

WATERAX



MINI-STRIKER

Portable Single Stage Fire Pump

Instruction & Service Manual



WE MOVE WATER

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GENERAL INFORMATION

SPECIFICATIONS

WARNING

CAUTION:
Always use proper unleaded gasoline with a pump octane rating of 86 or higher.

This handbook includes specifications, performance data, operating instructions, normal servicing information and parts list for the **Mini-Striker** centrifugal fire control unit.

The **Mini-Striker** has been designed to meet all the requirements of advanced techniques in forest fire control. It can also be used for non-related fire control such as marine services, irrigation, foam applications, etc.

The **Mini-Striker** Pump end is a horizontal 1 stage centrifugal pump, precision built and corrosion resistant. Both the 38 mm (1 1/2") NPSH male suction and discharge connections are made to standard forestry thread specifications.

This small lightweight equipment is powered by the smallest and lightest one cylinder, four-cycle, air-cooled engine; ball bearings used throughout; equipped with rewind, pull-cord starter. This engine meets the strict emissions standards of the US EPA and CARB 2000 regulations.

- The improper use of this pump could result in serious injuries. Please read this entire manual before using your **Mini-Striker** pump unit.
- Always wear eyes and ears protection when operating the pump unit.
- Always check for sufficient oil quantity in crankcase before use.
- Be alert and never touch the muffler guard when the engine is running. Always allow enough time, after stopping the unit, for proper cooling of the muffler and surrounding parts.
- Always use the proper unleaded gasoline with a pump octane rating of 86 or higher to assure suitable operation of the 4 cycles engine.
- Refuel engine with care. Gasoline is extremely flammable, and gasoline vapour can explode. Refuel in a well-ventilated area, with the engine stopped.

Characteristics		Maximum Performance				
		Pressure		Discharge Flow		
Complete unit	19.3 lbs 8.75 kg					
Height	15 3/4" 40 cm	kPa	psi	L/min	IMP GPM	US GPM
Width	10 3/4" 27 cm	0	0	256	68	56
Length	15 3/4" 40 cm	172	25	194	43	51
Pump end only	6.6 lbs 3.0 kg	345	50	120	26	32
Max. engine power	2.5 HP 1.8 kW	517	75	29	6	8
Ignition	Transistorised magneto	586	85	0	0	0
Spark plug	CR5HSB (NGK) or U16FSR-UB (DENSO)					
Consumption approx.	0.9 L/hour (0.20 IMP gal, 0.24 US gal)					

DIRECTIONAL REFERENCES

SERIAL NUMBERS

All references to right side and left side of unit are made as they appear to operator when facing rewind starter, thus the carburetor is on left side and the muffler is on right side.

Pump unit serial number is stamped on the side of cylinder head. Engine serial number is stamped on the cylinder block.

These serial numbers are the key to various design details pertaining to the original manufacture of each unit. Therefore it is very important to specify serial numbers whenever ordering parts and tools or when requesting information.

IMPORTANT

DO NOT run engine at full speed until thoroughly warmed up.
DO NOT run pump when dry.
DO NOT use suction hose without foot valve strainer.
 Drain pump after every use.

STARTER

The starter is an automatic rewind type, simple and very reliable. Proper operating technique will add many hours of life to starter rope and to starter internal mechanism.

Grasp handle firmly and pull slowly until resistance (past compression), then continue to pull with a short, vigorous stroke. Pulling handle sideways causes excessive wear.

When engine starts, retain grip on handle and allow rope to rewind slowly.

Note: The rope should be replaced when wear is apparent.

Do not disconnect the ignition cable from the spark plug while engine is running, likewise never operate the starter with the ignition cable disconnected. To do so imposes a severe load on the coil and the possibility of rupturing the winding insulation.

OPERATING INSTRUCTIONS

Fuel: Unleaded gasoline with an octane rating of 86 or higher. **Do not** use stale or contaminated gasoline or an oil/gasoline mixture.

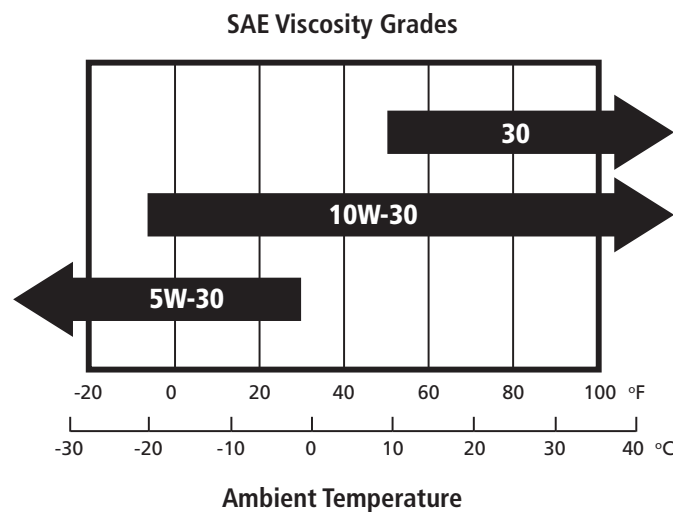
Occasionally you may hear a light "spark knock" or "pinging" while operating under heavy loads. This is no cause for concern. If you hear those noises at a steady engine speed, under normal load, change brands of gasoline. If spark knock or pinging persists, see your Wildfire dealer.

Running the engine with persistent spark knock or pinging can cause engine damage. This is misuse and the warranty does not cover parts damaged by misuse.

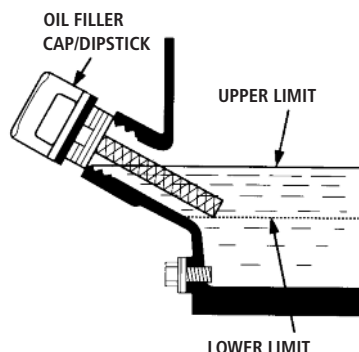
Recommended operating range of this engine is -15°C to 40°C (5°F to 104°F).

Lubrication: Fill crankcase to the proper level indicated on the oil dipstick with good quality clean engine oil 0.25 litre (0.26 quart).

Oil recommendations: Oil is a major factor affecting performance and service life. Use any 4-stroke high quality detergent oil having API service category "SF" or "SG" in this engine. SAE 10W-30 is recommended for general use. Other viscosity shown in the chart may be used when the average temperature in your area is within the recommended range.



OIL ALERT® SYSTEM (OPTIONAL)



PUMP UNIT

WARNING:
Exhaust gas contains
poisonous carbon
monoxide. Avoid inhalation
of exhaust gas. Never run
the Mini Striker in a closed
or confined area.

The Oil Alert® system is designed to prevent engine damage caused by an insufficient amount of oil in the crankcase. Before the oil level in the crankcase can fall below a safe limit, the Oil Alert® system will automatically stop the engine (the ignition switch will remain in the ON position).

If engine stops and will not restart, check engine oil level before trouble shooting other areas.

1. Place engine stopped in a level position.
2. Remove oil filler cap/dipstick and wipe it clean.
3. Insert and remove dipstick without screwing it into filler neck.
4. Check oil level shown on dipstick.
5. If oil level is low, fill to the edge of oil filler hole with the recommended oil.
6. Reinstall the oil filler cap/dipstick.

Controls:

There are only 4 controls which are used for normal operation: the FUEL VALVE LEVER, the IGNITION SWITCH, the THROTTLE LEVER and the CHOKE LEVER.

