

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 all Honda FG110 Mini-Tillers and incorporates supplement Z.

All information contained in this manual is based on the latest product information available at the time of printing. We reserve the right to make changes at any time without notice.


No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of the publisher. This includes text, figures, and tables.

As you read this manual, you will find information that is preceded by a **NOTICE** symbol. The purpose of this message is to help prevent damage to the tiller, other property, or the environment.

SAFETY MESSAGES

Your safety, and the safety of others, is very important. To help you make informed decisions, we have provided safety messages and other safety information throughout this manual. Of course, it is not practical or possible to warn you about all the hazards associated with servicing this tiller. You must use your own good judgement.

You will find important safety information in a variety of forms, including:

- **Safety Labels** – on the tiller.
- **Safety Messages** – preceded by a safety alert symbol  and one of three signal words: DANGER, WARNING, or CAUTION.

These signal words 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.

- **Instructions** – how to service this tiller correctly and safely.

**American Honda Motor Co., Inc.
Service Communications Department**

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1. SPECIFICATIONS

FG110

1. SPECIFICATIONS 1-1	2. WIRING DIAGRAM 1-3
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1. SPECIFICATIONS

• DIMENSIONS, WEIGHTS, AND CAPACITIES

Model		FG110	FG110K1
Description code		FAAA	FAAA
Overall length		1,038 mm (40.8 in)	
Overall width		365 mm (14.4 in)	
Overall height		1,000 mm (39.4 in)	
Weight	Dry (without wheels)	13.0 kg (28.8 lbs)	11.3 kg (24.9 lbs)
	Dry (with wheels)	13.9 kg (30.6 lbs)	12.2 kg (26.8 lbs)
	Wet (with wheels)	14.5 kg (31.9 lbs)	12.6 kg (27.8 lbs)
Minimum ground clearance		47 mm (1.9 in)	
Tilling width		230 mm (9 in)	
Tilling depth		203 mm (8 in)	
Tine number		4 (6 teeth per tine)	

• POWER TRANSMITTING SYSTEM

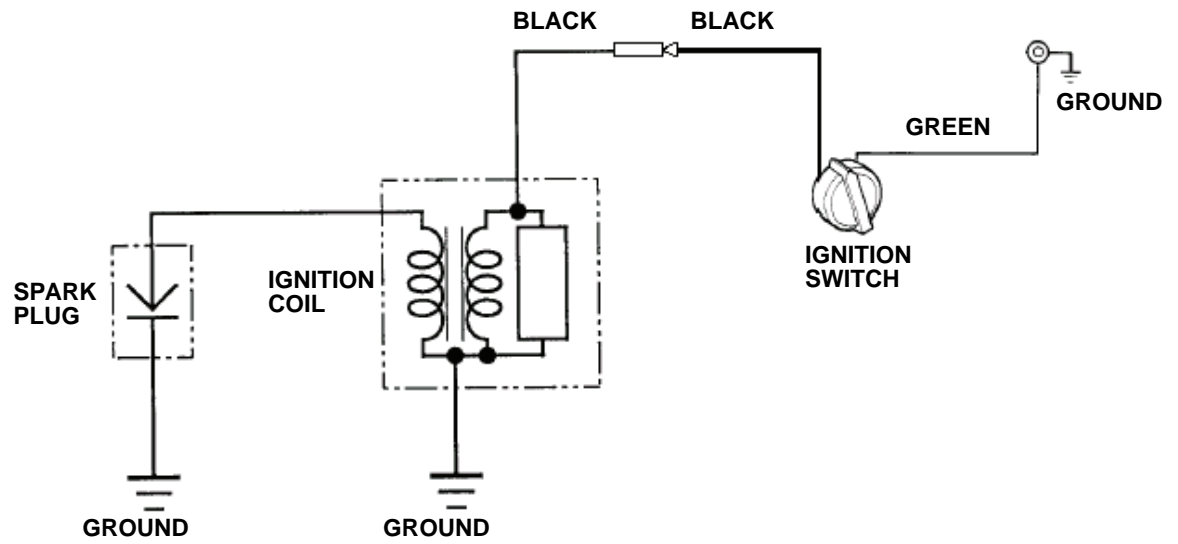
Type		Worm gear
Engine-to-tine shaft ratio		34:1 (engine at 6,200 rpm: tine shaft 182 rpm)
Clutch	Type	Internal expanding shoe
	Engagement	4,200 ± 200 rpm
Reduction case grease	Capacity	63 g min (2.2 oz min, 70 cc min)
	Type	NLGI #2 general purpose grease

• **ENGINE**

Engine model	GX25
Description code	GCAAM
Engine type	4-stroke, overhead cam, single cylinder, forced air cooled
Displacement	25 cm ³ (1.5 cu in)
Bore x stroke	35 x 26 mm (1.4 x 1.0 in)
Compression ratio	8.0:1
Fuel consumption*	340 g/kWh (250 g/HPh, 0.559 lb/HPh)
Cooling system	Forced air
Ignition system	Transistorized magneto ignition
Ignition timing	30° B.T.D.C. (Fixed)
Spark plug	CMR5H (NGK)
Carburetor	Diaphragm type
Air cleaner	Semi-dry type
Lubrication system	Oil mist
Oil capacity	80 cc (2.7 US oz, 2.8 Imp oz)
Recommended operating ambient temperature	-5°C ~ 40°C (23°F ~ 104°F)
Starting system	Recoil starter
Stopping system	Ignition primary circuit ground
Fuel used	Unleaded gasoline with a pump octane number 86 or higher
Fuel tank capacity	0.55 L (0.15 US gal, 0.12 Imp gal) (pre-2010 year)
	0.53 L (0.14 US gal, 0.12 Imp gal) (low-perm, horizontal type) (Serial # GCART-1161188 and later)
	0.54 L (0.14 US gal, 0.12 Imp gal) (low perm. vertical type) (Serial # GCART-1159428 and later)
	0.58 L (0.15 US gal)
PTO shaft rotation	Counterclockwise (from PTO shaft side)

*Actual fuel consumption will vary, depending on engine load conditions.

2. WIRING DIAGRAM



NOTES

2. SERVICE INFORMATION

FG110

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1. SERVICE RULES

- Use genuine Honda parts or their exact equivalent. Lower quality parts can damage the tiller or reduce its performance.
- Install new gaskets, O-rings, and seals during reassembly.
- This tiller uses metric fasteners and SAE (non-metric) fasteners. Metric bolts, nuts, and screws are not interchangeable with non-metric fasteners. The use of incorrect tools and fasteners may damage the tiller.
- 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 after disassembly.
- Lubricate sliding surfaces before reassembly.
- After reassembly, check parts installation and operation.

2. SYMBOLS USED IN THIS MANUAL

As you read this manual, you may find the following symbols with the instructions.



A special tool is required to perform the procedure.

(commercially available)

Commercially available tools are distinguished by the words (commercially available). They are not available through the American Honda Parts Department. Most commercially available tools shown in this shop manual can be ordered through the Tool and Equipment program by calling (888) 424-6857. Refer to the Tool and Equipment program catalogue for a complete tool listing.



Apply grease



Apply oil

O x O (O)

Indicates the diameter, length, and quantity of metric flange bolts used.

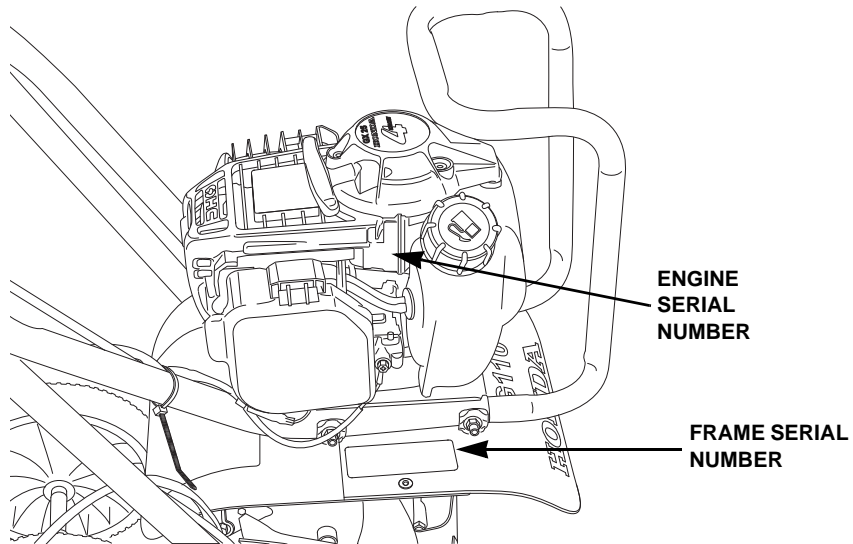
[P. O-O](#)

Indicates the reference page. When viewing on-screen, click the reference to go to the referenced page.

3. SERIAL NUMBER LOCATIONS

The engine serial number is located on the cylinder block near the carburetor. Refer to the engine serial number when ordering parts and when making technical inquiries.

The frame serial number is located on the right hand side of the fender.



4. SERVICE SPECIFICATIONS

Part	Item	Standard	Service Limit
Engine	Idle speed	3,100 ± 200 rpm	_____
	Cylinder compression	0.90 - 1.10 Mpa (9.2 - 11.2 kgf/cm ² , 131 - 159 psi) at 2,000 rpm	_____
Cylinder	Cylinder I.D.	35.000 - 35.015 mm (1.378 - 1.379 in)	35.100 mm (1.3819 in)
Piston	Skirt O.D.	34.970 - 34.990 mm (1.377 - 1.378 in)	34.900 mm (1.3740 in)
	Piston-to-cylinder clearance	0.010 - 0.045 mm (0.0004 - 0.0018 in)	0.120 mm (0.0047 in)
	Piston pin bore I.D.	8.010 - 8.026 mm (0.3154 - 0.3160 in)	8.060 mm (0.3173 in)
Piston pin	Pin O.D.	7.994 - 8.000 mm (0.3147 - 0.3150 in)	7.950 mm (0.3130 in)
	Piston pin-to-piston bore clearance	0.010 - 0.032 mm (0.0004 - 0.0013 in)	0.070 mm (0.0028 in)
Piston rings	Ring width: top/second	0.970 - 0.990 mm (0.0382 - 0.0390 in)	0.920 mm (0.0362 in)
	Ring side clearance: top/second	0.015 - 0.056 mm (0.0006 - 0.0022 in)	0.120 mm (0.0047 in)
	Ring end gap: top/second	0.10 - 0.25 mm (0.004 - 0.010 in)	0.60 mm (0.024 in)
Connecting rod	Small end I.D.	7.978 - 7.989 mm (0.3141 - 0.3145 in)	_____
Valves	Valve clearance (cold): IN	0.08 ± 0.02 mm	_____
	EX	0.11 ± 0.02 mm	_____
	Stem OD: IN	3.470 - 3.485 mm (0.1366 - 0.1372 in)	3.400 mm (0.1399 in)
	EX	3.435 - 3.450 mm (0.1352 - 0.1358 in)	3.380 mm (0.1331 in)
	Guide ID: IN/EX	3.500 - 3.518 mm (0.1378 - 0.1385 in)	3.560 mm (0.1402 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)	0.120 mm (0.0047 in)	
	Valve spring free length	20.66 mm (0.8134 in)	20.00 mm (0.7874 in)
Cam pulley	Cam height	22.097 mm (0.8700 in)	21.797 mm (0.8581 in)
	Cam pulley I.D.	4.020 - 4.050 mm (0.1583 - 0.1595 in)	4.100 mm (0.1614 in)
	Cam pulley shaft O.D.	3.990 - 4.000 mm (0.1571 - 0.1575 in)	3.950 mm (0.1555 in)
Cylinder block	Block I.D. (Cam pulley bearing)	4.000 - 4.018 mm (0.1575 - 0.1582 in)	4.050 mm (0.1594 in)
Carburetor	Main jet	#34	_____
Spark plug	Gap	0.6 - 0.7 mm (0.024 - 0.028 in)	_____
Ignition coil	Resistance: Primary coil	0.75 - 0.92 Ω	_____
	Secondary coil	6.1 - 9.3 kΩ	_____
	Flywheel air gap	0.3 - 0.5 mm (0.012 - 0.020 in)	_____
Clutch	Lining thickness	2.0 mm (0.08 in)	1.0 mm (0.04 in)

5. TORQUE VALUES

SPECIAL FASTENERS	THREAD DIAMETER (mm)	TORQUE		
		N•m	kg-m	ft-lb
Lower crankcase	M5 (CT)	6.4	0.7	5.1
Fan cover				
Oil outlet valve plate	M4	3.0	0.3	2.2
Ignition coil	M4	3.9	0.4	2.9
Recoil starter pulley	M6	6.4	0.7	5.1
Flywheel	M7	14.7	1.49	10.8
Valve adjusting lock nut	M5	4.9	0.5	3.6
Spark plug	M10	11.8	1.2	8.7
Transmission	M6 (CT)	10	1.0	7.2
Transmission grease fill	1/4"	7.5	0.8	5.5
Throttle	M3	0.7	0.07	0.52
Engine switch ground	M5	4.2	0.4	3.1

Use standard torque values for fasteners that are not listed above.

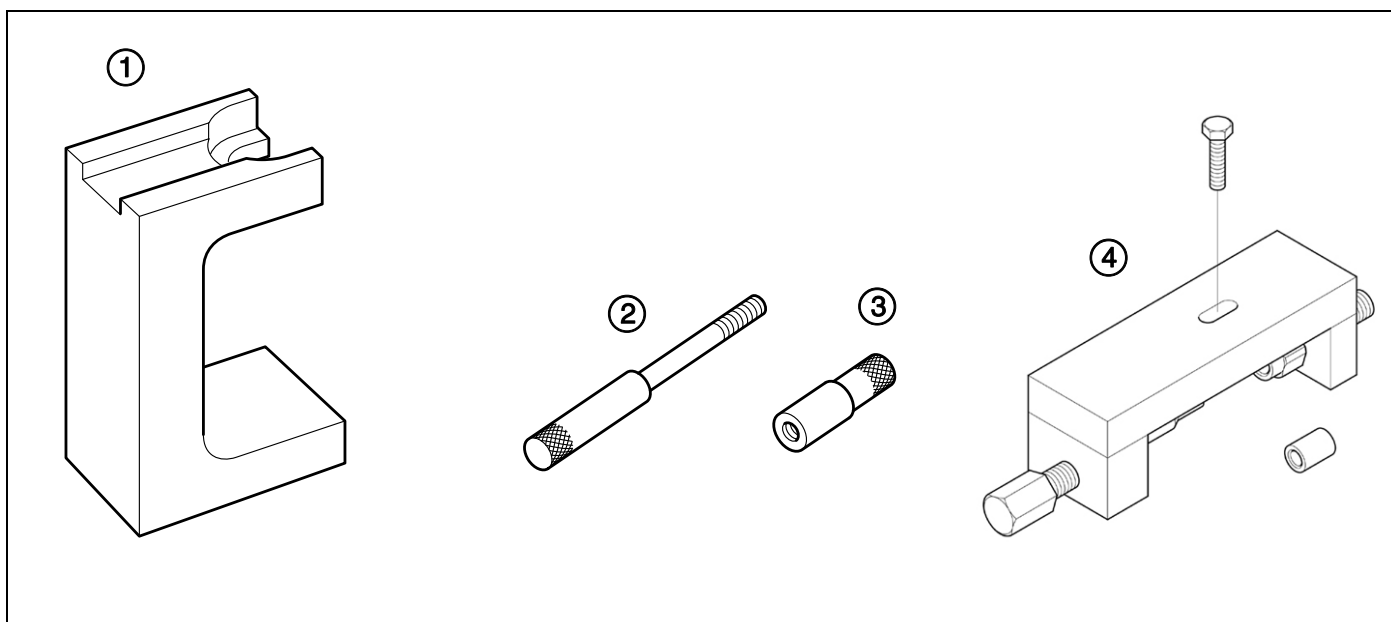
(CT) Indicates a self-tapping bolt.

Standard Torque Values

STANDARD FASTENERS	THREAD DIAMETER	TORQUE		
		N•m	kg-m	ft-lb
Screw	3 mm	1.0	0.1	0.7
	4 mm	2.1	0.2	1.4
Flange bolt and nut	4 mm	3.4	0.3	2.2
	5 mm	5.4	0.6	4.3
	6 mm	9.8	1.0	7.2
CT flange bolt	5 mm	5.9	0.6	4.3
	6 mm	12	1.2	8.7

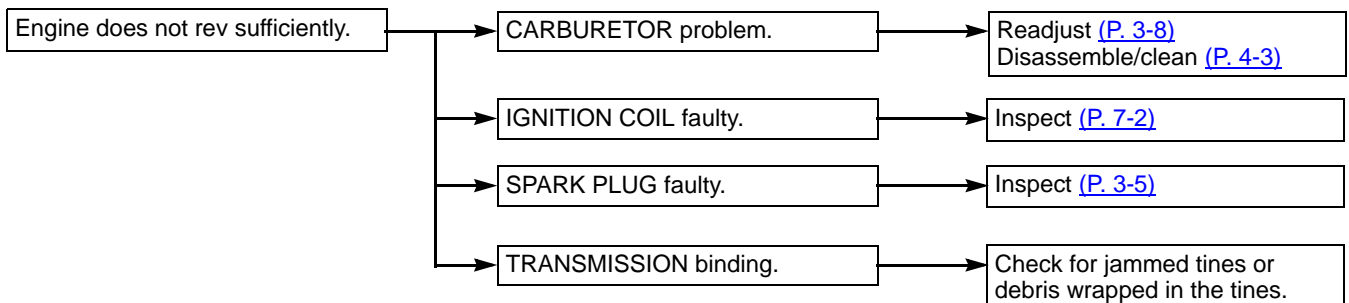
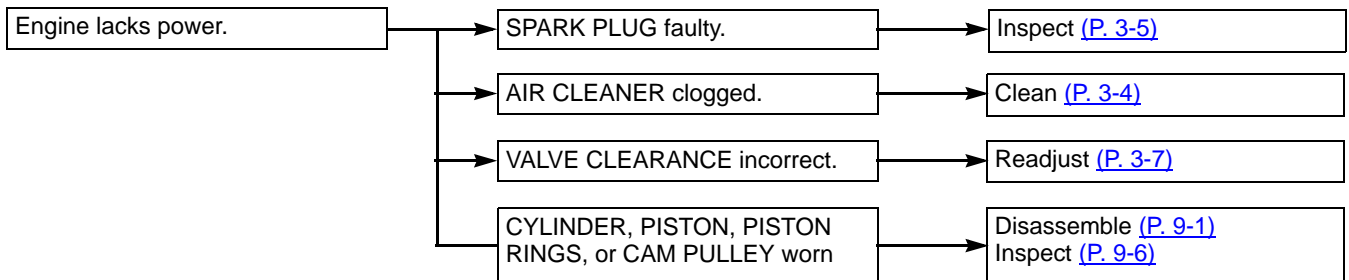
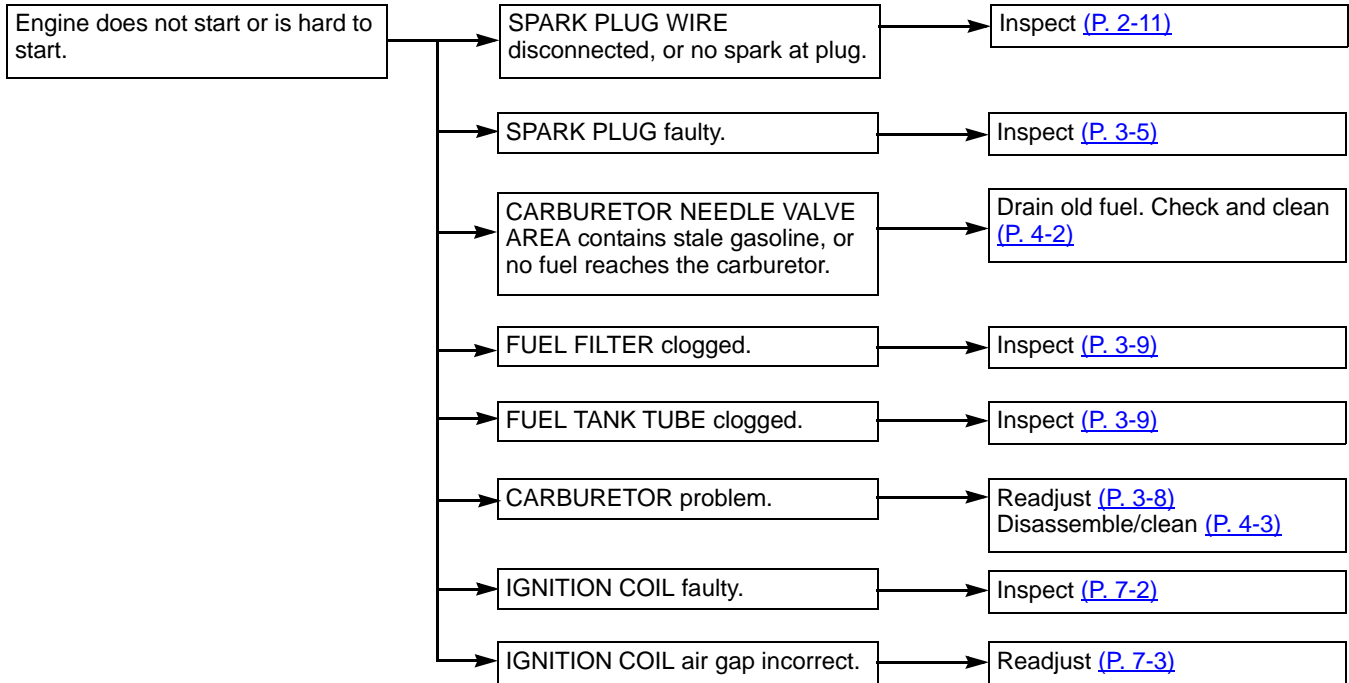
6. TOOLS**a. SPECIAL**

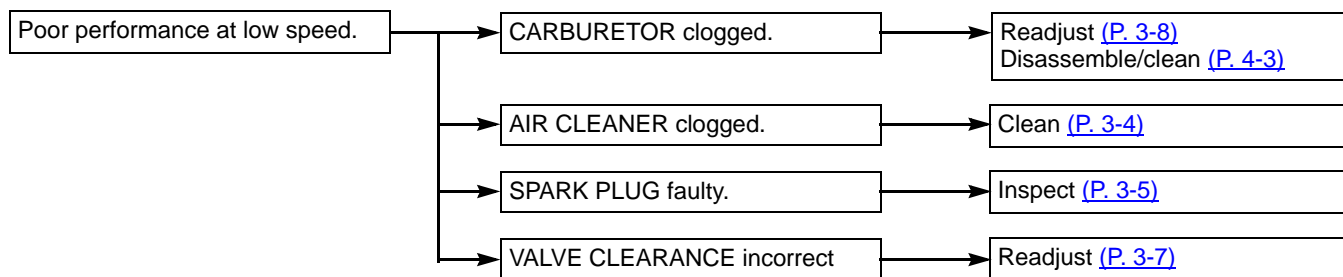
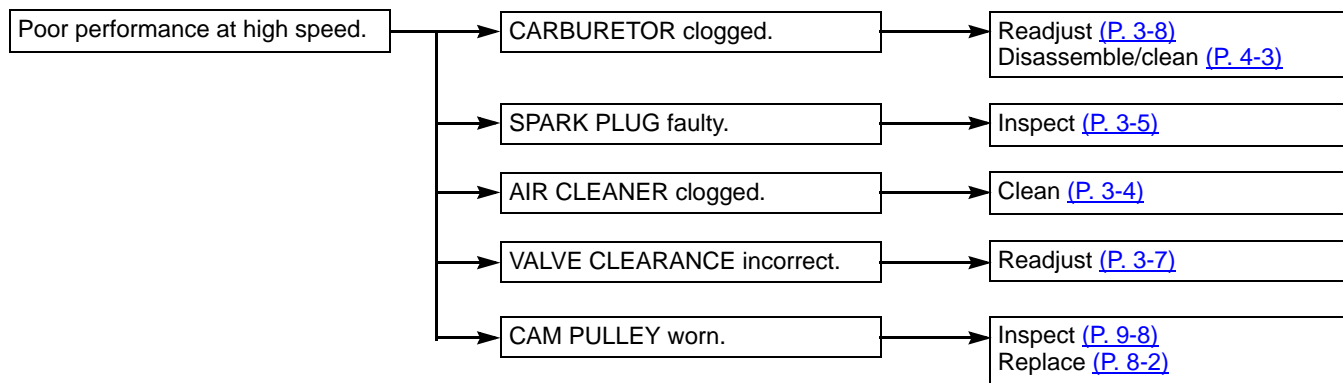
ITEM	TOOL NAME	TOOL NUMBER	APPLICATION
①	Piston base	07VPF-ZM3010B	Piston pin removal/installation
②	Push rod	07VPF-ZM3020A	
③	Guide	07VPF-ZM3030A	Piston pin installation
④	Rocker arm replacement tool	070PF-Z0HA100	Rocker arm removal/installation



