A Few Words About Safety

Service Information

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

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

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

For Your Customer's Safety

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

⚠WARNING

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

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

For Your Safety

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

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

⚠WARNING

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

Follow the procedures and precautions in this manual carefully.

Important Safety Precautions

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

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

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

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

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

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

CONTENTS

REVISION HISTORY

No.	Date of revision	Contents of revision
1	January, 2021	Changed belt tension adjustment. (page 3-8)

INTRODUCTION

This manual covers the service and repair procedures for the Honda FQ650 tiller.

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

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

SAFETY MESSAGES

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

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

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

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

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

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

- Instructions – how to service these products correctly and safely.

ALL INFORMATION, ILLUSTRATIONS, DIRECTIONS AND SPECIFICATIONS INCLUDED IN THIS PUBLICATION ARE BASED ON THE LATEST PRODUCT INFORMATION AVAILABLE AT THE TIME OF APPROVAL FOR PRINTING. Honda Motor Co., Ltd. RESERVES THE RIGHT TO MAKE CHANGES AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING ANY OBLIGATION WHATSOEVER. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT WRITTEN PERMISSION. THIS MANUAL IS WRITTEN FOR PERSONS WHO HAVE ACQUIRED BASIC KNOWLEDGE OF MAINTENANCE ON Honda PRODUCTS.

SERVICE RULES

- Use Honda Genuine or Honda-recommended parts and lubricants or their equivalents. Parts that do not meet Honda's design specifications may damage the unit.
- Use the special tools designed for the product.
- Install new gaskets, O-rings, etc. when reassembling.
- When torquing bolts or nuts, begin with larger-diameter or inner bolts first and tighten to the specified torque diagonally, unless a particular sequence is specified.
- Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before reassembly.
- After reassembly, check all parts for proper installation and operation.
- Many screws used in this machine are self-tapping. Be aware that cross-threading or overtightening these screws will strip the threads and ruin the hole.

Use only metric tools when servicing this unit. Metric bolts, nuts, and screws are not interchangeable with non-metric fasteners. The use of incorrect tools and fasteners will damage the unit.

SYMBOLS

The symbols used throughout this manual show specific service procedures. If supplementary information is required pertaining to these symbols, it will be explained specifically in the text without the use of the symbols.

	Replace the part(s) with new one(s) before assembly.
	Use the recommend engine oil, unless otherwise specified.
	Use molybdenum oil solution (mixture of the engine oil and molybdenum grease in a ratio of 1:1).
	Use multi-purpose grease (lithium based multi-purpose grease NLGI #2 or equivalent).
	Use marine grease (water resistant urea based grease).
	Apply a locking agent. Use a medium strength locking agent unless otherwise specified.
	Apply sealant.
	Use automatic transmission fluid.
(○ x ○) (○)	Indicates the diameter, length, and quantity of metric bolts used.
page 1-1	Indicates the reference page.

ABBREVIATIONS

Throughout this manual, the following abbreviations are used to identify the respective parts or systems.

Abbreviated term	Full term
ACG	Alternator
A/F	Air Fuel Ratio
API	American Petroleum Institute
Approx.	Approximately
Assy.	Assembly
ATDC	After Top Dead Center
ATF	Automatic Transmission Fluid
ATT	Attachment
BAT	Battery
BDC	Bottom Dead Center
BTDC	Before Top Dead Center
BARO	Barometric Pressure
CKP	Crankshaft Position
Comp.	Complete
CMP	Camshaft Position
CYL	Cylinder
DLC	Data Link Connector
EBT	Engine Block Temperature
ECT	Engine Coolant Temperature
ECM	Engine Control Module
EMT	Exhaust Manifold Temperature
EOP	Engine Oil Pressure
EX	Exhaust
F	Front or Forward
GND	Ground
HO_2S	Heated Oxygen sensor
HST	Hydrostatic Transmission
IAB	Intake Air Bypass
IAC	Idle Air Control
IAT	Intake Air Temperature
I.D.	Inside diameter
IG or IGN	Ignition
IN	Intake
INJ	Injection
L.	Left
MAP	Manifold Absolute Pressure
MIL	Malfunction Indicator Lamp
O.D.	Outside Diameter
OP	Optional Part
PGM-FI	Programmed-Fuel Injection
P/N	Part Number
Qty	Quantity
R.	Right
SAE	Society of Automotive Engineers
SCS	Service Check Signal
STD	Standard
SW	Switch
TDC	Top Dead Center
TP	Throttle Position
VST	Variable Speed Transmission
VTEC	Variable Valve Timing & Valve Lift Electronic Control

Bl	Black	G	Green	Br	Brown	Lg	Light green
Y	Yellow	R	Red	O	Orange	P	Pink
Bu	Blue	W	White	Lb	Light blue	Gr	Gray

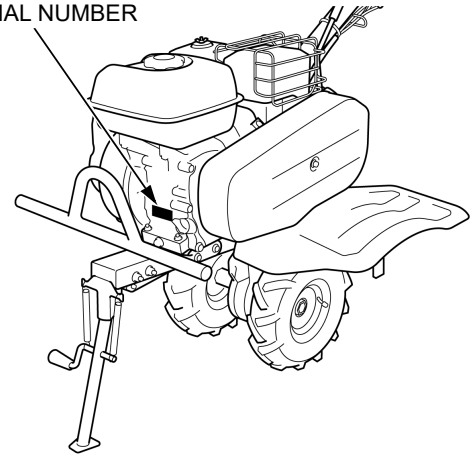
MEMO

1. SPECIFICATIONS

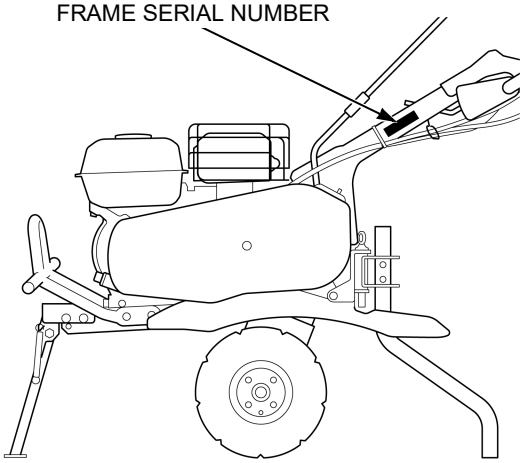
SERIAL NUMBER LOCATION

The engine serial number is located on the cylinder block.
The frame serial number is located on the handle column.
Refer to these numbers when ordering parts and when making technical inquiries.

ENGINE SERIAL NUMBER



FRAME SERIAL NUMBER



SPECIFICATIONS

DIMENSIONS AND WEIGHTS

Model	FQ650
Description code	FAFC
Type code	WH/DH
Overall length*	1,475 mm (58.1 in)
Overall width	650 mm (25.6 in)
Overall height*	1,000 mm (39.4 in)
Minimum ground clearance	130 mm (5.1 in)
Dry weight	55 kg (121 lbs)
Operating weight	58 kg (128 lbs)

Each dimension shall be determined when tines with each rotor is on level surface with engine bed in a level position.

*: Dimensions of overall length and overall height shall be determined when locating tightening position of handle pipe middle of movable range in vertical direction.

ENGINE

Model	GP200H
Description code	GCATH
Type	4-stroke, overhead valve, single cylinder, inclined by 25°
Total displacement	196 cm^3 (12.0 cu-in)
Bore and stroke	68.0 x 54.0 mm (2.68 x 2.13 in)
Max. horsepower	4.3 kW (5.8 PS)/3,600 min^{-1} (rpm)
Max. torque	12.4 N·m (1.26 kg·m, 9.1 lbf·ft)/2,500 min^{-1} (rpm)
Compression ratio	8.5 : 1
Cooling system	Forced-air
Ignition system	Transistorized magneto ignition
Ignition timing	20° B.T.D.C.
Spark plug	BPR6ES (NGK), W20EPR-U (DENSO)
Carburetor	Horizontal type, butterfly valve
Air cleaner	Dual element type
Lubricating system	Splash
Engine oil capacity	0.6 liters (0.63 US qt, 0.53 Imp qt)
Recommended engine oil	SAE 10W-30 API service classification SE or higher
Starting system	Recoil
Stopping system	Ignition primary circuit ground
Fuel used	Unleaded gasoline with a pump octane rating 86 or higher
Fuel tank capacity	2.4 liters (0.63 US gal, 0.53 Imp gal)
P.T.O. shaft rotation	Counterclockwise (from P.T.O. side)
Breather system	Flat valve type

FRAME

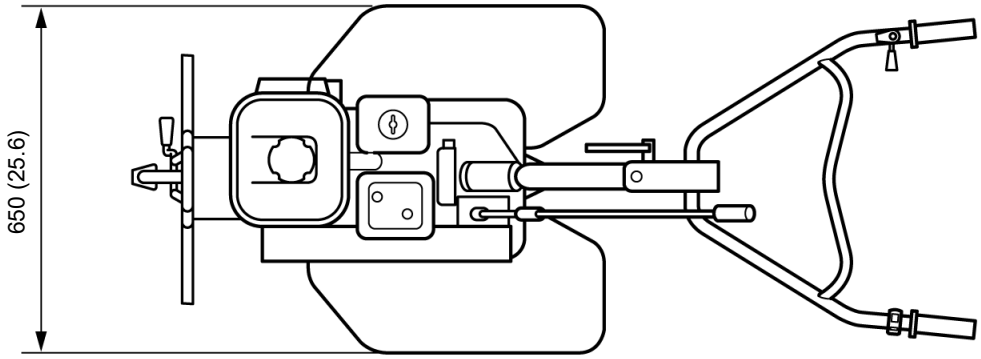
Model	FQ650
Type code	WH/DH
Standard handle height	930 mm (36.6 in)
Handle height adjustment	815 – 1,000 mm (32.1 – 39.4 in)
Rear hitch width	100 mm (3.9 in)
Rear hitch height	76 mm (3.0 in)
Engine to transmission mechanism	V-belt
V-belt	SB-38 / 17 x 980 (BT)
Clutch	Belt tension type
Clutch operation	Manual lever
Transmission lubrication	Oil bath
Transmission oil capacity	1.2 liters (1.3 US qt, 1.1 Imp qt)
Recommended transmission oil	SAE 10W-30 API service classification SE or higher
Transmission final gear ratio	1st: 41.27, 2nd: 30.01, R: 55.03
Tire size	3.50 – 4 4P.R.
Recommended tire pressure	137 – 157 kPa (1.4 – 1.6 kgf·cm^2, 19.9 – 22.8 psi)
Rotor shaft speed *	1st: 87.2 min^{-1} (rpm), 2nd: 119.9 min^{-1} (rpm), R: 65.4 min^{-1} (rpm)
Vehicle speed (Transporting speed)**	1st: 1.37 m/sec, 2nd: 1.88 m/sec, R: 1.03 m/sec

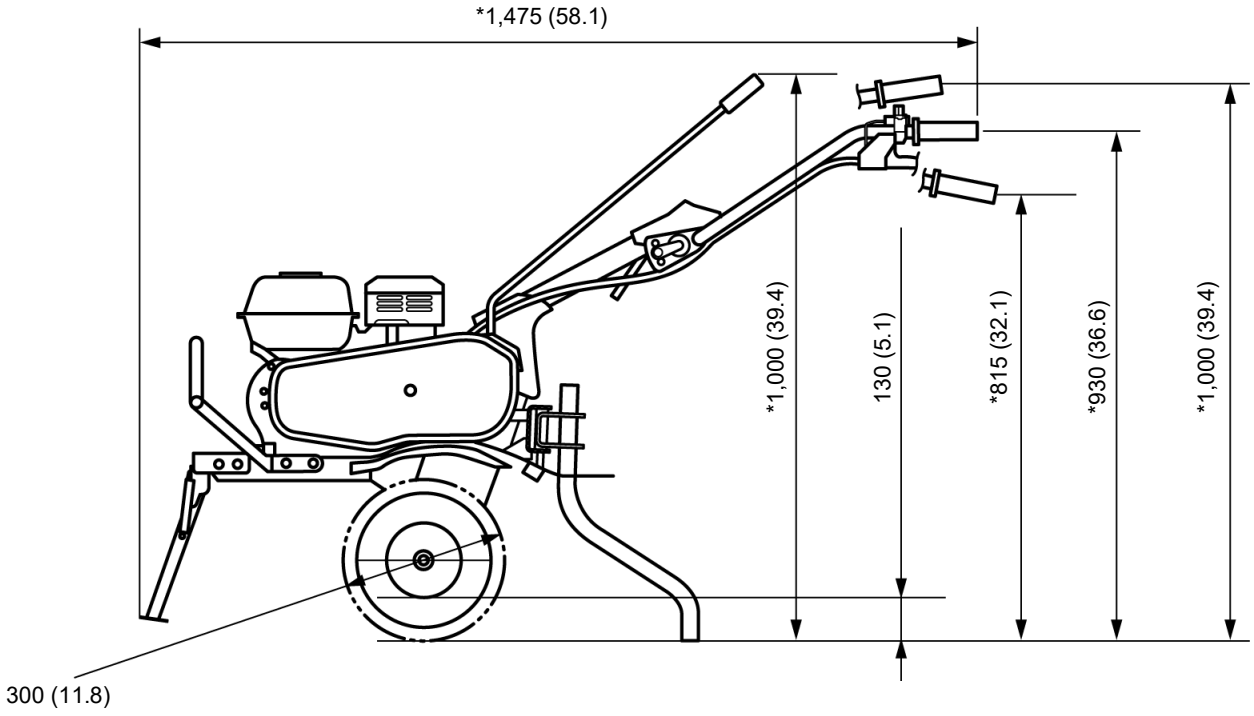
*: at engine speed 3,600 min^{-1} (rpm)

**: at tire O.D. 300 mm (11.8 in), engine speed 3,600 min^{-1} (rpm)

DIMENSIONAL DRAWINGS

Unit: mm (in)



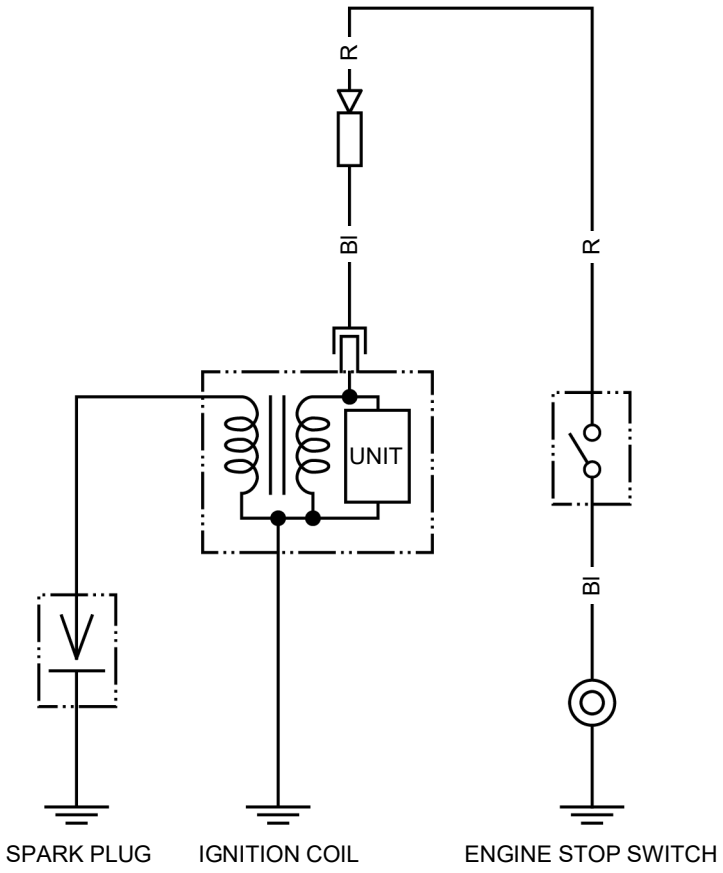


Each dimension shall be determined when tines with each rotor is on level surface with engine bed in a level position.

*: Dimensions of overall length, overall height and handle height shall be determined when locating tightening position of handle pipe middle of movable range in vertical direction.

WIRING DIAGRAM

BI: BLACK
R: RED



2. SERVICE INFORMATION

MAINTENANCE STANDARDS

Unit: mm (in)

Part	Item		Standard	Service limit
Engine	Idle speed		1,250 – 1,600 min^{-1} (rpm)	–
	Maximum engine speed (at no load)		3,800 $^{0}_{-200}$ min^{-1} (rpm)	–
	Cylinder compression		0.35 MPa (3.6 kgf/cm^2, 51 psi)/600 min^{-1} (rpm)	–
Cylinder	Sleeve I.D.		68.000 – 68.020 (2.6772 – 2.6779)	68.165 (2.6837)
Cylinder head	Warpage		–	0.10 (0.004)
Piston	Skirt O.D. at 10 mm (0.4 in) from bottom		67.965 – 67.982 (2.6758 – 2.6765)	67.845 (2.6711)
	Piston-to-cylinder clearance		0.018 – 0.055 (0.0007 – 0.0022)	0.12 (0.005)
	Piston pin bore I.D.		18.002 – 18.008 (0.7087 – 0.7090)	18.048 (0.7106)
Piston pin	Pin O.D.		17.992 – 17.998 (0.7083 – 0.7086)	17.954 (0.7068)
	Piston pin-to-piston pin bore clearance		0.004 – 0.016 (0.0002 – 0.0006)	0.06 (0.002)
Piston rings	Ring side clearance	Top	0.035 – 0.070 (0.0014 – 0.0028)	0.15 (0.006)
		Second	0.045 – 0.080 (0.0018 – 0.0032)	0.15 (0.006)
	Ring end gap	Top	0.200 – 0.350 (0.0079 – 0.0138)	1.0 (0.04)
		Second	0.350 – 0.500 (0.0138 – 0.0197)	1.0 (0.04)
		Oil (side rail)	0.20 – 0.70 (0.008 – 0.028)	1.0 (0.04)
	Ring width	Top	0.95 – 0.97 (0.037 – 0.038)	0.93 (0.037)
		Second	0.94 – 0.96 (0.037 – 0.038)	0.92 (0.036)
Connecting rod	Small end I.D.		18.006 – 18.017 (0.7089 – 0.7093)	18.07 (0.711)
	Big end I.D.		30.015 – 30.025 (1.1817 – 1.1821)	30.066 (1.1837)
	Big end oil clearance		0.035 – 0.055 (0.0014 – 0.0022)	0.12 (0.005)
	Big end side clearance		0.80 – 1.40 (0.031 – 0.055)	–
Crankshaft	Crank pin O.D.		29.970 – 29.980 (1.1799 – 1.1803)	29.920 (1.1780)
Valves	Valve clearance	IN	0.15 ± 0.02 (0.006 ± 0.001)	–
		EX	0.20 ± 0.02 (0.008 ± 0.001)	–
	Valve stem O.D.	IN	5.468 – 5.480 (0.2153 – 0.2157)	5.318 (0.2094)
		EX	5.425 – 5.440 (0.2136 – 0.2142)	5.275 (0.2077)
	Guide-to-stem clearance	IN	0.020 – 0.044 (0.0008 – 0.0017)	0.10 (0.004)
		EX	0.060 – 0.087 (0.0024 – 0.0034)	0.12 (0.005)
	Valve guide I.D.	IN/EX	5.500 – 5.512 (0.2165 – 0.2170)	5.572 (0.2194)
	Valve seat width		0.7 – 0.9 (0.03 – 0.04)	2.0 (0.08)
	Valve spring free length		30.5 (1.20)	29.0 (1.14)
	Valve spring perpendicularity		–	1.5°
Camshaft	Camshaft O.D.		13.966 – 13.984 (0.5498 – 0.5506)	13.916 (0.5479)
	Cam height	IN	27.500 – 27.900 (1.0827 – 1.0984)	27.45 (1.081)
		EX	27.547 – 27.947 (1.0845 – 1.1003)	27.50 (1.083)
Cylinder block	Camshaft holder I.D.		14.000 – 14.018 (0.5512 – 0.5519)	14.048 (0.5531)
Crankcase cover	Camshaft holder I.D.		14.000 – 14.027 (0.5512 – 0.5522)	14.048 (0.5531)
Spark plug	Gap		0.70 – 0.80 (0.028 – 0.031)	–
Spark plug cap	Resistance		7.5 – 12.5 kΩ	–
Ignition coil	Resistance	Primary side	0.6 – 1.0 Ω	–
		Secondary side	5.6 – 8.4 kΩ	–
	Air gap		0.2 – 0.6 (0.008 – 0.024)	–
Carburetor	Main jet		# 68	–
	Pilot screw opening		2-1/2 turns out	–
	Float level height		13.7 (0.54)	–

TORQUE VALUES

ENGINE TORQUE VALUES

Item	Tread Dia.	Torque values			Remarks
	mm	N·m	kgf·m	lbf·ft	
Cylinder head bolt	M8 x 1.25	24	2.4	18	Apply engine oil to the bolt threads and seating surface.
Rocker arm pivot bolt	M8 x 1.25	24	2.4	18	
Rocker arm pivot lock nut	M6 x 0.5	10	1.0	7	
Crankcase cover bolt	M8 x 1.25	24	2.4	18	
Engine oil drain bolt	M10 x 1.25	18	1.8	13	
Connecting rod bolt	M7 x 1.0	12	1.2	9	Apply engine oil to the bolt threads and seating surface.
Spark plug	M14 x 1.25	18	1.8	13	
Flywheel nut	M14 x 1.5	75	7.5	55	Apply engine oil to the nut threads and seating surface.
Fuel tank bolt	M6 x 1.0	10	1.0	7	
Fuel tank nut	M6 x 1.0	10	1.0	7	
Fuel filter joint	M10 x 1.25	2	0.20	1.5	
Air cleaner elbow nut	M6 x 1.0	9	0.92	6.6	
Muffler mounting nut	M8 x 1.25	24	2.4	18	
Muffler stay bolt	M6 x 1.0	12	1.2	9	
Muffler deflector mounting screw	M4 x 1.5	2	0.20	1.5	
Muffler protector screw	M5 x 0.8	3	0.31	2.2	
Governor arm nut	M6 x 1.0	3	0.31	2.2	See page 6-3
Recoil starter set screw	M6 x 1.0 (Special bolt)	8.8	0.90	6.5	Apply LOCTITE® 262 or equivalent to the threads

FRAME TORQUE VALUES

Item	Tread Dia.	Torque values			Remarks
	mm	N·m	kgf·m	lbf·ft	
Belt cover bolt	M8 x 1.25	15.5	1.6	11	
Inner belt cover mounting bolt	M6 x 1.0	6	0.6	4.4	
Handle column cover bolt	M5 x 0.8	1.25	0.13	0.9	
Handle column cover screw	M5 (Tapping)	1.25	0.13	0.9	
Handle column assembly mounting bolt	M8 x 1.25	24	2.4	18	
Engine stop switch ground terminal bolt	M5 x 0.8	3	0.31	2.2	
Engine stop switch mounting screw	M4 (Tapping)	1.5	0.15	1.1	
Throttle lever assembly mounting screw	M5 x 0.8	2.5	0.25	1.8	
Transmission bearing holder plate mounting bolt	M6 x 1.0	11	1.1	8	
Transmission shift fork mounting bolt	M6 x 1.0	11	1.1	8	
Transmission top cover mounting bolt	M6 x 1.0	11	1.1	8	
French rotor nut	M8 x 1.25	26.5	2.7	20	

STANDARD TORQUE VALUES

Item	Tread Dia.	Torque values		
		N·m	kgf·m	lbf·ft
Screw	4 mm	2	0.2	1.5
	5 mm	4	0.4	2.9
	6 mm	9	0.9	6.6
Bolt and nut	5 mm	3	0.31	2.2
	6 mm	10.5	1.1	8
	8 mm	23.5	2.4	17
	10 mm	46.5	4.7	34
Flange bolt and nut	6 mm	12	1.2	9
	8 mm	27	2.8	20
	10 mm	39	4.0	29
	12 mm	59	6.0	44
SH (Small head) flange bolt	6 mm	9	0.9	6.6
CT (Cutting threads) flange bolt (Retightening)	6 mm	12	1.2	9

LUBRICATION & SEAL POINT

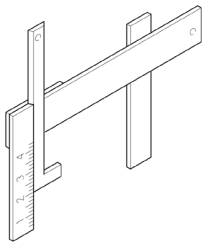
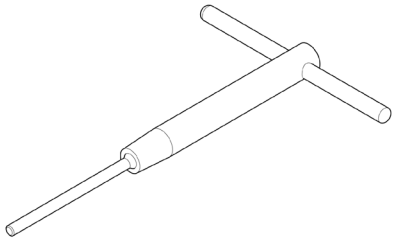
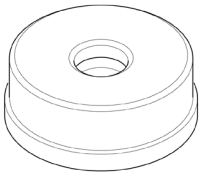
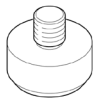
ENGINE

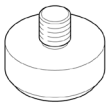
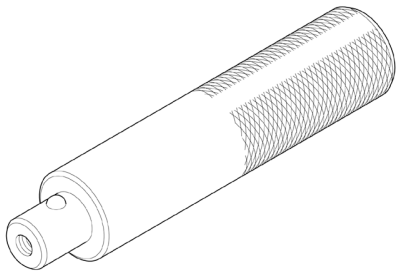
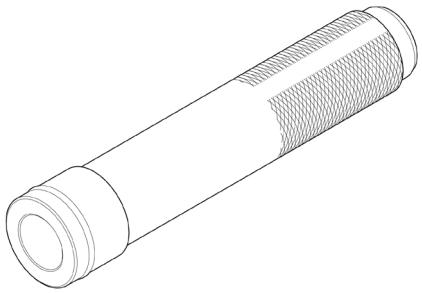
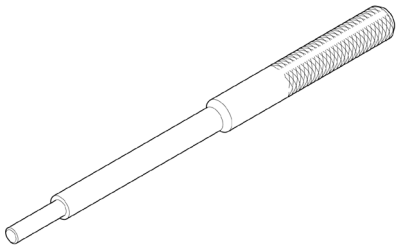
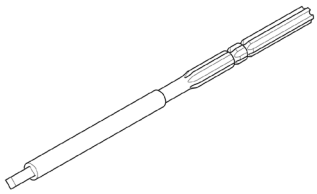
Material	Location	Remarks
Engine oil	Crank pin and gears	
	Piston outer surface	
	Piston ring whole surface	
	Piston pin whole surface	
	Cylinder inner surface	
	Connecting rod big and small end bearing	
	Connecting rod bolt threads and seating surface	
	Camshaft cam profile and journal	
	Valve lifter stem, stem end and slipper surface	
	Valve stem sliding surface and stem end	
	Rocker arm tappet surface and pivot	
	Rocker arm pivot threads and pivot	
	Rocker arm pivot bolt threads and seating surface	
	Flywheel nut threads and seating surface	
	Cylinder head bolt threads and seating surface	
	Governor weight holder gear and sliding surface	
	Governor holder shaft journal	
	Governor arm shaft journal	
Molybdenum disulfide oil (a mixture of 1/2 engine oil and 1/2 molybdenum disulfide grease)	Cam shaft cam profile	When new camshaft
Multi-purpose grease	Recoil starter case boss	
	Recoil starter case reel sliding surface	
	Recoil starter spring inner hook	
	Recoil starter ratchet sliding surface	
	Recoil starter ratchet guide inside	
Daphne Eponex No.2 or equivalent	Each oil seal rips	
	Each O–ring whole surface	
ThreeBond® 1216E, 1207B, or equivalent	Crankcase cover mating surface	
LOCTITE® 262 or equivalent	Recoil starter set screw threads	
LOCTITE® 638 or equivalent	Limiter cap inside	

FRAME

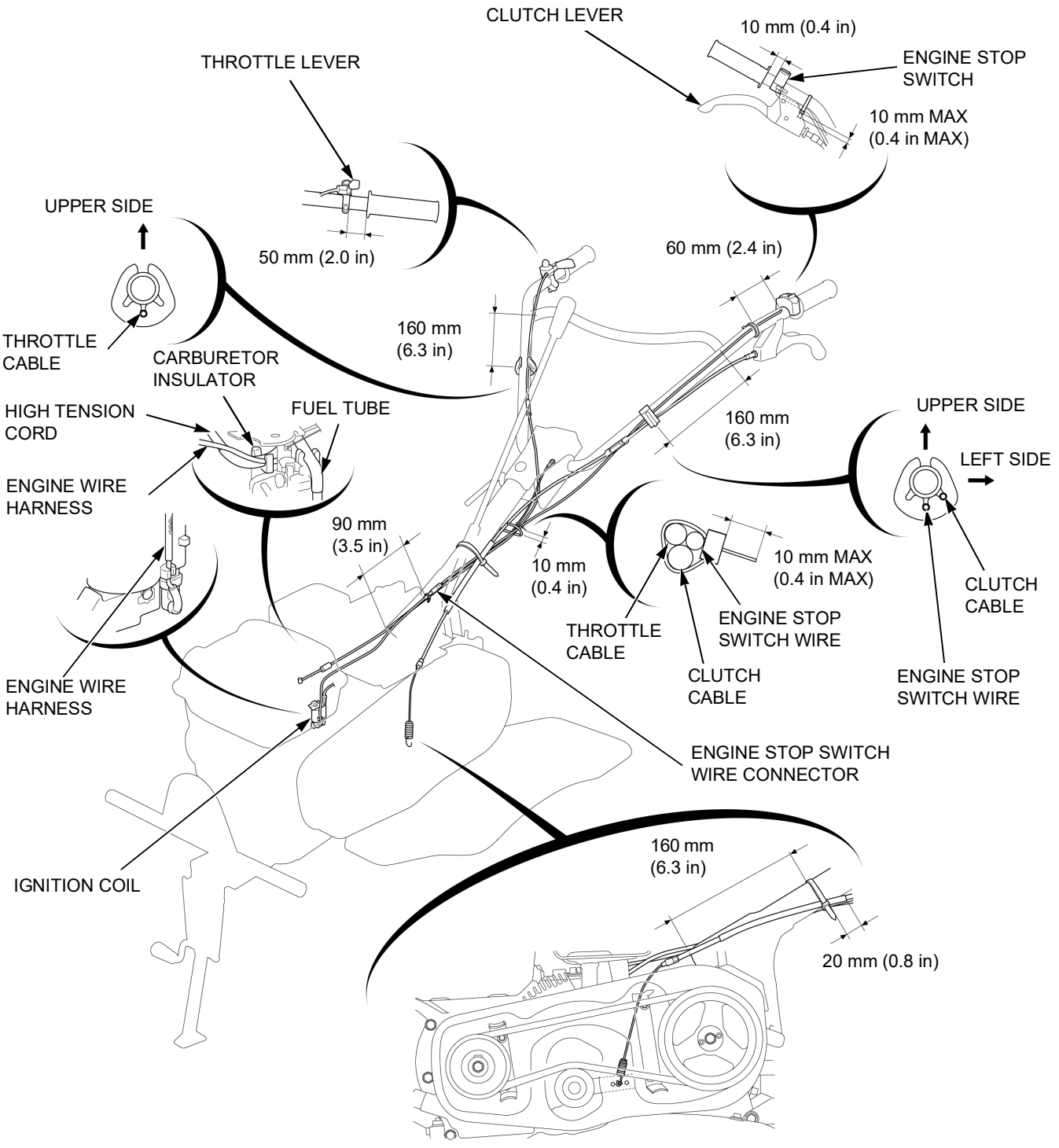
Material	Location	Remarks
Transmission oil	Transmission oil filler cap O-ring	
Shell Alvania grease RA or equivalent	Pin (6 x 24 mm) clutch lever sliding surface	
	Pin (8 x 27 mm) clutch lever sliding surface	
	Change lever holder change lever sliding surface	
	Handle column pivot change lever holder sliding surface	
	Engine output shaft surface	
	Input shaft surface	
	Tension arm shaft tension arm sliding surface	
	Throttle lever control plate sliding surface	
ThreeBond® 1530C or equivalent	Change lever grip inside	
	Handle grip inside	

TOOLS

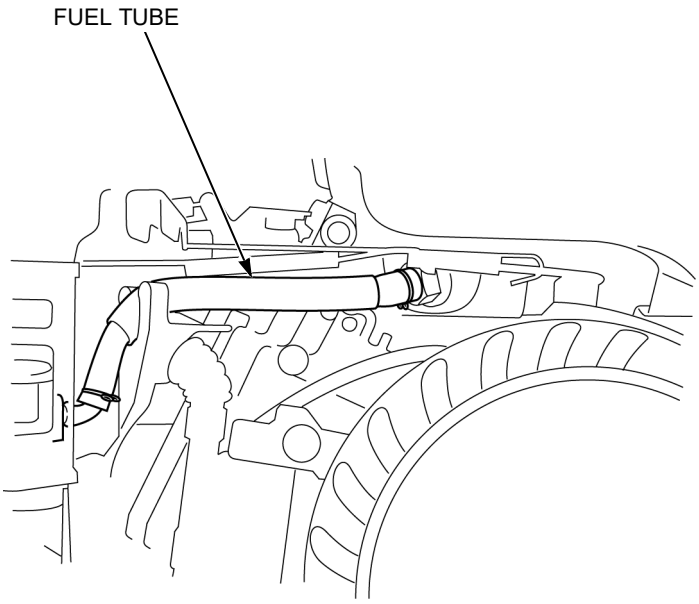
Float level gauge 07401-0010000 	Seat cutter, 27.5 mm (45° IN) 07780-0010200 	Seat cutter, 24.5 mm (45° EX) 07780-0010100 
Flat cutter, 28 mm (32° IN) 07780-0012100 	Flat cutter, 25 mm (32° EX) 07780-0012000 	Interior cutter, 26 mm (60° IN) 07780-0014500 
Interior cutter, 22 mm (60° EX) 07780-0014202 	Cutter holder 5.5 mm 07781-0010101 	Attachment, 52 x 55 mm 07746-0010400 
Attachment, 37 x 40 mm 07746-0010200 	Pilot, 22 mm 07746-0041000 	Pilot, 25 mm 07746-0040600 

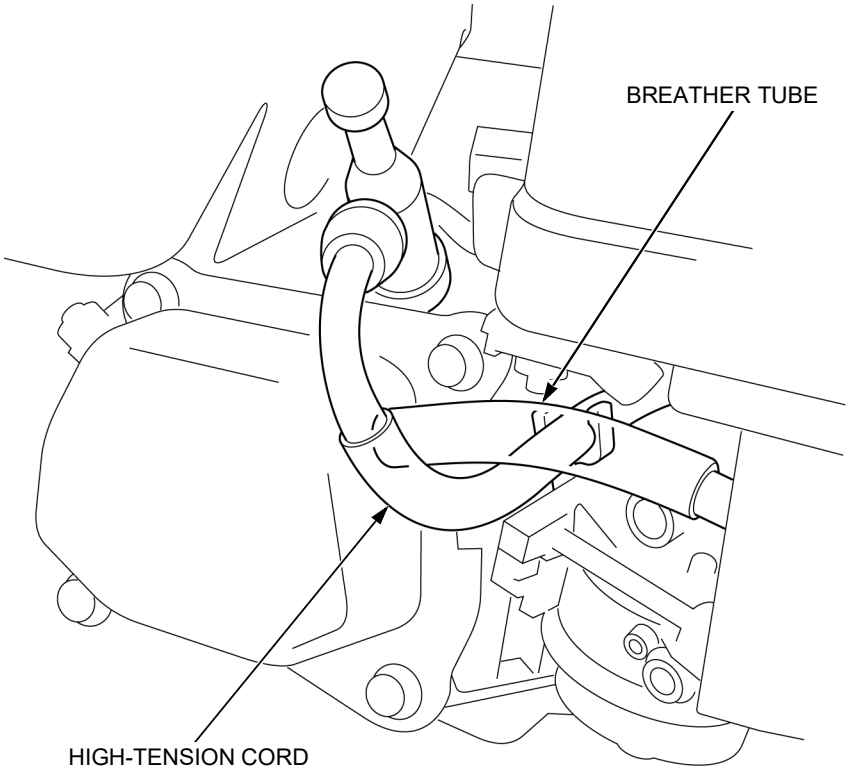
Pilot, 28 mm 07746-0041100 	Driver 07749-0010000 	Driver, 22 mm I.D. 07746-0020100 
Valve guide driver, 5.5 mm 07742-0010100 	Valve guide reamer, 5.510 mm 07984-2000001 	

CABLE/HARNESS ROUTING



TUBE ROUTING





MAINTENANCE SCHEDULE

ITEM		REGULAR SERVICE PERIOD (1) Perform at every indicated month or operating hour interval, whichever comes first.						Refer to page
		Before season	Each use	First month or 20 hrs.	Every 3 months or 50 hrs.	Every 6 months or 100 hrs.	Every year or 300 hrs.	
Engine oil	Check-Level		○					3-3
	Change	○		○		○		3-4
Air cleaner	Check		○					3-5
	Clean				○ (2)			3-5
	Replace						○	3-5
Tiller outside	Check		○					–
Throttle lever function	Check		○					–
Bolts and nuts tightens	Check		○					3-6
Wiring and cables	Check		○					2-7
Engine operation	Check		○					–
Tire pressure	Check		○					3-6
Tines [excessive wear, damage or looseness]	Check		○					–
Recoil starter cover	Check-Clean		○					8-2
Clutch lever function	Check-Clean		○					–
	Grease	○ (5)						14-4
Clutch cable	Check-Adjust			○		○		3-6
Drive belt	Check-Adjust			○ (4)		○ (4)		3-8
Transmission oil	Check level	○		○			○	3-10
Grease application	Grease lubricate	○						3-11
Spark plug	Check-Adjust					○		3-12
	Replace						○	3-12
Throttle cable	Check-Adjust						○	3-13
Idle speed	Check-Adjust						○	3-11
Valve clearance	Check-Adjust						○	3-13
Combustion chamber	Clean	After every 500 hrs. (3)						3-14
Fuel tank and filter	Clean	○				○		3-15
Fuel tube	Check	Every 2 years (Replace if necessary)						3-15

(1) For commercial use, log hours of operation to determine proper maintenance intervals.

(2) Service every 10 operating hours or every day when used in dusty areas.

(3) Service at the indicated service interval.

(4) Check that there is no crack and abnormal wear-out in the belt, and replace if it is abnormal.

(5) Apply grease to the pin part of the clutch lever fulcrum and so on for prevention of rust when you keep it for a long time (more than 30 days).

ENGINE OIL LEVEL CHECK

NOTICE

- *Check the engine oil level with the engine stopped.*

Place the tiller on a firm level surface with the tire or rotor set on the ground so that the engine becomes level.

Remove the oil filler cap/dipstick [1] and wipe the dipstick clean.

Insert the oil filler cap/dipstick in the oil filler neck, but do not screw it in.
Remove the oil filler cap/dipstick and check the oil level.

If the oil level is near or below the lower level [2] on the dipstick, fill with the recommended engine oil to the upper level (top of the oil filler neck) [3].

RECOMMENDED ENGINE OIL:
SAE 10W-30
API service classification SE or higher

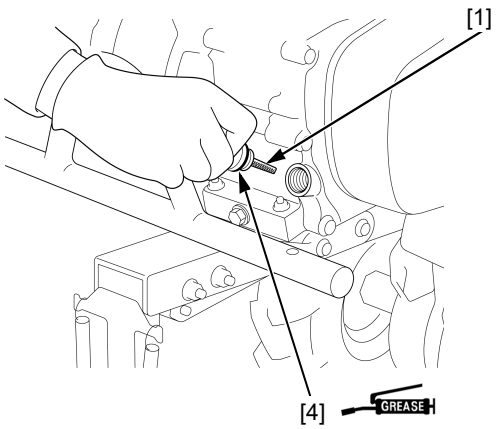
Oil is a major factor affecting performance and service life. Use 4-stroke automotive detergent oil.

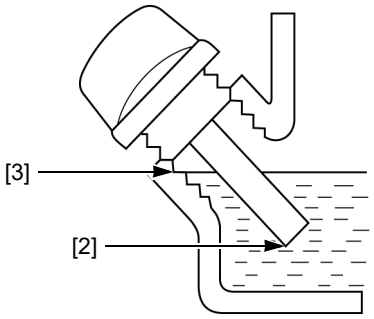
SAE 10W-30 is recommended for general use. Other viscosities shown in the chart may be used when the average temperature in your area is within the recommended range.

Check that the O-ring [4] is in good condition, replace it if necessary.

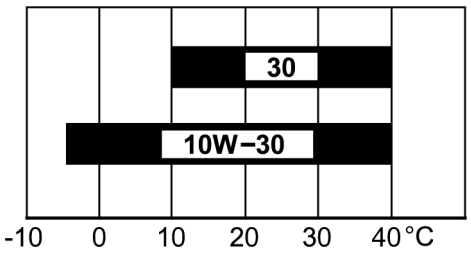
Apply engine oil to the O-ring.

Reinstall the oil filler cap/dipstick securely.





SAE VISCOSITY GRADES



AMBIENT TEMPERATURE

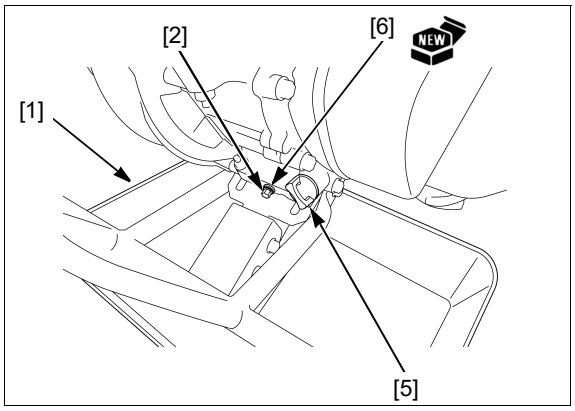
ENGINE OIL CHANGE

NOTE:

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

Place a suitable container [1] under the engine oil drain bolt (10 x 15 mm) [2].

Remove the oil filler cap/dipstick [5], drain bolt, sealing washer (10 mm) [6] and drain the engine oil into the suitable container.



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

⚠CAUTION

Used engine oil contains substances that have been identified as carcinogenic.
If repeatedly left in contact with the skin for prolonged periods, it may cause skin cancer.
Wash your hands thoroughly with soap and water as soon as possible after contact with used engine oil.

Install the drain bolt and new sealing washer.
Tighten the drain bolt to the specified torque.

TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)

With the tiller on a level surface, fill the recommended engine oil to the upper level (page 3-3).

ENGINE OIL CAPACITY:
0.6 liters (0.63 US qt, 0.53 Imp qt)

Install the oil filler cap/dipstick.

Recheck the engine oil level (page 3-3).

Make sure there are no engine oil leaks.

AIR CLEANER CHECK/CLEANING/ REPLACEMENT

A dirty air filter will restrict air flow to the carburetor, reducing engine performance. If the engine is operated in dusty areas, clean the air cleaner more often than specified in the MAINTENANCE SCHEDULE (page 3-2).

