

SAITO™

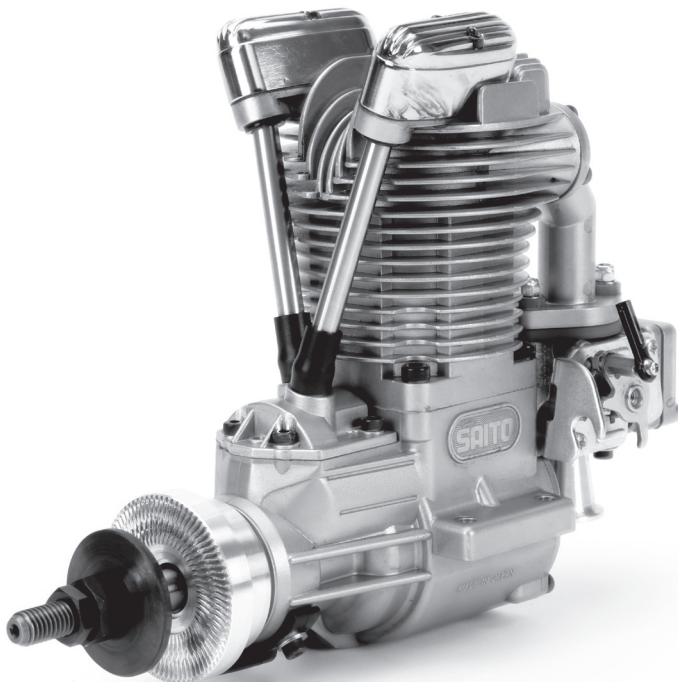
Saito™ 4-Stroke Gasoline Engines

Owner's Operating Instruction Manual

Model FG-14C, FG-17 & FG-21

Model FG-30B, FG-36B & FG-40

Version 2012



NOTICE

All instructions, warranties and other collateral documents are subject to change at the sole discretion of Horizon Hobby, Inc. For up-to-date product literature, visit horizonhobby.com and click on the support tab for this product.

Meaning of Special Language

The following terms are used throughout the product literature to indicate various levels of potential harm when operating this product:

NOTICE: Procedures, which if not properly followed, create a possibility of physical property damage AND a little or no possibility of injury.

CAUTION: Procedures, which if not properly followed, create the probability of physical property damage AND a possibility of serious injury.

WARNING: Procedures, which if not properly followed, create the probability of property damage, collateral damage, and serious injury OR create a high probability of superficial injury.



WARNING: Read the ENTIRE instruction manual to become familiar with the features of the product before operating. Failure to operate the product correctly can result in damage to the product, personal property and cause serious injury.

This is a sophisticated hobby product. It must be operated with caution and common sense and requires some basic mechanical ability. Failure to operate this Product in a safe and responsible manner could result in injury or damage to the product or other property. This product is not intended for use by children without direct adult supervision. Do not attempt disassembly, use with incompatible components or augment product in any way without the approval of Horizon Hobby, Inc. This manual contains instructions for safety, operation and maintenance. It is essential to read and follow all the instructions and warnings in the manual, prior to assembly, setup or use, in order to operate correctly and avoid damage or serious injury.

Age Recommendation: Not for children under 14 years. This is not a toy.

Safety Warnings and Precautions

This manual describes the engine and its general operating procedures. For mounting and control, see the instruction manual for the model airplane. Some suggestions are included in this manual for mounting the engine using the included motor mount.

For proper heat transfer, it is important to use a metal motor mount when mounting these engines in a model aircraft.

The engine is designed for use on a model radio control airplane. If it is used for any other purpose, we cannot be responsible for its reliability or safety.

- Always use genuine Saito parts for replacements.
- Be sure to check the propeller before each flight. If it is damaged, replace the propeller with a new one.
- If the propeller hits something while the engine is in operation, immediately stop the engine and check for damage.
- Start the engine on a flat surface free of stones or other debris.
- When mixing fuel, or operating the engine, do so in a well-ventilated area.

Model engines produce a substantial amount of power and can create unsafe situations if not used correctly. Always use common sense and observe all safety precautions when operating, handling or performing any procedure involving your engine. Failure to follow safety precautions could result in serious injury and property damage.

- Never return unused fuel from the fuel tank back into the fuel container.
- Never attempt to repair or modify a propeller beyond its intended use.
- Never handle model engines, mufflers and/or tuned pipes until they have had time to cool. They become extremely hot when in use.
- Never use hands, fingers, or any other body part to stop the propeller.
- Never throw any object into a propeller to stop it.
- Never run the engine in the vicinity of loose small objects, such as gravel or sand, to avoid the propeller uncontrollably throwing such materials.
- Never wear loose clothing or a loose neckstrap when operating your model engine as these items could become entangled in the propeller.
- Never have loose objects such as screwdrivers, pencils etc. in your pockets when operating your model engine. These could fall into the propeller.
- Never allow fuel to come into contact with eyes or mouth. Gasoline and other fuels used in model engines are poisonous.
- Always ensure spectators, especially children, are at least 30 feet away when running the engine.
- Always ensure that the propeller is securely attached to the engine shaft and all retaining fasteners are tightened properly before EACH flight. Use of blue threadlock to tighten nuts is advisable.
- Always keep small parts out of the reach of children as they can be choking hazards.
- Always secure the airplane before powering the engine.
- Always keep your face and body away from the path of the propeller blades when starting or running your engine.
- Always stand behind the propeller when making carburetor adjustments.
- Always wear safety glasses or goggles when starting and running your engine.
- Always keep your fuel in a safe place well away from sparks, heat or anything that can ignite.
- Always ensure the aircraft is secure and will not move once the engine is started.
- Always rebind your transmitter to your receiver(s) after setup and before first flight.
- Always ensure the throttle failsafe is set to low throttle in your transmitter.
- Always perform a range check prior to flight.
- Always cut off the fuel supply (pinch or disconnect the fuel line to the carburetor) or use the throttle linkage to shut off the air in order to stop the engine.
- Always ensure gasoline and fuel is stored in a clearly marked container well away from the reach of children.
- Always mount the engine securely on a bench mount or high-quality engine mount.
- Always use the correct size and pitch of propeller for your engine. Refer to Propeller Chart in this manual.
- Always confirm proper balance of your propeller prior to installation of the engine. Failure to do so could cause damage to the engine and/or the airframe.
- Always utilize an electric starter to start your engine.
- Always discard any propeller that is nicked, scratched, cracked or damaged in any way.
- Always run your model engine in a well-ventilated area. Model engines produce possibly harmful carbon monoxide fumes.
- Always store your fuel safely in a sealed, water-resistant container.
- Always store fuel in a cool, dry location. Do not allow fuel containers to come in direct contact with concrete, as the fuel may absorb moisture.
- Always responsibly discard fuel if there is condensation and/or water inside the fuel container.

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Introduction to the Saito™ Gasoline 4-Stroke Engines

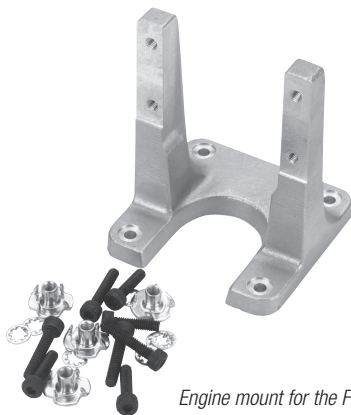
The Saito four-stroke gasoline series of engines were developed to satisfy a market need for a more cost-effective and cleaner answer to the then current glow-powered engines. Ever at the forefront of technology, Saito has led the way many times in developing engines with large displacements in small case sizes. It seemed only natural that they would also lead the way to a more cost-effective fuel alternative to glow-powered engines.

Components

	FG-14C	FG-17	FG-21	FG-30B	FG-36B	FG-40
Engine	✓	✓	✓	✓	✓	✓
Valve Adjusting Tools	✓	✓	✓	✓	✓	✓
Muffler Wrench				✓	✓	✓
Ignition	SAIG14C153	SAIG17153	SAIG17153	SAIG30B153	SAIG30B153	SAIG40153
Engine Mount	SAIG1495	SAI10095	SAIG2095	SAIG3095/ SAIG3695	SAIG3095/ SAIG3695	SAIG3695
Spark Plug	1/4-32; SAIG20120	1/4-32; SAIG20120	1/4-32; SAIG20120	CM-6; SAIG36120	CM-6; SAIG36120	CM-6; SAIG36120
Muffler	SAIG1474	SAIG1474	SAIG2074	SAIG3674	SAIG3674	SAIG3674
Muffler Manifold	SAIG8075B	SAI91S75	SAI125A75	SAI120S75A/ SAIG3675	SAI120S75A/ SAIG3675	SAIG3680
Muffler Nut, 2 Pcs	SAIG8080A	SAIG8080A	SAI125A80	SAI120S80/ SAIG3680	SAI120S80/ SAIG3680	SAIG3680
Spark Plug Wrench	SAIG20967	SAIG20967	SAIG20967	SAIG36969	SAIG36969	SAIG36969

FG-14C/FG-17/FG-21 Engine Instructions

Engine Mounting and Muffler Attachment



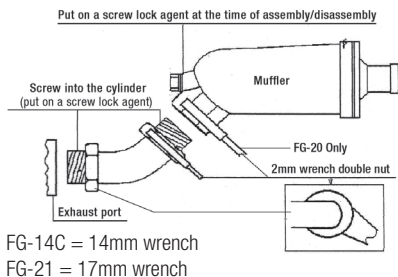
Engine mount for the FG-21

Mount the FG-14C, FG-17 or FG-21 engine on aircraft-grade plywood with more than 6mm thickness or to a mount of equivalent strength, then firmly fix with 4 bolts. We highly recommend the use of the included Saito Motor Mount for the FG-14C (SAIG1495B), FG-17 (SAI10095) or FG-21 (SAIG2095) to mount this engine to a model aircraft.

NOTICE: Be sure to use flat washers or a metal plate on the reverse side of the mount to prevent the bolts from sinking into the plywood. Before flying the airplane, be sure to check for loose bolts.

Since this engine is equipped with a floatless carburetor with a diaphragm pump, the direction of the cylinder in regards to the position of the fuel tank can be upright or inverted.

Figure 1



When you attach the muffler, use a drop of oil on the threads to ease the assembly. Screw the exhaust manifold into the engine exhaust port and the muffler as far as the thread will allow (see above drawing). Notice the use of the two wrenches used in tightening the two nuts on the muffler/manifold connection. Use of threadlock is recommended.

Remember to ensure cooling air passes by the engine and muffler in a cowled environment.

NOTICE: Air is necessary to cool the engine during operation. Make sure sufficient air circulation through the cowling is provided. As a basic reference, the outlet area should be 3 to 5 times the area of the inlet area to provide adequate cooling.

Throttle Linkage

Carefully attach the throttle linkage to the engine using a ball link on the carburetor throttle arm. Make sure the linkage is free to operate from low to high throttle. Also, confirm that the low throttle setting on the transmitter closes the carburetor throttle barrel to the low-idle position. Adjust the length of the pushrod until full throttle opens the carburetor throttle barrel to the fully open position and low throttle, low trim completely closes the throttle barrel.

Propeller

Recommended Propeller Sizes: The recommended propeller sizes are shown in the table below. The use of a large propeller will require care in balancing it. Vibration will reduce performance and can result in damage to the engine and airframe.

