke. In this case, immediately throttle down and return the model to shore. Re-open the needle-valve approximately one-half turn and repeat the runs until the optimum needle setting is found.



5. Aim to have the model achieving its highest performance after the engine has consumed about one litre of fuel. Having found the optimum needle-valve setting, make a note of the number of turns necessary to re-establish this from the closed position.
6. With the engine run-in and the optimum needle-valve setting determined, the mixture control valve should be checked as follows:
7. Launch the boat and gradually open the throttle to its fullest extent. If at this point, the engine puffs out a good deal of smoke and does not accelerate smoothly and rapidly, it is a sign that the idling mixture is too rich. Therefore, turn the mixture control screw clockwise 45 to 60°. Repeat the run and recheck the result.
8. If, on the other hand, the idling mixture is too lean, the engine is likely to speed up momentarily, then cut out abruptly when the throttle is re-opened. In this case, first turn the mixture control screw counter-clockwise 90° to make sure that the mixture has become richer, then make incremental adjustments, each way, until an acceptable balance between rich v.lean settings is achieved. Carry out these adjustments patiently under actual running conditions, until the engine responds quickly and positively to throttle movements. Use a small screwdriver to adjust the mixture control valve via its slotted screwhead in the center of the outer end of the throttle rotor.

9. With the optimum mixture control valve position, light smoke is visible during high-speed running and engine revolutions increase smoothly during acceleration. Remember that, if the engine is operated with the fuel/air mixture slightly too lean, it will overheat and run unevenly or cut out. As with all engines, it is wise to set both valves a little on the rich side of the best rpm setting, as a safety measure.
10. When the best balance of mixture adjustments has been determined and, especially as the engine becomes fully run-in, it will probably be found that the idling speed has increased. Readjust the throttle opening by means of the trim lever on the transmitter, so that the lowest idling speed, without risk of stalling the engine, may be obtained.

**WARNING :**

**For safety reasons, it is advisable to stop the engine before carrying out adjustments to the Mixture Control Screw.**

**Note :**

**Once the correct carburettor settings have been established, it should be unnecessary to alter them. Such slight Needle-Valve readjustments as may be required to compensate for variations in atmospheric conditions will not normally affect the other two controls. Slight readjustments may be necessary for optimum performance if different types of fuel, glowplugs or propellers are used.**

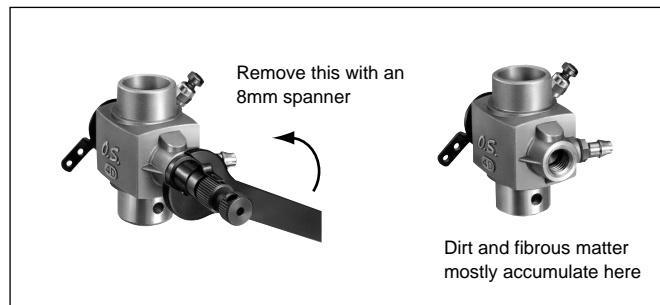
## CARBURETTOR CLEANLINESS

Proper functioning of the carburettor depends on its small fuel orifices remaining clear.

The minute particles of foreign matter that are present in any fuel, can partially obstruct these orifices and upset mixture strength so that engine performance becomes erratic and unreliable.

It is recommended that fuel is passed through a filter when the tank is filled and that a good in-line filter is installed between the fuel tank and carburettor and, furthermore, that this filter is frequently cleaned to remove dirt and lint that accumulate on the filter screen.

Finally, occasionally remove the needle-valve holder from the carburettor as shown below and extract any remaining foreign matter that may have lodged in the location shown.



## CARE AND MAINTENANCE

To ensure that you obtain long life and peak performance from your engine, observe the follow-ing.

- ① As previously observed, foreign matter in the fuel can cause problems. Therefore:
  - rinse out the fuel tank with methanol or fuel before installing it.
  - fit a fuel filter to the fuel delivery tube between tank and carburettor.
  - fit a fuel filter to the outlet of your squeeze bottle, or to the pump inlet if you use a manual or electric pump. \*
  - do not leave your fuel container open need-lessly.

\* O.S. 'Super-Filters' (large and small) are available, as optional extras, to deal with this problem. One of these filters, fitted to the outlet tube inside your refuelling container, will prevent the entry of foreign material into the fuel tank.
- ② Do not forget to clean the filters regularly to remove dirt and lint that accumulate on the filter screens. Also, clean the carburettor itself occasionally.
- ③ At the end of each operating session, drain out any fuel that may remain in the fuel tank. Afterwards, energize the glowplug and try to restart the engine, to burn off any fuel that may remain inside the engine. Repeat this procedure until the engine fails to fire. Leaving fuel residues within the engine can result in difficult starting after a period of storage. It may also cause corrosion.

