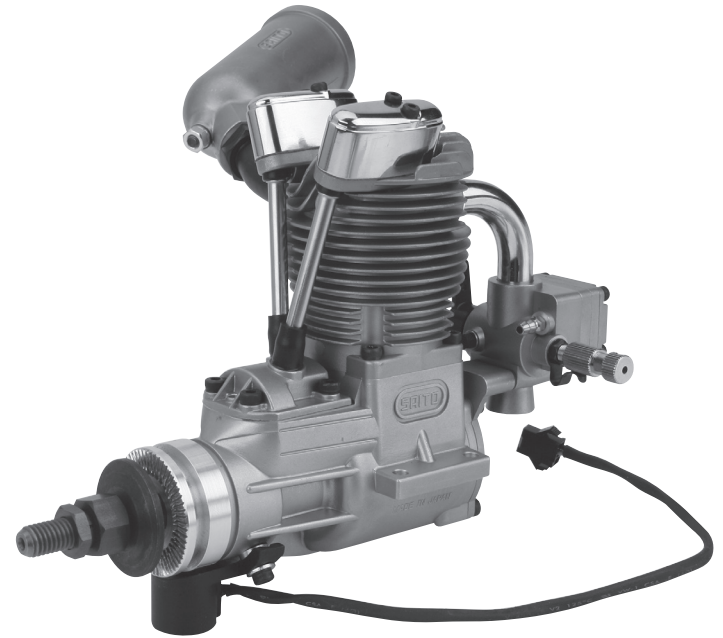


**SAITO™**

# Saito™ 4-Stroke Gasoline Engines

Owner's Operating Instruction Manual

Model FG-14B & FG-20 | Version 2009  
Model FG-30 & FG-36



**⚠ WARNING:**

- Do not modify any parts of the engine
- This engine is designed for use with radio control model aircraft
- In case of modifications by the customer, Horizon Hobby Inc. shall not bear any responsibility from any damage caused by such modification
- Keep the ignition system well maintained

**SAITO**

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4105 Fieldstone Road  
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[www.horizonhobby.com](http://www.horizonhobby.com)

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**VERY IMPORTANT**

*Failure to read and follow these instructions before you proceed to start your engine may result in engine damage and the voiding of your warranty.*

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**Contents Included**

**FG-14B**

- Engine
- Ignition (SAIG14153)
- Engine Mount (SAIG1495)
- Spark Plug 1/4-32 (SAIG20120)
- Muffler (SAIG1474)
- Muffler Manifold (SAIG8075B)
- Muffler Nut, 2 pcs (SAIG8080A)
- Spark Plug Wrench (SAIG20967)
- Valve Adjusting Tools

**FG-20**

- Engine
- Ignition (SAIG20153)
- Engine Mount (SAIG2095)
- Spark Plug 1/4-32 (SAIG20120)
- Muffler (SAIG2074)
- Muffler Manifold (SAIG2075)
- Muffler Nut, 2 pcs(SAIG2080)
- Spark Plug Wrench (FG20967)
- Valve Adjusting Tools

**FG-30**

- Engine
- Ignition (SAIG36153)
- Engine Mount (SAIG3695)
- Spark Plug CM-6 (SAIG36120)
- Muffler (SAIG3674)
- Muffler Manifold (SAIG3675)
- Muffler Nut, 2 pcs (SAIG3680)
- Spark Plug Wrench (SAIG36969)
- Muffler Wrench
- Valve Adjusting Tools

**FG-36**

- Engine
- Ignition (SAIG36153)
- Engine Mount (SAIG3695)
- Spark Plug CM-6 (SAIG36120)
- Muffler (SAIG3674)
- Muffler Manifold (SAIG3675)
- Muffler Nut, 2 pcs (SAIG3680)
- Spark Plug Wrench (SAIG36969)
- Muffler Wrench
- Valve Adjusting Tools

**Safety 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.

**Note:** 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.

## Engine Mounting and Muffler Attachment Notes

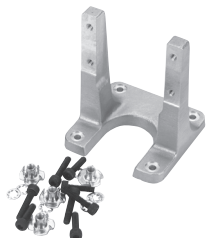


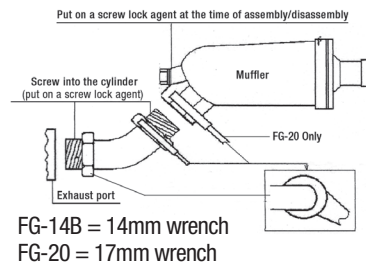
Photo is of the engine mount for the FG-20

Mount the FG-14B or FG-20 engine on aircraft-grade plywood with more than 6mm thickness or to a mount of equivalent strength, and firmly fixed, with 4 bolts. We highly recommend the use of the included Saito Motor Mount, SAIG1495B for the FG-14B, or SAIG2095 for the FG-20 to mount this engine to a model aircraft.

**Note:** 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.

**Note:** Since this engine is equipped with a float less carburetor with a diaphragm pump, the direction of the cylinder and the position of the fuel tank can be upright or inverted.

Figure 1



When you attach the muffer, use a drop of oil on the threads to ease the assembly. Screw the exhaust manifold into the engine exhaust port and the muffer 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 muffer/manifold connection. Use of threadlock is recommended.

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

**IMPORTANT:** Air is necessary to cool the engine during operation. Make sure that 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 throttle 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, while low throttle, low trim completely closes the throttle barrel.

## Propeller

Recommended Propeller Sizes:

The recommended propeller sizes are shown in the table below. Remember that 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 initial break-in and approximately 20 subsequent flights.

