

A Few Words About Safety

SERVICE INFORMATION

The service and repair information contained in this manual is intended for use by qualified, professional technicians. Attempting service or repairs without the proper training, tools, and equipment could cause injury to you and/or others. It could also damage this Honda product or create an unsafe condition.

This manual describes the proper methods and procedures for performing service, maintenance, and repairs. Some procedures require the use of special tools. Any person who intends to use a replacement part, service procedure, or a tool that is not recommended by Honda must determine the risks to his or her personal safety and the safe operation of this product.

If you need to replace a part, use Honda Genuine parts with the correct part number or an equivalent part. We strongly recommend that you do not use replacement parts of inferior quality.

For Your Customer's Safety

Proper service and maintenance are essential to the customer's safety and the reliability of this product. Any error or oversight while servicing this product can result in faulty operation, damage to the product, or injury to others.

⚠ WARNING

Improper service or repairs can create an unsafe condition that can cause your customer or others to be seriously hurt or killed.

Follow the procedures and precautions in this manual and other service materials carefully.

For Your Safety

Because this manual is intended for the professional service technician, we do not provide warnings about many basic shop safety practices (Hot parts-wear gloves, for example). If you have not received shop safety training or do not feel confident about your knowledge of safe servicing practice, we recommend that you do not attempt to perform the procedures described in this manual.

Some of the most important general service safety precautions are given below. However, we cannot warn you of every conceivable hazard that can arise in performing service and repair procedures. Only you can decide whether or not you should perform a given task.

⚠ WARNING

Failure to properly follow instructions and precautions can cause you to be seriously hurt or killed.

Follow the procedures and precautions in this manual carefully.

Important Safety Precautions

Make sure you have a clear understanding of all basic shop safety practices and that you are wearing appropriate clothing and using safety equipment. When performing any service task, be especially careful of the following:

- Read all of the instructions before you begin, and make sure you have the tools, the replacement or repair parts, and the skills required to perform the tasks safely and completely.
- Protect your eyes by using proper safety glasses, goggles, or face shields anytime you hammer, drill, grind, or work around pressurized air, pressurized liquids, springs or other stored-energy components. If there is any doubt, put on eye protection.
- Use other protective wear when necessary, for example gloves or safety shoes. Handling hot or sharp parts can cause severe burns or cuts. Before you grab something that looks like it can hurt you, stop and put on gloves.
- Protect yourself and others whenever you have engine-power equipment up in the air. Anytime you lift this product with a hoist, make sure that the hoist hook is securely attached to the product.

Make sure the engine is off before you begin any servicing procedures, unless the instruction tells you to do otherwise. This will help eliminate several potential hazards:

- Carbon monoxide poisoning from engine exhaust. Be sure there is adequate ventilation whenever you run the engine.
- Burns from hot parts. Let the engine and exhaust system cool before working in those areas.
- Injury from moving parts. If the instruction tells you to run the engine, be sure your hands, fingers and clothing are out of the way.

Gasoline vapors and hydrogen gasses from battery are explosive. To reduce the possibility of a fire or explosion, be careful when working around gasoline or batteries.

- Use only a nonflammable solvent, not gasoline, to clean parts.
- Never store gasoline in an open container.
- Keep all cigarettes, sparks, and flames away from the battery and all fuel-related parts.

INTRODUCTION

This manual covers service and repair procedures for Honda WMP20X multipurpose pumps.


All information contained in this manual is based on the latest product information available at the time of printing. Honda Power Equipment Mfg., Inc. reserves the right to discontinue or change specifications or design at anytime without notice and without incurring any obligation whatever.

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Detailed descriptions of standard workshop procedures, safety principles, and service operations are not included. Please note that this manual does not contain warnings and cautions against some specific service methods which could cause personal injury, damage the product, or make it unsafe. Please understand that these warnings and cautions cannot cover all conceivable ways in which service, whether or not recommended by American Honda, might be done, of the possible hazardous consequences of each conceivable way, nor could American Honda investigate all such ways. Anyone using service procedures or tools, whether or not recommended by American Honda, must satisfy himself thoroughly that neither personal safety nor product safety will be jeopardized.


Safety Messages


Your safety and the safety of others are very important. We have provided important safety messages in this manual and on the mower. Please read these messages carefully.

A safety message alerts you to potential hazards that could hurt you or others. Each safety message is preceded by a safety alert symbol  and one of three words: DANGER, WARNING, or CAUTION.

These mean:

 **DANGER** You WILL be KILLED or SERIOUSLY HURT if you don't follow instructions.

 **WARNING** You CAN be KILLED or SERIOUSLY HURT if you don't follow instructions.


 **CAUTION** You CAN be HURT if you don't follow instructions.

Each message tells you what the hazard is, what can happen, and what you can do to avoid or reduce injury.

Damage Prevention Messages

You will also see other important messages that are preceded by the word NOTICE.

This word means:

 **NOTICE** The pump or other property can be damaged if you don't follow instructions.

The purpose of these messages is to help prevent damage to the pump, other property, or the environment.

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SPECIFICATIONS

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SPECIFICATIONS

DIMENSIONS AND WEIGHTS

Length x Width x Height	520 x 400 x 450 mm (20.5 x 15.7 x 17.7 in)
Dry Weight	25.5 kg (56.2 lbs.)

ENGINE

Model	GX160K1
Type	4-stroke, overhead valve single cylinder, inclined by 25°
Total displacement	163 cc (9.9 cu in)
Bore and stroke	68 x 45 mm (2.7 x 1.8 in)
Compression ratio	8.5 : 1
Cooling system	Forced-air
Ignition system	Transistorized magneto ignition
Ignition timing	25° B.T.D.C. (Fixed)
Spark plug	BPR6ES (NGK), W20EPR-U (ND)
Carburetor	Horizontal type, butterfly valve
Air cleaner	Dual element type
Lubricating system	Splash
Oil capacity	0.6 l (0.63 US qt, 0.53 Imp qt)
Starting system	Recoil or electric starter
Stopping system	Ignition primary circuit ground
Fuel used	Regular gasoline (86 pump octane: unleaded preferred)
Fuel tank capacity	3.1 l (0.82 US gal)
PTO shaft rotation	Counterclockwise (from PTO side)

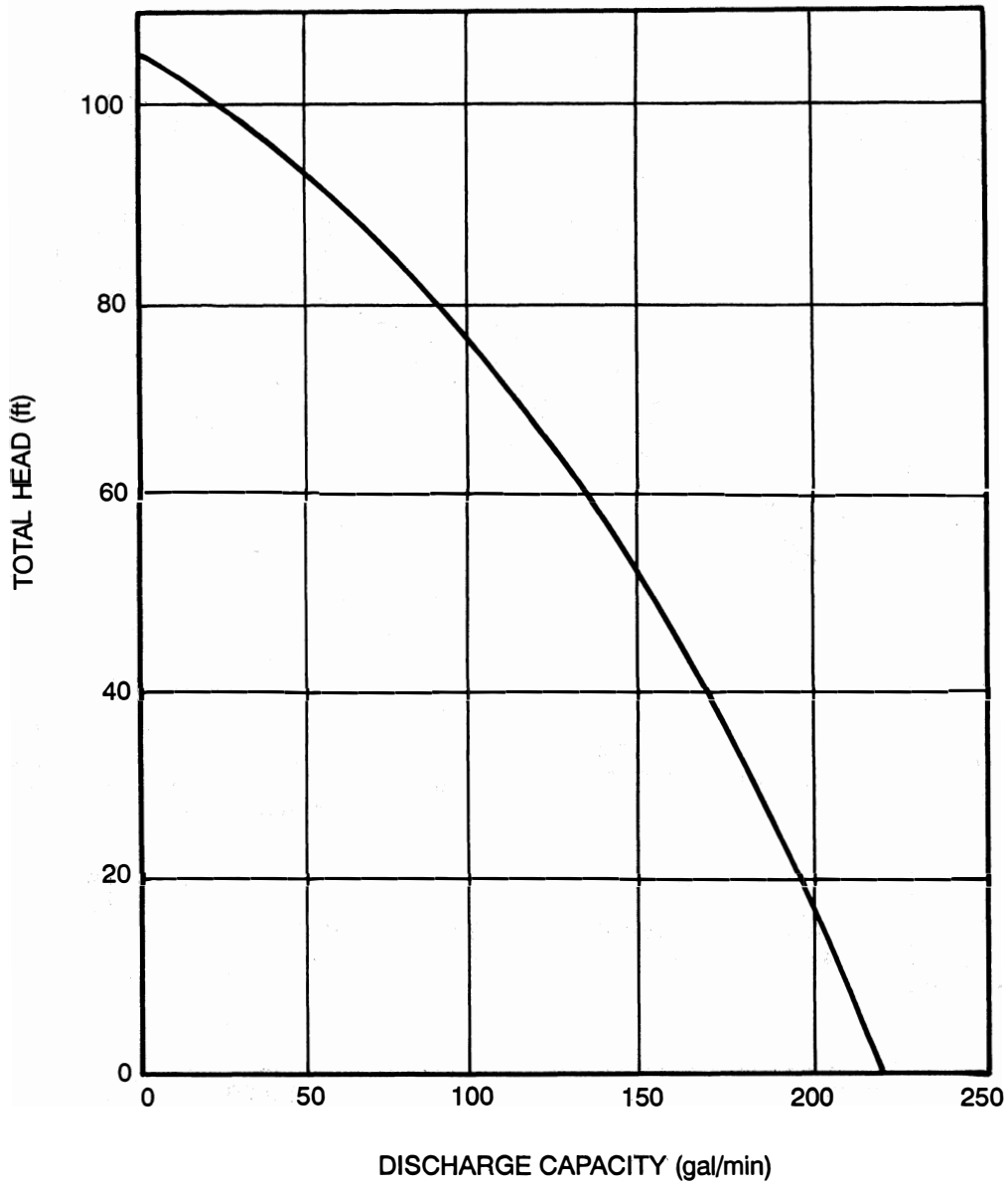
PUMP

Suction port diameter	50.8 mm (2.0 in)
Discharge port diameter	50.8 mm (2.0 in)
Rated rpm (maximum load)	3500 rpm
Total head	32 m (105 ft)
Suction head	8 m (26 ft)
Max discharge capacity	833 liters (220 US gal/min)
Self-priming time	65 sec at 5 m (16.4 ft)
Continuous running time	2 hrs 15 min

PERFORMANCE CURVES

PUMP

This graph shows the relationship between pump discharge capacity and total head. As you increase the total head, the discharge capacity will decrease.



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SERVICE RULES

- Engine exhaust gas contains poisonous carbon monoxide, which is colorless and odorless. If you run the engine in an area that is confined, or even partially enclosed, a dangerous amount of exhaust gas can accumulate. Breathing exhaust gas can make you lose consciousness and can kill you.
Run the engine outdoors or provide adequate ventilation. If you start to feel drowsy, stop the engine immediately and get fresh air.
- Gasoline is highly flammable and explosive. If ignited, gasoline can burn you severely.
Refuel in a well-ventilated area with the engine stopped. Keep flames and sparks away from the refueling area, and do not smoke in the area. Wipe up spills immediately. Never use gasoline to clean parts.
- A hot engine or exhaust system can burn you and can cause a fire if flammable materials are nearby.
Avoid touching a hot engine or exhaust system. Allow the engine to cool before performing maintenance or repairs.
- Use genuine Honda parts or their exact equivalent. Lower quality parts can damage the mower or reduce its performance.
- Install new gaskets, O-rings, and seals during reassembly.
- All nuts and bolts on this mower are metric. Use only metric wrenches. Nonmetric wrenches will not fit properly and can damage nuts and bolt heads.
- When tightening nuts and bolts, begin with the larger-diameter or inner bolts, and tighten diagonally to the specified torque values, unless a particular tightening sequence is specified.
- When tightening self-tapping screws, be especially careful to avoid cross-threading or overtightening.
- Clean parts in nonflammable solvent during disassembly.
- Lubricate sliding surfaces before reassembly.
- After reassembly, check parts installation and operation.



: Apply oil



: Use special tool

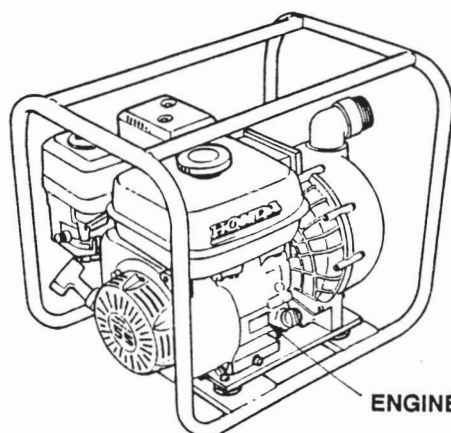


: Apply grease

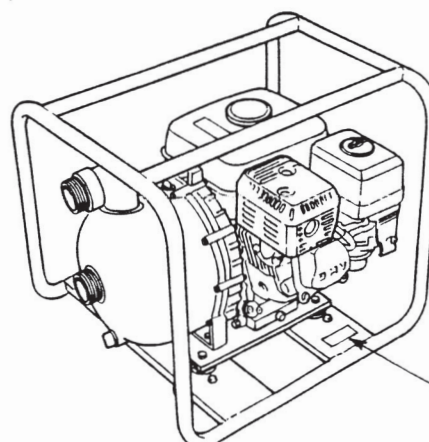
0 x 0 (O): Indicates the diameter, length, and quantity flange bolts used.

SERIAL NUMBER LOCATIONS

Refer to the serial numbers when ordering parts or making technical inquiries.



ENGINE SERIAL NUMBER

FRAME
SERIAL
NUMBER

WMP20X

MAINTENANCE STANDARDS

PART	ITEM	GX160K1	
		STANDARD	SERVICE LIMIT
Engine	Maximum speed	3,900 ± 150 rpm	-----
	Idle speed	1,400 ± 150 rpm	-----
	Cylinder compression	588 ~ 834 kPa (85 ~ 121 psi) at 600 rpm	-----
Cylinder	Sleeve ID	68.0 mm(2.68 in)	68.165 mm (2.6837 in)
Cylinder head	Warpage	—	0.10 (0.004 in)
Piston	Skirt OD	67.985 mm (2.6766 in)	67.845 mm (2.6711 in)
	Piston-to-cylinder clearance	0.015 ~ 0.050 mm (0.0006 ~ 0.0020 in)	0.12 mm (0.005 in)
	Piston pin bore ID	18.002 mm (0.7087 in)	18.048 mm (0.7105 in)
	Pin OD	18.0 mm (0.71 in)	17.954 mm (0.7068 in)
	Piston to piston pin bore clearance	0.002 ~ 0.014 mm (0.0001 ~ 0.0006 in)	0.08 mm (0.003 in)
Piston rings	Ring width	1.5 mm (0.06 in)	1.37 mm (0.054 in)
	Ring side clearance	2.5 mm (0.10 in)	2.37 mm (0.093 in)
	Ring end gap	0.015 ~ 0.045 mm (0.0006 ~ 0.0018 in)	0.15 mm (0.006 in)
Connecting rod	Small end ID	18.002 mm (0.7087 in)	13.07 mm (0.519 in)
	Big end ID	30.02 mm (1.182 in)	30.066 mm (1.1837 in)
	Big end oil clearance	0.040 ~ 0.063 mm (0.0016 ~ 0.0025 in)	0.12 mm (0.005 in)
	Big end side clearance	0.1 ~ 0.4 mm (0.004 ~ 0.016 in)	1.1 mm (0.043 in)
Crankshaft	Crank pin OD	29.98 mm (1.180 in)	29.92 mm (1.178 in)
Valves	Valve clearance (cold)	IN 0.15 ± 0.02 mm (0.006 ± 0.001 in) EX 0.20 ± 0.02 mm (0.008 ± 0.001 in)	-----
	Stem OD	IN 5.48 mm (0.216 in) EX 5.44 mm (0.214 in)	5.318 mm (0.2094 in) 5.275 mm (0.2077 in)
	Guide ID	IN/EX 5.50 mm (0.217 in)	5.572 mm (0.2194 in)
	Stem clearance	IN 0.02 ~ 0.044 mm (0.0008 ~ 0.0017 in) EX 0.06 ~ 0.087 mm (0.0024 ~ 0.0034 in)	0.10 mm (0.004 in) 0.12 mm (0.005 in)
	Seat width	IN/EX 0.8 mm (0.03 in)	2.0 mm (0.08 in)
	Spring free length	IN/EX 34.0 mm (1.34 in)	32.5 mm (1.28 in)
	Camshaft	Cam height	IN 27.7 mm (1.091 in) EX 27.75 mm (1.093 in)
Journal OD		13.984 mm (0.551 in)	13.916 mm (0.5479 in)
Camshaft holder (cover)		14.00 mm (0.550 in)	14.048 mm (0.5531 in)
Carburetor	Main jet	#70	-----
	Float height	13.7 mm (0.54 in)	-----
	Pilot screw opening	2 turns out	-----
Spark plug	Gap	0.7 ~ 0.8 mm (0.028 ~ 0.031 in)	-----
Spark plug cap	Resistance	7.5 ~ 12.5 kΩ	-----
Ignition coil	Resistance	Primary coil 0.8 ~ 1.0 Ω Secondary coil 5.9 ~ 7.1 kΩ	-----
	Air gap	(at flywheel) 0.4 ± 0.2 mm (0.016 ± 0.008 in)	-----

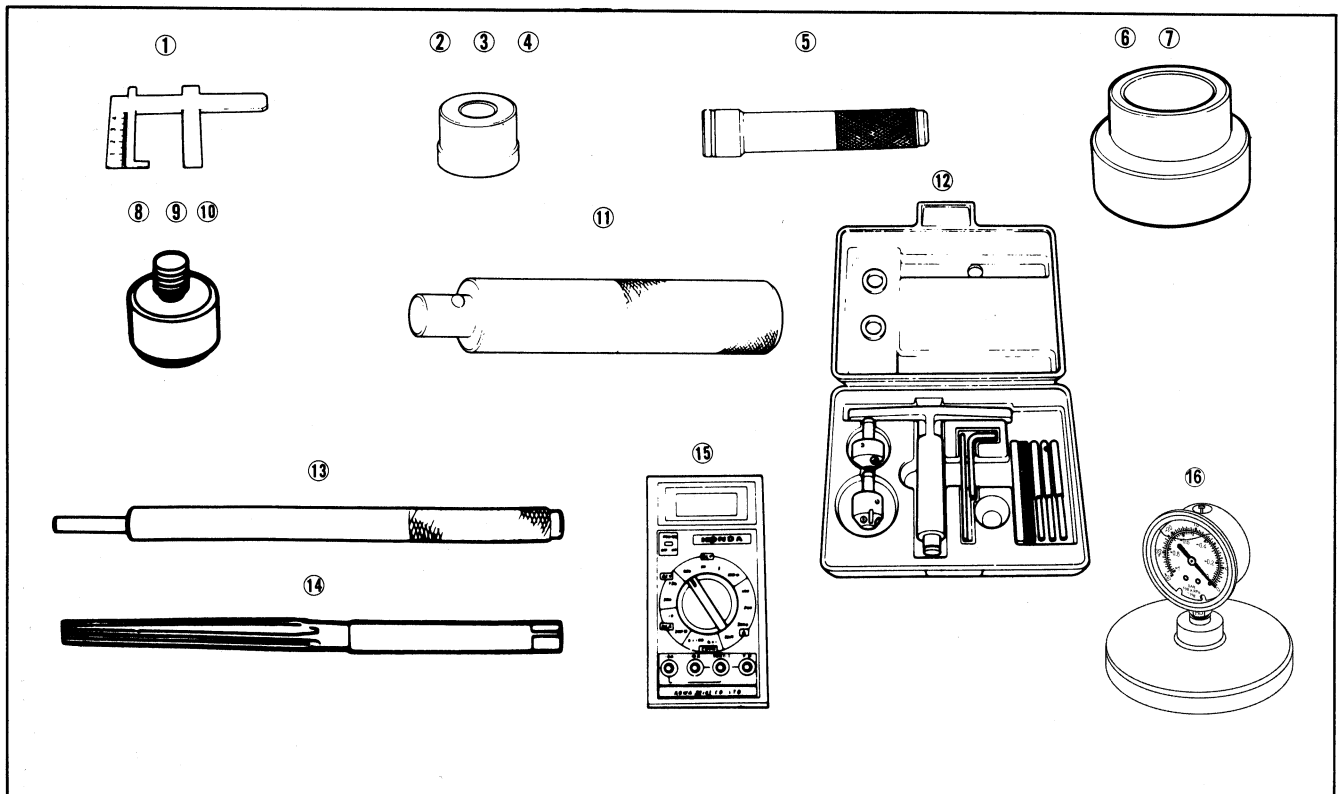
TORQUE VALUES

Item	Thread dia (mm)	Torque		
		N·m	kg-m	ft-lb
Connecting rod bolt	M7×1.0	12	1.2	9
Cylinder head bolt	M8×1.25	24	2.4	17
Flywheel nut	M14×1.5 (Special nut)	75	7.5	54
Rocker arm pivot lock nut	M6×0.5	10	1.0	7
Rocker arm pivot bolt	M8×1.25 (Special bolt)	24	2.4	17
Crankcase cover bolt	M8×1.25	24	2.4	17
Oil level switch joint nut	M10×1.25	10	1.0	7
Fuel filter joint nut	M10×1.25	2	0.2	1.4
Muffler mounting nut	M8×1.25	24	2.4	17
Air cleaner wing nut	M6×1.0	9	0.9	6.5
Oil drain bolt	M10×1.25	18	1.8	13
Fuel tank bolt, nut	M6×1.0	10	1.0	7
Air cleaner mounting nut (6 mm cap nut)	M6×1.0	8.5	0.85	6.1
Fuel strainer cup	M24×1.0	4	0.4	2.9
Standard torque values	5 mm bolt, nut	5.5	0.55	4.0
	6 mm bolt, nut	10	1.0	7
	8 mm bolt, nut	24	2.4	17
	10 mm bolt, nut	37.5	3.75	2
	12 mm bolt, nut	55	5.5	40

Use standard torque values for items not specifically described in this table.

