YAMAHA

SERVICE MANUAL

MX360

7HC-F8197-E0

FOREWORD

This manual was written by the Yamaha Motor Powered Products Co., Ltd. primarily for use by Yamaha dealers and their qualified mechanics. It is not possible to put an entire mechanic's education into one manual, so it is assumed that persons using this book to perform maintenance and repairs on Yamaha Multi-Purpose Engine have a basic understanding of the mechanical precepts and procedures inherent to Multi-Purpose Engine repair technology. Without such knowledge, attempted repairs or service to this model may render it unfit for use and/or unsafe.

Yamaha Motor Powered Products Co., Ltd. is continually striving to further improve all models manufactured by Yamaha. Modifications and significant changes in specifications or procedures will be forwarded to all Authorized Yamaha dealers and will, where applicable, appear in future editions of this manual.

MX360
SERVICE MANUAL

2nd Edition, November 2016

HOW TO USE THIS MANUAL

PARTICULARLY IMPORTANT INFORMATION

Particularly important information is distinguished in this manual by the following notations.

⚠
This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ WARNING

A WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

NOTICE

A NOTICE indicates special precautions that must be taken to avoid damage to the machine or other property.

TIP

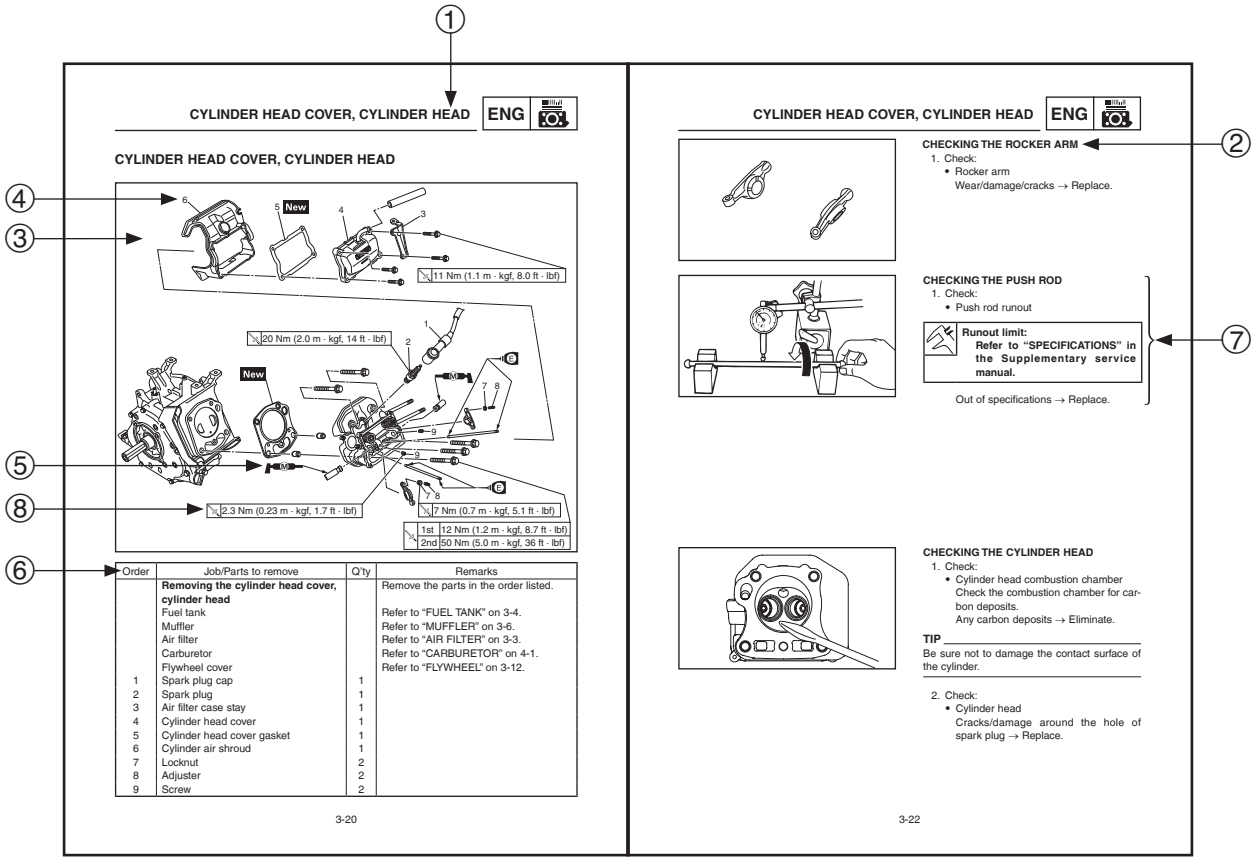
A TIP provides key information to make procedures easier or clearer.

HOW TO USE THIS MANUAL

This Service Manual contains general information on service procedure and data for the Multi-purpose engine. For complete information on service procedure and data, it is necessary to use this Service Manual together with the Supplementary Service Manual.

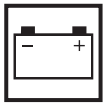
Comprehensive explanations of all installation, removal, disassembly, assembly, repair and check procedures are laid out with the individual steps in sequential order.

- The manual is divided into chapters and each chapter is divided into sections. The current section title is shown at the top of each page ①.
- Sub-section titles appear in smaller print than the section title ②.
- To help identify parts and clarify procedure steps, there are exploded diagrams at the start of each removal and disassembly section ③.
- Numbers are given in the order of the jobs in the exploded diagram. A number indicates a disassembly step ④.
- Symbols indicate parts to be lubricated or replaced ⑤.
  Refer to "ILLUSTRATED SYMBOLS".
- A job instruction chart accompanies the exploded diagram, providing the order of jobs, names of parts, notes in jobs, etc. ⑥. This step explains removal procedure only. For installation, reverse the steps.
- Jobs requiring more information (such as special tools and technical data) are described sequentially ⑦.
- These are general tightening torques for all Multi-purpose engines. Tightening torque specifications for each model are provided on the Supplementary Service Manual ⑧.



Order	Job/Parts to remove	Q'ty	Remarks
	Removing the cylinder head cover, cylinder head		Remove the parts in the order listed.
	Fuel tank		Refer to "FUEL TANK" on 3-4.
	Muffler		Refer to "MUFFLER" on 3-6.
	Air filter		Refer to "AIR FILTER" on 3-3.
	Carburetor		Refer to "CARBURETOR" on 4-1.
	Flywheel cover		Refer to "FLYWHEEL" on 3-12.
1	Spark plug cap	1	
2	Spark plug	1	
3	Air filter case stay	1	
4	Cylinder head cover	1	
5	Cylinder head cover gasket	1	
6	Cylinder air shroud	1	
7	Locknut	2	
8	Adjuster	2	
9	Screw	2	

ILLUSTRATED SYMBOLS
(Refer to the illustration)

SYMBOL	DEFINITION	SYMBOL	DEFINITION
	General information		Periodic checks and adjustments
	Engine		Carburetor
	Electrical		Troubleshooting
	Specifications		Filling fluid
	Lubricant		Special tool
	Tightening torque		Wear limit, clearance
	Engine speed		Electrical data
	Replace the part with a new one.		Lithium-soap base grease
	Molybdenum disulfide grease		Engine oil
	Molybdenum disulfide oil		Apply locking agent (LOCTITE®)

INDEX

CHAPTER 1.
GENERAL INFORMATION

CHAPTER 2.
PERIODIC CHECKS AND ADJUSTMENTS

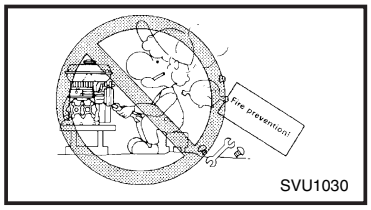
CHAPTER 3.
ENGINE

GENERAL INFORMATION

IMPORTANT INFORMATION

PREPARATION FOR REMOVAL AND DISASSEMBLY

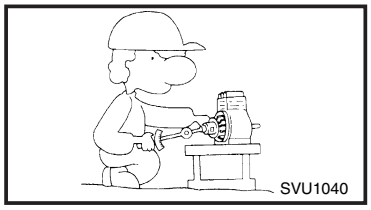
CAUTION ON SERVICE



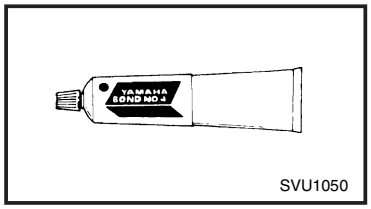
SVU1030

1. Fire prevention
   When servicing the engine, always keep the engine and yourself away from fire.

NOTES ON SERVICE

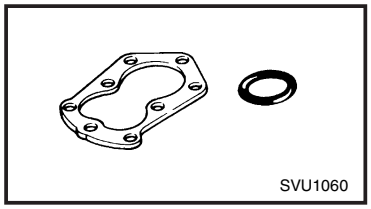

SVU1040

1. Correct tools
   Be sure to use the correct special tool for the job to guard against damage.

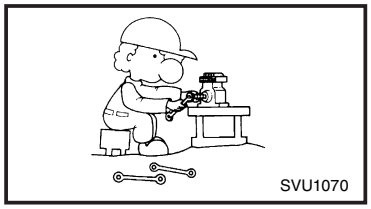


SVU1050

2. Oil, grease and seals
   Be sure to use genuine Yamaha oils, grease and sealers, or the equivalents.


SVU1060

3. Expendable parts
   Always replace the gaskets, O-rings, cotter pins and circlips with new parts when servicing engine.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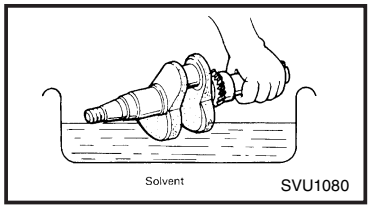
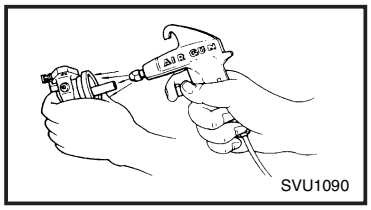
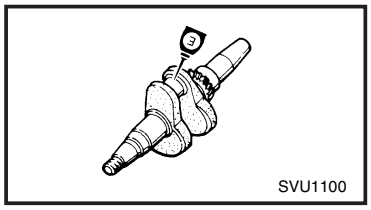
4. Tightening torque
   Be sure to follow torque specifications. When tightening bolts, nuts or screws, start with the largest-diameter fastener and work from an inner position to an outer position in a crisscross pattern.



SVU1080

5. Notes on disassembly and assembly
   a. Parts should be cleaned in solvent and blown dry with compressed air after disassembly.


SVU1090


SVU1100

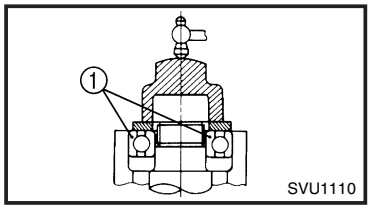
   b. Contact surfaces of moving parts should be oiled when reassembled.
   c. Make sure that the parts, move smoothly after each section of the machine is assembled.

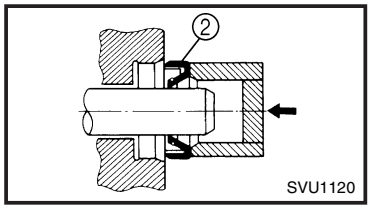
ALL REPLACEMENT PARTS

We recommend the use of genuine Yamaha parts for all replacements. Use oil and/or grease, recommended by Yamaha, for assembly and adjustment.

GASKETS, OIL SEALS, AND O-RINGS

1. All gaskets, seals, and O-rings should be replaced when an engine is overhauled. All gaskets surfaces, oil seal lips, and O-rings must be cleaned.
2. Properly oil all mating parts and bearings during reassembly. Apply grease to the oil seal lips.



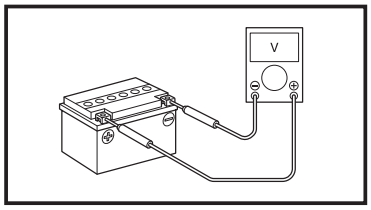


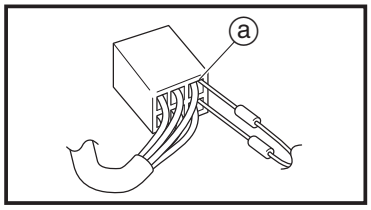
BEARINGS AND OIL SEALS

Install the bearing(s) ① and oil seal(s) ② with their manufacture's marks or numbers facing outward. (In other words, the stamped letters must be on the side exposed to view.) When installing oil seal(s), apply a light coating of lightweight lithium base grease to the seal lip(s). Oil the bearings liberally when installing.

NOTICE

Do not use compressed air to spin the bearings dry. This causes damage to the bearing surfaces.





BASIC SERVICE INFORMATION

ELECTRICAL SYSTEM

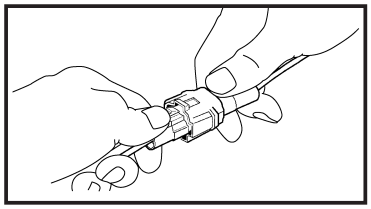
Checking the electrical system

TIP

Before checking the electrical system, make sure that the battery voltage is at least 12 V.

NOTICE

Never insert the tester probes into the coupler terminal slots. Always insert the probes from the opposite end ⓐ of the coupler, taking care not to loosen or damage the leads.



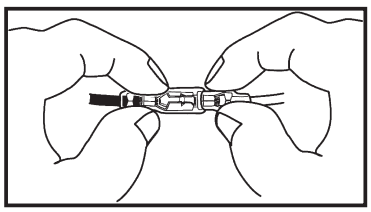
Checking the connections

Check the leads, couplers, and connectors for stains, rust, moisture, etc.

1. Disconnect:
   - Lead
   - Coupler
   - Connector

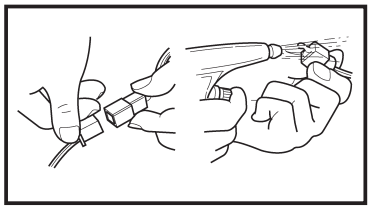
NOTICE

- **When disconnecting a coupler, release the coupler lock, hold both sections of the coupler securely, and then disconnect the coupler.**
- **There are many types of coupler locks; therefore, be sure to check the type of coupler lock before disconnecting the coupler.**



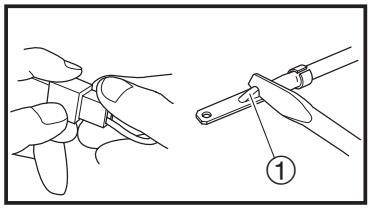
NOTICE

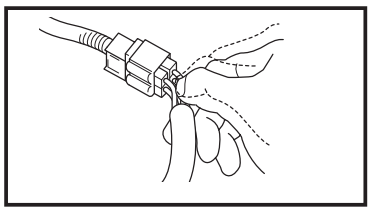
When disconnecting a connector, do not pull the leads. Hold both sections of the connector securely, and then disconnect the connector.



2. Check:
   - Lead
   - Coupler
   - Connector

   Moisture → Dry with an air blower.
   Rust/stains → Connect and disconnect several times.



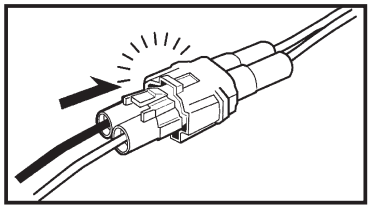


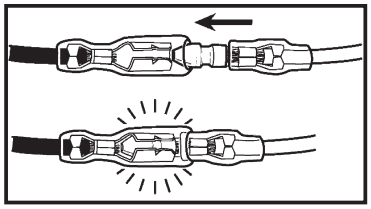
3. Check:
   - All connections

   Loose connection → Connect properly.

TIP

- If the pin ① on the terminal is flattened, bend it up.
- After disassembling and assembling a coupler, pull on the leads to make sure that they are installed securely.

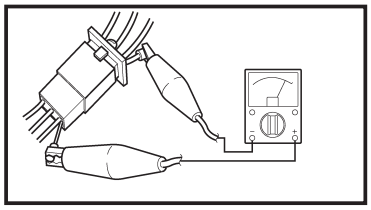


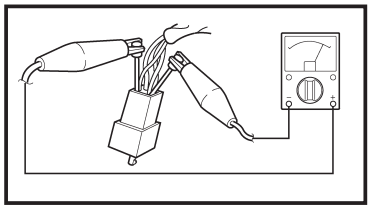


4. Connect:
   - Lead
   - Coupler
   - Connector

TIP

- When connecting a coupler or connector, push both sections of the coupler or connector together until they are connected securely.
- Make sure all connections are tight.



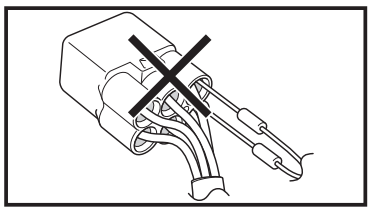


5. Check:
   - Continuity
     (with the pocket tester)

Analog pocket tester:
YU-03112-C
Pocket tester:
90890-03112

TIP

- If there is no continuity, clean the terminals.
- When checking the wire harness, perform steps (1) to (4).
- Make sure to check the connector and coupler of the TCI unit/CDI unit when replacing the TCI unit/CDI unit.
- As a quick remedy, use a contact revitalizer available at most part stores.



NOTICE

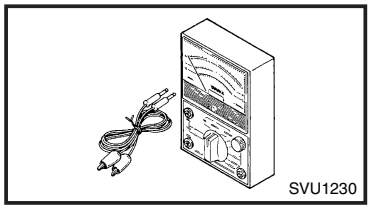
For waterproof couplers, never insert the tester leads directly into the coupler. When performing any checks using a waterproof coupler, use the specified test harness or a suitable commercially available test harness.

SPECIAL TOOLS AND TESTERS

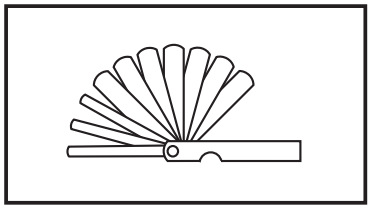
The proper special tools are necessary for complete and accurate tune-up and assembly. Using the correct special tool will help prevent damage caused by the use of improper tools or improvised techniques.

TIP

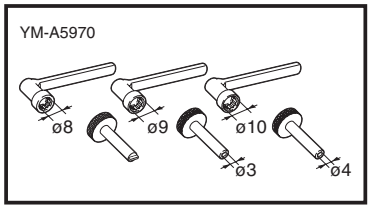
- For U.S.A. and Canada, use part number starting with “YM-”, “YU-”, or “YS-”.
- For others, use part number starting with “90890-”.



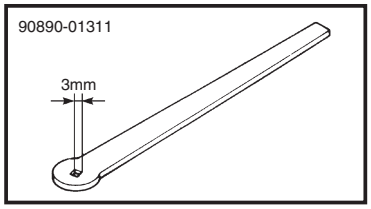
1. Analog pocket tester
   P/N. YU-03112-C
   Pocket tester
   P/N. 90890-03112
   This instrument is necessary for checking the electrical system.

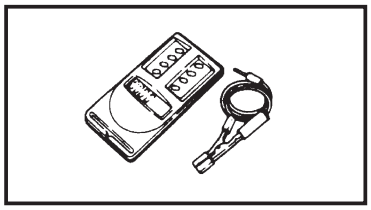


2. Feeler gauge set
   P/N. YU-26900-9
   Thickness gauge
   P/N. 90890-03180
   This gauge is used to adjust valve clearance, piston clearance and piston ring end gap.

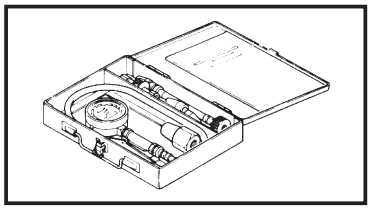


3. Six piece tappet set
   P/N. YM-A5970
   Tappet adjusting tool
   P/N. 90890-01311
   This tool is used to adjust the valve clearances.

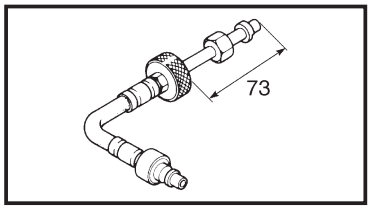




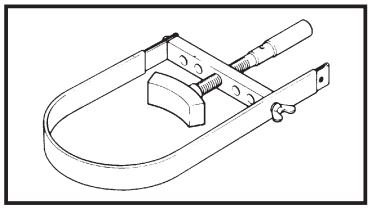
4. Digital tachometer
   P/N. YU-39951-B, 90890-06760
   This tool is needed for observing engine r/min.



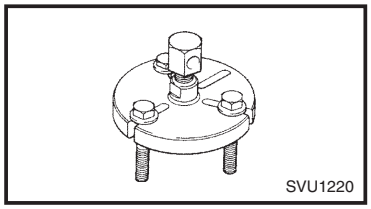
5. Engine compression tester
   P/N. YU-33223
   Compression gauge
   P/N. 90890-03081
   This tool is used for checking engine compression.



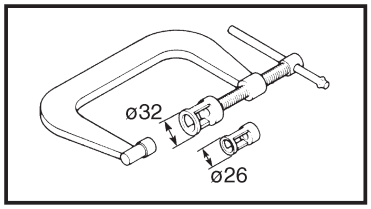
6. Extension
   P/N. 90890-04082
   This tool is used for checking engine compression.



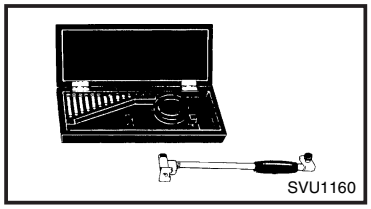
7. Primary clutch holder
   P/N. YS-01880-A
   Sheave holder
   P/N. 90890-01701
   This tool is necessary for holding the magneto rotor.



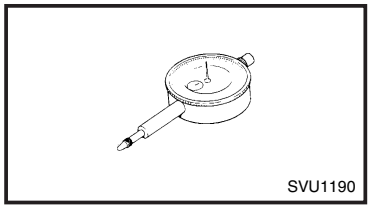
8. Heavy duty puller
   P/N. YU-33270-B
   Flywheel puller
   P/N. 90890-01362
   This tool is necessary for removing the magneto rotor.



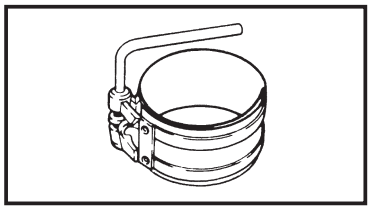
9. Valve spring compressor
   P/N. 90890-01253
   This tool is used to remove the valve springs.



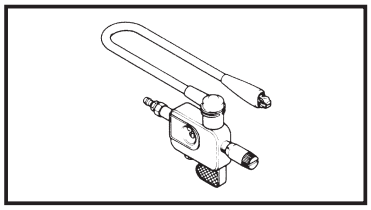
10. Cylinder gauge
    Commercially obtainable
    This instrument is used for checking cylinder bore size and condition.



11. Dial indicator gauge
    P/N. YU-A8428
    Dial gauge
    P/N. 90890-03097
    This instrument is used for checking crankshaft side clearance.



12. Piston ring compressor
    P/N. YM-08037, 90890-05158
    This tool is used to compress the piston rings when installing the piston.



13. Oppama pet–4000 spark checker
    P/N. YM-34487
    Ignition checker
    90890-06754
    This instrument is necessary for checking the ignition system components.

PERIODIC CHECKS AND ADJUSTMENTS

INTRODUCTION

This chapter includes all information necessary to perform recommended checks and adjustments. These preventive maintenance procedures, if followed, will ensure more reliable machine operation and a longer service life. The need for costly overhaul work will be greatly reduced. This information applies to machines already in service as well as new machines that are being prepared for sale. All service technicians should be familiar with this entire chapter.

MAINTENANCE INTERVALS CHART

Proper periodic maintenance is important. Especially important are the maintenance services related to emissions control. These controls not only function to ensure air filter but are also vital to proper engine operation and maximum performance.

PERIODIC MAINTENANCE/LUBRICATION INTERVALS

Item	Routine	Pre-operation check	Initial	Every		
			1 month or 20 Hrs	3 months or 50 Hrs	6 months or 100 Hrs	12 months or 300 Hrs
Spark plug	• Check condition. • Clean and replace if necessary.			√		
Fuel	• Check fuel level and leakage.	√				
Fuel hose	• Check fuel hose for cracks or damage. • Replace if necessary.	√				
Engine oil	• Check oil level in engine.	√				
	• Replace.		√		√	
Air filter element	• Check condition. • Clean.			√ (*1)		
Spark arrester	• Check condition. • Clean and replace if necessary.				√	
Fuel tank filter	• Clean and replace if necessary.				√	
Fuel strainer	• Clean and replace if necessary.				√	
Crankcase breather hose	• Check breather hose for cracks or damage. • Replace if necessary.					√
Cylinder head	• Decarbonize cylinder head. • More frequently if necessary.	After every 500 Hrs (★)				
Valve clearance	• Check and adjust when engine is cold.					★
Idle speed	• Check and adjust idle speed.					★

CHK ADJ

Item	Routine	Pre-operation check	Initial	Every		
			1 month or 20 Hrs	3 months or 50 Hrs	6 months or 100 Hrs	12 months or 300 Hrs
Recoil starter	• Check recoil starter for damage.					★
Fittings / fasteners	• Check all fittings and fasteners. • Correct if necessary.					★
The point where abnormality was recognized by use.		√				

*1····· The air filter element needs to be cleaned more frequently when using in unusually wet or dusty areas.

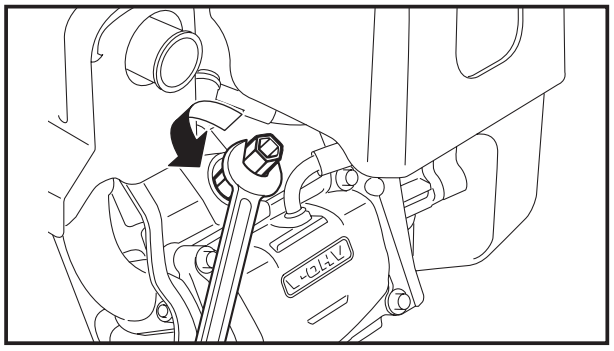
★····· Since these items require special tools, data and technical skills, have a Yamaha dealer perform the service.

PERIODIC MAINTENANCE

SPARK PLUG

⚠ WARNING

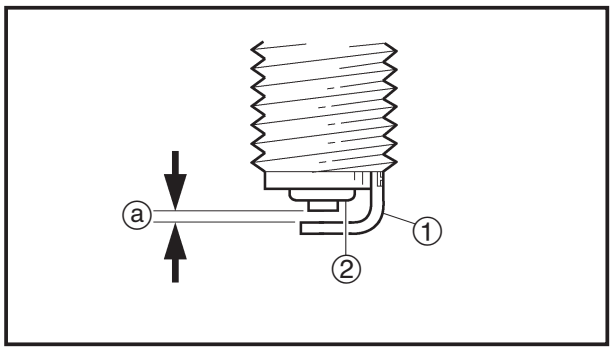
Check and adjust the areas around the cylinder head after the engine has cooled down completely.



1. Remove:
   - Spark plug cap
   - Spark plug

NOTICE

Before removing the spark plug, use compressed air to clean the cylinder head cover to prevent dirt from falling into the engine.



2. Check:
   - Spark plug type
     Not correct → Replace.

Spark plug type:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

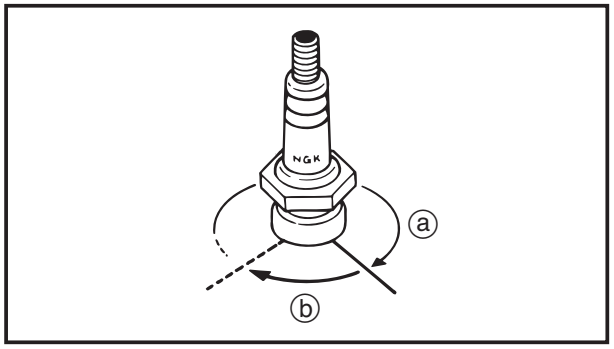
   - Electrode ①
     Wear/damage → Replace.
   - Insulator color ②
     Not normal → Replace.

3. Measure:
   - Spark plug gap ⓐ
     Use a wire gauge or thickness gauge.
     Out of specification → Regap.
     If necessary, clean the spark plug with a spark plug cleaner.

Feeler gauge set:
YU-26900-9
Thickness gauge:
90890-03180

Spark plug gap:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

TIP
Before installing the spark plug, clean the gasket surface and plug surface.



4. Install:
   - Spark plug

Spark plug:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

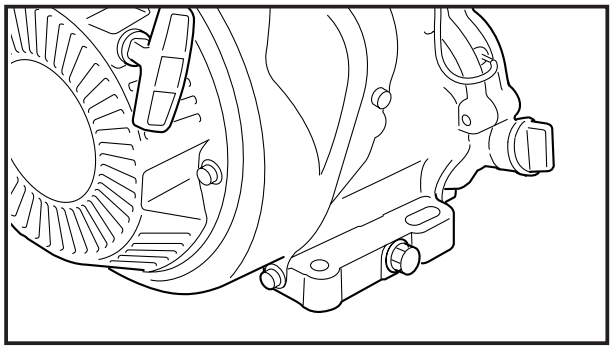
TIP
To prevent threads from being damaged, temporally tighten ⓐ the spark plug before tightening it to the specified torque ⓑ.

FUEL LEAKAGE

1. Check:
   - Leakage
     Check at fuel tank, fuel cock, fuel hose, and carburetor.

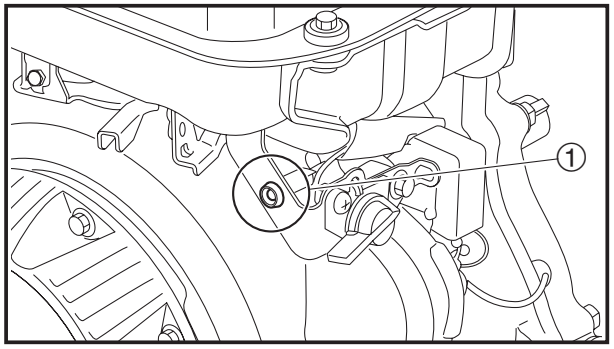
NOTICE

Replace fuel hose every four years.



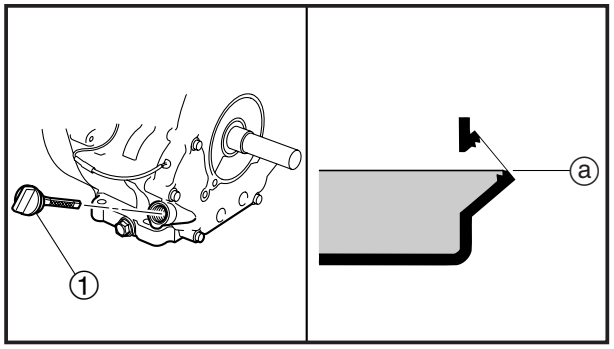
ENGINE OIL LEAKAGE

1. Place the multi-purpose engine on a level surface.
2. Check the areas outside of the engine for oil leakage.
   Oil leakage → Replace the gasket, oil seal, or O-ring.