NOTICE

Operating the engine without the air filters or with the filter installed loosely will allow dirt to enter the engine, causing rapid engine wear. Install the air filters securely.

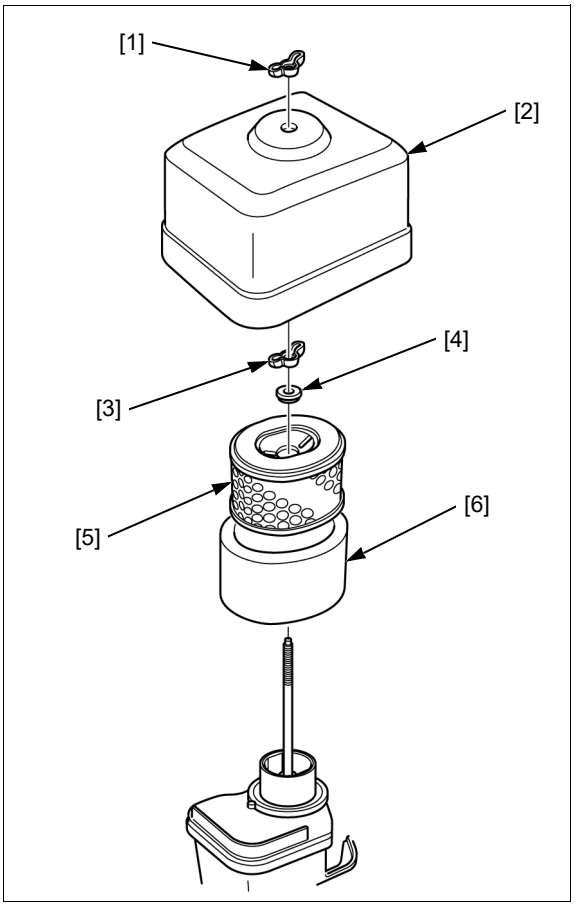
Remove the following:

- Wing nut [1]
- Air cleaner cover [2]
- Wing nut [3]
- Element Assy.
  - Grommet [4]
  - Inner filter (Paper) [5]
  - Outer filter (Foam) [6]

Carefully check both filters for holes or tears and replace if damaged.

Clean the filters if they are to be reused.

Installation is in the reverse order of removal.



Clean the foam element [1] in warm soapy water, rinse and allow to dry thoroughly, or clean with a high flush point solvent [2] and allow to dry thoroughly.

NOTE:

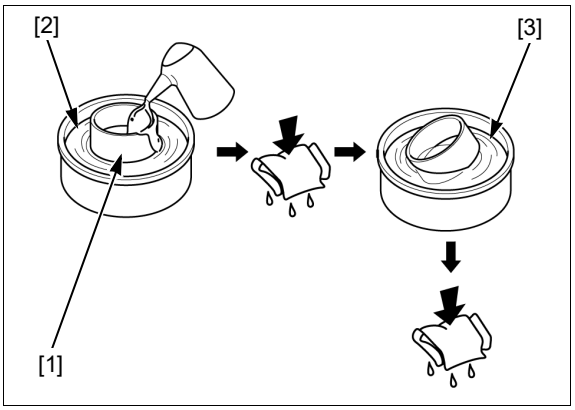
Do not twist the foam element.

Dip the foam element in clean engine oil [3] and squeeze out all the excess oil.

NOTE:

Do not twist the foam element.

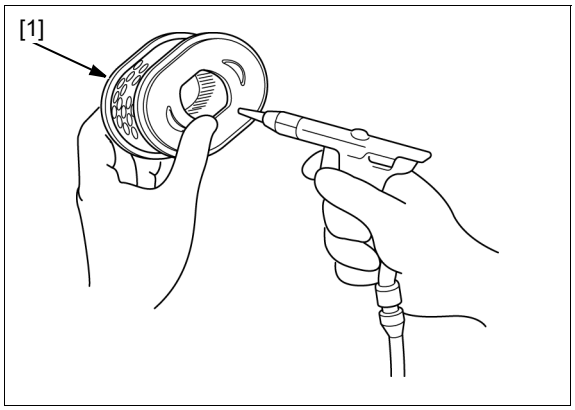
Excess oil will restrict air flow through the foam element and may cause the engine to smoke at startup.



Tap the paper element [1] several times on a hard surface to remove dirt, or blow compressed air (not exceeding 207 kPa, 2.1 kgf/cm^2, 30 psi) through the paper element from the inside.

Never try to brush off dirt; brushing will force dirt into the paper fibers.

Assemble the air cleaner in the reverse order of disassembly.



NUTS, BOLTS, TIGHTENS

Check that all chassis nuts and bolts are tighten to their correct torque values (page 2-3).

Check that all split pins, safety clips, hose clamps and cable stays are in place and properly secured.

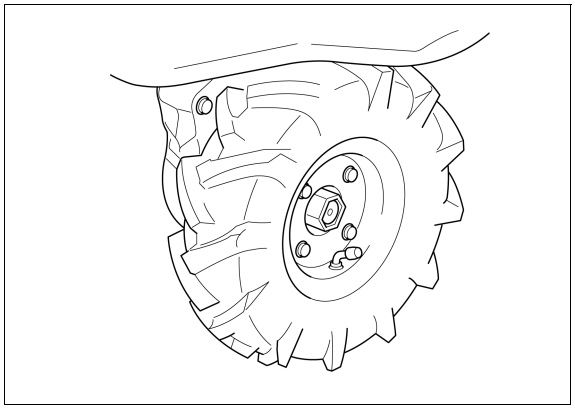
TIRE INSPECTION/TIRE PRESSURE ADJUSTMENT

Check the tires for cuts, embedded nails, or other damage.

Tire pressure should be checked when the tires are cold.

Check the cold tire pressure.

RECOMMENDED TIRE PRESSURE:
137 – 157 kPa (1.4 – 1.6 kgf/cm^2, 19.9 – 22.8 psi)



CLUTCH CABLE CHECK/ADJUSTMENT

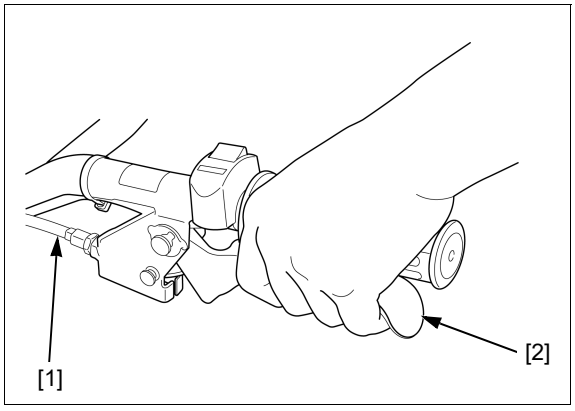
CHECK

Check for any deterioration or damage to the clutch cable [1].

Squeeze the clutch lever [2] several times.

If there is a problem, adjust the clutch cable (page 3-7).

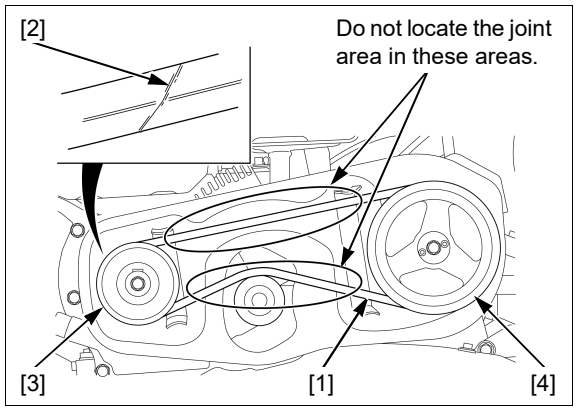
If there is a problem yet, disassemble the clutch lever and clean the parts (page 14-4).



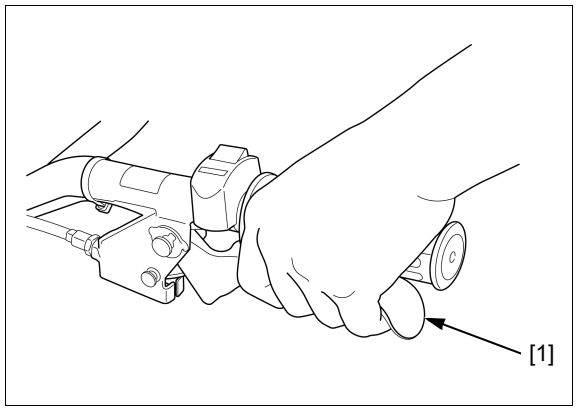
ADJUSTMENT

Remove the belt cover (page 11-2).

Set two V-belts [1] so that the V-belt joint area [2] is not located between the drive pulley [3] and driven pulley [4].

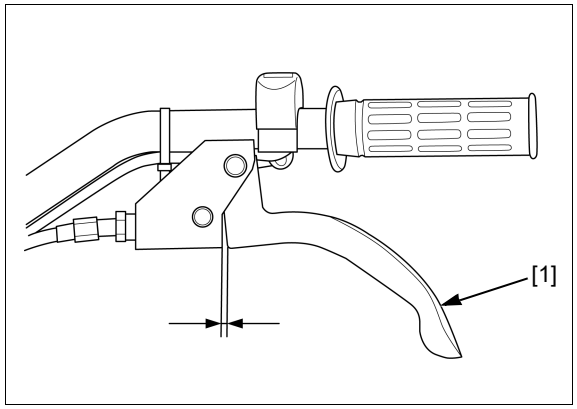


Squeeze the clutch lever [1] ten times.



Measure the free play at the clutch lever [1].

FREE PLAY:
2 – 3 mm (0.08 – 0.12 in)



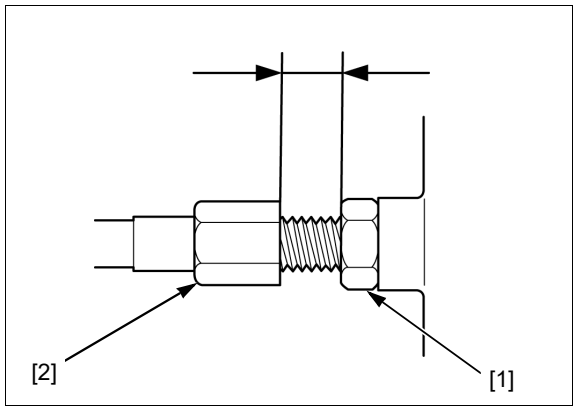
If adjustment is necessary:

Loosen the lock nut [1] and adjust the clearance by turning the adjusting bolt [2].

STANDARD CLEARANCE:
8 – 20 mm (0.3 – 0.8 in)

Recheck the free play.

After adjustment, tighten the lock nut securely.



BELT CHECK/ADJUSTMENT

CHECK

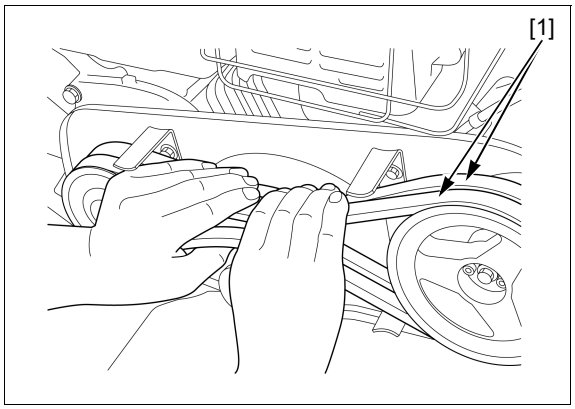
Remove the belt cover (page 11-2).

Check that there is no crack and abnormal wear-out in the belt, and replace if it is abnormal (page 11-2).

BELT TENSION ADJUSTMENT

Remove the belt cover (page 11-2).

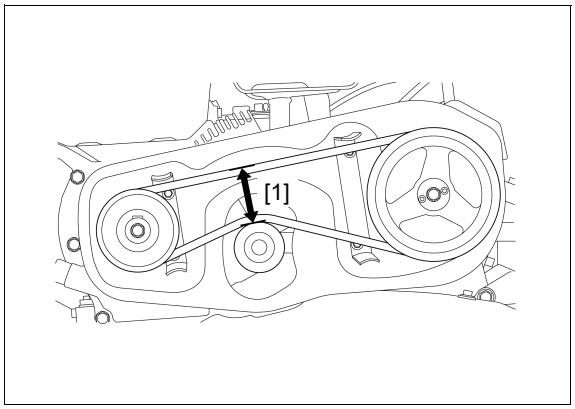
Squeeze two V-belts [1] with force more than six times as shown.



With the clutch engaged, measure the distance L [1] between the upper and lower belt runs at the belt tensioner.

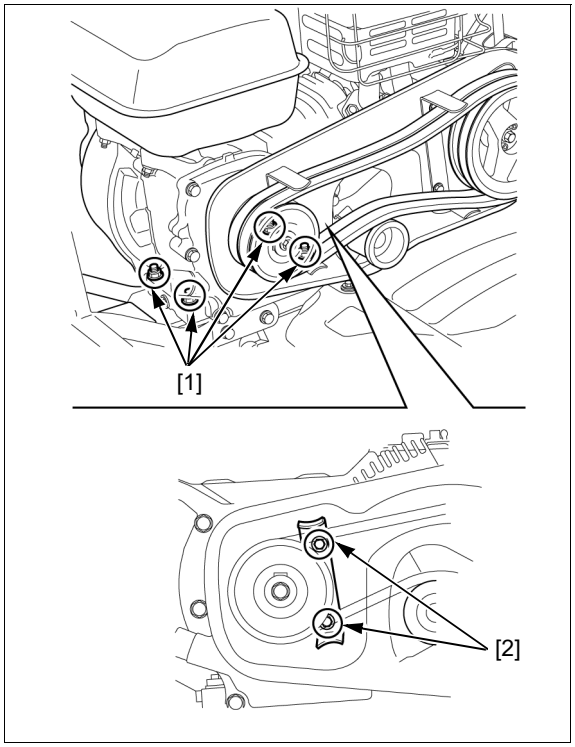
SPECIFIED DISTANCE L: 49 – 59 mm (1.9 – 2.3 in)

If the measured distance L is within specified distance L, adjust the belt stopper (page 3-9).



If the measured distance L is out of specified distance L, adjust the belt tension.

Loosen four engine mounting bolts (8 x 35 mm)/nuts (8 mm) [1] and two belt stopper A bolts (8 x 16 mm) [2].

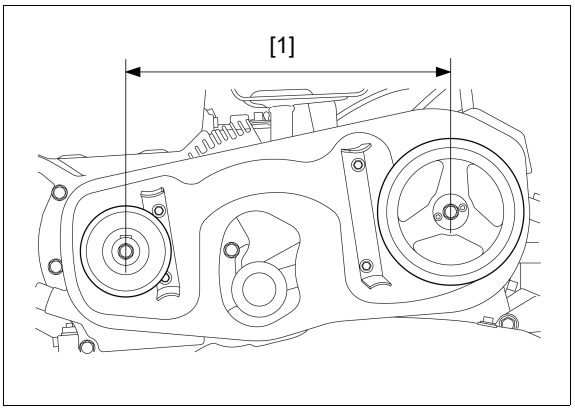


Adjust the distance ℓ [1] by moving the engine back or forward until the correct distance L is obtained.

SPECIFIED DISTANCE ℓ :
308.5 – 309.5 mm (12.15 – 12.19 in)

SPECIFIED DISTANCE L: 49 – 59 mm (1.9 – 2.3 in)

Recheck the distance L.



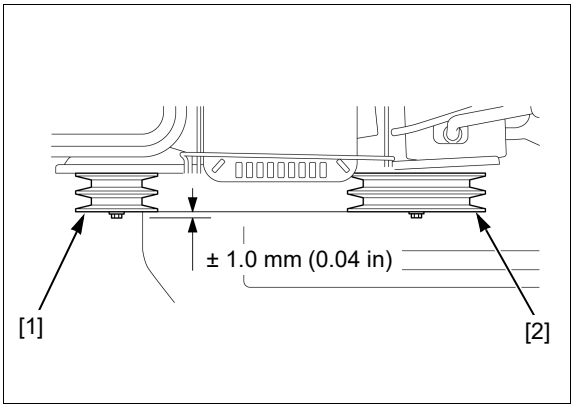
After adjusting the belt tension, check the drive pulley [1] and driven pulley [2] for proper alignment as shown.

If the pulleys are not aligned, check the pulley bolts for tightness and the pulleys for possible distortion.

Tighten the engine mounting bolts and belt stopper A bolts securely.

Adjust the belt stopper clearance (page 3-9).

After belt stopper clearance adjustment, adjust the clutch cable (page 3-7).



BELT STOPPER ADJUSTMENT

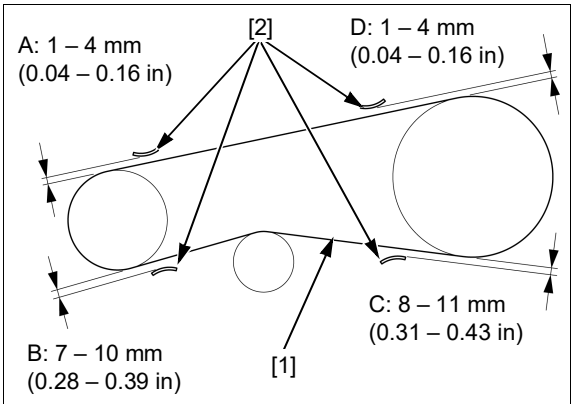
Remove the belt cover (page 11-2).

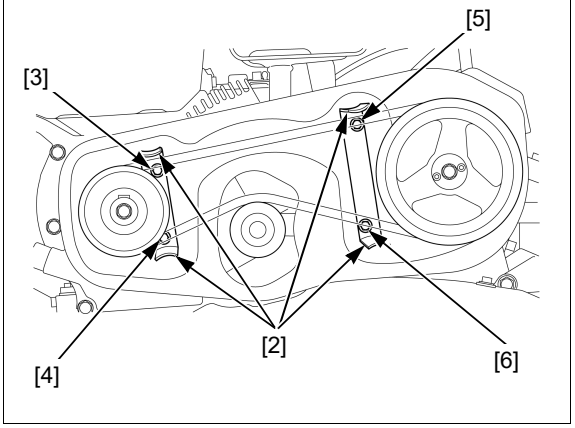
With the clutch engaged, measure the clearance between the V-belt [1] and four belt stoppers [2].

STANDARD CLEARANCE:
A: 1 – 4 mm (0.04 – 0.16 in)
B: 7 – 10 mm (0.28 – 0.39 in)
C: 8 – 11 mm (0.31 – 0.43 in)
D: 1 – 4 mm (0.04 – 0.16 in)

To adjust the clearance, loosen belt stopper A bolts (8 x 16 mm) [3] and [4], belt stopper B bolts (6 x 12 mm) [5] and [6], move the stoppers up or down as necessary and tighten the stopper bolts securely.

After adjusting the clearance, start the engine and then disengage the clutch and make sure that two V-belts are not being pulled by the drive pulley.





TRANSMISSION OIL LEVEL CHECK

NOTICE

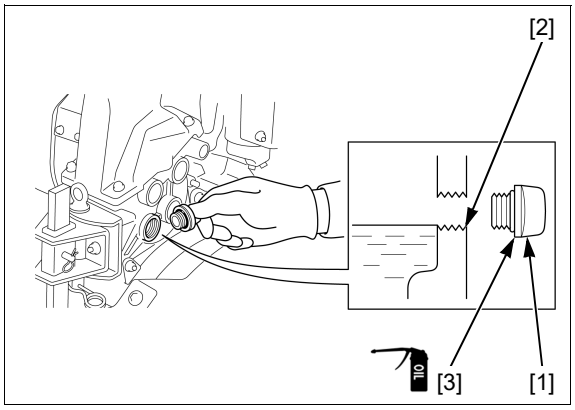
- *Check the transmission oil level with the engine stopped.*

Place the tiller on a firm level surface with the tire or rotor set on the ground so that the engine becomes level.

Remove the oil filler cap [1] and check the oil level is up to the lower edge [2] of the oil filler hole.

If the level is low, fill with the recommended transmission oil to the upper level (up to the lower edge of the oil filler hole).

RECOMMENDED TRANSMISSION OIL:
SAE 10W-30
API service classification SE or higher



Check that the O-ring [3] is in good condition, replace it if necessary.

Apply transmission oil to the O-ring.

Reinstall and tighten the oil filler cap securely.

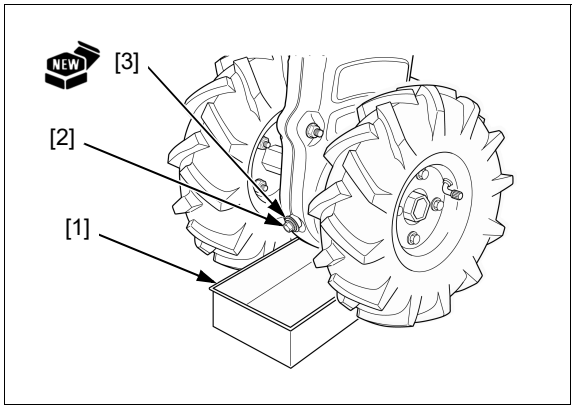
TRANSMISSION OIL CHANGE

Place a suitable container [1] under the drain plug bolt [2].

Remove the oil filler cap (page 3-10).

Remove the drain bolt, drain plug washer [3] and drain the transmission oil into the suitable container.

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



⚠CAUTION

Used transmission oil contains substances that have been identified as carcinogenic.
If repeatedly left in contact with the skin for prolonged periods, it may cause skin cancer.
Wash your hands thoroughly with soap and water as soon as possible after contact with used transmission oil.

Install the drain plug bolt and new drain plug washer.

With the tiller on a level surface, fill the recommended transmission oil (page 15-15).

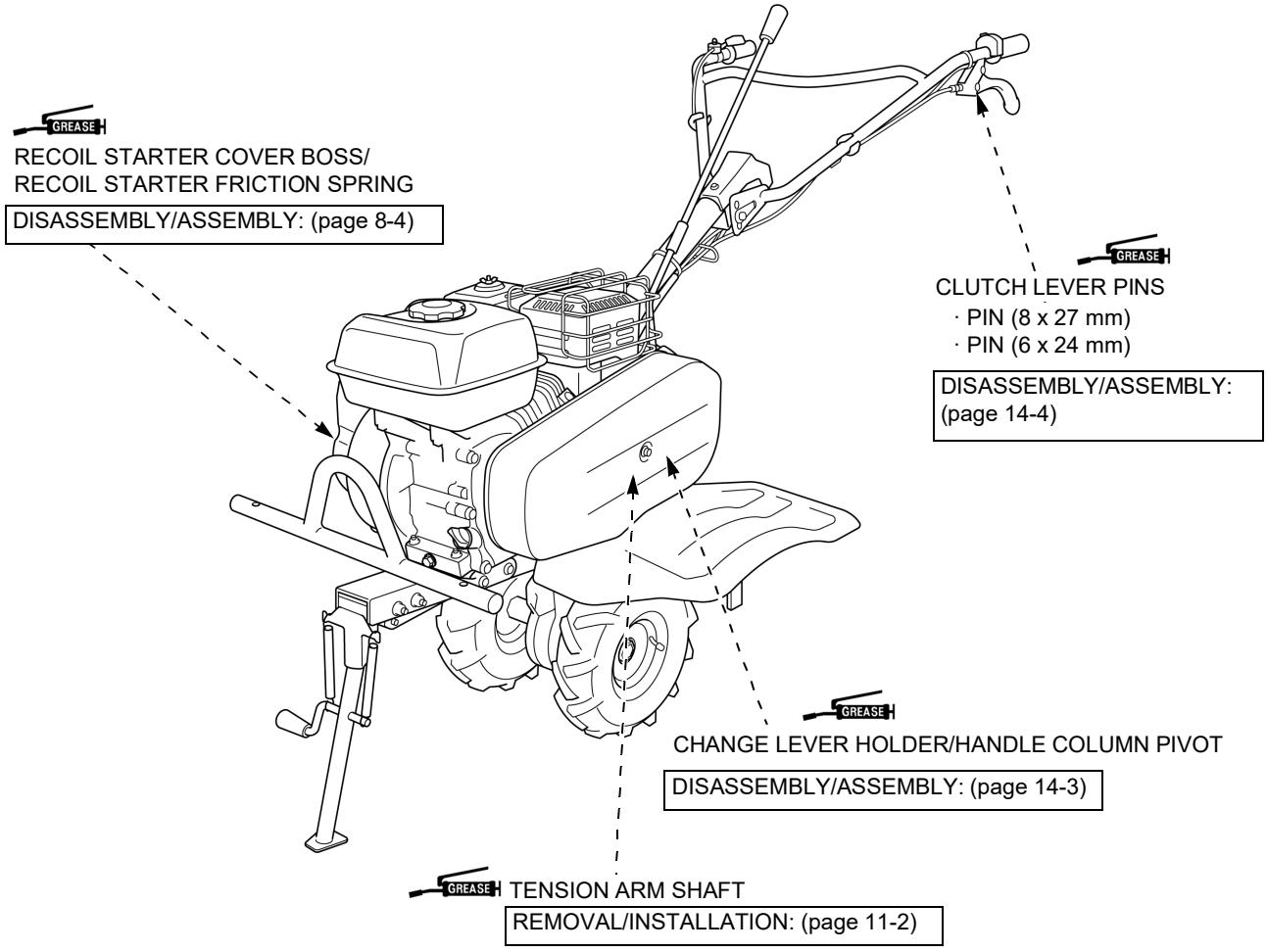
TRANSMISSION OIL CAPACITY:
1.2 liters (1.3 US qt, 1.1 Imp qt)

Recheck the transmission oil level (page 3-10).

Make sure there are no transmission oil leaks.

LUBRICATION

Apply grease to the following parts:



ENGINE IDLE SPEED CHECK/ ADJUSTMENT

NOTE:

- Use a tachometer with graduations of 50 min^{-1} (rpm) or smaller that will accurately indicate a 50 min^{-1} (rpm) change.

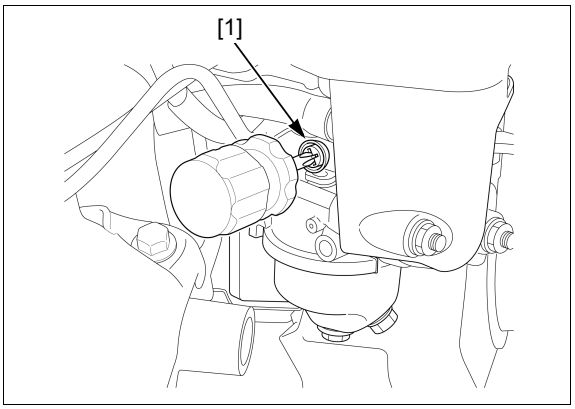
Warm up the engine.

Stop the engine and connect a tachometer according to manufacturer's operating instruction.

Start the engine and check the idle speed.

IDLE SPEED:1,250 – 1,600 min^{-1} (rpm)

If the idle speed is out of the specification, turn the throttle stop screw [1] to obtain the specified standard idle speed.



SPARK PLUG INSPECTION/ ADJUSTMENT/REPLACEMENT

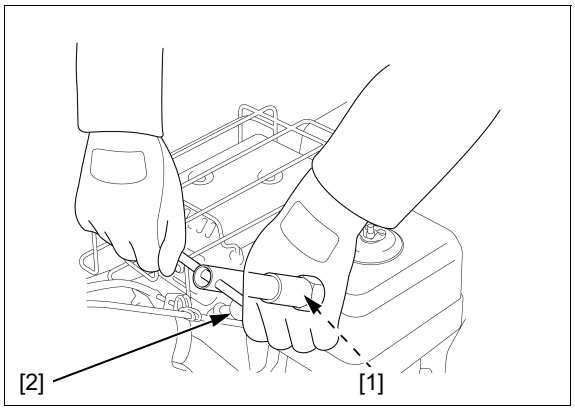
⚠ CAUTION

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

Clean any dirt from around the spark plug [1].

Remove the spark plug cap [2].

Remove the spark plug with a spark plug wrench.



Visually inspect the spark plug. Replace the plug if the insulator [1] is cracked or chipped.

Remove carbon or other deposits with wire brush.

Check the sealing washer [2], center electrode [3] and side electrode [4] for damage.

NOTICE

- *An incorrect spark plug can cause engine damage. Use the recommended spark plug or an exact equivalent.*
- *Replace the spark plug if the sealing washer is damaged.*

RECOMMENDED SPARK PLUG:
BPR6ES (NGK), W20EPR-U (DENSO)

Measure the plug gap with a thickness gauge. If the measurement is out of the specification, adjust by bending the side electrode.

SPARK PLUG GAP: 0.70 – 0.80 mm (0.028 – 0.031 in)

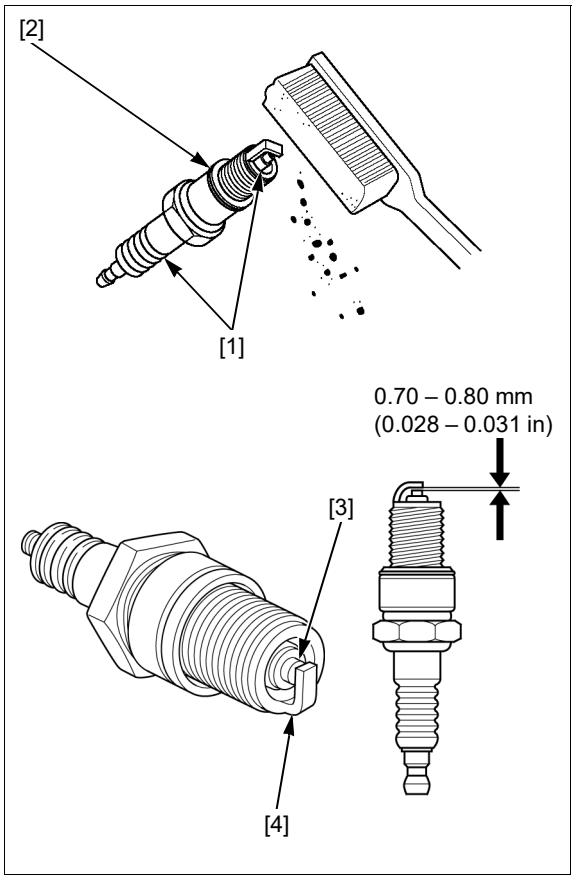
Install the spark plug finger tight to seat the washer, then tighten it to the specified torque.

TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)

NOTICE

- *A loose spark plug can become very hot and can damage the engine. Overtightening can damage the threads in the cylinder head.*

Install the spark plug cap.



THROTTLE CABLE CHECK/ ADJUSTMENT

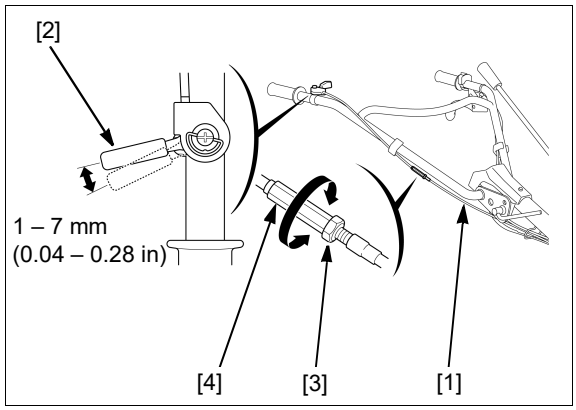
Check for any deterioration or damage to the throttle cable [1].
Check the throttle lever [2] for smooth operation.

Measure the throttle lever free play at the lever tip.

FREE PLAY: 1 – 7 mm (0.04 – 0.28 in)

If the throttle lever free play is incorrect, loosen the lock nut [3] and turn the adjusting nut [4] in or out as required.

After adjustment, tighten the lock nut securely.



VALVE CLEARANCE CHECK/ ADJUSTMENT

NOTICE

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

Remove the following:

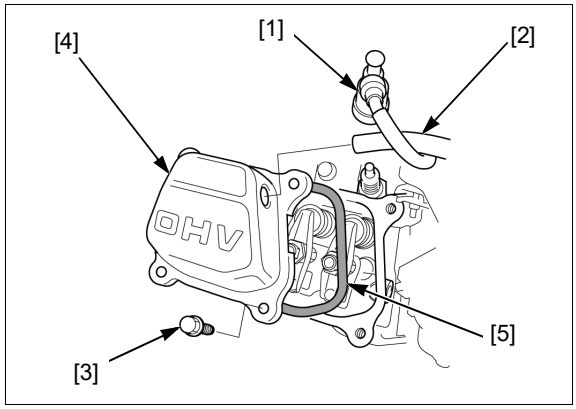
– Engine (page 10-2)
– Recoil starter (page 8-2)

Disconnect the spark plug cap [1] and remove the breather tube [2].

Remove the head cover bolts [3], cylinder head cover [4], cylinder head cover gasket [5].

NOTE:

- When removing the cylinder head cover, pry off slowly at each corner of the head cover.



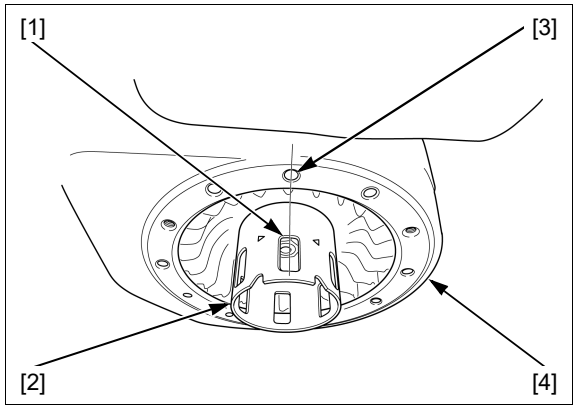
NOTICE

- *Using too much force can deform the cylinder head cover. The cylinder head cover must be replaced if it is deformed.*

Align the square hole [1] with "△" mark on the starter pulley [2] with the top hole [3] on the fan cover [4].

This will set the piston at top dead center of the compression stroke (both valves are fully closed).

If the exhaust valve is opened, turn the starter pulley one additional turn and align the square hole with "△" mark on the starter pulley with the top hole on the fan cover.



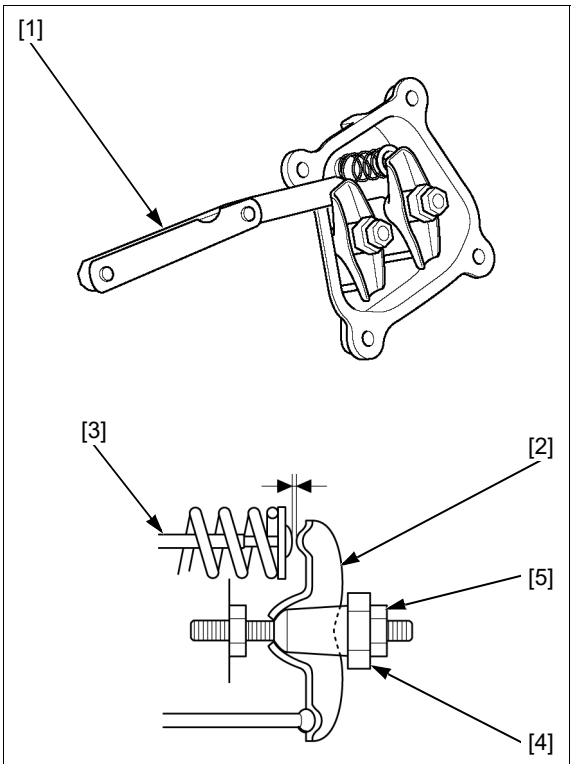
Insert a thickness gauge [1] between the rocker arm [2] and valve stem [3] to check the valve clearance.

VALVE CLEARANCE:
IN: 0.15 ± 0.02 mm (0.006 ± 0.001 in)
EX: 0.20 ± 0.02 mm (0.008 ± 0.001 in)

If adjustment is necessary, proceed as follows.

Hold the rocker arm pivot [4] and loosen the rocker arm pivot lock nut (6 mm) [5].

Adjust by turning the rocker arm pivot until there is a slight drag on the thickness gauge.



To increase valve clearance: screw out.
To decrease valve clearance: screw in.

Hold the rocker arm pivot [1] and retighten the rocker arm pivot lock nut (6 mm) [2] to the specified torque.

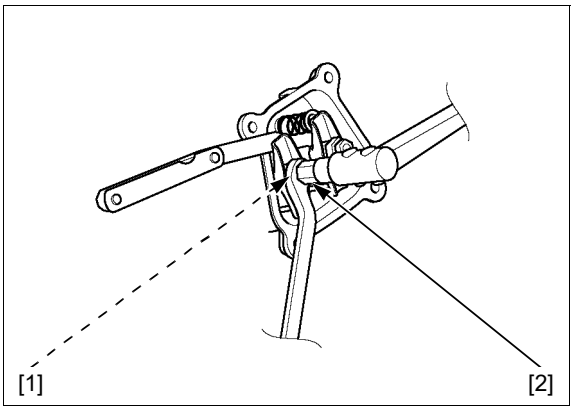
TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)

Recheck the valve clearance, and if necessary, readjust the clearance.

Do not reuse the cylinder head cover gasket.

Installation is in the reverse order of removal.

Check the V-belt tension (page 3-8).

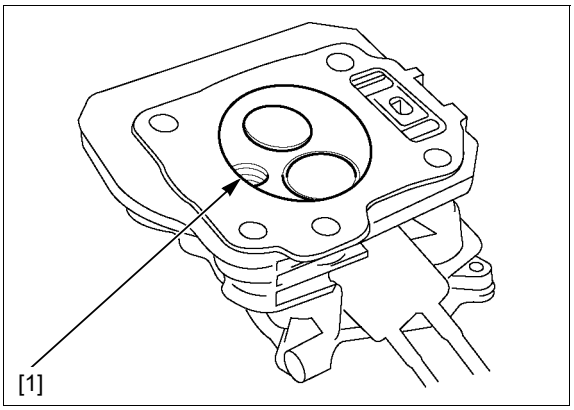


COMBUSTION CHAMBER CLEANING

Remove the cylinder head (page 12-3).

Clean any carbon deposits from the combustion chamber [1].

Install the cylinder head (page 12-3).



FUEL TANK AND FILTER CLEANING

⚠WARNING

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

Remove the fuel tank (page 5-3).

Remove the fuel filter joint [1].

Remove the O-ring [2] from the fuel filter joint.

Wash the fuel filter joint in nonflammable or high flash point solvent.

Inspect the fuel filter screen to be sure it is undamaged.

Clean the fuel tank [3] with nonflammable or high flash point solvent and allow to dry thoroughly.

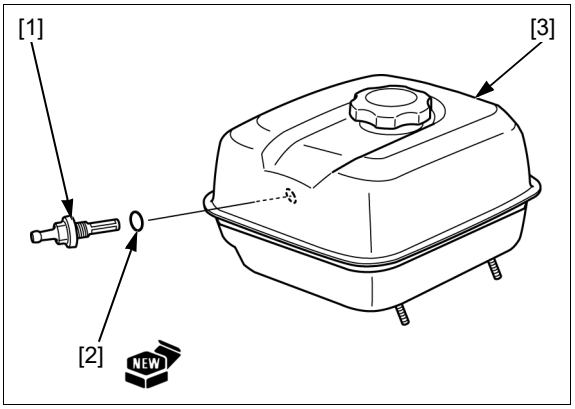
Check to be sure new O-ring is in place, and install the fuel filter joint.

Tighten the fuel filter joint to the specified torque.

TORQUE: 2 N·m (0.20 kgf·m, 1.5 lbf·ft)

Install the fuel tank (page 5-3).

Make sure there are no fuel leaks.



FUEL TUBE INSPECTION

⚠WARNING

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

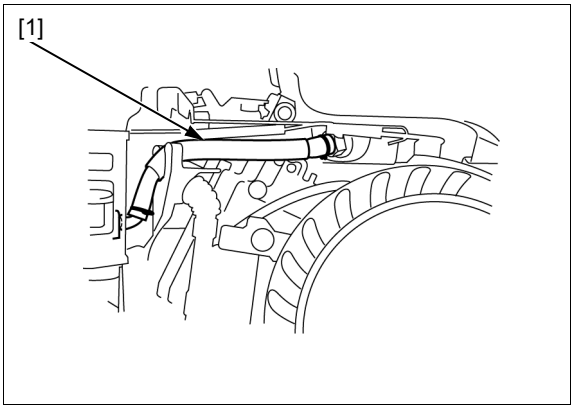
Remove the fan cover (page 8-2).

Check the fuel tube [1] for damage, fuel leakage, corrosion, and other abnormalities.

Check that the fuel tube is not interfering with the neighboring parts.

Replace the fuel tube if there is damage, fuel leakage or, corrosion (page 5-3).

Install the fan cover (page 8-2).



MEMO

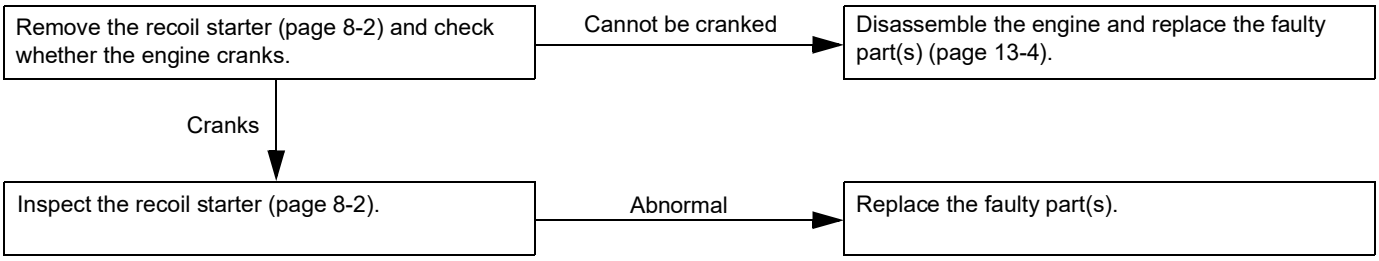
4. TROUBLESHOOTING

BEFORE TROUBLESHOOTING

- Check that the engine stop switch wire connector and ignition coil wire connector are connected securely.
- Check for sufficient fresh fuel in the fuel tank.

