

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

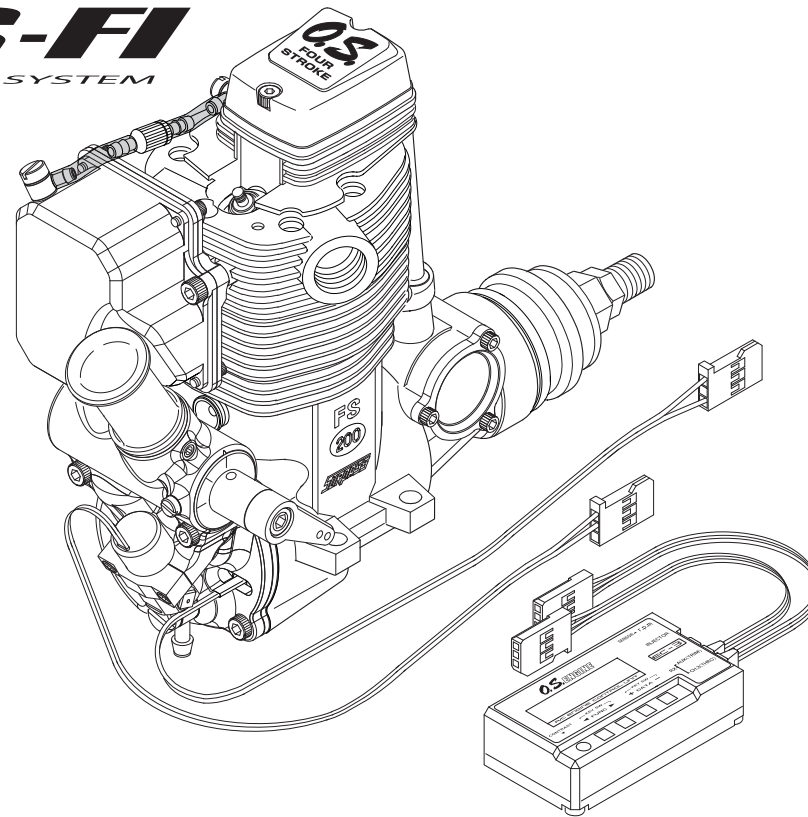
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## ***FS-200S-FI*** ELECTRONIC FUEL INJECTION SYSTEM

### **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 2-4 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 or abused. 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 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 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.



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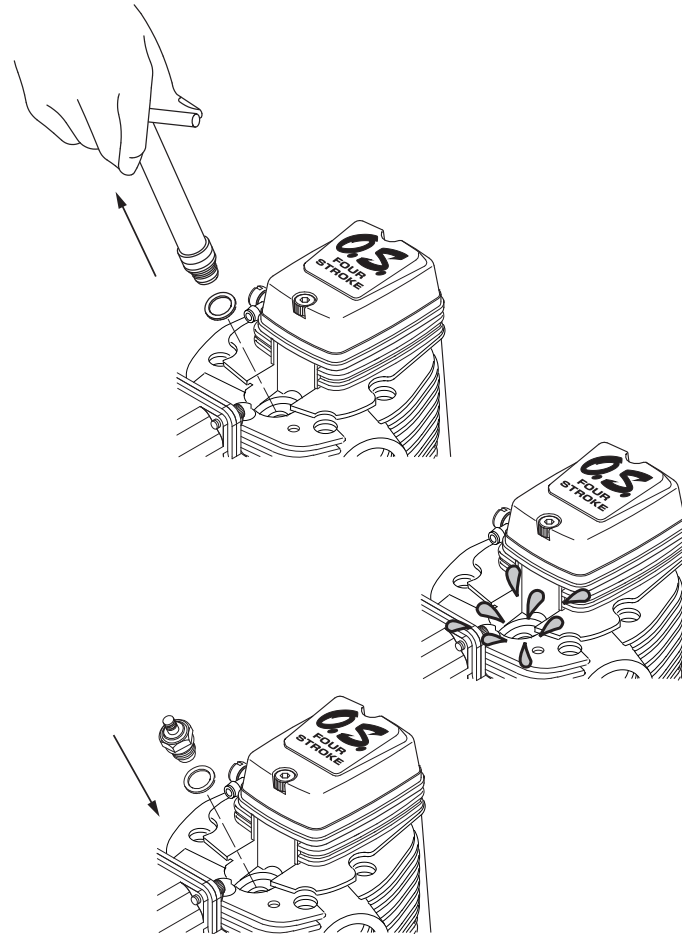
## NOTES

- 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.
- 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!

## 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 from getting into your eyes.



Since this is an engine expressly designed for F3A competition use, knowledge and experience about the F3A competition as well as engine are required to use this engine.

#### INTRODUCTION

This is the FS-200S-FI (fuel injection) engine developed expressly for F3A competition use and to meet the current F3A regulations.

This is equipped with a revolutionary fuel supply system that was jointly developed by Futaba, a leading manufacturer of radio control equipment and O.S. Engines, a leading manufacturer of model engines. Also, the engine is equipped with a super charger utilizing primary crankcase pressure. This is a powerful yet lightweight engine.

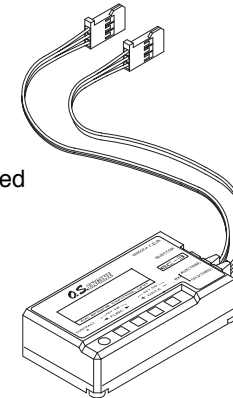
#### FEATURES

- Engine mounting dimensions are the same as the MAX-140RX-FI.
- Supplies the proper amount of fuel all times, which results in lower fuel consumption.
- Excellent linearity and response relative to stick operation.
- Pressurized fuel is controlled at a constant pressure with respect to all types of movement during flight allowing stable engine performance all times.

#### STANDARD ACCESSORIES

- Electronic Control Unit EC-3

- Driver to push EC-3 keys
- Double-sided sponge-backed cushioning tape
- Y harness



- Glowplug TypeF



- Check Valve (installed with the engine) (1pc.)