To reduce such risks, it is helpful to inject some corrosion inhibiting oil into the engine's air intake.

Rotate the engine many times to distribute the oil to all the working parts.

- ④ Drain the water remaining in the water cooling head, and wash out with methanol, then inject corrosion-inhibiting or moisture-displacing oil.
- ⑤ When cleaning the exterior of the engine, use methanol or kerosene. Do not use gasoline or any solvent that might damage the silicone fuel tubing or any plastic parts of the boat hull.
- ⑥ When the engine is not in use remove the glowplug and rinse out the interior with kerosene (not gasoline), by rotating the crankshaft. Shake out residue, then inject light machine-oil through the plug hole again rotating the shaft to distribute the protective oil to all working parts.
- ⑦ In the event of water having entered the cylinder, crankcase, etc., refer to the procedures recommended in the footnote to p.11.
- ⑧ Avoid unnecessary disassembly of your engine, but if attention to the 21XM's flexible drive shaft appears necessary, please refer to p.8.

# TROUBLE SHOOTING WHEN THE ENGINE FAILS TO START

## Four key points

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

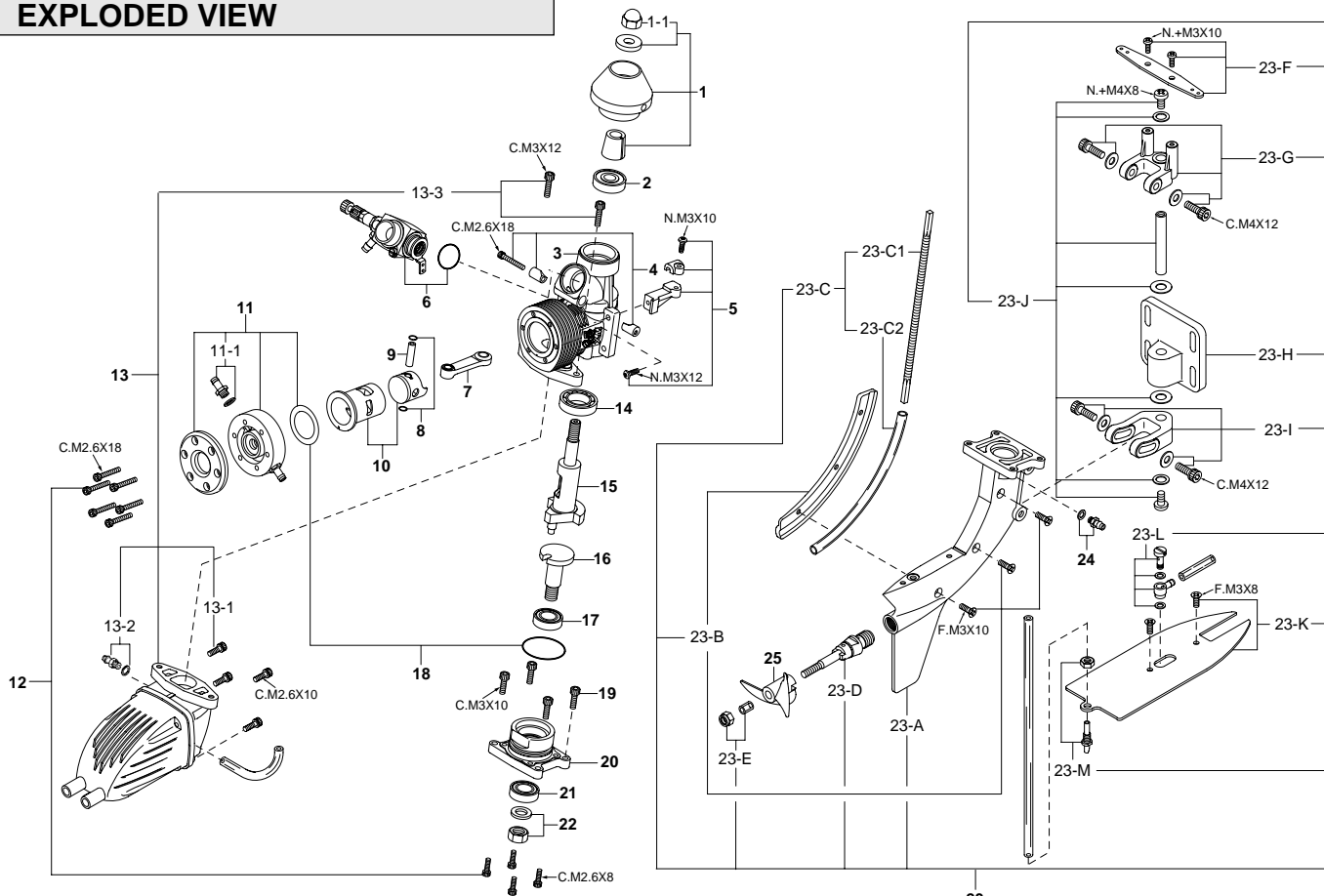
- ① **Good compression.** ② **Adequate "glow" at glowplug.** ③ **Correct mixture.** ④ **Sufficient electric starter rotating speed.**