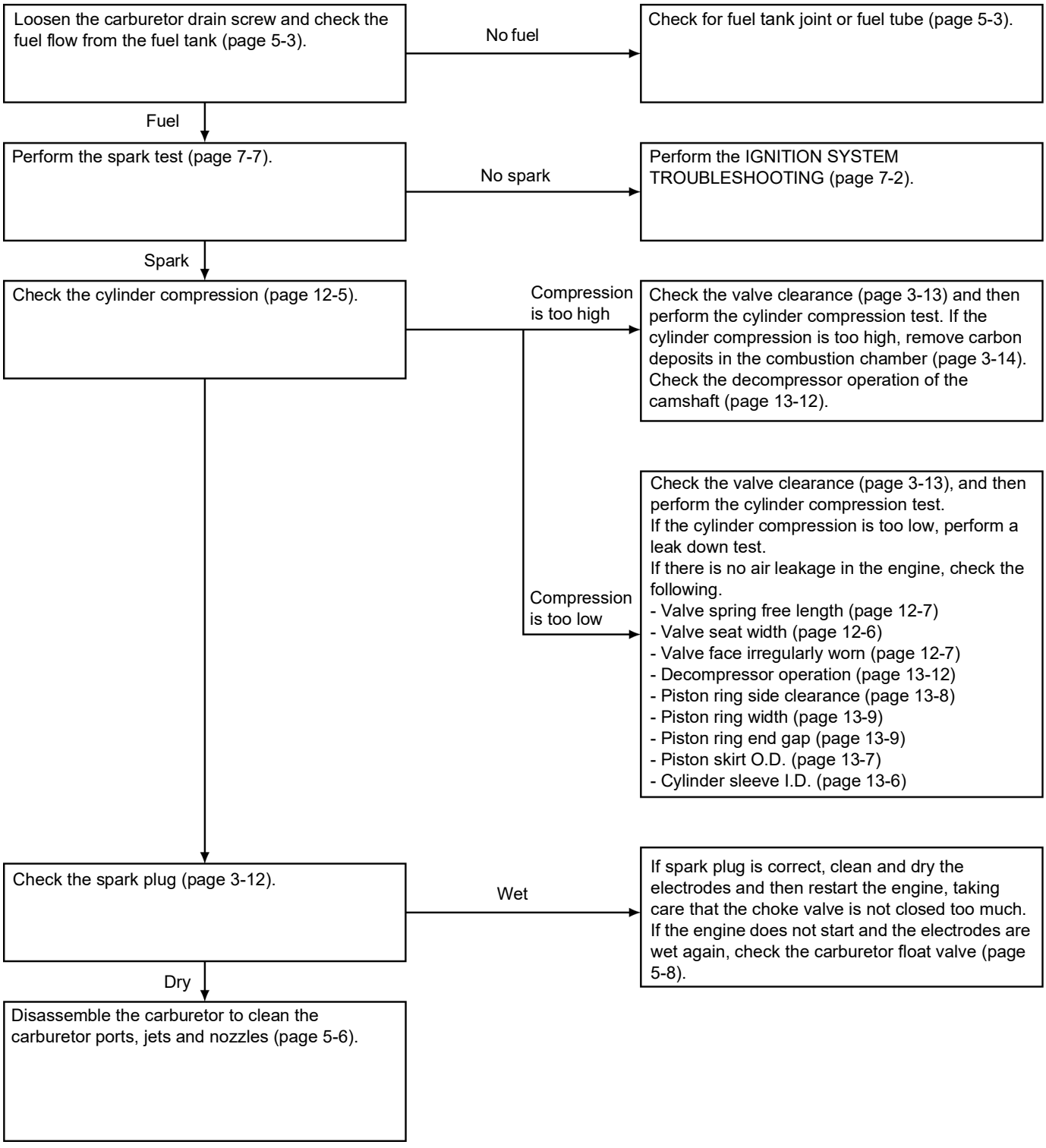
ENGINE TROUBLESHOOTING

ENGINE DOES NOT CRANK

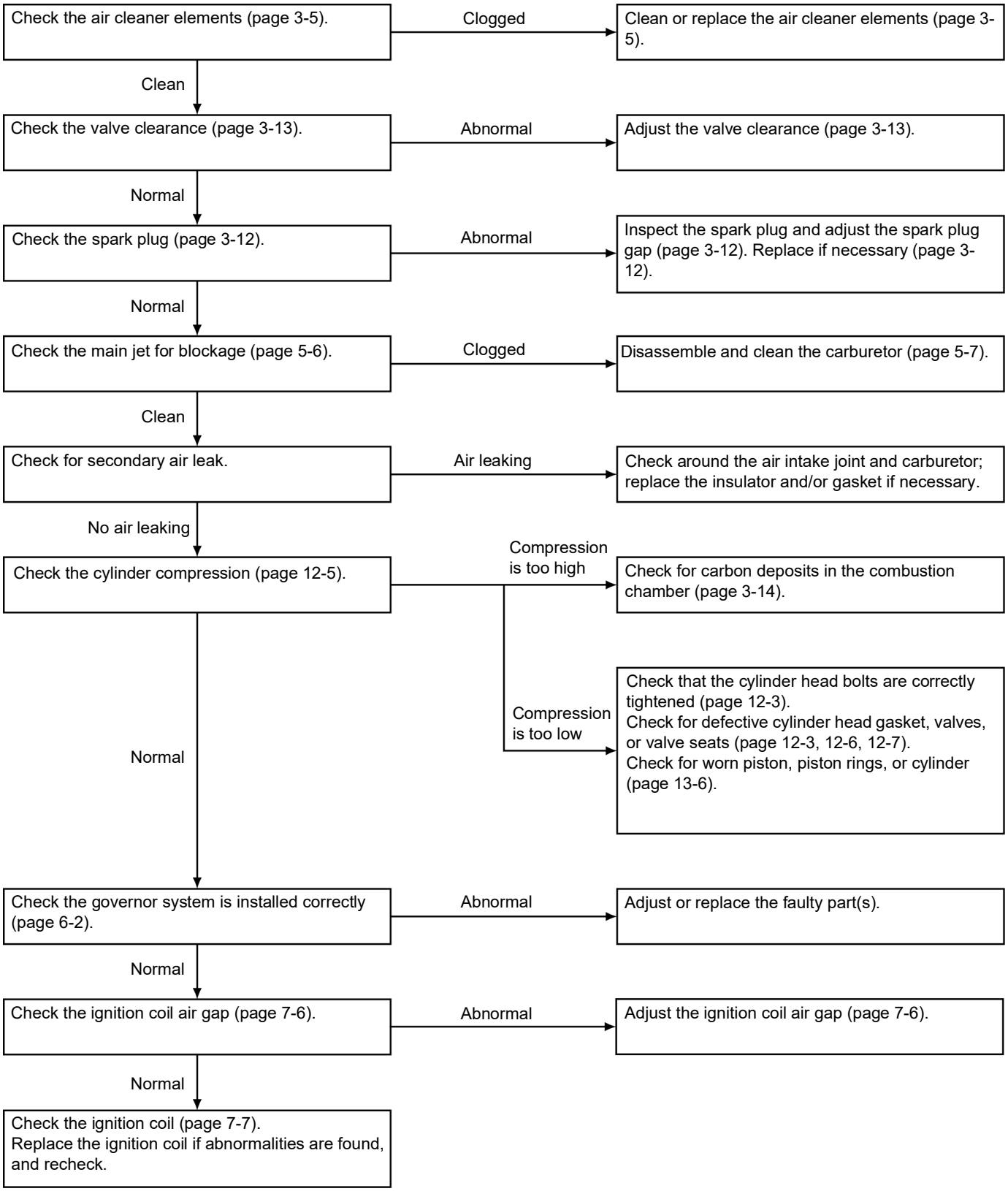


ENGINE CRANKS BUT WON'T START

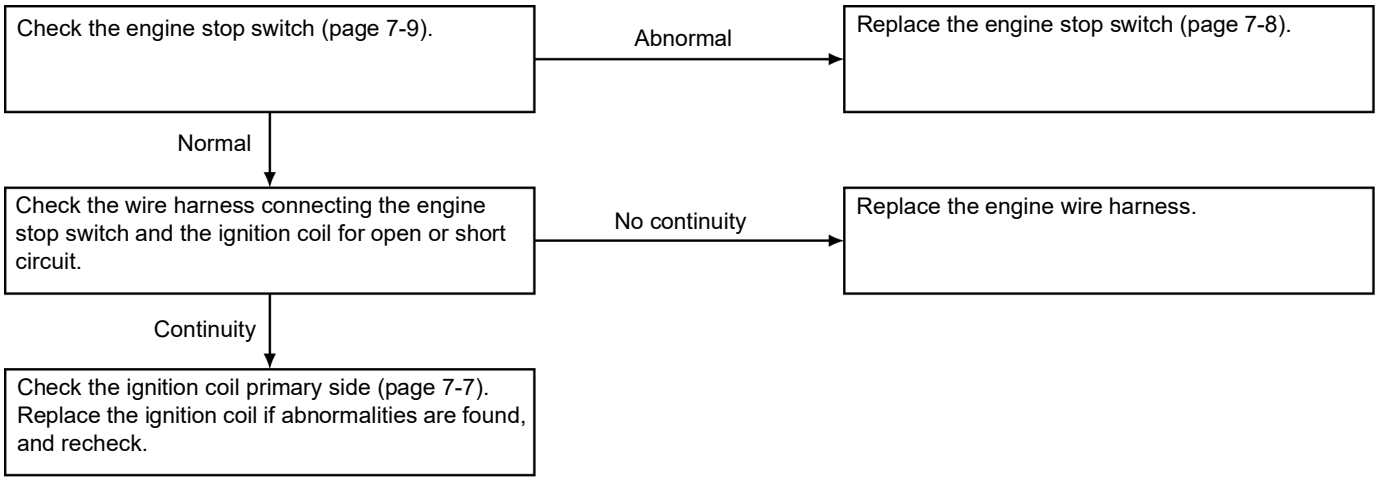
- Check the oil level before troubleshooting (page 3-3).



ENGINE SPEED DOES NOT INCREASE OR STABILIZE



ENGINE DOES NOT STOP WHEN ENGINE STOP SWITCH IS TURNED OFF



FRAME TROUBLESHOOTING

CLUTCH CAN NOT BE DISENGAGED

- Clutch cable misadjusted
  – Adjust (page 3-6).
- V-belt misadjusted
  – Adjust (page 3-8).
- Tension arm binding on tension arm shaft
  – Clean and lubricate (page 15-11)

CLUTCH CAN NOT BE ENGAGED

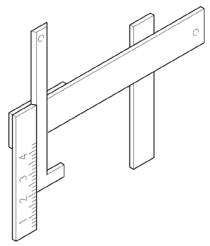
- Clutch cable misadjusted
  – Adjust (page 3-6).
- V-belt misadjusted
  – Adjust (page 3-8).
- Tension arm binding on tension arm shaft
  – Clean and lubricate (page 15-11).

MEMO

5. FUEL SYSTEM

TOOLS

Float level gauge
07401-0010000



FUEL TANK REMOVAL/INSTALLATION

⚠WARNING

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

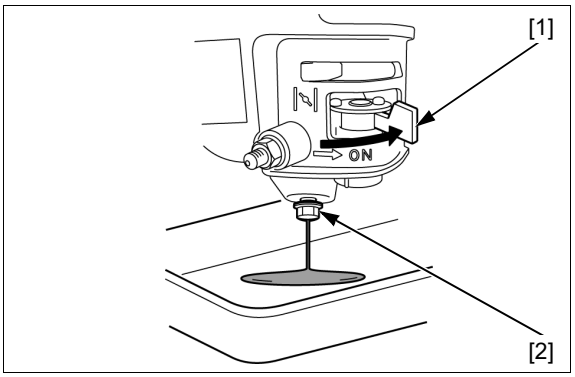
Remove the fan cover (page 8-2).

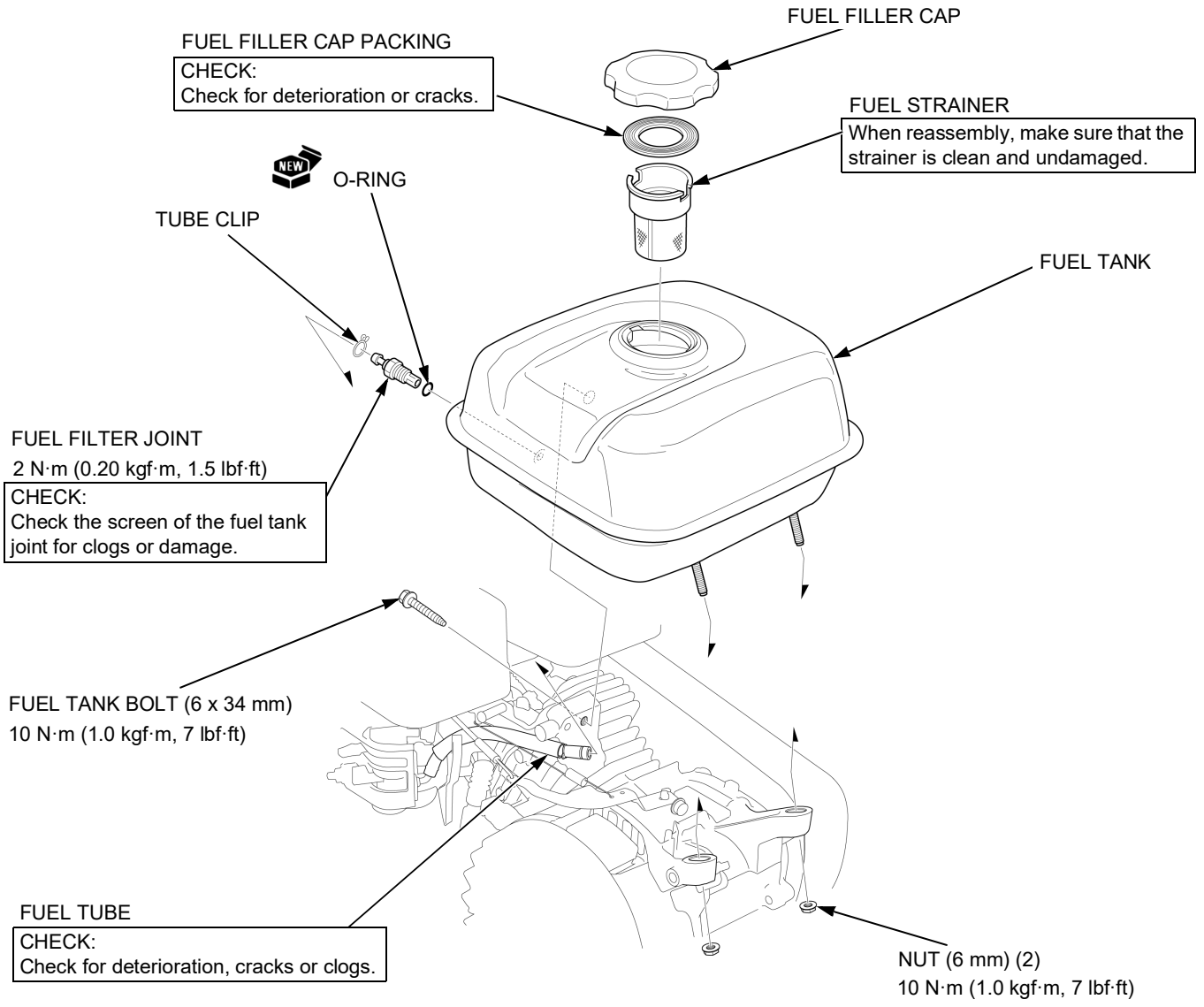
Place a suitable container under the carburetor.

Turn the fuel valve lever [1] to the ON position.

Loosen the drain screw [2] and drain the fuel.

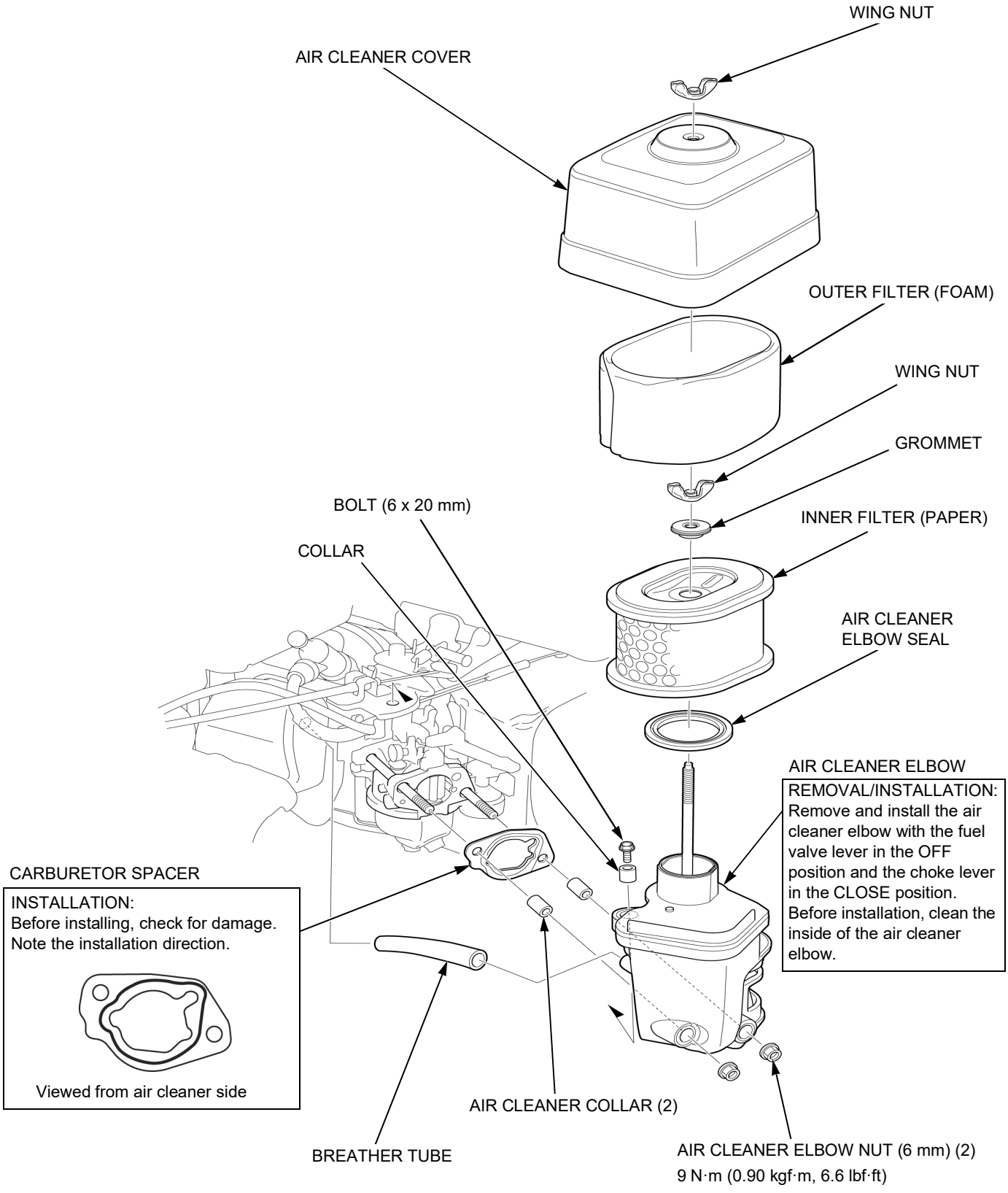
NOTE:
- Route the fuel tube properly (page 2-8).





AIR CLEANER REMOVAL/INSTALLATION

NOTE:
- Route the breather tube properly (page 2-8).



CARBURETOR REMOVAL/INSTALLATION

⚠ WARNING

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

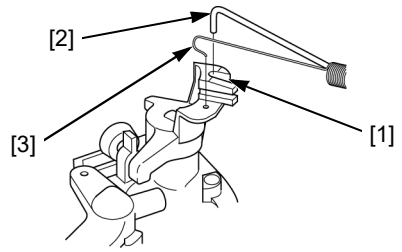
Remove the air cleaner elbow (page 5-4).

Set a commercially available tube clamp to the fuel tube.

Drain the fuel completely (page 5-3).

GOVERNOR ROD/THROTTLE RETURN SPRING

REMOVAL/INSTALLATION:
Pull the carburetor to a point where the groove [1] of the throttle arm lines up with the governor rod [2], and then lift the governor rod out of the hole of the throttle arm and unhook the throttle return spring [3].



CARBURETOR INSULATOR

INSTALLATION:
Before installing, clean the passage [1] thoroughly with compressed air.
Install the carburetor insulator with the vent groove facing toward the carburetor.
After installing, clamp the high-tension cord [2], the engine wire harness [3] and fuel tube [4] to the carburetor insulator.

CARBURETOR DISASSEMBLY/ASSEMBLY

⚠ WARNING

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

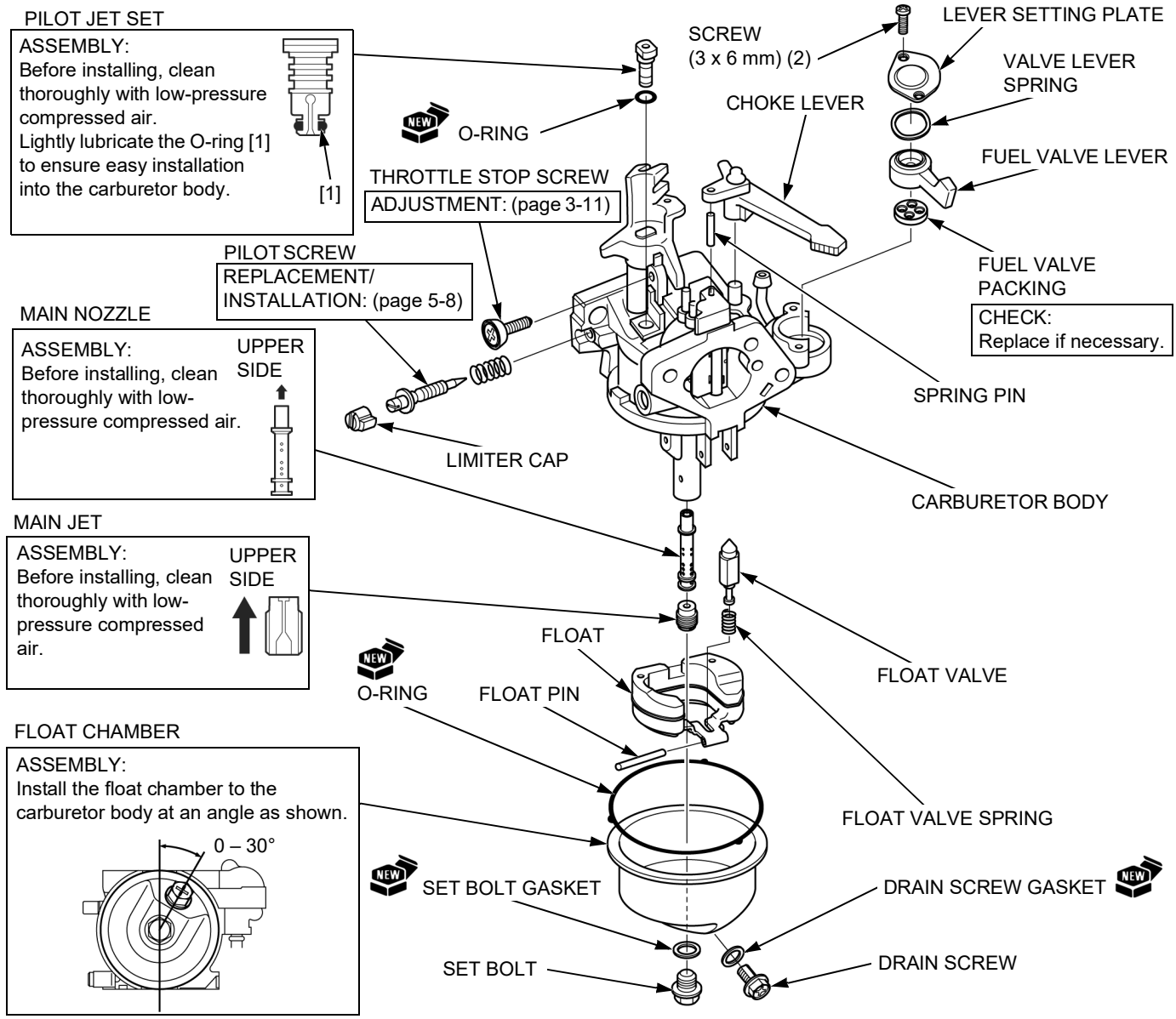
⚠ CAUTION

To prevent serious eye injury, always wear safety goggles or other eye protection when using compressed air.

Remove the carburetor (page 5-5).

Before disassembly, clean the outside of the carburetor.

BE69G A shown:



CARBURETOR BODY CLEANING

⚠ CAUTION

To prevent serious eye injury, always wear safety goggles or other eye protection when using compressed air.

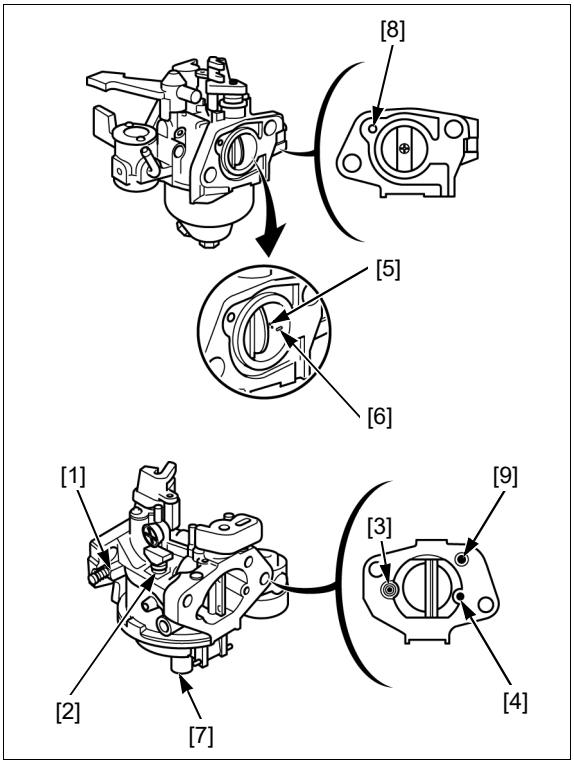
NOTICE

- *Some commercially available chemical cleaners are very caustic. These cleaners may damage plastic parts such as the O-ring, the float and the float valve seat of the carburetor. Check the container for instructions. If you are in doubt, do not use these products to clean Honda carburetors.*
- *High air pressure may damage the carburetor body. Use low air pressure (206 kPa (2.11 kgf/cm^2, 30 psi) or less) when cleaning passages and ports.*

Clean the carburetor body with non-flammable solvent.

Clean thoroughly the following passages and ports with low-pressure compressed air.

– Pilot screw hole [1]
– Pilot jet hole [2]
– Pilot air jet [3]
– Main air jet [4]
– Transition ports [5]
– Pilot outlet [6]
– Main nozzle holder [7]
– External vent port [8]
– Internal vent port [9]



CARBURETOR INSPECTION

FLOAT LEVEL HEIGHT

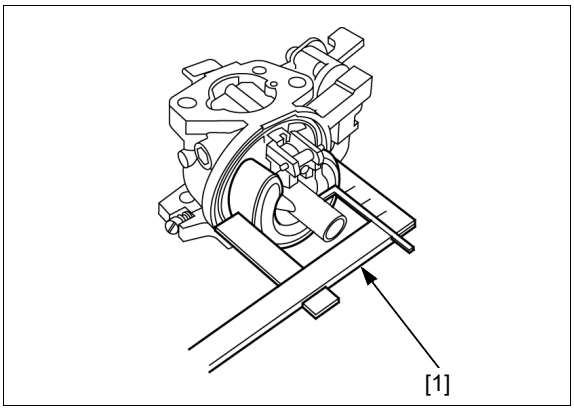
Place the carburetor in the position as shown. Measure the distance between the float top and carburetor body when the float just contacts the seat without compressing the valve spring.

TOOL:
Float level gauge [1] 07401-0010000

FLOAT HEIGHT: 13.7 mm (0.54 in)

If the measured float height is out of specification, check the float valve and the float valve spring (page 5-8).

If the float valve and float valve spring are normal, replace the float (page 5-6).



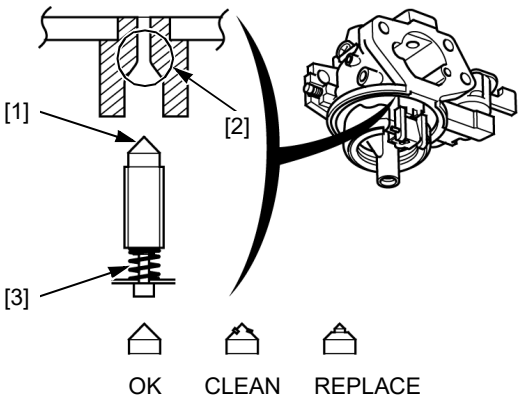
FLOAT VALVE

Check the float valve and its seat [1] for wear or contamination.

Check the valve seat [2] for clogs.

Before installation, check for wear or a weak float valve spring [3].

Check the operation of the float valve.



PILOT SCREW REPLACEMENT

Leave the pilot screw [1] and limiter cap [2] in place during carburetor cleaning. Remove only if necessary for carburetor repair.

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

When the limiter cap has been broken off, remove the broken pilot screw.

Place the spring on the replacement pilot screw, and install it on the carburetor.

Turn the pilot screw in until it is lightly seated and then turn the screw out the required number of turns.

PILOT SCREW OPENING: 2 – 1/2 turns out

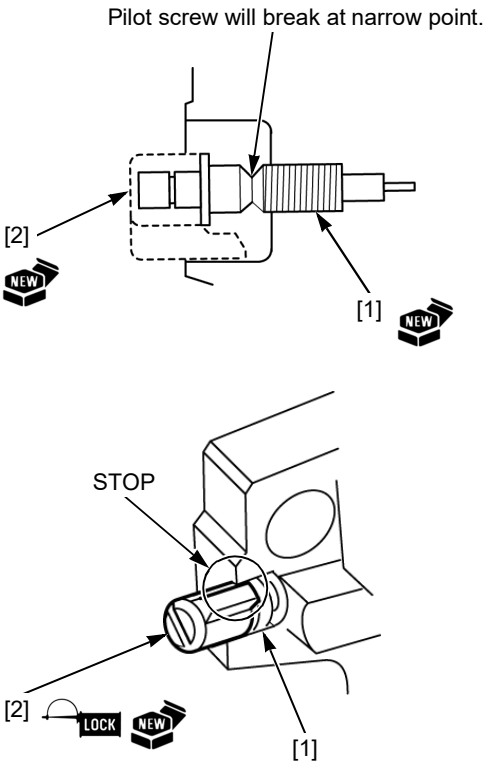
Refer to the table above for carburetor pilot screw initial opening setting.

BE69G A carburetor only: Apply LOCTITE® 638 or equivalent to the inside of the limiter cap and then install the cap so the stop prevents the pilot screw from being turned counterclockwise.

RA07 A carburetor only: Apply LOCTITE® 638 or equivalent to the inside of the limiter cap and then install the cap.

Be careful to avoid turning the pilot screw while installing the limiter cap. The pilot screw must stay at its required setting.

BE69G A shown:



CHOKE REPLACEMENT

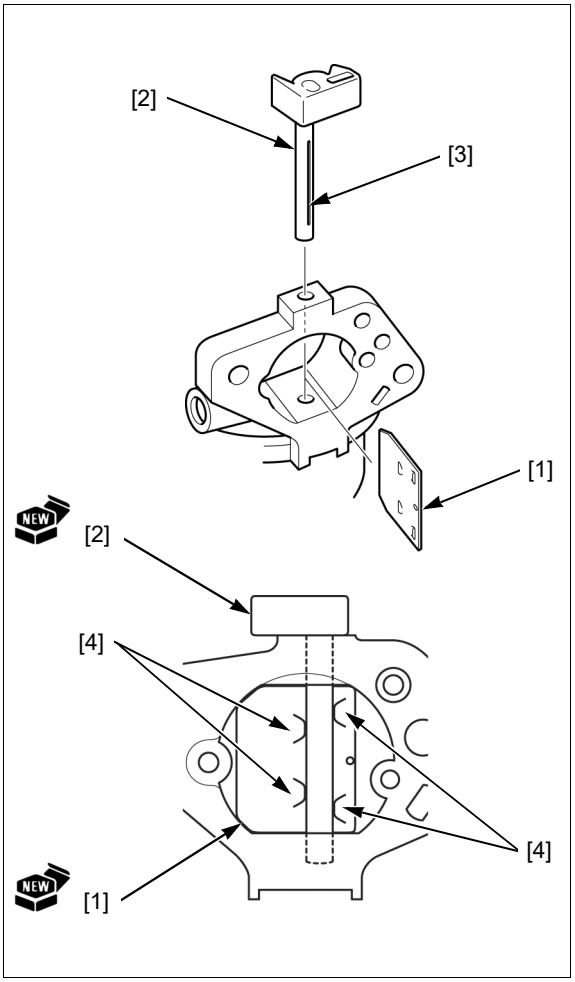
Remove the carburetor (page 5-5).

Pull out the choke valve plate [1].

Remove the choke shaft [2] and install a new choke shaft.

Insert a new choke valve plate into the slit [3] of the choke shaft.

Be sure the choke shaft is in the position between the projections [4] of the choke valve plate.

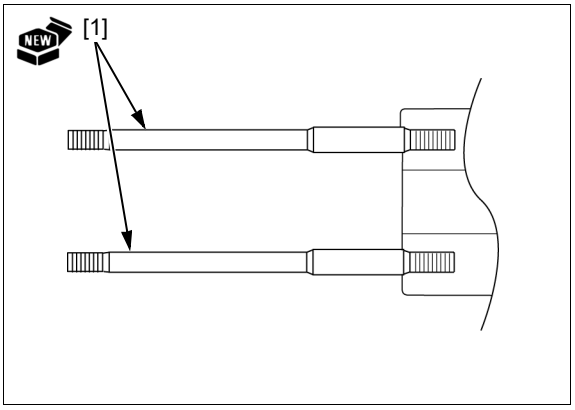


CARBURETOR STUD BOLT REPLACEMENT

Remove the carburetor (page 5-5).

Thread two nuts onto the carburetor stud bolts [1] and tighten them together, then use a wrench to turn the stud bolt out.

Install and tighten new stud bolts until they are fully seated.



MEMO

6. GOVERNOR SYSTEM

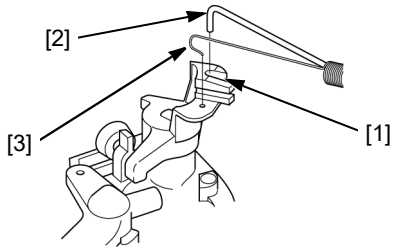
CONTROL BASE/GOVERNOR ARM REMOVAL/INSTALLATION

Remove the fuel tank (page 5-3).
Remove the air cleaner elbow (page 5-4).
Disconnect the throttle cable (page 10-2).

After installation, perform the "GOVERNOR ADJUSTMENT" (page 6-3).

GOVERNOR ROD/THROTTLE RETURN SPRING

REMOVAL/INSTALLATION:
Pull the carburetor to a point where the groove [1] of the throttle arm lines up with the governor rod [2], and then lift the governor rod out of the hole of the throttle arm and unhook the throttle return spring [3].



GOVERNOR SPRING

When reassembly, install the spring with the long end side toward the control base.

INSTALLATION:

Hook the throttle return spring on the hole marked "H".

GOVERNOR ADJUSTMENT

Remove the fuel tank (page 5-3).

Loosen the governor arm nut (6 mm) [1] and then move the governor arm [2] so that the throttle is completely open.

Rotate the governor arm shaft [3] as far as it will go in the direction that it was just turned by the governor arm.

Tighten the governor arm nut to the specified torque and then make sure that the clearance is normal as shown.

TORQUE: 3 N·m (0.31 kgf·m, 2.2 lbf·ft)

Install the fuel tank (page 5-3).

NOTE:

- Use a tachometer with graduations of 50 min^{-1} (rpm) or smaller that will accurately indicate a 50 min^{-1} (rpm) change.

Warm up the engine.

Stop the engine and connect a tachometer according to manufacturer's operating instruction.

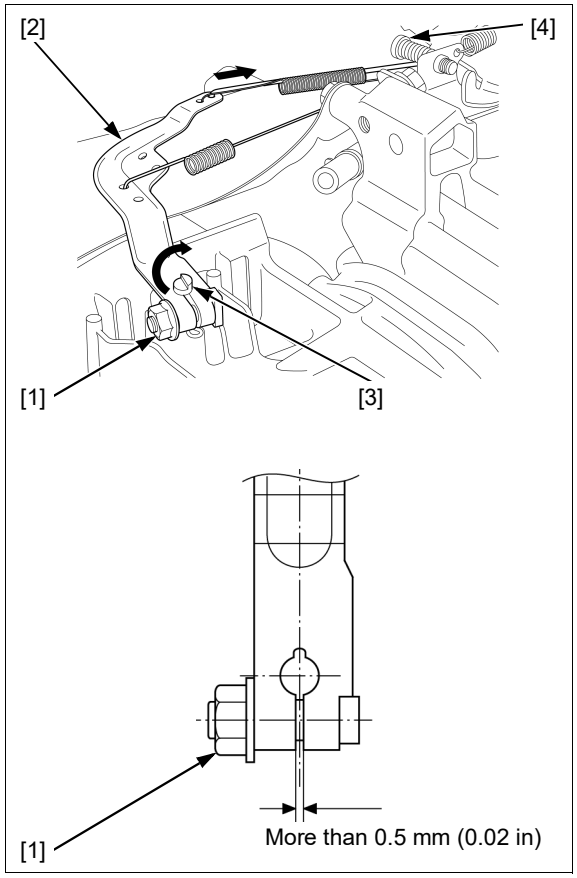
Start the engine and bring the engine to its standard speed with the throttle lever.

Adjust the throttle control screw [4] so that the throttle cannot be moved past this point.

MAXIMUM ENGINE SPEED (AT NO LOAD):

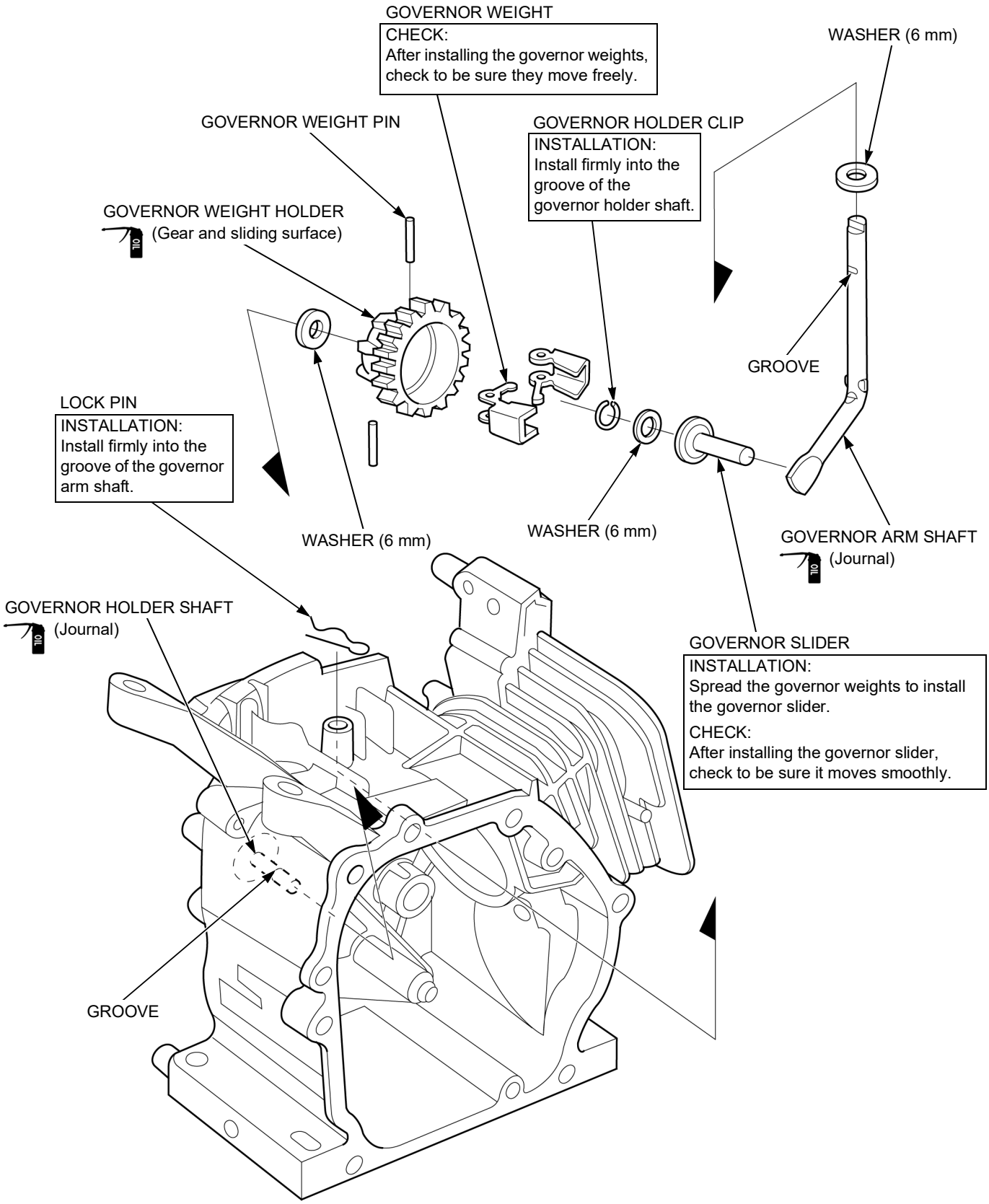
3,800 $^{+\ 0}_{-\ 200}$ min^{-1} (rpm)

After adjustment, adjust the engine idle speed (page 3-11) and throttle cable (page 3-13).



GOVERNOR REMOVAL/INSTALLATION

Remove the crankshaft (page 13-4).