ENGINE OIL LEVEL

1. Check:
   - Oil level with the oil warning light ①
     (With oil warning model)
     Check whether the oil warning light comes on by operating the recoil starter.
     Oil warning light comes on → Add oil.
     Oil warning light does not comes on → OK
2. Remove:
   - Oil filler cap ①

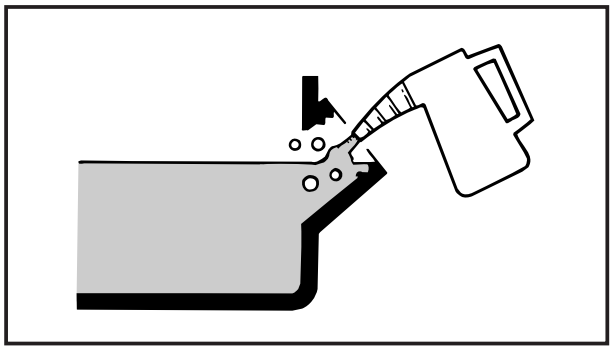


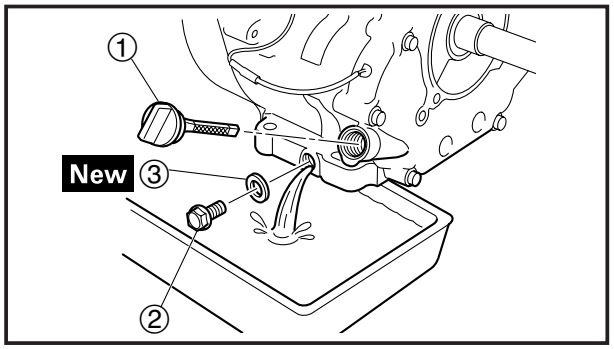
TIP

This engine is equipped with two oil filler caps. Use whichever side is accessible.

3. Check:
   - Check that engine oil is at the specified level ⓐ.

   Oil level checking steps:
   a. Place the multi-purpose engine on a level surface.
   b. Warm up the engine for several minutes.
   c. Stop the engine.
   d. Remove the oil filler cap.
   e. Check that engine oil is at the specified level ⓐ. Add oil if necessary.
4. Install:
   - Oil filler cap





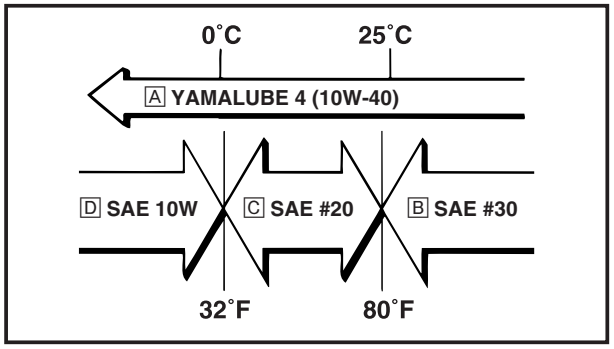
REPLACING THE ENGINE OIL

1. Warm up the engine for several minutes, and then stop the engine.
2. Remove:
   - Oil filler cap ①
   - Oil drain bolt ②
   - Oil drain bolt gasket ③

TIP

- This engine is equipped with two oil filler caps. Use whichever side is accessible.
- This engine is equipped with two oil drain bolts. Use whichever side is accessible.

3. Drain:
   - Engine oil
     Place the oil pan under the engine and drain the engine oil.
4. Install:
   - Oil drain bolt gasket ③ **New**
   - Oil drain bolt ②

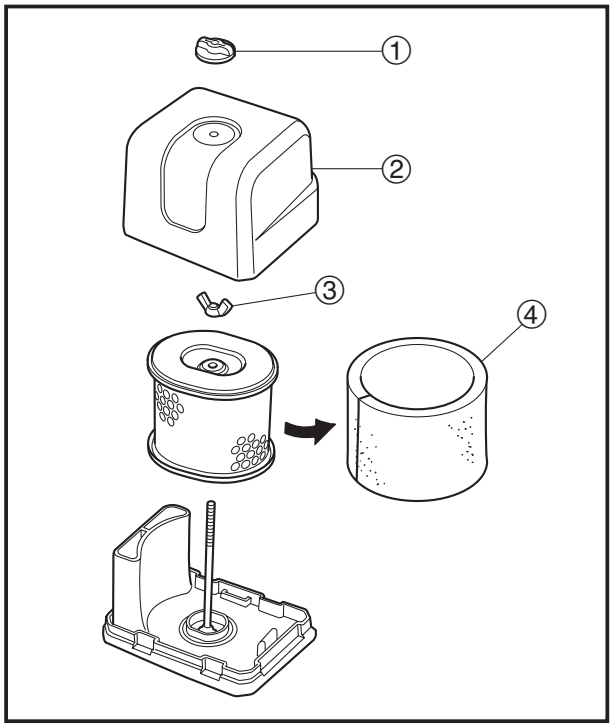


Oil drain bolt:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

5. Fill:
   - Engine oil
     Make sure to fill with the recommended engine oil from the oil filler hole in the crankcase.

Recommended engine oil:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Recommended engine oil grade:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Engine oil quantity:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

6. Check:
   - Engine oil level
     (Refer to "ENGINE OIL LEVEL" on 2-5)

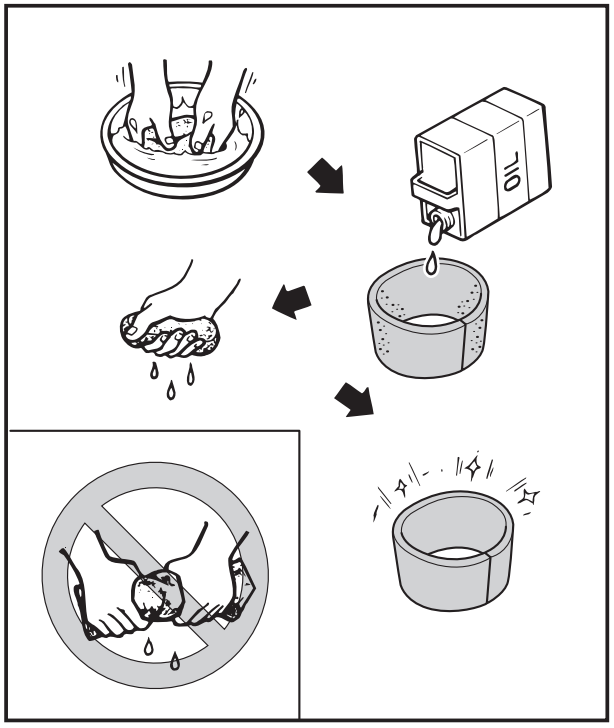


AIR FILTER ELEMENT

NOTICE

Be sure not to run the engine without air filter element. Otherwise this can result in excessive piston and/or cylinder wear.

1. Remove:
   - Air filter cover nut ①
   - Air filter cover ②
   - Air filter element nut ③
2. Remove:
   - Air filter element ④



3. Check:
   - Air filter element
     Damage → Replace.
     Clogged → Wash the element with solvent, and then dry it thoroughly.
     Oil the element and squeeze out the excess oil.

⚠ WARNING

Do not wash the element with gasoline or with acidic, alkalic, or organic solvents.

NOTICE

Do not wring out the element. This could cause it to tear.

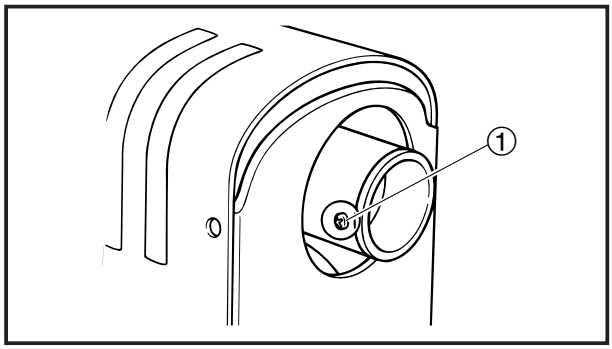
4. Install:
   - Air filter element
   - Air filter element nut
   - Air filter cover
   - Air filter cover nut

Air filter element nut:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.
Air filter cover nut:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

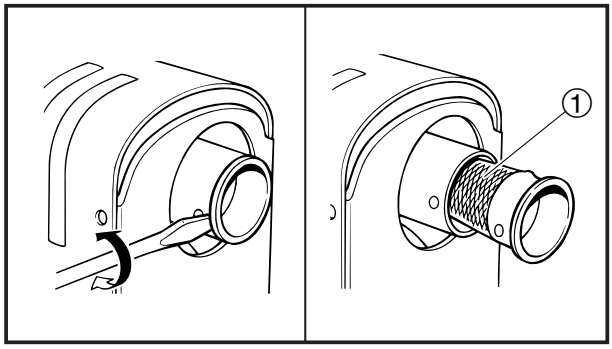
MUFFLER

⚠ WARNING

The engine and muffler will be very hot after the engine has been run.
Avoid touching the engine and muffler while they are still hot with any part of your body or clothing during check or repair.



1. Remove:
   • Spark arrester screw ①

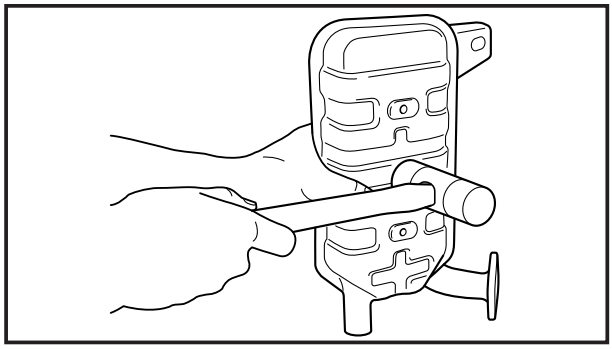


2. Remove:
   • Spark arrester ①

TIP

Use a flathead screw driver to pry the spark arrester out from the muffler.

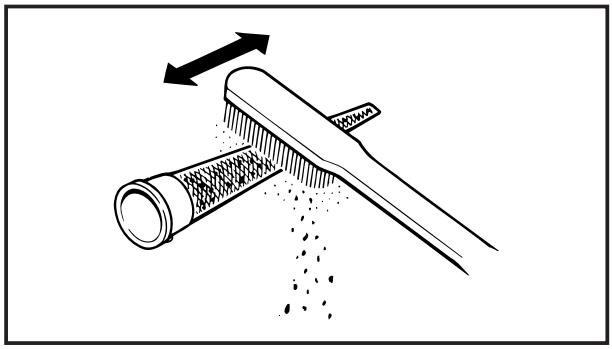
3. Remove:
   • Muffler
   (Refer to “MUFFLER” on 3-6)

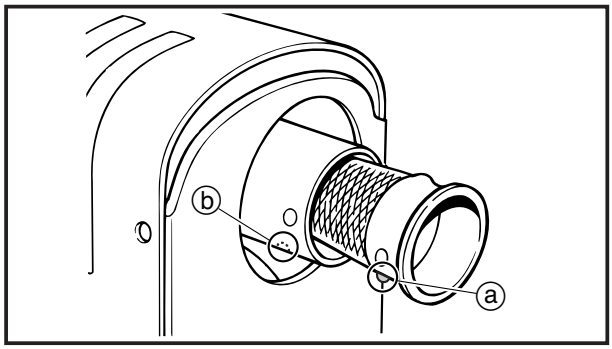


4. Decarbonize:
   • Muffler
   Tap on the muffler in the area shown in the illustration to loosen carbon build-up, and then shake it out from the end of the muffler.

NOTICE

Do not use a wire to clean, otherwise the noise damping material may come out, and the damping effect may be reduced.





5. Decarbonize:
   - Spark arrester

NOTICE

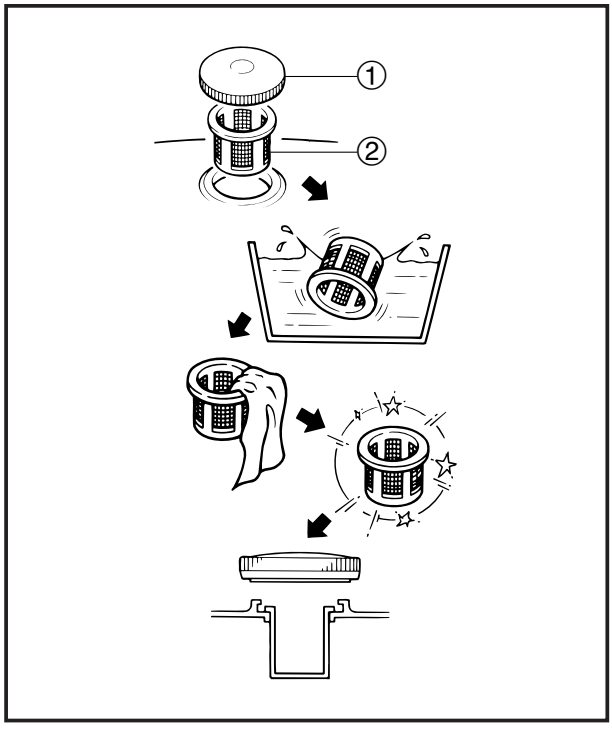
When cleaning with a wire brush, use it softly to avoid damage or scratch the spark arrester.

6. Install:
   - Muffler
     (Refer to "INSTALLING THE MUFFLER" on 3-7)
   - Spark arrester
   - Spark arrester screw

Spark arrester screw:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

TIP

Align the spark arrester lump ⓐ with the hole ⓑ in the muffler pipe.



FUEL TANK FILTER

⚠ WARNING

Do not smoke, and keep away from open flames, sparks, or any other source of fire when handling or in the vicinity of fuel.

1. Remove:
   - Fuel tank cap ①
   - Fuel tank filter ②
2. Check:
   - Fuel tank filter
     Damage → Replace.
     Dirt/clog → Clean.

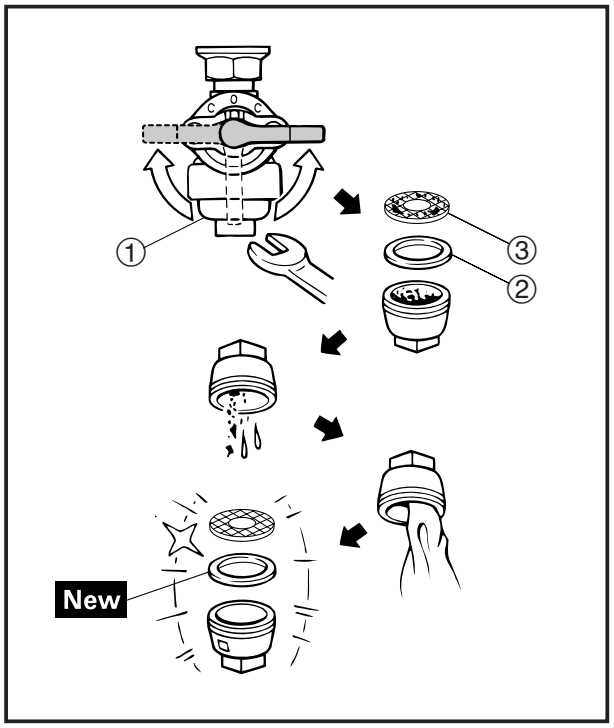
TIP

Clean the fuel tank filter with clean gasoline, and then dry it thoroughly.

3. Install:
   - Fuel tank filter
   - Fuel tank cap

⚠ WARNING

Make sure that the tank cap is tightened securely.



FUEL COCK STRAINER

⚠ WARNING

Do not smoke, and keep away from open flames, sparks, or any other source of fire when handling or in the vicinity of fuel.

1. Turn the fuel cock lever to the "OFF" position.
2. Remove:
   - Strainer cup ①
   - Gasket ②
   - Fuel cock strainer ③
3. Check:
   - Fuel cock strainer
     Damage → Replace.
     Dirt/clog → Clean.

TIP

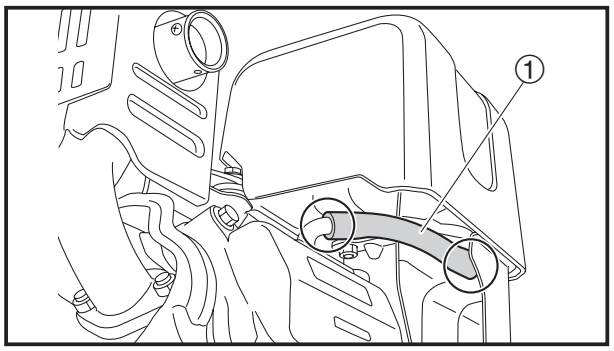
Clean the fuel cock strainer with clean gasoline, and then dry it thoroughly.

4. Install:
   - Fuel cock strainer
   - Gasket **New**
   - Strainer cup

Strainer cup:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

⚠ WARNING

Make sure that the strainer cup is tightened securely.

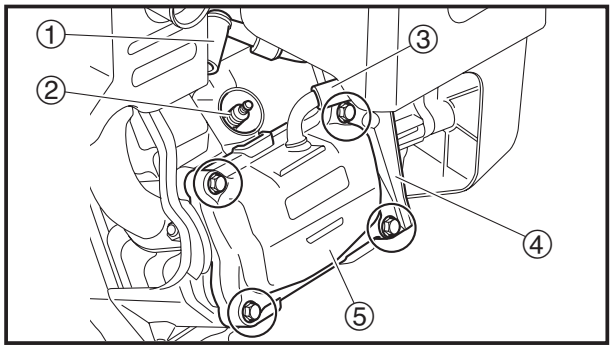


BREATHER HOSE

1. Check:
   - Breather hose ①
     Crack/damage → Replace.
     Poor connection → Connect.

CYLINDER HEAD DECARBONIZATION

1. Remove:
   - Cylinder head assembly
     (Refer to "CYLINDER HEAD COVER, CYLINDER HEAD" on 3-20)
2. Eliminate:
   - Carbon deposits
     (Refer to "CHECKING THE CYLINDER HEAD" on 3-22)
3. Install:
   - Cylinder head assembly
     (Refer to "INSTALLING THE CYLINDER HEAD ASSEMBLY" on 3-23)



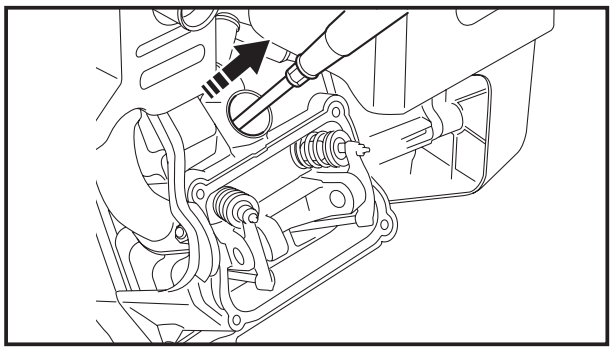
ADJUSTING THE VALVE CLEARANCE

1. Remove:
   - Spark plug cap ①
   - Spark plug ②

NOTICE

Before removing the spark plug, use compressed air to clean the cylinder head cover to prevent dirt from falling into the engine.

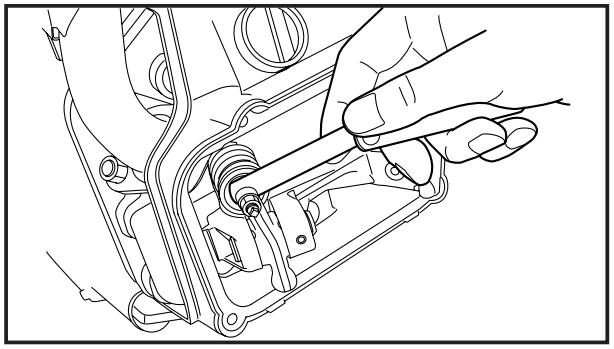
2. Remove:
   - Breather hose ③
   - Air filter case stay ④
   - Cylinder head cover ⑤
   - Cylinder head cover gasket



3. Pull the recoil starter slowly, and then set the piston at TDC (top-dead-center) on the compression stroke.

TIP

Check the piston position by inserting a screw driver into the spark plug hole.



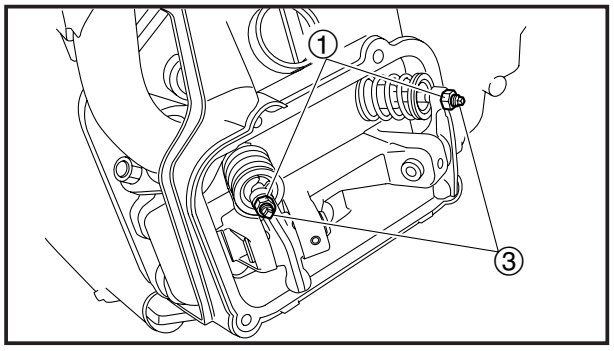
4. Measure:
   - Valve clearance
     (Between the rocker arm and valve stem end)
     Out of specification → Adjust.

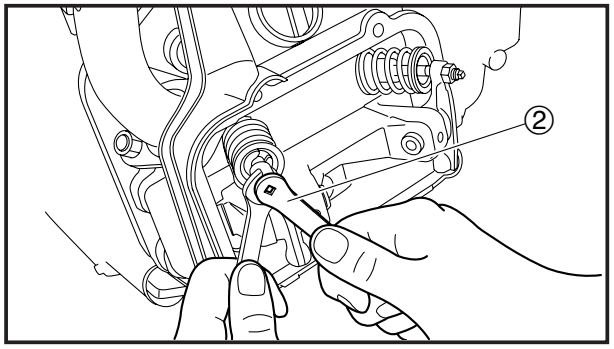
TIP

Valve clearance must be measured when the engine has cooled down enough to be touched.

Feeler gauge set:
YU-26900-9
Thickness gauge:
90890-03180

Valve clearance (cold):
Refer to "SPECIFICATIONS" in the Supplementary service manual.





5. Adjust:
   • Valve clearance
   Adjustment steps:
   a. Loosen the locknut ① and insert the 0.07 mm (0.0028 in) thickness gauge between the rocker arm and the valve tip.
   b. Using the tappet adjusting tool ② turn the adjuster ③ in or out to obtain the proper valve clearance. Move the thickness gauge up and down to check for the proper resistance.

Six piece tappet set:
YM-A5970
Tappet adjusting tool:
90890-01311
Feeler gauge set:
YU-26900-9
Thickness gauge:
90890-03180

Adjuster	Valve clearance
Turn clockwise	Decrease
Turn counterclockwise	Increase

   c. Tighten the locknut ①.

Valve adjuster locknut:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

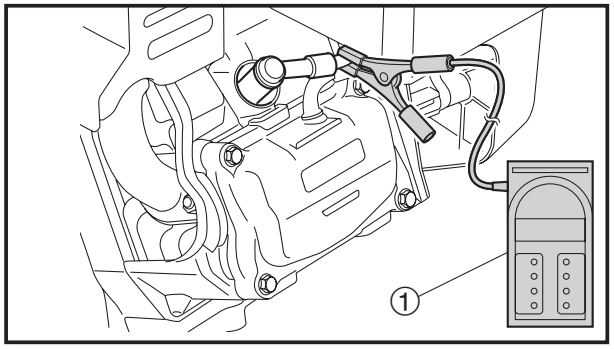
6. Install:
   - Cylinder head cover gasket **New**
   - Cylinder head cover
   - Air filter case stay

Cylinder head cover bolt:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

   - Breather hose
   - Spark plug

Spark plug:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

   - Spark plug cap



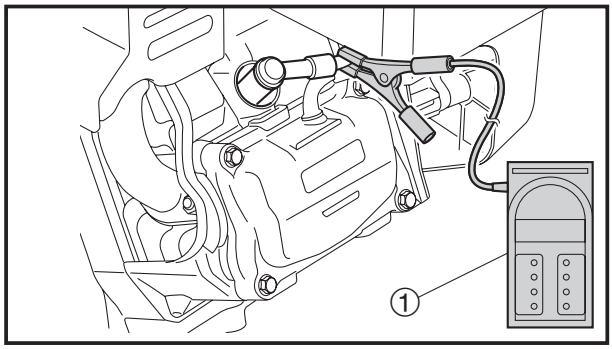
ENGINE SPEED (WITHOUT THROTTLE LEVER MODEL)

1. Warm up the engine for several minutes.
2. Attach:
   - Digital tachometer ①

Digital tachometer:
YU-39951-B, 90890-06760

3. Measure:
   - High engine speed (with no load)
     Out of specification → Adjust.

High engine speed:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



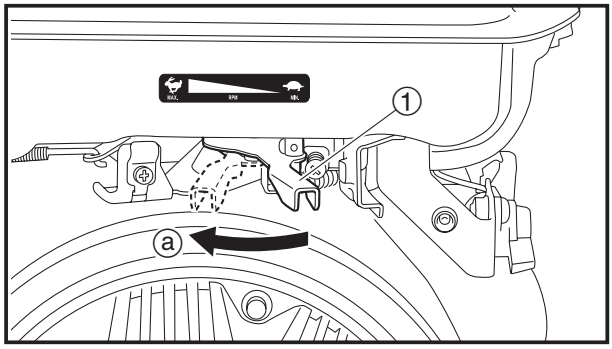
ENGINE SPEED (WITH THROTTLE LEVER MODEL)

1. Warm up the engine for several minutes.
2. Attach:
   - Digital tachometer ①

	Digital tachometer: **YU-39951-B, 90890-06760**

3. Measure:
   - High engine speed (with no load)
     Out of specification → Adjust.

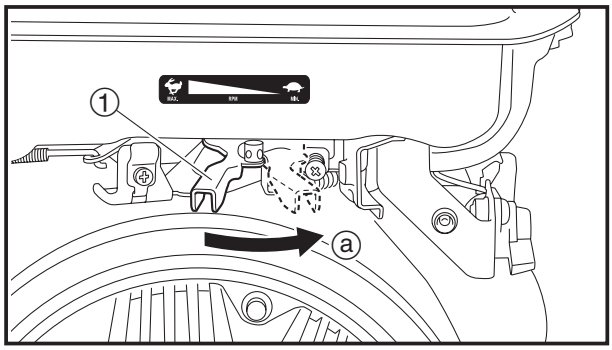
	High engine speed: **Refer to "SPECIFICATIONS" in the Supplementary service manual.**



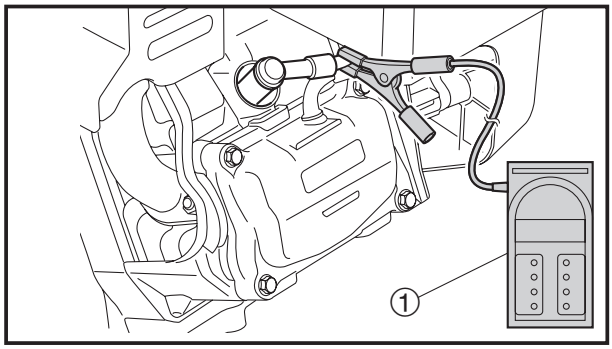
Measurement steps:
a. Move the throttle lever ① to the high engine speed position ⓐ.
b. Check the high engine speed.

4. Measure:
   - Low engine speed (with no load)
     Out of specification → Adjust.

	Low engine speed: **Refer to "SPECIFICATIONS" in the Supplementary service manual.**



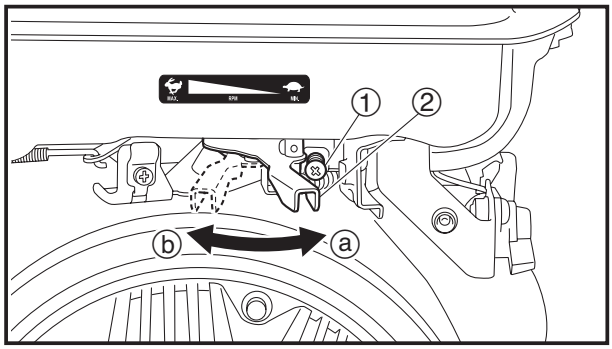
Measurement steps:
a. Move the throttle lever ① to the low engine speed position ⓐ.
b. Check the low engine speed.



ADJUSTING THE ENGINE SPEED

1. Warm up the engine for several minutes.
2. Attach:
   - Digital tachometer ①

Digital tachometer:
YU-39951-B, 90890-06760



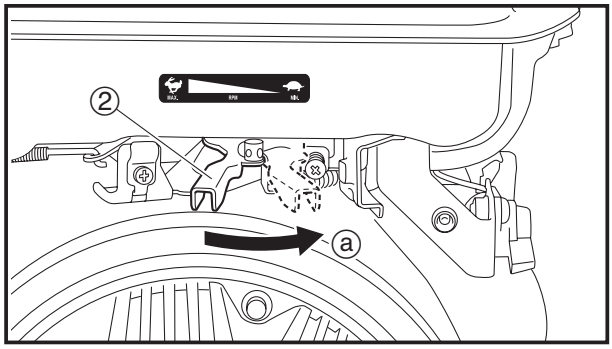
3. Adjust:
   - Engine speed

   Adjustment steps:
   a. Loosen the throttle stop screw ①.
   b. Move the throttle lever ② to direction ⓐ or ⓑ until the high engine speed is obtained.

High engine speed:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

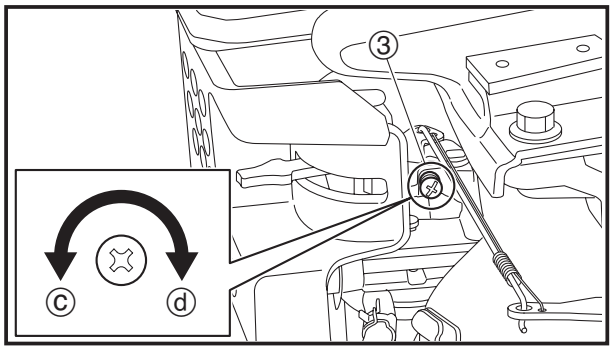
Direction ⓐ
High engine speed is decreased.
Direction ⓑ
High engine speed is increased.

   c. Tighten the throttle stop screw ① until it touches the throttle lever.



   d. Move the throttle lever ② to direction ⓐ until it stops.
   e. Turn the throttle stop screw ③ (carburetor) in direction ⓒ or ⓓ until the low engine speed is obtained.

Low engine speed:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



Direction ⓒ
Low engine speed is decreased.
Direction ⓓ
Low engine speed is increased.

RECOIL STARTER

1. Check:
   - Recoil starter operate smoothly
     Rough movement → Replace the defective part(s).
     (Refer to “CHECKING THE RECOIL STARTER” on 3-10)

FITTINGS AND FASTENERS

1. Check:
   - All fittings and fasteners
     Looseness → Tighten.
     Rough movement → Replace the defective part(s).
     Damage/pitting → Replace.