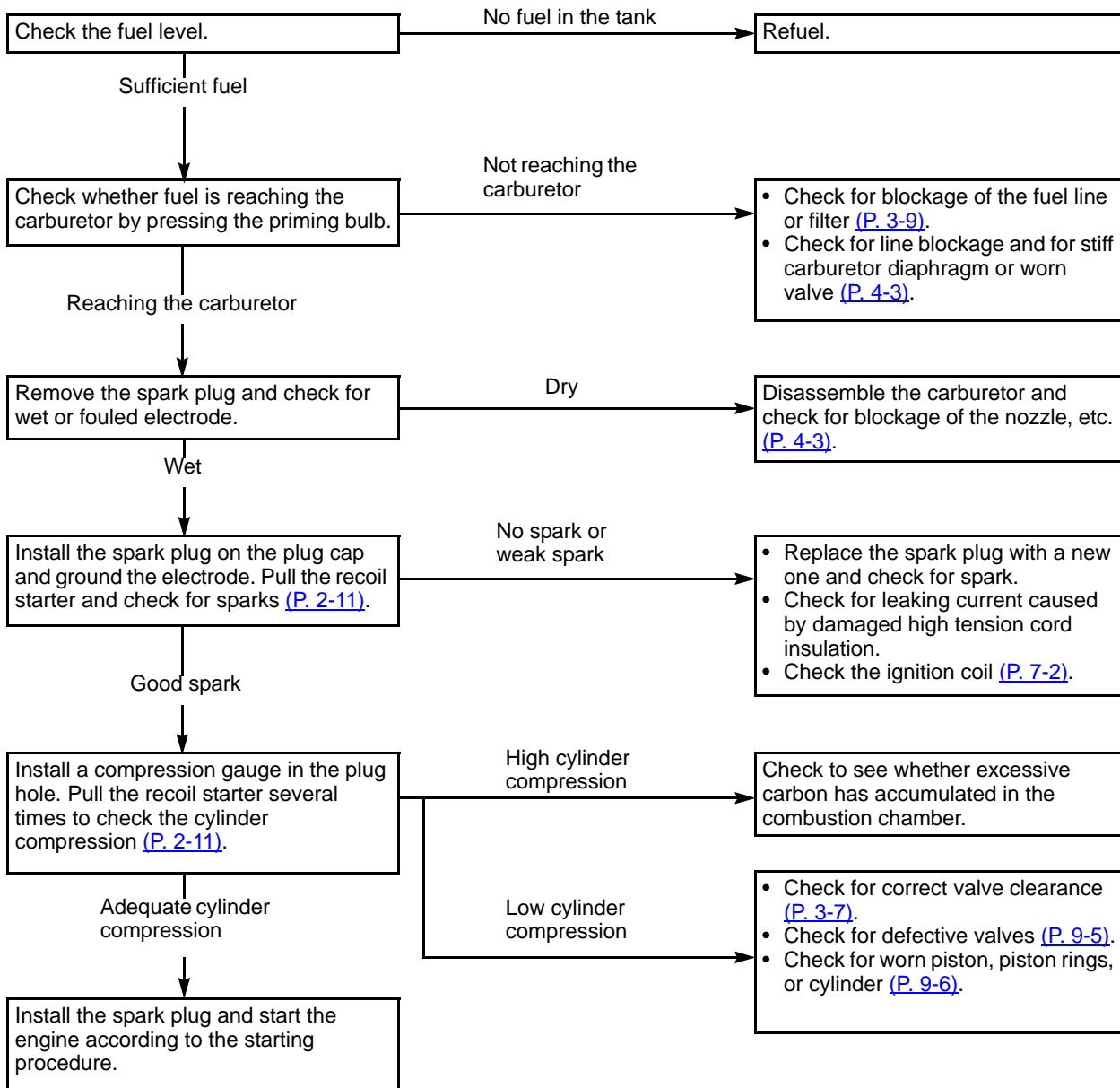
7. ENGINE TROUBLESHOOTING

a. GENERAL SYMPTOMS AND PROBABLE CAUSES

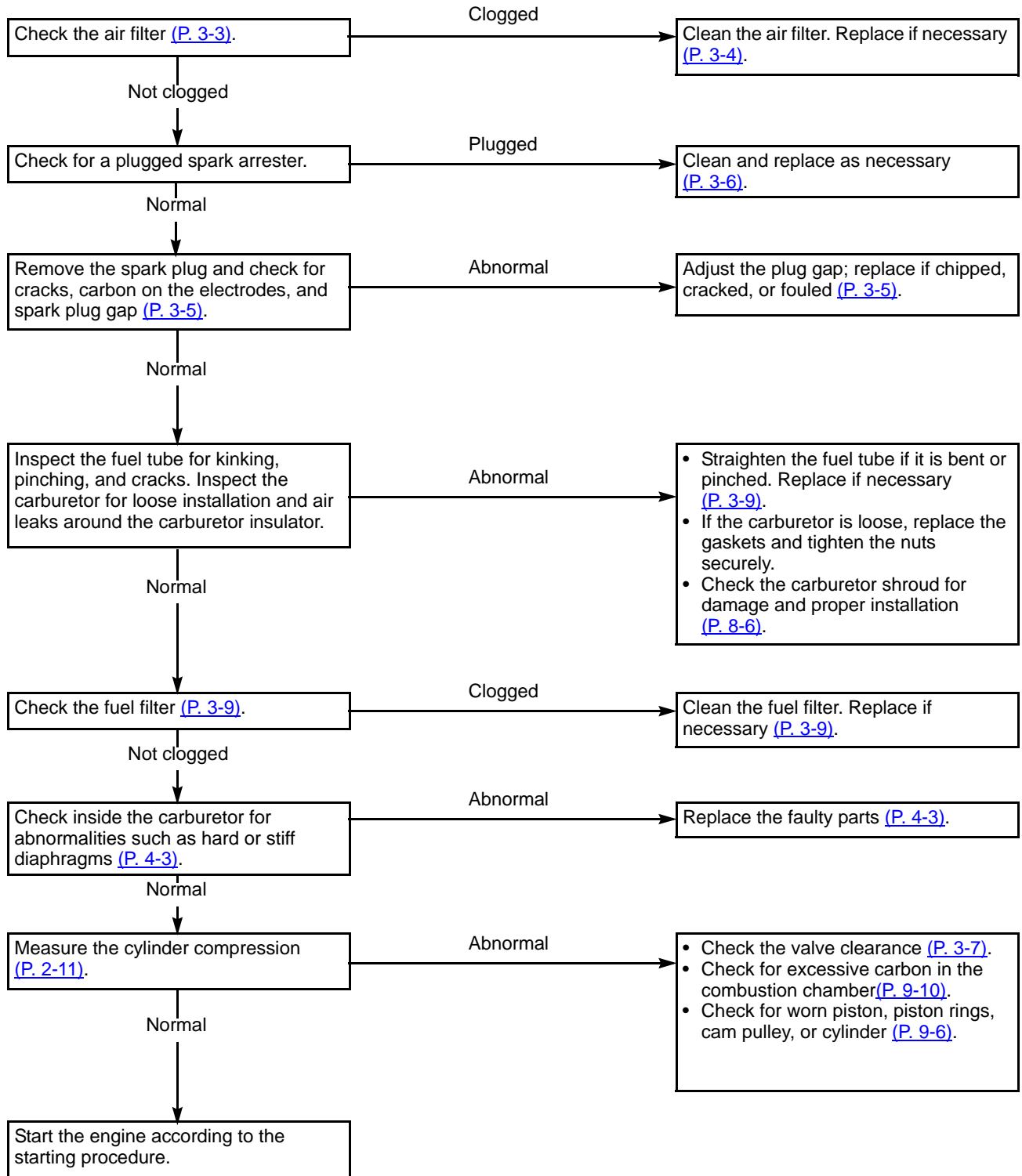




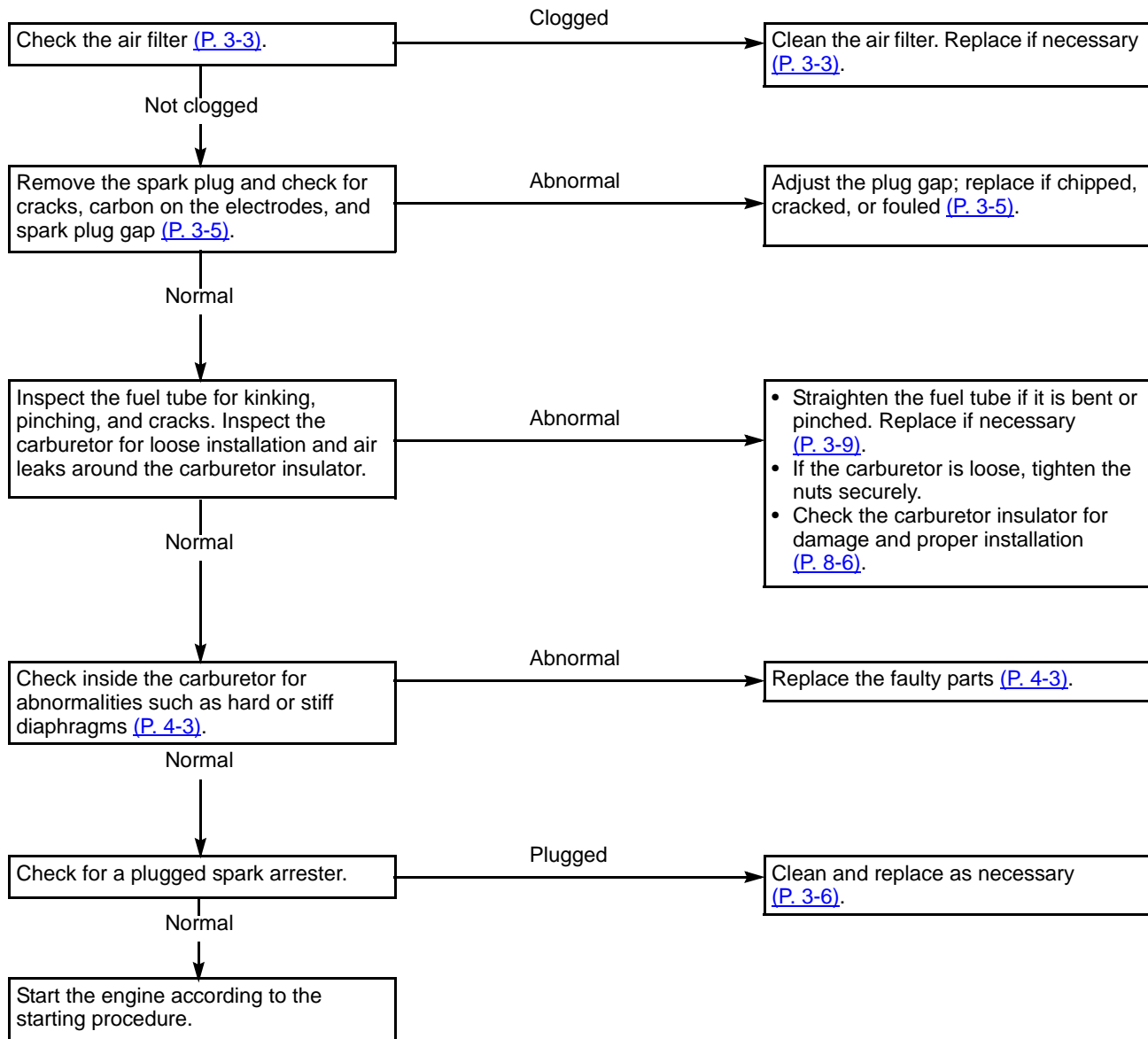
b. HARD STARTING



c. POOR PERFORMANCE AT LOW SPEED



d. POOR PERFORMANCE AT HIGH SPEED



e. SPARK TEST**⚠ WARNING**

Gasoline is highly flammable and explosive. If ignited, gasoline can burn you severely.

Before testing the spark plug:

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

1. Drain the fuel tank or take out the fuel filter from the fuel tank and drain the gasoline by pressing the carburetor primer bulb.

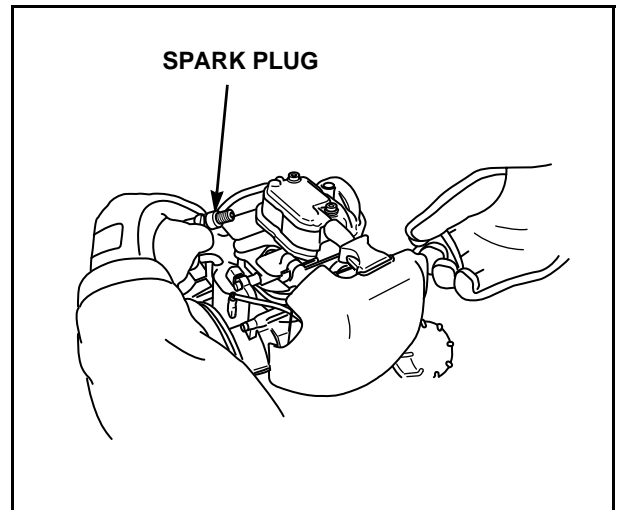
2. Remove the spark plug.

Unburned gasoline can ignite if it is left in the cylinder. Pull the recoil starter several times to release the unburned gasoline from the cylinder before testing. Do not touch the flywheel fins when pulling the recoil starter.

3. Install the removed spark plug on the spark plug cap.

4. Ground the negative (–) electrode of the spark plug to the engine block.

5. Pull the recoil starter to check for sparks.

**f. COMPRESSION TEST**

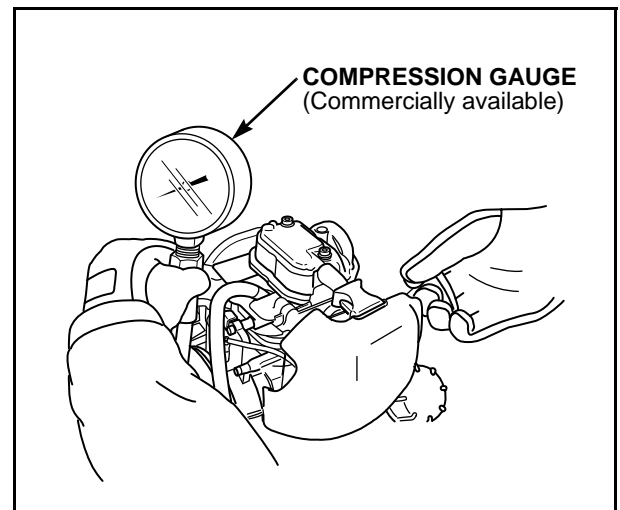
1. Drain the fuel tank.

2. Drain the gasoline by pressing the carburetor primer bulb.

3. Remove the spark plug cap and spark plug, and install a compression gauge in the spark plug hole.

4. Open the throttle wide open and make sure the choke is open.

5. Pull the recoil starter several times with force and measure the cylinder compression. Do not touch the flywheel when pulling the recoil starter.



Cylinder compression @ 2,000 rpm*	0.9~1.1 MPa (9.2~11.2 kgf/cm ² , 131~159 psi)
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* Decompressor mechanism engaged

g. PROBABLE CAUSES OF MAJOR CARBURETOR PROBLEMS

Symptom		Starting			Low speed			Acceleration/ deceleration			High speed	
		Hard starting	Overflow, fuel leaking	Hard to prime with primer bulb	Engine does not idle	Idle speed too low	Idle speed does not stabilize	Stalls when idling	Engine does not accelerate	Engine stalls at deceleration	Poor acceleration performance	Poor performance at high speed
Probable causes												
Throttle stop screw out of adjustment		<input type="radio"/>			<input type="radio"/>		<input type="radio"/>	<input type="radio"/>				
Fuel tank/line	Fuel filter clogged	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>
	Fuel line clogged	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>
	Air in fuel passage	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>
	Incorrect/deteriorated fuel	<input type="radio"/>					<input type="radio"/>					<input type="radio"/>
Pump diaphragm	Vacuum pulse leaking							<input type="radio"/>				<input type="radio"/>
	Vacuum pulse passage clogged							<input type="radio"/>				<input type="radio"/>
	Loose pump cover screw		<input type="radio"/>					<input type="radio"/>				<input type="radio"/>
	Pump diaphragm faulty							<input type="radio"/>	<input type="radio"/>			<input type="radio"/>
Primer bulb	Primer bulb damaged			<input type="radio"/>								
	Check valve faulty	<input type="radio"/>		<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>
Carburetor not installed securely					<input type="radio"/>		<input type="radio"/>		<input type="radio"/>			<input type="radio"/>
Insulator gasket faulty					<input type="radio"/>		<input type="radio"/>		<input type="radio"/>			<input type="radio"/>
Metering lever	Lever damaged	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>		<input type="radio"/>				<input type="radio"/>
	Lever too high		<input type="radio"/>			<input type="radio"/>		<input type="radio"/>	<input type="radio"/>			
	Lever too low							<input type="radio"/>				
	Lever not operating properly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>
Metering lever spring	Spring deformed		<input type="radio"/>					<input type="radio"/>				<input type="radio"/>
	Spring not installed properly						<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>
Metering diaphragm	Diaphragm damaged	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>		<input type="radio"/>			<input type="radio"/>
	Gasket faulty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>								<input type="radio"/>
Inlet needle valve	Stuck valve	<input type="radio"/>		<input type="radio"/>				<input type="radio"/>				
	Worn valve	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>
	Foreign matter stuck in valve	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>

3. MAINTENANCE

FG110

1. MAINTENANCE SCHEDULE	3-1	7. COOLING FIN INSPECTION	3-8
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6. VALVE CLEARANCE ADJUSTMENT	3-7	12. TRANSMISSION LUBRICATION	3-10

1. MAINTENANCE SCHEDULE

ITEM	REGULAR SERVICE PERIOD (3) Perform at every indicated month or operating hour interval, whichever comes first.	Before each use	First month or 10 hrs	Every month or 25 hrs	Every 3 months or 25 hrs	Every 6 months or 50 hrs	Every years or 100 hrs	Every 2 years or 300 hrs	Refer to page number
Engine oil	Check	O							3-2
	Change		O			O			
Air filter	Check	O							3-3
	Clean			O (1)					
Spark plug	Check						O		3-5
	Replace							O	
Throttle cable	Check	O							3-8
Cooling fins	Check	O				O			3-8
Spark arrester (optional part)	Clean						O		3-6
Fuel tank	Clean						O		3-9
Fuel filter	Check						O		
Clutch shoes	Check					O (2)			7-5
Idle speed	Check-Adjust							O (2)	3-8
Valve clearance	Check-Adjust							O (2)	3-7
Combustion chamber	Clean	After every 300 hours (2)							9-10
Nuts and bolts	Check (Retighten if necessary)	O							—
Transmission grease	Check				O				3-10
Fuel tubes	Check							O (2)	3-9

- (1) Service more frequently when used in dusty areas.
- (2) These items should be serviced by your servicing dealer, unless you have the proper tools and are mechanically proficient. Refer to the Honda shop manual for service procedures.
- (3) Log hours of operation to determine proper maintenance intervals.

2. ENGINE OIL

Level Check

Check the engine oil level before each use, or every 10 hours if operated continuously. Rest the tiller on a level surface, with the engine stopped and in an upright position.

1. Tip the tiller on its carry handlebar as shown.
2. Remove the oil filler cap/dipstick and wipe it clean.
3. Insert and remove the dipstick **without screwing it into the filler opening**. Check the oil level shown on the dipstick.
4. If the oil level is low, fill to the edge of the oil filler hole with the recommended oil (see [P. 3-3](#)). To avoid over-filling or under-filling, be sure the engine is in a level position, as shown.

NOTICE

Running the engine with too little or too much oil can cause engine damage.

5. Screw in the oil filler cap/dipstick securely.

Oil Change

Drain the used oil while the engine is warm. Warm oil drains quickly and completely.

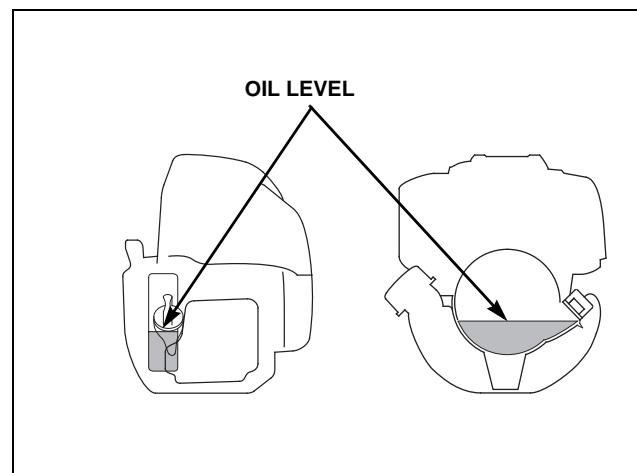
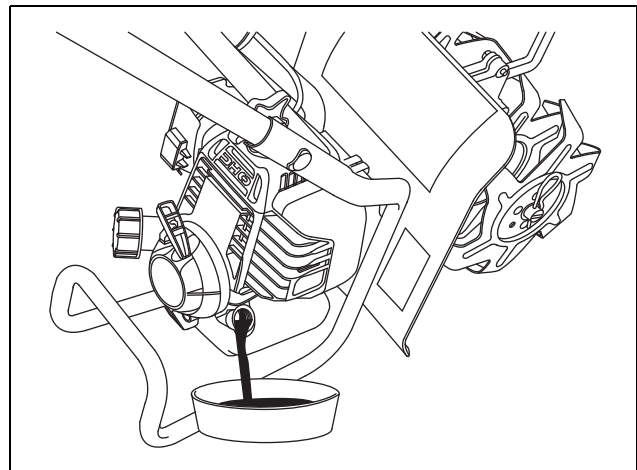
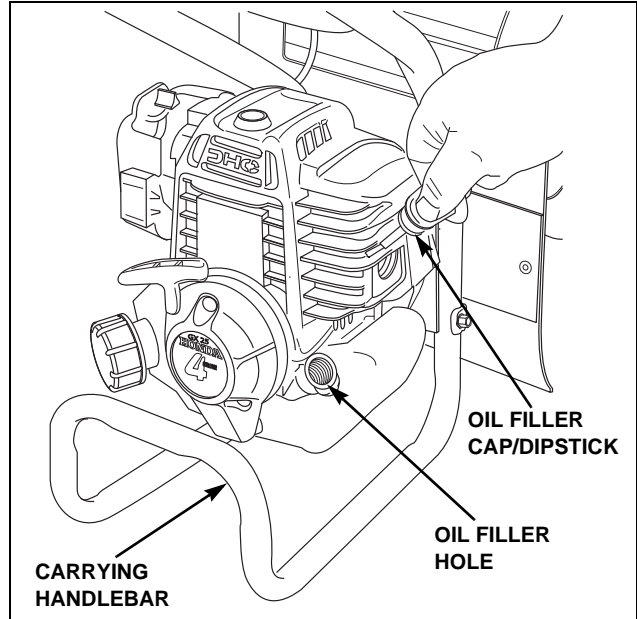
1. Place a suitable container below the engine to catch the used oil.
2. Remove the oil filler cap/dipstick.
3. Tip the tiller to drain the used oil through the oil filler opening. Allow the used oil to drain completely.

Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash, pour it on the ground or down a drain.

4. With the engine resting on the carrying handlebar on a level surface, fill to the edge of the oil filler hole with the recommended oil (see [P. 3-3](#)). Do not overfill.

Engine oil capacity	80 cc (2.7 US oz, 2.8 Imp oz)
Recommended operating ambient temperature	-5°C ~ 40°C (23°F ~ 104°F)

5. Screw in the filler cap/dipstick securely.



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Engine Oil Recommendations

Oil is a major factor affecting performance and service life. Use 4-stroke automotive detergent oil.

SAE 10W-30 is recommended for general use. Other viscosities shown in the chart may be used when the average temperature in your area is within the recommended ranges.

The SAE oil viscosity and service category are in the API label on the oil container. Honda recommends that you use API service category SJ (or later) oil.

3. AIR FILTER

Check

1. Move the choke lever to the CLOSED (N) position to prevent dirt from entering the engine.
2. Squeeze together the air cleaner upper tab at the top of the air cleaner cover to release it from its catch, then flip the cover down to remove it.
3. Check the air filter to be sure it is clean and in good condition.
4. If the air filter is dirty, clean it as described under *Air Filter Cleaning* (see [P. 3-4](#)). Replace the air filter if it is damaged.

NOTICE

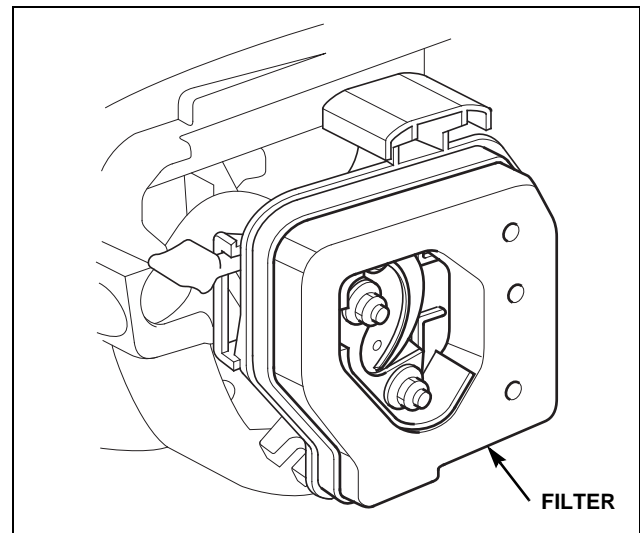
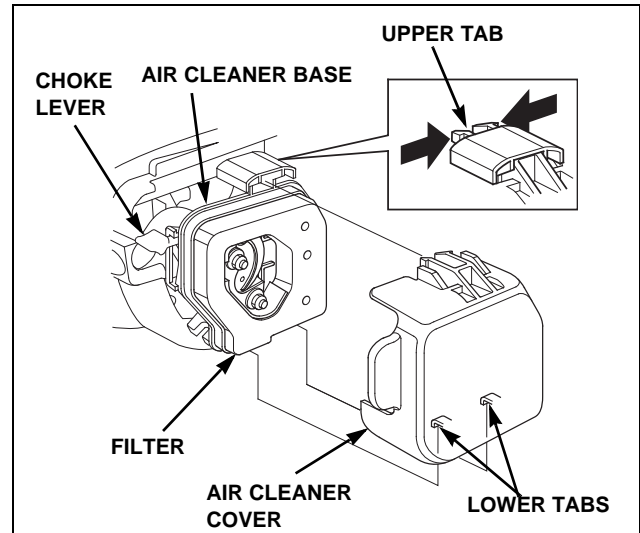
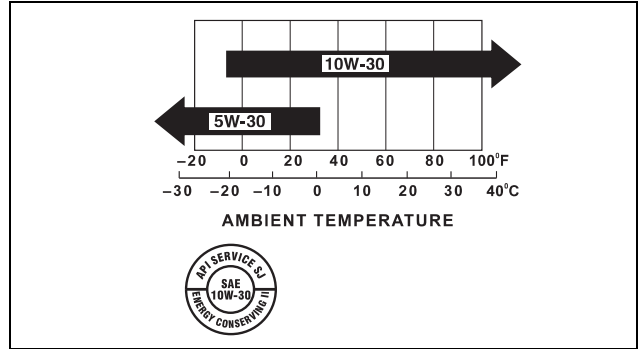
Operating the engine without an air filter, or with a damaged air filter, will allow dirt to enter the engine, causing rapid engine wear. This type of damage is not covered by the Distributor's Limited Warranty.

5. Align the air filter with the air cleaner base as shown. Reinstall the air filter by locating the three air cleaner base pegs into the three air filter holes. Slide the air filter over the pegs until it is flush with the air cleaner base.

NOTICE

An improperly installed air filter will allow dirt to enter the engine, causing rapid engine wear. Make sure the air filter is properly installed and flush with the air cleaner base before installing the air cleaner cover.

6. Reinstall the air cleaner cover by hooking the two lower tabs on the bottom of the cover and snapping the upper tab into place.



Air Filter Cleaning

A dirty air filter restricts air flow to the carburetor, reducing engine performance. If you operate the engine in very dusty areas, clean the air filter after each refueling.

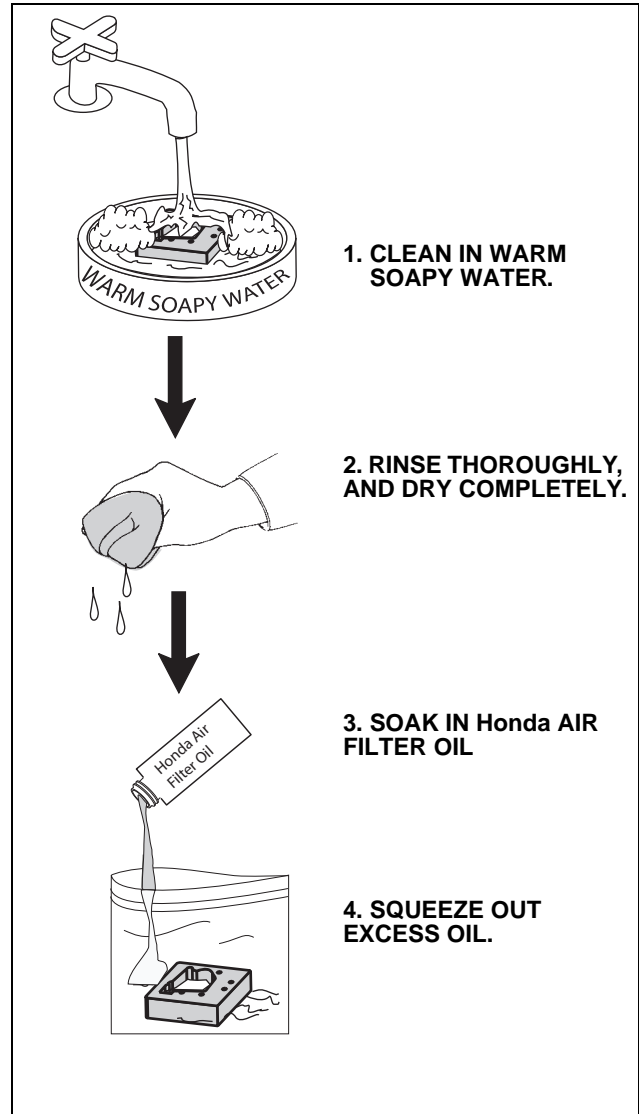
We recommend using Honda Air Filter Oil, which is available from any authorized Honda dealer.

1. Remove the foam air filter from the filter base (see [P. 3-3](#)).
2. Clean the air filter in warm soapy water, rinse, and allow it to dry thoroughly. Or, clean in nonflammable solvent and allow it to dry.
3. Place the filter in a resealable plastic bag and pour about 1 oz. (1/4 of a bottle) of Honda Air Filter Oil into the bag. Seal the bag closed and knead the bag for one minute or longer until the oil is completely distributed into the foam filter. Squeeze excess oil from the filter.
4. Remove the filter from the bag. We recommend using latex gloves when removing the oiled foam air filter from the bag.

NOTICE

Operating the engine with a dry air filter will allow dust to enter causing engine damage. The air filter must be oiled after cleaning.

5. Wipe dirt from the air cleaner base and cover using a moist rag. Be careful to prevent dirt from entering the carburetor.
6. Reinstall the air filter and air filter cover (see [P. 3-3](#)).



4. SPARK PLUG SERVICE

Recommended spark plugs	NGK – CM5H or CMR5H
-------------------------	---------------------

NOTICE

An incorrect spark plug can cause engine damage.

If the engine has been running, it will be very hot. Allow the engine to cool before proceeding.

1. Loosen the captive 5 mm hex bolt with a 4 mm Allen wrench, then remove the fan cover.
2. Disconnect the spark plug cap, and remove any dirt from around the spark plug area.
3. Remove the spark plug with a 5/8-inch spark plug wrench.
4. Inspect the spark plug. Replace it if the electrodes are worn, or if the insulator is cracked, chipped, or fouled.
5. Measure the spark plug electrode gap with a suitable gauge.

Spark plug gap	0.60 ~ 0.70 mm (0.024 ~ 0.028 in)
----------------	-----------------------------------

6. Correct the gap, if necessary, by carefully bending the side electrode.
7. Make sure the sealing washer is attached and install the spark plug carefully, by hand, to avoid cross-threading.
8. After the spark plug seats, tighten with a 5/8-inch spark plug wrench to compress the washer.

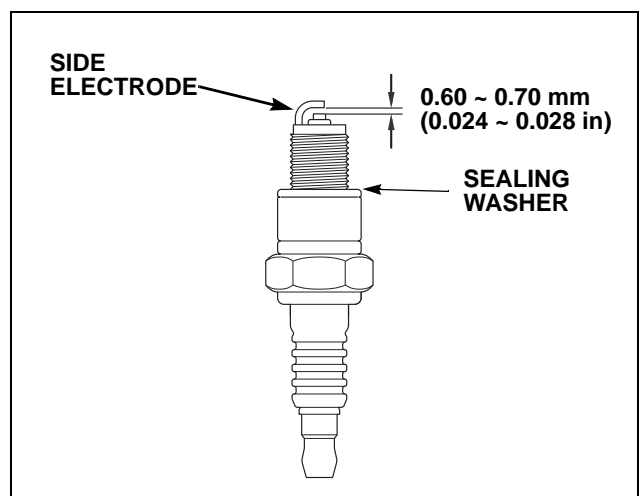
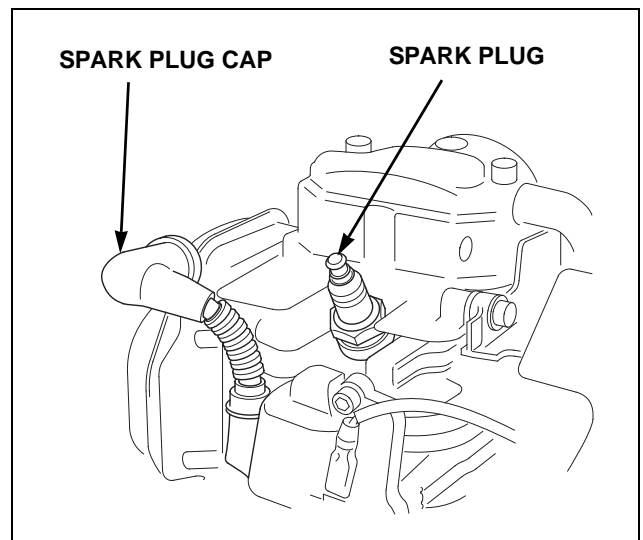
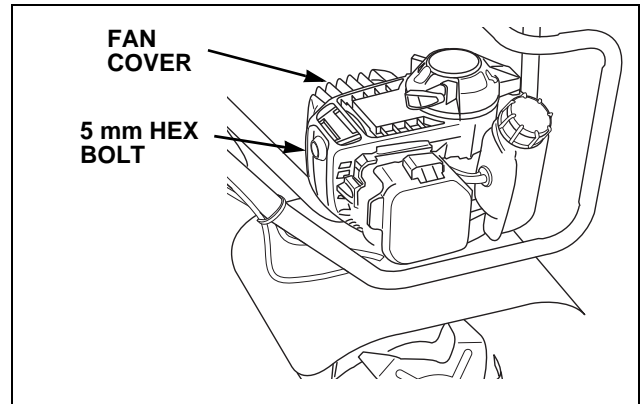
If reinstalling the used spark plug, tighten 1/8 ~ 1/4 turn after the spark plug seats.

If installing a new spark plug, tighten 1/2 turn after the spark plug seats.

NOTICE

A loose spark plug can overheat and damage the engine. Overtightening the spark plug can damage the threads in the cylinder head.

9. Attach the spark plug cap.
10. Install the fan cover and tighten the 5 mm hex bolt securely.

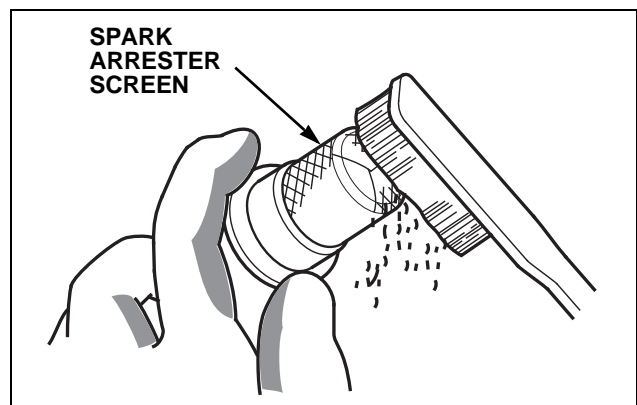
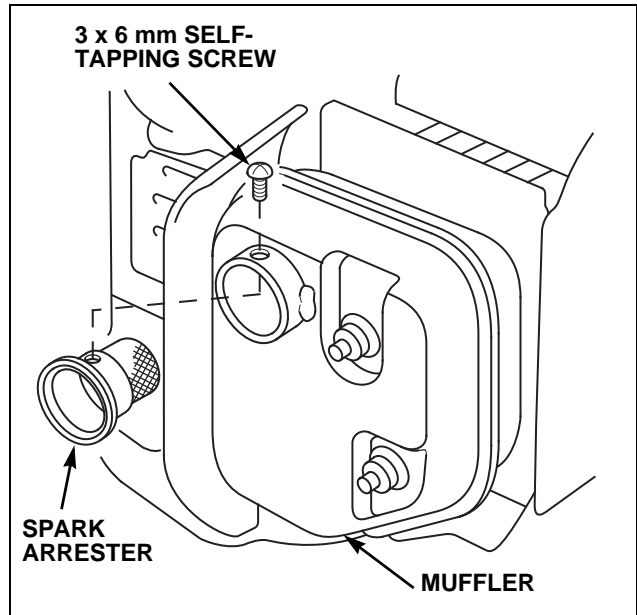


5. SPARK ARRESTER (optional part)

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

If the engine has been running, the muffler will be very hot. Allow the muffler to cool before servicing the spark arrester.