Diameter x Pitch (inches)

FG-14B	FG-20
13 x 8"	15 x 6–10"
14 x 6–8"	16 x 6–8"
15 x 4"	17 x 6"
	3 blade 15 x7–9"

The engine produces the maximum output when the engine is running at about 8,500–9,200 ground rpm for the FG-14B and 8,300–9,000 ground rpm for the FG-20.

## Propeller and Fuel Consumption

In order to decrease fuel consumption and prolong the life of the engine, a propeller should be selected that maximizes rpm's when the throttle is fully open, and an airframe that will perform 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's will be high, but the fuel consumption is lowered because the high-speed needle valve is closed or 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).

**Note:** 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 so very important that you use a high quality synthetic oil and not just the standard 2-stroke oil you may be currently used to using in your 2-stroke gas engine. We have found that although these 2-stroke oils work well in their intended applications they can cause a build up of a gummy type residue on the exhaust valve in a 4-stroke gas engine and this potentially leads to the need for sending your engine in for service as the exhaust valve begins to stick and not seal properly.

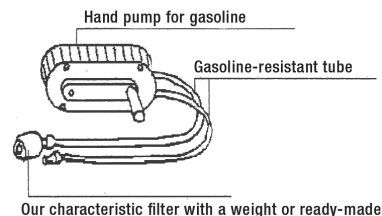
The high quality Evolution oil we recommend using will still build up a slight amount of carbon, but we have found that this build up is easily flaked off during normal operation of the engine and will not create the aforementioned typical gummy build up.

- 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.

### Note:

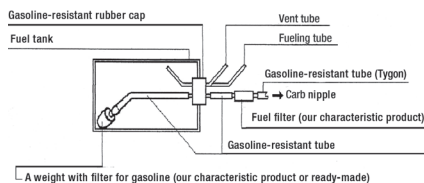
- Be sure to use a gasoline-resistant type of fuel tubing (like Tygon). DO NOT use any silicone rubber type of fuel line to the engine or in the fuel tank.
- The use of fuel with up to 10% ethanol has been tested and found to work fine.

Figure 2



## Fuel Tank and Plumbing

Figure 3



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

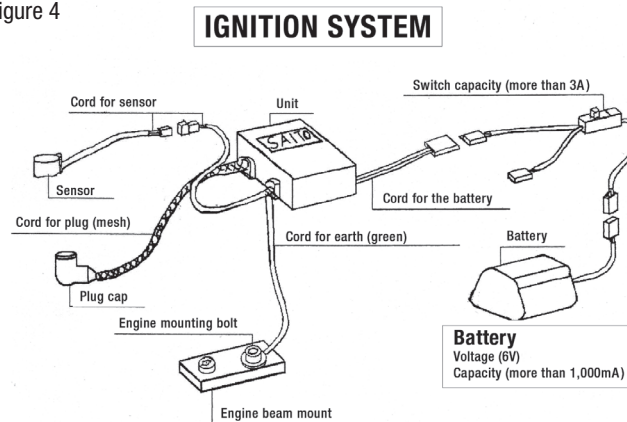
## Ignition System

Saito gasoline four-stroke engines come with Saito's own ignition system composed of the ignition unit, cord for sensor (black and white), cord for earth to ground (green) 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.

Saito recommends the use of a 5-cell battery with a voltage of 6V and rated to a minimum 1000mA.

Figure 4



## Spark Plug

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

The FG-14B and FG-20 come with Saito's own 1/4-32 spark plug (SAIG20120). When needed, please replace with identical appropriate plugs.

## 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.

**CAUTION:** If fuel remains in the carburetor after flight, the components made from rubber, such as the diaphragm, will deteriorate over time.

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 throttle barrel 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-14B: Mount a 14 x 6 plastic or wood propeller. Be sure it has been balanced. (Remember to check the tightness after every flight.)
- FG-20: Mount a 15 x 6 plastic or wood propeller. Be sure it has been balanced. (Remember to check the tightness after every flight.)
- It is suggested you employ a spinner when using an electric starter. (Remember to check the tightness after every flight.)
- Use a tachometer to prevent over-revving 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:** Do not let people stand in front of or to the side of the engine while attempting to start it to avoid serious injury. Also, make sure the engine test bench or aircraft is completely secure from movement.

## 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. The low-speed or idle needle valve is set clockwise in from flush from the throttle arm face (reference line). Please refer to the diagrams.

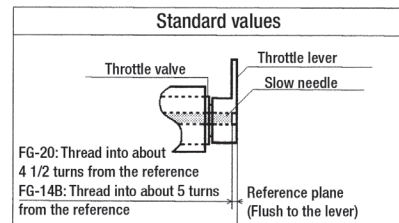
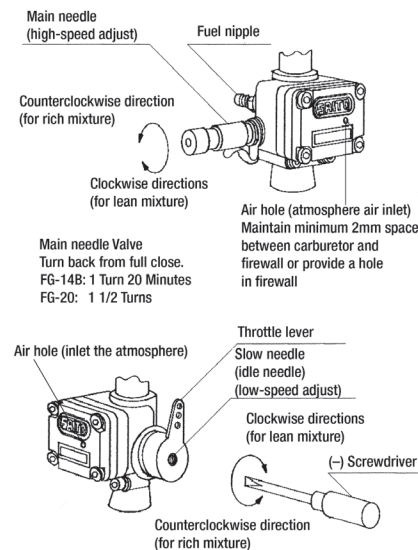
**Note:** The minutes listed are in reference to the minute hand of a clock.

