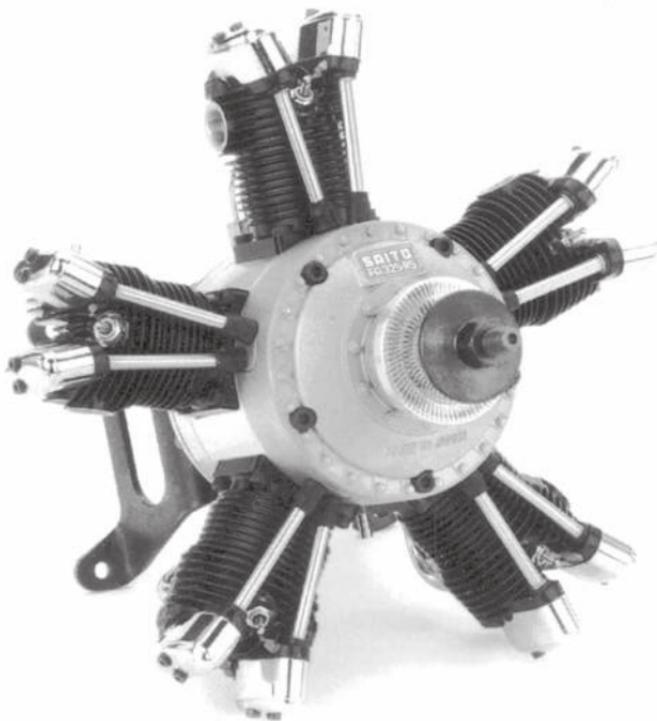


SAITO

Multi-Cylinder Four-Stroke Engines

INSTRUCTION MANUAL



- FA-90R3
- FA-170R3
- FA-325R5-D
- FA-200R3
- FA-450R3-D

**VERY
IMPORTANT**

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

INTRODUCTION

Congratulations on your purchase of a Saito 4-cycle engine. When cared for properly, there high-quality, finely crafted engines offer many years of modeling enjoyment.

This instruction manual has been developed to ensure optimum performance from the Saito engine you've purchased. The instructions must be read thoroughly prior to mounting and running the engine.

SAFETY INSTRUCTIONS

This model engine will give you considerable pleasure, satisfaction and performance if you strictly follow these safety instructions and take heed of the warnings as to its safe and proper use.

Remember at all times, *THIS ENGINE IS NOT A TOY*, but rather a precision-built machine with more than enough power to cause harm if misused or if the safety precautions are not observed.

YOU SHOULD ALWAYS:

1. When running the engine, be sure that all spectators, especially children, are at least 20 feet away.

2. Use the correct size and pitch of propeller for your engine; refer to the propeller chart in this manual.

3. It is extremely important to balance the propeller prior to installation of the engine. Failure to do so may cause damage to the Saito engine and/or the airframe. Install the propeller with the convex (curved) side facing forward. Securely tighten the propeller nut against the washer and propeller. A "jam" nut (or anti-loosening nut) is suggested for all 4-cycle engines.

4. Keep your face and body away from the path of the propeller blades when starting or running your engine.

5. Never allow your hands to come close to the propeller. Utilize either a "Start stick" or electric starter to start the engine.

6. Make all carburetor adjustments from behind the propeller.

7. To stop the engine, cut off fuel supply (pinch or disconnect the fuel line to the carburetor), or use the throttle linkage to shut off the air.

DO NOT USE HANDS, FINGERS OR ANY OTHER PART OF THE BODY TO STOP THE PROPELLER.

DO NOT THROW ANY OBJECT INTO A PROPELLER TO STOP IT!

8. Discard any propeller that is nicked, scratched, cracked or damaged in any way.

IT IS HIGHLY RECOMMENDED THAT:

1. Safety glasses or goggles be used when starting and running your engine.
2. You do not run the engine in the vicinity of loose gravel or sand. The propeller may throw such materials into your eyes. The engine may also ingest these harmful materials.
3. Loose clothing should be avoided when operating your model engine. Loose clothing can become entangled in the propeller, creating the possibility of bodily harm. Also, all loose objects (screwdrivers, pencils, nickel cadmium starters, etc.) Should be removed from your pockets so

they do not fall into the propeller.

4. Glow plug clips and cords are kept away from the propeller.

5. Your glow fuel is kept in a safe place well away from sparks, heat or anything that may ignite the fuel.

BEWARE:

1. Model engines get very hot while running. Do not attempt to handle the engine until it has cooled.
2. Always run your model engines in a well-ventilated area. Similar to automotive engines, model engines produce possibly harmful carbon monoxide fumes.
3. Remember that model engines produce a substantial amount of power, more than enough to seriously injure people and/or do considerable damage to property. Always use common sense, skill and constant observation of safety precautions.

DISASSEMBLY

The Saito multi-cylinder engines are assembled using special jigs and tools. As such, disassembly should be performed only at the factory authorized service center. If it becomes necessary to dismantle the engine, such as after a crash, please send your engine to the authorized service center:

Horizon Service Center
Attention: Saito Service
4105 Fieldstone Road
Champaign, IL 61822
(877-504-0233)

The engine has been assembled with the use of special tools and jigs to assure perfect assembly. Disassembly of the engine will result in the voiding of your warranty.

ENGINE PARTS IDENTIFICATION

It's important to be able to identify the parts of your Saito engines. In this manual you'll find an exploded view of Saito multi-cylinder engines, as well as a chart which includes part numbers and descriptions. This will assist you in easily and rapidly identifying the respective parts

of your Saito engine.