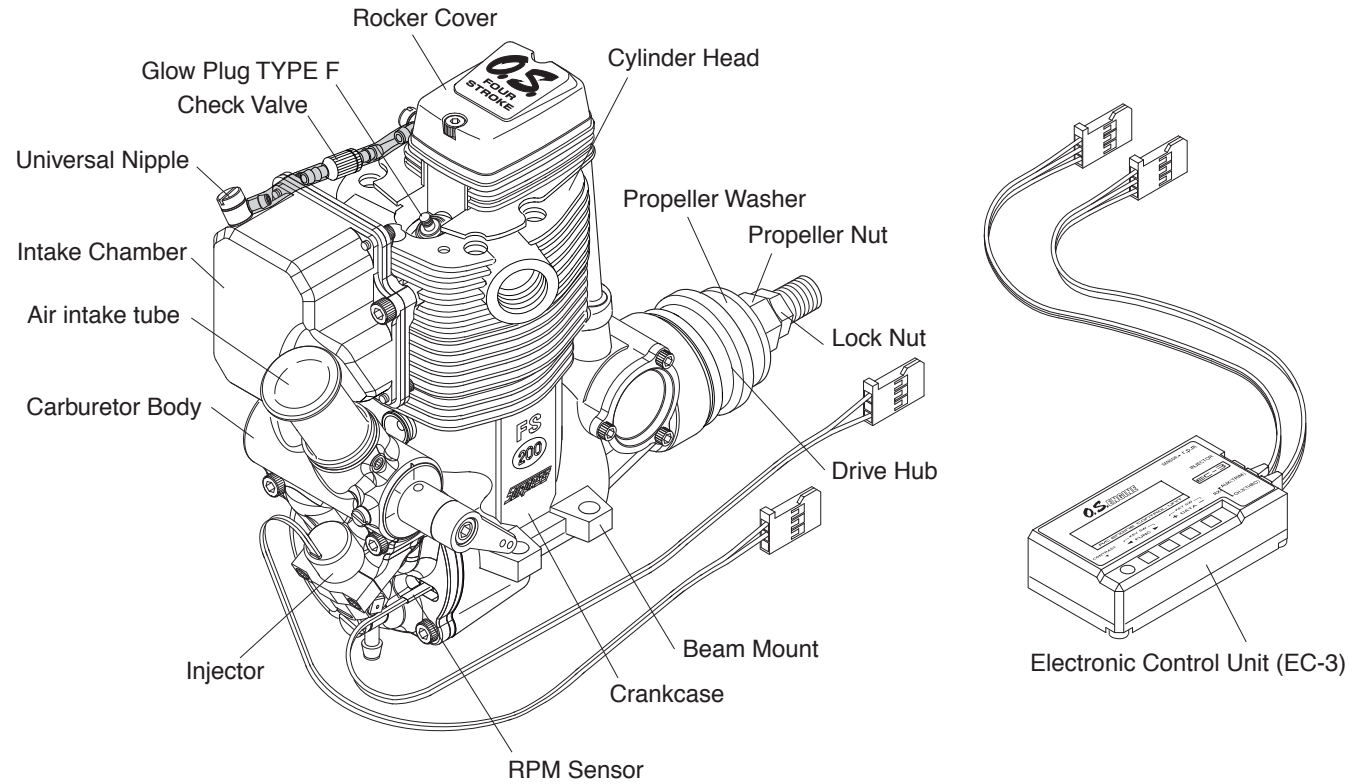
- Check Valve (1pc.)



- Fuel Filter (1pc.)



- Silicone Tubing 22mm (2pcs.) (installed with the engine)





**Electronic Control Unit (EC-3)**

(abbreviated as simply EC-3)

The EC-3 transmits fuel injection signals to the injector to ensure the proper amount of fuel injection based on basic fuel injection data that has been previously entered and constantly changes with position of throttle stick. In addition, engine speed and engine temperature during operation are displayed on the liquid crystal display.

**Injector**

The injector consists of a solenoid valve with built-in regulator. It controls pressurized fuel at a constant pressure and accurately injects fuel based on signals from the electronic control unit (EC-3).

\* **Never attempt to disassemble the injector.  
You may not be able to reassemble it.**

**RPM Sensor**

The RPM sensor is provided with a power generating sensor. When the crankshaft passes in front of the sensor, the signal that is generated is transmitted to the electronic control unit (EC-3). Engine speed is then calculated based on that signal which is then used to determine the timing at which fuel is injected.

**Check Valve (Accessories)**

This one-way valve's function is to pressurize the fuel tank by crankcase pressure and prevent fuel from returning to the engine crankcase.

**Check Valve (installed with the engine)**

This one-way valve's function is to return the surplus fuel in the intake chamber to the engine and prevent fuel returning to the intake chamber.

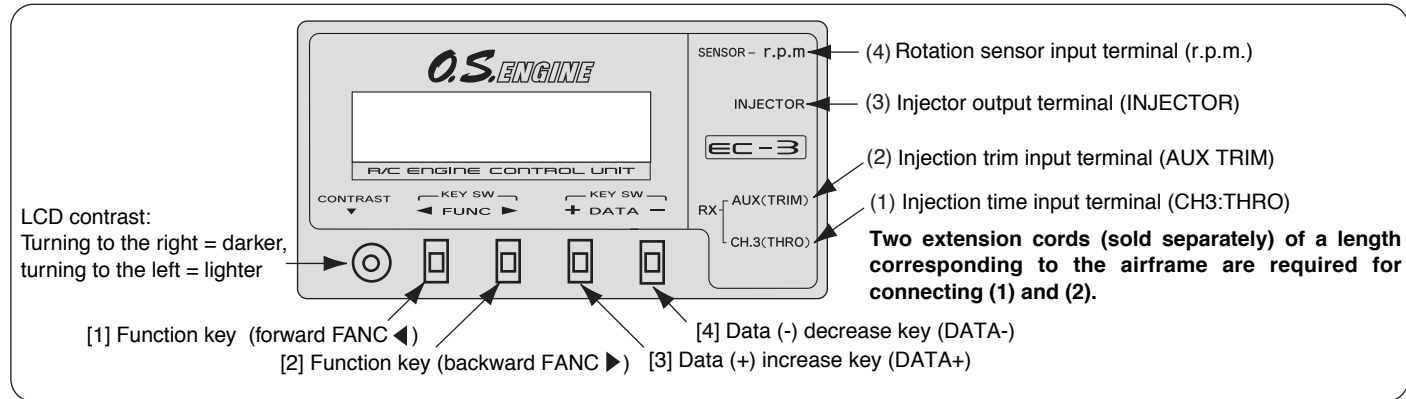
**Y harness**

This cord is used to connect the receiver (throttle channel), throttle servo and EC-3.

**Fuel Filter**

This fine mesh filter prevents foreign matter from plugging the small injector valve.

Connect the receiver and servo-related components (In the Normal manner)



**(1) Injection Time Input Terminal (CH3 THRO)**

Connect the y harness provided with the CH3 THRO input terminal to throttle channel (3) of the receiver (throttle: CH3), connect the wiring connector from the throttle servo to one of the double-opening connectors on the opposite side, and connect the other double-opening connector to CH3:THRO of EC-3.

**(2) Injection Trim Input Terminal (AUX TRIM)**

Connect a spare channel for dial use of the receiver (e.g. channel 7) to the AUX:TRIM terminal.