7. IGNITION SYSTEM

BEFORE TROUBLESHOOTING

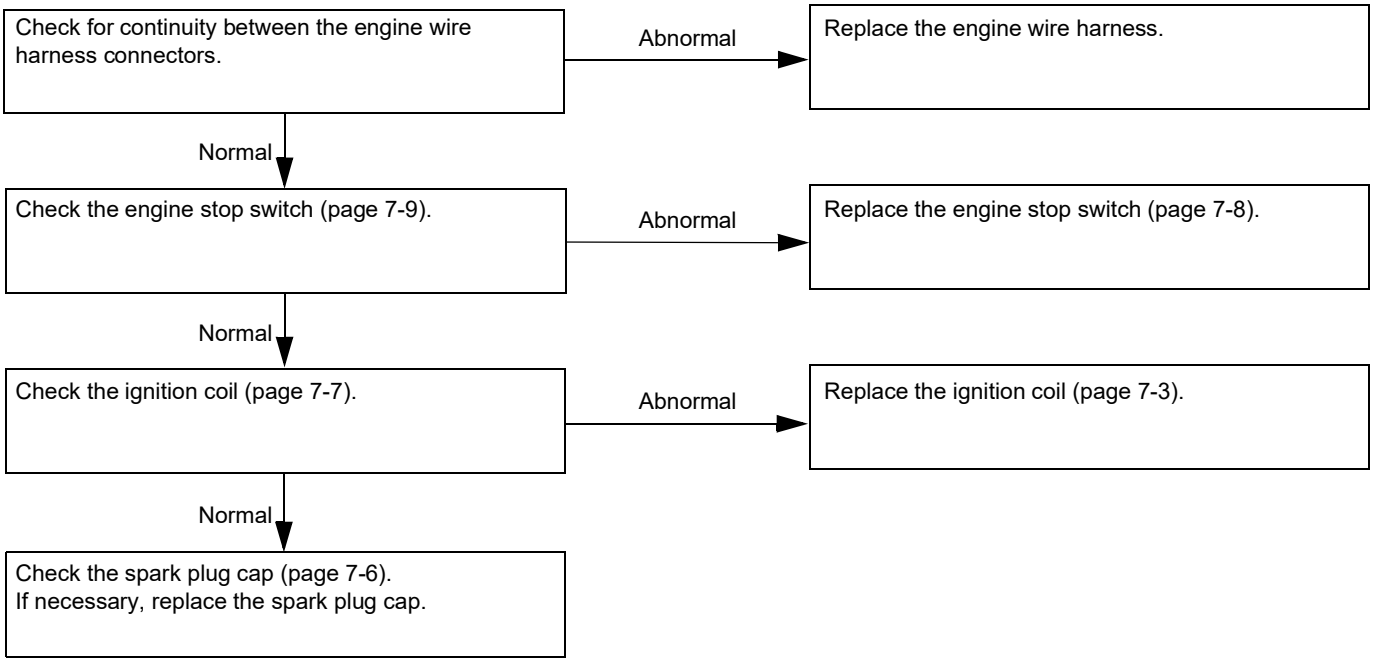
- Check that the engine stop switch wire connector and ignition coil wire connector are connected securely.
- Check that the engine stop switch is "ON" position.

IGNITION SYSTEM TROUBLESHOOTING

NO OR WEAK SPARK AT SPARK PLUG

Check the following before troubleshooting:

– Loose connectors
– Spark plug (page 3-12)
– Engine oil level (page 3-3)



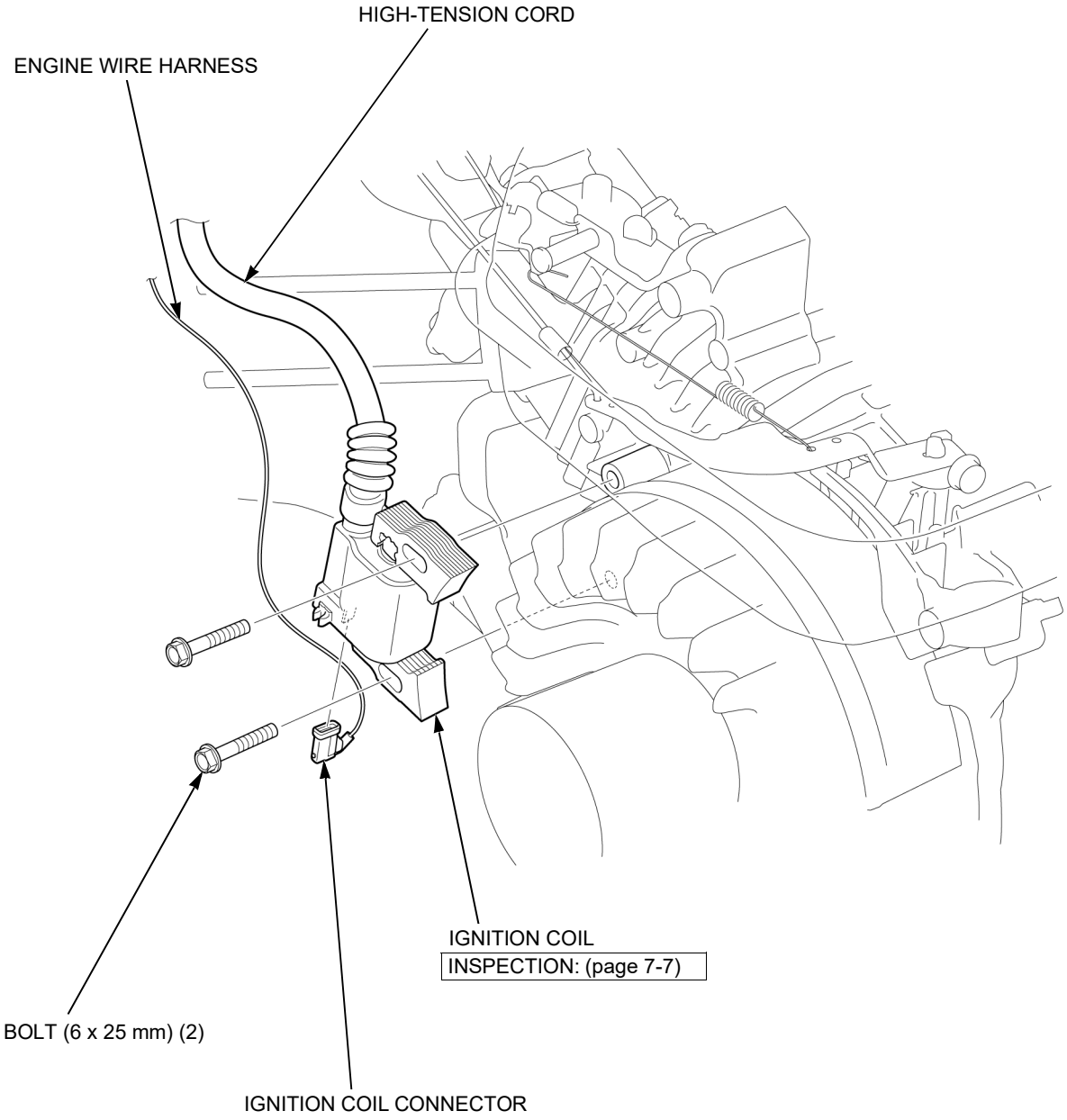
IGNITION COIL REMOVAL/INSTALLATION

Remove the following:

– Fan cover (page 8-2)
– Carburetor (page 5-5)

NOTE:

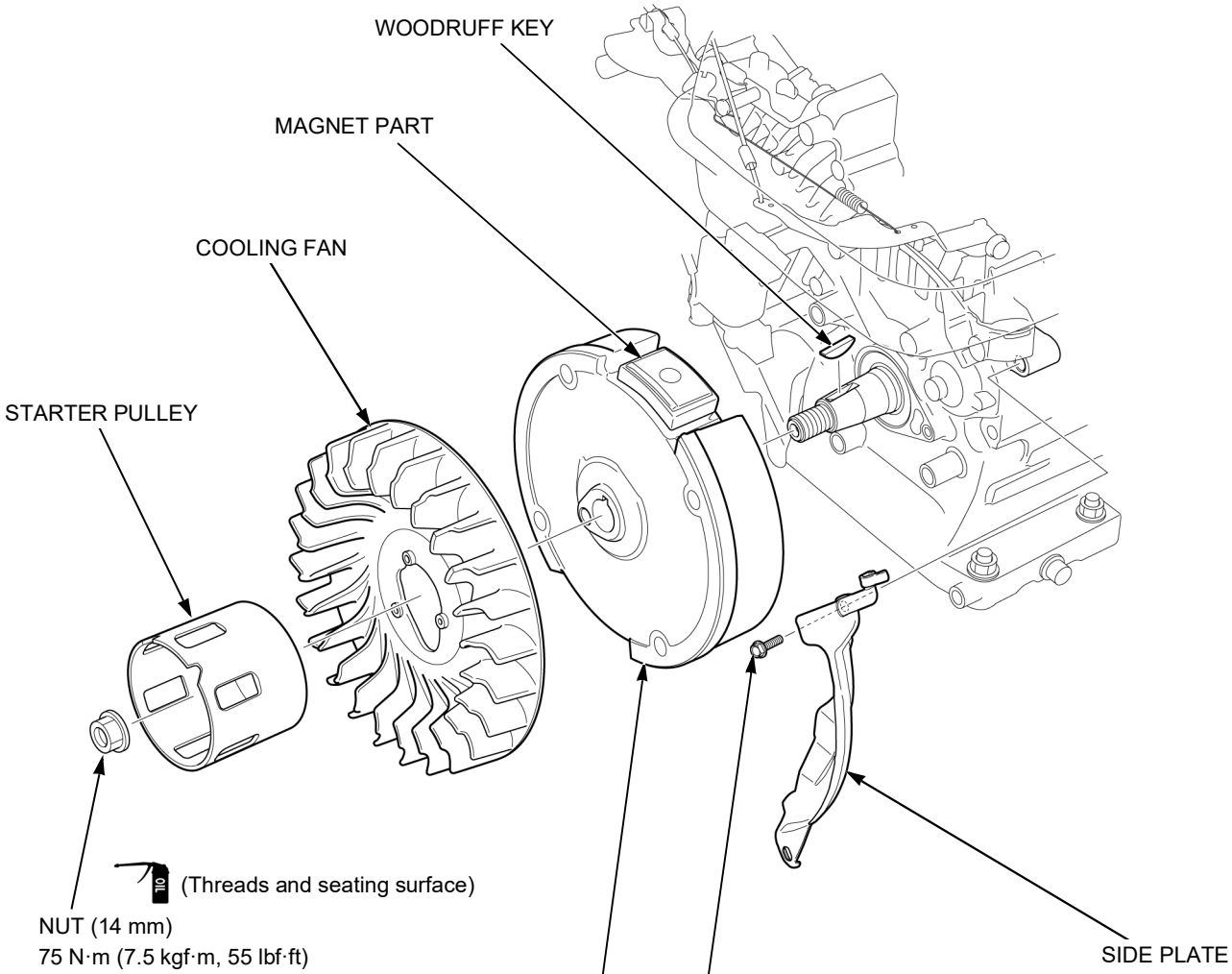
- Route the engine wire harness and high-tension code properly (page 2-8).
- After installation, check the ignition coil air gap (page 7-6).



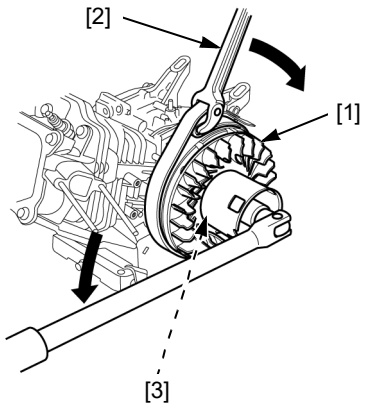
COOLING FAN/FLYWHEEL REMOVAL/INSTALLATION

REMOVAL

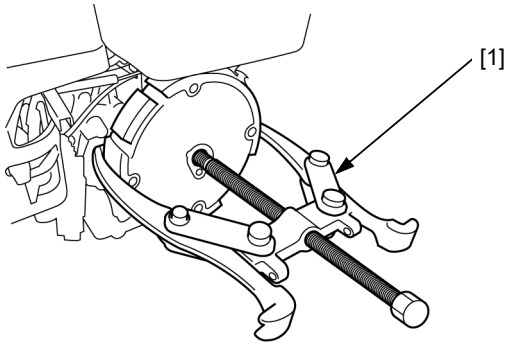
Remove the ignition coil (page 7-3).



REMOVAL:
Hold the flywheel [1] with a commercially available strap wrench [2], being careful not to damage the magnet part.
Remove the flywheel nut (14 mm) [3].



REMOVAL:
Use the commercially available tool [1] to remove the flywheel.



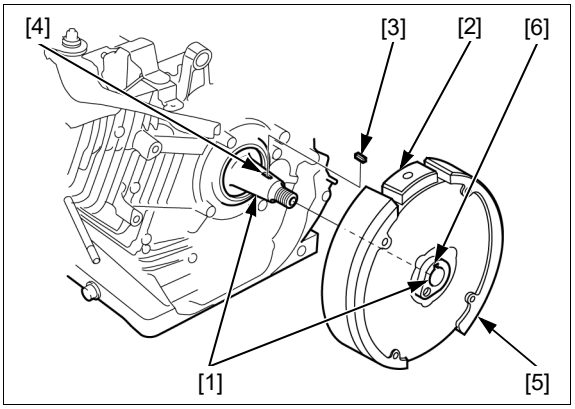
INSTALLATION

NOTICE

- *Clean the tapered parts [1] of dirt, oil, grease, and other foreign material before installation.*
- *Be sure there are no metal parts or other foreign material on the magnet part [2] of the flywheel.*

Set the woodruff key [3] in the key groove [4] of the crankshaft securely.

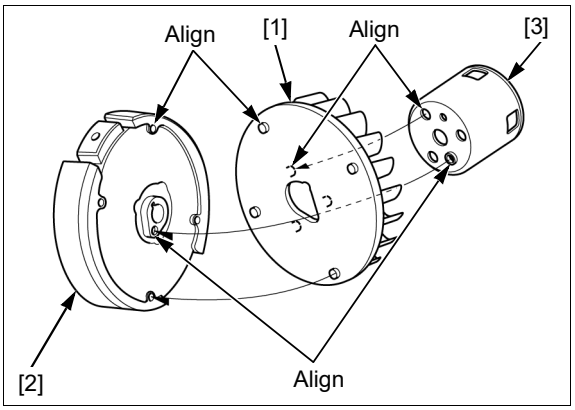
Set the flywheel [5] by aligning the key slot [6] with the woodruff key on the crankshaft.



Attach the cooling fan [1] to the flywheel [2] by aligning the four projections of the cooling fan with the holes of the flywheel.

Attach the starter pulley [3] by aligning the following:

– Holes of the pulley and tabs of the cooling fan
– Tab of the pulley and hole of the flywheel

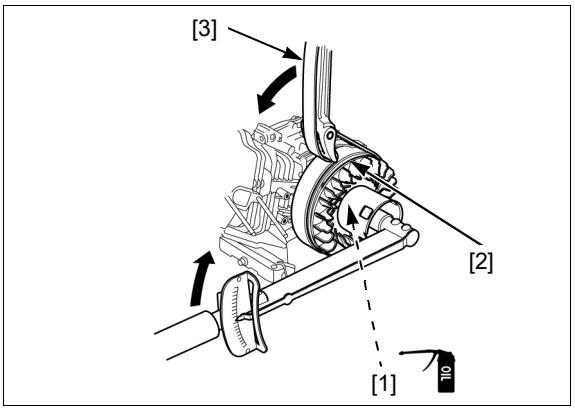


Apply a light coat of engine oil to the threads and the seating surface of the nut [1] and loosely tighten the nut.

Hold the flywheel [2] with a commercially available strap wrench [3], being careful not to damage the magnet part.

Tighten the flywheel nut to the specified torque.

TORQUE: 75 N·m (7.5 kgf·m, 55 lbf·ft)



IGNITION COIL AIR GAP CHECK/ADJUSTMENT

Remove the fan cover (page 8-2).

Insert the feeler gauge [1] of proper thickness between the ignition coil [2] and the flywheel [3].

IGNITION COIL AIR GAP:
0.2 – 0.6 mm (0.008 – 0.024 in)

NOTICE

- *Avoid the magnet part of the flywheel when adjusting.*
- *Adjust the ignition coil air gap equally on both sides.*

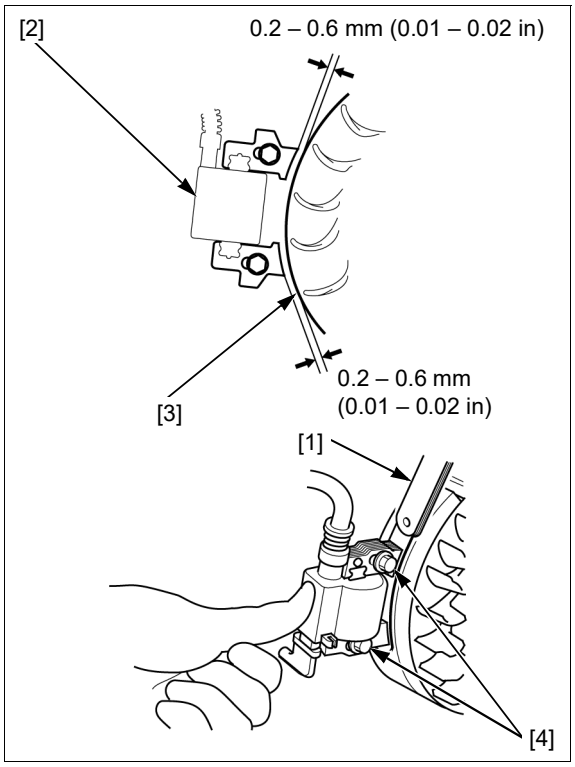
If measured clearance is out of specification, adjust the air gap.

Loosen the two bolts (6 x 25 mm) [4].

Insert the feeler gauge of proper thickness between the ignition coil and flywheel.

Push the ignition coil firmly against the flywheel and tighten the ignition coil bolts securely.

Remove the feeler gauge.

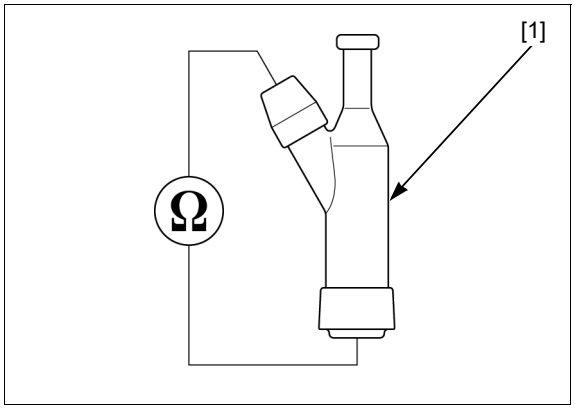


SPARK PLUG CAP INSPECTION

Measure the resistance of the spark plug cap [1] by attaching one ohmmeter probe to the terminal in the spark plug cap and the other to the high-tension cord terminal.

RESISTANCE: 7.5 – 12.5 kΩ

If measured resistance is out of specification, replace the spark plug cap.



IGNITION COIL INSPECTION

Remove the fan cover (page 8-2).

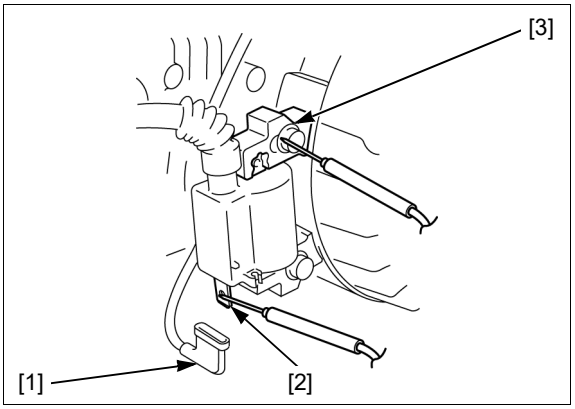
PRIMARY SIDE

Disconnect the ignition coil connector [1].

Measure the resistance of the primary coil by attaching one ohmmeter probe to the terminal [2] and the other at the iron core [3].

RESISTANCE: 0.6 – 1.0 Ω

If measured resistance is out of specification, replace the ignition coil.



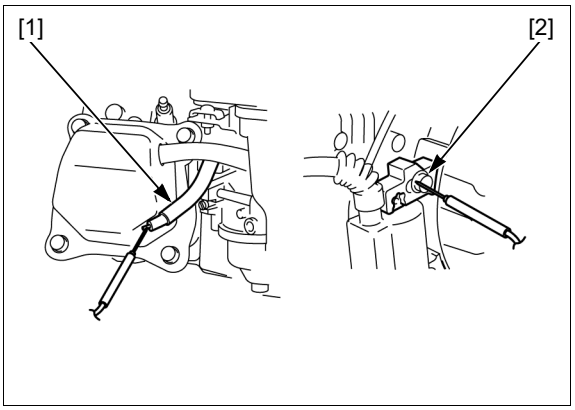
SECONDARY SIDE

Disconnect the spark plug cap from the high-tension cord [1].

Measure the resistance of the secondary coil by attaching one ohmmeter probe to the high-tension cord and the other at the iron core [2].

RESISTANCE: 5.6 – 8.4 kΩ

If measured resistance is out of specification, replace the ignition coil.



SPARK TEST

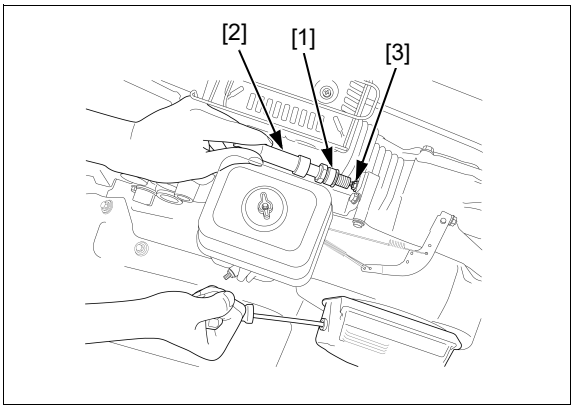
Inspect the following before performing spark test.

- Faulty spark plug
- Loose spark plug cap
- Water in the spark plug cap (Leaking the ignition coil secondary voltage)

Remove the spark plug cap (page 3-12).

Connect a known-good spark plug [1] to the spark plug cap [2] and ground the spark plug to the bolt [3].

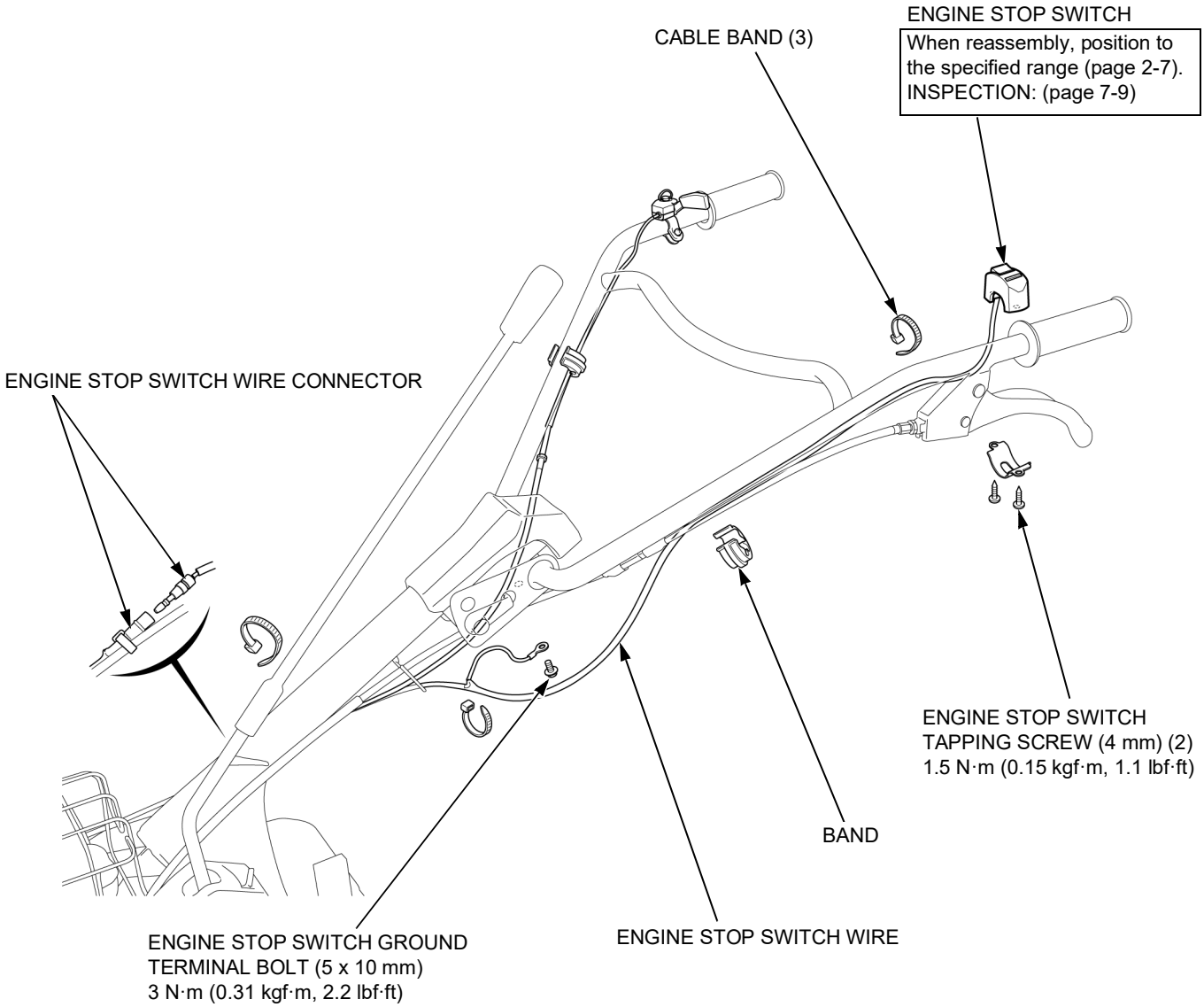
Turn the engine stop switch to the "ON" position, pull the recoil starter and check whether sparks jump across the electrode.



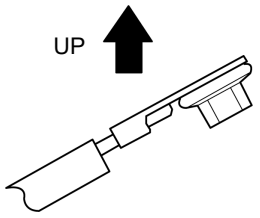
ENGINE STOP SWITCH REMOVAL/INSTALLATION

NOTE:

- When installation, route the wire harness properly (page 2-7).



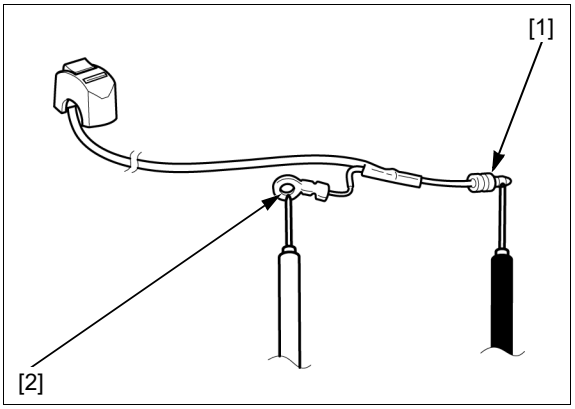
INSTALLATION:
Be sure to tighten with correct side of ground terminal up.
Tighten so that no bend or overlap occur.



ENGINE STOP SWITCH INSPECTION

Check for continuity between the engine stop switch wire connector [1] and ground terminal [2] in each switch position.

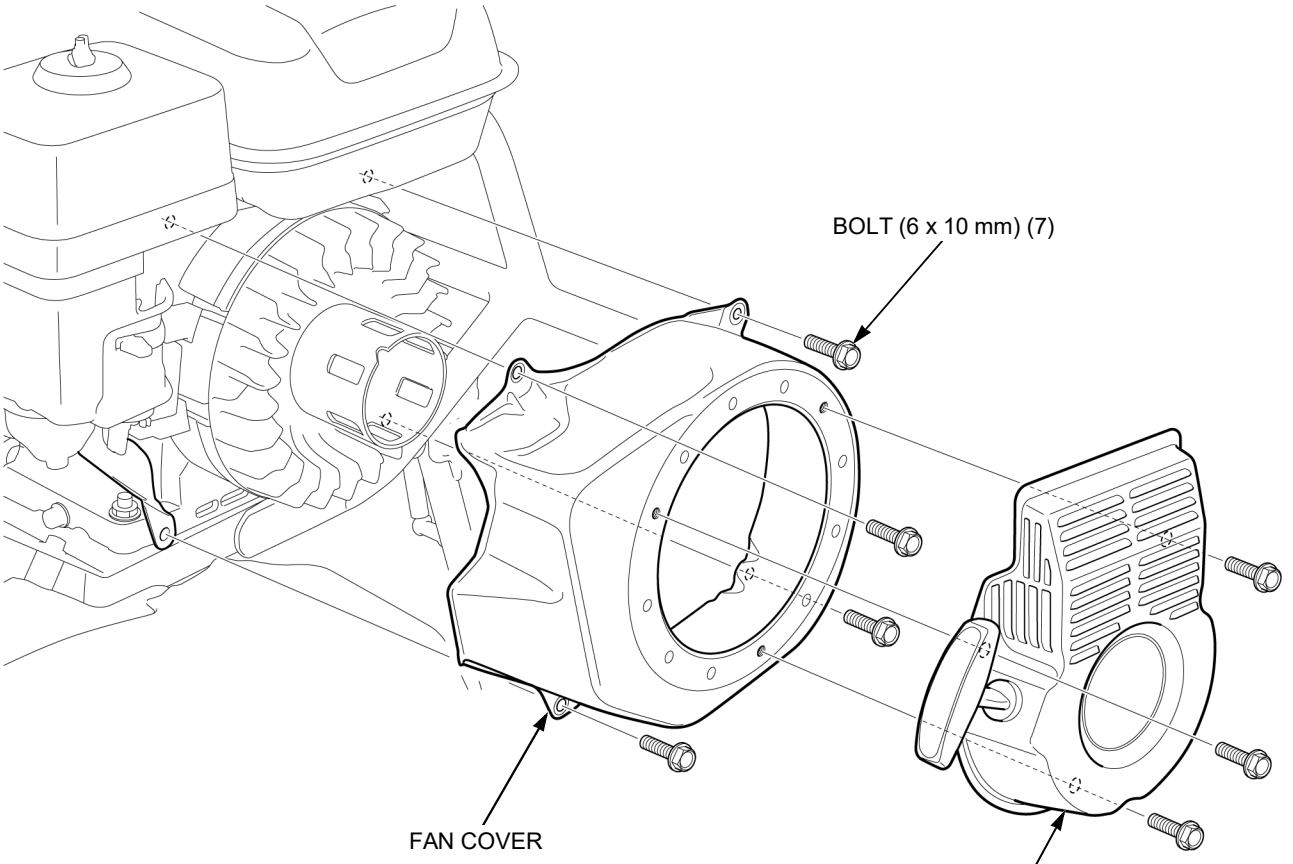
Switch position	Continuity
ON	No Continuity
OFF	Continuity



MEMO

8. STARTING SYSTEM

RECOIL STARTER REMOVAL/INSTALLATION



INSPECTION: (page 8-2)
DISASSEMBLY/ASSEMBLY: (page 8-4)

RECOIL STARTER INSPECTION

RECOIL STARTER

Remove the recoil starter (page 8-2).

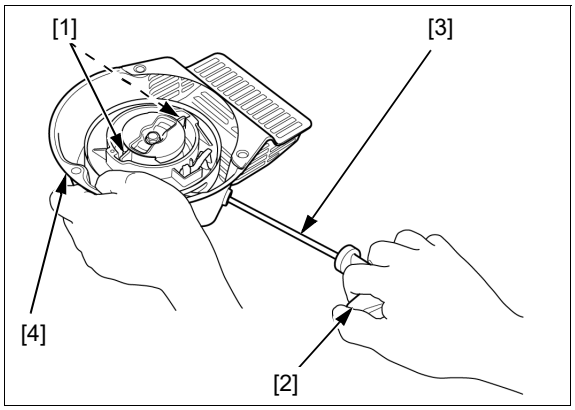
Check the operation of the two ratchets [1] by pulling the starter rope out several times.

Pull the starter grip [2] until the starter rope [3] is pulled out fully.

Check the rope for fraying or wearing.

Clean the recoil starter cover [4] to remove the dirt and debris.

Install the recoil starter (page 8-2).

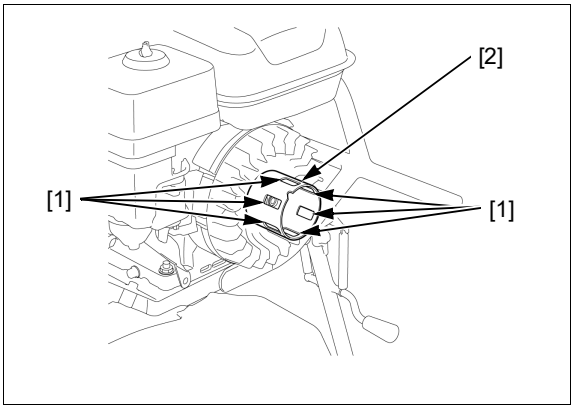


STARTER PULLEY

Remove the recoil starter (page 8-2).

Inspect the six square holes [1] of the starter pulley [2] for deformation.

Install the recoil starter (page 8-2).



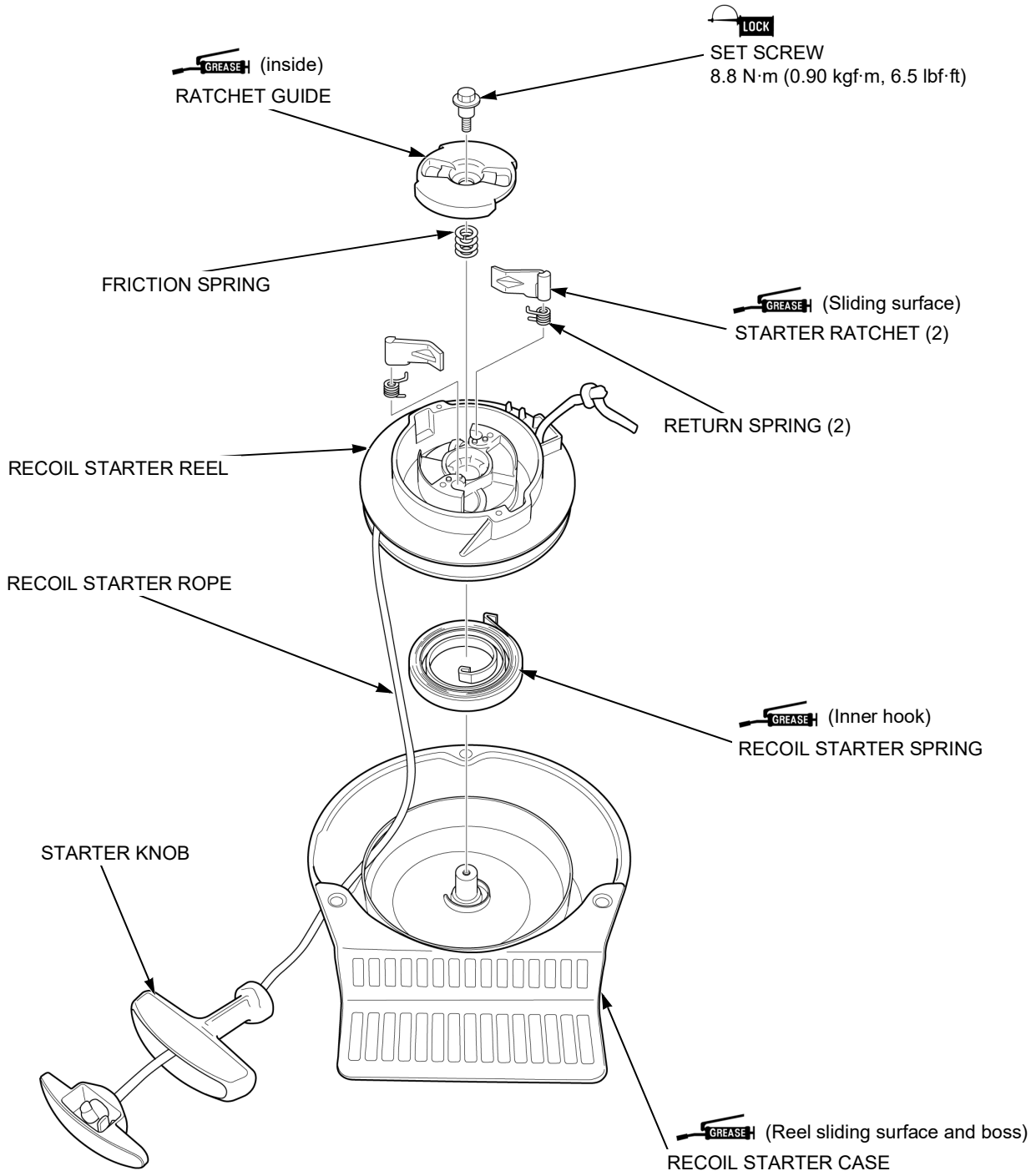
RECOIL STARTER DISASSEMBLY/ASSEMBLY

⚠ CAUTION

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

DISASSEMBLY

Remove the recoil starter (page 8-2).

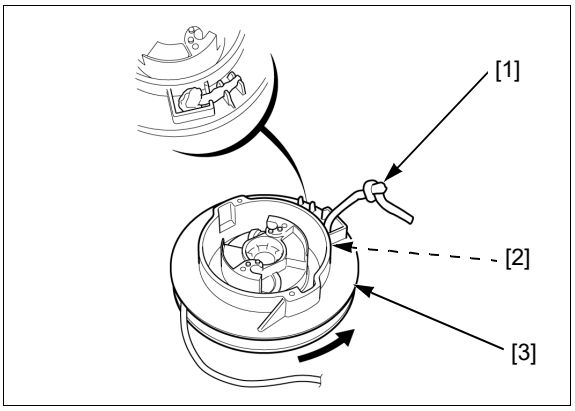


ASSEMBLY

⚠ CAUTION

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

Pass the recoil starter rope [1] through the hole [2] of the recoil starter reel [3], and then tie the rope as shown.

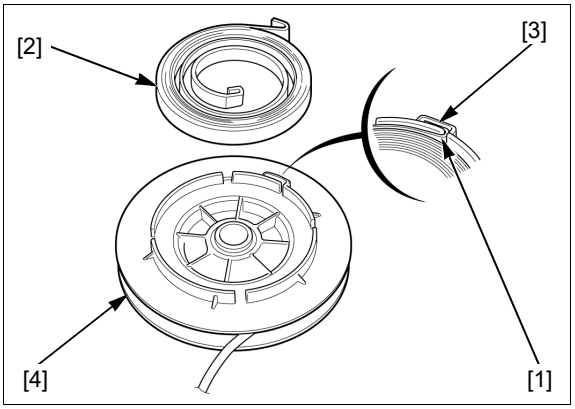


NOTICE

Before installing the recoil starter rope, check for fray or wear.

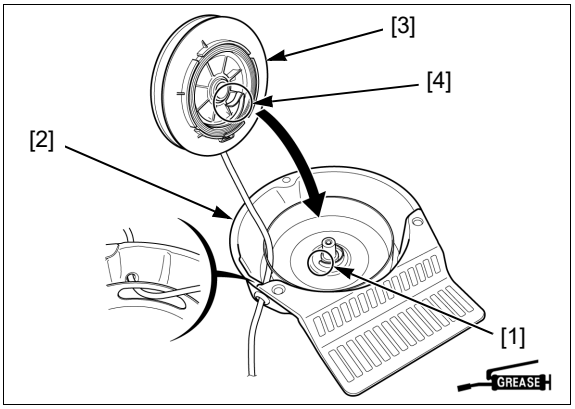
Wind the recoil starter rope onto the recoil starter reel counterclockwise.

Hook the outer hook [1] of the recoil starter spring [2] to the groove [3] of the recoil starter reel [4], and then install the recoil starter spring by winding it.



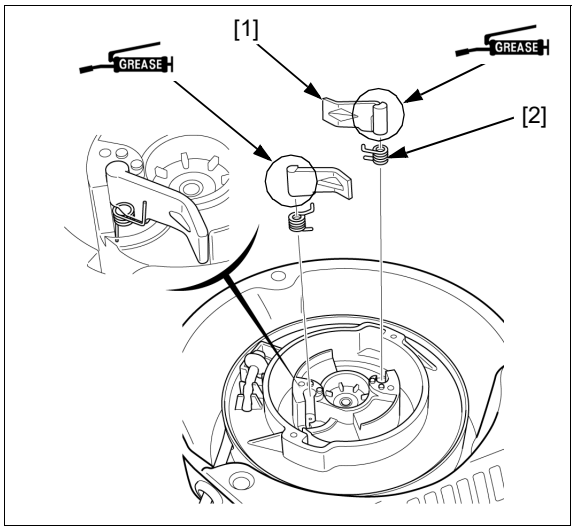
Apply grease to the boss [1] of the recoil starter case [2].

Set the recoil starter reel [3] to the recoil starter case by aligning the inner hook [4] of the recoil starter spring with the cutout of the recoil starter case.



Apply grease to the two starter ratchets [1].

Install the two starter ratchets and the two return springs [2] to the recoil starter reel as shown.



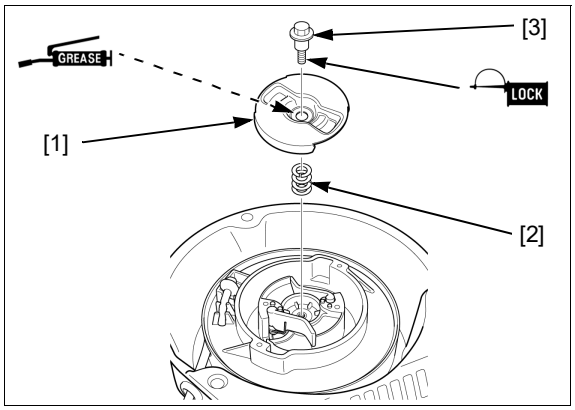
Apply grease to the inside of the ratchet guide [1].

Set the friction spring [2] and the ratchet guide to the recoil starter reel in the direction as shown.

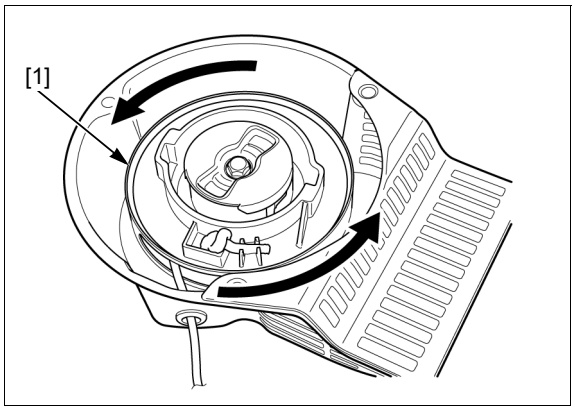
Apply locking agent (LOCTITE® 262 or equivalent) to the threads of the set screw [3].

Hold the ratchet guide and tighten the set screw to the specified torque.