For break-in, Saito recommends the use of a smaller propeller for the initial break-in and approximately 20 subsequent flights.

Diameter x Pitch (inches)

FG-14C	FG-17	FG-21
13 x 8	14 x 8	15 x 6–10
14 x 6–8	15 x 6–8	16 x 6–8
15 x 4	16 x 6	17 x 6
		3 blade 15 x 7–9

The engine produces the maximum output when the engine is running at about 8,500–9,200 ground rpm for the FG-14C and 8,300–9,000 ground rpm for the FG-17/FG-21.

Propeller and Fuel Consumption

In order to decrease fuel consumption and prolong the life of the engine, choose a propeller that maximizes rpm when the throttle is fully open, and an airframe that performs flights at about 90% of the propeller output. If the load is large (the diameter and pitch of the propeller is large), the air-fuel mixture will have to be rich. If the load is small, the rpm will be high, but the fuel consumption is less due to the high-speed needle valve being leaned out more.

Fuel

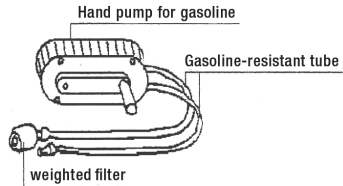
- Mix a ratio of gasoline to oil of 20:1 for break-in and continuous operation on all engines.
- A mixture of high-quality 91 octane unleaded gasoline and a reliable, high-quality 100% synthetic oil for 2-cycle engines must be used. We recommend Evolution Oil (EVOX1001Q).

With the use of an oil mixture of 20:1, it is normal to see a slight amount of carbon buildup on the exhaust valve itself. This is why it is important that you use a high-quality synthetic oil instead of standard 2-stroke oil you may be using in your 2-stroke gas engine. Although these 2-stroke oils work well in their intended applications, they can cause a build up of a gummy residue on the exhaust valve in a 4-stroke gas engine. This may require service for your engine if the exhaust valve begins to stick and not seal properly.

The high-quality Evolution oil we recommend will still build up a slight amount of carbon, but we have found that this build up is easily flaked off during normal operation of the engine. It will not create the typical gummy build up.

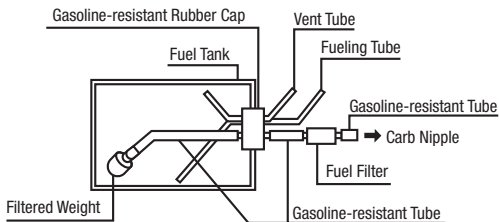
- Remember to use caution in the storage, use and transport of gasoline.
- Since commercial gasoline has many impurities, please be sure to use a reliable fuel filter (SAI50109 or HAN143) in your fuel system.
- The recommended fuel tubing is Evolution® Gasoline Fuel Tubing (EVOA102). DO NOT use a silicone rubber fuel line for the engine, the fuel tank, or your fueling system.
- The use of fuel with up to 10% ethanol has been tested and found to work fine.
- The use of a filtered clunk or sintered clunk on the fuel pick up line is required. The Evolution In-tank Felt Filter/Clunk (EVOA106) is designed specifically for gas engine operation.

Figure 2



Fuel Tank and Plumbing

Figure 3



Be sure to include a reliable fuel filter in your fuel system. The drawing to the left suggests the use of a fuel feed line and an air intake line. Also, be sure to use a fuel line that is compatible with gasoline.

Ignition System

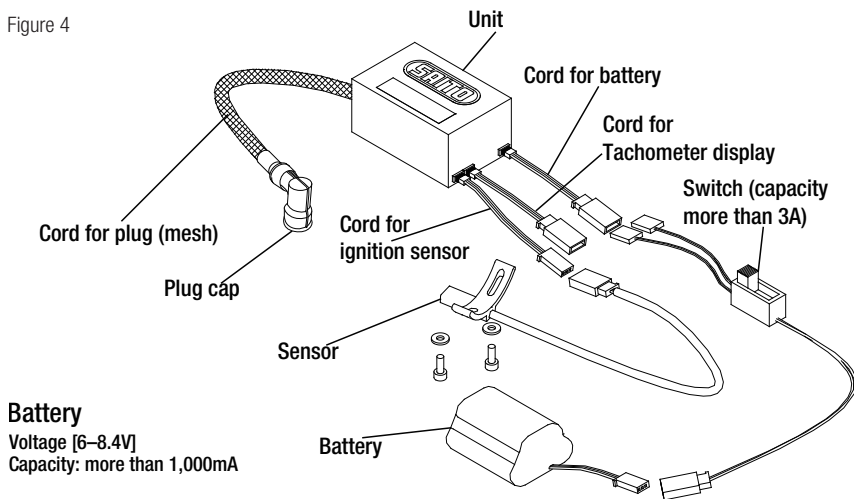
Saito gasoline four-stroke engines come with the Saito ignition system, composed of the ignition unit, a cord for the sensor (black and white), insulated plug cap, and cord (black and red) for connection to a battery (not included). You will also need to secure an on/off switch (safety switch system). The switch must carry a rating of 3 amps.

Be sure to mount the ignition system in a location near the engine and away from the receiver to prevent any

unwanted interference. Please refer to the diagram below.

The Saito ignition has an operating voltage from 4.8–9.0 volts. Saito recommends the use of a 5-cell Ni-Cd/Ni-MH battery or a 2-cell Li-Po/Li-Ion/Li-Fe with a minimum of 1000mAh. The recommended battery is the Team Orion® Avionics Li-Fe Receiver Pack 1300mAh 6.6V (ORI60503).

Figure 4



Battery

Voltage [6–8.4V]
Capacity: more than 1,000mA

Spark Plug

1/4-32
Spark gap = .4 to .5mm (.016 to .020 in)

Carburetor

The carburetors used on gasoline four-stroke engines are exclusive to Saito. Since they have a negative pressure type fuel pump, the engine can be mounted in any position.

NOTICE: Always remove fuel from the carburetor after flight. Not doing so will result in rubber engine components (such as the diaphragm) deteriorating over time, causing loss of engine performance.

The FG-14C, FG-17 and FG-21 come with the Saito 1/4-32 spark plug (SAIG20120). When needed, replace with identical plugs.

After a flying session, it is best to remove any fuel remaining in the carburetor by disconnecting the fuel line and running the engine until it is dry.

Do not needlessly disassemble the carburetor.

If you experience problems with the carburetor, return it to the Saito Horizon Service Center.

Preparation Before Starting the Engine (prior to break-in)

- Mount the engine on a strong, flat test bench or on the aircraft (in either case, the engine should be secured so it is immobile).
- Check to make sure the carburetor will open and close completely.
- Check the wiring of the ignition system to make sure it is connected correctly and securely.
- Make sure the fuel line is connected securely to the carburetor.
- For break-in, use a fuel/oil mix ratio of 20:1.
- FG-14C: Mount a 14 x 6 plastic or wood propeller. Be sure it has been balanced. Check the tightness after every flight.
- FG-17: Mount a 14 x 8 plastic or wood propeller. Be sure it has been balanced. Check the tightness after every flight.
- FG-21: Mount a 15 x 6 plastic or wood propeller. Be sure it has been balanced. Check the tightness after every flight.
- It is suggested you employ a spinner when using an electric starter. Check the tightness after every flight.
- Use a tachometer to determine proper needle valve settings of the engine.
- Be sure to connect a gasoline-proof line to the breather nipple to vent oil from the airframe.
- Check the battery of the electric starter to make sure it is fully charged.
- Be sure to use a safety on/off switch from the battery to the ignition.



WARNING: Always keep all spectators, especially children, are at least 30 feet away when running or starting the engine.



WARNING: Always ensure the aircraft is secure and cannot move when preparing to start the engine. Failure to do so could cause property damage and serious injury.

Understanding the Saito Gas Carb for the FG-14C, FG-17 and FG-21

To best understand the FG-14C, FG-17 and FG-21 carburetor, you need to know what it is not.

**It is not a Walbro carburetor.
It is not a glow carburetor.**

As we made strides to bring cheaper gasoline power to ever smaller engines, this uniquely designed carb was developed because the currently available carbs from the lawn power equipment world were way too large to be included with our smaller powerplants.

Gasoline fuel requires a much finer atomization of the droplets than glow fuel does. Because the amount of fuel flowing through the engine is so much lower than with a typical glow fuel setup (up to 60% less fuel), maintaining a constant flow and pressure becomes even more critical. Close inspection of the cat's eye orifice on the needle valve body in the FG-14C/21 carb reveals a miniscule opening; perfectly sized for the proper atomization of the fuel for your engine.

This new carb features a pump function designed to provide the correct amount of fuel to the needle valve assemblies to correctly operate the engines. It is not designed as a fuel pump to draw fuel from a tank mounted in the middle of your airplane. The fuel tank needs to be mounted as close to the centerline of the Carb assembly as possible; the same as we have had to do for all these years with our glow engine installations. If you stray very far from this rule, the engine will run differently upright and inverted. This usually leads to comments that an engine doesn't like to run inverted, etc., when in reality, the fuel delivery system needs to be optimized for the engine installation being used.

The pump is actuated by the negative pressure pulses when the intake valves are open and the engine is drawing fuel into the cylinder. On the latest version of the carburetor, we enlarged the area of the hole that delivers these pulses to the pump assembly. It has greatly improved the pumping action and has much more tolerance of 'less than optimum' fuel tank locations. But it is still not a Walbro carb and will not draw fuel from any long distance.

Starting the Engine (assuming the engine is mounted in an aircraft)

The carburetor on the Saito engine comes with the low-speed needle adjusted to a basic setting. The high-speed needle will need to be set by the user. The standard carburetor settings are as follows: The high-speed needle valve is set open counterclockwise from the fully closed position.

On the FG-14C, FG-17 and FG-21 the low-speed needle should be set at 7-5/8 from closed.

1. Disconnect the throttle arm from the throttle pushrod.
2. Manually hold the throttle barrel closed.
3. With a small tip flat screwdriver, screw in the idle adjustment all the way until you feel the throttle barrel trying to rotate. The low-speed adjustment is actually not a needle—it is a sleeve that cover/uncovers a cat's eye slit in the fuel supply tube. When you run the low-speed adjustment all the way in, the sleeve will bottom out against the fixed carb body and force the barrel to rotate.
4. Now richen the low-speed needle by 7 turns, 35 minutes. In our experience, this will be within an 1/8 of a turn (+/-) from perfect at the low end.
5. Reconnect the throttle pushrod.
6. Once this change is made to the low end, open the high end by 1/2 turn from where you ran it before, restart the engine and reset the high-end needle valve. Please refer to the diagrams.

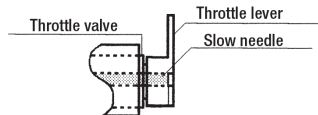
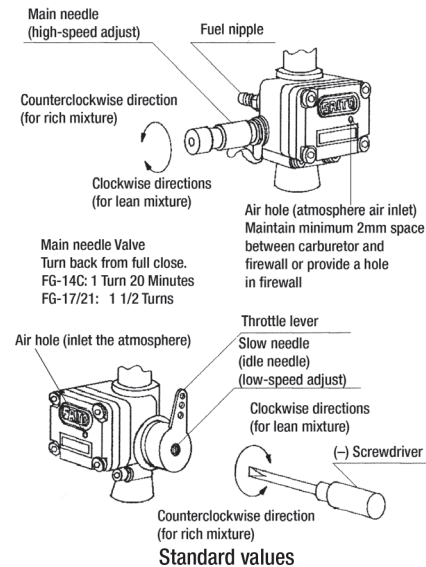
The minutes listed are in reference to the minute hand of a clock.

