HONDA GX690
WORKSHOP MANUAL

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 practice, we recommend that you do not attempt to perform the procedures described in this manual.

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

⚠WARNING

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

Follow the procedures and precautions in this manual carefully.

Important Safety Precautions

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

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

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

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

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

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

CONTENTS

INTRODUCTION

This manual covers the service and repair procedures for Honda GX630/630R/660/660R/690/690R.

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 others, 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 PUBLICATION OFFICE

Date of Issue: June 2009

SERVICE RULES

- Use genuine Honda 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 would 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 water resistant molybdenum disulfide grease (containing more than 3% molybdenum disulfide, NLGI #2 or equivalent). Example: UNILITE M No.2 manufactured by KYODO YUSHI, Japan
	Apply a locking agent. Use a medium strength locking agent unless otherwise specified.
	Apply sealant.
	Use automatic transmission fluid.
(O x O) (O)	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

Abbrev. term	Full term
ACG	Alternator
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
HO2S	Heated Oxygen sensor
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
VTEC	Variable Valve Timing & Valve Lift Electronic Control

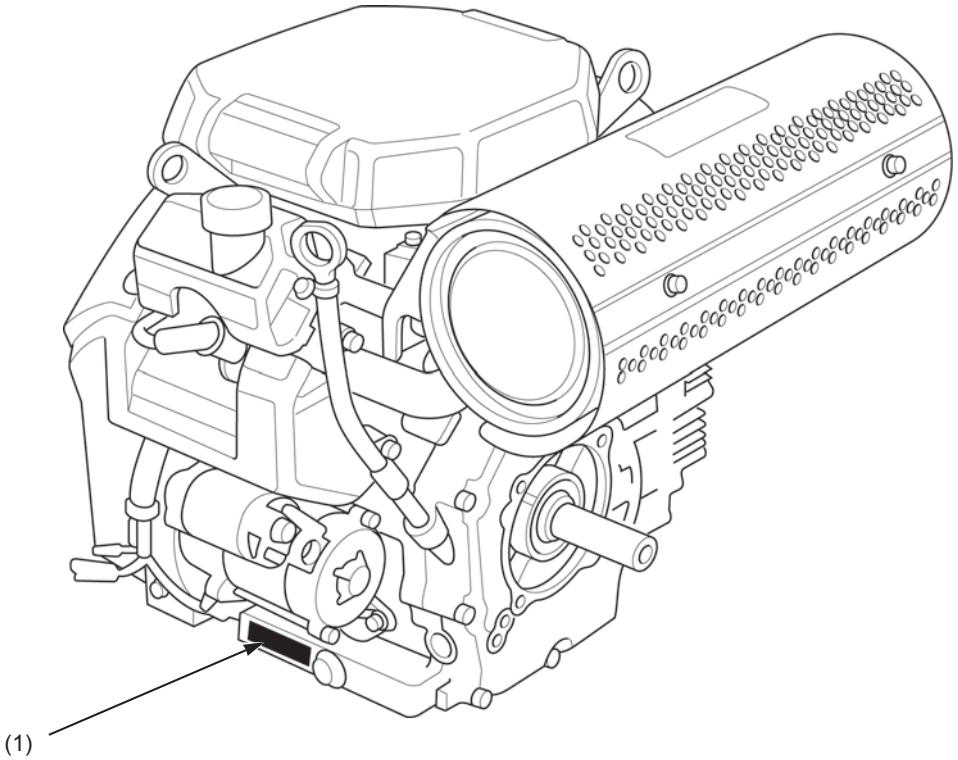
Bl	Black	G	Green	Br	Brown	Lg	Light green
Y	Yellow	R	Red	O	Orange	P	Pink
BU	Blue	W	White	Lb	Light blue	Gr	Gray

1. SPECIFICATIONS

SERIAL NUMBER LOCATION

The engine serial number (1) is stamped on the crankcase.

Refer to it when ordering parts or making technical inquiries.



DIMENSIONS AND WEIGHTS SPECIFICATIONS

Model	GX630	GX630R	GX660	GX660R	GX690	GX690R
Overall length	Q type: 405 mm (15.9 in) V type: 426 mm (16.8 in) S type: 396 mm (15.6 in) T type: 429 mm (16.9 in) B type: 442 mm (17.4 in) DEN type: 371 mm (14.6 in)					
Overall width	410 mm (16.1 in)					
Overall height	438 mm (17.2 in)					
Dry weight	Q, S types: 44.4 kg (97.9 lbs) V, T types: 44.6 kg (98.3 lbs) B type: 45.0 kg (99.2 lbs) DEN type: 44.3 kg (97.7 lbs)					
Operating weight	Q, S types: 46.0 kg (101.4 lbs) V, T types: 46.2 kg (101.9 lbs) B type: 46.6 kg (102.7 lbs) DEN type: 45.9 kg (101.2 lbs)					
Maximum angle of inclination	Forward and backward: 20° Left and right: 20°					

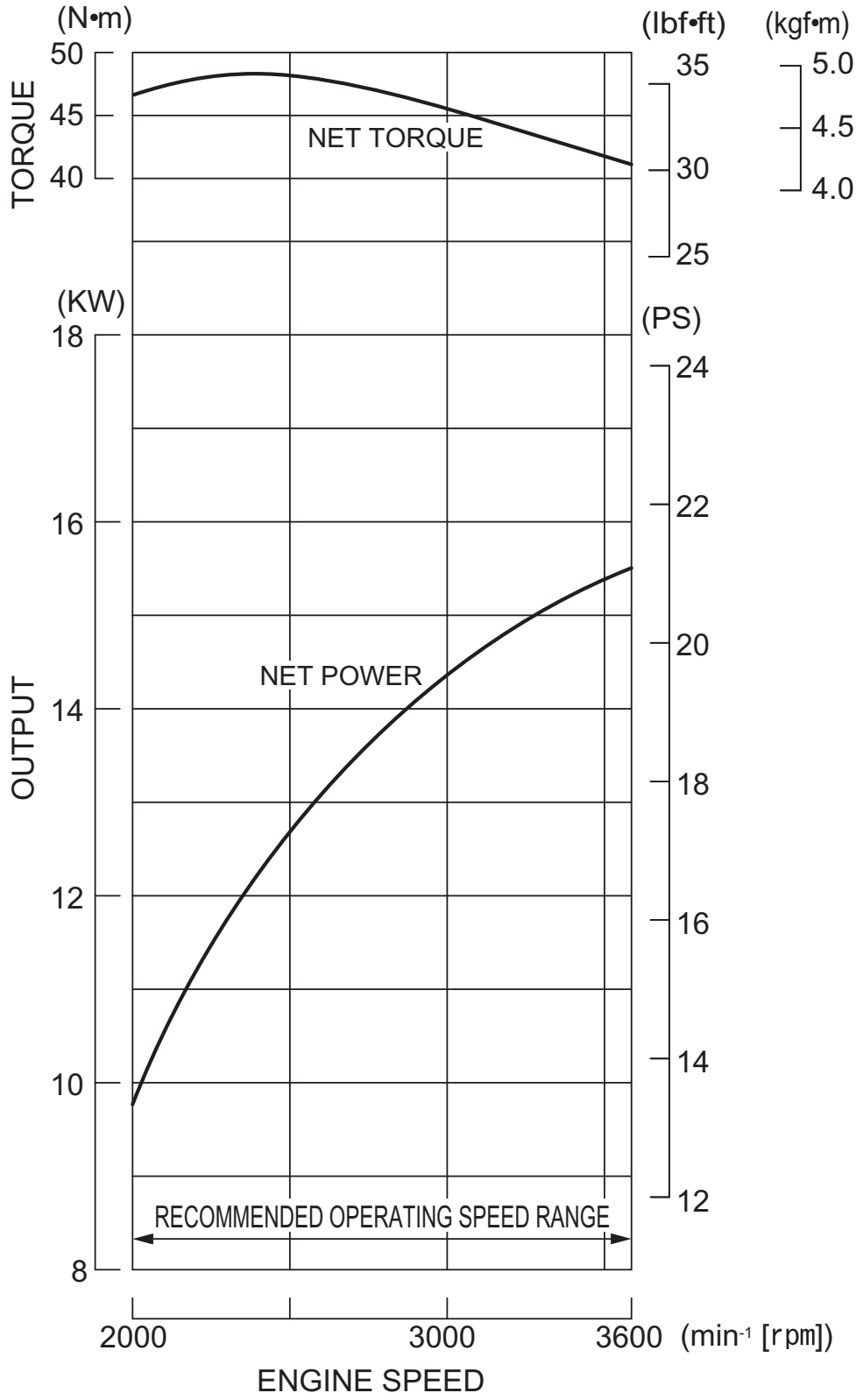
ENGINE SPECIFICATIONS

Model	GX630	GX630R	GX660	GX660R	GX690	GX690R
Description code	GCBBK	GCBEK	GCBCK	GCBFK	GCBDK	GCBGK
Type	4 stroke, overhead valve, 90° V–twin cylinder					
Displacement	688.0 cm^3 (41.97 cu–in)					
Bore x stroke	78.0 x 72.0 mm (3.07 x 2.83 in)					
Net power (SAE J1349)*	15.5 kW (21.1 PS) / 3,600 min^{-1} (rpm)		16.0 kW (21.8 PS) / 3,600 min^{-1} (rpm)		16.5 kW (22.4 PS) / 3,600 min^{-1} (rpm)	
Continuous rated power	12 kW (16.3 PS) / 3,600 min^{-1} (rpm)		12.5 kW (17.0 PS) / 3,600 min^{-1} (rpm)		13 kW (17.7 PS) / 3,600 min^{-1} (rpm)	
Maximum net torque (SAE J1349)*	48.3 N·m (4.93 kgf·m, 35.6 lbf·ft) / 2,500 min^{-1} (rpm)		48.3 N·m (4.93 kgf·m, 35.6 lbf·ft) / 2,500 min^{-1} (rpm)		48.3 N·m (4.93 kgf·m, 35.6 lbf·ft) / 2,500 min^{-1} (rpm)	
Maximum rpm (at no load)	3,850 ± 150 min-1 (rpm)					
Compression ratio	9.3 ± 0.2					
Fuel consumption (at continuous rated power)	6.0 Liters (1.59 US gal, 1.32 Imp gal) / h		6.3 Liters (1.66 US gal, 1.39 Imp gal) / h		6.7 Liters (1.77 US gal, 1.47 Imp gal) / h	
Ignition system	C.D.I.(Capacitor Discharge Ignition) type magneto					
Ignition timing	B.T.D.C. 9° / 1,000 min-1 (rpm)					
Spark advancer type	Electronic type					
Spark advancer performance	B.T.D.C. 9° – 23°					
Spark plug	ZFR5F (NGK)					
Lubrication system	Forced feed					
Oil capacity	Without oil filter replacement: 1.5 Liters (1.59 US qt, 1.32 Imp qt) With oil filter replacement: 1.7 Liters (1.80 US qt, 1.50 Imp qt)					
Recommended oil	SAE 10W-30 API service classification SE or later					
Cooling system	Forced air					
Starting system	Starter motor					
Stopping system	Ignition primary circuit open					
Carburetor	2 barrel horizontal type, butterfly valve					
Air cleaner	Dual type					
Governor	Mechanical centrifugal					
Breather system	Reed valve type, PCV (Positive Crankcase Ventilation) type					
Fuel used	Unleaded gasoline with a pump octane rating 86 or higher					

*: The power rating of the engine indicated in this document is the net power output tested on a production engine for the engine model and measured in accordance with SAE J1349 at 3,600 rpm (net power) and at 2,500 rpm (max net torque). Mass production engines may vary from this value. Actual power output for the engine installed in the final machine will vary depending on numerous factors, including the operating speed of the engine in application, environmental conditions, maintenance, and other variables.

PERFORMANCE CURVES

GX630/GX630R



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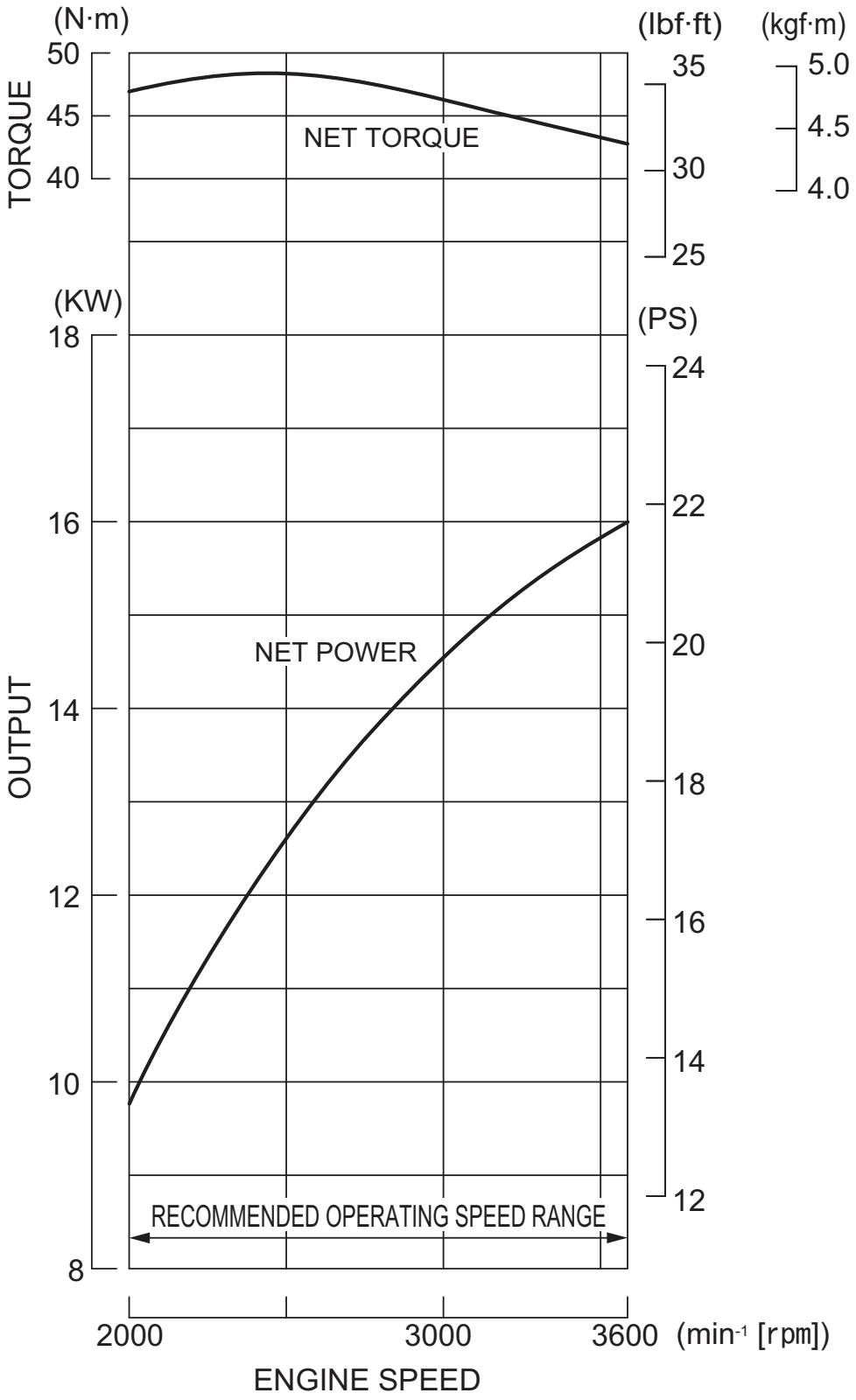
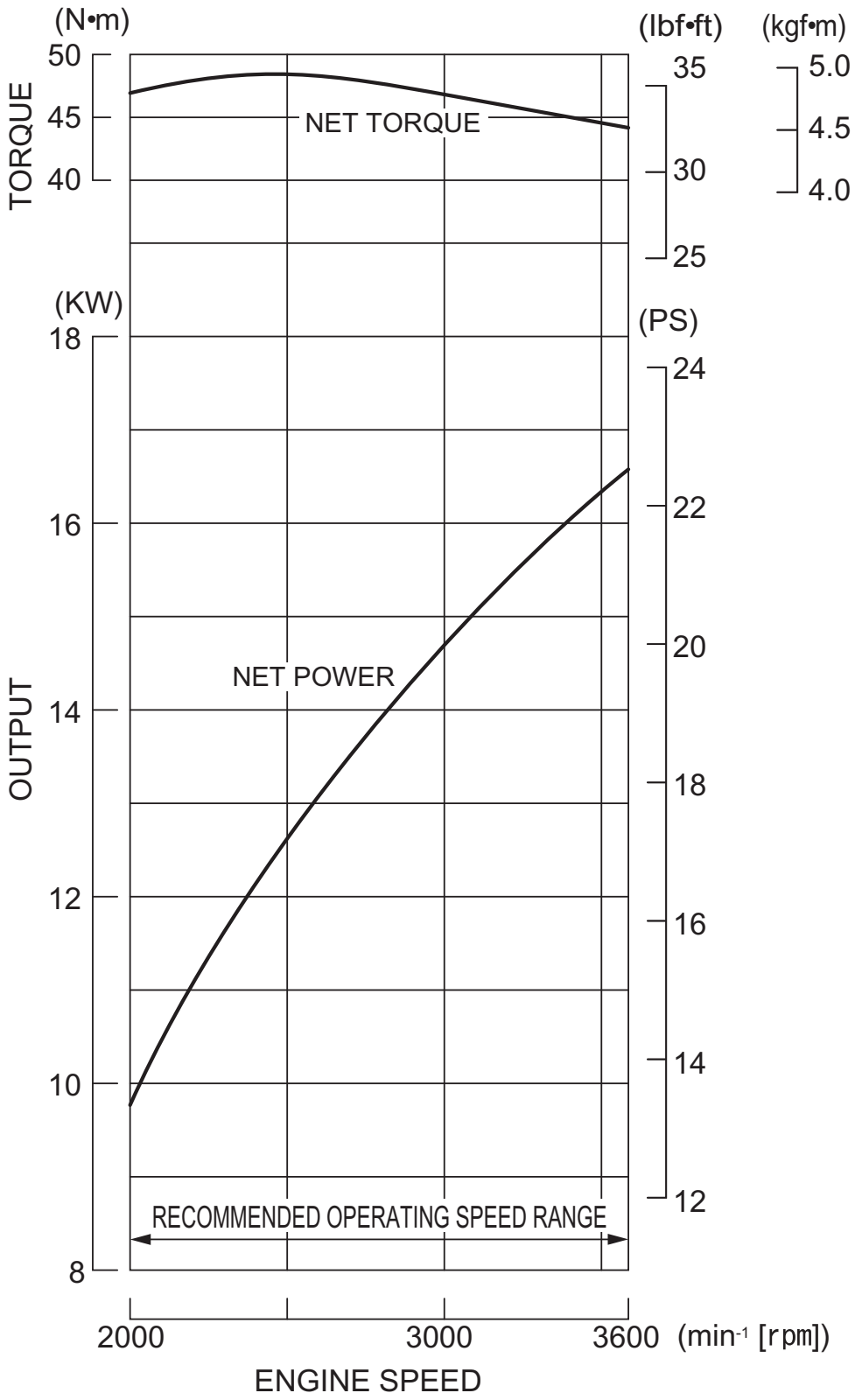
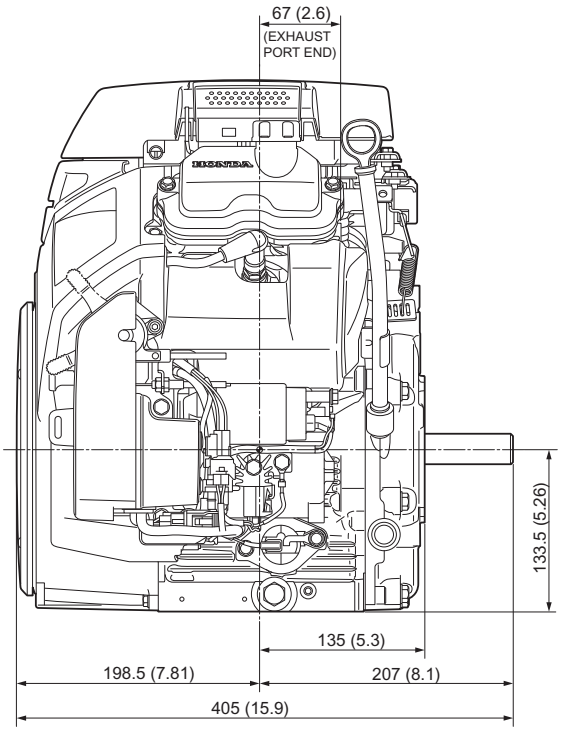


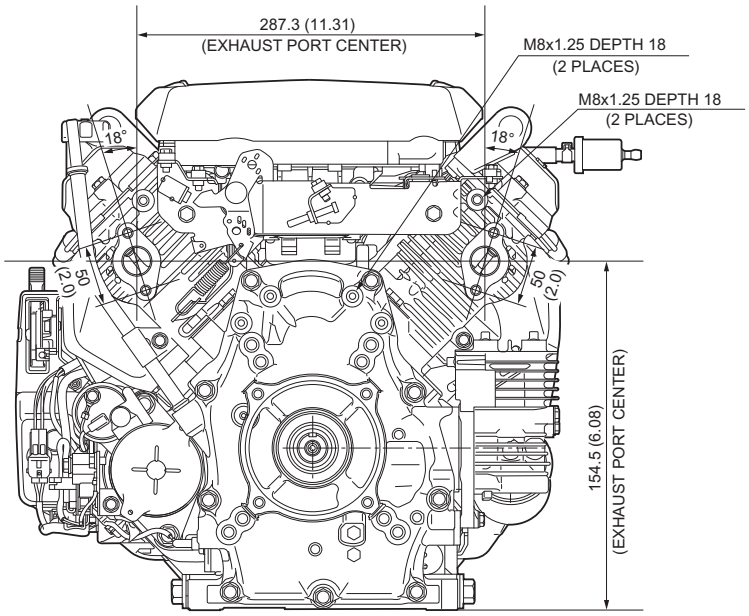
GX690/GX690R

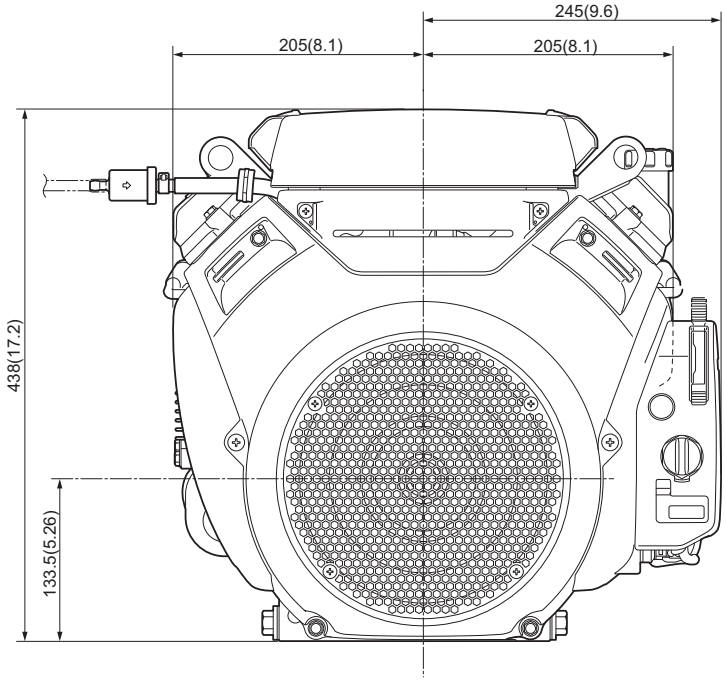


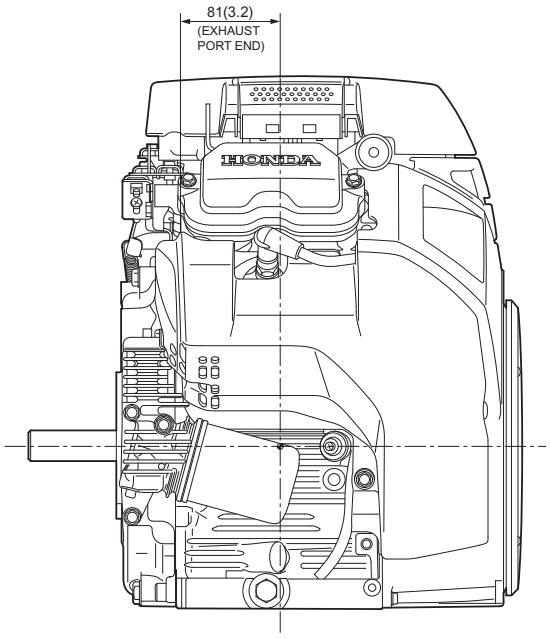
DIMENSIONAL DRAWINGS

Unit: mm (in)





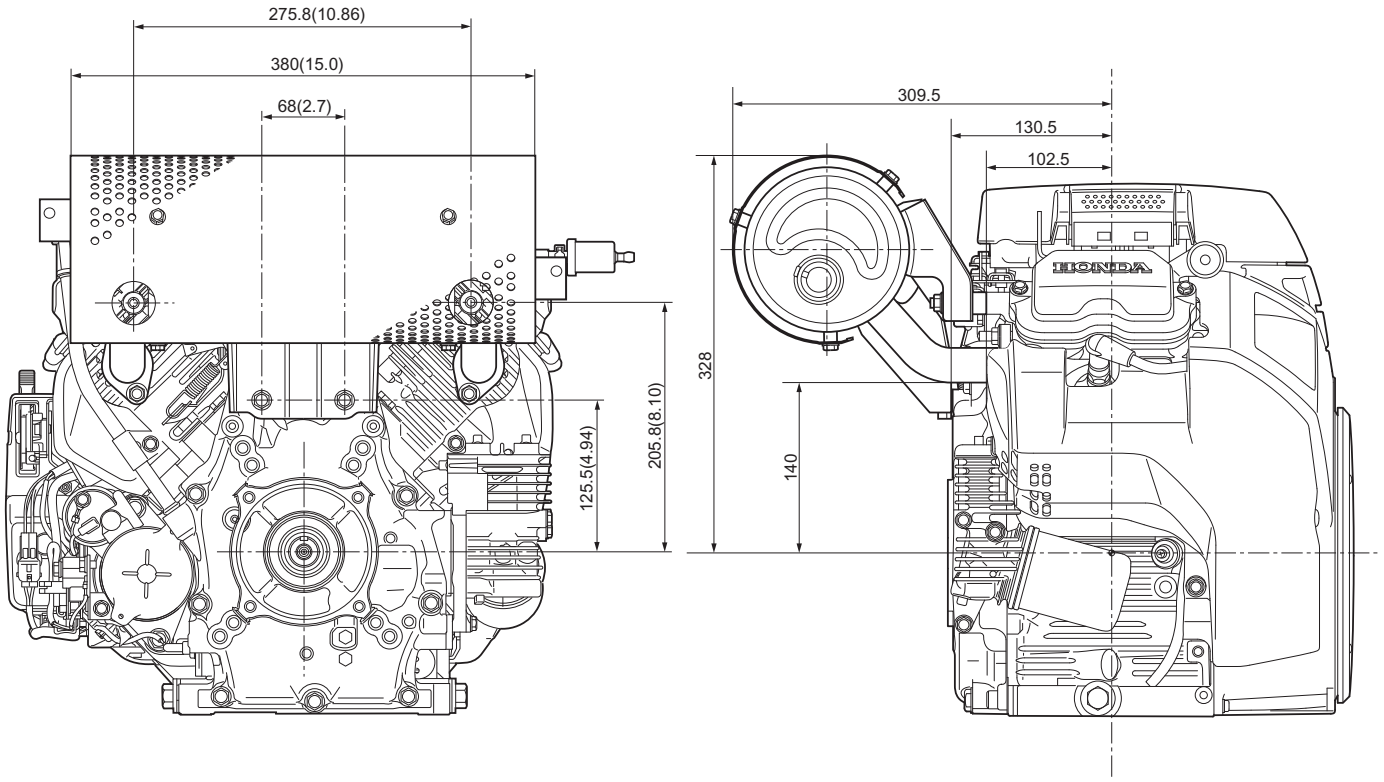




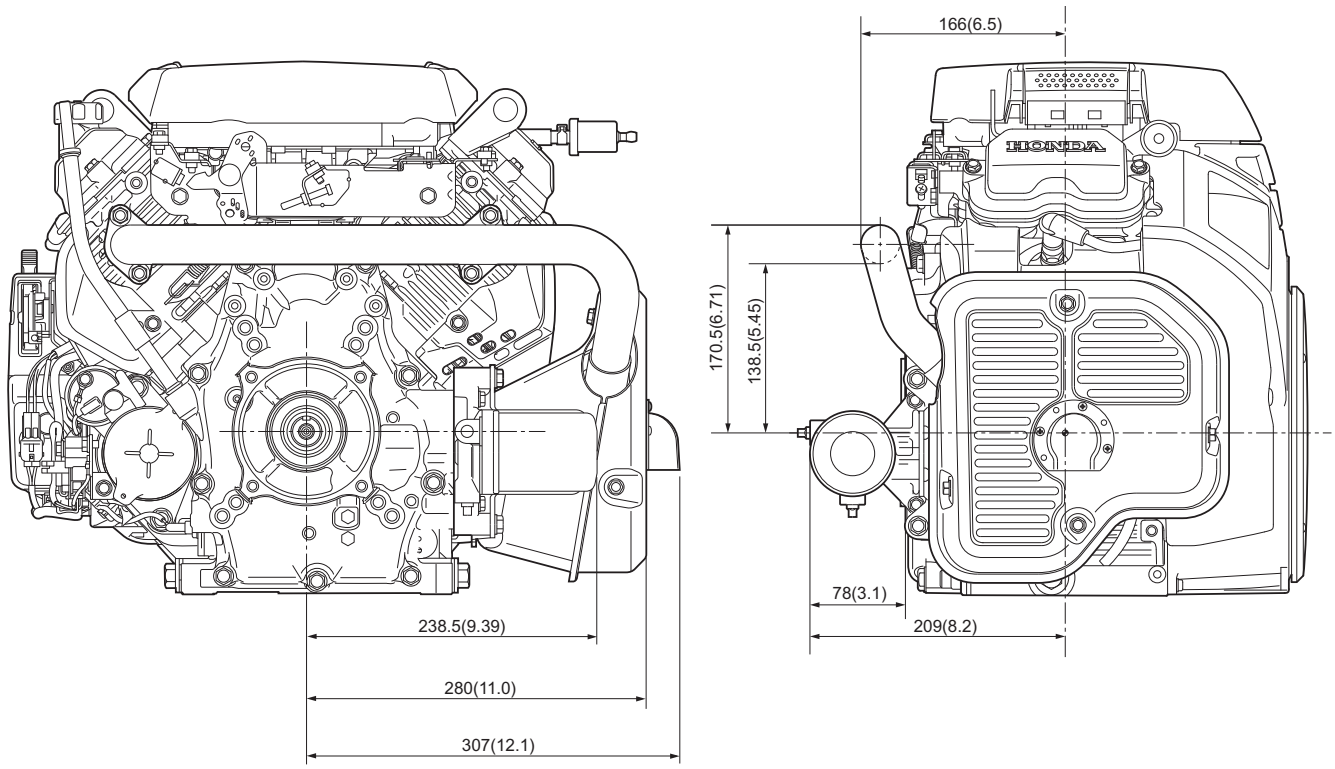
SPECIFICATIONS

HIGH MOUNT MUFFLER TYPE

Unit: mm (in)



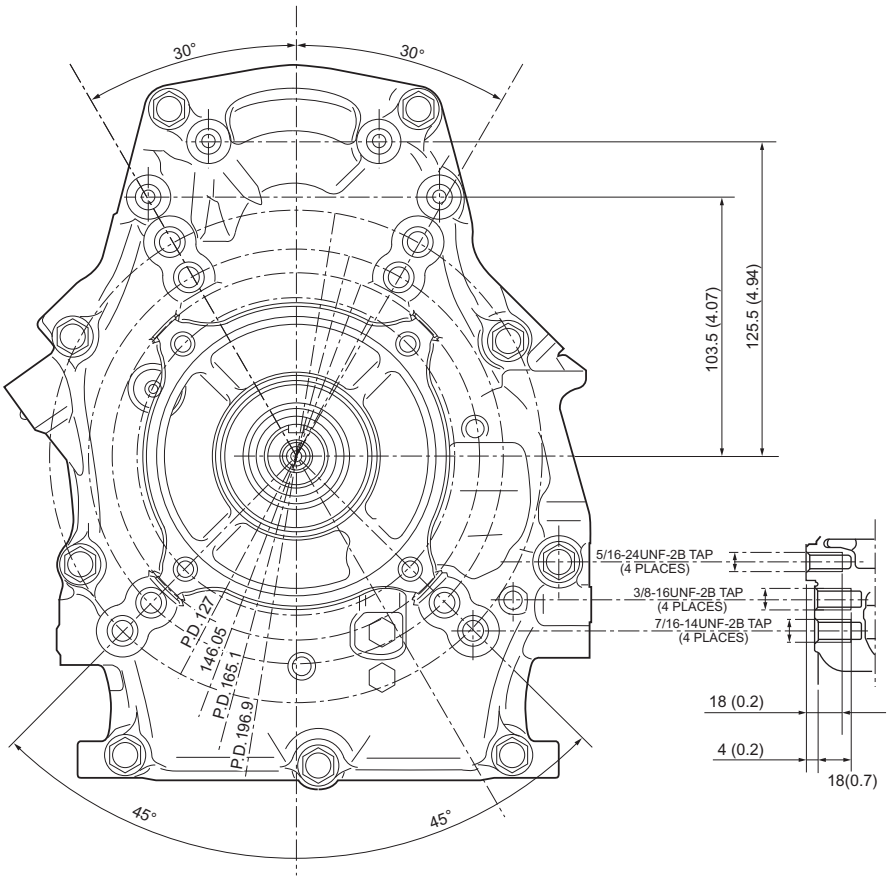
SIDE MOUNT MUFFLER TYPE



PTO DIMENSIONAL DRAWINGS

MOUNT PART

Unit: mm (in)



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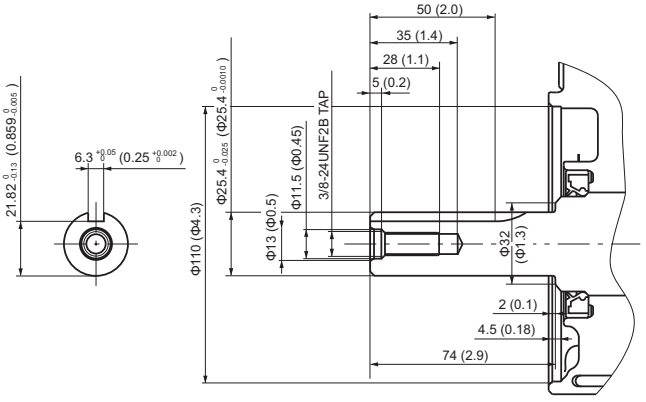
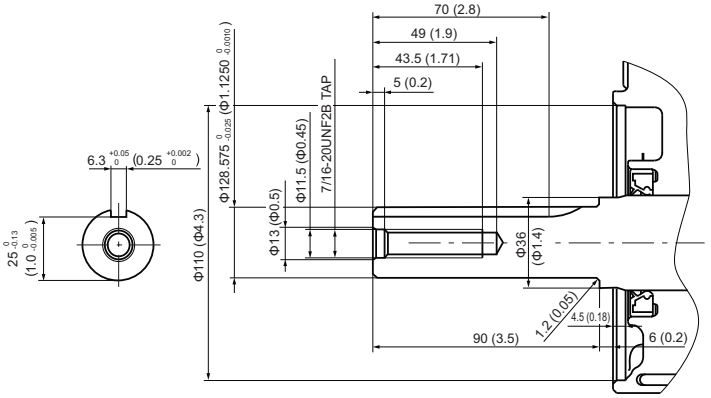


SPECIFICATIONS

T TYPE

Unit: mm (in)



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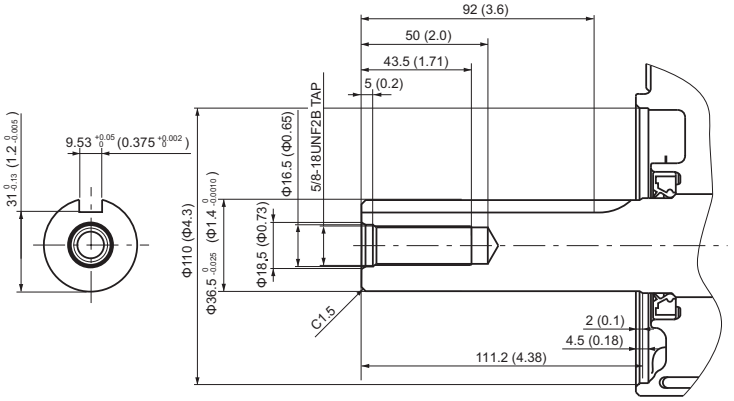

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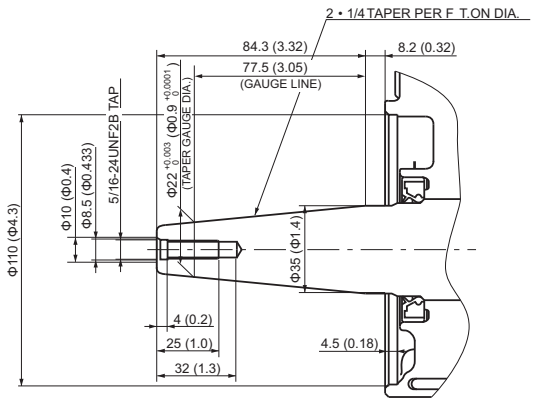

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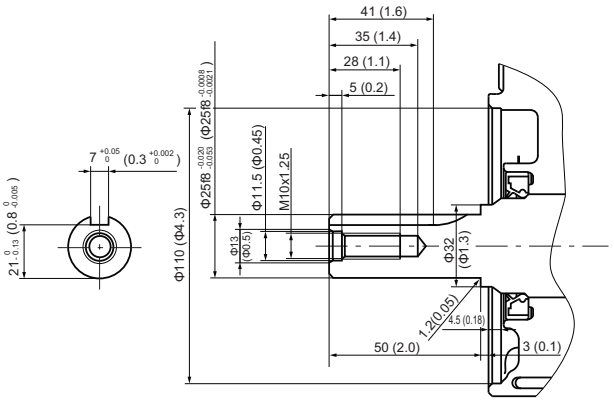
Unit: mm (in)



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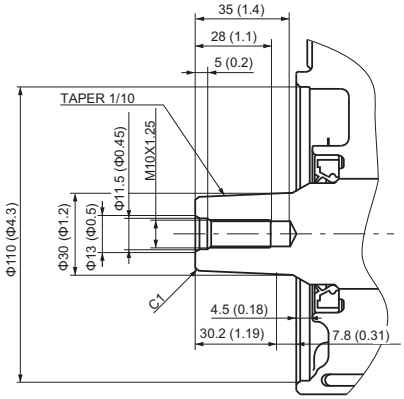
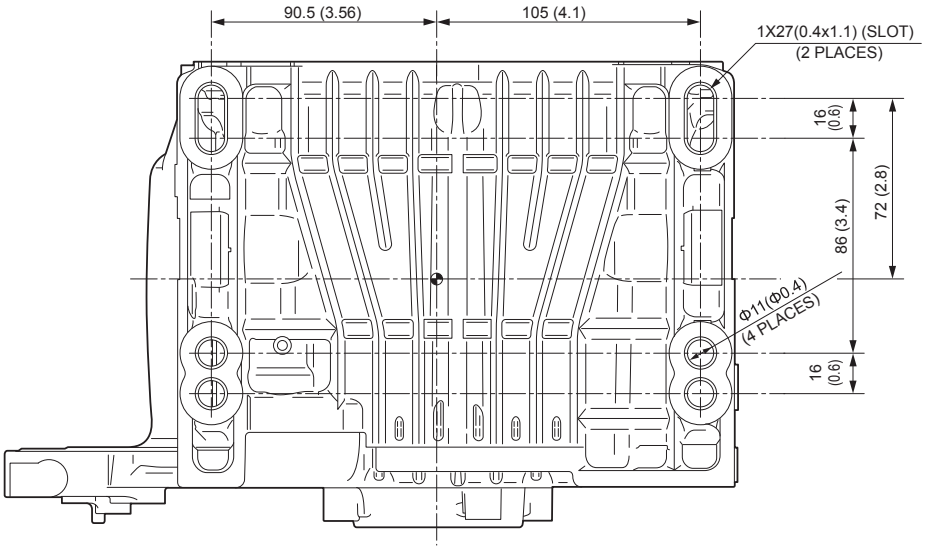


ENGINE MOUNT DIMENSIONAL DRAWING



MEMO

2. SERVICE INFORMATION

MAINTENANCE STANDARDS

Unit: mm (in)

Part	Item		Standard	Service limit
Engine	Maximum speed (at no load)		GX630: 3,850 ± 150 min^{-1} (rpm) GX630R: 3,850 ± 150 min^{-1} (rpm) 3,150 ± 150 min^{-1} (rpm) (QYD, VEP4, VXF types only) 3,200 ± 150 min^{-1} (rpm) (VXD8, VXE1 types only) GX660: 3,850 ± 150 min^{-1} (rpm) GX660R: 3,850 ± 150 min^{-1} (rpm) 3,200 ± 150 min^{-1} (rpm) (VXE1 type only) GX690: 3,850 ± 150 min^{-1} (rpm) GX690R: 3,850 ± 150 min^{-1} (rpm) 3,200 ± 150 min^{-1} (rpm) (VXE type only)	–
	Idle speed		1,400 ± 150 min^{-1} (rpm)	–
	Cylinder compression		0.5 – 0.7 MPa (5.09 – 7.14 kgf/cm^2, 73 – 102 psi) / 500 min^{-1} (rpm)	–
Cylinder	Sleeve I.D.		78.000 – 78.015 (3.0709 – 3.0715)	78.150 (3.0768)
Piston	Skirt O.D.		77.985 – 77.995 (3.0703 – 3.0707)	77.850 (3.0650)
	Piston-to-cylinder clearance		0.005 – 0.030 (0.0002 – 0.0012)	0.10 (0.004)
	Piston pin bore I.D.		18.002 – 18.008 (0.7087 – 0.7090)	18.042 (0.7103)
Piston pin	Pin O.D.		17.994 – 18.000 (0.7084 – 0.7087)	17.95 (0.707)
	Piston pin-to-piston pin bore clearance		0.002 – 0.014 (0.0001 – 0.0006)	0.08 (0.003)
Piston rings	Ring side clearance	Top	0.050 – 0.080 (0.0020 – 0.0031)	0.15 (0.006)
		Second	0.050 – 0.080 (0.0020 – 0.0031)	0.15 (0.006)
	Ring end gap	Top	0.200 – 0.350 (0.0079 – 0.0138)	1.0 (0.04)
		Second	0.200 – 0.350 (0.0079 – 0.0138)	1.0 (0.04)
		Oil (side rail)	0.20 – 0.70 (0.008 – 0.028)	1.0 (0.04)
	Ring width	Top	1.140 – 1.155 (0.0449 – 0.0455)	1.120 (0.0441)
		Second	1.140 – 1.155 (0.0449 – 0.0455)	1.120 (0.0441)
Connecting rod	Small end I.D.		18.006 – 18.018 (0.7089 – 0.7094)	18.07 (0.711)
	Big end I.D.		44.988 – 45.012 (1.7712 – 1.7721)	45.050 (1.7736)
	Big end oil clearance		0.005 – 0.039 (0.0002 – 0.0015)	0.070 (0.0028)
	Big end side clearance		0.2 – 0.4 (0.008 – 0.016)	1.000 (0.0394)
Crankshaft	Crank pin O.D.		44.973 – 44.983 (1.7706 – 1.7710)	44.920 (1.7685)
	Main journal O.D.		39.984 – 40.000 (1.5742 – 1.5748)	39.930 (1.5720)
	Thrust washer thickness		0.95 – 1.05 (0.037 – 0.041)	0.8 (0.03)
Crankcase	Camshaft bearing I.D.		17.016 – 17.027 (0.6699 – 0.6704)	17.06 (0.672)
	Main journal I.D.		40.025 – 40.041 (1.5758 – 1.5764)	40.06 (1.577)
	Crankshaft axial clearance		0.05 – 0.45 (0.002 – 0.018)	1.0 (0.04)
Crankcase cover	Camshaft bearing I.D.		17.016 – 17.027 (0.6699 – 0.6704)	17.06 (0.672)
	Main journal I.D.		40.025 – 40.041 (1.5758 – 1.5764)	40.06 (1.577)

Part	Item		Standard	Service limit
Valves	Valve clearance	IN	0.08 ± 0.02	–
		EX	0.10 ± 0.02	–
	Valve stem O.D.	IN	5.475 – 5.490 (0.2156 – 0.2161)	5.400 (0.2126)
		EX	5.435 – 5.450 (0.2140 – 0.2146)	5.300 (0.2087)
	Valve guide I.D.	IN/EX	5.500 – 5.512 (0.2165 – 0.2170)	5.560 (0.2189)
	Guide-to-stem clearance	IN	0.010 – 0.037 (0.0004 – 0.0015)	0.110 (0.0043)
		EX	0.050 – 0.077 (0.0020 – 0.0030)	0.130 (0.0051)
	Valve seat width		1.0 – 1.2 (0.04 – 0.05)	2.1 (0.08)
	Valve spring free length		38.3 (1.51)	36.8 (1.45)
	Valve spring perpendicularity		2° max.	–
Camshaft	Cam height	IN	29.506 – 29.706 (1.1617 – 1.1695)	29.36 (1.156)
		EX	29.410 – 29.610 (1.1579 – 1.1657)	29.26 (1.152)
	Camshaft O.D.		16.982 – 17.000 (0.6686 – 0.6693)	17.100 (0.6732)
Valve lifter	Valve lifter I.D.		6.010 – 6.040 (0.2366 – 0.2378)	6.070 (0.2390)
	Valve lifter shaft O.D.		5.970 – 6.000 (0.2350 – 0.2362)	5.940 (0.2339)
Rocker arm	Rocker arm I.D.		6.000 – 6.018 (0.050 – 0.077)	6.043 (0.2379)
	Rocker arm shaft O.D.		5.960 – 5.990 (0.2346 – 0.2358)	5.953 (0.2344)
	Rocker arm shaft bearing I.D.		6.000 – 6.018 (0.050 – 0.077)	6.043 (0.2379)
Oil pump	Oil pressure		2.8 kgf/cm^2 (39.8 psi) / 2,000 min^{-1} (rpm) and more	–
	Tip clearance		0.15 (0.006)	0.30 (0.012)
	Outer rotor-to-housing clearance		0.150 – 0.210 (0.0059 – 0.0083)	0.30 (0.012)
	Outer rotor-to-pump cover clearance		0.04 – 0.09 (0.002 – 0.004)	0.11 (0.004)
Carburetor	Main jet		GX630/630R: #102 (No.1 cylinder) #105 (No.2 cylinder) GX660/660R: #112 (No.1 / No.2 cylinder) GX690/690R: #118 (No.1 / No.2 cylinder)	–
	Pilot screw opening		GX630/630R: 2 turns out (No.1 cylinder) 1 - 7/8 turns out (No.2 cylinder) GX660/660R: 1 - 3/4 turns out (No.1 cylinder) 1 - 7/8 turns out (No.2 cylinder) GX690/690R: 1 - 7/8 turns out (No.1 cylinder) 1 - 3/4 turns out (No.2 cylinder)	–
	Float height		15.5 (0.61)	–
Spark plug	Gap		0.7 – 0.8 (0.028 – 0.031)	–
Ignition Coil	Air gap		0.2 – 0.6 (0.01 – 0.02)	–
Starter motor	Brush length		10 (0.4)	6 (0.2)
	Mica depth		–	0.2 (0.01)
Charge coil	Resistance	2.7A	1.95 - 2.93 Ω	–
		17A	0.18 - 0.28 Ω	–
		26A	0.17 - 0.25 Ω	–

TORQUE VALUES

ENGINE TORQUE VALUES

Item	Tread Dia. (mm)	Torque values		
		N·m	kgf·m	lbf·ft
Cylinder nut	M10 x 1.25	37	3.8	27
Oil drain plug bolt	M20 x 1.5	45	4.5	33
Oil filter cartridge	M20 x 1.5	12	1.2	9
Connecting rod bolt	M7 x 1.0	22	2.2	16
Tappet adjusting nut	M5 x 0.5	7.5	0.75	5.5
Governor arm nut	M6 x 1.0	11	1.1	8
Flywheel nut	M20 x 1.5	235	24	173
Fuel pump cover screw	M5 tapping screw	4	0.4	3.0
Fan cover protector screw	M4 special screw	1.7	0.17	1.3
Fan cover screw	M6 x 1.0 special screw	4.4	0.45	3.2
Fuel pump screw	M6 x 1.0	3	0.3	2.2
Oil pressure switch	PT1/8	9	0.9	6.6
Sealing bolt	PT1/8	9	0.9	6.6
Air cleaner wing nut	M6 x 1.0	0.8	0.08	0.6
Starter motor terminal nut	M8 x 1.25	9	0.9	6.6
Breather valve screw	M3 x 0.5	1	0.1	0.7
Hour meter screw	M3 tapping screw	0.8	0.08	0.6
Switch box bracket screw	M5 tapping screw	4	0.4	3.0
Combination switch nut	M22 x 1.0	4.9	0.5	3.6
Fuel cut solenoid	-	8.8	0.90	6.5
Screen grid cover bolt	M6 x 1.0	8.5	0.85	6.3
Screen grid cover nut	M6 x 1.0	8.5	0.85	6.3
Screen grid cover stud bolt	M6 x 1.0	12	1.2	9

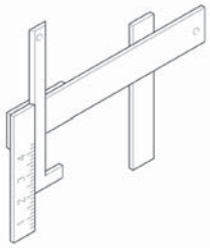
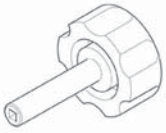
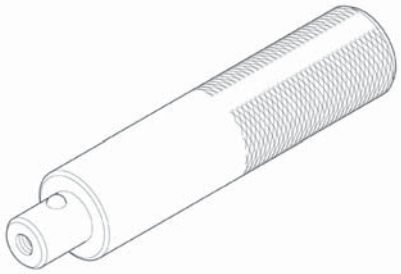
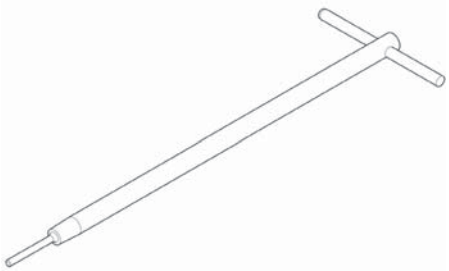
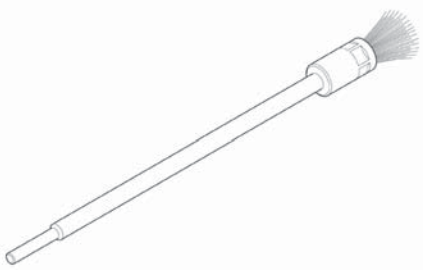
STANDARD TORQUE VALUES