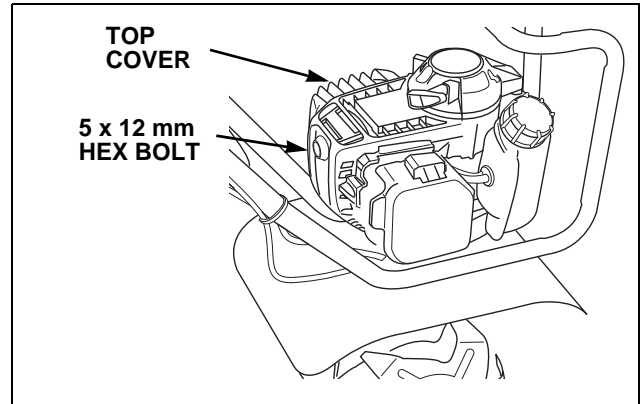
1. Loosen the captive 5 mm hex bolt, then remove the fan cover.
2. Remove the 3 x 6 mm self-tapping screw from the spark arrester, and remove the spark arrester from the muffler.
3. Use a brush to remove carbon deposits from the spark arrester screen. Be careful to avoid damaging the screen.
The spark arrester must be free of breaks and holes. Replace the spark arrester if it is damaged.
4. Install the spark arrester in the reverse order of removal.
5. Install the fan cover and tighten the captive 5 mm hex bolt securely.



6. VALVE CLEARANCE ADJUSTMENT

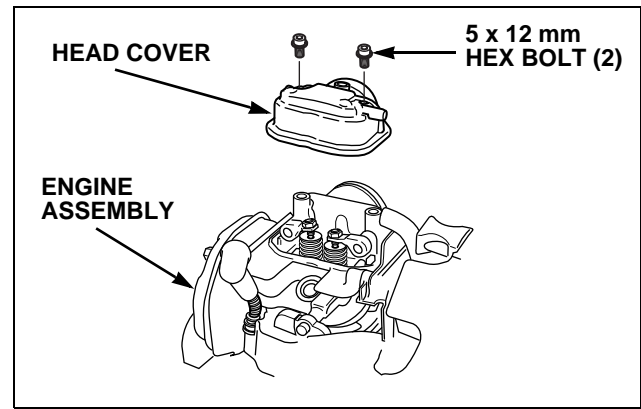
Valve clearance inspection and adjustment must be performed with the engine cold.

1. Remove the 5 x 12 mm hex bolt and remove the top cover.

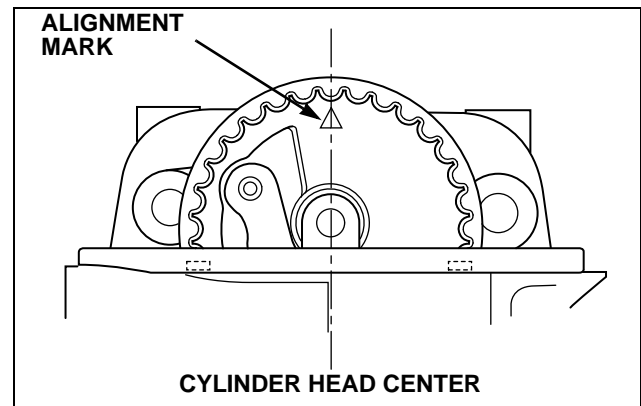


2. Remove the two 5 x 12 mm hex bolts from the head cover.

Engine oil can leak out when removing the head cover. Catch the leaking oil with a suitable material and wipe up the area immediately.



3. Set the piston at top dead center of the compression stroke by aligning the “△” mark on the cam pulley with the cylinder head center.



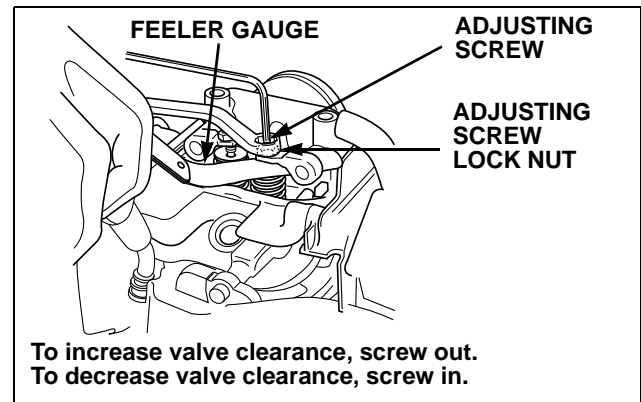
4. Insert a feeler gauge between the rocker arm and valve to measure the valve clearance.

Standard valve clearance	IN	0.08 ± 0.02 mm
	EX	0.11 ± 0.02 mm

5. If adjustment is necessary:
 - a. Loosen the adjusting screw lock nut and turn the adjusting screw right or left.
 - b. Hold the adjusting screw with the tappet adjusting wrench and tighten the lock nut to the specification.

Torque: 4.9 N•m (0.5 kgf•m, 3.9 lbf•ft)

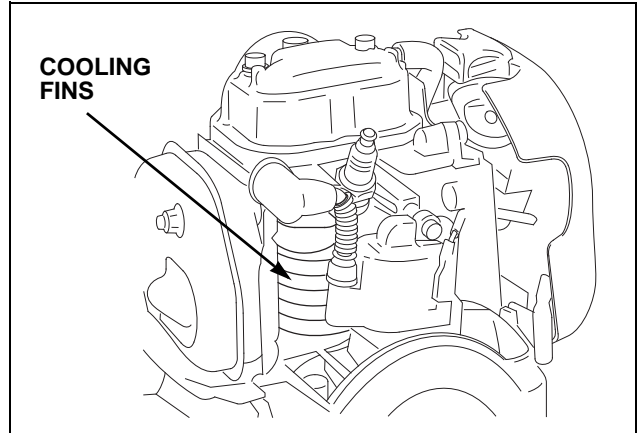
- c. Recheck the valve clearance.



7. COOLING FIN INSPECTION

Inspect the engine cooling fins. You should clean out any dirt and debris if air is obstructed from flowing across the cooling fins.

1. Loosen the 5 mm hex bolt, then remove the fan cover.
2. Remove all dirt and debris from the cooling fins.
3. Install the fan cover, and tighten the 5 mm hex bolt securely.



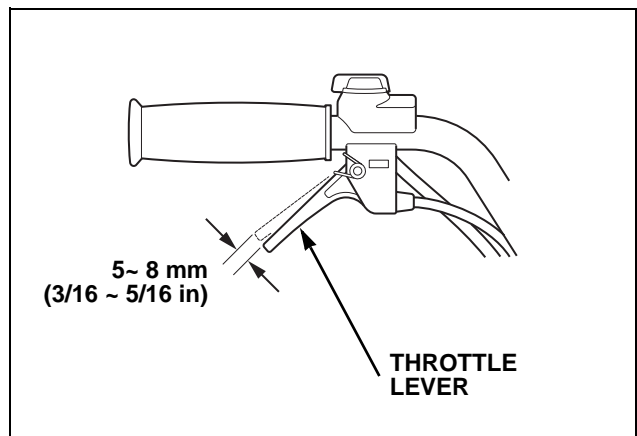
8. THROTTLE CABLE INSPECTION

Verify that the throttle trigger operates smoothly, releases properly, and the throttle cable is undamaged. If there is visible damage, or if the throttle lever does not operate smoothly or release properly, repair as needed.

Check the free play at the end of the throttle lever.

Throttle Lever Free play: 5 ~ 8 mm
(3/16 ~ 5/16 inch)

If adjustment is needed, use the *Throttle Cable Adjustment* procedure below.



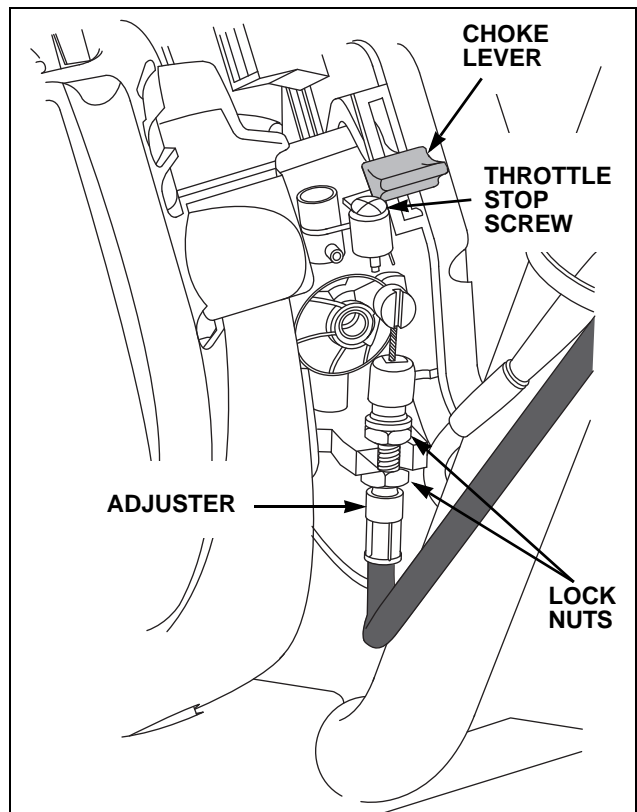
9. CARBURETOR ADJUSTMENT

A tachometer is required to adjust the idle speed.

1. Start the engine outdoors, and allow it to warm up to normal operating temperature.
2. Turn the throttle stop screw to obtain a stable idle, below the speed at which the tiller tines begin to turn.

Standard Idle Speed: 3,100 ± 200 rpm

3. Verify that the throttle lever free play is 5 ~ 8 mm (3/16 ~ 5/16 inch). If adjustment is needed, use the *Throttle Cable Adjustment* procedure below.



10. THROTTLE CABLE ADJUSTMENT

1. Loosen the lock nuts with a 10 mm wrench, and move the adjuster in or out as required.

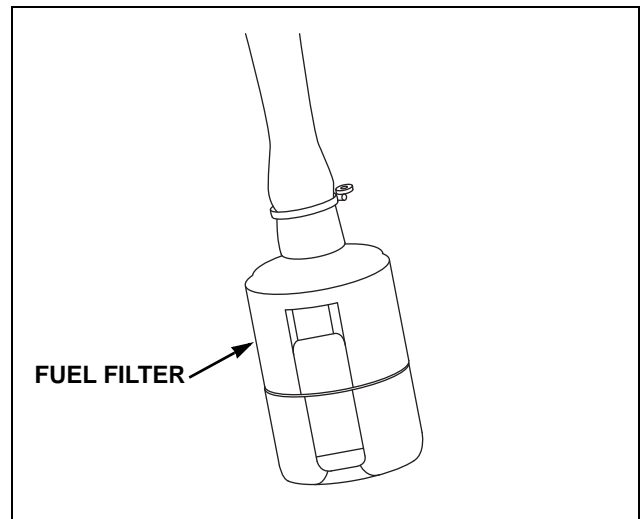
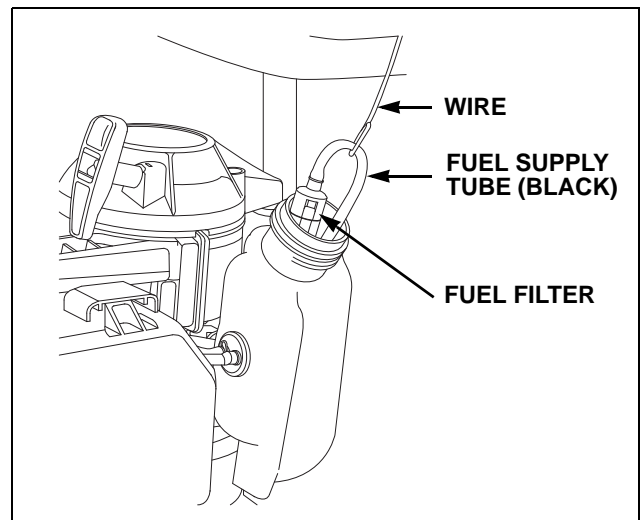
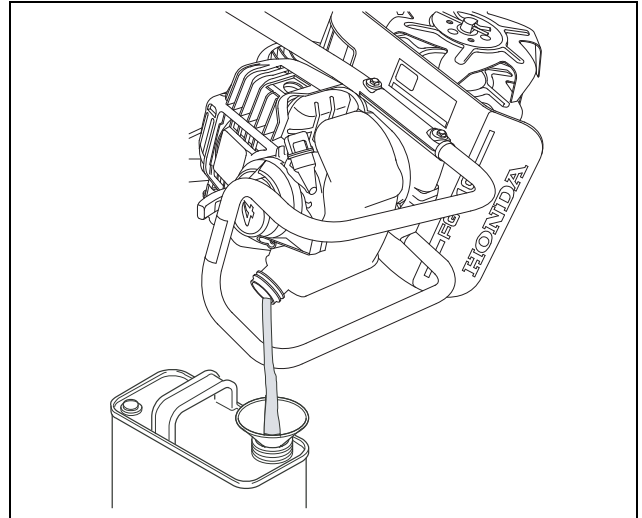
Throttle lever free play	5 ~ 8 mm (3/16 ~ 5/16 inch)
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2. Tighten the lock nuts and recheck throttle lever free play.

11. FUEL SYSTEM CLEANING**⚠ WARNING**

Gasoline is highly flammable and explosive.
You can be burned or seriously injured when handling fuel.
Keep heat, sparks, and flame away when refueling.
Handle fuel only outdoors.
Wipe up spills immediately.

1. Remove the fuel tank cap.
2. Tip the tiller as shown and empty the fuel tank into an approved gasoline container. Use a funnel to avoid spilling gasoline.
3. Pull the fuel filter out through the fuel filler neck by hooking the black fuel supply tube with a piece of wire, such as a partly straightened paper clip.
4. Inspect the fuel filter. If the fuel filter is dirty, wash it with nonflammable solvent. Be careful to avoid damaging the filter.
5. Replace the filter if it is damaged or excessively dirty.
6. Rinse sediment from the fuel tank with nonflammable solvent.
7. Insert the fuel filter in the fuel tank, and install the fuel tank cap.

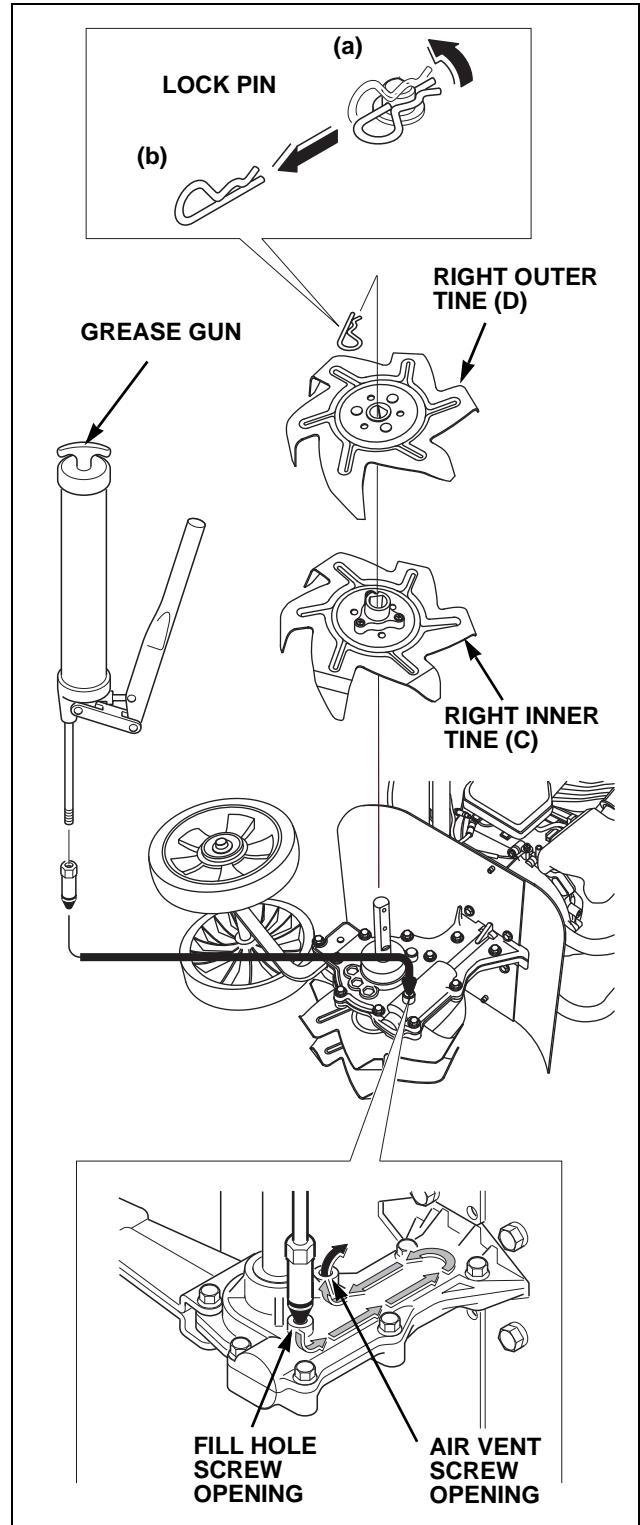


12. TRANSMISSION LUBRICATION

1. Place the tiller on the left side as shown.
2. Remove the lock pin from the right side tine shaft by turning it up [a] and pulling it out [b] as shown.
3. Wear heavy gloves and remove both right side tines. If the tines are difficult to remove, rinse the tine shaft with water and detergent to remove dirt from between the tines and shaft. Do not use a hammer to remove the tines, or you might distort the tine hub and make it difficult to remove the tines.
4. Remove the air vent screw and fill hole screw from the transmission case.
5. Fill the transmission by using a grease gun or grease applicator at the fill hole screw opening. Push the gun or applicator against the opening so as to seal the nozzle of the gun or applicator against the casting embossment. Apply grease until grease begins to come out of the top air vent hole.

Grease	NLGI #2 general purpose
--------	-------------------------

6. Reinstall the air vent screw and fill hole screw.
7. Clean the tine shaft and place a few drops of oil on the tine shaft before installing the tines.
8. Wear heavy gloves and reinstall the tines in the reverse order of removal.
9. Install the lock pin through the round side of the tine shaft hole, then turn it over to lock it in place.



4. AIR CLEANER/CARBURETOR

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1. AIR CLEANER REMOVAL/INSTALLATION . . . [4-1](#) 2. CARBURETOR REMOVAL/INSTALLATION . . . [4-2](#)

1. AIR CLEANER REMOVAL/INSTALLATION

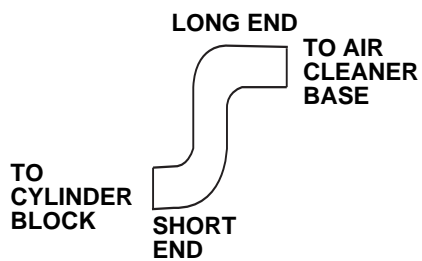
NOTICE

If these parts are left out, dirt will enter the intake system and damage the engine.

BREATHER TUBE

REASSEMBLY:

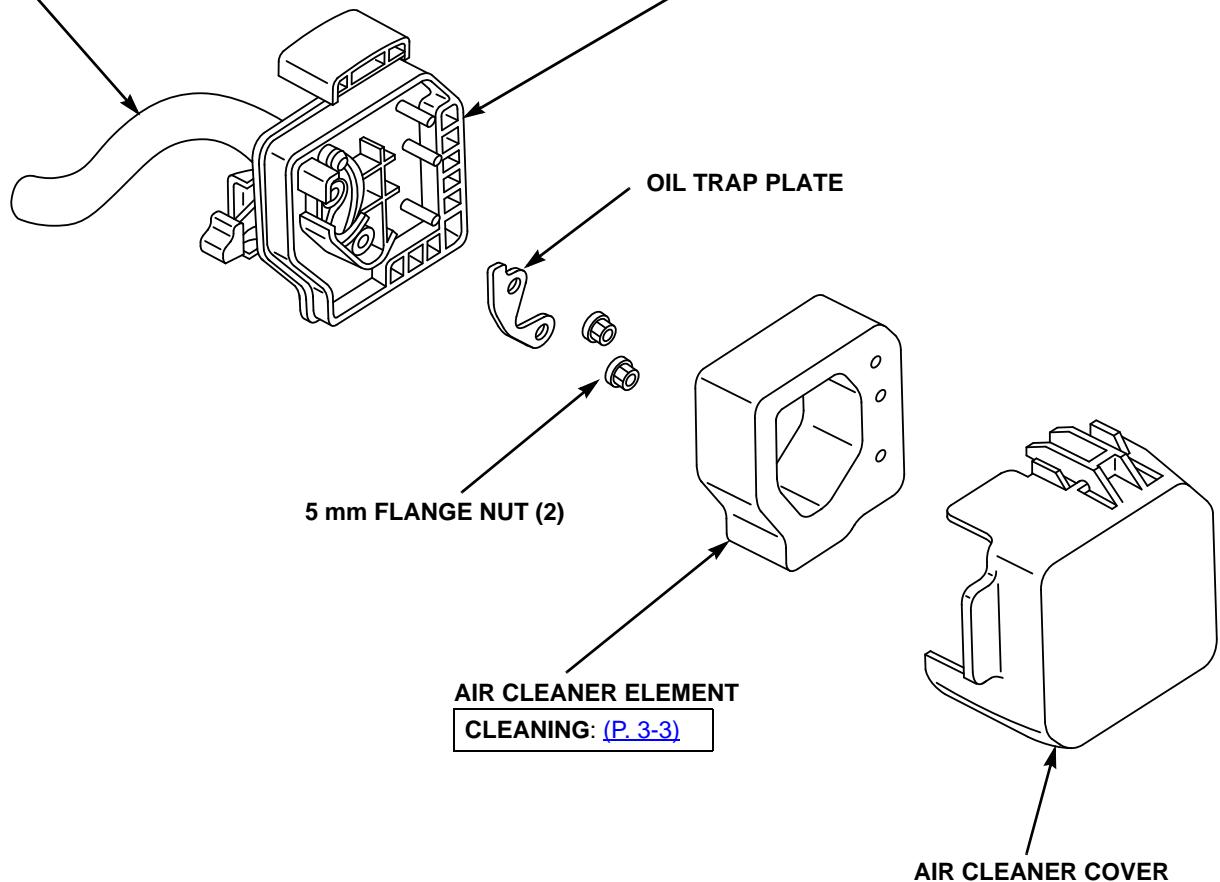
Before installing the breather tube, check for deterioration or damage. Replace if necessary.



AIR CLEANER HOUSING

REASSEMBLY:

Before installation, clean inside the case with compressed air



2. CARBURETOR REMOVAL/INSTALLATION

Before removal, completely drain the carburetor.

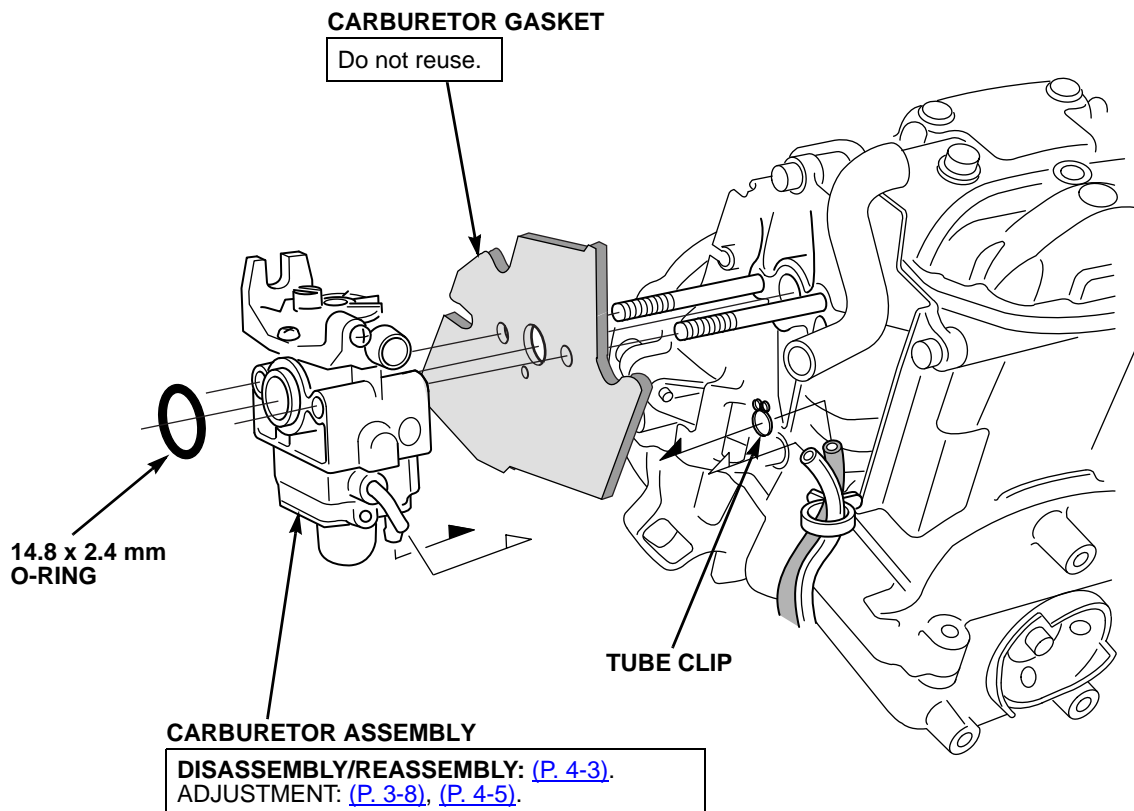
⚠ WARNING

Gasoline is highly flammable and explosive.
 You can be burned or seriously injured when handling fuel.
 Keep heat, sparks, and flame away when refueling.
 Handle fuel only outdoors.
 Wipe up spills immediately.

NOTICE

If these parts are left out, dirt will enter the intake system, damaging the engine.

1. Remove the top cover ([P. 6-1](#)).
2. Remove the air cleaner ([P. 4-1](#)).

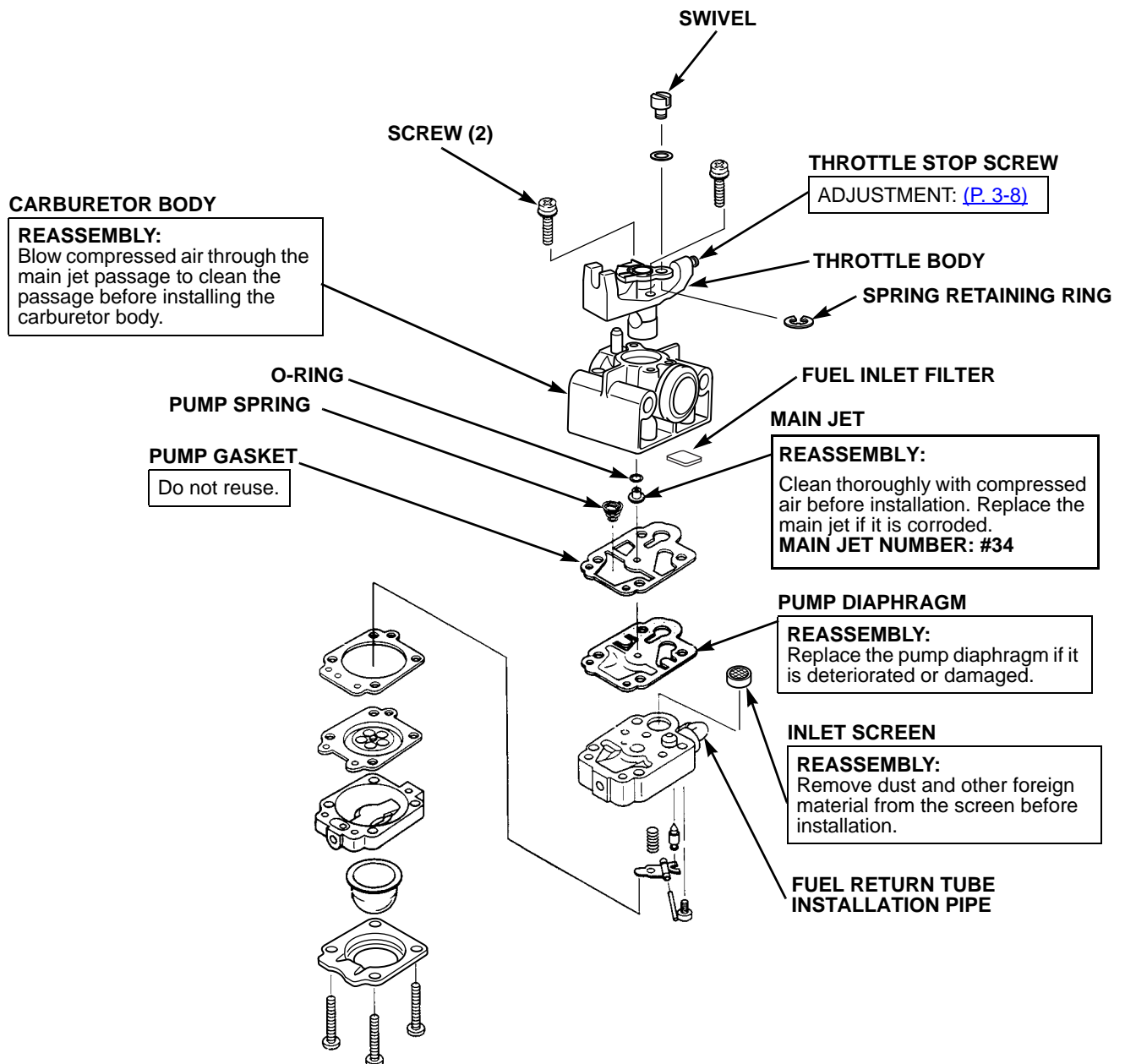


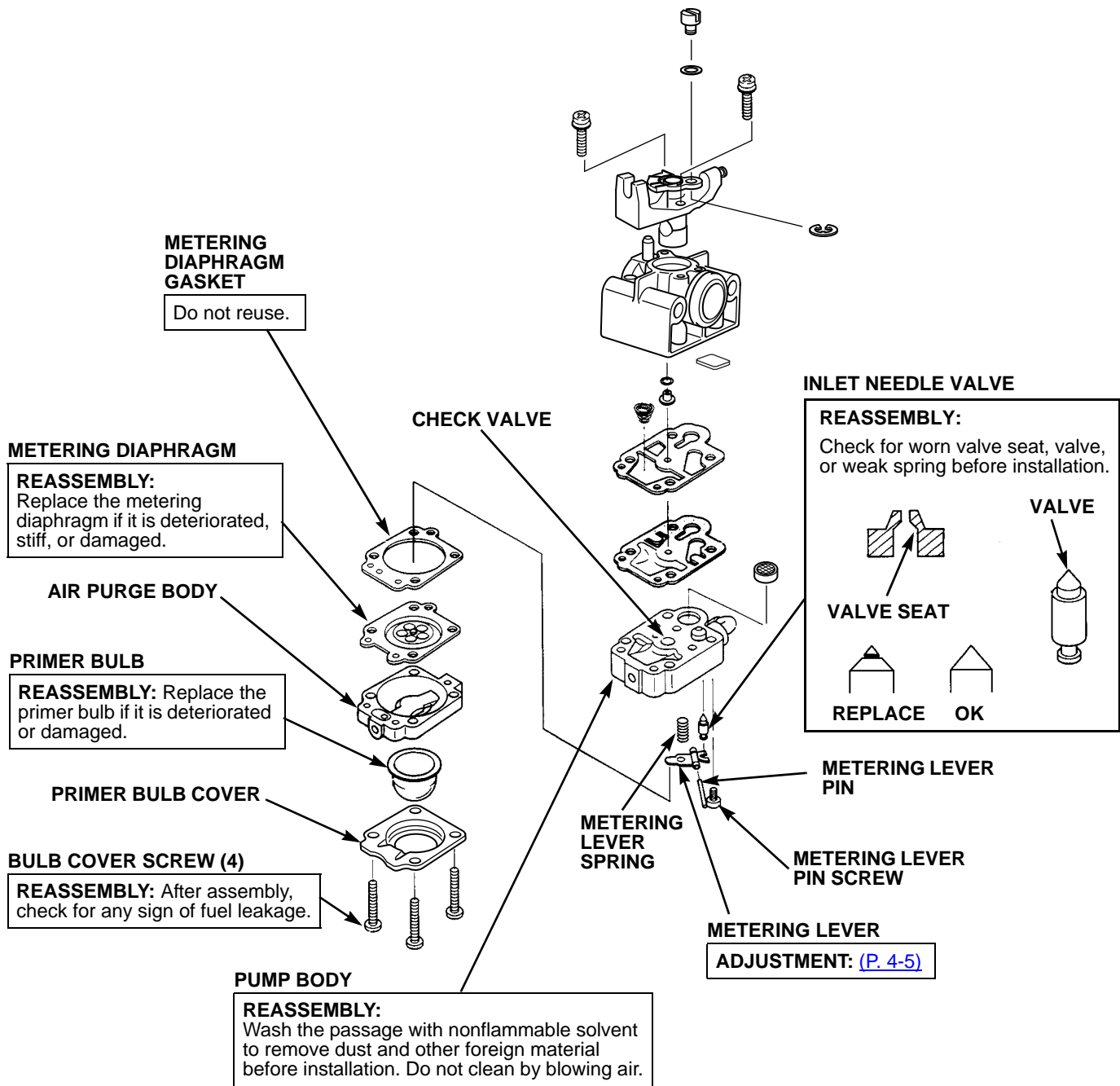
3. CARBURETOR DISASSEMBLY/REASSEMBLY

Clean the outside of the carburetor before disassembly.