	FG-14C	FG-17	FG-21
High-speed needle	1 turn 20 minutes	1 turn 30 minutes	1 turn 30 minutes
Low-speed needle	7 turns 35 minutes	7 turns 35 minutes	7 turns 35 minutes

Before you first start the engine, make sure the spark plug is screwed in and tightened and that the plug socket cap is fitted in place and fastened down properly. Fix the ignition sensor in the proper position at the bottom of the engine crankcase. The throttle servo should be mounted at a distance of 8 to 12 inches from the engine. The spark plug cable must not touch any part of the model structure as vibration may damage the shielded cable. If this is not practical, it will be necessary to provide an insulation material for the cable. The ignition unit itself should be wrapped in foam

rubber to prevent engine vibration from damaging the electronic components. All components must be protected from contact with engine fuel. Be sure to use an on/off (Safety or "kill") switch to allow the ignition to be turned off and on.

Figure 5—FG-14C/FG-17/FG-21 Carburetor



NOTICE: Never turn the engine over with the ignition turned on unless the spark plug is inserted in the plug socket. This could lead to ignition damage.

Saito 4-stroke gasoline engines come with a pumped carburetor. You do not have to choke the engine as you normally would a 2-stroke engine.

When you are ready to start the engine, switch the ignition on and set the throttle to a slightly high idle speed. We highly recommend the use of an electric starter.

Be sure to have a helper hold the model securely.

- Turn on the transmitter first, then the receiver and check the operation of the throttle servo and other controls.
- Turn on the power to the ignition system.
- Using an electric starter, begin cranking the engine. It should fire within seconds of applying the starter. Allow the engine to idle for 30 to 45 seconds.
- If the engine does not start, even after using the electric starter to crank the engine a second time, open the throttle to maximum, turn off the ignition and turn the engine over about 4 revolutions. Switch the ignition on again and then restart the engine with the throttle at a fast idle position.
- If the engine still will not start, unscrew the spark plug and check its contacts. Clean any possible excess fuel (an indication of engine flooding) and screw it in again. Further starting should only be done with the throttle at idle position. If the plug is dry, probably not enough fuel has been drawn into the carburetor. If that is the case, check the fuel feed and then return to the instructions above.

Conrods

Saito has developed a specific aluminum alloy and manufacturing process that allows them to eliminate the need for a separate bearing material in the lower end of their conrods. The benefit of this is you never have to worry about the bearing material (usually bronze oilite) rotating in the conrod and blocking off the critical bearing lubrication holes machined into the bottom of the conrod. This process also allows for smaller crankcases and smaller airplane applications. It also creates the requirement for the 20:1 oil mixture in our gasoline powered engines.

Break-in

Do not skip this step. You risk seizing the conrod to the crankshaft.

The most important component to break-in on all Saito 4-stroke engines, and especially the gasoline engines, is the conrod to crankshaft interface. The break-in process required for all Saito engines is designed to break-in the conrod to crankshaft interface more than to seat the ring. The ring will seat gradually over time and the engine will develop more and more power. Ensure the conrod is treated correctly from the beginning.

General Operating Procedures (to ensure the long life of the engine)

- Do not operate the engine with a “lean” mixture.
- Regularly check all screws and nuts on both the engine and muffler.
- After every 1 to 2 hours of operation, valve adjustment may be necessary. Adjust the valves as shown in the Engine Maintenance and Valve/Tappet Adjustment Sections.
- Saito engines are equipped with a “breather” nipple. It is recommended that a length of PFM type tubing (EVOA102) tubing be attached to this crankcase breather nipple and routed away from the engine compartment so the excess oil can be expelled outside of the aircraft.

We strongly urge the use of a tachometer to check rpm readings when breaking in the engine.

After starting and warming the engine for 30 to 45 seconds, adjust as follows: for initial break-in, do not exceed 4,000 rpm for the first 10 minutes of operation. This allows all the parts to mate properly with good lubrication.



WARNING: Before adjusting the carburetor, you **MUST** stop the engine. Failure to do so will cause the propeller to continue to move if the engine is not stopped, which could result in serious injury.

Subsequent runs may be made while slightly leaning out the mixture with each tank full of fuel. Forty minutes is considered sufficient time for normal break-in prior to the first flight.

Normal Operation, Maintenance and Additional Information

- Be sure to do a range check before flying your model. It would be wise to do the range check with the engine running and without it running. As a simple noise check, after the engine is started, do the normal range check your radio manufacturer recommends.
- Be sure to charge the ignition battery and radio system battery before the first flight of the day.
- To discharge the waste oil, connect a gasoline-proof line from the breather nipple on the crankcase and vent it outside of the aircraft.
- Lubrication of the piston, connecting rod, bearings and cam gear is blow-by lubrication, where the oil in the fuel goes into the crankcase from the clearance between the cylinder and the piston. Engine life is directly affected by the property of the fuel/oil mix. Please use reliable oil.
- Running the engine too lean causes heat; be sure to run the engine slightly “rich” from peak. Running too lean will cause “knocking” or engine failure and has an adverse effect on the connecting rod and the cam gear.
- Adjustment of the tappet is described in the “Valve/Tappet Gap Adjustment” section.
- When attaching an exhaust pipe to the cylinder or attaching a propeller nut, the use of threadlock is recommended.
- Sometimes it is helpful to tighten an exhaust nut, etc. when hot.
- When finished flying for the day, be sure to remove fuel from the carburetor and the fuel tank.
- If the engine will not be operated for a long period of time, remove the plug, rear cover, cylinder-head cover, etc., then clean thoroughly and re-oil. Assemble them in the original condition and place in a plastic or air-tight container.

Setting the Needle Valves in the Gas 4-Stroke Engines

Use a Tachometer

When setting any 4-stroke engine, it is critical that a tachometer is used in setting the needle valves. It is near impossible to set them properly by ear. A good quality tachometer will go a long way towards improving your usage of these engines and makes the experience even more enjoyable. Make the investment.

Set the High-Speed Needle First

A general starting point for the high-speed needle on the FG-14C carb is 1 turn 20 min. and the FG-17/FG-21 carb is 1 turn 30 min.

1. Start the engine. Using your tachometer to gradually lean the high-speed needle valve until the engine reaches its peak rpm.
 - a. This will take some patience because it will take a few seconds after making a 1 click needle change to register an increase.
 - b. As you hit the perfect peak setting, you will notice that there will be no rpm change.
 - c. Continue to lean the engine until you notice an rpm decrease. It is only once you have experienced the rpm decrease can you be sure you have actually reached the peak setting.

2. Once you are sure that you are on the lean side richen (open) the high-speed needle back to the peak rpm.
3. Open the high-speed needle 2 clicks rich from your confirmed peak and leave it there. You will likely notice a small rpm difference on your tachometer, but you will not likely be able to hear this drop in rpm.

Set the Low-Speed Needle

On the FG-14C, FG-17 and FG-21 the low-speed needle should be set at 7 5/8 from closed.

1. Disconnect the throttle arm from the throttle pushrod.
2. Manually hold the throttle barrel closed.
3. With a small tip flat screwdriver, screw in the idle adjustment all the way until you feel the throttle barrel trying to rotate. The low-speed adjustment is actually not a needle—it is a sleeve that covers/uncovers a cat’s eye slit in the fuel supply tube. When you run the low-speed adjustment all the way in, the sleeve will bottom out against the fixed carb body and force the barrel to rotate.
4. Now richen the low-speed needle by 7 turns, 35 minutes. In our experience, this will be within an 1/8 of a turn (+/-) from perfect at the low end.
5. Reconnect the throttle pushrod.

- Once this change made to the low end, open the high end by 1/2 turn from where you ran it before. Restart the engine and reset the high-end needle valve.
- With the engine running and the high-speed needle valve set as above, adjust your throttle setting to achieve the desired idle speed.

Tip: The more your prop weighs, the lower your achievable idle speed will be.

- Check the transition of the engine from low-speed to high-speed. To do this, let the engine idle for a period of 10 seconds and then rapidly move the throttle from low to wide open. One of three things will happen:
 - The engine will respond immediately and the transition will be very smooth to wide open throttle.
 - The engine will stumble and gradually increase the rpm to wide open throttle. In this case the idle needle setting is too rich. Make a very small adjustment to lean the needle (clockwise rotation) and try again. Continue to do this until you achieve an immediate response from the engine.
 - The engine will abruptly quit when the throttle is opened. This indicates a too-lean low-speed setting. Open the low-speed needle valve a small amount (counterclockwise) and try again. Continue to do this until you achieve an immediate response from the engine.

Recheck the High-Speed Needle Valve Setting

You need to go back and recheck the high-speed needle valve setting again as described above after adjusting the low-speed setting. Because of the design of the needle assembly, adjusting the low-speed needle actually affects the size of the fuel aperture and can affect the high-speed needle setting.

Enjoy Your New Engine

Once you have set your needle valves the final tuning will occur in the air. Listen carefully to your engine while it is running.

- If the rpm starts to drop a couple of minutes into the flight, or when you climb the airplane, your high-speed needle is a bit lean. Land as soon as you can and richen the high-speed needle settings a couple of clicks and take off again.
- If during flight your engine has good power but occasionally sounds like it 'misses', this is a good indication that you are running the engine too rich. The next time you land, lean the engine out one click at a time until you are happy with the performance in the air.

FG-30B/FG-36B/FG-40 Engine Instructions

Engine Mounting and Muffler Attachment



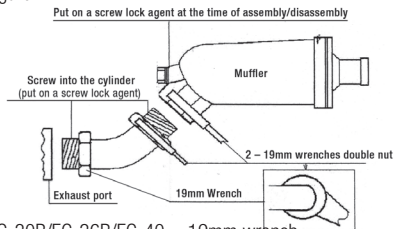
Engine mount for the FG-36B

Mount the FG-30B, FG-36B or FG-40 engine on aircraft-grade plywood with more than 10mm of thickness or to a mount of equivalent strength, then firmly fix with 4 bolts. We highly recommend the use of the Saito Motor Mount for the FG-30B (SAIG3095) or FG-36B/40 (SAIG3695) to mount this engine to a model aircraft.

NOTICE: Be sure to use flat washers or a metal plate on the reverse side of the mount to prevent the bolts from sinking into the plywood. Before flying the airplane, be sure to check for loose bolts.

Since this engine is equipped with a floatless carburetor with a diaphragm pump, the direction of the cylinder in relation to the position of the fuel tank can be upright or inverted.

Figure 1



FG-30B/FG-36B/FG-40 = 19mm wrench

When you attach the muffler, use a drop of oil on the threads to ease the assembly. Screw the exhaust manifold into the engine exhaust port and the muffler as far as the thread will allow (see above drawing).

Throttle Linkage

Carefully attach the throttle linkage to the engine using a ball link on the carburetor throttle arm. Make sure the linkage is free to operate from low to high throttle. Also, confirm that the low-throttle setting on the transmitter closes the carburetor throttle barrel to the low-idle position. Adjust the length of the pushrod until full throttle opens the carburetor throttle barrel to the fully open position and low throttle, low trim completely closes the throttle barrel.