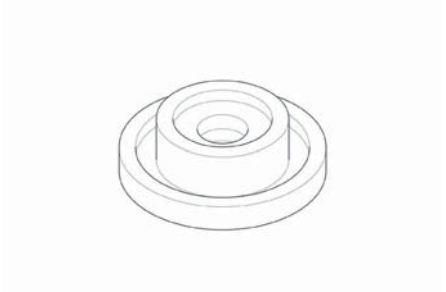
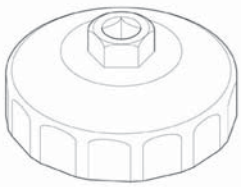
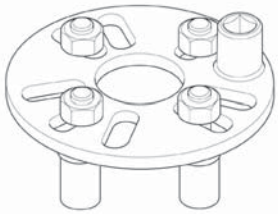
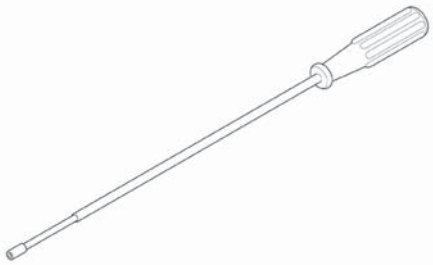
Item	Tread Dia. (mm)	Torque values		
		N·m	kgf·m	lbf·ft
Screw	4 mm	2	0.2	1.5
	5 mm	4	0.4	3.1
	6 mm	9	0.9	6.6
Bolt and nut	4 mm	3	0.4	2.5
	5 mm	5	0.5	3.8
	6 mm	10	1.0	7
	8 mm	22	2.2	16
	10 mm	34	3.5	25
	12 mm	54	5.5	40
Flange bolt and nut	5 mm	5	0.5	3.9
	6 mm	12	1.2	9
	8 mm	27	2.7	20
	10 mm	39	4.0	29
SH (Small head) flange bolt	6 mm	9	0.9	7

LUBRICATION & SEAL POINT

Location	Material	Remarks
Crankshaft pin, journal and gear	Engine oil	
Crankcase bearing		
Crankcase cover bearing		
Piston outer surface and piston pin hole		
Piston pin outer surface		
Piston ring		
Cylinder inner surface		
Connecting rod big and small end bearing		
Connecting rod bolt threads and seating surface		
Camshaft cam profile, bearing, decompressor and gear		
Valve lifter shaft and slipper		
Valve stem seal contact area of seal lip		
Valve stem sliding surface and stem end		
Valve spring		
Push rod end		
Rocker arm bearing and slipper		
Tappet adjusting screw and nut threads and seating surface		
Rocker arm shaft		
Crankshaft thrust washer		
Flywheel nut threads and seating surface		
Oil pump gear outer surface, rotor and shaft		
Governor weight holder gear and journal		
Governor holder shaft		
Governor slider		
Governor arm shaft		
Cylinder nut and bolt threads and seating surface		
Oil seal outer surface		
Oil filter cartridge O-ring	Multi-purpose grease	
Oil seal lip		
O-ring		
Cylinder	Liquid sealant (Threebond®1207B)	
Crankcase cover		
Breather cover		
Oil pressure switch	Liquid sealant (Threebond®1207B, 1141G, 1215)	
Sealing bolt		

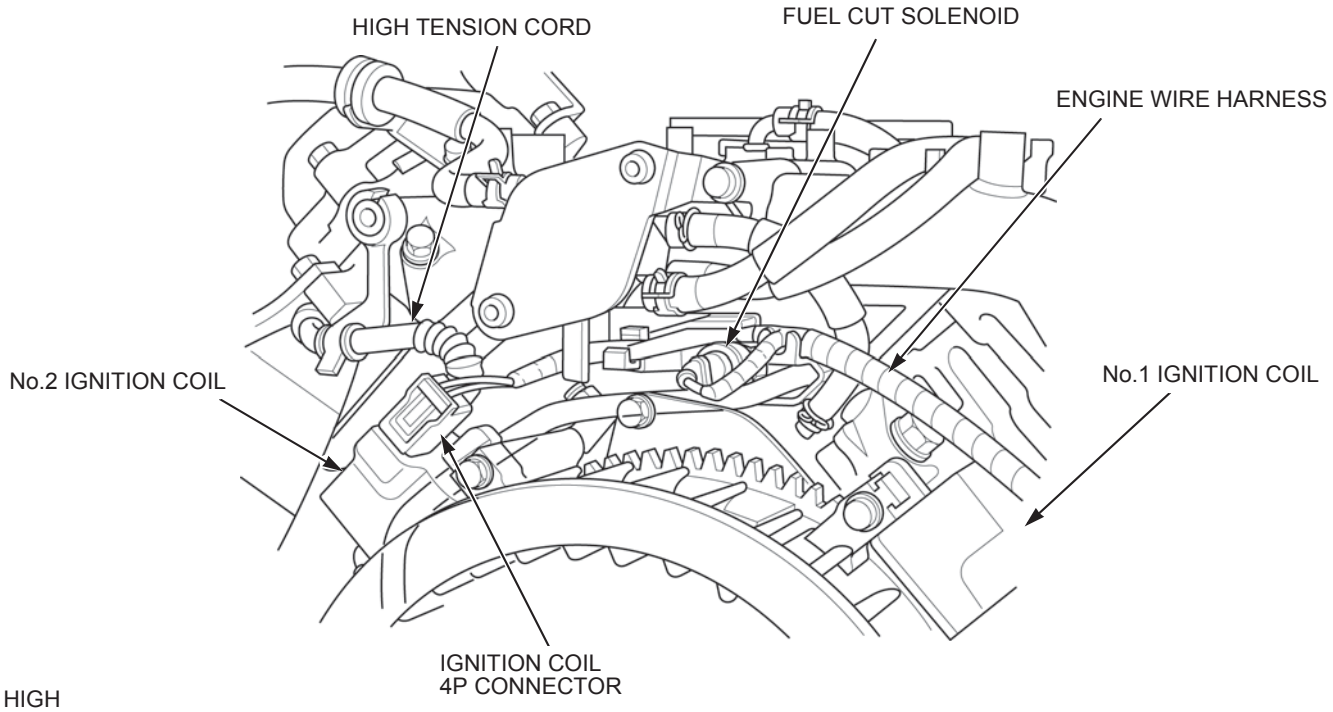
TOOLS

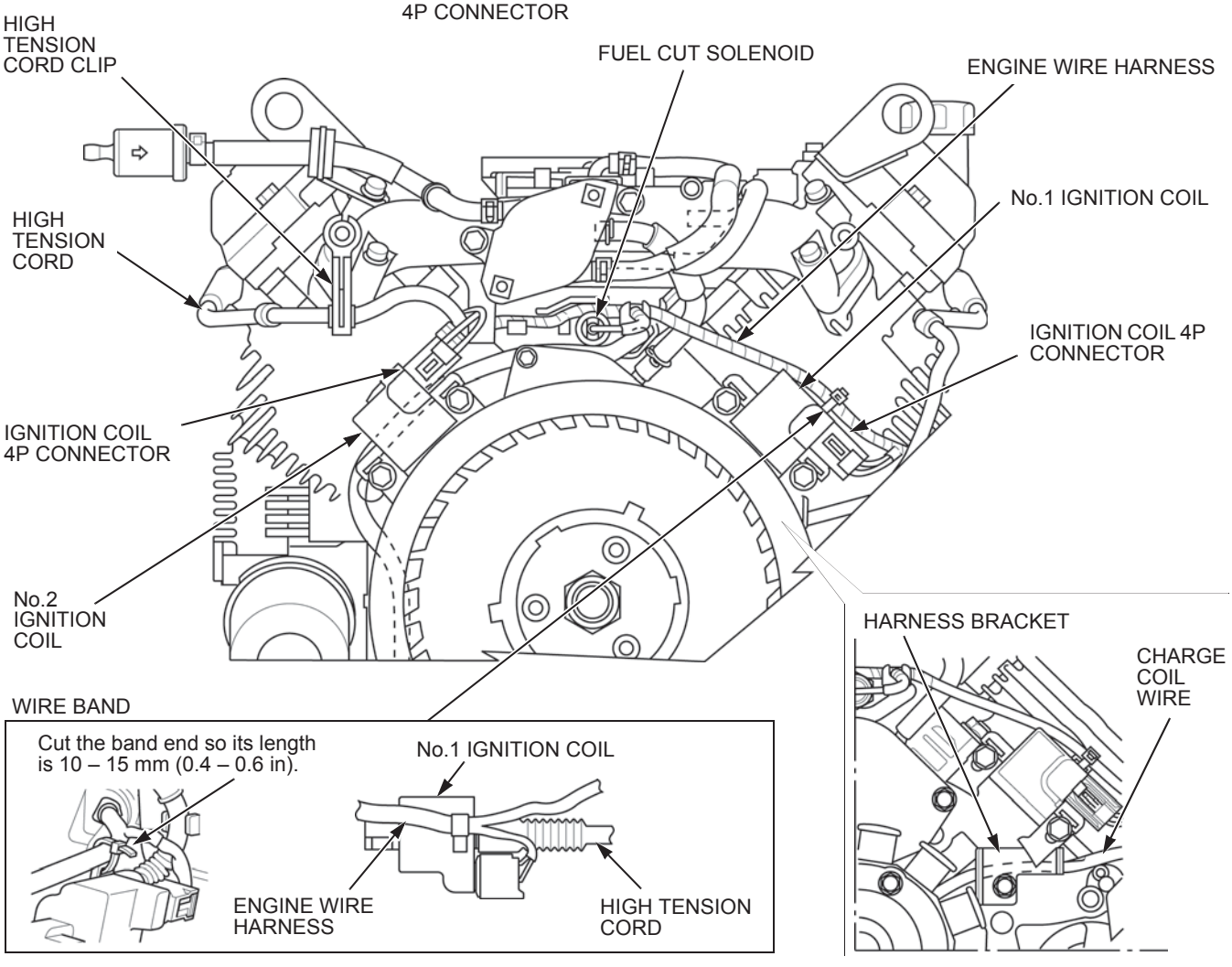
Float level gauge 07401-0010000 	Oil pressure gauge attachment 07406-0030000 	Oil pressure gauge set 07506-3000000 
Tappet adjusting wrench 3 mm 07708-0030400 	Pilot 17 mm 07746-0040400 	Driver handle 15 x 135L 07749-0010000 
Seat cutter 27.5 mm 07780-0010200 	Seat cutter 33 mm 07780-0010800 	Flat cutter 30 mm 07780-0012200 
Flat cutter 33 mm 07780-0012900 	Interior cutter 30 mm 07780-0014000 	Interior cutter 26 mm 07780-0014500 
Cutter holder 5.5 mm 07981-VA20101 	Valve guide reamer 5.510 mm 07984-2000001 	Cleaning brush 07998-VA20100 

Oil seal driver attachment 60 mm 07GAD-PG40100 	Oil filter wrench 64 mm 07HAA-PJ70100 	Clutch center holder 07JMB-MN50301 
Pilot screw wrench (D) 07KMA-MS60101 		

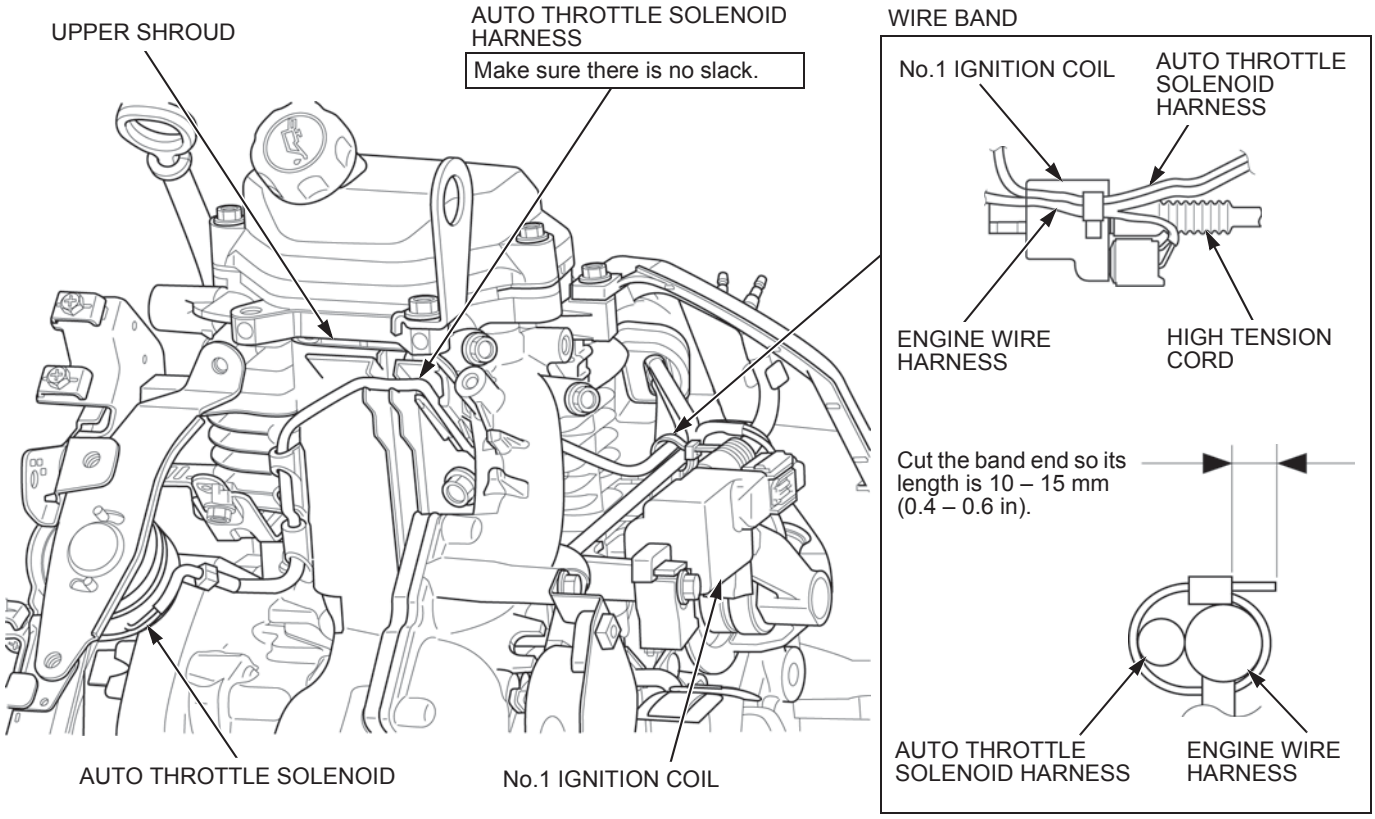
HARNESS ROUTING

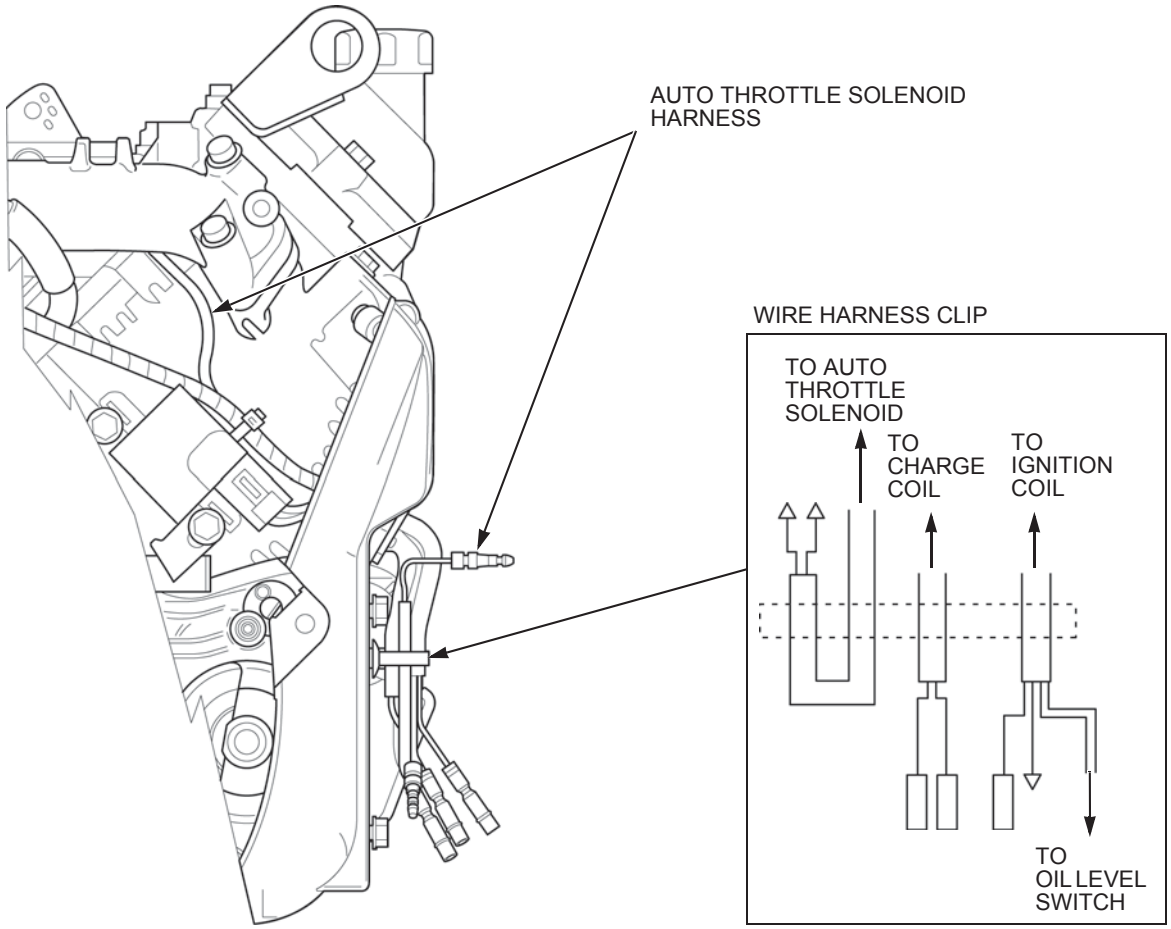
FRONT VIEW



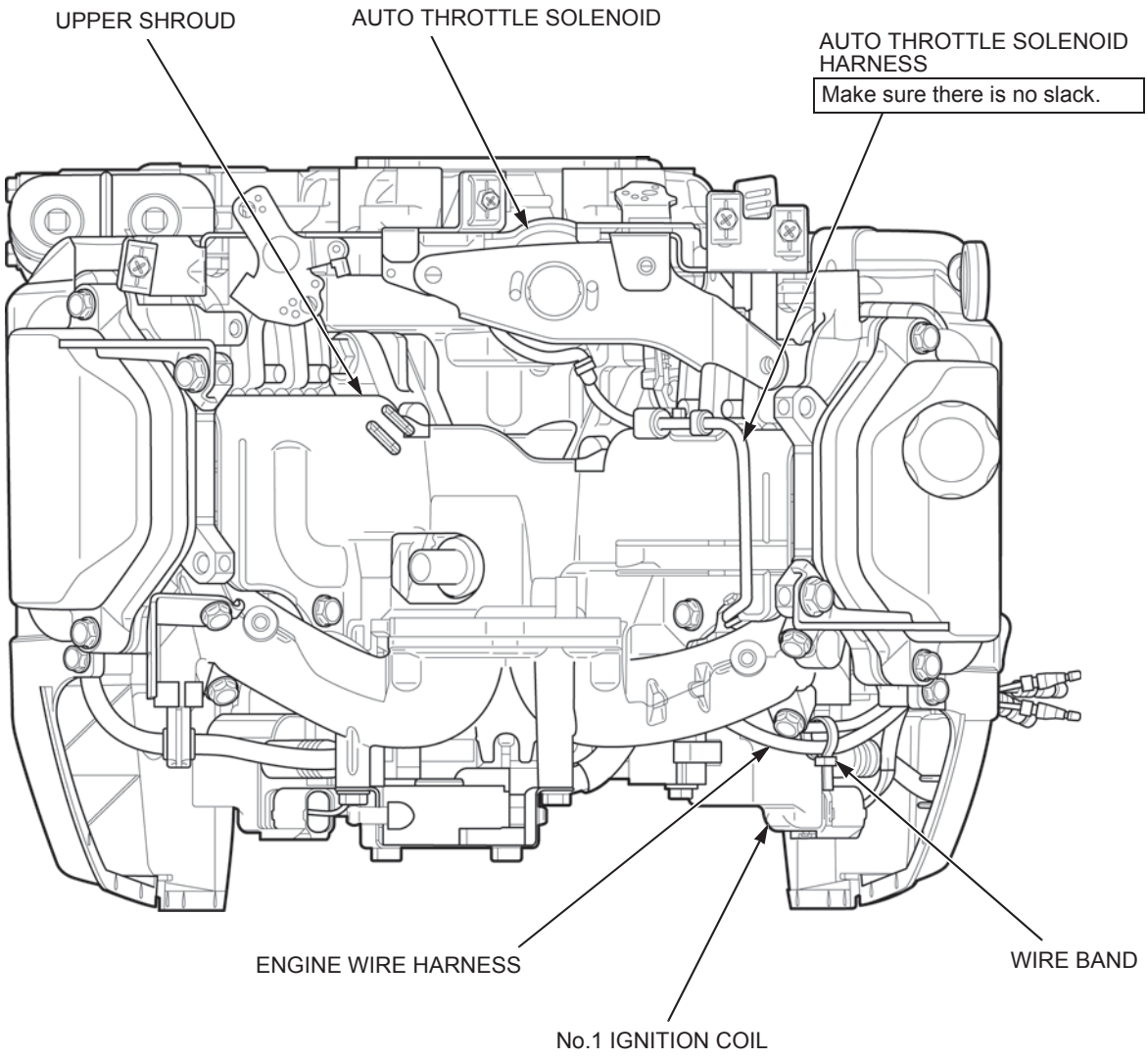


FRONT VIEW (AUTO THROTTLE TYPE)

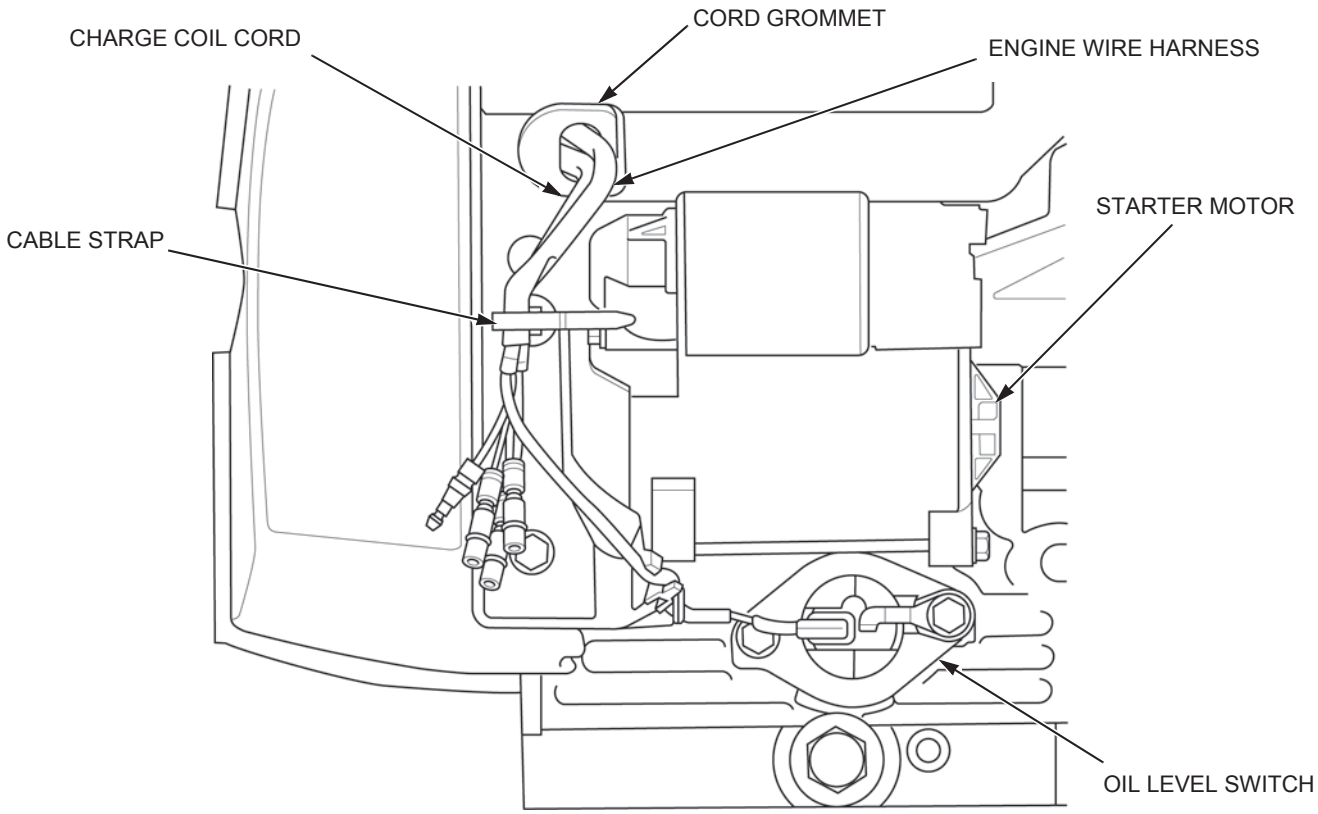


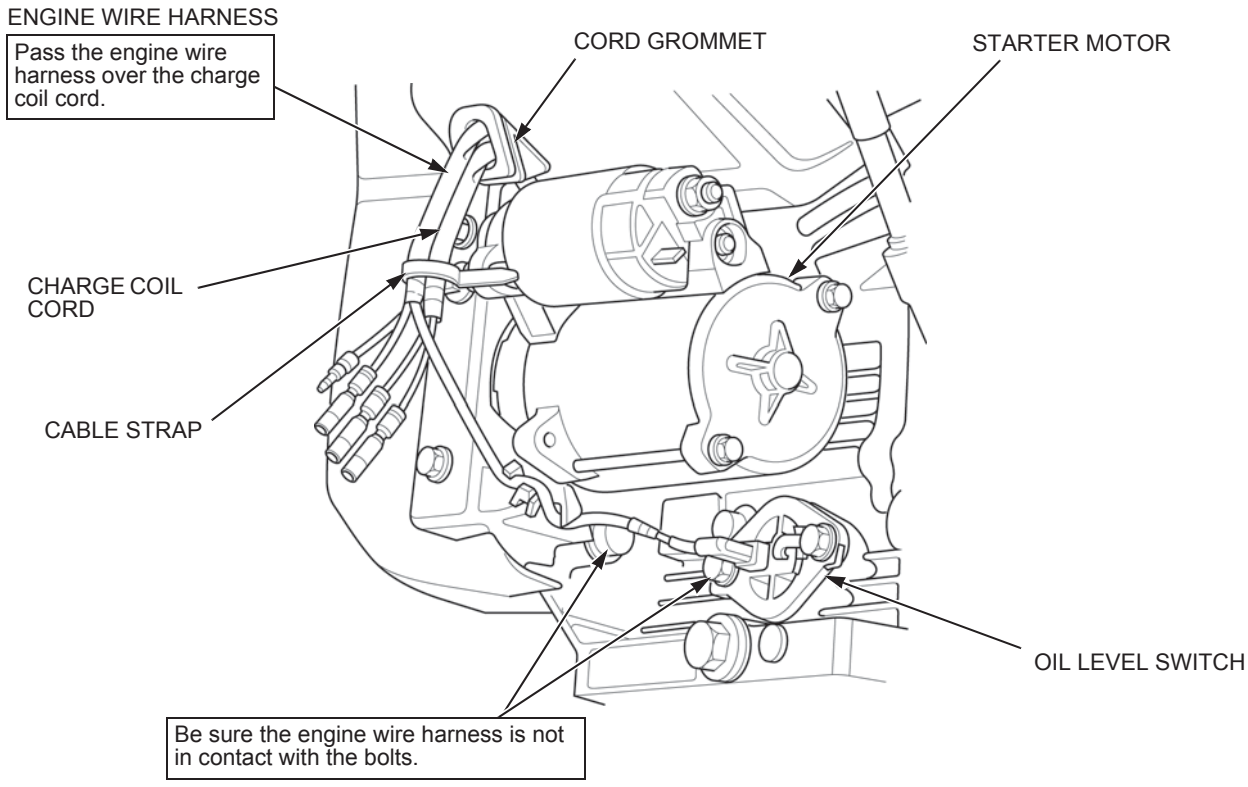


TOP VIEW (AUTO THROTTLE TYPE)

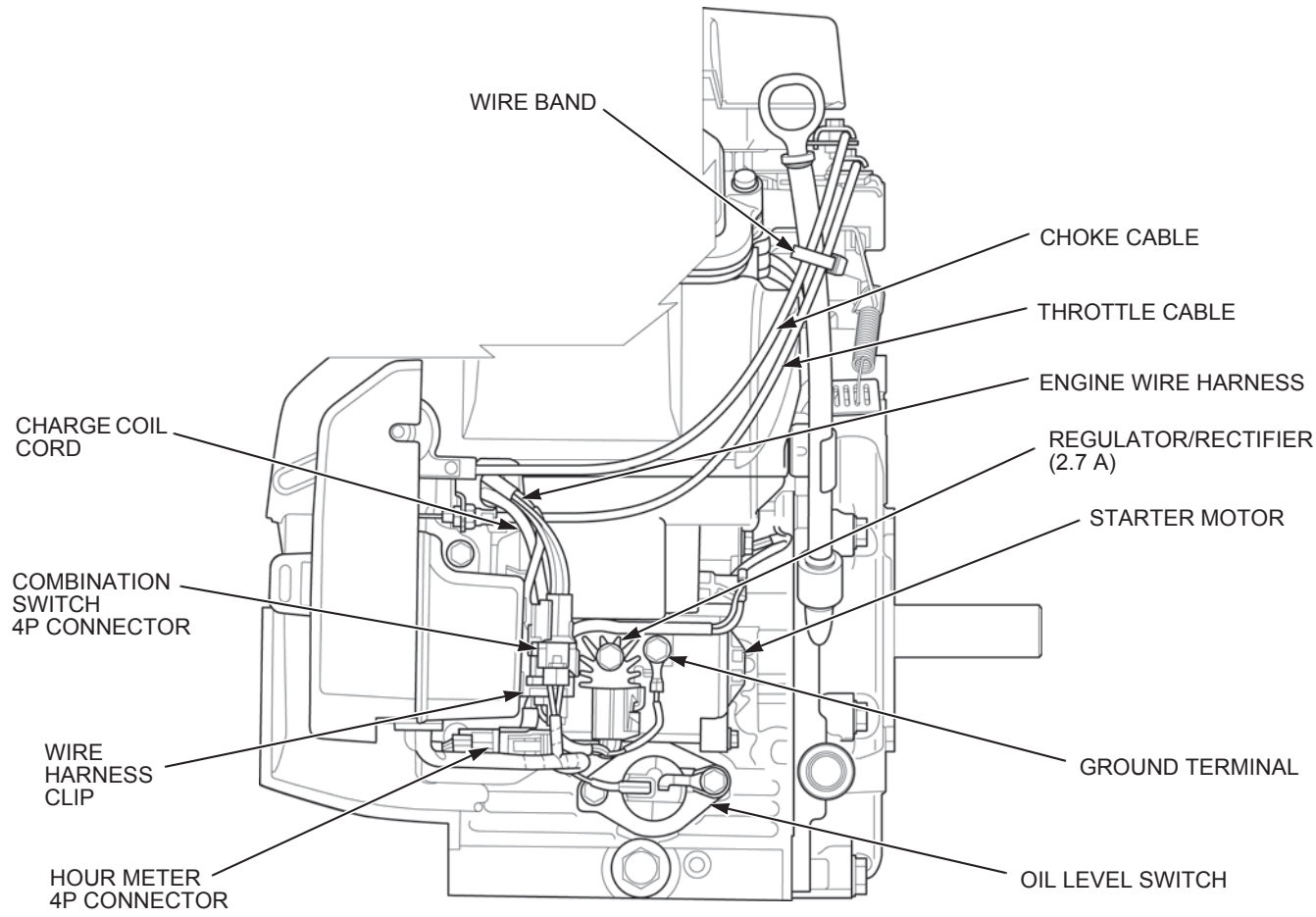


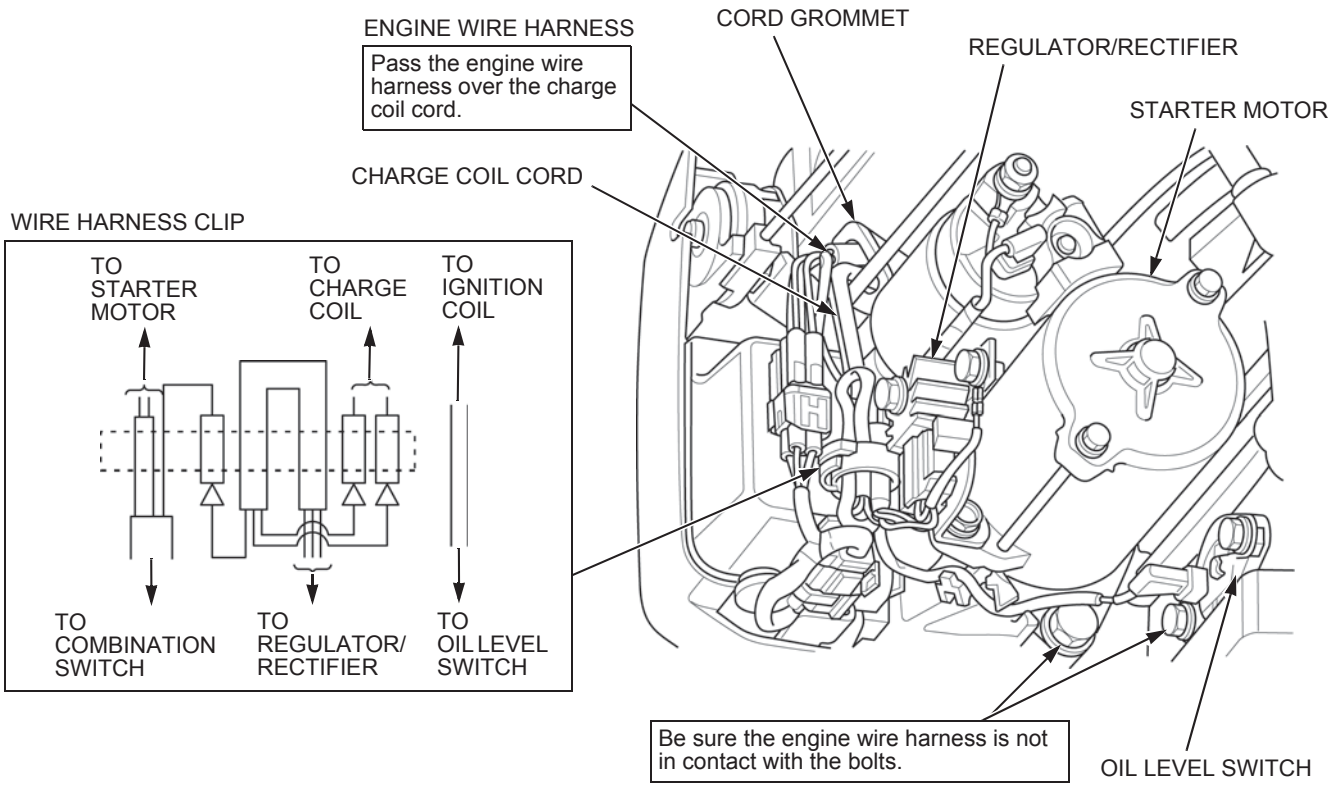
SIDE VIEW (REMOTE CONTROL TYPE)





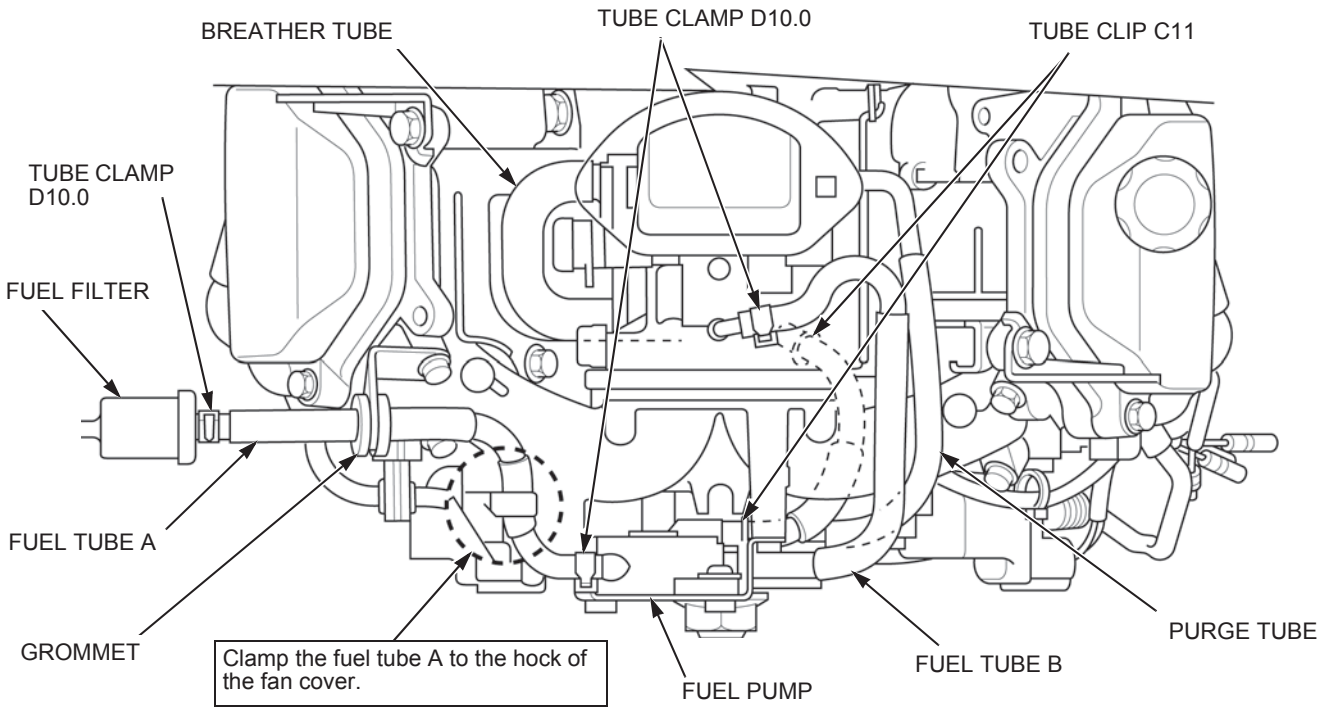
SIDE VIEW (WITH CONTROL BOX TYPE)



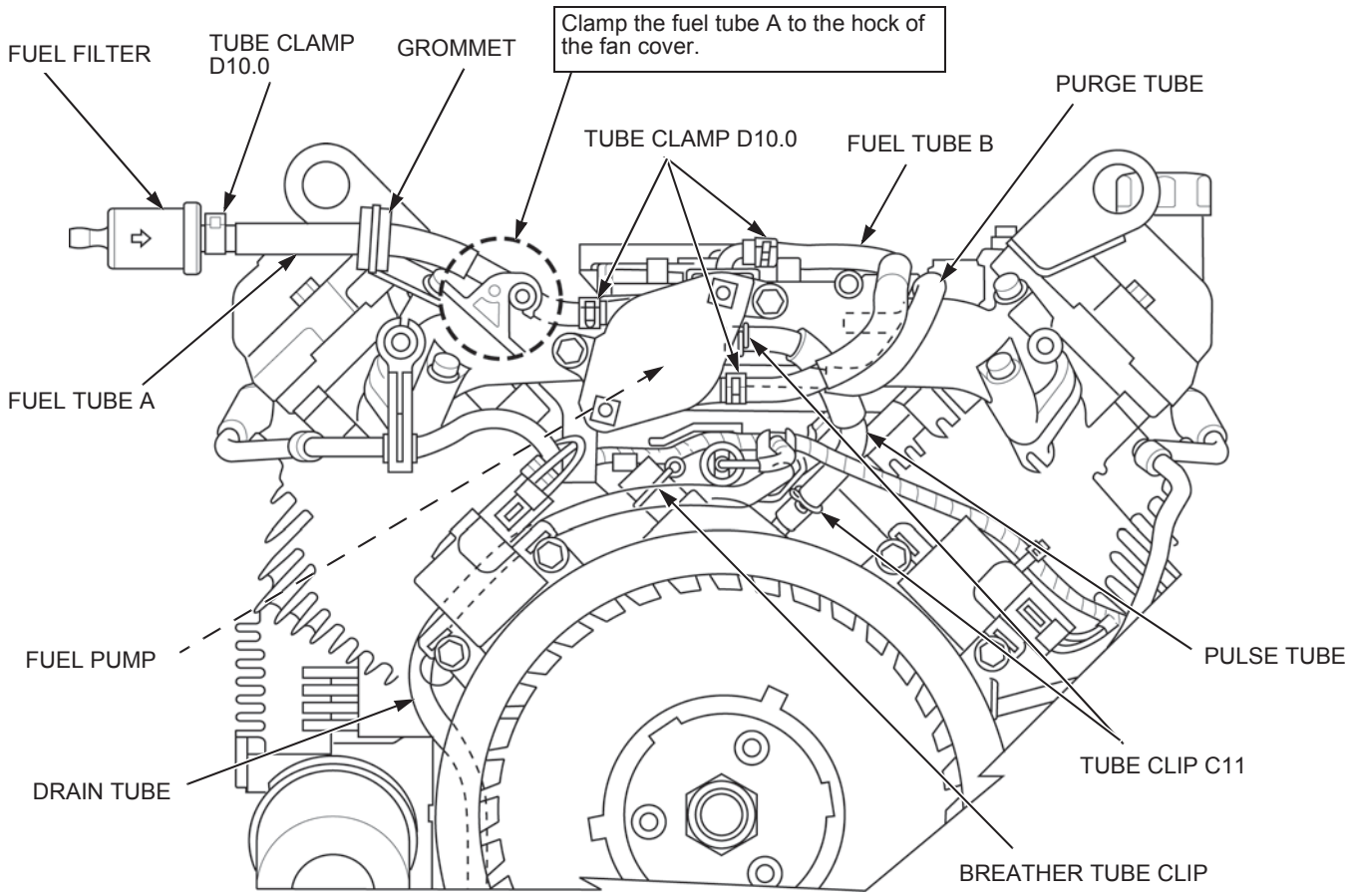


TUBE ROUTING

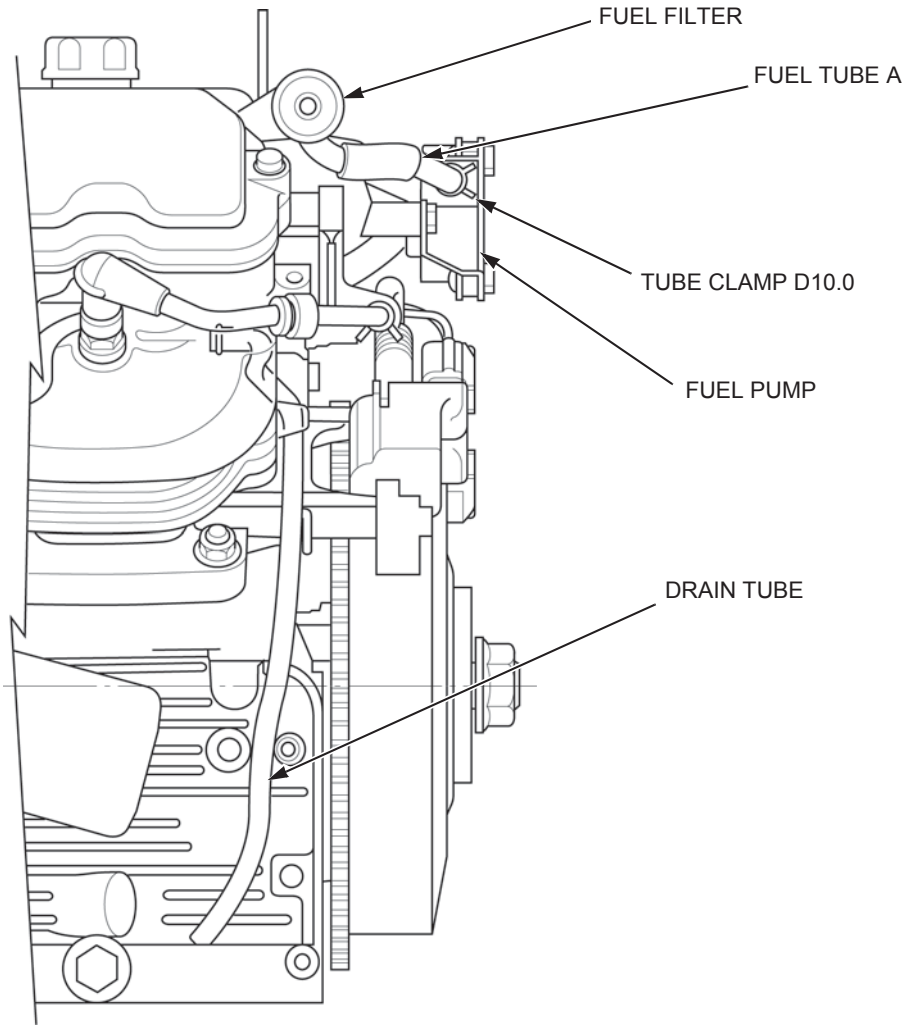
TOP VIEW



FRONT VIEW



RIGHT SIDE VIEW



3. MAINTENANCE

MAINTENANCE SCHEDULE

REGULAR SERVICE PERIOD (2) ITEM		Perform at every indicated month or operating hour interval, whichever comes first.	Each use	First month or 20 hrs.	Every 6 months or 100 hrs.	Every year or 300 hrs.	Every 2 years or 500 hrs.	Refer to page
·	Engine oil	Check level	○					3-3
		Change		○	○			3-4
·	Engine oil filter	Replace	Every 200 hours					3-4
·	Air cleaner	Check	○					3-5
		Clean			○ (1)			3-5
		Replace					○*	3-6
·	Spark plug	Check–adjust			○			3-6
		Replace				○		3-7
	Spark arrester (applicable types)	Clean			○			3-7
·	Idle speed	Check–adjust				○		3-8
·	Valve clearance	Check–adjust				○		3-8
·	Combustion chamber	Clean	After every 1,000 hours					3-10
·	Fuel filter	Replace				○		3-10
·	Fuel tube	Check	Every 2 years (Replace if necessary)					3-11

· : Emission related items

*: Replace inner filter (paper) only.

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

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

ENGINE OIL LEVEL CHECK

Place the engine on a level surface.

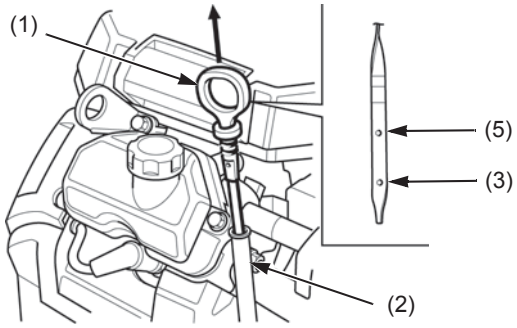
Start the engine and allow it to warm up for 1 to 2 minutes.

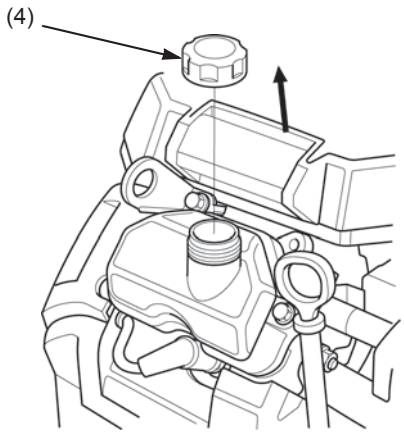
Remove the oil level dipstick (1), and wipe it clean.

Insert the oil level dipstick into the oil level pipe (2).

Remove the oil level dipstick and check oil level shown on the tip of the level dipstick.

If the oil level is near or below the lower level mark (3) on the oil level dipstick, remove the oil filler cap (4) from the head cover and fill with recommended oil to the upper level mark (5) of the level dipstick.



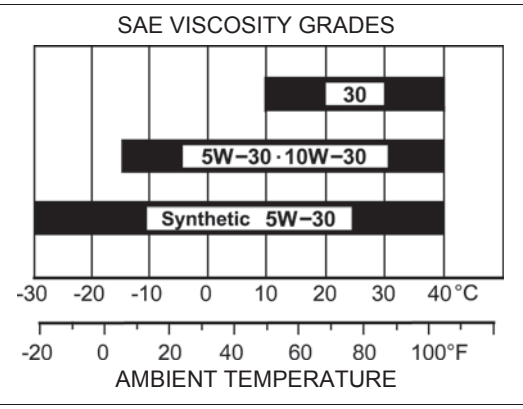


Oil is a major factor affecting performance and service life. Use 4 - stroke automotive detergent oil.

SAE 10W - 30 or 5W - 30 is recommended for general use. Use a full synthetic 5W - 30 for starting/operating temperatures between 15°C and -5°C. Other viscosities shown in the chart may be used when the average temperature in your area is within the recommended range.

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

Tighten the oil filler cap and install the oil level dipstick securely.



ENGINE OIL CHANGE

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

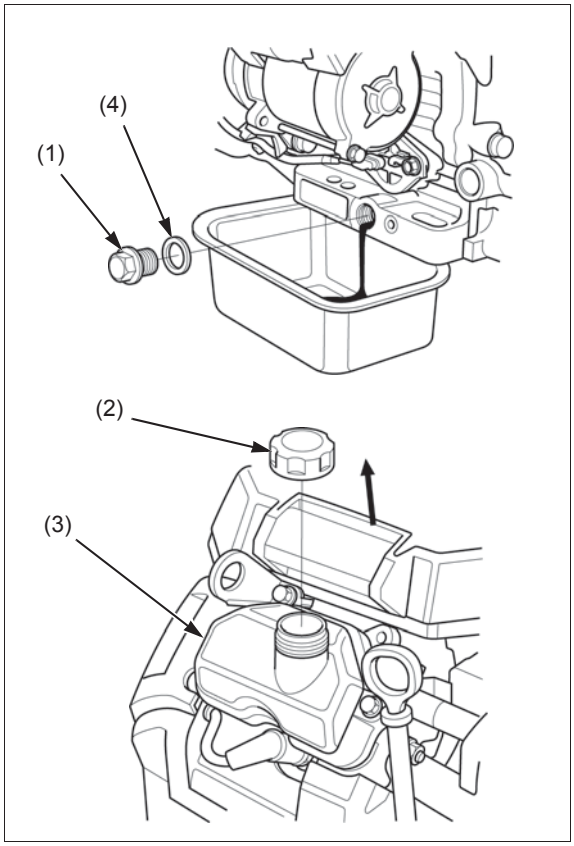
Place the engine on a level surface and place a suitable container under the drain plug bolt (1).