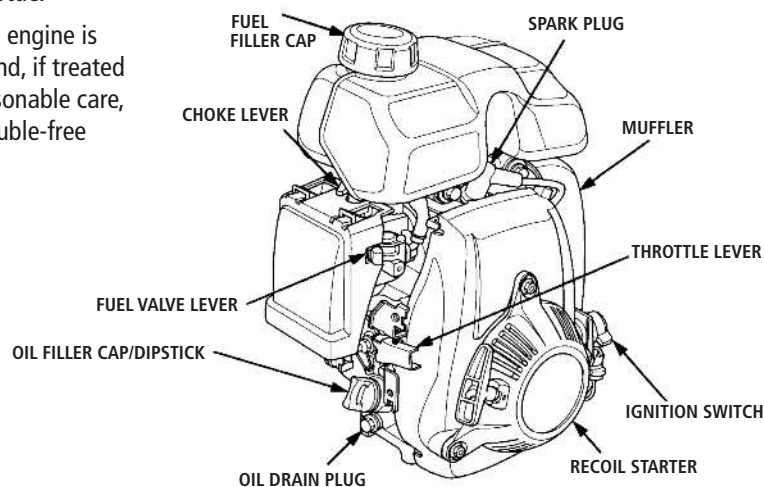
To start Mini-Striker unit :

1. Fill fuel supply tank with recommended fuel grade.
2. **Do not** forget to open fuel supply valve.
3. Connect discharge hose, nozzles, etc. to pump.
4. Connect foot valve strainer to male end of suction hose, then fill suction hose with water and connect to pump. Use universal hose coupling wrench to tighten coupling firmly.

Do not allow foot valve strainer to rest on bottom of lake or riverbed. Use a rope or other means to keep strainer at proper height, approximately 30 cm (1 foot) below water surface. If strainer is too close to the water surface, it will suck air and pump may lose prime. Check strainer frequently to make sure that it is not clogged with moss, leaves, etc. **Do not** lift strainer from water while the pump is operating.

5. Move the FUEL VALVE LEVER to "ON" position.
6. Close choke, if engine is cold.
7. Turn the IGNITION SWITCH to "ON" position.
8. Move throttle lever to 1/3 to 1/2 the full speed.
9. Slowly turn engine until resistance (past compression).
10. Give starter rope several quick, steady pulls until engine starts.
11. Slowly open the choke and allow engine to warm up for at least 2 minutes before using full throttle.

The Mini-Striker's engine is precision fitted and, if treated with normal, reasonable care, will give long trouble-free service.



COLD WEATHER

IMPORTANT:
In cold operation it is good practice to put a small quantity of aluminium compatible antifreeze into pump end through discharge immediately after use to ensure against damage from freezing.

To stop Mini-Striker unit:

1. Move throttle lever to "SLOW" position.
2. Move FUEL VALVE LEVER to the "OFF" position and wait for engine to stop.
3. Turn IGNITION SWITCH to the "OFF" position.

Recommended Procedure for Cold Weather or Prolonged Storage

The following procedure is recommended to assure proper protection of the engine if the engine is to be left idle for prolonged periods between use or if there is the possibility that the engine may be stored in an unheated area of where freezing temperatures may occur.

1. Move FUEL VALVE LEVER to the "OFF" position.
2. With pump unit running at approximately ½ throttle, allow engine to run until all fuel has left the carburetor and the engine comes to a stop.
3. Remove spark plug.
4. Rotate crankshaft until piston is at top dead centre.
5. Pour 30 ml (1 oz) of oil into spark plug opening.

It is preferable to keep the pump unit in dry storage above freezing temperature. However, as this is not always possible, some slight rusting may occur, which should have no detrimental effect on the life or performance of the unit.

To Remove Pump End from Engine:

1. Remove hex cap screws #16 on suction cover.
2. Remove suction cover #15.
3. Unscrew impeller #11 from pump shaft, while holding shaft.
4. Remove shaft seal #9.
5. Remove pump body screws #7.
6. Pull pump body #6 from engine.
7. Remove hex socket screw #12 from pump end shaft.
8. Remove shaft #14.

To Replace Pump End to Engine:

1. Apply anti-seize grease on engine shaft.
2. Apply vaseline on O-ring #10 and install on pump shaft #14.
3. Install key #8 with pump shaft #14 on engine shaft.
4. Apply some locktite to hex socket screw #12 and torque on pump shaft.
5. Apply vaseline inside rubber seal #9A and place inside diameter at bottom of pump body.
6. Install metallic seal #9B with the uniform surface up.
7. Install pump body #6 on engine and tighten screws #7 and #23.
8. Apply vaseline inside the carbon seal #9.
9. Install carbon seal #9C and spring #9D on pump shaft.
10. Apply anti-seize grease on shaft threads and tighten impeller #11.
11. Apply vaseline on suction cover #15 and torque screws #16 and #17.

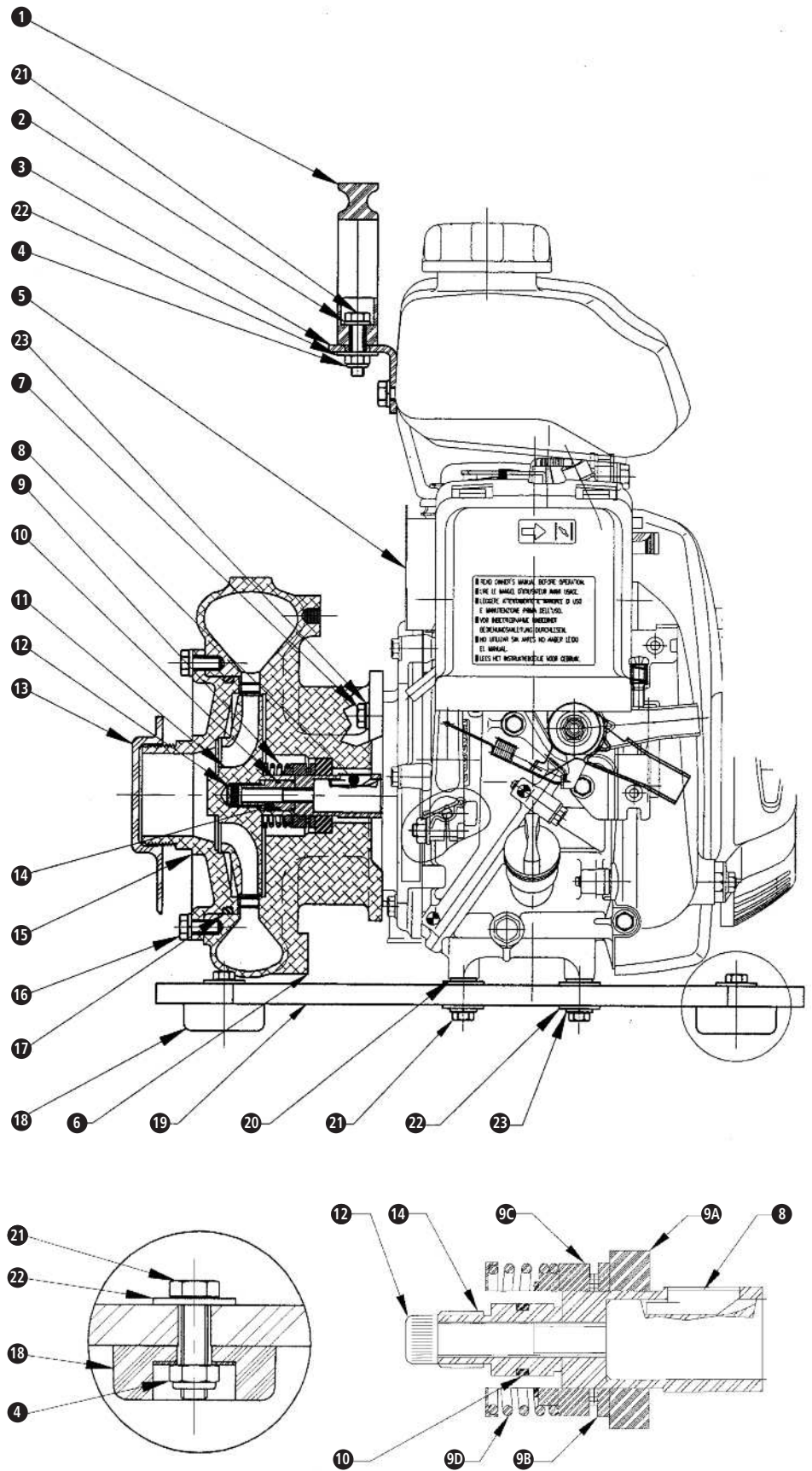
To Drain Pump:

It is recommended that the pump be drained after every use. **This is a MUST during cold weather, to prevent damage to pump, due to freezing.**

1. Remove discharge and suction caps.
2. Drain pump by tilting and rotating pump unit several times.
3. Replace discharge and suction caps.