SUPPORT EQUIPMENT

The following items, which are not included with your Saito engine, are necessary in order to operate the model engine:

- Fuel — For maximum protection and longevity of Saito engines, Saito manufacturing recommends a good quality airplane fuel with 10-15% nitro methane, such as Morgan Fuels, Omega, Cool Power etc. Use of fuels composed entirely of castor oil is NOT recommended. A mix of synthetic-castor oil is acceptable and can be found in the various fuel blends described above.
- Propeller — Refer to the Propeller Selection Chart, located on page 15, to determine the best initial propeller for your particular application.
- Igniting Glow Plugs — Your glow plugs may be properly heated by several different sources. The **FA-90R3**, **FA-170R3**, **FA-200R3**, **FA-325R5D**, and **FA-450R3D** all come with a wiring harness kit that can be used to provide several options for providing heat to the glow plug.

The red connectors are the glow plug cinnectors and there's one black ground wire lead.

The red glow plug leads should be connected to one another via a common lead. Attach the glow plug connectors to the rear glow plugs.

NOTE: The connectors should firmly grip the glow plug stems. If not, gently squeeze the clip together with your fingers.

NOTE: It is not necessary to ignite all six of the glow plugs for the **FA-450** or all 10 of the glow plugs for the **FA-325**. The front plugs will ignite once the engine reaches operating temperature. Attach the black (ground) lead to the motor mount. The **FA-90R3**, the **FA-170R3** and **FA-200R3** have one plug per cylinder.

1. On-Board Battery.

a. Solder the single common lead from the glow plug connector to the terminal of a 125V 10A micro-switch (not supplied).

b. Solder a lead from the micro-switch to the positive terminal on the Ni-Cad battery.

c. Attach the single lead from the ground wire to the negative terminal on the Ni-Cad battery. Please refer to Figure 1.

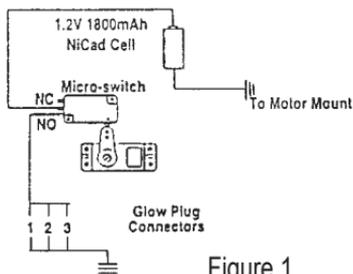


Figure 1

d. The on-board battery system may be activated in two ways.

First, using a servo to activate the switch, insert the servo lead into the gear (or other toggle-activated switch) channel in the receiver. Adjust the travel of the selected channel so that the servo arm "trips" the micro-switch and completes the circuit, heating the glow plugs accordingly. Placing the toggle switch in the opposite position will break the circuit, removing the heat from the glow plugs.

Alternatively, the servo may be connected to the throttle channel or the receiver via a Y-harness. Adjust the servo travel so that

contact with the micro-switch is completed at the desired location generally a low idle position.

2. Common Plug Activated
 - a. Solder the single lead from the glow plug connectors to one post of the female jack.
 - b. Attach the ground lead to the remaining post on the female jack.

To Glow Plug Connectors

- c. Attach a male connector to the positive and negative terminals of your 1.5V starting battery.

Refer to Figure 2.

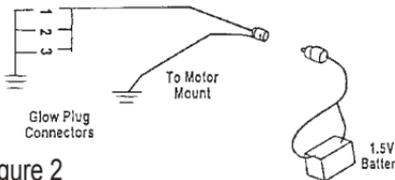


Figure 2

3. Multi-Cylinder Glow Driver

There are many fine glow driver units available on the market today. Please follow the instructions included with the glow driver you've selected.

NOTE: The use of an on-board glow system is highly recommended. This will guarantee a smooth, reliable idle. If an on-board glow system will NOT be utilized, replacement of the standard SAIP400S glow plugs with a "hotter" plug, such as the "Hangar 9 4-Cycle Super Plug (HAN3011)" or equivalent, is suggested.

- Glow Plug Wrench — Used to remove and tighten glow plugs.
- Manual or Electric Starter — For manual starts, a "Start stick" (HAN113) is highly recommended. **Never** use your fingers to start any model engine as doing so invites injury. There are a variety of electric starters on the market. The Hangar 9 Power Pro HD 12V Starter (HAN162) works perfectly on all Saito multi-cylinder engines.

BREAK-IN

The first run on any engine, whether 2-cycle or 4-cycle, is critical to the future of the engine itself. During this time, metal mating parts (piston and cylinder, ball bearings, etc.) wear in. Care must be taken that the engine is clean and free of any dust or grit that may have accumulated while building the model.

There are two accepted methods for breaking in a new engine: either running it mounted on a test stand or in an aircraft. Either method is acceptable; however, mounting the engine to a test stand allows the engine to be observed throughout its operation, as well as elevating it above the ground and away from harmful dust and dirt.

NOTE: Because your engine may have been sitting for an extended period of time prior to running it, a few drops of light oil applied through the crankcase breather nipple (19 on the exploded view), if applicable, and down the pushrod tubes (40) will ensure proper lubrication for the first run. Regardless of the mounting method chosen for break-in, the following procedures are applicable:

1. Use a break-in fuel as described in the "Support Equipment" section, of this manual.
 2. Use the proper glow plugs. Your engine includes the Saito SAIP400S glow plugs, which are standard replacement glow plugs for these engines.
 3. Select the correct propeller. To do so, refer to the Propeller Selection Chart on page 15 of this manual.
 4. Ensure that the high-speed needle valve (85) is opened (turned counterclockwise) five full turns. This guarantees a very rich setting.
- Do Not** adjust the low-speed needle valve at this time. The low speed needle valve is pre-adjusted at the factory for initial break-in.
5. The use of a tachometer (HAN111) is highly recommended since the adjustment of a 4-cycle engine, while similar to that of a 2-cycle engine, is more difficult to "set by ear," making it easier to damage the engine by "over leaning."