Remove the oil filler cap (2) from the head cover (3) and the drain plug bolt to drain the oil into a suitable container.

Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash, pour it into 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 a new drain plug washer (4) and tighten the drain plug bolt to the specified torque.

TORQUE: 45 N·m (4.5 kgf·m, 33 lbf·ft)

Fill with recommended oil to the upper level mark of the oil level dipstick (page 3-3).

Tighten the oil filler cap and install the oil level dipstick securely.

OIL FILTER REPLACEMENT

Drain the engine oil.

Remove the oil filter (1) using the special tool (2).

TOOLS:
Oil filter wrench 64 mm (2) 07HAA-PJ70100

Apply a light coat of grease to the O-ring (3) of the new oil filter.

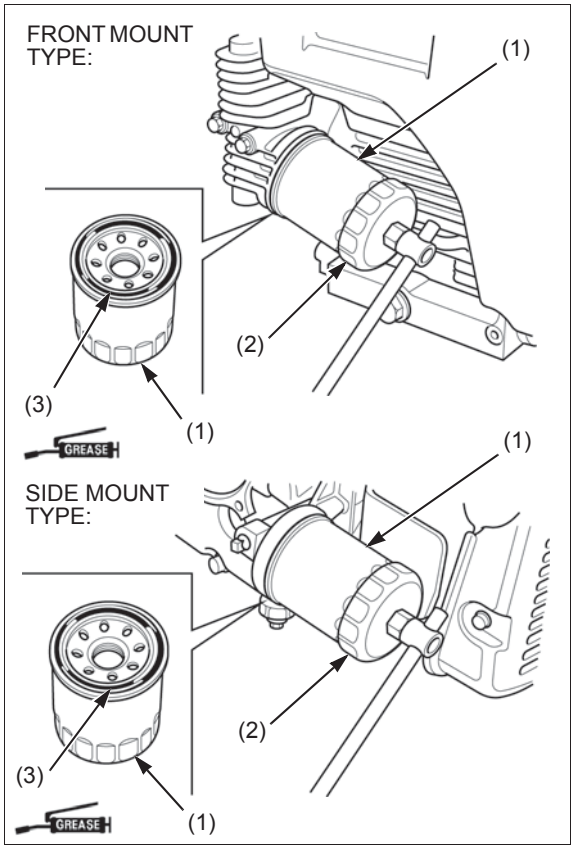
Install the new oil filter and tighten to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Fill with recommended oil to the upper level mark of the oil level dipstick (page 3-3).

Start the engine and warm up for 1 to 2 minutes.

Check the oil level and if necessary, fill the recommended oil to the upper mark of the oil level dipstick (page 3-3).



AIR CLEANER CHECK/CLEANING

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.

NOTICE

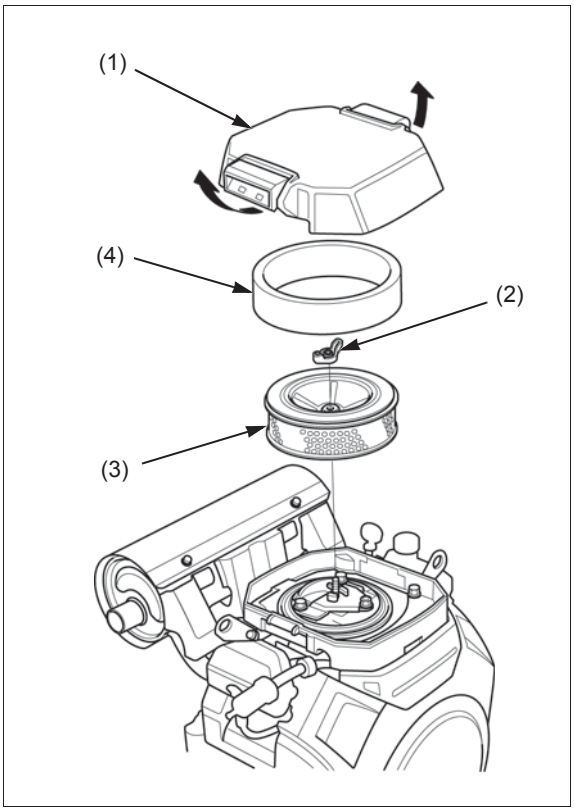
Operating the engine without the air filters or with the filter installed loosely will allow dirt to enter the engine, causing rapid engine wear. Install the air filters securely.

Remove the air cleaner cover (1).

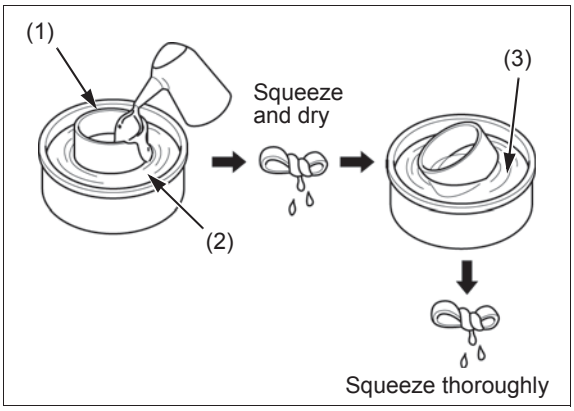
Remove the wing nut (2) and air filter assembly (3)(4).

Separate the air filters into the inner filter (Paper) (3) and the outer filter (Foam) (4).

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



Clean the outer filter (1) in warm soapy water (2), rinse and allow to dry thoroughly, or clean with a non-flammable solvent (2) and allow to dry thoroughly. Dip the filter in clean engine oil (3) and squeeze out all the excess oil. Excess oil will restrict air flow through the foam element and may cause the engine to smoke at startup.



Tap the inner filter (1) lightly several times on a hard surface to remove excess dirt or blow compressed air lightly (207 kPa (2.11 kgf/cm^2, 30 psi) or less) through the paper filter from the inside out. Never try to brush the dirt off; brushing will force dirt into the fibers.

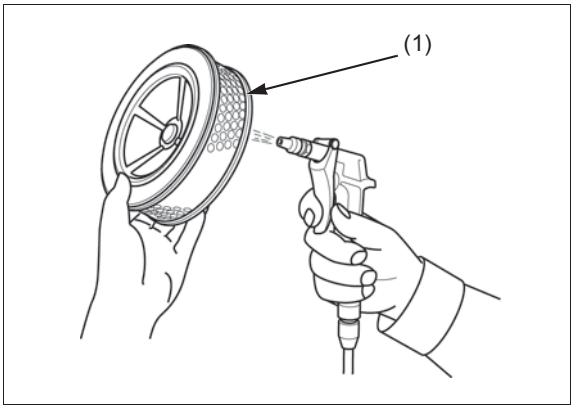
Wipe dirt from the inside of the air cleaner case and the air cleaner cover, using a rag.

Check the air cleaner case packing for deterioration or damage. Make sure the air cleaner packing installed securely.

Attach the outer filter on the inner element, and then install the air filter assembly and tighten the wing nut securely.

TORQUE: 0.8 N·m (0.08 kgf·m, 0.6 lbf·ft)

Install the air cleaner cover.



AIR CLEANER REPLACEMENT

Remove the air cleaner cover (page 3-5).
Remove the wing nut and air cleaner filters (page 3-5).

Wipe dirt from the inside of the air cleaner case and the air cleaner cover, using a rag.

Check the air cleaner case packing for deterioration or damage. Make sure the air cleaner packing installed securely.

Install a new air cleaner filters and tighten the wing nut securely.

TORQUE: 0.8 N·m (0.08 kgf·m, 0.6 lbf·ft)

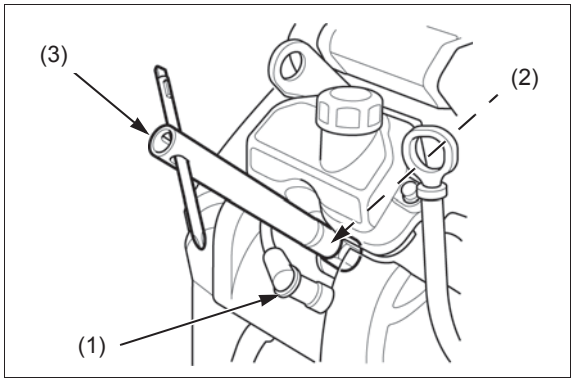
Install the air cleaner cover.

SPARK PLUG CHECK/ADJUSTMENT

⚠ CAUTION

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

Remove the spark plug cap (1), and then remove the spark plug (2) using a spark plug wrench (3).

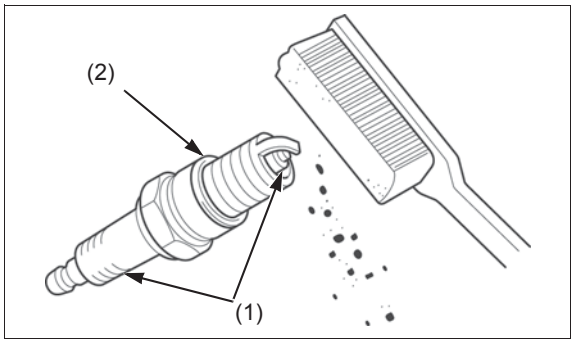


Visually check the spark plug. Replace the plug if the insulator (1) is cracked or chipped.

Remove carbon or other deposits with wire brush.

Check the sealing washer (2) for damage.

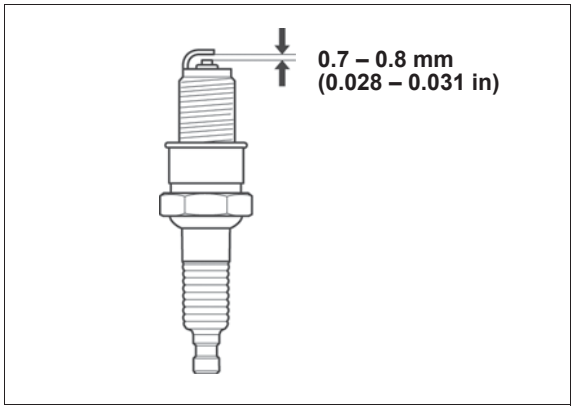
Replace the spark plug if the sealing washer is damaged (page 3-7).



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

PLUG GAP: 0.7 – 0.8 mm (0.028 – 0.031 in)

Install the spark plug finger-tight to seat the washer, and then tighten 1/8 – 1/4 turn with a spark plug wrench.



NOTICE

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

Install the spark plug cap securely.

SPARK PLUG REPLACEMENT

⚠CAUTION

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

Remove the spark plug cap, and then remove the spark plug using a spark plug wrench (page 3-6).

Verify the new spark plug gap is correct (page 3-6).

Install a new spark plug finger-tight to seat the washer, and then tighten 1/2 turn with a spark plug wrench.

SPARK PLUG: ZFR5F (NGK)

NOTICE

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

Install the spark plug cap securely.

SPARK ARRESTER CLEANING

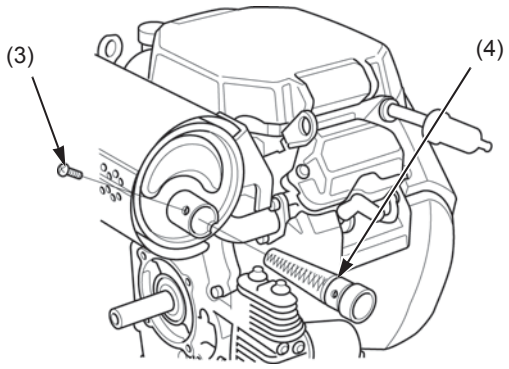
⚠CAUTION

The muffler becomes very hot during operation and remains hot for a while after stopping the engine. Be careful not to touch the muffler while it is hot. Allow it to cool before proceeding.

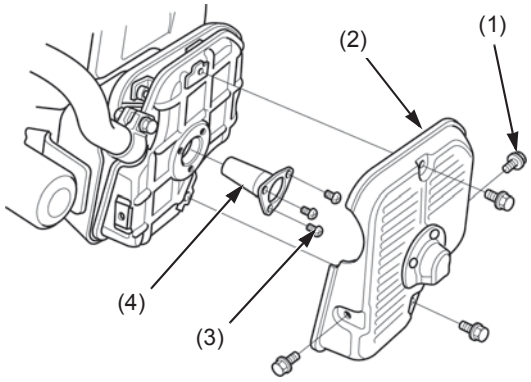
Remove the flange bolts (1) and muffler protector (2) (side mount type only).

Remove the tapping screw/s (3) and spark arrester (4).

HIGH MOUNT TYPE:



SIDE MOUNT TYPE:

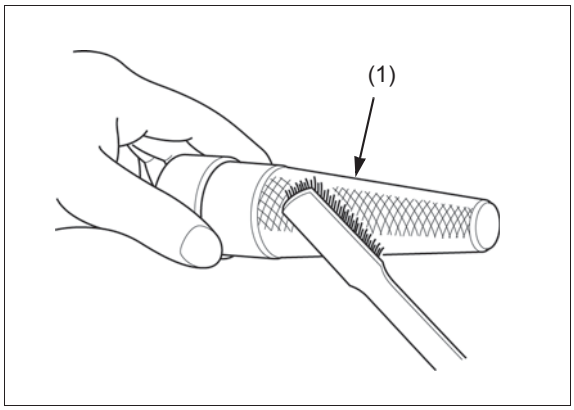


Clean the carbon deposits from the spark arrester screen (1) with a wire brush.

Check the spark arrester screen for damage. If the screen is damaged, replace the spark arrester.

Reinstall the spark arrester to the muffler.

Install the muffler protector (side mount type only).

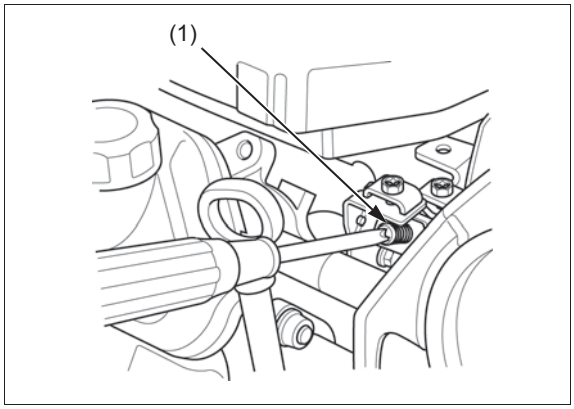


IDLE SPEED CHECK/ADJUSTMENT

Start the engine and allow it to warm up to normal operating temperature.

Turn the pan screw (1) of the control to obtain the specified idle speed.

IDLE SPEED: 1,400 ± 150 min^{-1} (rpm)

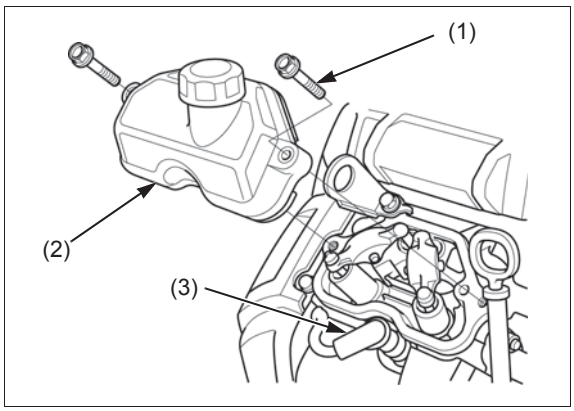


VALVE CLEARANCE CHECK/ ADJUSTMENT

Remove the four flange bolts (1) and the each valve cover (2).

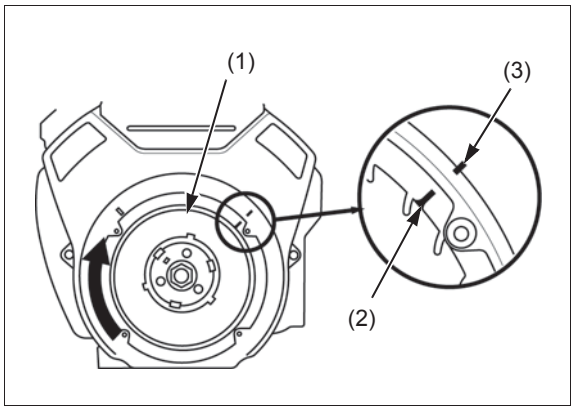
Remove the fan cover protector or screen grid (page 5-2).

Disconnect the spark plug caps (3) from the spark plugs.



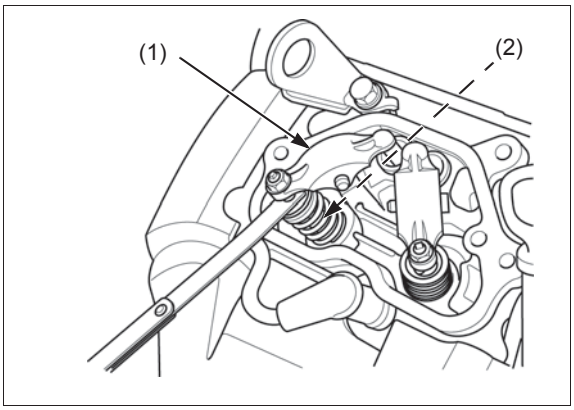
Set the piston of the No.1 cylinder at the top dead center of the cylinder compression stroke (both valves fully closed) by rotating the flywheel (1) clockwise slowly. When the No.1 piston is at the top dead center of the compression stroke, the “T” mark (2) on the cooling fan will align with the right side alignment mark (3) on the fan cover.

If the exhaust valve is opened, rotate the flywheel and align the “T” mark on the cooling fan with the alignment mark on the fan cover again.



Insert a thickness gauge between the valve rocker arm (1) and valve stem (2) to measure the valve clearance.

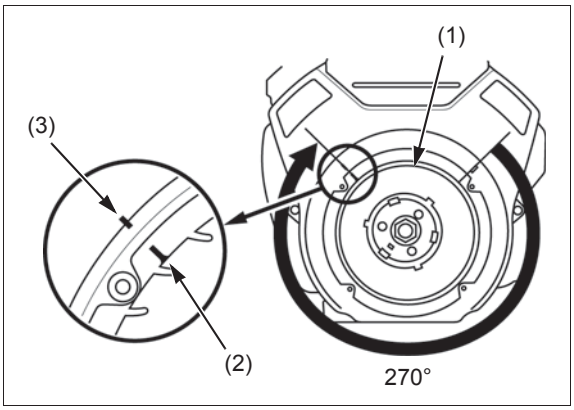
VALVE CLEARANCE:
IN: 0.08 ± 0.02 mm
EX: 0.10 ± 0.02 mm



Set the piston of the No.2 cylinder at the top dead center of the cylinder compression stroke (both valves fully closed) by rotating the flywheel (1) 270 degrees clockwise slowly. When the No.2 piston is at the top dead center of the compression stroke, the “T” mark (2) on the cooling fan will align with the left side alignment mark (3) on the fan cover.

Insert a thickness gauge between the valve rocker arm and valve stem to measure the valve clearance.

VALVE CLEARANCE:
IN: 0.08 ± 0.02 mm
EX: 0.10 ± 0.02 mm



If adjustment is necessary, proceed as follows.

Hold the tappet adjusting screw (1) and loosen the tappet adjusting nut (2).

TOOL:
Tappet adjusting wrench 3 mm (3) 07708-0030400

Turn the tappet adjusting screw to obtain the specified clearance.

VALVE CLEARANCE:
IN: 0.08 ± 0.02 mm
EX: 0.10 ± 0.02 mm

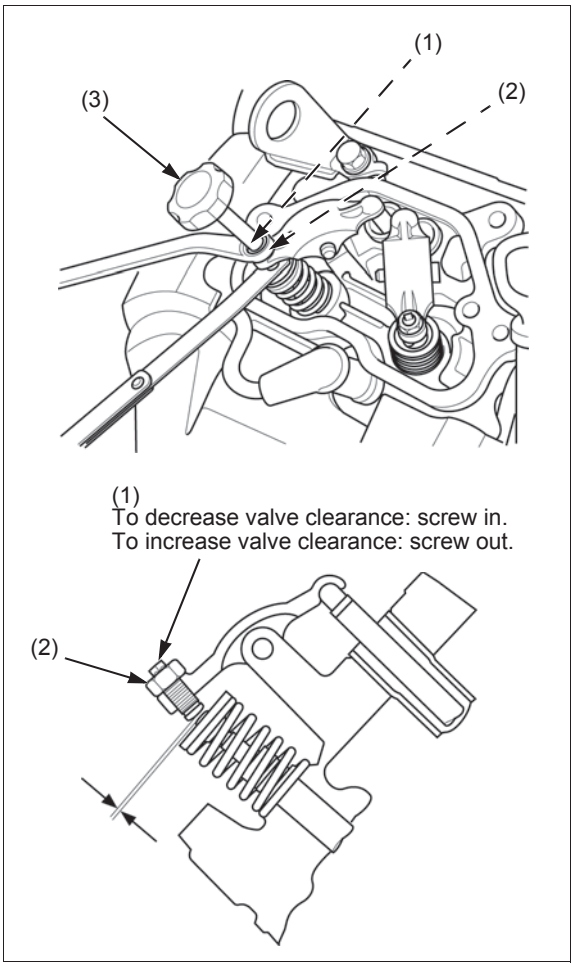
Hold the tappet adjusting screw and retighten the tappet adjusting nut to the specified torque.

TORQUE: 7.5 N·m (0.75 kgf·m, 5.5 lbf·ft)

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

Check the valve cover packing for damage or deterioration and install it on the valve cover.

Attach the cylinder valve cover to the cylinder and tighten the flange bolts securely.

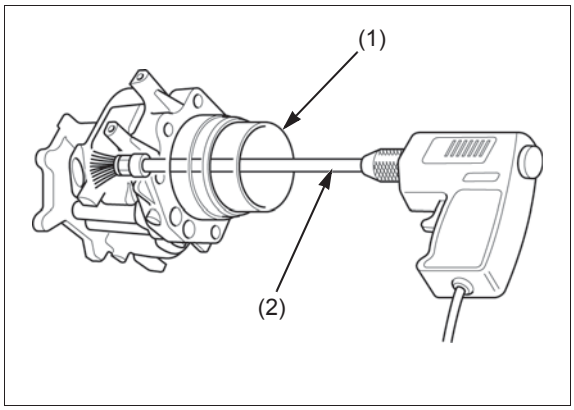


COMBUSTION CHAMBER CLEANING

Remove the cylinder (page 14-2).

Prepare a cylinder of a thick paper or equivalent material (1), which diameter is as large as to fit against the inner wall of the cylinder, and insert the paper into the cylinder.

Attach the cleaning brush (special tool) (2) to an electric drill and clean any carbon deposits from the combustion chamber.



TOOL:
Cleaning brush (2) 07998-VA20100

NOTICE

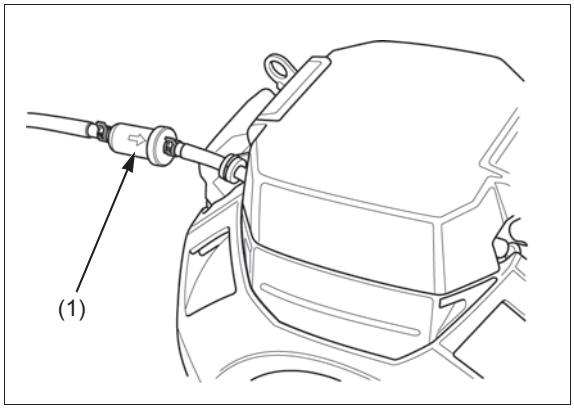
- *Do not remove valves from the cylinder while cleaning the combustion chamber.*
- *Be sure to insert a thick paper into the cylinder to protect the inner wall of the cylinder during clearing of the combustion chamber.*
- *Do not press the cleaning brush with force against the combustion chamber.*

FUEL FILTER REPLACEMENT

⚠ 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.

Check the fuel filter (1) for water accumulation or sediment. If necessary replace it.

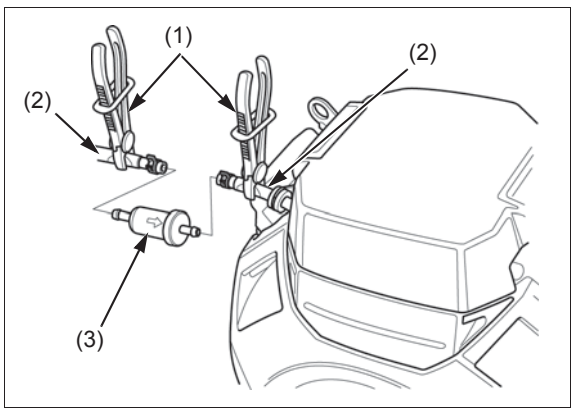


Install the commercially available tube clamps (1) on the fuel tubes (2) on both sides of the fuel filter (3).

Disconnect the fuel tube from the fuel filter to remove the fuel filter.

Install a new fuel filter with the arrow mark toward the carburetor side.

Check the connecting parts for any sign of fuel leakage.



FUEL TUBE CHECK

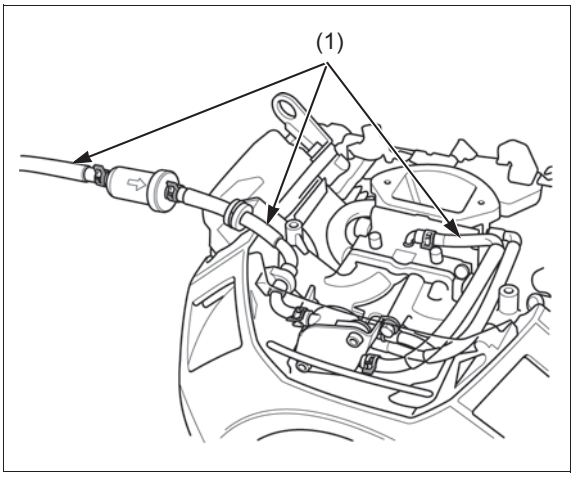
⚠WARNING

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 case (page 6-3).

Check the fuel tube (1) for deterioration, cracks or signs of leakage. If necessary replace it.

Install the air cleaner case (page 6-3).



MEMO

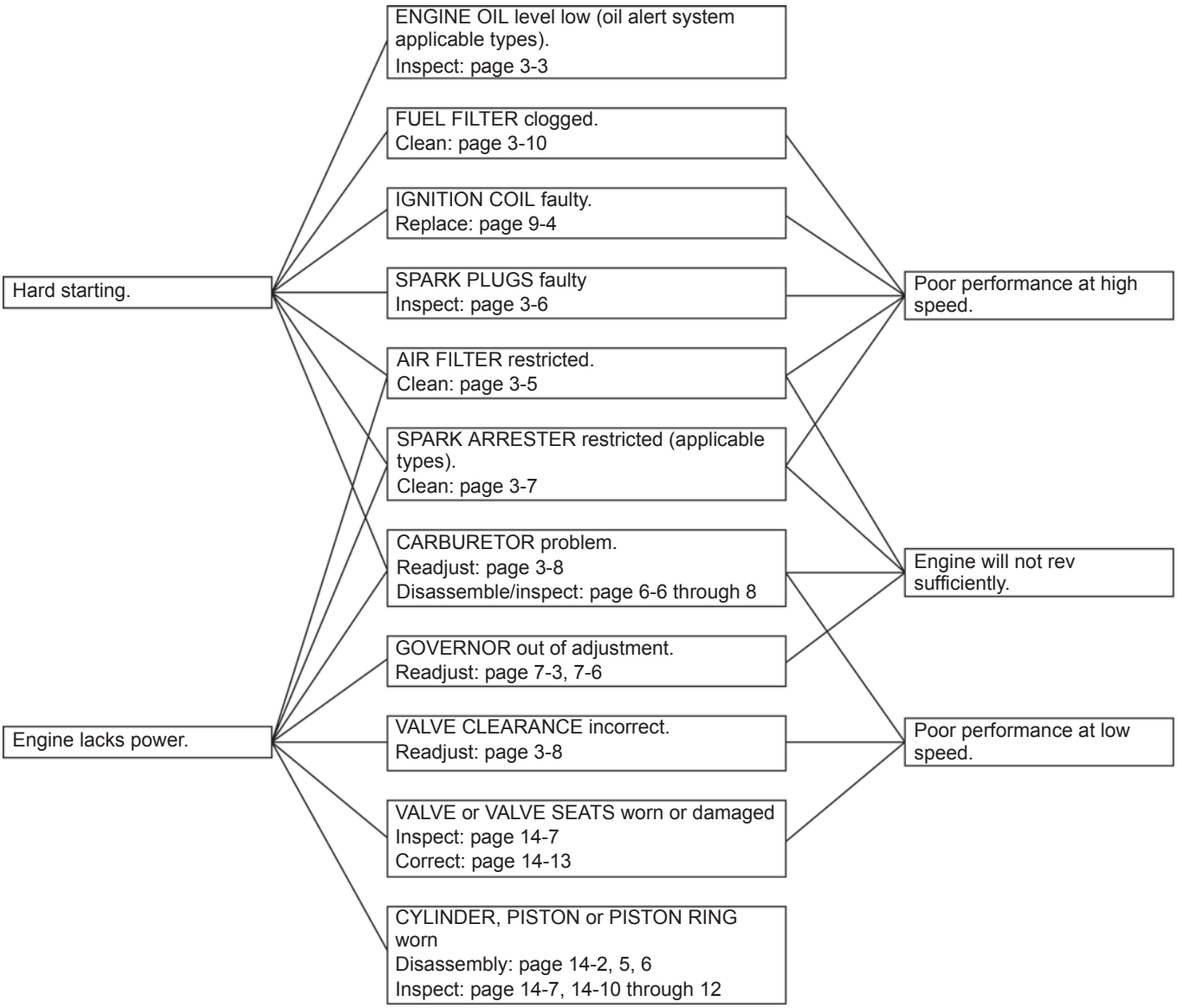
4. TROUBLESHOOTING

BEFORE TROUBLESHOOTING

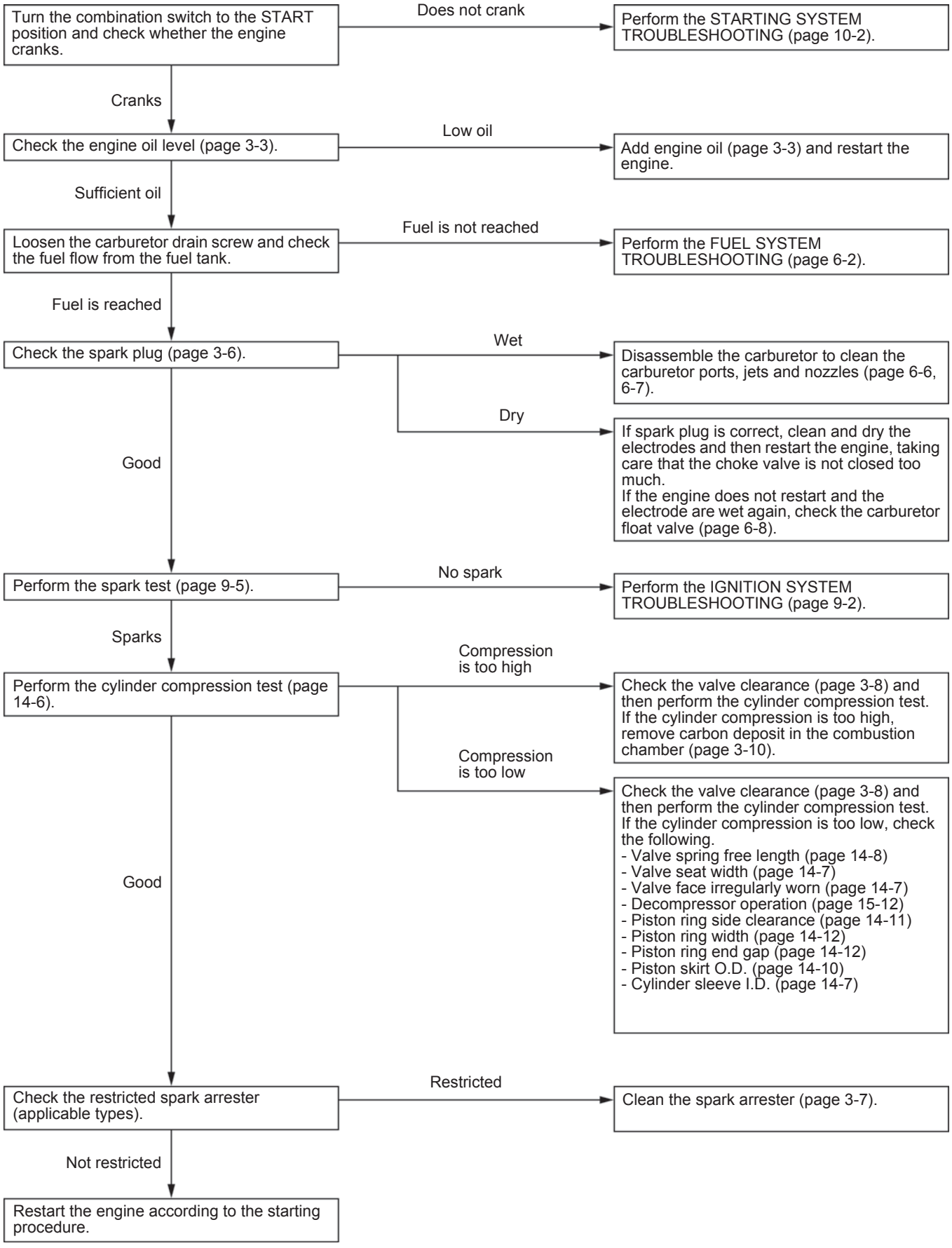
- Use a known-good battery for troubleshooting.
- Check that the connectors are connected securely.
- Check the sufficient fresh fuel in the fuel tank.
- Read the circuit tester's operation instructions carefully, and observe the instructions during inspection.
- Disconnect the battery cable before continuity inspection.

TROUBLESHOOTING

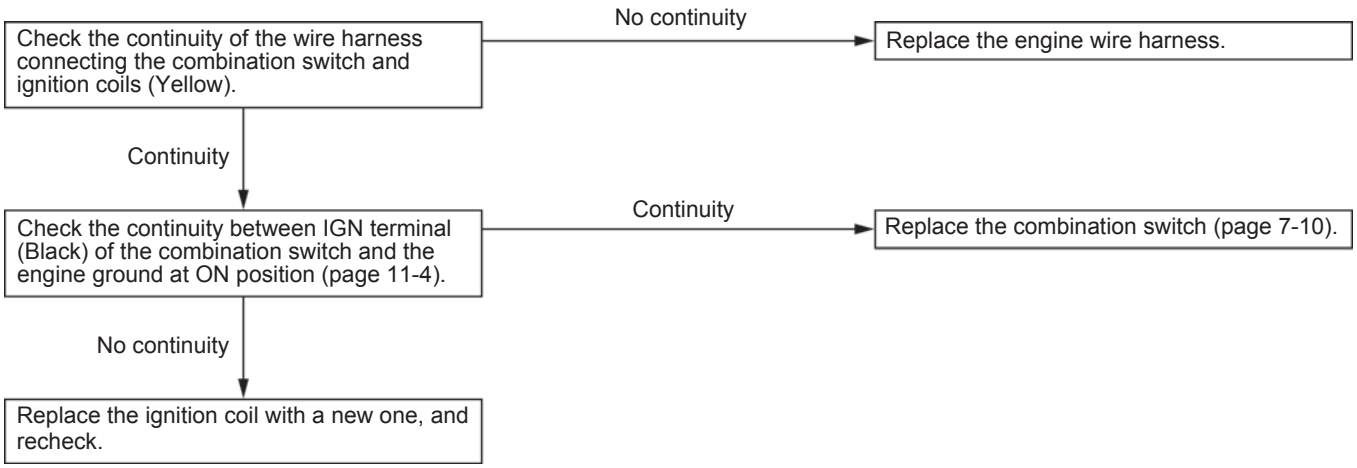
GENERAL SYMPTOMS AND POSSIBLE CAUSES



HARD STARTING



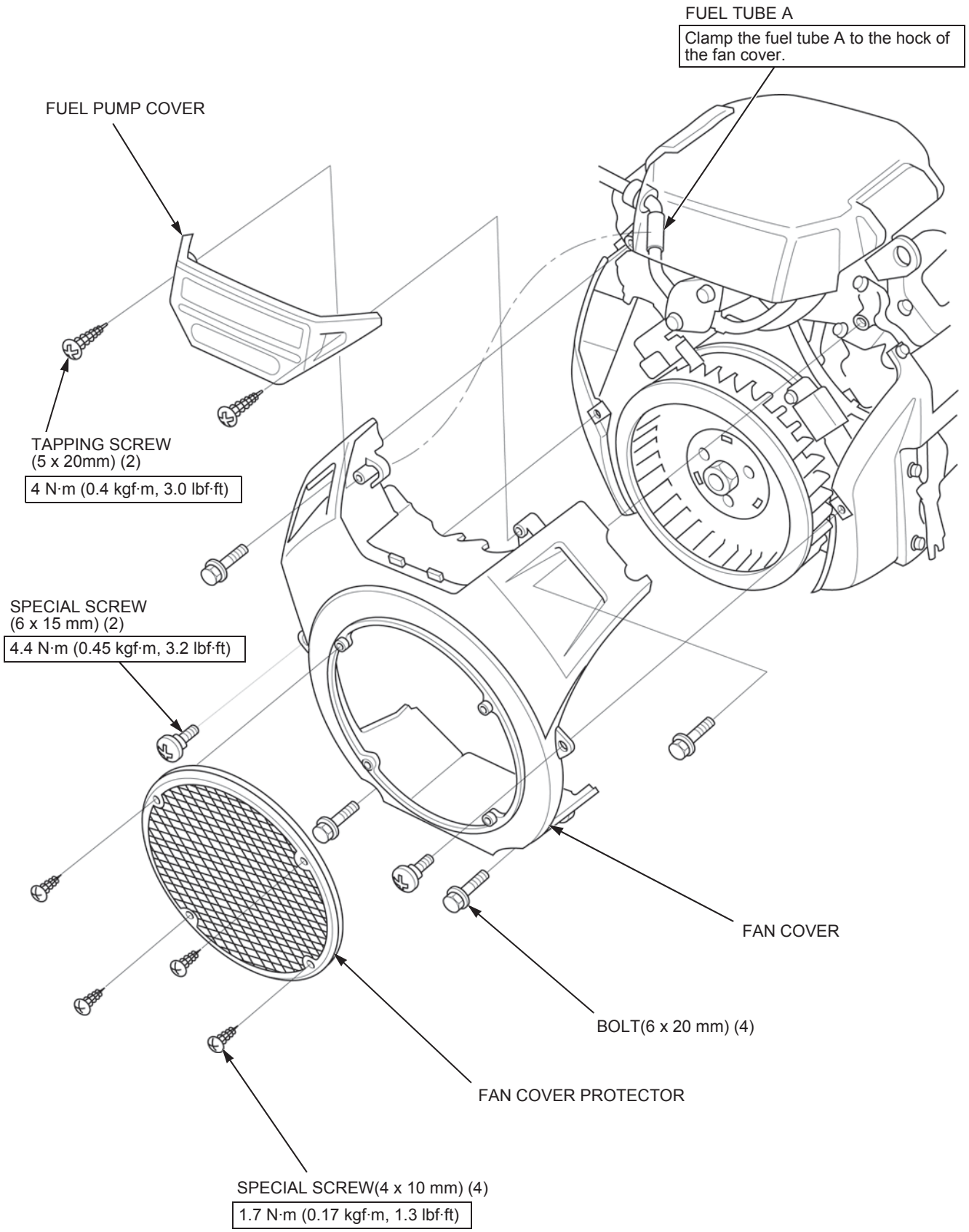
ENGINE DOES NOT STOP WHEN COMBINATION SWITCH IS TURNED OFF



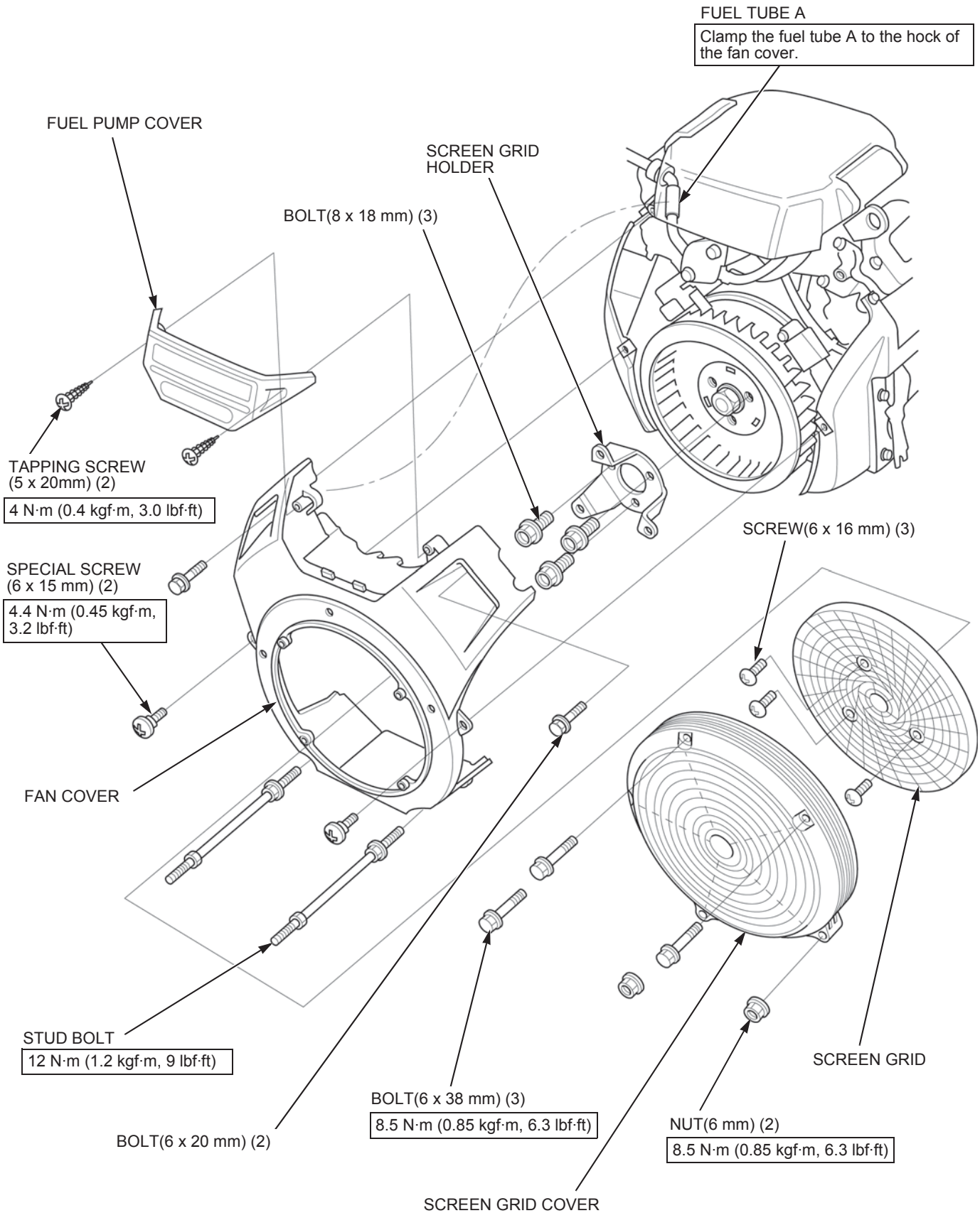
5. COVER

FAN COVER REMOVAL/INSTALLATION

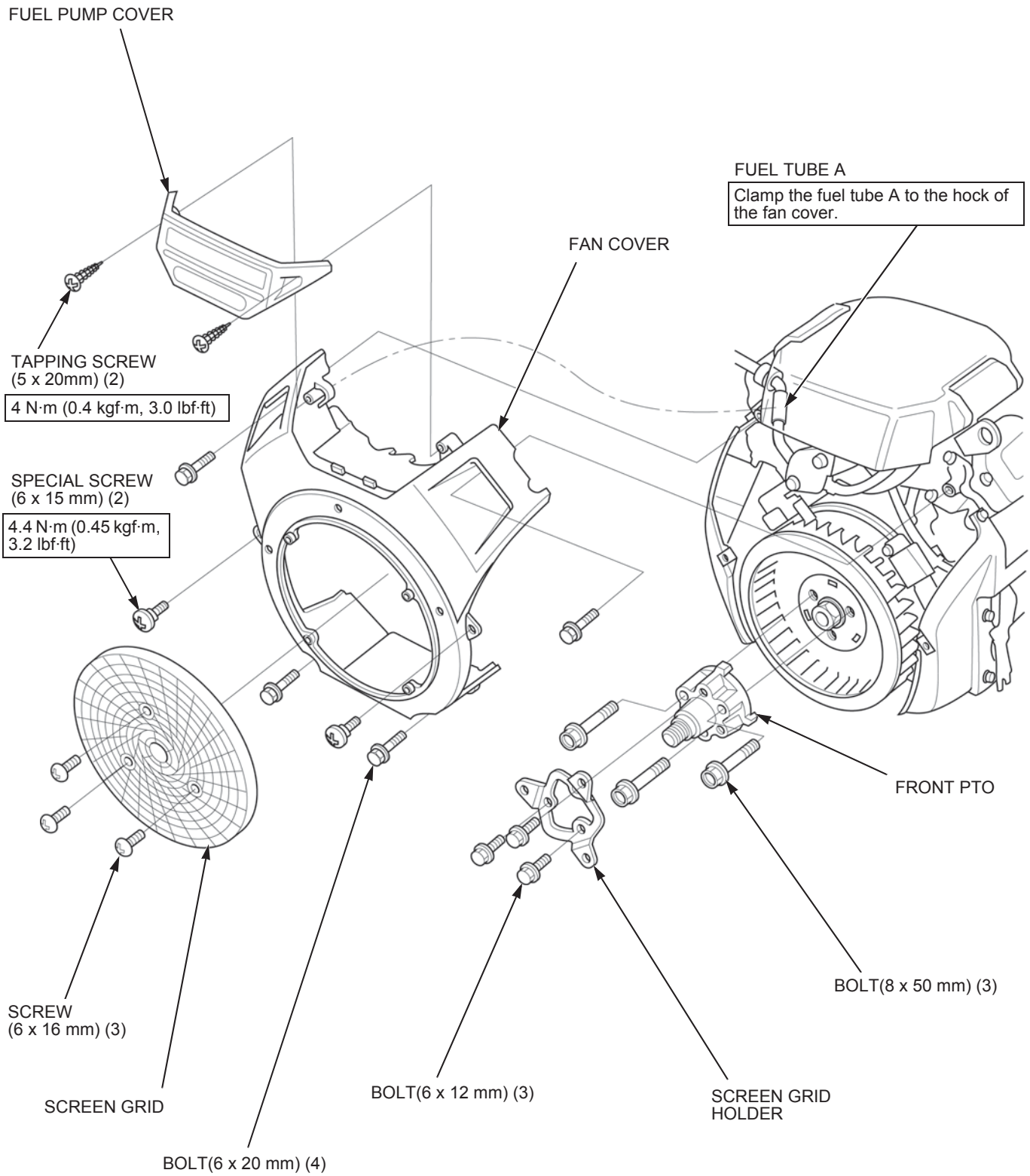
FAN COVER PROTECTOR TYPE



SCREEN GRID/SCREEN GRID COVER TYPE



FRONT PTO/SCREEN GRID TYPE



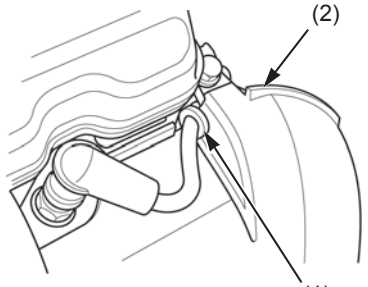
LOWER SHROUD REMOVAL/ INSTALLATION

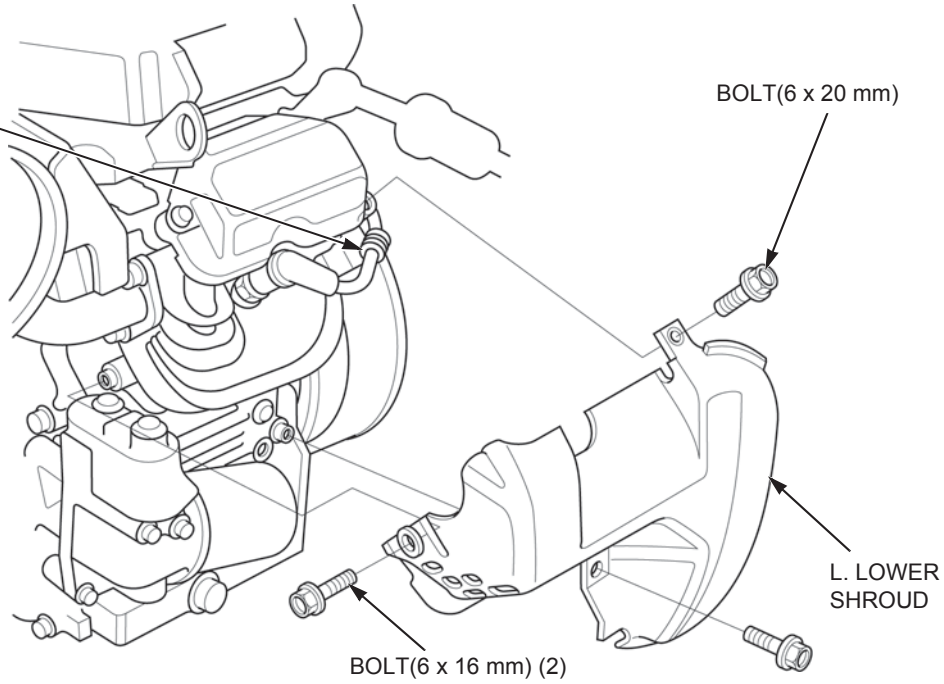
Remove the fan cover (page 5-2).

L. LOWER SHROUD

HIGH TENSION CORD GROMMET

INSTALLATION:
Align the grommet (1) with the cutout in the L. lower shroud (2) as shown.