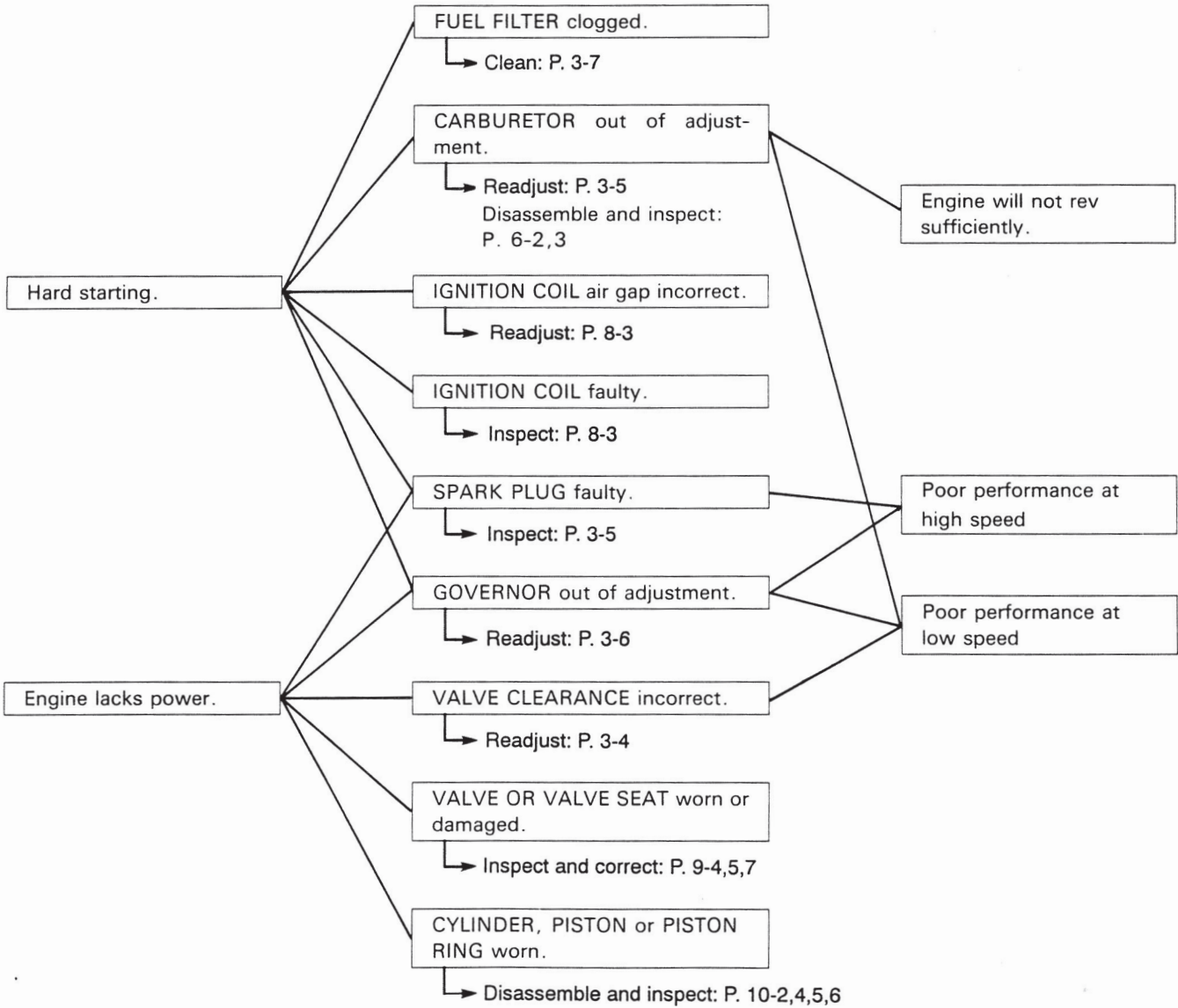
SPECIAL TOOLS

REF. NO.	DESCRIPTION	TOOL NUMBER	APPLICATION
1	Float level gauge	07401-0010000	Carburetor float level inspection
2	Attachment, 42 x 47 mm	07746-0010300	6204 bearing installation
3	Attachment, 52 x 55 mm	07746-0010400	6205, 62/22 bearing installation
4	Attachment, 62 x 68 mm	07746-0010500	6206, 6305 bearing installation
5	Driver, 40 mm I.D.	07746-0030100	Driver for tools 6, 7 and 8
6	Attachment, 30 mm I.D.	07746-0030300	Timing gear installation
7	Attachment, 35 mm I.D.	07746-0030400	Governor drive gear installation
8	Pilot, 20 mm	07746-0040500	6204 bearing installation
9	Pilot, 25 mm	07746-0040600	6205, 6305 bearing installation
10	Pilot, 30 mm	07746-0040700	6206 bearing installation
11	Driver	07749-0010000	Driver for tools 2, 3 and 4
12	Valve seat cutter #122 45°	07780-P01030A	Valve seat reconditioning
	Valve seat cutter #115 31°	07780-P01040A	Valve seat reconditioning
	Valve seat cutter #111 60°	07782-P01050A	Valve seat reconditioning
	Solid pilot bar, 5.50 mm	07781-P03010A	Valve seat reconditioning
	Solid pilot bar, 5.52 mm	07781-P03020A	Valve seat reconditioning
	Solid pilot bar, 5.55 mm	07781-P03030A	Valve seat reconditioning
	T-wrench, #505	07782-P01010A	Valve seat reconditioning
	T-wrench adapter, #503-1	07782-P01020A	Valve seat reconditioning
	Accessory package, #246	07782-P01030A	Valve seat reconditioning
13	Valve guide driver	07942-8920000	Valve guide removal/installation
14	Valve guide reamer	07984-4600000	Valve guide I.D. reaming
15	Digital multimeter	KS-AHM-32-003	Electrical testing
16	Vacuum tester	07APJ-YB3A100	Vacuum test

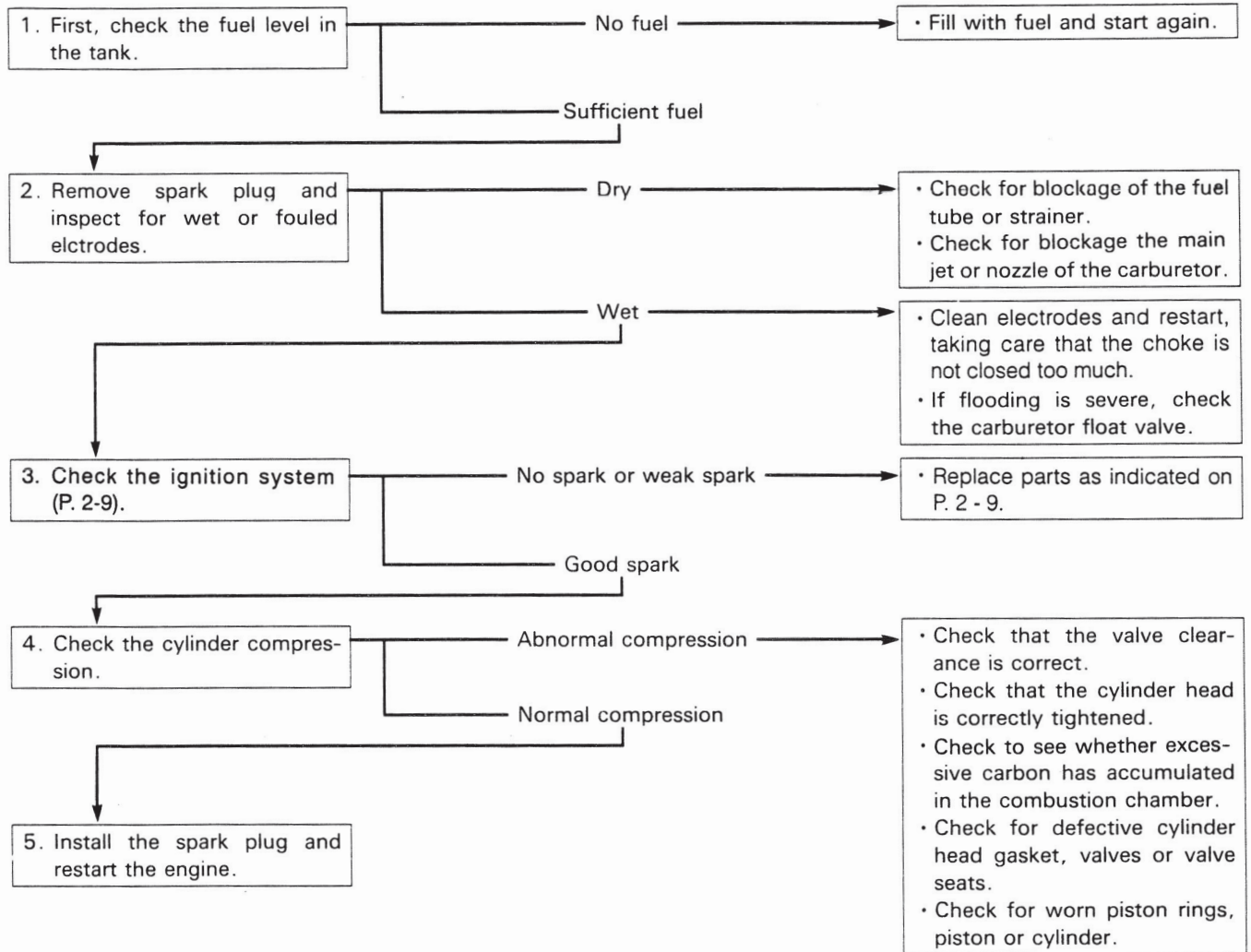


TROUBLESHOOTING

a. GENERAL SYMPTOM AND POSSIBLE CAUSES



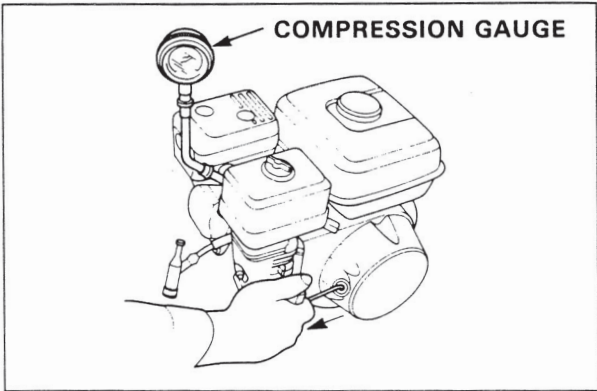
b. HARD STARTING



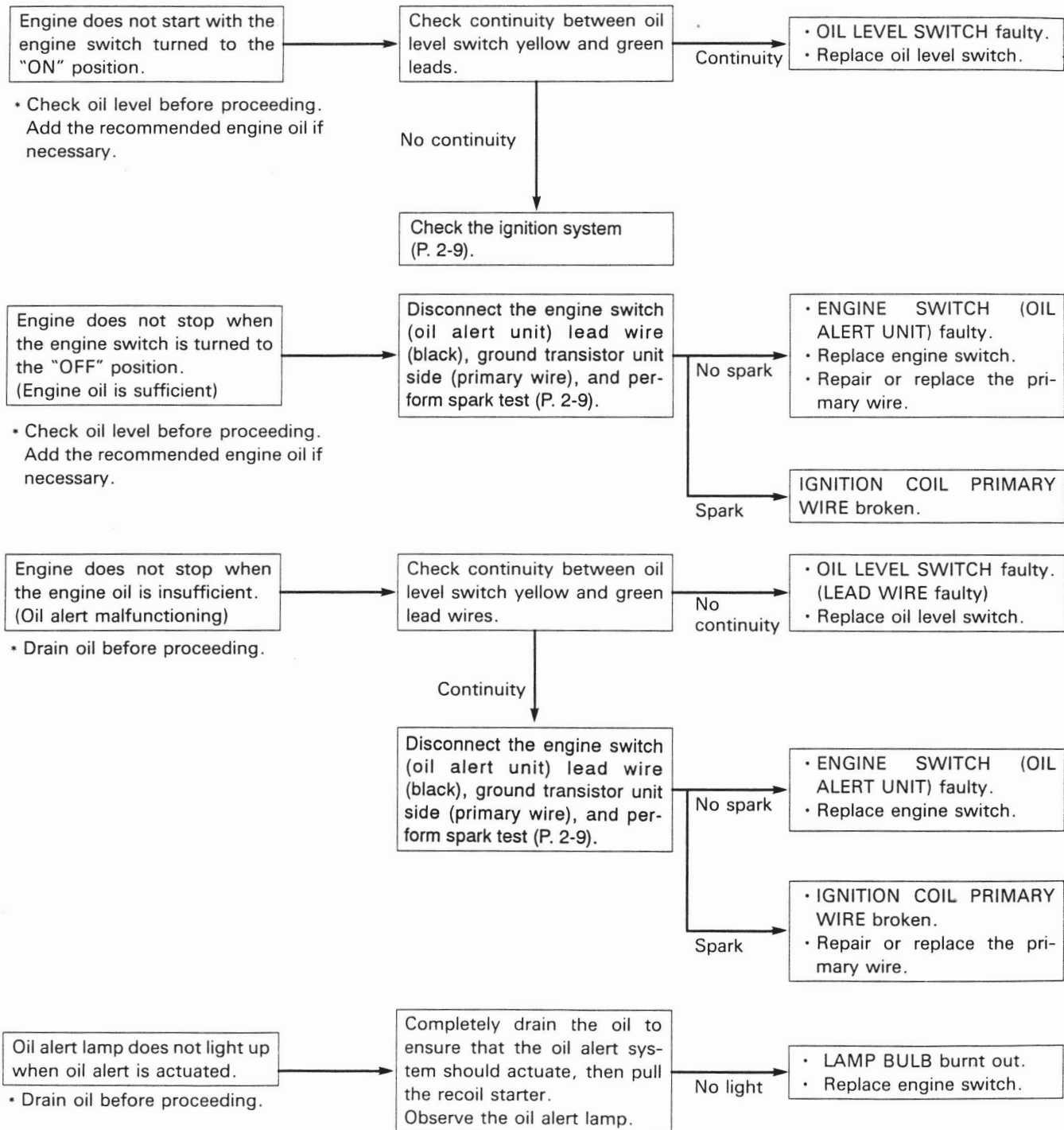
**CYLINDER COMPRESSION CHECK
(Mechanical decompressor engaged)**

- 1) Remove the spark plug and install a compression gauge in the spark plug hole.
- 2) Crank the engine several times with the recoil starter and measure the compression.

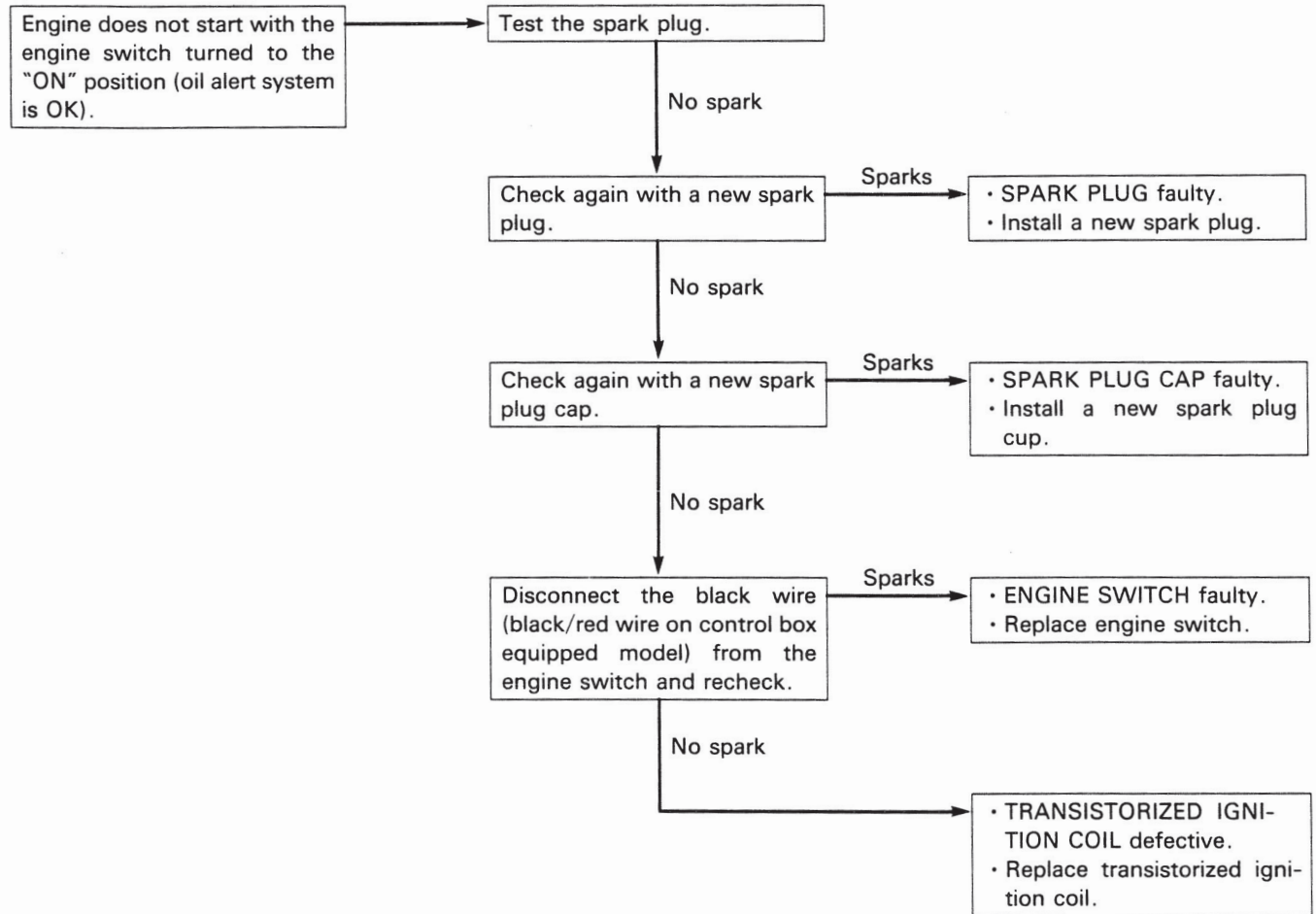
Compression	588 – 834 kPa (85 – 121 psi) at 600 rpm
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c. OIL ALERT SYSTEM



d. IGNITION SYSTEM



SPARK TEST

- 1) Remove the spark plug.
- 2) Install the spark plug to the spark plug cap and ground the side electrode against the cylinder head cover.
- 3) Turn the engine switch to the "ON" position, pull the recoil starter and check to see if sparks jump across the electrodes.

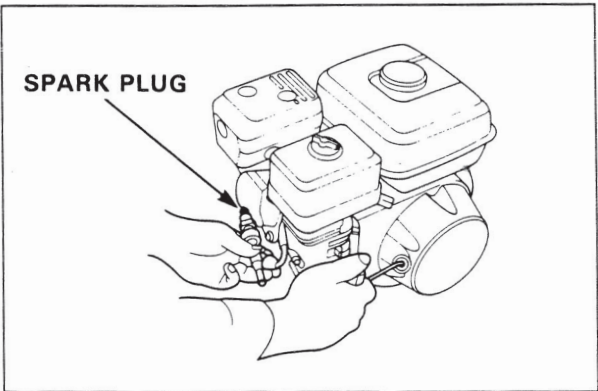
⚠ WARNING

Gasoline is highly flammable and explosive, and it can be ignited by this spark test.

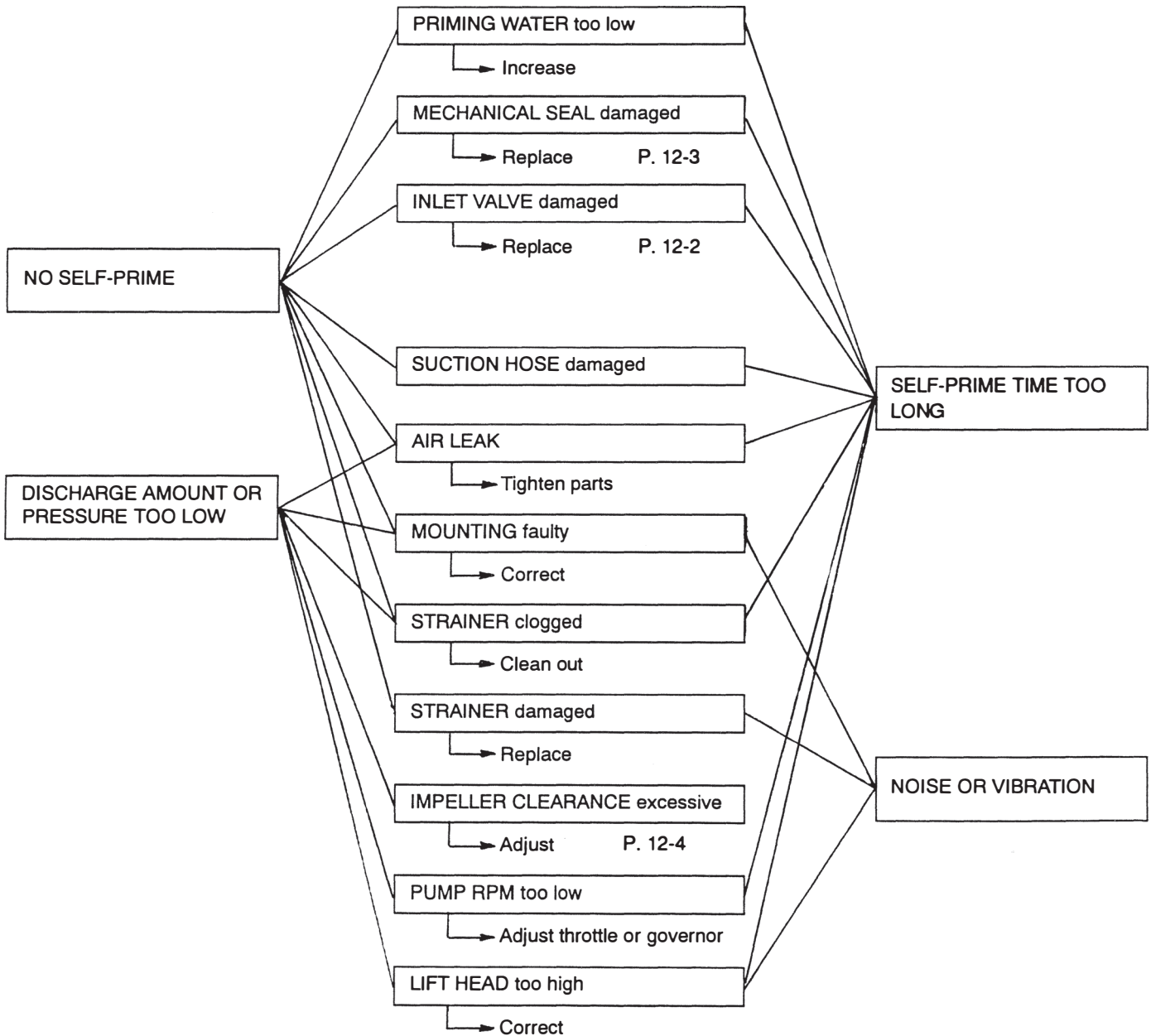
You can be burned or seriously injured.

Before testing the spark plug:

- Be sure there is no spilled fuel.
- Place the spark plug away from the spark plug hole.

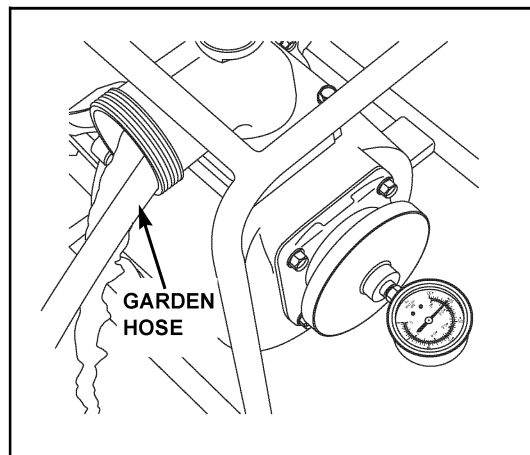


e. PUMP



VACUUM TEST

1. Fill the pump housing with water.
2. Position and hold a garden hose up to the discharge port, and turn the hose on so a steady stream of water flows into the discharge port. This will ensure the pump housing remains completely full during the test.
3. Start the engine, position the throttle lever in the fast position, and allow the engine to warm up for several minutes.
4. Adjust the maximum engine rpm to the proper no-load specification (P. 3-6).
5. Position the vacuum tester against the suction port to obtain the vacuum reading.



Minimum Vacuum: 22 inHg (at sea level)

The vacuum reading will decrease by approximately 1 inHg per 1000 ft increase in elevation.

6. Shut off the engine and confirm the vacuum gauge reading remains steady. This verifies the inlet (flapper) valve is sealing.

VACUUM TEST RESULTS

- If the vacuum gauge won't remain steady after shutting off the engine, disassemble and inspect the inlet (flapper) valve for wear or damage.
- A vacuum reading below 22 inches of mercury (decreases 1 inch of mercury for each 1000 ft elevation above sea level) indicates a problem with the pump. If the vacuum is low, disassemble the pump and inspect the following (P. 12-1):
 - Impeller and volute for damage or wear. Check the impeller/volute clearance.
 - Mechanical seal for damage.
 - Pump case housing and O-rings for damage or leaks.
- If the customer complains that the pump won't prime, but the vacuum reading is good, the customer likely has an air leak in the suction hose or fittings, or the suction head is too high.

MAINTENANCE

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VALVE CLEARANCE	3-4	FUEL FILTER	3-7
SPARK PLUG	3-5		

MAINTENANCE SCHEDULE

ITEM	REGULAR SERVICE PERIOD Perform at every indicated operating hour interval.	EACH USE	FIRST 20HRS	EVERY 50HRS	EVERY 100HRS	EVERY 300HRS	Refer to page	
Engine oil	Check level	○					3-2	
	Change		○		○			
Air cleaner	Check	○					3-3	
	Clean			○ (1)				
Fuel sediment cup	Clean				○		3-6	
Spark plug	Check-Clean				○		3-5	
Spark arrester (optional equipment)	Clean				○		3-6	
Valve clearance	Check-Adjust					○	3-4	
Fuel line	Check (Replace if necessary)		Every 2 years					3-7

NOTE: (1) Service more frequently when used in dusty areas.

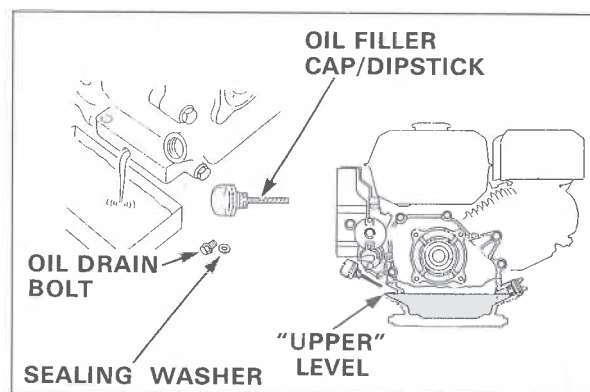
ENGINE OIL

Change the engine oil with the engine warm and in a horizontal position to assure complete and rapid draining.

1. Remove the oil filler cap/dipstick, drain bolt, and sealing washer. Allow the oil to drain completely.
2. Reinstall the drain bolt and sealing washer and then tighten to the specified torque.

TORQUE: 18 N•m (13 ft•lb)

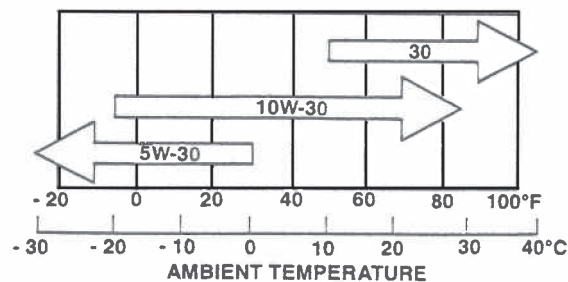
3. Fill the crankcase with the recommended engine oil to the outer edge of the oil filler neck. Reinstall the filler cap/dipstick.



Engine oil capacity	0.6 l (0.63 US qt)
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Recommended engine oil:

SAE 10W-30 is recommended for general, all temperature use; service category SJ or later. Other viscosities shown in the chart may be used when the average temperature in your area is within the indicated range.



WARNING

Used engine oil contains substances that have been identified as carcinogenic.

If repeatedly left in contact with the skin for prolonged periods, it may cause skin cancer.

Wash your hands thoroughly with soap and water as soon as possible after contact with used engine oil.

OIL ALERT

For convenience, perform this test in conjunction with the engine oil change.

- 1) With the engine running, disconnect the yellow lead from the engine switch, and ground the lead against the engine. The oil alert lamp should flash, and the engine should stop.
- 2) With the engine stopped, the crankcase filled with oil, and the oil level switch leads disconnected, check continuity between the yellow and green oil level switch leads. There should be no continuity.
- 3) With the engine stopped, the oil drained from the crankcase, and the oil level switch leads disconnected, check continuity between the yellow and green oil level switch leads. There should be continuity.