STARTING THE ENGINE

1. Make sure the glow plugs are installed and tightened.
2. Be sure the propeller is properly secured. The use of an anti-loosening or "jam nut" is encouraged on 4-cycle engines.
3. Make sure the fuel tank line(s) are properly connected. The main line should be connected to the carburetor nipple on the carburetor spray bar (82-1-2). The proper "plumbing" of the lines is extremely important to the performance of any engine.
4. Be certain the mufflers are installed properly by oiling the threads and inserting the crush washers, and that the lines are properly connected. See Figure 3 below.

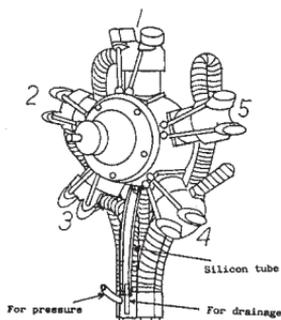


Figure 3

5. Fill the fuel tank.
6. Check to make sure the glow plugs are not connected to the heat source (glow plug clip/locking socket).

NOTE: If an electric starter will be used to start the engine, it's not necessary to prime the engine. To do so may result in an engine which becomes hydro-locked and serious damage can occur.

7. Open throttle fully.
8. Close the choke valve (92), if applicable (FA-450).

NOTE: The FA-90R3, FA-170R3, FA-200R3 and the FA-325R5D require priming via a syringe. (See page 8 text and diagrams)

9. Turn the prop one or two turns clockwise to suck in the fuel (FA-450 only).
10. Open the choke valve (92), if applicable (FA-450).

NOTE: The priming process for the FA-90R3 and FA-170R3 and FA-200R3 is described as follows: For priming, inject the approximate quantity of fuel (about 1-2cc) into the carburetor with a syringe, etc. as illustrated below in figure 4.

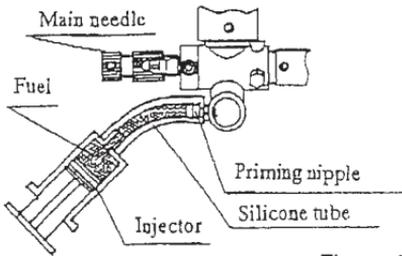


Figure 4

NOTE: the priming process for the FA-325R5D is described as follows: (See Figure 5)

For priming, inject the approximate quantity of fuel (about 1-2 cc) into the injection pipe on the rear of the engine as illustrated. After priming, be sure to install the plug.

Explanatory Drawing of Priming

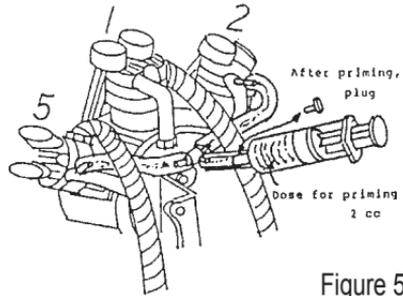


Figure 5

START THE ENGINE:

11. Close the throttle to 1/4 to 1/3 open position.
12. Rotate the propeller clockwise until it's against the compression stroke.
13. Rotate the propeller in a counterclockwise direction 2-3 times (FA-170/FA-325). If much force is needed to turn the propeller, the fuel in cylinders 2 and 3 (for an FA-90R3, FA-170R3, FA-200R3 and FA-450R3D; 2 and 5 for an FA-325) is compressed. Remove the glow plugs from these cylinders and slowly rotate the propeller clockwise to eject the excess fuel via the cylinder heads.
14. Connect the heating source to the glow plugs.

NOTE: It's not necessary to ignite all the plugs in a dual plug cylinder (two glow plugs per cylinder) of Saito engines. It's only necessary to apply heat to the rear plugs; the front plugs will ignite once the engine reaches operating temperature.

NOTE: A very common error is to remove the glow plug igniter (or on-board glow driver) too early. It's suggested that the igniter be left attached (or left on in the case of an on-board glow driver) until the engine has been run up and the high-speed needle valve has been properly adjusted.

15. Using either a "start stick" or electric starter, spin the propeller until the engine is running.

NOTE: When using an electric starter, care should be taken to be sure that the engine does not become "hydro-locked." While the electric starter will turn the engine over, it may damage the connecting rod or other components. If the engine becomes hydro-locked, simply remove the glow plugs and turn the engine over a few times with the chicken stick or electric starter. The excess fuel will be forced to exit the

engine via the cylinder heads.

16. Initial break-in:

After the engine starts, open the high speed needle valve slightly. **Do not** exceed 4,000 rpm for the first ten (10) minutes of operation. This allows all parts to mate properly with good lubrication.

NOTE: Due to the excessively "rich" mixture setting, it may be necessary to leave the heat source attached (or left on) to the glow plugs.

Subsequent runs may be made while slightly leaning out the mixture with each tank of fuel. Generally, 40 minutes is considered sufficient for normal break-in prior to the first flight.

NOTE: FA-90R3 rotary units and slide ways of the engine have been lubricated at assembly with black molybdenum oil to prevent wearing or seizure. Hence, black exhaust oil comes out of the breather nipple and muffler at break-in operation. This discharge is not a sign of trouble and you can continue flying.

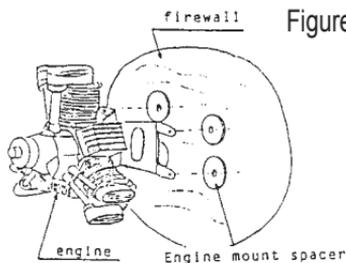


Figure 6

17. After break-in:

If a test stand was used for the break-in procedure, the engine may now be mounted on the aircraft using the integral motor mount and mounting hardware supplied with the Saito engine.