	FG-14B	FG-20
High-speed Needle	1 turn 20 minutes	1 turn 30 minutes
Low-speed Needle	5 turns	4 turns 20 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-14B/FG-20 Carburetor



**IMPORTANT:** 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.

**Note:** 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 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.

**Note:** 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.

**⚠ CAUTION:** The engine must be stopped while you adjust the carburetor in order to prevent injury by the propeller. 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.

## 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 Saito would also lead the way to a more cost effective fuel alternative to glow powered engines.

## 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

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. The conrod needs to be treated correctly from the beginning. **Do not skip this step. You risk seizing the conrod to the crankshaft.**

## Understanding the Saito Gas Carb for the FG-14B and FG-20

To best understand the FG-14B and FG-20 carburetor you need to know what it is not.

**It is not a Walbro carburetor.**

**It is not a glow carburetor.**

This uniquely designed carb came about because as we made strides to bring cheaper gasoline power to ever smaller engines, the currently available carb's from the lawn power equipment world were way too large to be included with our smaller powerplants. We had tried for years to reduce the weight and the footprint in each class of engine size and using the larger lawn power carbs did not work with our vision.

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-14B/20 carb will reveal 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 have enlarged the area of the hole that delivers these pulses to the pump assembly and 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.

## 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 make 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-14B carb is 1 turn 30 mins. and the FG-20 carb is 1 turn 40mins.

1. Start the engine, and using your tachometer 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. Now go further in the lean direction until you notice an rpm decrease. It is only once you have experienced the rpm decrease can you be sure that 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

The baseline settings for all Saito carbs are taken from the point where the adjustment end of the low-speed needle valve is flush with the throttle control arm. This in itself lends a degree of inaccuracy to our starting point because each of us can determine 'flush' at a slightly different position. Because of the design of the carb it is not possible to give a setting from 'closed'. Specific starting settings for the FG-14B and the FG-20 are different to please consult the appropriate section of the manual.

1. With the engine running, and the high-speed needle valve set as above, adjust your throttle setting to achieve the desired idle speed.

**Note:** The more your prop weighs the lower your achievable idle speed will be.

2. 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. There are one of three things that will happen:
  - a. The engine will respond immediately and the transition will be very smooth to wide open throttle.

- b. The engine will stumble and gradually increase rpms 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.
- c. 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 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.



## Engine Mounting and Muffler Attachment Notes



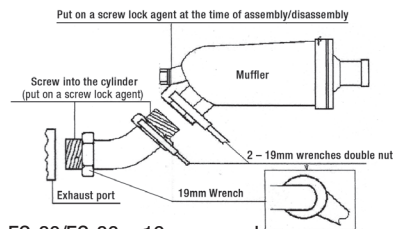
Photo of the engine mount for the FG-36

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

**Note:** 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.

**Note:** Since this engine is equipped with a floatless carburetor with a diaphragm pump, the direction of the cylinder and the position of the fuel tank can be upright or inverted.

Figure 1



FG-30/FG-36 = 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). 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.

**IMPORTANT:** Air is necessary to cool the engine during operation. Make sure that 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 throttle 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, while 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. Remember that 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 initial break-in and approximately 20 subsequent flights.

Diameter x Pitch (inches)

FG-30	FG-36
16 x 8–10"	17 x 10–13"
17 x 6–8"	18 x 8–10"
18 x 6"	19 x 8–10"
	20 x 8"

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

## Propeller and Fuel Consumption

In order to decrease fuel consumption and prolong the life of the engine, select a propeller that maximizes rpm's 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's will be high, but the fuel consumption is lowered because the high-speed needle valve is closed or 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).

**Note:** 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 so very important that you use a high quality synthetic oil and not just the standard 2-stroke oil you may be currently used to using in your 2-stroke gas engine. We have found that although these 2-stroke oils work well in their intended applications they can cause a build up of a gummy type residue on the exhaust valve in a 4-stroke gas engine and this potentially leads to the need for sending your engine in for service as the exhaust valve begins to stick and not seal properly.

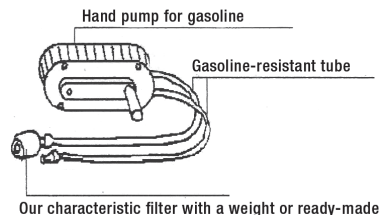
The high quality Evolution oil we recommend using will still build up a slight amount of carbon, but we have found that this build up is easily flaked off during normal operation of the engine and will not create the aforementioned typical gummy build up.

- 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.

### Note:

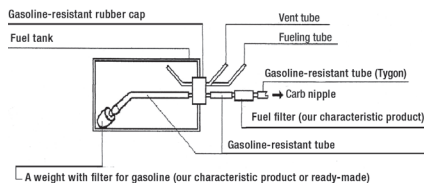
- Be sure to use a gasoline-resistant type of fuel tubing (like Tygon). DO NOT use any silicone rubber type of fuel line to the engine or in the fuel tank.
- The use of fuel with up to 10% ethanol has been tested and found to work fine.

Figure 2



## Fuel Tank and Plumbing

Figure 3

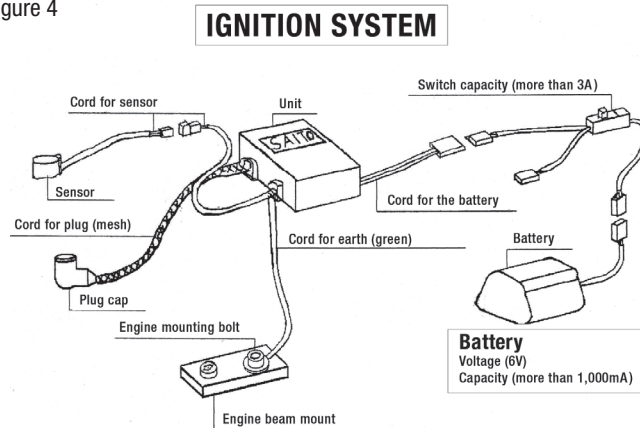


Be sure to include a reliable fuel filter in your fuel system. The drawing above suggests use of a fuel feed line and an air intake line. Also, be sure to use a fuel line compatible with gasoline.