AIR CLEANER

Dirty air filters will restrict air flow to the carburetor, reducing engine performance. If you operate the pump in very dusty areas, clean the air filters more often than specified in the MAINTENANCE SCHEDULE.

NOTICE

Operating the engine without air filters, or damaged filters will allow dirt to enter the engine, causing rapid engine wear. This type of damage is not covered by the Distributor's Limited Warranty.

- 1) Remove the nut, air cleaner cover and wing nut. Remove the air filter elements and separate them.
- 2) Inspect the filter elements, and replace them if they are damaged.
- 3) Clean the filter elements.

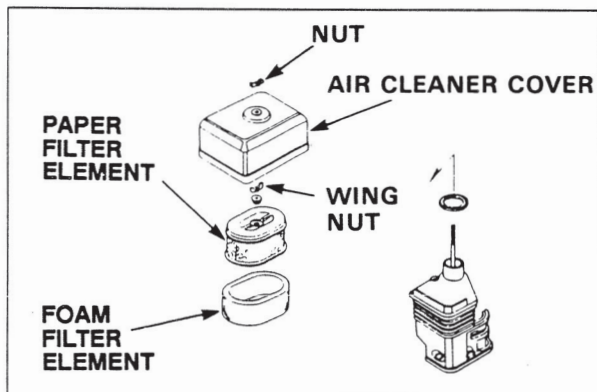
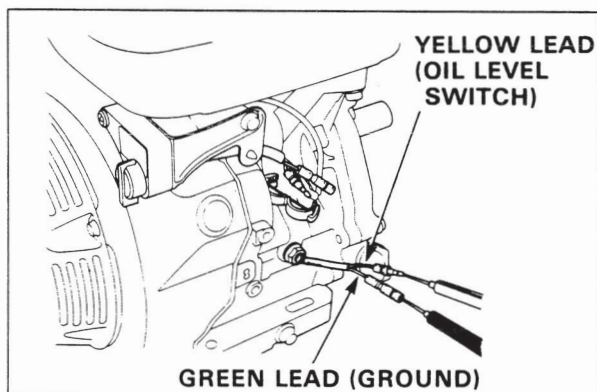
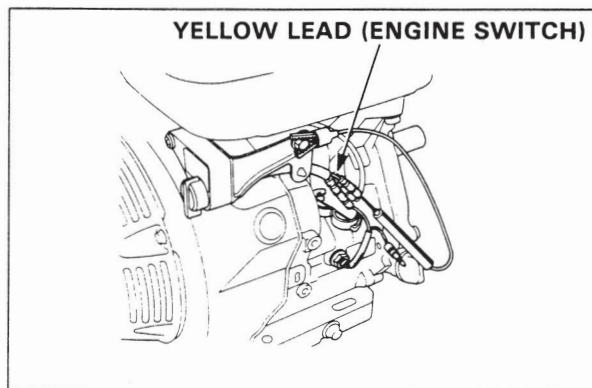
Paper filter: Tap the filter several times on a hard surface to remove dirt, or blow with compressed air (not exceeding 30 psi) through the filter from the inside. Never try to brush off dirt: brushing will force dirt into the fibers.

Foam filter: Clean in warm soapy water, rinse, and allow to dry thoroughly. Or clean in nonflammable solvent and allow to dry. Dip the filter in clean engine oil and squeeze out all excess oil.

NOTICE

Excess oil will restrict air flow through the foam filter and may transfer to the paper filter, soaking and clogging it.

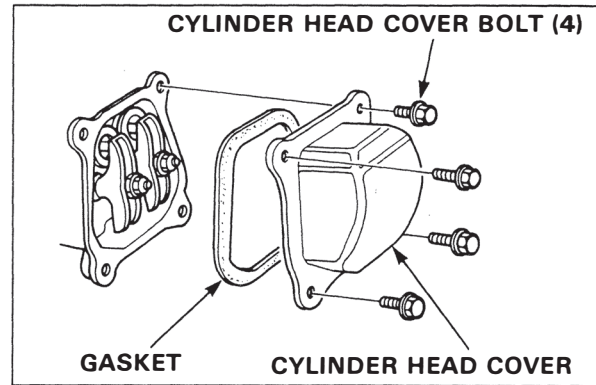
- 4) Wipe dirt from the inside of the air cleaner housing and cover, using a moist rag. Be careful to prevent dirt from entering the air duct that leads to the carburetor.
- 5) Shine a light through the filter elements, and inspect them carefully. Reinstall the filter elements if they are free of holes and tears.



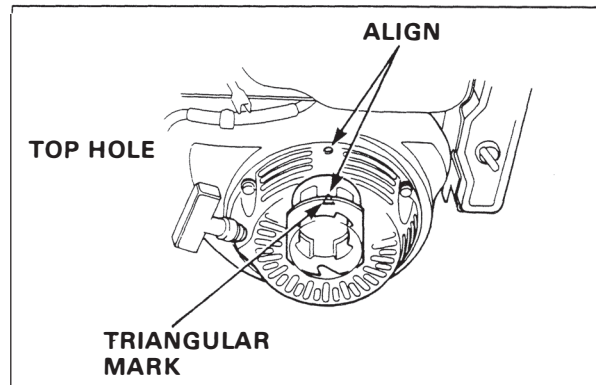
VALVE CLEARANCE

Valve clearance inspection and adjustment must be performed with the engine cold.

- 1) Remove the four cylinder head cover bolt, cylinder head cover and gasket.

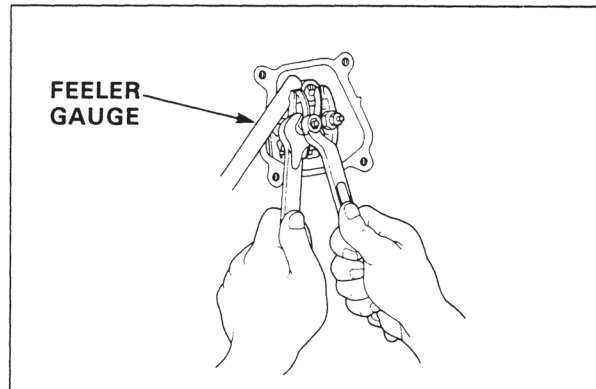


- 2) Set the piston at top dead center of the compression stroke (both valves fully closed). The triangular mark on the starter pulley will align with the top hole on the fan cover when the piston is at top dead center of the compression or exhaust stroke.

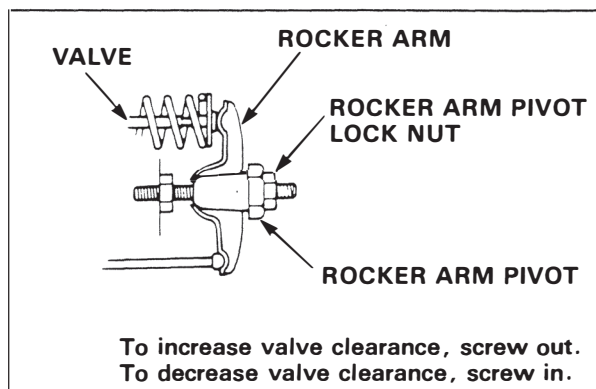


- 3) Insert a feeler gauge between the rocker arm and valve to measure valve clearance.

Standard valve clearance	IN	0.15 ± 0.02 mm (0.006 ± 0.001 in)
	EX	0.20 ± 0.02 mm (0.008 ± 0.001 in)



- 4) If adjustment is necessary, proceed as follows:
 - a. Hold the rocker arm pivot and loosen the rocker arm pivot lock nut.
 - b. Turn the rocker arm pivot to obtain the specified clearance.
 - c. Retighten the rocker arm pivot lock nut while holding the rocker arm pivot.
 - d. Recheck valve clearance after tightening the rocker arm pivot lock nut.



SPARK PLUG

- 1) Visually inspect the spark plug. Discard the plug if the insulator is cracked or chipped.
- 2) Remove carbon or other deposits with a stiff wire brush.
- 3) Measure the plug gap with a wire-type feeler gauge.

Standard spark plug	BPR6ES(NGK), W20EPR-U(ND)
---------------------	---------------------------

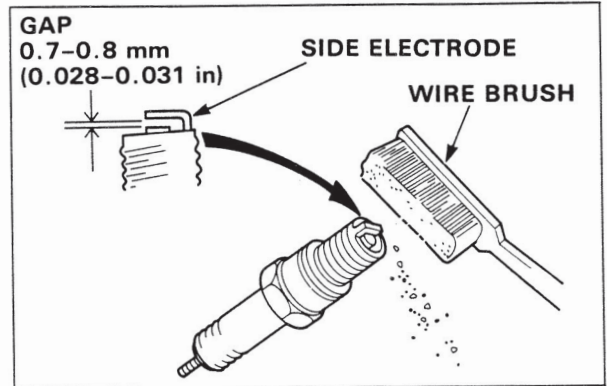
Spark plug gap	0.7-0.8 mm (0.028-0.031 in)
----------------	-----------------------------

If necessary, adjust the gap by bending the side electrode.

- 4) Make sure the sealing washer is in good condition; replace the plug if necessary.
- 5) Install the plug fingertight to seat the washer, then tighten with a plug wrench (an additional 1/2 turn if a new plug) to compress the sealing washer. If you are reusing a plug, tighten 1/8-1/4 turn after the plug seats.

NOTICE

- Incorrect spark plugs can cause engine damage. Use the recommended spark plugs or their exact equivalent.
- A loose spark plug can overheat and damage the engine. Over-tightening can damage the threads in the cylinder head.



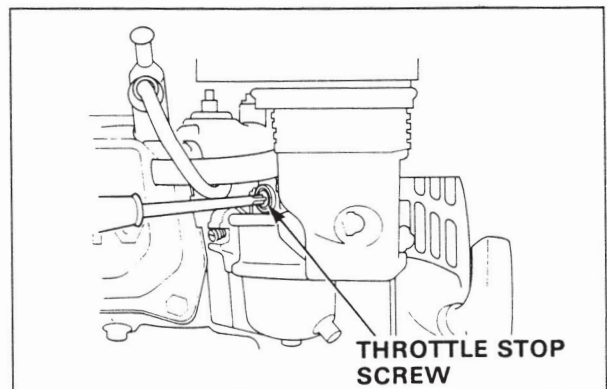
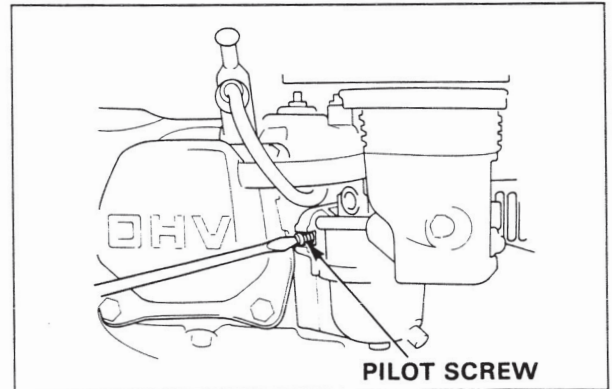
CARBURETOR

- 1) Fill the pump chamber with water, then start the engine and allow it to warm up to normal operating temperature.
- 2) With the engine idling, turn the pilot screw in or out to the setting that produces the highest idle rpm. The correct setting will usually be obtained at approximately the following number of turns out from the fully closed (lightly seated) position.

Pilot screw opening	3 turns out
---------------------	-------------

- 3) After the pilot screw is correctly adjusted, turn the throttle stop screw to obtain the standard idle speed.

Standard idle speed	1,400 ± 150 rpm
---------------------	-----------------



GOVERNOR

- 1) Remove the fuel tank (P. 7-2)
- 2) Loosen the nut on the governor arm and move the governor arm to fully open the throttle.
- 3) Rotate the governor arm shaft as far as it will go in the same direction the governor arm moved to open the throttle.
Tighten the nut on the governor arm.
- 4) Fill the pump chamber with water, then start the engine and allow it to warm up to normal operating temperature. Move the throttle lever to run the engine at the standard maximum speed, and adjust the throttle lever limiting screw so the throttle lever cannot be moved past that point.

Maximum speed	3,850±150 rpm
---------------	---------------

SEDIMENT CUP

- 1) Turn off the fuel valve and remove the sediment cup.
- 2) Clean the sediment cup with solvent.
- 3) Install the O-ring and sediment cup.
Tighten the sediment cup to the specified torque.

TORQUE: 4 N·m (0.4 kg·m, 2.9 ft·lb)

⚠ WARNING

Gasoline is highly flammable and explosive.

You can be burned or seriously injured.

Keep heat, sparks, and flame away. After servicing the sediment cup:

- Check for leaks.
- Wipe up spills immediately.
- Be sure the area is dry before starting the engine.

SPARK ARRESTER (Optional part)

The spark arrester must be serviced every 100 hours to keep it functioning as designed.

⚠ CAUTION

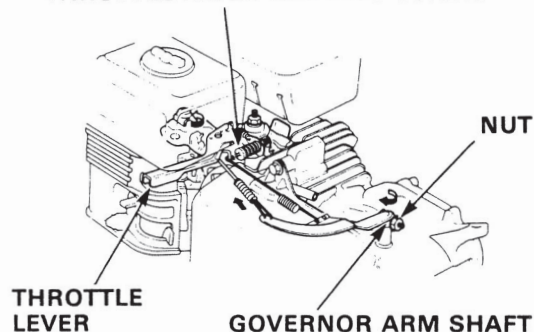
The engine and exhaust system become hot during operation and remain hot for a while after stopping.

A hot engine and exhaust system can burn you can can ignite some materials.

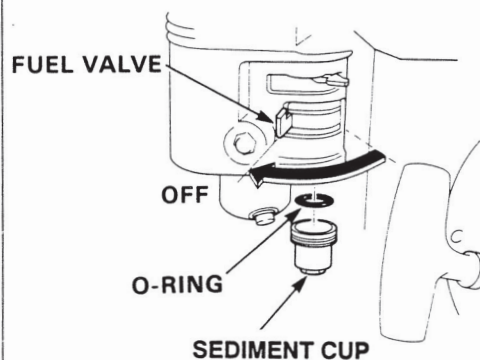
Avoid touching a hot engine or exhaust system. Allow the engine to cool before servicing the spark arrester.

- 1) Remove the four 5x8 mm self-tapping screws from the upper muffler protector.
- 2) Remove the upper muffler protector.
- 3) Remove the 4x8 mm screw and spark arrester.
Be careful not to damage the wire mesh of the spark arrester.
- 4) Check the carbon deposits around the exhaust port and spark arrester. Clean, if necessary.
Replace the spark arrester if there are any breaks or tears.
- 5) Install the spark arrester and upper muffler protector in the reverse order of removal.

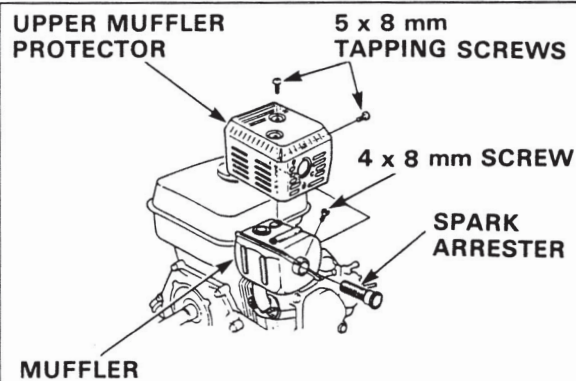
THROTTLE LEVER LIMITING SCREW



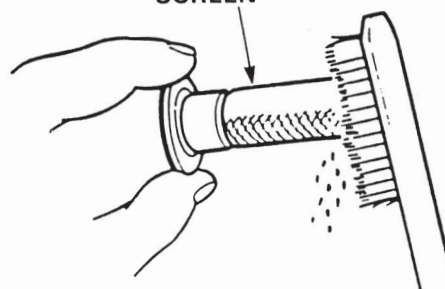
FUEL VALVE



UPPER MUFFLER PROTECTOR



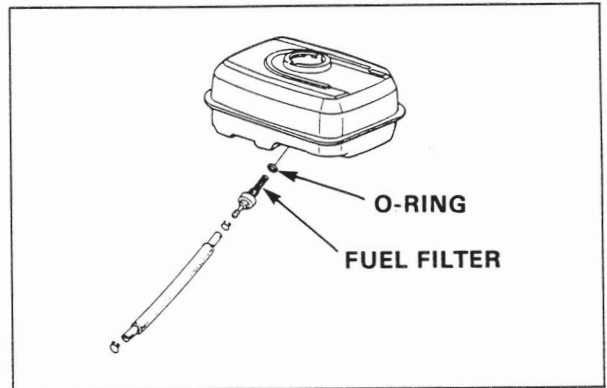
SPARK ARRESTER SCREEN



FUEL FILTER

- 1) Drain the fuel into a suitable container, and remove the fuel tank (P. 7-2).
- 2) Disconnect the fuel line, and unscrew the fuel filter from the tank.
- 3) Clean the filter with solvent, and check to be sure the filter screen is undamaged.
- 4) Place the O-ring on the filter and reinstall. Tighten the filter to the specified torque. After reassembly, check for fuel leaks.

TORQUE: 2 N·m (0.2 kg-m, 1.4 ft-lb)



⚠ WARNING

Gasoline is highly flammable and explosive.

You can be burned or seriously injured.

Keep heat, sparks, and flame away. After servicing the fuel filter:

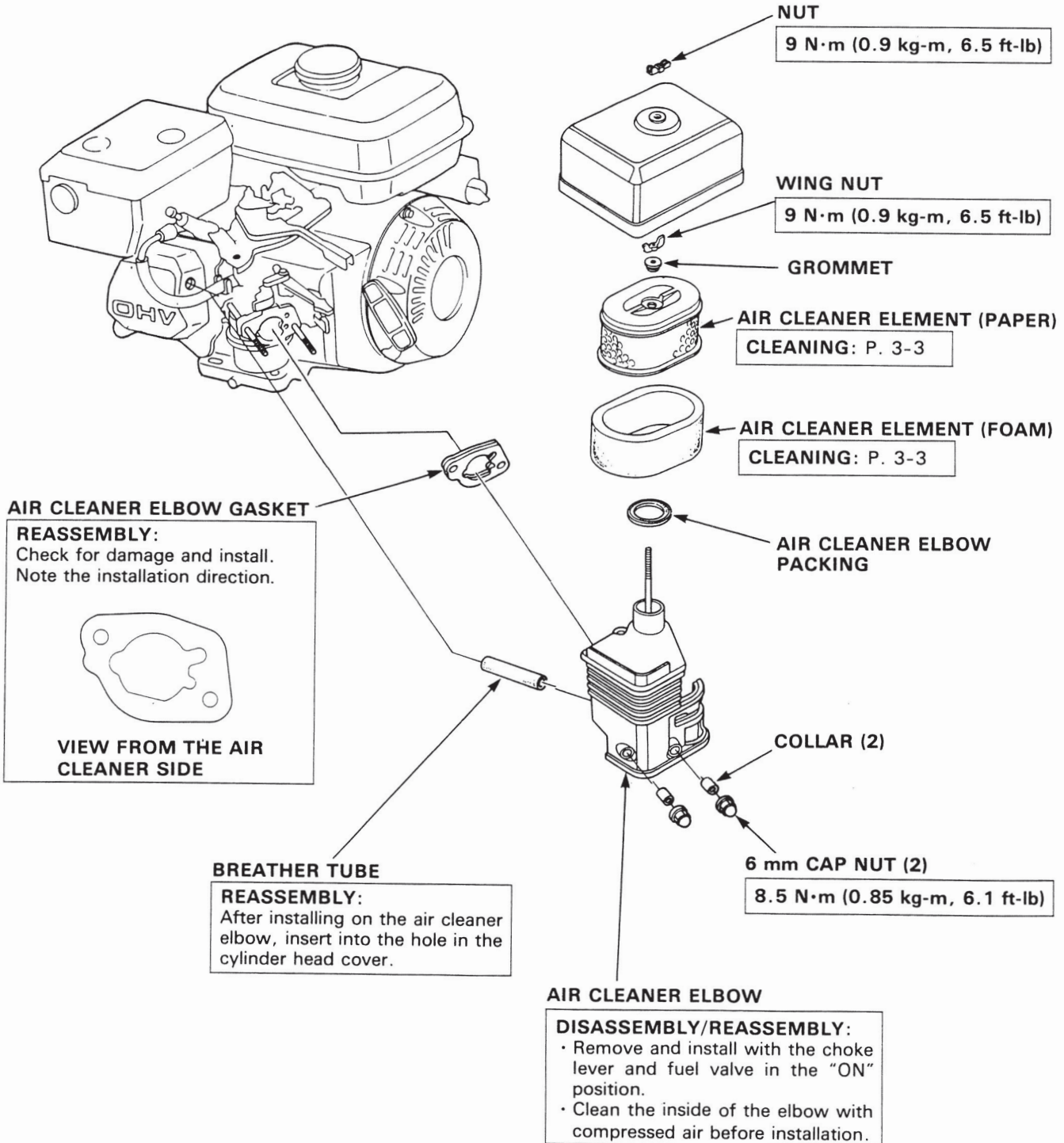
- Refuel only outside.
- Check for leaks.
- Wipe up spills immediately.
- Be sure the area is dry before starting the engine.

AIR CLEANER, MUFFLER

AIR CLEANER	4-2
MUFFLER	4-5

AIR CLEANER

a. DISASSEMBLY/REASSEMBLY

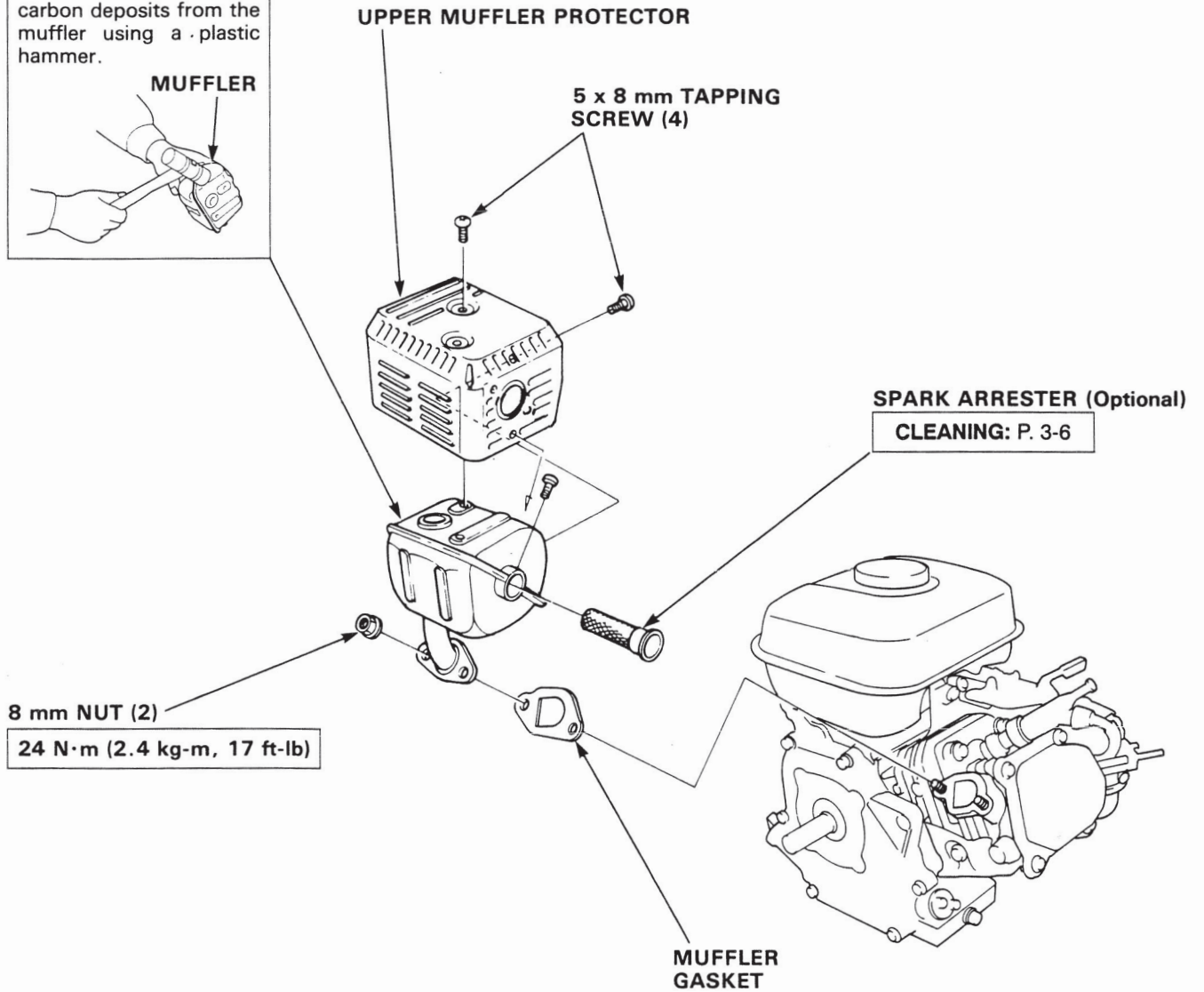
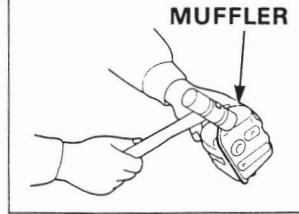


MUFFLER

a. DISASSEMBLY/REASSEMBLY

MUFFLER

REASSEMBLY:
Install after removing the carbon deposits from the muffler using a plastic hammer.



**RECOIL STARTER,
FAN COVER**

RECOIL STARTER5-2
FAN COVER5-5

RECOIL STARTER

a. DISASSEMBLY/REASSEMBLY

⚠ WARNING

The reel is under spring tension. Parts can fly off if spring tension is not released before disassembly.