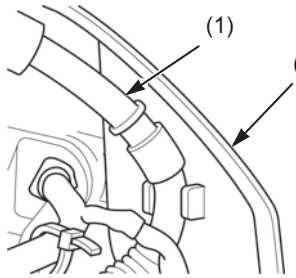


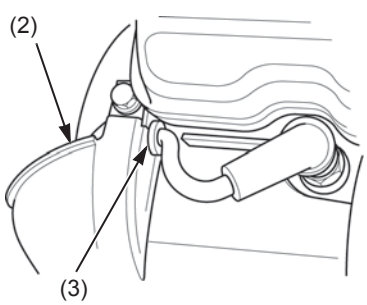


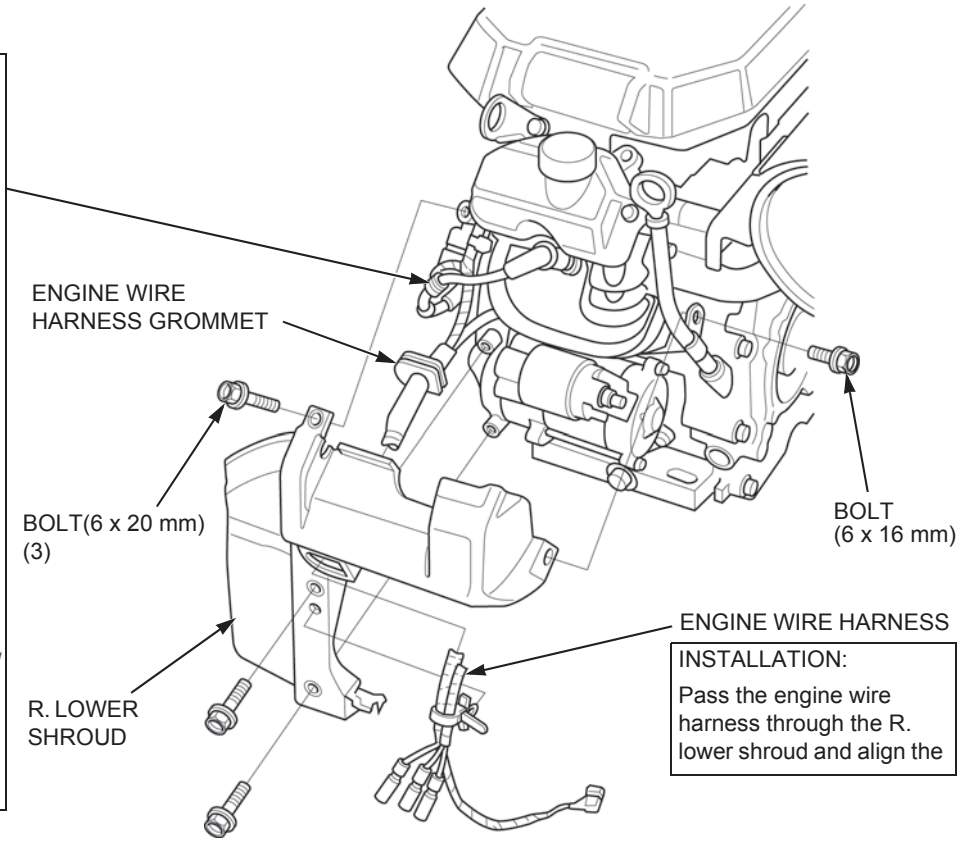
R. LOWER SHROUD

HIGH TENSION CORD GROMMET

INSTALLATION:
Clamp the high tension cord (1) to the inside of the R. lower shroud (2) and align the grommet (3) with the cutout in the shroud as shown.





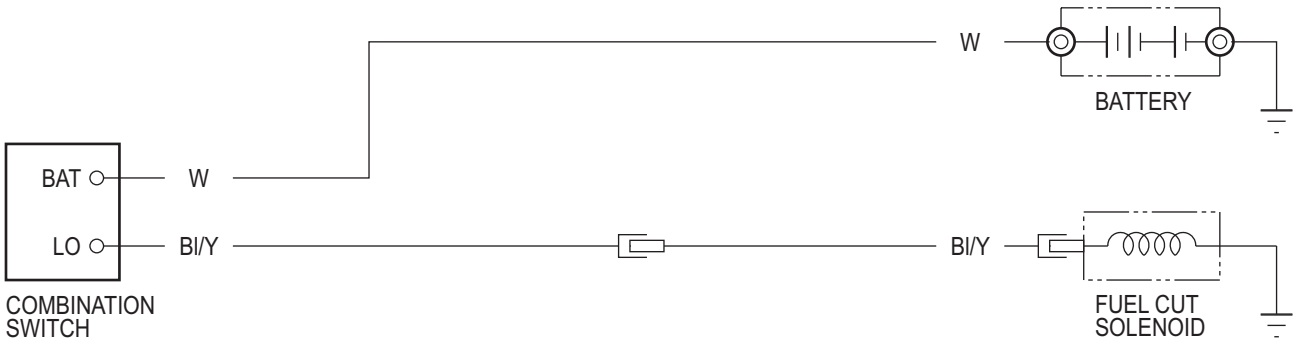


INSTALLATION:
Pass the engine wire harness through the R. lower shroud and align the

MEMO

6. FUEL SYSTEM

SYSTEM DIAGRAM

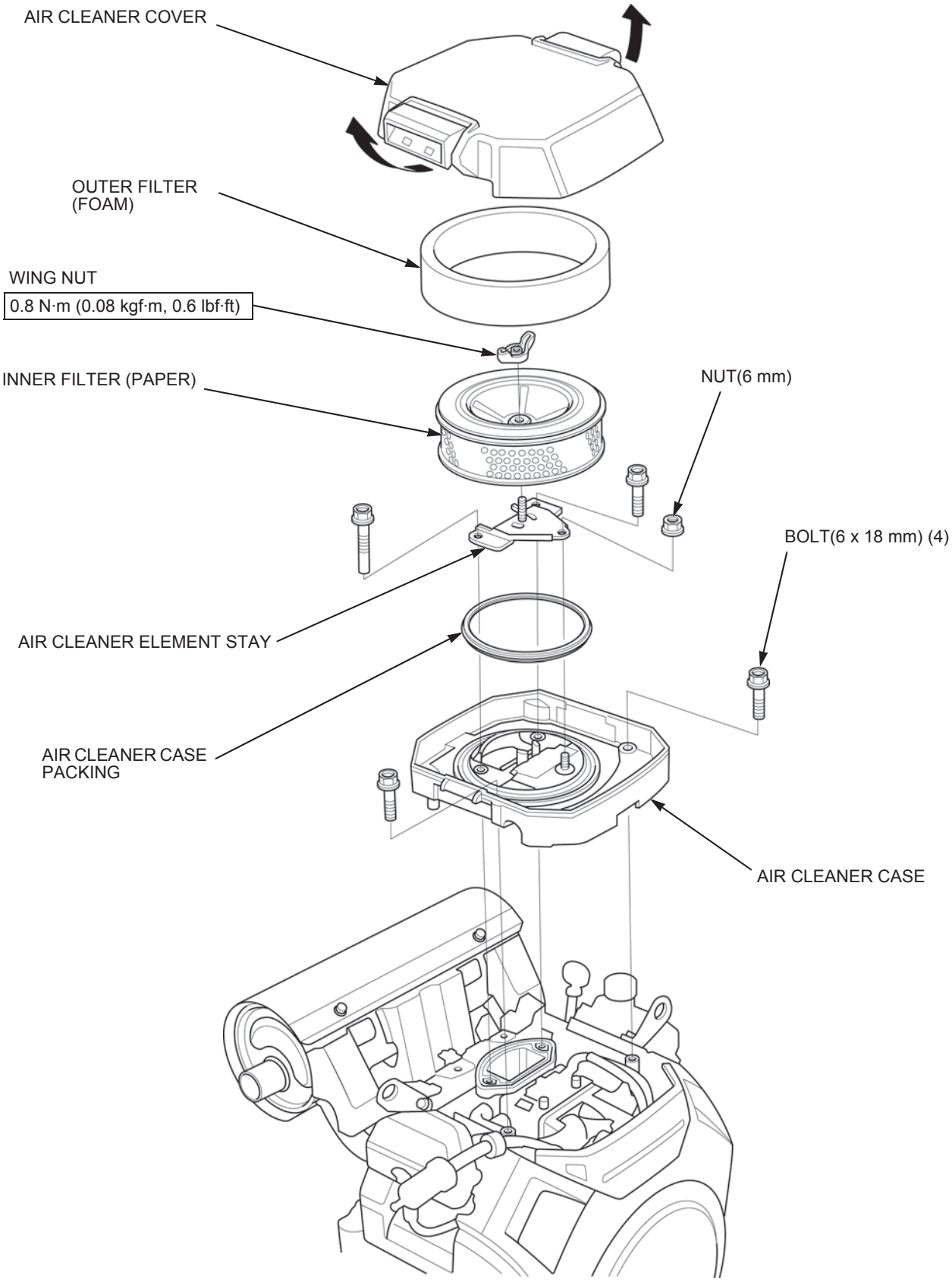


FUEL SYSTEM TROUBLESHOOTING

FUEL DOES NOT REACH CARBURETOR

Check the quantity and freshness of the fuel in the fuel tank.
- No fuel → Add fresh gasoline.
- Sufficient fuel → Check the fuel cut solenoid operation by operating noise of it when the combination switch is ON.
  - Operate → Check for clogged fuel filter, fuel tube and fuel strainer screen. If they are normal, replace the fuel pump (page 6-4).
  - Not operate → Check the continuity between LO terminal (Black/yellow) and BAT terminal (White) of the combination switch in the ON position (page 11-4).
    - No continuity → Replace the combination switch (page 7-10).
    - Continuity → Check the continuity of the wire harness connecting the combination switch and fuel cut solenoid (Black/yellow).
      - No continuity → Replace the engine wire harness.
      - Continuity → Check the fuel cut solenoid (page 6-8) and if necessary replace it (page 6-6).

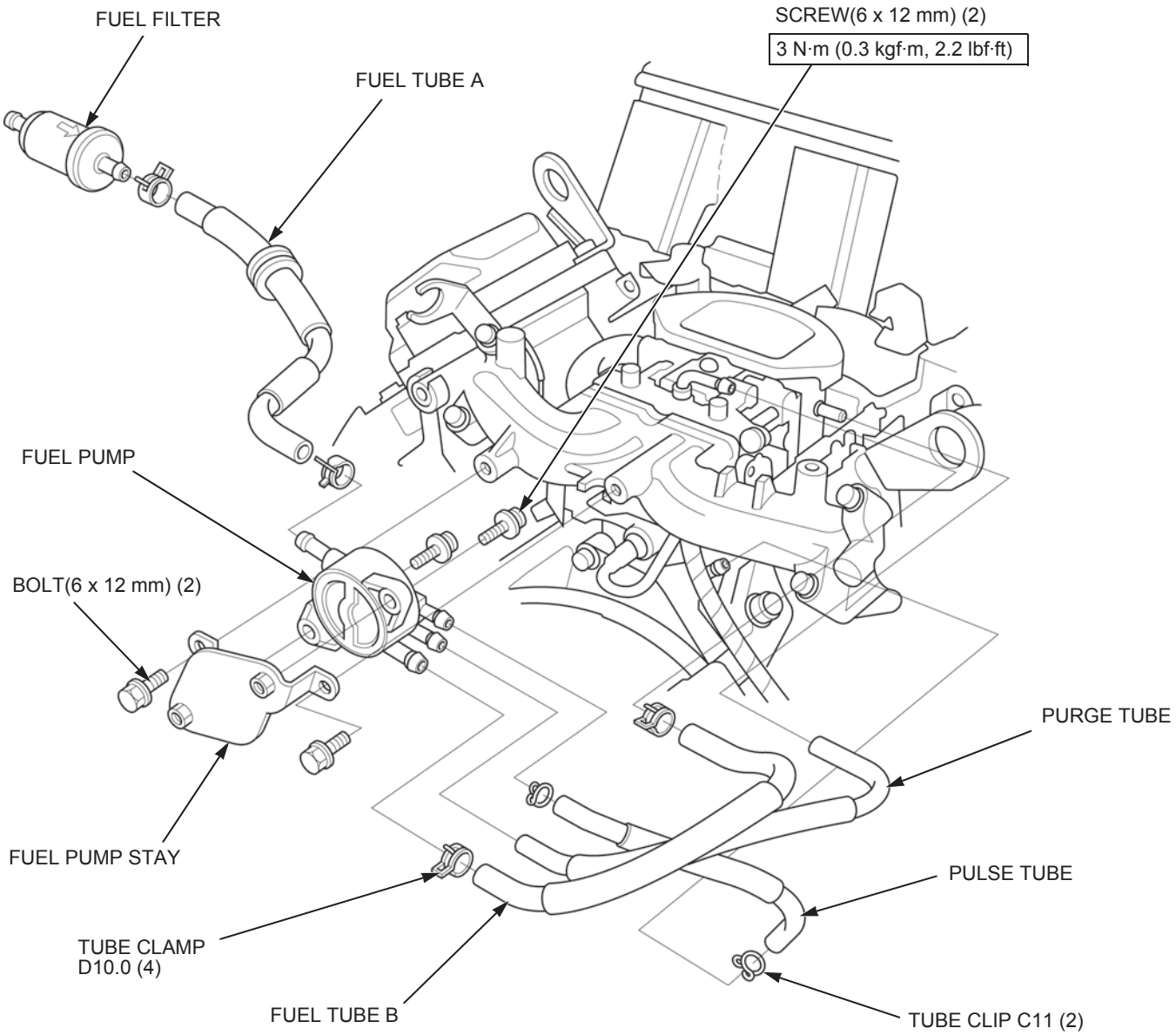
AIR CLEANER REMOVAL/ INSTALLATION



FUEL PUMP 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.



CARBURETOR REMOVAL/ INSTALLATION

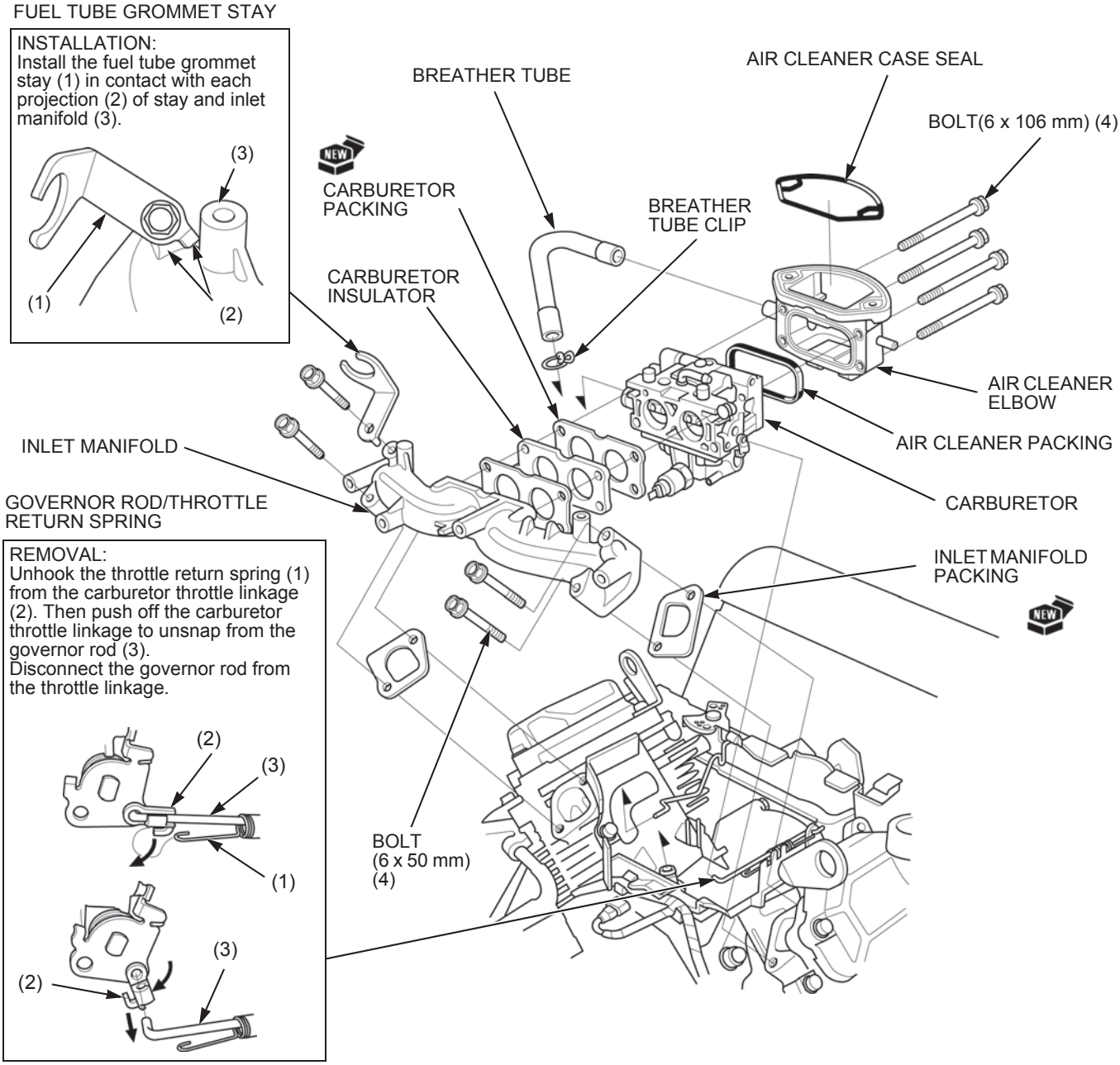
⚠WARNING

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 (page 6-3).

Attach a commercially available tube clamp to the fuel tube.
Disconnect the fuel tube from the carburetor.

Loosen the carburetor drain screw and drain the float chamber completely.



CARBURETOR DISASSEMBLY/ ASSEMBLY

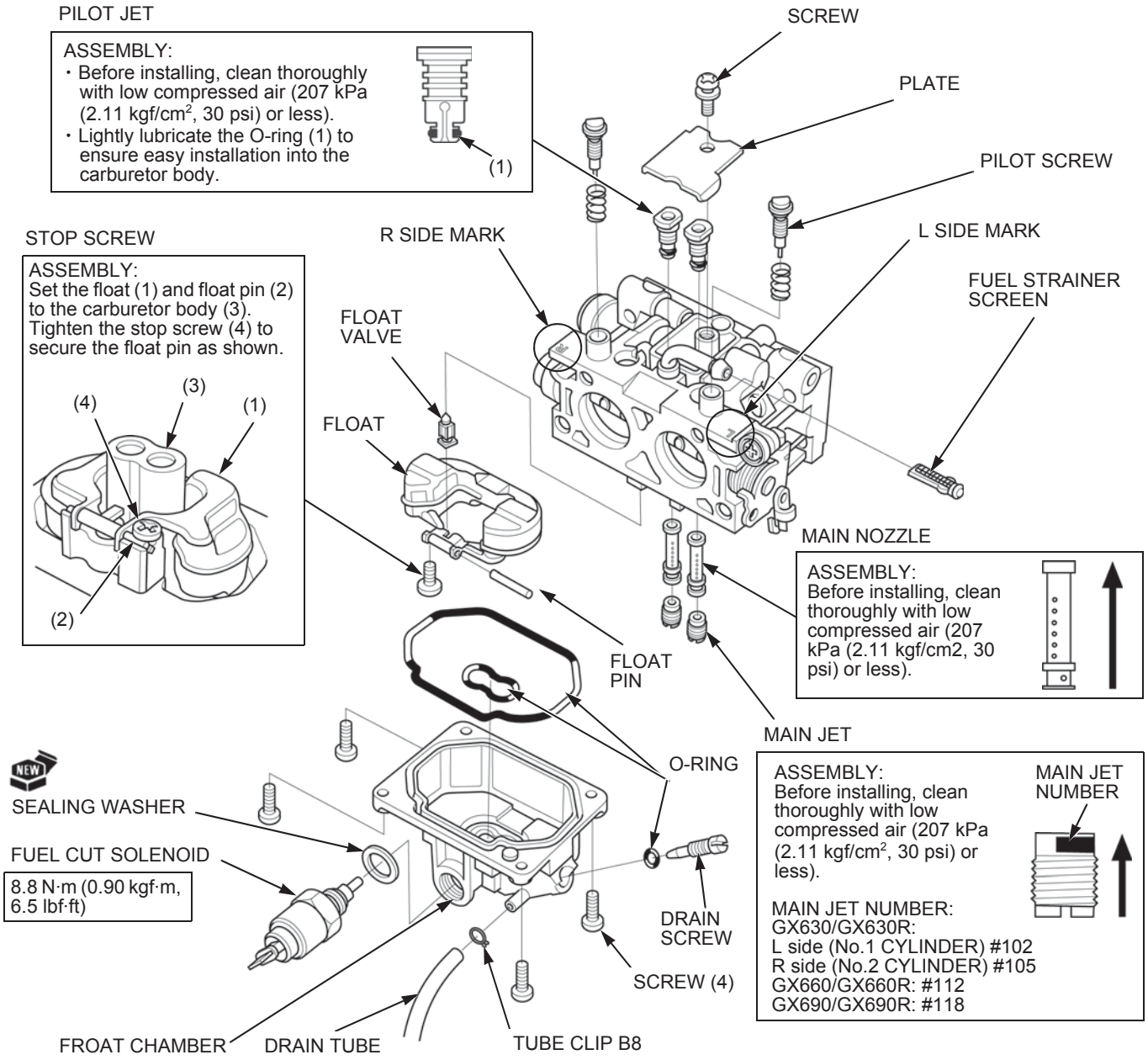
⚠WARNING

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

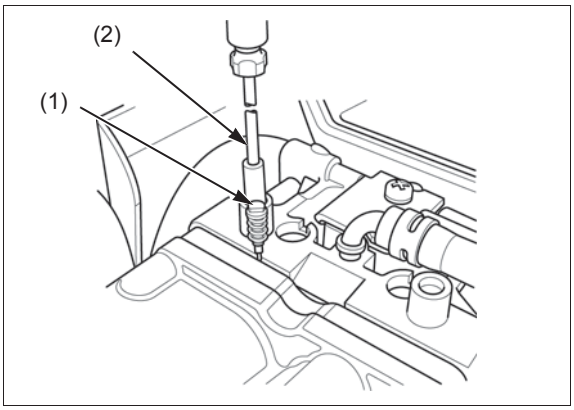
To prevent serious eye injury, always wear safety goggles or other eye protection when using compressed air.

Before disassembly, clean the outside of the carburetor.



PILOT SCREW REMOVAL/ INSTALLATION

Remove/install the pilot screw (1) using the special tool (2).



TOOL:
PILOT SCREW WRENCH (D) (2) 07KMA-MS60101

PILOT SCREW OPENING:
GX630/GX630R:
L side (No.1 cylinder): 2 turns out
R side (No.2 cylinder): 1 - 7/8 turns out
GX660/GX660R:
L side (No.1 cylinder): 1 - 3/4 turns out
R side (No.2 cylinder): 1 - 7/8 turns out
GX690/GX690R:
L side (No.1 cylinder): 1 - 7/8 turns out
R side (No.2 cylinder): 1 - 3/4 turns out

CARBURETOR BODY CLEANING

⚠CAUTION

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

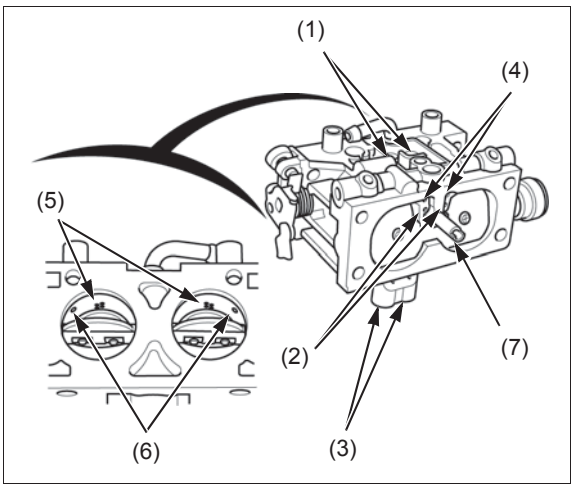
NOTICE

- *Some commercially available chemical cleaners are very caustic. These cleaners may damage plastic or parts such as the O-ring, the float and the float seat of the carburetor. Check the container for instructions. If you are in doubt, do not use these products to clean a Honda carburetor.*
- *High air pressure may damage the carburetor body. Use low air pressure (207 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 compressed air.

– Pilot jet hole (1)
– Main air jet (2)
– Main nozzle holder (3)
– Pilot air jet (4)
– Bypass ports (5)
– Pilot outlet ports (6)
– Internal vent port (7)



CARBURETOR INSPECTION

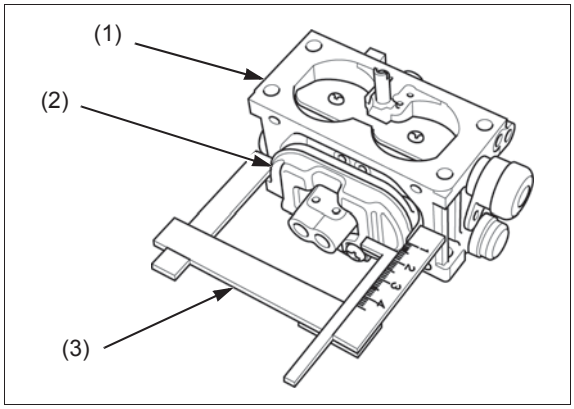
FLOAT LEVEL HEIGHT

Place the carburetor (1) in the position as shown and measure the distance between the float (2) top and carburetor body when the float just contacts the seat without compressing the valve spring.

TOOL:
Float level gauge (3) 07401-0010000

FLOAT HEIGHT: 15.5 mm (0.61 in)

If the measured float height is out of specification, check the float valve and the float valve spring (see below).If the float valve and the float valve spring are normal, replace the float.



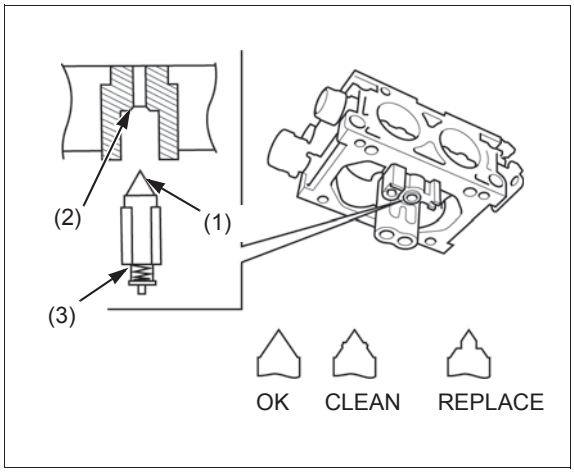
FLOAT VALVE

Check a worn float valve (1).

Check the float valve and valve seat (2) for contamination.

Check for wear or a weak spring (3).

After installation, check the operation of float valve.



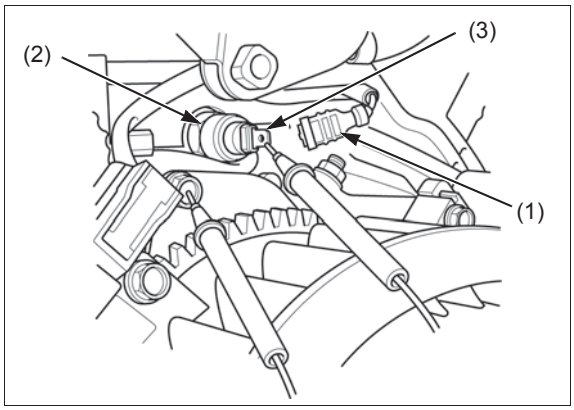
FUEL CUT SOLENOID

Remove the fan cover (page 5-2).

Disconnect the wire harness (1) from the fuel cut solenoid (2).

Apply 12V battery voltage between the terminal of the fuel cut solenoid (3) and engine ground and check the solenoid operating noise.

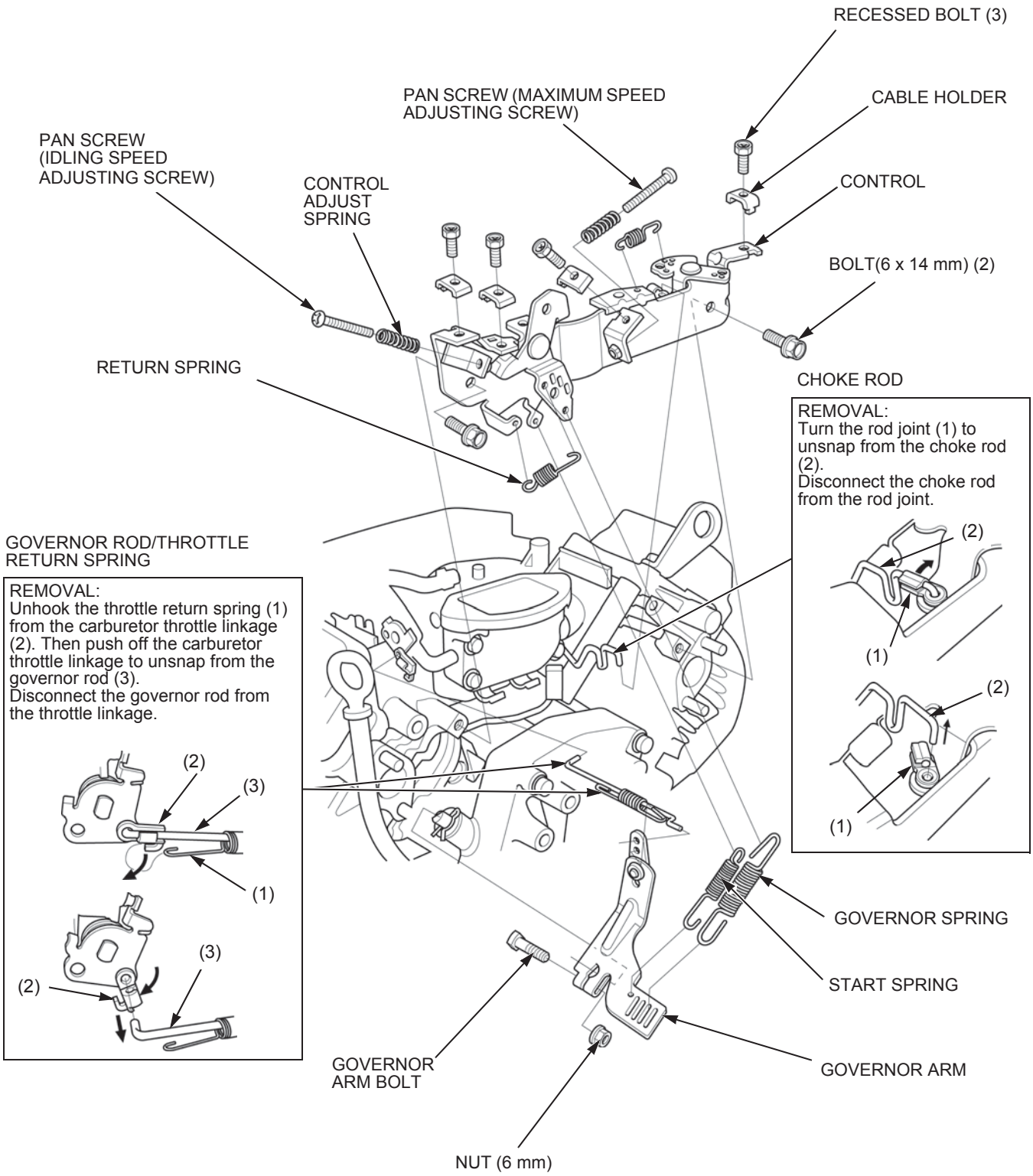
If the fuel cut solenoid does not operate, replace the fuel cut solenoid (page 6-6).



7. GOVERNOR SYSTEM

GOVERNOR ARM/CONTROL REMOVAL/INSTALLATION

Remove the air cleaner (page 6-3).

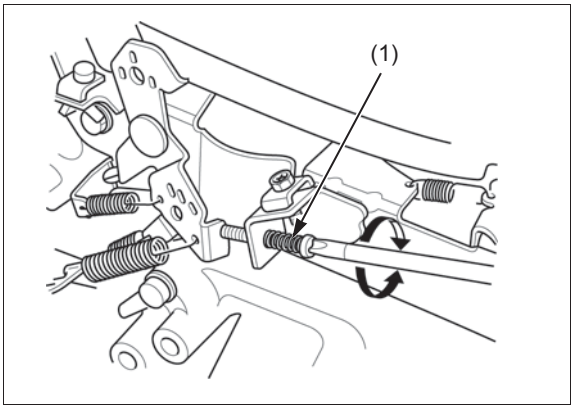


MAXIMUM SPEED ADJUSTMENT

Start the engine and allow it to warm up to normal operating temperature.

Turn the pan screw (1) of the control to obtain the specified maximum speed.

MAXIMUM SPEED: 3,850 ± 150 min^{-1} (rpm)
3,150 ± 150 min^{-1} (rpm)
(GX630R QYD, VEP4, GX660R VXF types only)
3,200 ± 150 min^{-1} (rpm)
(GX630R VXD8, VXE1, GX660R VXE1, GX690R VXE types only)



GOVERNOR ARM INSTALLATION (Without auto throttle type)

Install the governor arm (1) on the governor arm shaft (2) by aligning the cutout.

Tighten the governor arm nut (3).

TORQUE: 11 N·m (1.1 kgf·m, 8 lbf·ft)

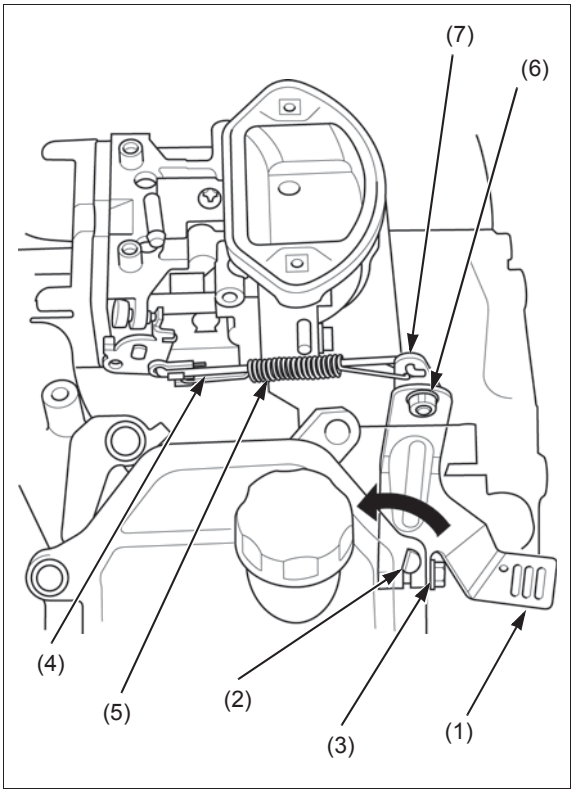
Connect the governor rod (4) and throttle return spring (5) to the governor arm and carburetor.

Loosen the governor sub arm nut (6).

Rotate the governor arm counterclockwise to fully open the carburetor throttle valve.

Rotate the governor sub arm (7) counterclockwise as far as it will go.

Hold the governor arm and governor sub arm, tighten the governor sub arm nut securely.



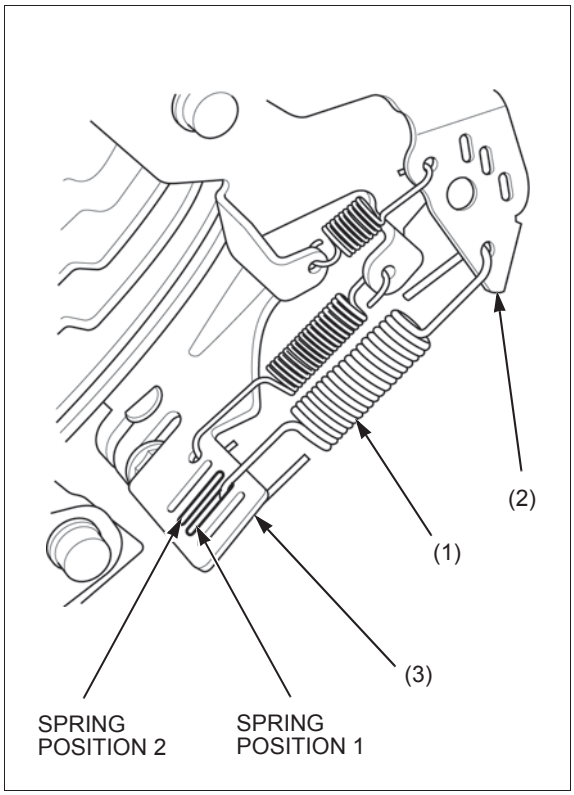
GOVERNOR SPRING INSTALLATION

Hook the governor spring (1) to the throttle lever (2) of the control.

Refer to the table below to confirm the governor spring position on the governor arm (3).

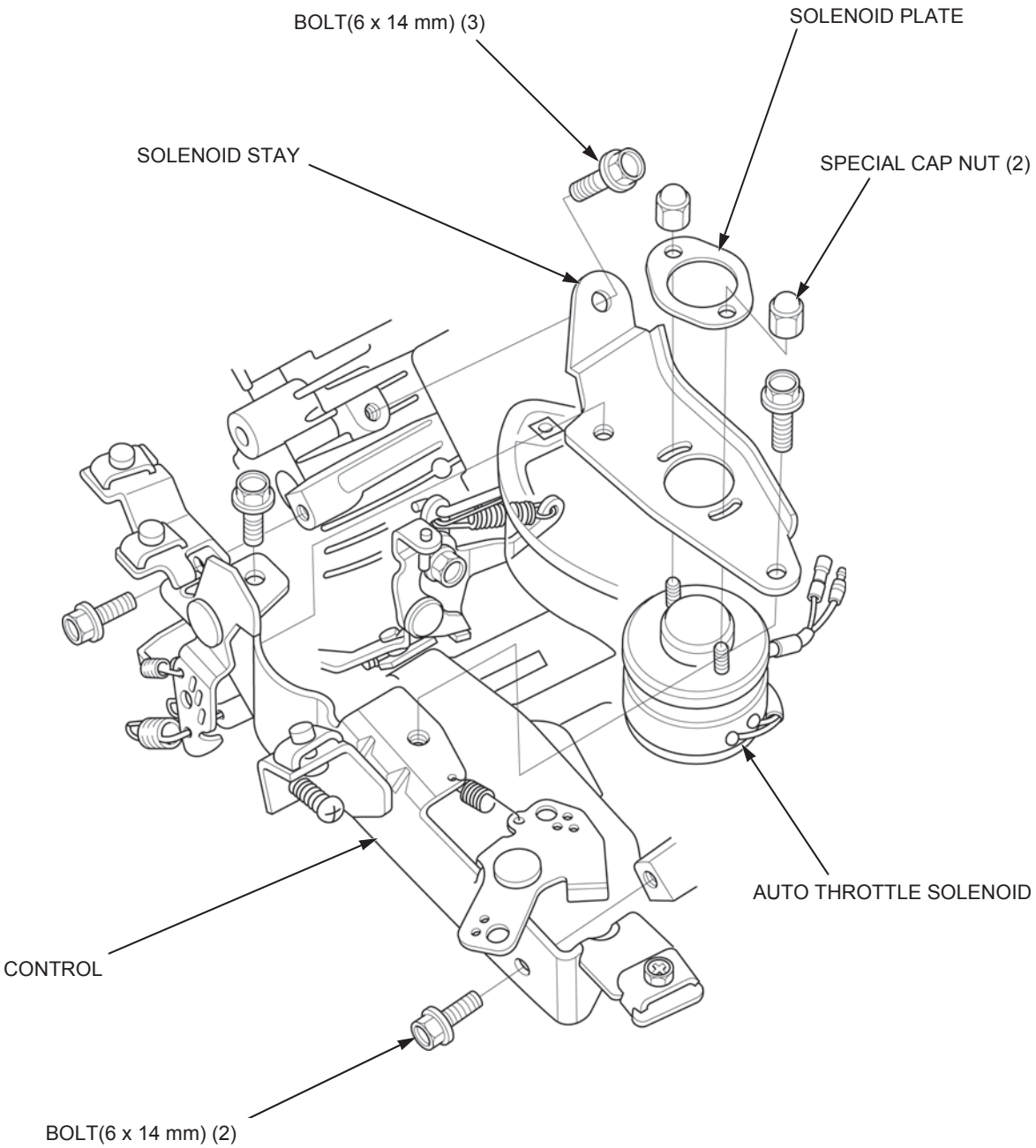
- The engine type is stamped on the crankcase near the engine serial number (page 1-2).

Model	Type	Spring position
GX630	All types	1
GX630R	Except QYD, VEP4, VXD8, VXE1, VXF	1
	QYD, VEP4, VXD8, VXE1, VXF	2
GX660	All types	1
GX660R	Except VXE1	1
	VXE1	2
GX690	All types	1
GX690R	Except VXE	1
	VXE	2



AUTO THROTTLE SOLENOID
REMOVAL

Remove the air cleaner case (page 6-3).
Disconnect the choke rod from the control (page 7-2).
Unhook the governor spring and start spring from the governor arm (page 7-2).



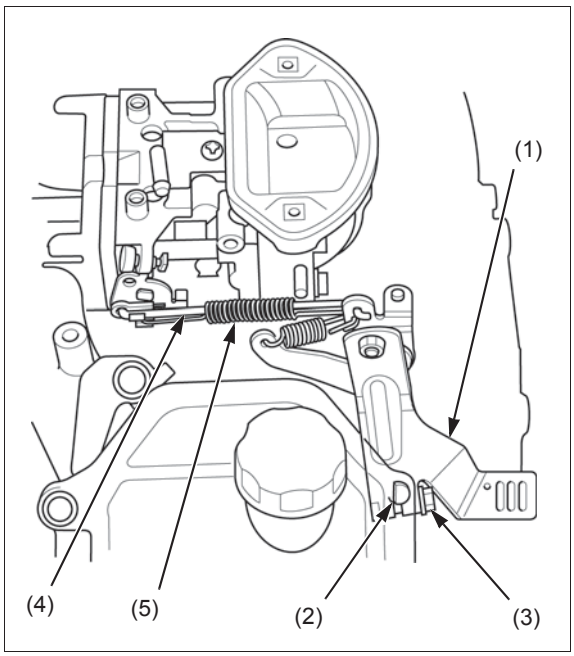
AUTO THROTTLE SOLENOID/ GOVERNOR ARM INSTALLATION

Install the governor arm (1) on the governor arm shaft (2) by aligning the cutout.

Tighten the governor arm nut (3).

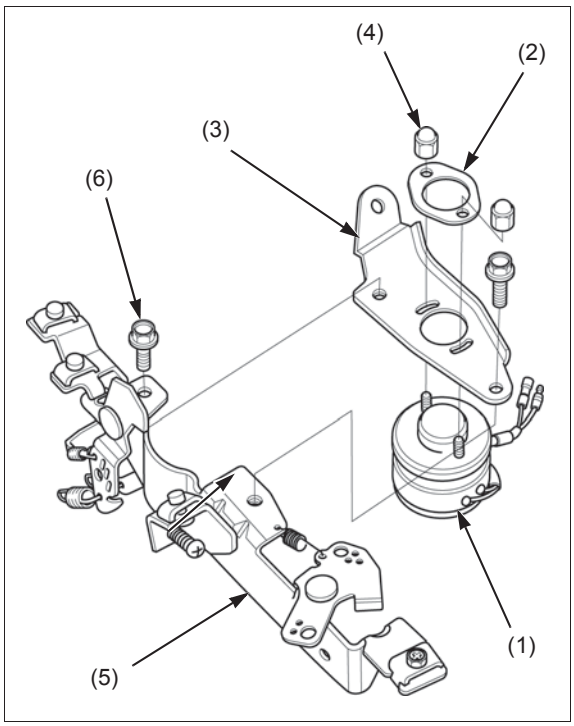
TORQUE: 11 N·m (1.1 kgf·m, 8 lbf·ft)

Connect the governor rod (4) and throttle return spring (5) to the governor arm and carburetor.



Install the auto throttle solenoid (1) and solenoid plate (2) on the solenoid stay (3) and loosely tighten the two special cap nuts (4).

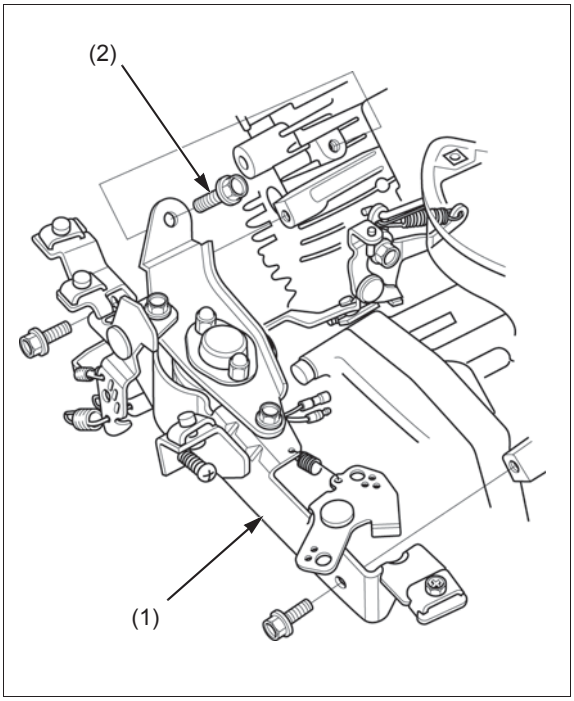
Install the solenoid stay on the control (5) and tighten the two bolts (6).



Route the auto throttle solenoid harness on the upper shroud loosely (page 2-9).

Install the control (1) on the cylinders and tighten the three bolts (2).

Hook the governor spring and start spring to the governor arm (page 7-4).



Rotate the governor arm (1) to fully open the throttle valve (2).

Slowly rotate the auto throttle solenoid (3) so the distance between the auto throttle lever (4) and the pin (5) of the governor sub arm (6) is in the specified clearance.

Do not rotate the governor sub arm during this procedure.

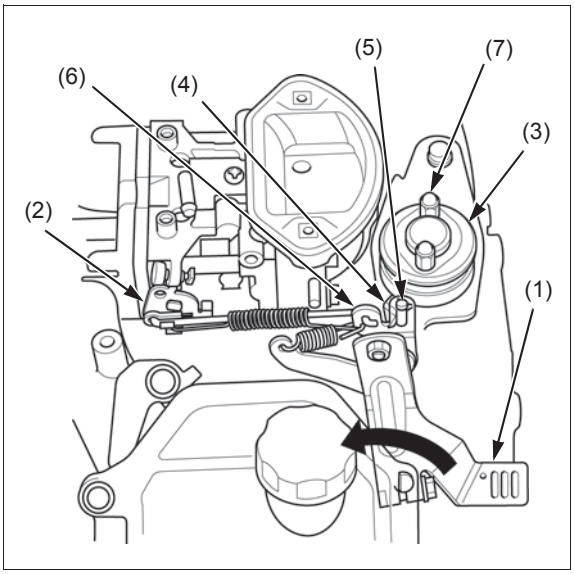
CLEARANCE: 0 – 1 mm (0 – 0.04 in)

Tighten the special cap nuts (7) to secure the auto throttle solenoid.

Check the clearance between the auto throttle lever and the governor sub arm pin.

Take up the slack of the auto throttle solenoid harness and route the crankcase (page 2-9).

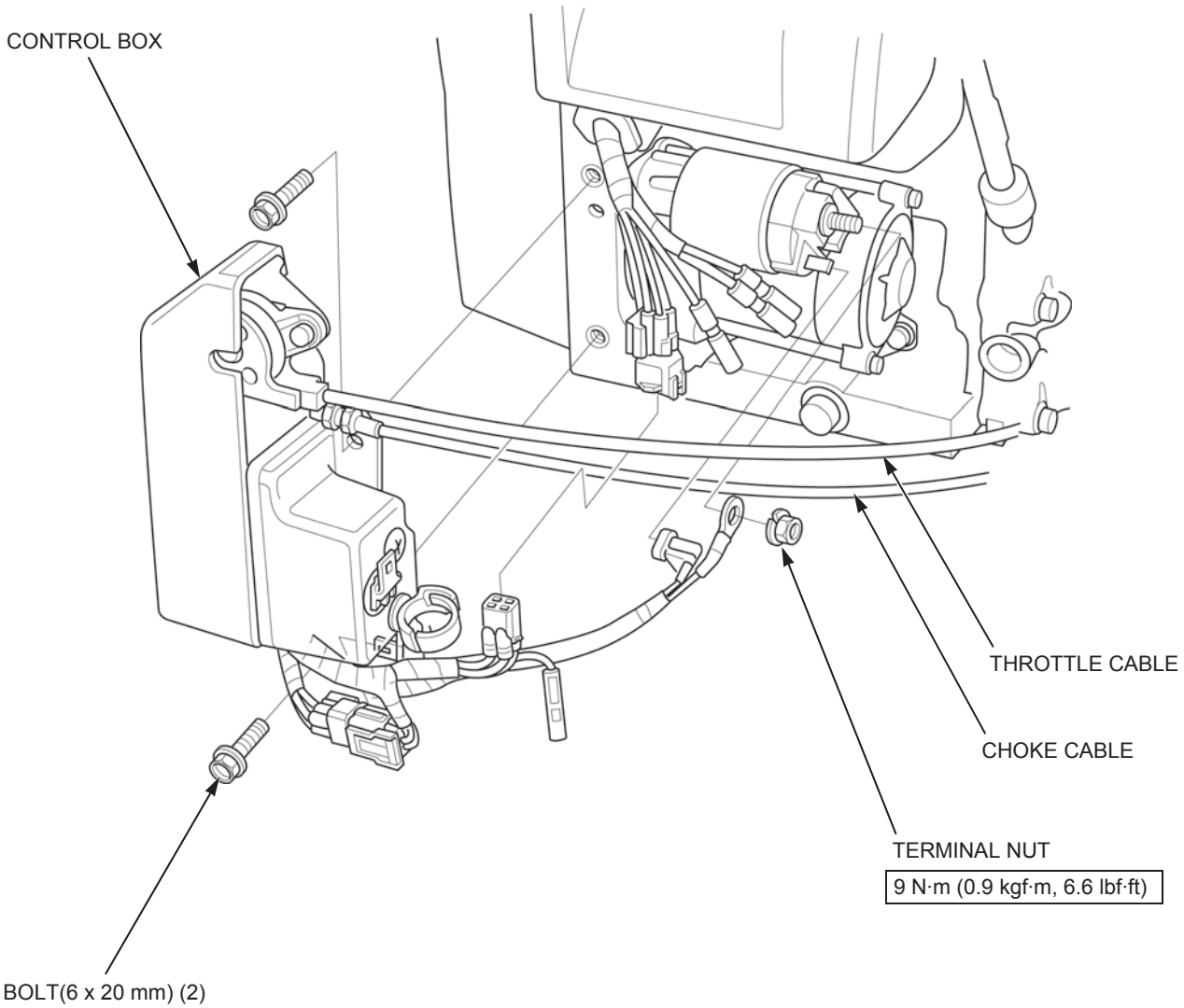
Rotate the governor arm to fully open the throttle valve and be sure that the pin on the governor sub arm is not touching to the auto throttle lever.



CONTROL BOX REMOVAL/ INSTALLATION

Disconnect the throttle cable and the choke cable from the control.

Disconnect the combination switch terminals and connector from the starter motor and regulator/rectifier.