## Ignition System

Saito gasoline four-stroke engines come with Saito's own ignition system composed of the ignition unit, cord for sensor (black and white), cord for earth to ground (green) 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.

Figure 4



## Spark Plug

NGK-CM6  
Spark gap = .7 to .8mm (.024 to .028 in)

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

## 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.

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.

Saito recommends the use of a 5-cell battery with a voltage of 6V and rated to a minimum 1000mA.

**CAUTION:** If fuel remains in the carburetor after flight, the components made from rubber, such as the diaphragm, will deteriorate over time.

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 throttle barrel 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-36: Mount an 18 x 8 or 19 x 8 carbon fiber propeller such as a Bolly or Mejzlik. Be sure it has been balanced. (Remember to check the tightness after every flight.)
- FG-30: Mount a 17 x 6 plastic or wood propeller. Be sure it has been balanced. (Remember to check the tightness after every flight.)
- It is suggested you employ a spinner when using an electric starter. (Remember to check the tightness after every flight.)
- Use a tachometer to prevent over-revving 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:** Do not let people stand in front of or to the side of the engine while attempting to start it to avoid serious injury. Also, make sure the engine test bench or aircraft is completely secure from movement.

## Starting the Engine

(assuming the engine is mounted in an aircraft)

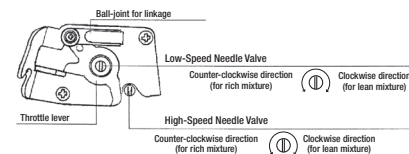
The carburetor on the Saito engine comes adjusted to a basic setting. This setting should be maintained during the initial break-in runs. The standard carburetor settings are as follows: the high-speed needle valve is set from the fully closed position. The low-speed or idle needle valve is set from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

	FG-30	FG-36
High-speed Needle	2 turns 30 minutes	2 turns 30 minutes
Low-speed Needle	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-30/FG-36 CARB



**IMPORTANT:** 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.

**Note:** 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 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.

**Note:** 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.

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 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, 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.

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.

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.

**⚠ CAUTION:** The engine must be stopped while you adjust the carburetor in order to prevent injury by the propeller. 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 breakin prior to the first flight.

## 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 rpms) 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:** Over-closing the main needle valve is very dangerous and could cause injury because it may cause knocking and preignition. It may also cause the propeller nut to loosen. Immediately turn the main needle counterclockwise to richen up 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 rpms become slow or go up suddenly, adjust carefully until the changes are smooth from idle to peak rpm, by adjusting the low-speed needle valve.
- After the previous steps have been accomplished, repeat the process from idle to high rpm quickly. If the rpms do not reach peak, but stutter 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.
- Factory settings for the main and low-speed needle valves are as follows.
- **Main needle valve:** Turn needle valve all the way clockwise and then back out 2 turns and 15 minutes.
- **Idle needle valve:** With the throttle barrel closed, turn the needle valve all the way clockwise and then back out 4 turns and 15 minutes.

## 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 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.
- The Saito engines are equipped with a “breather” nipple. It is recommended that a length of Tygon-type 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.

## 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, in which 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, clean thoroughly and re-oil. Then assemble them in the original condition and place in a plastic or air-tight container.

## Troubleshooting Guide

If the engine does not start:

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

### Mechanical Faults

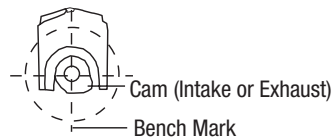
If the engine cannot be turned over easily:

- It is likely that the piston in the cylinder is seized.
- Visually examine the piston and crankcase to find the likely cause of the engine's mechanical problem.

## 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.

- 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 Saito Horizon Product Support Department at 877-504-0233. Our representatives will be happy to advise you on maintenance issues.

## Carburetor Maintenance

Should you experience difficulty with the carburetor of your engine:

- Be sure needles are set to factory specifications.

Generally speaking, there are very few things that will keep today's modern gasoline engines from starting. To that end, make sure you are using 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.

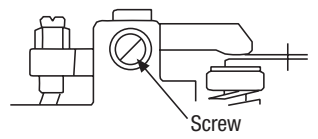
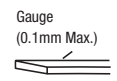
## Valve/Tappet Gap Adjustment

After approximately one hour 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.