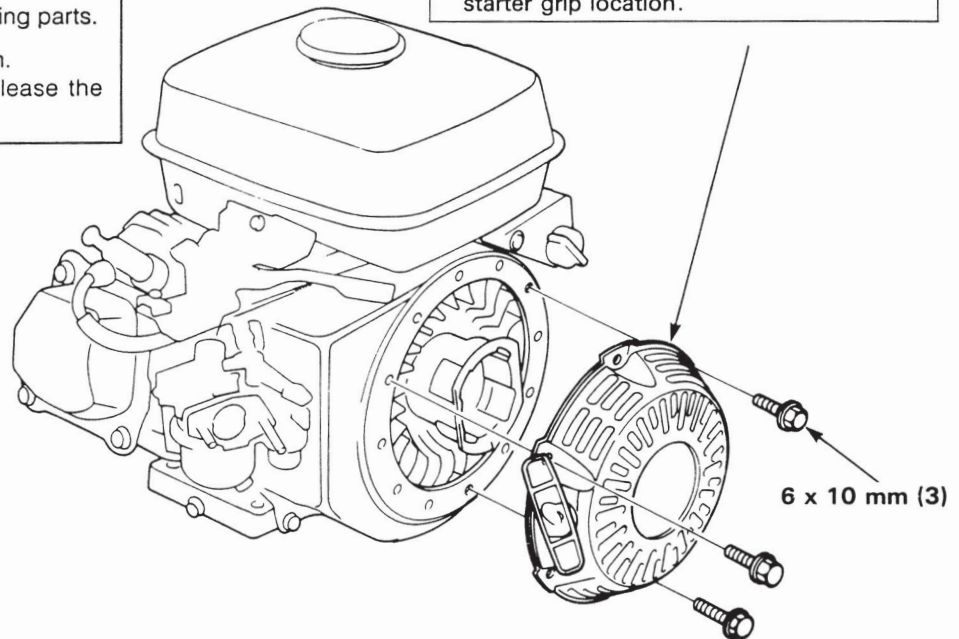
You can be seriously injured by flying parts.

- Wear gloves and eye protection.
- Remove the rope grip and release the reel before disassembly.

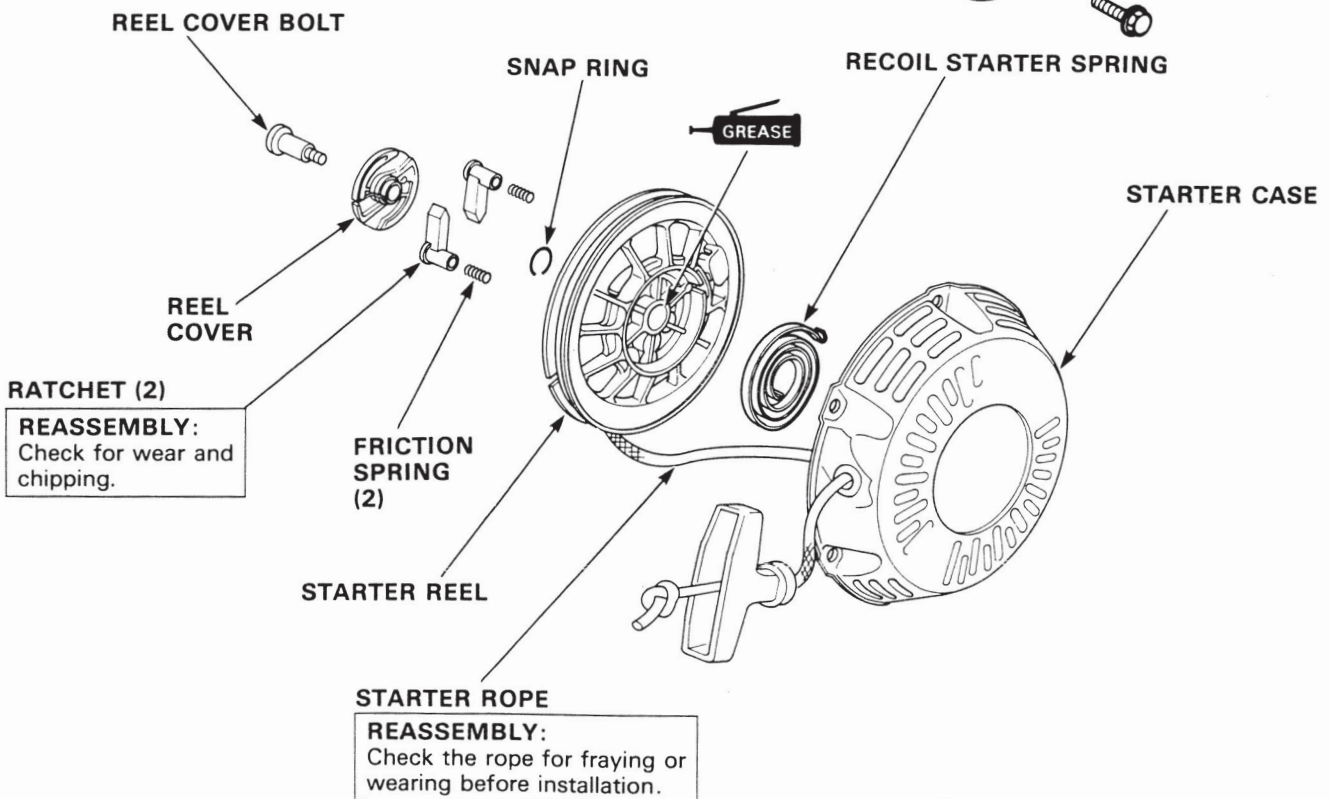
RECOIL STARTER

REASSEMBLY:

- Remove dirt and debris before installation.
- Position the recoil starter case for the best starter grip location.



6 x 10 mm (3)

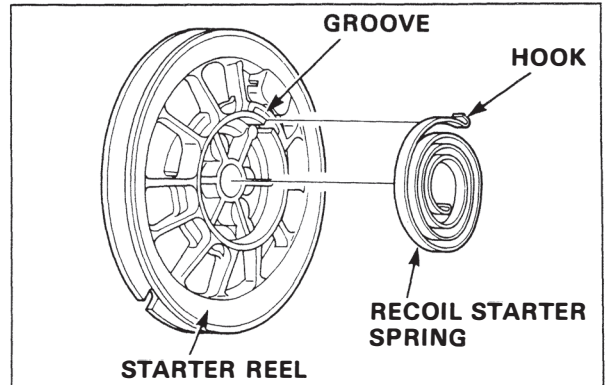


RATCHET (2)
REASSEMBLY:
 Check for wear and chipping.

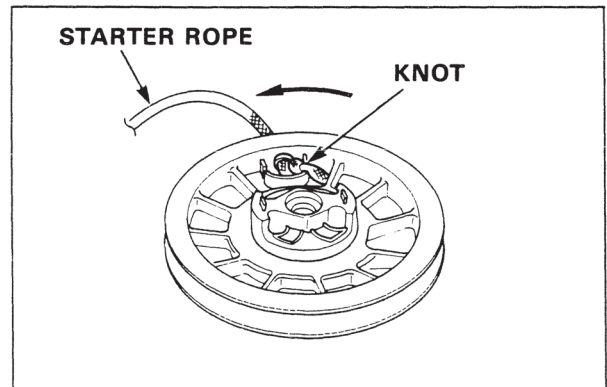
STARTER ROPE
REASSEMBLY:
 Check the rope for fraying or wearing before installation.

b. RECOIL STARTER ASSEMBLY

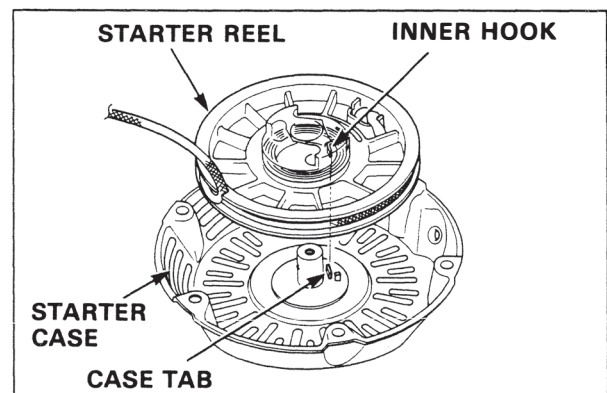
1) Insert the hook on the outer side of the spring into the groove inside the reel.



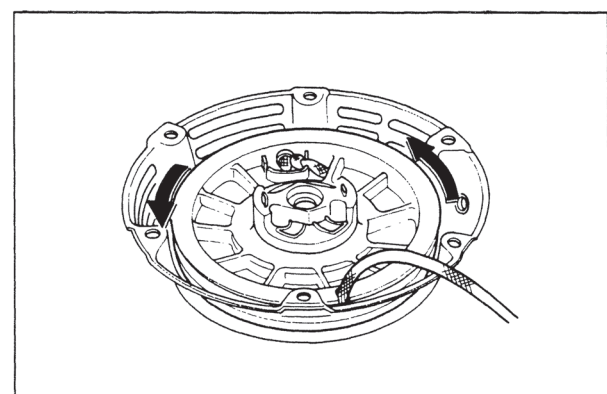
2) Pass the starter rope through the starter reel and tie it as shown. Wind the starter rope around the starter reel in direction of arrow. Leave approximately 30 cm (11.8 in) of the starter rope outside of the starter reel.



3) Install the starter reel on the starter case so that the spring inner hook is hooked to the case tab.



4) Hold the starter case and rotate the starter reel two revolutions in the direction of the arrow for preliminary winding.



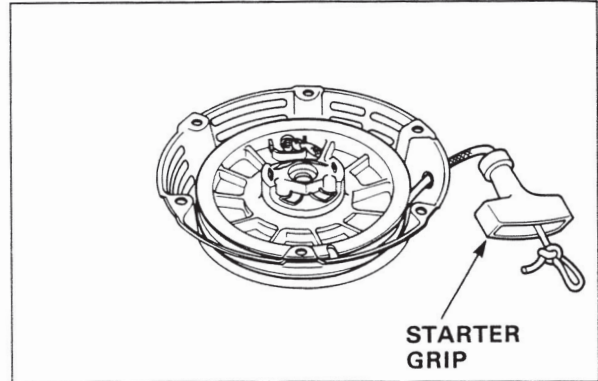
⚠ WARNING

When the reel is under spring tension, it can fly off if not retained in the starter case.

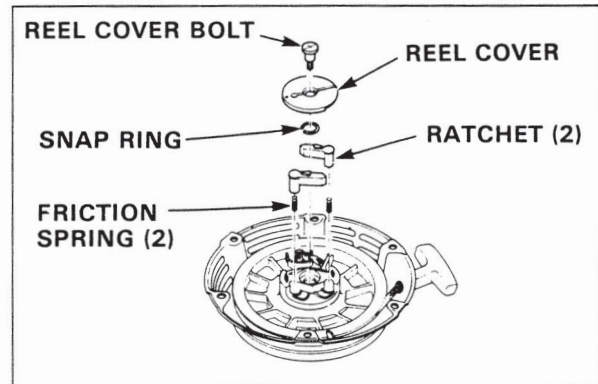
You can be seriously injured by flying parts.

- Wear gloves and eye protection.
- Hold the reel securely in the starter case until starter assembly is completed.

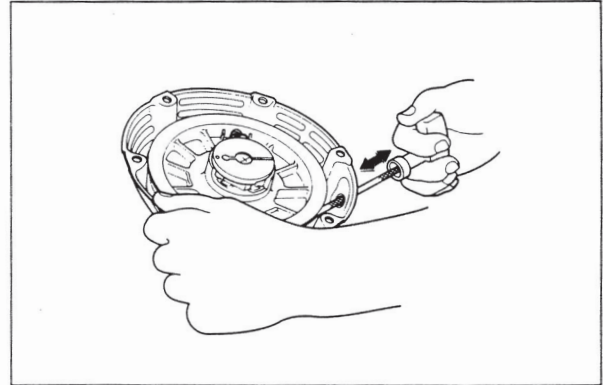
- 5) Pass the starter rope end through the starter case rope guide and pull it outwards. Pass the starter rope through the starter grip and tie the rope as shown.



- 6) Install the ratchet with the spring and reel cover. Tighten the reel cover bolt.

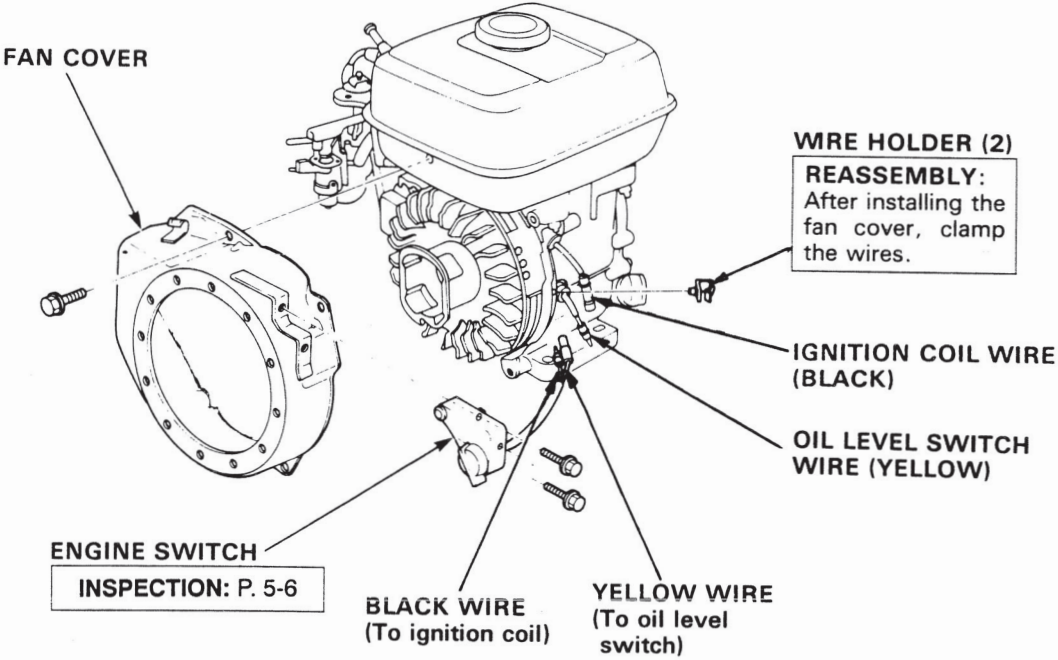


- 7) Check the operation of the ratchet by pulling the starter rope several times.



FAN COVER

a. DISASSEMBLY/REASSEMBLY



b. INSPECTION

● **ENGINE SWITCH**

- 1) Check the continuity between the engine switch black wire and the switch mounting bracket with an ohmmeter.

Switch position	Continuity
ON	No
OFF	Yes

Replace the switch assembly if the correct continuity is not obtained.

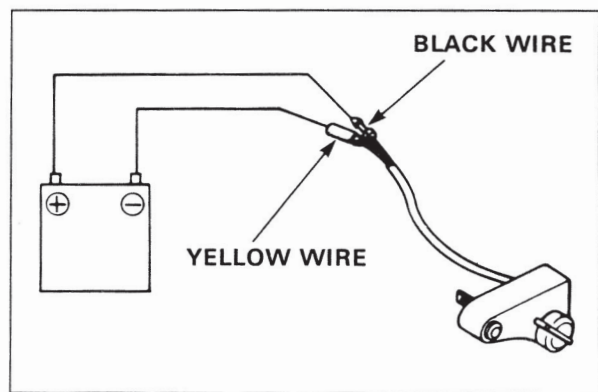
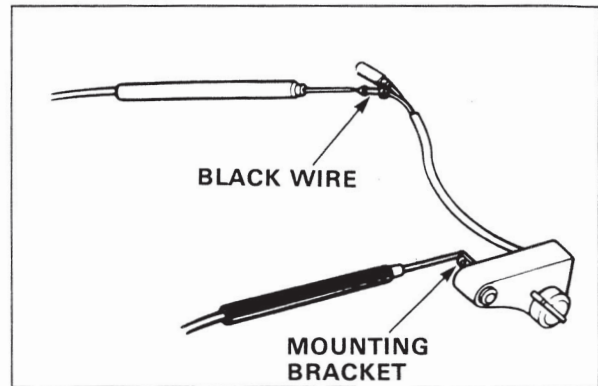
2) **OIL ALERT UNIT**

Connect a battery (1.5 to 6V)to the oil alert unit leads, as shown. The oil alert lamp should light. Replace the oil alert unit if the lamp does not light.

- Black lead to battery (+)
- Yellow lead to battery(-)

NOTICE

Never use a battery of more than 6V; it may burn out the light.

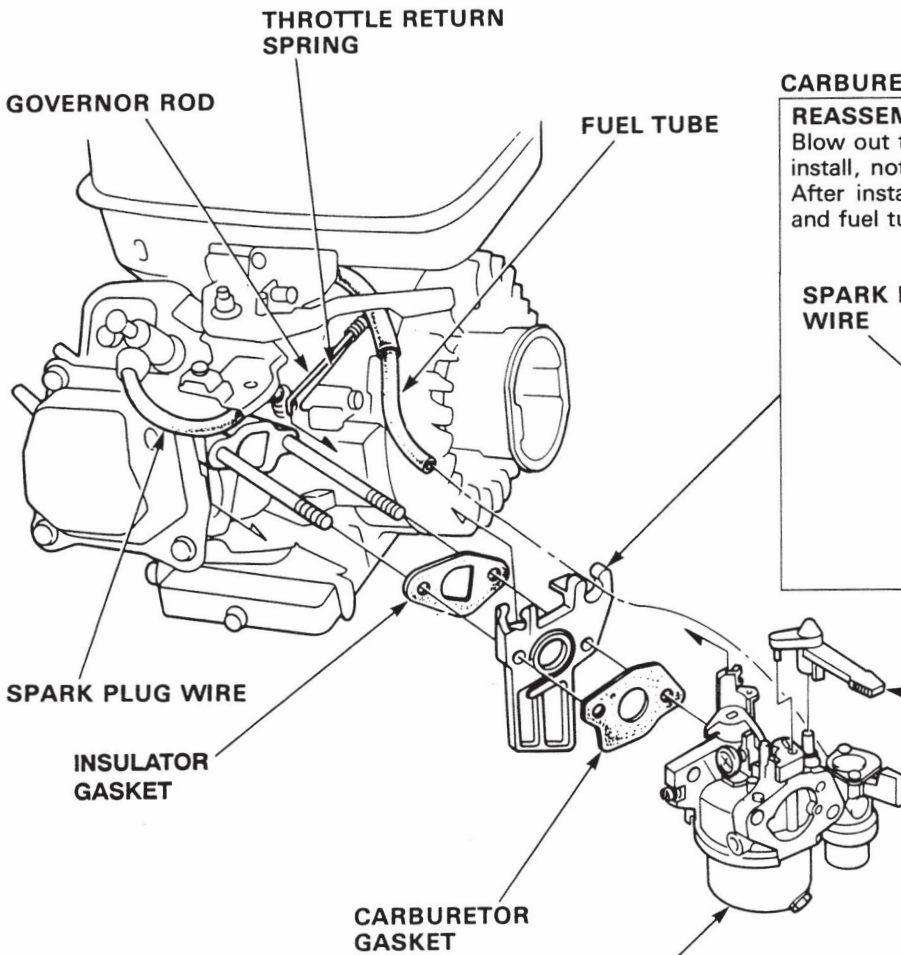


CARBURETOR

CARBURETOR6-2

CARBURETOR

a. REMOVAL/INSTALLATION



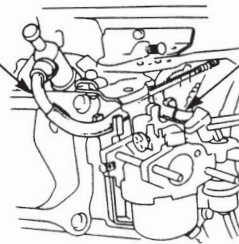
CARBURETOR INSULATOR

REASSEMBLY:

Blow out the passages with compressed air and install, noting the installation direction. After installation, connect the spark plug wire and fuel tube securely.

SPARK PLUG WIRE

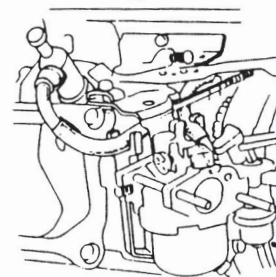
FUEL TUBE



CHOKE LEVER

DISASSEMBLY:

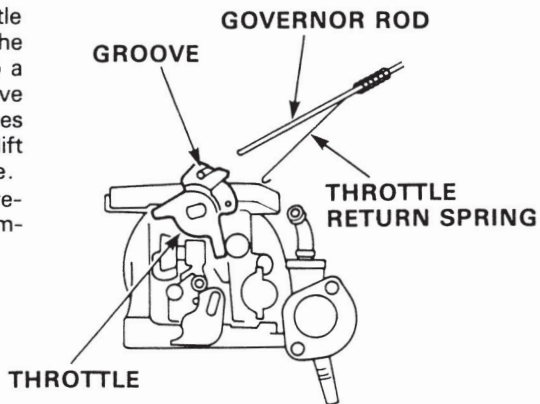
The short peg on the choke lever can be used to plug the end of the fuel tube.



CARBURETOR

DISASSEMBLY:

Unhook the throttle return spring. Pull the carburetor forward to a point where the groove in the throttle arm lines up with the rod, and lift the rod out of its hole. Reassembly is in the reverse order of disassembly.



WMP20X

b. DISASSEMBLY/REASSEMBLY

⚠ WARNING

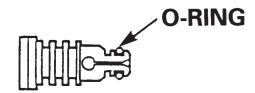
Gasoline is highly flammable and explosive. You can be burned or seriously injured.

- Before disassembly, drain the float chamber into an approved container.
- Keep heat, sparks, and flame away.

PILOT JET

REASSEMBLY:

- Clean thoroughly with compressed air before installation.
- Lightly lubricate the O-ring to ensure easy installation into carburetor body.



THROTTLE STOP SCREW

ADJUSTMENT: P. 3-5

PILOT SCREW

REASSEMBLY:
Inspect for wear or damage before installation.

REPLACEMENT: P.6-4

LIMITER CAP

REPLACEMENT: P.6-4

MAIN NOZZLE

REASSEMBLY:
Clean thoroughly with compressed air before installation.



MAIN JET

REASSEMBLY:
Clean thoroughly with compressed air before installation.

MAIN JET NUMBER: 70

MAIN JET



NOTICE Tampering is a violation of Federal and California law.

FLOAT

REASSEMBLY:
Check for smooth movement after installation.

CARBURETOR BODY

CLEANING: P. 6-5

FUEL VALVE

CHOKE LEVER

CHOKE PLATE

FUEL STRAINER CUP

REASSEMBLY:
Clean thoroughly with solvent before installation.

CLEANING: P. 3-6

FLOAT PIN

FLOAT VALVE

REASSEMBLY:
Check for worn float valve seat, float valve or weak spring before installation.



VALVE SEAT

FLOAT VALVE



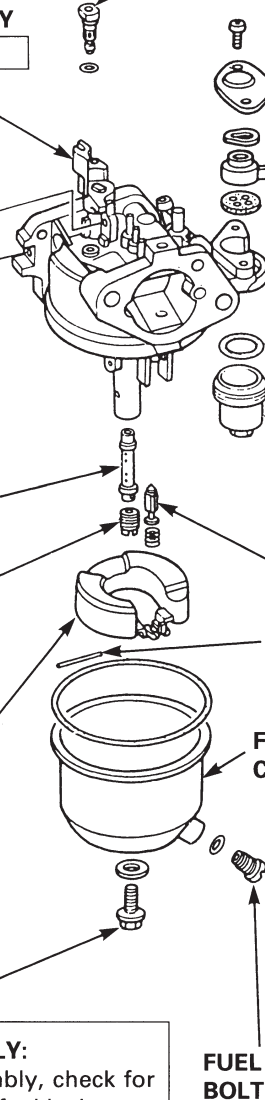
OK

REPLACE

SET BOLT

DISASSEMBLY:
After assembly, check for any sign of fuel leakage.

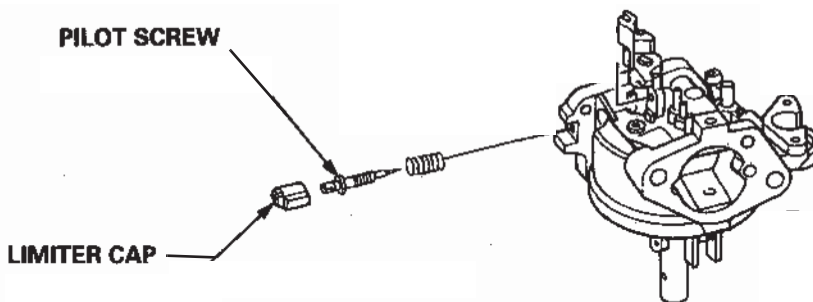
FUEL DRAIN BOLT



PILOT SCREW AND LIMITER CAP REPLACEMENT

Only remove the pilot screw and limiter cap when necessary for repair or to clean stubborn deposits from the pilot circuit passages.

Removal of the limiter cap requires breaking the pilot screw. A new pilot screw and limiter cap must be installed.