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.	④	★ Sluggish rotation . . . . .	Recharge the electric starter battery.
		★★ 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".)
	②	★ 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" . . . . .	Close needle-valve fully and remove glowplug, Apply starter to pump out excess fuel. Re-start engine.
		★ Insufficient fuel. . . . .	Refer to p.9
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"
		③—★★ Excess fuel . . . . .	Continue to apply starter. If necessary disconnect battery from glowplug and leave for a few minutes, then re-energize plug. If engine still does not start, remove glowplug and pump out excess fuel. Then re-start.
	④—★ Sluggish rotation. . . . .	Recharge the electric starter battery.	
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 revolutions decrease and engine eventually stops.	③—★★ Insufficient fuel . . . . .	Refer to p.9	
	③—★★★ Mixture too rich. . . . .	Close needle-valve half turn (180°) and wait for several minutes, then re-start.	
Engine starts, then revolutions increase and engine cuts out.	③—★ Fuel not reaching the engine. . . . .	Make sure that tank is filled with fuel. Check that there is not something wrong with fuel tubing (kinked or split). Check that carburettor is not clogged with dirt.	
Engine stops when battery leads are disconnected after starting.	③—★★ Mixture too rich. . . . .	Close the needle-valve a little.	
	②—★ Mismatch of glow plug and fuel. . . . .	Change fuel or glowplug.	



# EXPLODED VIEW



\* Type of screw C···Cap Screw M···Oval Fillister-head Screw F···Flat Head Screw N···Round Head Screw S···Set Screw

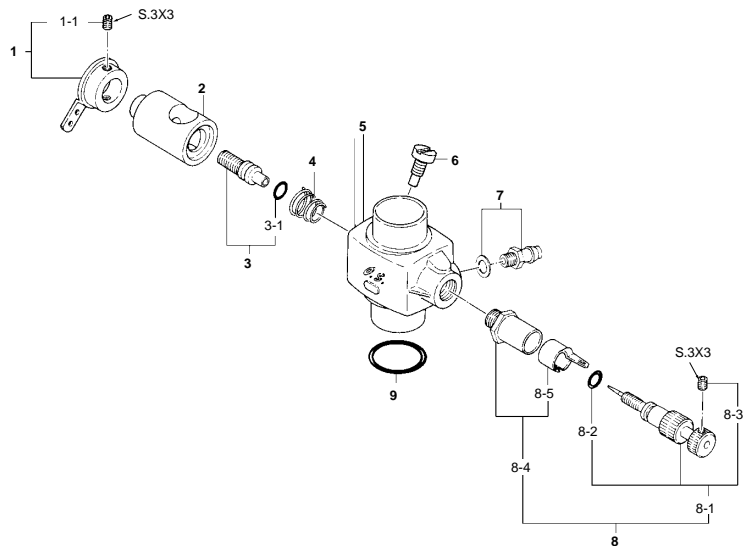
## PARTS LIST

No.	Code No.	Description
1	7 1802 100	Flywheel Assembly (No.2J)
1-1	2 7721 700	Flywheel Nut
2	4 1614 000	Crankshaft Ball Bearing ( Outer )
3	2 3851 000	Crankcase
4	2 3981 700	Carburettor Retainer
5	7 1532 000	Throttle Linkage Bracket
6	2 5382 000	Carburettor Type 20J
7	2 3805 000	Connecting Rod
8	2 3817 000	Piston Pin Retainer ( 2pcs.)
9	2 3906 000	Piston Pin
10	2 3803 010	Cylinder & Piston Assembly
11	2 3841 000	Water-Cooled Head Assembly
11-1	2 4025 923	Nipple No.2
12	2 3913 000	Screw Set
13	2 3875 000	E-2050 Silencer
13-1	2 3875 300	Silencer Assembly Screw (4pcs.)
13-2	2 2681 953	Nipple No.1
13-3	2 3875 400	Silencer Fixing Screw ( 2pcs.)
14	2 3930 000	Crankshaft Ball Bearing ( Inner )
15	2 3852 000	Crankshaft
16	2 3852 100	Power Take-Off Shaft
17	2 2631 019	PTO Shaft Ball-Bearing ( Inner )
18	2 3814 010	Gasket Set