**Note:** 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.

### Tappet Adjustment

Adjust between  
0.03 – 0.10mm (.002 in – .004



### How to Adjust

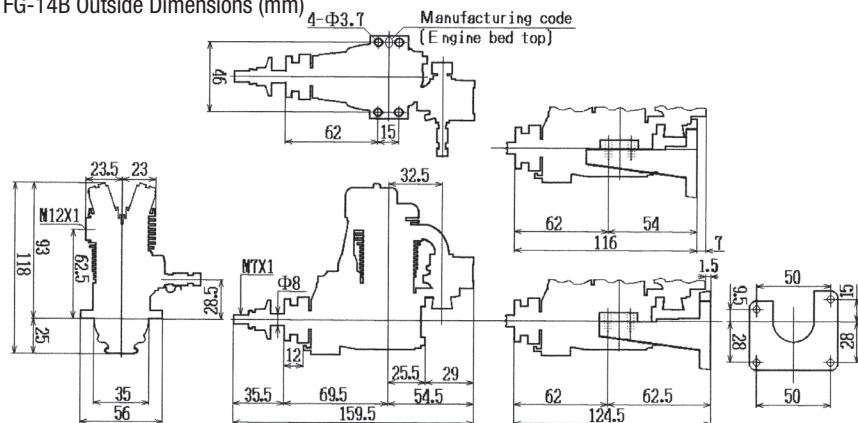
Remove the plug and the rocker arm cover and revolve the propeller slowly clockwise by hand. The intake side rocker arm stops, and by turning it, the piston reaches the compression top dead center (TDC).

In that position, adjust with the included gauge and hexagonal wrench so 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 adjustment, adjust between 0.03 and 0.10mm (0.002 to 0.004 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-14B Dimensions and Specifications

FG-14B Outside Dimensions (mm)



### SPECIFICATIONS

Disp: 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); 5.2 oz (146 g)

Total weight with muffler and ignition system:  
25.8 oz (732 g)

Crankshaft: M7x1

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 will depend on the load of the propeller. During actual flight, fuel consumption increases slightly.

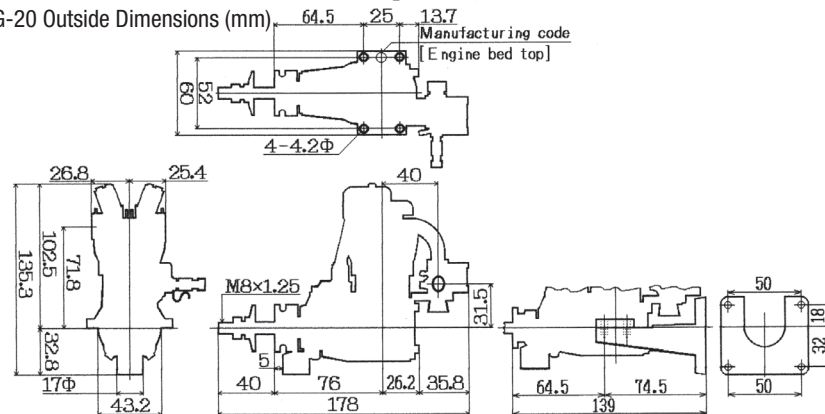
Electrical usage of ignition system:  
Approximately 200mAh for 15 minutes.

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-20 Dimensions and Specifications

FG-20 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); 5.2 oz (146 g)

Total weight with muffler and ignition system:  
30.1 oz (850 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 will depend on the load of the propeller. During actual flight, fuel consumption increases slightly.

Electrical usage of ignition system:  
Approximately 200mAh for 15 minutes.

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

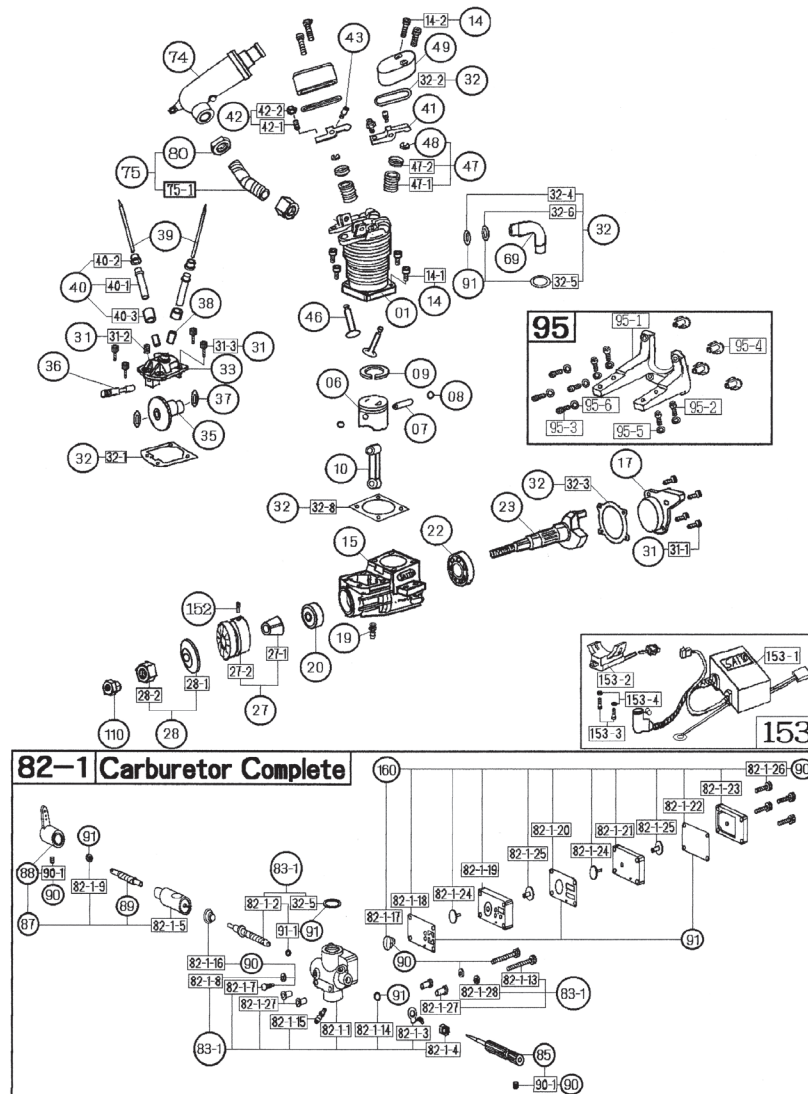
Oil: The use of only 100% synthetic oil is recommended such as our Evolution® Oil (EVOX1001Q)