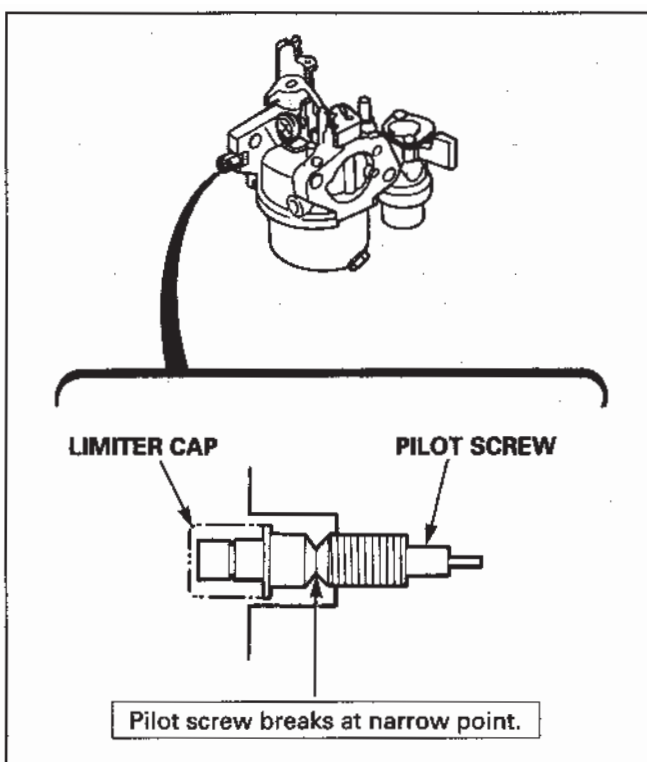


NOTICE

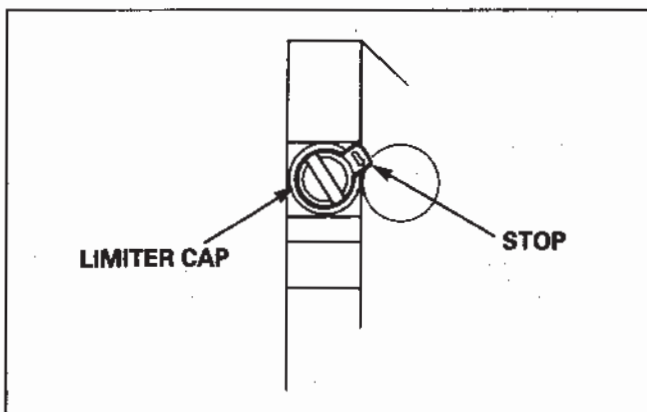
Tampering is a violation of Federal and California law.

1. When the limiter cap has been broken off, remove the broken pilot screw.
2. Place the spring on the replacement pilot screw, and install it on the carburetor.
3. Turn the pilot screw in until it is lightly seated, then turn the screw out the required number of turns.

Pilot screw opening	2 turns out
---------------------	-------------



4. Apply LOCKTITE® 638 to the inside of the limiter cap, then install the cap so its stop prevents the pilot screw from being turned counterclockwise. Be careful to avoid turning the pilot screw while installing the limiter cap. The pilot screw must stay at its required settings.



WMP20X

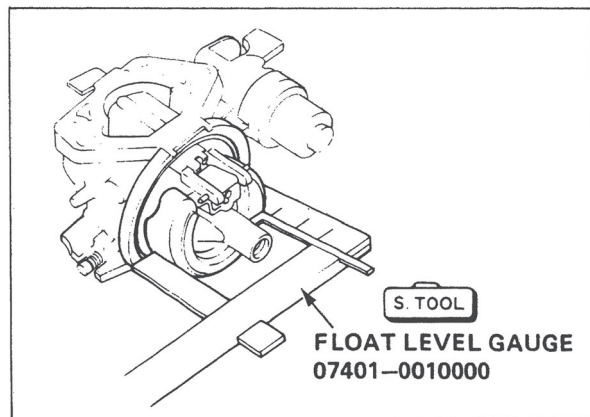
c. INSPECTION

• FLOAT LEVEL HEIGHT

Place the carburetor in the position as shown and measure the distance between the float top and the carburetor body when the float just contacts the seat without compressing the valve spring.

Standard float height	13.7 mm (0.54 in)
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If the height is out of specification, replace the float and/or the float valve. Recheck the float height.



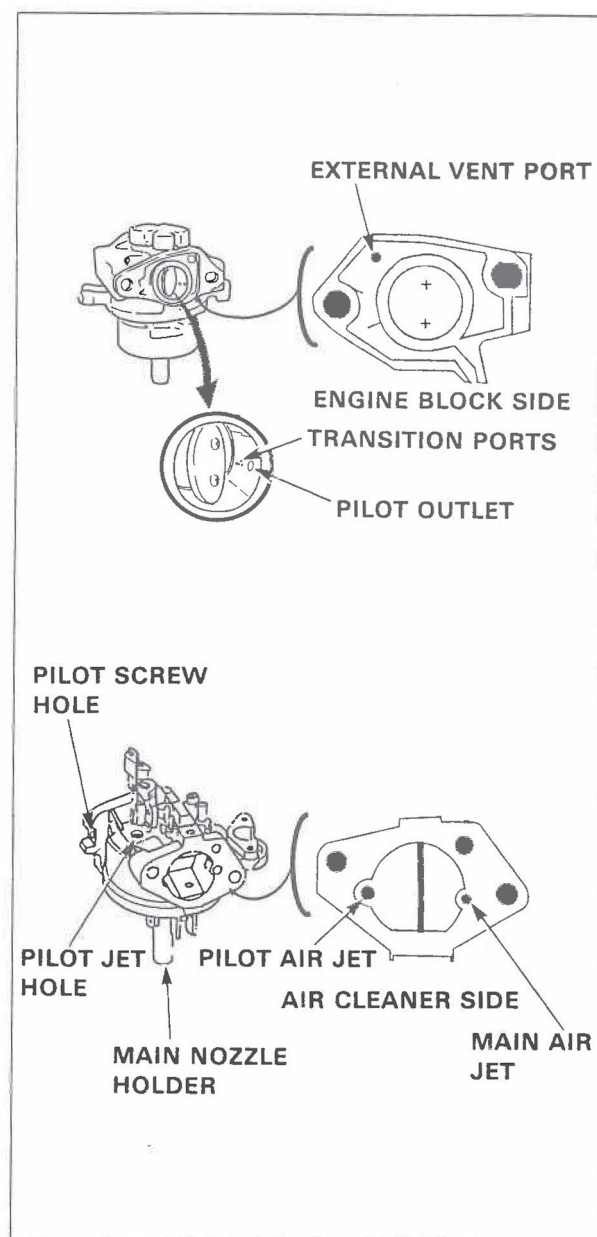
d. CLEANING

NOTICE

Some commercially available chemical cleaners are very caustic. These cleaners may damage plastic parts such as O-rings, floats, and float valve seats. Check the container for instructions. If you are in doubt, do not use these products to clean Honda carburetors.

High air pressure may damage the carburetor. Use low pressure settings when cleaning passages and ports.

1. Clean the carburetor body with high flash point solvent.
2. Use low air pressure to clean the following parts and passages. For safety, always wear eye protection when using compressed air.
 - External vent port
 - Pilot screw hole
 - Pilot jet hole
 - Pilot air jet
 - Main air jet
 - Transition ports
 - Pilot outlet



FUEL TANK, GOVERNOR ARM

FUEL TANK, GOVERNOR ARM7-2

FUEL TANK, GOVERNOR ARM

a. DISASSEMBLY/REASSEMBLY

⚠ WARNING

Gasoline is highly flammable and explosive. You can be burned or seriously injured.

- Before disassembly, drain the fuel tank into an approved container.
- Keep heat, sparks, and flame away.

FUEL TUBE

REASSEMBLY:

Inspect for cracks or deterioration before installation and replace if necessary.

6 mm LOCK NUT

REASSEMBLY:

Adjust control lever friction with this lock nut.

CONTROL LEVER SPRING

REASSEMBLY:

Install with the concave side toward the control lever.

WASHER

CONTROL LEVER

CABLE RETURN SPRING

REASSEMBLY:

Install with the short end side toward the control lever.

6 x 12 (2)

LIMITING SCREW

REASSEMBLY:

After assembling, start the engine and adjust the maximum speed (P. 3-6).

GOVERNOR SPRING

REASSEMBLY:

Install with the long end side toward the control lever.

6 mm FLANGE NUT (2)

10 N·m (1.0 kg-m, 7 ft-lb)

6 x 25

10 N·m (1.0 kg-m, 7 ft-lb)

FUEL TANK CAP

REASSEMBLY:

Make sure that the air vent hole is clean and unclogged. Blow with compressed air if necessary.

FUEL STRAINER

REASSEMBLY:

Check to be sure the strainer is clean and undamaged before installing.

FUEL TANK

FUEL CAPACITY:

3.1ℓ (0.82 US gal, 0.68 Imp gal)

REASSEMBLY:

Wash to remove any sediment and dry thoroughly before installing

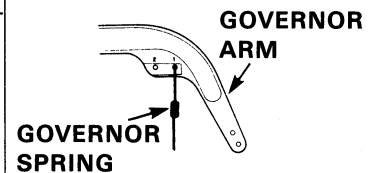
FUEL FILTER

2.0 N·m (0.2 kg-m, 1.4 ft-lb)
CLEANING: P. 3-7

GOVERNOR ARM

REASSEMBLY:

- Adjust the governor (P. 3-6).
- Hook the governor spring on the hole marked 1.



THROTTLE RETURN SPRING

REASSEMBLY:

Install with the long end side toward the control lever.

FLYWHEEL, IGNITION COIL

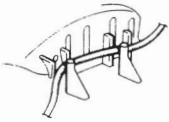
FLYWHEEL, IGNITION COIL8-2

FLYWHEEL, IGNITION COIL

a. DISASSEMBLY/REASSEMBLY

BLACK WIRE

Insert securely into the two ribs on the crankcase as shown.



WOODRUFF KEY

REASSEMBLY:
After installing the flywheel, check to be sure that the woodruff key is still in its slot on the crankshaft.

HIGH TENSION CORD

REASSEMBLY:
Check for cracked or damaged insulation; replace if necessary.

SPARK PLUG CAP

INSPECTION: P. 8-4

IGNITION COIL

INSPECTION/ADJUSTMENT: P. 8-3

COOLING FAN

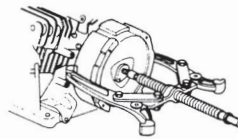
CAUTION:
When disassembling and reassembling, take care not to damage the fan blades.

REASSEMBLY:
Attach by aligning the four lugs on the rear side of the fan with the small holes in the flywheel.

FLYWHEEL

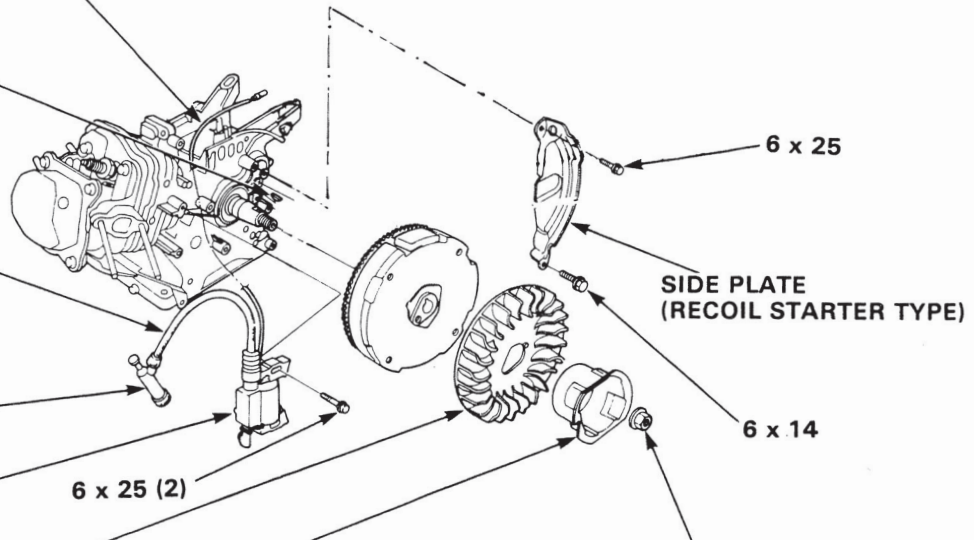
DISASSEMBLY:

- Remove the ignition coil before removing the flywheel.
- Do not hit the flywheel with a hammer.
- Remove with a commercially available six-inch puller.
- Avoid the magnet section when attaching the puller.



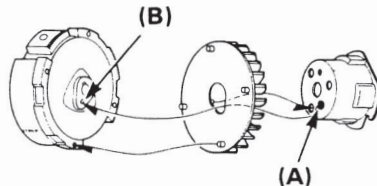
REASSEMBLY:

Clean the tapered surface of the crankshaft.



STARTER PULLEY

REASSEMBLY:
Attach by aligning the lug (A) on the pulley with the small hole (B) at the center of the flywheel.



14 mm FLANGE NUT

TORQUE:
75 N·m (7.5 kg-m, 54 ft-lb)
DISASSEMBLY/REASSEMBLY:
Hold the flywheel by placing a screwdriver in the pulley.

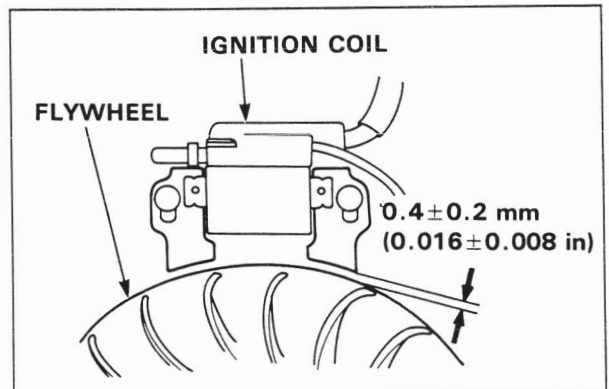
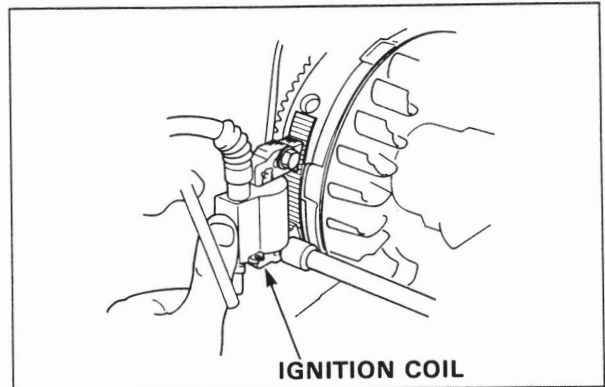
b. ADJUSTMENT

● IGNITION COIL AIR GAP

Adjustment is required only when the ignition coil or the flywheel has been removed.

- 1) Loosen the ignition coil bolts.
- 2) Insert a long thickness gauge or a piece of paper of the proper thickness between the ignition coil and the flywheel. Both gaps should be adjusted simultaneously. Avoid the magnet part of the flywheel when adjusting.
- 3) Push the ignition coil firmly toward the flywheel and tighten the bolts.

Specified clearance	$0.4 \pm 0.2 \text{ mm}$ ($0.016 \pm 0.008 \text{ in}$)
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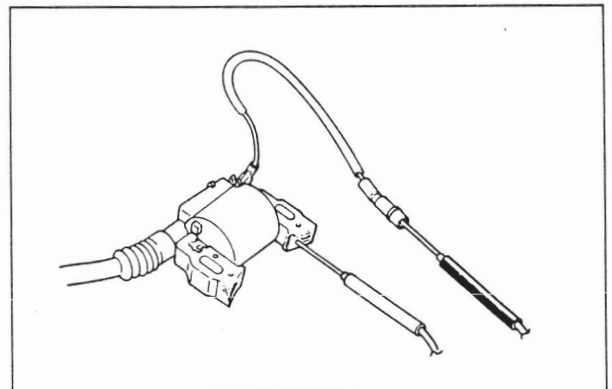
c. INSPECTION

● IGNITION COIL

<Primary side>

Measure the resistance of the primary coil by attaching one ohmmeter lead to the ignition coil's primary (black) lead while touching the other test lead to the iron core.

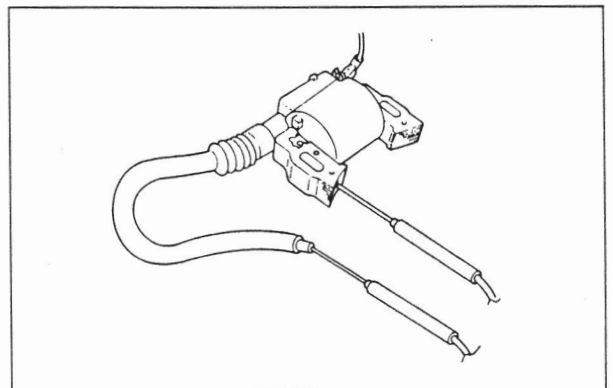
Primary side resistance value	$0.8 - 1.0 \Omega$
-------------------------------	--------------------



<Secondary side>

Measure the resistance of the secondary side of the coil by removing the spark plug cap and touching one test lead to the spark plug lead wire while touching the other lead to the coil's iron core.

Secondary side resistance value	$5.9 - 7.1 \text{ k}\Omega$
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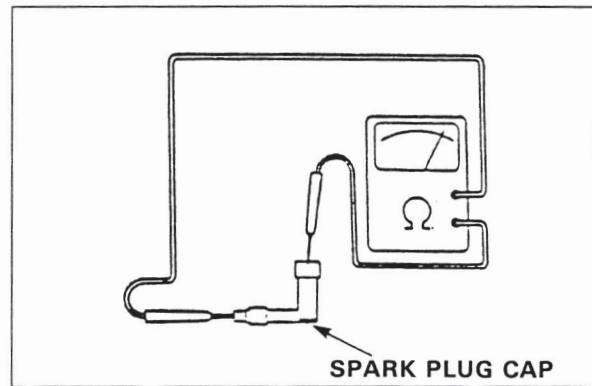
A false reading will result if the spark plug cap is not removed.

● SPARK PLUG CAP

Measure the resistance of the spark plug cap by touching one test lead at the wire end of the cap, and the other at the spark plug end.

Resistance	7.5–12.5 k Ω
------------	---------------------

Replace the spark plug cap if the resistance is not within the range specified.



CYLINDER HEAD, VALVES

CYLINDER HEAD, VALVES.....9-2

CYLINDER HEAD, VALVES

a. REMOVAL/INSTALLATION

8 x 60 (4)

TORQUE:

24 N·m (2.4 kg-m, 17 ft-lb)

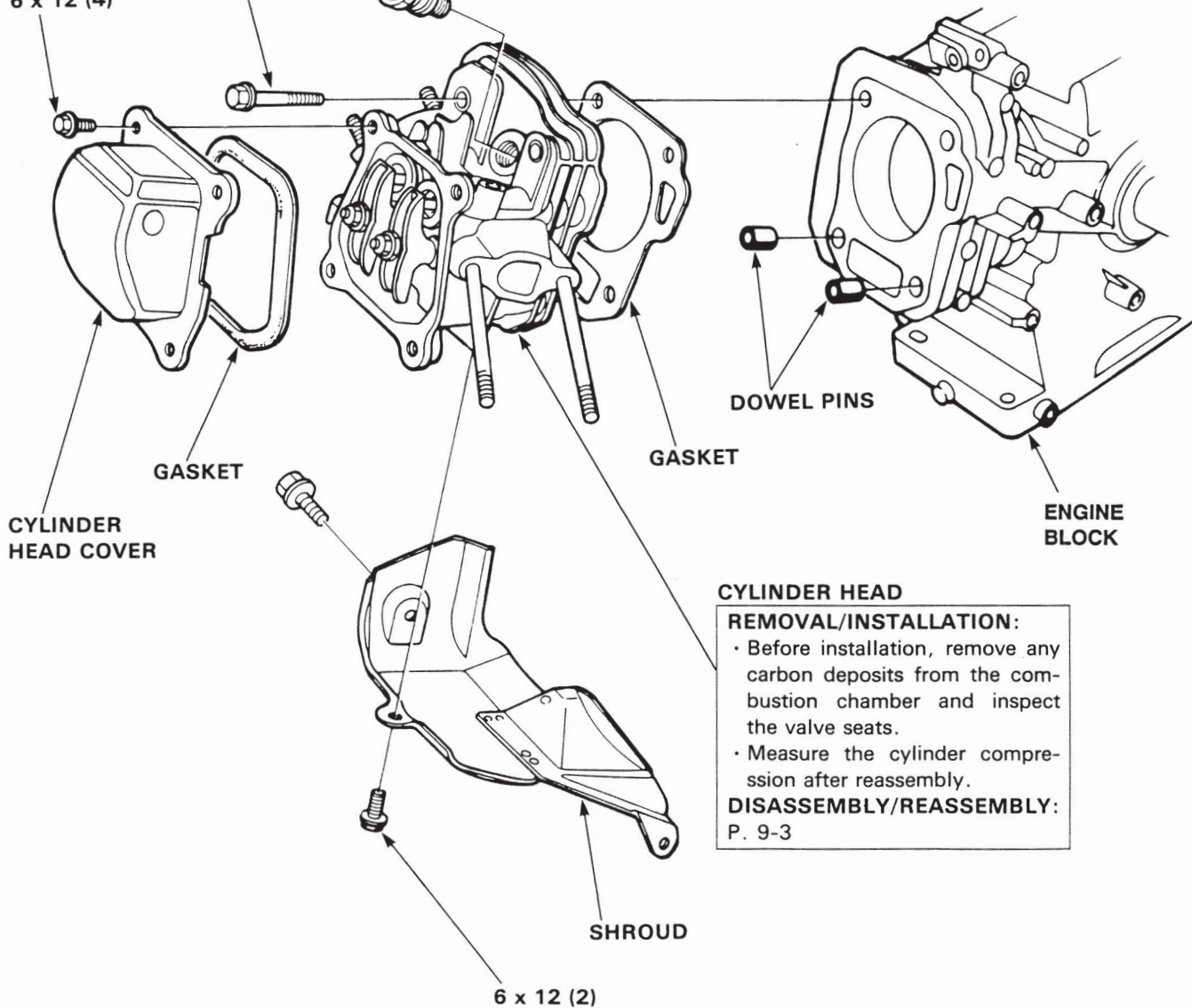
REMOVAL/INSTALLATION:

Loosen and tighten the bolts in a crisscross pattern in 2-3 steps.

SPARK PLUG

CLEANING, ADJUSTMENT: P. 3-5

6 x 12 (4)



CYLINDER HEAD

REMOVAL/INSTALLATION:

- Before installation, remove any carbon deposits from the combustion chamber and inspect the valve seats.
- Measure the cylinder compression after reassembly.

DISASSEMBLY/REASSEMBLY:
P. 9-3

b. DISASSEMBLY/REASSEMBLY

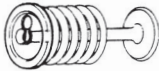
VALVE SPRING RETAINER (2)

DISASSEMBLY:

Push down and slide the retainer to the side, so the valve stem slips through the hole at the side of the retainer.

REASSEMBLY:

The exhaust valve retainer has a larger center recess than the intake valve retainer, so it can accept the valve rotator.



NOTICE

Do not remove the valve spring retainers while the cylinder head is installed, or the valves will drop into the cylinder.

VALVE ROTATOR
(Exhaust valve only)

NOTICE

If the valve rotator is not installed, the exhaust valve may drop into the cylinder when starting the engine.

EXHAUST VALVE

REASSEMBLY:

Before installation, remove carbon deposits and inspect the valve.

INSPECTION: P. 9-5

INTAKE VALVE

REASSEMBLY:

Do not interchange with the exhaust valve.

VALVE HEAD DIAMETER

IN: 25 mm (0.98 in)

EX: 24 mm (0.94 in)

INSPECTION: P. 9-5

VALVE SPRING (2)

INSPECTION: P. 9-4

VALVE GUIDE (2)

REPLACEMENT: P. 9-6

CYLINDER HEAD

INSPECTION:
P. 9-4

ROCKER ARM PIVOT
LOCK NUT (2)

10 N·m (1.0 kg-m, 7 ft-lb)

ROCKER ARM PIVOT
(2)

ROCKER ARM
PIVOT BOLT (2)

24 N·m (2.4 kg-m, 17 ft-lb)

ROCKER ARM (2)

REASSEMBLY:

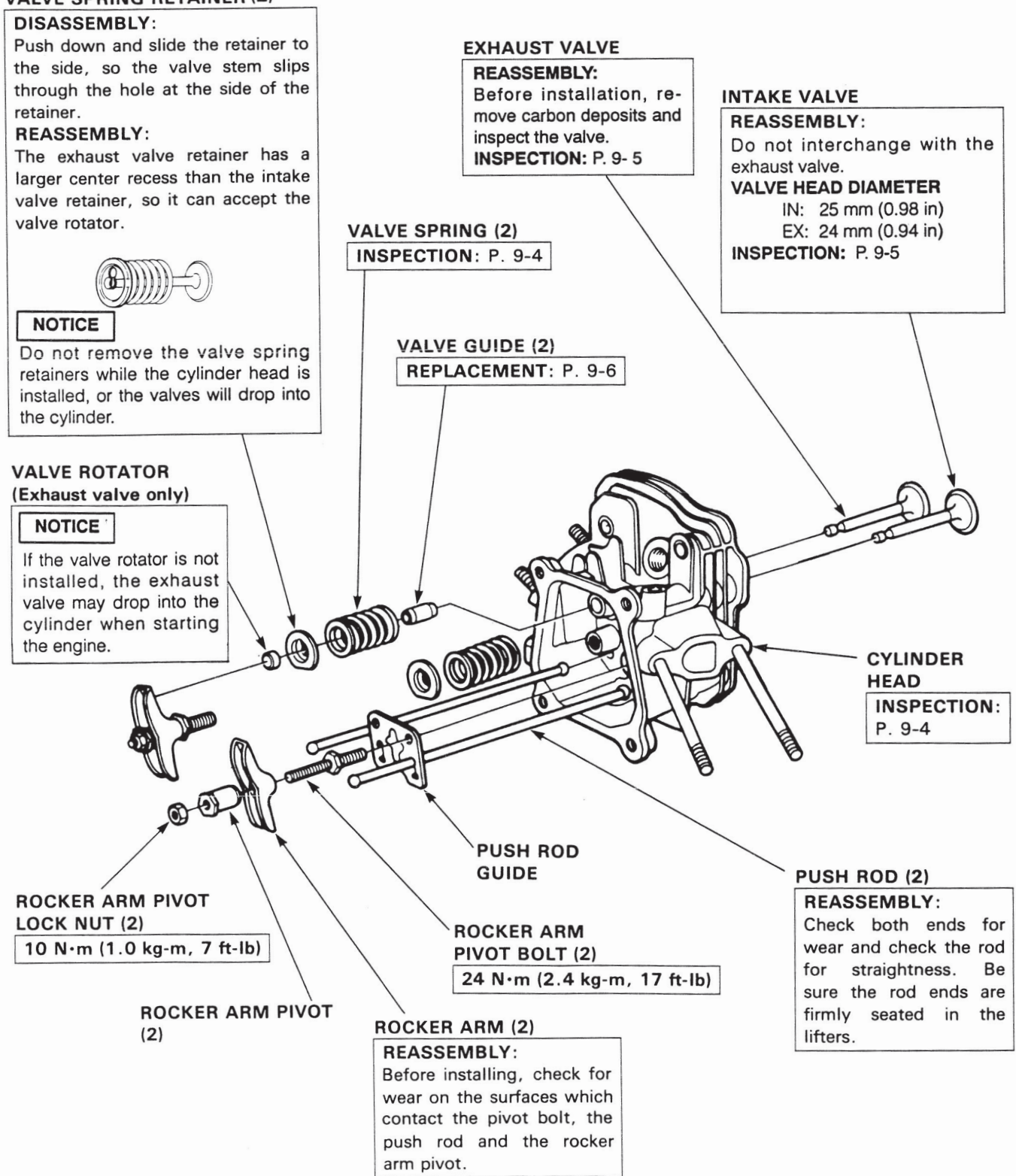
Before installing, check for wear on the surfaces which contact the pivot bolt, the push rod and the rocker arm pivot.