ENGINE

ENGINE INSPECTION

MEASURING THE COMPRESSION PRESSURE

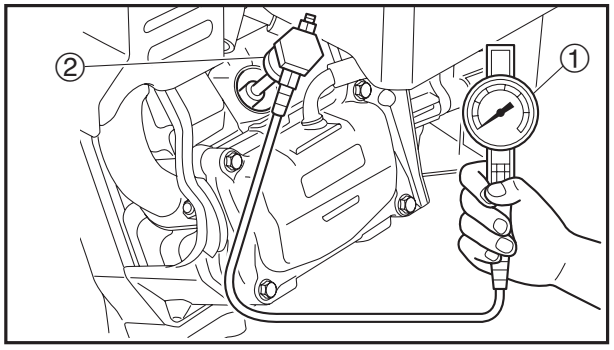
TIP

Measure the compression pressure after checking and adjusting the valve clearance.

1. Warm up the engine for several minutes.
2. Remove:
   - Spark plug cap
   - Spark plug

NOTICE

Before removing the spark plug, use compressed air to clean the cylinder head cover to prevent dirt from falling into the engine.



3. Connect:
   - Compression gauge ①
   - Extension ②

Engine compression tester:
YU-33223
Compression gauge:
90890-03081
Extension:
90890-04082

4. Measure:
   • Compression pressure
   Crank the engine until the needle stop rising on the compression gauge.
   Out of specification → Refer to the testing steps.

Standard compression pressure:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

⚠ WARNING

To prevent sparking when cranking the engine, ground the high tension cord.

Testing steps (below the minimum specification):
a. Squirt a few drops of oil into the cylinder.
b. Measure the compression again.

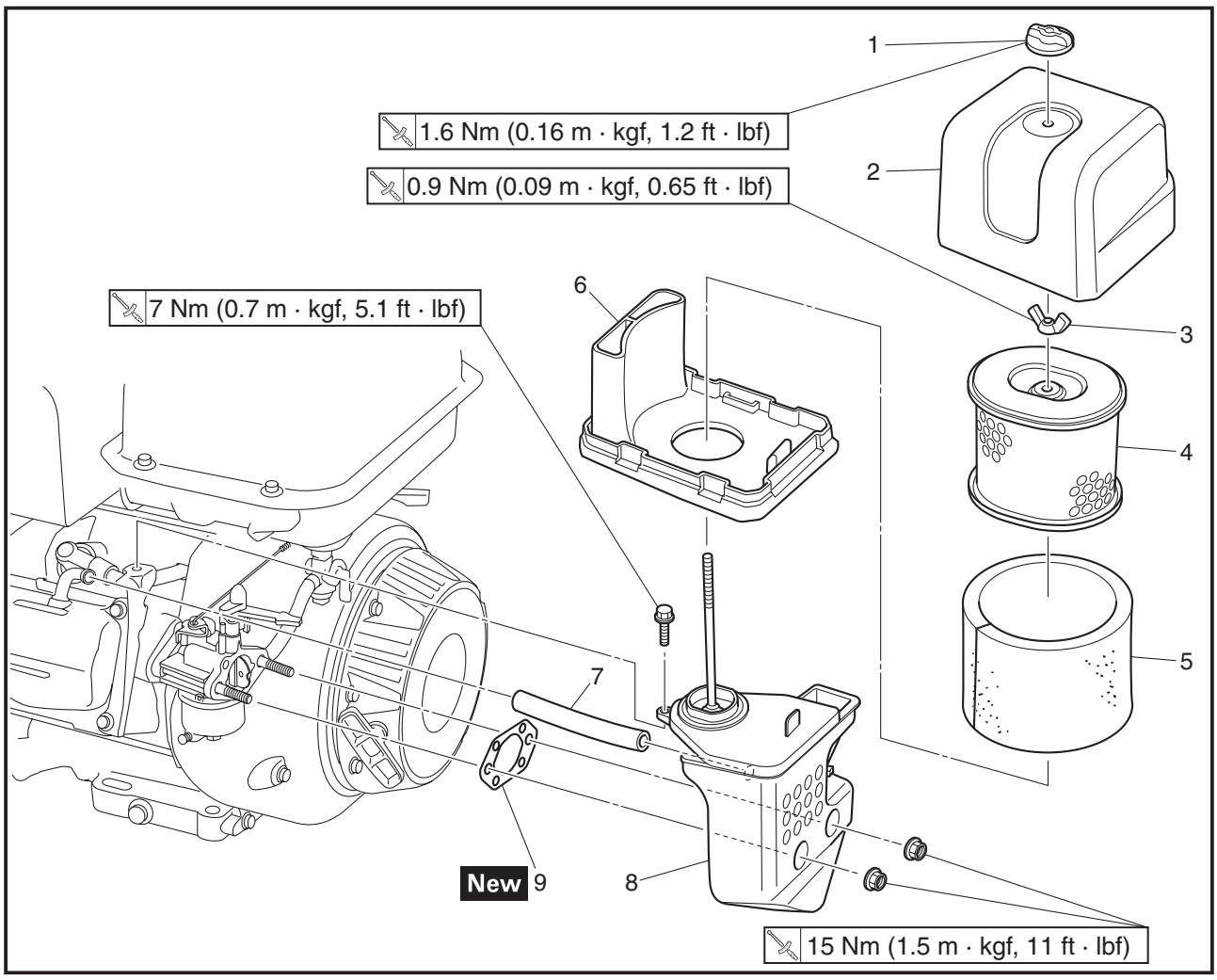
Reading	Diagnosis
Higher than without oil	• Worn cylinder, piston, and piston ring(s)
Same as without oil	• Defective piston, piston ring(s), valve(s), and cylinder head gasket • Improper valve timing and valve clearance

Testing step (above the maximum specification):
a. Check the cylinder head, valve surfaces, and piston crown for carbon deposits.
   Carbon deposits → Eliminate.
5. Install:
   • Spark plug

Spark plug:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

   • Spark plug cap

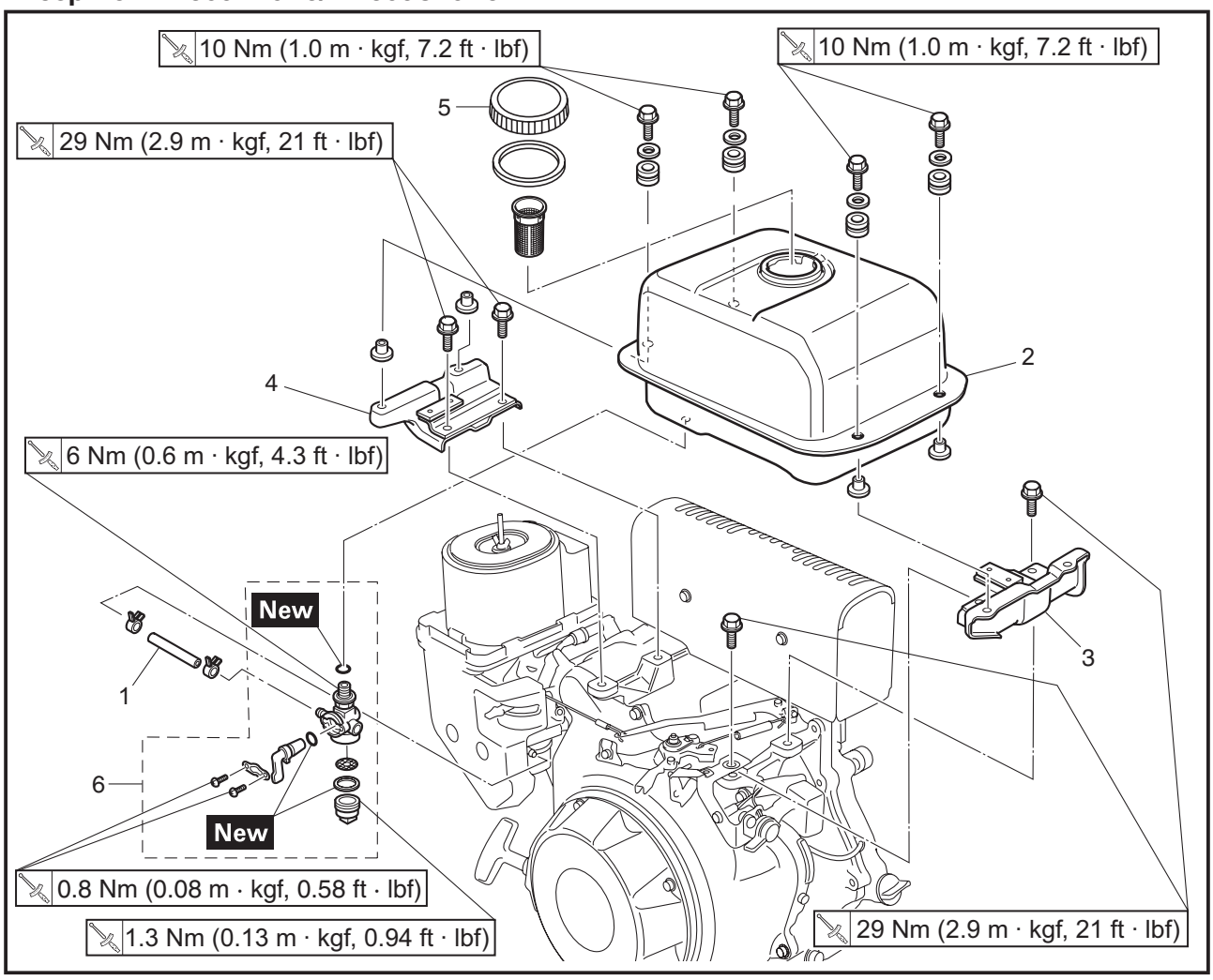
AIR FILTER



Order	Job/Parts to remove	Q'ty	Remarks
	Removing the air filter		Remove the parts in the order listed.
1	Air filter cover nut	1	
2	Air filter cover	1	
3	Air filter element nut	1	
4	Air filter element case	1	
5	Air filter element	1	
6	Air filter case	1	
7	Breather hose	1	
8	Duct	1	
9	Gasket	1	

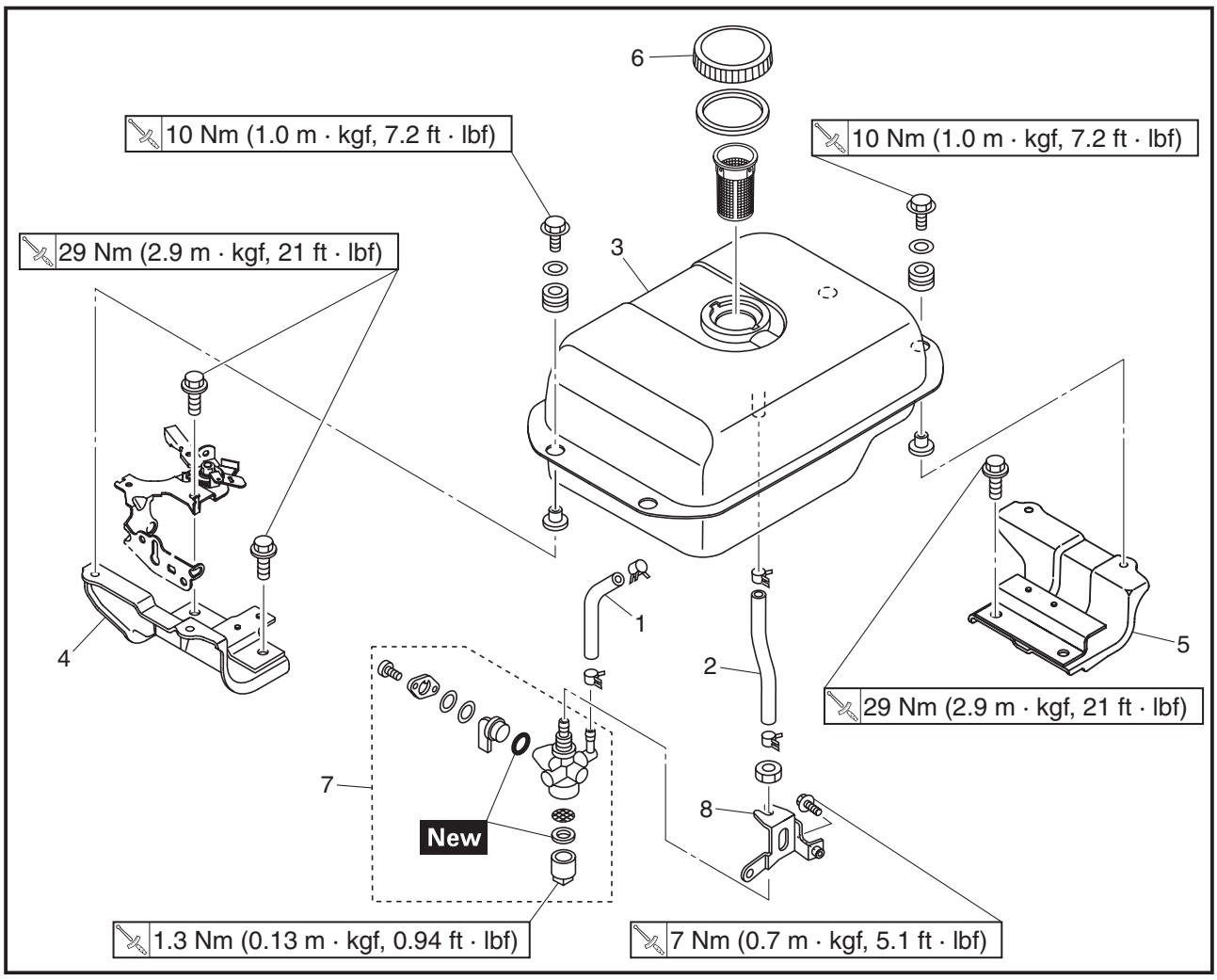
FUEL TANK

Except for MX360A46A5/MX360C46A5



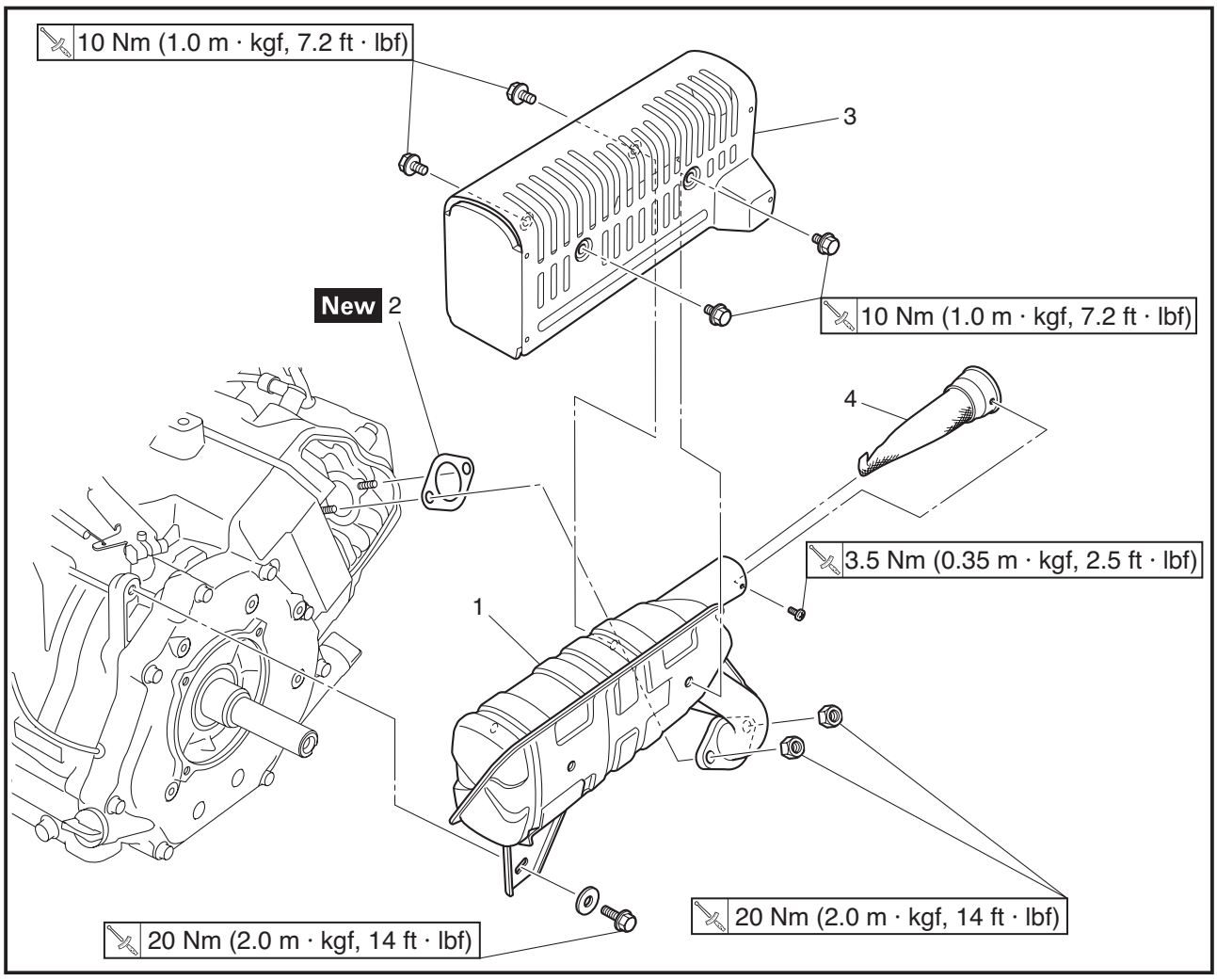
Order	Job/Parts to remove	Q'ty	Remarks
	Removing the fuel tank		Remove the parts in the order listed.
1	Fuel hose	1	Turn the fuel cock lever to the "OFF" position.
2	Fuel tank	1	
3	Fuel tank stay 1	1	
4	Fuel tank stay 2	1	
5	Fuel tank cap	1	
6	Fuel cock assembly	1	

MX360A46A5/MX360C46A5

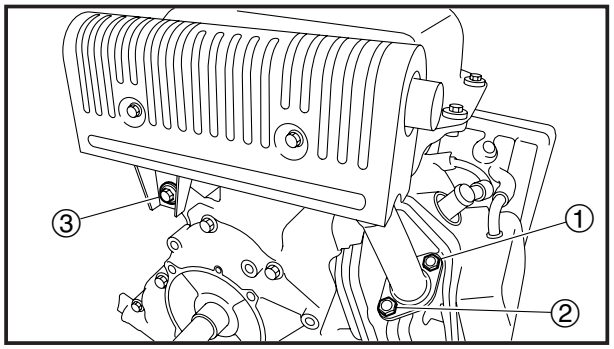


Order	Job/Parts to remove	Q'ty	Remarks
	Removing the fuel tank		Remove the parts in the order listed.
1	Fuel hose 1	1	Turn the fuel cock lever to the "OFF" position.
2	Fuel hose 2	1	
3	Fuel tank	1	
4	Fuel tank stay 1	1	
5	Fuel tank stay 2	1	
6	Fuel tank cap	1	
7	Fuel cock assembly	1	
8	Fuel cock stay	1	

MUFFLER



Order	Job/Parts to remove	Q'ty	Remarks
	Removing the muffler		Remove the parts in the order listed.
	Fuel tank		Refer to "FUEL TANK" on 3-4.
1	Muffler	1	
2	Gasket	1	
3	Muffler cover	1	
4	Spark arrester	1	



INSTALLING THE MUFFLER

1. Install:
   - Gasket **New**
   - Muffler assembly
   - Muffler nut ①
   - Muffler nut ②
   - Muffler bolt ③

TIP

Temporarily tighten the nut ①, nut ②, and bolt ③ until just comes in contact with the surface.

2. Tighten:
   - Muffler nut ①
   - Muffler nut ②

Muffler nut:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

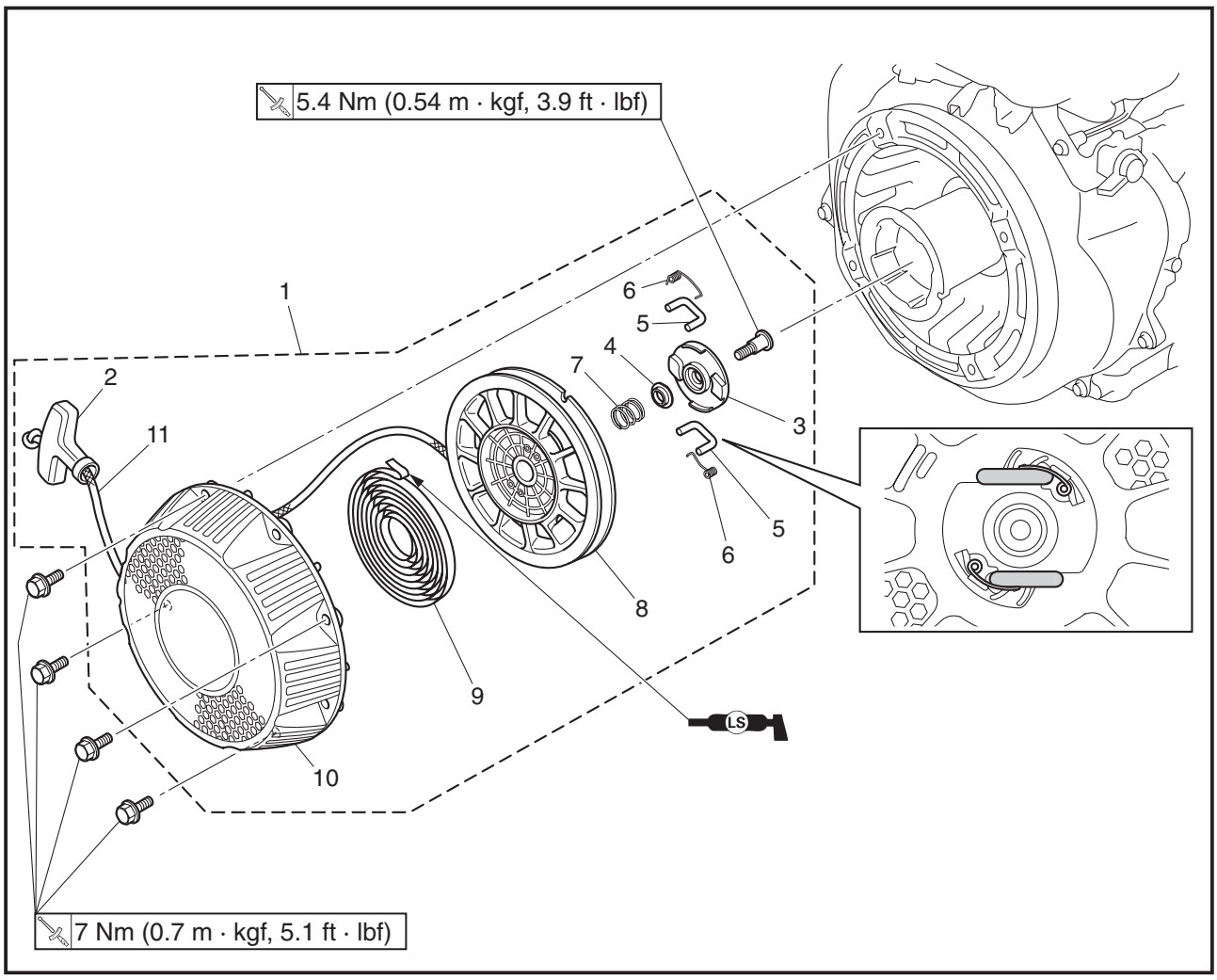
- Muffler bolt ③

Muffler bolt:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

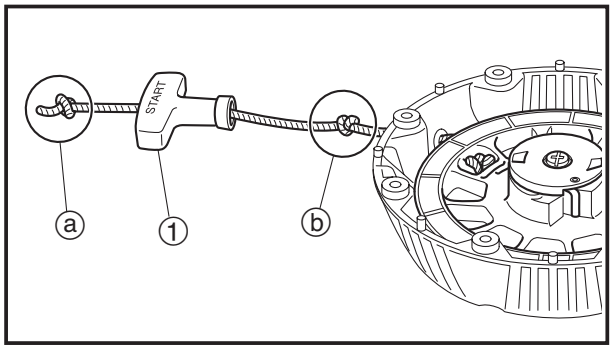
TIP

Tighten the nuts and bolt to the specified torque in order of muffler nut ①, muffler nut ②, and muffler bolt ③.

RECOIL STARTER



Order	Job/Parts to remove	Q'ty	Remarks
	Removing the recoil starter		Remove the parts in the order listed.
1	Recoil starter assembly	1	
2	Starter handle	1	
3	Drive plate	1	
4	Clip	1	
5	Drive pawl	2	
6	Spring	2	
7	Compression spring	1	
8	Sheave drum	1	
9	Starter spring	1	
10	Starter case	1	
11	Starter rope	1	

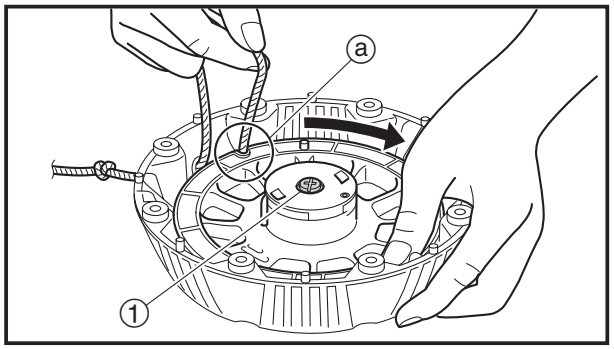


DISASSEMBLING THE RECOIL STARTER

1. Remove:
   - Starter handle ①

TIP

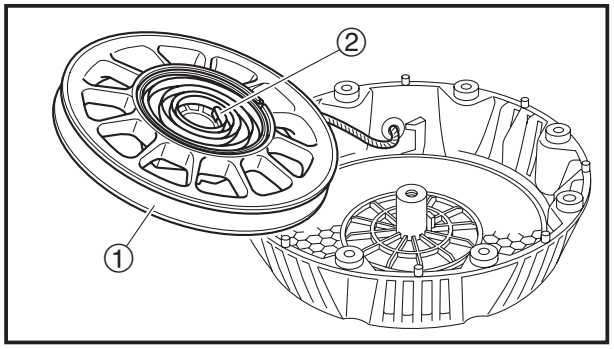
Before untying the knot ⓐ above the starter handle, make a knot ⓑ on the rope so that the rope is not pulled into the case.



2. Remove:
   - Drive plate screw ①
   - Drive plate/Clip
   - Drive pawls
   - Springs

TIP

Release the spring preload before removing the drive plate screw ①. Hook the rope into the sheave drum slot ⓐ and turn the sheave drum assembly clockwise.



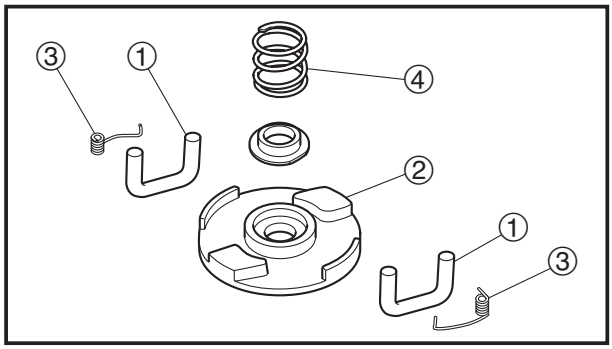
3. Remove:
   - Sheave drum assembly ①
   - Starter spring ②
   - Starter rope

NOTICE

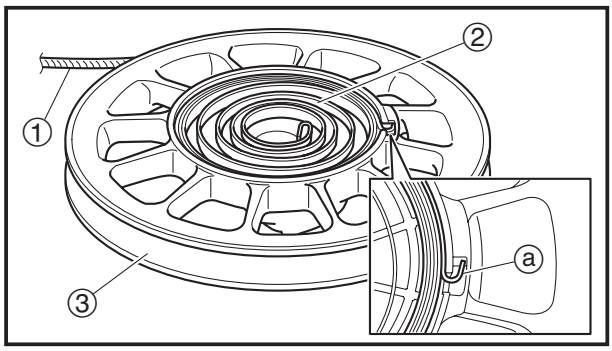
Be sure to press down on the sheave drum assembly, because the spring will spread out suddenly when it is removed from the starter case.

CHECKING THE RECOIL STARTER

1. Check:
   - Starter rope
     Wear/damage → Replace.
   - Starter case
     Cracks/damage → Replace.
   - Starter spring
     Dirt → Clean and apply grease.
     Wear/damage → Replace.



2. Check:
   - Drive pawls ①
   - Drive plate ②
     Wear/damage → Replace.
   - Springs ③
   - Compression spring ④
     Cracks/damage → Replace.

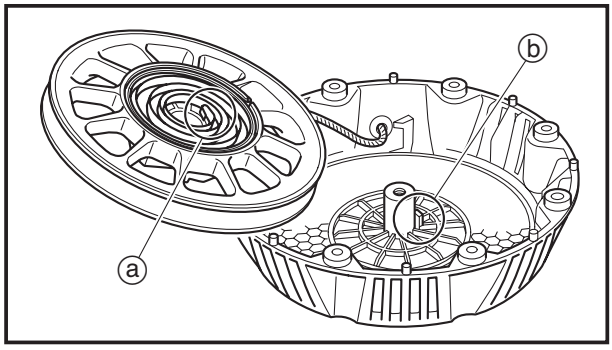


ASSEMBLING THE RECOIL STARTER

1. Install:
   - Starter rope ①
   - Starter spring ②
   - Sheave drum ③

TIP

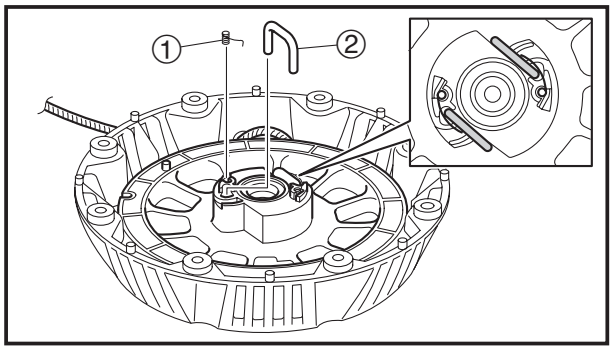
Engage the spring hook ⓐ with the drum slit, then wind the spring counterclockwise into the drum from the larger to the smaller diameter.



2. Install:
   - Sheave drum assembly

TIP

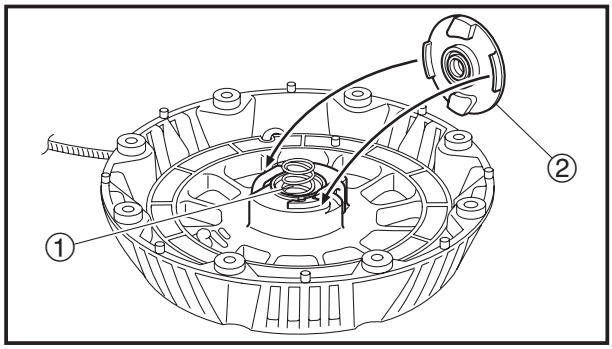
Engage the spring hook ⓐ with the starter case hook ⓑ.