NOTE: Always utilize the engine's mounting spacers. Place the mounting spacer between the integral motor mount and the firewall of the aircraft. The spacers will minimize firewall depression and serve to reinforce the mount. Soft mounting of Saito engines is not required due to low vibration levels found in the Saito multi-cylinder engines. (See Figure 6 Above)

The idle needle valve (89) can now be fine tuned. Please refer to the Low Speed Carburetor Adjustments Section on this page for information on how to do this.

The valves can be checked at this

time. Refer to the Engine Maintenance Section on page 12 for information on the valve adjustment. The use of a tachometer is encouraged for setting the high-speed needle valve (85) prior to flight. The peak rpm should be obtained and then reduced by approximately 200-300 rpm by turning the high speed needle valve counterclockwise.

LOW SPEED CARBURETOR ADJUSTMENTS

The low speed, or idle needle valve (89), is pre-adjusted at the factory for best performance during break-in. After break-in it may be necessary to "fine tune" the low speed adjustment using the following procedure:

1. Start the engine and let it warm up prior to attempting any adjustments.
2. Close the throttle slowly and adjust the low speed setting by rotating the needle valve (89) clockwise to lean the mixture and counterclockwise to richen the mixture.

NOTE: The fuel mixture is too rich when you open the throttle rapidly and the engine emits white

smoke and "stutters" or "stumbles." Correct this by rotating the idle needle valve clockwise 1/4 to 1/2 turn at a time until the engine transitions smoothly without hesitation upon opening the throttle rapidly. The fuel mixture may be too lean when the engine stops when the throttle is rapidly opened from idle. Attempt to correct this by rotating the idle needle valve counterclockwise 1/4 to 1/2 turn at a time until the engine transitions smoothly without hesitation upon opening the throttle rapidly. If the situation is not rectified by counterclockwise rotations of the idle needle valve, try turning the idle needle valve clockwise in 1/4 to 1/2 turn increments.

3. After obtaining the proper idle setting, the low rpm setting can be made through the positioning of the throttle adjustment screw, if applicable. If not, adjust the idle setting via the throttle trim of your transmitter.

NORMAL ENGINE OPERATION

If break-in was accomplished on a test bench, your engine is ready to be mounted to the aircraft and flown. The initial flight should be performed with the engine adjust-

ed for a rich fuel mixture.

1. Your Saito engine should be securely mounted to the aircraft using the motor mount and hardware kit provided. Soft mounting of the Saito multi-cylinder engines is not necessary due to the extremely low vibration level of these engines. Please refer to Step 17 in the "Starting the Engine" section for the proper mounting procedure.

2. General operating procedures which ensure long engine life are:

- **Do not** operate the engine with a "lean" mixture.
- When installing the mufflers, oil both the manifold threads and the engine cylinder heads. Optional flexible mufflers are available for the FA-90R3, FA-170R3D and FA-450R3D. An example of a connection for the flexible mufflers is shown in Figure 7 below. Refer to the Cross Reference Chart for the part numbers for flexible mufflers.

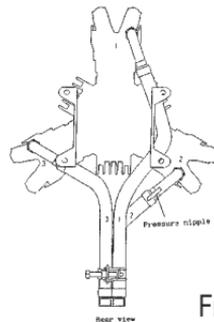


Figure 7

Regularly check all screws and nuts on both the engine and muffler.

After 1-2 hours of operation, valve adjustment should be checked. Adjust the valves as shown in the Engine Maintenance Section.

The multi-cylinder engines are equipped with a breather nipple. It's recommended that a length of silicone tubing be attached to this crankcase breather nipple (19) for routing away expelled oil from the engine compartment.

ENGINE MAINTENANCE

Do not dismantle the engine. The Multi-Cylinder Saito engines are assembled utilizing special jigs and tools. If it becomes necessary to disassemble the engine proper due to crash damage or any other reason, please forward your engine to the Horizon Service Center.

Normal engine maintenance, such as adjusting the valves or carburetor maintenance, is permissible without voiding the warranty; however, disassembly of the cylinders, crankshaft, and cam gear assembly should be done only by the Saito Service Center

because of the special jigs and tools required. If you have any questions concerning maintenance procedures, please contact the Horizon Service Center at: (877-504-0233).

Our technicians will be happy to advise you on maintenance issues.

Timing and cam gear alignment should also be done by the Saito Service Center.

After approximately one hour of operation, tappet gap adjustment may be necessary. Adjust the valves to a clearance of .03mm-.10mm (.002"-.004") using the supplied gauge. The valves must be adjusted with the engine cold due to thermal expansion.

NOTE: Valves must be in the closed position as shown in the figure. When adjustment is completed, make sure you tighten the lock nut. When you check the valves, lubricate the moveable parts. Also make sure screw is in tight before making adjustment to values.

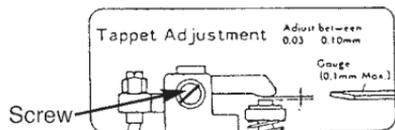


Figure 8

CARBURETOR MAINTENANCE

Should you experience difficulty with the carburetor of your engine:

1. Remove the high speed needle (85) and flush out the spray bar with clean fuel. Replace the high speed needle and follow the instructions in the Low Speed Carburetor Adjustment section.
2. Always use a high-quality 4-cycle glow plug. The SAIP400S glow plug is highly recommended, as well as the Hanger 9 Four Cycle Super Plug (HAN3011).