PUSH ROD
GUIDE

PUSH ROD (2)

REASSEMBLY:

Check both ends for wear and check the rod for straightness. Be sure the rod ends are firmly seated in the lifters.



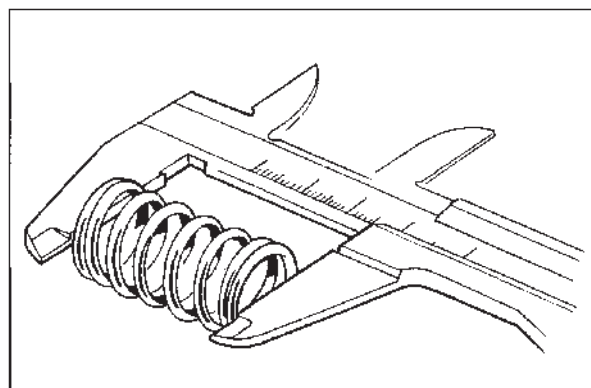
c. INSPECTION

• VALVE SPRING FREE LENGTH

Measure the free length of the valve springs.

Standard	Service limit
34.0 mm (1.34 in)	32.5 mm (1.28 in)

Replace the springs if they are shorter than the service limit.

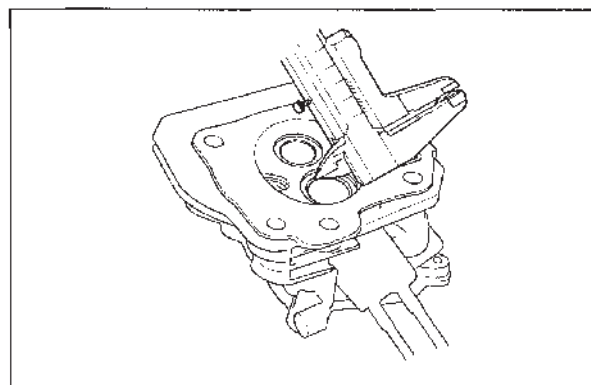


• VALVE SEAT WIDTH

Measure the valve seat width.

Standard	Service limit
0.8 mm (0.03 in)	2.0 mm (0.08 in)

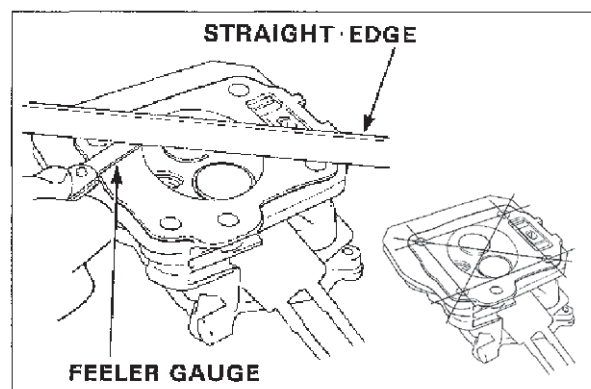
If the valve seat width is under the standard, or over the service limit, recondition the valve seat.



• CYLINDER HEAD

Clear off any gasket material from the cylinder head surface. Check the spark plug hole and valve areas for cracks. Check the cylinder head for warpage with a straight edge and a feeler gauge.

Service limit	0.10 mm (0.004 in)
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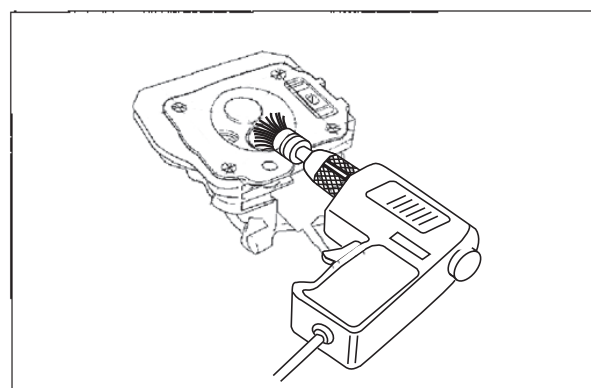
• COMBUSTION CHAMBER CLEANING

Attach a soft wire brush to an electric drill and clean any carbon deposits from the combustion chamber.

NOTICE

Do not remove the valves from the cylinder head when cleaning the combustion chamber; this could damage the valve seats.

Do not press the wire brush with force against the combustion chamber; this could damage the cylinder head.

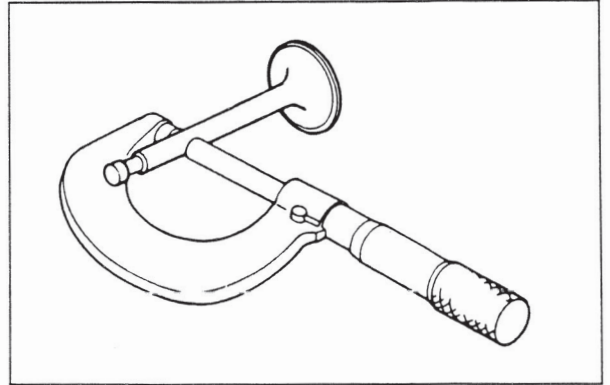


● **VALVE STEM O.D.**

Inspect each valve for face irregularities, bending or abnormal stem wear. Replace the valve if necessary. Measure and record each valve stem O.D.

	Standard	Service limit
IN	5.48 mm (0.216 in)	5.318 mm (0.2094 in)
EX	5.44 mm (0.214 in)	5.275 mm (0.2077 in)

Replace the valves if their O. D. is smaller than the service limit.



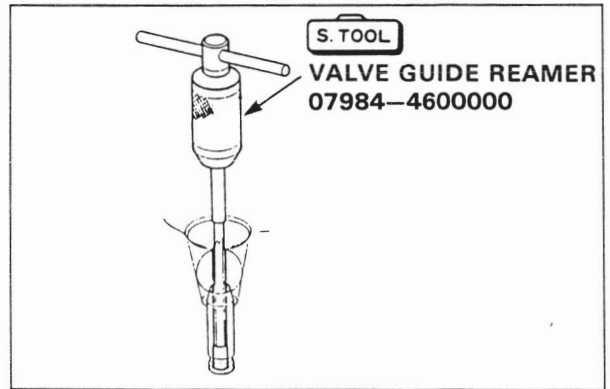
● **VALVE GUIDE I.D.**

Ream the valve guides to remove any carbon deposits before measuring.

Measure and record each valve guide I.D.

	Standard	Service limit
	5.50 mm (0.217 in)	5.572 mm (0.2194 in)

Replace the guides if they are over the service limit (P.9-6).



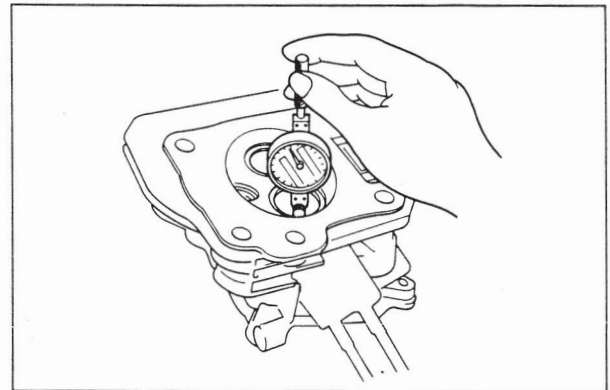
● **GUIDE-TO-STEM CLEARANCE**

Subtract each valve stem O.D. from the corresponding guide I.D. to obtain the stem-to-guide clearance.

	Standard	Service limit
IN	0.02-0.044 mm (0.0008-0.0017 in)	0.10 mm (0.004 in)
EX	0.06-0.087 mm (0.0024-0.0034 in)	0.12 mm (0.005 in)

If the stem-to-guide clearance exceeds the service limit, determine if the new guide with standard dimensions would bring the clearance within tolerance. If so, replace any guide as necessary and ream to fit. If the stem-to-guide clearance exceeds the service limit with new guides, replace the valves as well.

Recondition the valve seats whenever the valve guides are replaced (P. 9-7).



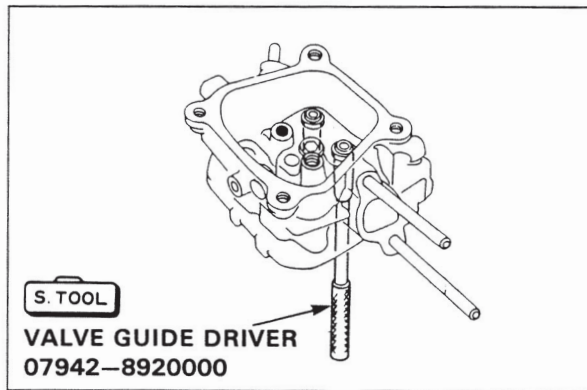
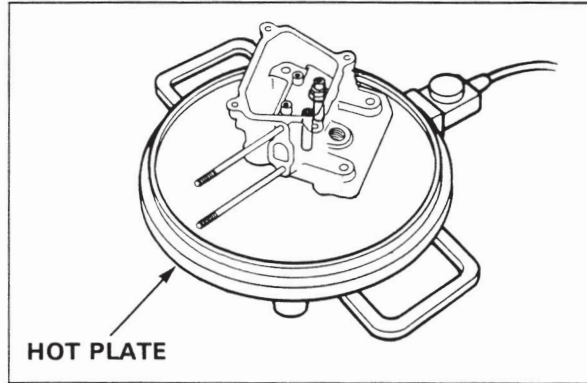
d. VALVE GUIDE REPLACEMENT

- 1) Chill the replacement valve guides in the freezer section of a refrigerator for about an hour.
- 2) Use a hot place or oven to heat the cylinder head evenly to 150° C (302° F).
Check the temperature with a temperature indicating stick (available at welding supply stores) or equivalent.

NOTICE

- Do not use a torch to heat the cylinder head; warpage of the cylinder head may result.
- Do not get the head hotter than 150°C (302°F); excessive heat may loosen the valve seats.

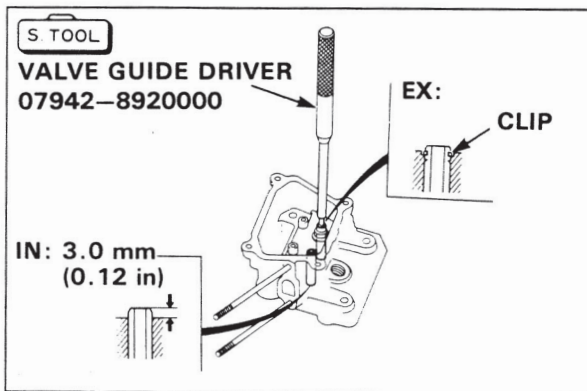
- 3) Remove the heated cylinder head from hot plate and support it with wooden blocks. Wear heavy gloves to avoid burns. Drive the valve guides out of the head from the combustion chamber side.



- 4) Remove the new valve guides from the refrigerator one at a time as needed.
- 5) Install the new valve guides from the valve spring side of the cylinder head.

Exhaust side: Drive the exhaust valve guide until the clip is fully seated as shown.

Intake side: Drive the intake valve guide to the specified height (measured from the top of the valve guide to the cylinder casting as shown).



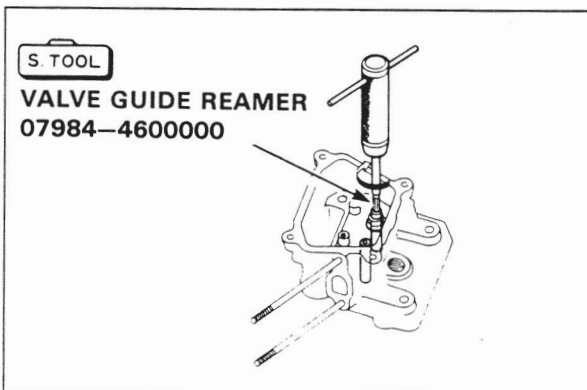
IN valve guide installation height	3.0 mm (0.12 in)
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- 6) After installation, inspect the valve guide for damage, replace the guide if damaged.

● VALVE GUIDE REAMING

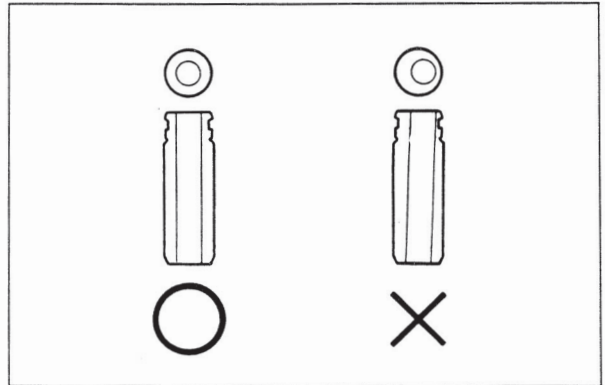
For best results, be sure the cylinder head is at room temperature before reaming valve guides.

- 1) Coat the reamer and valve guide with cutting oil.
- 2) Rotate the reamer clockwise through the valve guide the full length of the reamer.
- 3) Continue to rotate the reamer clockwise while removing it from the valve guide.



WMP20X

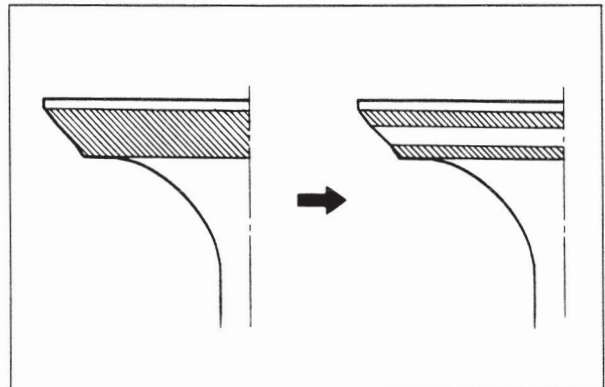
- 4) Thoroughly clean the cylinder head to remove any cutting residue.
- 5) Check the valve guide bore; it should be straight, round and centered in the valve guide. Insert the valve and check operation. If the valve does not operate smoothly, the guide may have been bent during installation. Replace the valve guide if it is bent or damaged.
- 6) Check the valve guide-to-stem clearance (P. 9-5).



e. VALVE SEAT RECONDITIONING

Standard	Service limit
0.8 mm (0.03 in)	2.0 mm (0.08 in)

- 1) Thoroughly clean the combustion chamber and valve seats to remove carbon deposits.
Apply a light coat of Prussian Blue or erasable felt-tipped marker ink to the valve face.
- 2) Insert the valve, and snap it closed against its seat several times. Be sure the valve does not rotate on the seat. The transferred marking compound will show any area of the seat that is not concentric.
- 3) Using a 45° cutter, remove enough material to produce a smooth and concentric seat. Follow the instructions of the valve seat cutter manufacturer.
Turn the cutter clockwise, never counterclockwise.
Continue to turn the cutter as you lift it from the valve seat.



S TOOL

SOLID PILOT BARS
 5.50 mm 07781 - P03010A
 5.52 mm 07781 - P03020A
 5.55 mm 07781 - P03030A

T-WRENCH, #505
 07782 - P01010A

T-WRENCH ADAPTER, #503-1
 07782 - P01020A

ACCESSORY PACKAGE, #246
 07782 - P01030A

VALVE SEAT CUTTERS

#111
60°
07780-P01050A

#115
31°
07780-P01040A

#122
45°
07780-P01030A

- 4) Use the 30°–32° and 60° cutters to narrow and adjust the valve seat so that it contacts the middle of the valve face. The 30°–32° cutter removes material from the top edge (contact too high).

The 60° cutter removes material from the bottom edge (contact too low).

Adjust the width of the finished valve seat to 0.8 mm (0.03 in).

- 5) Make a light pass with 45° cutter to remove any possible burrs at the edges of the seat.
- 6) After resurfacing the seats, inspect for even valve seating. Apply Prussian Blue compound or erasable felt-tipped marker ink to the valve faces. Insert the valve, and snap it closed against its seat several times. Be sure the valve does not rotate on the seat.

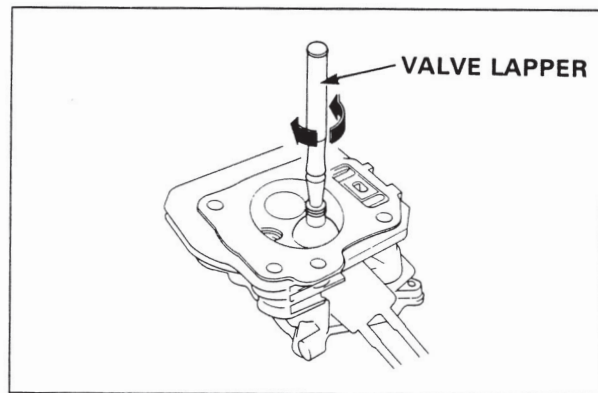
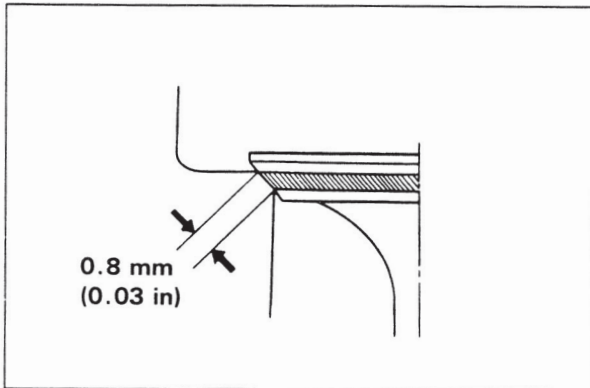
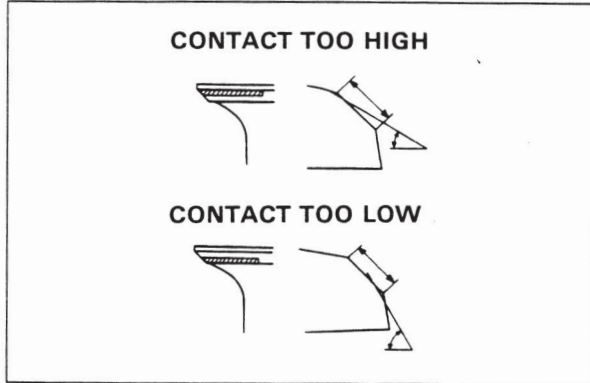
The seating surface, as shown by the transferred marking compound, should have good contact all the way around.

- 7) Lightly lap the valves into their seats, using a hand valve lapper and fine lapping compound (commercially available).

NOTICE

To avoid severe engine damage, be sure to remove all lapping compound from the engine before reassembly.

- 8) Adjust valve clearance after reassembly.

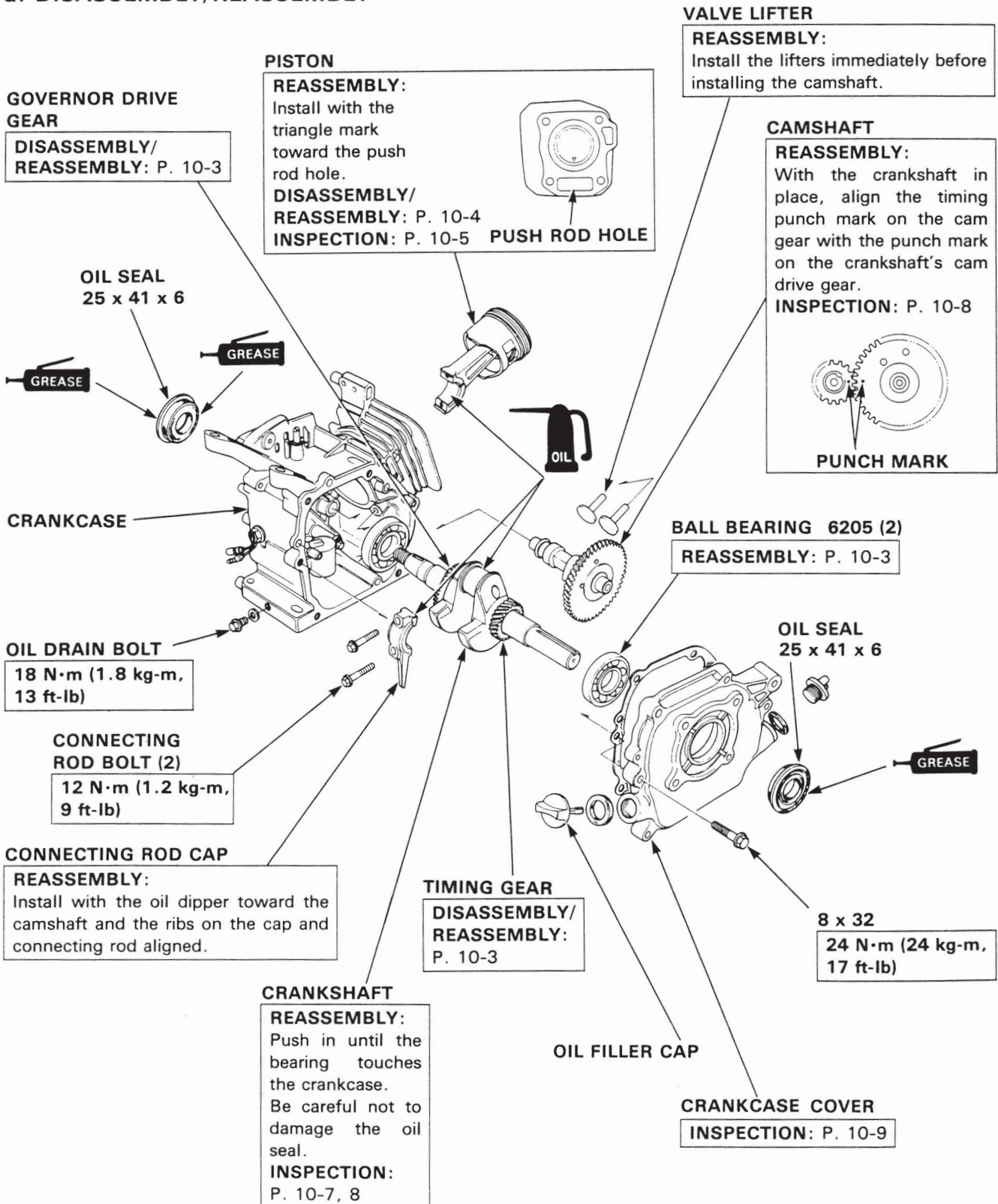


CRANKCASE COVER, CRANKSHAFT, PISTON

CRANKCASE COVER, CRANKSHAFT,
PISTON.....10-2

CRANKCASE COVER, CRANKSHAFT, PISTON

a. DISASSEMBLY/REASSEMBLY



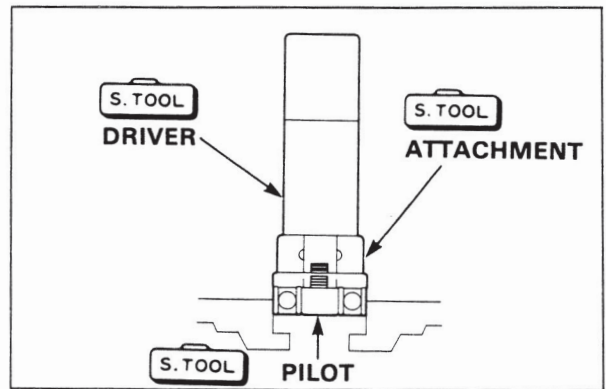
WMP20X

● CRANKSHAFT BEARING

REASSEMBLY:

Oil the circumference of the bearing, and install the bearing with the following special tools.