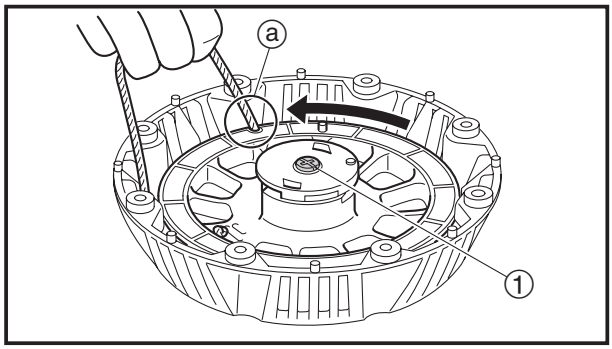
3. Install:
   - Springs ①
   - Drive pawls ②

TIP

Set the ends of the springs ① outside the drive pawls ②.



4. Install:
   - Compression spring ①
   - Drive plate/Clip ②



5. Install:
   - Starter handle
   - Drive plate screw ①

TIP

To set the spring preload, hook the starter rope into the sheave drum slot ⓐ and turn the sheave drum assembly counterclockwise four times, and then unhook the starter rope from the slot.

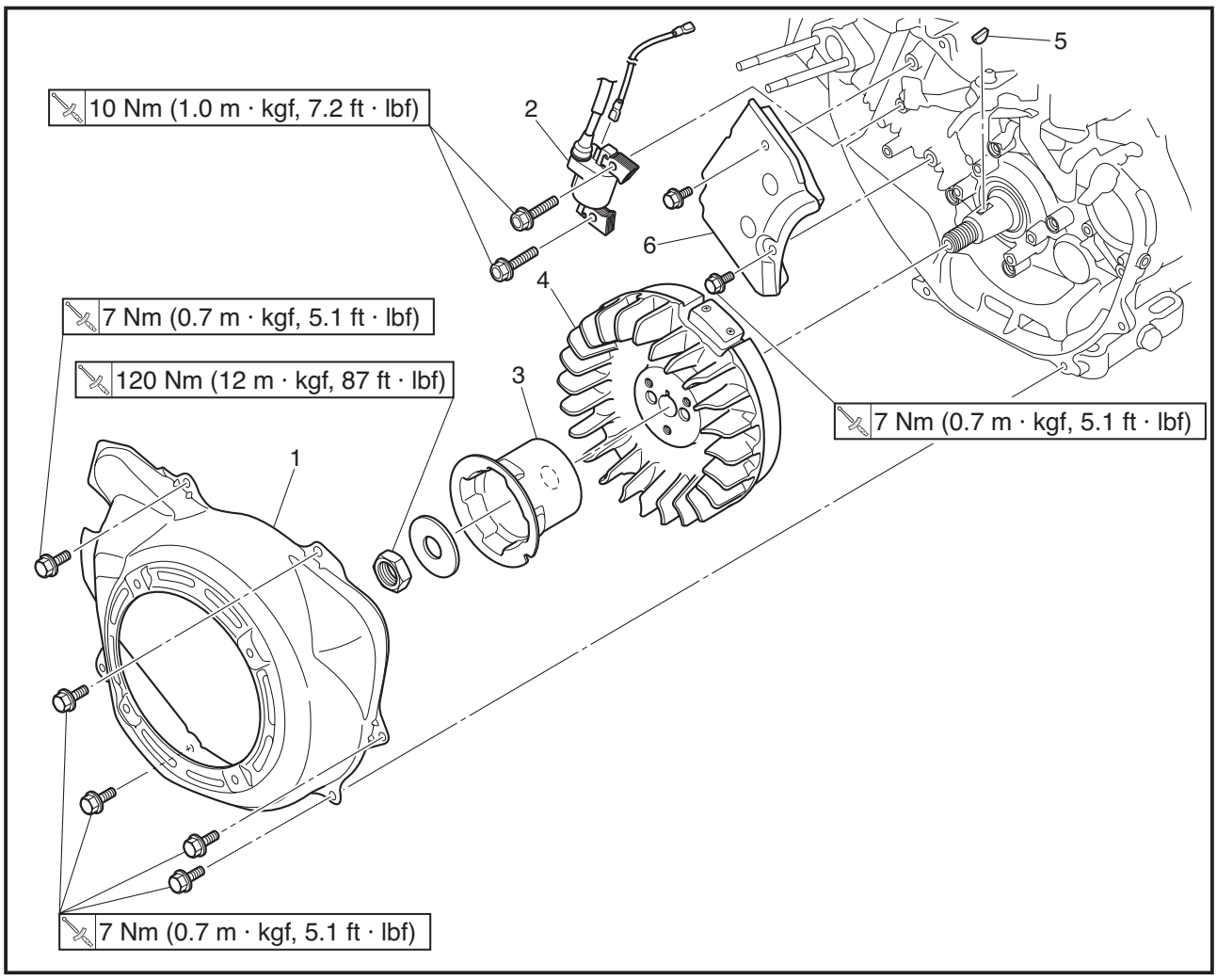
Drive plate screw:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

6. Check:
   - Recoil starter operation

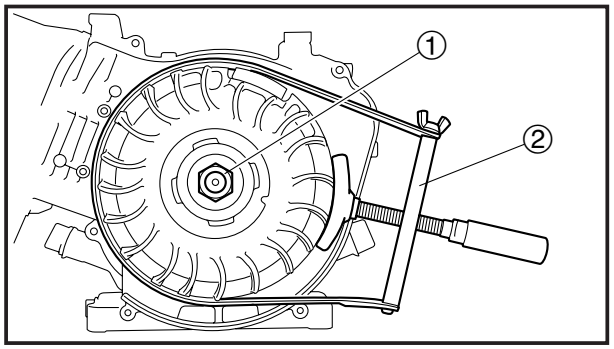
TIP

Pull the starter handle several times to check that the sheave drum turns smoothly and to check the starter rope for slack. Repeat steps 1–5 if necessary.

FLYWHEEL



Order	Job/Parts to remove	Q'ty	Remarks
	Removing the flywheel		Remove the parts in the order listed.
	Air filter		Refer to "AIR FILTER" on 3-3.
	Fuel tank		Refer to "FUEL TANK" on 3-4.
	Carburetor		Refer to "CARBURETOR" on 4-1.
	Recoil starter		Refer to "RECOIL STARTER" on 3-8.
1	Flywheel cover	1	
2	TCI unit	1	
3	Starter pulley	1	
4	Flywheel	1	
5	Woodruff key	1	
6	Cylinder air shroud plate	1	



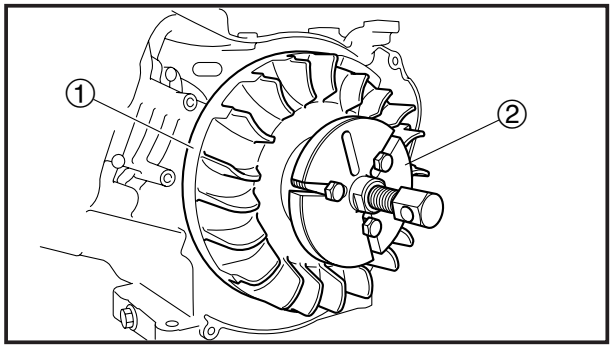
REMOVING THE FLYWHEEL

1. Remove:
   - Flywheel cover
   - TCI unit
2. Remove:
   - Flywheel nut ①
   - Washer
   - Starter pulley

TIP

Attach the sheave holder ② to hold the flywheel.

Primary clutch holder:
YS-01880-A
Sheave holder:
90890-01701

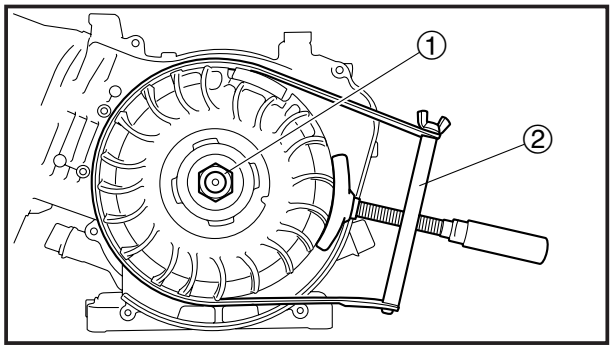


3. Remove:
   - Flywheel ①
   - Woodruff key

TIP

- Remove the flywheel ① using the flywheel puller ②.
- Fully tighten the tool holding bolts, making sure the tool body is parallel with the flywheel. If necessary, one bolt may be backed out slightly to level the tool body.

Heavy duty puller:
YU-33270-B
Flywheel puller:
90890-01362



INSTALLING THE FLYWHEEL

1. Install:
   - Woodruff key
   - Flywheel
2. Install:
   - Starter pulley
   - Washer
   - Flywheel nut ①

Flywheel nut:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

TIP

Tighten the flywheel nut ① using the sheave holder ② to hold the flywheel.

Primary clutch holder:
YS-01880-A
Sheave holder:
90890-01701

3. Install:
   - TCI unit

TCI unit bolt:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

(Refer to "INSTALLING THE TCI UNIT" on 3-15)

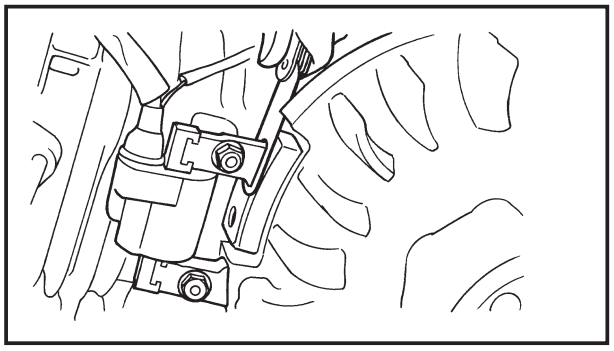
- Flywheel cover

Flywheel cover bolt:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

INSTALLING THE TCI UNIT

1. Install:
   - TCI unit
   - TCI unit bolts

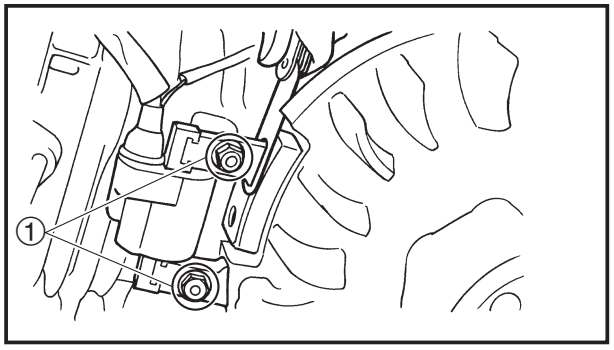
TCI unit bolt:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.



2. Measure:
   - TCI unit air gap
     Out of specification → Adjust.

Feeler gauge set:
YU-26900-9
Thickness gauge:
90890-03180

TCI unit air gap:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



3. Adjust:
   - TCI unit air gap

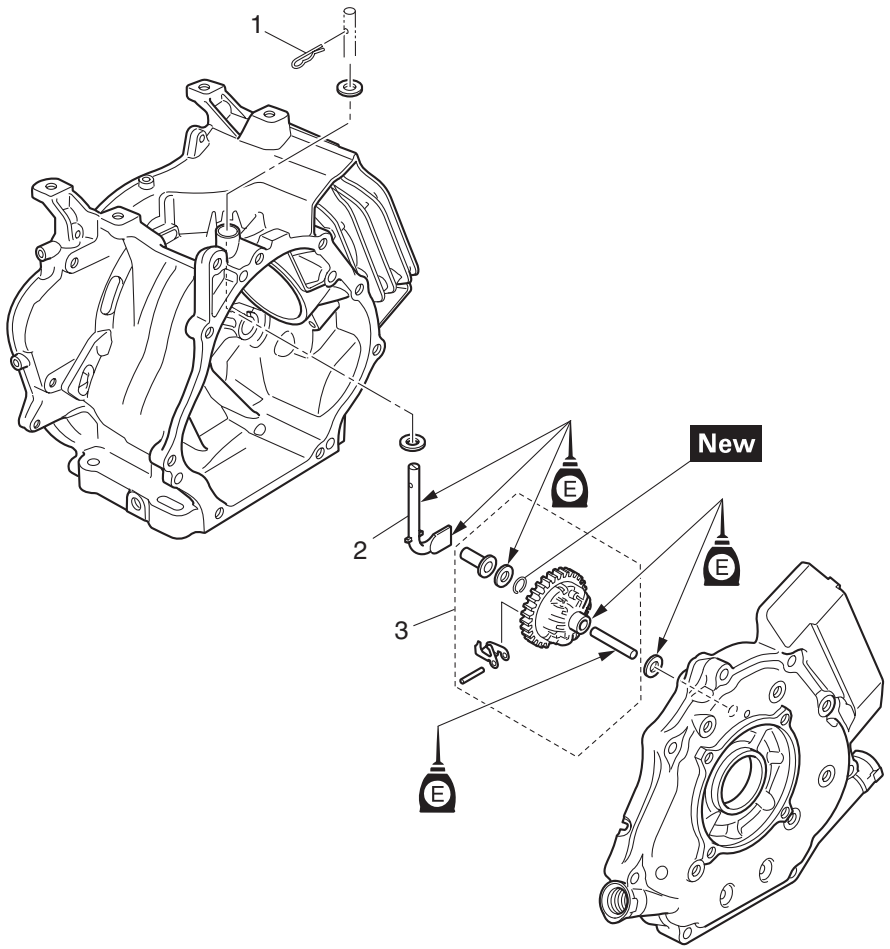
   Adjustment steps:
   a. Loosen the TCI unit bolts ①
   b. Adjust the TCI unit air gap

Feeler gauge set:
YU-26900-9
Thickness gauge:
90890-03180

   c. Tighten the TCI unit bolts ①

TCI unit bolt:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

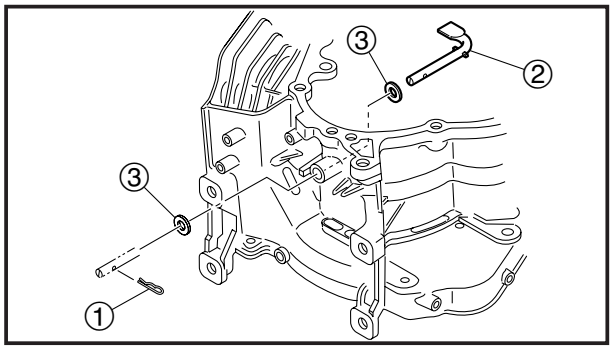
GOVERNOR



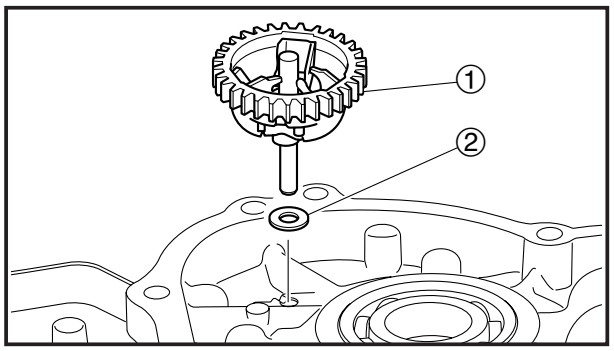
Order	Job/Parts to remove	Q'ty	Remarks
	Removing the governor		Remove the parts in the order listed.
	Fuel tank		Refer to "FUEL TANK" on 3-4.
	Fuel tank stay		Refer to "FUEL TANK" on 3-4.
	Engine switch and oil warning unit		Refer to "ENGINE SWITCH AND OIL WARNING UNIT" on 3-19.
	Crankcase cover		Refer to "PISTON, CAMSHAFT, CRANKCASE, AND CRANKSHAFT" on 3-31.
1	Clip	1	
2	Governor shaft	1	
3	Flyweight shaft assembly	1	

REMOVING THE FLYWEIGHT SHAFT ASSEMBLY AND GOVERNOR SHAFT

1. Remove:
   - Crankcase cover
     (Refer to "PISTON, CAMSHAFT, CRANKCASE, AND CRANKSHAFT" on 3-31)
   - Governor arm
     (Refer to "GOVERNOR" in the Supplementary service manual)



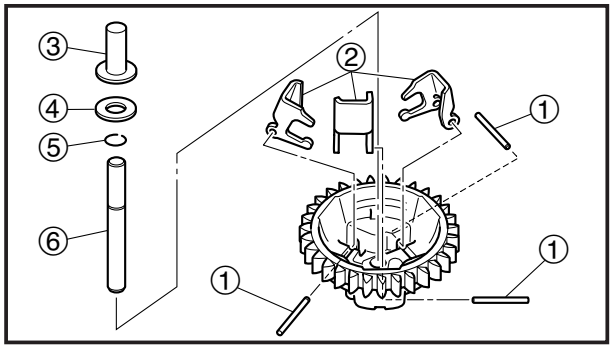
2. Remove:
   - Clip ①
   - Governor shaft ②
   - Washers ③



3. Remove:
   - Flyweight shaft assembly ①
   - Washer ②

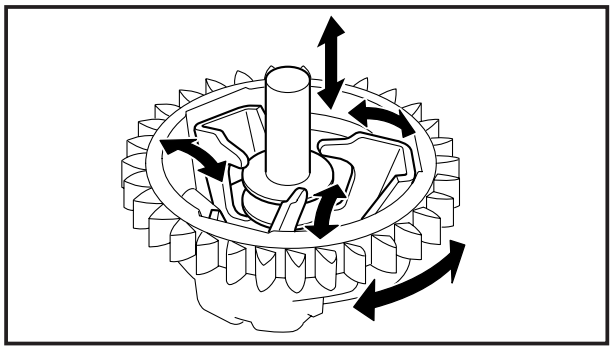
TIP

Remove the flyweight shaft assembly by tapping the flyweight shaft from outside of the crankcase cover.



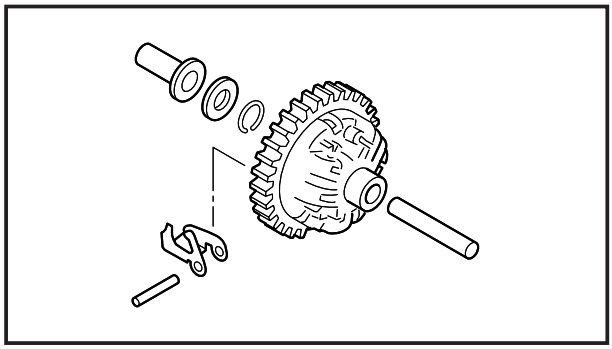
DISASSEMBLING THE FLYWEIGHT SHAFT ASSEMBLY

1. Remove:
   - Weight shafts ①
   - Weights ②
   - Collar ③
   - Washer ④
   - Circlip ⑤
   - Flyweight shaft ⑥

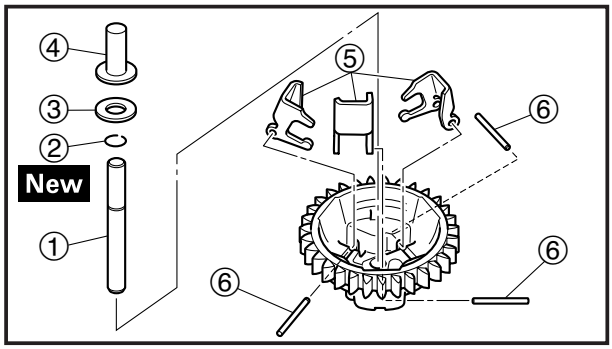


CHECKING THE FLYWEIGHT SHAFT ASSEMBLY AND GOVERNOR SHAFT

1. Check:
   - Flyweight shaft assembly move smoothly
     Rough movement → Replace.

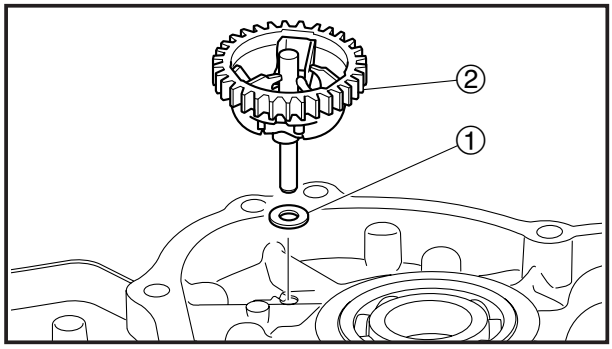


2. Check:
   - Flyweight gear
   - Flyweight shaft
   - Collar
   - Washer
   - Governor shaft
   Wear/damage → Replace.



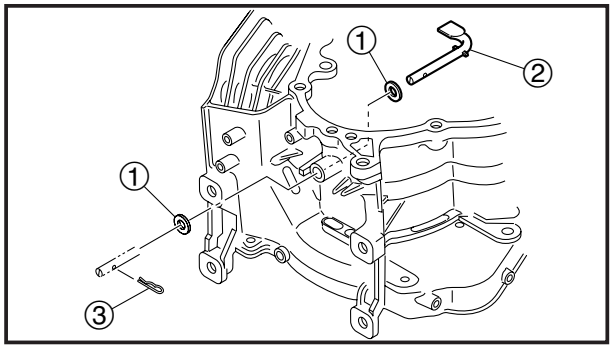
ASSEMBLING THE FLYWEIGHT SHAFT ASSEMBLY

1. Install:
   - Flyweight shaft ①
   - Circlip ② New
   - Washer ③
   - Collar ④
   - Weights ⑤
   - Weight shafts ⑥



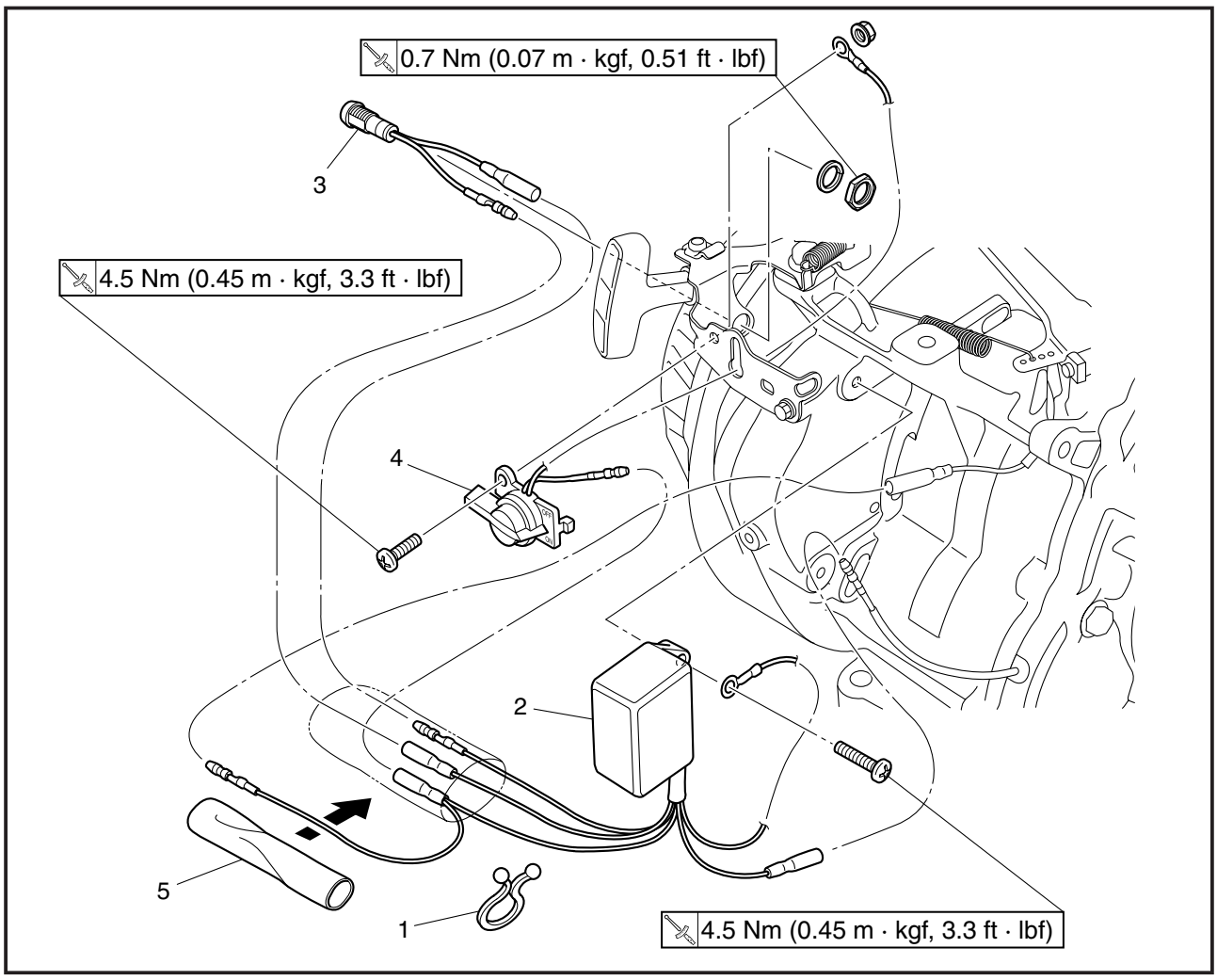
INSTALLING THE FLYWEIGHT SHAFT ASSEMBLY AND GOVERNOR SHAFT

1. Install:
   - Washer ①
   - Flyweight shaft assembly ②



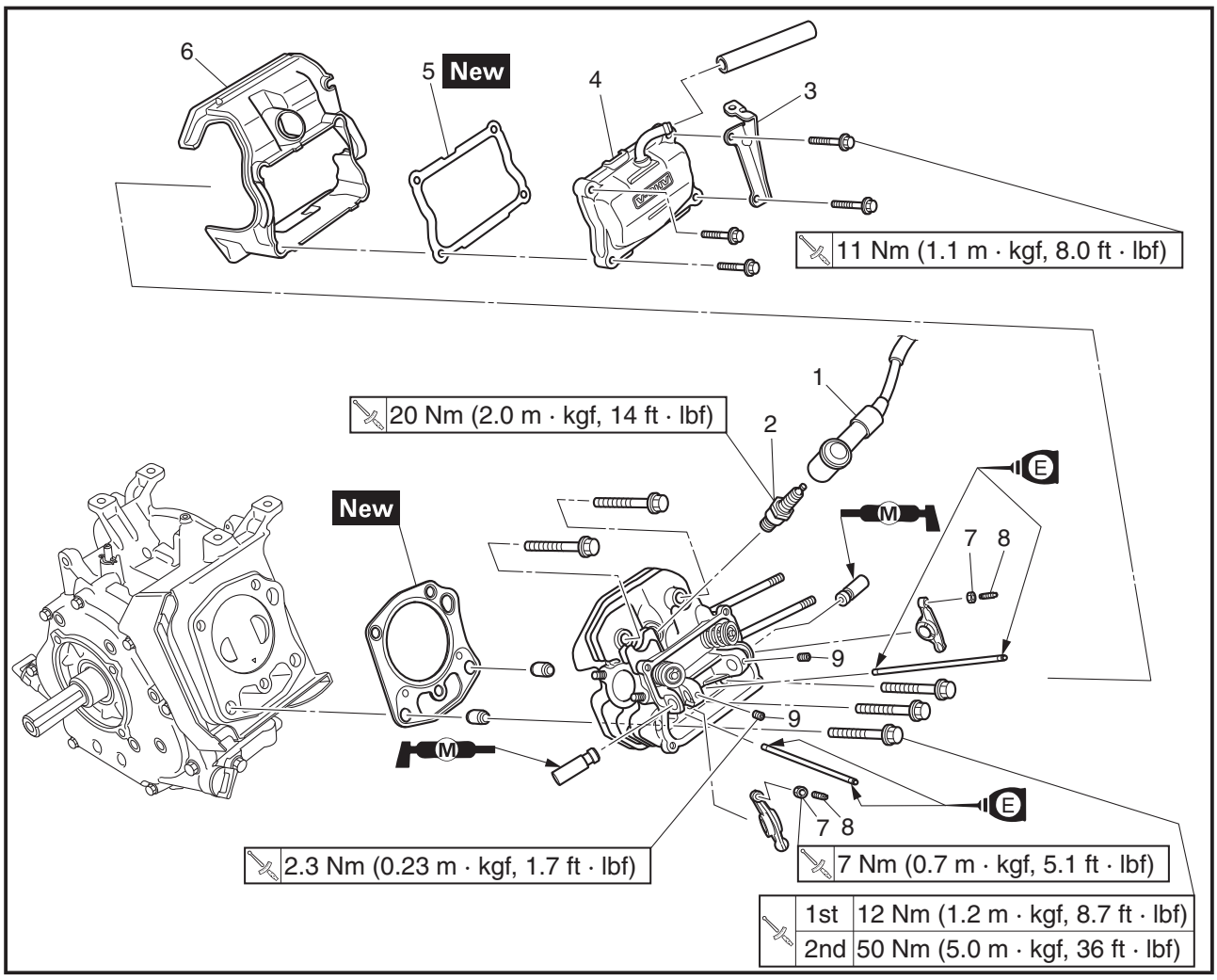
2. Install:
   - Washers ①
   - Governor shaft ②
   - Clip ③
3. Install:
   - Governor arm
   - Crankcase cover
   (Refer to "INSTALLING THE CRANKCASE COVER" on 3-36)