Propeller

Recommended Propeller Sizes: The recommended propeller sizes are shown in the table below. The use of a carbon fiber propeller is highly recommended. The use of a large propeller requires care in balancing it. Vibration reduces performance and can result in damage to the engine and airframe.

For break-in, Saito recommends the use of a smaller propeller for the initial break-in and approximately 20 subsequent flights.

Propeller and Fuel Consumption

In order to decrease fuel consumption and prolong the life of the engine, choose a propeller that maximizes rpm when the throttle is fully open, and an airframe that performs flights at about 90% of the propeller output. If the load is large (the diameter and pitch of the propeller is large), the air-fuel mixture will have to be rich. If the load is small, the rpm will be high, but the fuel consumption is less due to the high-speed needle valve being leaned out more.

Notice the use of the two wrenches used in tightening the two nuts on the muffler/manifold connection. Use of threadlock is recommended.

Remember to ensure cooling air passes by the engine and muffler in a cowled environment.

NOTICE: Air is necessary to cool the engine during operation. Make sure sufficient air circulation through the cowling is provided. As a basic reference, the outlet area should be 3 to 5 times the area of the inlet area to provide adequate cooling.

Diameter x Pitch (inches)

FG-30B	FG-36B	FG-40
16 x 8-10	17 x 10-13	17 x 10-13
17 x 6-8	18 x 8-10	18 x 8-10
18 x 6	19 x 8-10	19 x 8-10
	20 x 8	20 x 8

The FG-30B, FG-36B and FG-40 engines produce maximum output when the engine is running at about 8,300-9,000 rpm.

Fuel

- Mix a ratio of gasoline to oil of 20:1 for break-in and continuous operation on all engines.
- A mixture of high-quality 91 octane unleaded gasoline and a reliable, high-quality 100% synthetic oil for 2-cycle engines must be used. We recommend Evolution Oil (EVOX1001Q).
- Since commercial gasoline has many impurities, please be sure to use a reliable fuel filter (SAI50109 or HAN143) in your fuel system.
- The recommended fuel tubing is Evolution® Gasoline Fuel Tubing (EVOA102). DO NOT use a silicone rubber fuel line for the engine, the fuel tank, or your fueling system.

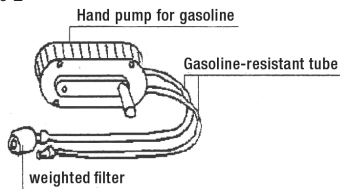
With the use of an oil mixture of 20:1, it is normal to see a slight amount of carbon buildup on the exhaust valve itself. This is why it is important that you use a high-quality synthetic oil instead of standard 2-stroke oil you may be using in your 2-stroke gas engine. Although these 2-stroke oils work well in their intended applications, they can cause a build up of a gummy residue on the exhaust valve in a 4-stroke gas engine. This may require service for your engine if the exhaust valve begins to stick and not seal properly.

The high-quality Evolution oil we recommend will still build up a slight amount of carbon, but we have found that this build up is easily flaked off during normal operation of the engine. It will not create the typical gummy build up.

- Remember to use caution in the storage, use and transport of gasoline.

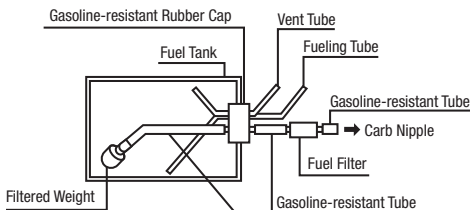
- The use of fuel with up to 10% ethanol has been tested and found to work fine.
- The use of a filtered clunk or sintered clunk on the fuel pick up line is required. The Evolution In-tank Felt Filter/Clunk (EVOA106) is designed specifically for gas engine operation.

Figure 2



Fuel Tank and Plumbing

Figure 3



Be sure to include a reliable fuel filter in your fuel system. The drawing to the left suggests the use of a fuel feed line and an air intake line. Also, be sure to use a fuel line that is compatible with gasoline.

Ignition System

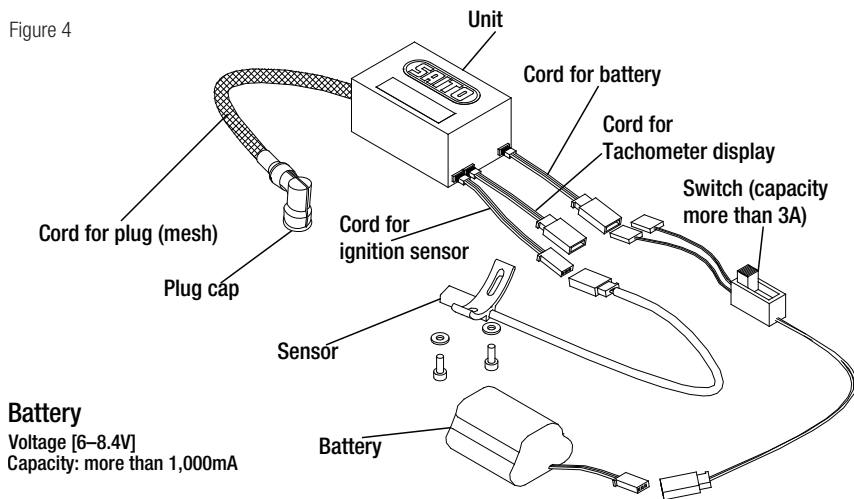
Saito gasoline four-stroke engines come with the Saito ignition system, composed of the ignition unit, a cord for the sensor (black and white), insulated plug cap, and cord (black and red) for connection to a battery (not included). You will also need to secure an on/off switch (safety switch system). The switch must carry a rating of 3 amps.

Be sure to mount the ignition system in a location near the engine and away from the receiver to prevent any

unwanted interference. Please refer to the diagram below.

The Saito ignition has an operating voltage from 4.8–9.0 volts. Saito recommends the use of a 5-cell Ni-Cd/Ni-MH battery or a 2-cell Li-Po/Li-Ion/Li-Fe with a minimum of 1000mAh. The recommended battery is the Team Orion Avionics Li-Fe Receiver Pack 1300mAh 6.6V (ORI60503).

Figure 4



Battery

Voltage [6–8.4V]

Capacity: more than 1,000mA

Spark Plug

NGK-CM6

Spark gap = .7 to .8mm (.024 to .028 in)

Carburetor

The carburetors used on gasoline four-stroke engines are exclusive to Saito. Since they have a negative pressure type fuel pump, the engine can be mounted in any position.

NOTICE: Always remove fuel from the carburetor after flight. Not doing so will result in rubber engine components (such as the diaphragm) deteriorating over time, causing loss of engine performance.

NGK-CM6 (SAIG36120) is the standard-equipped plug with the FG-30B, FG-36B and FG-40. When needed, please replace with identical plugs.

After a flying session, it is best to remove any fuel remaining in the carburetor by disconnecting the fuel line and running the engine until it is dry.

Do not needlessly disassemble the carburetor.

If you experience problems with the carburetor, return it to the Saito Horizon Service Center.

Preparation Before Starting the Engine (prior to break-in)

- Mount the engine on a strong, flat test bench or on the aircraft (in either case, the engine should be secured so it is immobile).
- Check to make sure the carburetor will open and close completely.
- Check the wiring of the ignition system to make sure it is connected correctly and securely.
- Make sure the fuel line is connected securely to the carburetor.
- For break-in, use a fuel/oil mix ratio of 20:1.
- FG-40: Mount an 18 x 8 or 19 x 8 carbon fiber propeller such as a Bolly or Mejzlik. Be sure it has been balanced. Check the tightness after every flight.
- FG-36B: Mount an 18 x 8 or 19 x 8 carbon fiber propeller such as a Bolly or Mejzlik. Be sure it has been balanced. Check the tightness after every flight.
- FG-30B: Mount a 17 x 6 plastic or wood propeller. Be sure it has been balanced. Check the tightness after every flight.
- It is suggested you employ a spinner when using an electric starter. Check the tightness after every flight.
- Use a tachometer to prevent over-rewinding of the engine.
- Be sure to connect a gasoline-proof line to the breather nipple to vent oil from the airframe.
- Check the battery of the electric starter to make sure it is fully charged. Be sure to use a safety on/off switch from the battery to the ignition.



WARNING: Always keep all spectators, especially children, at least 30 feet away when running or starting the engine.



WARNING: Always ensure the aircraft is secure and cannot move when preparing to start the engine. Failure to do so could cause property damage and serious injury.

Starting the Engine (assuming the engine is mounted in an aircraft)

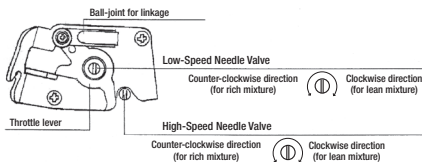
The carburetor on the Saito engine comes adjusted to a basic setting. This setting should be maintained during the initial break-in runs. The standard carburetor settings are as follows: the high-speed needle valve is set from the fully closed position. The low-speed or idle needle valve is set from the fully closed position. Please refer to the diagrams.

	FG-30B	FG-36B	FG-40
High-speed needle	2 turns 30 minutes	2 turn 30 minutes	2 turn 30 minutes
Low-speed needle	4 turns 15 minutes	4 turns 15 minutes	4 turns 15 minutes

Before you first start the engine, make sure the spark plug is screwed in and tightened, and that the plug socket cap is fitted in place and fastened down properly. Fix the ignition sensor in the proper position at the bottom of the engine crankcase. The throttle servo should be mounted at a distance of 8 to 12 inches from the engine. The spark plug cable must not touch any part of the model structure, as vibration may damage the shielded cable. If this is not practical, it will be necessary to provide an insulation material for the cable.

The ignition unit itself should be wrapped in foam rubber to prevent engine vibration from damaging the electronic components. All components must be protected from contact with engine fuel. Be sure to use an on/off (Safety or "kill") switch to allow the ignition to be turned off and on.

Figure 5—FG-30B/FG-36B/FG-40 Carburetor



NOTICE: Never turn the engine over with the ignition turned on unless the spark plug is inserted in the plug socket. This could lead to ignition damage.

Choking the Engine

The proper way to choke the carburetor that comes with your FG-30B/36B/40 engine is:

1. Make sure the ignition is off.
2. Open the throttle 100%
3. Using the included choking tool (long metal rod with one threaded end) and insert this into the middle of the throttle barrel where you access the low speed needle assembly, then screw this into place.
4. Pull on the threaded rod. It will move about 2mm. While you are pulling on the rod, turn the engine over 6 times. This method actually moves the low speed needle out of the way to allow a greater amount of fuel into the engine during the choking process.
5. Remove the threaded rod and continue with the start engine procedure.

When you are ready to start the engine, switch the ignition on and set the throttle to a slightly high-idle speed. We highly recommend the use of an electric starter.

- Be sure to have a helper hold the model securely.
- Turn on the transmitter first, then the receiver and

Running-In the Engine

- Factory settings for the main and low-speed needle valves are as follows.
- **Main needle valve:** Turn the needle valve all the way clockwise, then back out 2 turns and 15 minutes.
- **Idle needle valve:** With the throttle barrel closed, turn the needle valve all the way clockwise, then back out 4 turns and 15 minutes.

After starting and warming the engine for 30 to 45 seconds, adjust as follows: for initial break-in, do not exceed 4,000 rpm for the first 10 minutes of operation. This allows all the parts to mate properly with good lubrication.

Step I. Move the throttle to 2/3 high throttle position quickly (fast acceleration). Repeat three times. If the engine accelerates smoothly, go to Step III. If acceleration is not smooth, go to Step II.