TIPS FOR EXTENDED ENGINE LIFE

To add longer life to your Saito engine, we recommend the following:

1. Use a high quality airplane fuel, such as Omega mix at 10-15%. The use of all castor oil for lubrication is not recommended. A synthetic castor mix is the preferred lubrication.
2. Use the recommended glow plugs.

3. Use the proper propeller size and balance the propeller prior to use.

4. Use a tachometer for precise engine adjustments.

5. Use an "after-run" oil (EVOX-1001) when you're finished flying for the day.

6. For long-term storage, make sure there is no fuel left in the tank and the engine. Remove the glow plug(s) and apply several drops of high-quality oil (such as Evolution Blue Block After Run Oil (EVOX1001) to the top of the engine, into the glow plug hole, down the pushrod tubes, and through the crankcase pressure vent (breather nipple). Rotate the crankshaft several times. Store the engine in the box or on the airplane with the nose down in order to keep oil in the bearings.

TROUBLESHOOTING

Generally speaking, there are very few things that will keep today's modern glow engines from starting. To that end, make sure you're using high quality "fresh" fuel, there are good glow plugs installed, and the starting battery is charged and in good condition. Should the engine fail to start after these items are verified, refer to the following chart.

SYMPTOM	CAUSE	COPRECTIVE ACTION
Engine fails to Start	Low voltage on starting battery	Replace/recharge the starting battery
	Bad glow plug(s)	Inspect/Replace bad glow plugs
	Insufficient priming	Repeat priming procedure
	"Flooded" due to excessive priming	Disconnect battery, remove glow plugs and rotate propeller several times to "clear" cylinder(s)
Engine fires but does not run	Over primed	Disconnect battery and rotate propeller several times to "clear" cylinder(s)
Engine starts but slows down and then stops	Mixture too rich	Close high speed needle 1/2 turn and start again. Repeat engine is running smoothly.
Engine starts, speeds up, and until then quits	Mixture too lean	Open high speed needle valve 1/2 turn and start again.Repeat until engine is running smoothly.
Engine quits when glow ignitor is removed	Mixture too rich	Close high speed needle valve 1/2 turn and restart.
	Incorrect glow plugs	Change glow plugs
	Incorrect or bad fuel	Change fuel

In the event that none of the above procedures results in the engine running properly, contact our service departments for suggestions at:Horizon Hobby, Inc. 4105 Fieldstone Road, Champaign, IL 61822
877-504-0233 (Mon-Fri 8:00-5:00 CST)

PROPELLER SELECTION

In the chart below is a propeller selection list. This chart enables you to select the best propeller for initial set-up of your Saito engine.

Remember, it is imperative to balance each propeller prior to installation onto your Saito engine. Failure to do so may cause unwanted vibration in your aircraft.

You will note a letter (A,B,C, etc.) stamped on the top of the motor mount. This letter identifies the production version of your engine. Should you ever need to order a part or have a question pertaining to your engine, specify this letter along with the engine type. This will allow for easier identification of your engine.

SATIO MULTI CYLINDER PROPELLER CHART

NOTE: All recommendations are based on engines using APC props, Power Master 15% 2-stroke fuel, and Saito SAIP400S glow plugs.

ENGINE:

FA-90R3 12X7 to 13X7
2,000 - 10,000

FA-170R3 15X8 to 16X8
2,000 - 9,500

FA-200R3 16X8 to 17X8
1,900 - 9,500

FA-325R5D 20X8 to 20X10
1,700 - 7,500

FA-450R3D
1,200 - 6,800 (w/On-Board Glow) 22X10, 22X12
1,600 - 6,800 (without On-Board) 24X8
glow system

ENGINE SPECIFICATIONS

FUEL CONSUMPTION

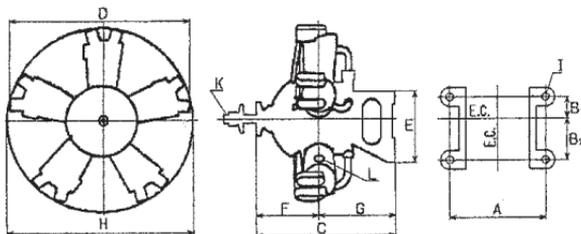
FA-90R3 25cc per minute (15% Nitro, 13x6 propeller, full throttle)

FA-170R3 45cc per minute (15% Nitro, 15x8 propeller, full throttle)

FA-200R3 46cc per minute (15% Nitro, 16x8 propeller, full throttle)

FA-325R5D 75cc per minute (10% Nitro, 20x8 propeller, full throttle)

FA-450R3D 60cc per minute (15% Nitro, 22x10 propeller, full throttle)



Note: Measurements correlate with chart.

L=Dia. of Thread of Ex. Pipes.

I=Dia. of Fitting Holes.

OUTSIDE DIMENSIONS (MM)

Items	A	B1	B2	C	D	E	F	G	H	I
FA90R3	50	20	38	129	156	58	60	69	168φ	4.2φ
FA170R3	94	25	49.5	155	186	74.5	77.5	79.5	198φ	4.5φ
FA200R3	94	25	49.5	155	186	74.5	77.5	79.5	198φ	4.5φ
FA325R5D	100	30	49	170	220	79	77	93	225φ	5.2φ
FA450R3D	110	30	49	200	237	79	100	100	250φ	5.2φ