THROTTLE CABLE INSTALLATION

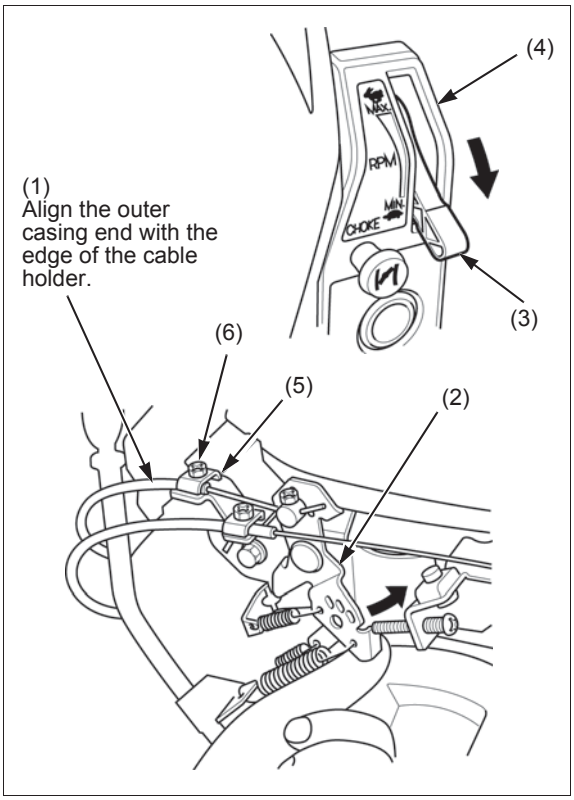
Connect the throttle cable (1) to the throttle lever (2) of the control.

Move the throttle lever (3) on the control box (4) to throttle off position.

Pull the throttle cable and be sure not to slack it.
Set the throttle cable to the cable holder (5) of the control as shown.
Tighten the recessed bolt (6) on the cable holder to secure the throttle cable.

Move the throttle lever of the control box to throttle off position and be sure there is free play of the throttle position.
Move the throttle lever of the control box to full throttle position and be sure the throttle lever of the control touches the maximum speed adjusting screw.

Secure the choke cable to the oil level pipe with the wire band.



CHOKE CABLE INSTALLATION

Install the choke cable (1) on the control box bracket (2).

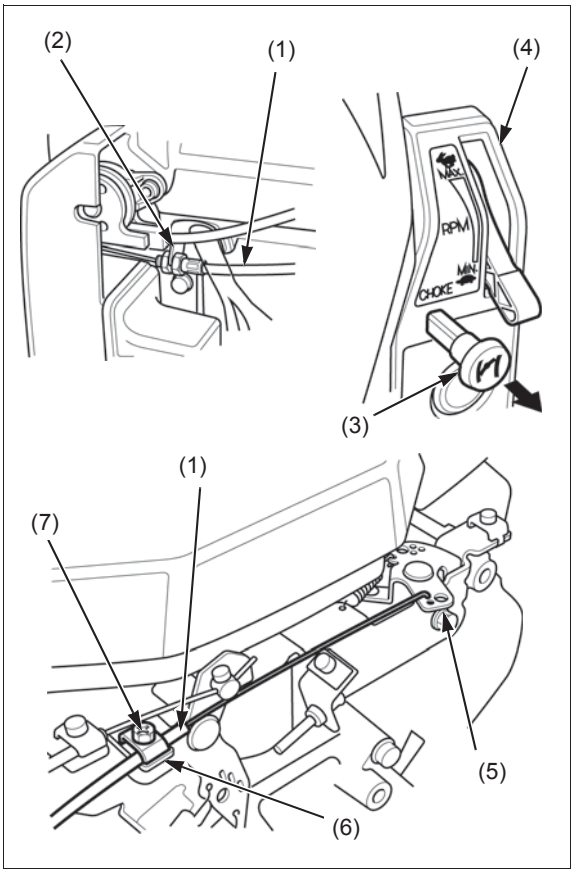
Pull the choke knob (3) of the control box (4) to the fully closed position.

Hook the choke cable to the choke lever (5) of the control.

Pull the choke cable until the choke lever of the control touches with the control to fully close the carburetor choke valve.
Set the choke cable to the cable holder (6) of the control and be sure not to slack it.
Tighten the recessed bolt (7) on the cable holder to secure the choke cable.

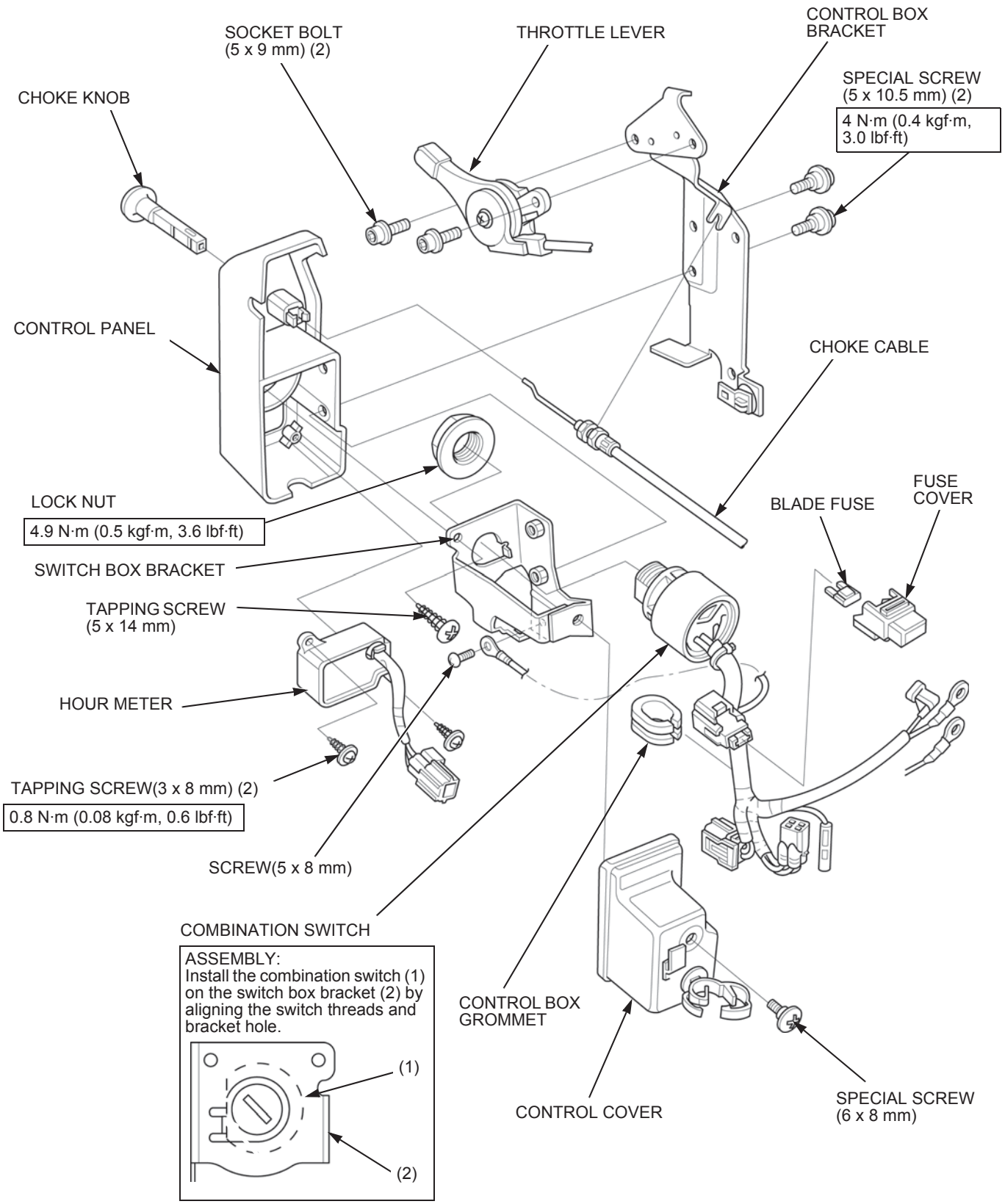
Push the choke knob of the control box fully and be sure the choke lever of the control returns to the original position.
Pull the choke knob of the control box until it clicks and be sure the choke lever of the control touches the control base.

Secure the choke cable to the oil level pipe with the wire band.



CONTROL BOX DISASSEMBLY/ ASSEMBLY

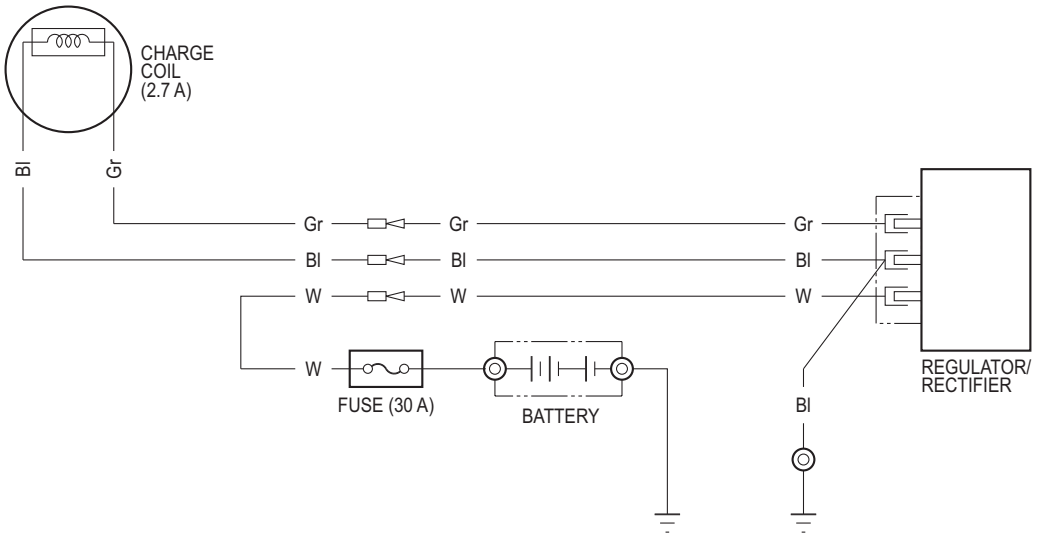
Remove the control box (page 7-8).



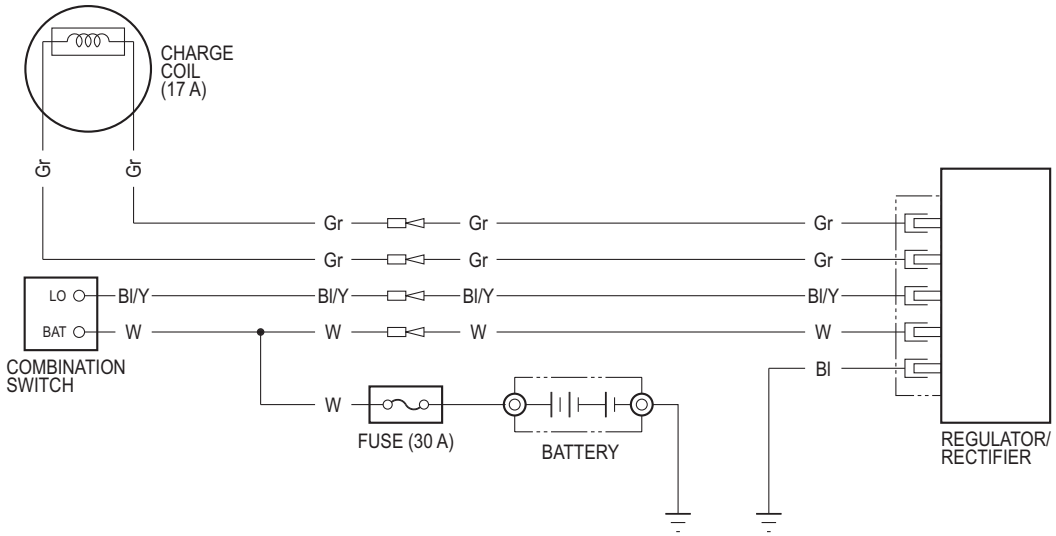
8. CHARGING SYSTEM

SYSTEM DIAGRAM

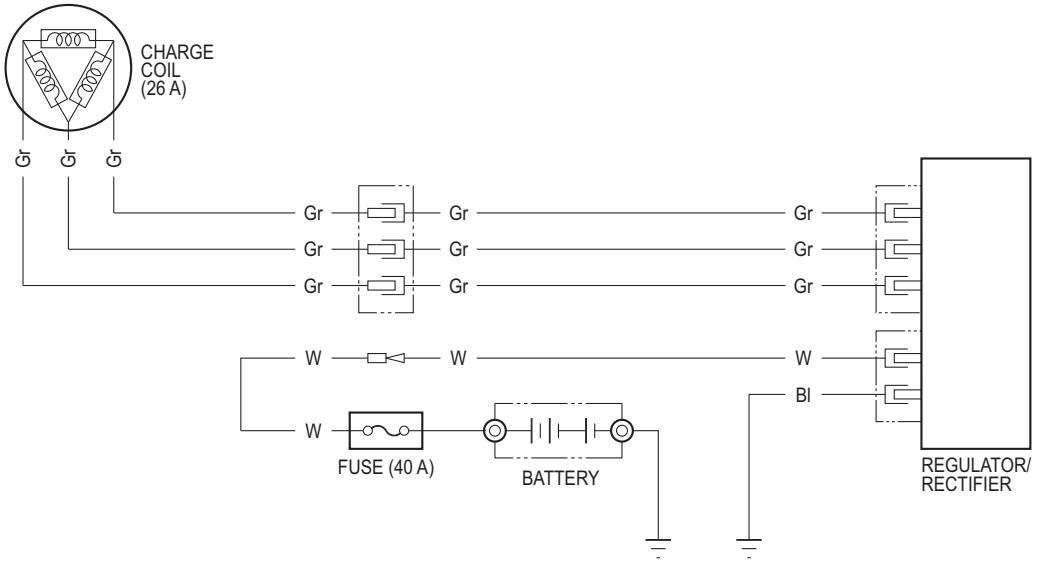
2.7 A CHARGE COIL TYPE



17 A CHARGE COIL TYPE

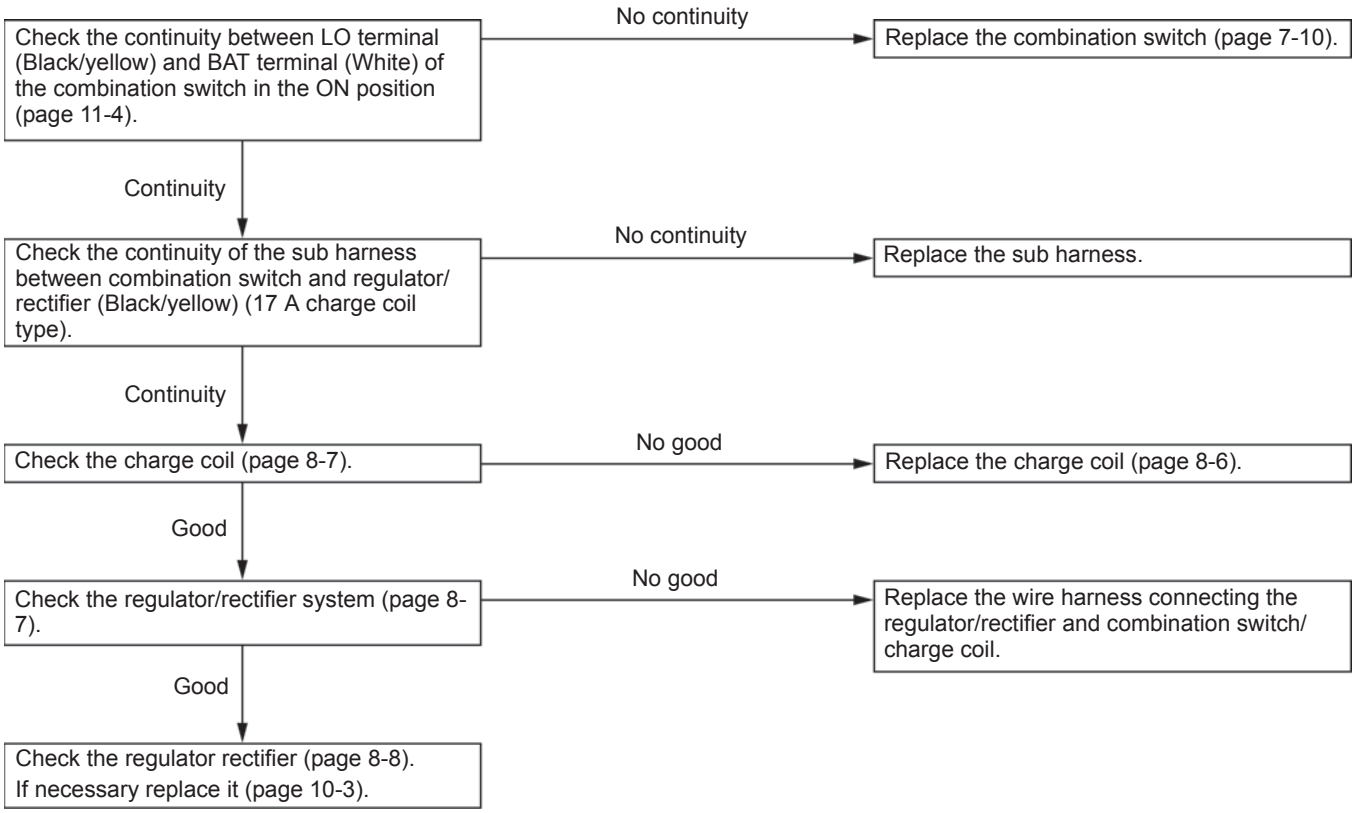


26 A CHARGE COIL TYPE



CHARGING SYSTEM TROUBLESHOOTING

BATTERY DAMAGED OR WEAK



COOLING FAN/FLYWHEEL REMOVAL/ INSTALLATION

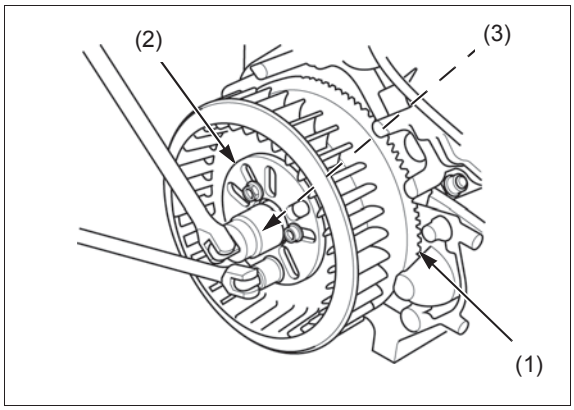
REMOVAL

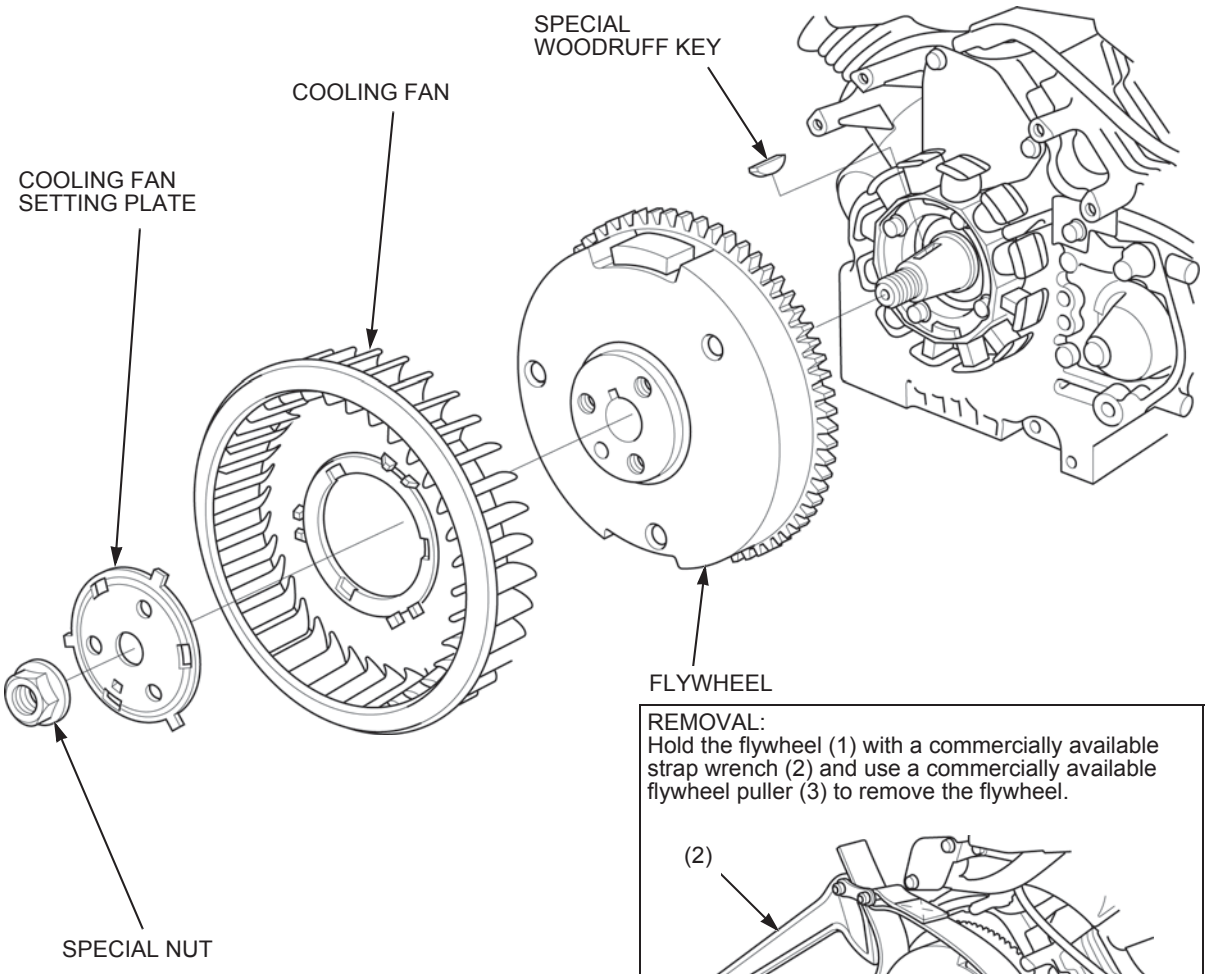
Remove the following parts.

– Fan cover (page 5-2)
– L./R. lower shroud (page 5-5)
– Ignition coil (page 9-4)

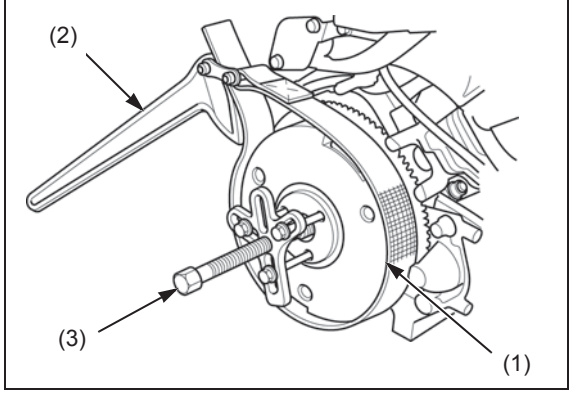
Hold the flywheel (1) with the special tool (2) and remove the special nut (3).

TOOL:
Clutch center holder (2) 07JMB-MN50301





REMOVAL:
Hold the flywheel (1) with a commercially available strap wrench (2) and use a commercially available flywheel puller (3) to remove the flywheel.



INSTALLATION

Clean the tapered part of the crankshaft (1) and flywheel (2) 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 of the flywheel.

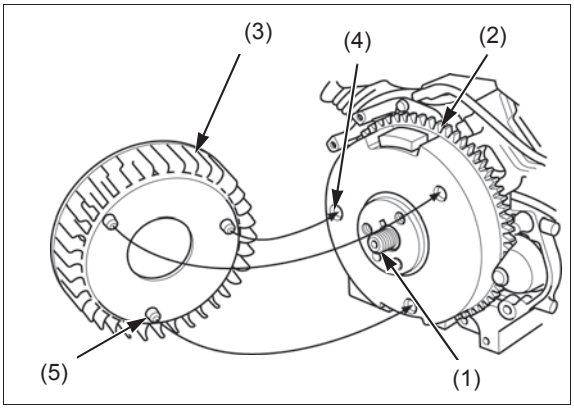
Set the special woodruff key in the key groove of the crankshaft securely.

Install the flywheel on the crankshaft.

NOTICE

The flywheel may push the key out of its slot; check after installation.

Attach the cooling fan (3) by aligning the holes (4) with projections (5) as shown.



Attach the cooling fan setting plate (1) to the cooling fan (2) by aligning the claws of the cooling fan setting plate with the projections of the cooling fan

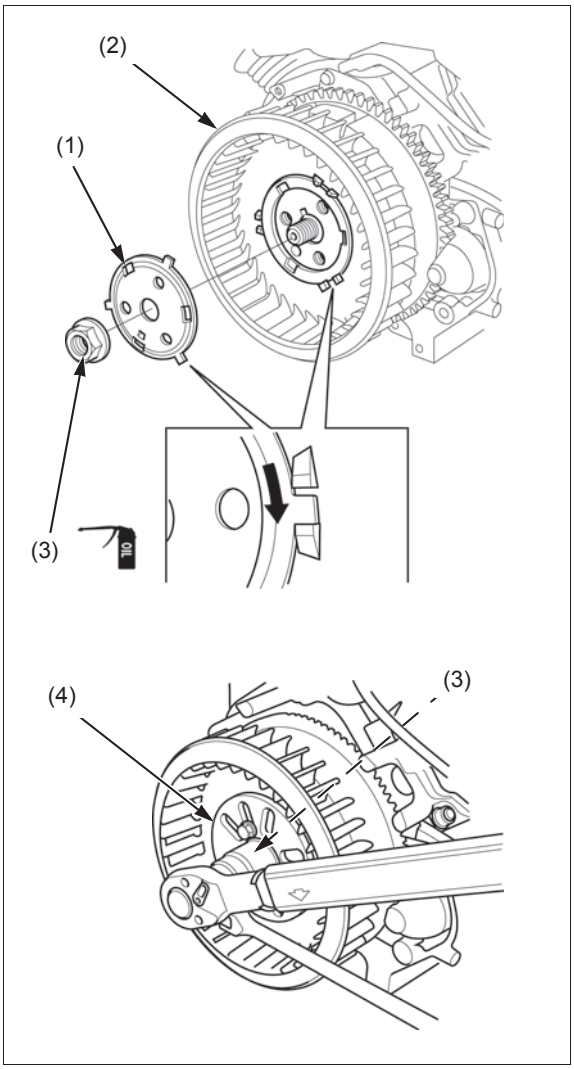
Rotate the cooling fan setting plate clockwise to touch the claw of the cooling fan setting plate with projections of the cooling fan.

Apply a light coat of oil to the threads and the seating surface of the special nut (3) and loosely tighten the nut.

Hold the flywheel with special tool (4), tighten the special nut to the specified torque.

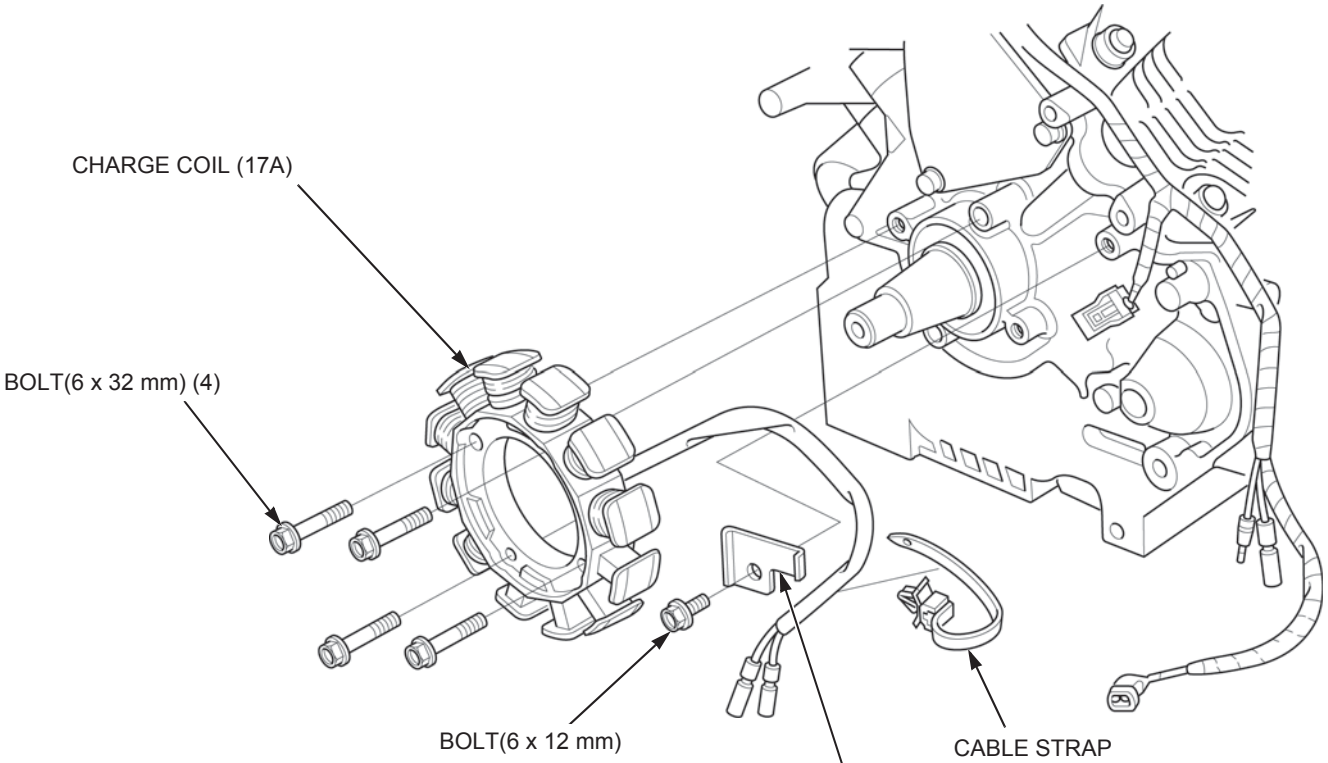
TOOL:
Clutch center holder (4) 07JMB-MN50301

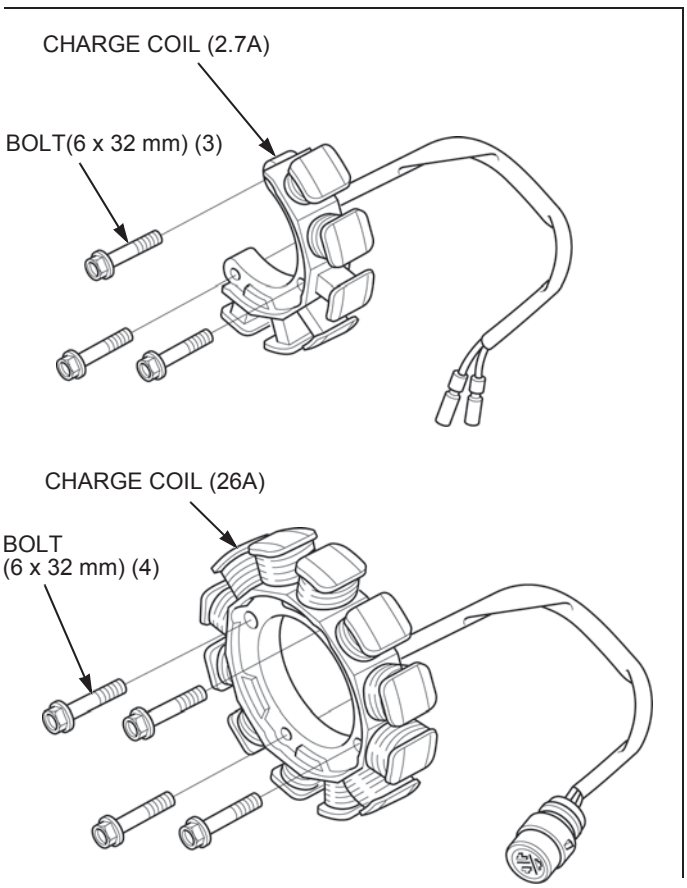
TORQUE: 235 N·m (24 kgf·m, 173 lbf·ft)



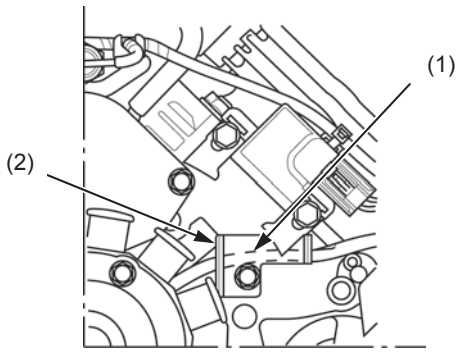
CHARGE COIL REMOVAL/ INSTALLATION

Remove the flywheel (page 8-4).





INSTALLATION:
Be sure not to pinch the charge coil wire (1) with the harness bracket (2).



CHARGE COIL INSPECTION

Disconnect the charge coil connector/s.

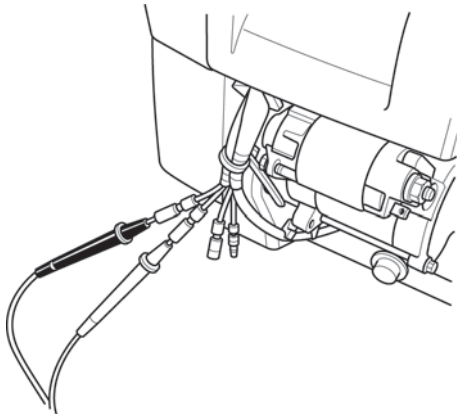
Measure the resistance between the terminals of the charge coil.

Resistance:
2.7 A: 1.95 - 2.93 Ω
17 A: 0.18 - 0.28 Ω
26 A: 0.17 - 0.25 Ω

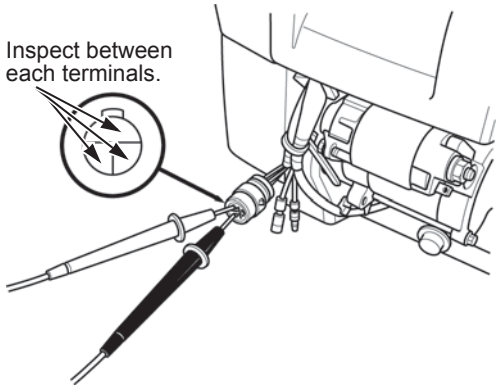
Check for continuity between each terminal and engine ground.
There should be no continuity.

If the measured resistance is not within the range specification or if any wire has continuity to engine ground, replace the charge coil (page 8-6).

2.7 A / 17 A TYPES:



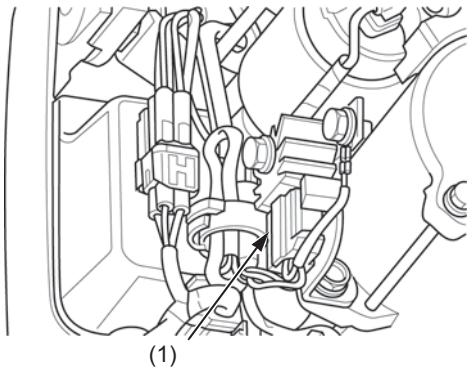
26 A TYPE:



REGULATOR/RECTIFIER SYSTEM INSPECTION

Disconnect the regulator/rectifier connector (1) and check the regulator/rectifier connector terminals (wire harness side) as follows:

Item	Terminal	Specification
Battery charging line	White (+) and ground	Battery voltage should register
Charge coil line	Gray and ground	2.7A: 1.95 - 2.93 Ω
		17A: 0.18 - 0.28 Ω
		26A: 0.17 - 0.25 Ω
Ground line	Black and ground	Continuity should exist



REGULATOR/RECTIFIER INSPECTION

Disconnect the regulator/rectifier connector/s.

Measure the resistance between the terminals and be sure that the measurements are within the specifications in the table below.

- Use a following range of recommended analog multitester.
  SP-15D (SANWA): kΩ range
  TH-5H (KOWA): R x 100 range

2.7 A: Unit: Ω

		(+) probe		
		CHG1	CHG2	BAT
(-) probe	CHG1	–	∞	∞
	CHG2	∞	–	∞
	BAT	1k – 10k	∞	–

17 A: Unit: Ω

		(+) probe		
		ACG1	ACG2	BAT
(-) probe	ACG1	–	∞	290 – 22k
	ACG2	∞	–	290 – 22k
	BAT	∞	∞	–
	SENSE	80k – ∞	80k – ∞	120k – ∞
	CHG.M	150k – ∞	150k – ∞	300k – ∞
	GND	∞	∞	∞

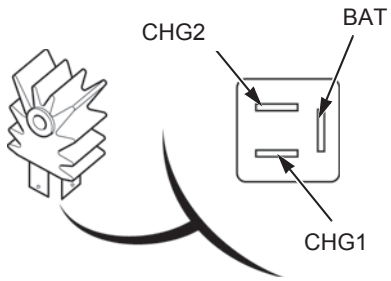
		(+) probe		
		SENSE	CHG.M	GND
(-) probe	ACG1	∞	∞	∞
	ACG2	∞	∞	∞
	BAT	∞	∞	∞
	SENSE	–	2k – 150k	8k – 150k
	CHG.M	300 – 30k	–	20k – 300k
	GND	∞	∞	–

26 A: Unit: Ω

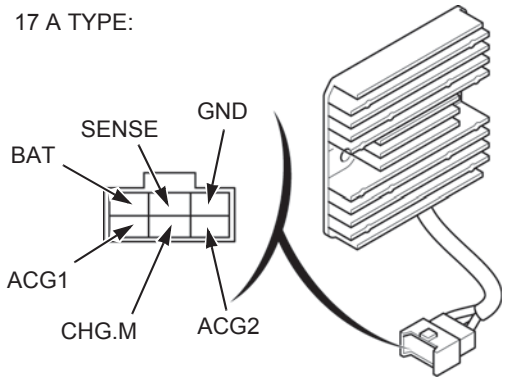
		(+) probe		
		ACG1	ACG2	ACG3
(-) probe	ACG1	–	30k – 420k	30k – 420k
	ACG2	30k – 420k	–	30k – 420k
	ACG3	30k – 420k	30k – 420k	–
	BAT	30k – 420k	30k – 420k	30k – 420k
	LAMP	∞	∞	∞
	GND	30k – 950k	30k – 950k	30k – 950k

		(+) probe		
		BAT	LAMP	GND
(-) probe	ACG1	∞	∞	∞
	ACG2	∞	∞	∞
	ACG3	∞	∞	∞
	BAT	–	30k – 340k	15k – 190k
	LAMP	∞	–	∞
	GND	400 – 25k	30k – 420k	–

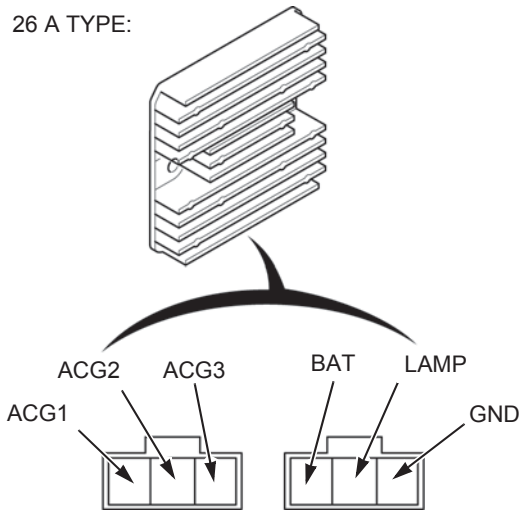
2.7 A TYPE:



17 A TYPE:

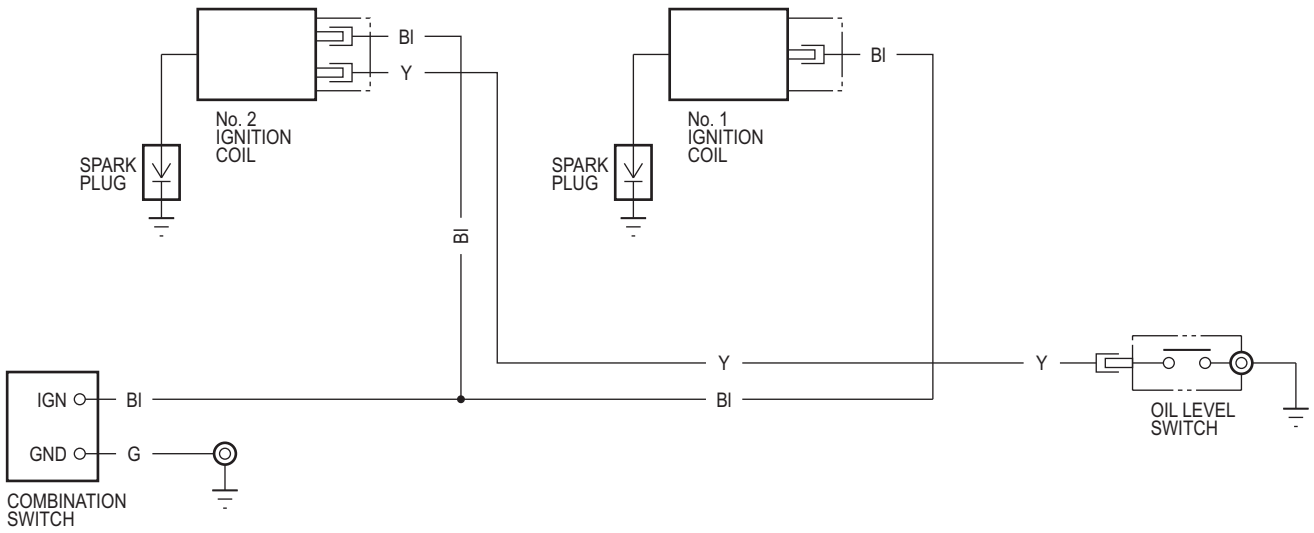


26 A TYPE:



9. IGNITION SYSTEM

SYSTEM DIAGRAM



IGNITION SYSTEM TROUBLESHOOTING

NO SPARK AT SPARK PLUG

Check whether the oil indicator is on (applicable types).
Check the engine oil level (page 3-3) (oil level switch applicable types).

Indicator is on or low oil → Add engine oil (page 3-3).

Sufficient oil ↓

Disconnect the oil level switch wire connector (Yellow) and perform the spark test (page 9-5).

Sparks → Inspect the oil level switch (page 11-3).

No spark ↓

Check the continuity of the wire harness connecting the oil level switch and ignition coils (Yellow) (oil level switch applicable types).

Continuity → Replace the engine wire harness.

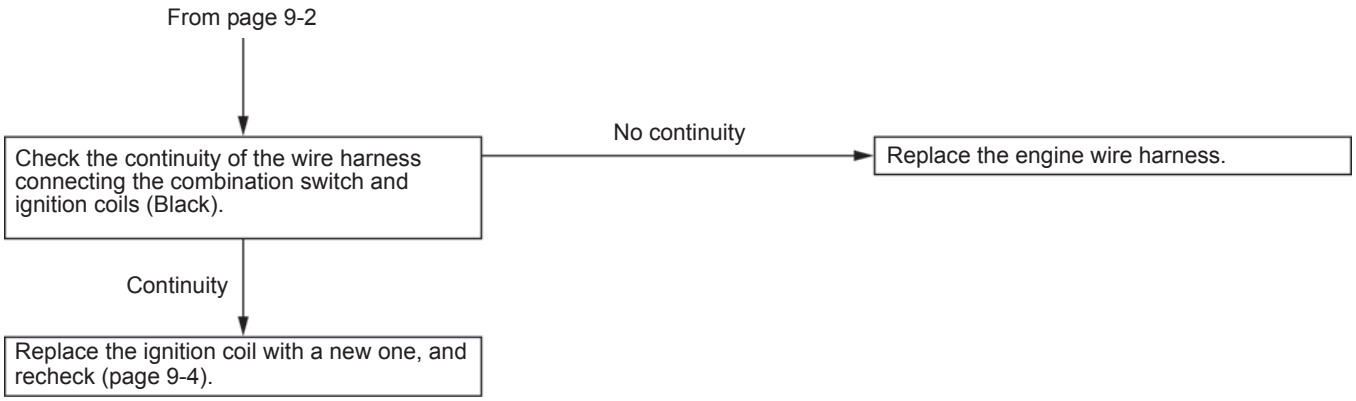
No continuity ↓

Check the continuity between IGN terminal (Black) and GND terminal (Green) of the combination switch in the ON position (page 11-4).

No continuity → Replace the combination switch (page 7-10).

Continuity ↓

Go to page 9-3

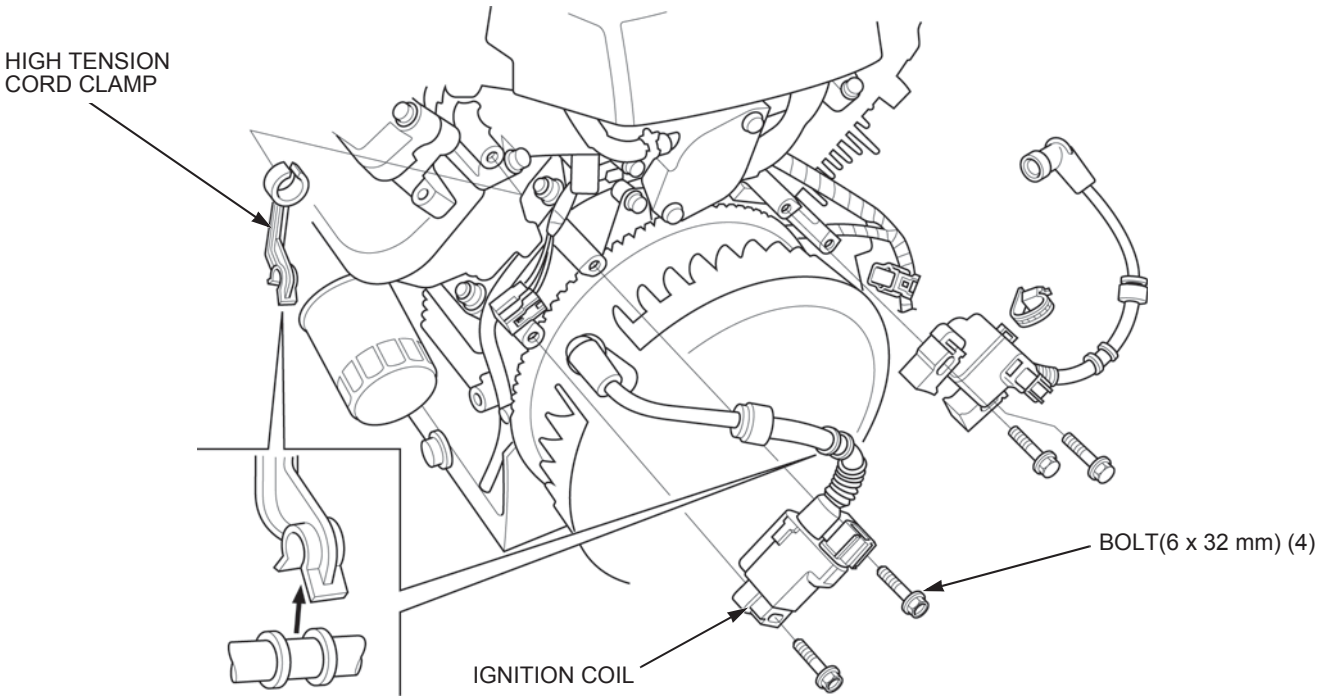


IGNITION COIL REMOVAL/ INSTALLATION

REMOVAL

Remove the following parts:

– Fan cover (page 5-2).
– L./R. lower shroud (page 5-5).



INSTALLATION

Attach the ignition coil (1) and loosely tighten the two flange bolts (2).

Insert the thickness gauge (3) of proper thickness between the ignition coil and the flywheel (4).

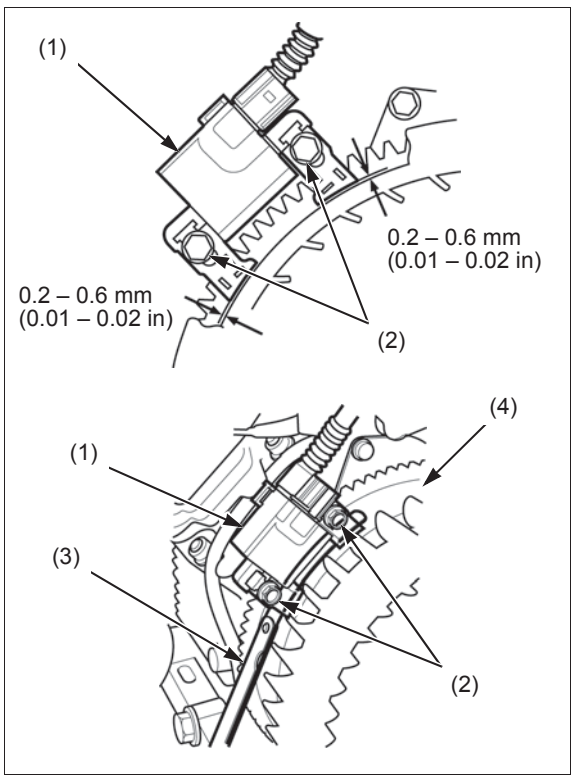
IGNITION COIL AIR GAP:
0.2 – 0.6 mm (0.01 – 0.02 in)

NOTICE

Adjust the ignition coil air gap equally at both side.

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

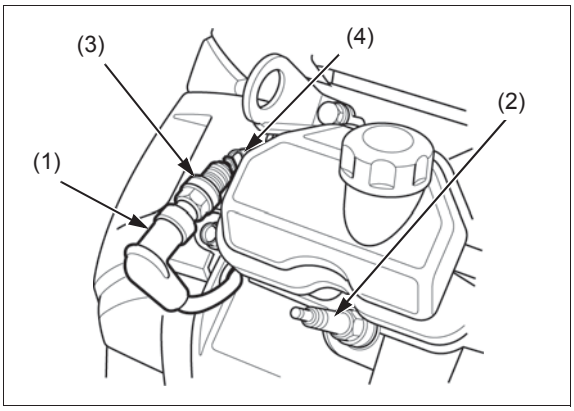
Remove the thickness gauge.



SPARK TEST

Inspect the following before spark test.

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



Disconnect the spark plug cap (1) from the spark plug (2).

Connect a known-good spark plug (3) to the spark plug cap and ground the spark plug to the head cover bolt (4).

Crank the engine by operating the starter motor several seconds and check whether sparks jump across the electrode.