Ref. #	Part #	Description	Qty
—	12-2D	Shaft sub-assembly (includes parts with * and **, 7 items)	—
—	12-2E	Shaft sub-assembly (includes parts with **, 4 items)	—
22	12-50	Locknut, stainless	1
23	12-49*	Lockwasher, stainless	1
24	12-11*	Impeller	1
25	12-9	Distributor	2
26	12-7*	Impeller	3
27	12-6	Distributor	1
28	B-5312-4	O-ring for drive bushing	1
29	12-4AS	Drive bushing (includes B-5312-4)	1
30	12-48**	Double row ball bearing	1
31	12-3**	Retaining ring for bearing	1
32	12-25	Mach. screw flat Phillips, stainless	6
33	12-27	O-ring	2
34	12-26	O-ring	1
35	12-17	Coupling - buffer	1
36	12-2C**	Shaft - riveted assembly	1

Items 12-3, 12-4AS, 12-6, 12-7, 12-9 and 12-11 are available with a corrosion resistant coating for salted water or foam application. Just add the letters "CR" at the end of the part number.



TROUBLESHOOTING CHART

ENGINE DOES NOT START OR STARTS MOMENTARILY THEN STOPS

Possible cause	Remedy
Fuel supply tank empty	Refill fuel tank
Leak in fuel supply system	Tighten or replace fittings
Engine oil level below the safe limit	* Refill to outer edge of oil filler hole
Spark plug fouled or defective	* Clean or replace
Stop switch or cable shorted	* Inspect and/or change
Weak or intermittent spark	* Inspect and/or change
Ignition coil faulty, or with incorrect air gap	* Inspect ignition coil and/or readjust
Dirty fuel filter	* Inspect and clean
Water or dirt in fuel system	* Drain; flush thoroughly
Carburetor mountings loose or misadjusted	* Tighten mountings and/or readjust

ENGINE RUNS IRREGULARLY OR MISSES

Possible cause	Remedy
Fuel supply tank empty	Refill fuel tank
Leak in fuel supply system	Tighten or replace fittings
Spark plug fouled or defective	* Clean or replace
Weak or intermittent spark	* Inspect and/or change
Ignition coil faulty, or with incorrect air gap	* Inspect ignition coil and/or readjust
Dirty fuel filter	* Inspect and clean
Water or dirt in fuel system	* Drain; flush thoroughly
Carburetor mountings loose or misadjusted	* Tighten mountings and/or readjust
Air filter dirty	* Clean or replace
Governor out of adjustment	* Readjust
Valve clearance incorrect	* Readjust
Excessive carbon deposits in the combustion chamber	Decarbonise

ENGINE DOES NOT IDLE PROPERLY

Possible cause	Remedy
Check whether the choke is open	Open the choke fully
Spark plug fouled or defective	* Clean or replace
Weak or intermittent spark	* Inspect and/or change
Carburetor mountings loose or misadjusted	* Tighten mountings and/or readjust
Idle mixture screw misadjusted	* Adjust mixture screw
Ignition coil faulty, or with incorrect air gap	* Inspect ignition coil and/or readjust
Governor out of adjustment	* Readjust
Excessive carbon deposits in the combustion chamber	Decarbonise

ENGINE DOES NOT DEVELOP NORMAL POWER AND/OR OVERHEATS

Possible cause	Remedy
Check whether the choke is open	Open the choke fully
Air filter dirty	* Clean or replace
Carburetor main jet clogged	Clean the main jet
Spark plug fouled or defective	* Clean or replace
Weak or intermittent spark	* Inspect and/or change
Carburetor mountings loose or misadjusted	* Tighten mountings and/or readjust
Idle mixture screw misadjusted	* Adjust mixture screw
Excessive carbon deposits in the combustion chamber	Decarbonise
Muffler blocked or dirty	* Clean and/or replace
Governor out of adjustment	* Readjust

*Refer to "HONDA GXH50 Shop Manual" for more information.

PUMP TEST KIT

Ref. #	Part #	Description	Qty
—	12-2D	Shaft sub-assembly (includes parts with * and **, 7 items)	—
—	12-2E	Shaft sub-assembly (includes parts with **, 4 items)	—
22	12-50	Locknut, stainless	1
23	12-49*	Lockwasher, stainless	1
24	12-11*	Impeller	1
25	12-9	Distributor	2
26	12-7*	Impeller	3
27	12-6	Distributor	1
28	B-5312-4	O-ring for drive bushing	1
29	12-4AS	Drive bushing (includes B-5312-4)	1
30	12-48**	Double row ball bearing	1
31	12-3**	Retaining ring for bearing	1
32	12-25	Mach. screw flat Phillips, stainless	6
33	12-27	O-ring	2
34	12-26	O-ring	1
35	12-17	Coupling - buffer	1
36	12-2C**	Shaft – riveted assembly	1

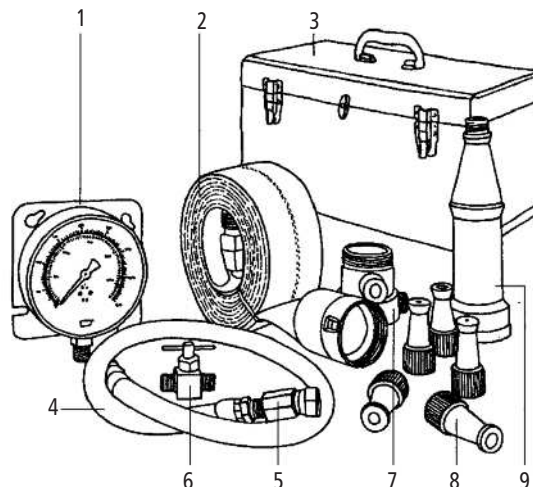
Items 12-3, 12-4AS, 12-6, 12-7, 12-9 and 12-11 are available with a corrosion resistant coating for salted water or foam application. Just add the letters "CR" at the end of the part number.

GOVERNOR SYSTEM

WARNING:
Should the pump lose its prime, the engine should be stopped as soon as possible.

Testing Procedure

The best way to check your pump unit is to make an actual performance test. A test kit consisting of pressure gauge, pressure gauge adapter, 3 m (10') length of discharge hose, a nozzle and a calibrated set of nozzle tips, is available. Your **Mini-Striker** is in satisfactory running condition if, when using the various calibrated tips, the pressures agree with the following chart:



NOZZLE SIZE	1/2" (12.7 mm)	7/16" (11 mm)	3/8" (9.5 mm)	5/16" (8 mm)	1/4" (6 mm)	1/8" (3 mm)
MINIMAL PRESSURE RANGE	145-150 psi 1000-1034 kPa	215-220 psi 1482-1517 kPa	275-280 psi 1896-1931 kPa	330-335 psi 2275-2310 kPa	2275-2310 psi 2586-2620 kPa	405-410 psi 2792-2827 kPa

Governor system (overspeeding) protection may occur if:

1. Pump not primed properly.

- Suction hose and/or pump body not completely filled with water.
- A bend in the suction hose located higher than the pump suction inlet, causing an air lock. (The suction hose between the pump and water supply source must have a downward slope.)

2. Loose suction hose coupling.

3. Foot valve strainer clogged or too close to surface of water.

4. Pump loses prime.

- Due to lack of water, air lock may form in the suction hose when pump unit works against a high delivery head. If this happens, disconnect the discharge hose from the pump then reprime pump in the normal manner.
- Pump runs out of water, either because of lack of sufficient water supply or by attempting to pump water from a shallow or choppy water source.

The foot valve must remain at least a foot (30 cm) under the water surface while pump is operating.

All suction couplings, including foot valve, must be wrench tightened. Proper fitting gaskets must be used in all coupled joints. Worn or dried out gaskets should be replaced with new gaskets.

The governor system will not stop the engine. For damage protection, the governor will avoid engine of higher speed than 7800 ± 150 RPM without load.