SPECIFICATIONS

Items	Displacement cu. in.	Bore (mm)	Stroke (mm)	Weight (oz)	K (ISO)	Cyl	HP	EX. Dia
FA90R3	0.9/15.9cc	20	16	29.8	M7x1	AAC	0.95	M9xP0.75
FA170R3	1.7/27.8cc	24.8	19.2	46	M8x1.25	AAC	2.5	M10xP1
FA200R3	2.0/33cc	27	19.2	48.5	M8x1.25	AAC	2.7	M10xP1
FA325R5D	3.25	24.8	22.0	84	M8x1.25	ABC	3.8	M12xP1
FA450R3D	4.5/75cc	34	27.6	99	M10x1.25	AAC	5.5	M14xP1

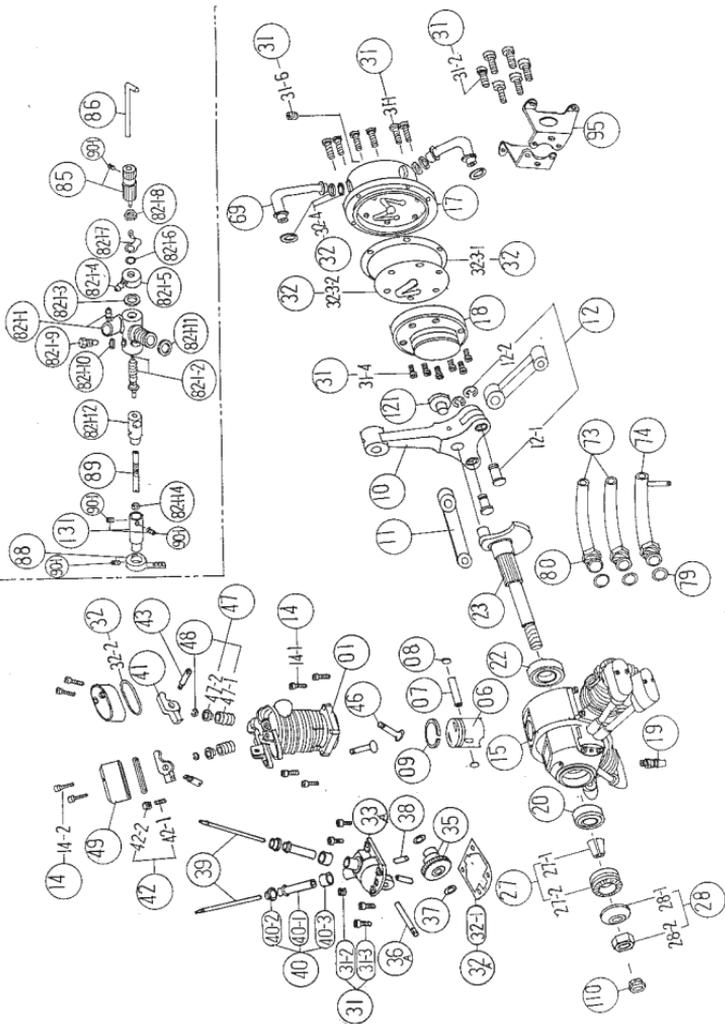
NOTE: The FA170R3 and FA450R3D have muffler inserts that allow use of short pipes (standard issue) that are 14mm. For use of flexible mufflers, remove the adapter nut installed in the cylinder.