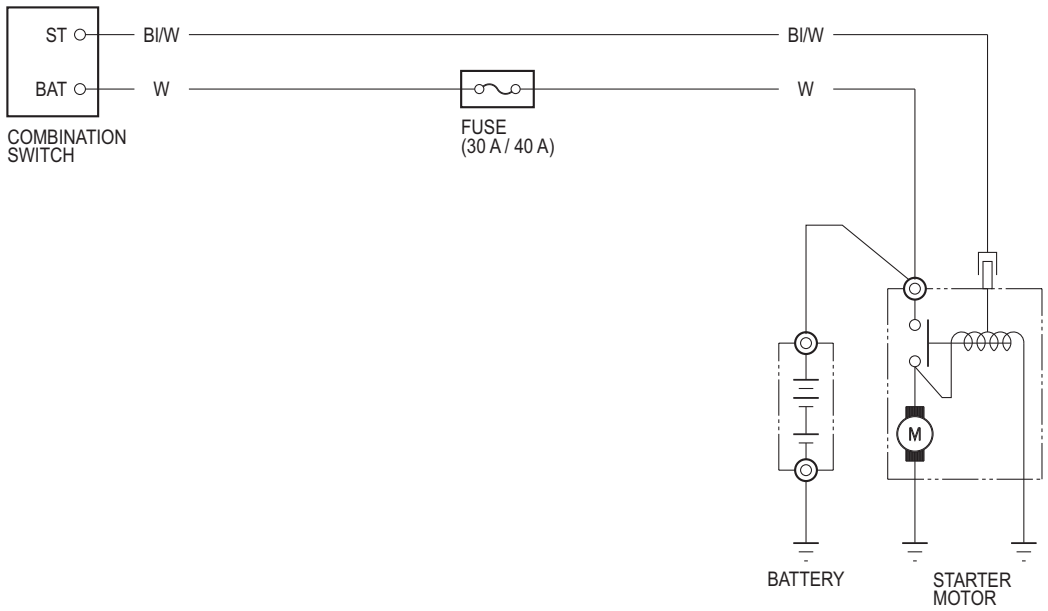
NOTICE

Do not operate the starter motor for more than 5 seconds at a time. When operating the starter motor several times in a row, wait 10 – 20 seconds between operation to recover the battery voltage.

MEMO

10. STARTING SYSTEM

SYSTEM DIAGRAM



STARTING SYSTEM TROUBLESHOOTING

STARTER MOTOR DOES NOT OPERATE

Check the battery condition.
- No good → Replace with a known-good battery. If the battery runs out again, perform the CHARGING SYSTEM TROUBLESHOOTING (page 8-3).
- Good ↓

Check the battery voltage between the starter motor side positive (+) battery cable terminal and engine ground.
- Low voltage → Replace battery positive (+) cable.
- Good ↓

Check the continuity between BAT terminal (W) and ST terminal (Black/white) of the combination switch in the START position (page 11-4).
- No continuity → Replace the combination switch (page 7-10).
- Continuity ↓

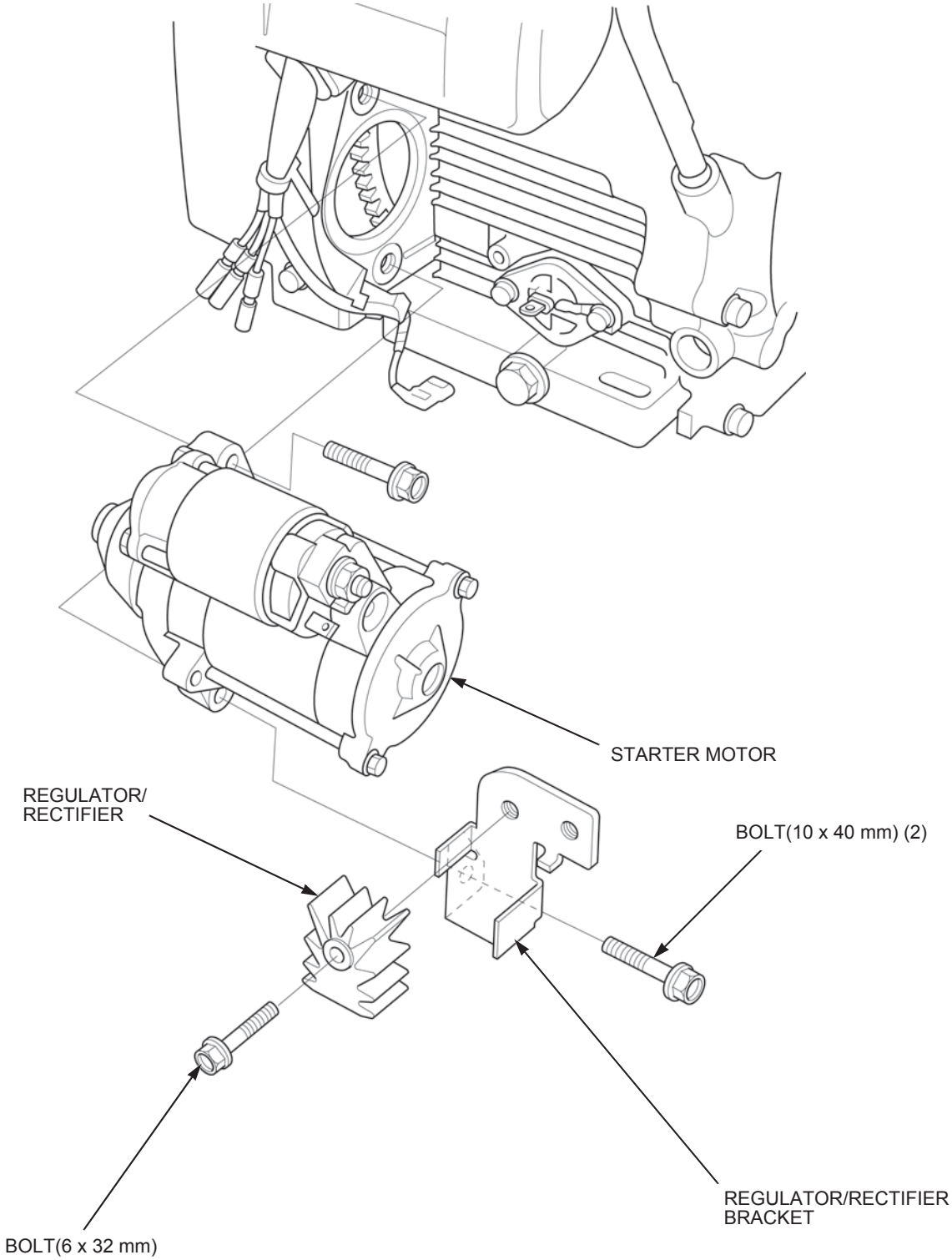
Check the blade fuse in the control box (page 11-4).
- Blown → Replace the blade fuse.
- Not blown ↓

Check the magnetic switch (page 10-6).
- No good → Replace the magnetic switch (page 10-4).
- Good ↓

Perform the starter motor performance test (page 10-5). If necessary disassemble the starter motor (page 10-4) and check the each parts (page 10-6, 7).

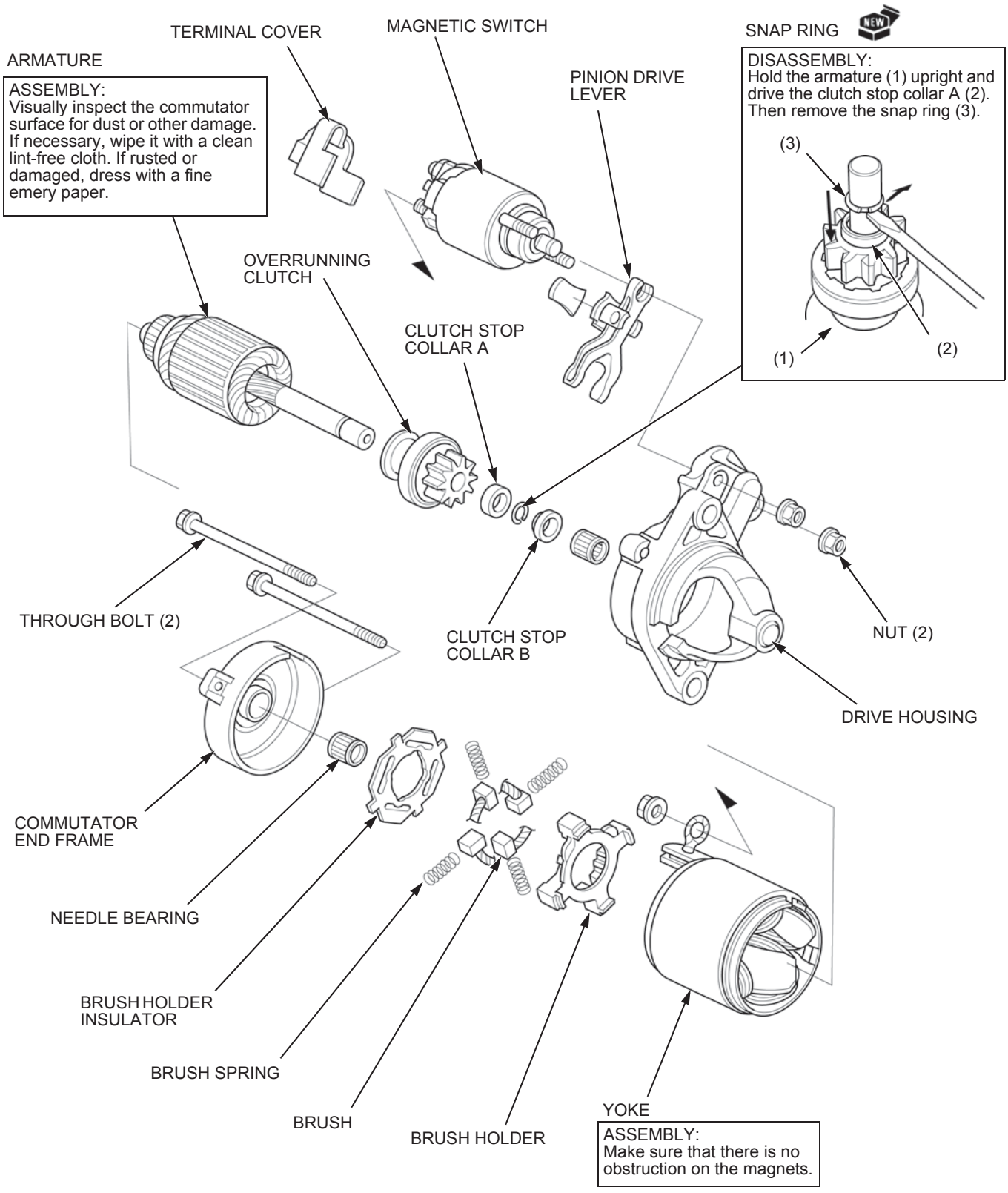
STARTER MOTOR REMOVAL/ INSTALLATION

Disconnect the starter motor wires from the starter motor.



STARTER MOTOR DISASSEMBLY/ ASSEMBLY

DISASSEMBLY



ASSEMBLY

Attach the pinion drive lever (1) to the magnetic switch (2). Set the pinion drive lever to the overrunning clutch (3) of the armature.

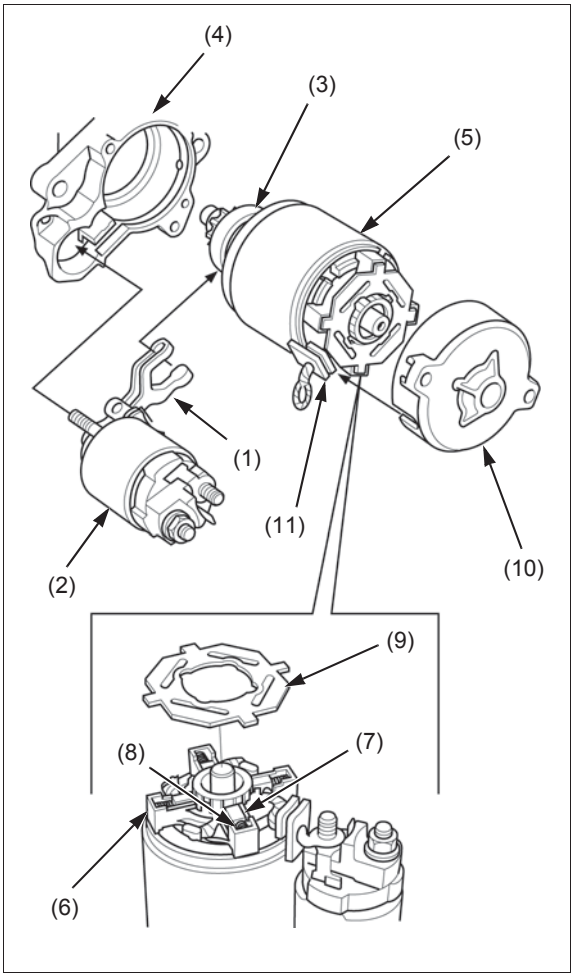
Install the magnetic switch and armature to the drive housing (4) and tighten the flange nuts to secure the magnetic switch.

Install the yoke (5) to the drive housing.

Install the brush holder (6) to the yoke, and set the brushes (7) and brush springs (8) to the brush holder. Install the brush holder insulator (9).

Install the commutator end frame (10) by aligning the brush terminal grommet (11) with the cutout of the commutator end frame.

Tighten the through bolts to secure the drive housing and commutator end frame.



STARTER MOTOR INSPECTION

PERFORMANCE TEST

Measure starter performance while cranking the engine.

STARTER MOTOR PERFORMANCE:
UNDER LOAD:
CRANKING VOLTAGE: 9 V
CRANKING CURRENT: 150 A
ENGINE CRANKING SPEED: 1,950 min^{-1} (rpm) min.
NO LOAD:
CRANKING VOLTAGE: 11.5 V
CRANKING CURRENT: 50 A max.

- To get accurate results, the test must be operated in the normal ambient temperature.
- Battery: 55B24 (12 V 36 AH/5 HR)
- Battery cable: 15 sq x 1.5 m (4.9 ft) each for battery positive cable and battery negative cable.

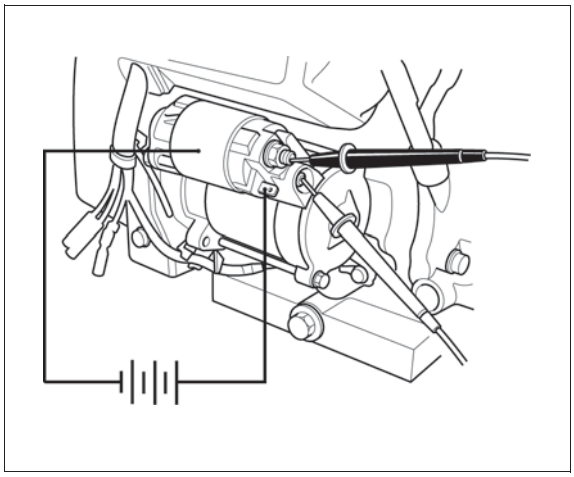
If the measurement is out of specification, disassemble and inspect the starter motor.

MAGNETIC SWITCH

Check the continuity between the terminals of the magnetic switch.

There should be no continuity between the terminals.

If there is continuity, replace the magnetic switch (page 10-4).

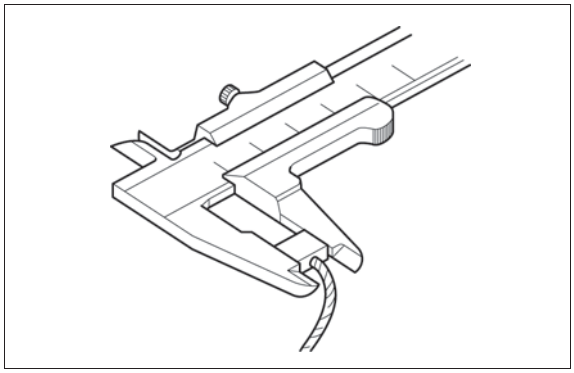


BRUSH LENGTH

Measure the brush length.

STANDARD: 10 mm (0.4 in)
SERVICE LIMIT: 6 mm (0.2 in)

If brush length is less than the service limit, replace the brush (page 10-8).

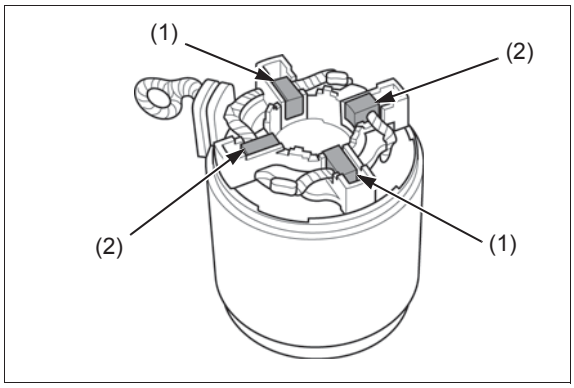


BRUSH CONTINUITY CHECK

Check for continuity between the positive (+) brushes (1) and negative (-) brushes (2).

There should be continuity between both the positive brushes.
There should be continuity between both the negative brushes.
There should be no continuity between both the positive and negative brushes.

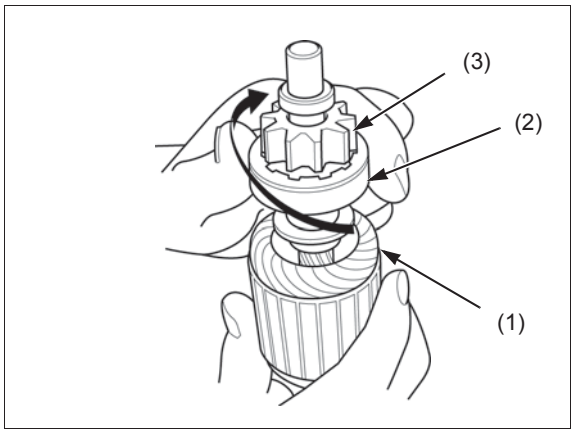
If the correct continuity is not obtained, replace the yoke (page 10-4).



OVERRUNNING CLUTCH

Hold the armature (1) as shown and check that the overrunning clutch (2) turns clockwise and slides smoothly. If necessary, apply oil or replace the overrunning clutch (page 10-4).

Check the pinion gear (3) for wear or damage and replace the over running clutch if necessary (page 10-4).
If the pinion gear is worn or damaged, the flywheel ring gear must be inspected.

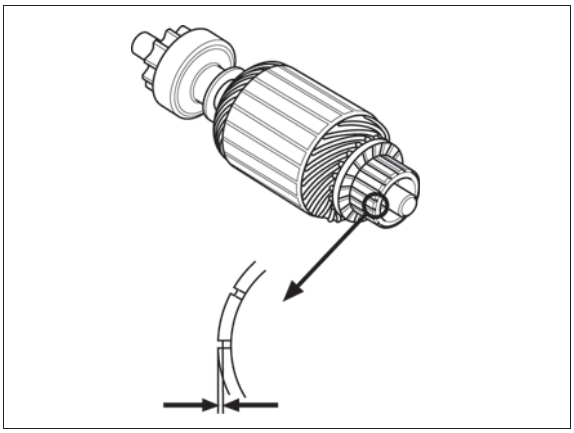


MICA DEPTH

Clean the commutator, and then measure the mica depth.

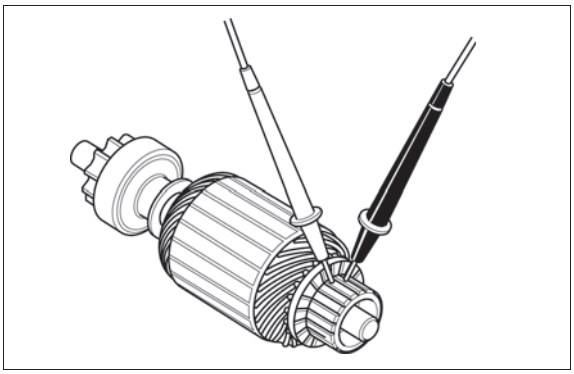
SERVICE LIMIT: 0.2 mm (0.01 in)

If the measurement is less than the service limit, replace the armature (page 10-4).



ARMATURE CONTINUITY CHECK - COMMUTATOR SEGMENTS

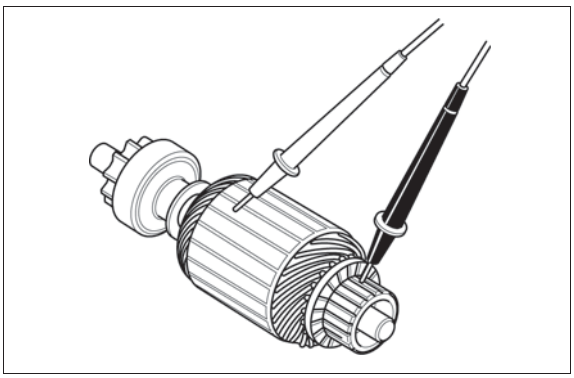
Check for continuity between segments. If an open circuit (no continuity) exists between any two segments, replace the armature (page 10-4).



ARMATURE CONTINUITY CHECK - COMMUTATOR TO CORE

Check for continuity between the commutator segments and the armature coil core.

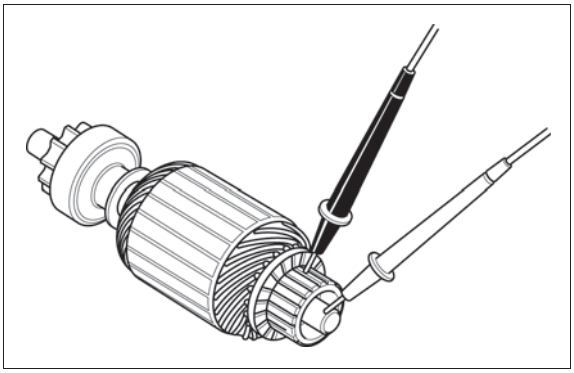
Replace the armature if continuity exists between any of the commutator segments and the armature coil core (page 10-4).



ARMATURE CONTINUITY CHECK - COMMUTATOR TO SHAFT

Check for continuity between the commutator and the armature shaft.

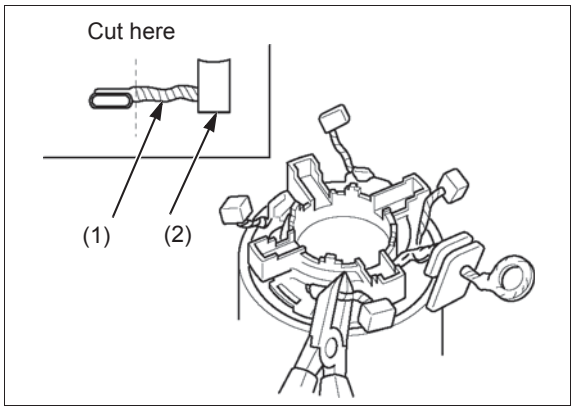
Replace the armature if continuity exists between any of the commutator segments and the armature shaft (page 10-4).



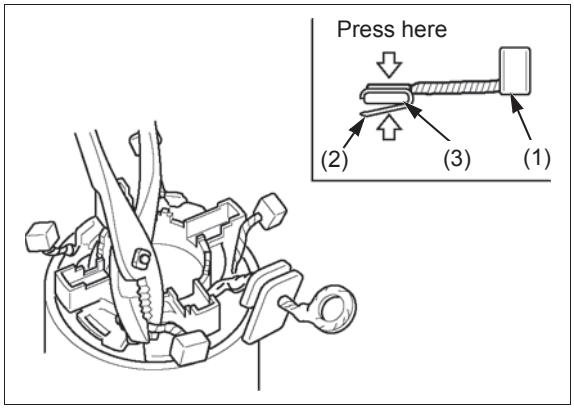
BRUSH REPLACEMENT

Cut off the brush lead (1) at the point shown and remove the brush (2).

Remove the remaining brush lead and deposited solder from the terminal.

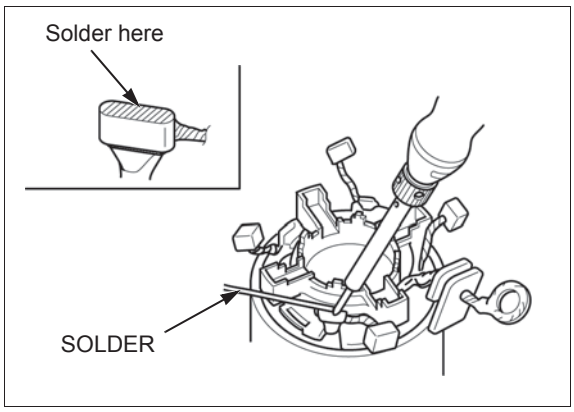


Hold a new brush (1) in the same direction of the removed brush and put a new plate (2) over the new brush and terminal (3) and press it using a pair of pliers as shown.



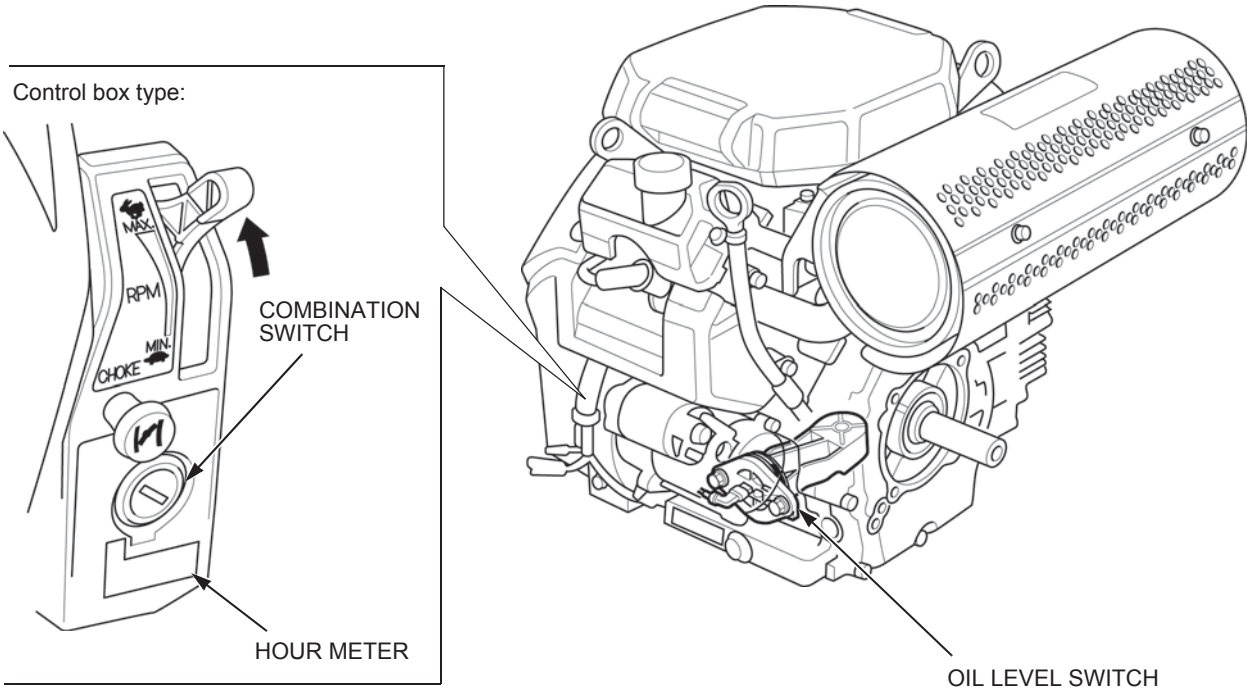
Solder the plate on the terminal.

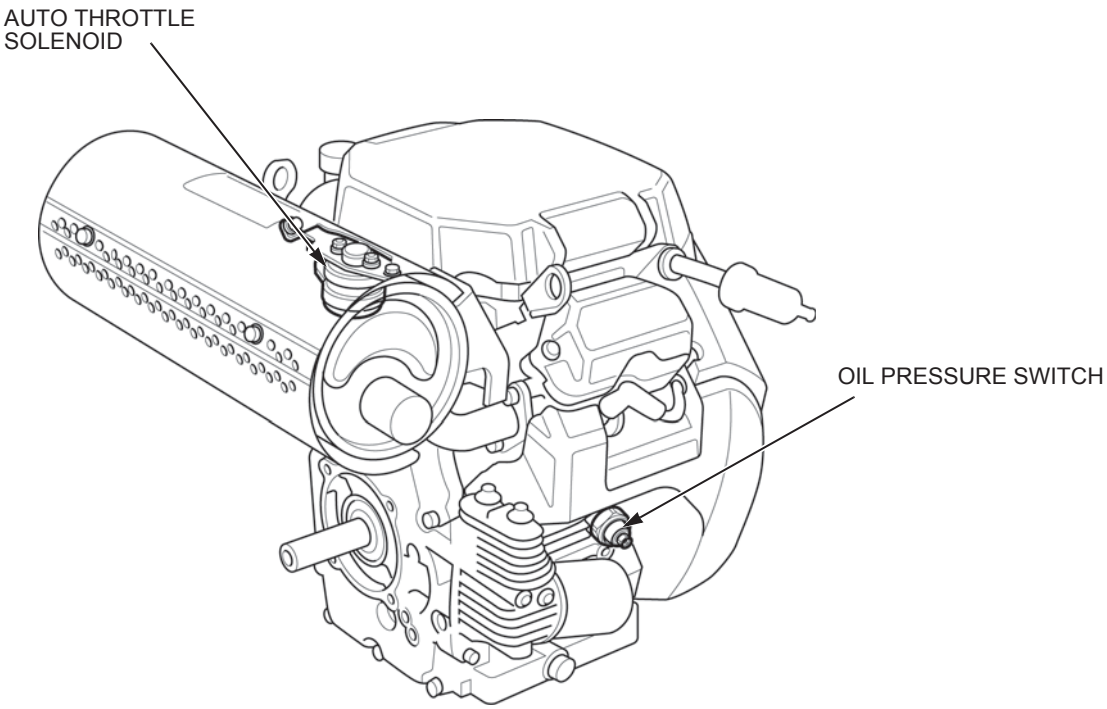
- Before soldering, heat the pressed part of the plate well to make sure solder reaches the end of the pressed part.
- Prevent solder from flowing down the brush lead.
- Do not allow solder to run down onto the field winding of the yoke.
- File the brush so that the brush and commutator can fit using an emery paper #500 or #600.



11. OTHER ELECTRICAL

COMPONENT LOCATION





OIL LEVEL SWITCH INSPECTION

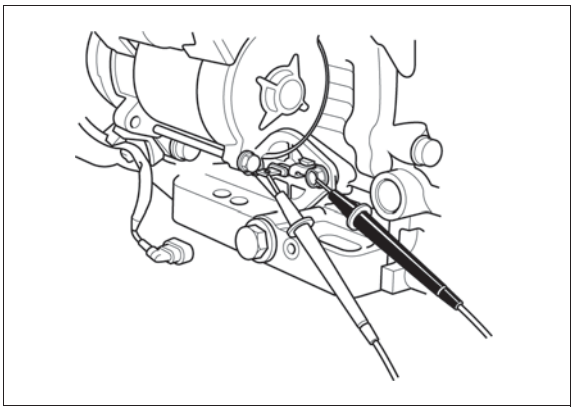
Disconnect the engine wire harness from the oil level switch.

Check continuity between the switch terminals.
There should be no continuity when the engine is full of oil.

Drain the engine oil completely (page 3-4).
Check continuity between the switch terminals.
There should be continuity.

Check continuity between the switch terminals while filling the engine oil.
The ohmmeter reading should go from continuity to no continuity as the oil is filled.

If the correct continuity is not obtained, replace the oil level switch (page 15-4).

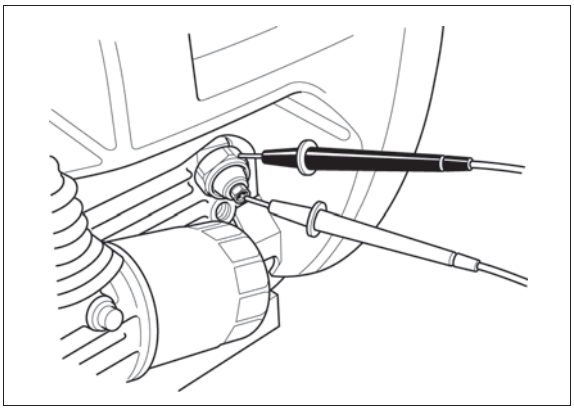


OIL PRESSURE SWITCH INSPECTION

With the combination switch OFF, check continuity between the switch terminal and switch body.
There should be continuity.

Start the engine and check continuity between the switch terminal and switch body.
There should be no continuity.

If the correct continuity is not obtained, replace the oil pressure switch (page 13-3).



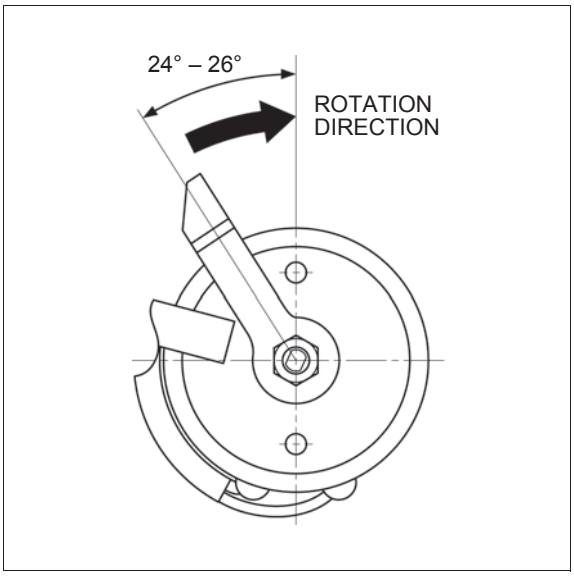
AUTO THROTTLE SOLENOID INSPECTION

Disconnect the auto throttle solenoid terminals.

Apply 12V battery voltage and check the auto throttle solenoid lever operation.

OPERATING LEVER ANGLE: 24° – 26°

If the auto throttle solenoid is not operate or the operating angle is out of specification, replace the auto throttle solenoid (page 7-6).

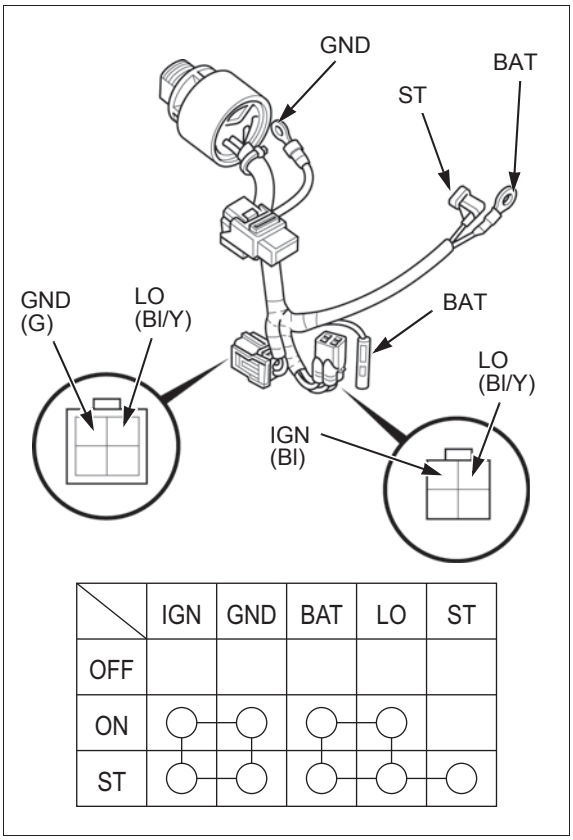


COMBINATION SWITCH INSPECTION

Remove the combination switch (page 7-10).

Check continuity between the terminals at each switch position.

If the correct continuity is not obtained, replace the combination switch (page 7-10).



	IGN	GND	BAT	LO	ST
OFF					
ON	○	○	○	○	
ST	○	○	○	○	○

Disconnect the charge coil connectors and combination switch 4P connector (1). Remove the combination switch 4P connector, and open the wire harness clip (2) to remove the wire harness.

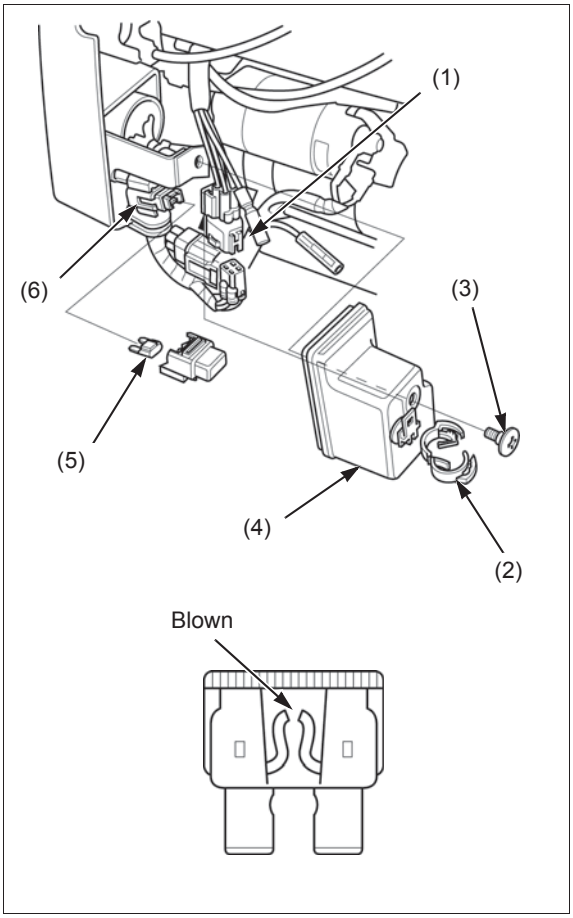
Remove the special screw (3) and the control cover (4).

Remove the blade fuse (5) from the fuse box (6).

Visually inspect the blade fuse.

Check continuity between the blades of the fuse.

If there is not continuity, replace the blade fuse.

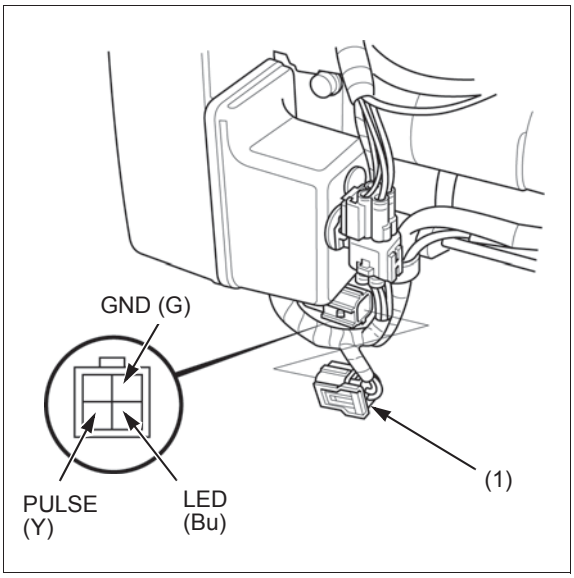


HOUR METER INSPECTION

Remove and disconnect the hour meter 4P connector (1).

Apply a 9 V battery voltage between the PULSE terminal (Yellow) and GND terminal (Green).
The hour meter should start counting time.

Apply a 4.5 V battery voltage between the LED terminal (Blue) and GND terminal (Green).
The oil indicator should come on.



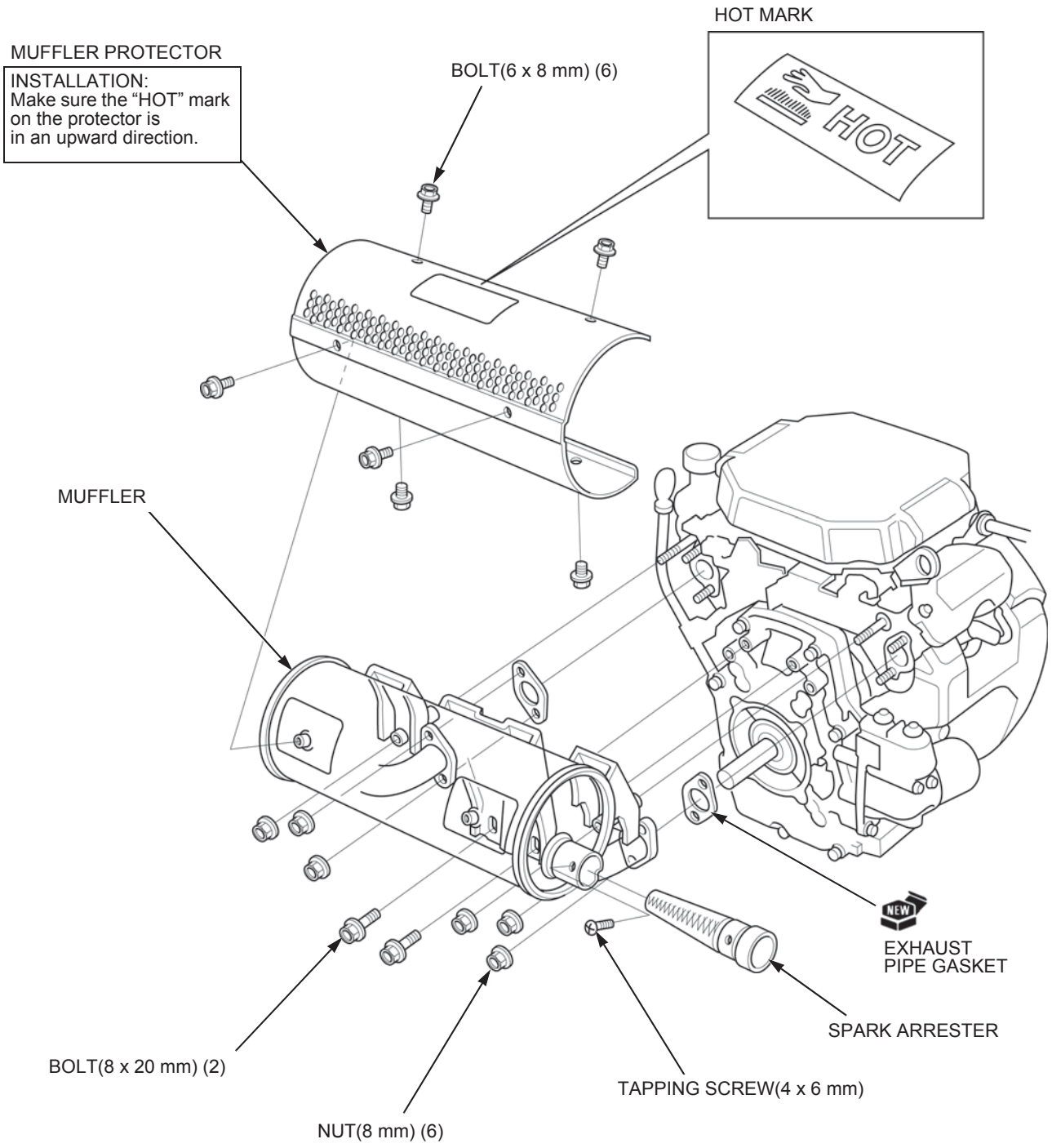
MEMO

12. MUFFLER

HIGH MOUNT MUFFLER REMOVAL/ INSTALLATION

⚠ CAUTION

The muffler becomes very hot during operation and remains hot for a while after stopping the engine. Be careful not to touch the muffler while it is hot. Allow it to cool before proceeding.

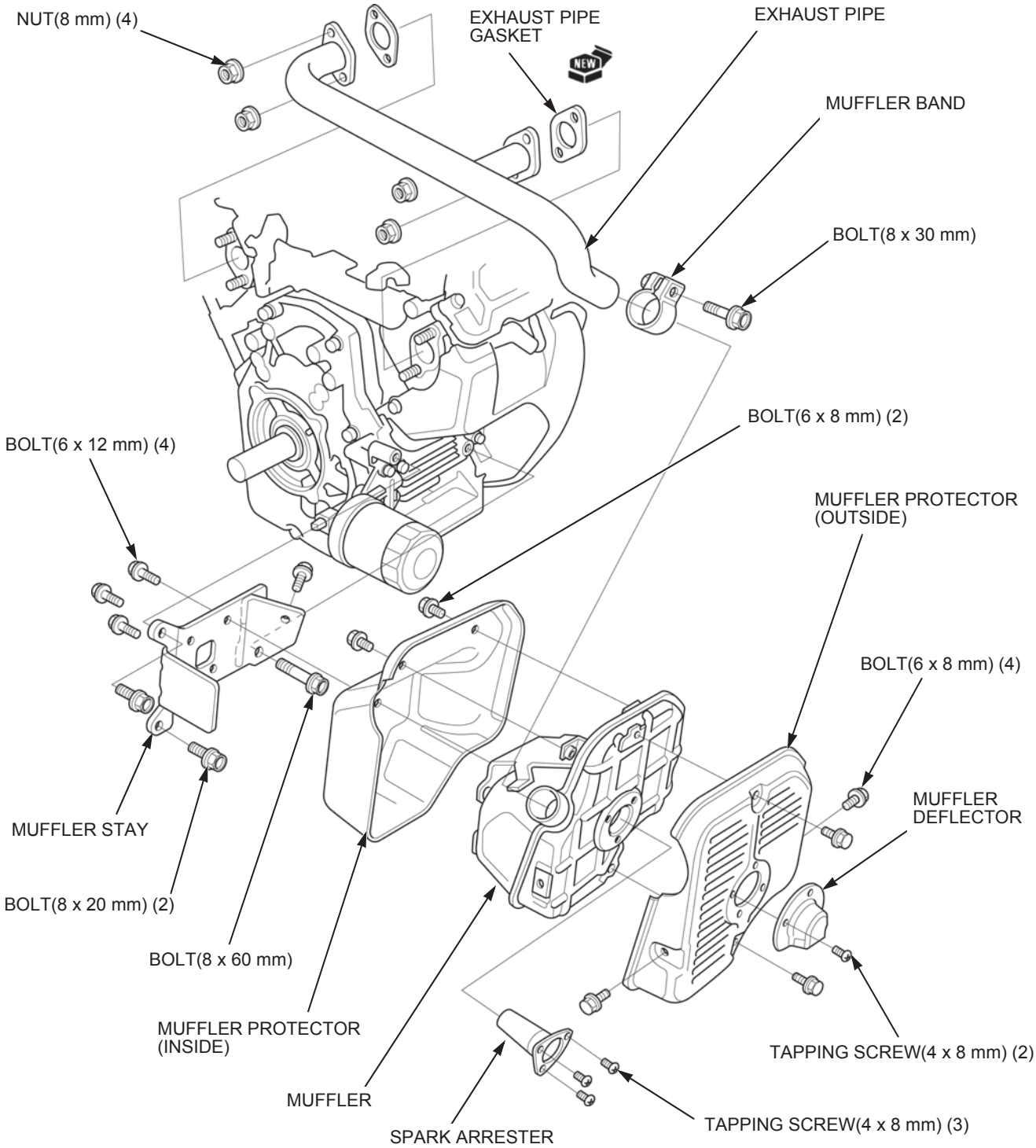


SIDE MOUNT MUFFLER REMOVAL/ INSTALLATION

⚠CAUTION

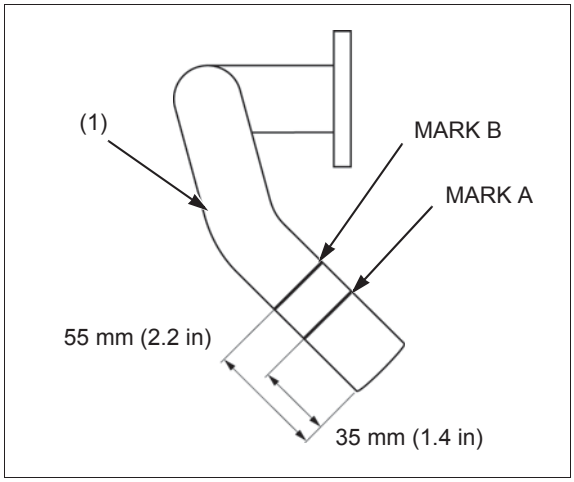
The muffler becomes very hot during operation and remains hot for a while after stopping the engine. Be careful not to touch the muffler while it is hot. Allow it to cool before proceeding.

REMOVAL



INSTALLATION

Make marks on the exhaust pipe (1) in the positions as shown.



Install the muffler band (1) to the muffler (2) and insert the exhaust pipe (3) into the muffler to mark A.

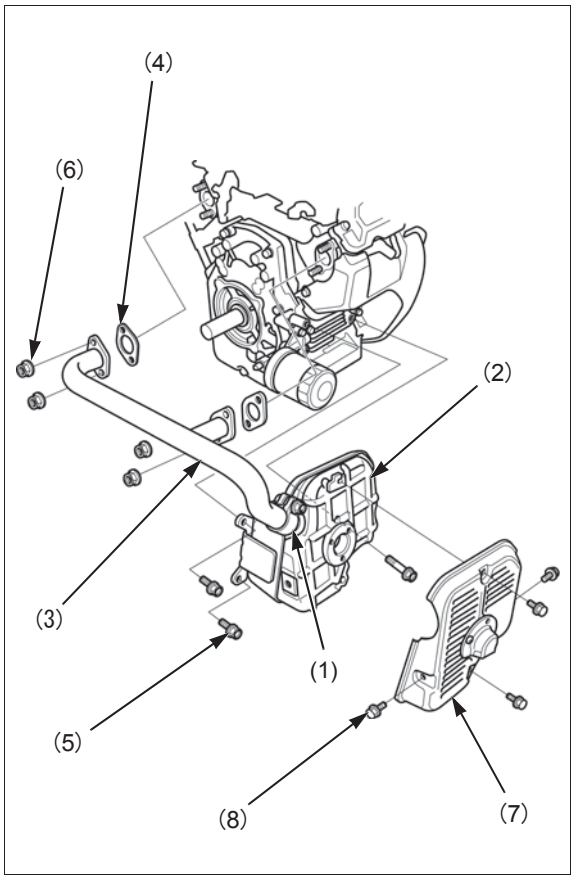
Install the two exhaust muffler gaskets (4) and exhaust pipe to the cylinders, then slide the exhaust pipe to mark B.

Tighten the three bolts (5) to secure the muffler.

Tighten the four nuts (6) to secure the exhaust pipe.

Tighten the muffler band.

Install the muffler protector (outside) (7) and tighten the four bolts (8).

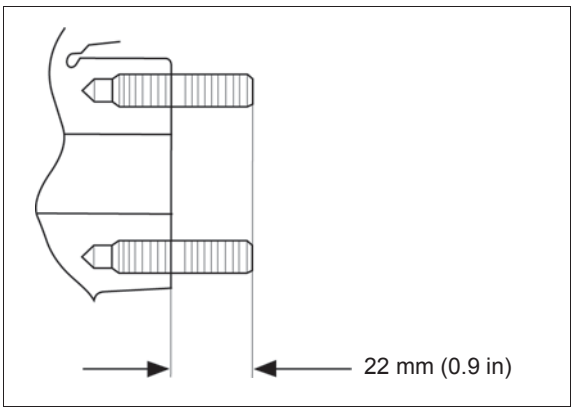


EXHAUST PIPE STUD BOLT REPLACEMENT

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

Install new stud bolts.

SPECIFIED LENGTH: 22 mm (0.87 in)

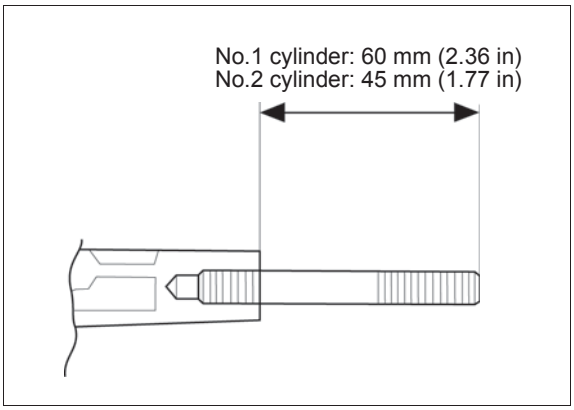


HIGH MOUNT MUFFLER MOUNTING STUD BOLT REPLACEMENT

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

Install new stud bolts.

