

OPERATION MANUAL

FOUR CYCLE ENGINE SATIO FA-325R5DABC

FA-325R5 is equipped with a fuel priming device, which is very convenient for scale planes, etc.

Thank you very much for purchasing SATIO ENGINE FA-325R5. Please read this operation manual carefully and save it for future reference. If any defect in the manufacture of this engine is detected we will repair it at our cost. Since this engine is constructed using dedicated jigs and tools, never disassemble it. Please note that we may not guarantee our products if they have been disassembled.

Recently, large-sized planes such as the so-called 1/4 scale plane have become popular. They have an allure for dynamic flight, etc., which is closer to actual planes.

Major data of airplanes mounted with FA-325R5

Air foil section	Wing area	Weight
Clark Y	about 100 dm ²	about 8 kg
Symmetrical wing	about 80 dm ²	about 8 kg

Features of FA-325R5

- o Exhaust sound which is closer to that of actual airplanes
- o Low vibration
- o Easy engine starting
- o Homogenization of mixed gas which is difficult even in actual airplanes is obtained by means of an impeller which is built in the crankcase. This provides a low speed revolution of about 1,700 rpm.
- o For the fire order of the 5-cylinder engine, the central upper portion fires in the order of No. 1, 3, 5, 2 and 4 in the direction of propeller rotation as seen from the passengers seat in the forward direction. (Fig. 1)
- o Cylinder

For the inner surface, brass is hard chrome plated in order to increase the durability. The cylinder head is incorporated in the cylinder in order to eliminate distortion and improve the cooling efficiency, etc.

o Piston

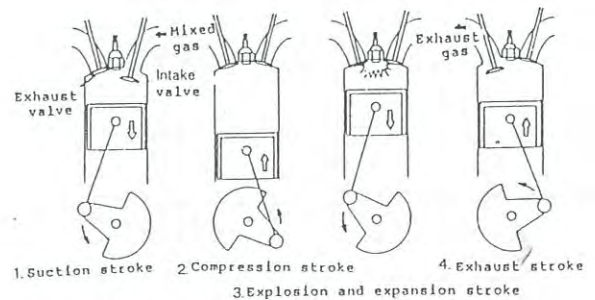
The piston is made of high silicon aluminum and provided with compressing rings for high performance.

o Crankshaft

The crankshaft is made of chrome-molybdenum steel and of integral structure for very rigid construction. 2-ball bearing support type.



Explanation of four cycle engine

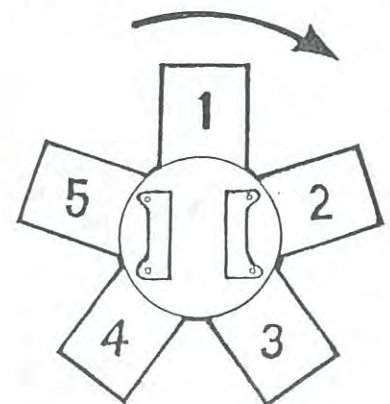


Four cycle engine operation consists of the following four strokes. A stroke means the movement of a piston from top dead center to bottom dead center. In the four cycle engine, the condition of gas, the change and valve movement, etc., in the cylinder return to the initial condition after four strokes or two reciprocations of the piston, that is, 1 cycle is completed whenever the crankshaft makes two revolutions.

(Fig. 1)

Fire order in the cylinder
1 - 3 - 5 - 2 - 4

Direction of propeller rotation



Cylinder No. as viewed from the back

o Link rod pin

The outside diameter is hard chrome plated and has excellent wear and rust resistance.

o Carburetor

The carburetor is provided with an interlocking slow needle.

o Breather nipple

The breather nipple efficiently discharges surplus waste oil. (Usually, longer nipple tube causes waste oil to go and return within the tube, making the discharge more difficult. This new mechanism solves this problem.)

o Safety design for preventing propeller from falling

This safety mechanism prevents the nuts from loosening.

o The cylinder head adopts a half-sphere type combustion chamber with good combustion efficiency.