The Governor will not interfere with normal operation of the unit and will also allow the use of small nozzle tips as well as complete pump shut-off for short periods of time.

REGULAR MAINTENANCE

MAINTENANCE CHECK LIST

Regular maintenance is a schedule of continuous systematic maintenance, designed to prevent frequent or major breakdowns before they occur.

Maintenance on a fire pump unit should not be done on the fireline. Therefore, check your pump unit immediately after use.

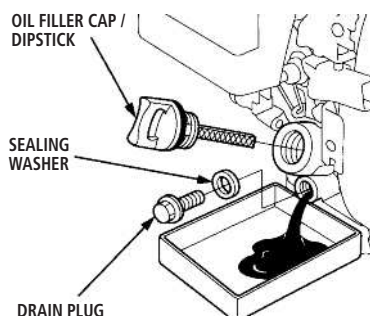
1. Clean unit thoroughly.
2. Check and clean air filter element (foam) if required.
3. Remove any accumulated dirt or debris around the muffler and recoil starter.
4. Clean air intake casing and cover with compressed air.
5. Check the engine oil level.
6. Make sure cooling passages and cylinder fins are clean.
7. Make sure spark plug is cleaned and has proper gap setting.
8. Check stop-switch for proper operation
9. Check throttle and choke control for proper operation.
10. Check fuel line and fittings for signs of wear, etc.
11. Check starter cable and mechanisms and replace if it show excessive wear.
12. Check pump end.
13. Check carburetor adjustments.
14. Operate pump unit and check general performance.
15. Note any performance irregularities of any abnormal mechanical sounds.
16. Make sure pump seal is not leaking.
17. Make sure that all necessary tools, spares and accessories are with pump unit. It is strongly suggested to always have an extra spark plug on hand.

Perform at every indicated month or operation hour interval, whichever comes first.		Before use	First month or 10 hrs	Every season or 25 hrs	Every season or 50 hrs	Every 100 hrs	Every 200 hrs
Engine oil	Check – Refill	●					
	Replace		●		● (1)		
Air filter	Check	●					
	Clean			● (2)			
Fuel tank and filter	Clean					●	
Spark plug	Clean-adjust					●	
Spark arrester	Clean or replace					●	
Valve clearance	Inspect - Adjust						●
Fuel line	Inspect	Every 2 years					
	Replace	Every 4 years					

NOTE:

- (1) Change engine oil every 25 hours when used under heavy load or in high ambient temperature.
- (2) Service more frequently when used in dusty areas.

ENGINE OIL



SPARK PLUG

AIR FILTER

IMPORTANT:
DO NOT use gasoline to
clean the air filter.

Engine Overhaul Service Procedure

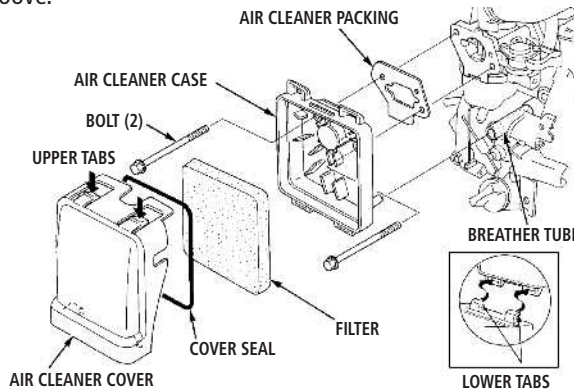
1. While the engine is warm, remove the oil filler cap/dipstick.
2. Place a suitable container under the drain plug and remove drain plug and sealing washer.
3. Drain the used oil and then reinstall sealing washer and drain plug.
4. With the engine in a level position, fill to outer edge of oil filler hole with the recommended oil.
5. Screw in the oil filler cap/dipstick securely.

Operation with defective or wrong type plug will be reflected in Mini-Striker engine's performance: as indicated by hard starting, fouling, missing, overheating, pre-ignition or lack of normal power. Therefore, at time of each regular maintenance inspection and whenever check of ignition system indicates that spark plug is in need of attention, remove for inspection and service as follows:

1. Disconnect spark plug cap, and remove any dirt around spark plug area.
2. Remove spark plug with a 5/8" spark plug wrench.
3. Clean spark plug with a wire brush and inspect carefully. If tip of insulator core is rough, cracked, broken or blistered, or if electrodes are burned away to the extent that they are too thin and can not be satisfactorily adjusted to recommended gap, replace with new plug.
4. Reinstall spark plug. Start threads one or two turns with fingers to avoid cross threading and torque to recommended specification.
5. Reconnect spark plug cap.

A dirty air filter restricts airflow to the carburetor, causing the engine to run irregularly and lose power due to an over-rich mixture entering carburetor. Therefore, whenever filter becomes dirty, or whenever any of the above conditions occur, remove the filter element as follows:

1. Press latch tabs on top of the air cleaner cover and remove cover.
2. If required, clean filter in warm soapy water, rinse and dry thoroughly. Then dip it in clean engine oil, and squeeze out any excess oil.
3. Replace filter if damaged or cannot be cleaned thoroughly.
4. Clean the air cleaner cover making sure no dust or dirt enters in the engine.
5. Reinstall the filter and the air cleaner cover ensuring cover seal is properly set in its groove.



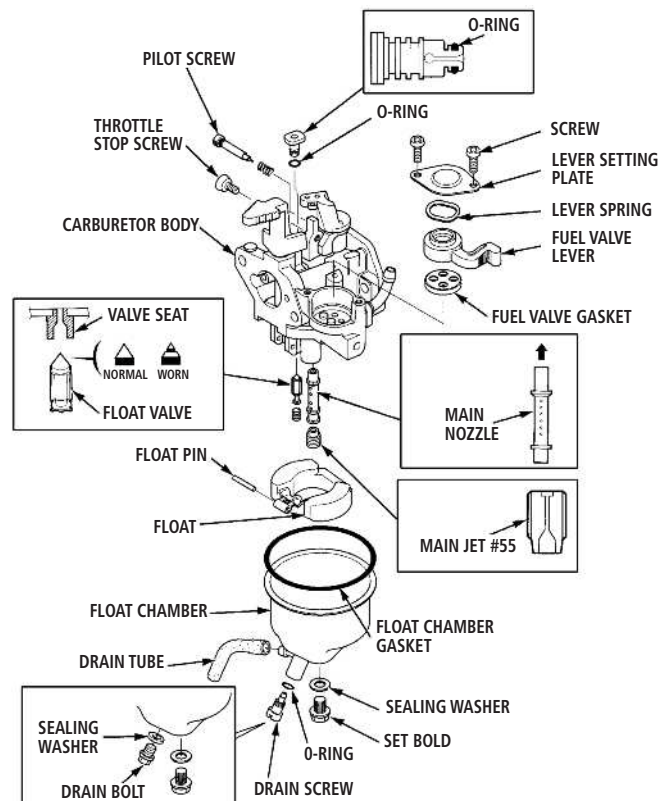
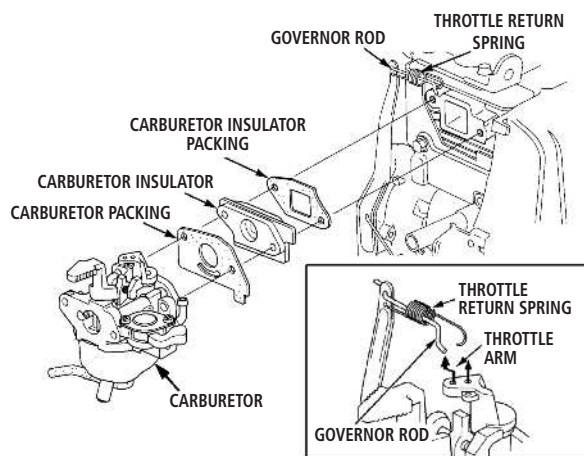
CARBURETOR

Operation with defective carburetor is reflected in engine performance: as indicated by engine not starting, momentarily starting then stopping, running irregularly or missing, backfiring, not properly idling or not developing normal power and/or overheating. Therefore, at time of each regular maintenance inspection and whenever check of carburetor indicates it is in need of attention proceed as follows:

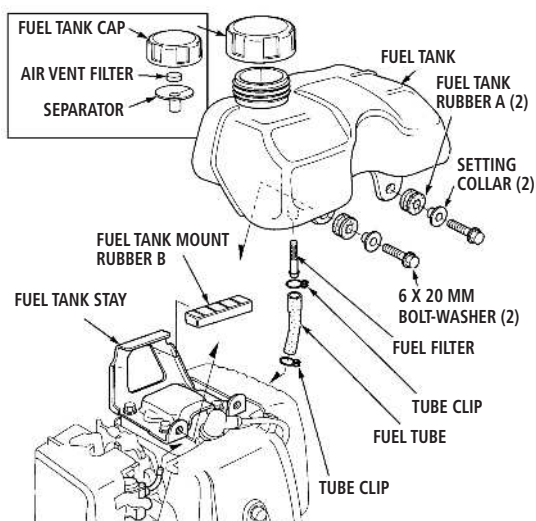
1. With engine warm up and idling, turn pilot screw to setting producing the highest idle speed. Correct pilot screw opening is approximately 1 1/8 turns out from the fully closed position.
2. Then turn throttle stop screw to obtain a standard idle speed of 2500 ± 200 RPM.

If more than an adjustment is required proceed as follows:

1. Remove air cleaner and air return packing.
2. Disconnect throttle return spring
3. Twist carburetor and disconnect governor rod from throttle valve.
4. Remove carefully the pilot jet and blow compressed air to clean passage. Remove the lever setting plate, lever spring and fuel valve lever to check the fuel valve gasket. If worn or damaged replace it.
5. Remove set bolt, float chamber and float pin.
6. Remove main jet #55 and main nozzle. Blow compressed air to clean the passage.
7. Remove spring and float valve. Check spring and tip for wear.
8. Check valve seat passage.
9. Clean carburetor body by blowing compressed air.
10. Reassemble float valve and spring operation.
11. Reassemble main nozzle.
12. Reassemble float and check operation by lightly pushing with a finger
13. With carburetor upright, measure the distance between the float top and carburetor body when the float just touches the float valve. Standard float height is 12.0 mm (0.47 in). If out of specification, replace the float.
14. Reassemble float chamber and tighten set bolt securely (check for gasoline leakage).
15. Reinstall the fuel valve gasket, valve lever, lever spring and lever setting plate.
16. Apply light coat of oil to O-ring before reinstalling pilot jet.
17. Reinstall carburetor in reverse order of removal.

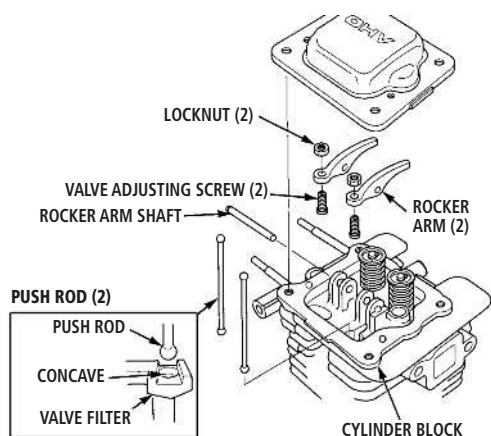
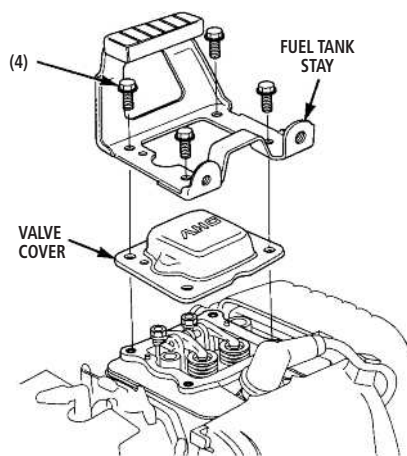


FUEL SYSTEM



1. Remove fuel tank cap and clean air vent filter with warm soapy water.
2. Move fuel valve lever to "ON" position
3. Loosen carburetor drain screw, and drain carburetor.
4. Disconnect fuel tube.
5. Remove fuel filter and clean by blowing compressed air.
6. Check fuel filter for blockage and damage. Replace if necessary.
7. Clean fuel tank and dry thoroughly.
8. Check fuel tube for deterioration, cracks or signs of leakage. Replace if necessary.
9. Set fuel filter in the fuel tank and reconnect fuel tank tube.
10. Reinstall fuel tank on rubber mounts and secure with setting collar and bolt-washer (10 N•m / 84 inch-lbs (7 ft-lbs))
11. Check for leakage.

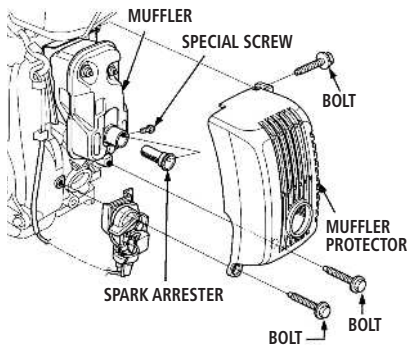
VALVES



Operation with misadjusted valve clearance is reflected in engine performance: as indicated by engine not starting, momentarily starting then stopping, running irregularly or missing, backfiring, not properly idling or not developing normal power and/or overheating. Therefore, at time of each regular maintenance inspection and whenever check of valve clearance indicates it is in need of attention, remove for inspection and service as follow:

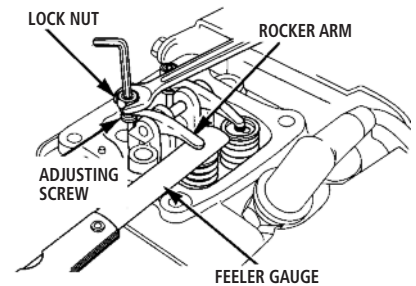
1. Remove fuel tank.
2. Remove fuel tank stay.
3. Carefully pry off the valve cover (if deformed, replace the valve cover).
4. Pull on the recoil starter rope and set piston at top dead centre of compression stroke. Align the cut out in flywheel fin or the boss with alignment mark "△" on fan cover. (If the exhaust side opens when the cutout in the flywheel fin is in line with the alignment mark, turn recoil starter pulley one turn and align marks).
5. Insert a feeler gauge between the rocker arm and the valve and measure its clearance.
6. Adjust if necessary as follows:
 - a) Loosen adjustment screw lock nut and adjust valve clearance by turning adjusting screw.
 - b) Hold adjusting screw with a socket wrench and tighten the lock nut to specified torque.
 - c) Torque to 5.5 N•m (4.0 lbf•ft)
7. Recheck the valve clearance before reinstalling the removed parts in reverse order of removal (apply a bead of 2.0 mm (0.08 in) of liquid packing (Three Bond 1207B or equivalent) to cylinder block before reinstalling valve cover.

ROCKER ARMS AND PUSH RODS



SPARK ARRESTER

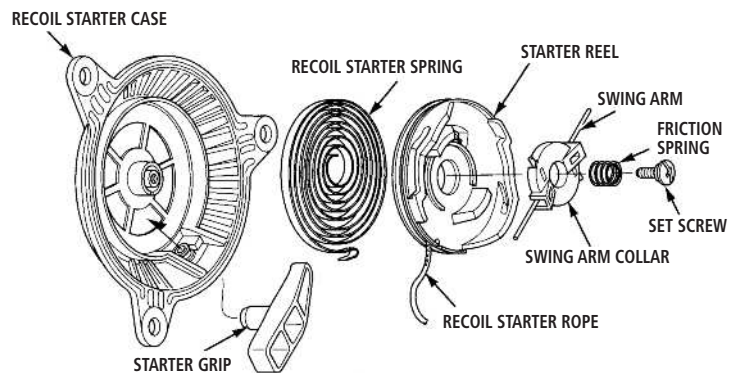
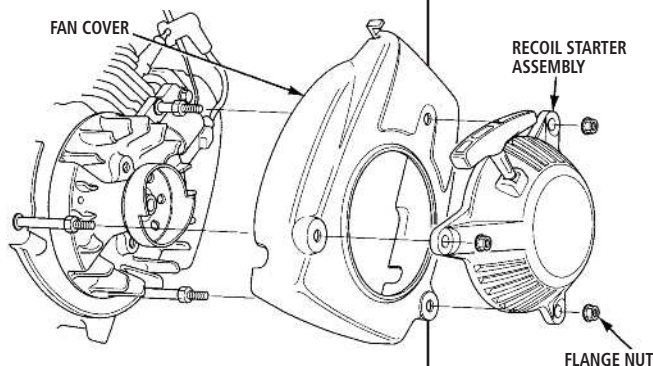
1. Remove fuel tank, fuel tank stay and carefully pry off the valve cover (if deformed, replace it).
2. Remove the rocker arm shaft.
3. Check for wear and bend at both ends of the push rod. Replace if needed.
4. Reinstall push rod and carefully align into concave in valve adjusting screw and in valve lifter.
5. Readjust the valves and reinstall the removed parts.