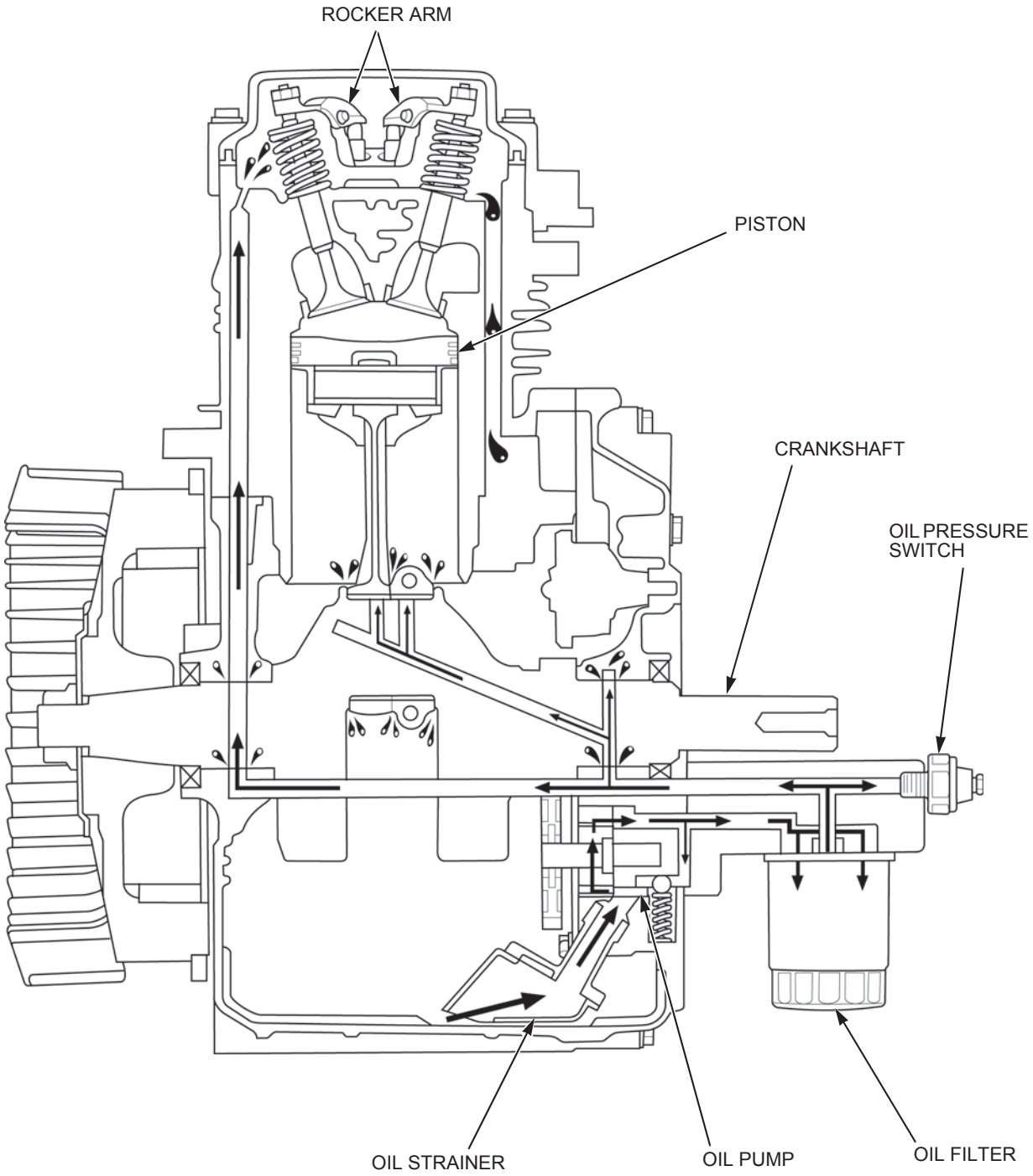
SPECIFIED LENGTH:
No.1 cylinder: 60 mm (2.36 in)
No.2 cylinder: 45 mm (1.77 in)



MEMO

13. LUBRICATION SYSTEM

LUBRICATION SYSTEM DIAGRAM

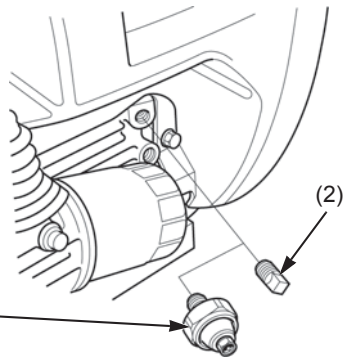


OIL PRESSURE TEST

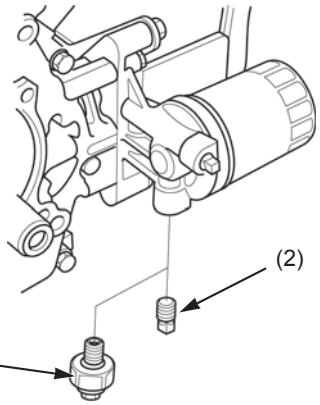
Check the engine oil level (page 3-3).

Remove the oil pressure switch (1) or sealing plug (2).

FRONT MOUNT TYPE:



SIDE MOUNT TYPE:



Install the special tools (1)(2).

TOOLS:
Oil pressure gauge attachment (1) 07406-0030000
Oil pressure gauge set (2) 07506-3000000

TORQUE: 9 N·m (0.9 kgf·m, 6.6 lbf·ft)

NOTICE

Tighten the oil pressure gauge attachment to the specified torque. Do not overtighten the attachment to avoid damaging the crankcase threads.

Start the engine and allow it to warm up for 10 minutes.

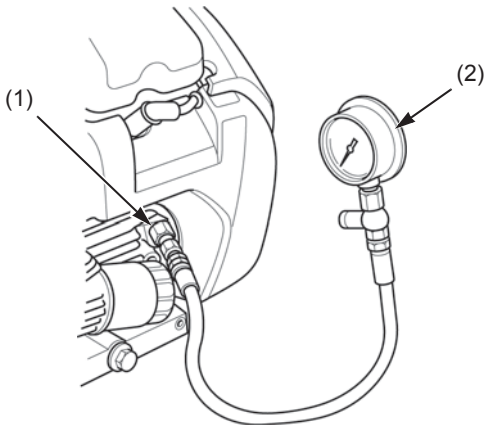
While the engine is at idle, measure the oil pressure.

OIL PRESSURE:
2.8 kgf/cm^2 (39.8 psi) / 2,000 min^{-1} (rpm) and more

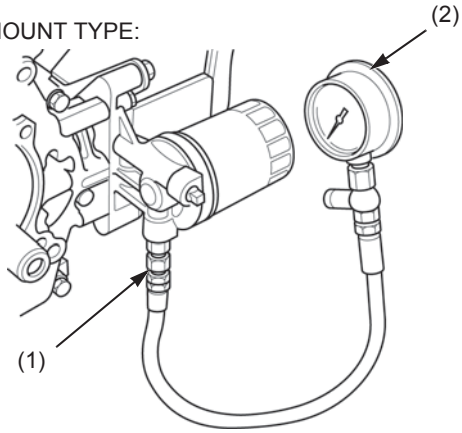
If the oil pressure is less than the specification, inspect the oil pump (page 13-4).

Remove the special tools.

FRONT MOUNT TYPE:

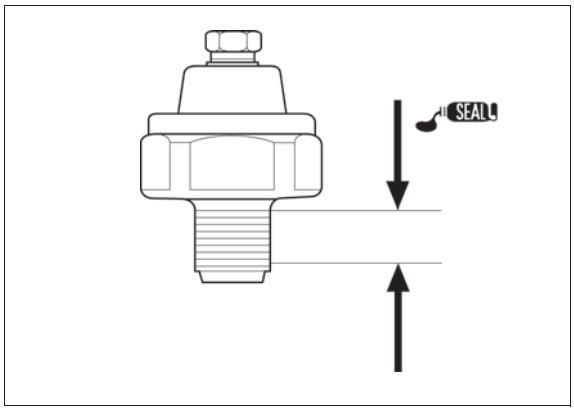


SIDE MOUNT TYPE:



Clean the oil pressure switch or sealing bolt threads, and apply liquid sealant (Threebond 1207B, 1141G,1215) to the threads as shown.
Tighten the oil pressure switch or sealing bolt to the specified torque.

TORQUE: 9 N·m (0.9 kgf·m, 6.6 lbf·ft)



NOTICE

Do not apply liquid sealant to the tip of the threads.

Tighten the oil pressure switch or sealing bolt to the specified torque. Do not overtighten the attachment to avoid damaging the crankcase threads.

OIL PUMP INSPECTION

OIL PUMP TIP CLEARANCE

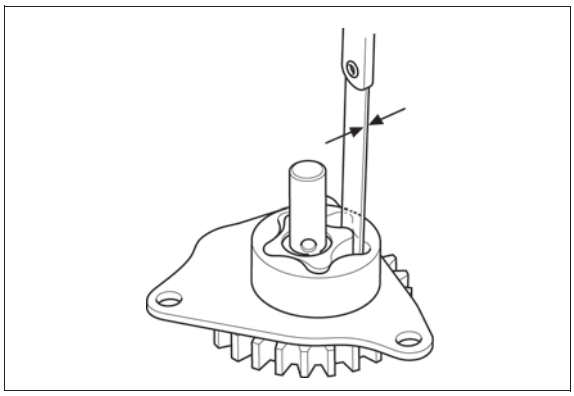
Remove the crankcase cover (page 15-2).

Remove the oil pump cover (page 15-7).

Measure the oil pump rotor tip clearance.

STANDARD: 0.15 mm (0.006 in)
SERVICE LIMIT: 0.30 mm (0.012 in)

If the measurement is more than the service limit, replace the inner rotor and outer rotor (page 15-7).



OUTER ROTOR-TO-HOUSING CLEARANCE

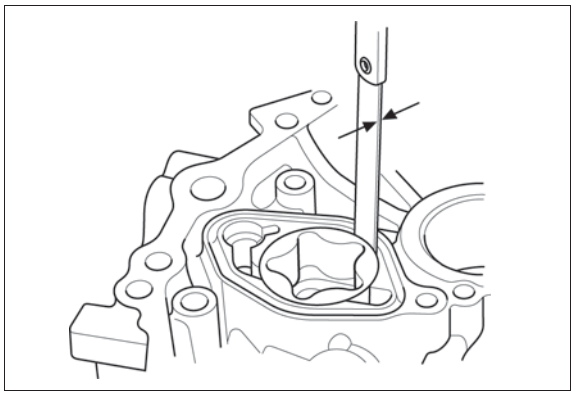
Remove the crankcase cover (page 15-2).

Remove the oil pump cover (page 15-7).

Measure the oil pump outer rotor-to-housing clearance.

STANDARD: 0.150 – 0.210 mm (0.0059 - 0.0083 in)
SERVICE LIMIT: 0.30 mm (0.012 in)

If the measurement is more than the service limit, replace the outer rotor (page 15-7).



OUTER ROTOR-TO-PUMP COVER CLEARANCE

Remove the crankcase cover (page 15-2).

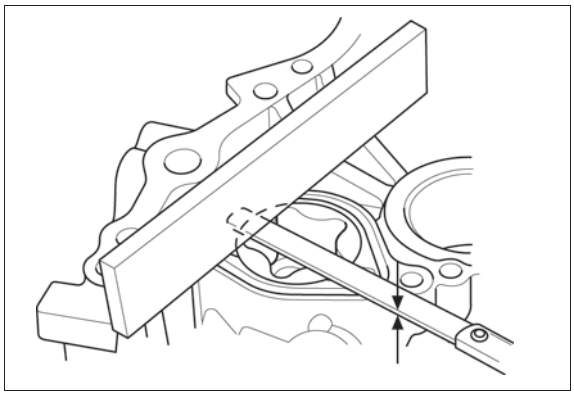
Remove the oil pump cover (page 15-7).

Remove the oil pump O-ring (page 15-7).

Measure the oil pump outer rotor-to-pump cover clearance.

STANDARD: 0.04 – 0.09 mm (0.002 – 0.004 in)
SERVICE LIMIT: 0.11 mm (0.004 in)

If the measurement is more than the service limit, replace the outer rotor (page 15-7).



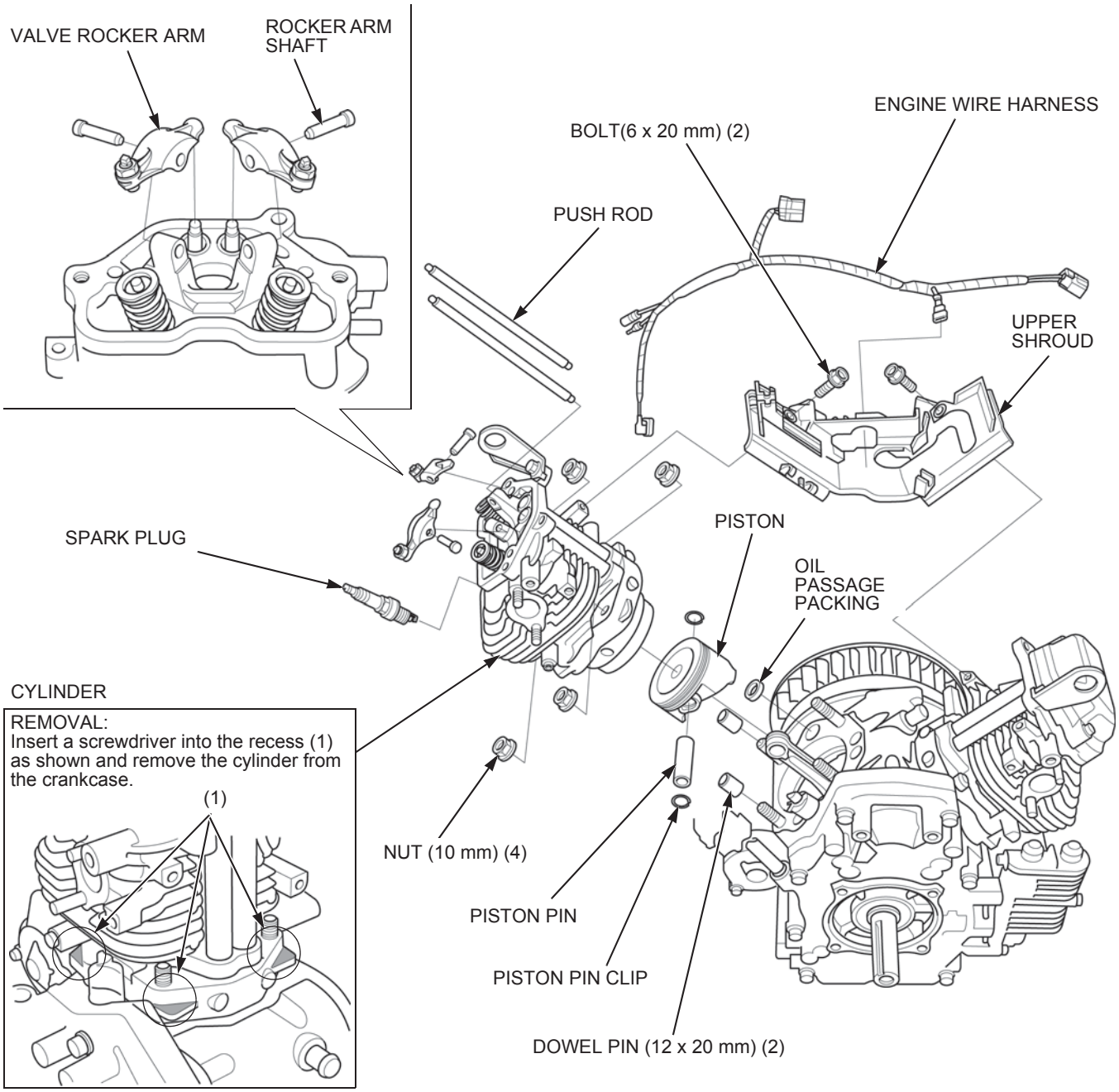
14. CYLINDER

CYLINDER/PISTON REMOVAL

Set the piston at the top dead center of the cylinder compression stroke (page 3-8).

Remove the following parts:

– Air cleaner (page 6-3)
– Carburetor (page 6-5)
– Muffler (page 12-2), (page 12-3)
– Control and governor arm (page 7-2)
– Fan cover (page 5-2)
– L./R. lower shroud (page 5-5)
– Ignition coil (page 9-4)
– Starter motor (page 10-3)
– Oil level pipe (page 15-2).
– Head cover (page 3-8).



PISTON INSTALLATION

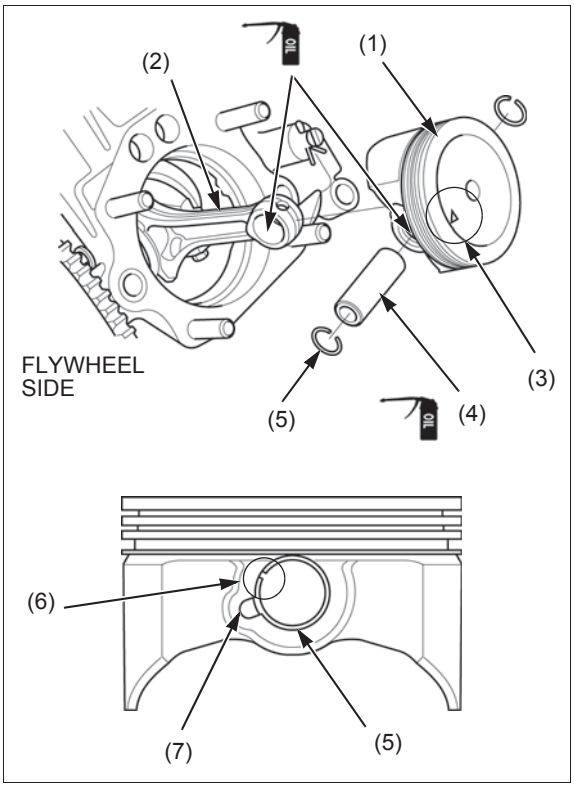
Position the connecting rod of the cylinder near top dead center by rotating the crankshaft slowly.

Install the piston (1) on the connecting rod (2) with triangle mark (3) of the piston pointing toward the flywheel side as shown.

Apply oil to the piston pin (4) outer surface, connecting rod small end and piston pin bore.
Install the piston pin through the piston and connecting rod.

Install new piston pin clips (5) into the grooves in the piston pin hole.

- Make sure the piston pin clips are seated securely.
- Do not align the piston pin clip end gap (6) with the piston cutout (7).

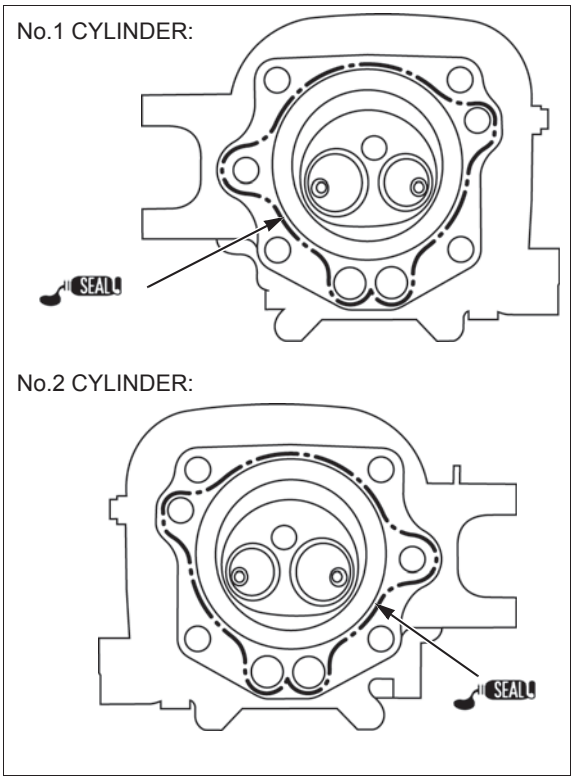


CYLINDER INSTALLATION

Clean the mating surfaces of the cylinder and crankcase of old liquid gasket, oil and other foreign material.

Loosely install the fan cover and set the piston near top dead center by rotating the crankshaft slowly (page 3-8).

Apply a bead (Φ1.0 - 1.5 mm (Φ0.04 - 0.06 in) of liquid gasket (Threebond TB1207B) to the mating surface of the cylinder as shown.



Apply grease to the oil passage packing (1).
Install the dowel pins (2) and oil passage packing on the crankcase.

Apply oil to the cylinder inner surface, piston outer surface and piston rings.

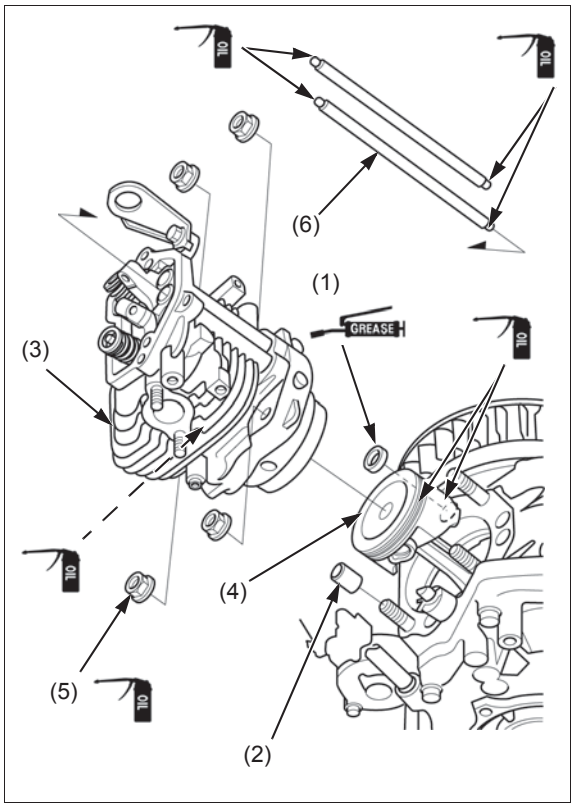
Install the cylinder (3) over the piston (4) while compressing the piston rings with your fingers.

Apply a light coat of oil to the threads and the seating surface of the four flange nuts (5) and tighten them to the specified torque.

TORQUE: 37 N·m (3.8 kgf·m, 27 lbf·ft)

- Assemble the cylinder within 3 minutes after applying liquid gasket.
- Wait for 30 minutes after assembly before filling with oil and starting the engine.

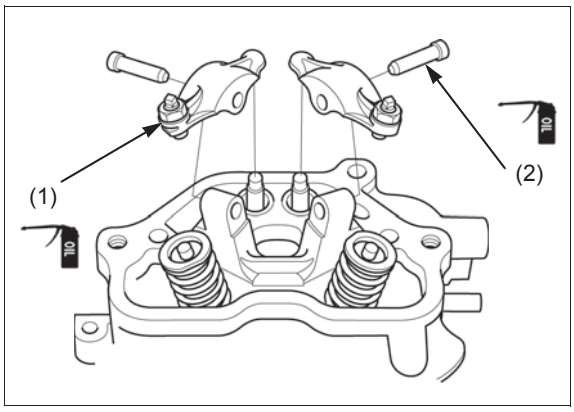
Apply oil to the both end of the two push rods (6) and insert them into the cylinder.



Apply oil to the bearing and slipper of the rocker arms (1) and install them to the cylinder.

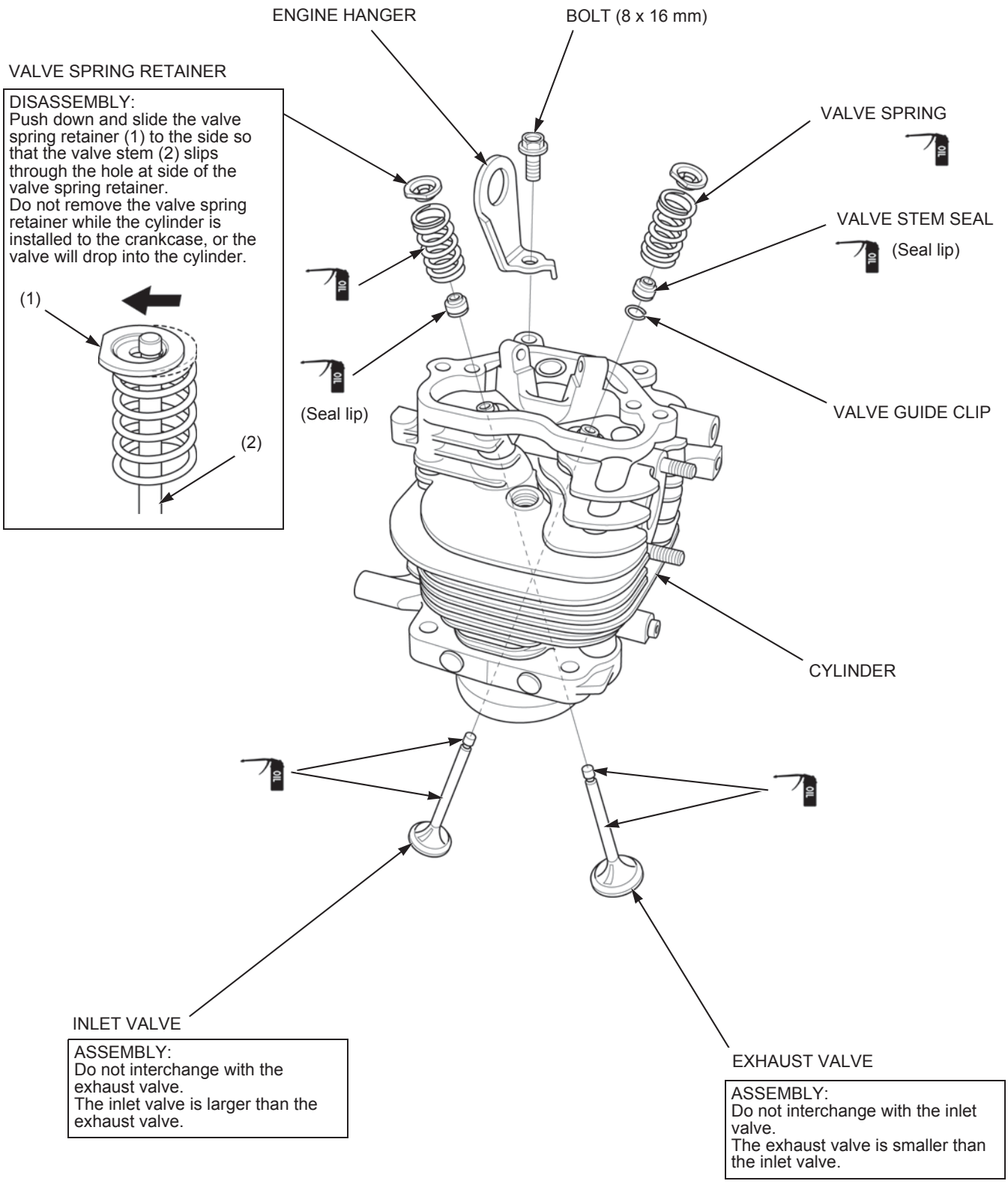
Apply oil to the rocker arm shaft (2) and insert into the cylinder in the direction as shown.

Install the head cover (page 3-8).



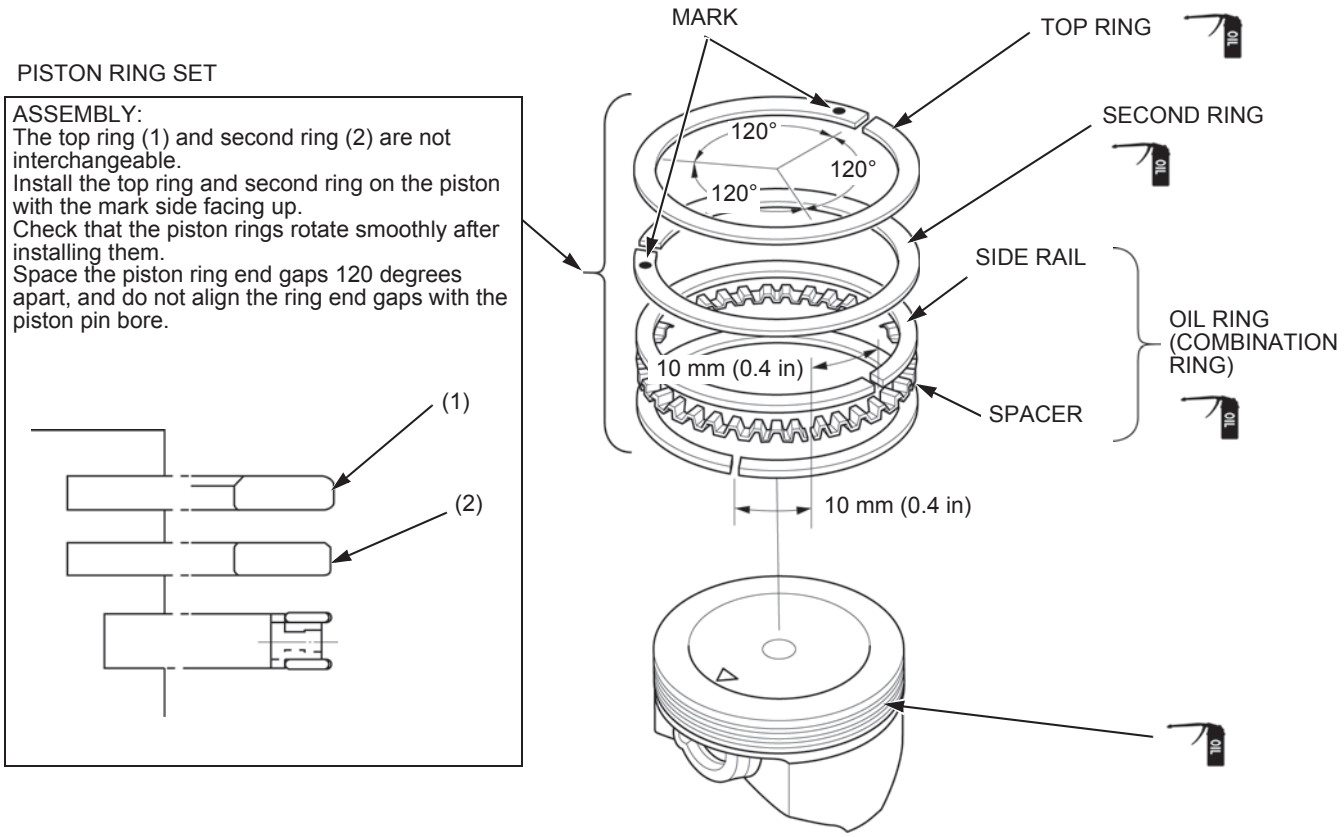
CYLINDER DISASSEMBLY/ASSEMBLY

Remove the cylinder (page 14-2).



PISTON DISASSEMBLY/ASSEMBLY

Remove the piston (page 14-2).



PISTON RING SET

ASSEMBLY:
The top ring (1) and second ring (2) are not interchangeable.
Install the top ring and second ring on the piston with the mark side facing up.
Check that the piston rings rotate smoothly after installing them.
Space the piston ring end gaps 120 degrees apart, and do not align the ring end gaps with the piston pin bore.

CYLINDER/PISTON INSPECTION

CYLINDER COMPRESSION CHECK

Start the engine and warm up to normal operating temperature.

Turn the fuel valve lever of the application to the OFF position, and then loosen the carburetor drain screw to drain the float chamber.

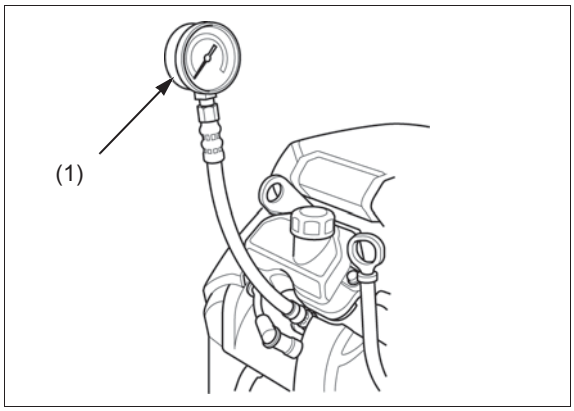
Remove the spark plug cap from the spark plug.

Remove the spark plug using a spark plug wrench.

Operate the starter motor to expel unburned gas.

Attach a compression gauge (1) to the spark plug hole.

Operate the starter motor to measure stable cylinder compression.



NOTICE

Do not operate the starter motor for more than 5 seconds at a time. When operating the starter motor several times in a row, wait 10 – 20 seconds between operation to recover the battery voltage.

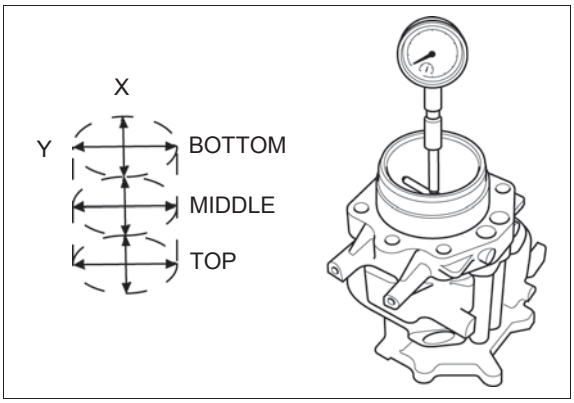
CYLINDER COMPRESSION:
0.5 – 0.7 MPa (5.09 – 7.14 kgf/cm^2, 73 – 102 psi) / 500 min^{-1} (rpm)

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: 78.000 – 78.015 mm (3.0709 – 3.0715 in)
SERVICE LIMIT: 78.150 mm (3.0768 in)

If the measurement is more than the service limit, replace the cylinder (page 14-5).



VALVE SEAT WIDTH

Remove the carbon deposits from the combustion chamber (page 3-10).

Inspect each valve face for irregularities.

If necessary, replace the valve (page 14-5).

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

Using a valve lapper, 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.

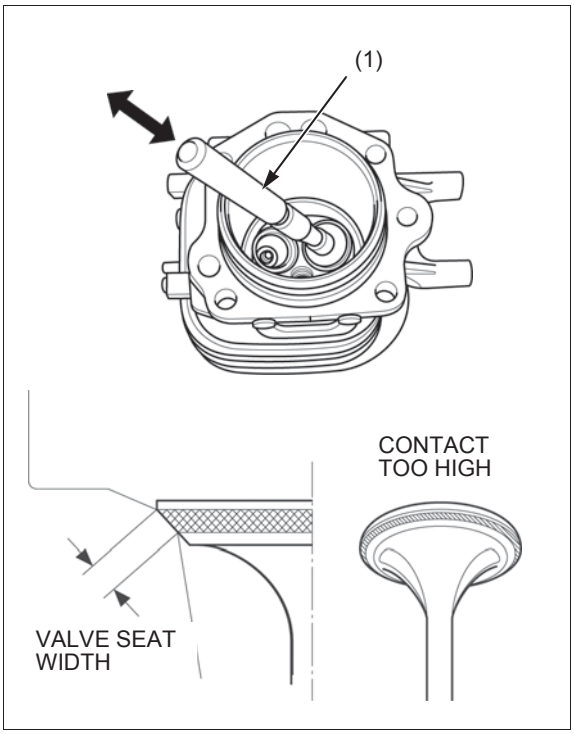
Measure the valve seat width of the cylinder.

STANDARD: 1.0 – 1.2 mm (0.04 – 0.05 in)
SERVICE LIMIT: 2.1 mm (0.08 in)

If the measurement is more than the service limit, recondition the valve seat (page 14-13).

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

If the valve seat is too high, recondition the valve seat (page 14-13).



VALVE GUIDE I.D.

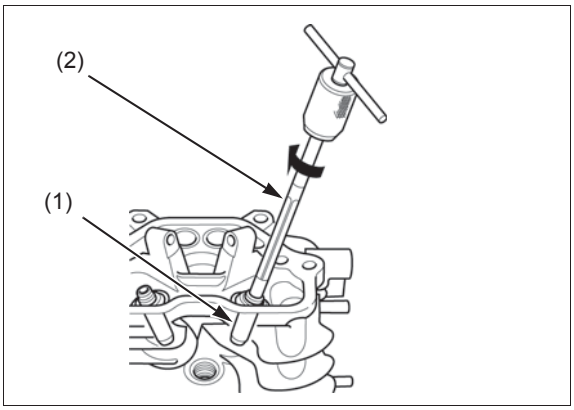
Ream the valve guide (1) to remove any carbon deposits before measuring.

TOOL:
Valve guide reamer 5.510 mm (2) 07984-2000001

NOTICE

Turn the special tool (Valve guide reamer) clockwise, never counterclockwise.

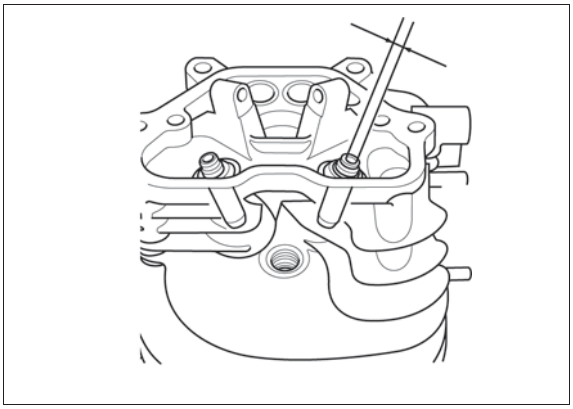
Continue to rotate the special tool while removing it from the valve guide.



Measure and record each valve guide I.D.

STANDARD: 5.500 – 5.512 mm (0.2165 – 0.2170 in)
SERVICE LIMIT: 5.560 mm (0.2189 in)

If the measured valve guide I.D. is more than the service limit, replace the cylinder (page 14-5).



VALVE STEM O.D.

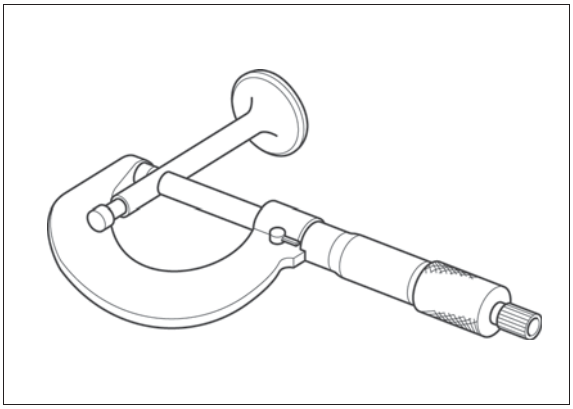
Inspect each valve for bending or abnormal stem wear.

If necessary, replace the valve (page 14-5).

Measure and record each valve stem O.D.

STANDARD:
IN: 5.475 – 5.490 mm (0.2156 – 0.2161 in)
EX: 5.435 – 5.450 mm (0.2140 – 0.2146 in)
SERVICE LIMIT:
IN: 5.400 mm (0.2126 in)
EX: 5.300 mm (0.2087 in)

If the measurement is less than the service limit, replace the valve (page 14-5).



GUIDE-TO-STEM CLEARANCE

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

STANDARD:
IN: 0.010 – 0.037 mm (0.0004 – 0.0015 in)
EX: 0.050 – 0.077 mm (0.0020 – 0.0030 in)
SERVICE LIMIT:
IN: 0.110 mm (0.0043 in)
EX: 0.130 mm (0.0051 in)

If the calculated clearance is more than the service limit, replace the following:

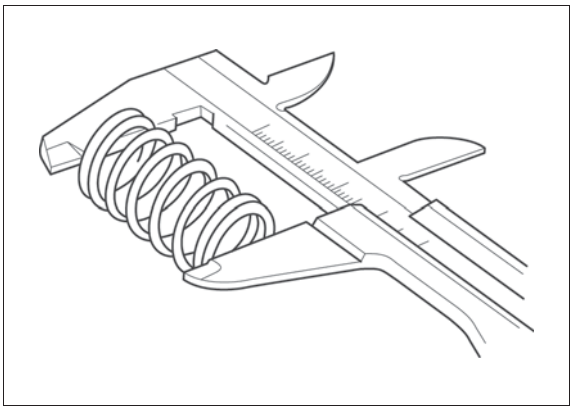
– Valve (page 14-5)
– Cylinder (page 14-5)

VALVE SPRING FREE LENGTH

Measure the valve spring free length.

STANDARD: 38.3 mm (1.51 in)
SERVICE LIMIT: 36.8 mm (1.45 in)

If the measured length is less than the service limit, replace the valve spring (page 14-5).

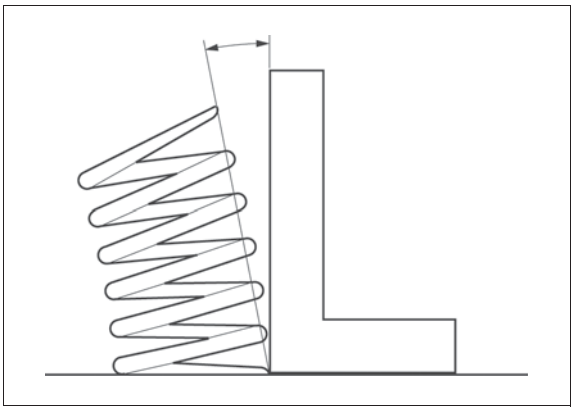


VALVE SPRING PERPENDICULARITY

Measure the valve spring perpendicularity.

STANDARD: 2° max.

If the measured perpendicularity is more than the specification, replace the valve spring (page 14-5).

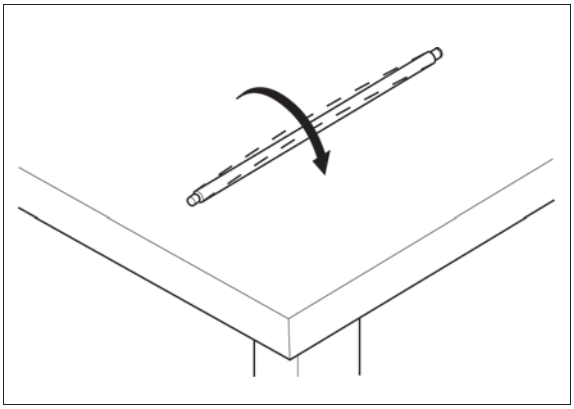


PUSH ROD RUNOUT

Check both ends of the push rod for wear.

Check the push rod for straightness.

If necessary, replace the push rod (page 14-2).

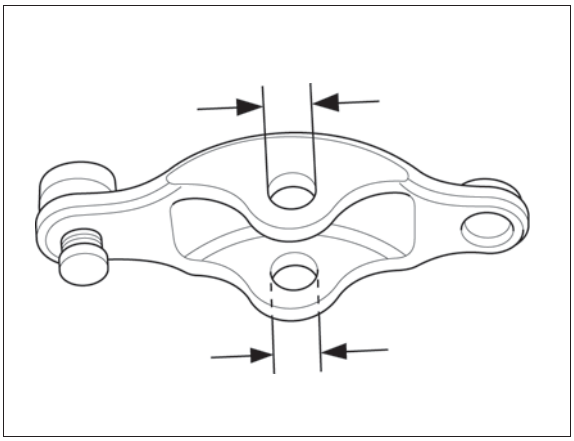


ROCKER ARM I.D.

Measure the rocker arm I.D.

STANDARD: 6.000 – 6.018 mm (0.050 – 0.077 in)
SERVICE LIMIT: 6.043 mm (0.2379 in)

If the measurement is more than the service limit, replace the rocker arm (page 14-4).

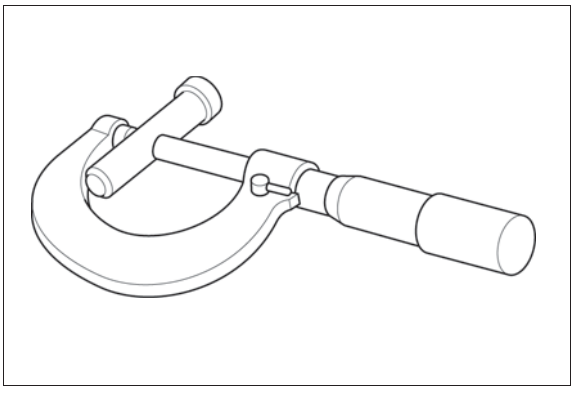


ROCKER ARM SHAFT O.D.

Measure the rocker arm shaft O.D.

STANDARD: 5.960 – 5.990 mm (0.2346 – 0.2358 in)
SERVICE LIMIT: 5.953 mm (0.2344 in)

If the measurement is less than the service limit, replace the rocker arm shaft (page 14-4).

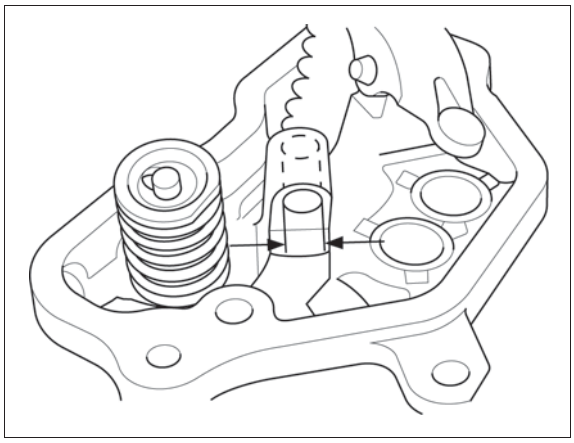


ROCKER ARM SHAFT BEARING I.D.

Measure the rocker arm shaft bearing I.D.

STANDARD: 6.000 – 6.018 mm (0.050 – 0.077 in)
SERVICE LIMIT: 6.043 mm (0.2379 in)

If the measurement is more than the service limit, replace the cylinder (page 14-5).

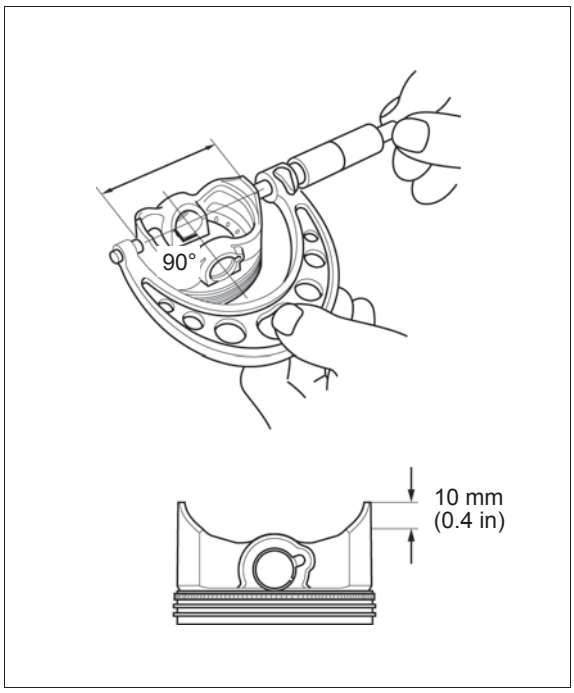


PISTON SKIRT O.D.

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

STANDARD: 77.985 – 77.995 mm (3.0703 – 3.0707 in)
SERVICE LIMIT: 77.850 mm (3.0650 in)

If the measurement is less than the service limit, replace the piston (page 14-6).



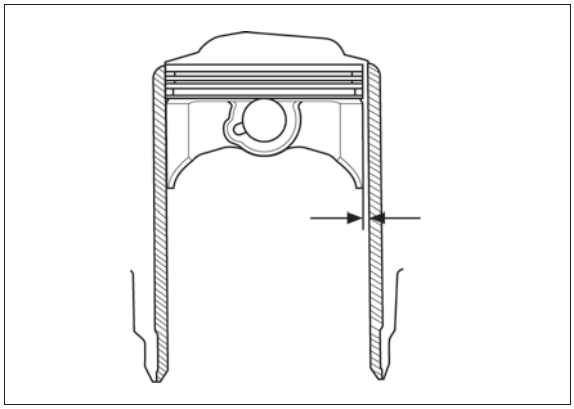
PISTON-TO-CYLINDER CLEARANCE

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

STANDARD: 0.005 – 0.030 mm (0.0002 – 0.0012 in)
SERVICE LIMIT: 0.10 mm (0.004 in)

If the calculated clearance is more than the service limit, replace the piston (page 14-6) and recheck the clearance.

If the clearance is still more than the service limit with the new piston, replace the cylinder (page 14-5).

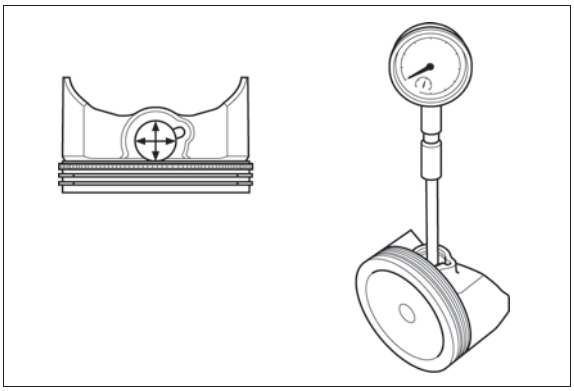


PISTON PIN BORE I.D.

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: 18.042 mm (0.7103 in)

If the measurement is more than the service limit, replace the piston (page 14-6).

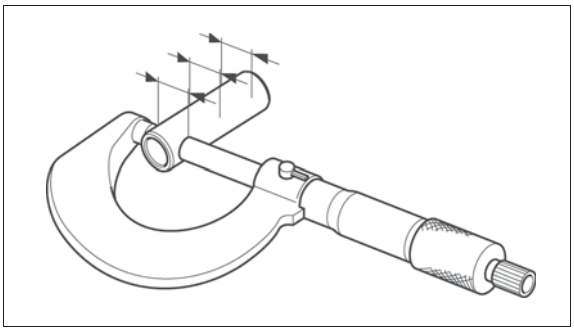


PISTON PIN O.D.

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: 17.994 – 18.000 mm (0.7084 – 0.7087 in)
SERVICE LIMIT: 17.95 mm (0.707 in)

If the measurement is less than the service limit, replace the piston pin (page 14-3).



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: 0.002 – 0.014 mm (0.0001 – 0.0006 in)
SERVICE LIMIT: 0.08 mm (0.003 in)

If the calculated clearance is more than the service limit, replace the piston pin (page 14-3) and recheck the clearance.

If the clearance is still more than the service limit with the new piston pin, replace the piston (page 14-6).