TORQUE: 8.8 N·m (0.90 kgf·m, 6.5 lbf·ft)

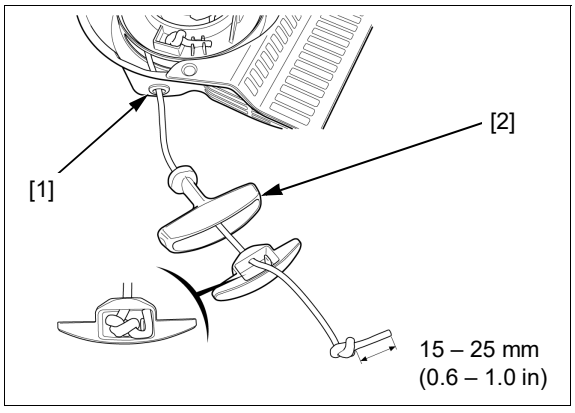


Turn the recoil starter reel [1] more than 2 turns counterclockwise to preload the recoil starter spring. Be sure to hold the recoil starter reel.



Pass the recoil starter rope through hole [1] of the recoil starter case, the starter knob [2], and then tie the rope as shown.

Check the recoil starter operation (page 8-2).



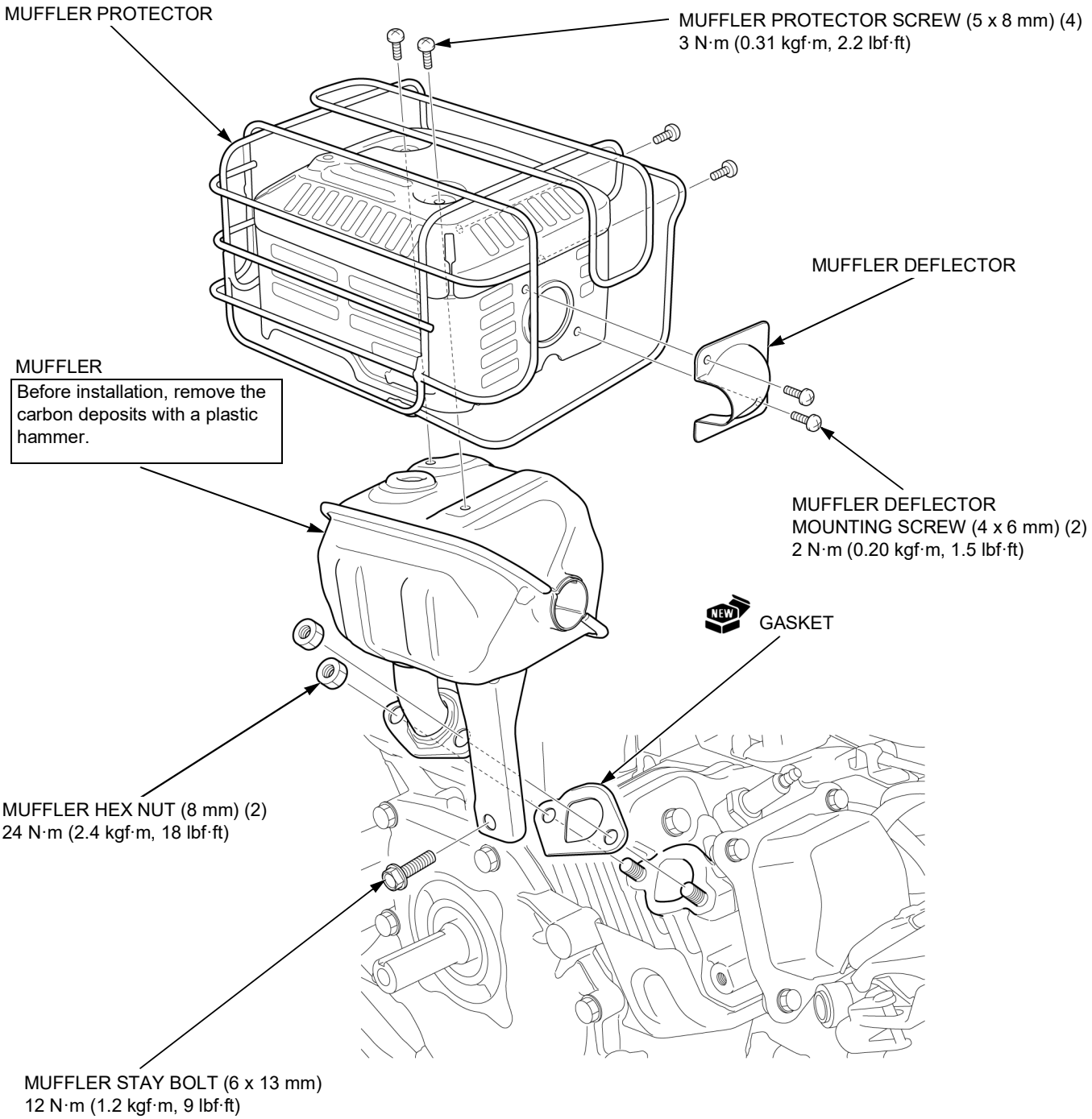
9. MUFFLER

MUFFLER REMOVAL/INSTALLATION

⚠ CAUTION

The engine and muffler become very hot during operation and they remain hot for a while after operation.
The muffler removal must be made while the engine is cold.

Remove the inner belt cover (page 11-2).



10. ENGINE REMOVAL/INSTALLATION

ENGINE REMOVAL/INSTALLATION

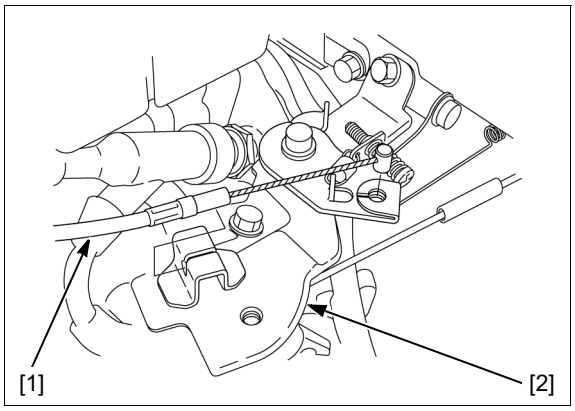
NOTE:

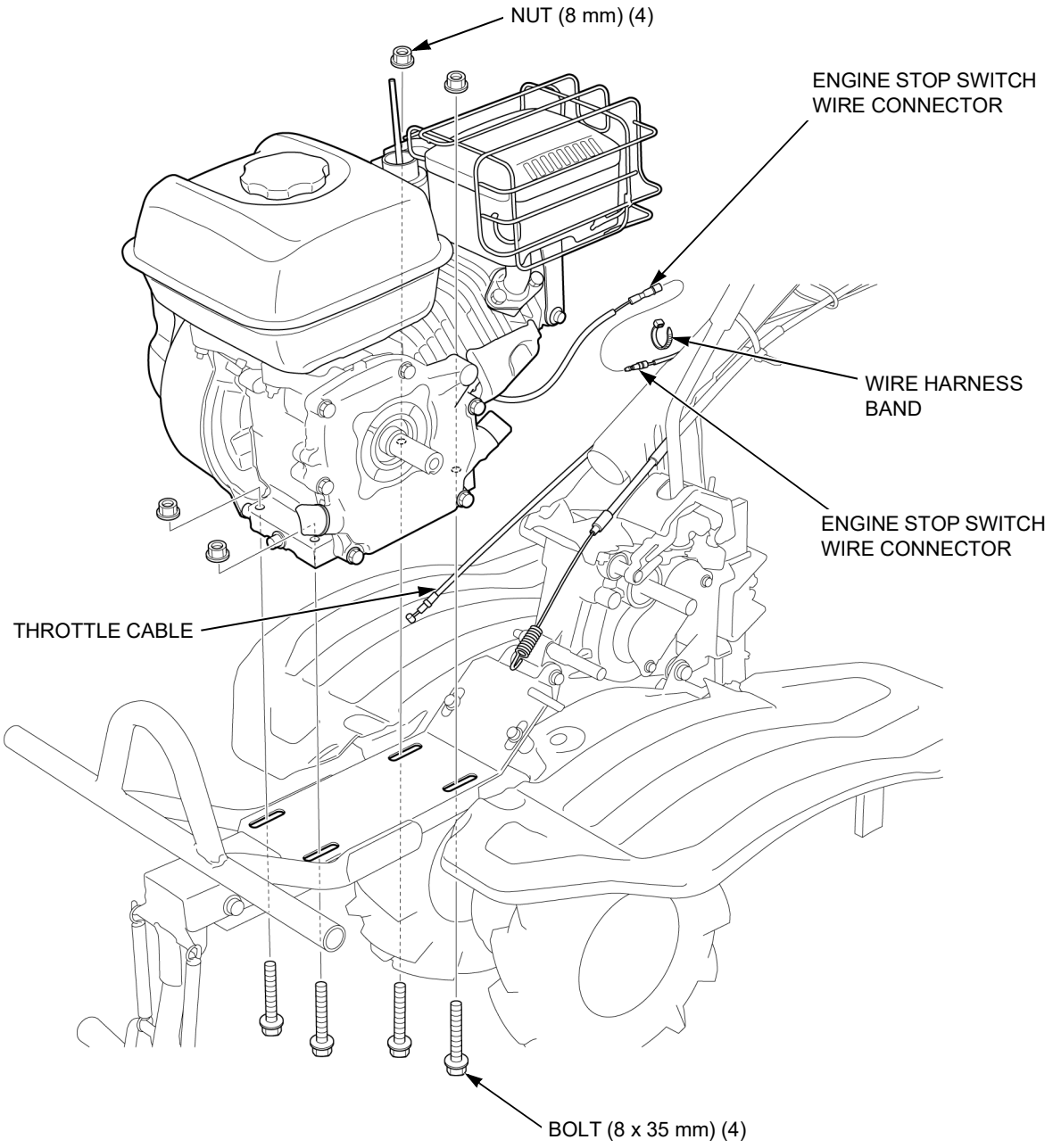
- When installation, route the wire harness properly (page 2-7)
- After installation, adjust the V-belt tension (page 3-8).

Remove the tension arm (page 11-2).

Remove the air cleaner elbow (page 5-4).

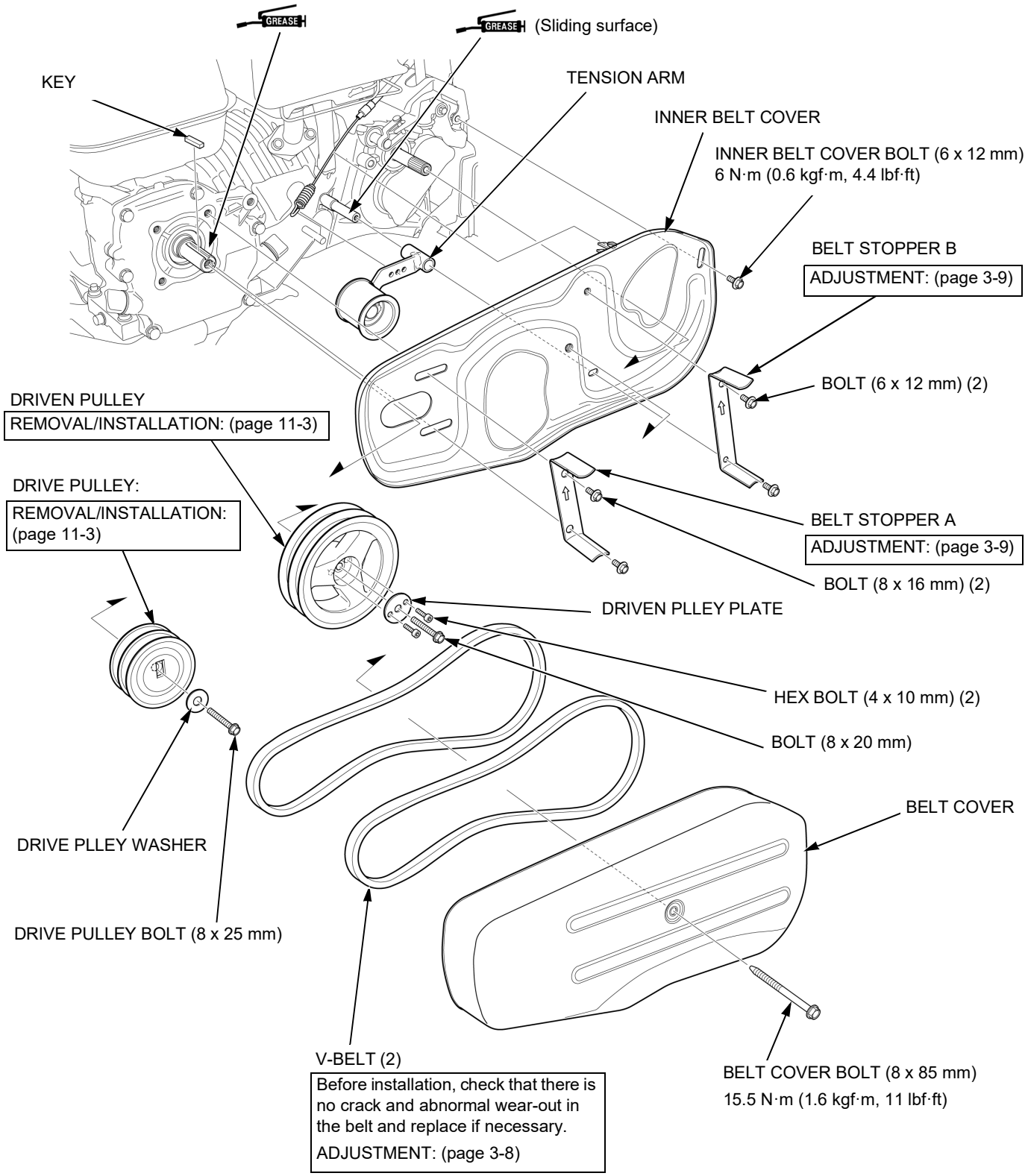
Move the throttle lever to the "LOW" position and disconnect the throttle cable [1] from the control plate [2].





PULLEY/V-BELT REMOVAL/INSTALLATION

After installation, adjust the V-belt tension (page 3-8).



DRIVE PULLEY REMOVAL/INSTALLATION

NOTICE

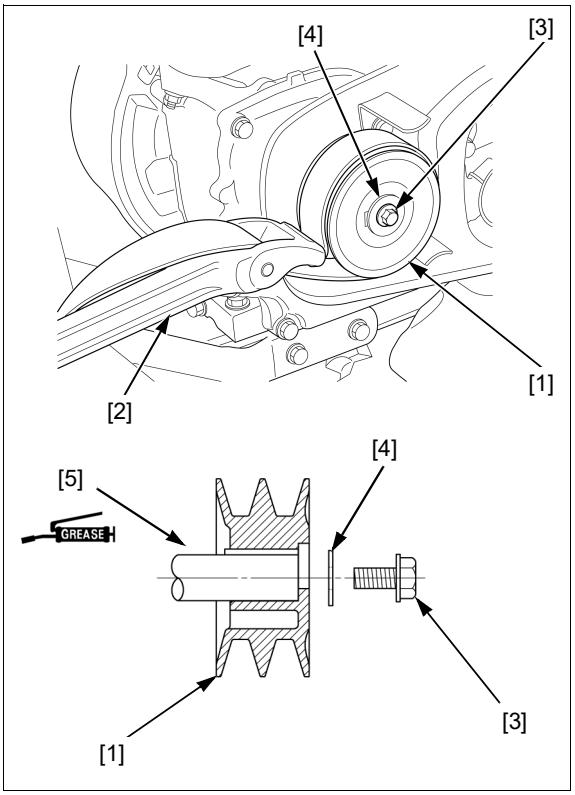
- *Take care not to damage the drive pulley with the strap wrench.*

Hold the drive pulley [1] with a commercially available strap wrench [2], remove the bolt (8 x 25 mm) [3] and the drive pulley washer [4].

Apply grease to the surface [5].

Install the drive pulley, the drive pulley plate and the bolt.

Hold the drive pulley with a commercially available strap wrench and tighten the bolt securely.



DRIVEN PULLEY REMOVAL/INSTALLATION

NOTICE

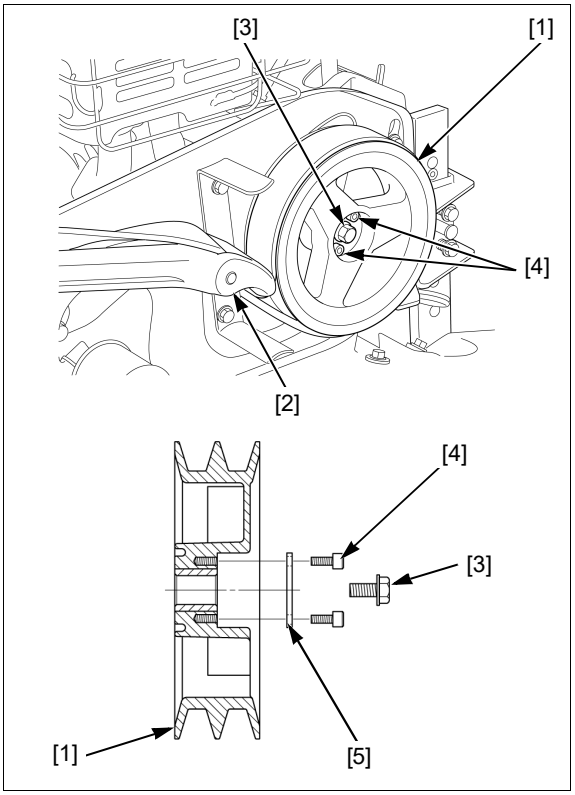
- *Take care not to damage the driven pulley with the strap wrench.*

Hold the driven pulley [1] with a commercially available strap wrench [2] and remove the bolt (8 x 20 mm) [3], two bolts (4 x 10 mm) [4] and the driven pulley plate [5].

Install the driven pulley, the driven pulley plate and bolts (4 x 10 mm, 8 x 20 mm) as shown.

Hold the driven pulley with a commercially available strap wrench.

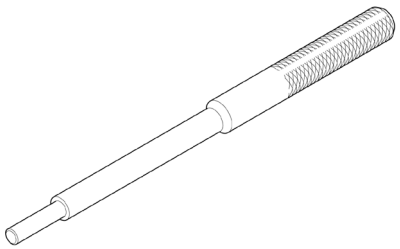
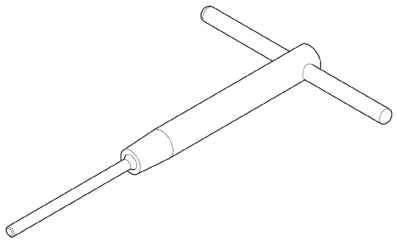
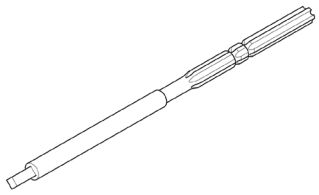
Loosely tighten the two bolts (4 x 10 mm) and tighten the bolt (8 x 20 mm) securely.
Tighten the two bolts (4 x 10 mm) securely.



MEMO

12. CYLINDER HEAD

TOOLS

Valve guide driver, 5.5 mm 07742-0010100 	Seat cutter, 27.5 mm (45° IN) 07780-0010200 	Seat cutter, 24.5 mm (45° EX) 07780-0010100 
Flat cutter, 28 mm (32° IN) 07780-0012100 	Flat cutter, 25 mm (32° EX) 07780-0012000 	Interior cutter, 26 mm (60° IN) 07780-0014500 
Interior cutter, 22 mm (60° EX) 07780-0014202 	Cutter holder, 5.5 mm 07781-0010101 	Valve guide reamer, 5.510 mm 07984-2000001 

CYLINDER HEAD REMOVAL/INSTALLATION

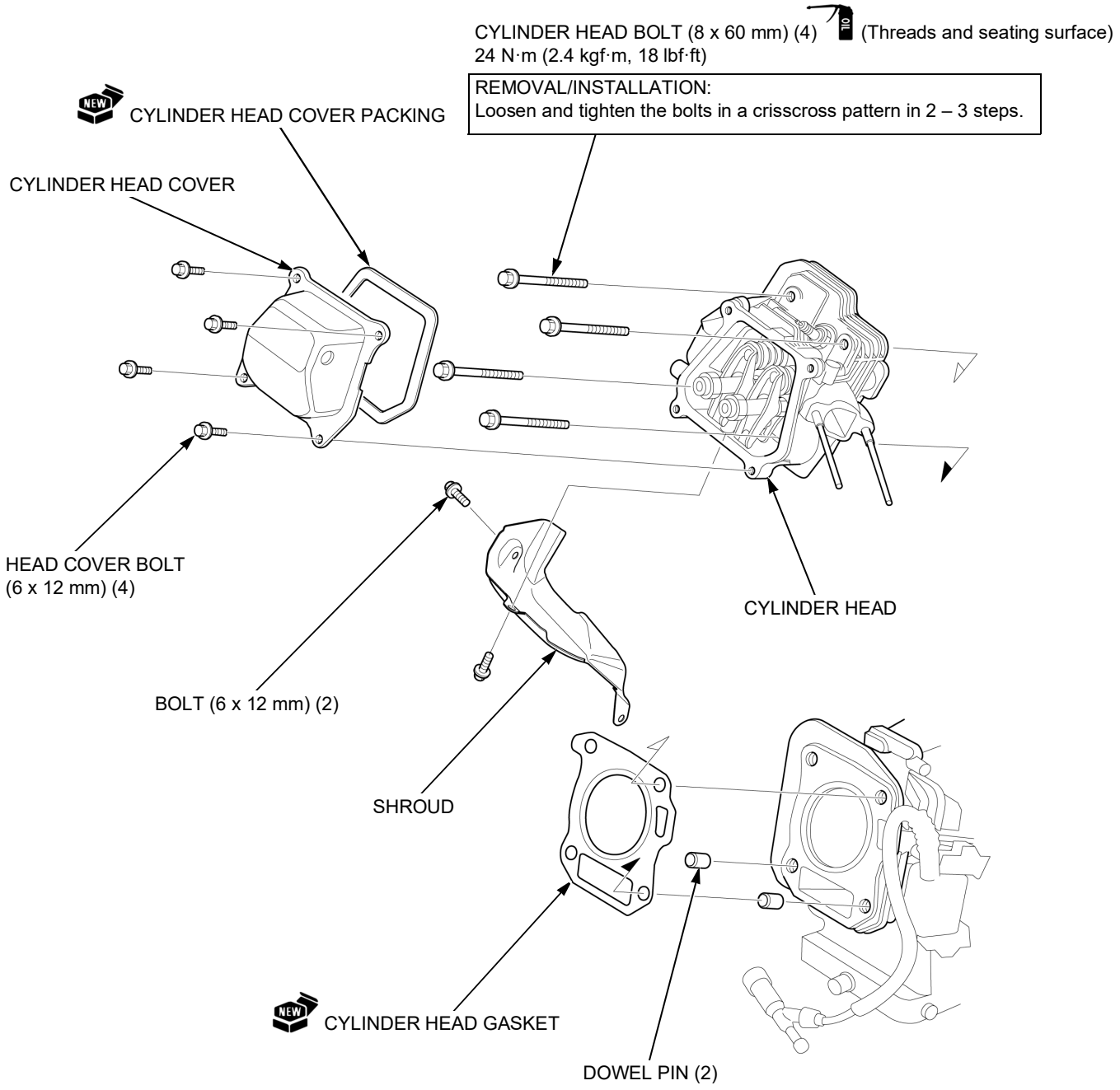
Set the piston at top dead center of the cylinder compression stroke (page 3-13).

Remove the following:

– Fan cover (page 8-2)
– Carburetor (page 5-5)
– Control base (page 6-2)
– Muffler (page 9-2)

After installation, inspect following:

– Valve clearance (page 3-13)
– Cylinder compression (page 12-5)

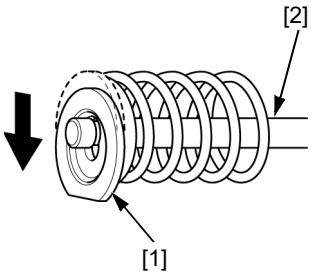


CYLINDER HEAD DISASSEMBLY/ASSEMBLY

Remove the cylinder head (page 12-3).

VALVE SPRING RETAINER

REMOVAL:
Push down and slide the valve spring retainer [1] to the side so that the valve stem [2] slips through the hole at the side of the valve spring retainer.
Do not remove the valve spring retainers while the cylinder head is installed to the cylinder barrel, or the valve will drop into the cylinder.



EXHAUST VALVE (OIL) (Sliding surface and stem end)

INSPECTION: (page 12-7)
INSTALLATION:
Do not interchange with the intake valve.
The exhaust valve is smaller than the intake valve.

SPARK PLUG
INSPECTION: (page 3-12)

VALVE SPRING (2)
INSPECTION: (page 12-7)

(NEW) VALVE STEM SEAL

CLIP

EXHAUST VALVE GUIDE

INTAKE VALVE GUIDE

CYLINDER HEAD
INSPECTION: (page 12-5)

ROCKER ARM PIVOT LOCK NUT (2)
10 N·m (1.0 kgf·m, 7 lbf·ft)

INTAKE VALVE (OIL) (Sliding surface and stem end)

INSPECTION: (page 12-7)
INSTALLATION:
Do not interchange with the exhaust valve.
The intake valve is larger than the exhaust valve.

PUSH ROD GUIDE PLATE

ROCKER ARM PIVOT (2)
(OIL) (Threads and pivot)

(OIL) (Threads and seating surface)
ROCKER ARM PIVOT BOLT (2)
24 N·m (2.4 kgf·m, 18 lbf·ft)

PUSH ROD

INSPECTION: (page 12-8)
ASSEMBLY:
Before installing the push rods, check the ends of the push rod for wear.
Be sure the ends of the push rods are firmly seated in the lifters.

VALVE ROCKER ARM (OIL) (Tappet surface and pivot)

INSTALLATION:
Before installing the valve rocker arm, check for wear on the surfaces of the rocker arm that contact the pivot bolt, push rod, and valve stem.

CYLINDER HEAD/VALVES INSPECTION

CYLINDER COMPRESSION CHECK

Start the engine and warm up to normal operating temperature.

Turn the engine stop switch to the OFF position.

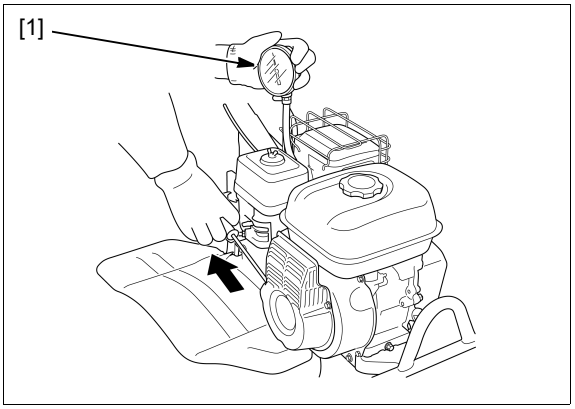
Turn the fuel valve lever to the OFF position, and then loosen the drain screw of the carburetor to drain the fuel completely (page 5-3).

Remove the spark plug (page 3-12).

Pull the recoil starter several times to expel unburned gas.

Attach a commercially available compression gauge [1] to the spark plug hole.

Pull the recoil starter forcefully to measure stable cylinder compression.



CYLINDER COMPRESSION:
0.35 MPa (3.6 kgf/cm^2, 51 psi)/600 min^{-1} (rpm)

CYLINDER HEAD WARPAGE

Check the spark plug hole and valve areas for cracks.

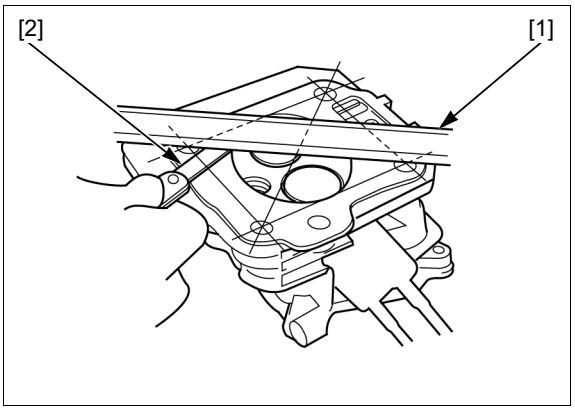
Clean any gasket material from the cylinder head mating surface and check the cylinder head warpage using a straightedge [1] and feeler gauge [2].

NOTE:

- Be careful not the damage the mating surface.

SERVICE LIMIT: 0.10 mm (0.004 in)

If the measurement is more than the service limit, replace the cylinder head.



VALVE SEAT WIDTH

Remove the carbon deposits from the combustion chamber (page 3-14).

Inspect each valve face for irregularities.

If necessary, replace the valve.

Apply a light coat of Prussian Blue or erasable felt-tipped marker ink to each valve seat.

Insert the valve, and snap it closed against its seat several times. Be sure the valve does not rotate on the seat.

The transferred marking compound will show any area of the valve face that is not concentric.

Measure the valve seat width of the cylinder head.

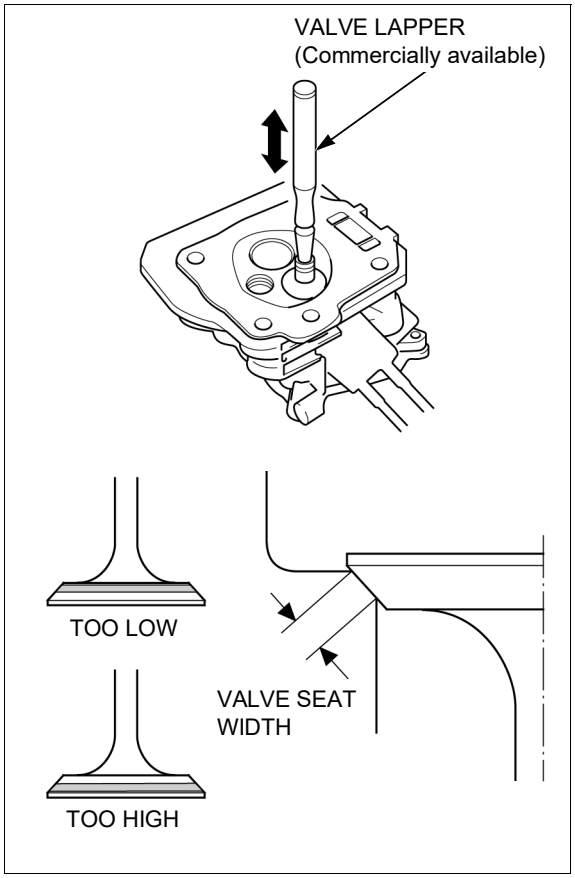
STANDARD: 0.7 – 0.9 mm (0.03 – 0.04 in)

SERVICE LIMIT: 2.0 mm (0.08 in)

If the measurement is more than the service limit, recondition the valve seat (page 12-10).

Check whether the valve seat contact area of the valve is too high or too low.

If the valve seat is too high or too low, recondition the valve seat (page 12-10).



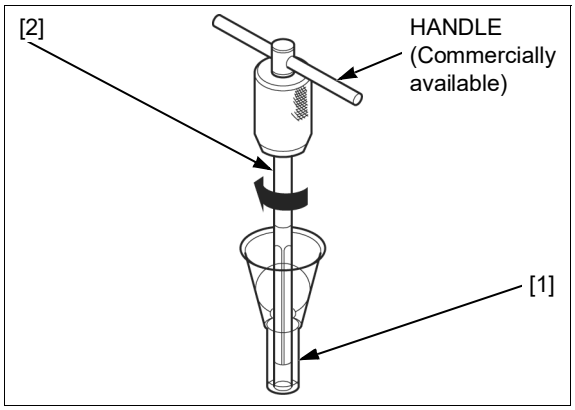
VALVE GUIDE I.D.

Ream the valve guide to remove any carbon deposits before measuring the guide [1] I.D.

TOOL:
Valve guide reamer 5.510 mm [2] 07984-2000001

NOTICE

- *Turn the valve guide reamer (special tool) clockwise, never counterclockwise.*
- *Continue to rotate the special tool while removing it from the valve guide.*

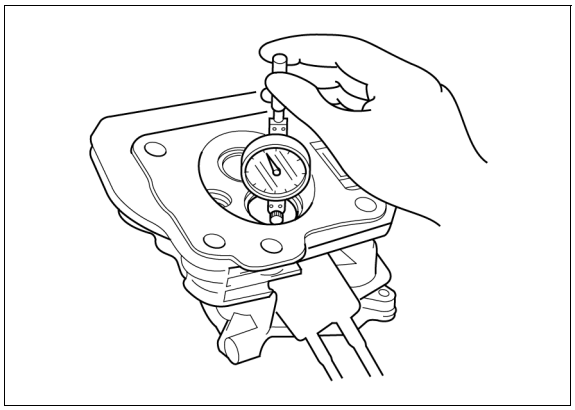


Measure and record each valve guide I.D.

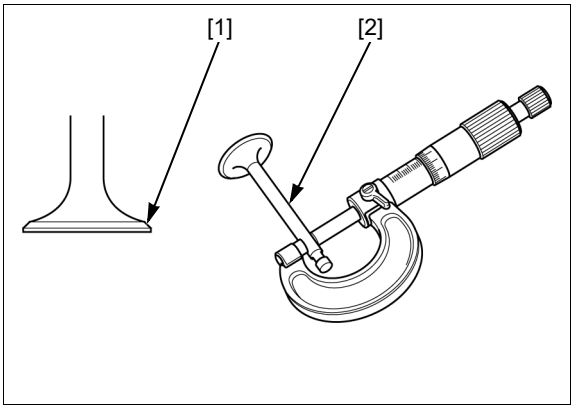
STANDARD: 5.500 – 5.512 mm (0.2165 – 0.2170 in)

SERVICE LIMIT: 5.572 mm (0.2194 in)

If the measured valve guide I.D. is more than the service limit, replace the cylinder head (page 12-4).



VALVE FACE/VALVE STEM O.D.



Inspect each valve face [1] for irregularities.

If necessary, replace the valve.

Inspect each valve [2] for bending or abnormal stem wear.

If necessary, replace the valve.

Measure and record each valve stem O.D.

STANDARD:
IN: 5.468 – 5.480 mm (0.2153 – 0.2157 in)
EX: 5.425 – 5.440 mm (0.2136 – 0.2142 in)

SERVICE LIMIT:
IN: 5.318 mm (0.2094 in)
EX: 5.275 mm (0.2077 in)

If the measurement is less than the service limit, replace the valve.

GUIDE-TO-STEM CLEARANCE

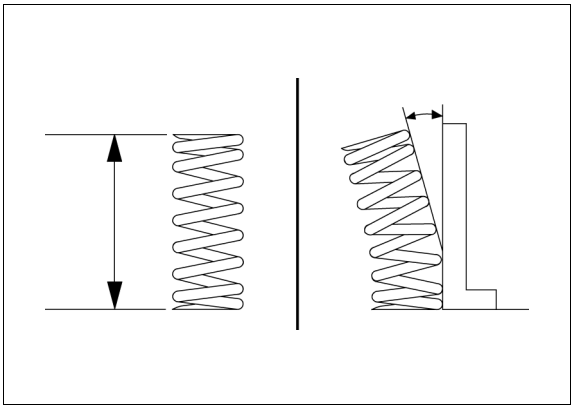
Subtract each valve stem O.D. from the corresponding guide I.D. to obtain the guide-to-stem clearance.

STANDARD:
IN: 0.020 – 0.044 mm (0.0008 – 0.0017 in)
EX: 0.060 – 0.087 mm (0.0024 – 0.0034 in)

SERVICE LIMIT:
IN: 0.10 mm (0.004 in)
EX: 0.12 mm (0.005 in)

If the calculated clearance is more than the service limit, replace the valve and cylinder head as a set (page 12-4).

VALVE SPRING FREE LENGTH/ PERPENDICULARITY



Measure the valve spring free length.

STANDARD: 30.5 mm (1.20 in)

SERVICE LIMIT: 29.0 mm (1.14 in)

If the measured length is less than the service limit, replace the valve spring.

Measure the valve spring perpendicularity.

SERVICE LIMIT: 1.5° max.

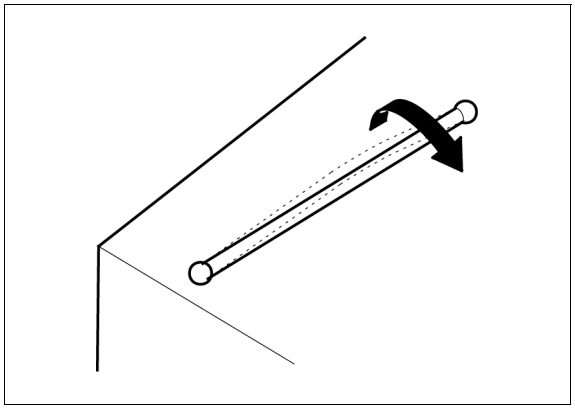
If the measured perpendicularity is more than the service limit, replace the valve spring.

PUSH ROD RUNOUT

Check both ends of the push rod for wear.

Check the push rod for straightness.

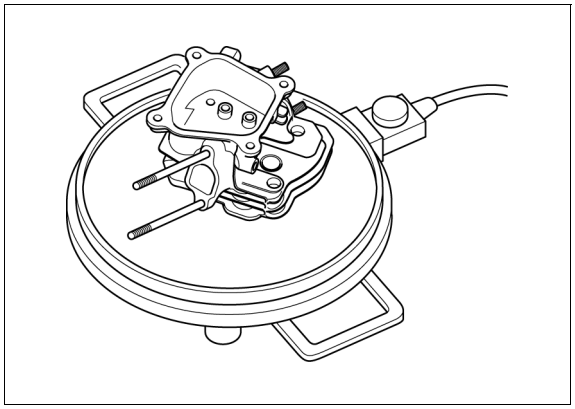
If necessary, replace the push rod.



VALVE GUIDE REPLACEMENT

Chill the replacement valve guides in the freezer section of a refrigerator for about an hour.

Use a hot plate or oven to heat the cylinder head evenly to 150°C (300°F).



⚠CAUTION

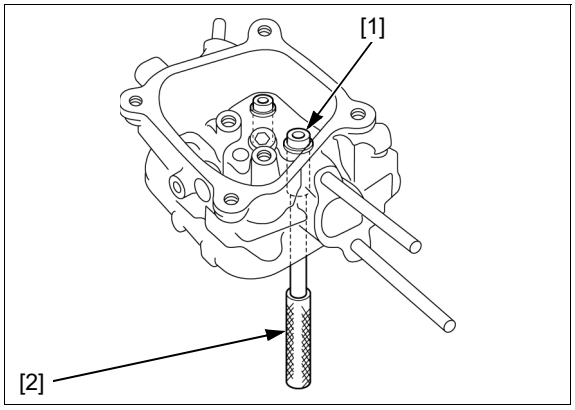
To avoid burns, use heavy gloves when handling the heated cylinder head.

NOTICE

- *Do not use a torch to heat the cylinder head; warpage of the cylinder head may result.*
- *Do not get the cylinder head hotter than 150°C (300°F); excessive heat may loosen the valve seat.*

Remove the heated cylinder head from the hot plate and support it with wooden blocks.

Drive the valve guides [1] out of the cylinder head from the combustion chamber side.



TOOL:
Valve guide driver, 5.5 mm [2] 07742-0010100

NOTICE

- *When driving the valve guides out, be careful not to damage the cylinder head.*

Remove new valve guides from the refrigerator one at a time as needed.

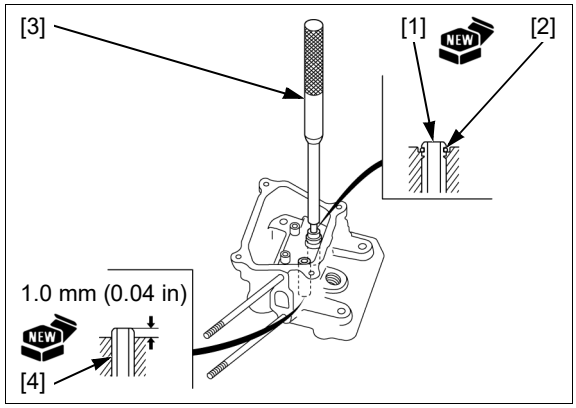
Drive the exhaust valve guide [1] until the valve guide clip [2] is fully seated as shown from the valve spring side of the cylinder head.

TOOL:
Valve guide driver, 5.5 mm [3] 07742-0010100

Drive the intake valve guide [4] to the specified height (measured from the end of the valve guide to the cylinder head as shown) from the valve spring side of the cylinder head.

TOOL:
Valve guide driver, 5.5 mm 07742-0010100

INTAKE VALVE GUIDE INSTALLATION HEIGHT:
1.0 mm (0.04 in)



After installing the valve guide, check the guide for damage.

Replace the valve guide if damaged.

Let the cylinder head cool to room temperature.

Ream the valve guide (page 12-9).

VALVE GUIDE REAMING

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

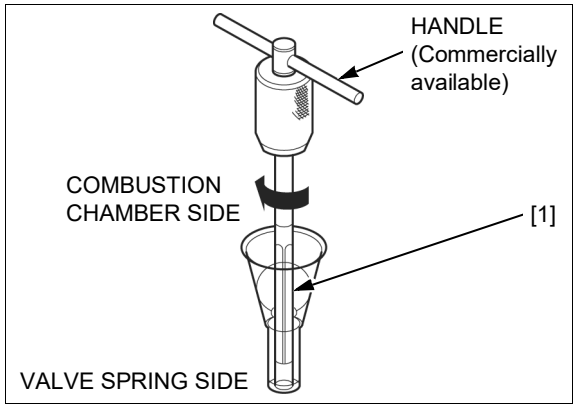
Coat the reamer and valve guide with cutting oil.

TOOL:
Valve guide reamer 5.510 mm [1] 07984-2000001

Rotate the reamer clockwise through the valve guide the full length of the reamer.

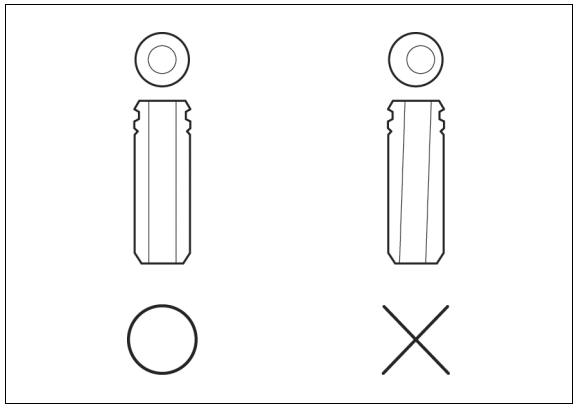
NOTICE

- *Turn the special tool (valve guide reamer) clockwise, never counterclockwise.*
- *Continue to rotate the special tool while removing it from the valve guide.*



Thoroughly clean the cylinder head to remove any cutting residue.

Check the valve guide bore; it should be straight, round and centered in the valve guide. Insert the valve and check operation. If the valve does not operate smoothly, the guide may have been bent during installation.



Replace the cylinder head if it is bent or damaged (page 12-4).

Check the valve stem-to-guide clearance (page 12-7).