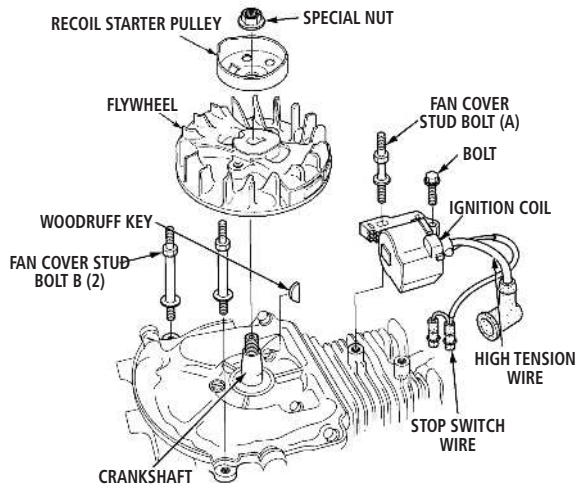
1. While the muffler is cold, remove bolts and muffler protector.
2. Remove the special screw from spark arrester, and remove spark arrester from muffler.
3. Brush off the carbon deposits from spark arrester screen. Be careful to avoid damaging the screen.
4. Check muffler for carbon deposits. If necessary remove muffler and tap outer flange with a plastic hammer. Do not tap on seal flange. If seal flange has dents or damage, replace muffler.
5. Reinstall in reverse order of removal.

RECOIL STARTER

1. Remove recoil starter.
2. While wearing heavy gloves take care not to allow the recoil starter spring to pop out when disassembling.
3. To reassemble, set recoil starter spring hook into starter reel groove.
4. Pass starter rope through hole in recoil starter reel and make a knot at rope end.
5. Wind rope on recoil starter reel in direction of arrow.
6. Align inner end hook of the recoil starter spring with starter case groove and install.
7. Pass starter rope through cutout in recoil starter case and turn the recoil starter reel 3 turns to preload spring.
8. Pull out the rope end through recoil starter case hole and through starter grip before making a knot.
9. Install swing arm, swing arm collar and friction spring before securing with set screw.



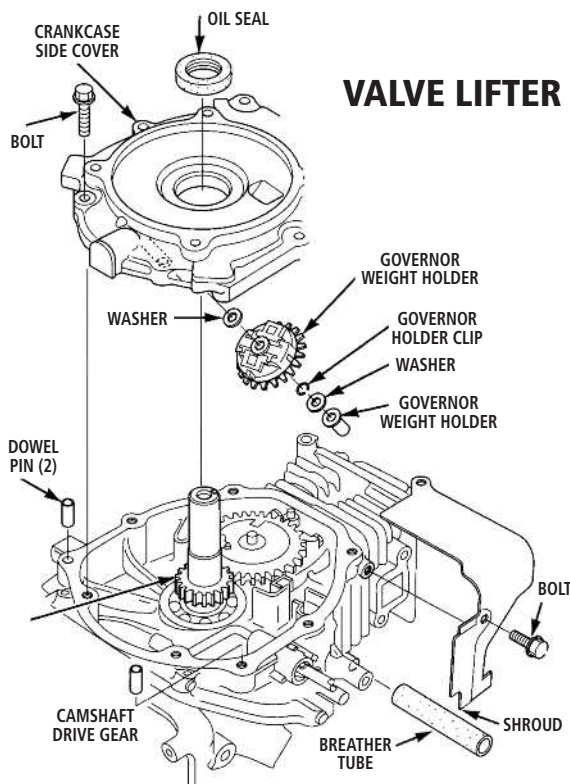
FLYWHEEL AND IGNITION COIL



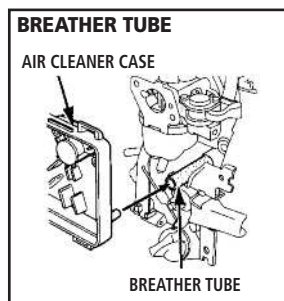
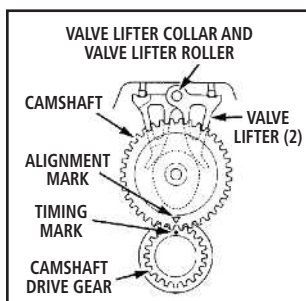
Efficient engine cooling is accomplished by a fan attached to the flywheel. This fan pulls air through the rewind starter that forces air around the cylinder and through the spaces between the cylinder and cylinder head fins. In time, the cooling air passages will become partially clogged and fins will become coated with dirt, therefore reducing the cooling efficiency. Whenever this situation occurs proceed as follow:

1. Remove recoil starter assembly and the fan cover.
2. Remove nut holding the recoil starter pulley while holding the flywheel with a strap wrench.
3. Remove the recoil starter then the flywheel with a flywheel puller
4. Clean crankshaft of dirt, oil, grease and other foreign material.
5. Clean flywheel and ensure no foreign material are on the magnetic part.
6. Check ignition coil wires for tears and damage.
7. Reinstall the flywheel over crankshaft and ensure the key groove is properly aligned.
8. Apply light coat of oil to crankshaft threads and tighten special nut to specified torque.
9. Reinstall the ignition coil. Make sure the air gap between the magnetic part of flywheel and the ignition coil is within tolerance. The clearance should be equal at both ends of the ignition coil.
10. Reinstall fan cover and recoil starter assembly.

VALVE LIFTER



1. Insert a screwdriver into concave provided and remove crankcase side cover.
2. Remove the governor weight assembly from governor shaft.
3. Remove the camshaft and valve lifter components.
4. Inspect and measure the I.D. of the camshaft roller bearing and valve lifter bearing (compare with engine standard and service limit).
5. Inspect and measure camshaft I.D. and its height. Compare with engine standard and service limit.
6. Inspect and measure the camshaft roller O.D. and valve lifter roller O.D. Compare with engine standard and service limit.
7. Inspect and measure the valve lifter I.D. and compare with engine standard and service limit.
8. Inspect and measure the rocker arm I.D. and compare with engine standard and service limit.
9. Inspect and measure the rocker arm shaft O.D. and compare with engine standard and service limit.
10. Inspect and measure the rocker arm shaft bearing I.D. and compare with engine standard and service limit.
11. Clean mating surfaces of crankcase side cover and cylinder block.
12. Reassemble the valve lifter assembly and camshaft (make sure the mark on the camshaft drive gear is properly aligned with the timing mark on the camshaft).
13. Open the governor weight holder and insert the slider into the shaft. Check for smooth operation.
14. Apply a bead of 2,0 mm (0.08 in) of liquid packing (Three Bond 1216E or equivalent) to cylinder block before reinstalling crankcase side cover.