Step II. Faulty acceleration and a tendency to quit is usually attributable to a poor fuel mixture in the medium rpm range. Stop the engine and recheck the fuel feed. The fuel line must not be pinched or

check the operation of the throttle servo and other controls.

- Turn on the power to the ignition system.
- Using an electric starter, begin cranking the engine. It should fire within seconds of applying the starter. Allow the engine to idle for 30 to 45 seconds.
- If the engine does not start, even after using the electric starter to crank the engine a second time, open the throttle to maximum, turn off the ignition and turn the engine over about 4 revolutions. Switch the ignition on again and then restart the engine with the throttle at a fast idle position.
- If the engine still will not start, unscrew the spark plug and check its contacts. Clean any possible excess fuel (an indication of engine flooding) and screw it in again. Further starting should only be done with the throttle at idle position. If the plug is dry, probably not enough fuel has been drawn into the carburetor. If that is the case, check the fuel feed and then return to the instructions above.

We strongly urge the use of a tachometer to check rpm readings when breaking in the engine.

broken. Restart the engine and test acceleration again. If the problem persists, adjust the carburetor. Open the low-speed needle by 5 minutes and retest. If acceleration is smooth, open the needle by another 3 to 5 minutes. This should be done because the needle was previously set too lean. If the engine continues to not accelerate properly, open the low-speed needle by 10 minutes. If the engine's operation does not improve, shut it off and check the basic setting, then restart the engine and test the acceleration. If the engine continues to not accelerate properly, the defect is likely to lie somewhere other than an adjustment. If the engine runs correctly, go to Step III.



WARNING: Before adjusting the carburetor, you **MUST** stop the engine. Failure to do so will cause the propeller to continue to move if the engine is not stopped, which could result in serious injury.

Step III. If the engine accelerates correctly, set it at idle speed and accelerate to full speed. Repeat twice more. If the engine functions correctly, go to Step IV. If it cuts out, open the low-speed needle valve by 5 to 10 minutes more. If the engine does not respond to acceleration fast enough, keep closing the low-speed needle until the engine starts to cut out in response to throttle opening. At that point, re-open the low-speed needle by 5 to 10 minutes.

Final Adjustment of the Carburetor

The low-speed needle valve is set at the factory so that idle rpm may be between 1,800 and 2,100 rpm.

In principle, a carburetor is adjusted by first achieving highest rpm with the high-speed needle valve and then performing idling (low-speed rpm) with the throttle valve and the low-speed needle valve. Unless peak rpm is achieved, idling adjustment will be difficult to adjust and will not be stable.

- After filling the tank, start the engine and move the throttle to the fully open position.
- Turn the main needle valve screw clockwise (refer to Figure 5, page 7) with the carburetor adjustment bar (provided in the accessories package) or a small screw driver and adjust to achieve peak rpm. Use a tachometer to verify rpm.



CAUTION: Never over-close the main needle valve. Doing so could cause knocking, preignitions and/or loosening of the propeller nut.

Troubleshooting Guide

If the engine does not start:

- Check the spark plug. Replace if needed.
- Check the fuel lines.
- Check for proper mechanical function by turning the engine over.
- Check that the carburetor is correctly installed.

Mechanical Faults

If the engine cannot be turned over easily:

- If your engine is mounted inverted it is possible the cylinder is flooded. Remove the spark plug and rotate the propeller to clear the excess fuel before moving on.

Step IV. If the engine reacts correctly, set it at full speed. If the revolutions do not drop, the engine has been adjusted successfully. If the revolutions seem to drop, open the high-speed needle by about 5 to 10 minutes.

Successful runs may be made while slightly leaning out the mixture with each tank full of fuel. Forty minutes is considered sufficient time for normal break-in prior to the first flight.

If you see that you have over-closed the main needle valve, immediately turn the main needle counterclockwise to richen the setting.

- Next, close the throttle valve until the engine operates stably and with an idle rpm of around 1,700 rpm. Do this by adjusting the low-speed needle valve with the carburetor adjustment bar (or small screwdriver) and manipulating the throttle valve via the throttle stick on the transmitter.
- After reaching the stable 1,700 rpm, slowly open the throttle fully. If the rpm starts to decrease, or rapidly increases, adjust the low-speed needle valve carefully until the changes are smooth from idle to peak rpm.
- After the previous steps have been accomplished, repeat the process from idle to high rpm quickly. If the rpm does not reach peak, but stutters as the throttle moves from low to high, re-tune the main needle valve and perform the process from idling to peak quickly.
- Repeat the process until the response is a smooth transition from idle to peak rpm.

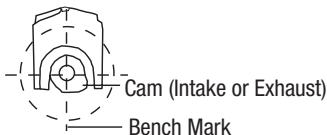
- It is possible the conrod or the piston has seized. Do not force the engine to turn over. Return the engine for service.

Engine Maintenance

Do not needlessly disassemble your Saito single-cylinder engine. If you must disassemble your engine, please refer to the following steps.

- Cylinder screws should be loosened in a crisscross pattern.
- Assemble the cam gear lining up the timing mark at the "6 o'clock" position. The crankshaft must be positioned at the "12 o'clock" or "top dead center"

(TDC) position. Refer to figure below:



- Reassemble the piston, rod, rocker arm, pins, pushrod, tappet, etc. in their original positions. Engine parts are mated after running the engine and must be reassembled as close as possible to their original position.

Carburetor Maintenance

Should you experience difficulty with the carburetor of your engine:

- Be sure the needles are set to factory specifications.
- Generally speaking, there are very few things that keep today's modern gasoline engines from starting. To that end, make sure you use good-quality "fresh" fuel, the spark plug is good, and the ignition system is working properly.
- Check the battery voltage to make sure the ignition is getting the proper voltage. Should the engine fail to start after these items are verified, refer to the Troubleshooting Guide.

Valve/Tappet Gap Adjustment

After approximately every 1 to 2 hours of operation, tappet gap adjustment may be necessary. When you check the valves, lubricate the moveable parts. Also, make sure the screw is in tight before making adjustments to valves.

Adjust the valves to a clearance of .03mm to .10mm (.002 to .004 in) using the supplied gauge. The valves must be adjusted with the engine cold due to thermal expansion.

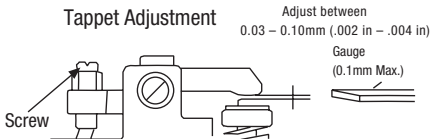
How to Adjust the Valve/Tappet Gap

Remove the plug and the rocker arm cover and revolve the propeller slowly clockwise by hand. The intake side rocker arm stops, and by turning it, the piston reaches the compression top dead center (TDC).

In that position, adjust with the included gauge and hexagonal wrench so the tappet gap may be set to almost zero when the engine is in the compression stroke. If the gauge can enter a limit gauge with a 0.1 mm thickness, the clearance is at maximum and needs

- Assemble the engine, reversing the crisscross pattern used in the disassembly. Prior to tightening each of the screws, apply a drop of oil to prevent thread damage.
- Normal engine maintenance, such as adjusting the valves or carburetor, is permissible without voiding the warranty. If you have any questions concerning maintenance procedures, please contact the Horizon Product Support Department at 877-504-0233. Our representatives will be happy to advise you on maintenance issues.

Valves must be in the compression stroke or closed position as shown in the following figure. When adjustment is completed, make sure you tighten the lock nut.

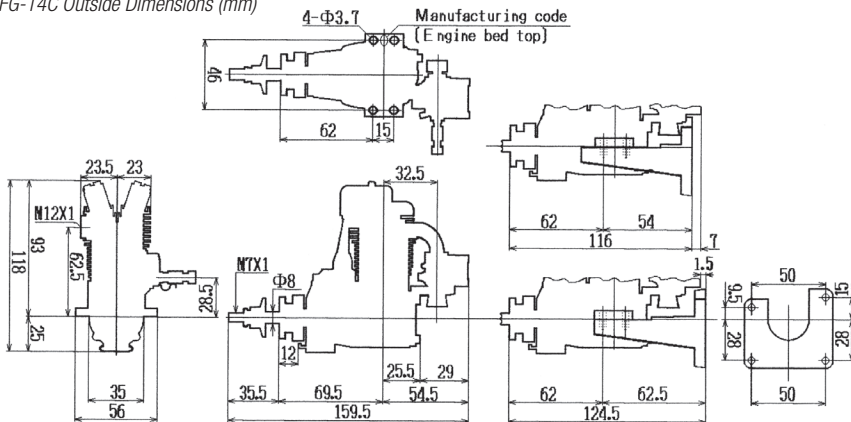


adjustment. Adjust between 0.03 and 0.10mm (0.002 to 0.04 in.) After the gap is checked, tighten the locknut securely. Do not over-tighten.

The tappet gap is the most important factor in the maintenance of 4-stroke engines, and operation with an excess clearance will degrade performance. In particular, a large gap aggravates abrasion of the tappet and the cam and also increases the unusual sound.

FG-14C Dimensions and Specifications

FG-14C Outside Dimensions (mm)



SPECIFICATIONS

Displacement	13.8cc (.82 cu in)
Bore	29.0mm (1.14 in)
Stroke	20.4mm (.80 in)
Weight (Engine only)	18.6 oz (528 g)
Weight (Muffler only)	2.1 oz (58 g)
Weight (Ignition only)	3.7 oz (105 g)
Total Weight (all inclusive)	24.4 oz (691 g)
Crankshaft	M7 x 1
Cylinder	AAC
Fuel Efficiency	8cc/minute
Propeller Size	Dia. 13-14 x Pitch 6-8, Dia. 15 x Pitch 4W
Benchmark Propeller	APC 14 x 6 @ 9,300 rpm
Practical Ground RPM Range	1,700–9,500

Fuel consumption

Fuel consumption depends on the load of the propeller. During actual flight, fuel consumption increases slightly.

Electrical usage of ignition system

Approximately 125mAh for 15 minutes.

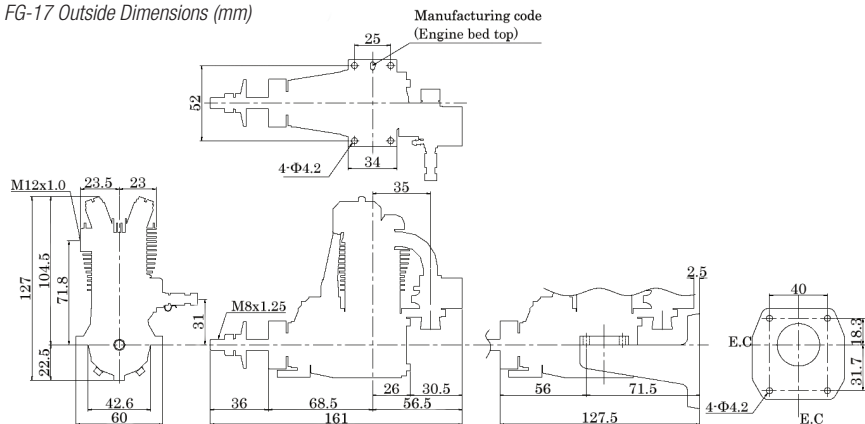
Ignition Operating Voltage: 4.8–9.0 volts.

Fuel: Gasoline-Oil mix of 20:1 (20:1 is recommended for break-in and continuous operation).