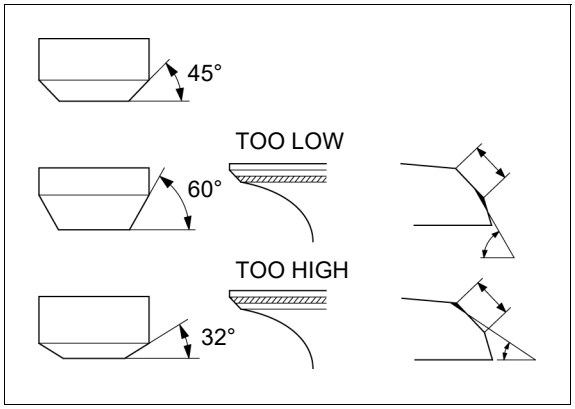
VALVE SEAT RECONDITIONING

Inspect the valve seat contact area (page 12-6).

Using a 45° seat cutter, remove any roughness or irregularities from the seat.

If the contact area is too low on the valve, the seat must be raised using a 60° interior cutter.

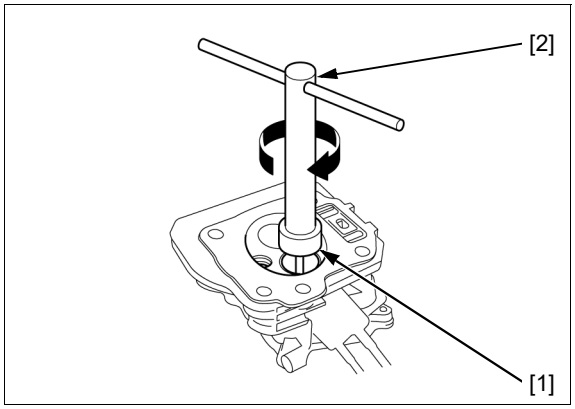
If the contact area is too high on the valve, the seat must be lowered using a 32° flat cutter.



Valve seat cutters [1]/grinder or equivalent valve seat refacing equipment is recommended to correct a worn valve seat.

NOTICE

- *Turn the cutter clockwise, never counterclockwise.*
- *Continue to turn the cutter as you lift it from the valve seat.*



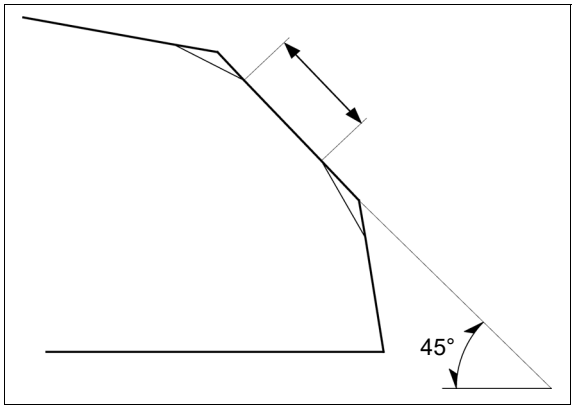
TOOLS:

Cutter holder, 5.5 mm [2]	**07781-0010101**
Seat cutter, 27.5 mm (45° IN)	**07780-0010200**
Seat cutter, 24.5 mm (45° EX)	**07780-0010100**
Flat cutter, 28 mm (32° IN)	**07780-0012100**
Flat cutter, 25 mm (32° EX)	**07780-0012000**
Interior cutter, 26 mm (60° IN)	**07780-0014500**
Interior cutter, 22 mm (60° EX)	**07780-0014202**

Make a light pass with the 45° cutter to remove any possible burrs at the edge of the seat.

Be sure that the width of the finished valve seat is within specification.

STANDARD: 0.7 – 0.9 mm (0.03 – 0.04 in)

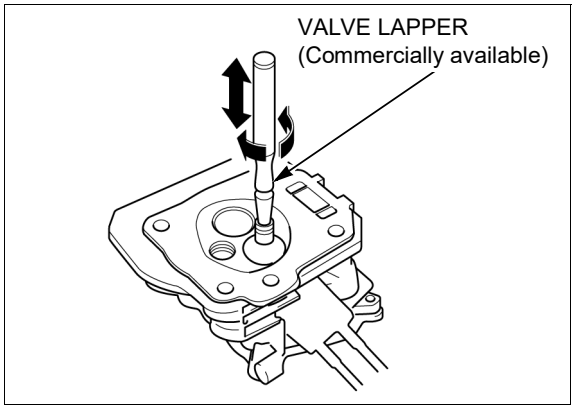


Lap the valves into their seats, using a commercially available valve lapper and lapping compound.

After lapping, wash all residual compound off the cylinder head and valve.

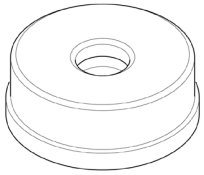
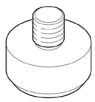
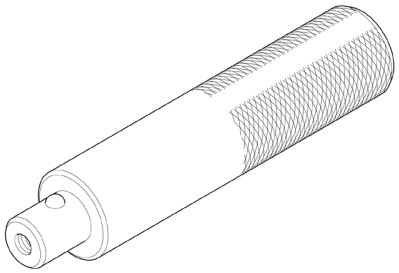
NOTICE

- *Do not push the valve against the seat with force during lapping. Apply a light pass with the valve lapper.*
- *Avoid lapping the valve in the same position as it causes uneven wear. Lap the valve by turning the lapper slowly.*
- *Take care not to allow the lapping compound to enter the gap between the stem and guide.*



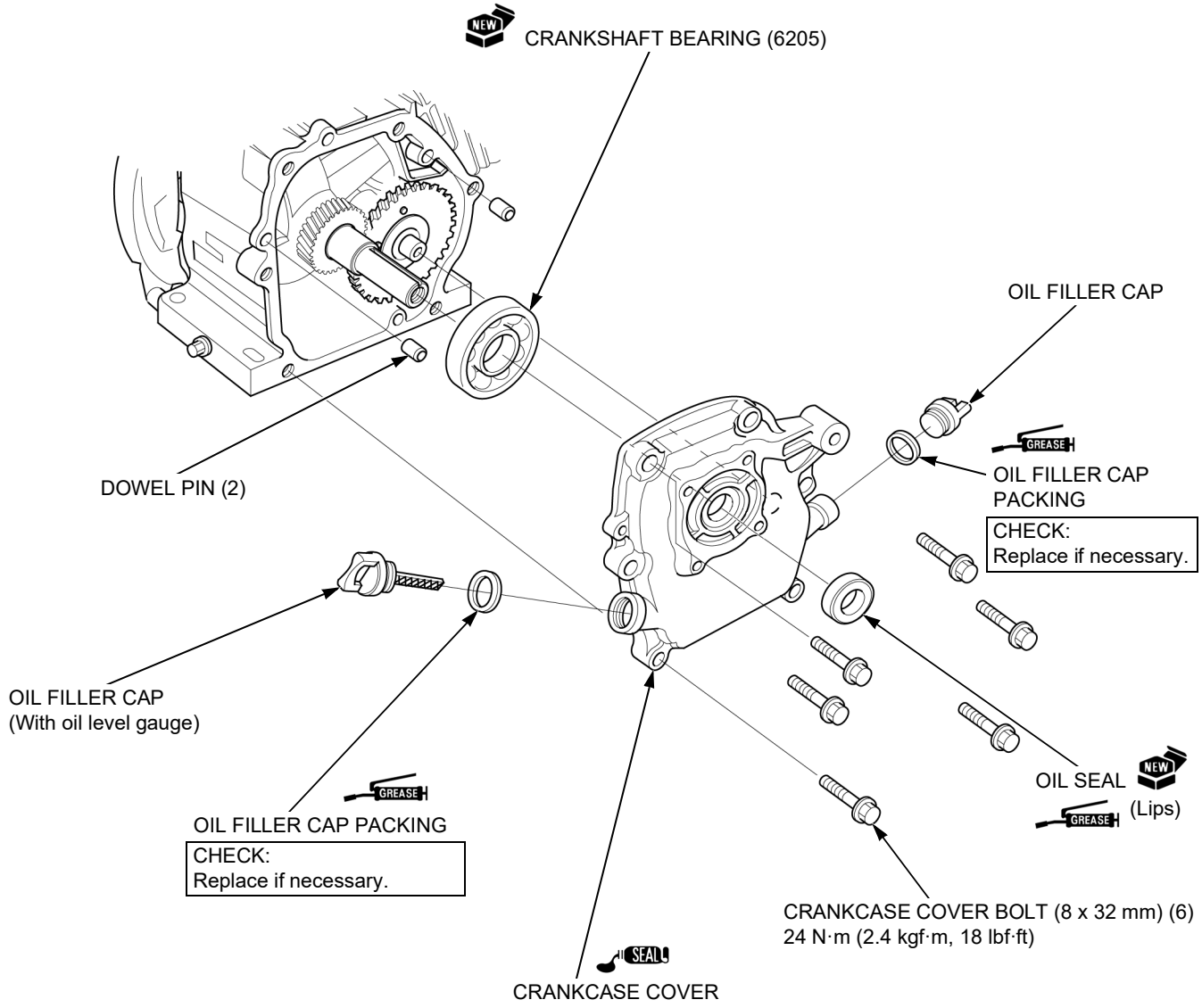
13. CYLINDER BLOCK

TOOLS

Attachment, 37 x 40 mm 07746-0010200 	Attachment, 52 x 55 mm 07746-0010400 	Pilot, 25 mm 07746-0040600 
Driver 07749-0010000 		

CRANKCASE COVER REMOVAL/INSTALLATION

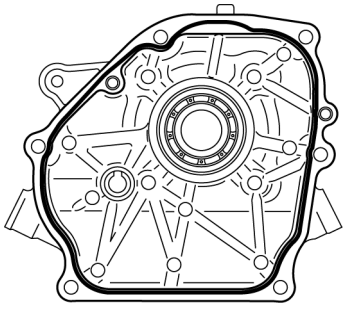
Drain the engine oil (page 3-4).



INSTALLATION:

Be careful not to damage the oil seal lips.

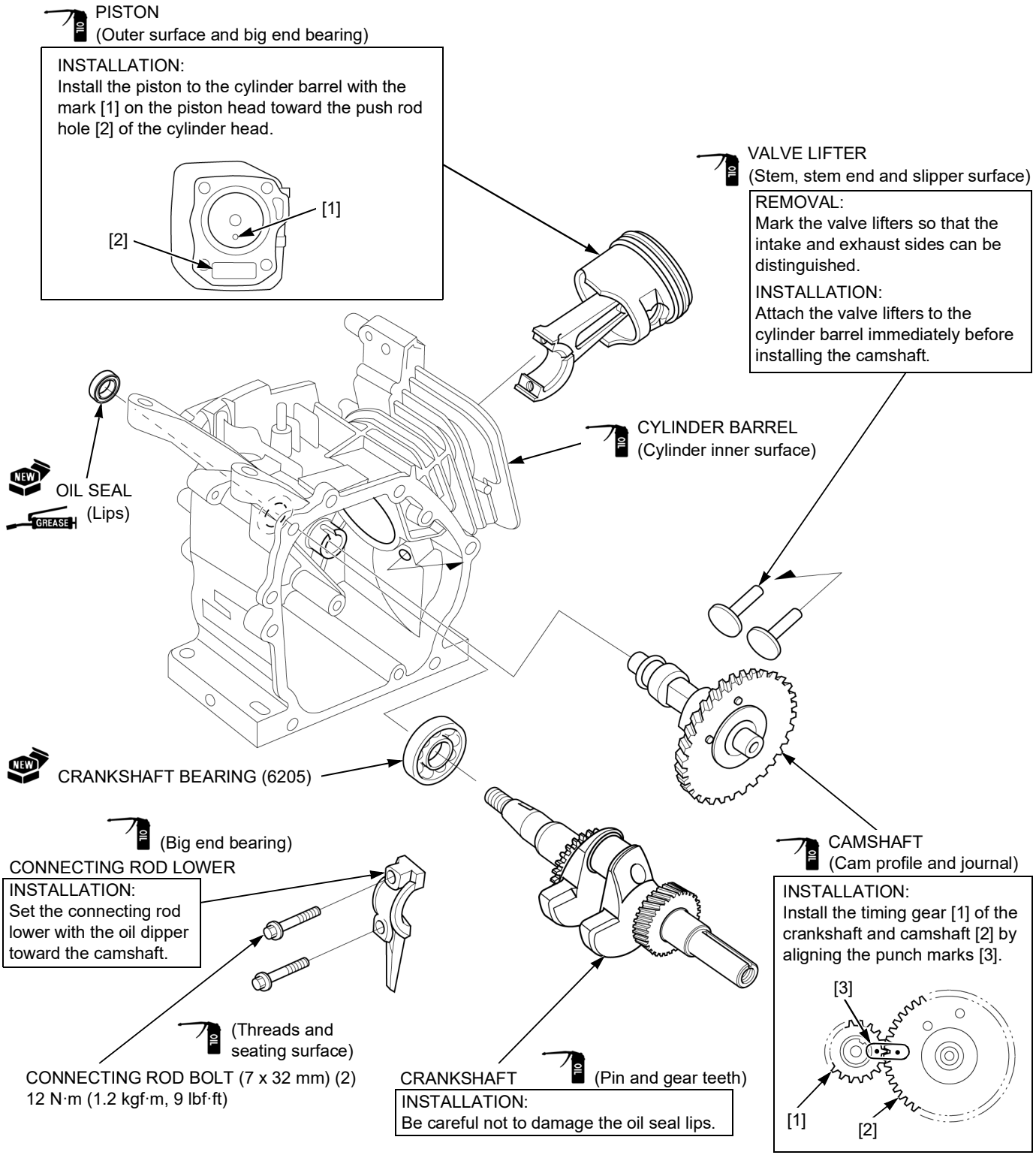
Clean the mating surface and apply a bead (2.0 – 2.5 mm (0.08 – 0.10 in)) of liquid sealant (ThreeBond® 1216E, 1207B, or equivalent) as shown. Install the cover within 3 minutes after application. Pouring the engine oil is performed after 30 minutes have elapsed from assembling.



CRANKSHAFT/CAMSHAFT/PISTON REMOVAL/INSTALLATION

Remove the following:

- Fuel tank (page 5-3)
- Flywheel (page 7-4)
- Cylinder head (page 12-3)
- Crankcase cover (page 13-3)

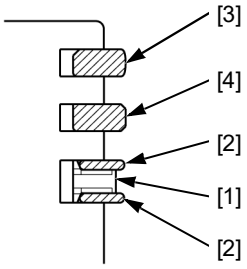


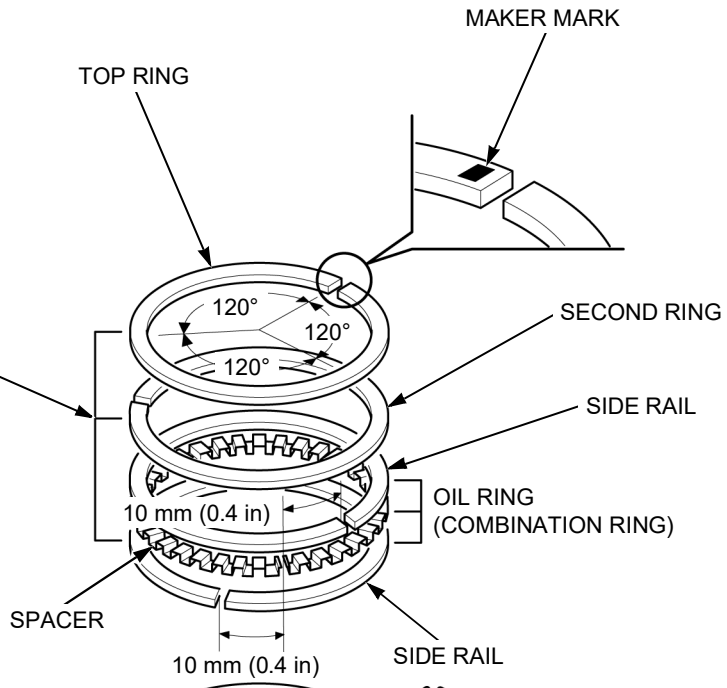
PISTON DISASSEMBLY/ASSEMBLY

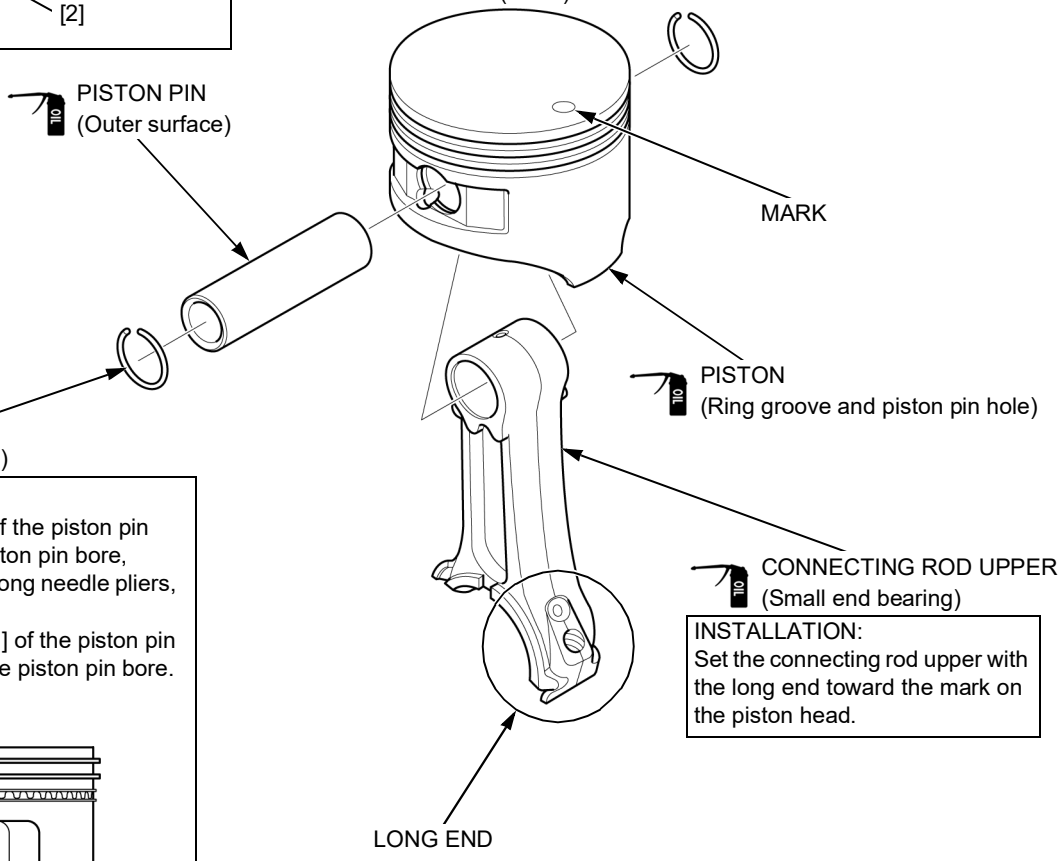
Remove the piston (page 13-4).

PISTON RING SET (OIL) (Entire surface)

INSPECTION: (page 13-8)
INSTALLATION:
To install the oil ring, install the spacer [1] first, and then install the side rails [2].
Be sure that the top ring [3] and second ring [4] are not interchanged.
Install the top ring and second ring on the piston with the maker mark side facing up.
Check that the piston rings rotate smoothly after installing them.
Space the piston ring end gaps 120° apart, and do not align the ring end gaps with the piston pin bore.

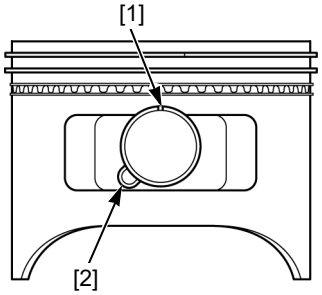






(NEW) PISTON PIN CLIP (2)

INSTALLATION:
Install by setting one end of the piston pin clip in the groove of the piston pin bore, holding the other end with long needle pliers, and rotating the clip in.
Do not align the end gap [1] of the piston pin clip with the cutout [2] of the piston pin bore.



INSTALLATION:
Set the connecting rod upper with the long end toward the mark on the piston head.

CRANKCASE COVER/CYLINDER BARREL/PISTON/CONNECTING ROD/ CRANKSHAFT/CAMSHAFT INSPECTION

CAMSHAFT JOURNAL I.D.

CRANKCASE COVER SIDE

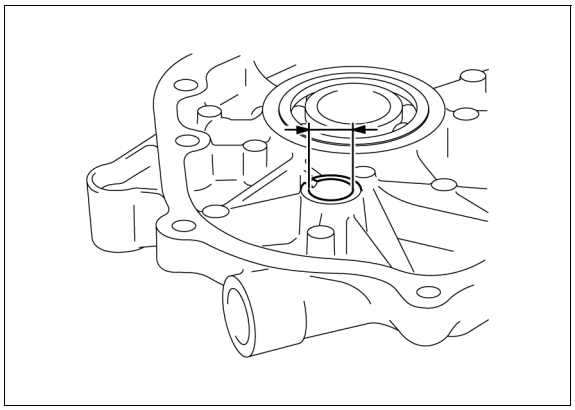
Measure the camshaft journal I.D. of the crankcase cover.

STANDARD: 14.000 – 14.027 mm (0.5512 – 0.5522 in)

SERVICE LIMIT: 14.048 mm (0.5531 in)

If the measurement is more than the service limit, replace the crankcase cover.

Inspect the camshaft O.D. (page 13-12).



CYLINDER BARREL SIDE

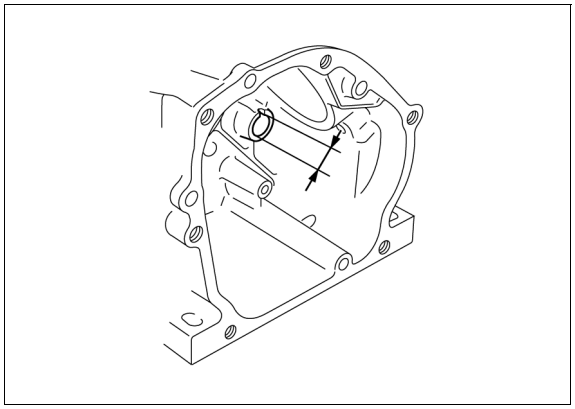
Measure the camshaft journal I.D. of the cylinder barrel assembly.

STANDARD: 14.000 – 14.018 mm (0.5512 – 0.5519 in)

SERVICE LIMIT: 14.048 mm (0.5531 in)

If the measurement is more than the service limit, replace the cylinder barrel.

Inspect the camshaft O.D. (page 13-12).



CYLINDER SLEEVE I.D.

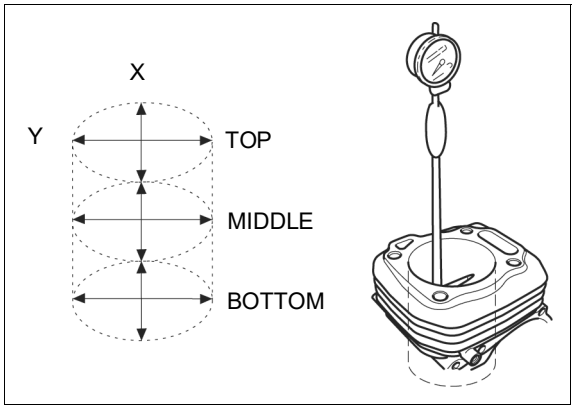
Measure and record the cylinder I.D. at three levels in both the "X" axis (perpendicular to crankshaft) and the "Y" axis (parallel to crankshaft). Take the maximum reading to determine cylinder wear and taper.

STANDARD: 68.000 – 68.020 mm (2.6772 – 2.6779 in)

SERVICE LIMIT: 68.165 mm (2.6837 in)

If the measurement is more than the service limit, replace the cylinder barrel.

Inspect the piston skirt O.D. (page 13-7).



PISTON SKIRT O.D.

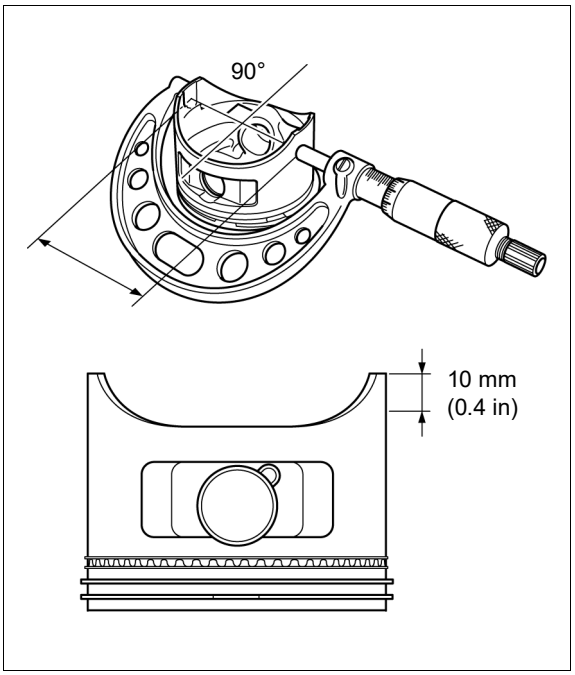
Measure and record the piston skirt O.D. at a point 10 mm (0.4 in) from the bottom of the skirt and 90° to the piston pin bore.

STANDARD:
67.965 – 67.982 mm (2.6758 – 2.6765 in)

SERVICE LIMIT: 67.845 mm (2.6711 in)

If the measurement is less than the service limit, replace the piston.

Inspect the cylinder sleeve I.D. (page 13-6).



PISTON-TO-CYLINDER CLEARANCE

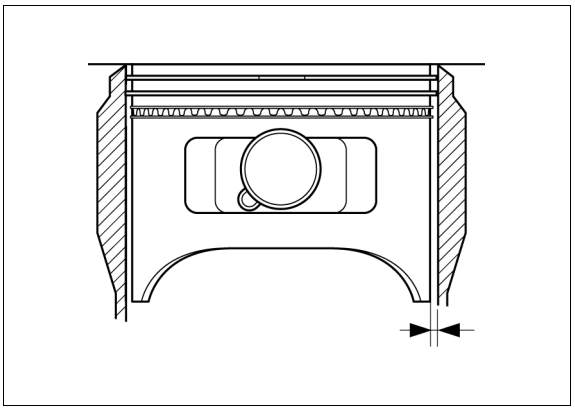
Subtract the piston skirt O.D. from the cylinder sleeve I.D. to obtain the piston-to-cylinder clearance.

STANDARD:
0.018 – 0.055 mm (0.0007 – 0.0022 in)

SERVICE LIMIT: 0.12 mm (0.005 in)

If the calculated clearance is more than the service limit, replace the piston and recheck the clearance.

If the clearance is still more than the service limit with a new piston, replace the cylinder barrel.



PISTON PIN BORE I.D.

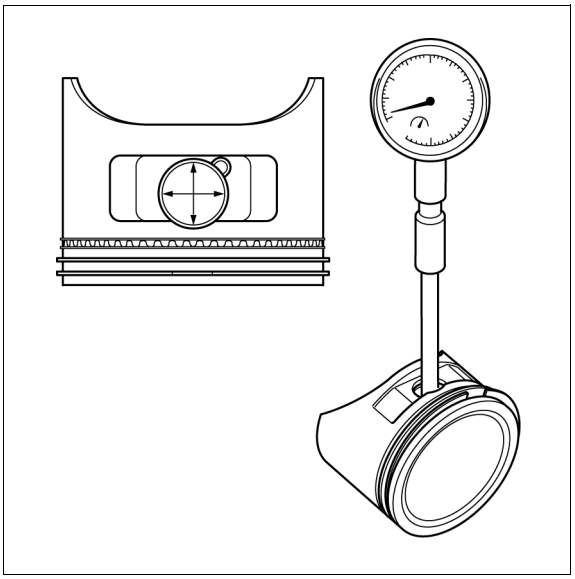
Measure and record the piston pin bore I.D. of the piston.

STANDARD: 18.002 – 18.008 mm (0.7087 – 0.7090 in)

SERVICE LIMIT: 18.048 mm (0.7106 in)

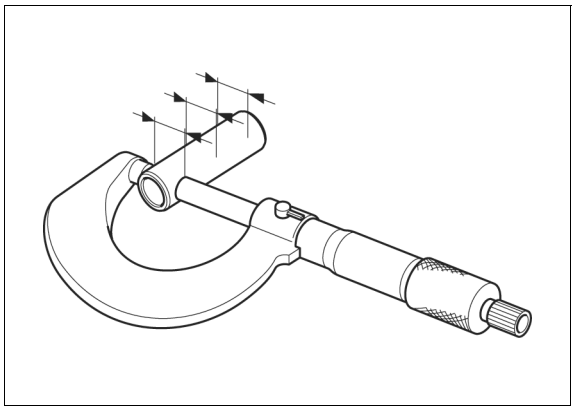
If the measurement is more than the service limit, replace the piston.

Inspect the piston pin O.D. (page 13-8).



PISTON PIN O.D.

Measure and record the piston pin O.D. at three points (both ends and middle). Take the minimum reading to determine piston pin O.D.



STANDARD: 17.992 – 17.998 mm (0.7083 – 0.7086 in)

SERVICE LIMIT: 17.954 mm (0.7068 in)

If the measurement is less than the service limit, replace the piston pin.

Inspect the piston pin bore I.D. (page 13-7).

Inspect the connecting rod small end I.D. (page 13-10).

PISTON PIN-TO-PISTON PIN BORE CLEARANCE

Subtract the piston pin O.D. from the piston pin bore I.D. to obtain the piston pin-to-piston pin bore clearance.

STANDARD: 0.004 – 0.016 mm (0.0002 – 0.0006 in)

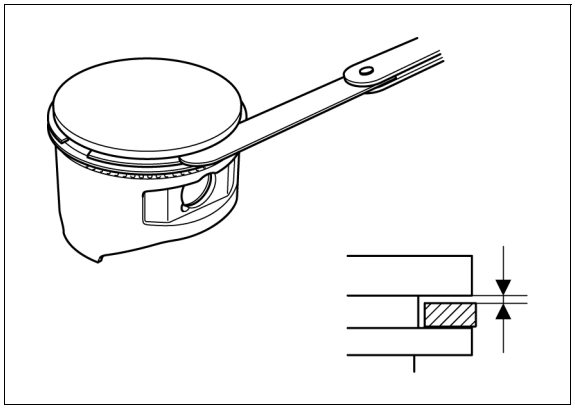
SERVICE LIMIT: 0.06 mm (0.002 in)

If the calculated clearance is more than the service limit, replace the piston pin and recheck the clearance.

If the clearance is still more than the service limit with a new piston pin, replace the piston.

PISTON RING SIDE CLEARANCE

Measure the clearance between each piston ring and ring groove of the piston using a feeler gauge.



STANDARD:
Top: 0.035 – 0.070 mm (0.0014 – 0.0028 in)
Second: 0.045 – 0.080 mm (0.0018 – 0.0032 in)

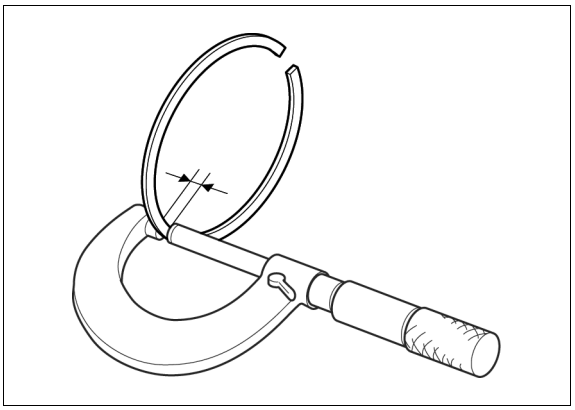
SERVICE LIMIT:
Top: 0.15 mm (0.006 in)
Second: 0.15 mm (0.006 in)

If any of the measurements is more than the service limit, inspect the piston ring width.

If the piston ring width is normal, replace the piston and recheck the clearance.
If necessary, replace the piston rings (top, second, oil) as a set and recheck the clearance.
If any of the measurements is still more than the service limit with the piston rings, replace the piston.

PISTON RING WIDTH

Measure each piston ring width.



STANDARD:
Top: 0.95 – 0.97 mm (0.037 – 0.038 in)
Second: 0.94 – 0.96 mm (0.037 – 0.038 in)

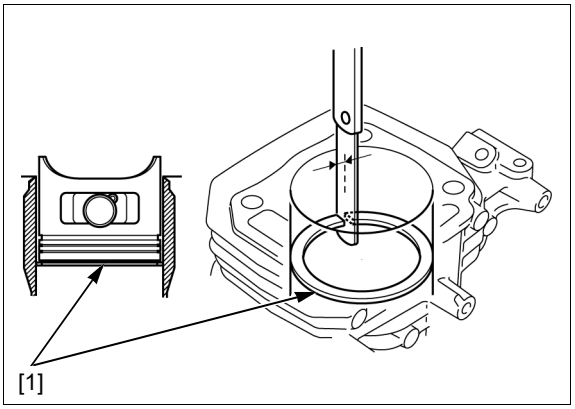
SERVICE LIMIT:
Top: 0.93 mm (0.037 in)
Second: 0.92 mm (0.036 in)

If any of the measurements is less than the service limit, replace the piston rings (top, second, oil) as a set.

PISTON RING END GAP

Before inspection, check whether the cylinder sleeve I.D. is within the specification (page 13-6).

Measure each piston ring [1] end gap using a feeler gauge.



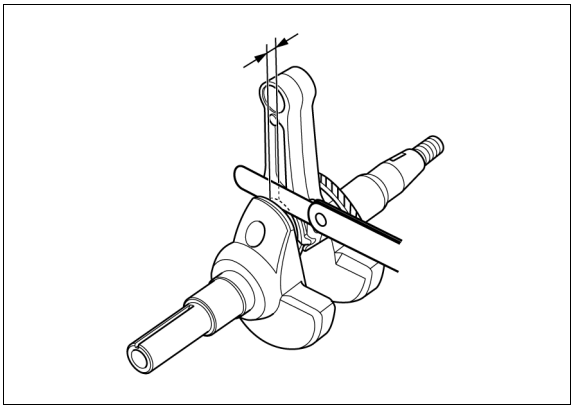
STANDARD:
Top: 0.200 – 0.350 mm (0.0079 – 0.0138 in)
Second: 0.350 – 0.500 mm (0.0138 – 0.0197 in)
Oil (side rail): 0.20 – 0.70 mm (0.008 – 0.028 in)

SERVICE LIMIT:
Top: 1.0 mm (0.04 in)
Second: 1.0 mm (0.04 in)
Oil (side rail): 1.0 mm (0.04 in)

If any of the measurements is more than the service limit, replace the piston rings (top, second, oil) as a set.

CONNECTING ROD BIG END SIDE CLEARANCE

Measure the clearance between the connecting rod big end and crankshaft using a feeler gauge.



STANDARD: 0.80 – 1.40 mm (0.031 – 0.055 in)

SERVICE LIMIT: –

If necessary, replace the connecting rod and/or crankshaft.

CONNECTING ROD SMALL END I.D.

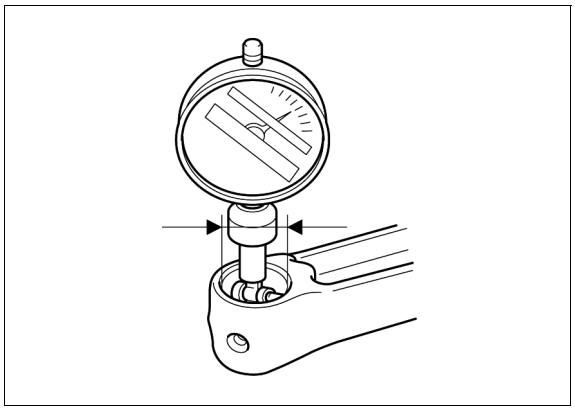
Measure the connecting rod small end I.D.

STANDARD: 18.006 – 18.017 mm (0.7089 – 0.7093 in)

SERVICE LIMIT: 18.07 mm (0.711 in)

If the measurement is more than the service limit, replace the connecting rod.

Inspect the piston pin O.D. (page 13-8).



CONNECTING ROD BIG END I.D.

Apply engine oil to the connecting rod bolt threads and seating surface.

Set the connecting rod lower to the connecting rod upper and tighten the connecting rod bolts to the specified torque.

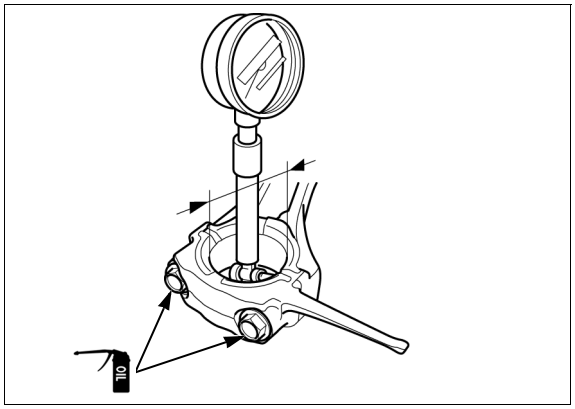
TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Measure the connecting rod big end I.D.

STANDARD: 30.015 – 30.025 mm (1.1817 – 1.1821 in)

SERVICE LIMIT: 30.066 mm (1.1837 in)

If the measurement is more than the service limit, replace the connecting rod (page 13-5).



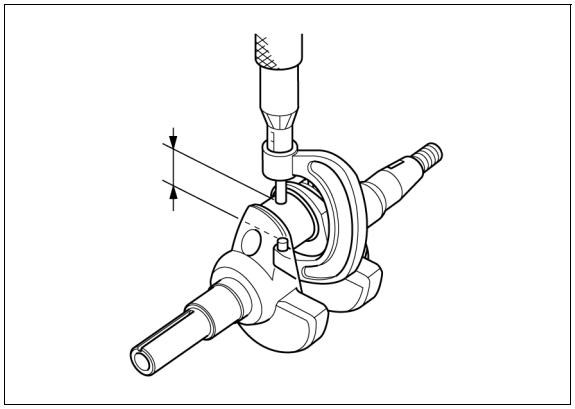
CRANKPIN O.D.

Measure the crankpin O.D. of the crankshaft.

STANDARD: 29.970 – 29.980 mm (1.1799 – 1.1803 in)

SERVICE LIMIT: 29.920 mm (1.1780 in)

If the measurement is less than the service limit, replace the crankshaft.



CONNECTING ROD BIG END OIL CLEARANCE

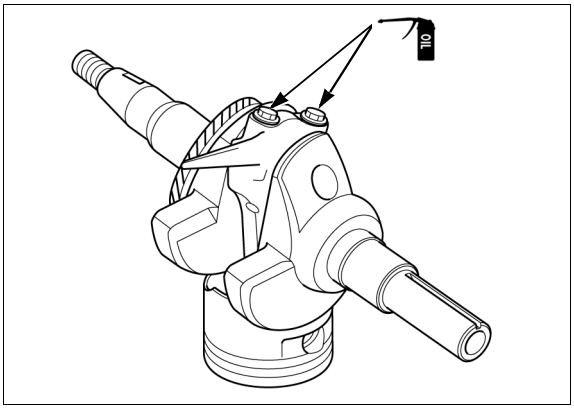
Clean all oil from the crankpin and connecting rod big end surface.

Apply engine oil to the connecting rod bolt threads and seating surface.

Place a piece of plastigauge on the crankpin, install the connecting rod upper and the connecting rod lower, and tighten the connecting rod bolts to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

NOTE:
Do not rotate the crankshaft while the plastigauge is in place.



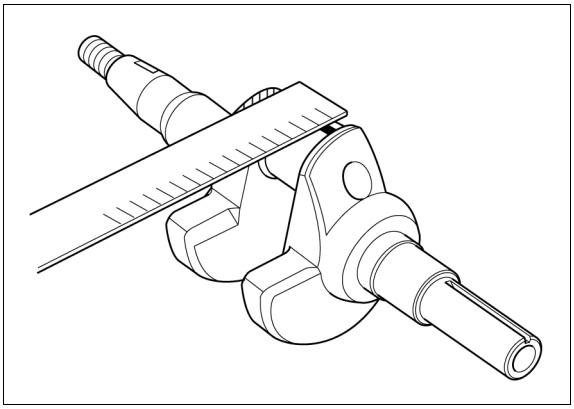
Remove the connecting rod and measure the plastigauge.

STANDARD: 0.035 – 0.055 mm (0.0014 – 0.0022 in)

SERVICE LIMIT: 0.12 mm (0.005 in)

If the clearance is more than the service limit, inspect the connecting rod big end I.D. and the crankpin O.D.

If necessary replace the part that is not within the service limit and recheck the clearance.

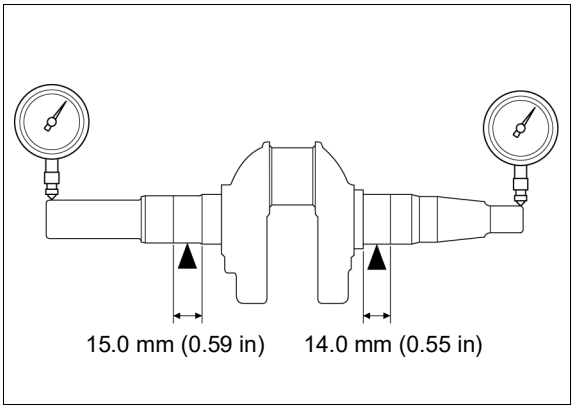


CRANKSHAFT RUNOUT

Set the crankshaft on V-blocks and measure the runout using a dial indicator.

SERVICE LIMIT: 0.10 mm (0.004 in)

If the measured runout is more than the service limit, replace the crankshaft.



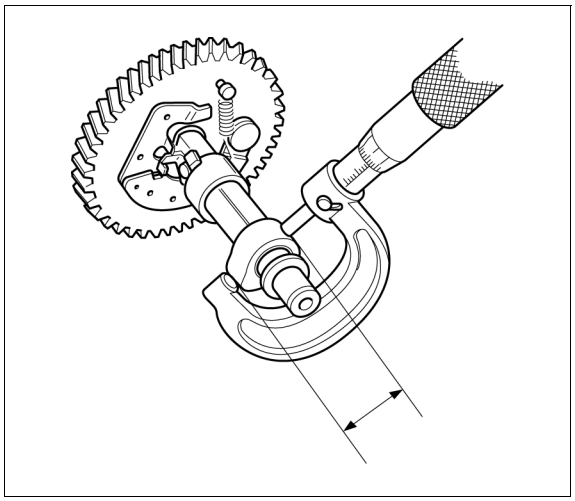
CAMSHAFT CAM HEIGHT

Measure the cam height of the camshaft.