ENGINE SWITCH AND OIL WARNING UNIT

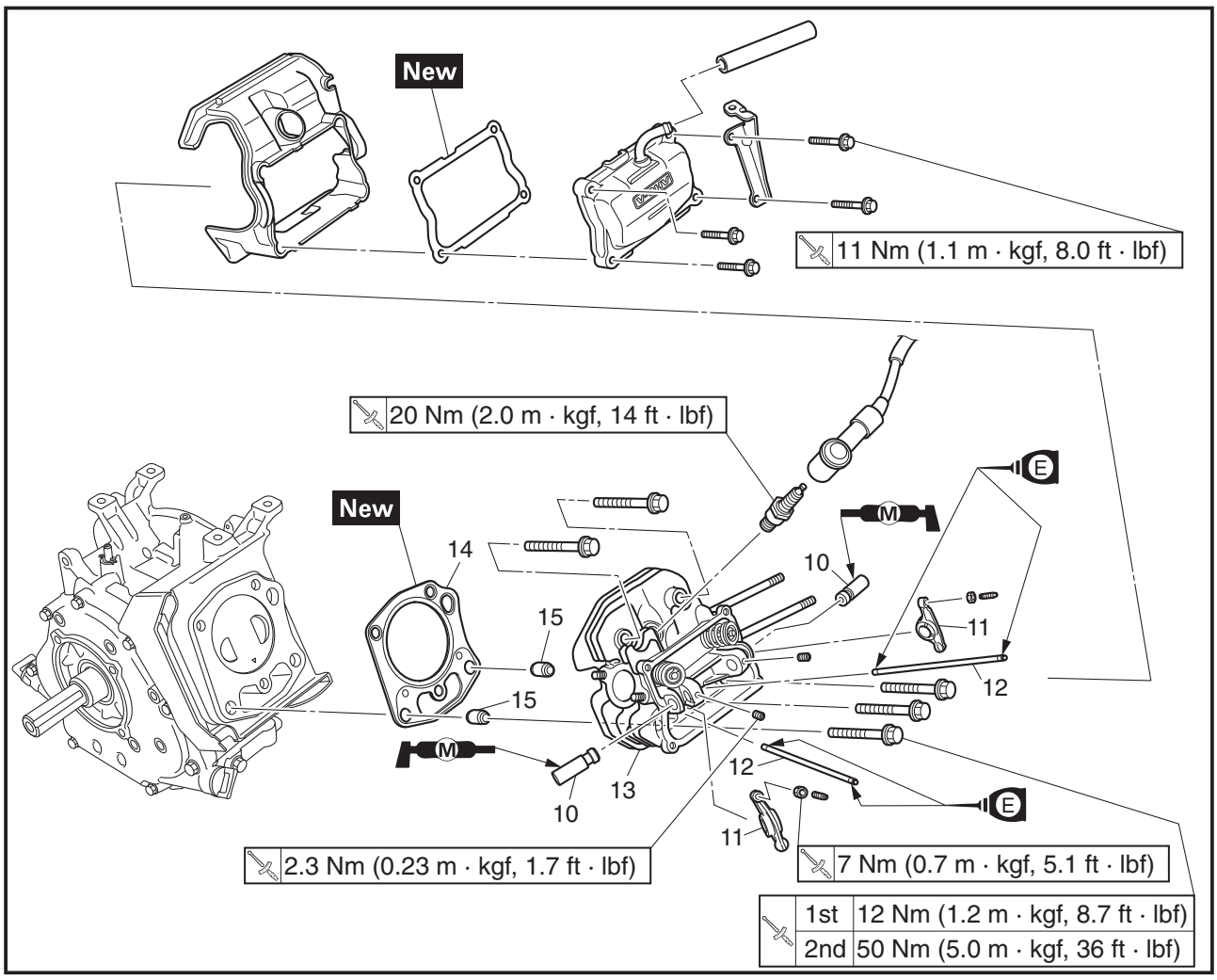


Order	Job/Parts to remove	Q'ty	Remarks
	Removing the engine switch and oil warning unit		Remove the parts in the order listed.
	Fuel tank		Refer to "FUEL TANK" on 3-4.
	Fuel tank stay		Refer to "FUEL TANK" on 3-4.
1	Clamp	1	With oil warning model
2	Oil warning unit	1	With oil warning model
3	Oil warning light	1	With oil warning model
4	Engine switch	1	
5	Protector	1	With oil warning model

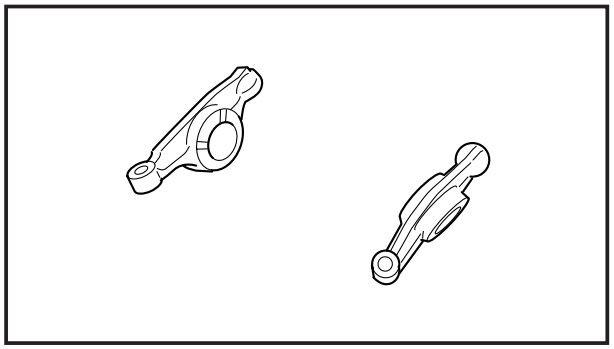
CYLINDER HEAD COVER, CYLINDER HEAD



Order	Job/Parts to remove	Q'ty	Remarks
	Removing the cylinder head cover, cylinder head		Remove the parts in the order listed.
	Fuel tank		Refer to "FUEL TANK" on 3-4.
	Muffler		Refer to "MUFFLER" on 3-6.
	Air filter		Refer to "AIR FILTER" on 3-3.
	Carburetor		Refer to "CARBURETOR" on 4-1.
	Flywheel cover		Refer to "FLYWHEEL" on 3-12.
1	Spark plug cap	1	
2	Spark plug	1	
3	Air filter case stay	1	
4	Cylinder head cover	1	
5	Cylinder head cover gasket	1	
6	Cylinder air shroud	1	
7	Locknut	2	
8	Adjuster	2	
9	Screw	2	

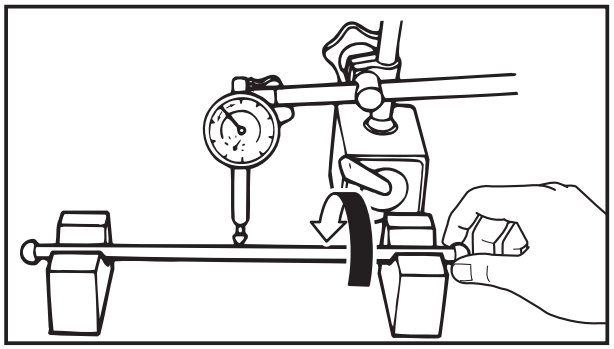


Order	Job/Parts to remove	Q'ty	Remarks
10	Rocker arm shaft	2	
11	Rocker arm	2	
12	Push rod	2	
13	Cylinder head assembly	1	
14	Cylinder head gasket	1	
15	Dowel pin	2	



CHECKING THE ROCKER ARM

1. Check:
   - Rocker arm
     Wear/damage/cracks → Replace.

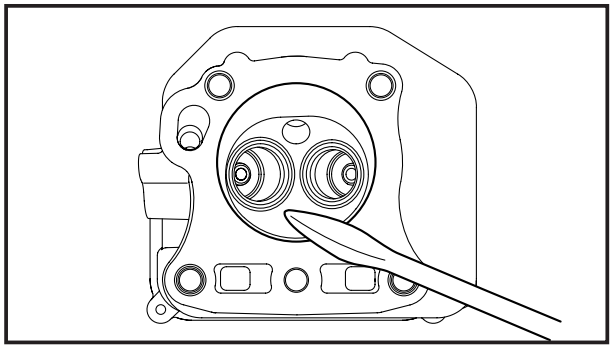


CHECKING THE PUSH ROD

1. Check:
   - Push rod runout

Runout limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

Out of specifications → Replace.



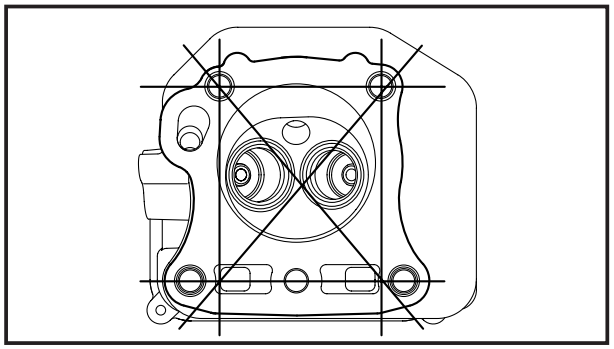
CHECKING THE CYLINDER HEAD

1. Check:
   - Cylinder head combustion chamber
     Check the combustion chamber for carbon deposits.
     Any carbon deposits → Eliminate.

TIP

Be sure not to damage the contact surface of the cylinder.

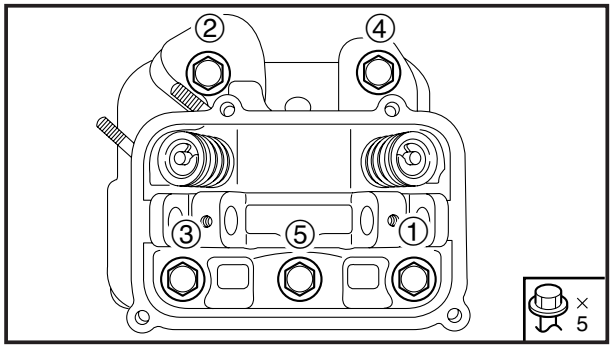
2. Check:
   - Cylinder head
     Cracks/damage around the hole of spark plug → Replace.



3. Measure:
   • Cylinder head warpage
   Measure the warpage on the contact surface of the cylinder head at six points using the straight edge and thickness gauge.

Warpage limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

Out of specifications → Resurface or replace.



INSTALLING THE CYLINDER HEAD ASSEMBLY

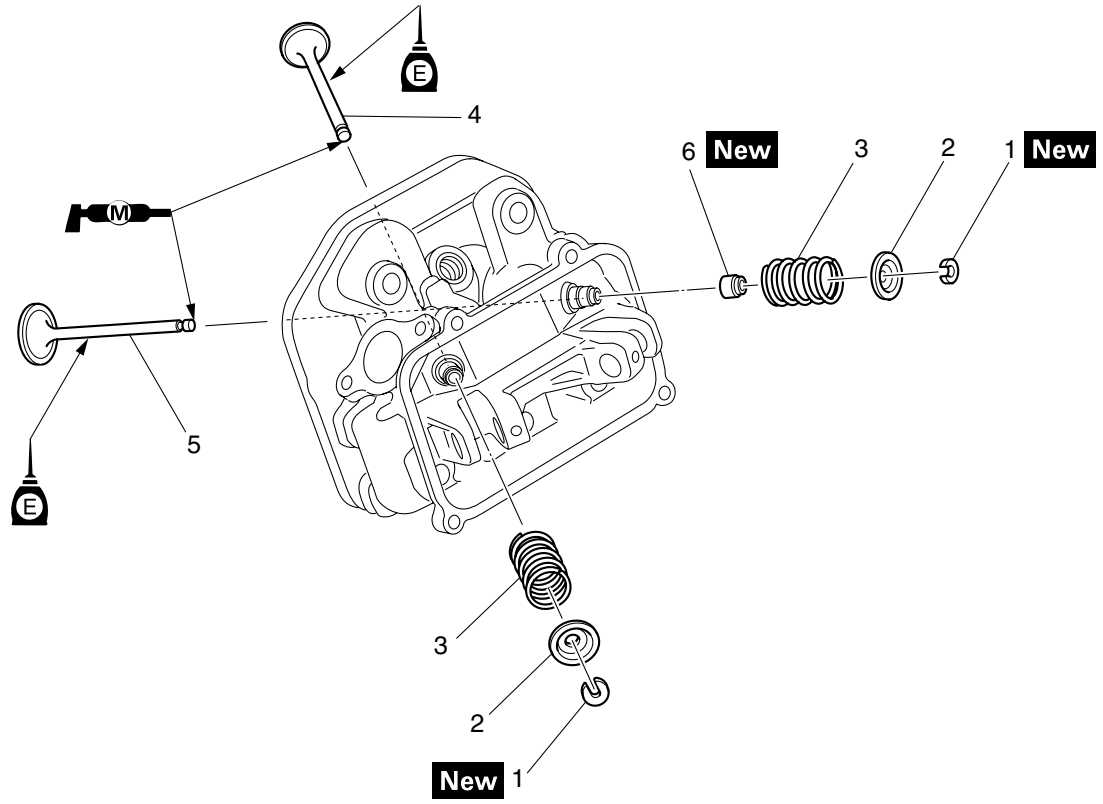
1. Install:
   • Cylinder head
   • Cylinder head bolts ① to ⑤.

TIP

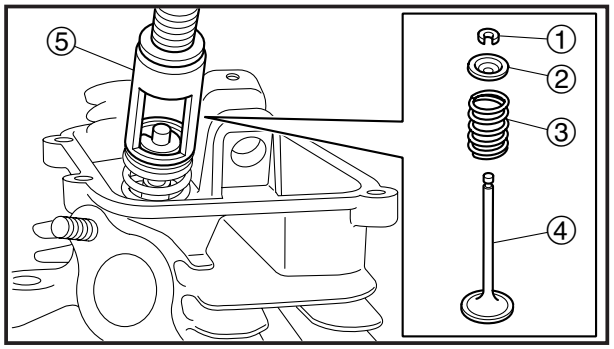
Tighten the bolts to the specified torque in two steps and in order from ① to ⑤.

Cylinder head bolt:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

VALVE



Order	Job/Parts to remove	Q'ty	Remarks
	Removing the valve		Remove the parts in the order listed.
	Cylinder head assembly		Refer to "CYLINDER HEAD COVER, CYLINDER HEAD" on 3-20.
1	Valve cotter	2	
2	Valve spring retainer	2	
3	Valve spring	2	
4	Exhaust valve	1	
5	Intake valve	1	
6	Valve stem seal	1	Intake side only.



REMOVING THE VALVE AND VALVE SPRING

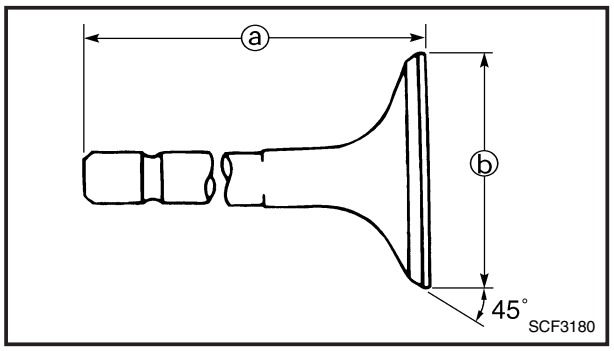
1. Remove:
   - Valve cotters ①
   - Valve spring retainers ②
   - Valve springs ③
   - Valves ④
   - Valve stem seal (Intake side only)

   Remove the parts using the valve spring compressor ⑤.

NOTICE

Do not compress the valve spring more than necessary.

	Valve spring compressor: 90890-01253

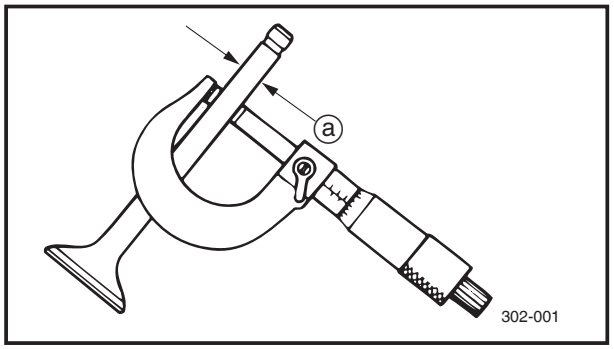


MEASURING THE VALVE AND VALVE SPRING

1. Measure:
   - Valve stem length ⓐ
   - Valve head diameter ⓑ

	Valve stem length: **Refer to "SPECIFICATIONS" in the Supplementary service manual.** **Valve head diameter:** **Refer to "SPECIFICATIONS" in the Supplementary service manual.**

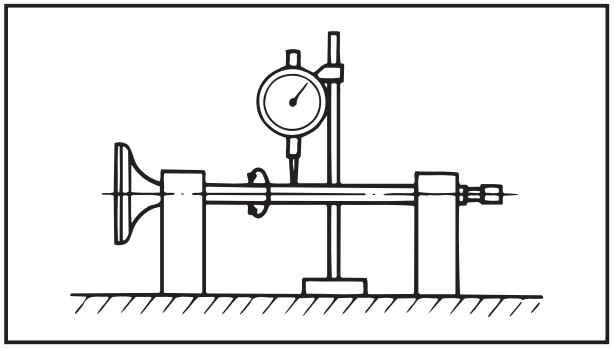
Out of specifications → Replace.

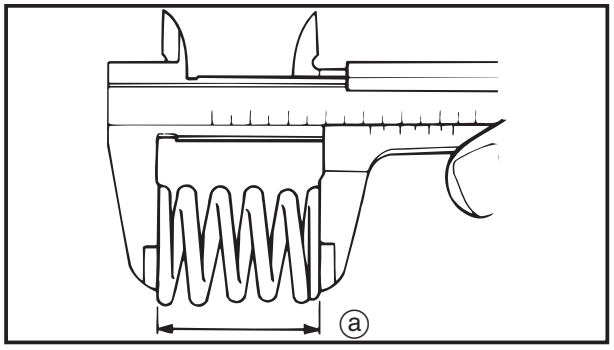


2. Measure:
   • Valve stem diameter ⓐ

Valve stem diameter:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

Out of specifications → Replace.





3. Measure:
   • Valve stem runout

Valve stem runout limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

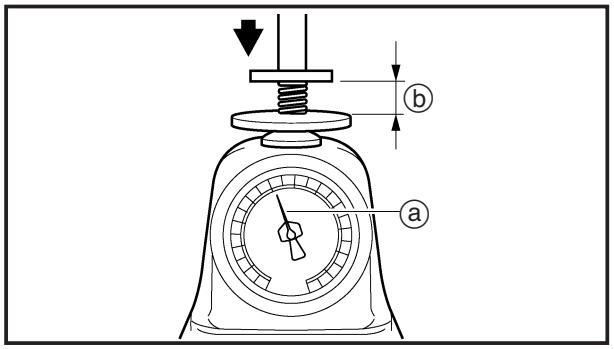
Out of specifications → Replace.

TIP
The value is half of that indicated on the dial gauge.

4. Measure:
   • Valve spring free length ⓐ

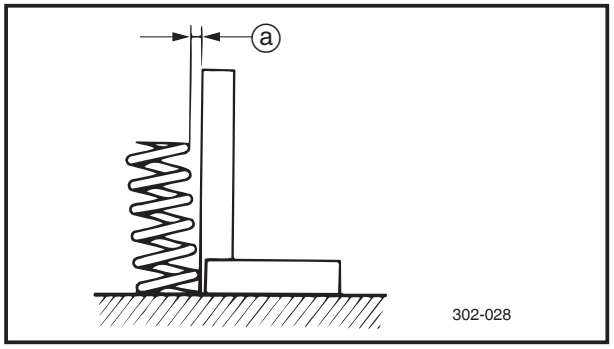
Valve spring free length:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

Out of specifications → Replace.



5. Measure:
   - Compressed valve spring force ⓐ
   - Installed length ⓑ
     Out of specification → Replace.

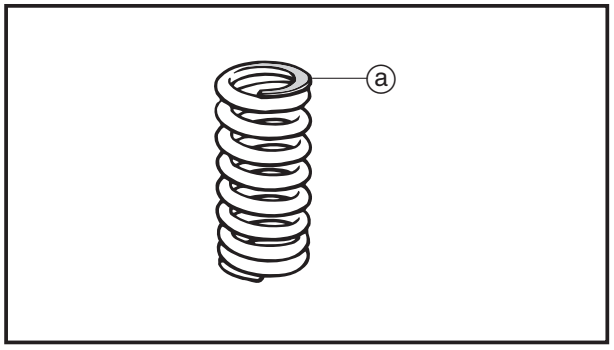
Installed compression spring force:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Installed length:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



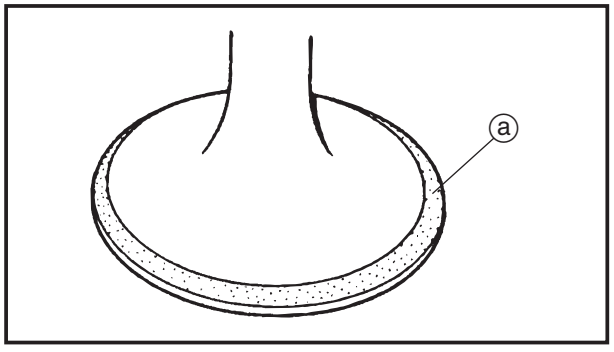
6. Measure:
   - Valve spring tilt ⓐ

Tilt limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

Out of specifications → Replace.

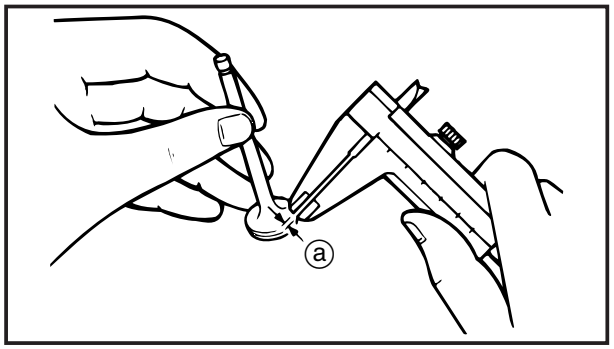


7. Check:
   - Valve spring contact surface ⓐ
     More than 2/3 of the contact surface does not contact → Replace.



CHECKING THE VALVE SEAT

1. Remove carbon deposits from the valve face and valve seat.
2. Apply a small amount of coarse mechanic's blueing dye (Dykem) to the valve face ⓐ.
3. Insert the valve into the valve guide and use a valve lapper to contact the valve face with the valve seat.



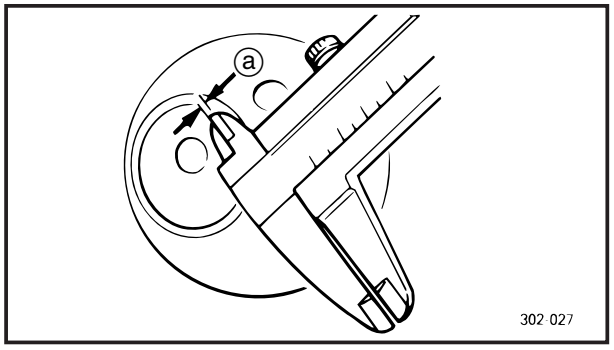
TIP

Do not rotate the valve while the valve face is contacting the valve seat.

4. Measure:
   - Valve face contact width ⓐ
     Make sure that the contact width along the entire valve face is within specifications.

Valve face contact width:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

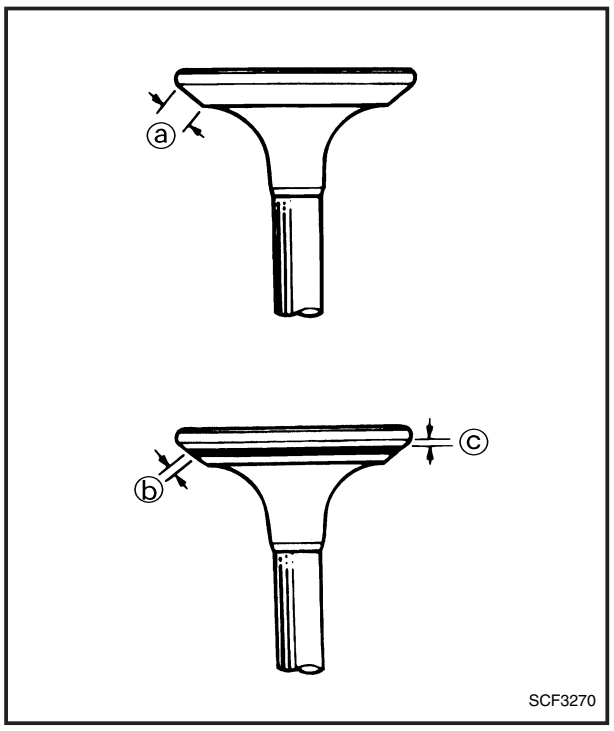
Out of specification/rough/eccentric wear → Replace.



5. Measure:
   - Valve seat contact width ⓐ
     Make sure that the contact width along the entire valve seat is within specifications.

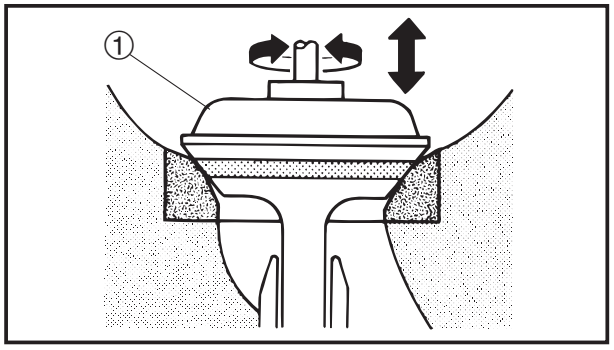
Valve seat contact width:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

Out of specification/rough/eccentric wear → Replace.



6. Remove carbon deposits on the valve face ⓐ and valve seat.
   - Valve seat width ⓑ
   - Valve margin thickness ⓒ
     Apply a small amount of coarse mechanic's blueing dye (Dykem) to the valve seat.
     Press the valve through the valve guide and onto the valve seat to make a clear impression.
   - Valve margin thickness
     Out of specification → Replace.
   - Valve face contact width
     Out of specification → Replace.

Valve seat width:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Valve margin thickness:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



VALVE LAPPING

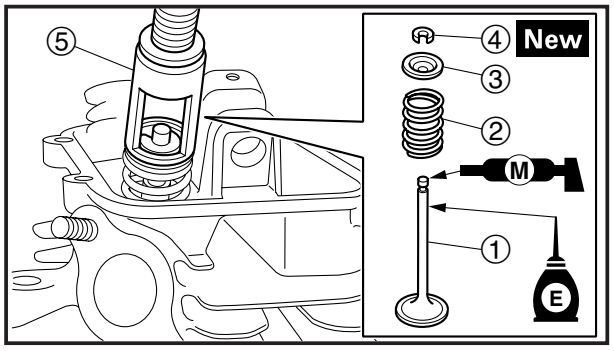
1. Apply a coarse lapping compound evenly on the valve face. Lap the valve by tapping and rotating the valve lapper ① clockwise and counterclockwise.
2. Clean off all of the lapping compound from the valve face and valve seat. Apply fine lapping compound on the valve face and lap the valve as described in step 1.
3. Once the contacting surface of the valve face is polished and becomes shiny, apply mechanic's blueing dye (Dykem) to make sure that there are traces of even contact in the center of the valve face.

NOTICE

Do not let the lapping compound enter the gap between the valve stem and the valve guide.

TIP

After every lapping procedure, clean off the compound from the valve face and valve seat.

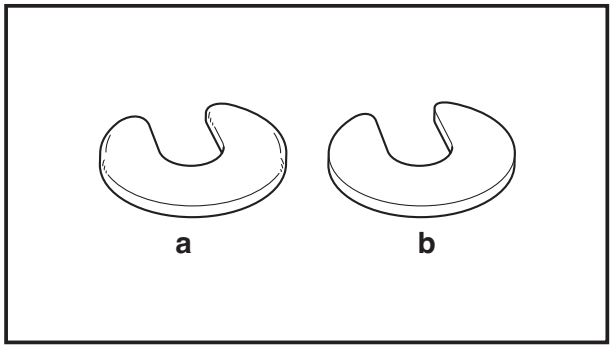


INSTALLING THE VALVE AND VALVE SPRING

1. Install:
   - Valve stem seal **New** (Intake side only)
   - Valves ①
   - Valve springs ②
   - Valve spring retainers ③
   - Valve cotters ④ **New**

     Apply a small amount of molybdenum disulfide grease to the valve stem and use the valve spring compressor ⑤ to install the parts.

	Valve spring compressor: 90890-01253

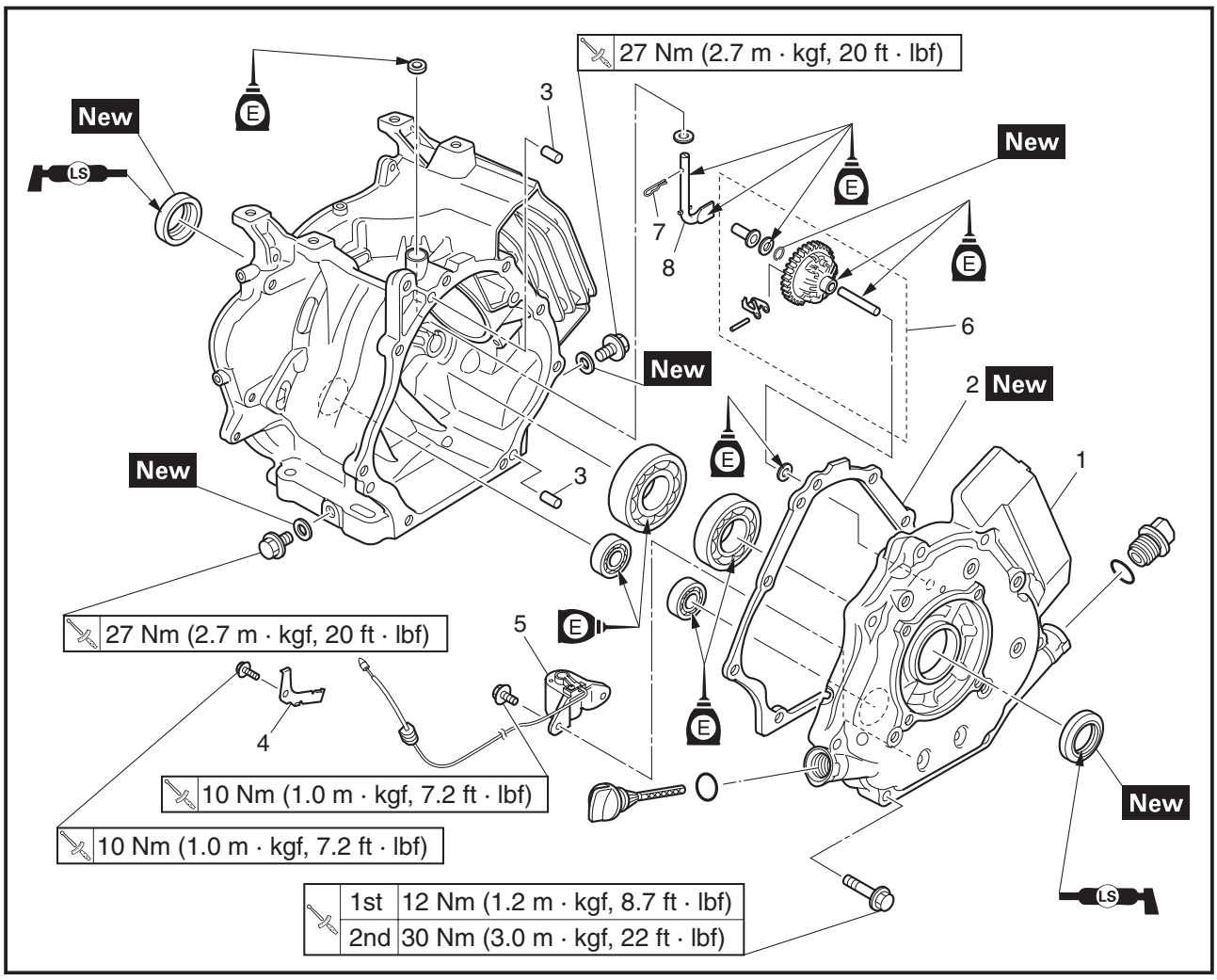


NOTICE

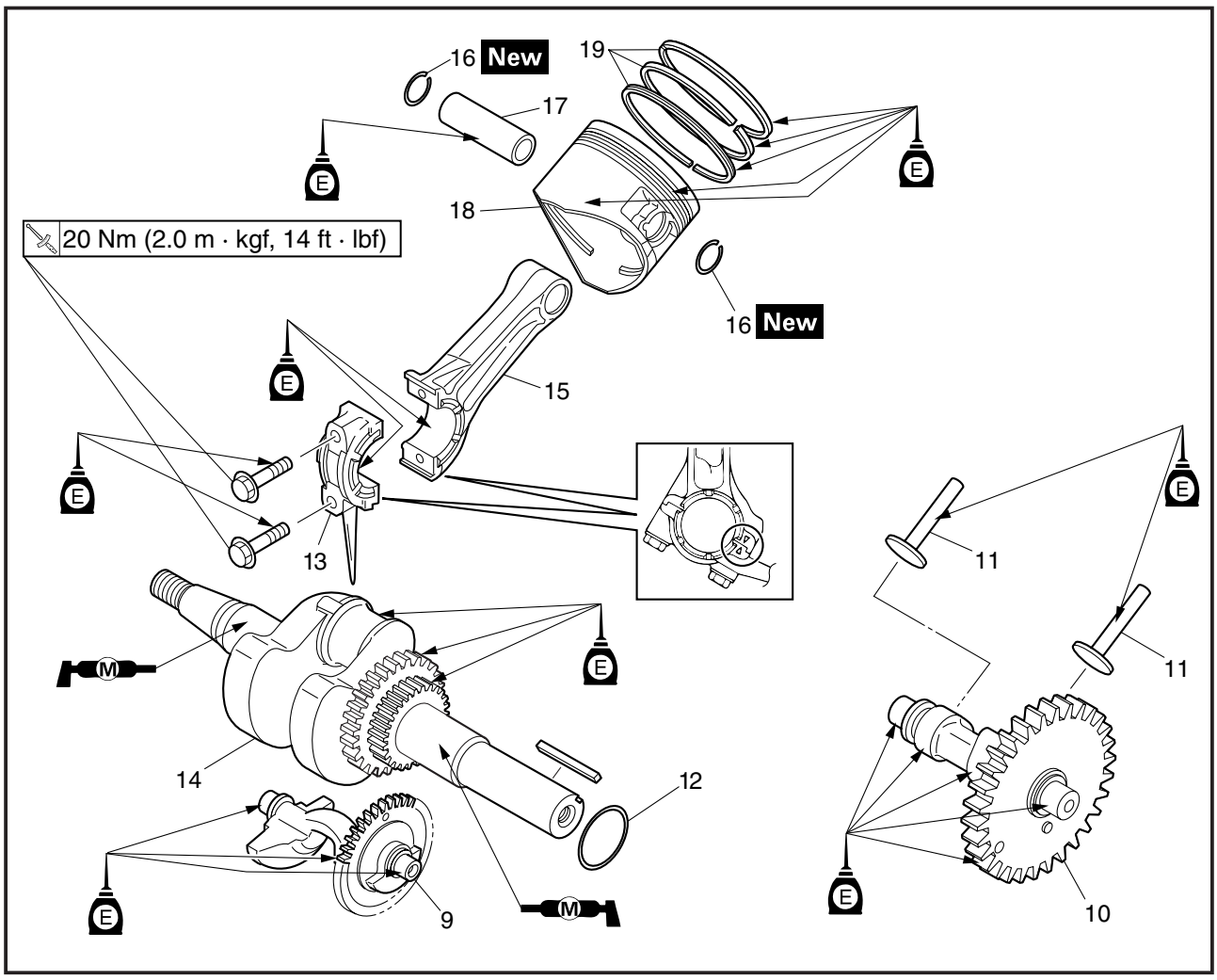
- **Do not compress the spring more than necessary.**
- **Surface "a" with the rounded edges of the valve cotter must face downward (to the valve spring retainer side) when installing it on top of the valve spring retainer.**

  If surface "b" of the opposite side is facing downward when the valve cotter is installed, it could result in the premature wear of the valve cotter.