### Saito FG-14B/FG-20 Parts List

#	DESCRIPTION	QTY
01	Cylinder (left)	1
06	Piston	1
07	Piston Pin	1
08	Piston Pin Retainer	2
09	Piston Ring	1
10	Connecting Rod	1
14	Cylinder Screw Set (14-1, 14-2, 14-3, 14-4)	1set
15	Crankcase	1
17	Rear Cover	1
19	Breather Nipple	1
20A	Front Bearing	1
22	Rear Bearing	1
23	Crankshaft	1
27A	Taper Collet and Drive Flange (27-1, 27-2)	1ea
28	Prop Washer and Nut (28-1,28-2)	1ea
31	Crankcase Screw Set (31-1, 31-2, 31-3)	1set
32	Engine Gasket Set (32-1, 32-2, 32-3, 32-4)	1set
33	Cam Gear Housing	1
35	Cam Gear	1
36A	Cam Gear Shaft	1
37	Steel and Washer Set (37-1, 37-2)	1set
38	Tappet	2
39	Pushrod	2
40	Pushrod Cover and Rubber Seal (40-1, 40-2, 40-3)	2ea
41	Rocker Arm	2

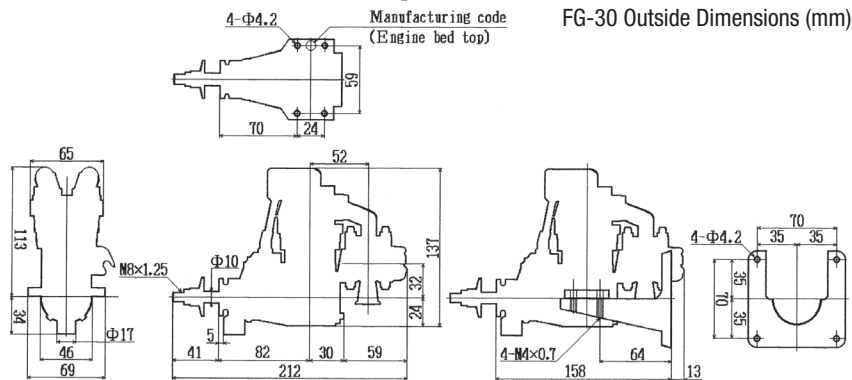
#	DESCRIPTION	QTY
42	Rocker Arm Screw and Nut (42-1,42-2)	2ea
43	Rocker Arm Pin	2
44	Rocker Arm Bracket (Left)	1
45	Rocker Arm Bracket (Right)	1
46	Valve (In and Out) (46-1, 46-2)	2
47	Valve Spring+Keeper+Retainer (47-1,47-2,48)	2ea
48	Valve Retainer (Cotter)	4
49	Rocker Arm cover	2
69	Intake Manifold	1
74	Muffler	1
75	Muffler Manifold (75-1, 80)	1
80	Muffler Nut	2
82-1	Carburetor Complete	1set
83-1	Carburetor Body Assembly (82-1-1, 82-1-2, 82-1-3, 82-1-4, 82-1-5)	1set
90	Carburetor Screw and Spring Set (82-1-9, 82-1-10, 82-1-11, 82-1-12)	1set
91	Carburetor Gasket Set (82-1-6, 82-1-7, 82-1-8)	1set
93	Intake Velocity Stack	1
95	Engine Mount Set (95-1, 95-2, 95-3, 95-4, 95-5)	1set
110	Anti Loosening Nut	1
149	Oil Slinger	1
152	Screw-Pin (for Drive Flange Setting)	1
153	Electronic Ignition System (153-1, 153-2, 153-3, 153-4)	1set

### Saito FG-14B/FG-20 Exploded View





## FG-30 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) 5.6 oz (158 g)

Total weight with motor mount, muffler and ignition system: 52.5 oz (1488 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

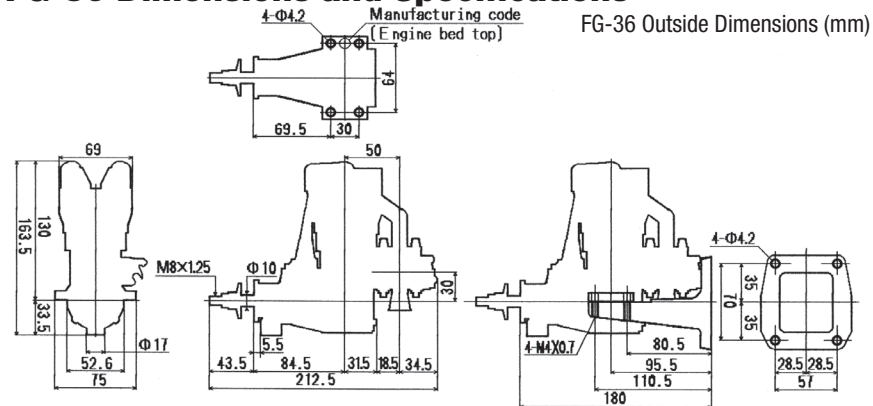
Fuel Consumption: Approximately 25cc/minute at full throttle and approximately 7,500 rpm. Fuel consumption will depend on the load of the propeller. During actual flight, fuel consumption increases slightly.

Electrical usage of ignition system:  
Approximately 200mAh for 15 minutes.