**(3) Injector Output Terminal**

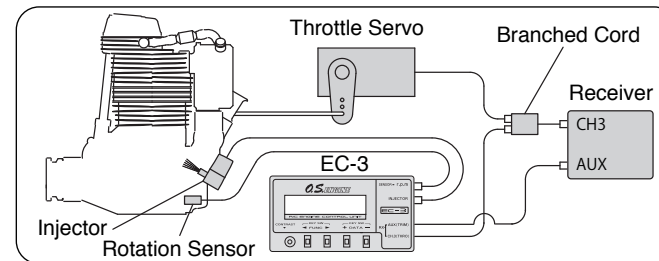
Connect the injector connector to the injector output terminal.

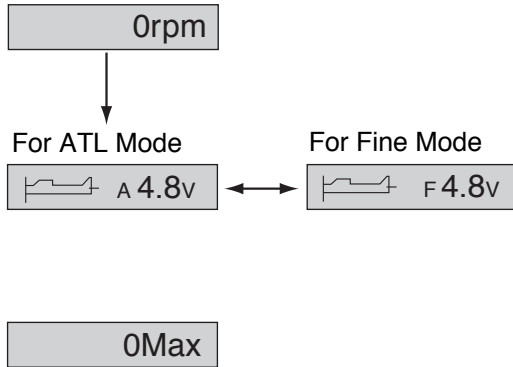
**(4) Rotation Sensor Input Terminal**

Connect the rotation sensor connector to the rpm input terminal.

**Note:**

Soft mounts may become soft due to excessively high temperatures leading to increased vibration amplitude of the engine. Make connections so that the lead wire does not make contact with the engine mount, manifold or airframe under any conditions.





**RPM Display**

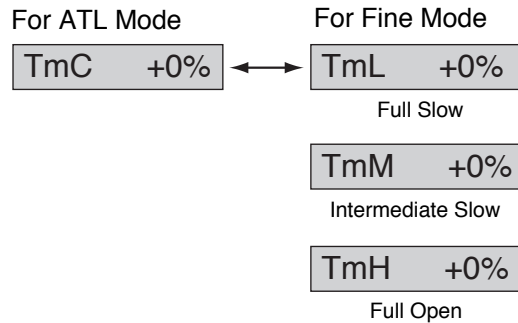
The current engine rpm is displayed.  
If the engine is not running after more than 1 second has elapsed, the display changes to a display of the battery voltage.

**Voltage Display**

The battery voltage is displayed.  
It changes to the RPM display when the engine runs.

**Maximum RPM Display**

The maximum engine rpm stored in memory after the power is turned on is displayed (and reset when the power is turned off).



**Injection Trim**

Adjustment amount is displayed with (+) or (-) percentage from the basic position, which is equivalent to normal carburetor.  
In case of ATL Mode, TmC is displayed.  
In case of Fine Mode, TmL, TmM or TmH is displayed according to the throttle stick position on the transmitter.  
Adjustments in injection volume can be made with the injection trim adjustment dial (spare channel dial) on the transmitter.

TMD ATL

TMD Fine

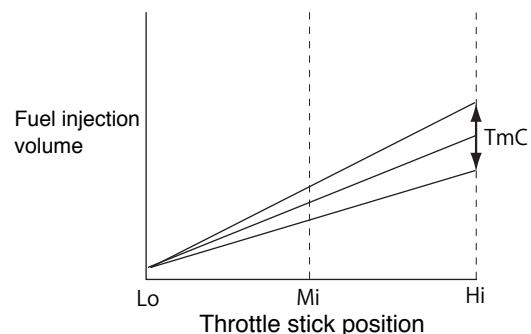
**Injection Trim Mode**

Pressing the (+) or (-) data keys switches the display changes between TmD ATL and TmD Fine.

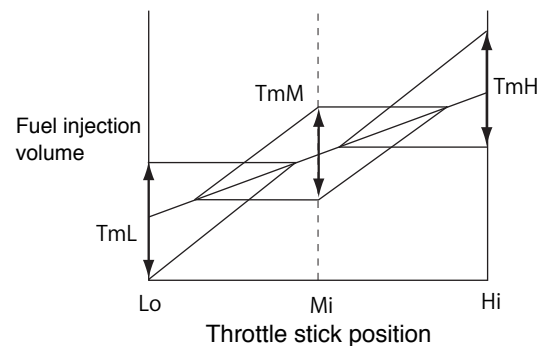
With ATL mode, no change at low end and injection trim volume becomes maximum at high end.

- **It is recommended to use ATL mode as much as possible. Mid range adjustment can be done using program mixing with ATL mode. Adjustment with ATL mode is easier than with Fine mode.**

ATL Mode

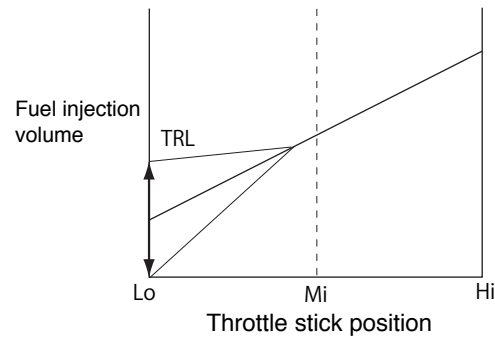


Fine Mode



With Fine mode, injection trim can be adjusted independently for three points. The display changes according to the throttle stick position on the transmitter. Lo (full slow TmL) is adjusted on the TRL menu displayed following the function menu.

TRL +0%



**Idle Injection Trim**

This refers to the idle injection volume adjustment trim, which is equivalent to idle adjustment on the normal carburetor. Adjustable range is  $\pm 100\%$  but actual variation range is  $\pm 30\%$ .

Bat 4.8v

**Voltage Display**

This displays the battery voltage. "Low Battery" is displayed when the battery voltage decreases to 3.8 V.

Bt 4.0mS

**Boost Volume Display**

Injection volume (priming) is displayed when starting the engine. Press the data keys to increase or decrease the injection volume.

BtT 5S

**Boost Time Display**

Time of duration for boost function is displayed. Press data keys to increase or decrease time. After the power supplies are turned on, it calculates total time of engine rotation with an electric starter. The boost function will finish when the set time is over.

Lmt LoW ↔ Lmt □ LoW

Lmt □ High

Lmt □ LoW

FS - 200

### Limit Display

To set the control range of fuel injection time, and direction from low to high and high to low. Be sure to perform limit setting when using for the first time or when changing the throttle movement volume.

First, blinking Low is displayed. Move the throttle stick and throttle trim to full low position (carburetor fully closed). Then, press either the data (+) key or data (-) key to set the low limit setting, and □ mark will appear from the bottom and changes to blinking High display.

Next, move the throttle stick and throttle trim to full high position, then press either the data (+) key or data (-) key to set the high limit setting, and □ mark will appear from the bottom and changes to blinking Low display.

Repeatedly move the throttle stick between the slow and fully high positions and confirm the display of □ mark.

**■ INSTALLATION**

Use a rigid enough engine mount with more than 4mm or larger steel Allen type hexagon socket cap screws with washers and locknuts.