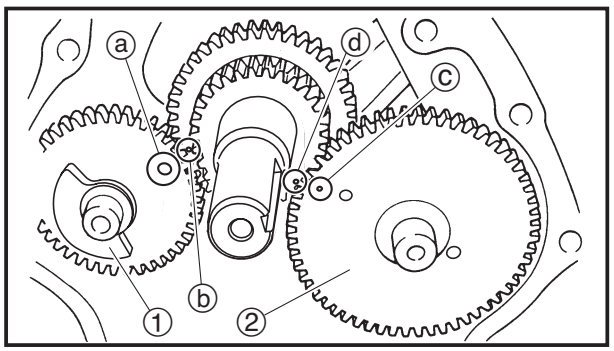
PISTON, CAMSHAFT, CRANKCASE, AND CRANKSHAFT



Order	Job/Parts to remove	Q'ty	Remarks
	Removing the piston, camshaft, crankcase, and crankshaft		Remove the parts in the order listed.
	Cylinder head assembly		Refer to "CYLINDER HEAD COVER, CYLINDER HEAD" on 3-20.
	Flywheel		Refer to "FLYWHEEL" on 3-12.
1	Crankcase cover	1	
2	Gasket	1	
3	Dowel pin	2	
4	Clamp	1	With oil warning model
5	Oil level switch	1	With oil warning model
6	Flyweight shaft assembly	1	
7	Clip	1	
8	Governor shaft	1	



Order	Job/Parts to remove	Q'ty	Remarks
9	Balancer shaft	1	
10	Camshaft	1	
11	Valve lifter	2	
12	Crankshaft shim	—	Refer to "SELECTING THE CRANKSHAFT SHIM" on 3-47.
13	Connecting rod cap	1	
14	Crankshaft	1	
15	Connecting rod	1	
16	Piston pin circlip	2	
17	Piston pin	1	
18	Piston	1	
19	Piston ring set	1	



REMOVING THE BALANCER SHAFT, CAMSHAFT, AND VALVE LIFTER

1. Remove:
   - Balancer shaft ①

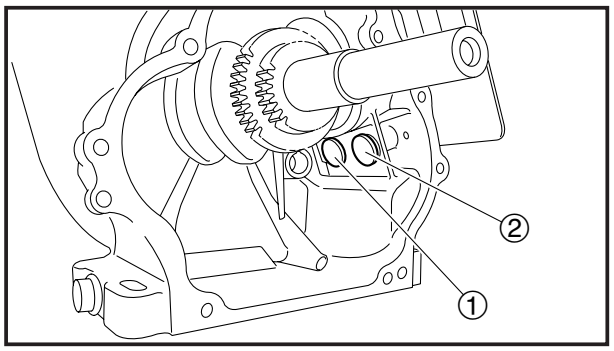
TIP

Remove the balancer shaft ① when the balancer shaft gear mark ⓐ and the crankshaft gear mark ⓑ are aligned.

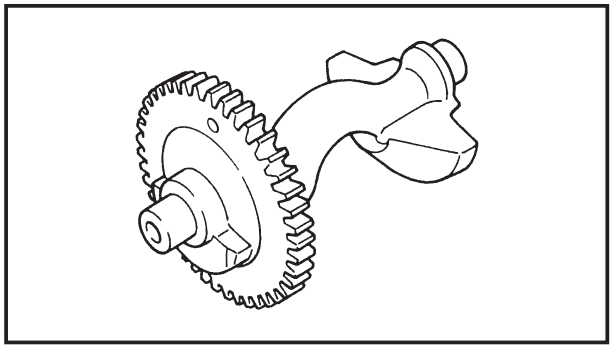
2. Remove:
   - Camshaft ②

TIP

Remove the camshaft ② when the camshaft gear mark ⓒ and the crankshaft gear mark ⓓ are aligned.

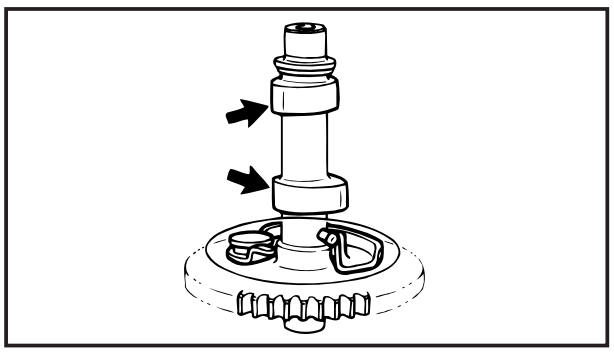


3. Remove:
   - Intake valve lifter ①
   - Exhaust valve lifter ②



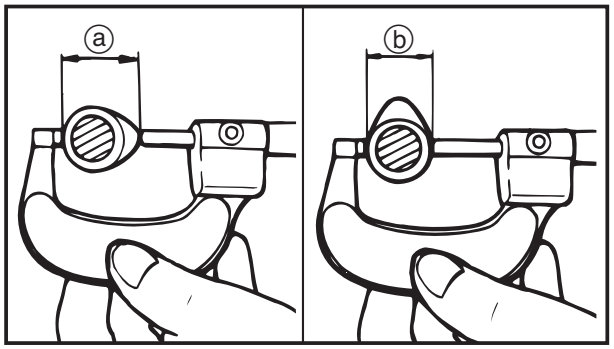
CHECKING THE BALANCER SHAFT

1. Check:
   - Balancer gear teeth
   - Balancer shaft
     Wear/damage → Replace.



CHECKING THE CAMSHAFT

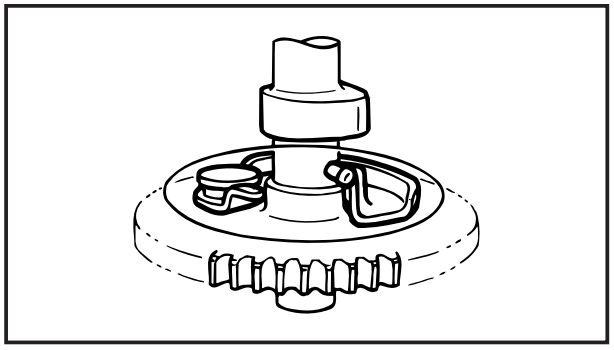
1. Check:
   - Camshaft
     Crack/damage/wear → Replace.



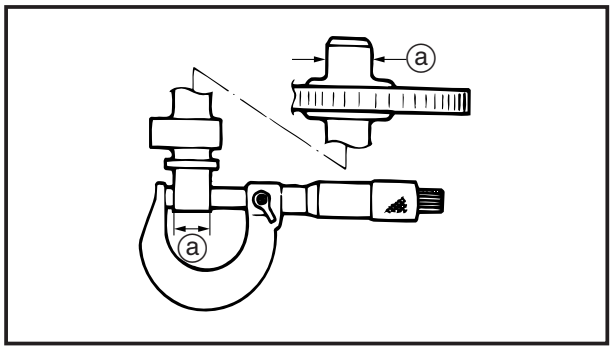
2. Check:
   - Camshaft lobe dimensions ⓐ and ⓑ

Camshaft lobe dimensions:
Dimension ⓐ:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Dimension ⓑ:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

Out of specification → Replace.



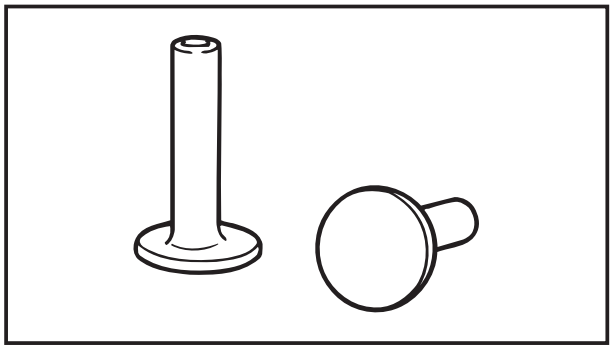
3. Check:
   - Surface of camshaft gear teeth
   - Decompressor
   Crack/damage/wear → Replace.



4. Check:
   - Camshaft journal diameter ⓐ

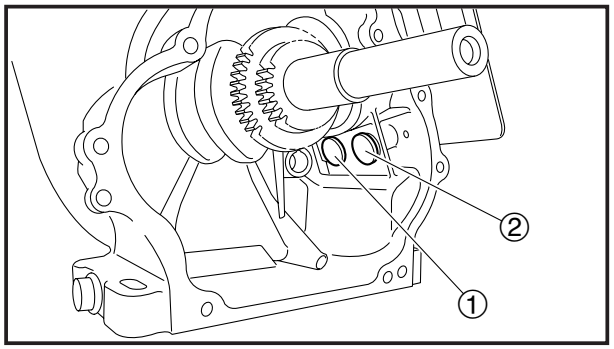
Camshaft journal diameter (limit):
Refer to "SPECIFICATIONS" in the Supplementary service manual.

Out of specification → Replace.



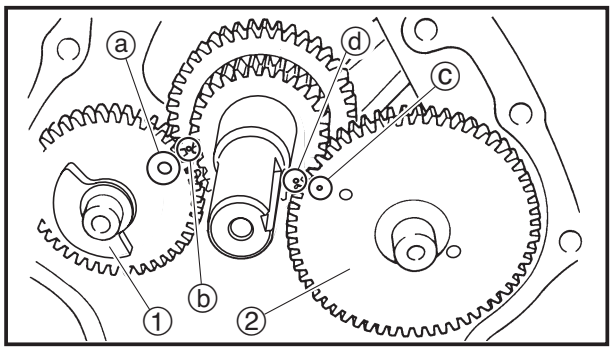
CHECKING THE VALVE LIFTER

1. Check:
   - Valve lifter
     Damage → Replace.



INSTALLING THE VALVE LIFTER, BALANCER SHAFT, AND CAMSHAFT

1. Install:
   - Intake valve lifter ①
   - Exhaust valve lifter ②



2. Install:
   - Balancer shaft ①

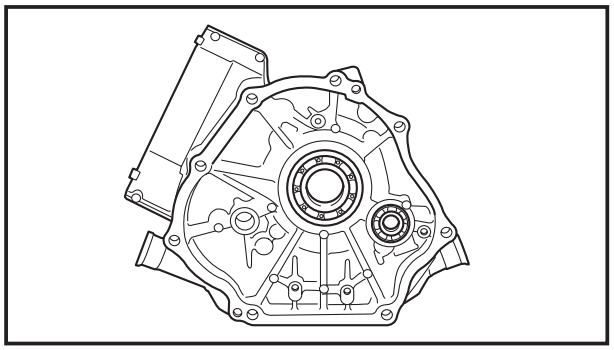
NOTICE

Be sure to align the balancer shaft ① gear mark ⓐ with the crankshaft gear mark ⓑ.

3. Install:
   - Camshaft ②

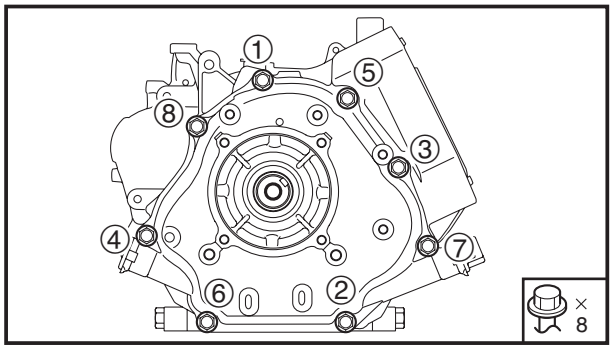
NOTICE

Be sure to align the camshaft ② gear mark ⓒ with the crankshaft gear mark ⓓ.



CHECKING THE CRANKCASE COVER

1. Check:
   - Crankcase cover
     Damage → Replace.
   - Bearings
     Noise/wear/rotational failure → Replace.



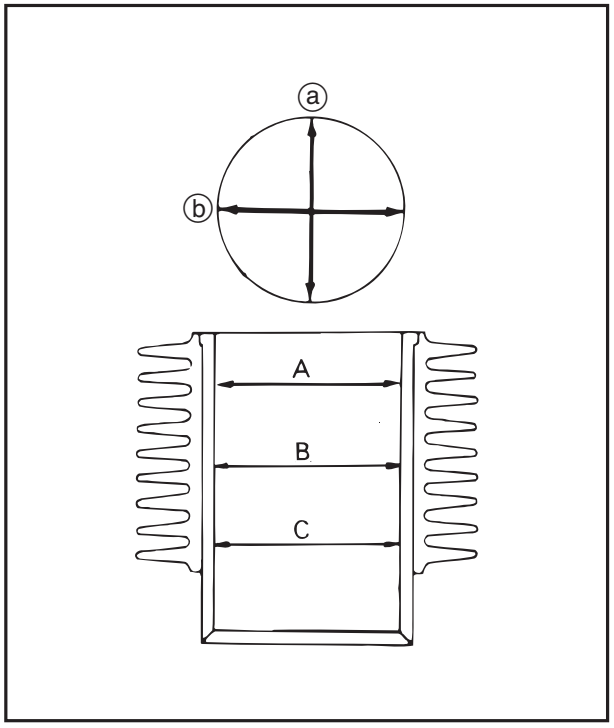
INSTALLING THE CRANKCASE COVER

1. Install:
   - Crankcase cover
   - Crankcase cover bolts ① to ⑧

TIP

Tighten the bolts to the specified torque in two steps and in order from ① to ⑧.

Crankcase cover bolt:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.



MEASURING THE CYLINDER

1. Measure:
   - Cylinder inside diameter

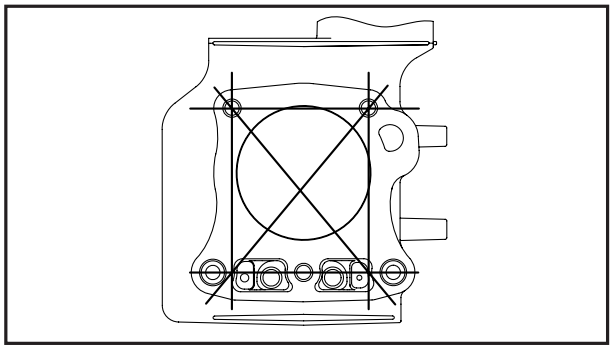
TIP

Take side to side ⓐ and front to back ⓑ measurements at each of the three locations A, B, C (total of six measurements) using the cylinder gauge, and then calculate the average of the measurements.

Cylinder taper = Maximum A – Minimum C.

Out of specification → Replace the crankcase.

Cylinder inside diameter:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Cylinder taper limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



2. Measure:
   • Cylinder warpage

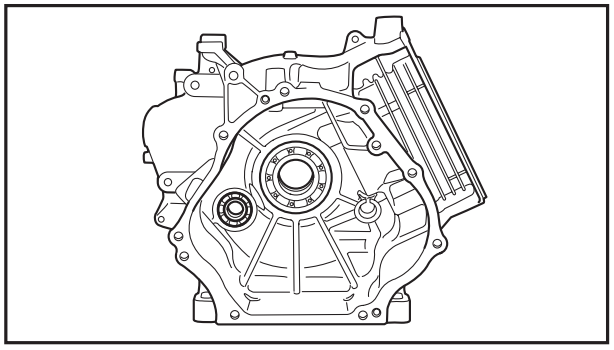
TIP

Measure the warpage on the contact surface of the cylinder head at six points using the straight edge and thickness gauge.

Feeler gauge set:
YU-26900-9
Thickness gauge:
90890-03180

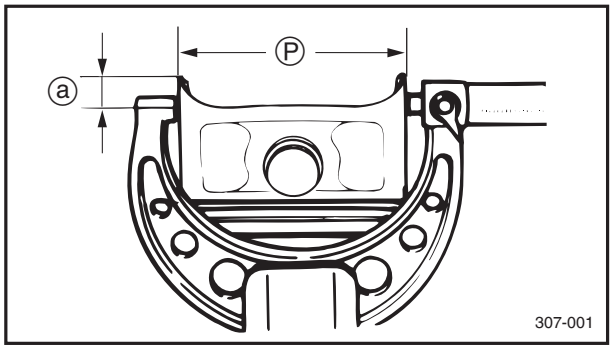
Warpage limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

Out of specification → Replace the crankcase.



CHECKING THE CRANKCASE

1. Check:
   • Crankcase
   Damage → Replace.
   • Bearings
   Noise/wear/rotational failure → Replace.



CHECKING THE PISTON AND PISTON PIN

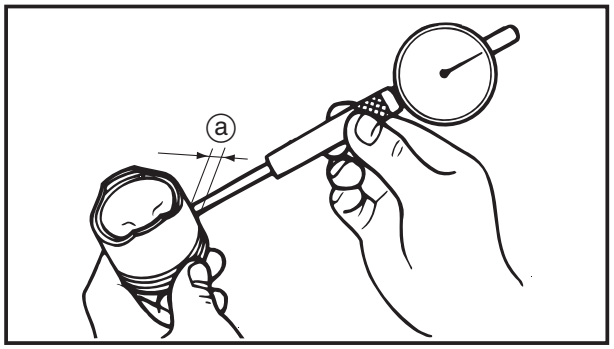
1. Measure:
   - Piston skirt diameter Ⓟ
     ⓐ = 10 mm (0.4 in) from the piston bottom edge
     Out of specification → Replace.

Piston skirt diameter:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

2. Measure:
   - Piston clearance
     Out of specifications → Rebore or replace the cylinder, and then replace the piston and piston rings.

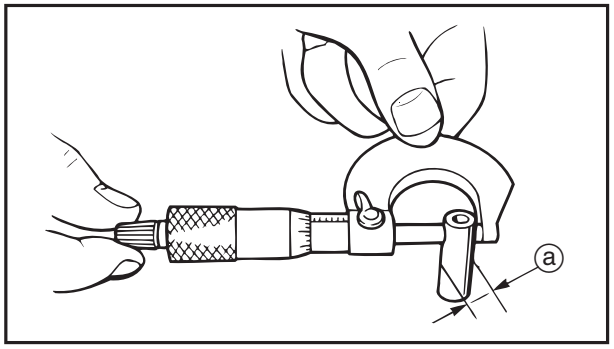
Piston clearance =
Cylinder inside diameter –
Piston skirt diameter

Piston clearance:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



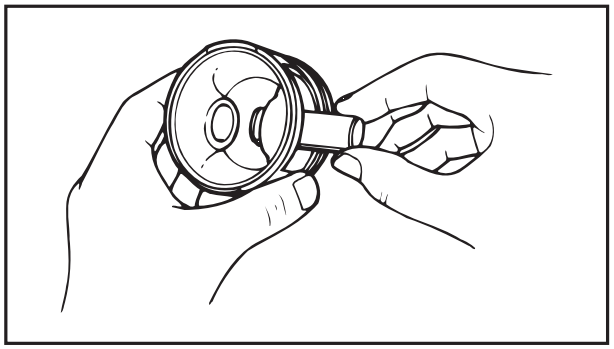
3. Measure:
   • Piston pin hole inside diameter ⓐ
   Out of specifications → Replace.

Piston pin hole inside diameter:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



4. Measure:
   • Piston pin diameter ⓐ
   Out of specification → Replace.

Piston pin diameter:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



5. Check:
   - Check that the piston pin enters smoothly into the piston pin hole.

TIP

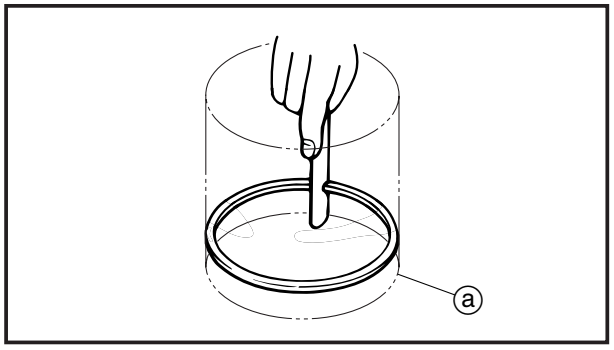
If the piston pin fits too tight into the piston, check the piston pin hole. If there is any protrusion, use a knife or scraper to gently remove it so that piston pin can be pushed in smoothly with your fingers.

MEASURING THE PISTON RING

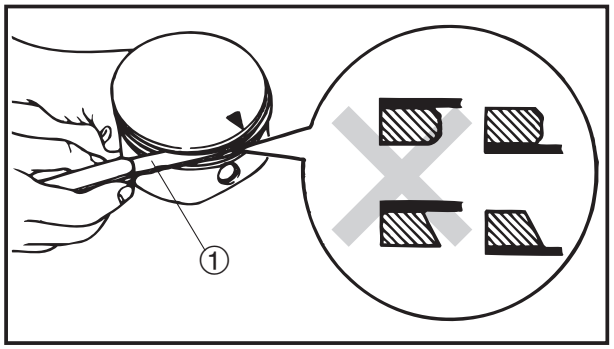
1. Measure:
   - Piston ring end gap
     Out of specification → Replace the piston and piston ring as a set.
2. Install:
   - Piston ring
     (into the cylinder)

TIP

Using the piston crown, level the piston ring into the bottom of the cylinder ⓐ where the cylinder is least worn.



	Piston ring end gap	Limit
Top ring	Refer to "SPECIFICATIONS" in the Supplementary service manual.	Refer to "SPECIFICATIONS" in the Supplementary service manual.
2nd ring		
Oil ring		—

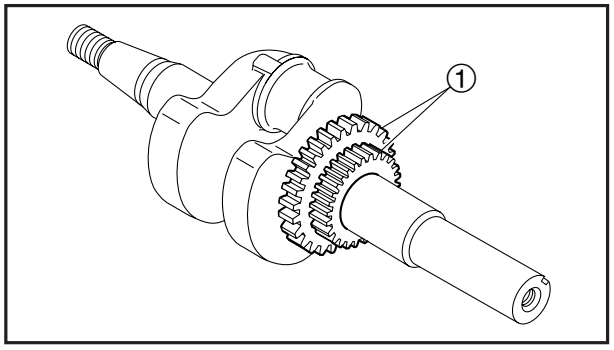


3. Measure:
   • Piston ring side clearance
   Out of specification → Replace the piston and piston ring as a set.
   Use a thickness gauge ①.

TIP
- Clean carbon deposits from the piston ring grooves and rings before measuring the side clearance.
- Measure the side clearance at several positions.

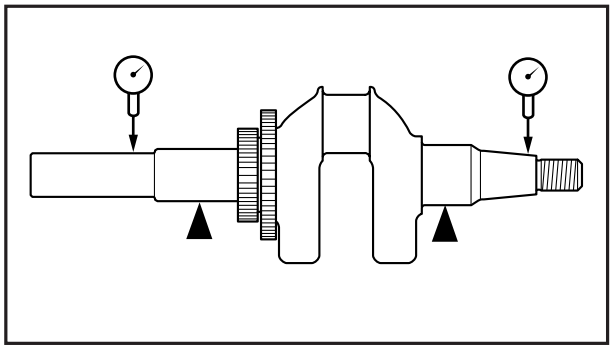
Feeler gauge set:
YU-26900-9
Thickness gauge:
90890-03180

	Piston ring side clearance	Limit
Top ring	Refer to "SPECIFICATIONS" in the Supplementary service manual.	Refer to "SPECIFICATIONS" in the Supplementary service manual.
2nd ring		



CHECKING THE CRANKSHAFT

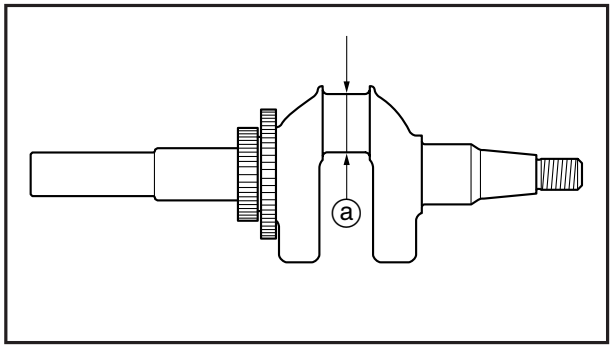
1. Check:
   • Crankshaft sprocket ①
   Damage/wear → Replace the crankshaft.



2. Measure:
   • Crankshaft runout limit
   Out of specification → Replace.
   Use a dial gauge.

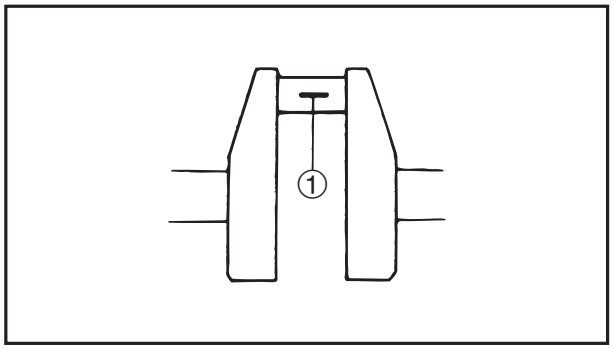
Dial indicator gauge:
YU-A8428
Dial gauge:
90890-03097

Runout limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



3. Measure:
   • Crank pin outside diameter ⓐ
   Out of specification → Replace.
   Use a micrometer.

Crank pin outside diameter:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



CHECKING THE CONNECTING ROD OIL CLEARANCE

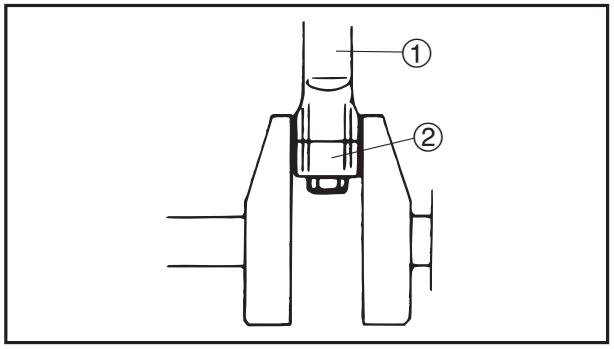
TIP

Measure the oil clearance if replacing the crankshaft or connecting rod.

1. Place a piece of Plastigauge® ① on the crank pin horizontally.

TIP

Wipe off oil thoroughly from the crankshaft, connecting rod, and connecting rod cap.

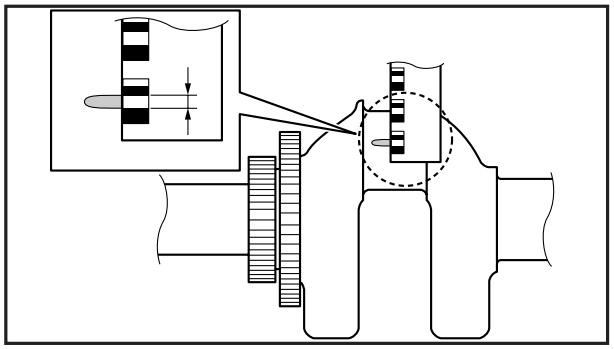


2. Install:
   - Connecting rod ①
   - Connecting rod cap ②

Connecting rod cap bolt:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

TIP

Tighten the cap bolts so that the crankshaft does not move while the oil clearance is being measured.