Oil: The use of only 100% synthetic oil is recommended such as our Evolution Oil (EVOX1001Q)

FG-17 Dimensions and Specifications

FG-17 Outside Dimensions (mm)



SPECIFICATIONS

Disp	17.2cc (1.05 cu in)
Bore	29.0mm (1.14 in)
Stroke	26mm (1.02 in)
Weight (Engine only)	21.5 oz (610 g)
Weight (Muffler only)	2.1 oz (60 g)
Weight (Ignition only)	3.7 oz (105 g)
Total weight (all inclusive)	27.2 oz (770 g)
Crankshaft	M8x1.25
Cylinder	AAC
Fuel Efficiency	15cc/minute
Propeller Size	Dia. 14 x Pitch 8, Dia. 15–16 x Pitch 6
Benchmark Propeller	APC 15 x 6 @ 9,200 rpm
Practical Ground RPM Range	2,000–9,500

Fuel consumption

Fuel consumption depends on the load of the propeller. During actual flight, fuel consumption increases slightly.

Electrical usage of ignition system

Approximately 125mAh for 15 minutes.

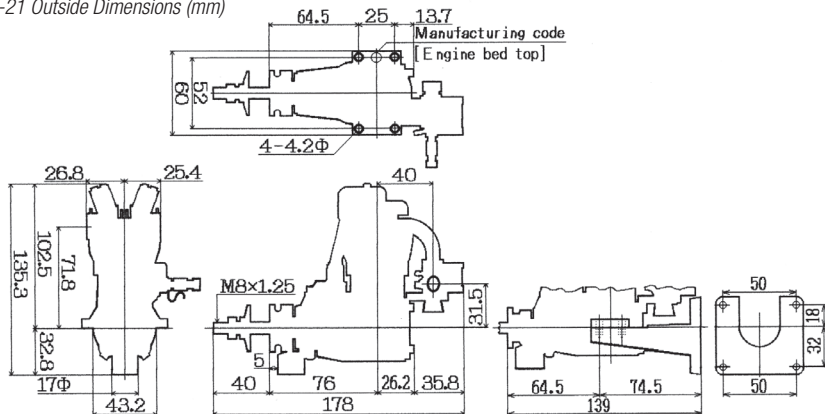
Ignition Operating Voltage: 4.8–9.0 volts.

Fuel: Gasoline-Oil mix of 20:1 (20:1 is recommended for break-in and continuous operation).

Oil: The use of only 100% synthetic oil is recommended such as our Evolution Oil (EVOX1001Q)

FG-21 Dimensions and Specifications

FG-21 Outside Dimensions (mm)



SPECIFICATIONS

Disp	20.52cc (1.25 cu in)
Bore	31.7mm (1.24 in)
Stroke	26mm (1.02 in)
Weight (Engine only)	21.9 oz (620 g)
Weight (Muffler only)	2.9 oz (80 g)
Weight (Ignition only)	3.7 oz (105 g)
Total weight (all inclusive)	28.5 oz (805 g)
Crankshaft	M8x1.25
Cylinder	AAC
Fuel Efficiency	15cc/minute
Propeller Size	Dia. 15–16 x Pitch 6–8, Dia. 17 x Pitch 6
Benchmark Propeller	APC 16 x 6 @ 8,900 rpm
Practical Ground RPM Range	1,700–9,500

Fuel consumption

Fuel consumption depends on the load of the propeller. During actual flight, fuel consumption increases slightly.

Electrical usage of ignition system

Approximately 125mAh for 15 minutes.

Ignition Operating Voltage: 4.8–9.0 volts.

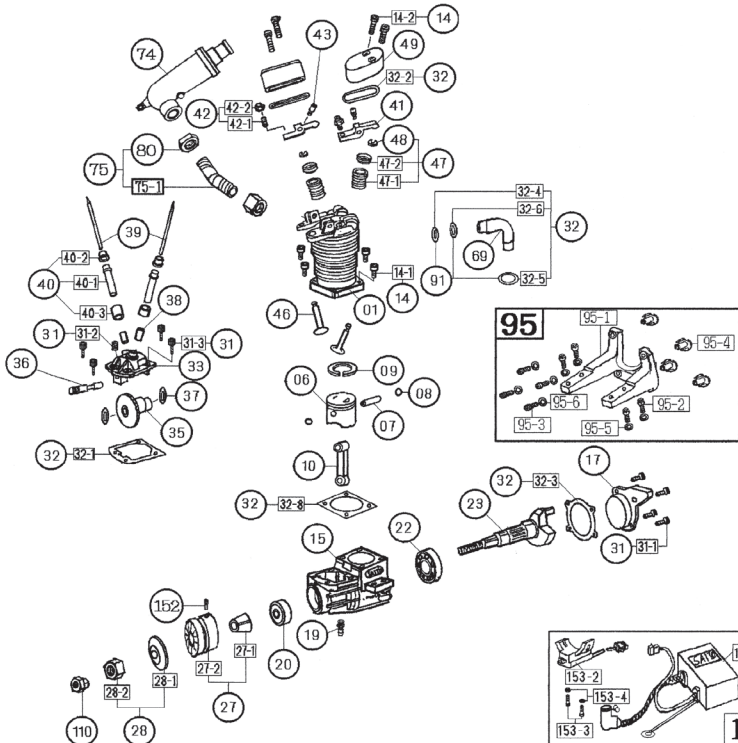
Fuel: Gasoline-Oil mix of 20:1 (20:1 is recommended for break-in and continuous operation).

Oil: The use of only 100% synthetic oil is recommended such as our Evolution Oil (EVOX1001Q)

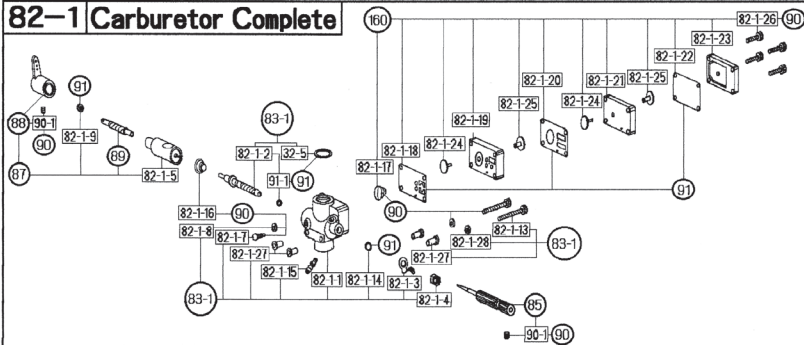
Saito FG-14C/FG-17/FG-21 Parts List

#	DESCRIPTION	QTY	#	DESCRIPTION	QTY
01	Cylinder (left)	1	42	Rocker Arm Screw and Nut (42-1,42-2)	2
06	Piston	1	43	Rocker Arm Pin	2
07	Piston Pin	1	44	Rocker Arm Bracket (Left)	1
08	Piston Pin Retainer	2	45	Rocker Arm Bracket (Right)	1
09	Piston Ring	1	46	Valve (In and Out) (46-1, 46-2)	2
10	Connecting Rod	1	47	Valve Spring+Keeper+Retainer (47-1,47-2,48)	2
14	Cylinder Screw Set (14-1, 14-2, 14-3, 14-4)	1	48	Valve Retainer (Cotter)	4
15	Crankcase	1	49	Rocker Arm Cover	2
17	Rear Cover	1	69	Intake Manifold	1
19	Breather Nipple	1	74	Muffler	1
20A	Front Bearing	1	75	Muffler Manifold (75-1, 80)	1
22	Rear Bearing	1	80	Muffler Nut	2
23	Crankshaft	1	82-1	Carburetor Complete	1
27A	Taper Collet and Drive Flange (27-1, 27-2)	1	83-1	Carburetor Body Assembly (82-1-1, 82-1-2, 82-1-3, 82-1-4, 82-1-5)	1
28	Prop Washer and Nut (28-1,28-2)	1	90	Carburetor Screw and Spring Set (82-1-9, 82-1-10, 82-1-11, 82-1-12)	1
31	Crankcase Screw Set (31-1, 31-2, 31-3)	1	91	Carburetor Gasket Set (82-1-6, 82-1-7, 82-1-8)	1
32	Engine Gasket Set (32-1, 32-2, 32-3, 32-4)	1	93	Intake Velocity Stack	1
33	Cam Gear Housing	1	95	Engine Mount Set (95-1, 95-2, 95-3, 95-4, 95-5)	1
35	Cam Gear	1	110	Anti-Loosening Nut	1
36A	Cam Gear Shaft	1	149	Oil Slinger	1
37	Steel and Washer Set (37-1, 37-2)	1	152	Screw-Pin (for Drive Flange Setting)	1
38	Tappet	2	153	Electronic Ignition System (153-1, 153-2, 153-3, 153-4)	1
39	Pushrod	2			
40	Pushrod Cover and Rubber Seal (40-1, 40-2, 40-3)	2			
41	Rocker Arm	2			

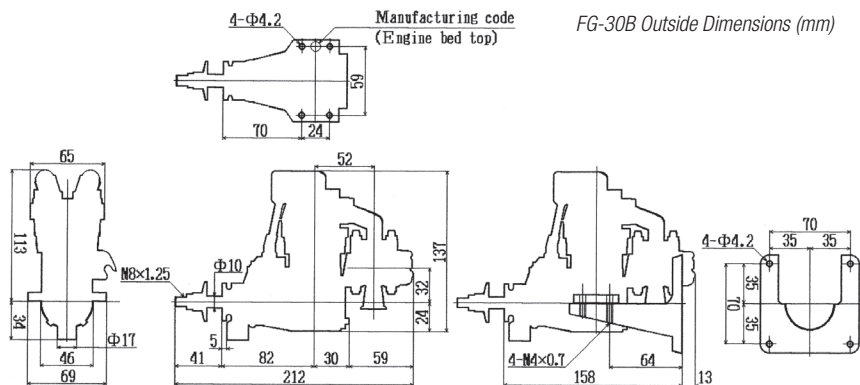
Saito FG-14C/FG-17/FG-21 Exploded View



82-1 Carburetor Complete



FG-30B Dimensions and Specifications



SPECIFICATIONS

Disp	29.1cc (1.80 cu in)
Bore	36.0mm (1.41 in)
Stroke	28.6mm (1.12 in)
Weight (Engine only)	37.2 oz (1055 g)
Weight (Muffler only)	3.0 oz (85 g)
Weight (Engine Mount only)	6.7 oz (190 g)
Weight (Ignition only)	3.7 oz (105 g)
Total weight (all inclusive)	50.6 oz (1435 g)
Crankshaft	M8x1.25
Cylinder	AAC
Fuel Efficiency	25cc/minute
Propeller Size	Dia. 16 x Pitch 8–10; Dia. 17 x Pitch 6
Benchmark Propeller	APC 17 x 6 @ 8700
Practical Ground RPM Range	1,700–9,000

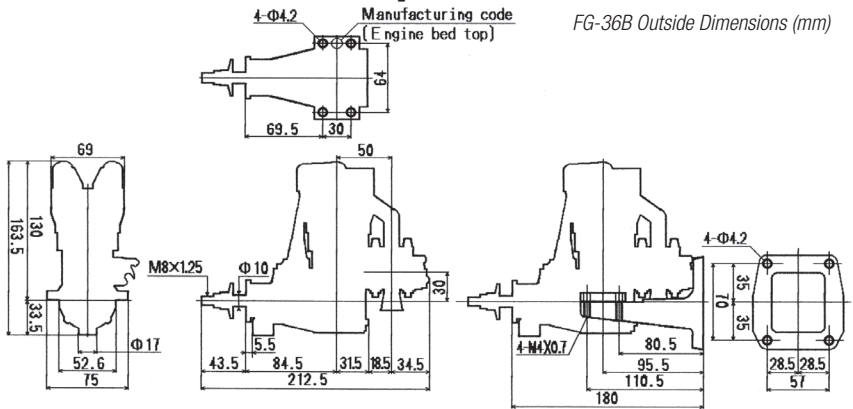
Fuel consumption

Approximately 25cc/minute at full throttle and approximately 7,500 rpm. Fuel consumption depends on the load of the propeller. During actual flight, fuel consumption increases slightly.