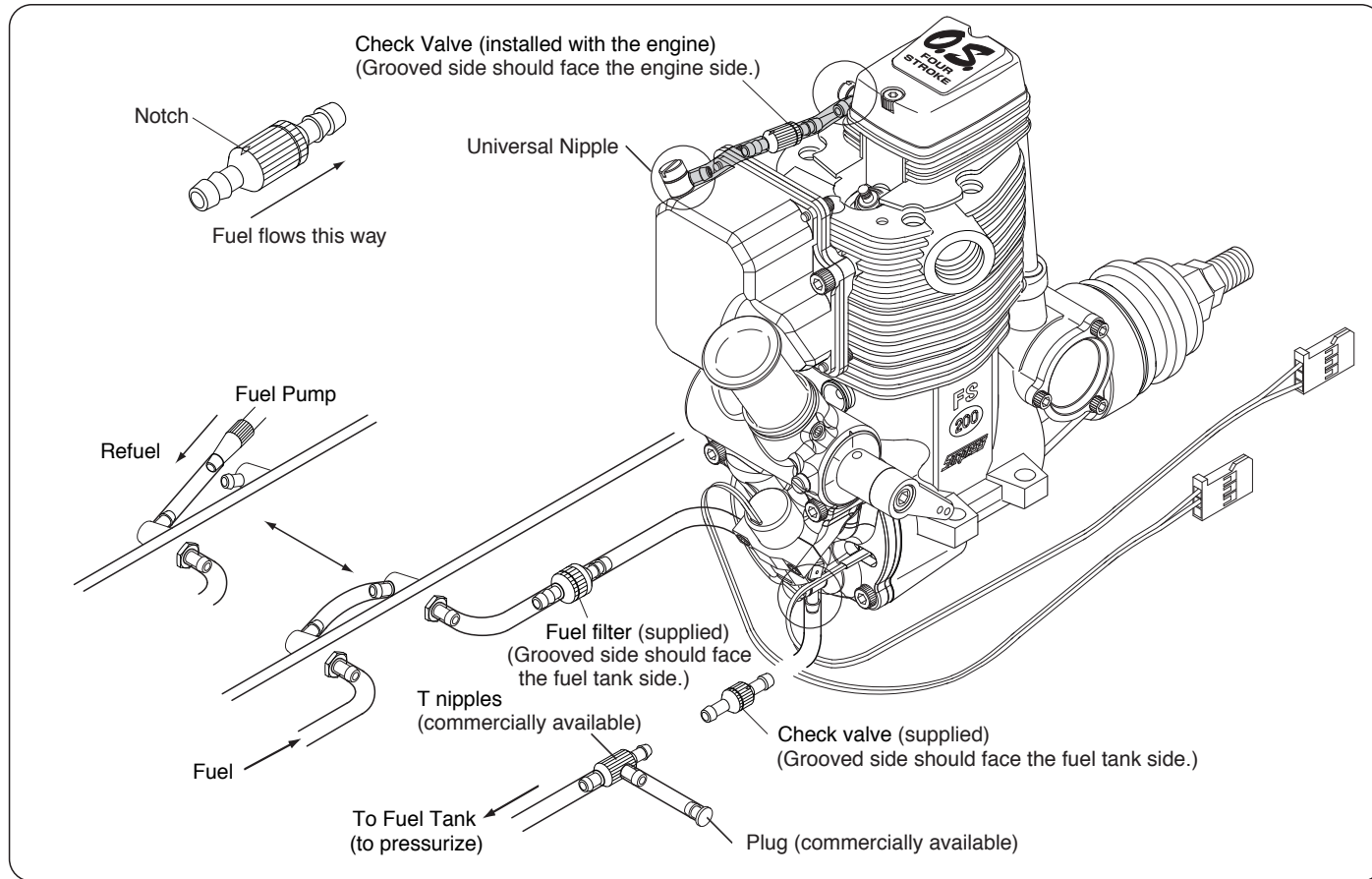
In case of a soft engine mount, it should be made of firm enough material to prevent excessive engine movement but still minimize engine vibration.

**■ EC-3**

Install the EC-3 in a location that is not susceptible to the effects of heat, fuel or vibration while allowing easy access for adjustment. Always make sure to attach double-sided, sponge-backed cushioning tape or Velcro tape between the airframe and EC-3 as measures against vibration.

**■ FUEL TANK AND LINES**

- 600cc fuel tank will give approximately 12~14 minutes running time for the F3A pattern flight.  
(This will vary greatly depending on fuel, propeller, climatic conditions and flying style.)
- Since high pressure is applied to the fuel tank from the engine crankcase, be sure to use a commercially available thick-walled fuel tank with strong enough cap. Also, be sure to securely seal the area around the cap.
- Make connections using heavy duty silicone tube of 2.5mm inner dia and 5mm outer dia. Use commercially available tube clips or 3mm long tube over the connecting points.
- Retighten the three universal nipples marked with ○ in the sketch before starting the engine.





The choice of propeller depends on the design and weight of the aircraft and on 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 propeller noise will increase if blade tip velocity is raised, due to higher rpm or if a larger-diameter / lower-pitch prop is used.

As a starting point, suggested propellers are 16.5 x13W and 17x13.

**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-control system.**

**DO NOT forget the WARNINGS and NOTES on propeller and spinner safety given on pages 2,3 and 4.**

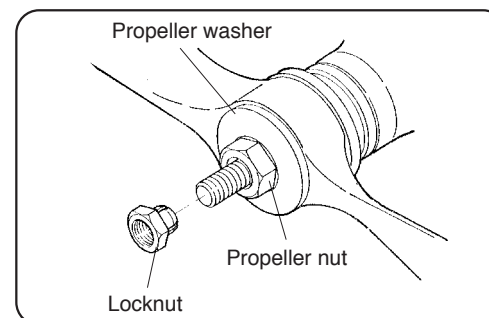
■ **PROPELLER & SPINNER ATTACHMENT**

There is a risk, particularly with powerful four-stroke 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. Safety 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 the retaining washer and prop nut and tighten firmly with a 14mm wrench. (not supplied).
3. Add the special tapered and slotted locknut and secure with a 12mm wrench while holding the prop nut with the 14mm wrench. (not supplied).



**Note:**

**Some spinners which are retained at the top of the 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 4mm) and (Code No.45910300 5mm).**

**NOTE:**

**Make a habit of always checking the tightness of the propeller 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. Retighten the propeller nut if necessary after loosening the Safety Propeller Locknut. The locknut should be tightened firmly after retightening the propeller nut.**

Since the FS-200S FI is intended to be started with an electric starter, the addition of a spinner assembly for centering the starter sleeve is desirable. Special propeller locknut sets are available for use with spinners.

Use a good quality well balanced spinner, enclosing the propeller boss. Make sure that it is of precision-made and sturdy construction so that the spinner shell cannot loosen when the starter is used.