Data for FA-325R5 (53 cc)

Bore 24.8 mm x 5

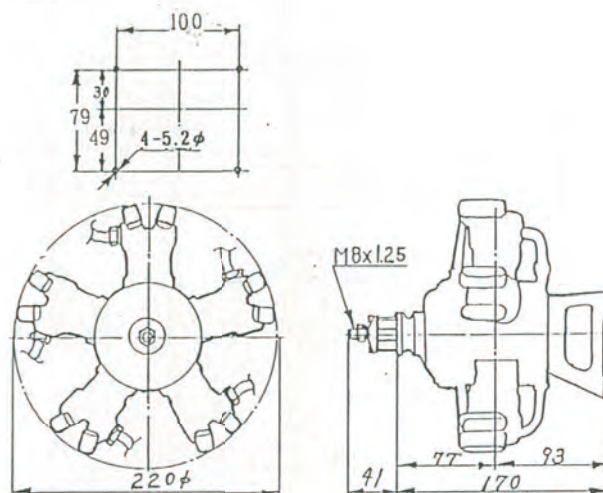
Stroke ... 22.0 mm x 5

Actual revolution speed ... about 1,700 to about 7,500 r.p.m.

Fuel consumption 1 minute/75 cc

At full throttle, Fuel: Castor oil system
containing nitro 10~20%, Propeller: Dyna
Thrust Co. make 20" x 8"

Weight about 2,450 g



(The fuel consumption differs according to the size of the propeller. Fuel consumption increases for propellers with greater load and decreases for propellers with less load.)

ACCESSORIES FOR FA-325R5-D

1. Spanner for tappet adjusting screw	1
2. Screwdriver for slow needle adjustment	1
3. Tappet adjusting screw gap gauge (0.1t)	1
4. Hexagonal spanner (wrench) (3, 2.5, 2, 1.5)	1 each
6. Needle valve extension bar	1
7. F-1 fuel filter	1
8. Glow plug fitted in the engine	10
9. Wire harness for plug	1 set
10. Leather washer	2
11. Syringe (for fuel priming)	1
12. Engine mount bolt M5x25 & washer M5	4 each
13. Blind nut for mounting bolt M5	4
14. Muffler ring w/gasket	1
15. Muffler (single) w/gasket	5
17. Engine mount spacer (washer) M5	4

(A) Fuel

It is very important for engine to use high quality fuel containing 10~20% nitro. For consistent performance and long engine life, use fuel containing **AT LEAST 20%** lubricant by volume. **(DO NOT USE LOW OIL FUEL)** Since the 4-cycle engine has high exhaust temperature and carbon is apt to accumulate when castor oil type lubricants are used. The fuel filter is to be installed and SAITO F-1 is designed for this model engines. **SAITO fuel filter "F-1" exhibits highest performance.**

(B) Fuel Tank

Fuel tank with a capacity of about 1,000 cc (Since large-sized planes may be damaged during an emergency landing due to a shortage of fuel, etc., a large-sized tank is used). The tank level is set 5 mm lower than the center of the carburetor.

(C) Plug

Since a four cycle engine fires every two revolutions, selection of the plug is important. We recommend SAITO P-2 plugs. Improper plugs do not allow the engine to operate correctly.

Use of SAITO "SAI GP01" (SS) Glow Plug is recommended.

(D) Propeller

Standard propellers are 18" x 10", 20" x 8" and 20" x 10". Select one according to the Model. A propeller made of glass nylon is preferred. (Since this is a large-diameter propeller, it is important that it is well balanced. An improperly balanced propeller causes vibrations.)

(E) Carburetor Adjustment, Engine Start and Break-In

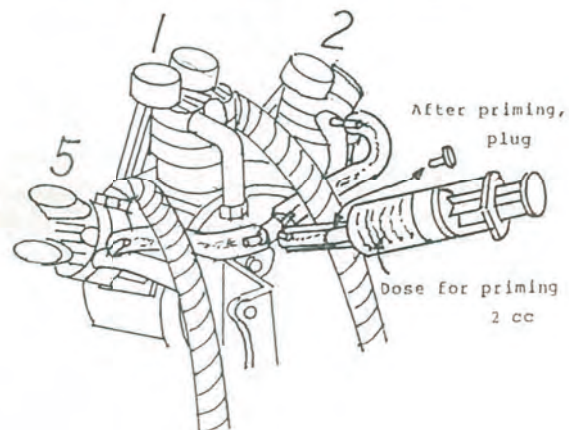
During break-in, fit with the single exhaust pipe. (This is necessary in order to view the smoke from each exhaust pipe to check whether or not each cylinder is firing normally and whether or not there is any misfiring.)

How to Prime

After replenishing fuel, use the attached syringe to pour 2 cc of fuel through the injection pipe as shown in Fig. 3. After pouring the fuel, be sure to install the plug. Then, rotate the propeller gently and slowly once or twice in the direction of the engine rotation. When resistance is unusually heavy at this time, fuel in cylinders No. 2 and No. 5 might have been compressed. Therefore, rotate the propeller more slowly and check whether or not the engine is flooded.