MULTI-CYLINDER CROSS REFERENCE CHART

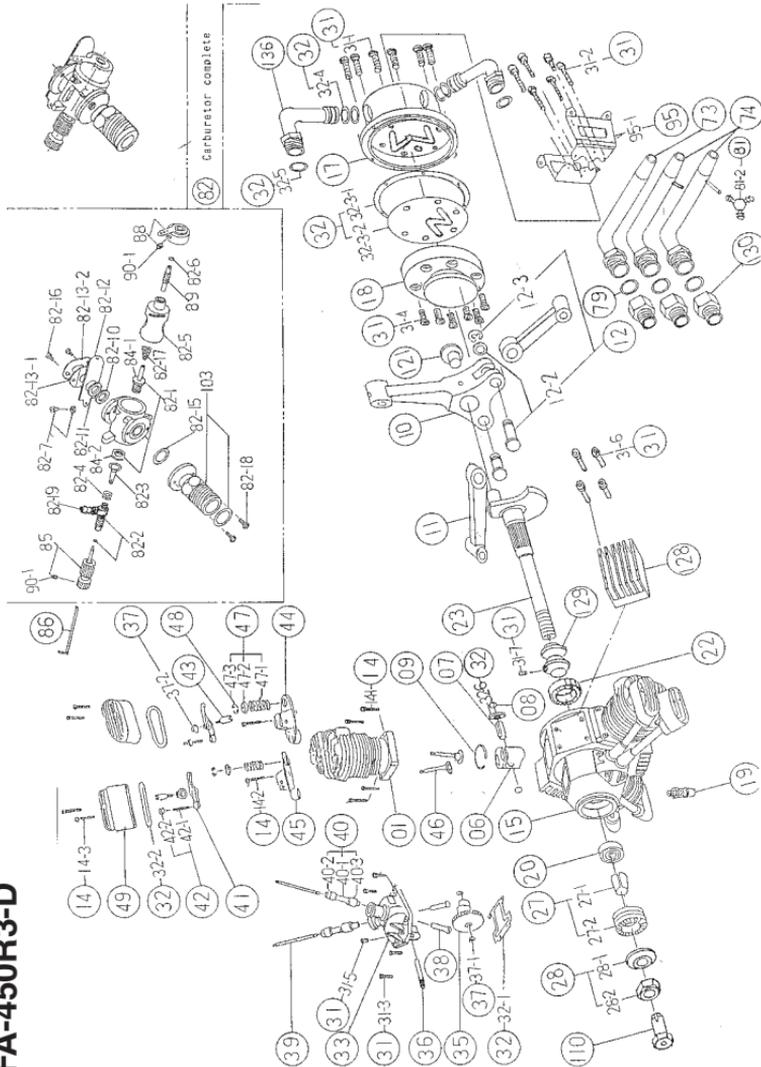
PART	TT	KK	Y	HH	PART	TT	KK	Y	HH	
	FA-90R3	FA-170R3	FA-200R3	FA-32SR5D		FA-450R3D	FA-90R3	FA-170R3	FA-200R3	FA-32SR5D
01 Cylinder, Left	90R301	56GK01B	200R301	32SR5D01C	450R3D01					
02 Cylinder, Right										
06 Piston	30S06	5606	200R306	6506A	150S06					
07 Piston Pin	30S07	6507	91807	6507	150S07					
08 Piston Pin Retainer	30S08	6508	8008	6508	300T08					
09 Piston Ring	60T09	6509	8009	6509	300T09					
10 Connecting Rod	90R310	170R310	170R310	32SR5D10	450R3D10A					
11 Linked Conrod	90R311	170R311	170R311	32SR5E11	450R3D11					
12 Conrod Link pin & "E" clips		170R312A	170R312A	32SR5E12	450R3D12B					
12-1 Link rod pin & washer	90R312-1	*	*	*	*					
12-2 "E" Ring	90R312-2	*	*	*	*					
12-28 Link Rod pin & washer	*	*	*	*	450R3D12-28					
12-38 "E" Ring	*	*	*	*	450R3D12-38					
13 Connecting Rod Screw										
14 Cylinder Screw Set	90R314	5014	5014	5514	120S14					
15 Crankcase	90R315	170R315	200R315	32SR5E15A	450R3D15					
16 Front Shield	*	*	*	32SR5E16	*					
17 Rear Cover (a)	90R317	170R317	200R317	32SR5E17	450R3D17					
18 Rear Cover (b)	90R318	170R318	170R318		450R3D18					
19 Breather Nipple	6519	6519	6519	5019	6519					
20 Front Ball Bearing	6520A	120S20A	120S20A	300T20A	450R3D20					
21 Main Ball Bearing	*	300T21	300T21	*	*					
22 Rear Ball Bearing	6522A	*	300T22	450R3D22	*					
23 Crankshaft	90R323A	170R323A	170R323A	32SR5E23A	450R3D23A					
24 Pinion-crankshaft	*	*	*	*	*					
25 Pinion gear pin	*	*	*	32SR5E26	*					
26 Collar, Crankshaft	*	*	*	*	*					
27 Taper Colllet & drv flange	6527	120S27	120S27	300T27B	450R3D27					
28 Prop washer & nut	6528	170R328A	170R328A	170R328A	450R3D28					
29 Prop Nut, sginner	*	120S29	120S29	120S29	*					
30 Prop Nut, Electric starter	5030	120S30	120S30	120S30	*					
31 Crankcase screw set	90R331	170R331	170R331	32SR5E31	450R3D31					
32 Engine Gasket Set	40a321	170R332	170R332	32SR5E32	450R3D32A					
33 Cam Gear Housing	40a33	170R333	170R333	*	300T33					
34 Cam Gear, Left	*	*	*	32SR5E34	*					
35 Cam Gear, Right	30S35	6535A	6535A	*	120S35					
36 Cam Gear Shaft	90R336A	170R336A	170R336A	32SR5E36	5036A					
37 Teflon & Steel washer set	30S37	120S37	120S37	32SR5E37	120S37					
38 Tappet	30S38	5038	5038	5038	120S38					
39 Pushrod	90R339	170R339	170R339	32SR5E39	450R3D39					
40 Pushrod ovt & rubber seal	90R340	60T40	60T40	32SR5E40	450R3D40					
41 Rocker Arm	60T41	5041	5041	5041	120S41					
42 Rocker Arm screw & nut	5042	60T42	5042	5042	120S42					
43 Rocker Arm pin	30S43	5043	5043	5043	120S43					
44 Rocker Arm Bracket, Left	*	*	*	*	150S44					
45 Rocker Arm Bracket, Rt	*	*	*	*	150S45					
46 Valve In/out/pin	30S46	5646	5646	32SR5E46	120S46					
47 Vlv spgr, tpr & retainer	30S47	5047	5047	32SR5E47	120S47					
48 Valve Retainer	5048	5048	5048	5048	120S48					
49 Rocker Arm Cover	50GK49	50GK49	50GK49	50GK49	120S49					
50 Cam Gear Base(a)	*	*	*	32SR5E50A	*					
51 Cam Gear Base(b)	*	*	*	32SR5E51	*					
52 Counter Gear	*	*	*	32SR5E52	*					
53 Counter Gear Shaft	*	*	*	32SR5E53	*					
54 Cam Gear Base Strut	*	*	*	32SR5E54A	*					
55 Impeller Fan	*	*	*	*	*					
56 Crank, Impeller	*	*	*	*	*					
57 Ball Bearing, Impeller Axle	*	*	*	*	*					
58 E-clip, Impeller Ball Bearing	*	*	*	*	*					
64 Pump Assembly	*	*	*	*	*					
65 Air Pump Housing	*	*	*	*	*					
66 Diaphragm & Check Vlv st	*	*	*	*	*					
67 Diaphragm, pushrod Rtn Sp	*	*	*	*	*					
68 Check valve in/out (pair)	*	*	*	*	*					
69 Intake Manifold, Left	90R369	170R369	200R369	32SR5E69	*					
70 Intake Manifold, Right	*	*	*	*	*					
71 Intake Manifold Nut	*	*	*	32SR5E71	*					
72 Intake Manifold w/Primer	*	*	*	*	*					
72-1 Intake Manifold w/Primer (Left)	*	*	*	32SR5E72-1	*					
72-2 Intake Manifold w/Primer (Right)	*	*	*	32SR5E72-2	*					
73 Muffler, Left	90R373	170R373	182D73	450R3D73	*					
74 Muffler, Right w/riser	90R374	170R374	182D74A	450R3D74	*					