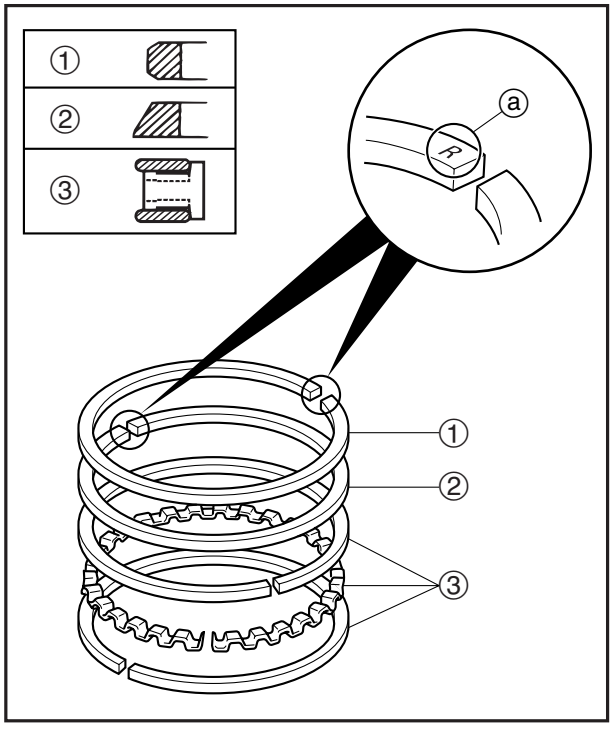


3. Remove:
   - Connecting rod cap
   - Connecting rod
4. Measure:
   - Connecting rod big end oil clearance
     Out of specification → Replace crankshaft or connecting rod assembly, and then measure the clearance again.

TIP

Measure the widest portion of the pressed Plastigauge®.

Connecting rod big end oil clearance:
Refer to "SPECIFICATIONS" in the Supplementary service manual.
Limit:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



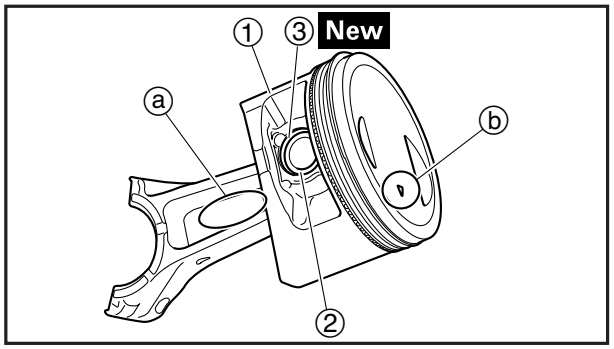
INSTALLING THE PISTON AND PISTON RING

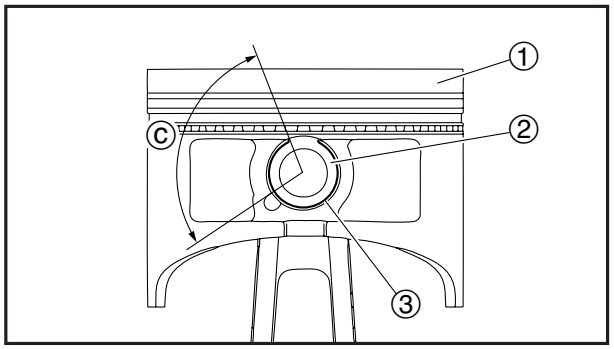
1. Install:
   - Top ring ①
   - 2nd ring ②
   - Oil ring ③

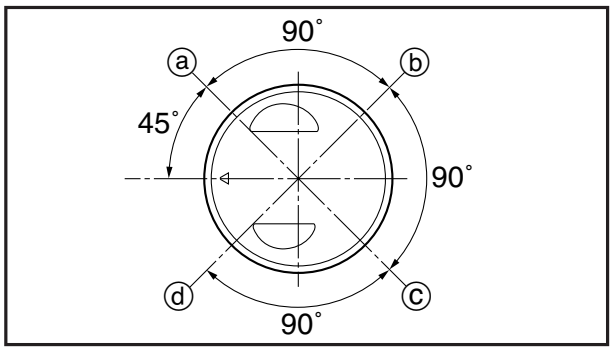
TIP

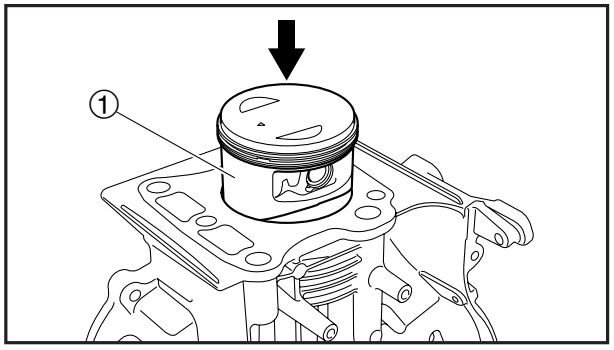
- Be sure to install the top ring and 2nd ring so that the "R" mark ⓐ faces toward the piston head.
- Make sure that the piston rings move smoothly.

2. Apply the engine oil to the inside of the connecting rod small end.









3. Install:
   - Piston ①
   - Piston pin ②
   - Piston pin circlips ③ New

TIP

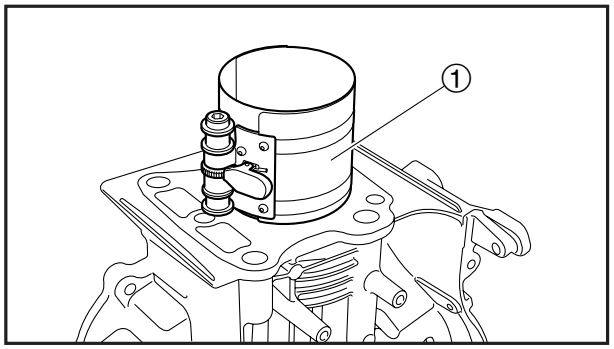
- Make sure that the "7HD" mark ⓐ on the connecting rod faces toward the crankcase cover.
- Make sure that the "▽" mark ⓑ on the piston head faces toward the push rod.
- Install the piston pin circlips so that the circlip ends are 45° ⓒ or more from the cutout in the piston.

INSTALLING THE CRANKSHAFT

1. Make sure that the end gap of each piston ring is positioned correctly, as shown in the illustration.

ⓐ Lower oil ring rail
ⓑ 2nd ring
ⓒ Upper oil ring rail
ⓓ Top ring, oil ring expander

2. Install:
   - Piston with the connecting rod ①

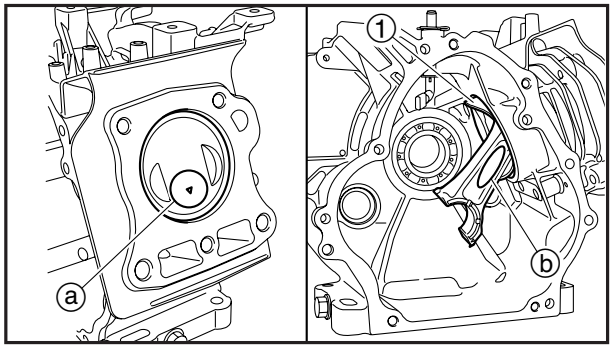


3. Attach:
   - Piston ring compressor ①

	Piston ring compressor: **YM-08037, 90890-05158**

TIP

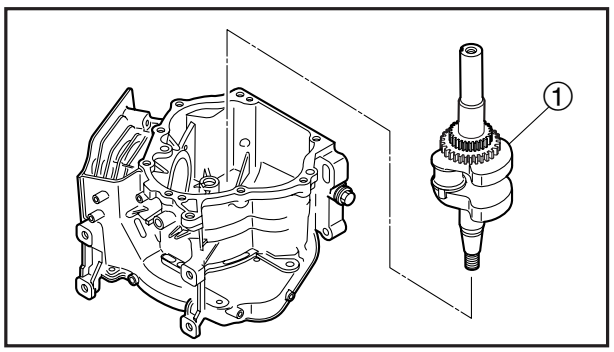
Attach the piston ring compressor to the piston, and then insert the piston into the cylinder.



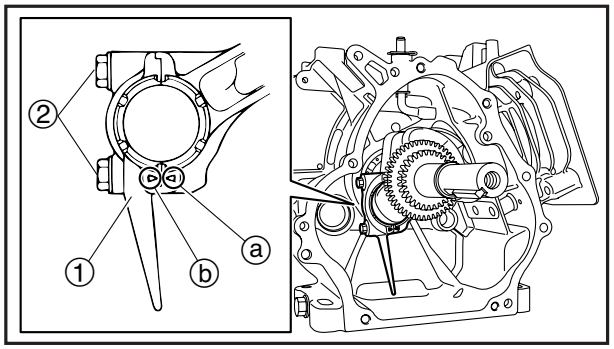
4. Check:
   - Piston with the connecting rod ① position

TIP

- Make sure that the "▽" mark ⓐ on the piston head faces toward the push rod.
- Make sure that the "7HD" mark ⓑ on the connecting rod faces toward the crankcase cover.



5. Install:
   - Crankshaft ①



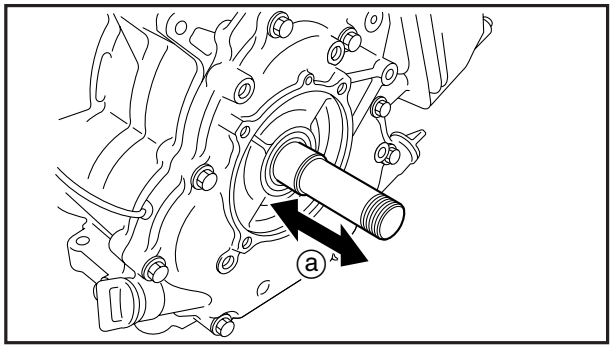
6. Install:
   - Connecting rod cap ①
   - Connecting rod cap bolts ②

Connecting rod cap bolt:
Refer to "TIGHTENING TORQUES" in the Supplementary service manual.

TIP

- Make sure that the "▽" mark ⓐ on the connecting rod is aligned with the "▽" mark ⓑ on the connecting rod cap.
- Tighten the connecting rod cap bolts alternately two to three times.

7. Install:
   - Balancer shaft
   - Camshaft
     (Refer to "INSTALLING THE VALVE LIFTER, BALANCER SHAFT, AND CAMSHAFT" on 3-35)
   - Crankcase cover
     (Refer to "INSTALLING THE CRANKCASE COVER" on 3-36)



SELECTING THE CRANKSHAFT SHIM

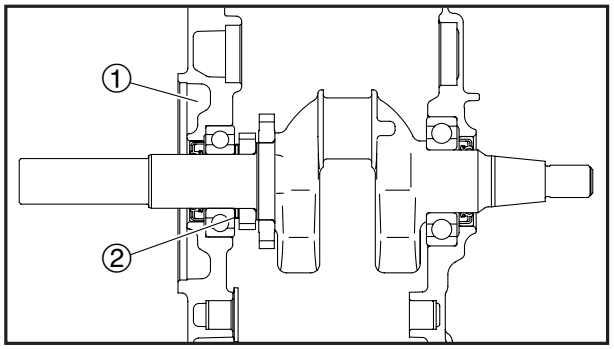
1. Measure:
   - Crankshaft free play ⓐ
     Out of specification → Adjust.

Crankshaft free play:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

2. Calculate
   - Shim thickness

TIP

For example, if the free play is 0.4 mm (0.016 in), install a 0.3 mm (0.012 in) shim on the crankshaft so that free play is 0.1 mm (0.004 in).



3. Adjust:
   • Crankshaft free play
   Adjustment steps:
   a. Remove the crankcase cover ①.
      (Refer to "PISTON, CAMSHAFT, CRANKCASE, AND CRANKSHAFT" on 3-31)
   b. Install or remove the shim ② of the proper thickness.
   c. Install the crankcase cover ①.
      (Refer to "INSTALLING THE CRANKCASE COVER" on 3-36)
   d. Measure the crankshaft free play again.

TIP

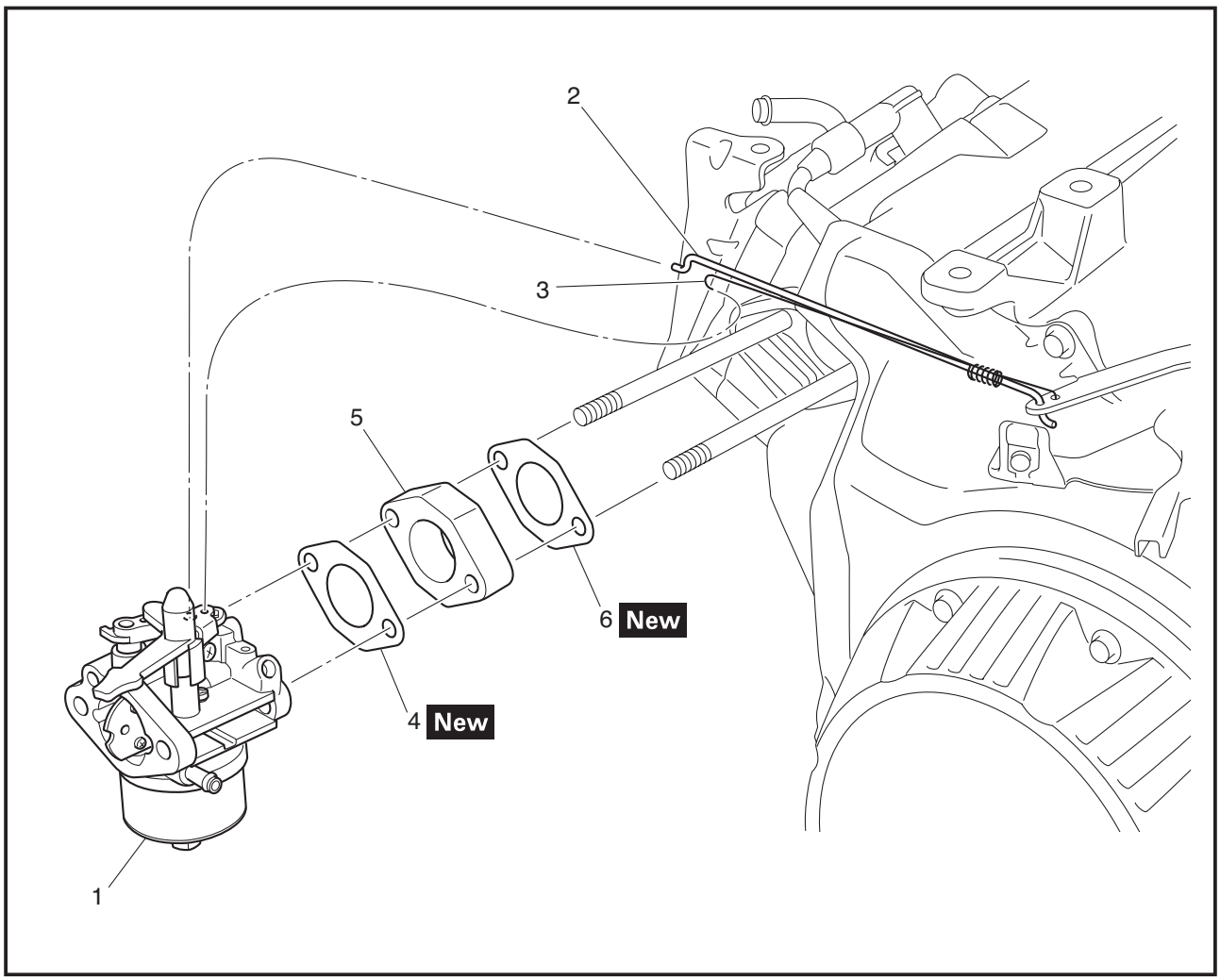
Repeat these steps until the free play is within specification.

Shim thickness table:

Part number	Shim thickness
7CT-E1561-00	0.1 ± 0.03 mm (0.0039 ± 0.0012 in)
7CT-E1561-10	0.2 ± 0.05 mm (0.0079 ± 0.0020 in)
7CT-E1561-20	0.3 ± 0.05 mm (0.0118 ± 0.0020 in)
7CT-E1561-30	0.4 ± 0.05 mm (0.0157 ± 0.0020 in)

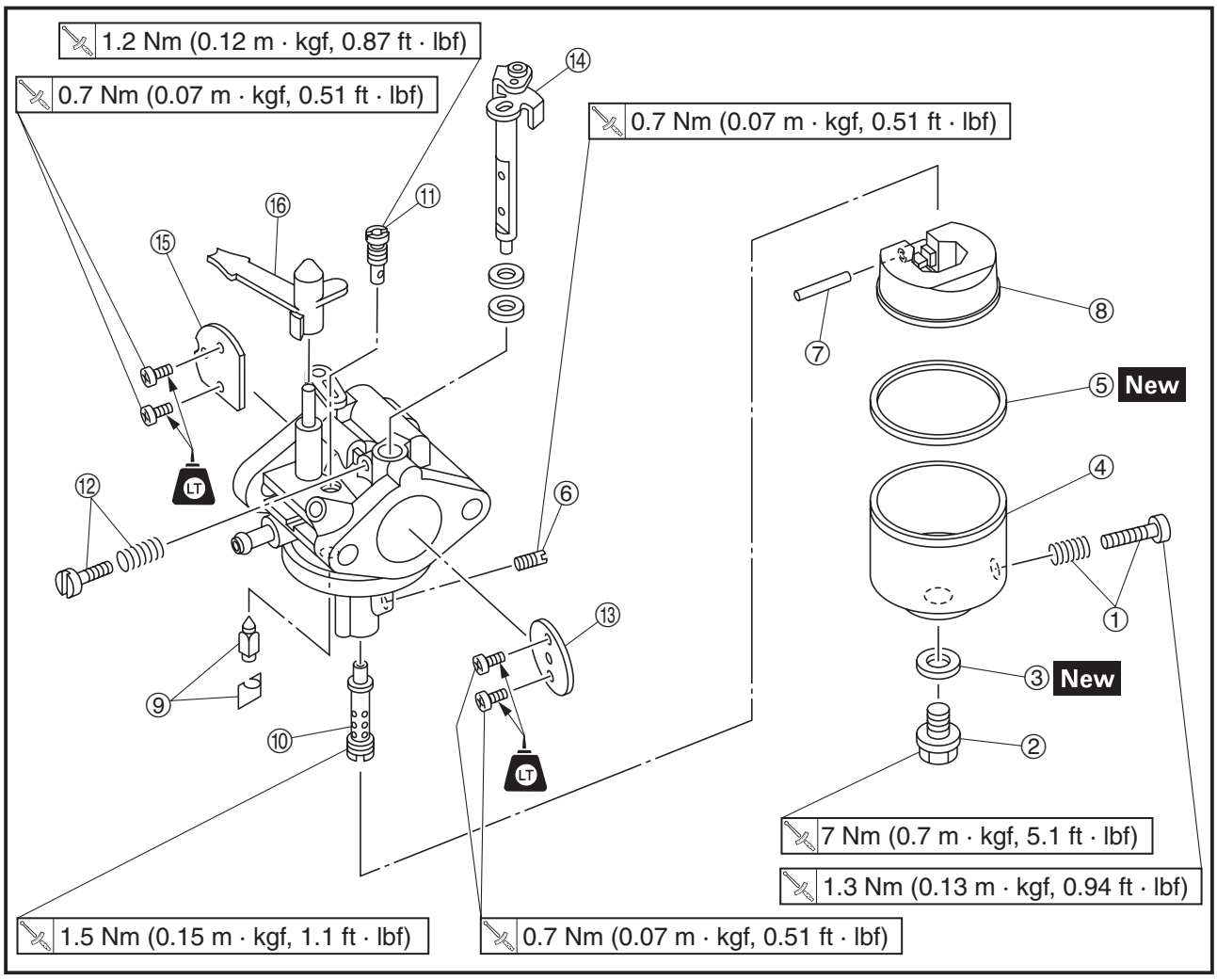
CARBURETOR

REMOVING THE CARBURETOR

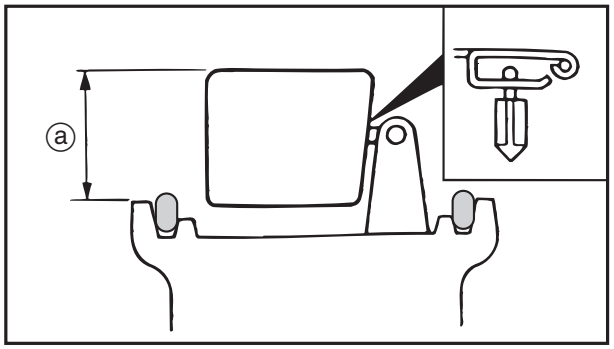


Order	Job/Parts to remove	Q'ty	Remarks
	Removing the carburetor		Remove the parts in the order listed.
	Fuel tank		Refer to "FUEL TANK" on 3-4.
	Air filter		Refer to "AIR FILTER" on 3-3.
1	Carburetor assembly	1	
2	Link rod	1	
3	Spring	1	
4	Gasket	1	
5	Joint	1	
6	Gasket	1	

DISASSEMBLING THE CARBURETOR



Order	Job/Parts to remove	Q'ty	Remarks
	Disassembling the carburetor		Disassemble the parts in the order listed.
①	Drain screw/Spring	1/1	
②	Float chamber bolt	1	
③	Gasket	1	
④	Float chamber	1	
⑤	Gasket	1	
⑥	Main jet	1	
⑦	Float pin	1	
⑧	Float	1	
⑨	Needle assembly	1	
⑩	Main nozzle	1	
⑪	Pilot jet	1	
⑫	Throttle stop screw/Spring	1/1	
⑬	Throttle valve	1	
⑭	Throttle shaft	1	
⑮	Choke valve	1	
⑯	Choke lever	1	



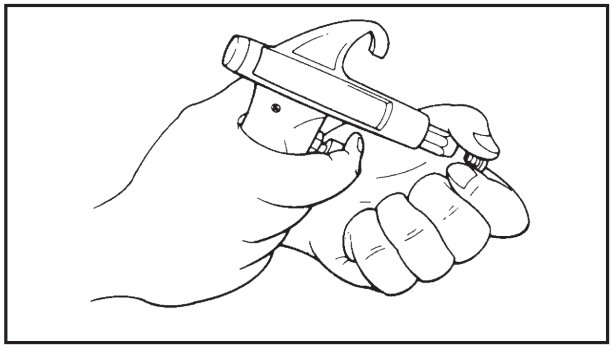
CHECKING THE CARBURETOR

1. Measure:
   - Float height ⓐ
     Out of specification → Replace.

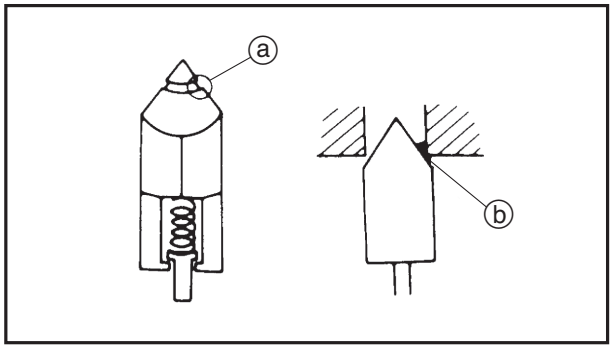
TIP

- Lift up the float so that the tip of the float valve lightly contacts the float arm, and then measure the float height ⓐ.
- Do not adjust the float height.

Float height:
Refer to "SPECIFICATIONS" in the Supplementary service manual.



2. Check:
   - Jets
   - Carburetor body
     Clogged → Apply compressed air to clean the jet.

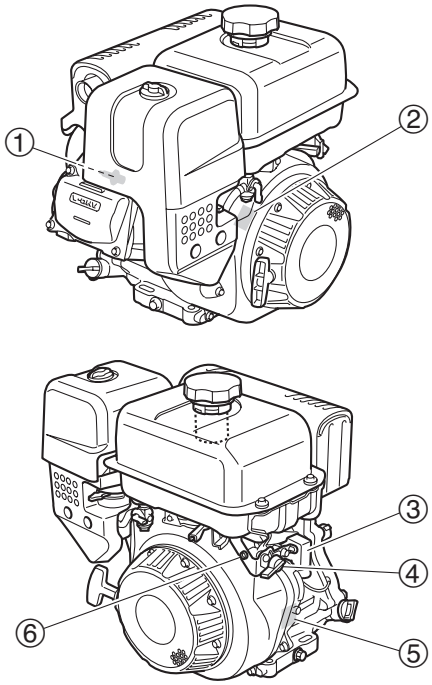


3. Check:
   - Valve seat
     Wear/damage → Replace.
     Dirt → Clean.

ⓐ Wear at groove
ⓑ Dirt

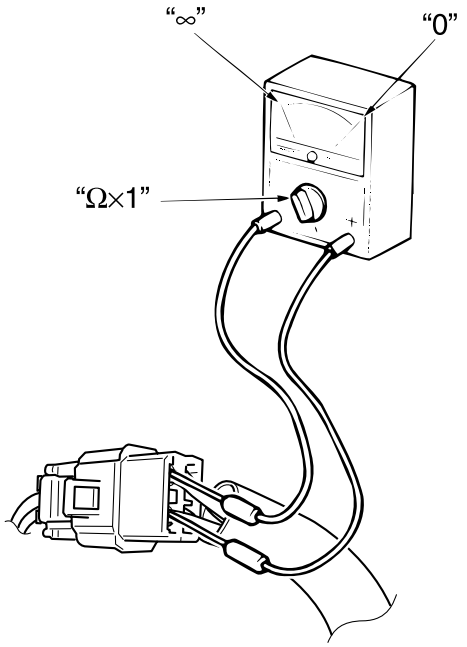
ELECTRICAL

ELECTRICAL COMPONENTS



① Spark plug
② TCI unit
③ Oil warning unit (With oil warning model)
④ Engine switch
⑤ Oil level switch (With oil warning model)
⑥ Oil warning light (With oil warning model)

A



SWITCHES

CHECKING THE SWITCH CONTINUITY

Use a pocket tester to check the terminals for continuity. If a continuity error is found at any point, replace the switch.

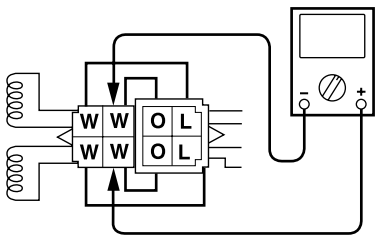
Analog pocket tester:
YU-03112-C
Pocket tester:
90890-03112

TIP

- Set the pocket tester to "0" before starting a test.
- To test the switch for continuity, set the pocket tester to the "Ω × 1" range.
- Turn the switch ON and OFF several times during the test.

A A typical example of switch continuity test.

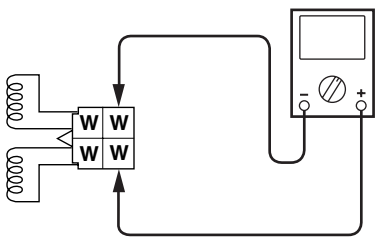
A



Measurement example of the electric components

A Connect the connector and check.

B



B Disconnect the connector and check.

IGNITION SYSTEM

TROUBLESHOOTING CHART

NO SPARK OR WEAK SPARK

Inspection steps:

1. Engine oil level
2. Spark plug
3. Ignition spark gap
4. Spark plug cap resistance
5. Air gap
6. Ignition coil (TCI unit) resistance
7. Ignition coil (TCI unit) resistance
8. Engine switch
9. Oil level switch (With oil warning model)
10. Wire harness

TIP

Use the following special tool(s) for troubleshooting.

Analog pocket tester:
YU-03112-C
Pocket tester:
90890-03112

Oppama pet–4000 spark checker:
YM-34487
Ignition checker:
90890-06754

1. Engine oil level
   - Check the oil level. (Refer to “ENGINE OIL LEVEL” on 2-5)

MEETS SPECIFICATION

OUT OF SPECIFICATION → Add engine oil.

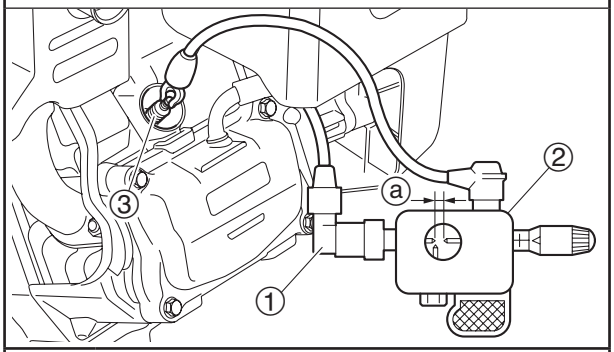
2. Spark plug
   - Check the spark plug condition. (Refer to “SPARK PLUG” on 2-3)

GOOD

NOT GOOD → Repair or replace the spark plug.

3. Ignition spark gap

- Disconnect the spark plug cap ① from the spark plug.
- Connect the ignition checker ② as shown.



Spark plug cap ① → Ignition checker ②
Ignition checker lead → Spark plug ③

- Turn the crankshaft and measure the ignition spark gap ⓐ.

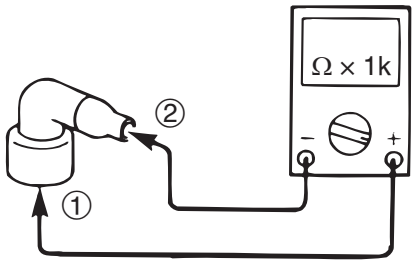
Minimum spark gap:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

MEETS SPECIFICATION

OUT OF SPECIFICATION OR NO SPARK →

The ignition system is good.

4. Spark plug cap resistance
- Remove the spark plug cap from the high tension cord.
- Connect the pocket tester (Ω × 1k) to the spark plug cap.



Tester ⊕ lead → Spark plug side ①
Tester ⊖ lead → High tension cord side ②

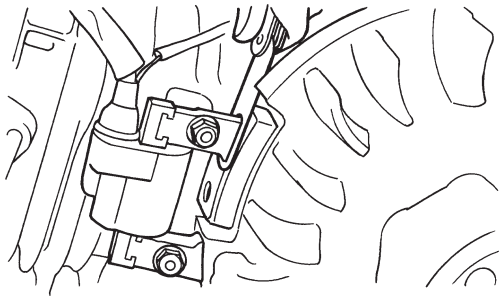
Spark plug cap resistance:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

TIP
- Do not pull out the spark plug cap from the high tension cord.
  - Remove → Turn the spark plug cap counterclockwise.
  - Install → Turn the spark plug cap clockwise.
- Check the high tension cord for cracks or deterioration before installing the spark plug cap.
- Cut 5 mm (0.2 in) off the end of the high tension cord, and then connect it to the spark plug cap.

MEETS SPECIFICATION ⇓

OUT OF SPECIFICATION → Replace the spark plug cap.

5. Air gap
- Measure the thickness between the magnet rotor and TCI unit.



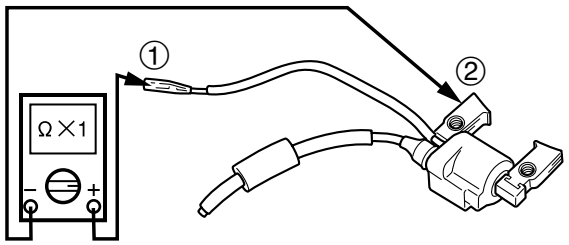
TCI unit air gap:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

MEETS SPECIFICATION ⇓

OUT OF SPECIFICATION → Adjust the air gap.