⚠ WARNING

Gasoline is highly flammable and explosive.
 You can be burned or seriously injured when handling fuel.
 Keep heat, sparks, and flame away when refueling.
 Handle fuel only outdoors.
 Wipe up spills immediately.





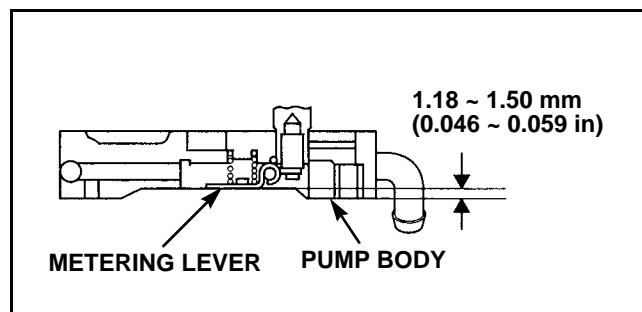
4. CARBURETOR ADJUSTMENT

1. Install the metering body spring, inlet needle valve, metering lever, metering lever pin, and the metering lever pin screw on the pump body (P. 4-4).

2. Measure the gap between the metering lever surface and the pump body surface.

Specification	1.18 ~ 1.50 mm (0.046 ~ 0.059 in)
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3. If the measurement is outside the specification, adjust by bending the metering lever.



NOTES

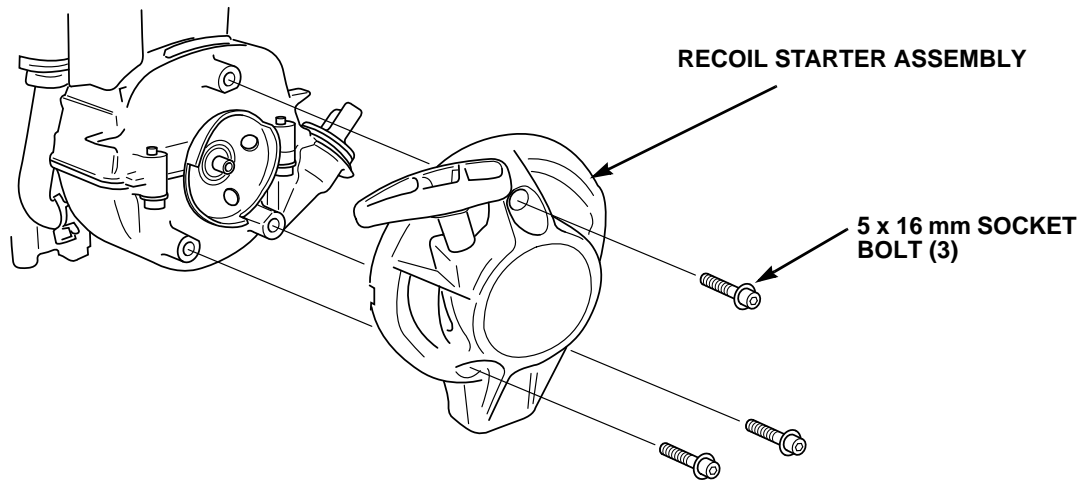
5. RECOIL STARTER/STARTER PULLEY/FUEL TANK

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1. RECOIL STARTER.....	5-1	3. FUEL TANK REMOVAL/INSTALLATION	5-6
2. STARTER PULLEY	5-5		

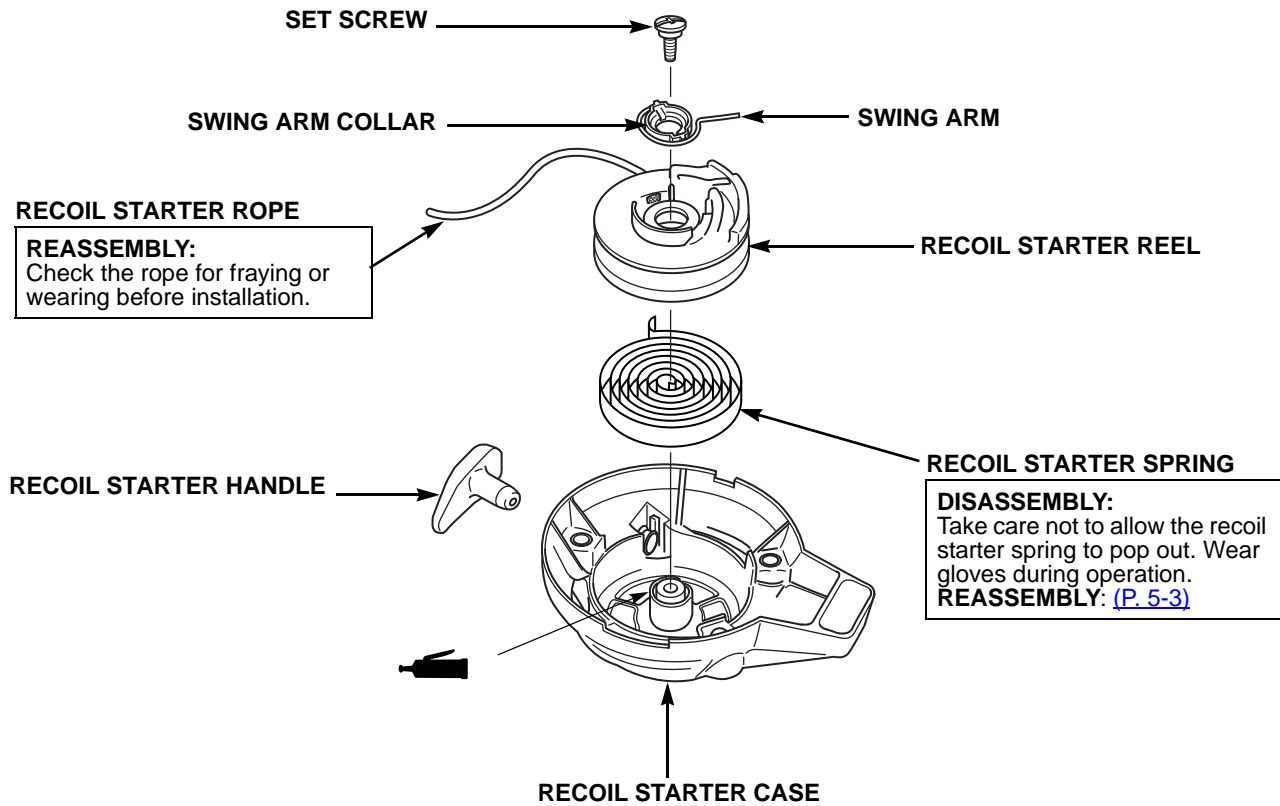
1. RECOIL STARTER

a. REMOVAL/INSTALLATION



b. DISASSEMBLY

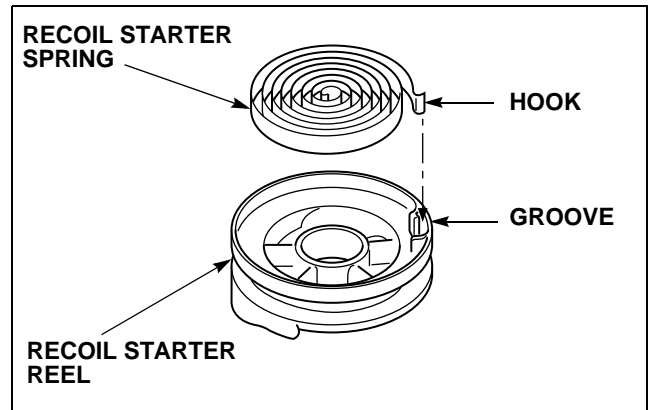
- Wear gloves and eye protection.
- During disassembly, take care not to allow the return spring to come out.



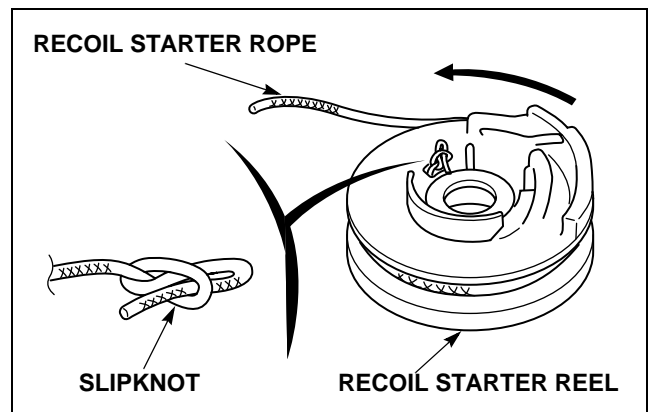
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c. REASSEMBLY

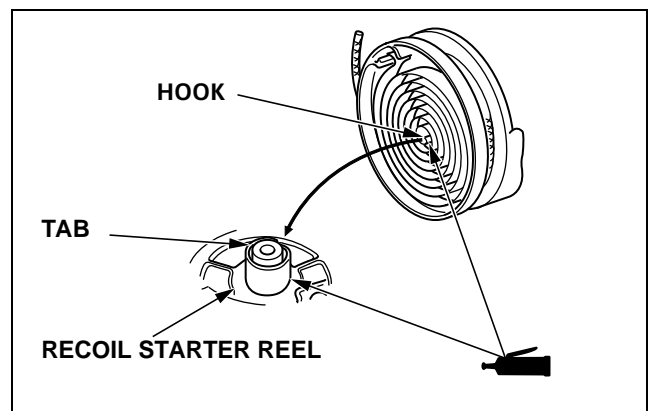
- Wear gloves and eye protection.
 - During assembly, take care not to allow the return spring to come out.
1. Insert the hook on the outer side of the spring into the groove inside the starter reel.
 2. Carefully wind the recoil starter spring inside the starter reel.



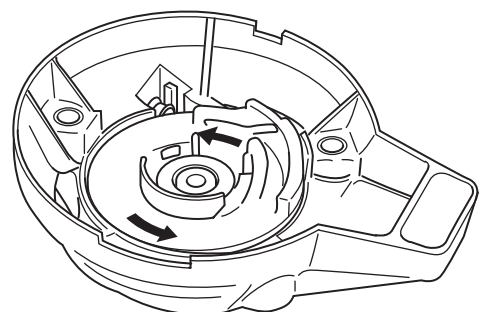
3. Pass the starter rope through the starter reel and tie the rope so that it can be untied easily by pulling it as shown.
4. Wind the starter rope around the recoil starter reel in the direction of the arrow.



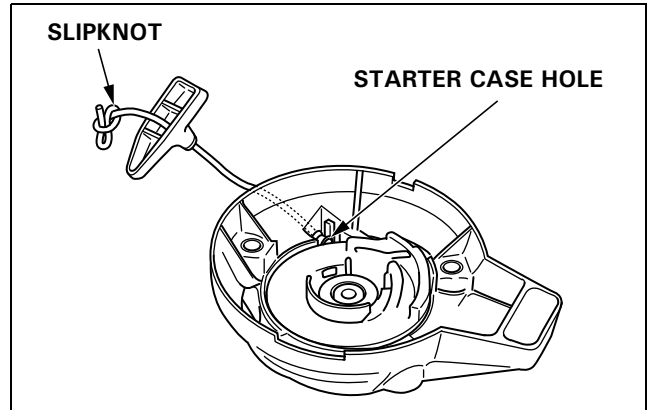
5. Install the starter reel on the starter case so that the spring inner hook is hook to the case tab.



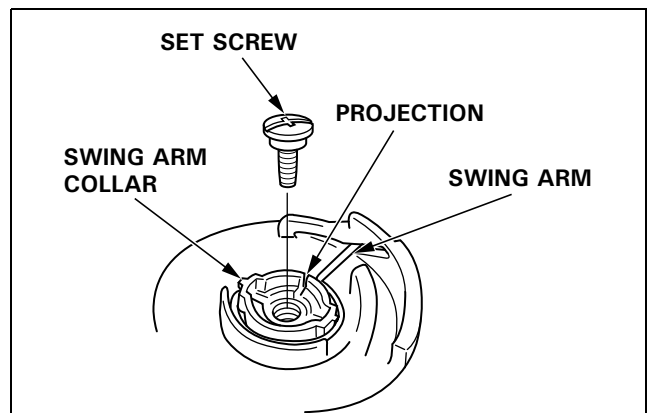
6. Hold the starter case and rotate the starter reel three turns in the direction of the arrow for preliminary winding.



7. Pass the starter rope end through the case and pull it outwards.
8. Pass the starter rope through the starter handle and tie the rope so that it can be untied easily by pulling it as shown.



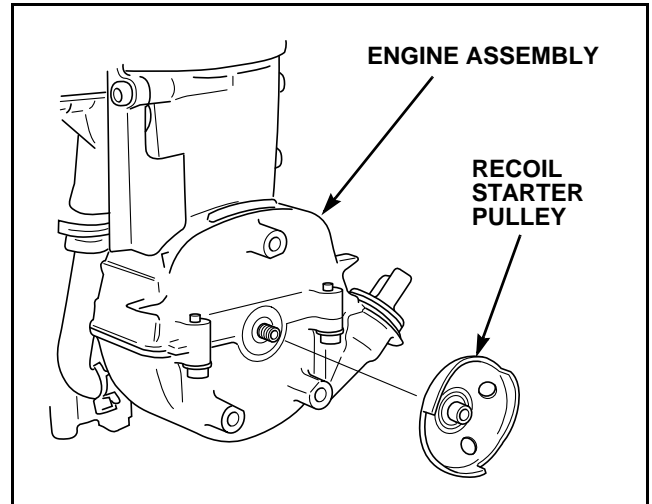
9. Secure the starter reel with the set screw. Make sure to align the projection of the swing arm collar and swing arm.
10. Pull the starter handle several times to make sure the swing arm operates properly.



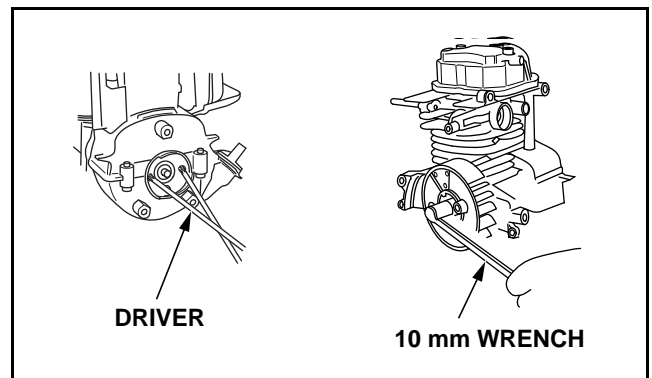
2. STARTER PULLEY

a. DISASSEMBLY

1. Remove the engine top cover (P. 6-1).
2. Remove the recoil starter (P. 5-1).
3. Remove the ignition coil (P. 7-3).
4. Remove the fan cover (P. 7-4).
5. Remove the clutch assembly (P. 7-4).



6. Hold the recoil starter pulley with a driver or equivalent tool and loosen the flywheel with a 10 mm wrench.

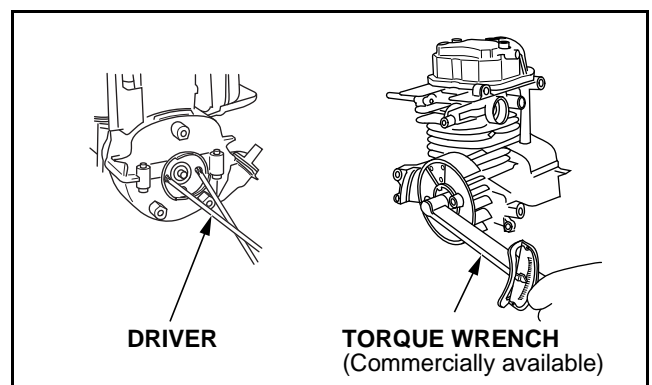


b. REASSEMBLY

1. Hold the recoil starter pulley with a driver or equivalent tool and tighten the flywheel to the specified torque.

TORQUE: 6.4 N•m (0.7 kg-m, 5.1 lb-ft)

2. Install the clutch assembly, fan cover, and ignition coil.
3. Adjust the ignition coil air gap (P. 7-3).
4. Install the recoil starter and engine cover.



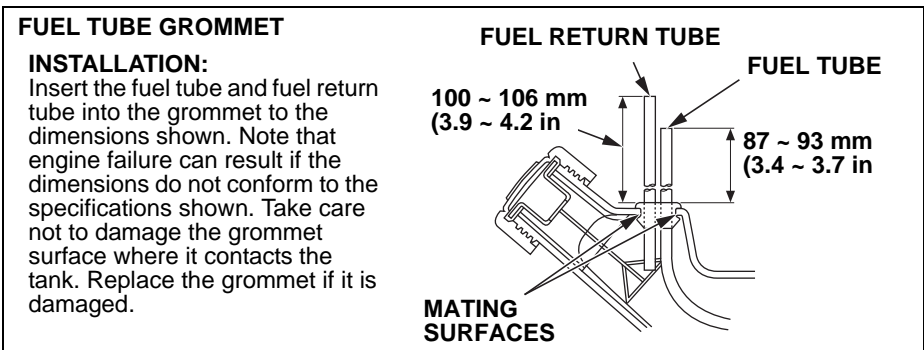
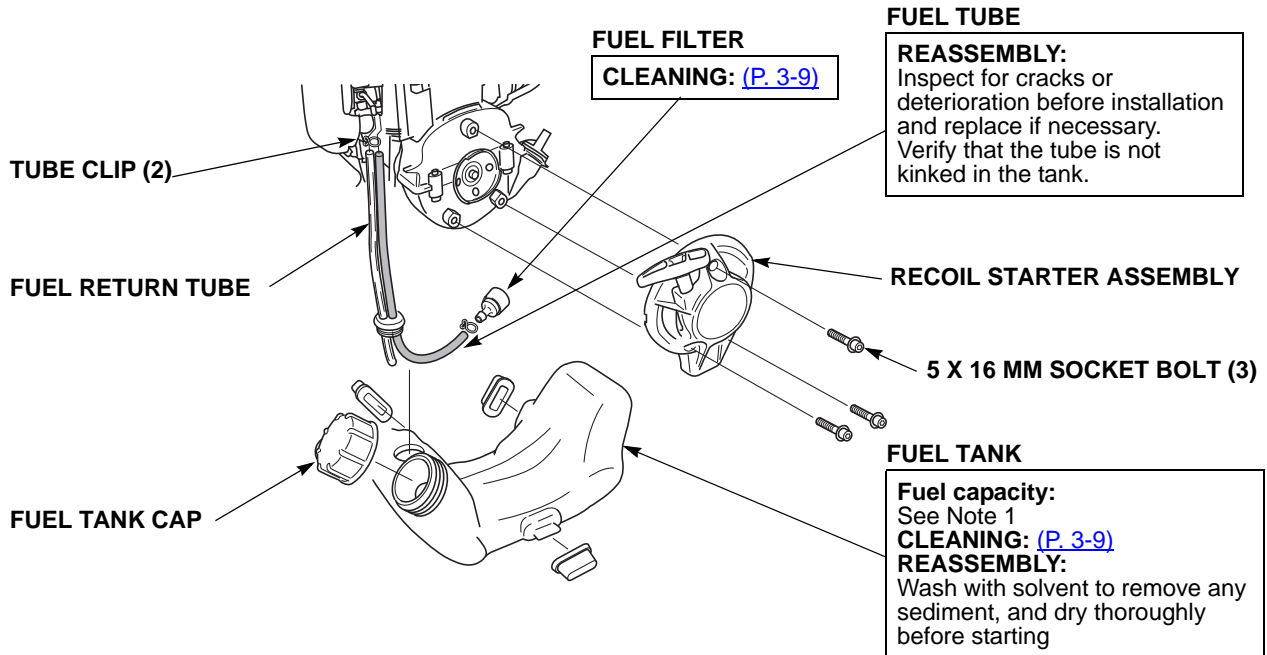
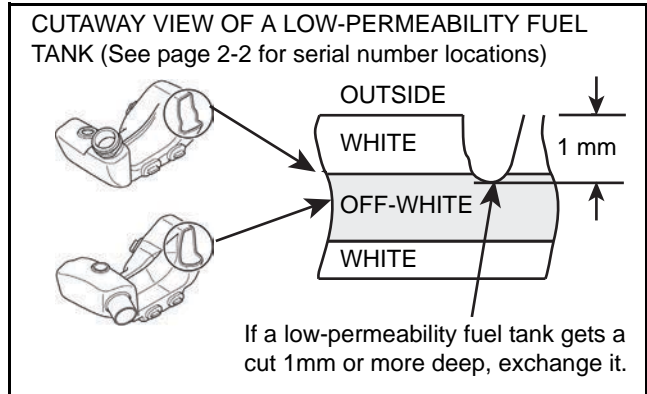
3. FUEL TANK REMOVAL/INSTALLATION

Before removal, completely drain the fuel tank and fuel line.

⚠ WARNING

- Gasoline is highly flammable and explosive.
 You can be burned or seriously injured when handling fuel.
- Keep heat, sparks, and flame away when refueling.
 - Handle fuel only outdoors.
 - Wipe up spills immediately.

Loosen the fuel tank cap and release the pressure from the tank before operation.



Note 1:
Fuel tank capacity (See page 2-2 for serial number locations):

Pre-2010 year:
 0.55 l
 (0.15 US gal, 0.12 Imp gal)

Low-perm horizontal type:
 0.53 l
 (0.14 US gal, 0.12 Imp gal)

Low-perm vertical type:
 0.54 l
 (0.14 US gal, 0.12 Imp gal)

6. TOP COVER/MUFFLER

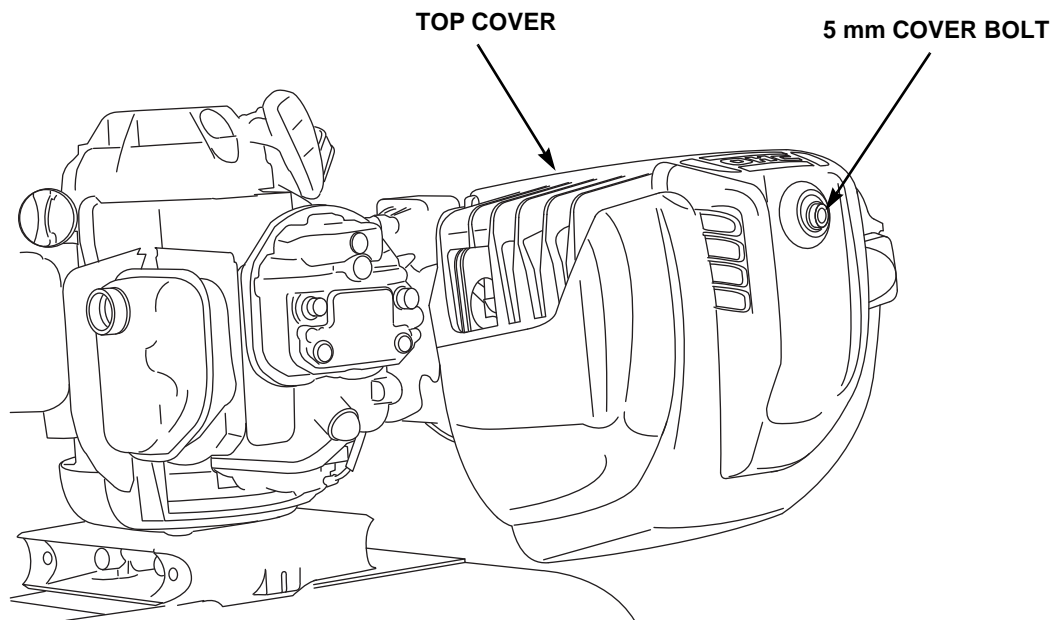
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1. TOP COVER.....	6-1	2. MUFFLER.....	6-2
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1. TOP COVER

a. REMOVAL

1. Loosen the 5 mm captive cover bolt.
2. Slide the cover off the engine.



b. INSTALLATION

1. Slide the cover onto the engine.
2. Tighten the 5 mm captive cover bolt.

2. MUFFLER

a. REMOVAL

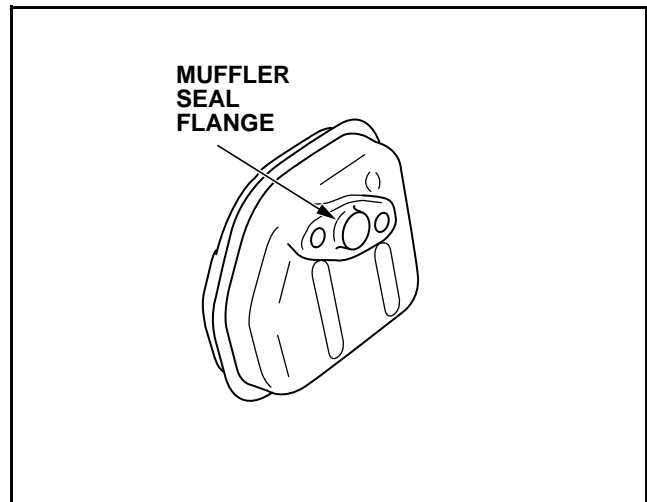
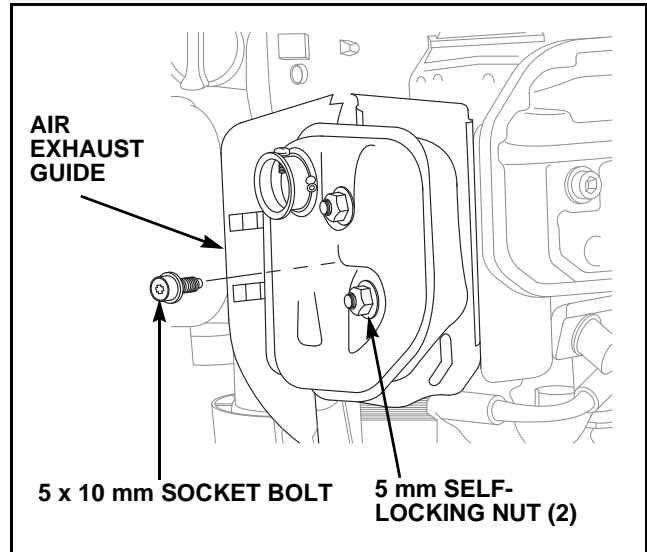
⚠ CAUTION

The engine and muffler become very hot during operation and they remain hot for a while after operation. Be sure that the engine is cold before muffler removal/installation.

1. Remove the two 5 mm self-locking nuts.
2. Remove the 5 x 10 mm socket bolt from the air exhaust guide.
3. Remove the muffler and air exhaust guide from the engine.
4. Separate the muffler from the air exhaust guide.

b. INSTALLATION

1. Remove any carbon deposits from the muffler.
2. Use a plastic hammer to install the muffler and air exhaust guide on the two studs.
Do not tap on the muffler seal flange or you will damage it. If the seal flange is dented or damaged, replace the muffler.
3. Install the two 5 mm self-locking nuts on the studs.
4. Install the 5 x 10 mm socket bolt through the air exhaust guide.
5. Check the muffler exhaust port for damage.