Driver	07749-0010000
Attachment, 52×55 mm	07746-0010400
Pilot, 25 mm	07746-0040600



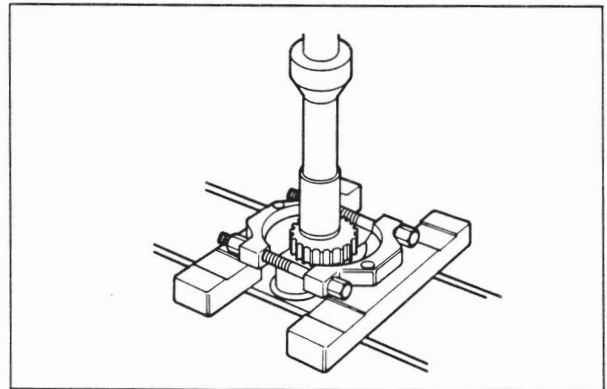
● TIMING GEAR/GOVERNOR DRIVE GEAR

DISASSEMBLY:

Mark a line on the crankshaft and a timing gear.

Set the commercially available bearing puller plate on the bottom part of the governor drive gear and remove the crankshaft and timing gear using a hydraulic press.

Remove the governor drive gear in the same way.



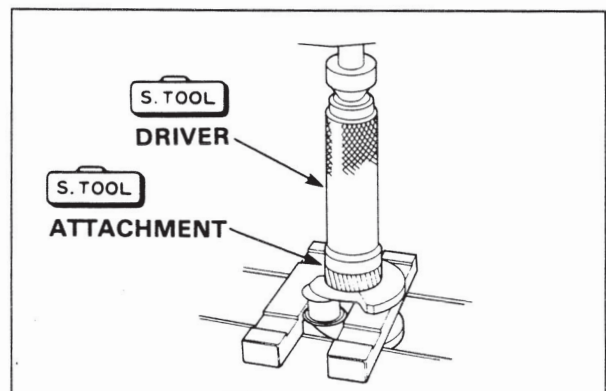
REASSEMBLY:

● TIMING GEAR

Using the old gear for reference, make a mark at the same position on the new gear.

Using a hydraulic press, driver and attachment I.D. (special tools), press the new gear onto the crankshaft.

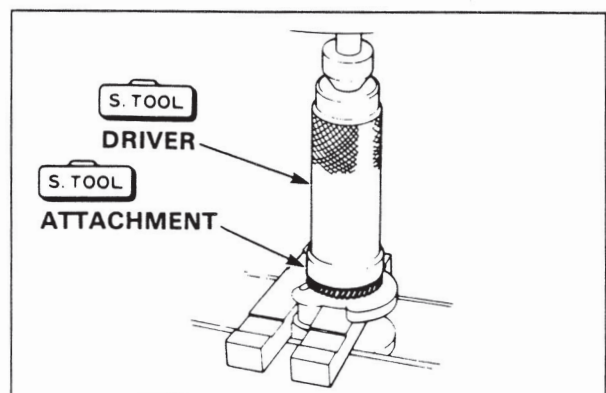
Driver, 40 mm I.D.	07746-0030100
Attachment 30, mm I.D.	07746-0030300



● GOVERNOR DRIVE GEAR

Use a hydraulic press and the common tools shown below to press in a new governor drive gear.

Driver, 40 mm I.D.	07746-0030100
Attachment, 35 mm I.D.	07746-0030400

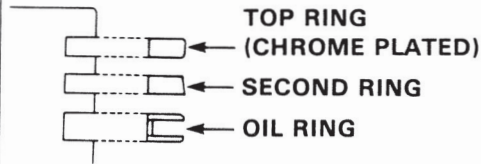


• PISTON

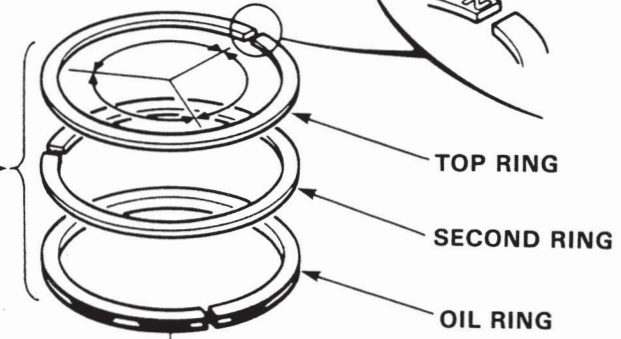
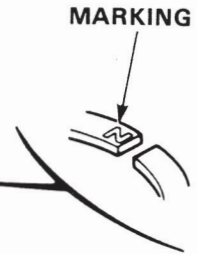
PISTON RING

REASSEMBLY:

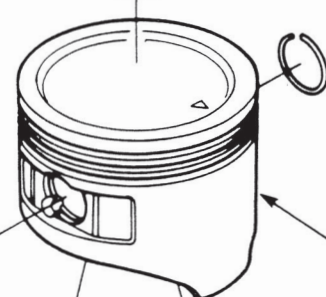
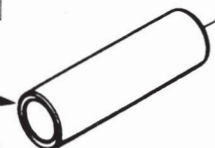
- Install all rings with the markings facing upward.
- Be sure that the top and second rings are not interchanged.
- Check that the rings rotate smoothly after installation.
- Space the piston ring end gaps 120 degrees apart, and do not align the gaps with the piston pin bore.



INSPECTION: P. 10-5, 6



PISTON PIN



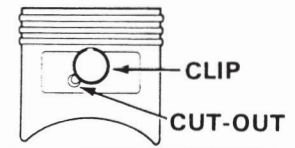
PISTON

PISTON PIN CLIP

REASSEMBLY:

Install by setting one end of the clip in the piston groove, holding the other end with long-nosed pliers, and rotating the clip in.

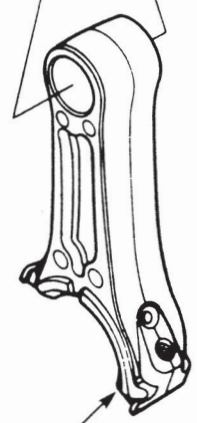
Do not align the end gap of the clip with the cutout in the piston pin bore.



CONNECTING ROD

REASSEMBLY:

Install the connecting rod with the long end toward the triangle marked side of the piston.

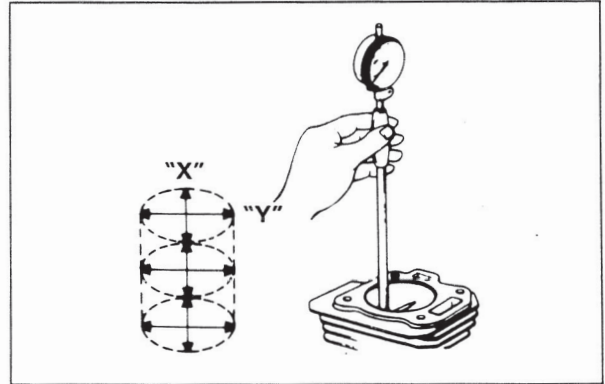


b. INSPECTION

● **CYLINDER I.D.**

Measure and record the cylinder I.D. at three levels in both the "X" axis (perpendicular to crankshaft) and the "Y" axis (parallel to crankshaft). Take the maximum reading to determine cylinder wear and taper.

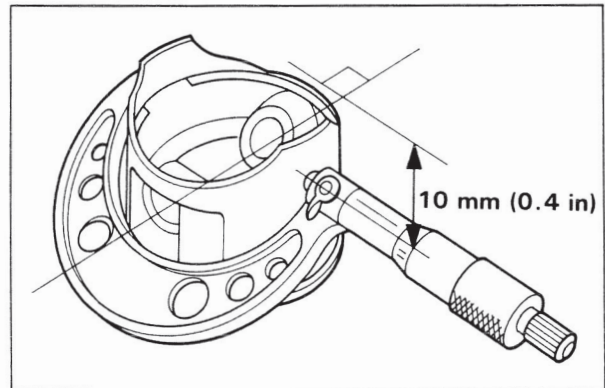
Standard	Service limit
68.0 mm (2.68 in)	68.165 mm (2.6837 in)



● **PISTON SKIRT O.D.**

Measure and record the piston O.D. at a point 10 mm (0.4 in) from the bottom of the skirt and 90° to the piston pin bore.

Standard	Service limit
67.985 mm (2.6766 in)	67.845 mm (2.7111 in)

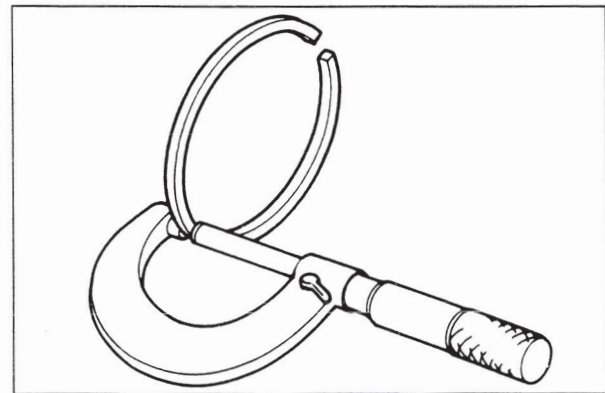


● **PISTON-TO-CYLINDER CLEARANCE**

Standard	Service limit
0.015-0.050 mm (0.0006-0.0020 in)	0.12 mm (0.005 in)

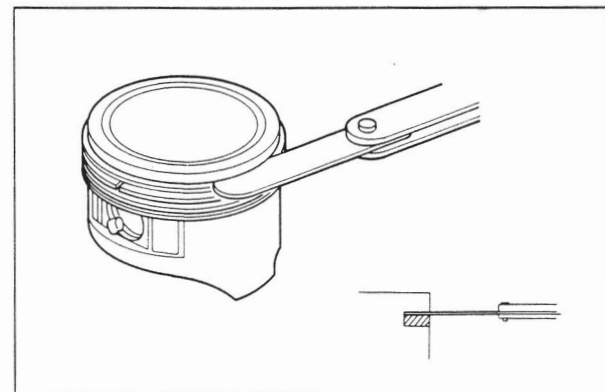
● **PISTON RING WIDTH**

	Standard	Service limit
Top/second	1.5 mm (0.06 in)	1.37 mm (0.054 in)
Oil	2.5 mm (0.10 in)	2.37 mm (0.093 in)



● **PISTON RING SIDE CLEARANCE**

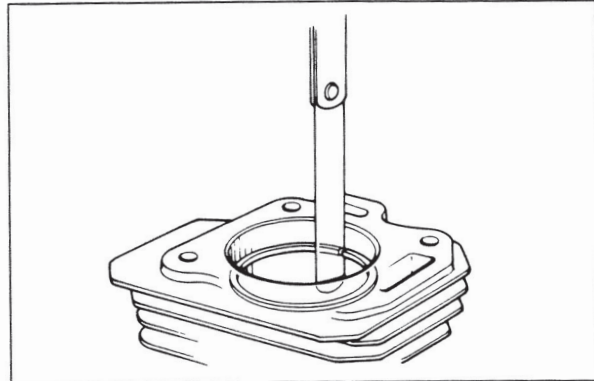
	Standard	Service limit
Top/second/ oil	0.015-0.045 mm (0.0006-0.0018 in)	0.15 mm (0.006 in)



● PISTON RING END GAP

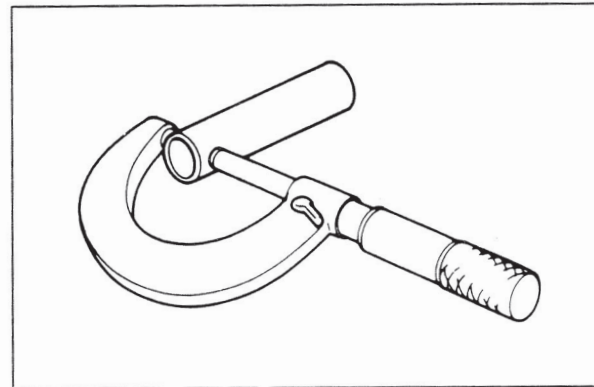
	Standard	Service limit
Top/second	0.2-0.4 mm (0.008-0.016 in)	1.0 mm (0.04 in)
Oil	0.15-0.35 mm (0.006-0.014 in)	1.0 mm (0.04 in)

Use the top of the piston to position the ring horizontally in the cylinder.



● PISTON PIN O. D.

Standard	Service limit
18.0 mm (0.71 in)	17.954 mm (0.7068 in)

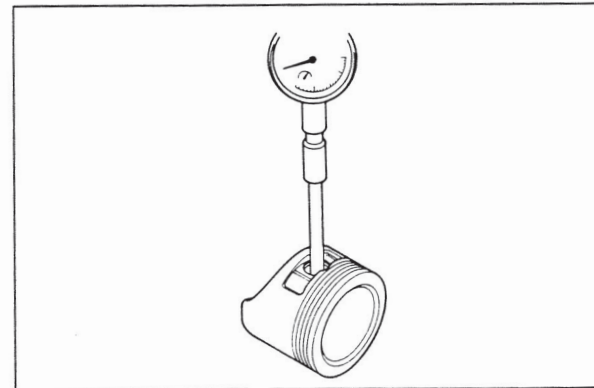


● PISTON PIN BORE I. D.

Standard	Service limit
18.002 mm (0.7087 in)	18.048 mm (0.7105 in)

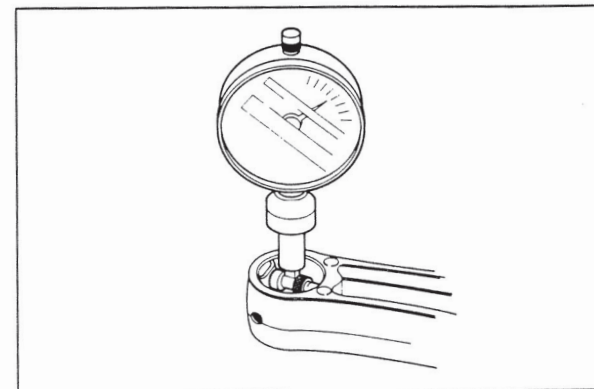
● PISTON-TO-PISTON PIN BORE CLEARANCE

Standard	Service limit
0.002-0.014 mm (0.0001-0.0006 in)	0.06 mm (0.002 in)



● CONNECTING ROD SMALL END I. D.

Standard	Service limit
18.002 mm (0.7087 in)	18.07 mm (0.711 in)



WMP20X

● CONNECTING ROD BIG END I.D.

ORIGINAL SIZE

Standard	Service limit
30.02 mm (1.182 in)	30.066 mm (1.1837 in)

0.25 mm UNDERSIZE

Standard	Service limit
29.770-29.783 mm (1.1720-1.1726 in)	29.816 mm (1.1739 in)

● CRANKPIN O.D.

Standard	Service limit
29.98 mm (1.180 in)	29.92 mm (1.178 in)

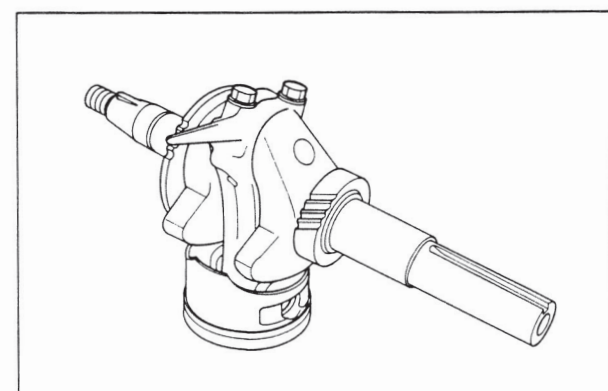
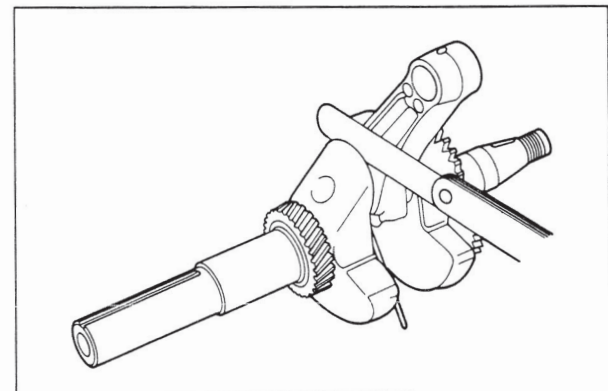
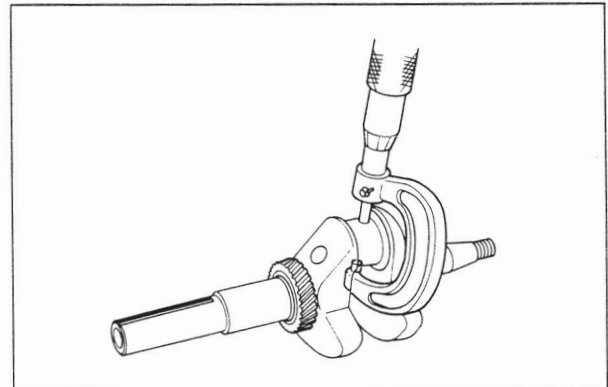
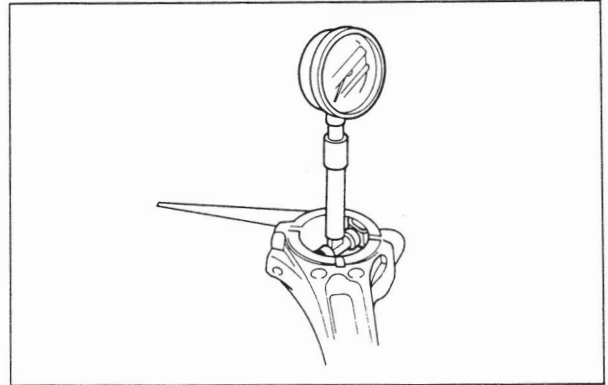
● CONNECTING ROD BIG END SIDE CLEARANCE

Standard	Service limit
0.1-0.7 mm (0.004-0.028 in)	1.1 mm (0.043 in)

● CONNECTING ROD BIG END OIL CLEARANCE

- 1) Clean all oil from the crankpin and connecting rod big end surfaces.
- 2) Place a piece of plastigauge on the crankpin, install the connecting rod and cap, and tighten the bolts to the specified torque. Do not rotate the crankshaft while the plastigauge is in place.

TORQUE: 12 N·m (1.2 kg·m, 9 ft·lb)

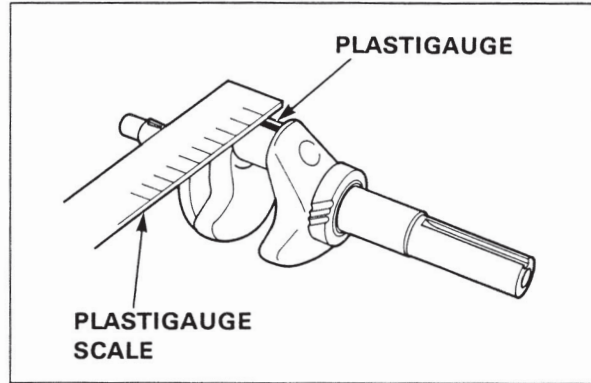


3) Remove the connecting rod and measure the plastigauge.

Standard	Service limit
0.040-0.063 mm (0.0016-0.0025 in)	0.12 mm (0.005 in)

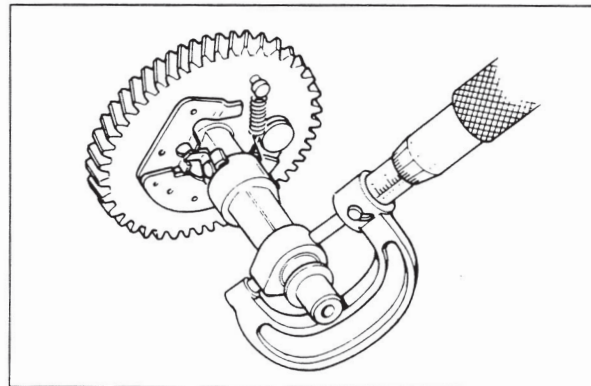
4) If the clearance exceeds the service limit, replace the connecting rod and recheck the clearance.

Replacement connecting rods are available with standard and undersized bearing surfaces.



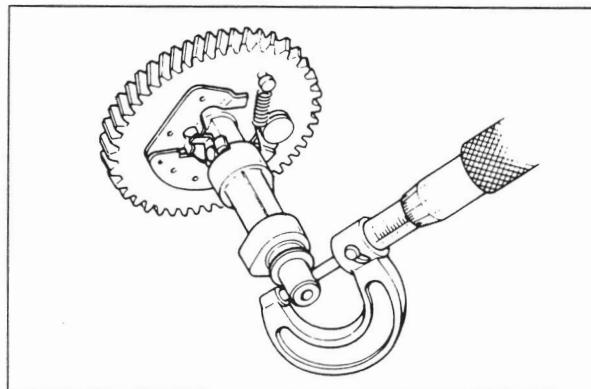
● CAMSHAFT CAM HEIGHT

	Standard	Service limit
IN	27.7 mm (1.09 in)	27.45 mm (1.081 in)
EX	27.75 mm (1.093 in)	27.50 mm (1.083 in)



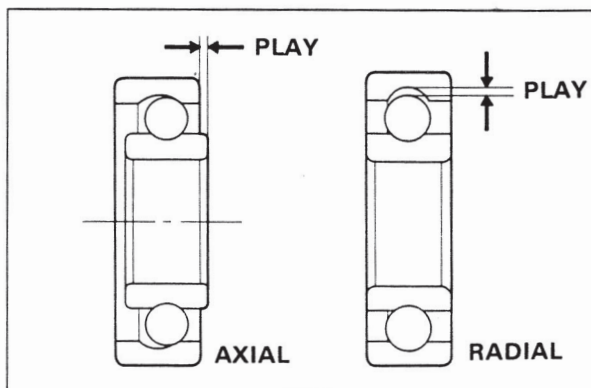
● CAMSHAFT O. D.

Standard	Service limit
13.984 mm (0.5506 in)	13.916 mm (0.5479 in)



● CRANKSHAFT BEARING FREE PLAY

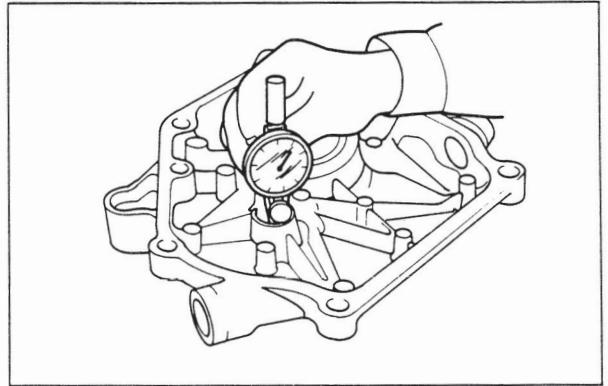
- 1) Clean the bearing in solvent and dry it.
- 2) Spin the bearing by hand and check for play. Replace the bearing if it is noisy or has excessive play.



WMP20X

● CAMSHAFT HOLDER I.D.

Standard	Service limit
14.0 mm (0.55 in)	14.048 mm (0.5531 in)

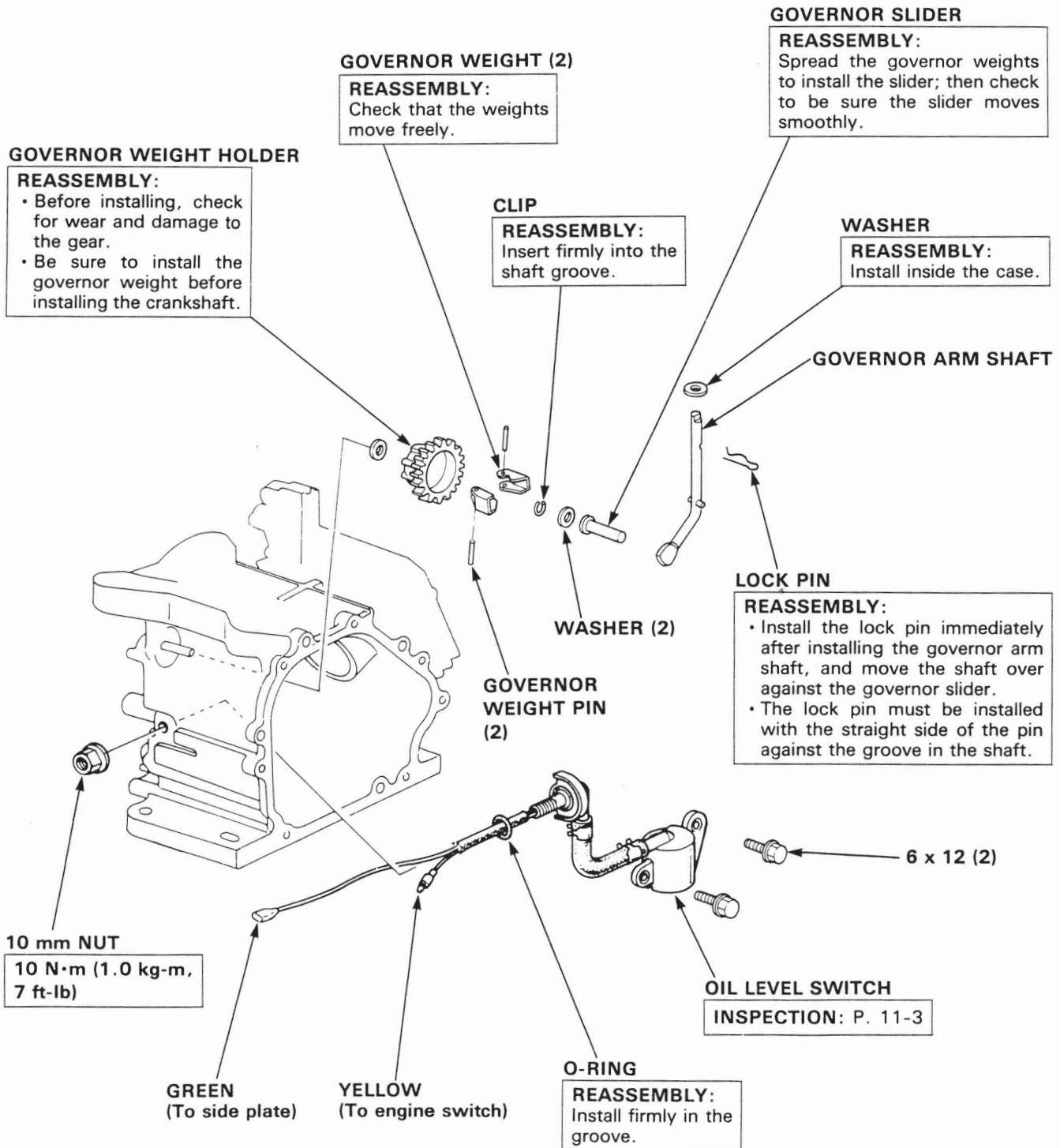


GOVERNOR, OIL LEVEL SWITCH

GOVERNOR, OIL LEVEL SWITCH11-2

GOVERNOR, OIL LEVEL SWITCH

a. DISASSEMBLY/REASSEMBLY

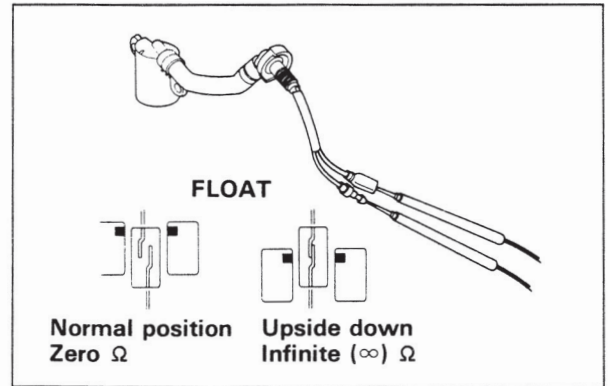


b. INSPECTION

● OIL LEVEL SWITCH

Check continuity between the yellow and green switch leads with an ohmmeter.