Electrical usage of ignition system

Approximately 125mAh for 15 minutes.
 Ignition Operating Voltage: 4.8–9.0 volts
 Fuel: Gasoline-Oil mix of 20:1 (20:1 is recommended for break-in and continuous operation).
 Oil: The use of only 100% synthetic oil is recommended such as our Evolution Oil (EVOX1001Q)

FG-36B Dimensions and Specifications



SPECIFICATIONS

Disp	36.3cc (2.20 cu in)
Bore	38mm (1.49 in)
Stroke	32mm (1.26 in)
Weight (Engine only)	44.2 oz (1253 g)
Weight (Muffler only)	3.0 oz (85 g)
Weight (Engine Mount only)	9.6 oz (270 g)
Weight (Ignition only)	3.7 oz (105 g)
Total weight (all inclusive)	60.5 oz (1713 g)
Crankshaft	M8x1.25
Cylinder	AAC
HP	3.5 approximately
Fuel Efficiency	30cc/minute
Propeller Size	Dia. 18–19 x Pitch 8–9; Dia. 20x Pitch 8
Benchmark Propeller	APC 18x6W @ 8,300
Practical Ground RPM Range	1,700–9,000

Fuel consumption

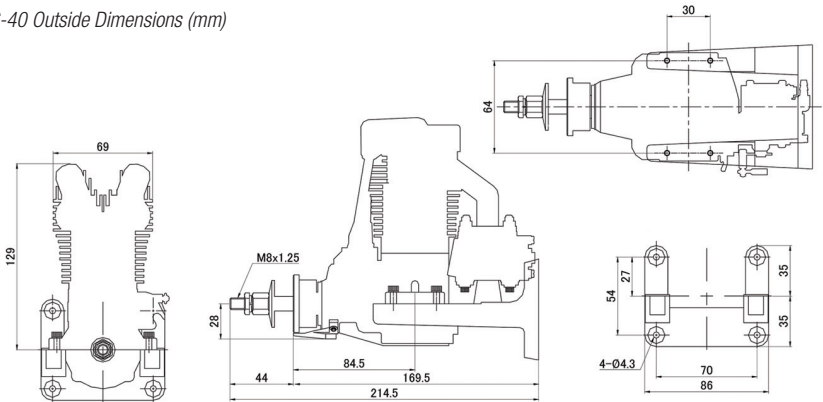
Approximately 30cc/minute at full throttle and approximately 7,500 rpm. Fuel consumption depends on the load of the propeller. During actual flight, fuel consumption increases slightly.

Electrical usage of ignition system:

Approximately 125mAh for 15 minutes.
 Ignition Operating Voltage: 4.8–9.0 volts
 Fuel: Gasoline-Oil mix of 20:1 (20:1 is recommended for break-in and continuous operation).
 Oil: The use of only 100% synthetic oil is recommended such as our Evolution Oil (EVOX1001Q)

FG-40 Dimensions and Specifications

FG-40 Outside Dimensions (mm)



SPECIFICATIONS

Disp	40.2cc (2.40 cu in)
Bore	40mm (1.57 in)
Stroke	32mm (1.26 in)
Weight (Engine only)	44.2 oz (1253 g)
Weight (Muffler only)	3.0 oz (85 g)
Weight (Engine Mount only)	9.6 oz (270 g)
Weight (Ignition only)	3.7 oz (105 g)
Total weight (all inclusive)	60.5 oz (1713 g)
Crankshaft	M8x1.25
Cylinder	AAC
HP	3.5 approximately
Fuel Efficiency	30cc/minute
Propeller Size	Dia. 18–19 x Pitch 8–9; Dia. 20x Pitch 8
Benchmark Propeller	APC 18x6W @ 8,000
Practical Ground RPM Range	1,700–9,000

Fuel consumption

Approximately 30cc/minute at full throttle and approximately 7,500 rpm. Fuel consumption depends on the load of the propeller. During actual flight, fuel consumption increases slightly.

Electrical usage of ignition system:

Approximately 125mAh for 15 minutes.

Ignition Operating Voltage: 4.8–9.0 volts

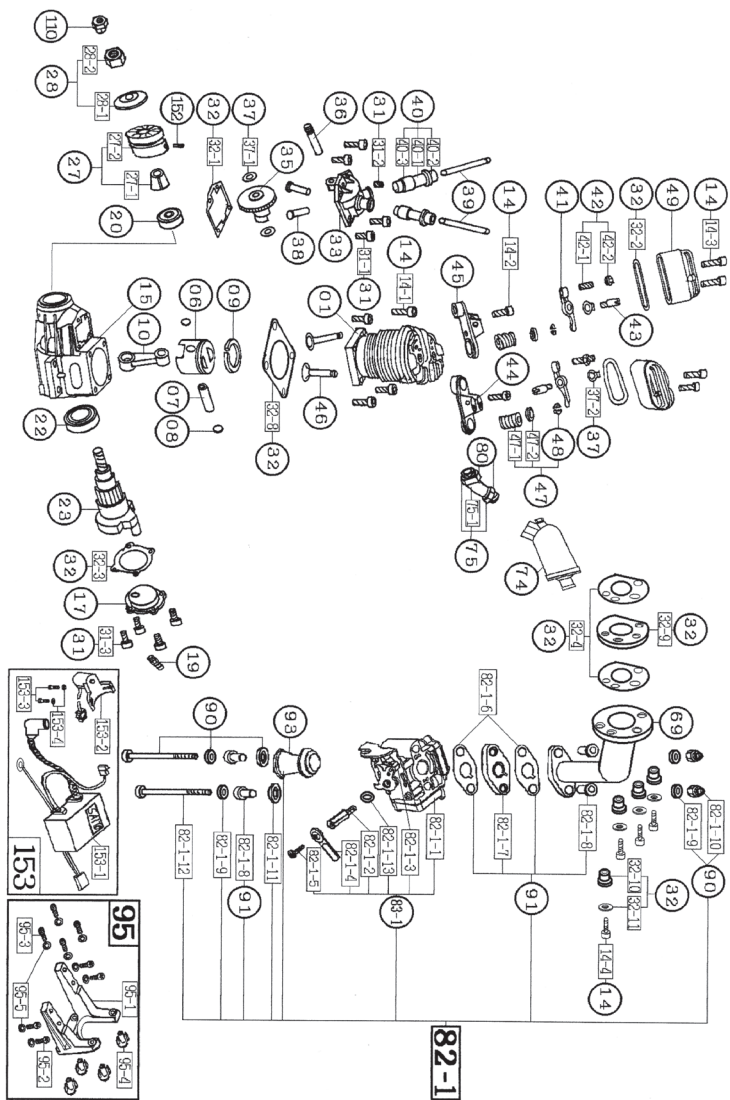
Fuel: Gasoline-Oil mix of 20:1 (20:1 is recommended for break-in and continuous operation).

Oil: The use of only 100% synthetic oil is recommended such as our Evolution Oil (EVOX1001Q)

Saito FG-30B/FG-36B/FG-40 Parts List

#	DESCRIPTION	QTY	#	DESCRIPTION	QTY
01	Cylinder (left)	1	41	Rocker Arm	2
06	Piston	1	42	Rocker Arm Screw and Nut (42-1,42-2)	2
07	Piston Pin	1	43	Rocker Arm Pin	2
08	Piston Pin Retainer	2	44	Rocker Arm Bracket (Left)	1
09	Piston Ring	1	45	Rocker Arm Bracket (Right)	1
10	Connecting Rod	1	46	Valve (In and Out) (46-1, 46-2)	2
14	Cylinder Screw Set (14-1, 14-2, 14-3, 14-4)	1	47	Valve Spring + Keeper + Retainer (47-1,47-2,48)	2
15	Crankcase	1	48	Valve Retainer (Cotter)	4
17	Rear Cover	1	49	Rocker Arm Cover	2
19	Breather Nipple	1	69	Intake Manifold	1
20A	Front Bearing	1	74	Muffler	1
22	Rear Bearing	1	75	Muffler Manifold (75-1, 80)	1
23	Crankshaft	1	80	Muffler Nut	2
27A	Taper Collet and Drive Flange (27-1, 27-2)	1	82-1	Carburetor Complete	1
28	Prop Washer and Nut (28-1,28-2)	1	83-1	Carburetor Body Assembly (82-1-1, 82-1-2, 82-1-3, 82-1-4, 82-1-5)	1
31	Crankcase Screw Set (31-1, 31-2, 31-3)	1	90	Carburetor Screw and Spring Set (82-1-9, 82-1-10, 82-1-11, 82-1-12)	1
32	Engine Gasket Set (32-1, 32-2, 32-3, 32-4)	1	91	Carburetor Gasket Set (82-1-6, 82-1-7, 82-1-8)	1
33	Cam Gear Housing	1	93	Intake Velocity Stack	1
35	Cam Gear	1	95	Engine Mount Set (95-1, 95-2, 95-3, 95-4, 95-5)	1
36A	Cam Gear Shaft	1	110	Anti-Loosening Nut	1
37	Steel and Washer Set (37-1, 37-2)	1	149	Oil Slinger	1
38	Tappet	2	152	Screw-Pin (for Drive Flange Setting)	1
39	Pushrod	2	153	Electronic Ignition system (153-1, 153-2, 153-3, 153-4)	1
40	Pushrod Cover and Rubber Seal (40-1, 40-2, 40-3)	2			