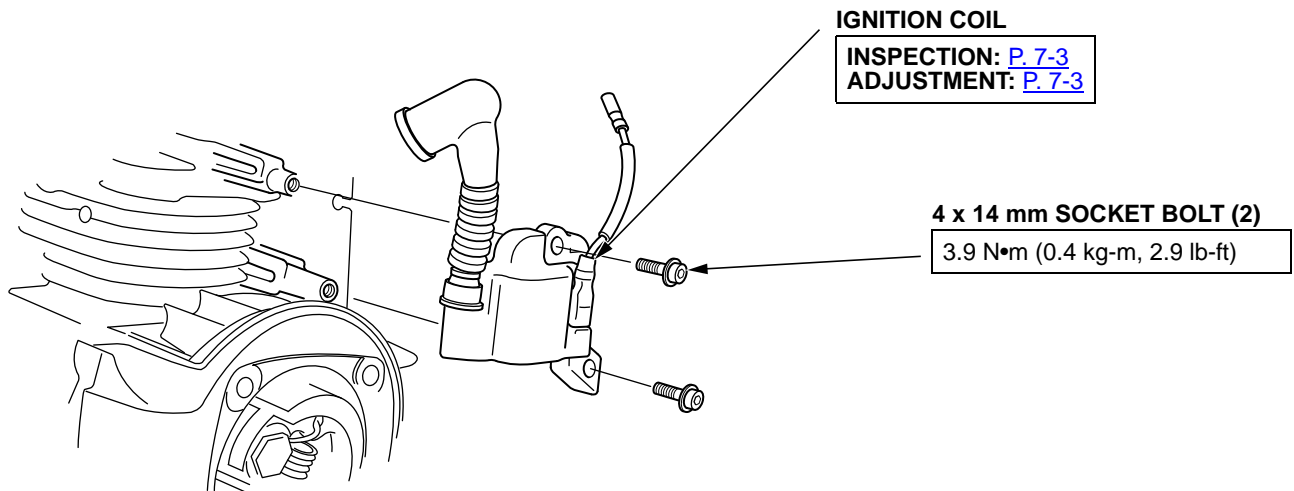
7. IGNITION COIL/CLUTCH SHOE/FLYWHEEL

FG110

1. IGNITION COIL	7-1	3. FLYWHEEL	7-6
2. CLUTCH ASSEMBLY	7-4		

1. IGNITION COIL

a. ASSEMBLY/DISASSEMBLY

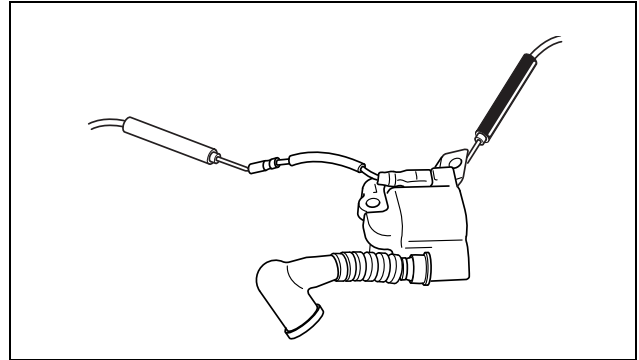


b. INSPECTION

• **PRIMARY RESISTANCE**

1. Attach one lead of the tester to the engine stop switch wire and the other tester lead to the iron core.
2. Measure the primary resistance of the ignition coil.

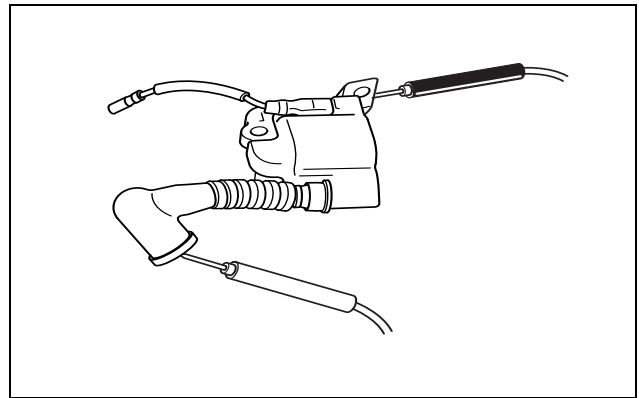
Resistance	0.75 ~ 0.92 Ω
------------	---------------



• **SECONDARY RESISTANCE**

1. Attach one lead of the tester to the terminal inside the spark plug cap and the other tester lead to the iron core.
2. Measure the secondary resistance of the ignition coil.

Resistance	6.1 ~ 9.3 kΩ
------------	--------------

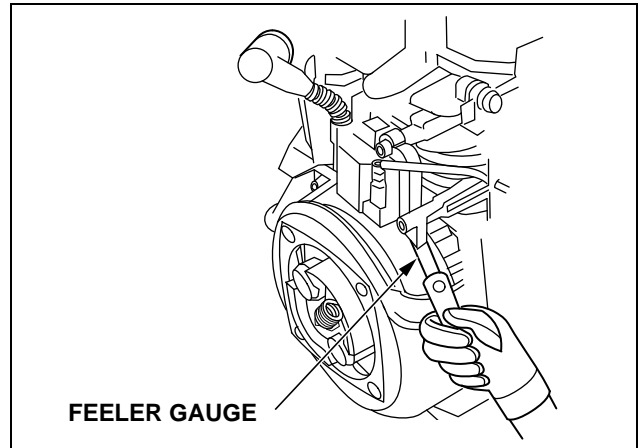


FG110

c. AIR GAP ADJUSTMENT

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

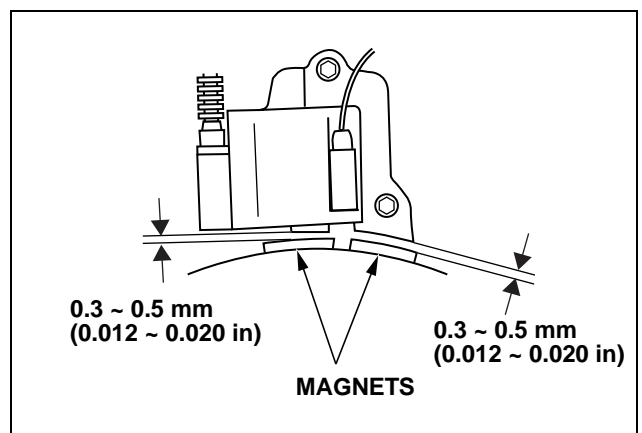
1. Loosen the ignition coil's two 4 x 14 mm hex bolts.
2. Rotate the flywheel to align the magnets with the ignition coil.
3. Insert a feeler gauge between the ignition coil and the magnets on the flywheel.



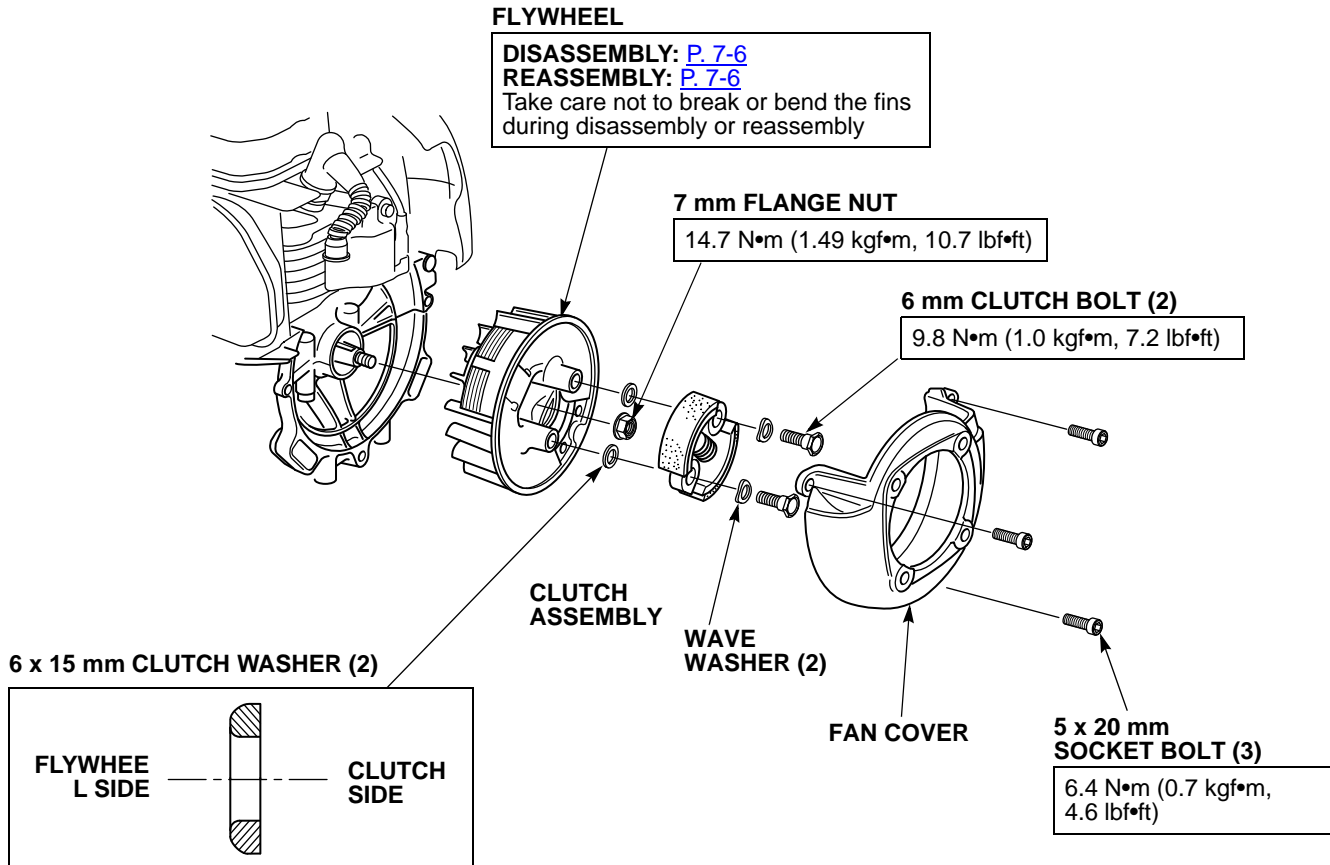
4. Push the ignition coil firmly toward the flywheel and tighten the bolts.
5. Adjust the clearance at the magnetic part of the flywheel.

Clearance	0.3 ~ 0.5 mm (0.012 ~ 0.020 in)
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6. Adjust the gaps at both the right and left sides of the ignition coil simultaneously so they are equal.



2. CLUTCH ASSEMBLY



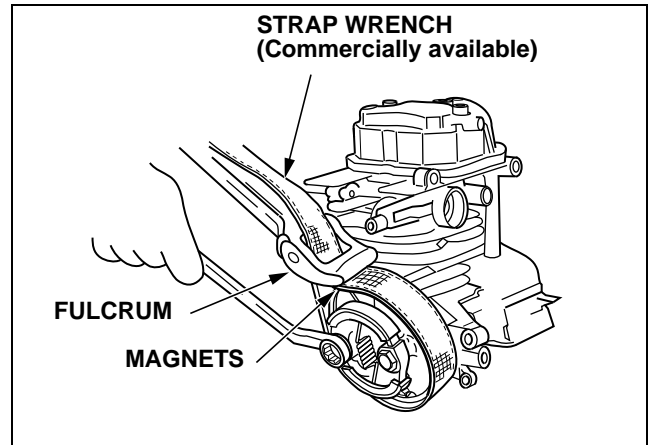
FG110

NOTICE


To avoid damage to the flywheel fan blades, position the strap wrench fulcrum at the flywheel magnetic parts.

a. CLUTCH DISASSEMBLY:

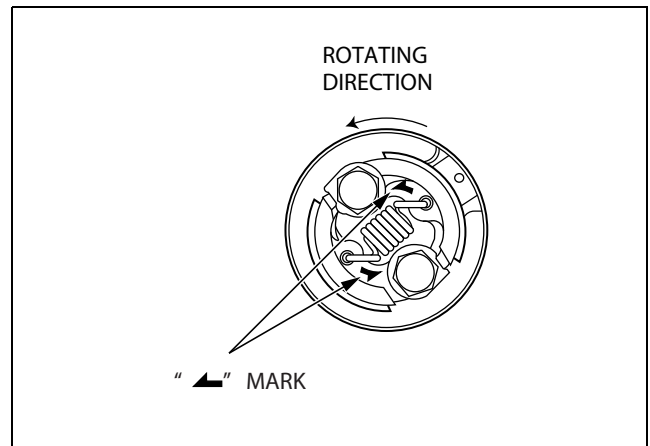
1. Hold the flywheel with a commercially available strap wrench.
2. Remove the two clutch bolts.
3. Remove the clutch assembly.



b. CLUTCH REASSEMBLY:

1. Install the clutch assembly so that the  mark is visible, as shown.
2. Set the clutch washer between the clutch assembly and the flywheel.
3. Hold the flywheel with a commercially available strap wrench.
4. Install the two clutch bolts and tighten to the specified torque.

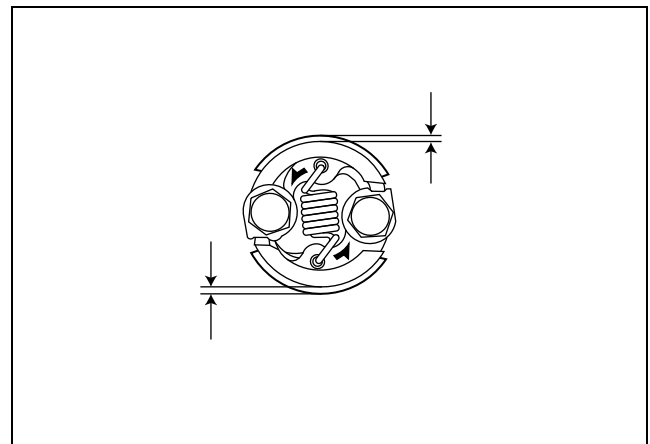
TORQUE: 9.8 N•m (1.0 kgf•m, 7.2 lbf•ft)



c. CLUTCH INSPECTION

Measure the thickness at the center of the clutch lining.

Standard	Service limit
2.0 mm (0.08 in)	1.0 mm (0.04 in)



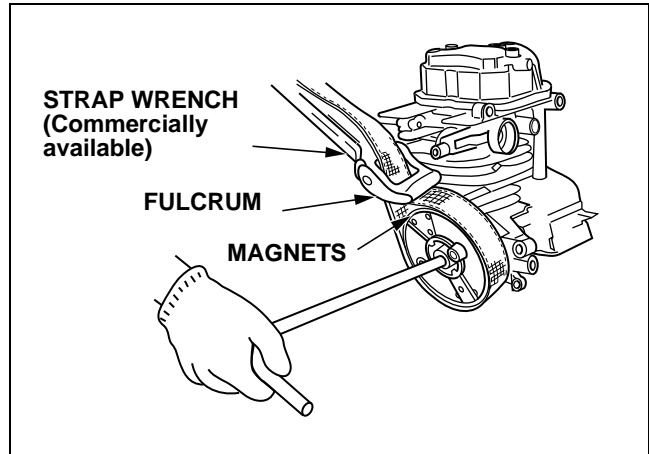
3. FLYWHEEL

a. DISASSEMBLY

NOTICE

To avoid damage to the flywheel fan blades, position the strap wrench fulcrum at the flywheel magnetic parts.

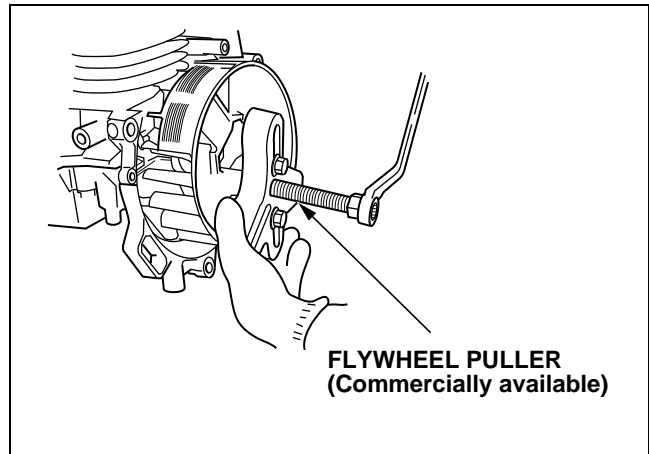
1. Hold the flywheel with a commercially available strap wrench.
2. Remove the 7 mm flange nut from the flywheel.



NOTICE

Do not remove the flywheel by tapping it with a hammer or you might damage the flywheel

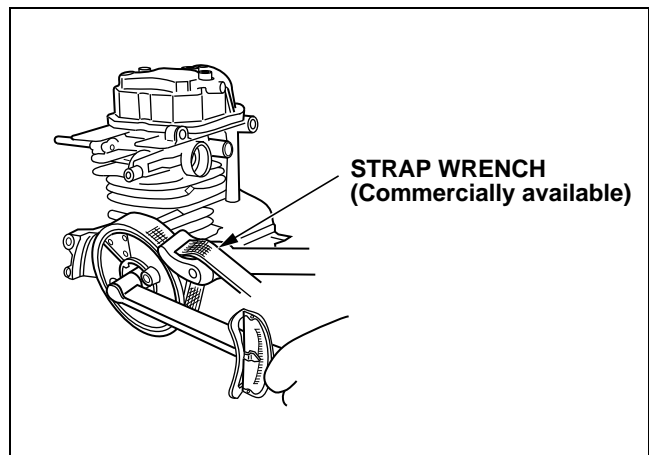
3. Remove the flywheel using a commercially available flywheel puller.



b. REASSEMBLY

1. Clean the tapered portion of the crankshaft of dirt, oil, grease, and other foreign material.
2. Install the flywheel, making sure the flywheel key is properly set in the crankshaft groove.
3. Hold the flywheel with a commercially available strap wrench. Position the fulcrum at the flywheel magnets.
4. Install the 7 mm flange nut to the specified torque.

TORQUE: 14.7 N•m (1.49 kgf•m, 10.7 lbf•ft)



8. CAM PULLEY/CYLINDER HEAD COVER/LOWER CRANKCASE

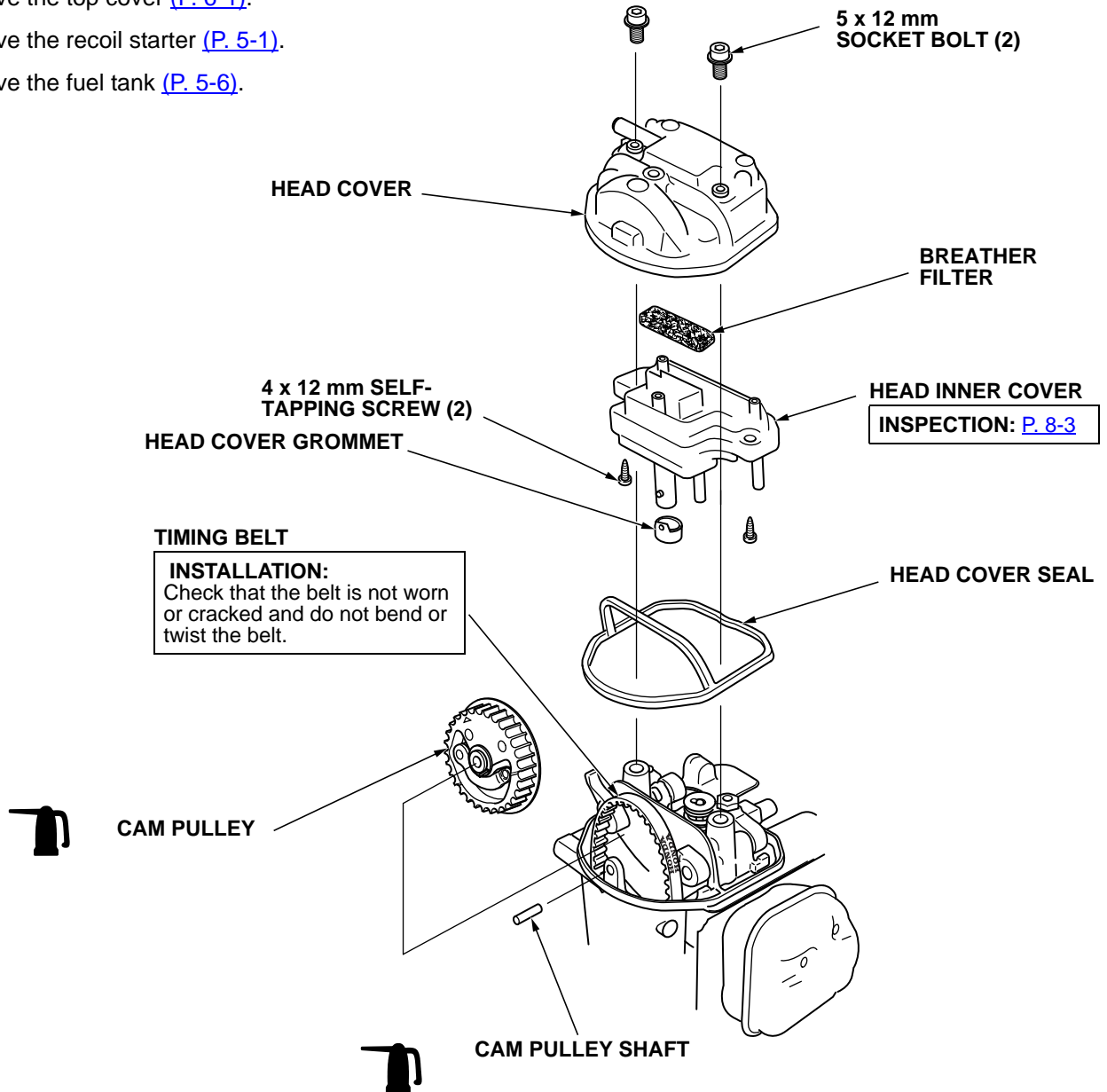
FG110

1. CAM PULLEY/CYLINDER HEAD COVER 8-1 2. LOWER CRANKCASE. 8-4

1. CAM PULLEY/CYLINDER HEAD COVER

a. DISASSEMBLY/REASSEMBLY

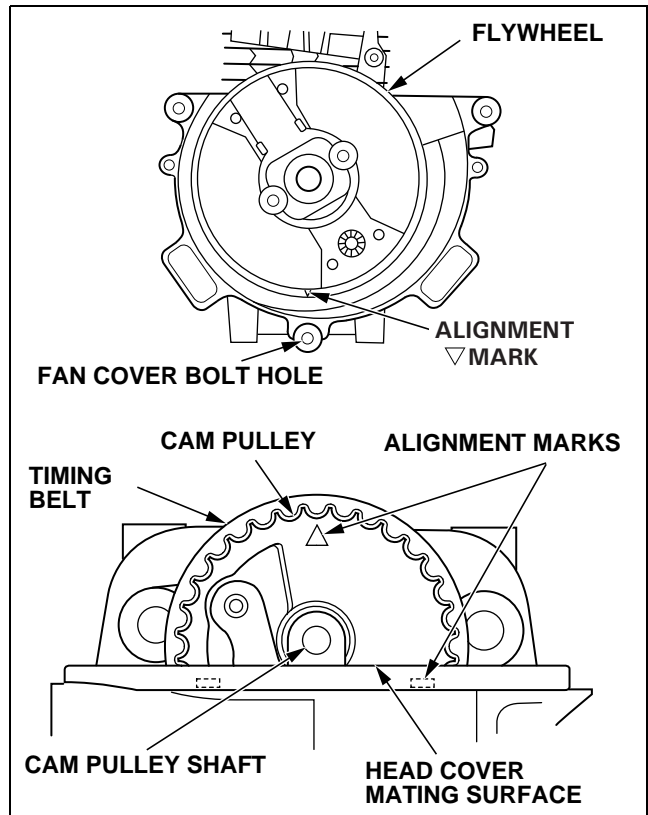
1. Remove the top cover (P. 6-1).
2. Remove the recoil starter (P. 5-1).
3. Remove the fuel tank (P. 5-6).



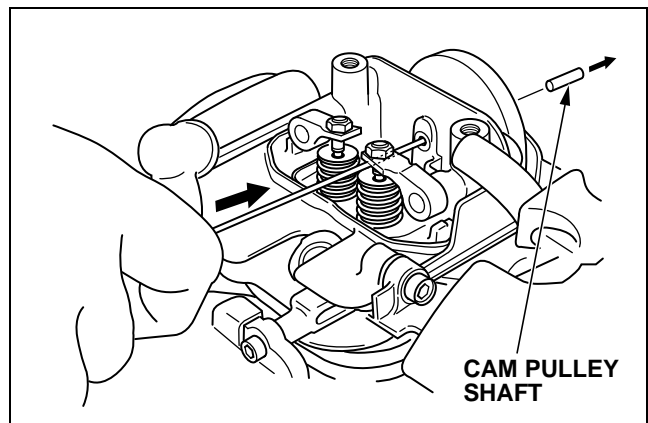
b. CAM PULLEY REMOVAL

1. Remove the spark plug.
2. Remove the head cover.
3. Set the piston at top dead center (TDC) of the compression stroke.

When the piston is at TDC of the compression stroke, the flywheel alignment mark "▽" will align with the fan cover bolt hole. Also, the cam pulley alignment marks will be positioned as shown.



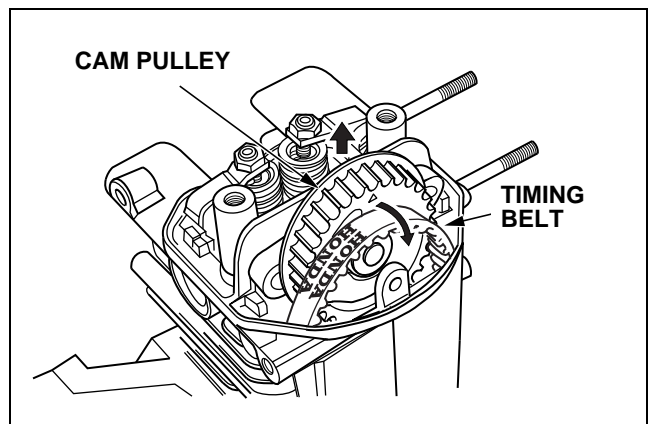
4. Push the cam pulley shaft out from the valve spring side using a pin approximately 2 mm in diameter.



5. Remove the timing belt from the cam pulley.
6. Remove the cam pulley.

c. CAM PULLEY INSTALLATION

Install the cam pulley and timing belt in the reverse order of removal.

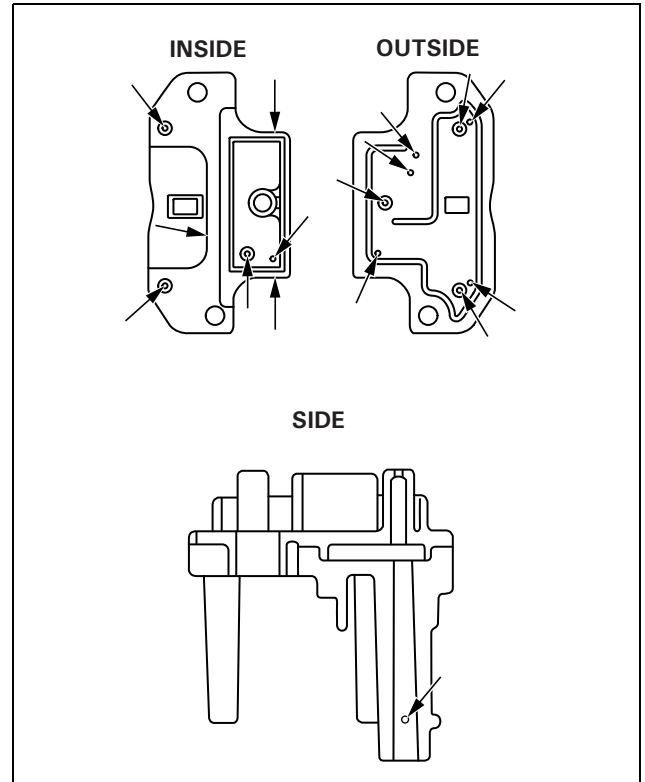


FG110

d. CYLINDER HEAD INNER COVER INSPECTION

Check the oil return passages of the cylinder head inner cover for restrictions. If they are restricted, clean with compressed air.

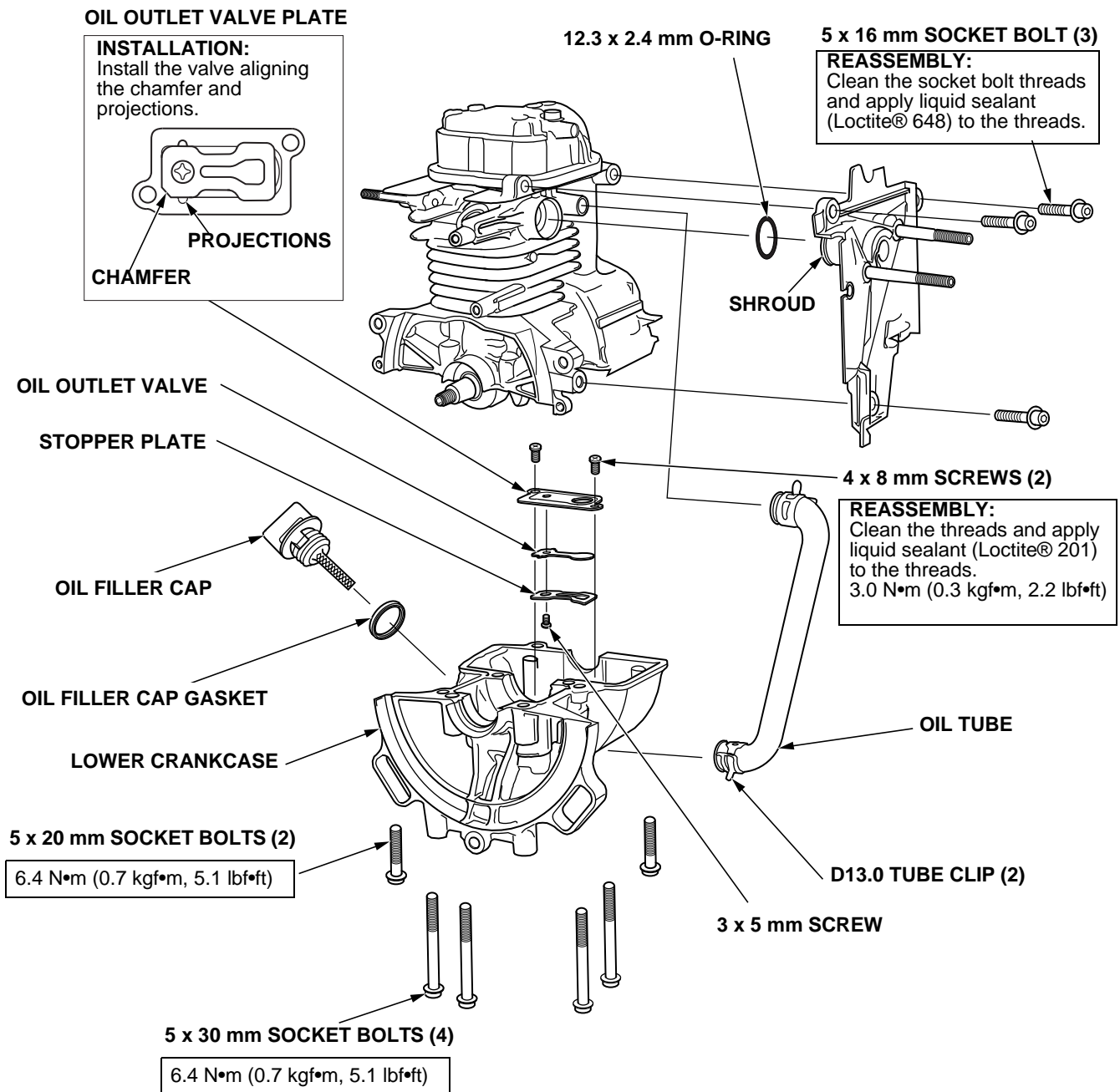
Arrows in this diagram identify the oil return passages.