- 1) Hold the switch in its normal position. The ohmmeter should read zero resistance.
- 2) Hold the switch upside down. The ohmmeter should read infinite (∞) resistance.
- 3) Inspect the float by dipping the switch into a container of oil. The ohmmeter reading should go from zero to infinity as the switch is lowered.



PUMP

PUMP BODY, CHECK VALVE,
VOLUTE12-2

IMPELLER, PUMP BRACKET12-3

PUMP BODY, CHECK VALVE, VOLUTE

DISASSEMBLY/REASSEMBLY

BODY O-RING

INSTALLATION:
Coat with a thin film of vegetable oil before installing on bracket flange.

VOLUTE TOP SCREW, #10 x 1/2 in

1.5 - 2.0 N·m (1.1 - 1.5 ft-lb)

INSTALLATION:

NOTICE

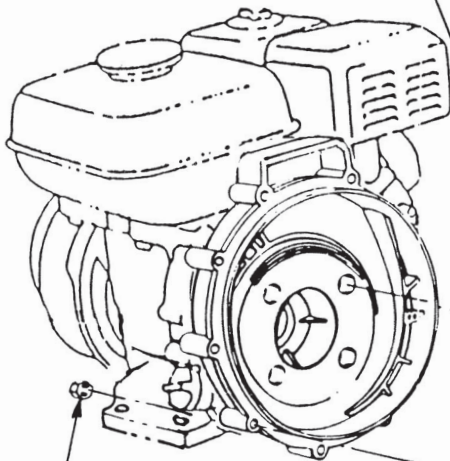
Tighten in a clockwise pattern, starting with the nut at the left of the drain plug.

CHECK VALVE

INSTALLATION:
Press firmly around the edges to be sure the check valve is seated.

FILLER PLUG

INSTALLATION:
Tighten only hand tight. Do not use a wrench.



O-RING SEGMENT

VOLUTE



FILLER PLUG O-RING

BODY NUT, 1/4 IN (10)

INSTALLATION:
Tighten in a clockwise pattern, starting with the nut at the left of the drain plug.

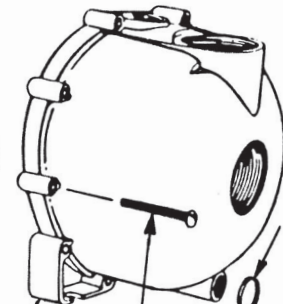
VOLUTE BOTTOM SCREW, #6x1/2 in (2)

1.0 - 1.5 N·m (0.7 - 1.1 ft-lb)

INSTALLATION:

NOTICE

Overtightening will strip the bracket threads.



DRAIN PLUG O-RING

BODY SCREW, 1/4 x 2-3/8 in (10)

3.9 - 4.9 N·m (2.9 - 3.6 ft-lb)

DRAIN PLUG

INSTALLATION:
Tighten only hand tight. Do not use a wrench.

BODY

INLET/OUTLET CONNECTIONS:

Use pipe joint compound or Teflon tape on threads. Do not overtighten pump fittings. One turn past hand tight is usually sufficient.

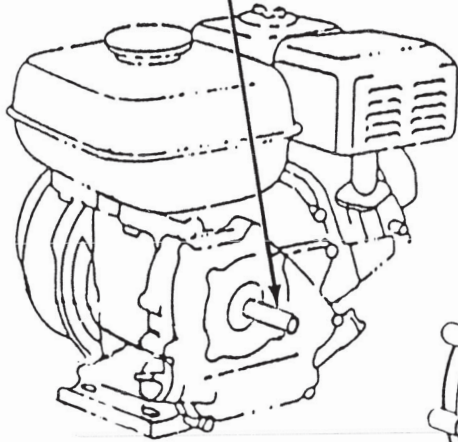
IMPELLER, PUMP BRACKET

a. DISASSEMBLY/REASSEMBLY

CRANKSHAFT NOSE

PUMP INSTALLATION:

Coat crankshaft nose with Honda dielectric grease or equivalent.



SCREW HEAD O-RING (5)

INSTALLATION:

Lubricate O-ring with vegetable oil.

BRACKET SCREW, 5/16 x 1-1/4 in (4)

INSTALLATION:

Apply one large drop of Loctite 242 or equivalent to the threads of each screw.

IMPELLER KEY

INSTALLATION:

Key should slide easily into place; if not, file keyway.

SCREW HEAD O-RING (5)

INSTALLATION:

Lubricate O-ring with vegetable oil.

BRACKET

SEAL SHAFT O-RING

INSTALLATION:

Lubricate O-ring with vegetable oil.

MECHANICAL SEAL

INSTALLATION:

Place O-ring on mechanical seal, then press mechanical seal into pump bracket.

NOTICE

Pressing on seal face can cause damage and leakage. Press only on metal flange, using a machined piece of pipe.

CERAMIC RING

INSTALLATION:

Lubricate rubber boot with vegetable oil and press ring into impeller.

SHIM(S)

INSTALLATION:

Select shims to achieve specified clearance between impeller and volute (see page 12-4).

Impeller/Volute Clearance:
0.4 - 0.6 mm
(0.015 - 0.024 in)

IMPELLER

INSTALLATION:

Lubricate ceramic ring with vegetable oil.

Coat mounting hole of impeller with Honda dielectric grease or equivalent.

IMPELLER SCREW, 5/16 x 3/4 in

INSTALLATION:

Apply one large drop of Loctite 242 or equivalent to the threads.

b. IMPELLER CLEARANCE INSPECTION AND SHIM SELECTION

Pump parts replacement, crankshaft replacement, or impeller wear will alter the clearance between the impeller and volute.

The specified impeller to volute clearance must be maintained for maximum pumping performance.

IMPELLER TO VOLUTE CLEARANCE	0.4 – 0.6 mm (0.015 – 0.024 in)
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Before installing the pump body, check impeller clearance by inserting a feeler gauge between the impeller and volute as shown.

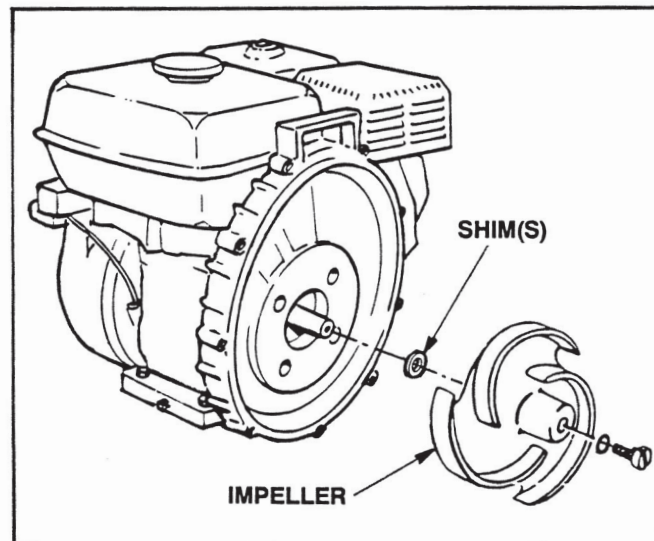
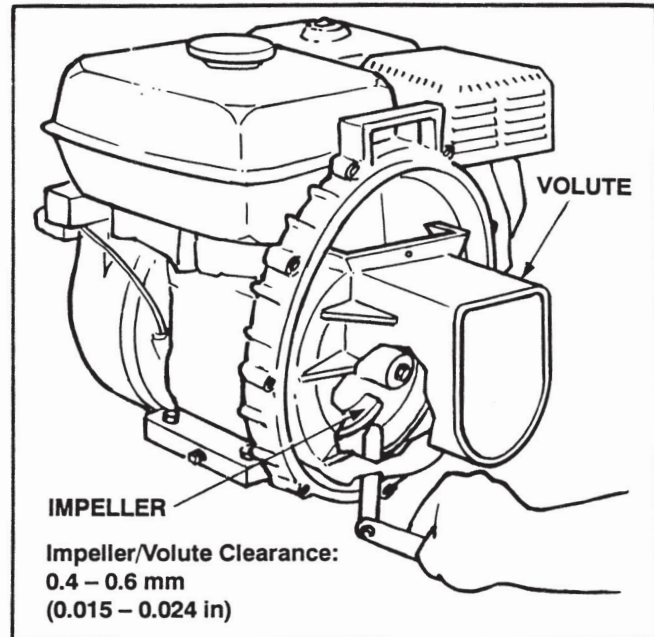
If necessary, slowly crank the engine to reposition the impeller to facilitate measurement.

If impeller clearance is not within the specified range, remove the volute and impeller, and change the shim(s) to achieve the specified clearance.

Shims are available in three thicknesses, and they can be combined for additional thicknesses.

SHIM SIZE	THICKNESS
A	0.15 mm (0.006 in)
B	0.38 mm (0.015 in)
C	0.76 mm (0.030 in)

If more than 2.3 mm (0.091 in) of shims are required to achieve the specified impeller clearance, replace the impeller.

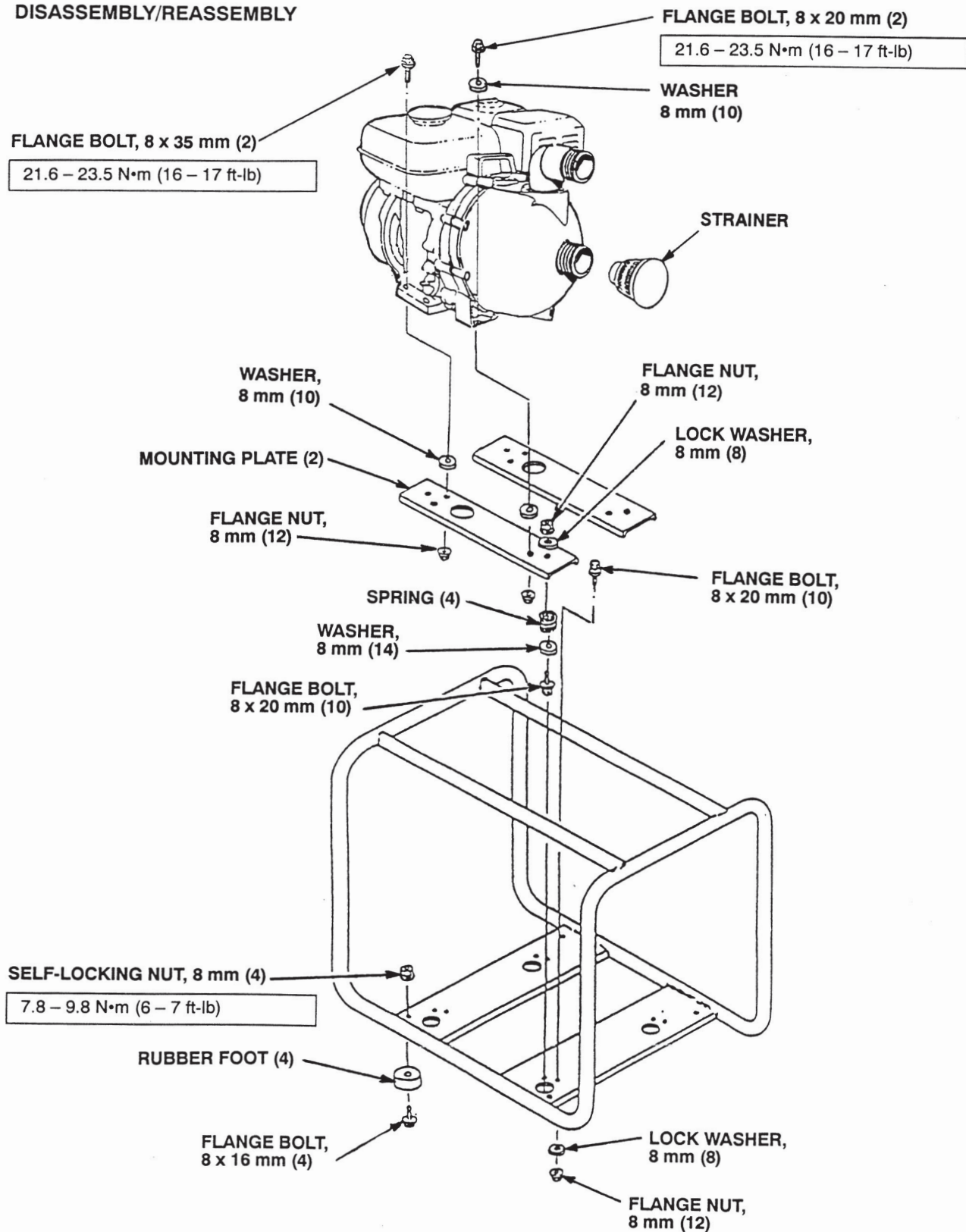


FRAME

FRAME13-2

FRAME

DISASSEMBLY/REASSEMBLY



ENGINE FEATURES AND OPERATING PRINCIPLES

CARBURETOR.....	14-2
OIL ALERT SYSTEM	14-3
TRANSISTORIZED IGNITION.....	14-4

CARBURETOR

MAIN CIRCUIT

When the throttle is opened, enough air is moving through the carburetor air horn to produce an appreciable vacuum in the venturi. Since the fuel nozzle is centered in the venturi, atmospheric pressure pushes fuel in the float chamber out into the main nozzle via the main jet.

As the air flows past the main nozzle and the air jet, it meets fuel moving through the air bleed. They mix and flow past the main nozzle. The mixture has a high proportion of fuel. It leans out as it mixes with other air flowing through the air horn to produce the final mixture.

SLOW CIRCUIT

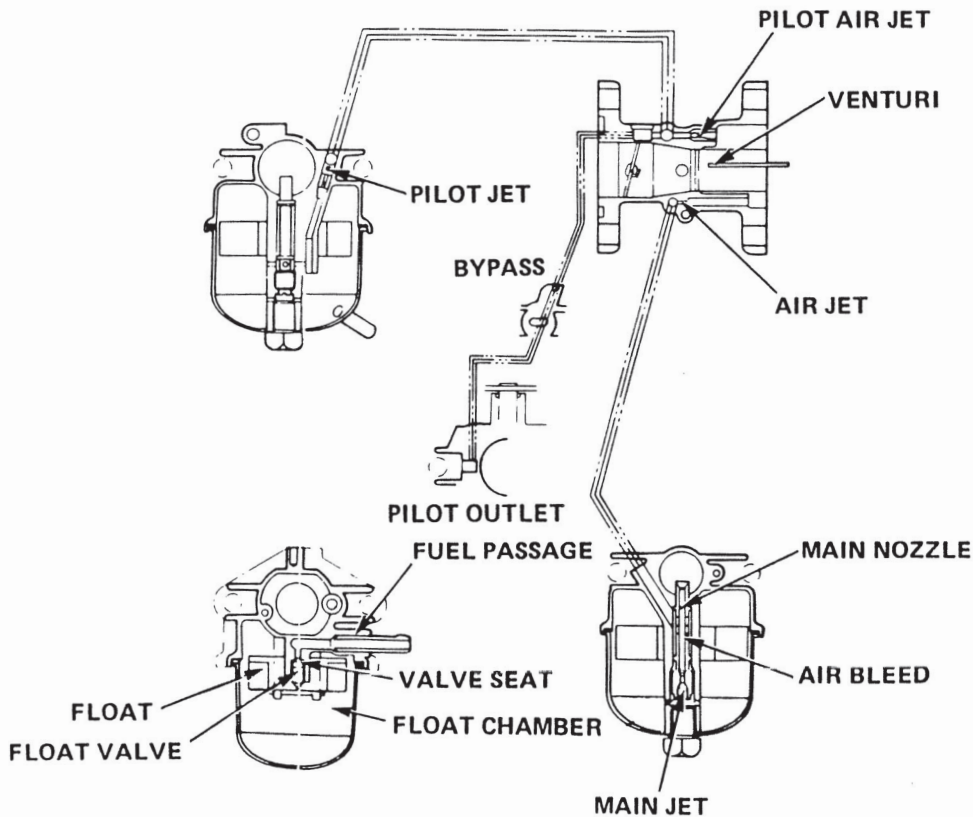
When the throttle is opened slightly, a vacuum is produced in the bypass and pilot outlet. Under this connection, fuel in the float chamber is pushed out, flowing through the main jet into the passage. The pilot jet meters the fuel as it passes through it. The metered fuel then meets air that enters via the pilot air jet. Again they mix and flow past the bypass and pilot outlet into the carburetor air horn. The mixture also has a high proportion of fuel.

As the mixture discharges into the air horn, it mixes with other air moving through the air horn, thereby producing the final mixture for slow speed operation.

FLOAT CHAMBER

The fuel from the fuel tank flows past the fuel passage, valve seat and float valve into the float chamber. The float then moves up and pushes the float valve into the seat.

This shuts the fuel inlet so that no fuel can enter. When the level is lowered, the float moves down, allowing the valve to move away from the valve seat. Repetition of this sequence of events assures a constant level.

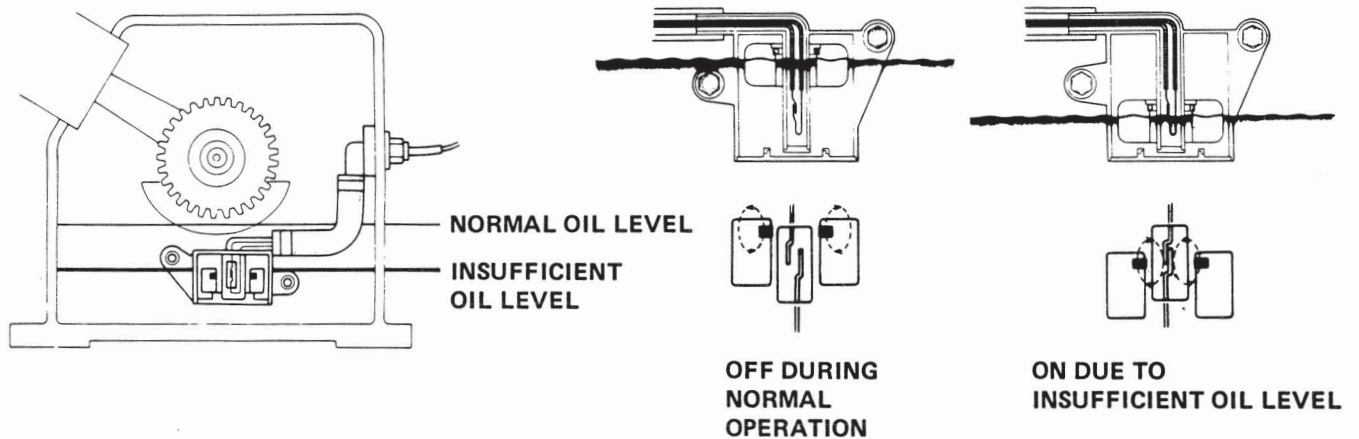


OIL ALERT

The Oil Alert system is designed to prevent engine damage caused by an insufficient amount of oil in the crankcase. The Oil Alert system will automatically stop the engine before the oil level falls below a safe limit. A light emitting diode acts as a warning lamp and makes it possible to determine if the engine has stopped due to a low oil condition.

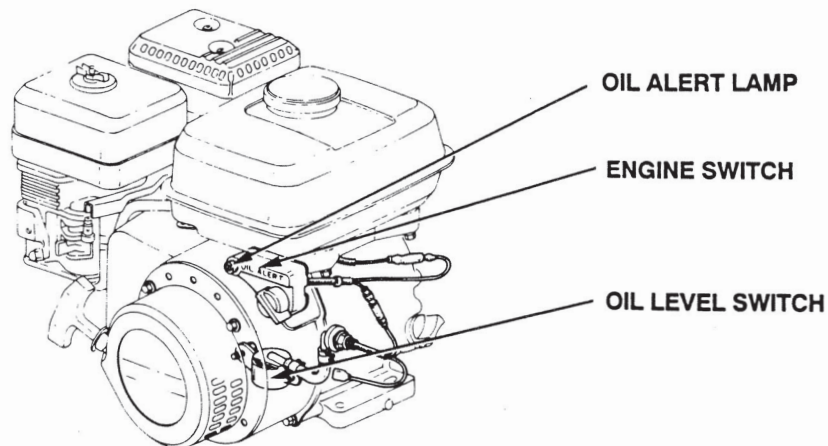
OIL LEVEL SWITCH

1) When the engine oil reaches a predetermined level, the float (with magnet) inside the switch unit in the crankcase will descend and approach the reed switch. As a result, electromagnetism in the reed switch will strengthen, and the contact points will be pulled together and make contact.



ENGINE SWITCH

- 1) When the reed switch has continuity, a thyristor inside the engine switch will come on, the primary side of the transistorized ignition coil will be short-circuited, and the engine will stop.
- 2) Voltage generated in the primary winding of the transistorized ignition unit, until the flywheel stops, lights the Oil Alert lamp, indicating insufficient oil.
- 3) After the engine has stopped, if the starter is pulled without adding oil, the engine will not start, and the Oil Alert lamp will flash.



TRANSISTORIZED IGNITION

The ignition system uses a fully transistorized unit with a current carrying capacity superior to that of conventional ignition breaker points. The ignition coil and transistor switching unit are molded into one piece.

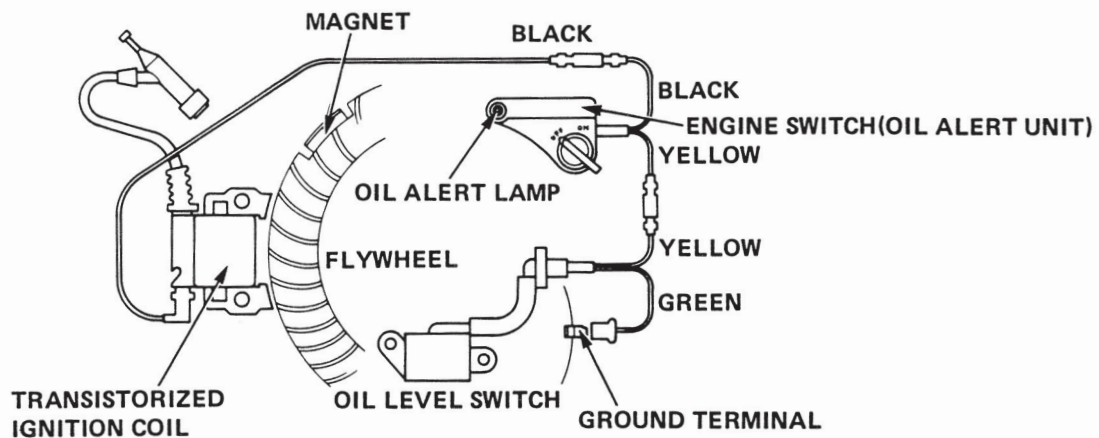
- Requires no periodic maintenance
- Offers improved resistance to water and dust
- Longer, troublefree life
- Positive starting
- Simple construction: Unlike the CDI systems, this unit has no exciter coil requiring attention. It also allows easier access because it is mounted on the outside of the flywheel.

OPERATING PRINCIPLES

The flywheel has a magnet fastened to its outer periphery. As it turns, it passes close to the laminated core of the ignition coil, building up a voltage in the primary winding.

When the transistor is turned off, a high voltage (several hundred volts) is induced in the primary winding.

This produces a very high rate of rise of the ignition secondary voltage which creates a spark at the spark plug due to collapsed flux in the ignition coil.



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