STANDARD:
IN: 27.500 – 27.900 mm (1.0827 – 1.0984 in)
EX: 27.547 – 27.947 mm (1.0845 – 1.1003 in)

SERVICE LIMIT:
IN: 27.45 mm (1.081 in)
EX: 27.50 mm (1.083 in)

If the measurement is less than the service limit, replace the camshaft.



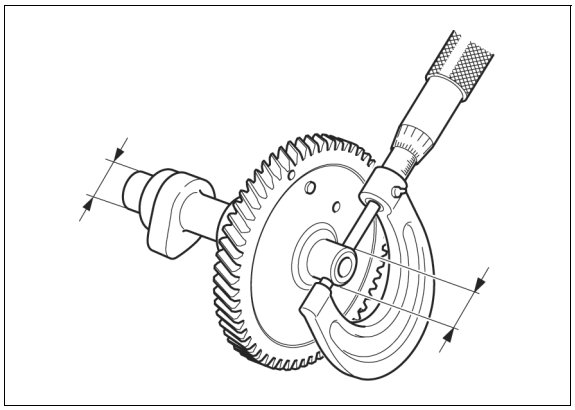
CAMSHAFT O.D.

Measure the O.D. of the camshaft.

STANDARD: 13.966 – 13.984 mm (0.5498 – 0.5506 in)

SERVICE LIMIT: 13.916 mm (0.5479 in)

If the measurement is less than the service limit, replace the camshaft.



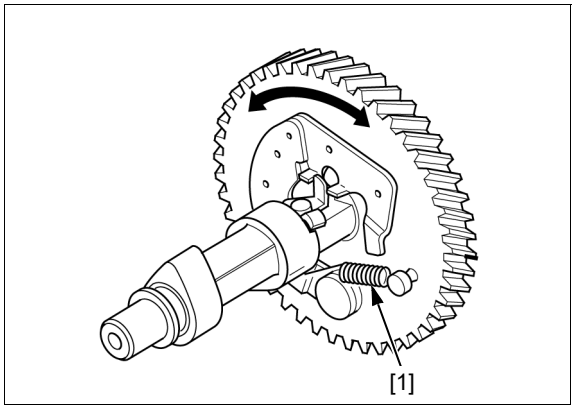
DECOMPRESSOR WEIGHT

Check for worn and weakened spring.

If the weight return spring [1] is worn or weakened, replace it.

Check that the decompressor weight moves smoothly.

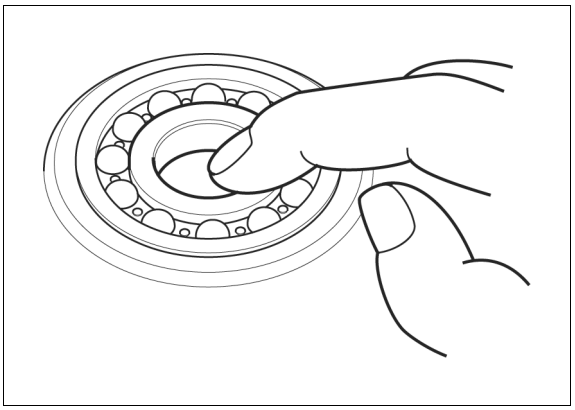
If the decompressor weight does not move correctly, replace the camshaft.



CRANKSHAFT BEARING

Turn the inner race of the bearing with your finger and check for play.

Replace the bearing if it is noisy or has excessive play.



CRANKSHAFT BEARING/OIL SEAL REPLACEMENT

CRANKSHAFT BEARING

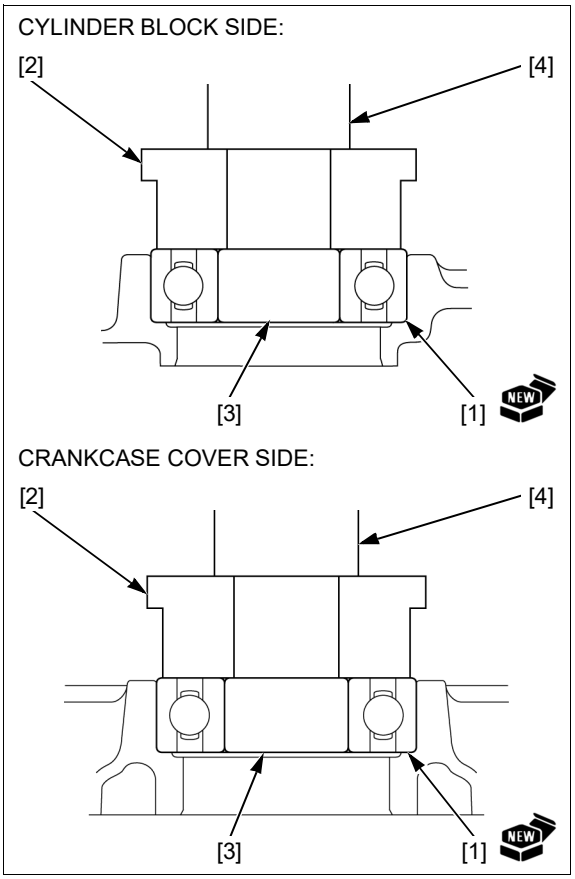
Cylinder block side: Drive out the bearing (6205) from the cylinder block (page 13-4).

Crankcase cover side: Drive out the bearing (6205) from the crankcase cover (page 13-3).

Drive a new bearing [1] with its marked side facing up until it is fully seated on the end using the special tools.

TOOLS:

Attachment, 52 x 55 mm [2]	**07746-0010400**
Pilot, 25 mm [3]	**07746-0040600**
Driver [4]	**07749-0010000**



CRANKSHAFT OIL SEAL

Cylinder block side: Remove the oil seal (25 x 41 x 6 mm) from the cylinder block (page 13-4).

Crankcase cover side: Remove the oil seal (25 x 41 x 6 mm) from the crankcase cover (page 13-3).

Apply grease to the lips of a new oil seal (25 x 41 x 6 mm) [1].

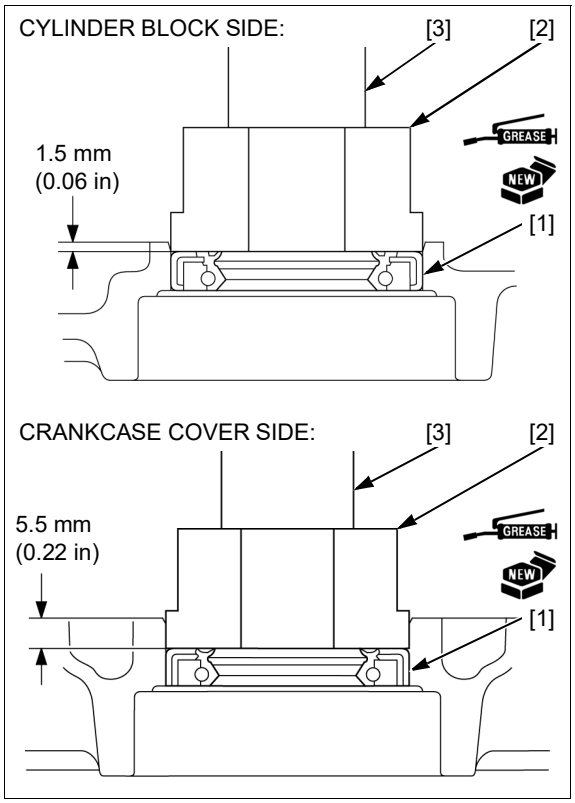
Drive the oil seal in the position as shown with its flat surface side facing up, using the special tools.

TOOLS:

Attachment, 37 x 40 mm [2]	**07746-0010200**
Driver [3]	**07749-0010000**

INSTALLATION HEIGHT:

Cylinder block side:	**1.5 mm (0.06 in)**
Crankcase cover side:	**5.5 mm (0.22 in)**



HANDLE COLUMN ASSEMBLY REMOVAL/INSTALLATION

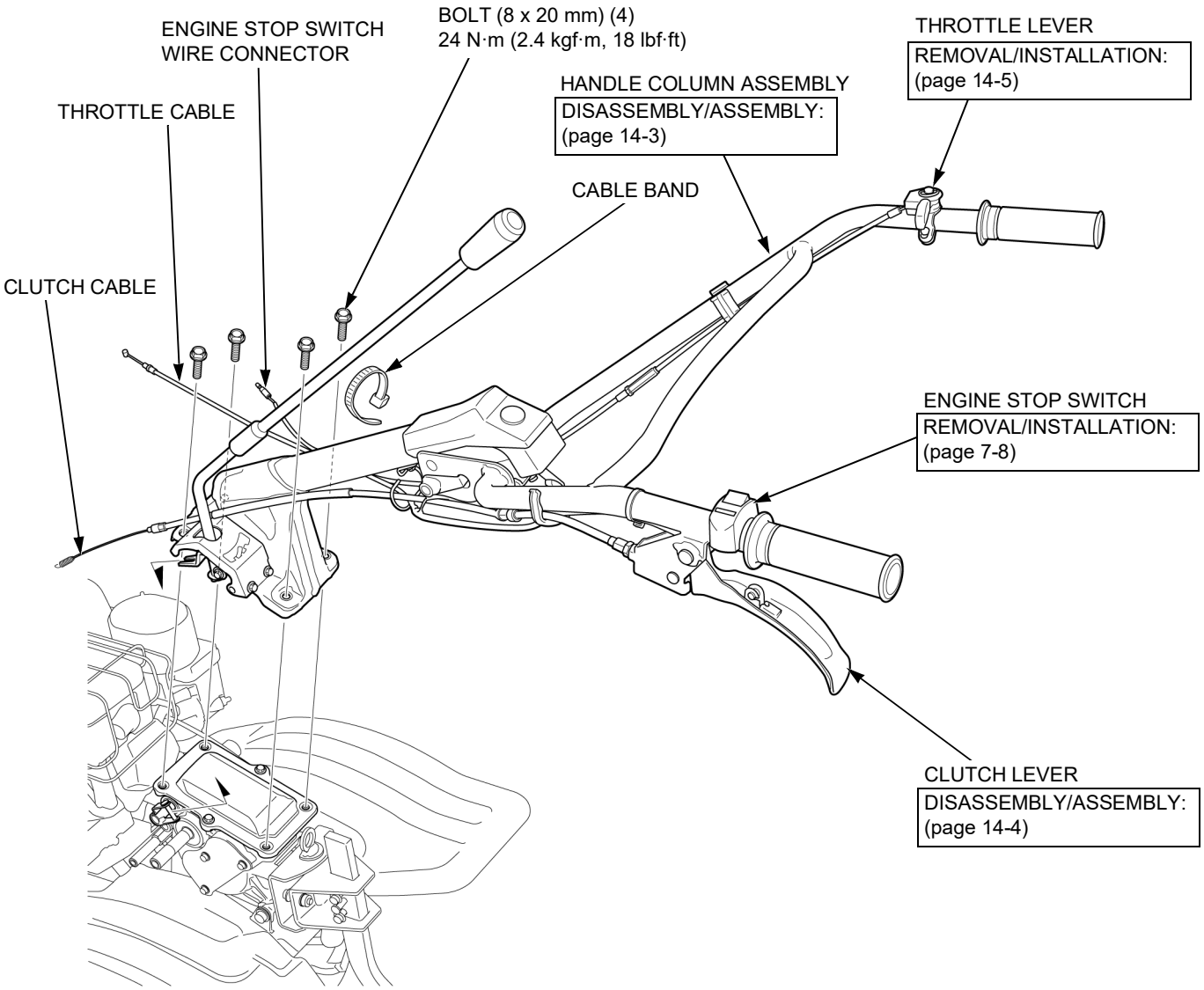
Remove the following:

– Air cleaner elbow (page 5-4)
– Tension arm (page 11-2)

Disconnect the throttle cable (page 10-2).

NOTE:

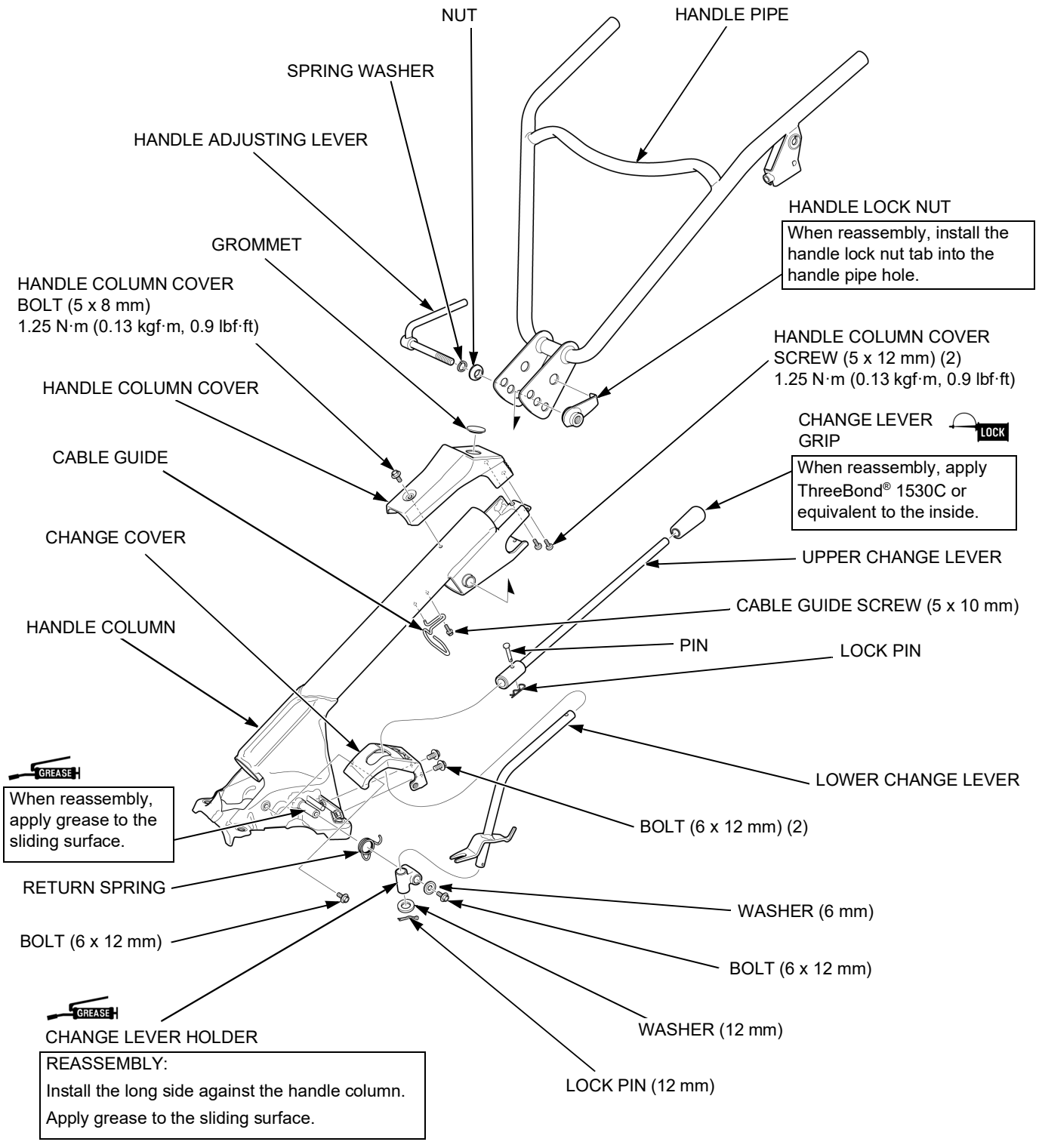
• When installing the handle column assembly, route the wire harness properly (page 2-7).



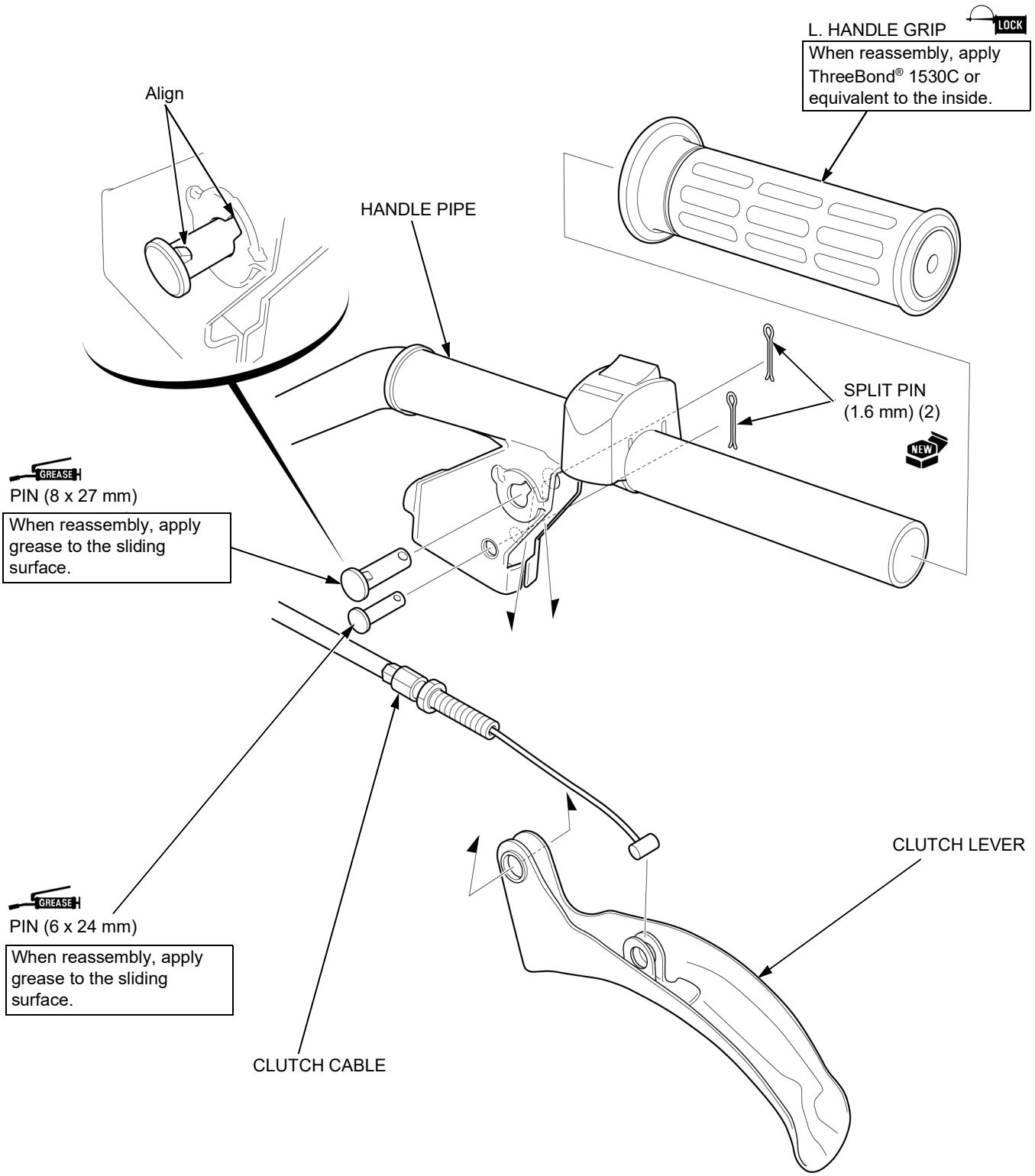
HANDLE COLUMN DISASSEMBLY/ASSEMBLY

Remove the following:

- Handle column assembly (page 14-2)
- Engine stop switch (page 7-8)
- Clutch lever (page 14-4)
- Throttle lever (page 14-5)



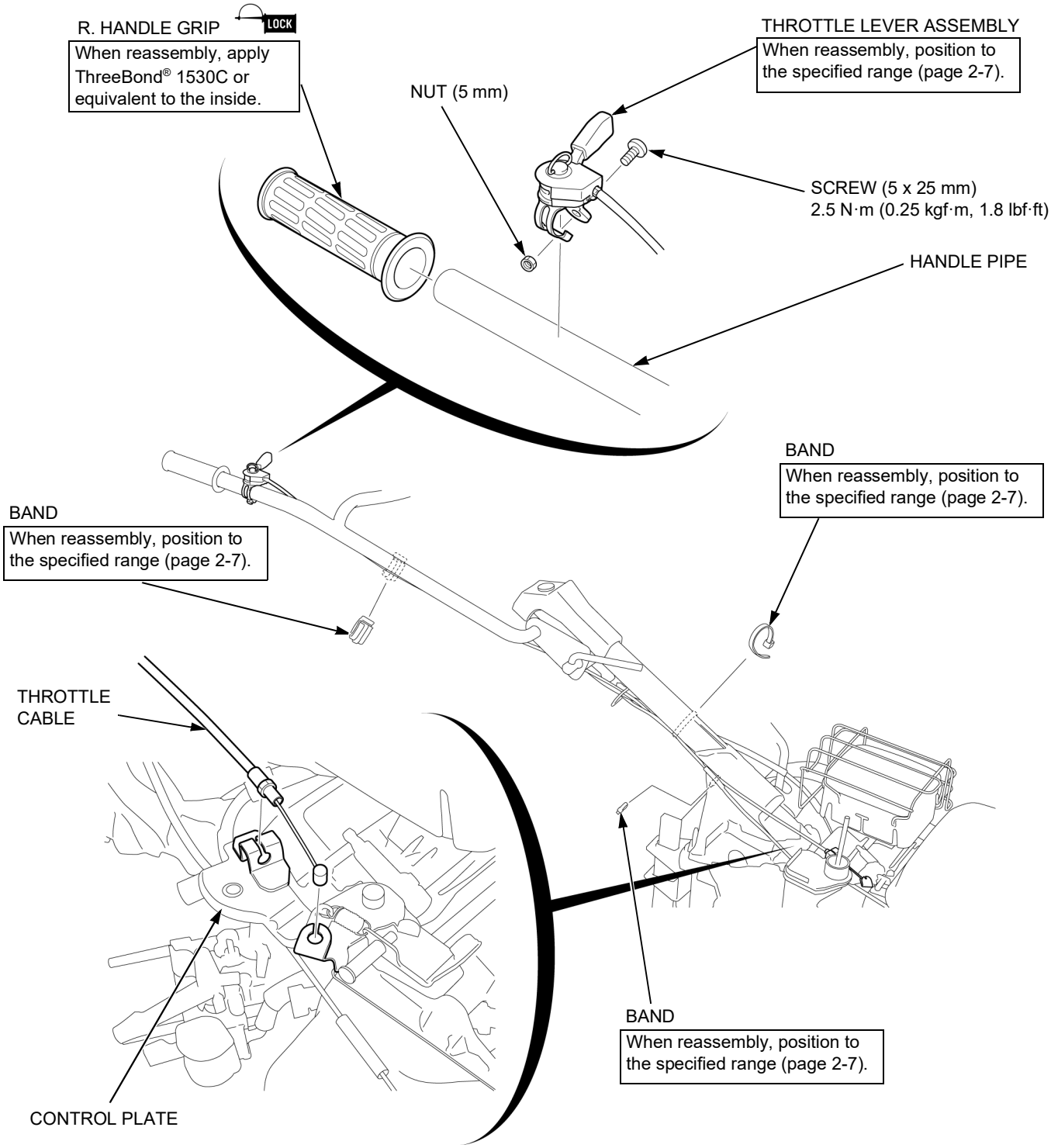
CLUTCH LEVER DISASSEMBLY/ASSEMBLY



THROTTLE LEVER ASSEMBLY REMOVAL/INSTALLATION

Disconnect the throttle cable from the control plate (page 10-2).

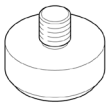
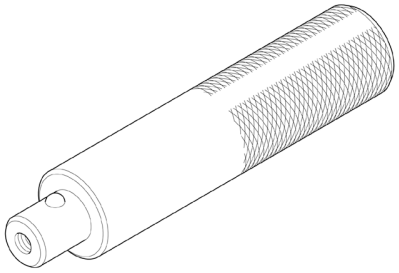
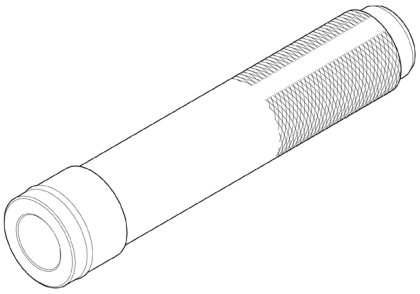
After installation, perform the "THROTTLE CABLE CHECK/ADJUSTMENT" (page 3-13).



MEMO

15. WHEEL/ROTOR/TRANSMISSION

TOOLS

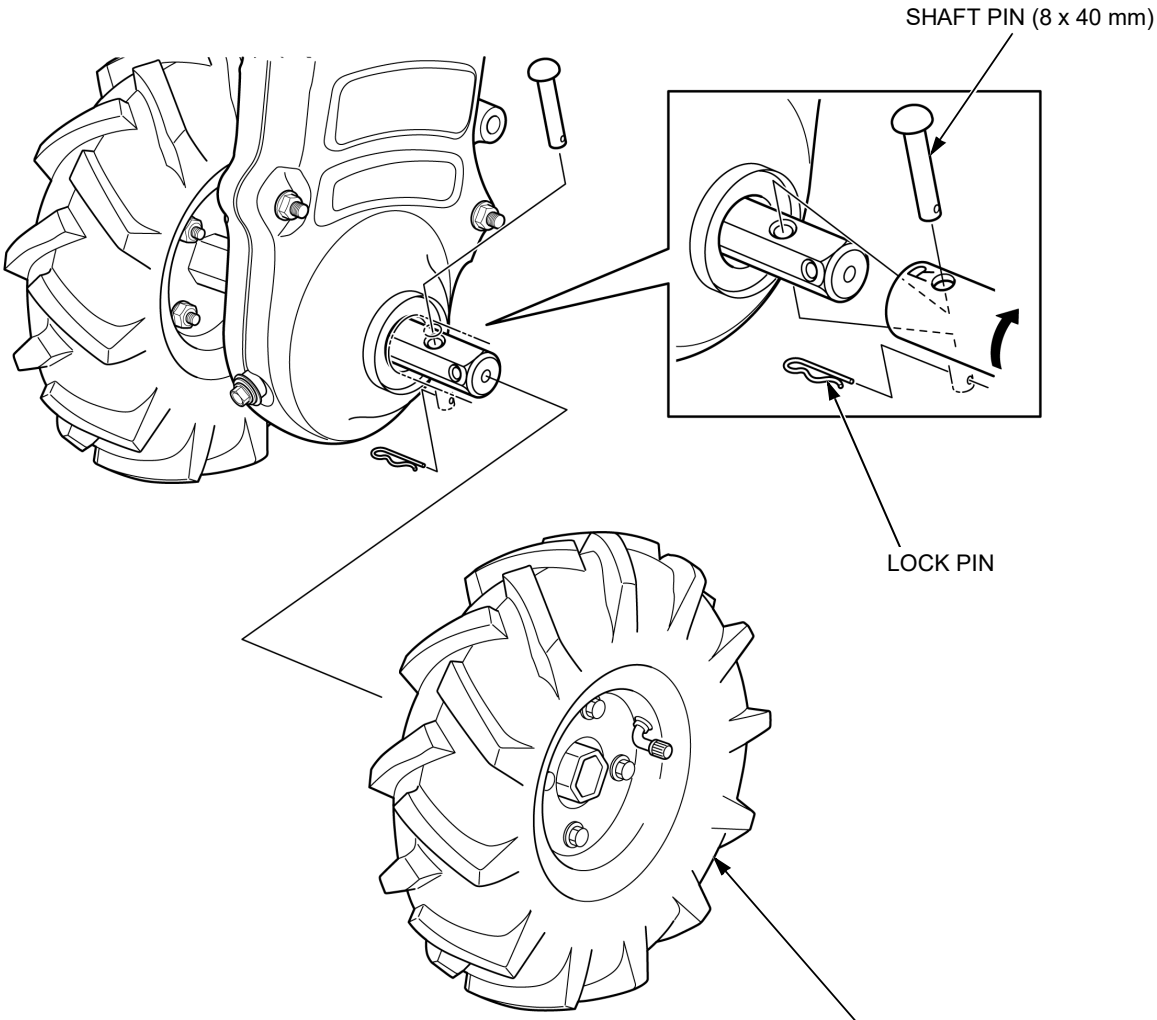
Pilot, 22 mm 07746-0041000 	Pilot, 28 mm 07746-0041100 	Driver 07749-0010000 
Driver, 22 mm I.D. 07746-0020100 		

WHEEL REMOVAL/INSTALLATION

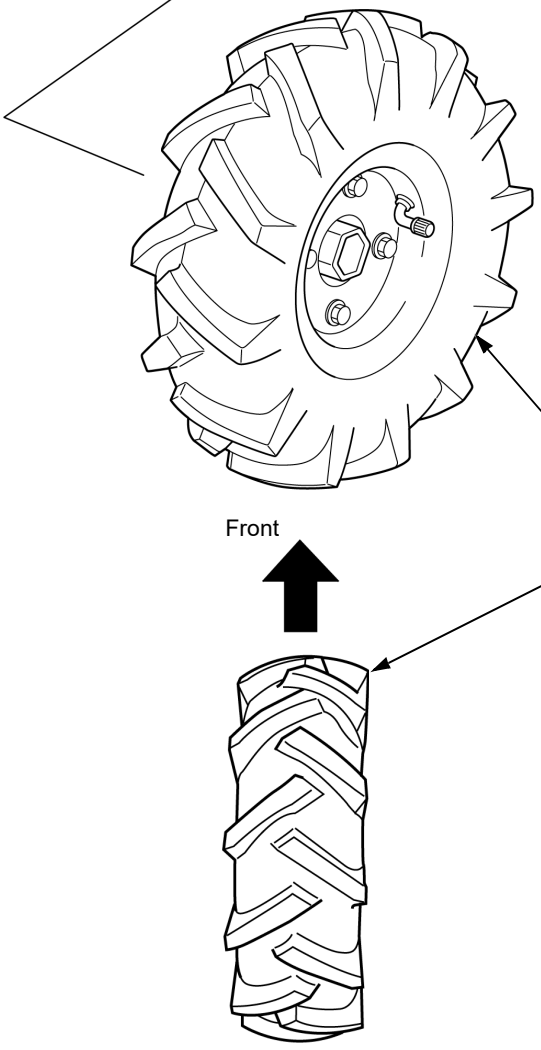
NOTE:

- The R. wheel and L. wheel can be removed in the same manner.

R. wheel shown:



Up side view:

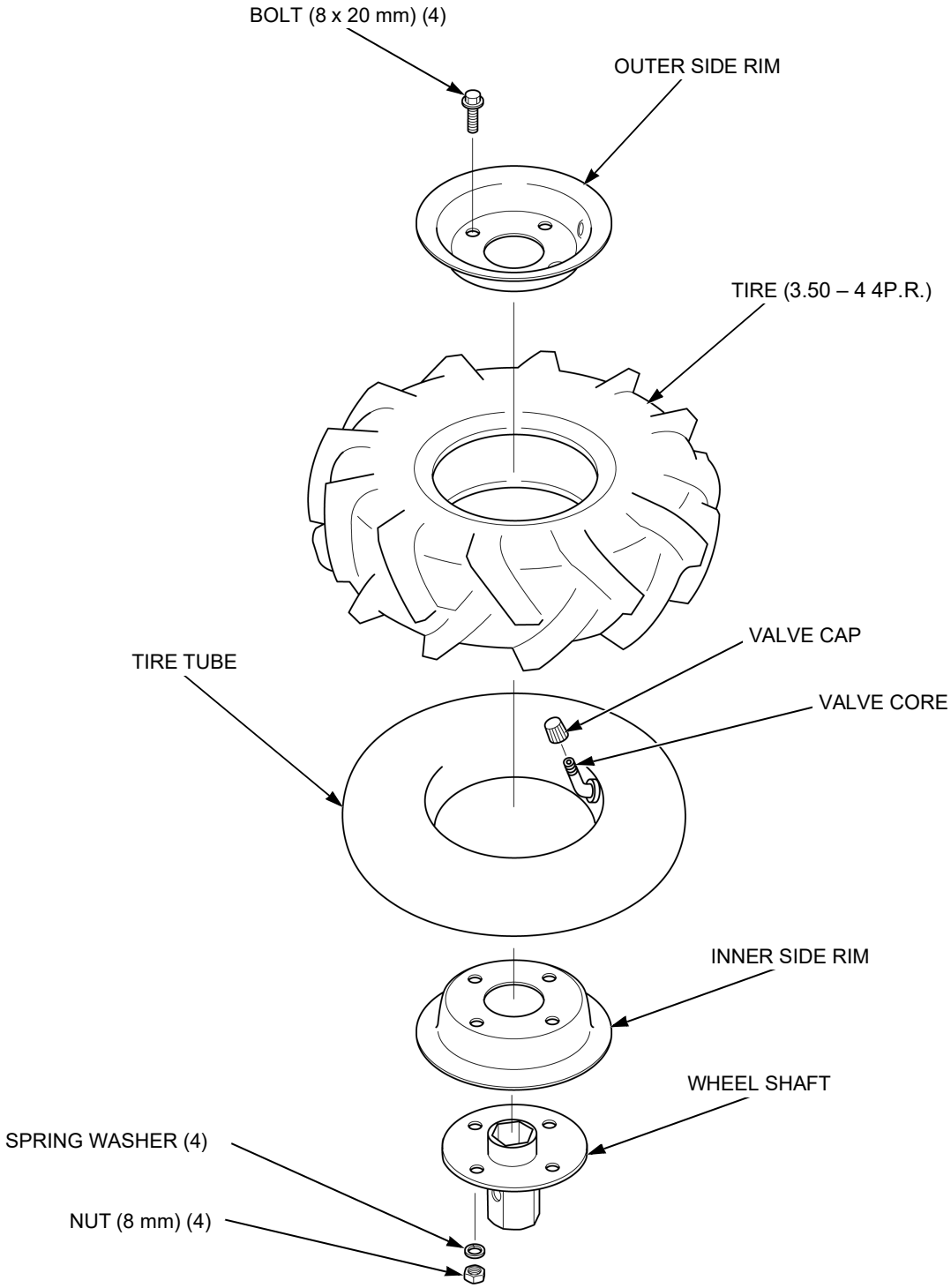


WHEEL DISASSEMBLY/ASSEMBLY

WHEEL DISASSEMBLY

NOTE:

- For disassembling the wheel, push the valve core and decrease the air pressure.



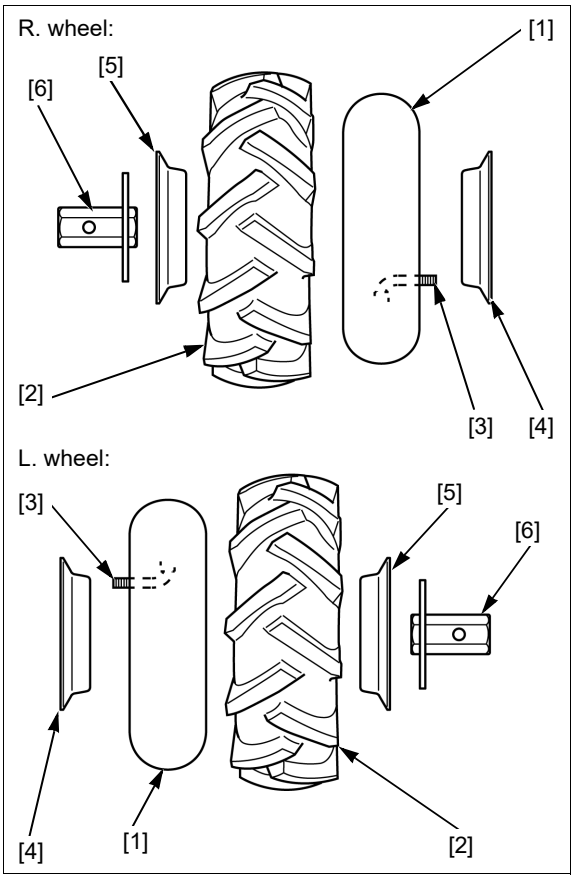
WHEEL ASSEMBLY

Install the tire tube [1] to tire [2] so the valve [3] is in direction as shown.

Assemble the outer side rim A [4], the inner side rim B [5] and the wheel shaft [6] as shown.

NOTICE

- *Take care not to pinch the tube.*



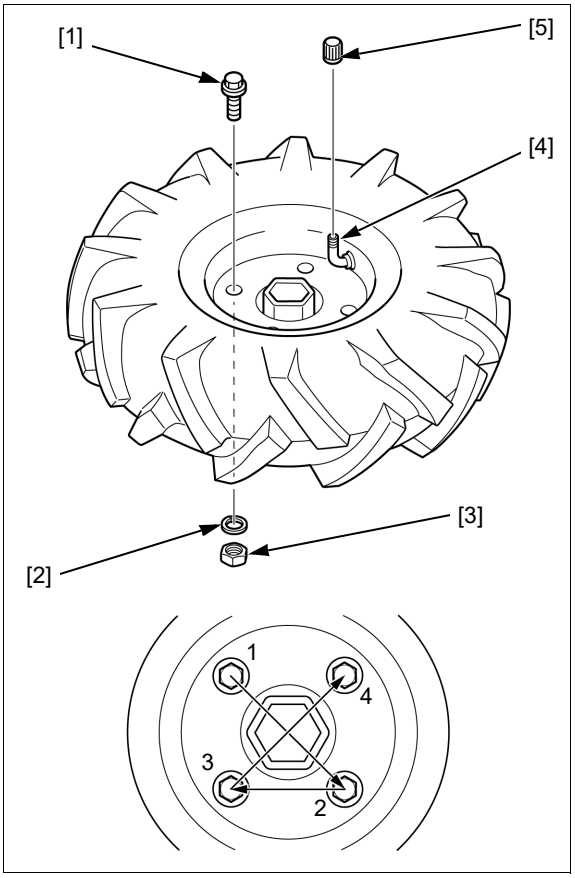
Install the four bolts (8 x 20 mm) [1], spring washers [2] and nuts (8 mm) [3].

Tighten the nuts securely in the specified sequence as shown.

Apply air pressure to the valve [4] to specified air pressure.

RECOMMENDED TIRE PRESSURE:
137 – 157 kPa (1.4 – 1.6 kgf/cm^2, 19.9 – 22.8 psi)

Install the valve cap [5].

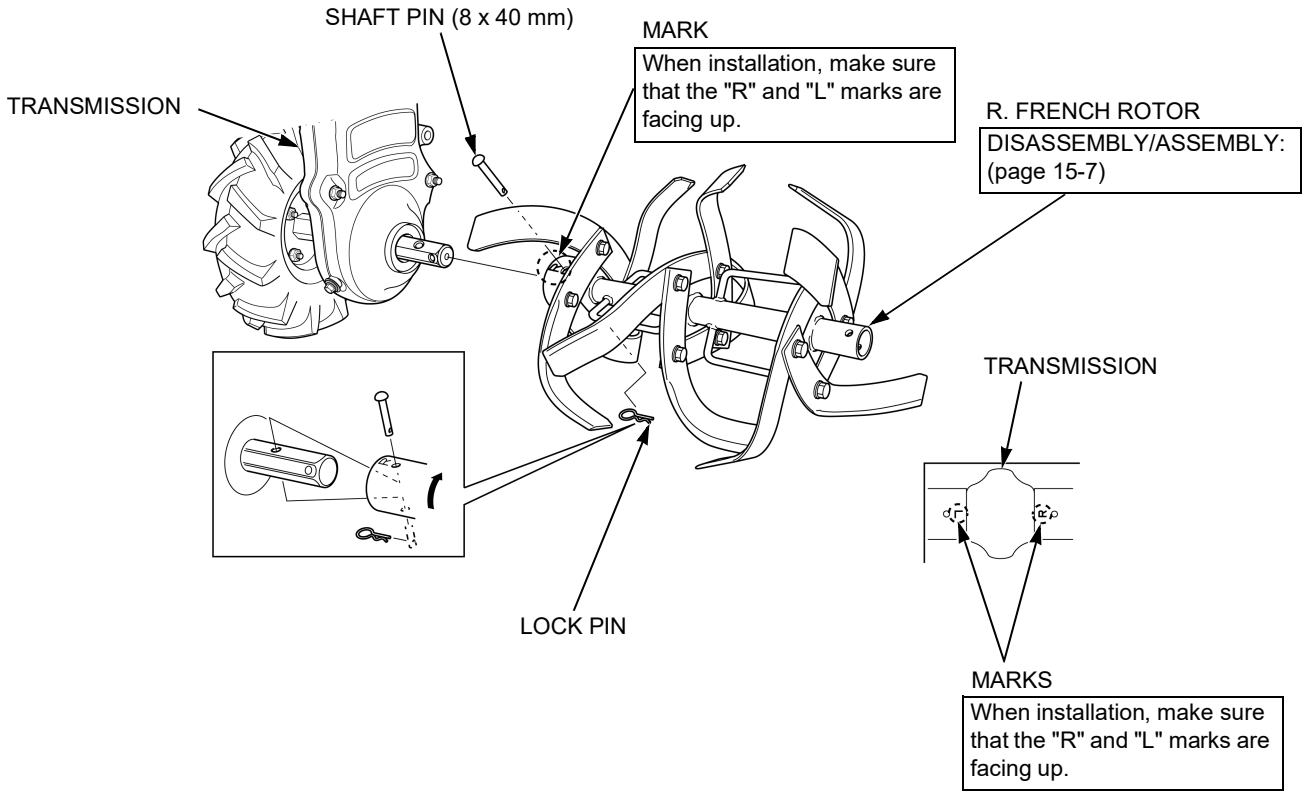


ROTOR REMOVAL/INSTALLATION

NOTE:

- The right side rotor and left side rotor can be removed in the same manner.
- After installation, make sure that the right and left rotors are symmetry (page 15-9).