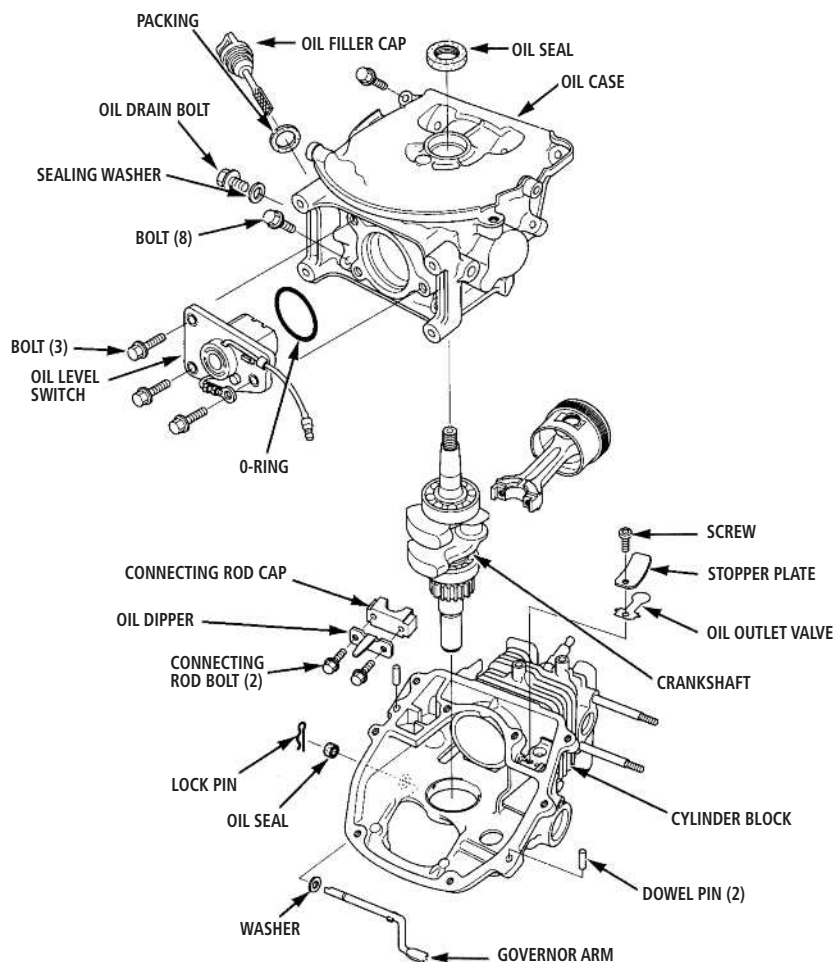


VALVE LIFTER cont'd

OIL CASE AND CRANKSHAFT

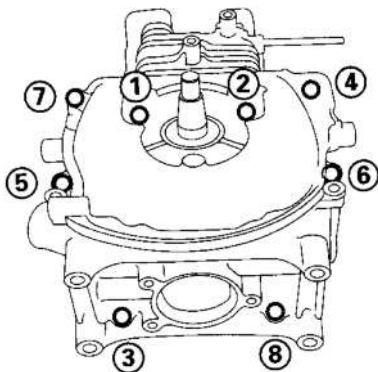
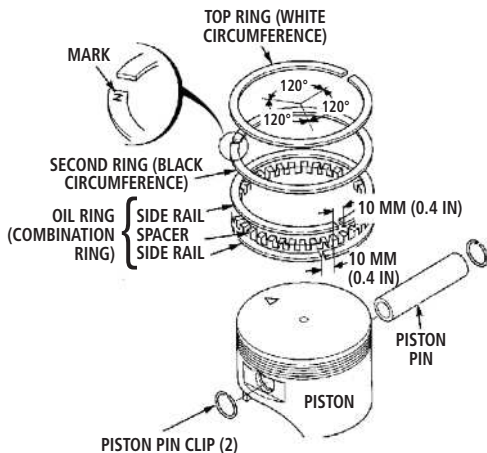
15. Reinstall crankcase side cover then loosely tighten the bolts. Tighten bolts diagonally in 2 or 3 steps to specified torque.
16. Drive in the oil seal to the specified depth using proper tool.
17. Reinstall remaining component in reverse order of removal.
18. Wait 30 minutes after assembly before adding oil into crankcase.

1. Set the piston at top dead center and remove oil case screws.
2. Insert a screwdriver into concave provided and remove oil case.
3. Clean mating surfaces of oil case and cylinder block.
4. Disconnect piston from connecting rod assembly.
5. Remove inlet and outlet valves. Push down and slide retainer sideways, so the valve stem slips through the valve spring retainer.
6. Remove carbon deposits from inlet and outlet valves. Make sure not to interchange the inlet and outlet valves.
7. Check valve head for pitting and damage (replace in necessary).
8. Insert a protective lining of thick paper or equivalent material inside the cylinder.
9. Attach a cleaning brush to an electric drill and clean combustion chamber.
10. Measure the piston skirt O.D. at a point 10 mm (0.4 in) from bottom of skirt and 90° to piston pin bore and compare with engine standard and service limit.
11. Measure the cylinder I.D. at three levels perpendicularly and in parallel to piston pin. Take the maximum reading of each measurement to determine the cylinder I.D. Compare with engine standard and service limit.



OIL CASE AND CRANKSHAFT cont'd

PISTON/CONNECTING ROD ASSEMBLY



12. Calculate the piston to cylinder clearance and compare with engine standard and service limit.
13. Inspect and measure the piston rings (top ring and second ring) and compare with engine standard and service limit.
14. Measure ring side clearance and compare with engine standard and service limit.
15. Insert the piston ring in the cylinder and position using the piston. Then measure the piston ring end gap and compare with engine standard and service limit.
16. Measure the piston pin O.D. and compare with engine standard and service limit.
17. Measure the piston pin bore I.D. and compare with engine standard and service limit.
18. Measure connecting rod small end I.D. and compare with engine standard and service limit.
19. Measure connecting rod big end I.D. and compare with engine standard and service limit.
20. Measure crank pin O.D. and compare with engine standard and service limit.
21. Clean the crank pin and connecting rod big end.
22. Set a plastigauge in the axial direction on crank shaft pin. Install connecting rod cap and tighten the connecting rod bolt to the specified torque (see torque values table).
23. Remove the connecting rod cap and measure the plastigauge with the plastigauge scale. If it exceeds the service limit replace the connecting rod and recheck the clearance. If the clearance measured using a new connecting rod, exceeds the service limit, replace the crankshaft.
24. Measure the connecting rod big end side clearance using a feeler gauge and compare with engine standard and service limit.
25. Measure the valve spring free length and compare with engine standard and service limit.
26. Measure the inlet and outlet valve stem O.D. and compare with engine standard and service limit.
27. Measure the inlet and outlet valve guide I.D. and compare with engine standard and service limit.
28. Measure the inlet and outlet valve stem-to-guide clearance and compare with engine standard and service limit.
29. Clean the cylinder block thoroughly before reassembling.
30. Reassemble the piston as shown on the drawing and following the recommendation below.
 - a) Ensure top ring (white circumference) is installed with chamfer facing up.
 - b) Ensure second ring (black circumference) is installed with chamfer facing up.
 - c) Do not interchange the top and second rings.
 - d) After assembly, check for smooth movement of piston rings.
 - e) Stagger the piston ring end gaps 120° apart (make sure it is not aligned with the piston pin).
 - f) Stagger the side rail end gap to the right or left of spacer end gap.
31. Reassemble the inlet and outlet valves.
32. Insert the piston inside the cylinder.
33. Clean the oil outlet valve and stopper plate.
34. Install the oil outlet valve and the stopper plate aligning the projection with the groove and chamfer in the cylinder block.
35. Reassemble the piston to connecting rod assembly (ensure markings on the connecting rod and the piston are aligned). Make sure the oil dipper is facing the flywheel side. Install the connecting rod cap and tighten connecting rod bolt to specified torque.
36. Apply a bead of 2.0 mm (0.08 in) of liquid packing (Three Bond 1216E or equivalent) to cylinder block before reinstalling oil case.
37. Reinstall crankcase side cover then loosely tighten the bolts. Tighten bolts to the specified torque in the numbered sequence shown.
38. Drive in the oil seal to the specified depth using proper tool.