(Fig. 3)

Explanatory Drawing of Priming

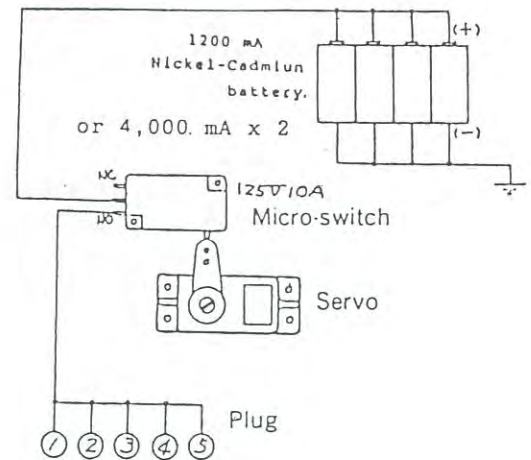


Plug Heat

(Fig. 4)

Reference Drawing of Plug Heat

Rotate the propeller once or twice in the direction of the forward rotation and if normal, set the throttle to the idling position (Since the engine is large-sized, be sure to check), heat the plug (See Fig. 4) and set the transmitter gear switch to the plug heat ON position. (At this time, it is convenient to fit the cockpit, etc. with pilot lamps for model railway. When starting the engine, it is recommended that the operator wear gloves.)



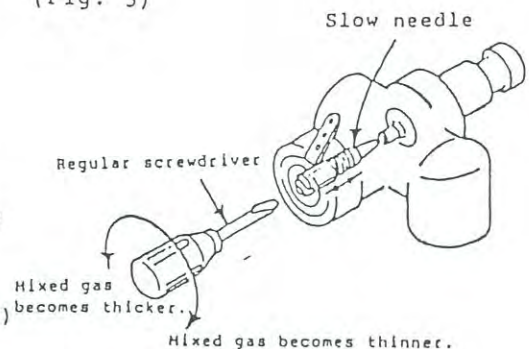
Engine Start

Vigorously rotate the propeller in the direction of the forward rotation. After the engine starts, open the needle slightly so as not to cause a misfire at revolution speeds of 4,000 rpm for operation. During break-in, operate it for the first 5 to 10 minutes while heating the plug. It takes time to consume fuel to the two tanks (capacity: about 1,000 cc). (Break-in for each rod and gear is performed at the same time by this operation.)

Then, fully open the throttle (Remove the booster at this time) and use the main needle to reach the peak. After the peak is attained, loosen 2 or 3 clicks. (The main needle opening is normally about 4.1/2 times)

Then, gradually reduce the throttle and observe at a revolution speed of about 2,500 rpm to determine whether gas from each cylinder is thick or thin. When white, thick gas comes from the exhaust pipe, turn the slow needle clockwise. When little gas comes out from the exhaust pipe, it is too thin and turn the slow needle counterclockwise in order to make it thicker. (See Fig. 5)

(Fig. 5)



Further, continue to close the throttle to 1,700 to 1,800 rpm and repeat the above-mentioned operation.

In order to adjust to the slowest speed, observe each cylinder and adjust to ensure that the cylinder from which the thickest smoke comes out does not cause the engine to stop. Misfire occurs at both low speed and high speed when fuel is too thin or too thick. When the fuel is too thick, the sound is thick and thick smoke comes out. In order to handle the multicylinder engine, it is necessary to distinguish the normal sound from the sound during a misfire and some experience is required to do so. (Until you have enough experience, heat the plug while running the engine at a low speed and if a misfire occurs, a normal sound will be heard. Then, adjust the needle.) For the main needle, readjust it when the engine is sufficiently warmed.

* Cautions

- o Never choke fuel from the carburetor. Otherwise, fuel will flow into No. 3 and No. 4 cylinders, thus causing damage to the cylinder and connecting rod.
- o Especially for large-sized engines, sufficiently warm-up in winter, etc. If the engine is operated at a high speed before it becomes sufficiently warm, the lubricating oil will run short, thus shortening the engine's life. Please note that if the plane takes off before the engine becomes sufficiently warm, the engine will not output a sufficient amount of power.
- o Before starting the engine, make sure the engine is not locked by fuel flowing into cylinders No. 3 and 4. It should be noted that starting the engine with the electric-driven starter or manually without confirming that the engine is not locked due to fuel damages the engine. This phenomenon occurs even with actual planes, etc.
- o For large-sized engines, it is recommended to use a tachometer.
- o Since plugs for multicylinder engines deteriorate quickly, replace the plug for the cylinder in which a misfire occurs consecutively.
- o For the propeller, use a well-balanced one. Abnormal vibration occurs from an improperly balance propeller. Please note that a wooden propeller may cause vibration since different grain between its right and left causes the end of the propeller to flutter as the rotation increases.
- o Before starting the engine, confirm the position of the throttle lever. Since starting when the throttle is fully opened is very dangerous, be sure to start at a slow position.
- o In order to re-start after operating the engine, rotate the propeller once or twice gently and slowly while not heating the plug in order to make sure that the engine is not locked due to fuel.
- o Before starting, if any person is present, have him go behind the plane. After an accident occurs, no measure cannot remedy it.