Make sure the spinner notches do not interfere the propeller. If they do, cut the notches to clear.

**■ FUEL**

The FS-200S-FI should be operated on a methanol based fuel containing not less than 18% castor-oil, or a top quality synthetic lubricant (or a mixture of both), plus a small percentage (15-30%) of nitromethane for improved flexibility and power. (EC-3 data are based on a fuel containing 20% nitromethane and 20% lubricant.) 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 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.

**Reminders:**

**All 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. Though not as volatile as gasoline, model engine fuel is also highly inflammable.**

**Keep it away from an open flame, excessive heat, sources of sparks, or anything else that might ignite it. Smoking is firmly discouraged.**



Since the compatibility of the glowplug and fuel may have a marked effect on performance and reliability, it is suggested to use the O.S. Type F plug when it is necessary to replace. 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.

#### **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.

**LINKAGE AND INITIAL SETTINGS**

Ensuring a proper linkage is important in the FS-200S-FI system in terms of a proper air-fuel mixture. In other words, it is necessary to maintain the proper relationship between opening of the air valve (stick position) and fuel injection by the injector.

(The following pertains in the case of a Futaba radio.)

1. Set the angle adjustment of all throttle channels (ATV, ARF) to 100%.
2. Set mixing of the throttle curve, expo channel and so forth to off (0).
3. Set the throttle trip to full slow position.
4. Connect a linkage so that carburetor rotor center mark may align with the guide mark when the throttle stick is in the center position. Make sure there is no mechanical differential at this time.

**Note:**

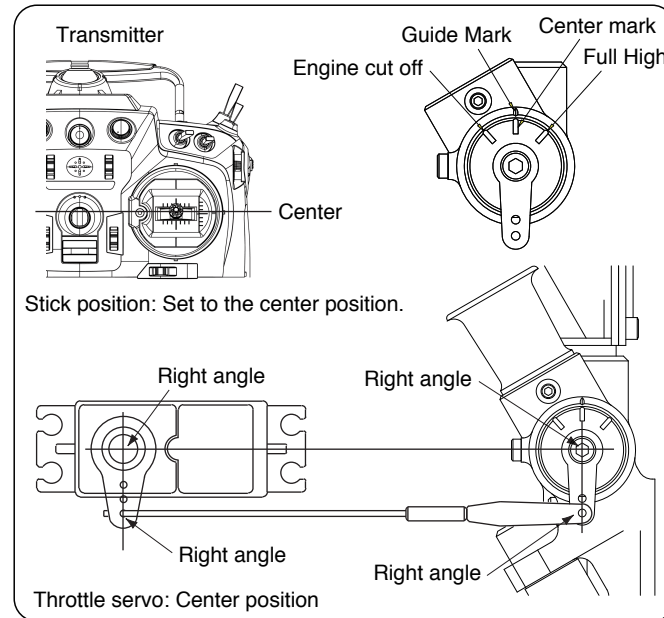
Check the center of throttle channel in the angle adjustment function displays (ATV, AFR).

**NOTE:**

Make sure that the injection trim adjustment dial (spare channel dial) movement is in accordance with the change displayed on the EC-3 monitor. If the movement is reverse, set the reverse function.

Adjust steering angle adjustment function on the transmitter (ATV or AFR) so that the injection trim adjustment volume adjustable range can be  $\pm 100\%$ .

( It varies with brand of radio and model.)



5. Adjust the opening of the air valve with the throttle angle adjustment function (AFR) so that throttle lever points engine cutoff mark when the throttle stick is fully pulled down and points full high mark when the throttle stick is fully advanced. If the linkage is connected properly, value at slow and at high should be almost the same. With Futaba B type servo horn, linkage using most outside hole (13.5mm from the center) shows approximately 83% on ARF.

**6. Limit (LmT) Setting**

The movement of engine control has considerable significance with respect to the injection operation. To set the control range of fuel injection time, and direction from low to high and high to low.

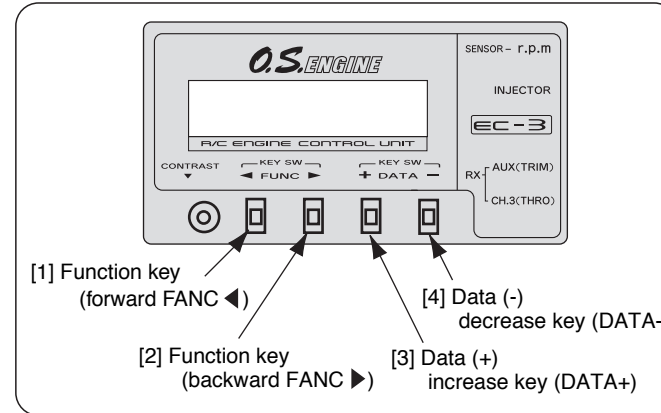
Press the function key on the EC-3 to display the LmT Low display.

First, blinking Low is displayed. Move the throttle stick and throttle trim to full low position (carburetor fully closed). Then, press either the data (+) key or data (-) key to set the low limit setting, and □ mark will appear from the bottom and changes to blinking High display.

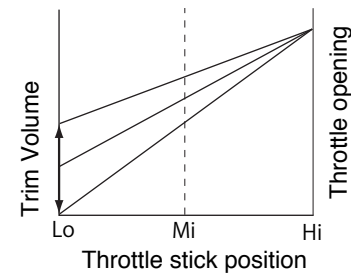
Next, move the throttle stick and throttle trim to full high position, then press either the data (+) key or data (-) key to set the high limit setting, and □ mark will appear from the bottom and changes to blinking Low display.

Repeatedly move the throttle stick between the slow and fully high positions and confirm the display of □ mark.

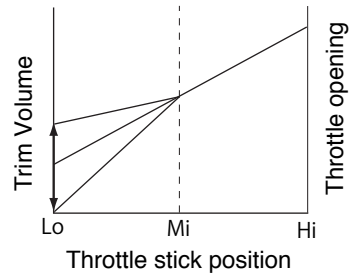
Now the limit setting is finished. This setting remains in memory.



7. Set the throttle trim at the center (temporary idle position). In case of the Futaba radio, as the throttle trim moves with full high as point of base, carburetor rotor position changes according to the throttle trim position when the throttle stick is at the center, as shown in the graph.



As with a radio for helicopter, if carburetor rotor position does not change as the throttle trim moves when the throttle stick is at the center, set the exponential at full throttle as shown in the sketch.



8. Engine Cutoff Adjustment

Adjust the throttle travel position so that idle r.p.m. will be between 1,900~2,000, then readjust the engine cutoff function.