Saito FG-30B/FG-36B/FG-40 Exploded View



DESCRIPTION	FG-14C	FG-17	FG-21	FG-30B	FG-36B	FG-40
01 Cylinder, Left	G14B01	G1701	G2001	G3001	G3601	G4001
06 Piston	10006	10006	125A06	18006	220A06	G4006
07 Piston Pin	1007	10007	120S07	18007	220A07	G4007
08 Piston Pin Retainer (6)	6508	6508	120S08	300T08	300T08	G4008
09 Piston Ring	1009	10009	125A09	18009	220A09	G4009
10 Connecting Rod	82A10	G1710	125A10	18010A	G3210A	G4010
14 Cylinder Screw Set	6514	6514	6514	G3014	220A14	220A14
15 Crankcase	G14B15	G1715	G2015	G3015	G3615	G4015
17 Rear Cover (A)	G14B17	G1717	G2017	18017	220A17	220A17
19 Breather Nipple	5019	5019	5019	G3619	G3619	G3619
20 Front Bearing	91S20A	91S20A	120S20A	120S20A	120S20A	G4020
22 Rear Bearing	91S22A	300T21	120S22A	120S22A	120S22A	120S22A
23 Crankshaft	G14B23	G1723	G2023	G3023	G3623	G4023
27 Taper Collet & Drive Flange	G14B27	G1727	G2027	G2027	G3627	G36B27
28 Prop Washer & Nut	5628	125A28	125A28	170R328	170R328	170R328
30 Prop Nut for Electric Starter	5030A	120S30A	120S30A	120S30A	120S30A	120S30A
31 Crankcase Screw Set	G14B31	5031	5031	5031	5031	5031
32 Engine Gasket Set	G14B32	G1732	G2032	G3032	G3632	G3632
33 Cam Gear Housing	170R333	G1733	170R333	300T33	300T33	G3633
35 Cam Gear	6535A	6535A	6535A	120S35	120S30	120S35
36 Cam Gear Shaft	170R336A	170R336A	170R336A	5036A	5036A	5036A
37 Steel Washer Set	125A37	125A37	125A37	120S37	120S37	G3637
38 Tappet (2)	5038	5038	5038	120S38	120S38	120S38
39 Pushrod (2)	7239A	10039	90TS39	18039	220A39	G4039
40 Pushrod Cover & Rubber Seal (2)	7240	10040	325R540	120S40	220A40	220a40
41 Rocker Arm (2)	5041	5041	5041	120S41	120S41	120S41
42 Rocker Arm Screw & Nut (2)	5042	5042	5042	300T42	300T42	300T42
43 Rocker Arm Pin (2)	5043	5043	5043	120S43	120S43	120S43
44 Rocker Arm Bracket, Left	–	–	–	120S44	120S44	120S44
45 Rocker Arm Bracket, Right	–	–	–	120S45	120S45	120S45

	DESCRIPTION	FG-14C	FG-17	FG-21	FG-30B	FG-36B	FG-40
46	Valve-In/Out (2)	91S46	10046	125A46	120S46	G3646	G3646
47	Valve Spring, Keeper, Retainer (2)	6547	6547	6547	120S47	120S47	120S47
48	Valve Retainer (4)	5048	5048	5048	120S48	120S48	120S48
49	Rocker Arm Cover (2)	5049	5049	5049	150S49	150S49	150S49
69	Intake Manifold, Left	G14B69	G1769	G2069	G3069	G3669	G4069
74	Muffler, Right	G14B74	G14B74	G2074	G3074	G3674	G3674
75	Muffler Manifold, Standard	8075C	91S75	125A75	G3675	G3675	220A75
80	Muffler Nut (2)	8080A	8080A	125A80	G3680	G3680	220A80
82-1	Carburetor-Complete, Left	G14B821	G17821	G20821	G30821	G36821	G36821
83-1	Carburetor Body Assembly, Left	G14B831	G17831	G20831	G30831	G36831	G36831
85	High-Speed Needle Valve	G2085	G2085	G2085	G3685	G3685	G3685
86	High-Speed Needle Valve Extension	5086	5086	5086	—	—	—
87	Throttle Barrel Assembly	G14B87	G1787	G2087	G3087	G3687	G4087
88	Throttle Lever	5088B	5088B	5088B	—	—	—
89	Idle Needle Valve	91S89	130T89	91S89	G3689	G3689	G3689
90	Carburetor Screw & Spring Set	G14B90	G1790	G2090	G3690	G3690	G3690
91	Carburetor Gasket Set	G14B91	G2091	G2091	G3691	G3691	G3691
93	Intake Velocity Stack	—	—	—	G3693	G3693	G3693
95	Engine Mount	G14B95	10095	G2095	G3095	G3695	G36B95
96	Tool Set	G2096	G2096	G2096	G3696	G3696	G3696
109	F-1 Fuel Filter	50109	50109	50109	50109	50109	50109
110	Anti-Loosening Nut	56110	170R3110	170R3110	170R3110	170R3110	170R3110
117	M4 Nut for Spinner	65177	120S117	120S117	120S117	120S117	120S29
118	M5 Nut for Spinner	65118	120S118	120S118	120S118	120S118	120S118
120	Spark Plug	SAIG20120	SAIG20120	SAIG20120	SAIG36120	SAIG36120	SAIG36120
135	Prop Washer/Nut/ Anti-Loosening Nut	56135	125A135	125A135	170R3135	170R3135	170R3135
152	Screw Pin	G36152	G36152	G36152	G36152	G36152	G36152
153	Electronic Ignition System	G14B153	G17153	G20153	G36153	G36153	G40153
160	Pump Assembly	G20160	G20160	G20160	—	—	—

3-YEAR LIMITED WARRANTY

What this Warranty Covers - Horizon Hobby, Inc., (Horizon) warrants to the original purchaser that the product purchased (the "Product") will be free from defects in materials and workmanship for a period of 3 years from the date of purchase.

What is Not Covered - This warranty is not transferable and does not cover (i) cosmetic damage, (ii) damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or due to improper use, installation, operation or maintenance, (iii) modification of or to any part of the Product, (iv) attempted service by anyone other than a Horizon Hobby authorized service center, (v) Product not purchased from an authorized Horizon dealer or (vi) Product not compliant with applicable technical regulations.

OTHER THAN THE EXPRESS WARRANTY ABOVE, HORIZON MAKES NO OTHER WARRANTY OR REPRESENTATION, AND HEREBY DISCLAIMS ANY AND ALL IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE PURCHASER ACKNOWLEDGES THAT THEY ALONE HAVE DETERMINED THAT THE PRODUCT WILL SUITABLY MEET THE REQUIREMENTS OF THE PURCHASERS INTENDED USE.

Purchasers Remedy - Horizons sole obligation and purchasers sole and exclusive remedy shall be that Horizon will, at its option, either (i) service, or (ii) replace, any Product determined by Horizon to be defective. Horizon reserves the right to inspect any and all Product(s) involved in a warranty claim. Service or replacement decisions are at the sole discretion of Horizon. Proof of purchase is required for all warranty claims. SERVICE OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE PURCHASERS SOLE AND EXCLUSIVE REMEDY.

Limitation of Liability - HORIZON SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY, REGARDLESS OF WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY OR ANY OTHER THEORY OF LIABILITY, EVEN IF HORIZON HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Further, in no event shall the liability of Horizon exceed the individual price of the Product on which liability is asserted. As Horizon has no control over use, setup, final assembly, modification or misuse, no liability shall be assumed nor accepted for any resulting damage or injury. By the act of use, setup or assembly, the user accepts all resulting liability. If you as the purchaser or user are not prepared to accept the liability associated with

the use of the Product, purchaser is advised to return the Product immediately in new and unused condition to the place of purchase.

Law - These terms are governed by Illinois law (without regard to conflict of law principals). This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Horizon reserves the right to change or modify this warranty at any time without notice.

WARRANTY SERVICES

Questions, Assistance, and Services - Your local hobby store and/or place of purchase cannot provide warranty support or service. Once assembly, setup or use of the Product has been started, you must contact your local distributor or Horizon directly. This will enable Horizon to better answer your questions and service you in the event that you may need any assistance. For questions or assistance, please visit our website at www.horizonhobby.com, submit a Product Support Inquiry or call 877.504.0233 toll free to speak to a Product Support representative.

Inspection or Services - If this Product needs to be inspected or serviced and is compliant in the country you live and use the Product in, please use the Horizon Online Service Request submission process found on our website or call Horizon to obtain a Return Merchandise Authorization (RMA) number. Pack the Product securely using a shipping carton. Please note that original boxes may be included, but are not designed to withstand the rigors of shipping without additional protection. Ship via a carrier that provides tracking and insurance for lost or damaged parcels, as Horizon is not responsible for merchandise until it arrives and is accepted at our facility. An Online Service Request is available at http://www.horizonhobby.com/content/_service-center_render-service-center. If you do not have internet access, please contact Horizon Product Support to obtain a RMA number along with instructions for submitting your product for service. When calling Horizon, you will be asked to provide your complete name, street address, email address and phone number where you can be reached during business hours. When sending product into Horizon, please include your RMA number, a list of the included items, and a brief summary of the problem. A copy of your original sales receipt must be included for warranty consideration. Be sure your name, address, and RMA number are clearly written on the outside of the shipping carton.

Notice: Do not ship LiPo batteries to Horizon. If you have any issue with a LiPo battery, please contact the appropriate Horizon Product Support office.

Warranty Requirements - For Warranty consideration,

you must include your original sales receipt verifying the proof-of-purchase date. Provided warranty conditions have been met, your Product will be serviced or replaced free of charge. Service or replacement decisions are at the sole discretion of Horizon.

Non-Warranty Service - Should your service not be covered by warranty, service will be completed and payment will be required without notification or estimate of the expense unless the expense exceeds 50% of the retail purchase cost. By submitting the item for service you are agreeing to payment of the service without notification. Service estimates are available upon request. You must include this request with your item submitted for service. Non-warranty service estimates will be billed a minimum of ½ hour of labor. In addition you will be billed for return freight.

Horizon accepts money orders and cashiers checks, as well as Visa, MasterCard, American Express, and Discover cards. By submitting any item to Horizon for service, you are agreeing to Horizons Terms and Conditions found on our website http://www.horizonhobby.com/content/_service-center_render-service-center.

NOTICE: The sale, warranty and service of Saito products distributed by Horizon is limited to the geographic regions of North America, Central America and South America. Saito products distributed by Horizon cannot be purchased in other regions and may not be compliant with applicable regulations. If non-compliant product is received by Horizon for service, it will be returned unserviced at the sole expense of the purchaser.

WARRANTY AND SERVICE CONTACT INFORMATION

Country of Purchase	Horizon Hobby	Address	Phone Number/Email Address
United States of America	Horizon Service Center (Electronics and engines)	4105 Fieldstone Rd Champaign, Illinois, 61822 USA	877-504-0233 Online Repair Request: www.horizonhobby.com/service
	Horizon Product Support (All other products)	4105 Fieldstone Rd Champaign, Illinois, 61822 USA	877-504-0233 productsupport@horizonhobby.com

PARTS CONTACT INFORMATION

Country of Purchase	Horizon Hobby	Address	Phone Number/Email Address
United States	Sales	4105 Fieldstone Rd Champaign, Illinois, 61822 USA	800-338-4639 sales@horizonhobby.com

Consumer Warranty and Repair Policy

Saito engines are guaranteed against workmanship and manufacturing defects for a period of 3 years from the original date of purchase. This warranty is limited to the original purchaser of the engine and is not transferable. Warranty repairs will not cover:

- Normal engine wear
- Damage due to insufficient maintenance
- Damage related to over-revving of engine due to small prop size or unreasonable use
- Rusted bearings
- Crash damage
- Damage due to use of improper fuel and/or glow plug
- Damage due to lean runs, such as rusted bearings, seized connecting rod or piston, etc.
- Damage caused by foreign objects (dirt or broken glow plug filaments)
- Damage caused by unreasonable mountings or running conditions (dust, insufficient cooling, improper mounting, improper propeller size, or lack of balancing, etc.)
- Damage due to improper disassembly
- Modifications of any kind
- Repair or replacement and any warranty coverage is Horizon's sole decision

Please cut on dotted line.



Consumer Warranty Registration

Complete this form and mail along with your dated sales receipt (send copy, keep original for your files) within 10 days of purchase to:

Horizon Service Center
Attn: Saito Warranty Dept.
4105 Fieldstone Road
Champaign, IL 61822

Engine Type _____

Date of Purchase _____

Owner's Name _____

Street Address _____

City/State/Zip _____

Daytime Phone Number _____

Purchased From:

Dealer's Name _____

Street Address _____

City/State/Zip _____



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