78 Muffler, Complete Set	*	170R378	170R378	32SR5E78B	*					
78-1 Flex Muffler #1 Cylinder 250mm	90R378-1	170R378-1	170R378-1	see 78B1	see 1111 thru 1113					
78-2 Flex Muffler #2 Cylinder 100mm	90R378-2	170R378-2	170R378-2	thru 78B6A	below					
78-3 Flex Muffler #3 Cylinder 250mm	90R378-3	*	*	below	below					
78-6 Cable Tie	170R378-6	170R378-6	170R378-6	*	*					
79 Muffler Gasket	90R379	5079	5079	32SR5E79	450R3D79					
80 Muffler Nut	90R380	32SR580	*	32SR580	450R3D80					
81 Priming Harness	*	*	*	32SR581	*					
82 Carburetor, Complete	*	*	*	*	*					
82-1 Carburetor, Complete (left)	90R382-1	170R382-1A	170R382-1A	32SR5E82-1A	450R3D82-1D					
82-2 Carburetor, Complete (rt)	*	*	*	*	*					
83-1 Carburetor Body Assy, lft	90R383-1	170R383-1	170R383-1	32SR5E83-1	450R3D83-1A					
83-2 Carburetor Body Assy, rt	*	*	*	*	*					
83-3 Carburetor Body Assembly	*	*	*	*	*					
84 Spray Bar Assembly	*	*	*	*	450R3D84A					
85 High Speed Needle Valve	60T85	60T85	60T85	10085	120S85					
86 High Speed In Valve Extension	5086	5086	5086	5086	5086					
87 Throttle Barrel Assembly	90R387	170R387A	170R387A	32SR5E87A	450R3D87B					
88 Throttle Lever	5088B	5088B	5088B	32SR5E88A	5088B					
89 Idle Needle Valve	170R389	170R389	170R389	5089	120S89					
90 Carb Spring & Spring set	170R390	170R390	170R390	32SR5E90	120S90A					
91 Carburetor Gasket set	32SR591	32SR591	32SR591	32SR591	300TDP91					
92 Choke Valve Assembly	*	*	*	*	450R3D92					
93 Intake Velocity Stack										
94 Glow Plug Harness	170R394	170R394	170R394	32SR594	450S3D94					
95 Engine Mount	90R395	170R395	170R395	32SR5E95A	32SR5E95B					
96 Tool Set	90R396	170R396	170R396	32SR5E96	450R3D96					
97 Instruction Manual	SAIMAN3	SAIMAN3	SAIMAN3	SAIMAN3	SAIMAN3					
98 Muffler Bracket	*	*	*	*	*					
101 Twin Carb Control Assy	*	*	*	*	*					
102 Fuel Pump System	*	*	*	*	*					
103 Carb Filling flange w/screw	*	*	*	*	450R3D103					
104 Cam Gear Bearing, rear	*	*	*	*	*					
105 Cam Gear Bearing, front	*	*	*	*	*					
106 Cam Gear Bearing, Shield	*	*	*	*	*					
107 Carburetor Bracket	*	*	*	*	*					
108 F-1 Fuel Filter	50109	50109	50109	50109	50109					
110 Anti-slopping prop nut	56110	170R3110	170R3110	170R3110	300T110					
111-1 Muffler #1 Cyl. 350mm	*	*	*	*	450R3D111-1					
111-2 Muffler #2 Cyl. 195mm whipline	*	*	*	*	450R3D111-2					
111-3 Muffler #3 Cyl. 250mm	*	*	*	*	450R3D111-3					
116 M3 Nut for Spinner	*	*	*	*	*					
117 M4 Nut for Spinner	65117	120S117	120S117	120S117	*					
118 M5 Nut for Spinner	65118	120S118	120S118	120S118	*					
119 Rear Cover w/intro Motor M	*	*	*	*	*					
120 Saito Glow Plug SAIP400S	SAIP400S	SAIP400S	SAIP400S	SAIP400S	SAIP400S					
121 Crank Pin Spacer, Teflon	90R3121	170R3121	170R3121	32SR5E121	450R3D121					
122 Spray Bar "O" ring	170R3122	170R3122	170R3122	32SR5E122	*					
123 Rubber bush for PR cvr (L)	50123	50123	50123	50123	120S123					
124 Rubber bush for PR cvr (R)	50124	50124	50124	50124	120S124					
125 Muffler	*	*	*	*	*					
126 Needle Stopper & Nut	50126	50126	50126	50126	120S126					
128 Heat Sink	*	*	*	*	450R3D128					
129 Lub adaptor/scr screw M4x4	*	*	*	*	450R3D129					
130 Muffler, Adaptor Nut	*	170R3130	170R3130	*	450R3D130					
131 Throttle Valve ext adaptor	90R3131	170R3131	170R3131	*	*					
135 Prop wash/nut/anti-loos nut	56135	170R3135	170R3135	170R3135	450R3D135					
136 Intake Manifold Nut	*	*	*	*	450R3D136A					
139 Valve Guide	30S139	50139	50139	65139	120S139					
78B1 Flex Mut										

FA-90R3

824 Carburetor complete



FA-450R3-D



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.

(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).

Warranty Services

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, 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 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 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 _____



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