■ Notes on Injector

- Never disassemble the injector. The original performance may not be restored after reassembly.
- Never plug the two holes on the side of injector, or the injector may not perform correctly.
- Never insert anything into the nipple or nozzle. This is likely to damage inside parts and render it inoperative.
- Use fuel filters.  
Any foreign matter entering the injector may interfere with its correct functioning. Be sure to filter all fuel before filling the tank and, most important, use a good quality fine filter in the delivery tube between tank and injector.
- Do not use kerosene, light oil gasoline nor thinner for cleaning, or the silicone rubber inside may deteriorate. Use alcohol or glow fuel.
- It is suggested to prime the injector by turning the engine with an electric starter after switching the transmitter switch on before filling the tank with fuel, especially when after starting the engine after being out of operation for a long time or the temperature is low.

**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. Excessively rich running and prolonged low speed running should be avoided.**

1. Use the same fuel and propeller as you intend for flying your model.
2. Turn the transmitter switch on, then the receiver switch on.
3. Set the injection trim volume at most rich position (TmC+100%).

**Note**

**Be sure to use an electric starter for starting the engine for safety.**

**Connect the current to the plug only after the electric starter starts rotating to avoid any danger from kicking back.**

4. Turn the propeller backwards (clockwise) by hand until it is against compression, and start the engine with the throttle stick one to two clicks pushed up.

5. Since the engine is equipped with a priming function, there is no need to build pressure in the fuel tank prior to starting. However, abrupt advancing the throttle stick may cause detonation due to insufficient pressure. This is because tank pressure will not rise until advancing the throttle stick 30%. It is suggested to crank the propeller by hand. 10 turns which will provide sufficient pressure when the tank is full.

**Note**

**Never try to build pressure in the tank using an electric starter with the throttle fully open, or the engine may start specially when the engine is hot even without connecting the current to the plug.**

6. When the engine starts, advance the throttle stick a little and disconnect the current to the plug.
7. Warm the engine up and build pressure in the tank at mid speed, then gradually open the throttle fully.
8. Repeat raising and lowering r.p.m. with the injection trim volume gradually extending the short periods of high-speed operation until two tanks of fuel have been consumed.

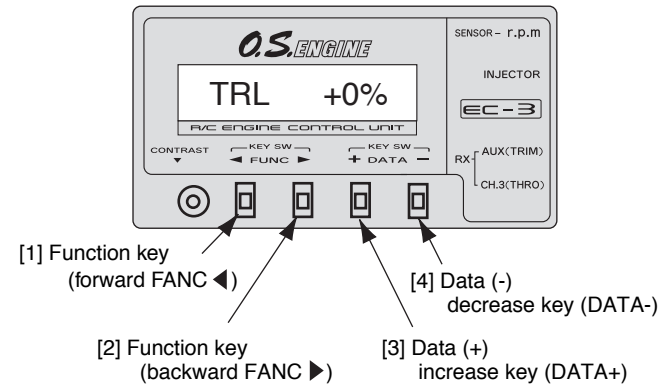
**Note**

**Prolonged running-in on the ground is not required, it is just to achieve initial settings. Proceed running-in while flying the model.**

9. For the first flight, set the injection trim volume on the rich side to the extent you have no problem in flying. Also, set the idle r.p.m. higher to avoid a dead stick landing.
10. With each successive flight, adjust the injection trim volume for slightly higher speed. Until, at the end of about 10 flights, the injection volume is set for full power.



- ◆ Adjust the throttle travel so that the idle r.p.m. in between 1,900~2,000, then readjust the engine cutoff function.
- ◆ If necessary, adjust injection volume at idle in TRL.
  - Press function key on the EC-3 to display TRL +0%.
  - Press data key (+) to make the mixture rich and data key (-) to make the mixture lean. Adjustment volume is displayed with  $\pm 00\%$  and remains in memory even when the switch is turned off.
  - Richening the mixture makes engine slow down more effective and the throttle response from idle softer.
  - Leaning the rich mixture decreases fuel consumption and danger of engine cutoff.
  - Too lean a mixture makes engine slow down less effective and the throttle response from idle sensitive.
  - Too lean a mixture damages the engine.
  - Adjust the mixture judging the engine slow down effect and throttle response from idle.



- ◆ General reference for engine speed
  - Proceed adjustment carefully checking engine sound, exhaust smoke volume and exhaust oil color.

Throttle position	16.5x13 W	17x13
Intermediate engine speed	7,200-7,500rpm	6,900-7,200rpm
Full high engine speed	8,300-8,600rpm	8,100-8,400rpm

**Note**

The engine speed will not be the same depending on propeller variations, engine mounting method, fuel and climatic conditions. Especially intermediate engine speed greatly depends on linkage method between the throttle servo and air valve. If the engine speed is quite different from those shown, it may mean that the setting for the throttle servo and air valve linkage is incorrect or the fuel injection travel volume has changed considerably. Check these items by returning to the procedure for readjustment.

- ◆ You may adjust the intermediate engine speed to your preference by means of exponential to the throttle channel or throttle curve.

**Note**

This adjustment can be made only after basic linkage and adjustment are finished.

■ **VALVE ADJUSTING**

Valve clearances are correctly set before any O.S. engine leaves the factory and, in normal use, will seldom require adjustment. However, if, after a considerable amount of running time, a loss of power is detected, or if the engine has been disassembled for repair, these clearances should be checked and reset as necessary.

For checking and adjusting the valve clearances, a VALVE ADJUSTING TOOL KIT is available as an optional accessory. Also, a 5.5mm wrench (not supplied) is required for this purpose.

- Wrench 5.5mm

The kit comes in a plastic case and includes:  
(Code No.72200060)