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-36 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) 5.6 oz (158 g)

Total weight with motor mount, muffler and ignition system: 66.2 oz (1765 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 rpm

Practical Ground RPM Range: 1,700–9,000

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

Electrical usage of ignition system:  
Approximately 200mAh for 15 minutes.

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

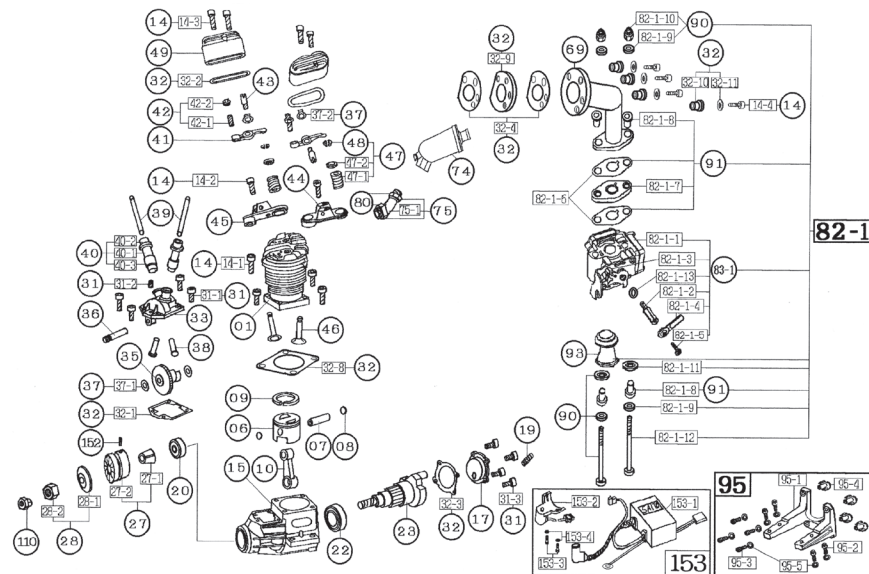
Oil: The use of only 100% synthetic oil is recommended such as our Evolution Oil (EVOX1001Q)

## Saito FG-30/FG-36 Parts List

#	DESCRIPTION	QTY
01	Cylinder (left)	1
06	Piston	1
07	Piston Pin	1
08	Piston Pin Retainer	2
09	Piston Ring	1
10	Connecting Rod	1
14	Cylinder Screw Set (14-1, 14-2, 14-3, 14-4)	1set
15	Crankcase	1
17	Rear Cover	1
19	Breather Nipple	1
20A	Front Bearing	1
22	Rear Bearing	1
23	Crankshaft	1
27A	Taper Collet and Drive Flange (27-1, 27-2)	1ea
28	Prop Washer and Nut (28-1,28-2)	1ea
31	Crankcase Screw Set (31-1, 31-2, 31-3)	1set
32	Engine Gasket Set (32-1, 32-2, 32-3, 32-4)	1set
33	Cam Gear Housing	1
35	Cam Gear	1
36A	Cam Gear Shaft	1
37	Steel and Washer Set (37-1, 37-2)	1set
38	Tappet	2
39	Pushrod	2
40	Pushrod Cover and Rubber Seal (40-1, 40-2, 40-3)	2ea
41	Rocker Arm	2

#	DESCRIPTION	QTY
42	Rocker Arm Screw and Nut (42-1,42-2)	2ea
43	Rocker Arm Pin	2
44	Rocker Arm Bracket (Left)	1
45	Rocker Arm Bracket (Right)	1
46	Valve (In and Out) (46-1, 46-2)	2
47	Valve Spring+Keeper+Retainer (47-1,47-2,48)	2ea
48	Valve Retainer (Cotter)	4
49	Rocker Arm Cover	2
69	Intake Manifold	1
74	Muffler	1
75	Muffler Manifold (75-1, 80)	1
80	Muffler Nut	2
82-1	Carburetor Complete	1set
83-1	Carburetor Body Assembly (82-1-1, 82-1-2, 82-1-3, 82-1-4, 82-1-5)	1set
90	Carburetor Screw and Spring Set (82-1-9, 82-1-10, 82-1-11, 82-1-12)	1set
91	Carburetor Gasket Set (82-1-6, 82-1-7, 82-1-8)	1set
93	Intake Velocity Stack	1
95	Engine Mount Set (95-1, 95-2, 95-3, 95-4, 95-5)	1set
110	Anti Loosening Nut	1
149	Oil Slinger	1
152	Screw-Pin (for Drive Flange Setting)	1
153	Electronic ignition system (153-1, 153-2, 153-3, 153-4)	1set