TORQUE VALUES

PUMP END

Pump shaft hex. socket screw (FAST-44)	5.7 – 6.2 N•m / 50-55 inch-lbs (4.2 – 4.6 ft-lbs)
Pump body hex head screw (FAST-46)	7.9 - 8.5 N•m / 70-75 inch-lbs (5.8 – 6.3 ft-lbs)
Suction cover hex. cap screw (FAST-18)	7.9 - 8.5 N•m / 70-75 inch-lbs (5.8 – 6.3 ft-lbs)
Mounting board hex. cap screw (FAST-21)	6.0 N m / 52 inch-lbs (4.3 ft-lbs)

ENGINE

Spark plug	12.0 N•m / 108 inch-lbs (9 ft-lbs)	Carburetor drain bolt	4.5 N•m / 40 inch-lbs (3.3 ft-lbs)
Crankcase side cover	7.5 N•m / 65 inch-lbs (5.4 ft-lbs)	Carburetor drain screw	1.5 N•m / 13 inch-lbs (1.1 ft-lbs)
Oil case bolt	7.5 N•m / 65 inch-lbs (5.4 ft-lbs)	Carburetor drain knob	1.2 N•m / 11 inch-lbs (0.9 ft-lbs)
Connecting rod bolt	6.0 N•m / 52 inch-lbs (4.3 ft-lbs)	Governor arm nut	7.0 N•m / 61 inch-lbs (5.1 ft-lbs)
Valve cover bolt	6.0 N•m / 52 inch-lbs (4.3 ft-lbs)	Flange bolt and nut	3.5 N•m / 30 inch-lbs (2.5 ft-lbs)
Oil drain bolt	11.0 N•m / 96 inch-lbs (8.0 ft-lbs)		5.5 N•m / 48 inch-lbs (4.0 ft-lbs)
Flywheel hub nut	21.5 N•m / 186 inch-lbs (15.5 ft-lbs)		10.0 N•m / 84 inch-lbs (7.0 ft-lbs)
Fuel tank bolt	10.0 N•m / 84 inch-lbs (7.0 ft-lbs)	Screw	1.0 N•m / 8 inch-lbs (0.7 ft-lbs)
Ignition coil bolt	6.0 N•m / 52 inch-lbs (4.3 ft-lbs)		2.0 N•m / 17 inch-lbs (1.4 ft-lbs)
Fan cover stud bolt	6.0 N•m / 52 inch-lbs (4.3 ft-lbs)	Self-tapping flange bolt	5.5 N•m / 48 inch-lbs (4.0 ft-lbs)

CLEARANCE DATA
& LIMIT (ENGINE)

PART	ITEM	STANDARD	SERVICE LIMIT
Engine	Maximum speed without load	7 800 ± 150 RPM	
	Idle speed	2 500 ± 200 RPM	
	Cylinder compression	0.42 MPa (61 psi) @ 1000 RPM	
Cylinder	Sleeve I.D.	41.800 – 41.815 mm (1.6457 – 1.6463 in)	41.900 mm (1.6496 in)
Piston	Skirt O.D.	41.770 – 41.790 mm (1.6445 – 1.6453 in)	41.700 mm (1.6417 in)
	Piston-to-cylinder clearance	0.010 – 0.045 mm (0.0004 – 0.0018 in)	0.120 mm (0.0047 in)
	Pin bore I.D.	10.002 – 10.008 mm (0.3938 – 0.3940 in)	10.050 mm (0.3957 in)
Piston pin	O.D.	9.994 – 10.000 mm (0.3935 – 0.3937 in)	9.950 mm (0.3917 in)
Piston rings	Pin-to-piston clearance	0.002 – 0.014 mm (0.0001 – 0.0006 in)	0.100 mm (0.0039 in)
	Ring width (Top)	0.77 – 0.79 mm (0.030 – 0.031 in)	0.720 mm (0.0283 in)
	(Second)	0.97 – 0.99 mm (0.038 – 0.039 in)	0.920 mm (0.0362 in)
	Ring side clearance (Top/Second)	0.015 – 0.050 mm (0.0006 – 0.0020 in)	0.120 mm (0.0047 in)
	Ring end gap (Top/Second)	0.150 – 0.300 mm (0.0059 – 0.0118 in)	0.600 mm (0.0236 in)
Connecting rod	Small end I.D.	10.006 – 10.017 mm (0.3939 – 0.3944 in)	10.050 mm (0.3957 in)
	Big end I.D.	15.000 – 15.011 mm (0.5906 – 0.5910 in)	15.040 mm (0.5921 in)
	Big end oil clearance	0.016 – 0.038 mm (0.0006 – 0.0015 in)	0.100 mm (0.0039 in)
	Big end side clearance	0.1 – 0.6 mm (0.004 – 0.024 in)	0.8 mm (0.031 in)
Crankshaft	Crank pin O.D.	14.973 – 14.984 mm (0.5895 – 0.5899 in)	14.940 mm (0.5882 in)
Valves	Valve clearance (IN)	0.06 – 0.10 mm (0.0024 – 0.0039 in)	-----
	(EX)	0.09 – 0.13 mm (0.0035 – 0.0051 in)	-----
	Stem O.D. (IN)	3.970 – 3.985 mm (0.1563 – 0.1569 in)	3.900 mm (0.1535 in)
	(EX)	3.935 – 3.950 mm (0.1549 – 0.1555 in)	3.880 mm (0.1528 in)
	Stem-to-guide clearance (IN)	0.015 – 0.048 mm (0.0006 – 0.0019 in)	0.098 mm (0.0039 in)
	(EX)	0.050 – 0.083 mm (0.0020 – 0.0033 in)	0.098 mm (0.0039 in)
Valve springs	Free length (IN / EX)	23.7 mm (0.93 in)	22.8 mm (0.90 in)
Camshaft	Cam height	27.972 mm (1.1013 in)	26.972 mm (1.0619 in)
	I.D. (Bearing)	5.020 – 5.050 mm (0.1976 – 0.1988 in)	5.100 mm (0.2008 in)
Camshaft roller	O.D.	4.990 – 5.000 mm (0.1965 – 0.1969 in)	4.950 mm (0.1949 in)
Valve lifters	I.D. (Bearing)	5.005 – 5.025 mm (0.1970 – 0.1978 in)	5.050 mm (0.1988 in)
Valve lifter roller	O.D.	4.990 – 5.000 mm (0.1965 – 0.1969 in)	4.950 mm (0.1949 in)
Crankcase side cover	Camshaft (Bearing I.D.)	5.005 – 5.023 mm (0.1970 – 0.1978 in)	5.050 mm (0.1988 in)
	Valve lifter roller (Bearing I.D.)	5.005 – 5.023 mm (0.1970 – 0.1978 in)	5.050 mm (0.1988 in)
Cylinder block	Camshaft roller (Bearing I.D.)	5.005 – 5.023 mm (0.1970 – 0.1978 in)	5.050 mm (0.1988 in)
	Valve lifter roller (Bearing I.D.)	5.005 – 5.023 mm (0.1970 – 0.1978 in)	5.050 mm (0.1988 in)
	Rocker arm roller (Bearing I.D.)	4.000 – 4.018 mm (0.1575 – 0.1582 in)	4.050 mm (0.1594 in)
	Valve guide I.D. (IN / EX)	4.000 – 4.018 mm (0.1575 – 0.1582 in)	4.060 mm (0.1598 in)
Rocker arms	I.D. (Bearing)	4.005 – 4.025 mm (0.1577 – 0.1585 in)	4.050 mm (0.1594 in)
Rocker arm roller	O.D.	3.990 – 4.000 mm (0.1571 – 0.1575 in)	3.950 mm (0.1555 in)
Spark plug	Gap	0.6 – 0.7 mm (0.024 – 0.028 in)	-----
Ignition coil	Resistance (Primary side)	0.98 – 1.20 Ω	-----
	(Secondary side)	8 – 10 Ω	-----
		0.3 – 0.5 mm (0.012 – 0.020 in)	-----
Carburetor	Main jet	#55	-----
	Float level height	12 mm (0.47 in)	-----
	Pilot screw opening	1 1/8 turn out	-----

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