Since a lot of things which you have not experienced so far may occur, handle the engine with care.

(F) Adjusting the Engine Response with the Throttle Valve

When suddenly opening the throttle valve fully while the engine is running at idle.

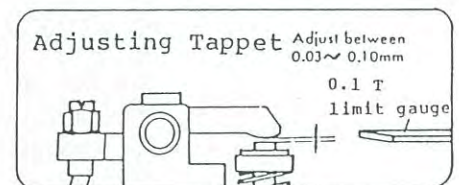
- a. When the revolution speed increases quickly, the engine is normal.

b. c. Problems and causes

	State	Cause
b.	When shifting from a low speed to a high speed is not performed smoothly, thick gas comes out from the exhaust pipe. Unstable state at low speed.	When mixed gas is too thick.
C	When the speed is changed from low speed to high speed, the engine stops.	When mixed gas is too thin.

(G) Normal Operation and Maintenance

- (a) Since excessively throttling the needle valve causes overheating, adjust it somewhat lower than the peak. (Excessive throttling stops the engine and adversely affects the piston and connecting rod)
- (b) After the first 1 hour of operation, adjust the tappet gap since it has an initial wear. Use the attached open-ended wrench and hexagonal spanner (1.5) to adjust it so that there is a slight gap at compression stroke while the engine is cool. After checking the gap, tighten the lock nut. Hereafter, follow the procedures in item (b) to check the gap from time to time, and adjust the gap so the gauge (thickness 0.1 mm) passes through the gap.



Running with the gap too large may lower the performance. The tappet gap is a very important element in the maintenance of the four cycle engine.

* Lubrication Inside the Engine and Drainage of Waste Oil

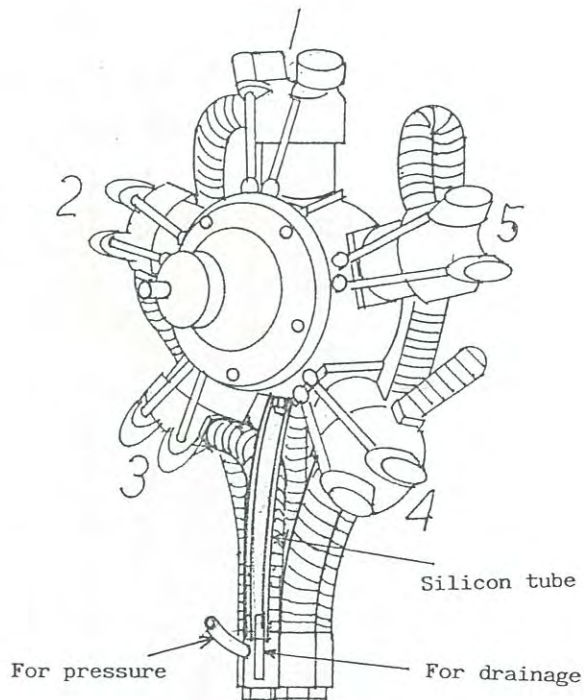
For lubrication of the piston, bearing, cam and gear, etc., lubricating oil which has been mixed in the fuel enters the inside through the piston clearance for lubrication. The waste oil is drained from the breather nipple at the bottom of the crankcase to the exhaust pipe nipple through silicon tube, etc.

- (c) Lubricate the rocker arm and valve surroundings as required during inspection.

- (d) Since rust occurs inside quicker than in normal single cylinder because of multicylinder, pay special attention to the rust-preventive surface. After running, spray dry lubricating oil through the plug hole for the valve surroundings and through the breather nipple for the bearing surroundings.

* How to install the muffler complete

Remove one side of the engine mount for installation. In order to tighten the nut, be sure to manually screw the nut in two or three threads and then use an open-ended wrench to tighten. If you use the open-ended wrench to tighten the nut from the beginning, the threads are likely to become stripped if the nut enters at an angle.



- * When screwing a muffler in a cylinder, oil both an external screw on the muffler and an internal one on the cylinder side.

FA-325R5-D

• Dual-plug system

During starting the rear plug is ignited.