Right side shown:

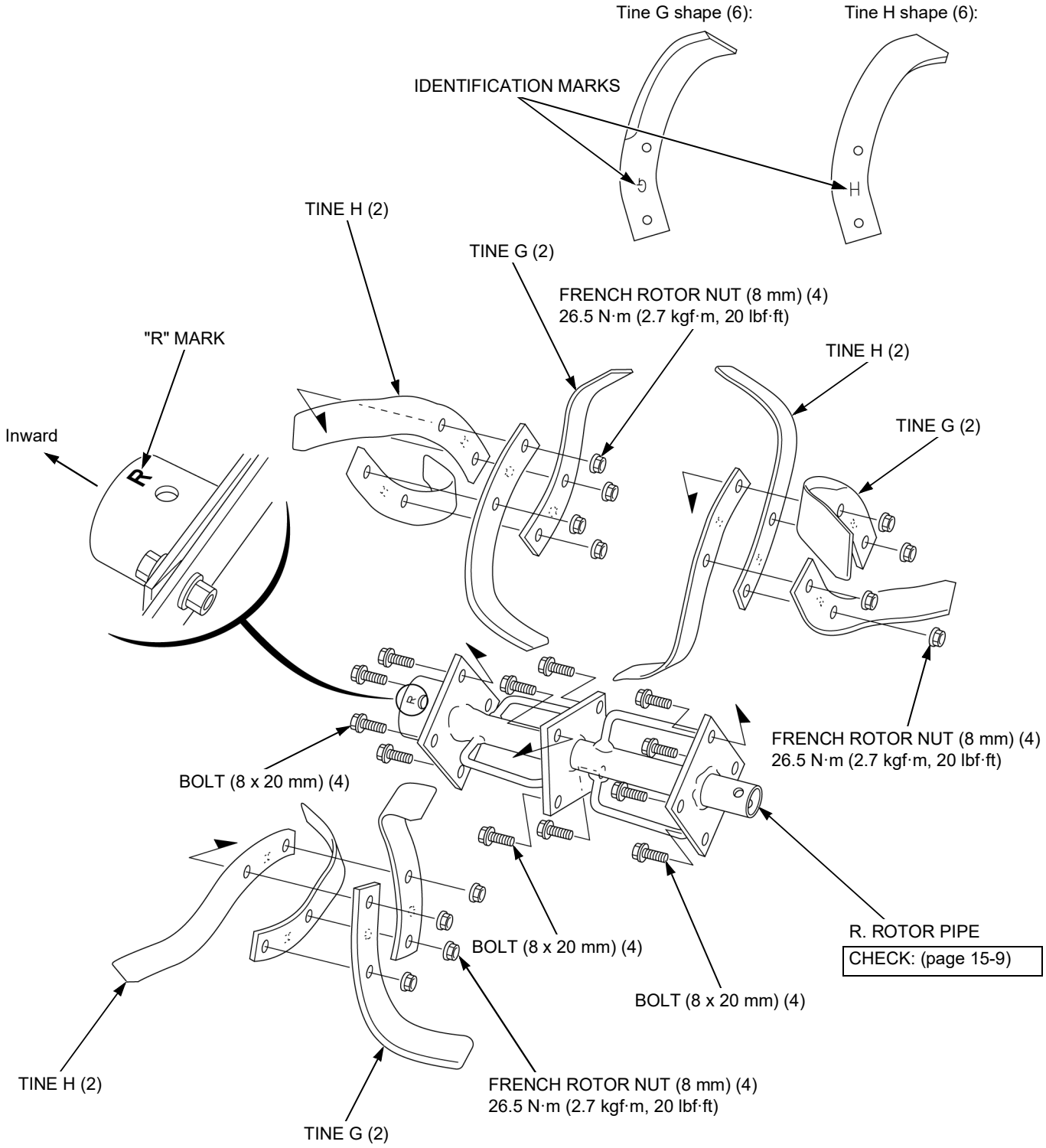


FRENCH ROTOR DISASSEMBLY/ASSEMBLY

R. ROTOR

NOTE:

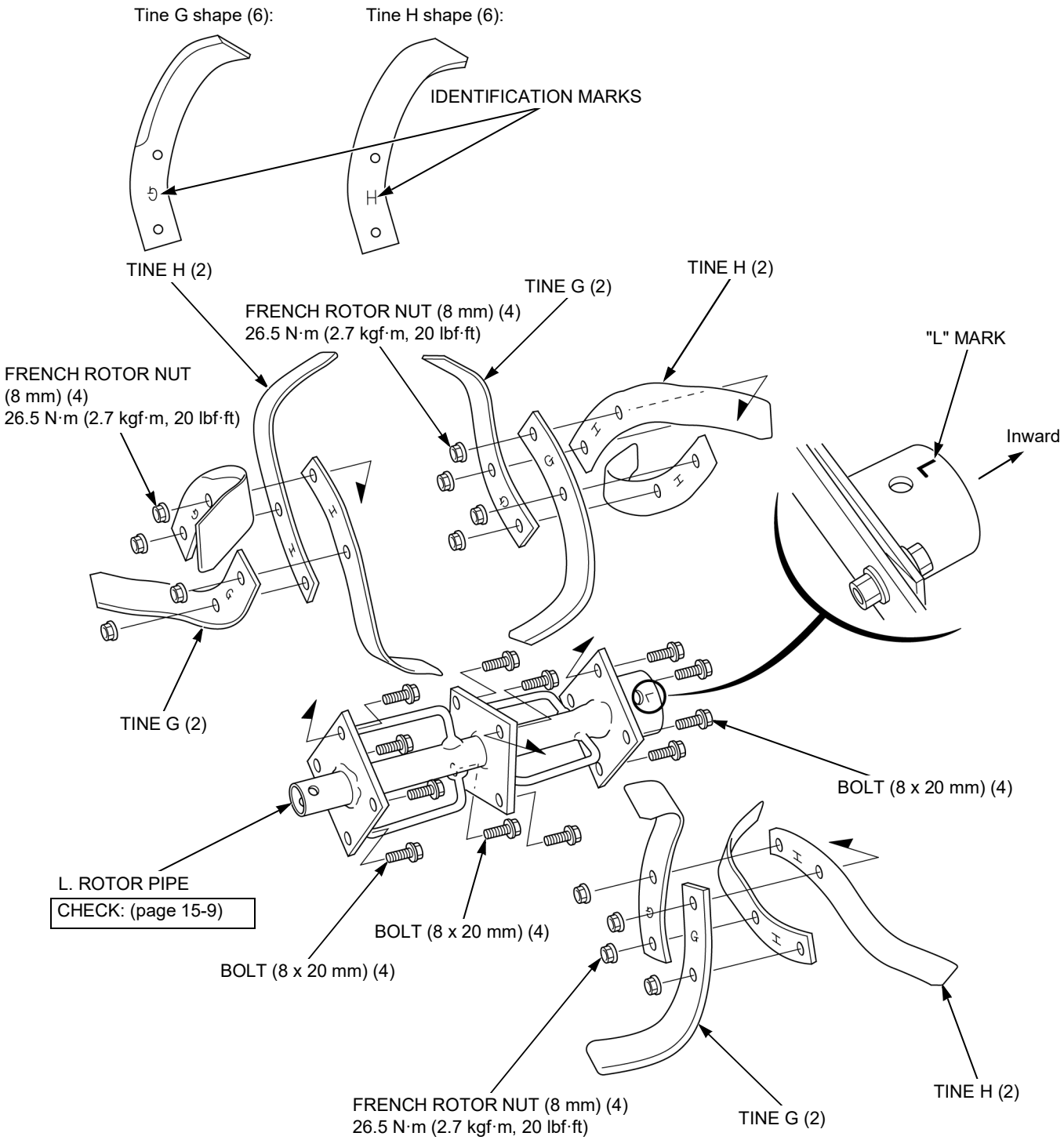
- When reassembly, assemble the tines with its identification marks ("G" and "H") facing inward.



L. ROTOR

NOTE:

- When reassembly, assemble the tines with its identification marks ("G" and "H") facing outward.

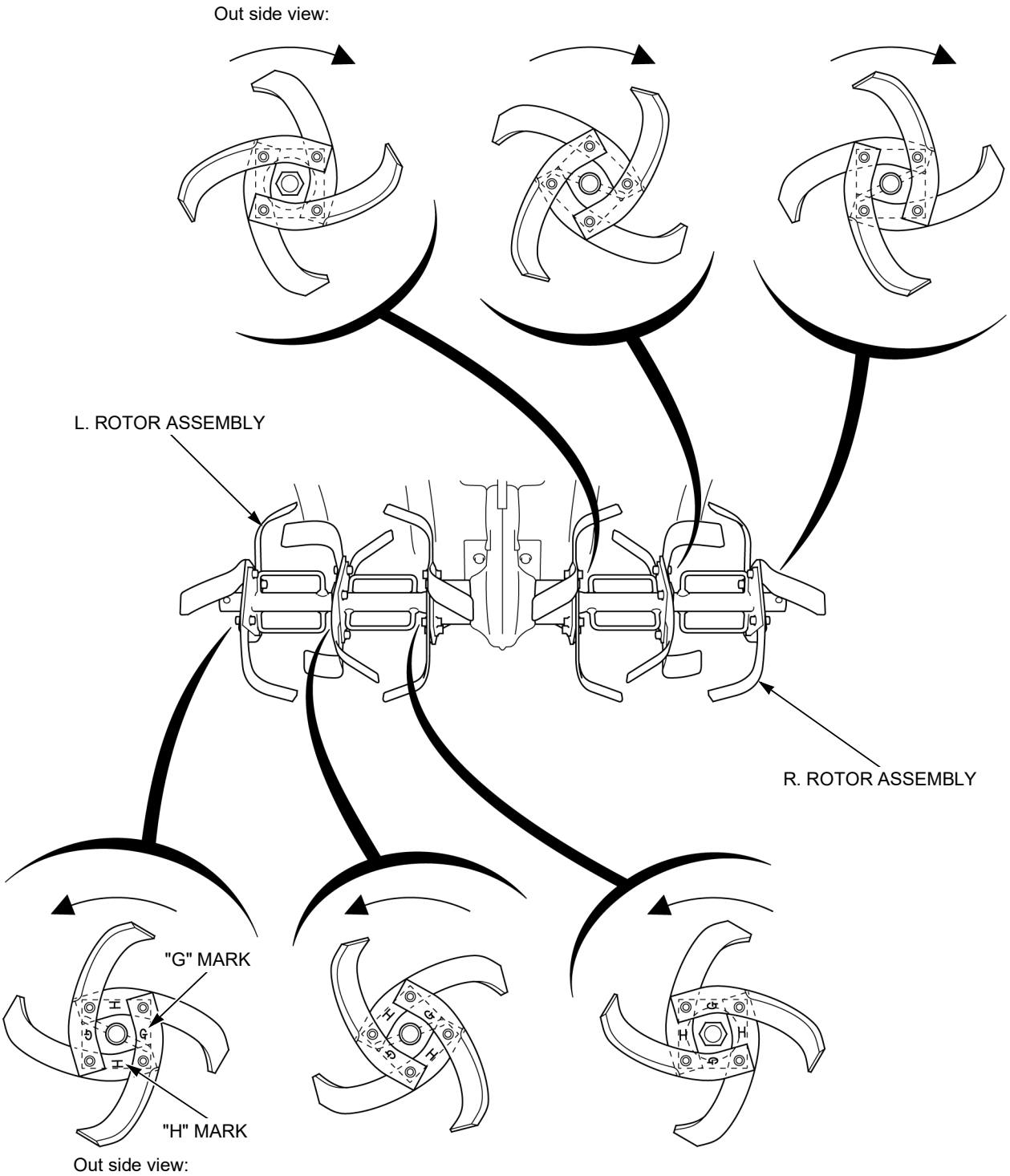


FRENCH ROTOR ASSEMBLY CHECK

Check that the tines are assembled properly as shown.

NOTE:

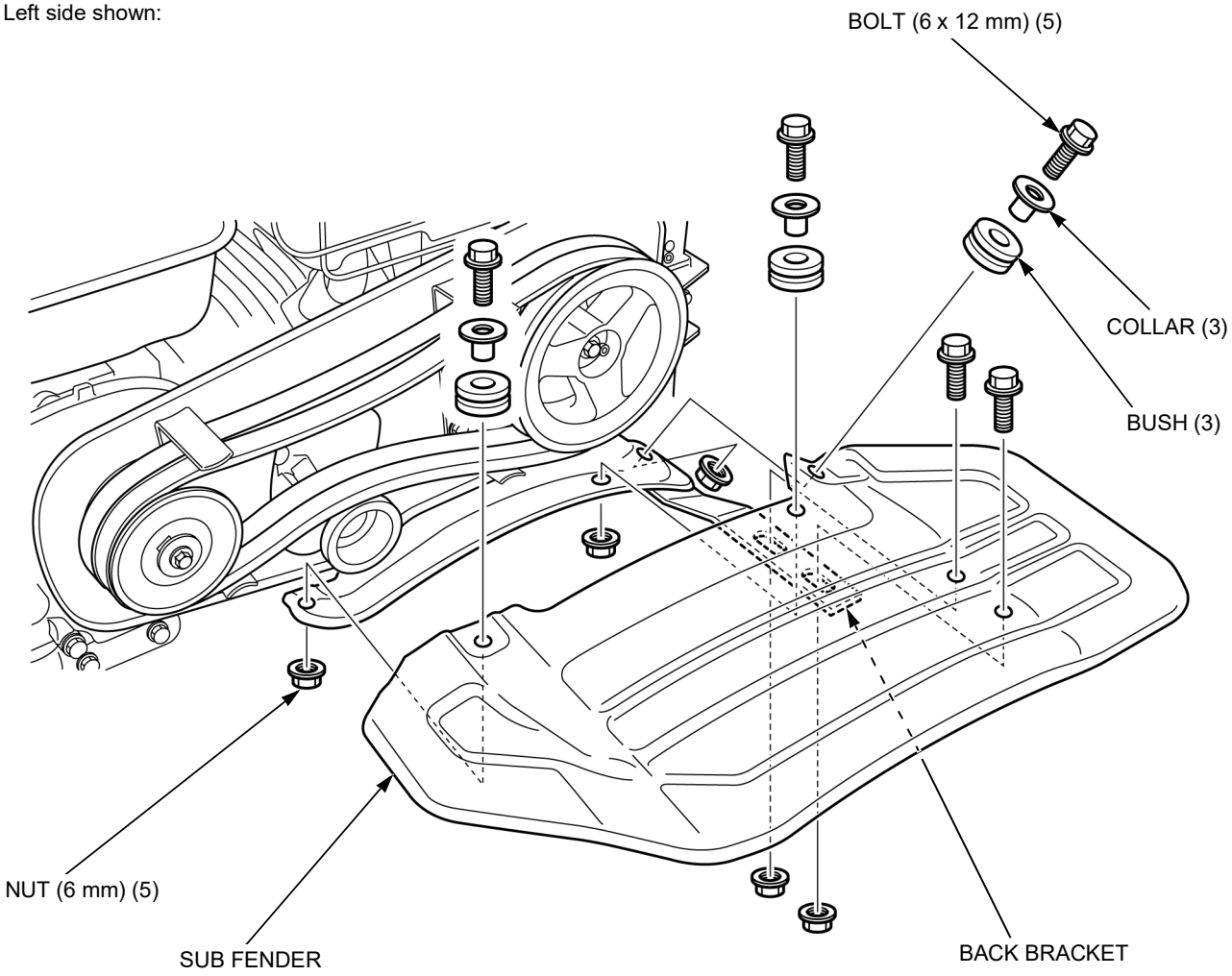
- The right rotor and left rotor are symmetry.



SUB FENDER REMOVAL/INSTALLATION

Left side only: Remove the belt cover (page 11-2).

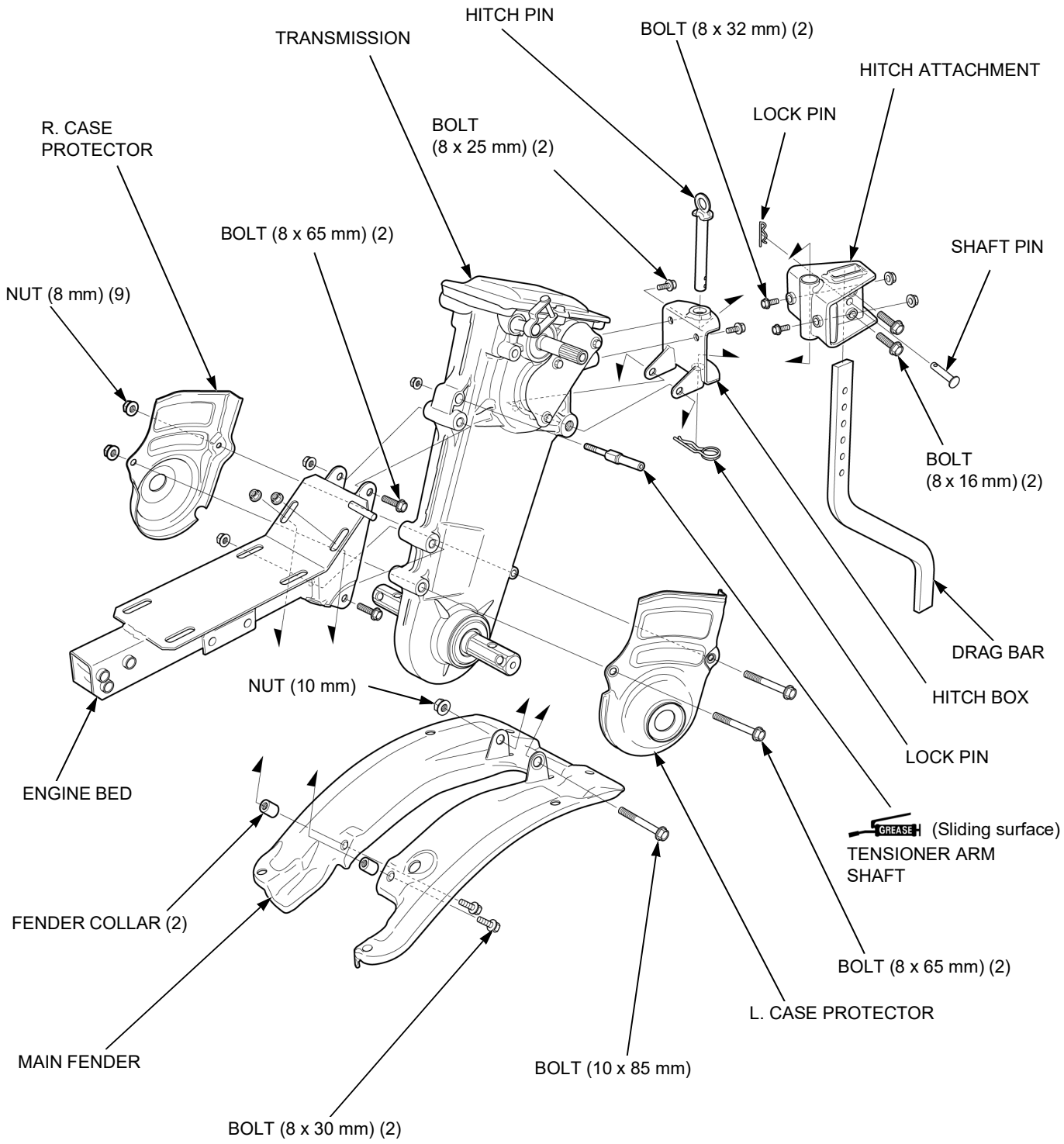
Left side shown:



TRANSMISSION/MAIN FENDER/ENGINE BED REMOVAL/INSTALLATION

Remove the following:

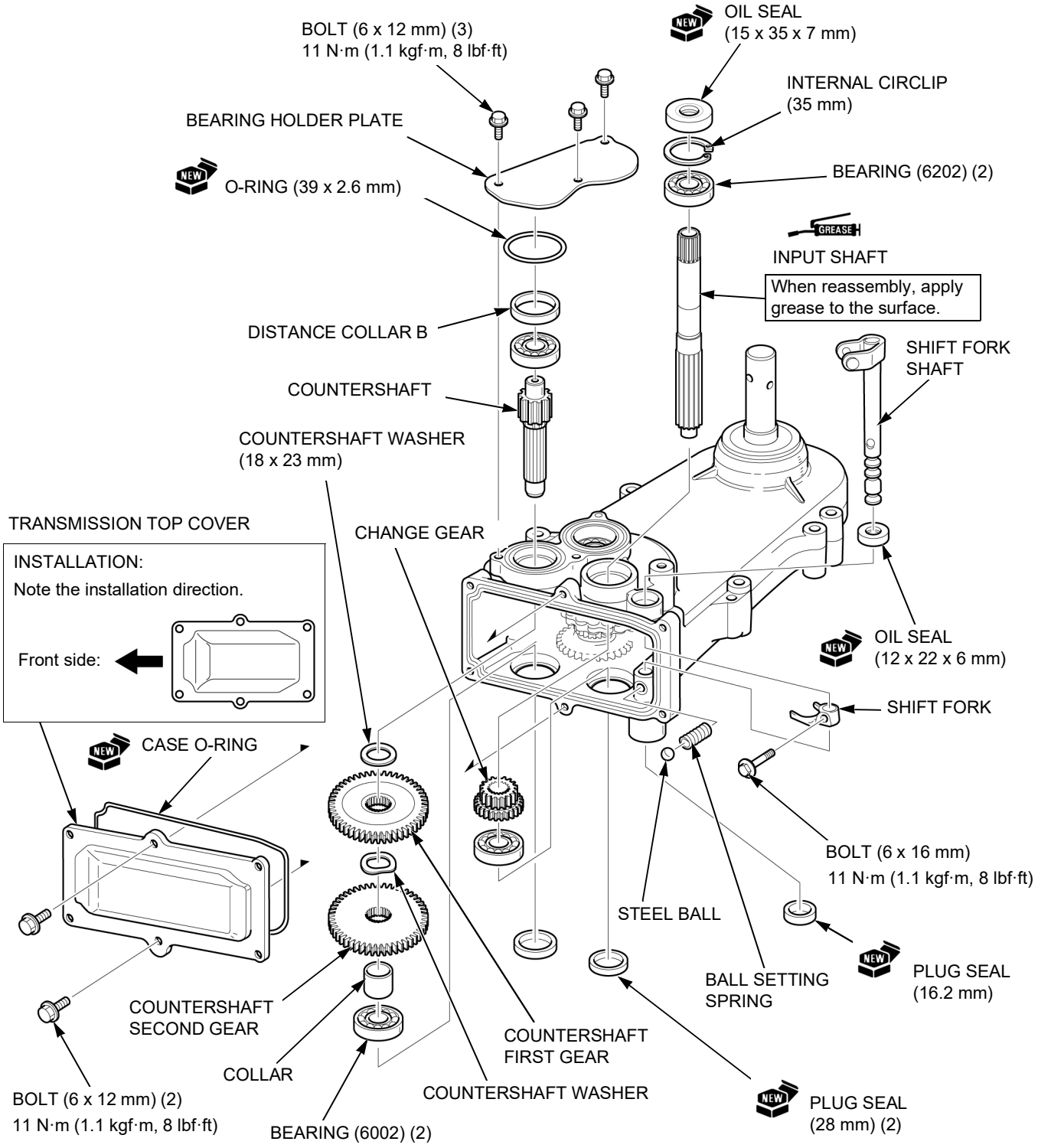
- Engine (page 10-2)
- Handle pipe/handle column (page 14-2)

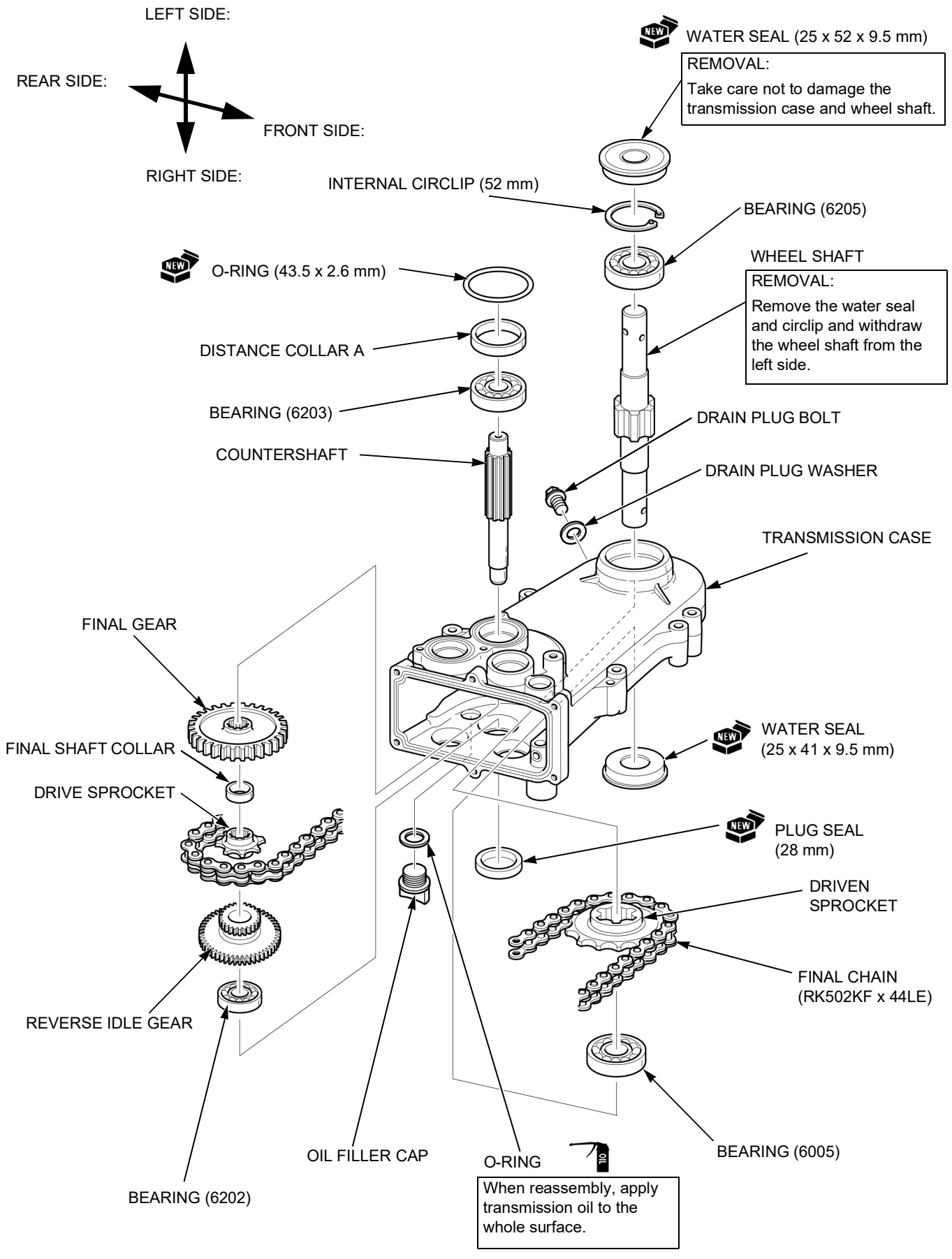


TRANSMISSION DISASSEMBLY/ASSEMBLY

NOTE:

- The transmission case cannot be separated. For ease of transmission disassembly/assembly, turn the transmission as shown in the figure.
- When assembling the transmission, position all gears in the case and then insert the shafts.
- The gears on the final shaft and counter shaft and driven sprocket can be removed without removing the input shaft.



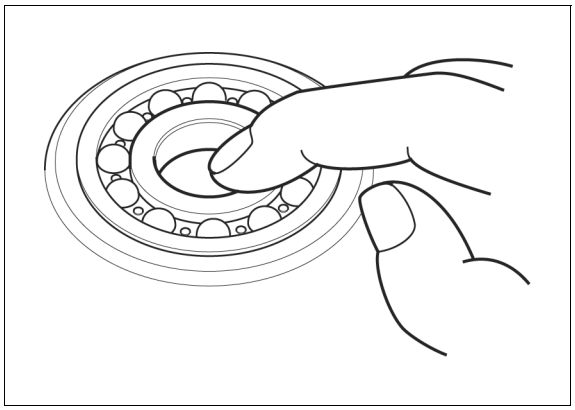

LEFT SIDE:
REAR SIDE:
FRONT SIDE:
RIGHT SIDE:
WATER SEAL (25 x 52 x 9.5 mm)
REMOVAL:
Take care not to damage the transmission case and wheel shaft.
INTERNAL CIRCLIP (52 mm)
BEARING (6205)
WHEEL SHAFT
REMOVAL:
Remove the water seal and circlip and withdraw the wheel shaft from the left side.
O-RING (43.5 x 2.6 mm)
DISTANCE COLLAR A
BEARING (6203)
COUNTERSHAFT
DRAIN PLUG BOLT
DRAIN PLUG WASHER
TRANSMISSION CASE
FINAL GEAR
FINAL SHAFT COLLAR
DRIVE SPROCKET
WATER SEAL (25 x 41 x 9.5 mm)
PLUG SEAL (28 mm)
DRIVEN SPROCKET
FINAL CHAIN (RK502KF x 44LE)
REVERSE IDLE GEAR
OIL FILLER CAP
O-RING
BEARING (6005)
BEARING (6202)
When reassembly, apply transmission oil to the whole surface.

RADIAL BALL BEARING INSPECTION

Clean the bearing with solvent and dry it thoroughly.

Turn the inner race or outer race of the radial ball bearing with your finger and check for play.

If it is noisy or has excessive play, replace the radial ball bearing (page 15-12).



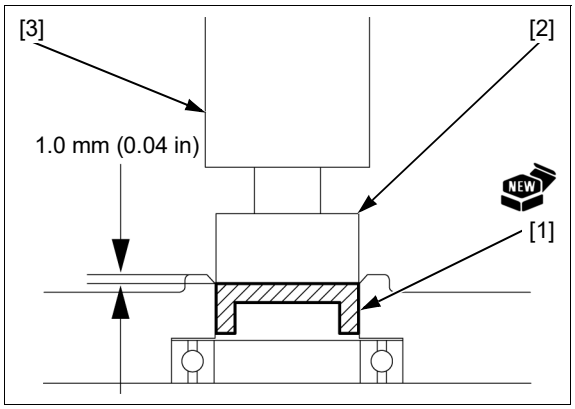
PLUG SEAL/OIL SEAL/WATER SEAL INSTALLATION

PLUG SEAL (28 mm)

Drive a new plug seal (28 mm) [1] from outside until it is flush with the transmission case surface by using the special tools.

TOOLS:

Pilot, 28 mm [2]	**07746-0041100**
Driver [3]	**07749-0010000**

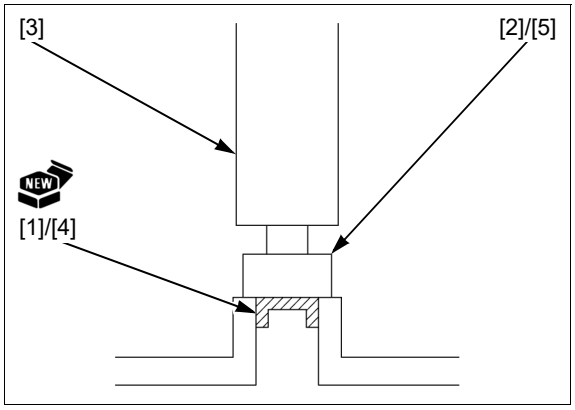


PLUG SEAL (16.2 mm)/OIL SEAL (12 x 22 x 6 mm)

Drive a new plug seal (16.2 mm)/oil seal (12 x 22 x 6 mm) from outside until it is flush with the transmission case surface by using the special tools.

TOOLS:

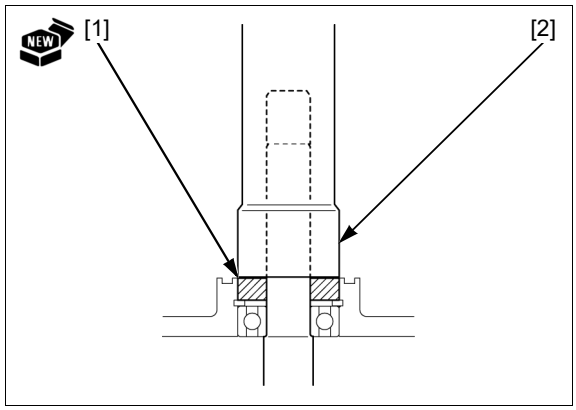
Plug seal (16.2 mm) [1]:	
Pilot, 22 mm [2]	**07746-0041000**
Driver [3]	**07749-0010000**
Oil seal (12 x 22 x 6 mm) [4]:	
Pilot, 28 mm [5]	**07746-0041100**
Driver	**07749-0010000**



OIL SEAL (15 x 35 x 7 mm)

Drive a new oil seal (15 x 35 x 7 mm) [1] from outside until it is flush with the transmission case surface by using the special tools.

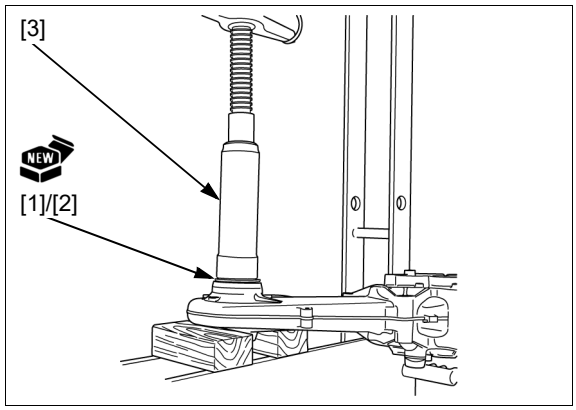
TOOL:
Driver, 22 mm I.D. [2] 07746-0020100



WATER SEAL (25 x 52 x 9.5 mm)/WATER SEAL (25 x 41 x 9.5 mm)

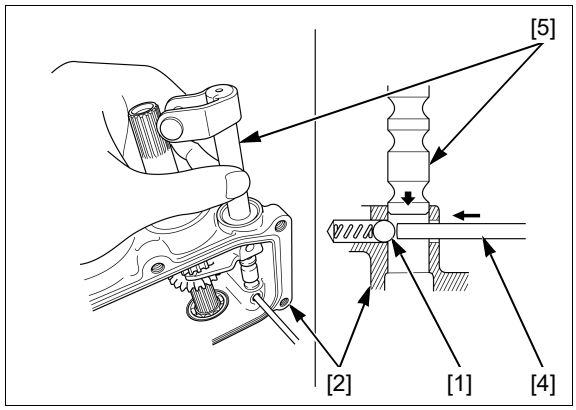
Install a new water seal (25 x 52 x 9.5 mm) [1]/water seal (25 x 41 x 9.5 mm) [2] until it is fully seated by using the special tool and hydraulic press.

TOOL:
Driver, 22 mm I.D. [3] 07746-0020100



SHIFT FORK SHAFT INSTALLATION

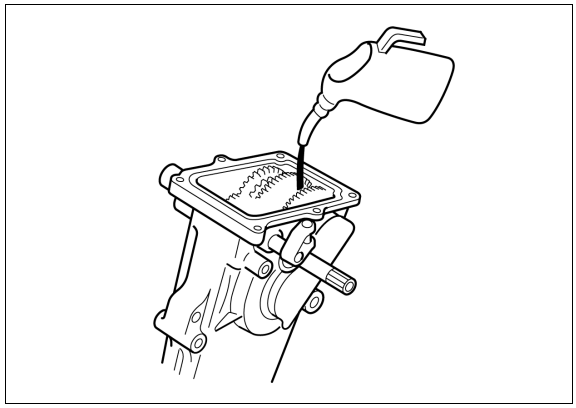
Push the steel ball [1] into the transmission case [2] against the spring [3] with the suitable rod [4] and insert the shift fork shaft [5].



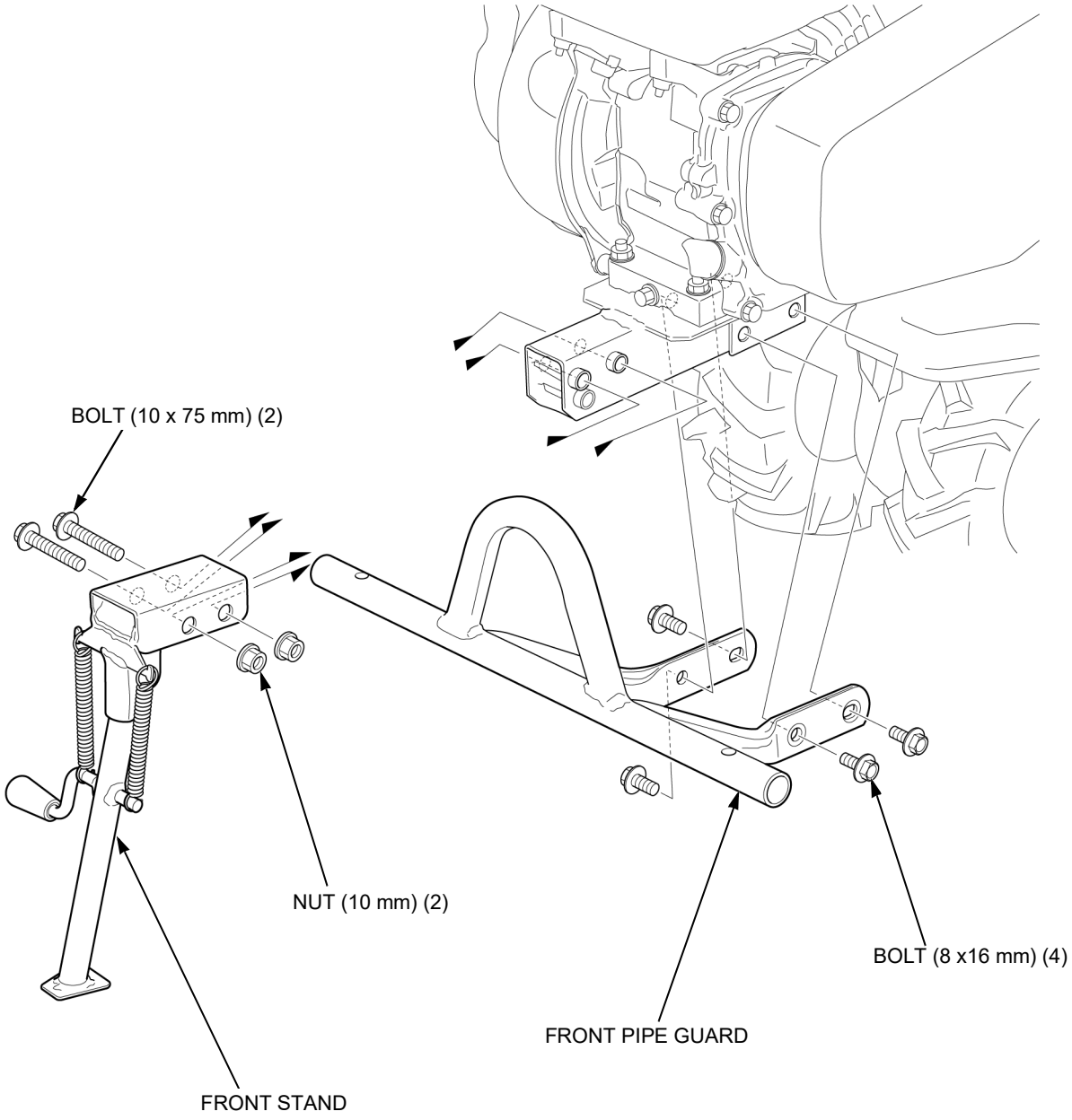
TRANSMISSION OIL FILLING

Fill the specified amount of recommended transmission oil into the transmission case.

RECOMMENDED TRANSMISSION OIL:
SAE 10W-30
API service classification SE or higher
TRANSMISSION OIL CAPACITY:
1.2 liters (1.3 US qt, 1.1 Imp qt)

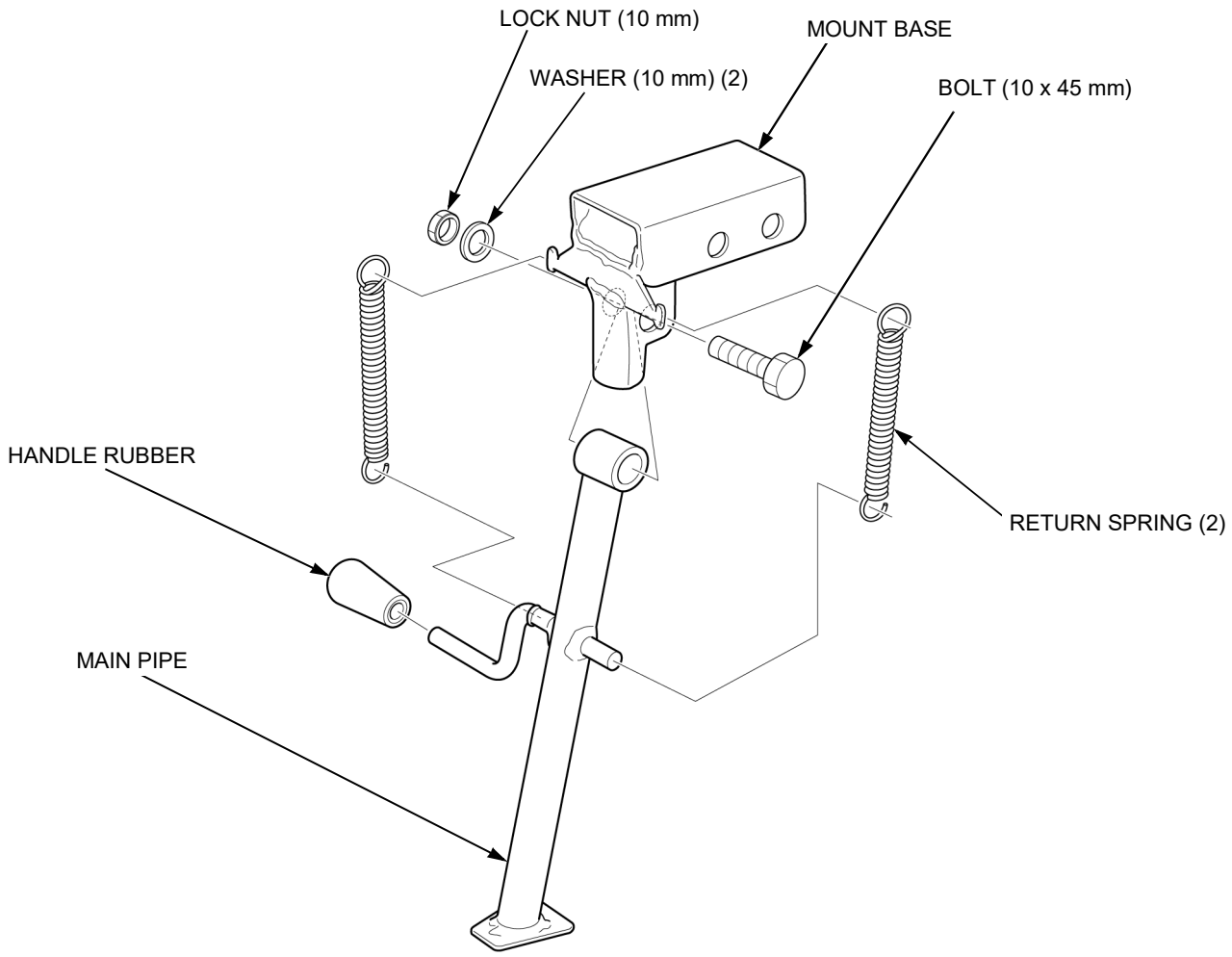


FRONT STAND/FRONT PIPE GUARD REMOVAL/INSTALLATION



FRONT STAND DISASSEMBLY/ASSEMBLY

Remove the front stand (page 15-16).



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