No.	Code No.	Description
19	2 3871 130	Outboard Unit Fixing Screw (4pcs.)
20	2 3861 000	Crankcase Rear Housing
21	2 2631 019	PTO Shaft Ball-Bearing ( Outer )
22	2 3852 200	PTO Shaft Nut
23	2 3871 000	Outboard Unit Assembly
23-A	2 3871 100	Lower Housing and Skeg
23-B	2 3871 200	Side Plate
23-C	2 3873 010	Flexible Drive Assembly
23-C1	2 3873 000	Flexible Drive Shaft
23-C2	2 3873 100	Flexible Drive Shaft Sleeve
23-D	2 3871 400	Propeller Shaft Assembly
23-E	2 3810 000	Propeller Nut
23-F	2 3874 500	Steering Arm
23-G	2 3874 100	Upper Swivel Bracket
23-H	2 3874 000	Transom Mounting Plate
23-I	2 3874 200	Lower Swivel Bracket
23-J	2 3874 300	Swivel/Tilt Assembly
23-K	2 3871 300	Cavitation Plate
23-L	4 5571 100	Universal Nipple L3.5
23-M	2 3871 700	Cooling Water Pickup
24	2 2681 953	Nipple No.1
25	2 3870 000	Marine Propeller
	7 1608 001	Glowplug No.8

The specifications are subject to alteration for improvement without notice.

## CARBURETTOR EXPLODED VIEW & PARTS LIST



No.	Code No.	Description
1	2 4981 405	Throttle Lever Assembly
1-1	2 6381 501	Set-screw
2	2 5381 203	Carburettor Rotor
3	2 6781 309	Mixture Control Valve
3-1	2 4881 824	" O " Ring (2pcs.)
4	2 6781 506	Rotor Spring
5	2 5382 100	Carburettor Body
6	2 5381 220	Rotor Guide Screw

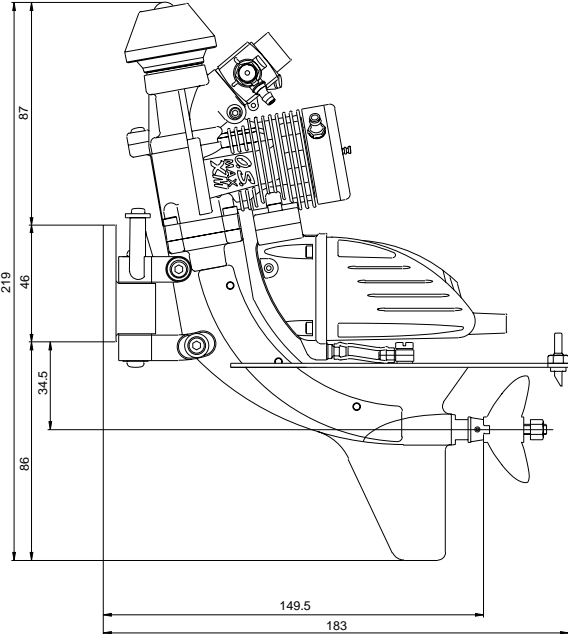
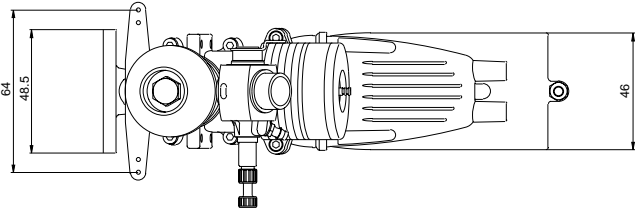
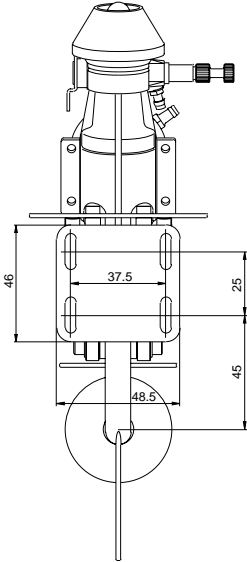
No.	Code No.	Description
7	2 2681 953	Fuel Inlet
8	2 7881 900	Needle Valve Assembly
8-1	2 4981 959	Needle
8-2	2 4981 837	" O " Ring (2pcs.)
8-3	2 6381 501	Set-screw
8-4	2 7381 940	Needle Valve Holder Assembly
8-5	2 6711 305	Ratchet Spring
9	2 9015 019	Carburettor Rubber Gasket

The specifications are subject to alteration for improvement without notice.

# THREE VIEW DRAWING

## SPECIFICATION

- Displacement 3.46 c.c. ( 0.211 cu.in.)
- Bore 16.6 mm ( 0.654 in.)
- Stroke 16.0 mm ( 0.630 in.)
- Practical R.P.M. 3,000~25,000 r.p.m.
- Power output 1.3 bhp / 25,000r.p.m.
- Weight 670g ( 23.6 oz.)



# MEMO

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