- Feeler gauge 0.04mm    • Hex. key 1.5mm
- Feeler gauge 0.1mm    • Wrench 5mm

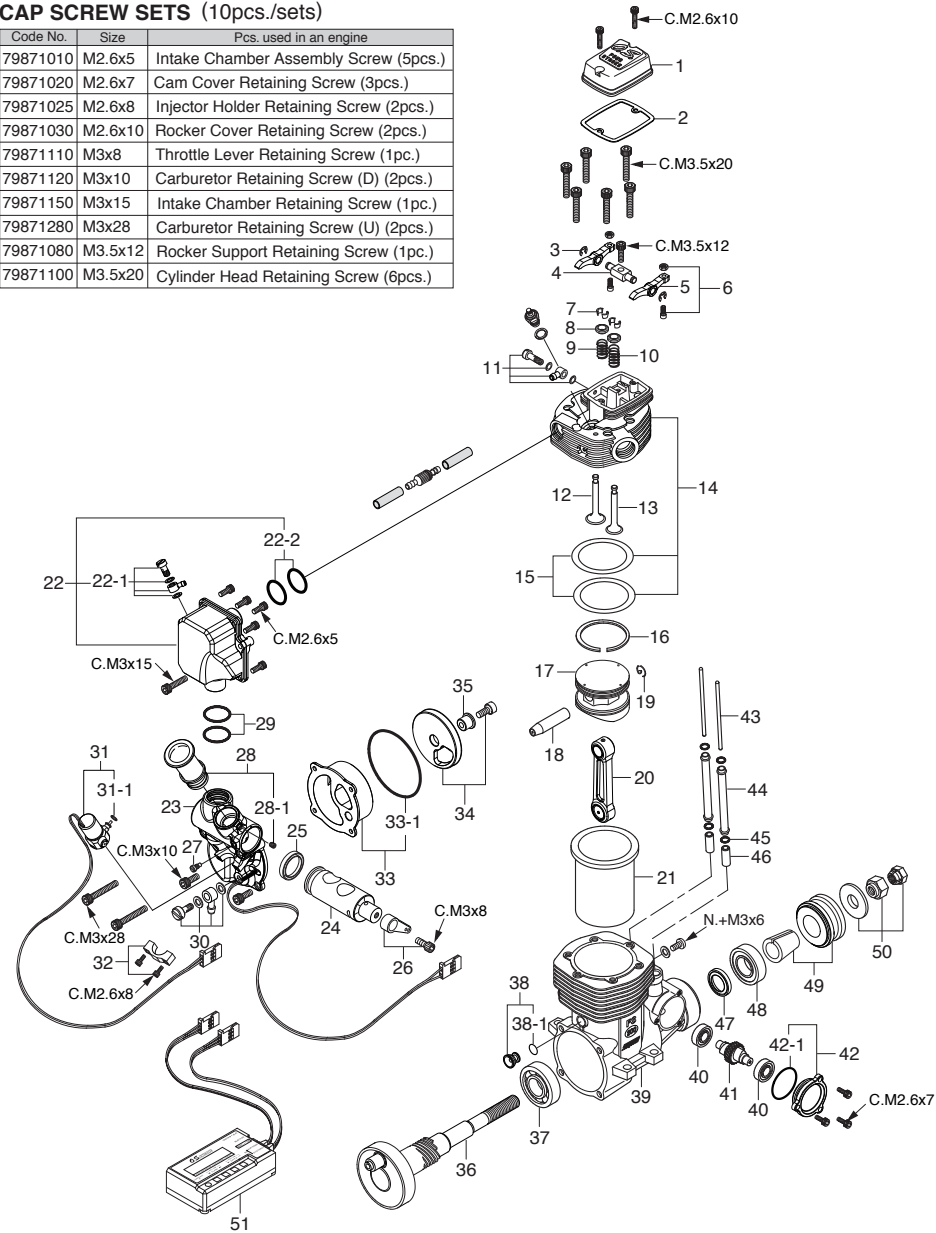
**Please pay attention to the matters described below to ensure that your engine serves you well in regard to performance, reliability and long life.**

- 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 foreign matter in the fuel container from entering the fuel tank. O.S. Super Filters (L) is available as an optional extra.
- First vent the pressure from the fuel tank. Next, drain any fuel in the fuel tank. Turn on the transmitter and receiver switches but do not heat the plug. Move the transmitter throttle stick to the center position without heating the plug, and then turn the engine over with the electric starter for several seconds. (This is to discharge any fuel between the tank and injector.) Pour a little maintenance oil or lubricant in the air valve and turn over the engine with the electric starter for several seconds. Use an oil which will not deteriorate silicone rubber inside the injector.
- In order to maintain the engine in the optimum state, it is important to vent any residual combustion by products generated during engine operation as quickly as possible. In addition, since this engine uses a manifold and silencer, residual combustion by products may be present in those components as well. It is recommended to remove the silencer after use and store it.
- Connectors and leads are arranged in the engine compartment. They may be soiled with dust or other debris. (This can cause a malfunction.) Clean these components to prevent them from becoming soiled as much as possible. Do not use paint thinner, gasoline or other cleaners that erode plastic when cleaning.

Problem	Confirmation
<p><b>Engine does not start</b></p>	<ul style="list-style-type: none"> <li>● Is the power turned on?</li> <li>● Is the lead wire broken?</li> <li>● Has Lmt been set?</li> <li>● Are the connectors securely connected?</li> <li>● Is the plug burned out?</li> <li>● Is engine speed displayed on the EC-3 when the engine is running?</li> </ul>
<p><b>Engine operation is unstable at low speeds</b></p>	<ul style="list-style-type: none"> <li>● Are the rubber dampers of the engine soft mount too soft?</li> <li>● Are the rubber dampers of the soft mount damaged?</li> <li>● Is the throttle linkage sticking?</li> <li>● Is the check valve normal?</li> <li>● Is the linkage too weak causing it to be affected by vibrations?</li> <li>● Is the servo malfunctioning or is the servo mount loose?</li> </ul>
<p><b>Engine operation is unstable at high speeds</b></p>	<ul style="list-style-type: none"> <li>● Is the propeller size correct?</li> <li>● Is the engine running at 9,000 rpm or higher?</li> <li>● Is there an abnormality in the engine soft mount (cracked)?</li> <li>● Is the filter clogged?</li> </ul>
<p><b>Engine stalls</b></p>	<ul style="list-style-type: none"> <li>● Are the rubber dampers of the engine soft mount too soft?</li> <li>● Are the rubber dampers of the soft mount damaged?</li> <li>● Has the plug deteriorated?</li> <li>● Is there any sticking or abnormalities in the linkage?</li> <li>● Is the oil content of the fuel correct?</li> <li>● Is the engine speed too low?</li> <li>● Is the check valve functioning properly?</li> <li>● Is the air control servo operating abnormally (hunting)?</li> <li>● Is the air control linkage too weak so that the operation of the air valve either stops or is delayed relative to the operation of the servo? (Try using a heavier component for the linkage.)</li> </ul>

CAP SCREW SETS (10pcs./sets)

Code No.	Size	Pcs. used in an engine
79871010	M2.6x5	Intake Chamber Assembly Screw (5pcs.)
79871020	M2.6x7	Cam Cover Retaining Screw (3pcs.)
79871025	M2.6x8	Injector Holder Retaining Screw (2pcs.)
79871030	M2.6x10	Rocker Cover Retaining Screw (2pcs.)
79871110	M3x8	Throttle Lever Retaining Screw (1pc.)
79871120	M3x10	Carburetor Retaining Screw (D) (2pcs.)
79871150	M3x15	Intake Chamber Retaining Screw (1pc.)
79871280	M3x28	Carburetor Retaining Screw (U) (2pcs.)
79871080	M3.5x12	Rocker Support Retaining Screw (1pc.)
79871100	M3.5x20	Cylinder Head Retaining Screw (6pcs.)