2. LOWER CRANKCASE

a. DISASSEMBLY/REASSEMBLY

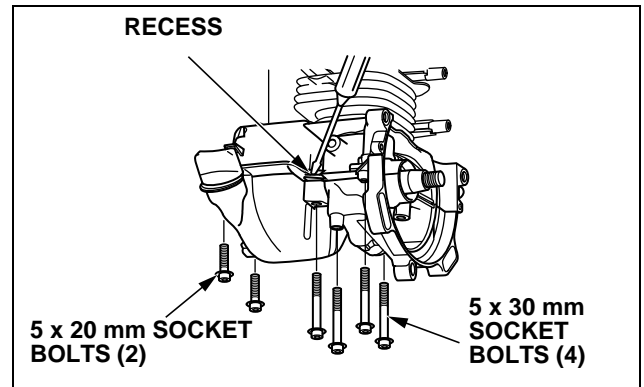
1. Drain the engine oil (P. 3-2).
2. Remove the air cleaner case assembly (P. 4-1).
3. Remove the carburetor (P. 4-2).
4. Remove the recoil starter and fuel tank (P. 5-6).
5. Remove the muffler (P. 6-2).
6. Remove the recoil starter pulley (P. 5-5).
7. Remove the flywheel (P. 7-6).



FG110

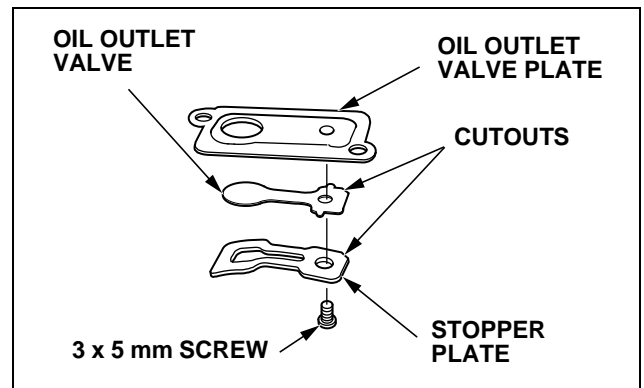
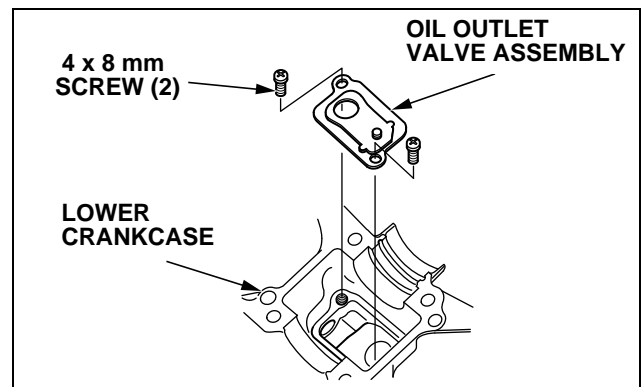
b. LOWER CRANKCASE REMOVAL

1. Remove the two 5 x 20 mm socket bolts and the four 5 x 30 mm socket bolts.
2. Remove the oil tube ([P. 8-4](#)).
3. Insert a screwdriver or equivalent tool into the recess as shown, and remove the lower crankcase from the cylinder block.



c. OIL OUTLET VALVE DISASSEMBLY

1. Remove the two 4 x 8 mm screws and oil outlet valve assembly.
2. Remove the 3 x 5 mm screw, stopper plate, oil outlet valve, and oil outlet valve plate.
3. Check the oil outlet valve and stopper plate for contamination and foreign material.

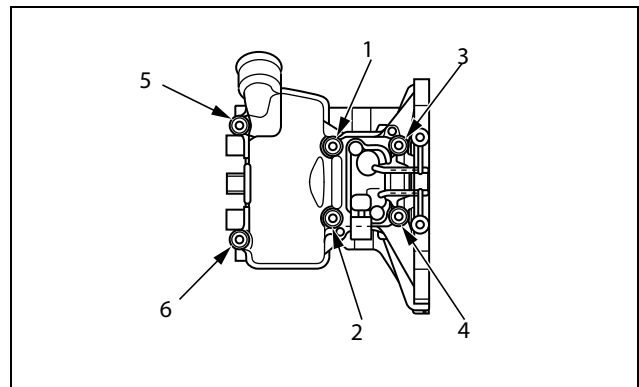
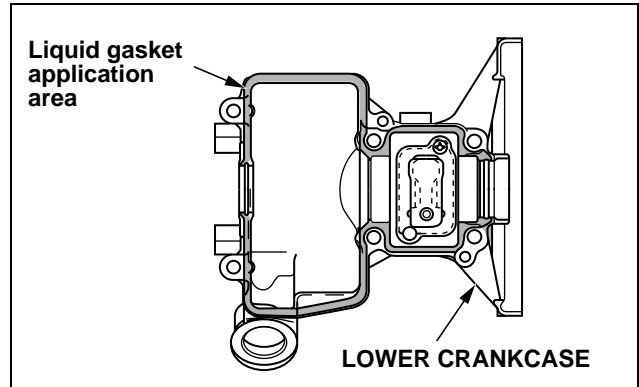


d. LOWER CRANKCASE INSTALLATION

1. Clean the mating surfaces of the cylinder block and the lower crankcase using a degreasing cleaning agent and clean shop towel.
2. Apply a bead [$\phi 1.0 \sim 1.5$ mm ($\phi 0.04 \sim 0.06$ in)] of liquid gasket (Hondabond 4, ThreeBond® #1216, 1216E, or equivalent) to the lower crankcase surface that mates with the cylinder block.
3. Install the lower crankcase on the cylinder block. Assemble within 3 minutes after applying the liquid gasket.
4. Loosely tighten each of the two 5 x 20 mm and the four 5 x 30 mm socket bolts.
5. Tighten the socket bolts in the numbered sequence shown in the diagram.

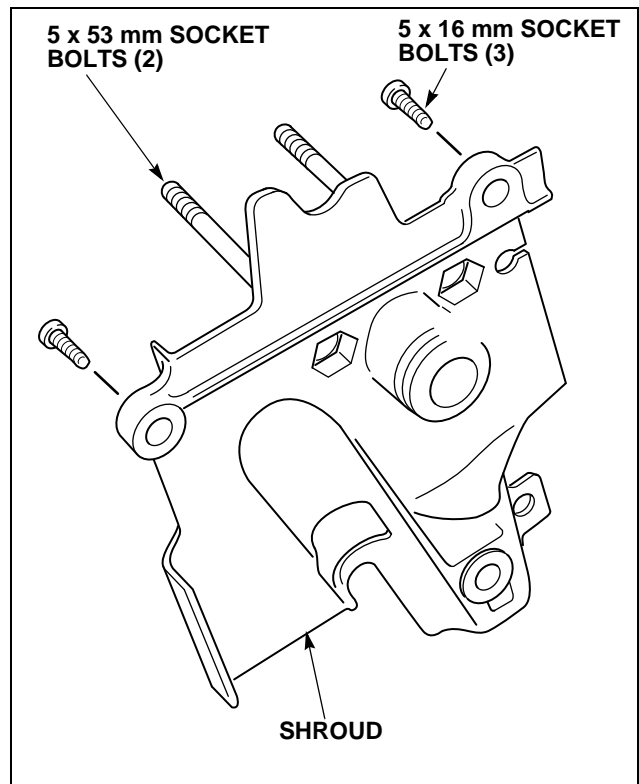
TORQUE: 6.4 N•m (0.7 kgf•m, 5.1 lbf•ft)

6. Wait approximately 60 minutes after assembly before filling with oil and starting the engine.



e. SHROUD REASSEMBLY

1. Set the two 5 x 53 mm bolts into the shroud.
2. Make sure the bolt heads are fully inserted into the cutouts in the shroud.
3. Attach the shroud to the cylinder block using three 5 x 16 mm socket bolts.



9. CRANKSHAFT/PISTON/CYLINDER BLOCK/VALVES

FG110

1. CRANKSHAFT/PISTON. 9-1 2. CYLINDER BLOCK/ROCKER ARMS/VALVES. 9-5

1. CRANKSHAFT/PISTON

a. DISASSEMBLY/REASSEMBLY

Remove the lower crankcase (P. 8-4).

PISTON RING

INSPECTION: (P. 9-2)
REASSEMBLY:

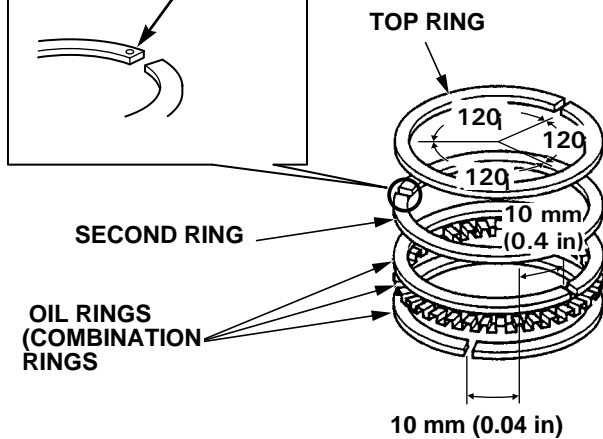
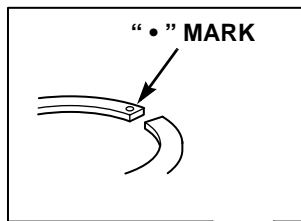
- Install the second ring with the “•” mark facing up.
- Do not interchange the top ring and the second ring.
- After assembly, check for smooth movement of the piston ring.
- Stagger the piston ring end gaps 120° apart. Do not align with the piston end.
- Space the side rail end gaps at least 10 mm (0.4 in) apart. Coat the oil ring with oil after assembly.

TOP RING
(WHITE CIRCUMFERENCE)

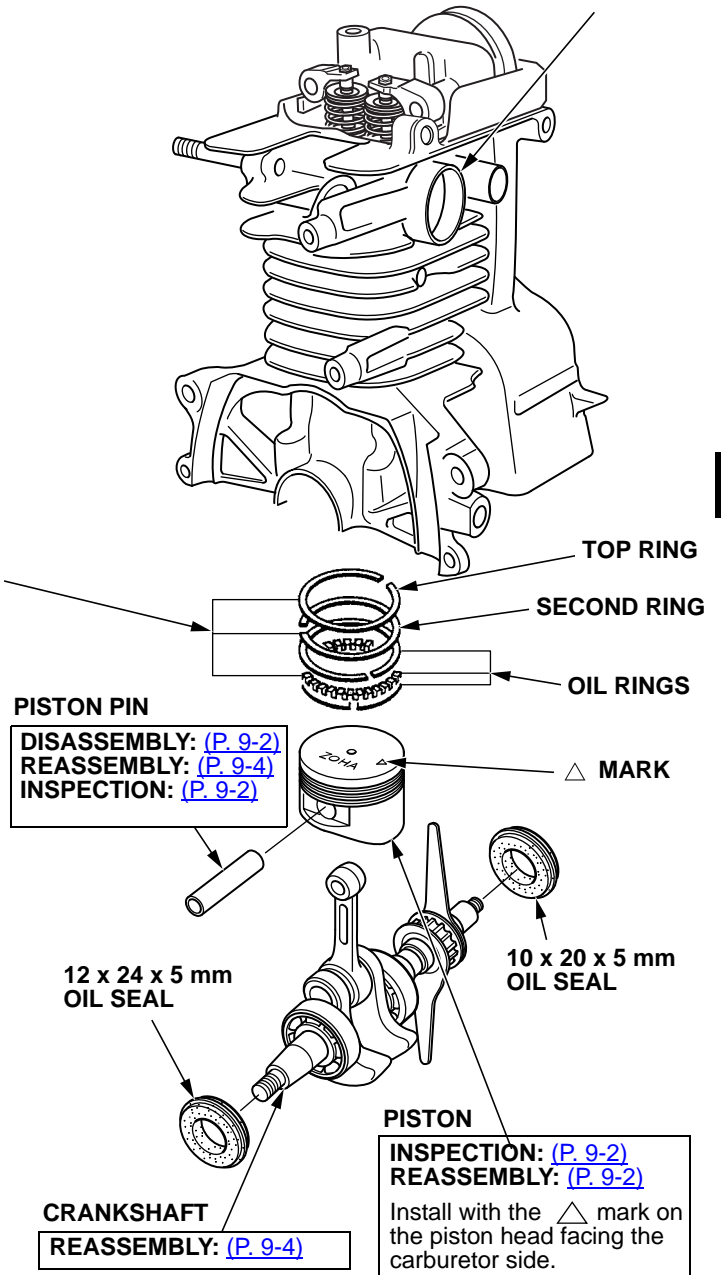
SECOND RING
(BLACK CIRCUMFERENCE)

OIL RINGS
(COMBINATION RINGS)

SIDE RAIL
SPACER
SIDE RAIL



CARBURETOR SIDE

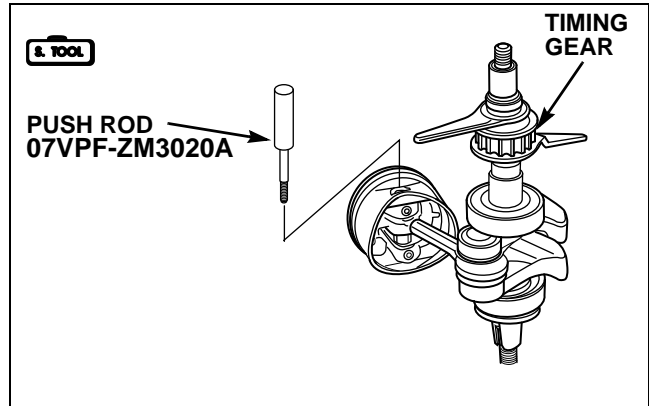


b. PISTON PIN

DISASSEMBLY

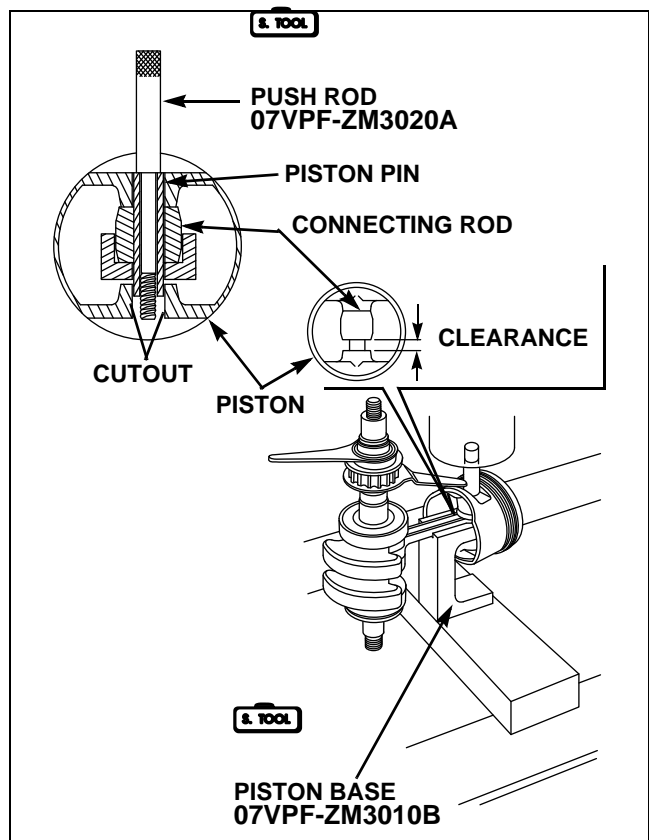
1. Insert the push rod special tool into the piston pin with the crankshaft timing gear upward, as shown.

TOOL:
 Push rod **07VPF-ZM3020A**



2. Set the cutout part of the piston base special tool in the clearance between the connecting rod and the piston as shown.
 - Be sure that the connecting rod small end is securely set in the cutout of the piston base special tool.
3. Remove the piston pin from the connecting rod using a hydraulic press.

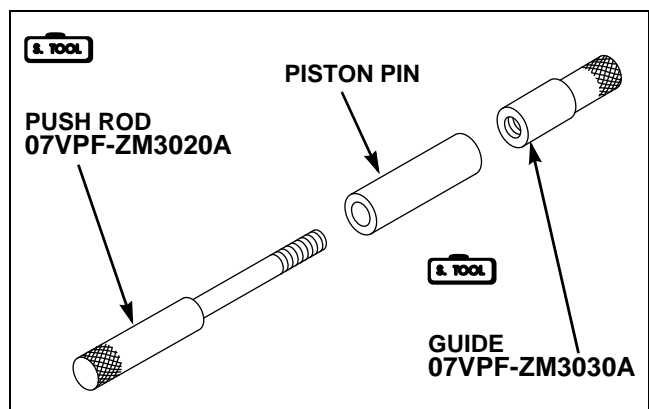
TOOLS:
 Piston base **07VPF-ZM3010B**
 Push rod **07VPF-ZM3020A**



REASSEMBLY

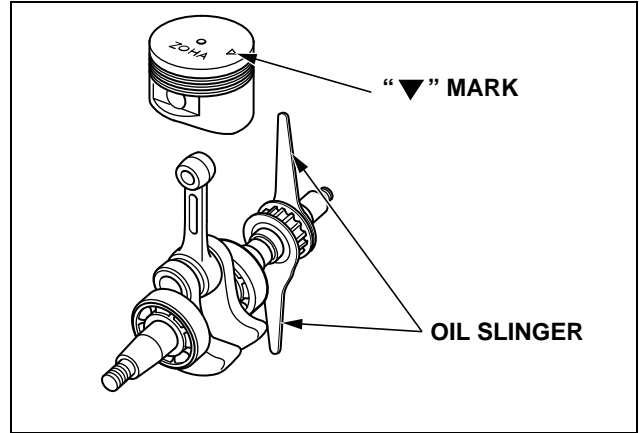
1. Slide the piston pin over the push rod special tool and install the guide special tool.

TOOLS:
 Push rod **07VPF-ZM3020A**
 Guide **07VPF-ZM3030A**



FG110

- Set the piston over the connecting rod so that the crankshaft oil slinger is on the right side with the "▼" mark on the piston head pointing toward you, as shown.



- Apply oil to the piston pin and assemble the piston pin with the special tools attached, as shown.

With the timing gear up, align the piston pin hole with the connecting rod hole and insert the special tool guide into the piston pin hole.

- Set the cutout part of the piston base special tool in the clearance between the connecting rod and the piston, as shown.

Be sure that the connecting rod small end is securely set in the cutout of the piston base special tool.

- Press-fit the piston pin into the connecting rod using a hydraulic press.

Press in the piston pin until the piston pin is flush with the piston recess.

- Remove the special tools from the piston pin.

TOOLS:

Piston base

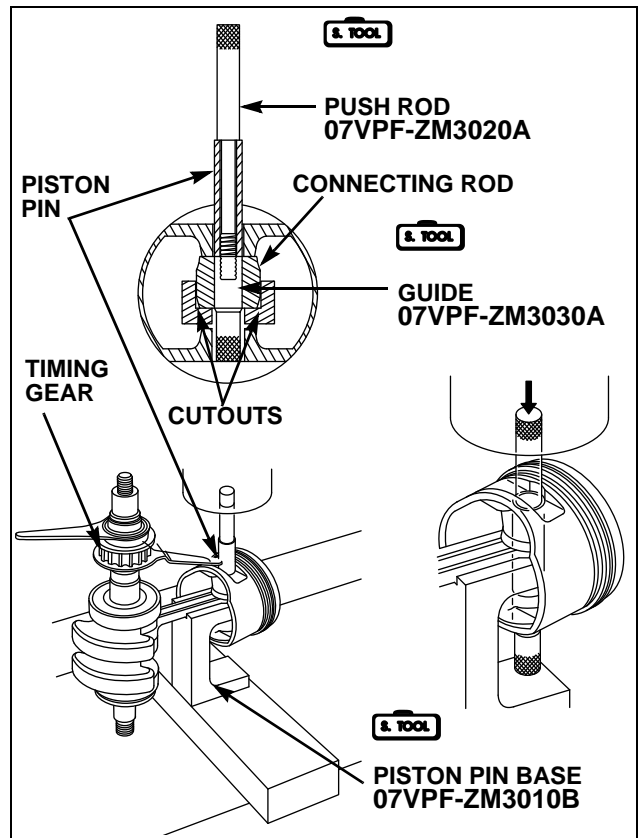
07VPF-ZM3010B

Push rod

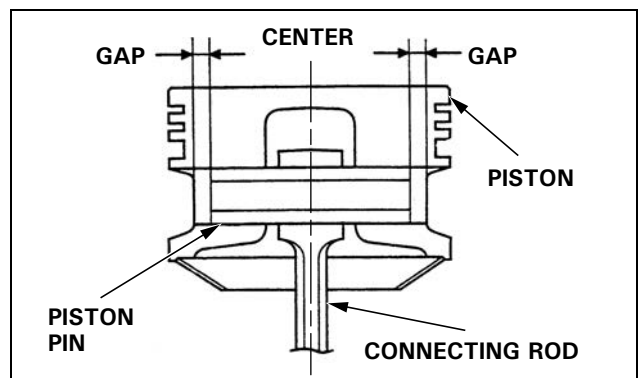
07VPF-ZM3020A

Guide

07VPF-ZM3030A



- After assembling the piston pin, set the connecting rod at the center of the piston. Be sure that the gap from the piston pin end to the piston end is equal at the right and left sides.



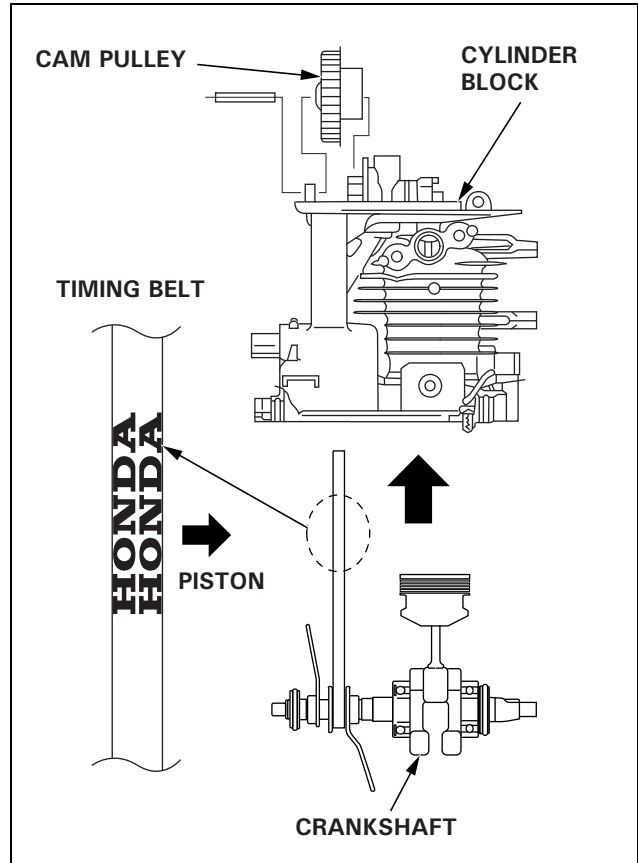
- If the right and left gaps are not equal, raise or lower the piston pin as needed.

c. CRANKSHAFT REASSEMBLY

1. Install the timing belt on the crankshaft timing gear. Pay attention to the direction of the letters on the timing belt, as shown in the diagram.

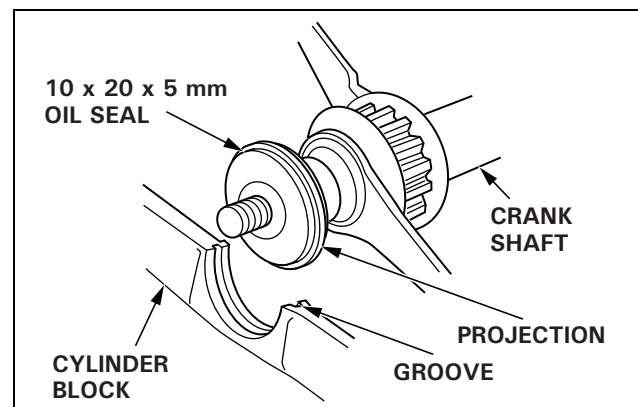
Replace a worn or cracked timing belt. Do not bend or twist the timing belt.

2. Install the crankshaft in the cylinder block.
3. Apply a bead of liquid gasket to the cylinder block, specifically to the mating surface of the crankcase cover.
4. Install the crankcase cover on the cylinder block ([P. 8-6](#)).
5. Install the cam pulley and timing belt in the cylinder block ([P. 8-2](#)).



d. 10 x 20 x 5 mm OIL SEAL ASSEMBLY

1. Set the oil seal on the crankshaft.
2. Install by aligning the oil seal projection with the groove in the cylinder block.
3. Install the lower crankcase ([P. 8-6](#)).



2. CYLINDER BLOCK/ROCKER ARMS/VALVES

a. DISASSEMBLY/REASSEMBLY

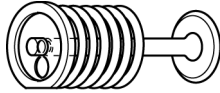
1. Remove the head cover and cam pulley (P. 8-2).
2. Remove the lower crankcase (P. 8-5).
3. Remove the crankshaft (P. 9-1).

VALVE SPRING RETAINER (2)

REMOVAL:

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

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



INTAKE VALVE ROCKER ARM

REMOVAL/INSTALLATION:
(P. 9-11)

Do not interchange with the exhaust valve rocker arm.
Do not reuse after removing.



Viewed from
clutch side.



INTAKE VALVE LIFTER

REMOVAL/INSTALLATION:
(P. 9-11)

Do not interchange with the exhaust valve rocker arm.
Do not reuse after removing.



Viewed from recoil
starter side.

VALVE SPRING (2)



(Whole surface)



VALVE STEM SEAL (Intake valve only)

SPARK PLUG

11.8 N·m (1.2 kgf·m, 8.7 lbf·ft)

ADJUSTING SCREW (2)

ADJUSTING SCREW LOCK NUT (2)

4.9 N·m (0.50 kgf·m, 3.6 lbf·ft)



EXHAUST VALVE ROCKER ARM

REMOVAL/INSTALLATION:
(P. 9-11)

Do not interchange with the intake valve rocker arm.
Do not reuse after removing.



Viewed from
clutch side.



EXHAUST VALVE LIFTER

REMOVAL/INSTALLATION:
(P. 9-11)

Do not interchange with the intake valve rocker arm.
Do not reuse after removing.



Viewed from recoil
starter side.

INTAKE



(Sliding surface)

INSTALLATION:
Do not interchange with the exhaust valve.

EXHAUST VALVE



(Sliding surface)

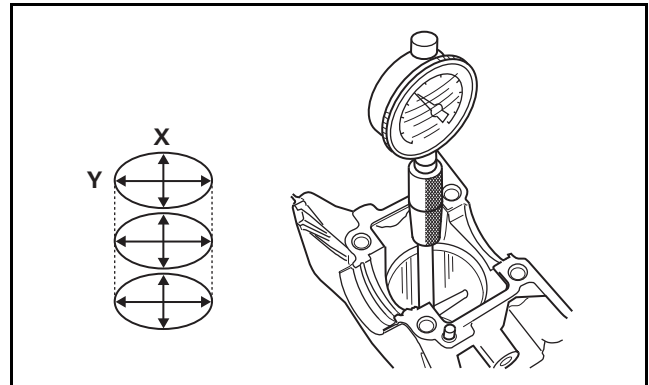
INSTALLATION:
Do not interchange with the intake valve.
Before installation, remove the carbon deposits and inspect the valve.

b. INSPECTION

• **CYLINDER SLEEVE I.D.**

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

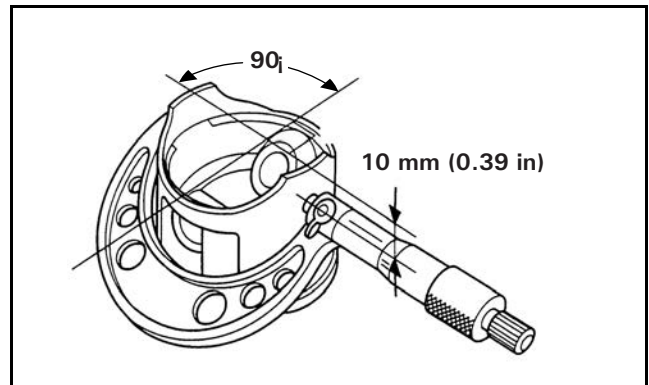
Standard	Service limit
35.000 ~ 35.015 mm (1.378 ~ 1.379 in)	35.100 mm (1.3819 in)



• **PISTON SKIRT O.D.**

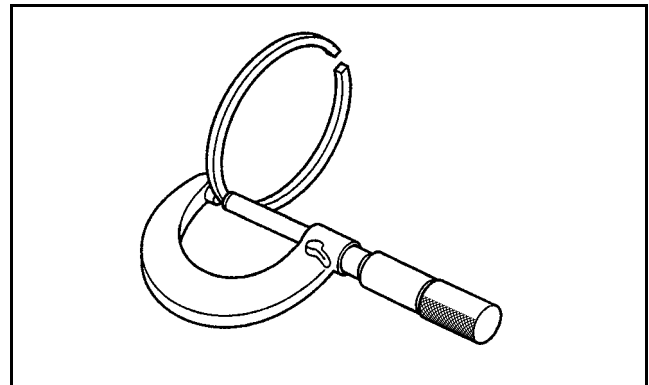
Measure and record the piston O.D. at a point 10 mm (0.39 in) from the bottom of the skirt and 90° to the piston pin bore.