The front plug is heated by combustion after the engine is running.

This dual plug system offers excellent reliability during idling and improves combustion characteristics.

Improved performance without plug heat in idle mode.(about 1,700 r.p.m.)

SAITO FA-325R5-D PARTS LIST

No.	Description	Q'ty	No.	Description	Q'ty
01	Cylinder (Left)	5	43	Rocker arm pin	10
06	Piston	5	46	Valve (in & out)	10
07	Piston pin	5	47-1	Valve spring	10
08	Piston pin retainer	10	47-2	valve spring keeper	10
09	Piston ring	5	48	Valve retainer	10
10	Master rod	1	49	Rocker arm cover	10
11	Linked conrod	4	50	Cam gear base (A) /set screw M3 X 4	1
12-1	Link pin	4	51	Cam gear base (B) /set screw M3 X 4	1
12-2	Link pin set screw	4	52	Counter-gear / bearing press fitted	5
14-1	Cap screw M3.5 X 12 for cylinder	20	53	Counter-gear shaft	5
14-2	Cap screw M2.6 X 16 for rocker arm cover	20	54	Cam gear base strut	5
15	Crankcase	1	69	Intake manifold (A)	3
16	Front shield	1	71	Intake manifold nut	5
17	Rear cover(A) / Set screw M3 X 4	1	72-1	Intake manifold (B) / choke pipe (Left)	1
19	Breather nipple	1	72-2	Intake manifold (B) / choke pipe (Right)	1
20	Front bearing	1	73	Muffler, Left (with cap nut)	4
22	Rear bearing	1	74	Muffler, Right (with nipple & cap nut)	1
23-1	Crankshaft	1	78-1	Flexible muffler No.1 cylinder	1
23-2	Steel spacer for crankshaft	1	78-2	Flexible muffler No.2 cylinder	1
26	Collar for crankshaft	1	78-3	Flexible muffler No.3 cylinder	1
27-1	Taper collet	1	78-4	Flexible muffler No.4 cylinder	1
27-2	Drive flange	1	78-5	Flexible muffler No.5 cylinder	1
28-1	Propeller washer	1	78-6	Cable tie	2
28-2	Propeller Nut	1	79	Muffler gasket	5
31-1	Cap screw M4 X 18 for front housing	5	80	Muffler nut	5
31-2	Cap screw M4 X 22 for rear cover	5	81	Priming harness	1
31-3	Cap screw M4 X 12 for engine mount	6	82-1	carburetor Body	1
31-4	Cap screw M3 X 10 for cam gear base	5	82-2	Spraybar / O ring P-2 NBR	1
31-5	Cap scrwe M4 X 10 (SUS) for impeller	1	82-3	O ring P-8.25 NBR for nipple fitting body	1
31-6	Set screw M3 X 3 for cam gear shaft	5	82-5	Inlet nipple ring / carburetor nipple	1
31-7	Set screw M3 X 4 for counter-gear shaft/cabu	6	82-6	O ring P-5 NBR for spray bar	1
32-1	Gasket for Rocker arm cover	10	82-7	Full throttle needle stopper	1
32-2-1	Gasket for rear cover (A)	1	82-8	Lock nut for Spray bar	1
32-2-2	Gasket for rear cover (B)	1	82-9	Throttle adjusting screw	1
32-3	O ring 7.5 X 1 for intake pipe	5	82-10	Spring for throttle adjusting screw	1
32-4	O ring P-7 viton for intake pipe	5	82-11	O ring P-7 NBR for carburetor body	1
32-5	Aluminum gasket for intake pipe	5	82-12	Throttle valve	1
34	Cam gear	5	82-13	Spring for throttle valve	1
36	Cam gear shaft	5	82-14	O ring P-2 NBR for idle needle	1
37-1	Teflon Washer set for cam gear shaft	1 set	85	Full throttle needle valve / set screw M3 X 3	1
37-2	Teflon Washer set for counter-gear shaft	1 set	86	Full throttle needle extension	1
38	Tappet	10	88	Throttle lever / Set screw M3 X 3	1
39	Pushrod	10	89	Idle needle	1
40-1	Pushrod cover	10	91-1	O ring P-2 NBR for spray bar	1
40-2	Rubber bush for push-rod cover (U)	10	95	Engine mount (R&L) set	1 set
40-3	Rubber bush for push-rod cover (L)	10	110	Anti loosening nut	1
41	Rocker arm	10	121	Crank pin spacer	1
42-1	Rocker arm screw	10	141	Impeller Assembly Complete	1 set
42-2	Lock nut for Rocker arm screw	10			

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