## Saito FG-30/FG-36 Exploded View



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

	DESCRIPTION	FG-14B	FG-20	FG-30	FG-36
46	Valve-In/Out (pr)	91S46	125A46	120S46	G3646
47	Valve Spring, Keeper, Retainer (2 set)	6547	6547	120S47	120S47
48	Valve Retainer (4 pc.)	5048	5048	120S48	120S48
49	Rocker Arm Cover (pr)	5049	5049	150S49	150S49
69	Intake Manifold, Left	G14B69	G2069	G3069	G3669
74	Muffler, Right	G14B74	G2074	G3074	G3674
75	Muffler Manifold, Standard	8075C	125A75	G3675	G3675
80	Muffler Nut (2 pc.)	8080A	125A80	G3680	G3680
82-1	Carburetor-Complete, Left	G14B821	G20821	G30821	G36821
83-1	Carburetor Body Assembly, Left	G14B831	G20831	G30831	G36831
85	High-Speed Needle Valve	G2085	G2085	G3685	G3685
86	High-Speed Needle Valve Extension	5086	5086	–	–
87	Throttle Barrel Assembly	G14B87	G2087	G3087	G3687
88	Throttle Lever	5088B	5088B	–	–
89	Idle Needle Valve	91S89	91S89	G3689	G3689
90	Carburetor Screw & Spring Set	G14B90	G2090	G3690	G3690
91	Carburetor Gasket Set	G14B91	G2091	G3691	G3691
93	Intake Velocity Stack	–	–	G3693	G3693
95	Engine Mount	G14B95	G2095	G3095	G3695
96	Tool Set	G2096	G2096	G3696	G3696
97	Instruction Manual	MAN1G	MAN1G	MAN1G	MAN1G
109F-1	Fuel Filter	50109	50109	50109	50109
110	Anti-Lossening Nut	56110	170R3110	170R3110	170R3110
117	M4 Nut for Spinner	65177	120S117	120S117	120S117
118	M5 Nut for Spinner	65118	120S118	120S118	120S118
120	Spark Plug	SP-1	SP-1	CM-6	CM-6
135	Prop Washer/Nut/Anti-Lossening Nut	56135	125A135	170R3135	170R3135
152	Screw Pin	G36152	G36152	G36152	G36152
153	Electronic Ignition System	G14B153	G20153	G36153	G36153
160	Pump Assembly	G20160	G20160	–	–

Exclusive Warranty- Horizon Hobby, Inc., (Horizon) warrants that the Products purchased (the "Product") will be free from defects in materials and workmanship for a period of 3 years from the date of purchase by the Purchaser.

### **3 Year Limited Warranty**

**Horizon reserves the right to change or modify this warranty without notice and disclaims all other warranties, express or implied.**

(a) This warranty is limited to the original Purchaser ("Purchaser") and is not transferable. REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE PURCHASER. This warranty covers only those Products purchased from an authorized Horizon dealer. Third party transactions are not covered by this warranty. Proof of purchase is required for warranty claims. Further, Horizon reserves the right to change or modify this warranty without notice and disclaims all other warranties, express or implied.

(b) Limitations- HORIZON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCT. THE PURCHASER ACKNOWLEDGES THAT THEY ALONE HAVE DETERMINED THAT THE PRODUCT WILL SUITABLY MEET THE REQUIREMENTS OF THE PURCHASER'S INTENDED USE.

(c) Purchaser Remedy- Horizon's sole obligation hereunder shall be that Horizon will, at its option, (i) repair or (ii) replace, any Product determined by Horizon to be defective. In the event of a defect, these are the Purchaser's exclusive remedies. Horizon reserves the right to inspect any and all equipment involved in a warranty claim. Repair or replacement decisions are at the sole discretion of Horizon. This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or modification of or to any part of the Product. This warranty does not cover damage due to improper installation, operation, maintenance, or attempted repair by anyone other than Horizon. Return of any goods by Purchaser must be approved in writing by Horizon before shipment.

### **Damage Limits**

HORIZON SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCT, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY. 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 this Product, you are advised to return this 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).

### **Safety Precautions**

This is a sophisticated hobby Product and not a toy. 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. The Product 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 injury.

### **Questions, Assistance, and Repairs**

Your local hobby store and/or place of purchase cannot provide warranty support or repair. Once assembly, setup or use of the Product has been started, you must contact 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 direct your email to [productsupport@horizonhobby.com](mailto:productsupport@horizonhobby.com), or call 877.504.0233 toll free to speak to a Product Support representative.

### **Inspection or Repairs**

If this Product needs to be inspected or repaired, please call for a Return Merchandise Authorization (RMA). 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. A Service Repair Request is available at [www.horizonhobby.com](http://www.horizonhobby.com) on the "Support" tab. If you do not have internet access, please include a letter with your complete name, street address, email address and phone number where you can be reached during business days, your RMA number, a list of the included items, method of payment for any non-warranty expenses and a brief summary of the problem. Your original sales receipt must also be included for warranty consideration. Be sure your name, address, and RMA number are clearly written on the outside of the shipping carton.

### **Warranty Inspection and Repairs**

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

### **Non-Warranty Repairs**

Should your repair not be covered by warranty the repair 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 repair you are agreeing to payment of the repair without notification. Repair estimates are available upon request. You must include this request with your repair. Non-warranty repair estimates will be billed a minimum of ½ hour of labor. In addition you will be billed for return freight. Please advise us of your preferred method

of payment. Horizon accepts money orders and cashiers checks, as well as Visa, MasterCard, American Express, and Discover cards. If you choose to pay by credit card, please include your credit card number and expiration date. Any repair left unpaid or unclaimed after 90 days will be considered abandoned and will be disposed of accordingly. Please note: non-warranty repair is only available on electronics and model engines.

### **United States**

Electronics and engines requiring inspection or repair should be shipped to the following address:

Horizon Service Center  
4105 Fieldstone Road  
Champaign, Illinois 61822  
USA

All other Products requiring warranty inspection or repair should be shipped to the following address:

Horizon Product Support  
4105 Fieldstone Road  
Champaign, Illinois 61822  
USA

Please call 877-504-0233 or e-mail us at [productsupport@horizonhobby.com](mailto:productsupport@horizonhobby.com) with any questions or concerns regarding this product or warranty.

## 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 oil and/or oil ratio
- Damage due to lean runs, such as rusted bearings, seized connecting rod or piston, etc.
- Damage caused by foreign objects (dirt or other debris)
- 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 \_\_\_\_\_