Standard	Service limit
34.970 ~ 34.990 mm (1.377 ~ 1.378 in)	34.900 mm (1.374 in)



• **PISTON-TO-CYLINDER CLEARANCE**

Standard	Service limit
0.010 ~ 0.045 mm (0.0004 ~ 0.0018 in)	0.120 mm (0.0047 in)



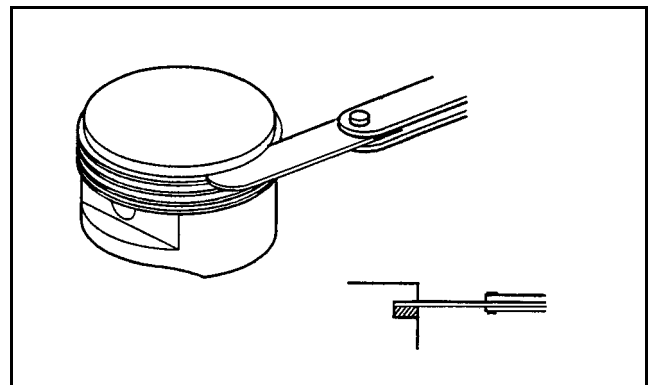
• **PISTON RING WIDTH**

	Standard	Service limit
Top/Second	0.970 ~ 0.990 mm (0.0382 ~ 0.0390 in)	0.920 mm (0.0362 in)

• **PISTON RING SIDE CLEARANCE**

	Standard	Service limit
Top/Second	0.015 ~ 0.056 mm (0.0006 ~ 0.0022 in)	0.120 mm (0.0047 in)

When any piston ring exceeds the service limit, replace all the piston rings as a set.



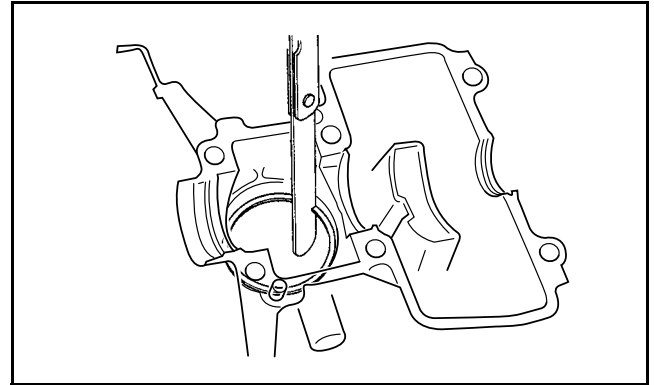
FG110

• PISTON RING END GAP

Put the piston ring in the cylinder and then use the piston crown to push the ring down. This will make the piston ring horizontal so the ring end gap can be measured.

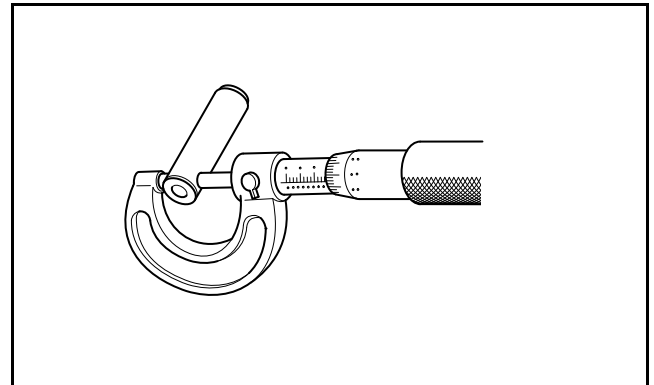
	Standard	Service limit
Top/Second	0.10 ~ 0.25 mm (0.004 ~ 0.010 in)	0.60 mm (0.024 in)

Because the combination oil rings are used on this model, always replace the piston rings as a set.



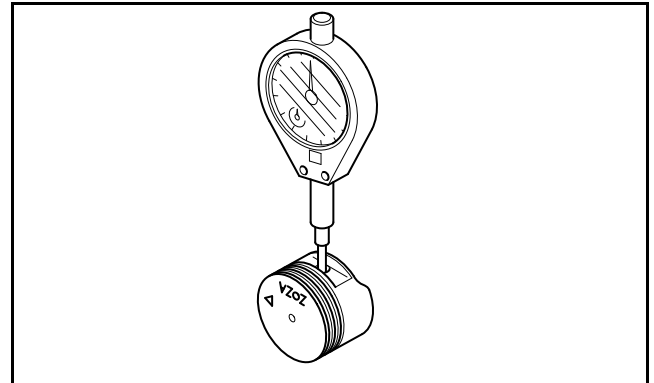
• PISTON PIN O.D.

Standard	Service limit
7.994 ~ 8.000 mm (0.3147 ~ 0.3150 in)	7.950 mm (0.3130 in)



• PISTON PIN BORE I.D.

Standard	Service limit
8.010 ~ 8.026 mm (0.3154 ~ 0.3160 in)	8.060 mm (0.3173 in)

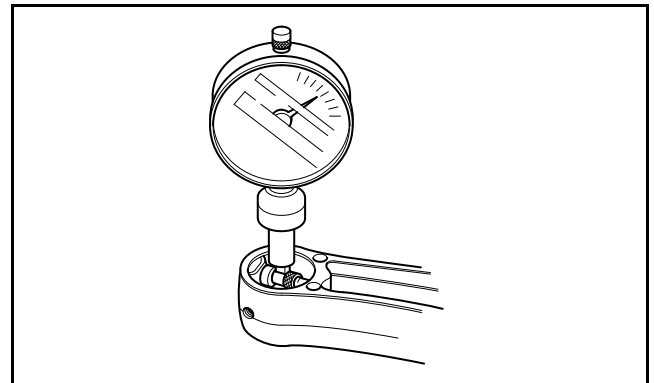


• PISTON PIN-TO-PISTON PIN BORE CLEARANCE

Standard	Service limit
0.010 ~ 0.032 mm (0.0004 ~ 0.0013 in)	0.070 mm (0.0028 in)

• CONNECTING ROD SMALL END I.D.

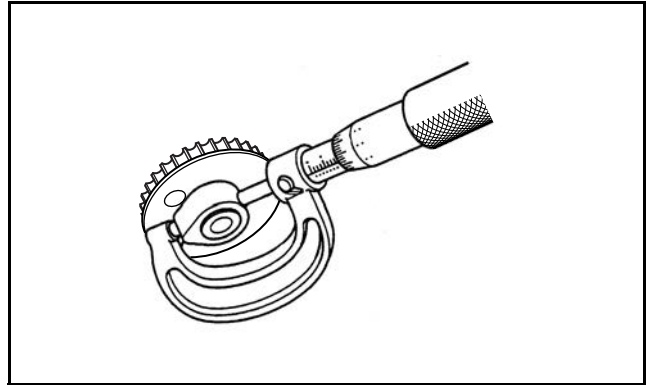
Standard	Service limit
7.978 ~ 7.989 mm (0.3141 ~ 0.3145 in)	Replace if exceeding the standard value.



• **CAM HEIGHT**

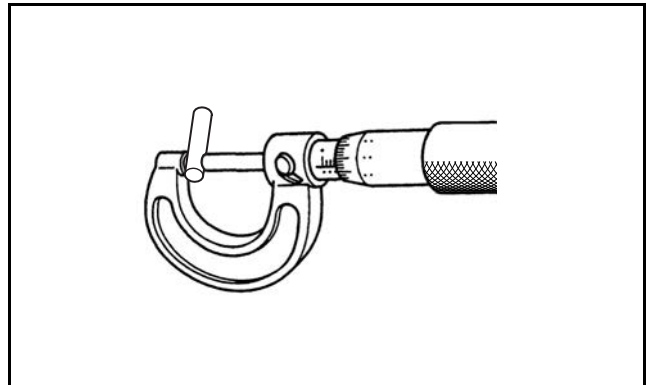
Standard	Service limit
22.097 mm (0.8700 in)	21.797 mm (0.8581 in)

Replace the cam if the cam height is lower than the service limit.



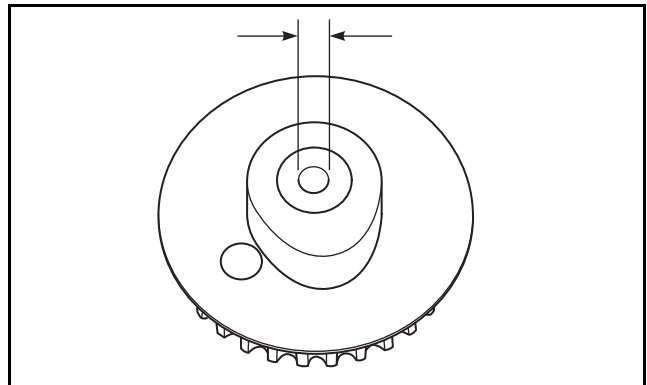
• **CAM PULLEY SHAFT O.D.**

Standard	Service limit
3.990 ~ 4.000 mm (0.1571 ~ 0.1575 in)	3.950 mm (0.1555 in)



• **CAM PULLEY I.D.**

Standard	Service limit
4.020 ~ 4.050 mm (0.1583 ~ 0.1595 in)	4.100 mm (0.1614 in)

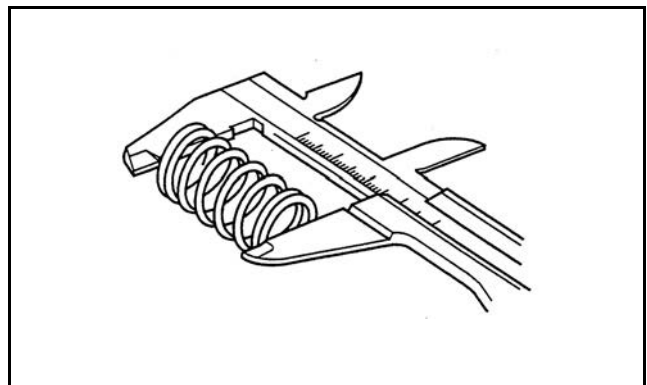


• **VALVE SPRING FREE LENGTH**

Measure the free length of the valve spring.

Standard	Service limit
20.66 mm (0.8134 in)	20.00 mm (0.7874 in)

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

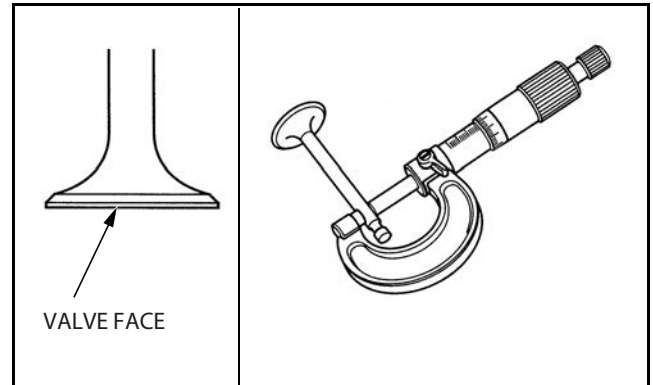


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• VALVE FACE/STEM O.D.

1. Inspect each valve for pitting or wear irregularities.
2. Inspect each valve stem for bending or abnormal stem wear.
3. Replace the valve, if necessary.
4. Measure and record each valve O.D. Replace the valves if their O.D. is smaller than the service limit.

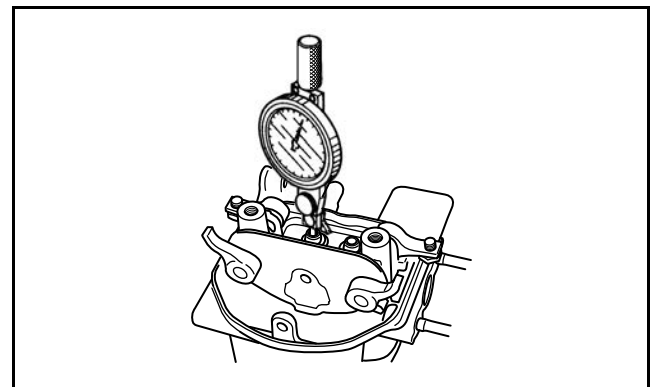
Valve	Standard	Service limit
IN	3.470 ~ 3.485 mm (0.1366 ~ 0.1372 in)	3.400 mm (0.1339 in)
EX	3.435 ~ 3.450 mm (0.1352 ~ 0.1358 in)	3.380 mm (0.1331 in)



• VALVE GUIDE I.D.

1. Measure and record each valve guide I.D.
2. Replace the cylinder block if the measurement exceeds the service limit.

Standard	Service limit
3.500 ~ 3.518 mm (0.1378 ~ 0.1385 in)	3.560 mm (0.1402 in)



• VALVE STEM-TO-GUIDE CLEARANCE

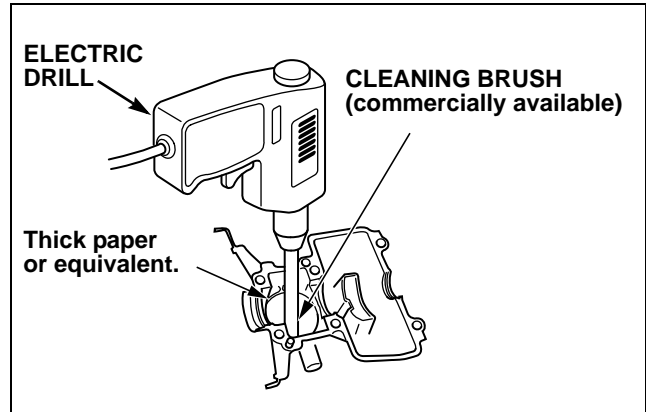
For each valve stem, subtract the O.D. from the corresponding guide I.D. to obtain the valve stem-to-guide clearance.

Valve	Standard	Service limit
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)	0.120 mm (0.0047 in)

c. COMBUSTION CHAMBER CLEANING

1. Prepare a cylinder of thick paper or equivalent material with a diameter large enough to fit against the inner wall of the cylinder.
2. Insert the thick paper into the cylinder to protect the cylinder wall during combustion chamber cleaning.
3. Attach a commercially available combustion chamber cleaning brush to an electric drill and clean the combustion chamber.

Do not press the cleaning brush with force against the combustion chamber.

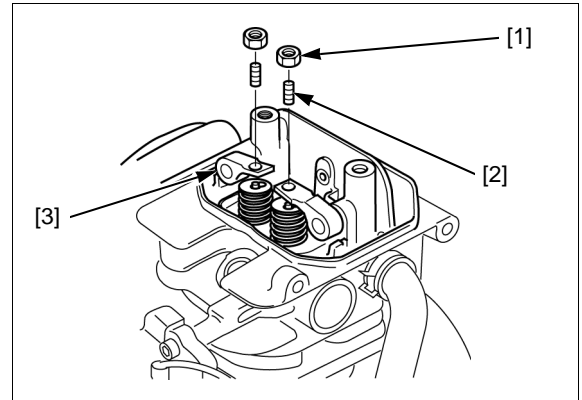


d. ROCKER ARM/VALVE LIFTER REMOVAL/INSTALLATION

REMOVAL

1. Remove the adjusting screw lock nuts [1] and remove the adjusting screws [2] from the rocker arms [3].

Remove the cam pulley [\(P. 8-2\)](#).



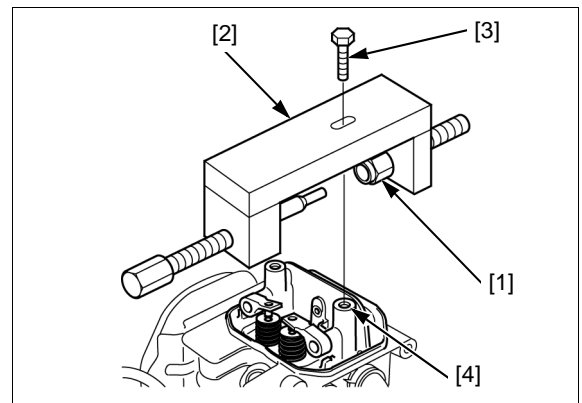
2. Tighten the holder bolt [1] of the special tool fully as shown.

TOOL:

Rocker arm replacement tool [2] 070PF-Z0HA100

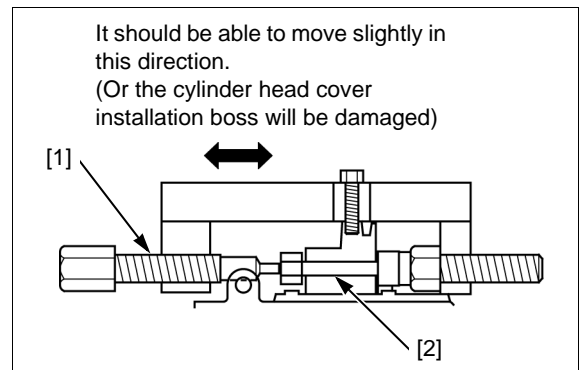
Set the special tool on the cylinder head over the rocker arm and valve lifter that you are going to take apart, and tighten the bolt (5 mm) [3] to the cylinder head cover installation boss [4] by hand.

Do not tighten the bolt (5 mm) using a wrench.



3. Tighten the push rod [1] of the special tool by hand until the tip of the push rod comes to the center of the valve lifter shaft [2]. Move the special tool left and right and check that it can be moved slightly.

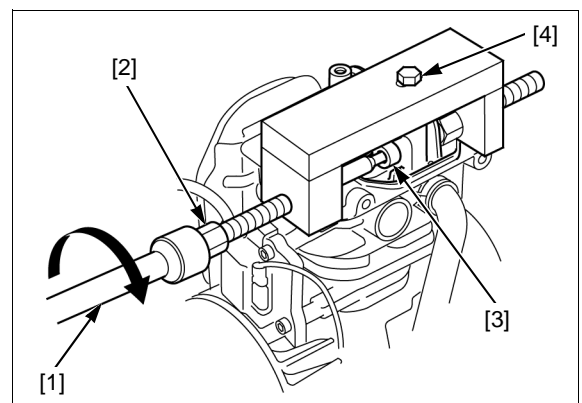
It should be able to move slightly in this direction.
(Or the cylinder head cover installation boss will be damaged)



4. Using a 14 mm wrench [1], tighten the push rod [2] until the shaft of the valve lifter goes out from the rocker arm [3].

Loosen the push rod and remove the bolt (5 mm) [4], and then remove the special tool.

The valve lifters and rocker arms cannot be reused after they are pressed apart. Always replace with new parts.

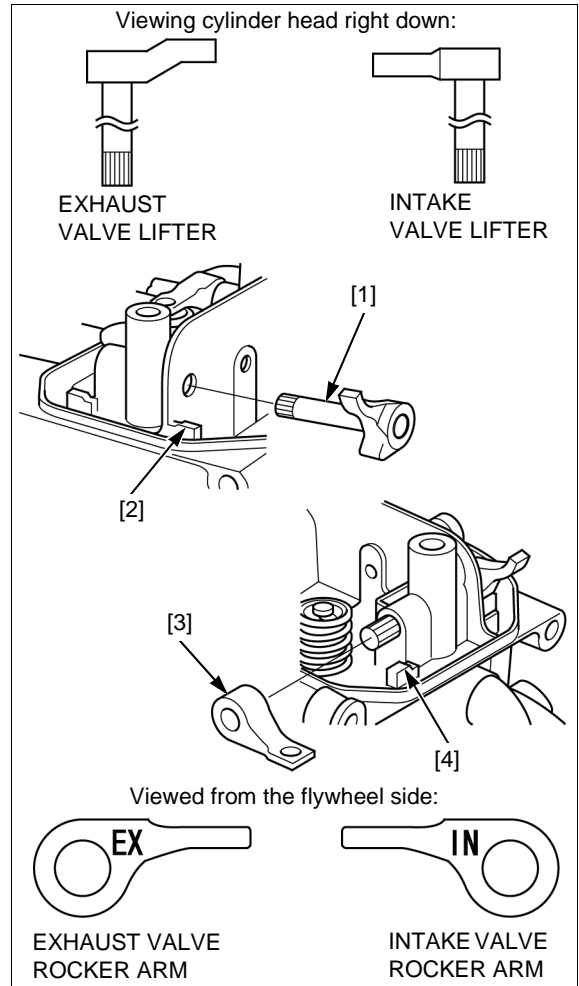


INSTALLATION

1. Install the new valve lifter [1] on the cylinder head and bring the valve lifter in contact with the installation guide rib [2] of the cylinder head.

Push the new rocker arm [3] into the shaft of the valve lifter by hand while holding the valve lifter in the position and holding the rocker arm against the installation guide rib [4] of the cylinder head.

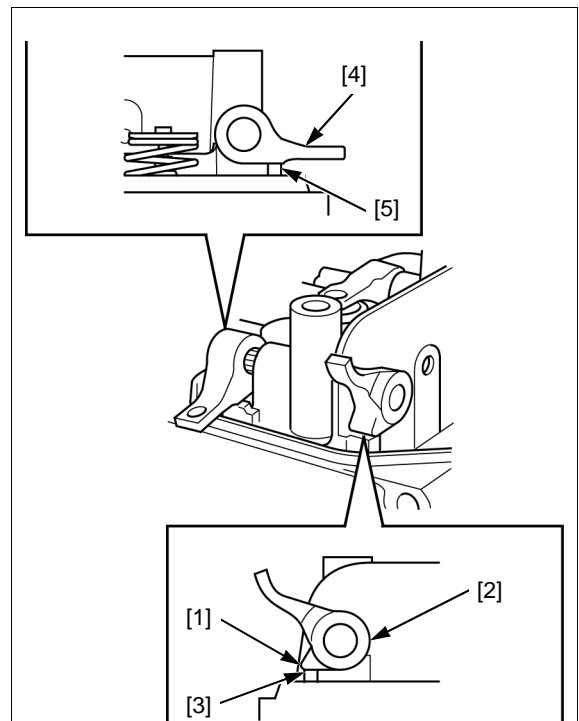
- Check the valve lifter for inlet side and exhaust side before installation. Do not interchange them.
- Check the rocker arm for "IN" or "EX" marks before installation. Do not interchange them.



2. Set the projection [1] of the valve lifter [2] in contact with the installation guide rib [3] of the cylinder head.

Set the rocker arm [4] in contact with the installation guide rib [5] of the cylinder head.

Check that the projection on the valve lifter and the rocker arm are in contact with the installation guide rib of the cylinder head.



3. Install the holder bolt [1] of the special tool in the direction as shown.

TOOL:

Rocker arm replacement tool [2] 070PF-Z0HA100

Install the adapter [3] on the tip of the push rod [4] that is set on the special tool.

Install the special tool on the cylinder head so that the bolt (5 mm) [5] sets in the center of the long hole in the special tool as shown.

Tighten the bolt (5 mm) against the cylinder head cover mounting boss by hand.

- Set the bolt (5 mm) in the center of the long hole.
- Do not tighten the bolt (5 mm) using a wrench.

4. Bring the projection on the valve lifter [1] and the rocker arm [2] to come in contact with the cylinder head positioning ribs [3].

Bring the clearance A [4] and B [5] to be equal by moving the valve lifter and rocker arm right and left.

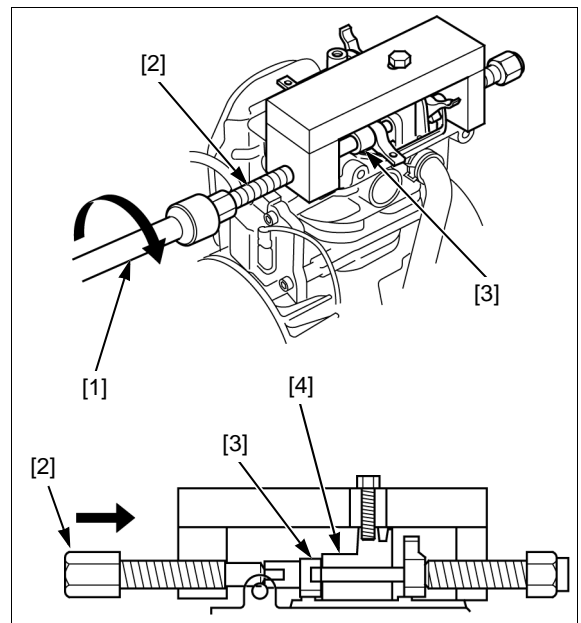
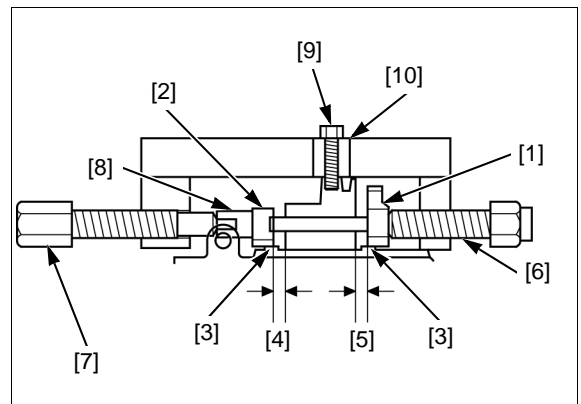
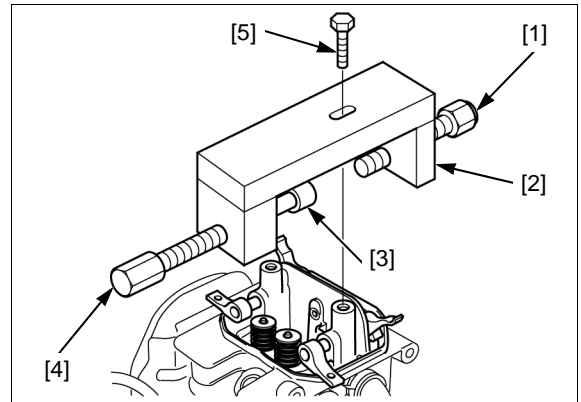
While holding the valve lifter and rocker arm in the position, tighten the holder bolt [6] by hand until it contacts the valve lifter. Tighten the push rod [7] by hand until the adapter [8] contacts the rocker arm.

After installing the special tool, check that the bolt (5 mm) [9] is in the center of the long hole [10] in the tool.

NOTICE

The cylinder head cover mounting boss can be damaged by tightening the push rod with the bolt (5 mm) not in the center but on either side in the long hole. Be sure that the bolt is in the center of the long hole securely.

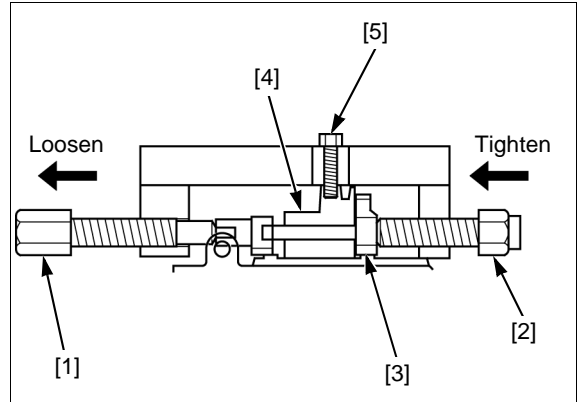
5. Using a 14 mm wrench [1], tighten the push rod [2] until the rocker arm [3] comes to the cylinder head cover installation part. [4]



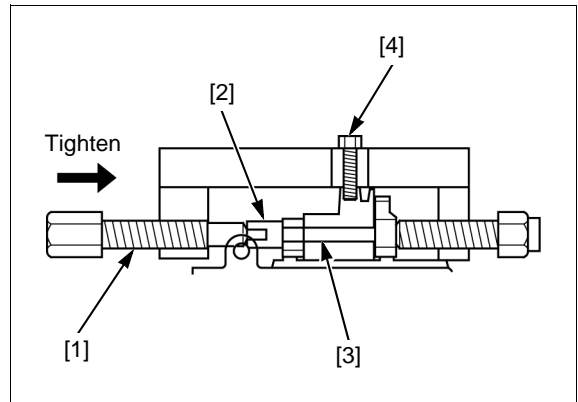
- Loosen the push rod [1] and tighten the holder bolt [2] by hand until the valve lifter [3] contacts the cylinder head cover mounting boss [4]. Be sure that the bolt (5 mm) [5] is in the center of the long hole in the special tool.

NOTICE

The cylinder head cover mounting boss can be damaged by tighten the push rod with the bolt (5 mm) not in the center but on either side in the long hole. Be sure that the bolt is in the center of the long hole securely.



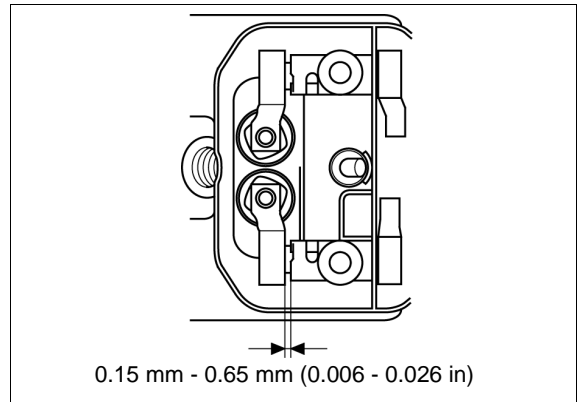
- Using a 14 mm wrench, retighten the push rod [1] until the adapter [2] comes to the shaft of the valve lifter [3]. Loosen the push rod and remove the bolt (5 mm) [4], and then remove the special tool.



- Measure the clearance between the rocker arm and the cylinder head, and make sure if the clearance are within the specification.

**Rocker arm and cylinder head clearance:
0.15 – 0.65 mm (0.006 – 0.026 in)**

If the clearance is over the specification, the rocker arm is not correctly installed to the valve lifter. Install the special tool again, and tighten the push rod until the rocker arm is completely pressed onto the shaft of the valve lifter.

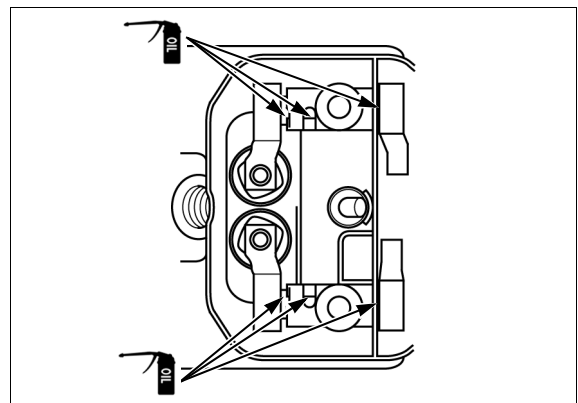


- Inject the oil as shown. Lift the lifter by finger and release the lifter, and make sure it operates by the lifter's weight.

Install the adjusting screws and the adjusting screw lock nuts to the rocker arms.

Install the cam pulley ([P. 8-2](#)).

Adjust the valve clearance ([P. 3-7](#)).