6. Ignition coil (TCI unit) resistance

- Remove the ignition coil (TCI unit).
- Connect the pocket tester (Ω × 1) to the primary terminal.



Tester ⊕ lead → Black/White terminal ①
Tester ⊖ lead → Body ground ②

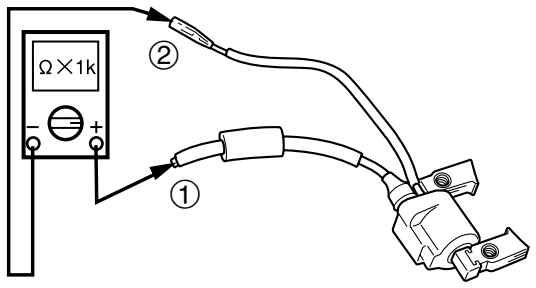
Primary coil resistance:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

MEETS SPECIFICATION

OUT OF SPECIFICATION → Replace the TCI unit.

7. Ignition coil (TCI unit) resistance

- Remove the ignition coil (TCI unit).
- Connect the pocket tester (Ω × 1k) to the secondary terminal.



Tester ⊕ lead → High tension cord ①
Tester ⊖ lead → Black/White terminal ②

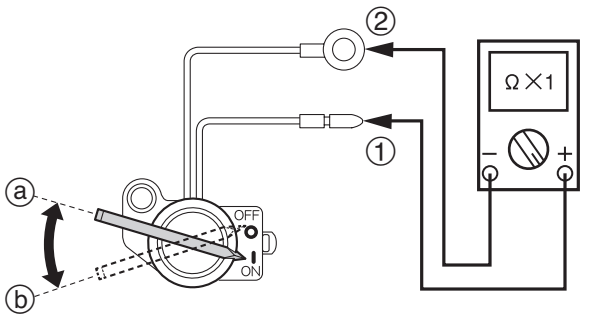
Secondary coil resistance:
Refer to "SPECIFICATIONS" in the Supplementary service manual.

MEETS SPECIFICATION

OUT OF SPECIFICATION → Replace the TCI unit.

8. Engine switch

- Disconnect the engine switch connectors.
- Connect the pocket tester (Ω × 1) to the engine switch connectors.
- Check the engine switch continuity.



Tester ⊕ lead → Black terminal ①
Tester ⊖ lead → Black terminal ②

Switch "ON" ⓐ → Continuity
Switch "OFF" ⓑ → No continuity

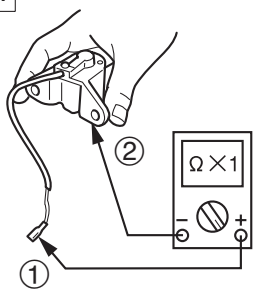
MEETS SPECIFICATION

OUT OF SPECIFICATION → Replace the engine switch.

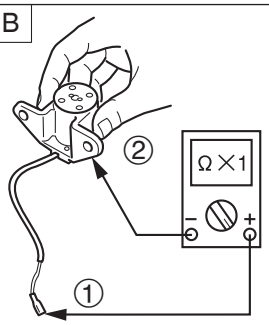
9. Oil level switch (With oil warning model)

- Remove the oil level switch from the bottom of the crankcase cover.
  (Refer to "PISTON, CAMSHAFT, CRANKCASE, AND CRANKSHAFT" on 3-31)
- Connect the pocket tester (Ω × 1) to the oil level switch lead and check for continuity.

A



B



Tester ⊕ lead → Oil level switch lead ①
Tester ⊖ lead → Body ground ②

A **Continuity → Correct**
B **No continuity → Correct**

MEETS SPECIFICATION

OUT OF SPECIFICATION → Replace the oil level switch.

10. Wire harness

- Check the terminal of the connector for contamination, rust, or disconnection.

GOOD

NOT GOOD → Clean or replace the connector.

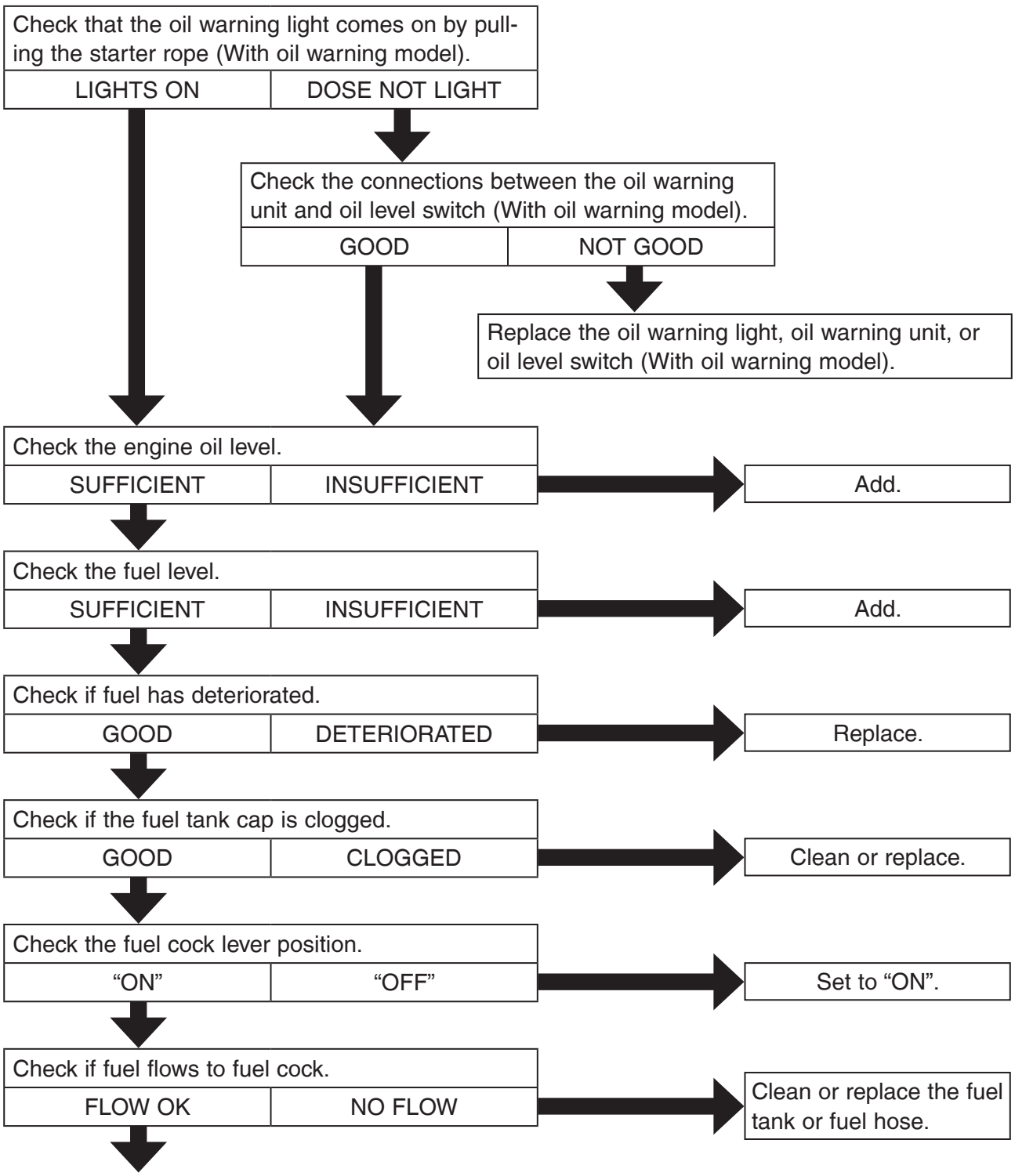
Replace the TCI unit.

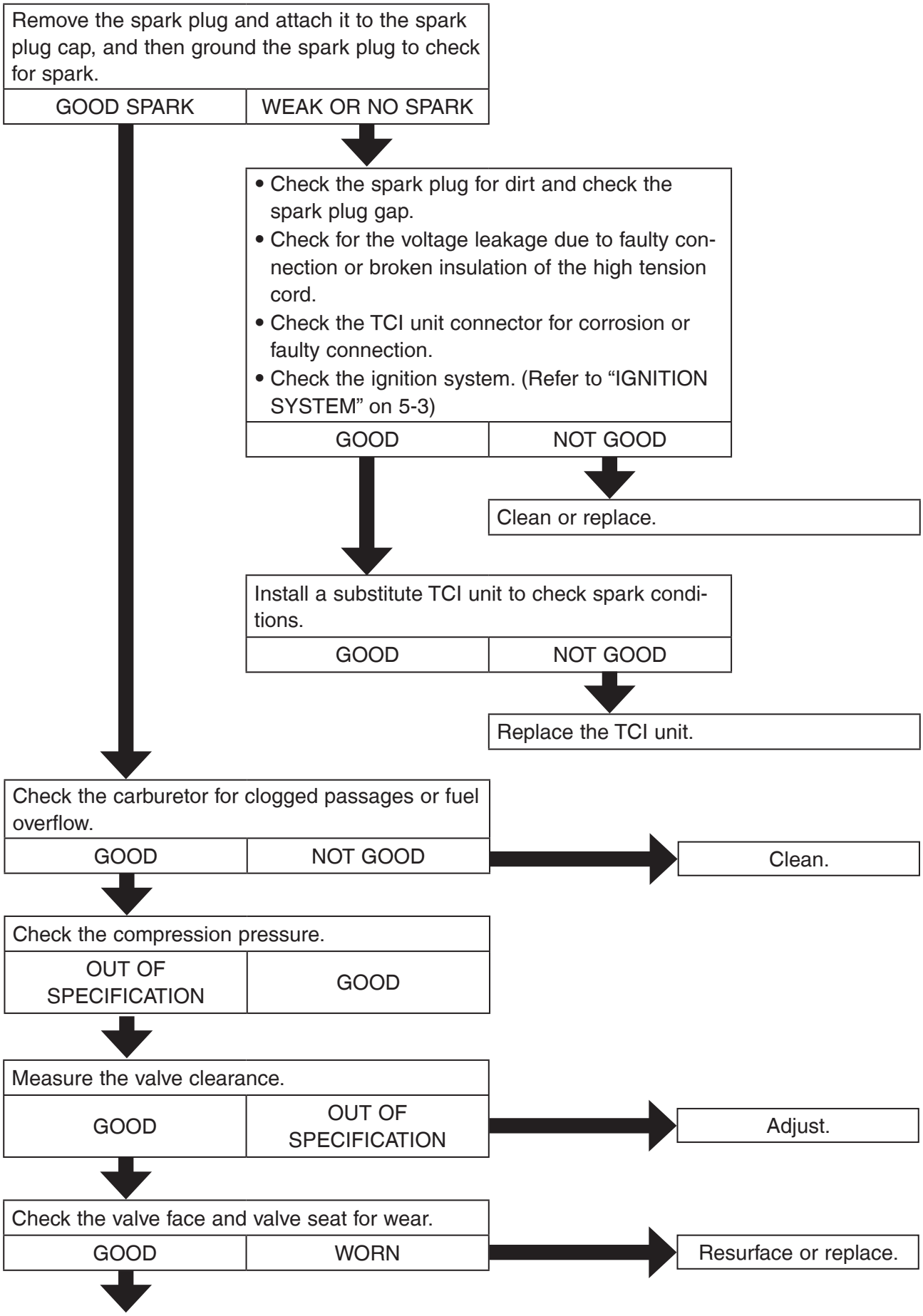
NOT GOOD → Replace the oil warning unit. (With oil warning model)

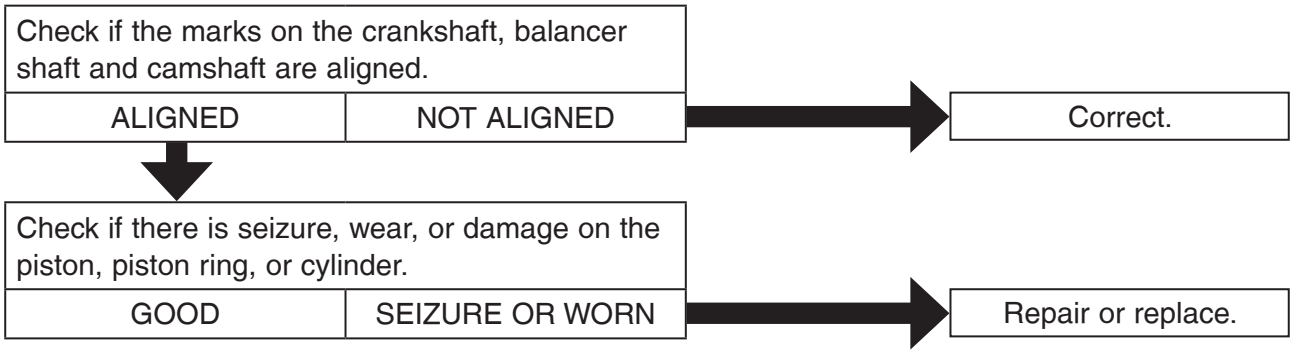
TROUBLESHOOTING

ENGINE

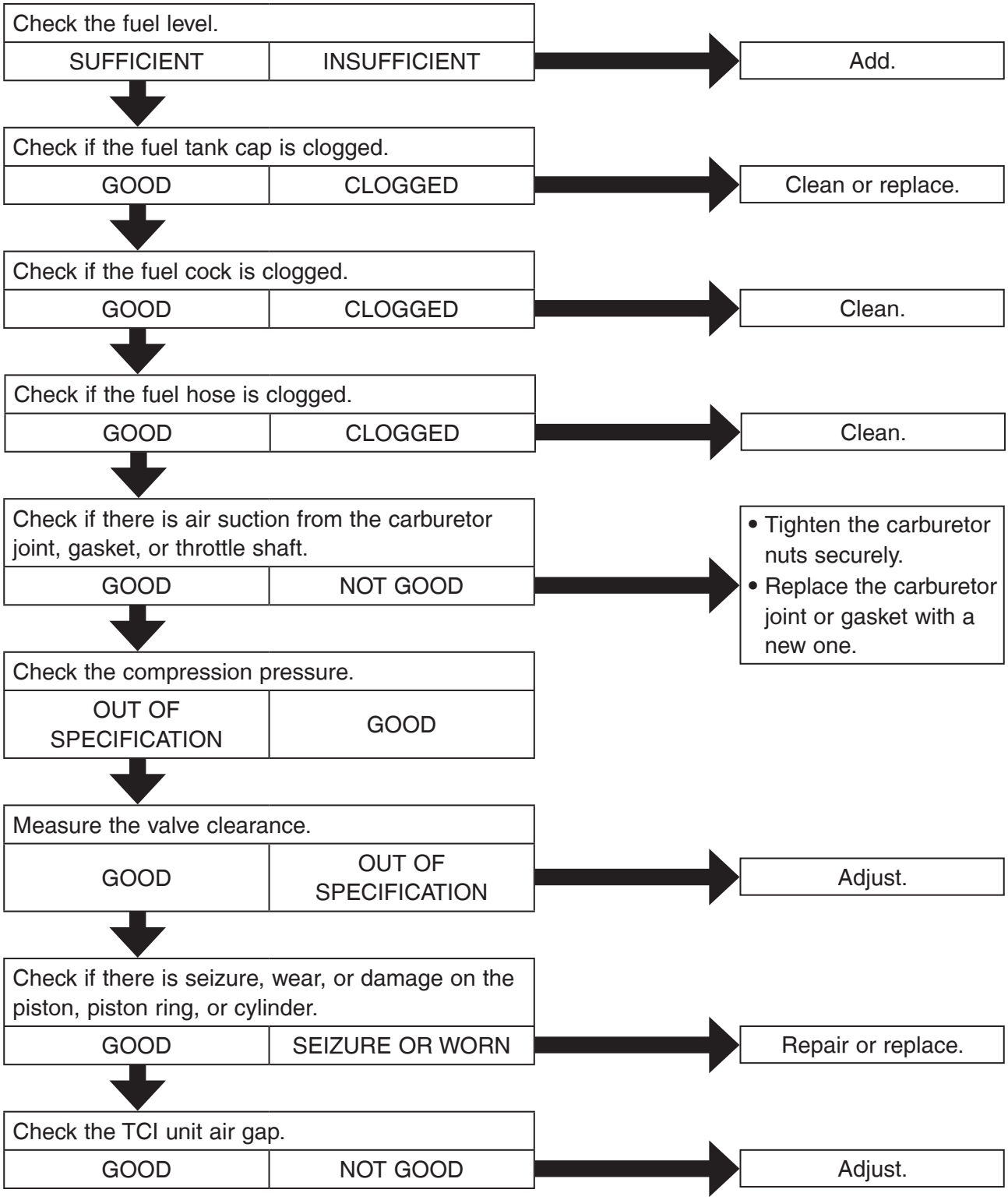
ENGINE DOES NOT START



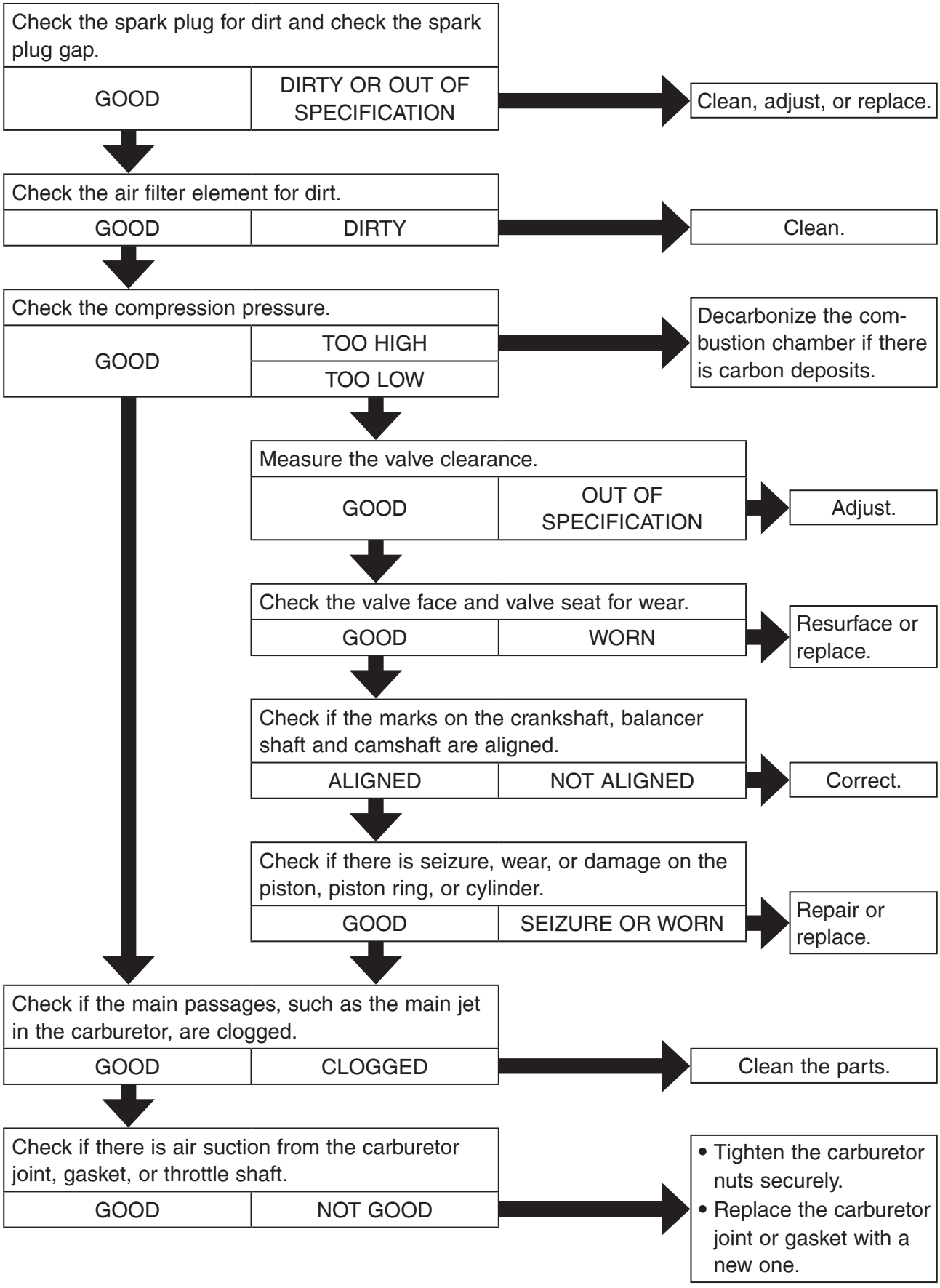

Remove the spark plug and attach it to the spark plug cap, and then ground the spark plug to check for spark.
GOOD SPARK
WEAK OR NO SPARK
• Check the spark plug for dirt and check the spark plug gap.
• Check for the voltage leakage due to faulty connection or broken insulation of the high tension cord.
• Check the TCI unit connector for corrosion or faulty connection.
• Check the ignition system. (Refer to "IGNITION SYSTEM" on 5-3)
GOOD
NOT GOOD
Clean or replace.
Install a substitute TCI unit to check spark conditions.
GOOD
NOT GOOD
Replace the TCI unit.
Check the carburetor for clogged passages or fuel overflow.
GOOD
NOT GOOD
Clean.
Check the compression pressure.
OUT OF SPECIFICATION
GOOD
Measure the valve clearance.
GOOD
OUT OF SPECIFICATION
Adjust.
Check the valve face and valve seat for wear.
GOOD
WORN
Resurface or replace.


Check if the marks on the crankshaft, balancer shaft and camshaft are aligned.
ALIGNED
NOT ALIGNED
Correct.
Check if there is seizure, wear, or damage on the piston, piston ring, or cylinder.
GOOD
SEIZURE OR WORN
Repair or replace.

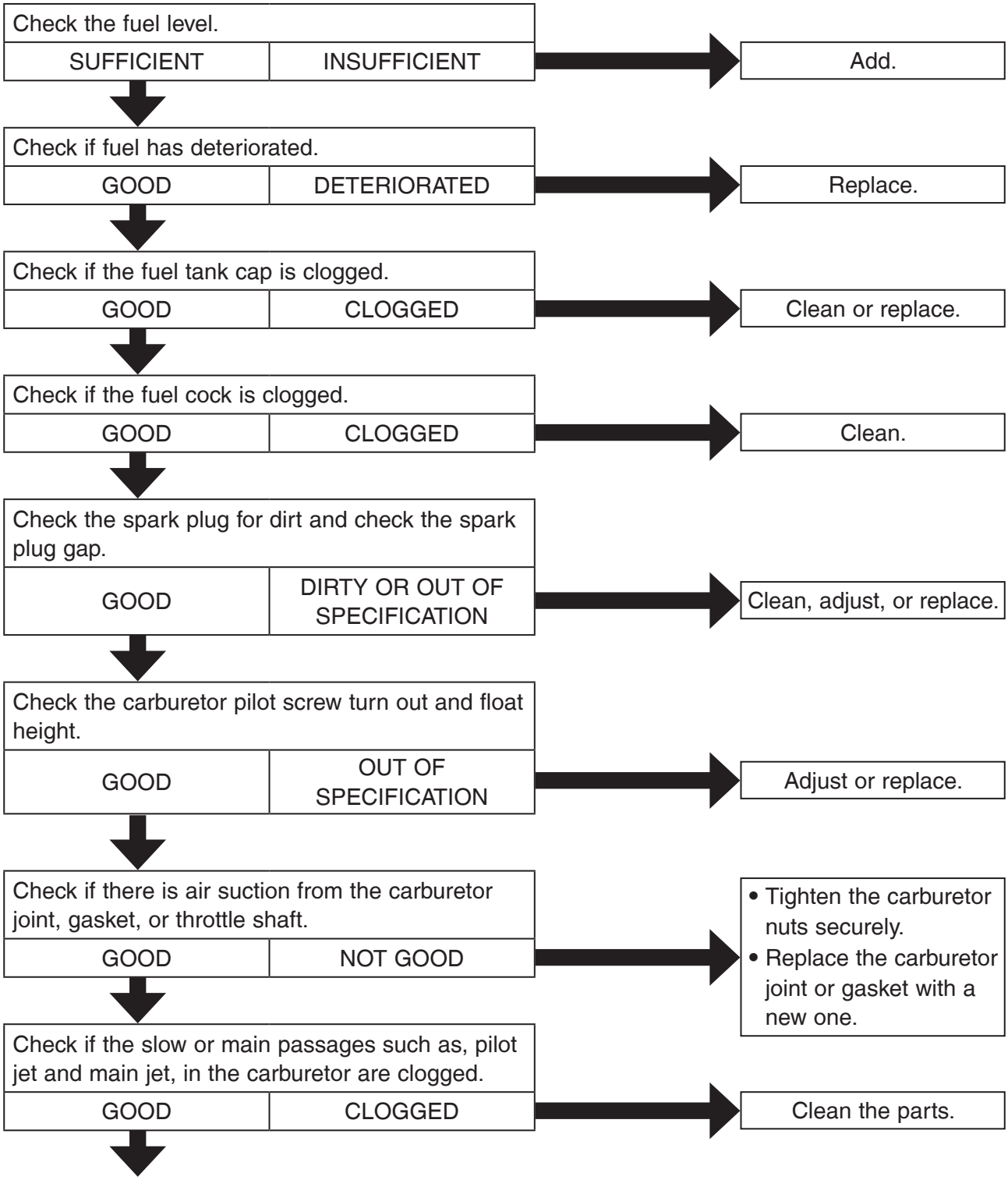
ENGINE STARTS BUT STALLS

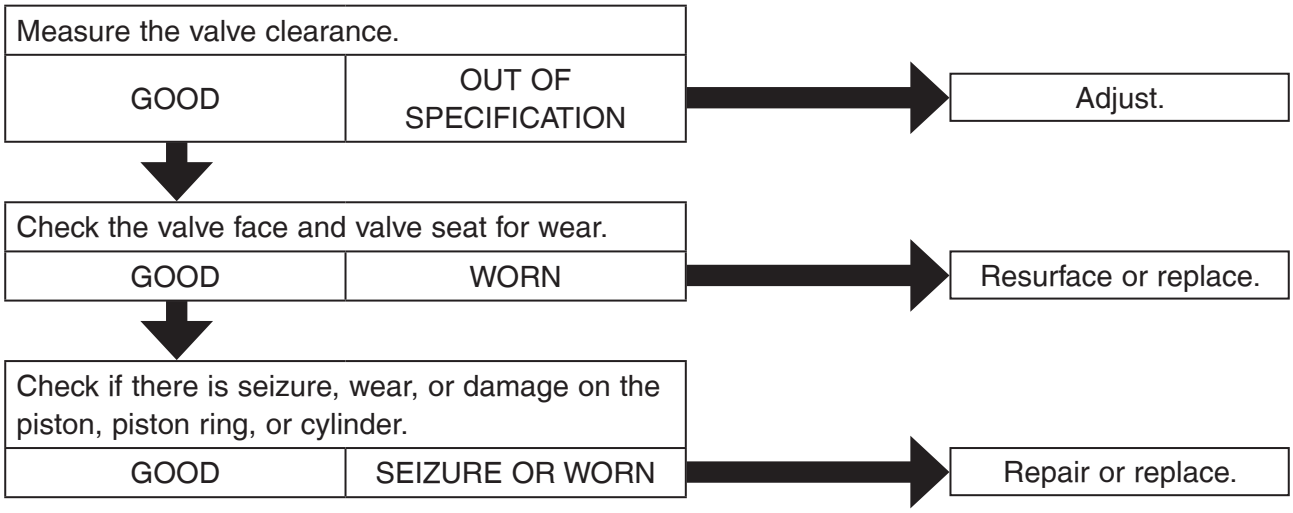


ENGINE SPEED DOES NOT INCREASE

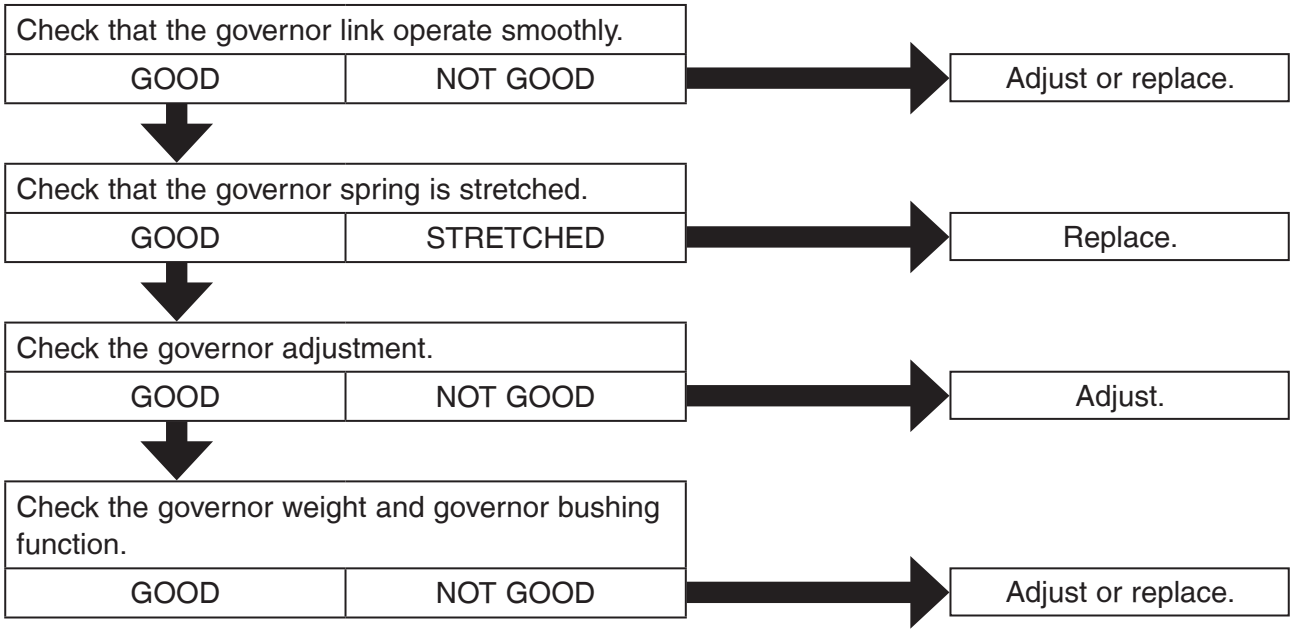


ENGINE SPEED IS UNEVEN




Measure the valve clearance.
GOOD
OUT OF SPECIFICATION
Adjust.
Check the valve face and valve seat for wear.
GOOD
WORN
Resurface or replace.
Check if there is seizure, wear, or damage on the piston, piston ring, or cylinder.
GOOD
SEIZURE OR WORN
Repair or replace.

GOVERNOR OPERATION



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