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

**O.S. ENGINE****ENGINE PARTS LIST**

No.	Code No.	Description
1	44504210	Rocker Cover
2	44514300	Rocker Cover Gasket
3	45761600	Rocker Arm Retainer (2pcs.)
4	44561400	Rocker Support
5	44561000	Rocker Arm (1pc.)
6	44561200	Tappet Adjusting Screw (1pair)
7	45560410	Split Cotter (2ps./1pair)
8	45560310	Valve Spring Retainer (1pc.)
9	45560210	Intake Valve Spring (1pc.)
10	45560220	Exhaust Valve Spring (1pc.)
11	45571000	Universal Nipple (1pc.)
12	44550000	Intake Valve (1pc.)
13	44551000	Exhaust Valve (1pc.)
14	44504110	Cylinder Head (W/Gasket 2pcs.)
15	44514100	Head Gasket (2pcs.)
16	44503400	Piston Ring
17	44503210	Piston
18	44506000	Piston Pin
19	28117000	Piston Pin Retainer
20	44505000	Connecting Rod
21	44503110	Cylinder Liner
22	44517000	Intake Chamber Assembly
22-1	45571000	Universal Nipple (1pc.)
22-2	44514110	Intake Manifold Gasket
23	44581110	Carburetor Body
24	44581210	Carburetor Rotor
25	44581220	Carburetor Rotor Gasket
26	27381400	Throttle Lever Assembly
27	45581820	Rotor Guide Screw
28	44581300	Air Funnel
28-1	26381501	Air Funnel Retaining Screw
29	44514110	Carburetor Gasket
30	45571000	Universal Nipple (1pc.)

No.	Code No.	Description
31	44584000	Injector Assembly
31-1	46066319	Injector Nozzle "O" Ring (L)
32	29483300	Injector Holder
33	44501800	Rear Housing Assembly
33-1	29061410	Rear Housing Gasket
34	44516000	Disk Valve
35	44516100	Disk Valve Pivot
36	44502010	Crankshaft
37	27930000	Crankshaft Ball Bearing (Rear)
38	44501120	Crankcase Plug
38-1	45566310	"O" Ring (2pcs.)
39	44501010	Crankcase
40	45231100	Camshaft Ball Bearing (1pc.)
41	44562010	Camshaft
42	44501100	Cam Cover (W/Gasket)
42-1	44501110	Cam Cover Gasket
43	44566000	Push Rod (2pcs.)
44	44566100	Push Rod Cover (1pc.)
45	45566310	Push Rod Cover "O" Ring (2pcs.)
46	44564000	Cam Follower (2pcs.)
47	44501130	Oil Seal
48	29431000	Crankshaft Ball Bearing (Front)
49	44508010	Drive Hub (W/Collet)
50	45910100	Lock Nut Set
51	74001030	Electronic Control Unit EC-3 Assembly
	71615009	Glow Plug Type F
	72403070	Check Valve
	72403061	Check Valve
	72403060	Fuel Filter

The specifications are subject to alteration for improvement without notice.

■ **PROPELLER LOCKNUT SET**  
(45910200) (For Spinner)

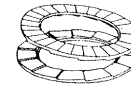
■ **BOOSTER TERMINAL KIT**  
(72200130)

■ **LOCK WASHER (10sets)**

■ **VALVE ADJUSTING TOOL KIT**  
(72200060)

M3 (55500002)  
M4 (55500003)

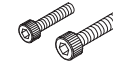
■ **PROPELLER LOCKNUT SET FOR 4C SPINNER**  
5/16"-M5  
(45910300)



■ **BOOSTER CABLE SET**  
(72200110)

■ **NON-BUBBLE WEIGHT**  
(71531000)

■ **CAP SCREW SET (10pcs.)**



M2.6x5 (79871010)  
M2.6x7 (79871020)  
M2.6x8 (79871025)  
M2.6x10 (79871030)  
M3x8 (79871110)

M3x10 (79871120)  
M3x15 (79871150)  
M3x28 (79871280)  
M3.5x12 (79871080)  
M3.5x20 (79871100)

■ **NON-BUBBLE WEIGHT**  
S  
(71531010)



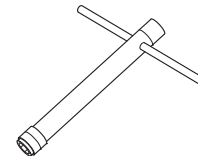
■ **SUPER FILTER (L)**  
(72403050)

■ **BLIND NUT (10pcs.)**

■ **LONG SOCKET WRENCH WITH PLUG GRIP**  
(71521000)



M3 (79870030)  
M4 (79870040)



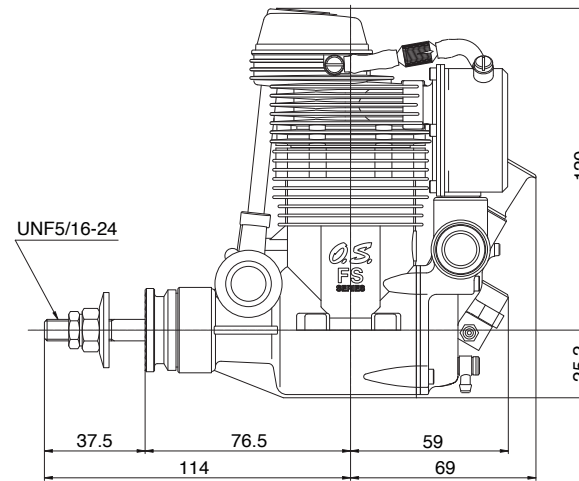
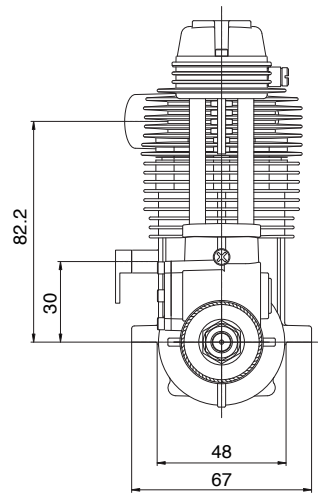
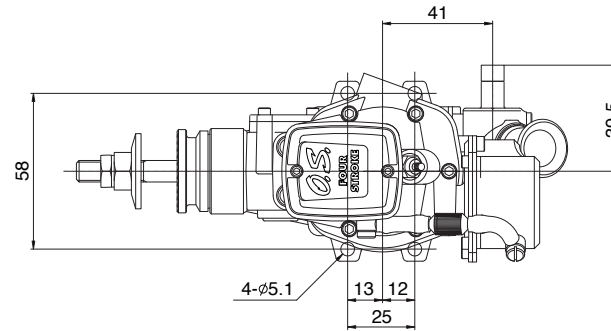
The specifications are subject to alteration for improvement without notice.

**O.S.**ENGINE

**THREE VIEW DRAWING**

**Specifications**

■ Displacement	32.4 cc / 1.98 cu.in.
■ Bore	38.0 mm / 1.50 in.
■ Stroke	28.6 mm / 1.13 in.
■ Practical R.P.M.	1,800 - 10,000 r.p.m.
■ Output	
■ Weight	1,000 g / 35.27 oz. (EC-3 including)



Dimensions (mm)



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***O.S. ENGINES*** MFG.CO.,LTD.  
URL : <http://www.os-engines.co.jp>

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