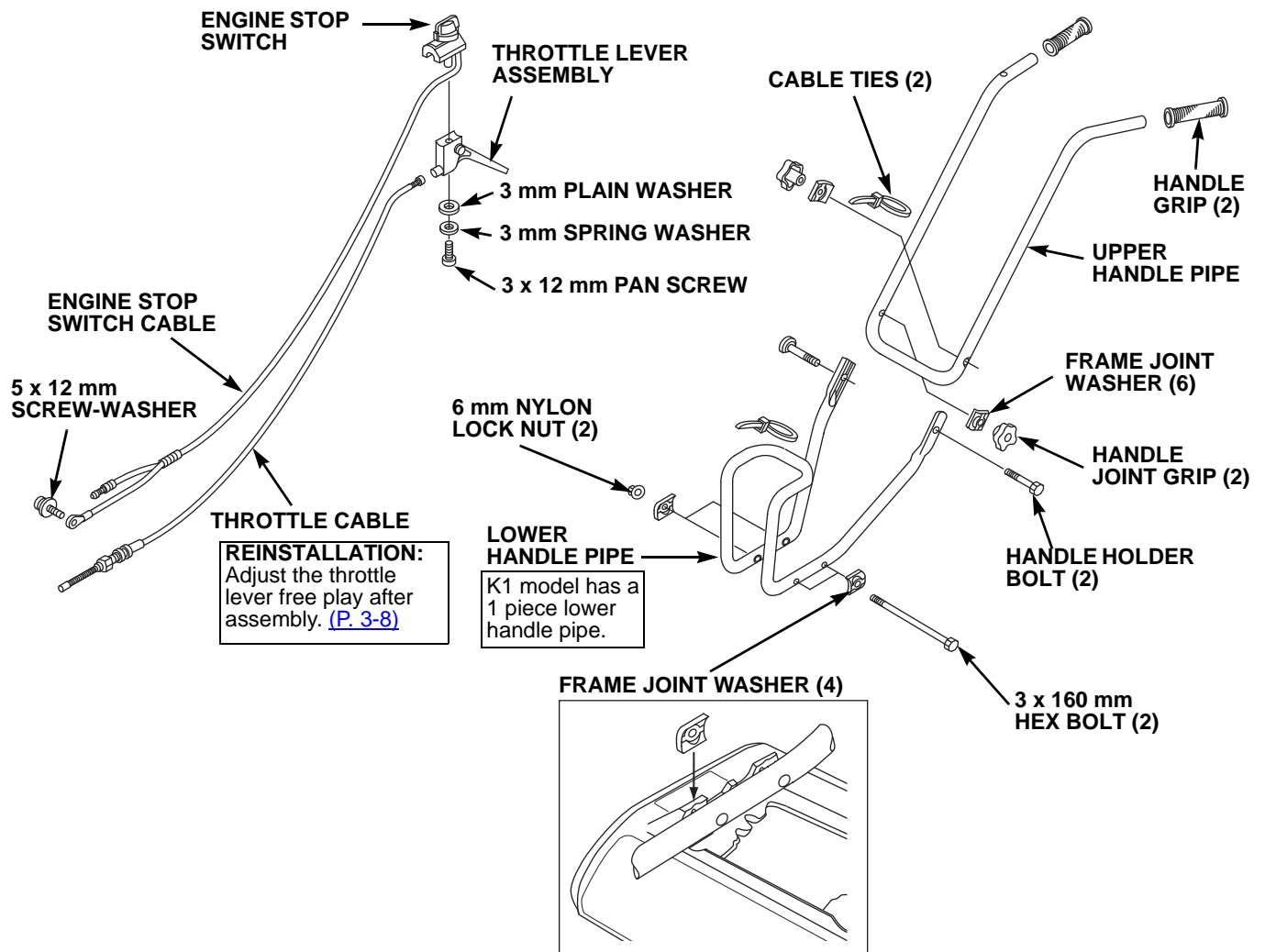


10. HANDLEBAR/TINES/FENDER

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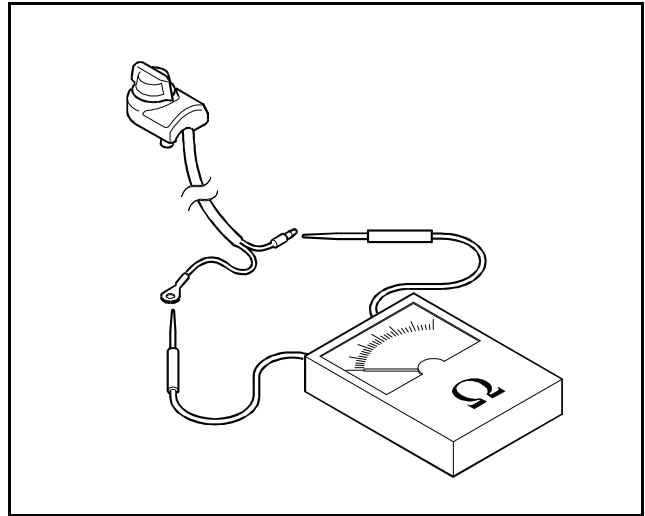
1. HANDLEBAR ASSEMBLY	10-1	3. TINES	10-2
2. ENGINE STOP SWITCH INSPECTION	10-2	4. FENDER/WHEELS	10-4

1. HANDLEBAR ASSEMBLY



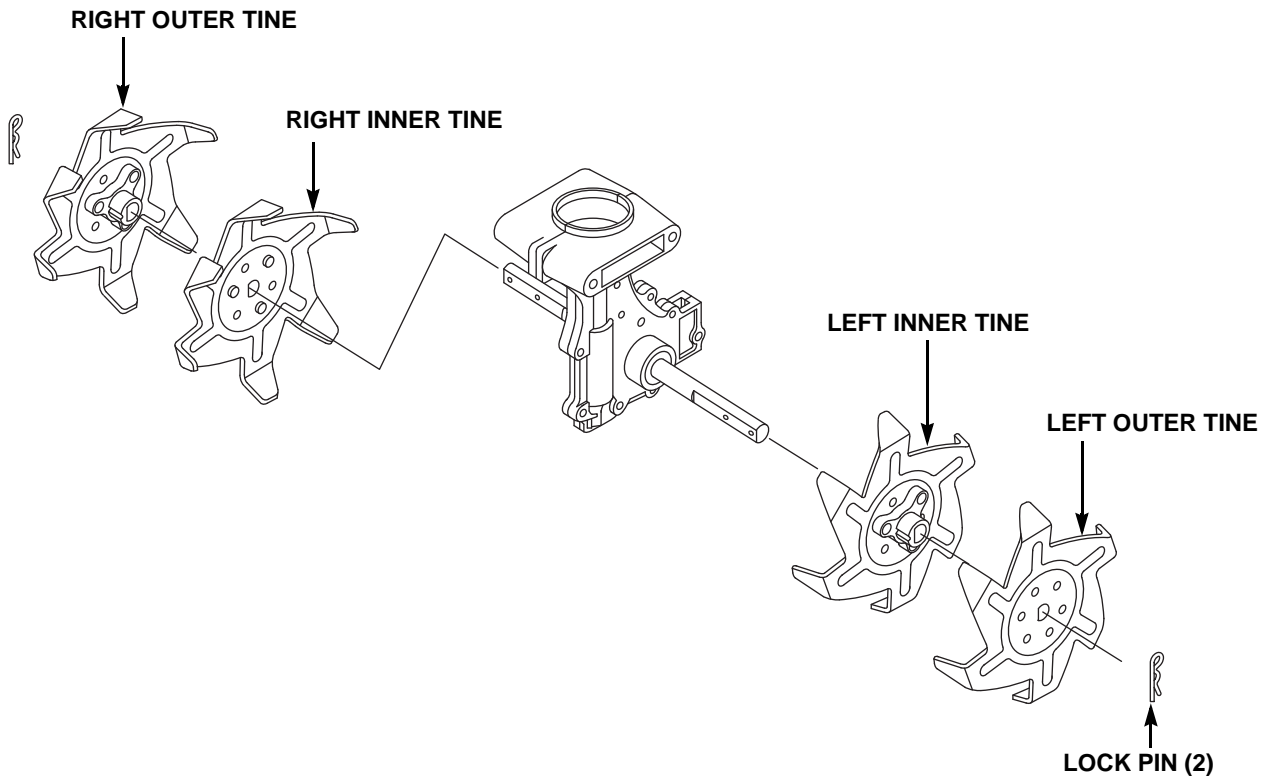
2. ENGINE STOP SWITCH INSPECTION

Check for continuity between the engine stop switch wires. There should be continuity when the switch is in the OFF position. There should be no continuity when the switch is in the ON position.



3. TINES

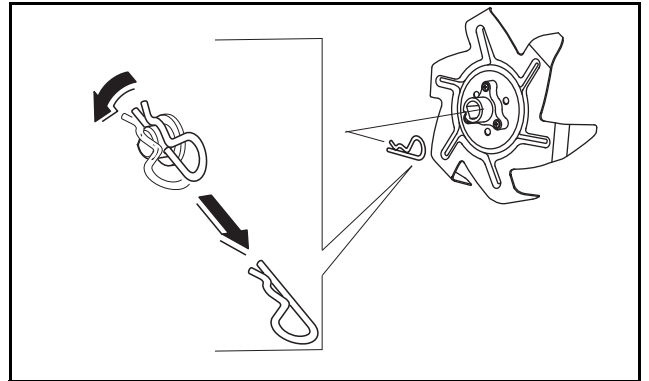
a. DISASSEMBLY/REASSEMBLY



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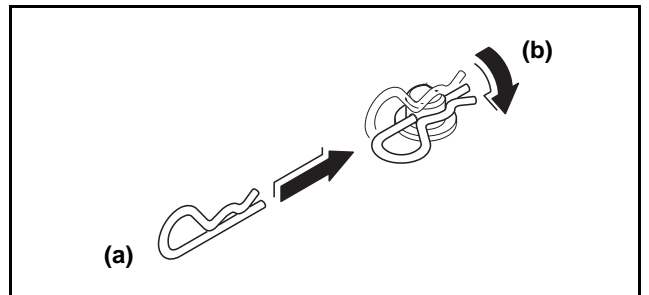
b. TINE REMOVAL

1. Remove the left and right tine shaft lock pins and pull them out.
2. Clean the tine shaft ends and remove the tines.



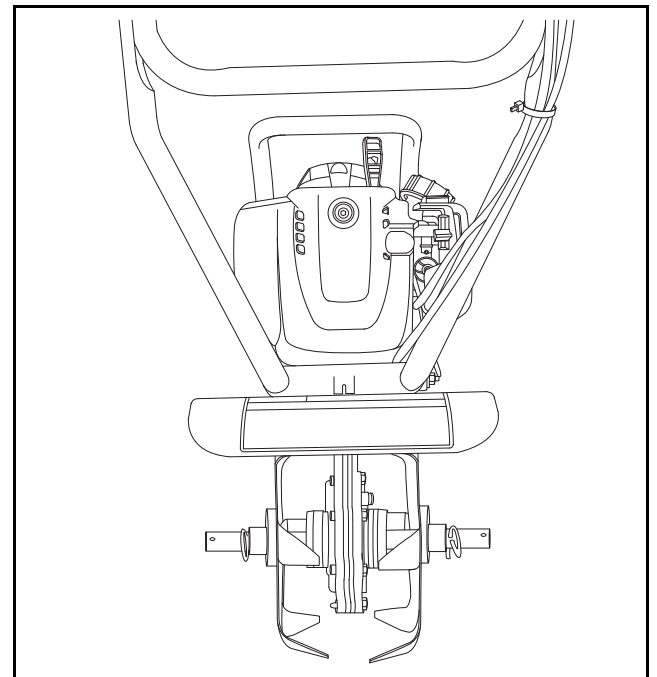
c. TINE INSTALLATION

1. Clean the tine shaft and tine hubs of any foreign material.
The tines should easily slide onto the tine shaft in the order shown in the diagram above. Do not force the tines onto the shaft.
2. Install the lock pins through the tine shaft round side hole (a), then rotate the pin (b) to lock the pin in place.



d. NARROW CULTIVATING

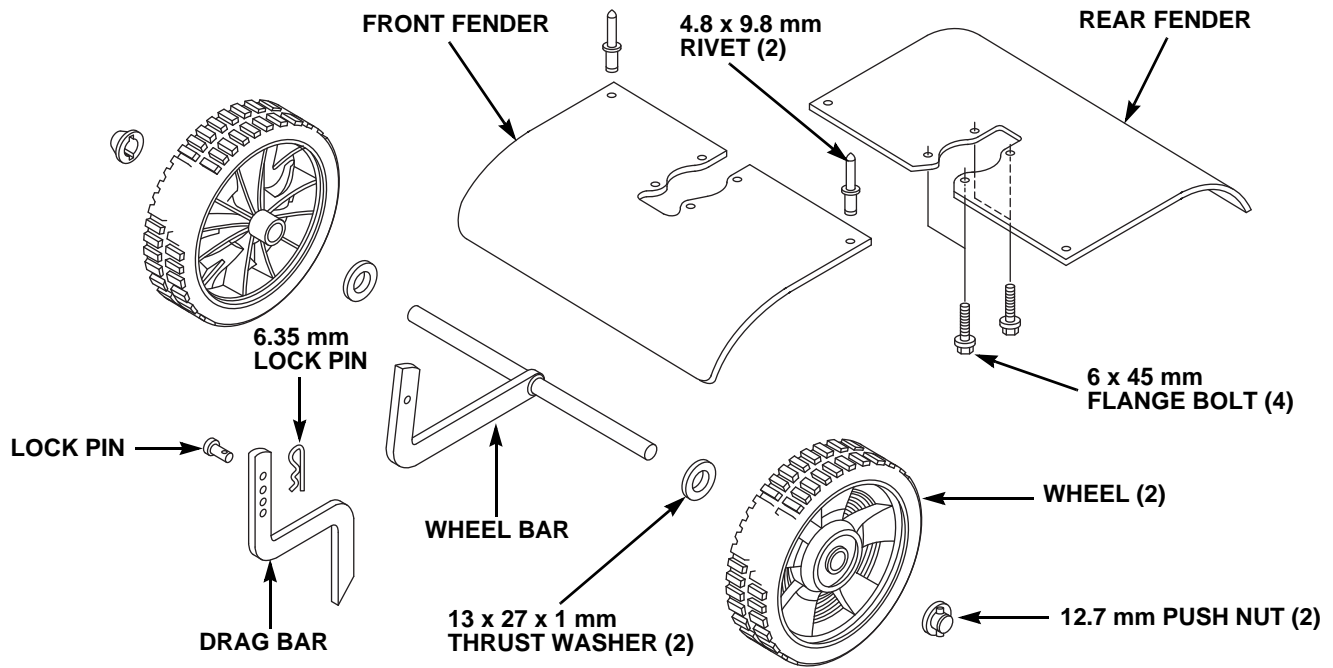
1. Remove the two outer tines by pulling the lock pins out of the holes in the end of the tine shaft.
2. Slide the outside tine set off the tine shaft.
3. Secure the inner set of tines onto the tine shaft by placing the lock pins in the inside set of lock pin holes.



4. FENDER/WHEELS

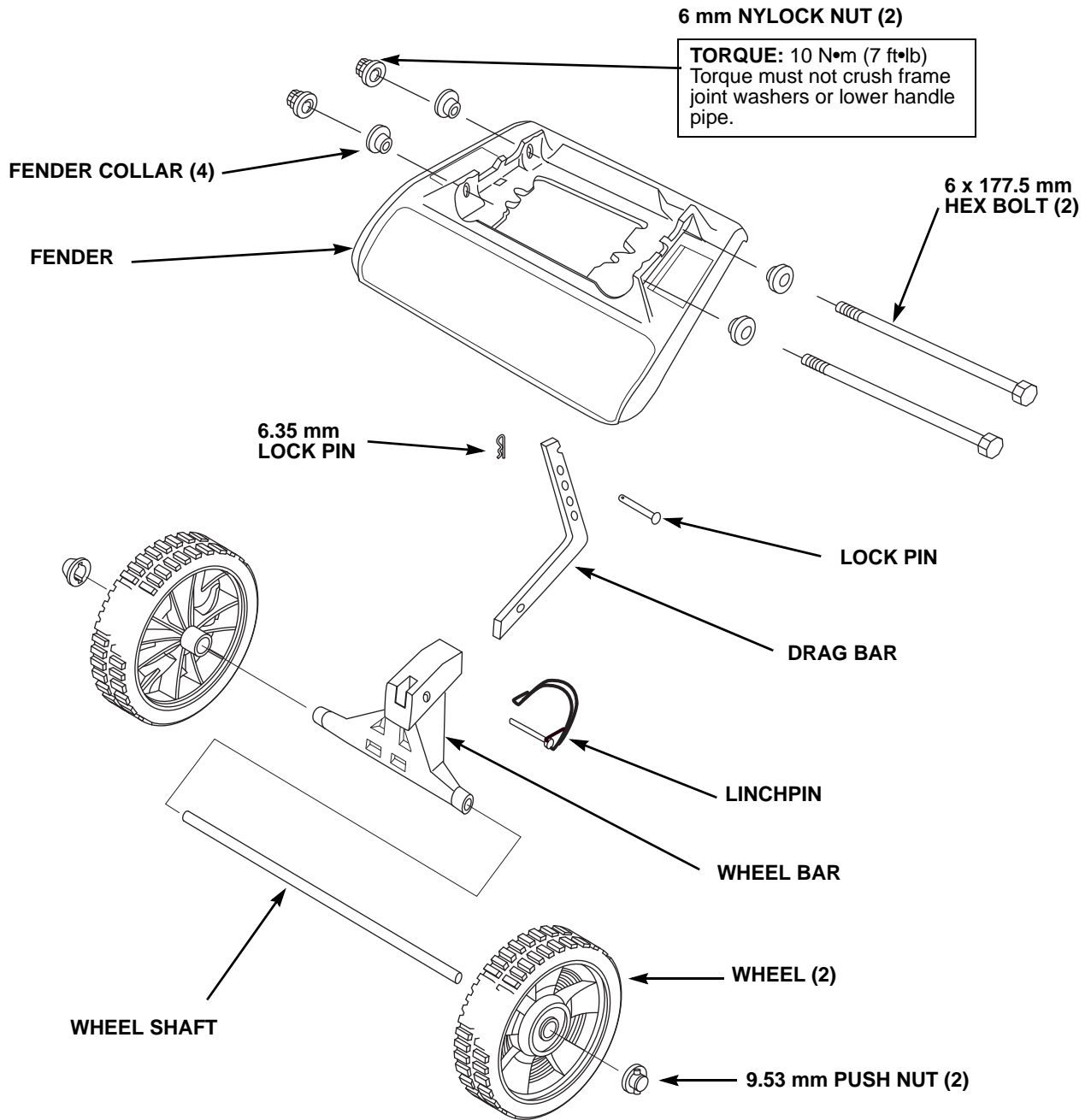
ASSEMBLY/DISASSEMBLY

FG110



FG110

FG110K1

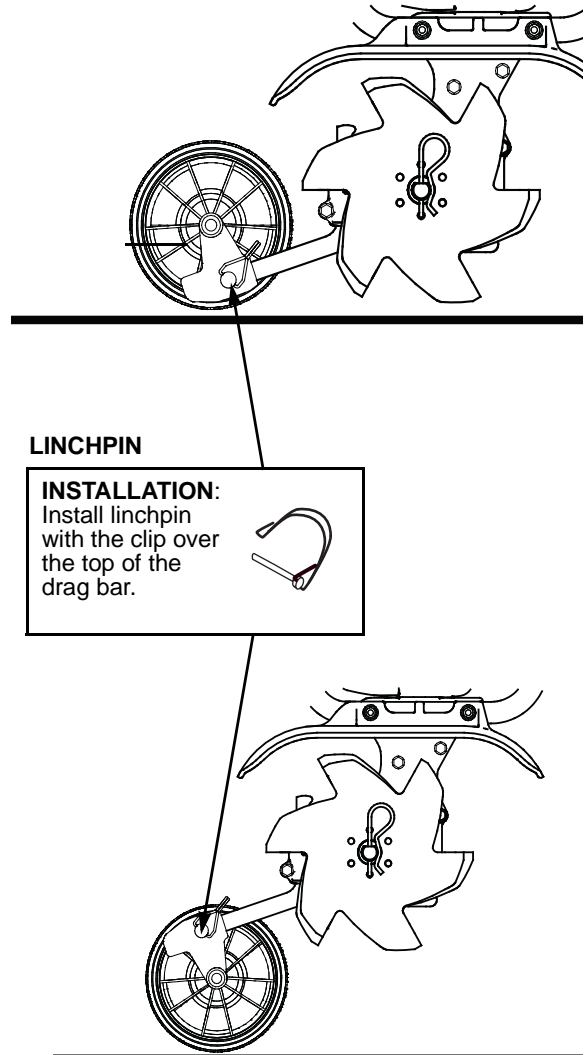


WHEEL BAR (K1 models only)

The wheel bar assembly can be attached to the drag bar in two ways.

When in the storage position, the unit can be stored upright. It can also be transported over smooth ground or pavement.

When in the transport position, the unit can be transported over rough ground. This position also prevents the tines from dragging against grass or other vegetation.

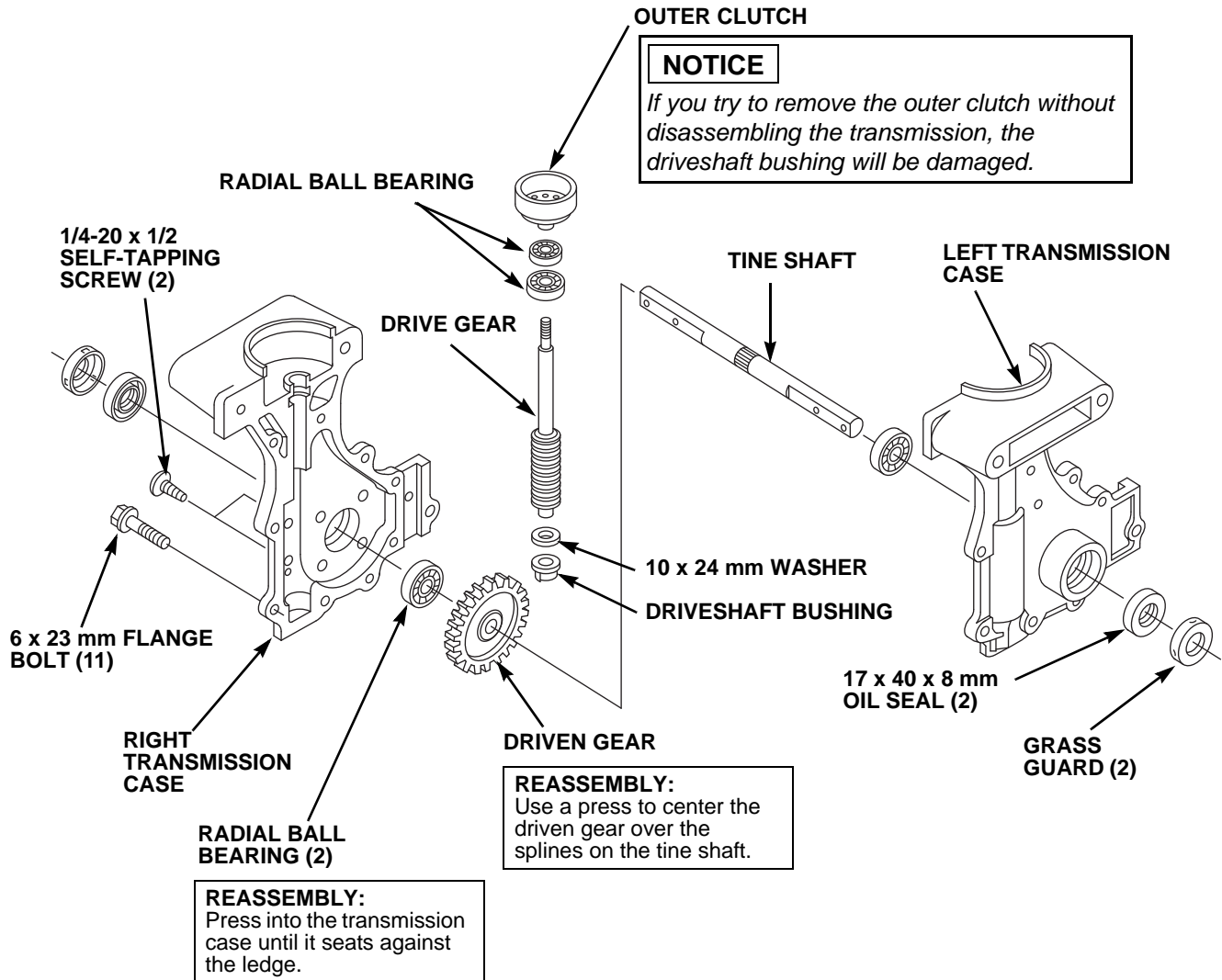


11. TRANSMISSION/OUTER CLUTCH

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1. TRANSMISSION COMPONENTS	11-1	3. REASSEMBLY	11-3
2. DISASSEMBLY	11-2		

1. TRANSMISSION COMPONENTS

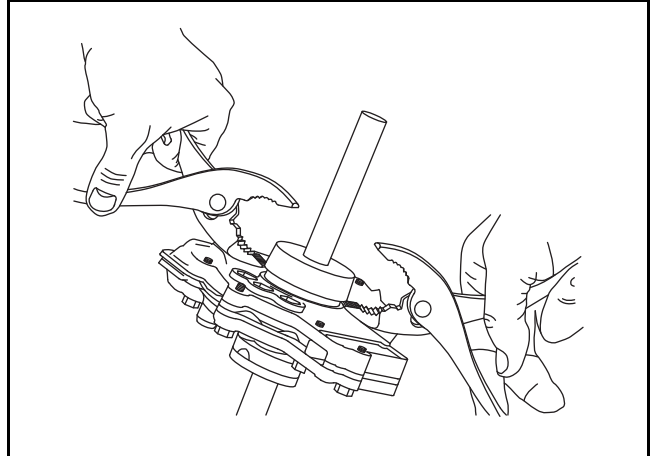


2. DISASSEMBLY

a. REMOVE THE GRASS GUARDS

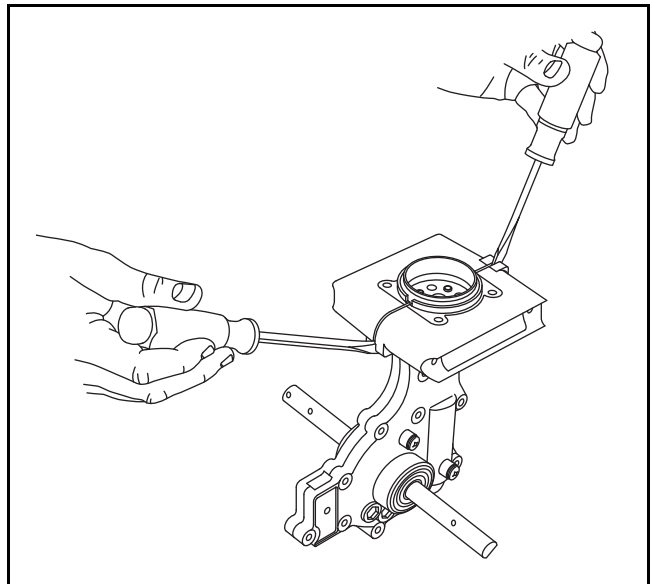
Remove the grass guard(s) only if you need to replace the oil seal(s).

1. Using pliers or similar tools, pry one grass guard off the transmission housing, as shown in the diagram.
2. Using the same technique, pry the grass guard from the other side of the transmission.



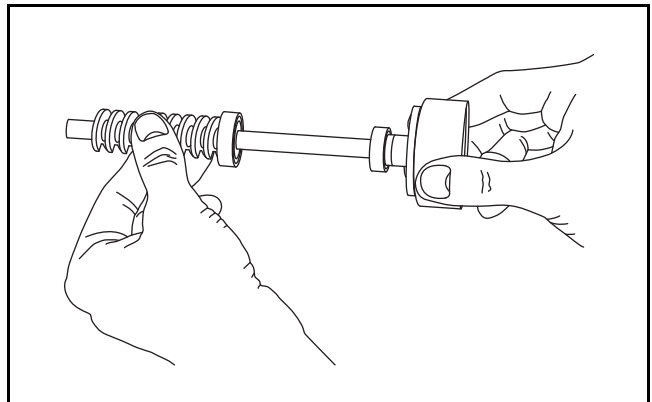
b. SEPARATE THE TRANSMISSION HALVES

1. Remove the eleven 6 x 23 mm flange bolts.
2. Place a screwdriver or similar tool in each of the two recesses between the transmission halves.
3. Pry the transmission halves apart.



c. REMOVE THE OUTER CLUTCH

1. Remove the driveshaft from the transmission.
2. Hold the worm gear firmly in one hand.
3. Loosen and remove the outer clutch from the worm gear assembly.
4. Slide the driveshaft bushing, washer, and bearings off the worm gear.

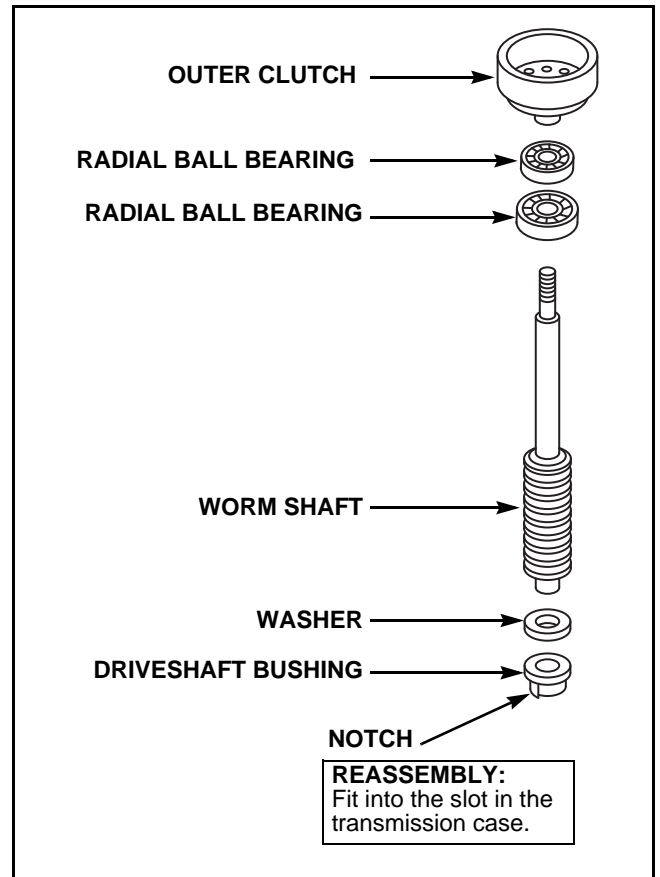


d. REMOVE THE TINE SHAFT

1. Slide the tine shaft out of the transmission case.
2. Use a press to remove the driven gear from the tine shaft.

3. REASSEMBLY

1. Press each tine shaft bearing into the transmission case until it seats against the ledge in the case.
2. Reassemble the driveshaft components as shown.
3. Hold the worm shaft by hand and hand tighten the outer clutch.
4. Install the assembled driveshaft into the transmission case. Be sure the notch on the driveshaft bushing fits into the slot in the transmission case.
5. Remove the old sealant from both halves of the transmission case.
6. Clean the mating halves of the transmission case using a degreasing agent and a clean shop towel.
7. Apply a thin bead of liquid gasket (Hondabond 4, Three Bond 1207 or equivalent) to the transmission case.
8. Install the tine shaft into the transmission case halves.
9. Assemble the two halves of the transmission and tighten the eleven 6 x 23 mm flange bolts.
10. If the grass guards were removed, reinstall them over the tine shaft.
11. Lubricate the assembled transmission ([P. 3-10](#)).



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