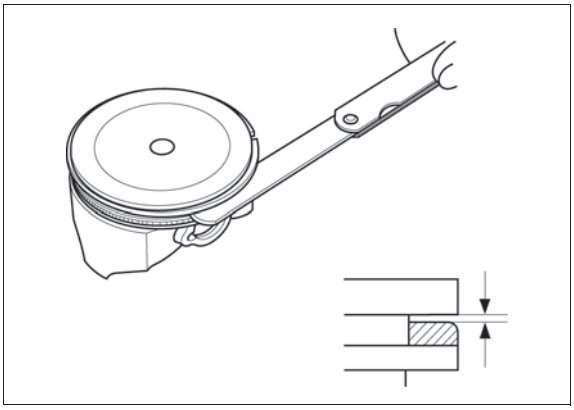
PISTON RING SIDE CLEARANCE

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

STANDARD:
Top: 0.050 – 0.080 mm (0.0020 – 0.0031 in)
Second: 0.050 – 0.080 mm (0.0020 – 0.0031 in)
SERVICE LIMIT:
Top: 0.15 mm (0.06 in)
Second: 0.15 mm (0.06 in)

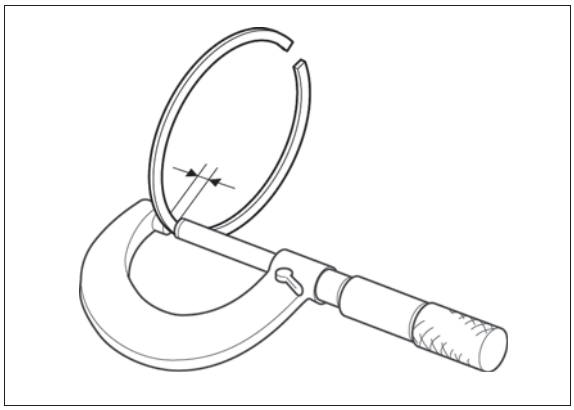
If any of the measurements is more than the service limit, inspect the piston ring width. If necessary replace the piston rings (top, second, oil) as a set (page 14-6) and reinspect the clearance.
If any of the measurements is still more than the service limit with the new piston rings, replace the piston (page 14-6).

If the piston ring width is normal, replace the piston (page 14-6) and reinspect the clearance.
If necessary replace the piston rings (top, second, oil) as a set (page 14-6) and reinspect the clearance.



PISTON RING WIDTH

Measure each piston ring width.



STANDARD:
Top: 1.140 – 1.155 mm (0.0449 – 0.0455 in)
Second: 1.140 – 1.155 mm (0.0449 – 0.0455 in)
SERVICE LIMIT:
Top: 1.120 mm (0.0441 in)
Second: 1.120 mm (0.0441 in)

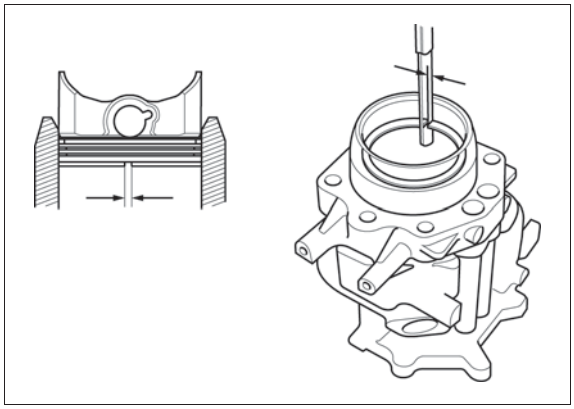
If any of the measurements is less than the service limit, replace the piston rings (top, second, oil) as a set (page 14-6).

PISTON RING END GAP

Before inspection, check whether the cylinder sleeve I.D. is within the specification.

Set the piston ring into the cylinder sleeve using the piston head.

Measure each piston ring end gap using a feeler gauge.

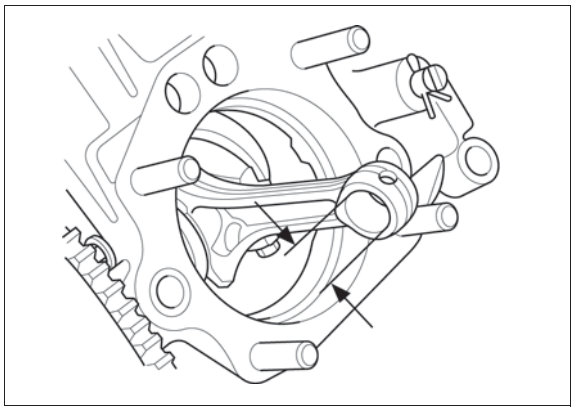


STANDARD:
Top: 0.200 – 0.350 mm (0.0079 – 0.0138 in)
Second: 0.200 – 0.350 mm (0.0079 – 0.0138 in)
Oil (side rail): 0.20 – 0.70 mm (0.008 – 0.028 in)
SERVICE LIMIT:
Top: 1.0 mm (0.04 in)
Second: 1.0 mm (0.04 in)
Oil (side rail): 1.0 mm (0.04 in)

If any of the measurements is more than the service limit, replace the piston rings (top, second, oil) as a set (page 14-6).

CONNECTING ROD SMALL END I.D.

Measure the connecting rod small end I.D.



STANDARD: 18.006 – 18.018 mm (0.7089 – 0.7094 in)
SERVICE LIMIT: 18.07 mm (0.711 in)

If the measurement is more than the service limit, replace the connecting rod (page 15-4).

VALVE SEAT RECONDITIONING

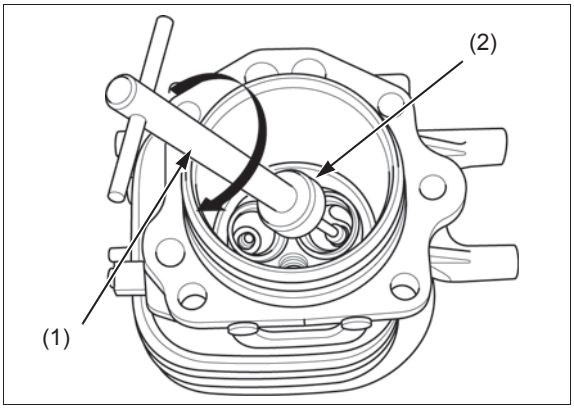
Valve seat cutters/grinders or equivalent valve seat refacing equipment are recommended to correct worn valve seats.

Using a 45° cutter remove enough material to produce a smooth and concentric seat.

TOOLS:

Cutter holder 5.5 mm (1)	**07981-VA20101**
Seat cutter 33 mm (45° IN) (2)	**07780-0010800**
Seat cutter 27.5 mm (45° EX) (2)	**07780-0010200**

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



Use the 32° and 60° cutters to adjust the valve seat so that it contacts the middle of the valve face.

The 32° cutter removes material from the top edge.

TOOLS:

Cutter holder 5.5 mm	**07981-VA20101**
Flat cutter 33 mm (32° IN)	**07780-0012900**
Flat cutter 30 mm (32° EX)	**07780-0012200**

The 60° cutter removes material from the bottom edge.

TOOLS:

Cutter holder 5.5 mm	**07981-VA20101**
Interior cutter 30 mm (60° IN)	**07780-0014000**
Interior cutter 26 mm (60° EX)	**07780-0014500**

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

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

TOOLS:

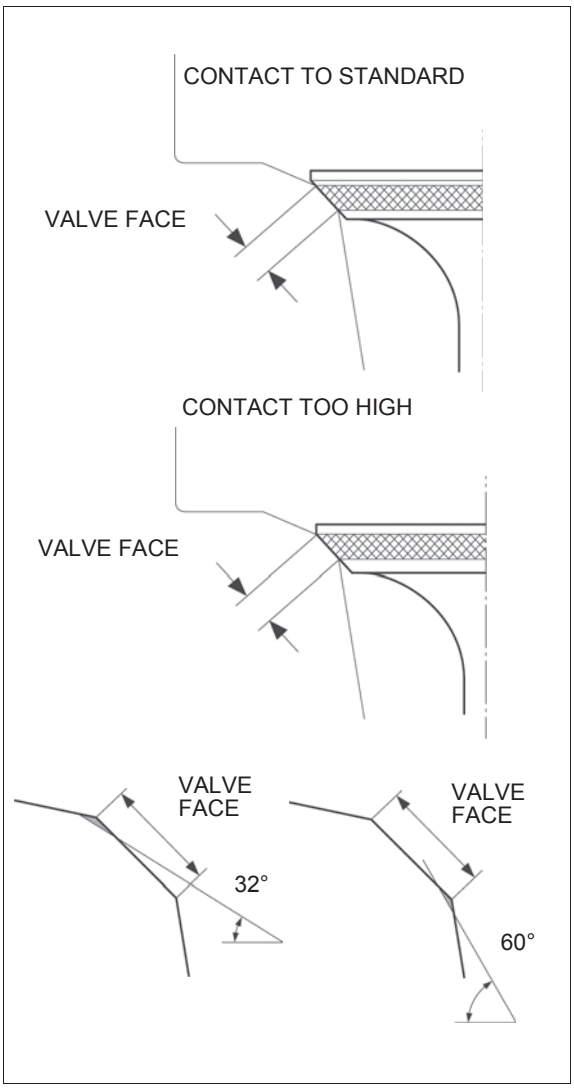
Cutter holder 5.5 mm	**07981-VA20101**
Seat cutter 33 mm (45° IN)	**07780-0010800**
Seat cutter 27.5 mm (45° EX)	**07780-0010200**

After resurfacing the seats, inspect for even valve seating.

Apply Prussian Blue compound or erasable felt-tipped marker ink to the 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 seating surface, as shown by the transferred marking compound, should have good contact all the way around.

Thoroughly clean the cylinder to remove any cutting residual.



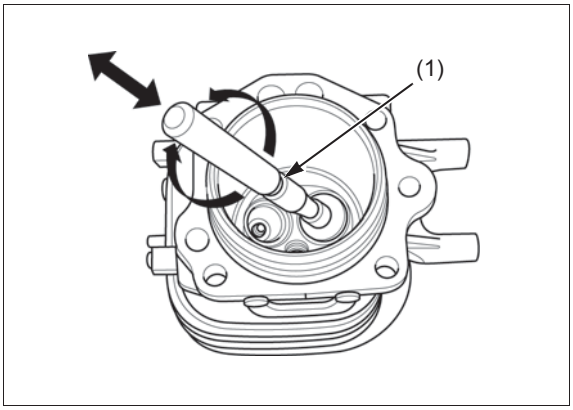
Lap the valves into their seats, using a commercially available valve lapper (1) and lapping compound.

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

NOTICE

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

Adjust the valve clearance after reassembly (page 3-8).

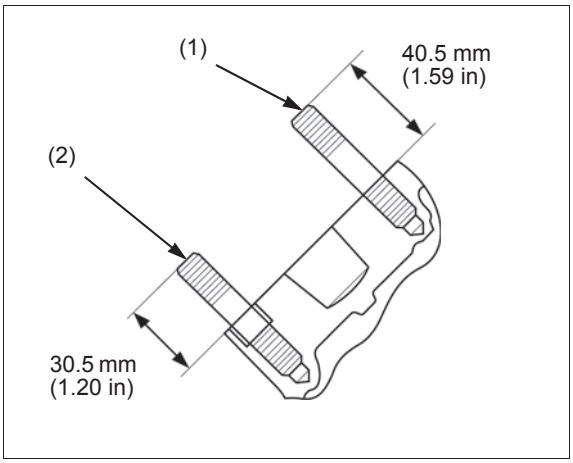


CYLINDER STUD BOLT REPLACEMENT

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

Install new stud bolts.

SPECIFIED LENGTH:
Upper side (1): 40.5 mm (1.59 in)
Lower side (2): 30.5 mm (1.20 in)

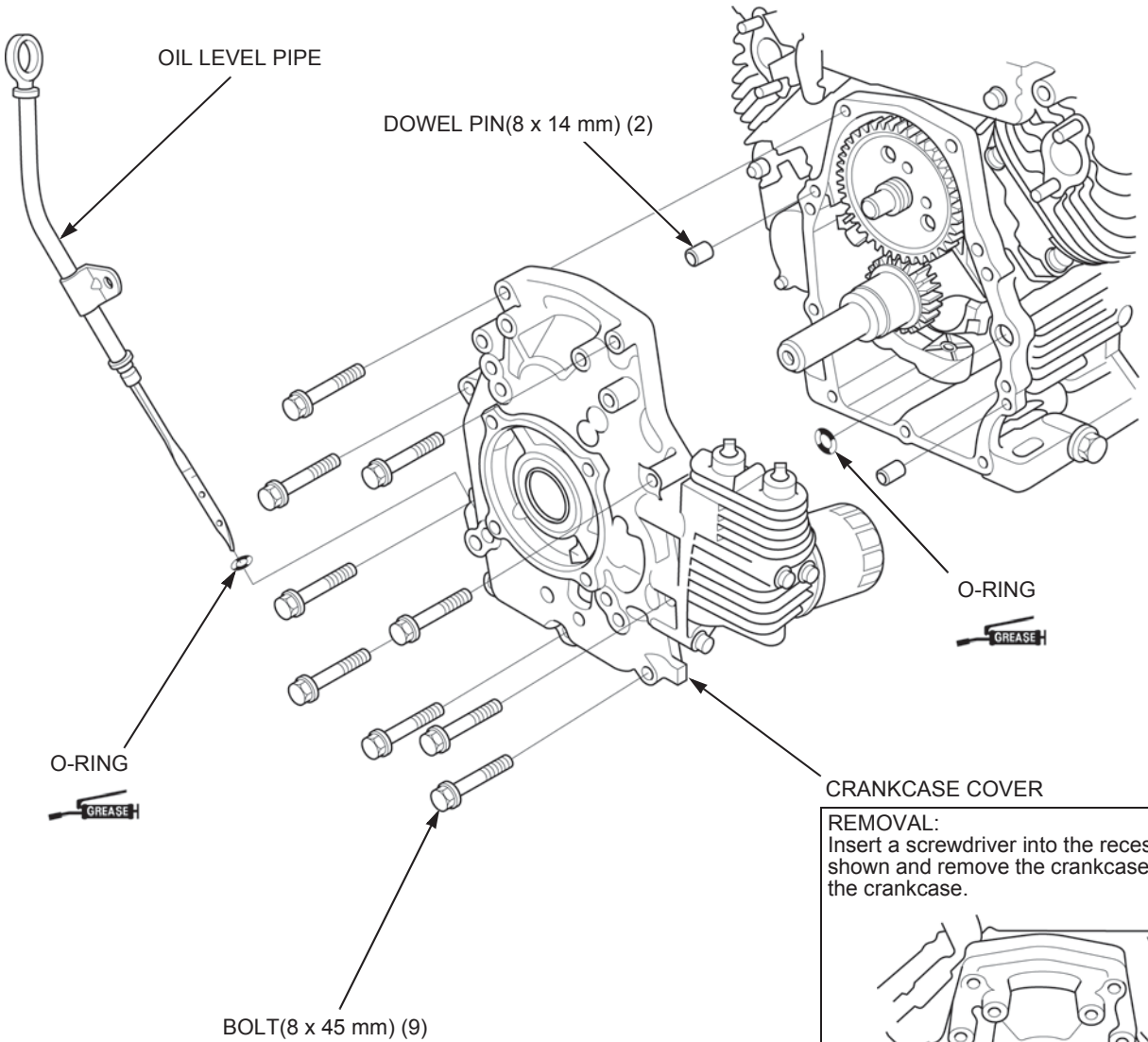


15. CRANKCASE

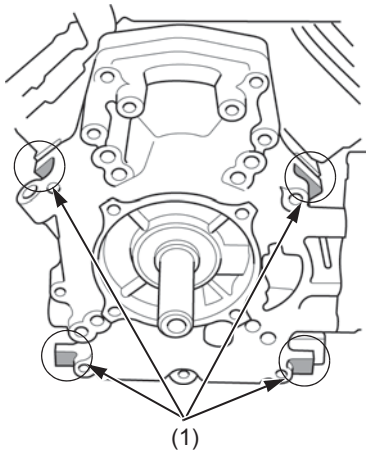
CRANKCASE COVER REMOVAL/ INSTALLATION

REMOVAL

Drain the engine oil (page 3-4).



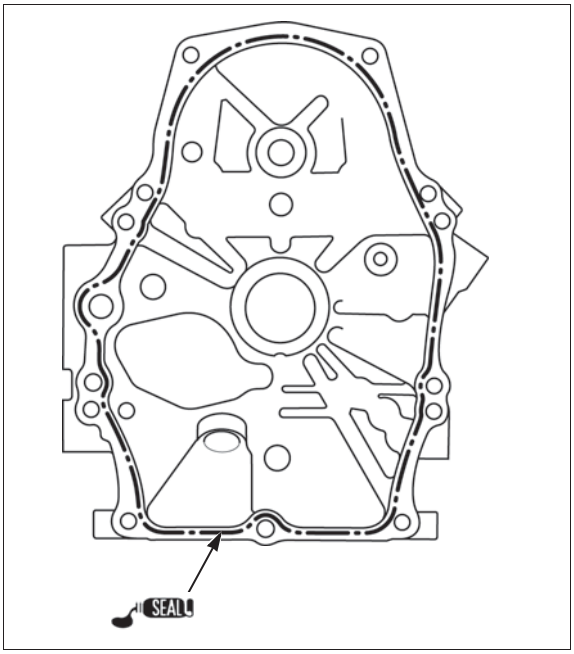
REMOVAL:
Insert a screwdriver into the recess (1) as shown and remove the crankcase cover from the crankcase.



INSTALLATION

Clean the mating surfaces of the crankcase cover and crankcase of old liquid gasket, oil and other foreign material.

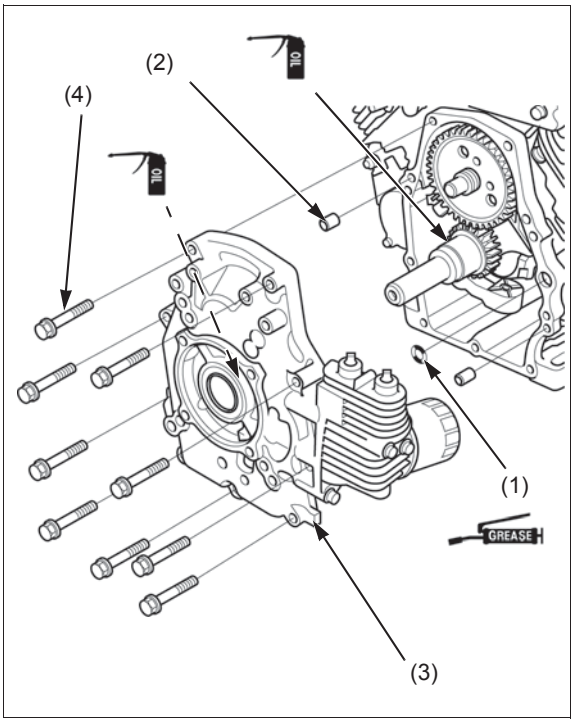
Apply a bead (Φ1.0 – 1.5 mm (Φ0.04 – 0.06 in) of liquid gasket (Threebond TB1207B) to the mating surface of the crankcase cover as shown.



Apply grease to the O-ring (1).
Install the two dowel pins (2) and O-ring to the crankcase.

Apply a light coat of oil to the main journal part of the crankshaft and crankcase cover (3).
Install the crankcase cover and tighten the nine flange bolts (4) securely.

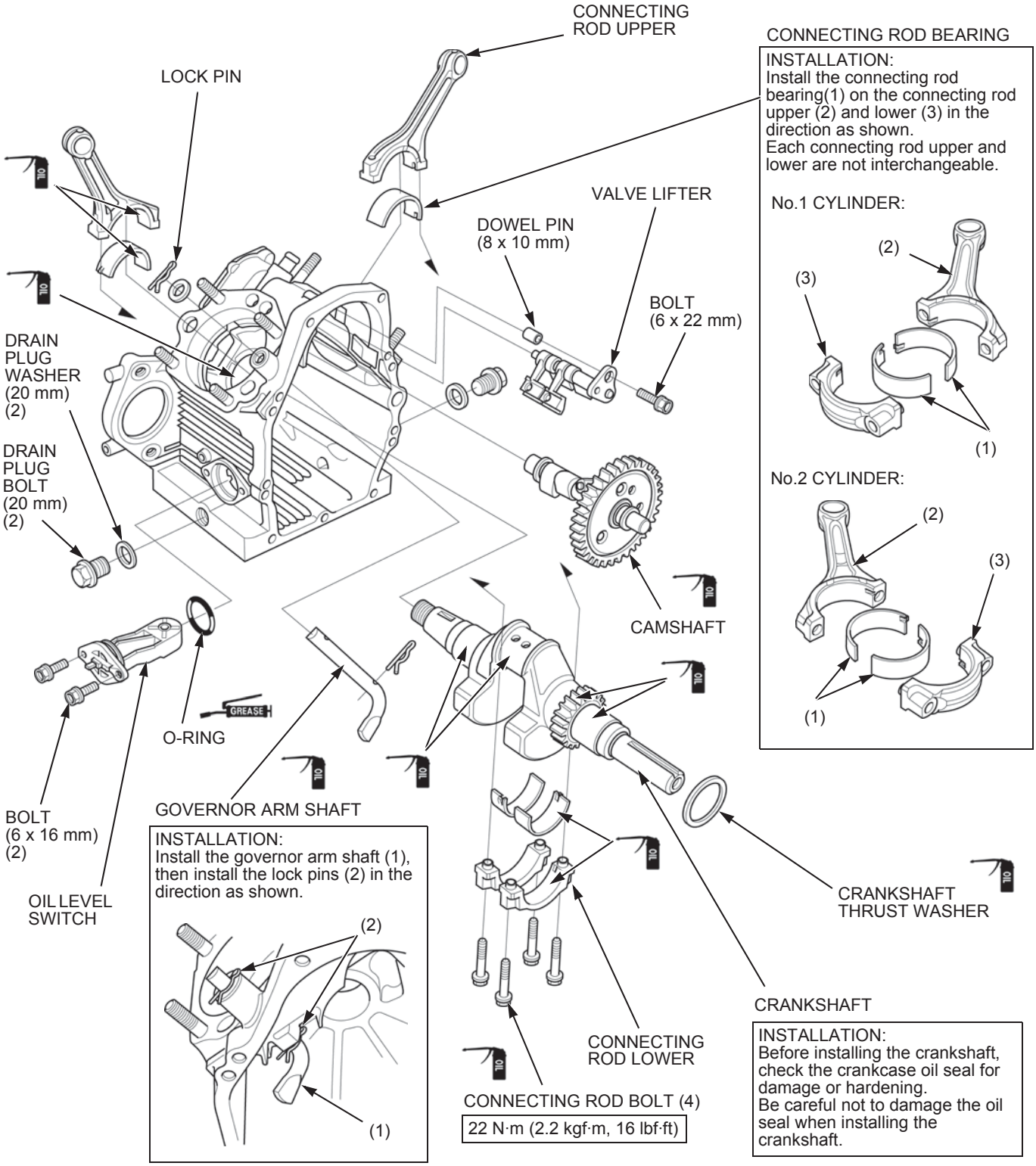
- Assemble the crankcase cover within 3 minutes after applying liquid gasket.
- Wait for 30 minutes after assembly before filling with oil and starting the engine.



CRANKSHAFT/CONNECTING ROD/ CAMSHAFT/VALVE LIFTER REMOVAL/ INSTALLATION

Remove the following:

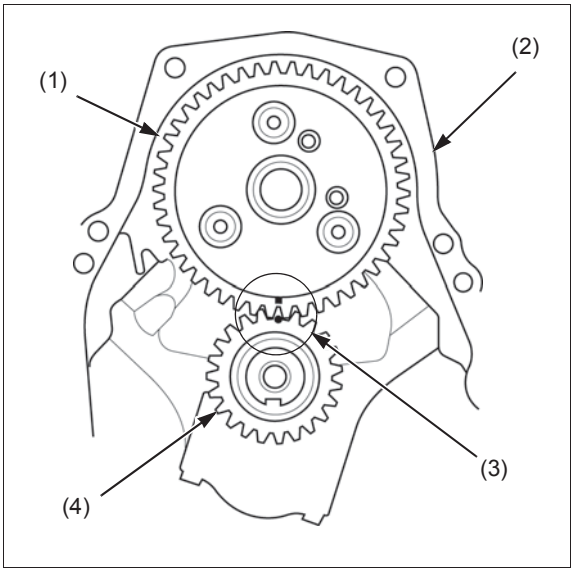
- Flywheel (page 8-4)
- Cylinder (page 14-2)
- Crankcase cover (page 15-2)



CAMSHAFT INSTALLATION

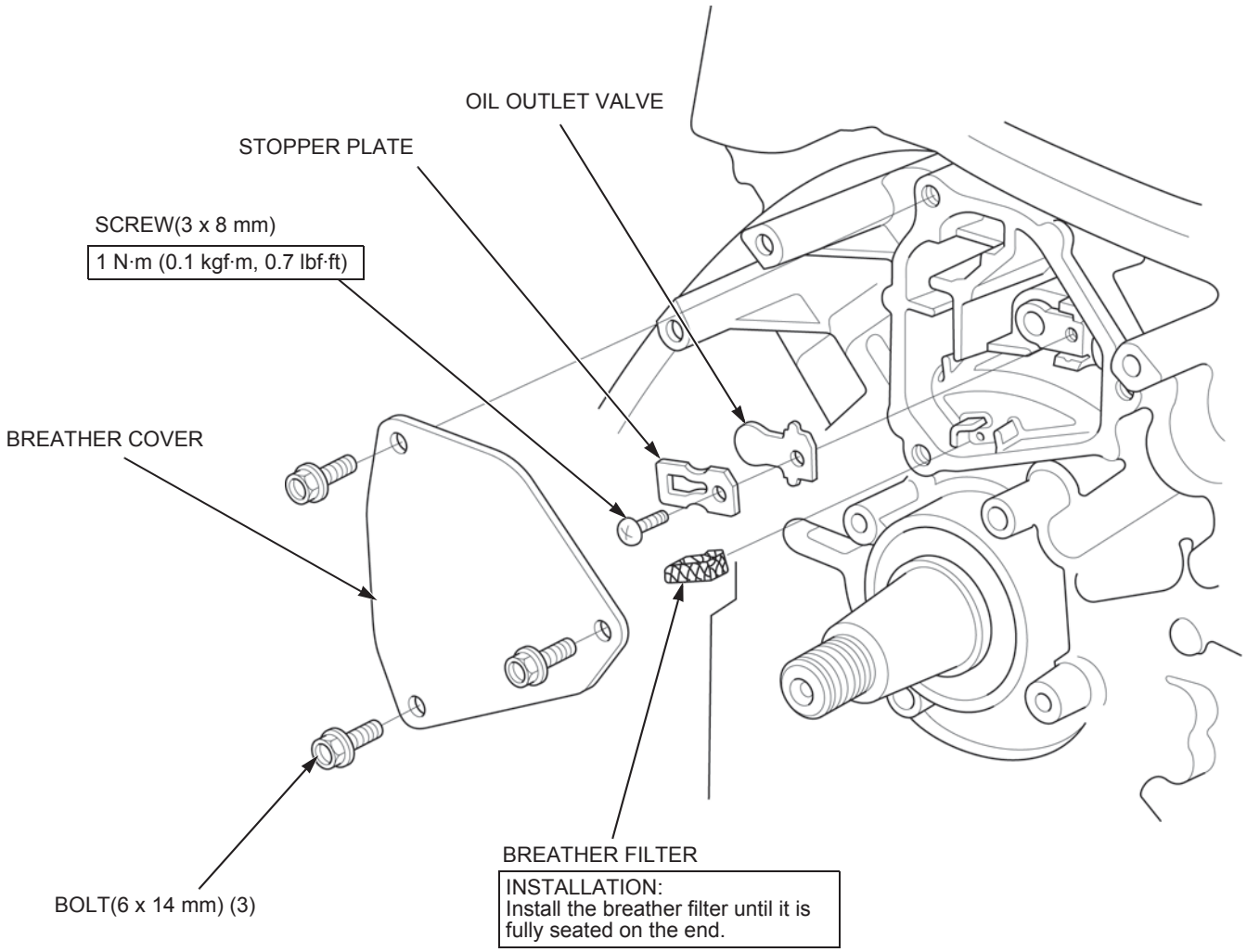
Open the valve lifters in the crankcase.

Install the camshaft (1) to the crankcase (2) by aligning the punch marks (3) on the camshaft and the crankshaft (4) (marked on the timing gear).



BREATHER DISASSEMBLY/ ASSEMBLY

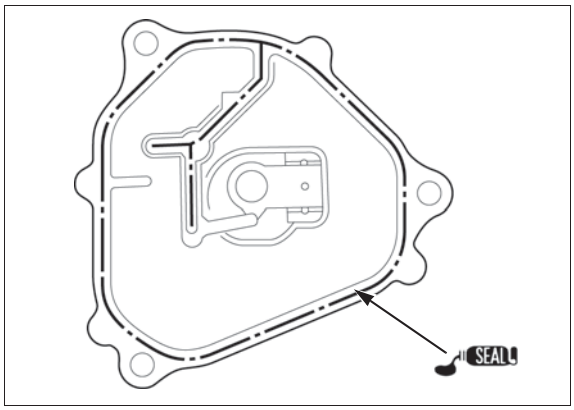
Remove the charge coil (page 8-6).



BREATHER COVER INSTALLATION

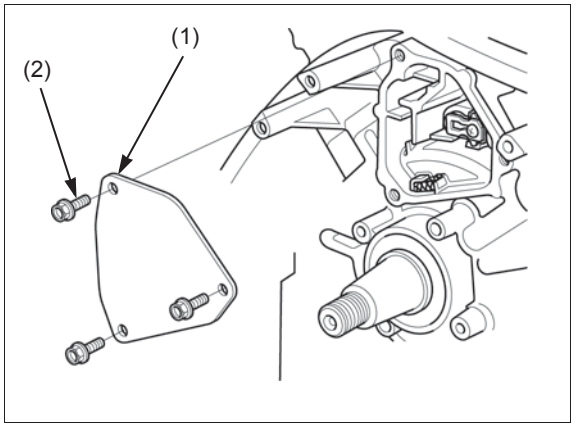
Clean the mating surfaces of the breather cover and crankcase of old liquid gasket, oil and other foreign material.

Apply a bead (Φ1.0 – 1.5 mm (Φ0.04 – 0.06 in) of liquid gasket (Threebond TB1207B) to the mating surface of the crankcase as shown.



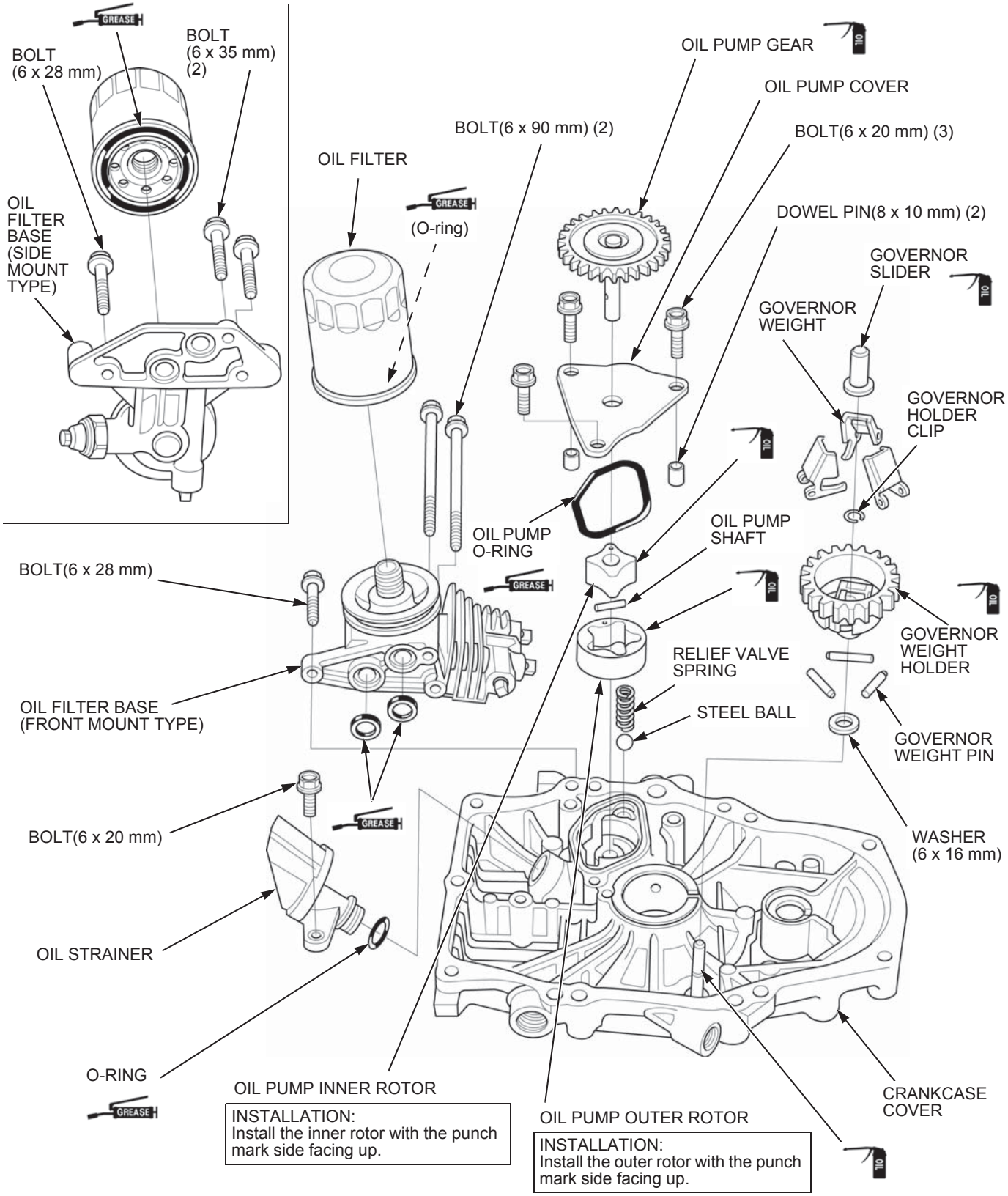
Install the breather cover (1) and tighten the three flange bolts (2) securely.

- Be sure not to catch the breather filter between the breather cover and crankcase.
- Assemble the breather cover within 3 minutes after applying liquid gasket.
- Wait for 30 minutes after assembly before filling with oil and starting the engine.



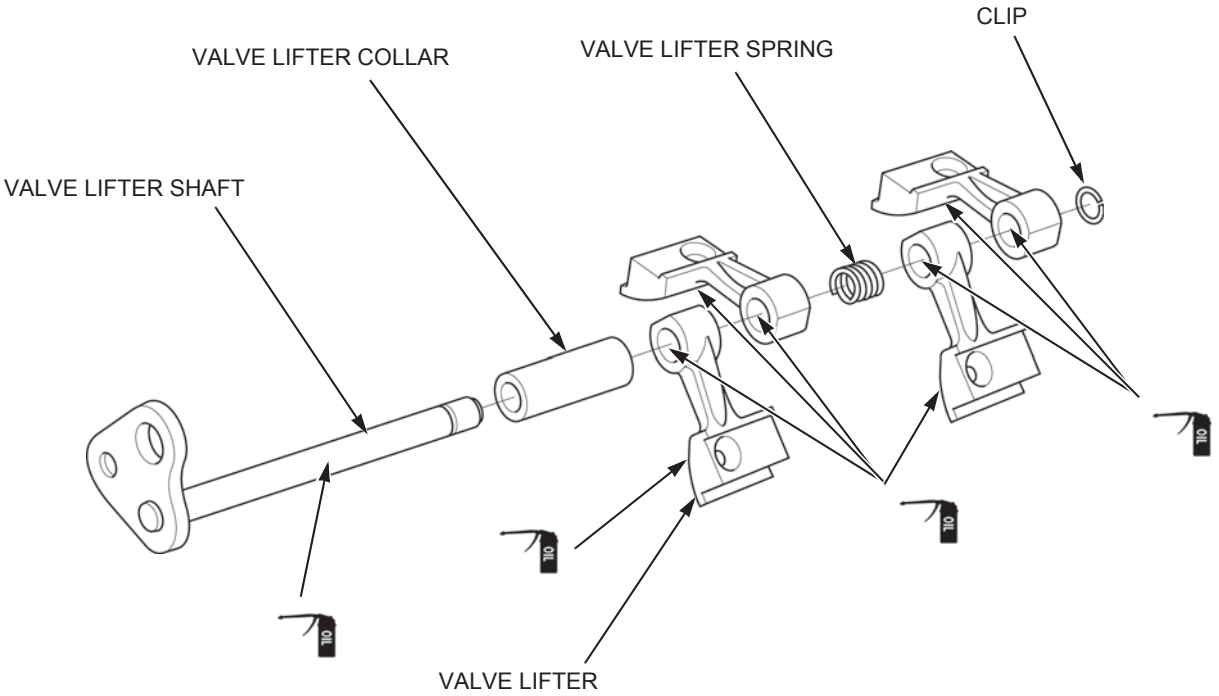
GOVERNOR/OIL PUMP/OIL FILTER DISASSEMBLY/ASSEMBLY

Remove the crankcase cover (page 15-2).



VALVE LIFTER DISASSEMBLY/ ASSEMBLY

Remove the valve lifter (page 15-4).



CRANKCASE COVER/CRANKCASE/ CRANKSHAFT/CONNECTING ROD/ CAMSHAFT/VALVE LIFTER INSPECTION

CRANKSHAFT AXIAL CLEARANCE

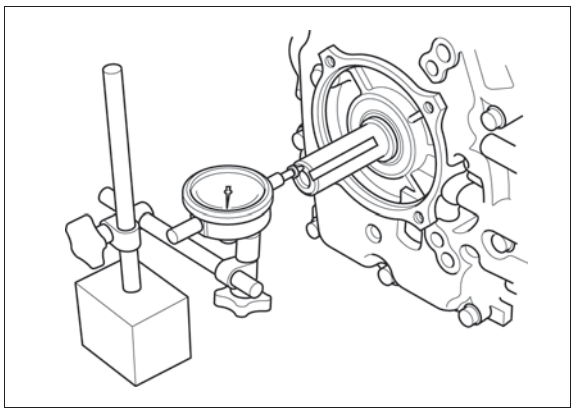
Remove the connecting rods (page 15-4).

Reinstall the crankcase cover.

Measure the crankshaft axial clearance.

STANDARD: **0.05 – 0.45 mm (0.002 – 0.018 in)**
SERVICE LIMIT: **1.0 mm (0.04 in)**

If the measurement is more than the service limit, inspect the crankshaft thrust washer (page 15-10).

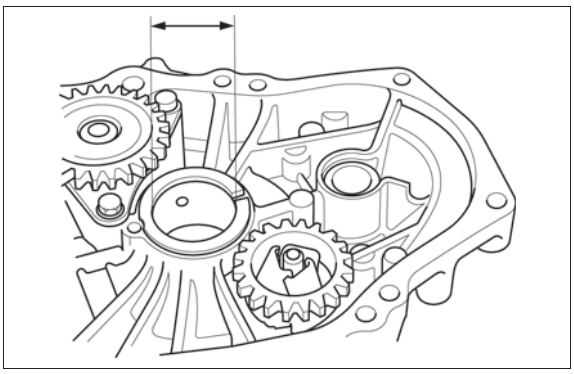


MAIN JOURNAL I.D.: CRANKCASE COVER SIDE

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

STANDARD: **40.025 – 40.041 mm (1.5758 – 1.5764 in)**
SERVICE LIMIT: **40.06 mm (1.577 in)**

If the measurement is more than the service limit, replace the crankcase cover (page 15-7).

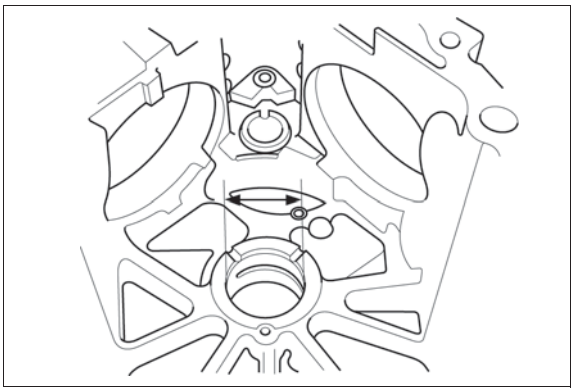


MAIN JOURNAL I.D.: CRANKCASE SIDE

Measure the main journal I.D. of the crankcase.

STANDARD: **40.025 – 40.041 mm (1.5758 – 1.5764 in)**
SERVICE LIMIT: **40.06 mm (1.577 in)**

If the measurement is more than the service limit, replace the crankcase (page 15-4).

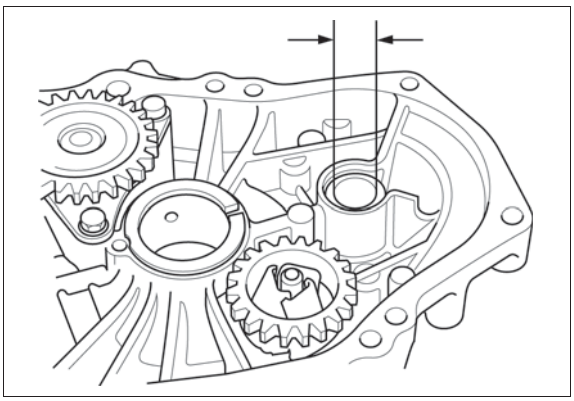


CAMSHAFT BEARING I.D.: CRANKCASE COVER SIDE

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

STANDARD: **17.016 – 17.027 mm (0.6699 – 0.6704 in)**
SERVICE LIMIT: **17.06 mm (0.672 in)**

If the measurement is more than the service limit, replace the crankcase cover (page 15-7).

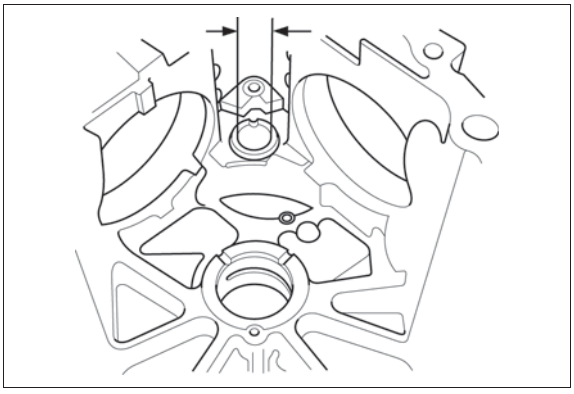


CAMSHAFT BEARING I.D.: CRANKCASE SIDE

Measure the camshaft bearing I.D. of the crankcase.

STANDARD: **17.016 – 17.027 mm (0.6699 – 0.6704 in)**
SERVICE LIMIT: **17.06 mm (0.672 in)**

If the measurement is more than the service limit, replace the crankcase (page 15-4).

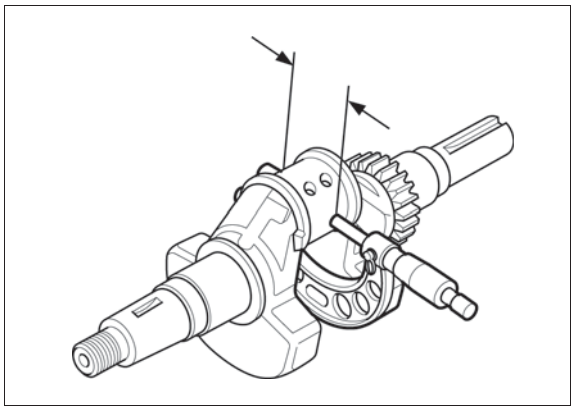


CRANK PIN O.D.

Measure the crank pin O.D. of the crankshaft.

STANDARD: 44.973 – 44.983 mm (1.7706 – 1.7710 in)
SERVICE LIMIT: 44.920 mm (1.7685 in)

If the measurement is less than the service limit, replace the crankshaft (page 15-4).

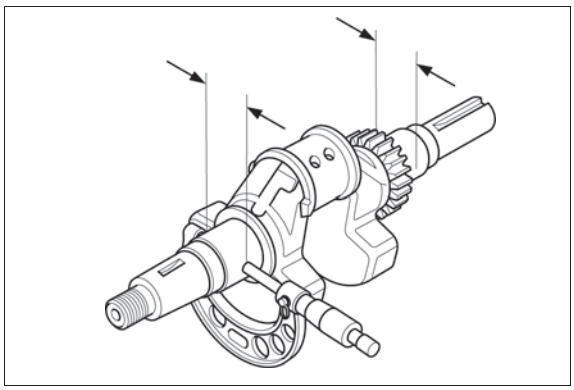


CRANKSHAFT MAIN JOURNAL O.D.

Measure the main journal O.D. of the crankshaft.

STANDARD: 39.984 – 40.000 mm (1.5742 – 1.5748 in)
SERVICE LIMIT: 39.930 mm (1.5720 in)

If the measurement is less than the service limit, replace the crankshaft (page 15-4).

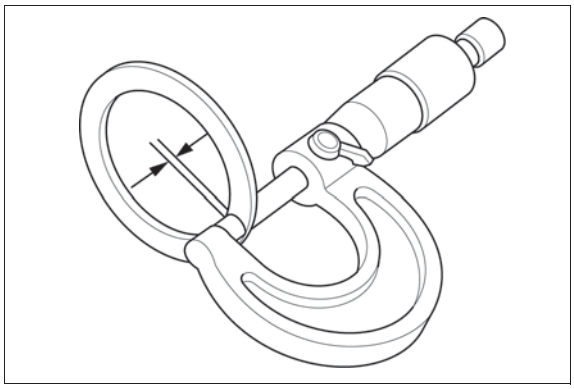


CRANKSHAFT THRUST WASHER THICKNESS

Measure the crankshaft thrust washer thickness.

STANDARD: 0.95 – 1.05 mm (0.037 – 0.041 in)
SERVICE LIMIT: 0.8 mm (0.03 in)

If the measurement is less than the service limit, replace the crankshaft thrust washer (page 15-4).



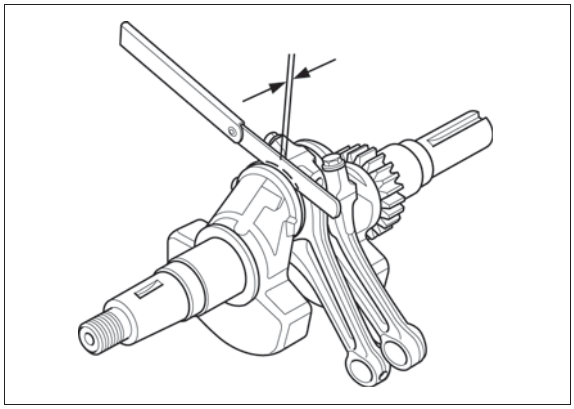
CONNECTING ROD BIG END SIDE CLEARANCE

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

STANDARD: 0.2 – 0.4 mm (0.008 – 0.016 in)
SERVICE LIMIT: 1.000 mm (0.0394 in)

If the measurement is more than the service limit, replace the connecting rod (page 15-4) and recheck the clearance.

If the clearance is still more than the service limit with the new connecting rod, replace the crankshaft (page 15-4).



CONNECTING ROD BIG END I.D.

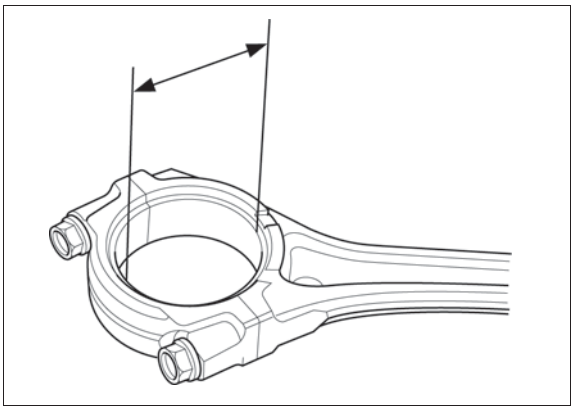
Set the connecting rod lower and connecting rod bearings to the connecting rod upper and tighten the connecting rod bolts to the specified torque.

TORQUE: 22 N·m (2.2 kgf·m, 16 lbf·ft)

Measure the connecting rod big end I.D.

STANDARD: 44.988 – 45.012 mm (1.7712 – 1.7721 in)
SERVICE LIMIT: 45.050 mm (1.7736 in)

If the measurement is more than the service limit, replace the connecting rod bearings (page 15-4).



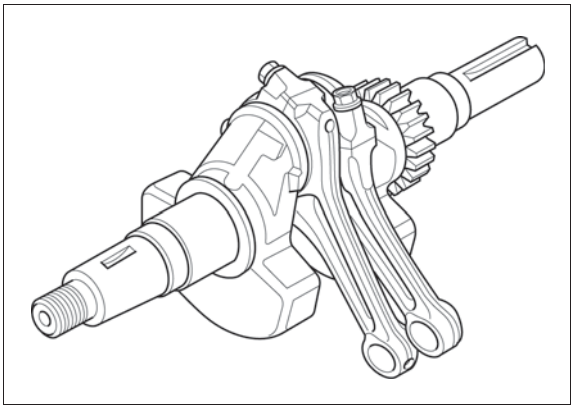
CONNECTING ROD BIG END OIL CLEARANCE

Clean all oil from the crank pin, connecting rod big end surface and connecting rod bearings.

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

TORQUE: 22 N·m (2.2 kgf·m, 16 lbf·ft)

- Do not rotate the crankshaft while the plastigauge is in place.

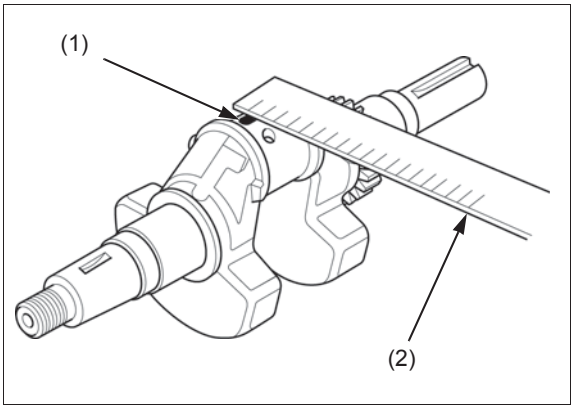


Remove the connecting rod and measure the plastigauge.

STANDARD: 0.005 – 0.039 mm (0.0002 – 0.0015 in)
SERVICE LIMIT: 0.070 mm (0.0028 in)

If the clearance is more than the service limit, replace the connecting rod bearings (page 15-4) and recheck the clearance.

If the clearance is still more than the service limit with the new connecting rod bearings, replace the crankshaft (page 15-4).

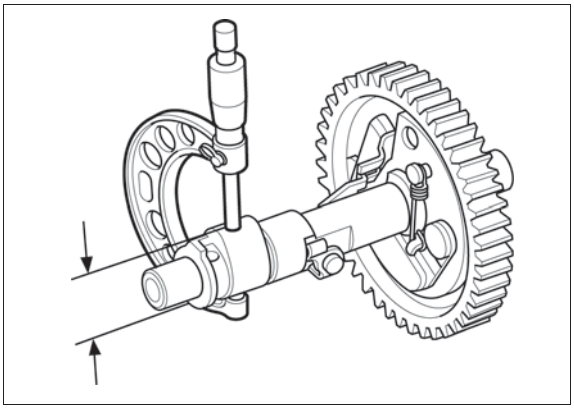


CAMSHAFT CAM HEIGHT

Measure the cam height of the camshaft.

STANDARD:
IN: 29.506 – 29.706 mm (1.1617 – 1.1695 in)
EX: 29.410 – 29.610 mm (1.1579 – 1.1657 in)
SERVICE LIMIT:
IN: 29.36 mm (1.156 in)
EX: 29.26 mm (1.152 in)

If the measurement is less than the service limit, replace the camshaft (page 15-4).

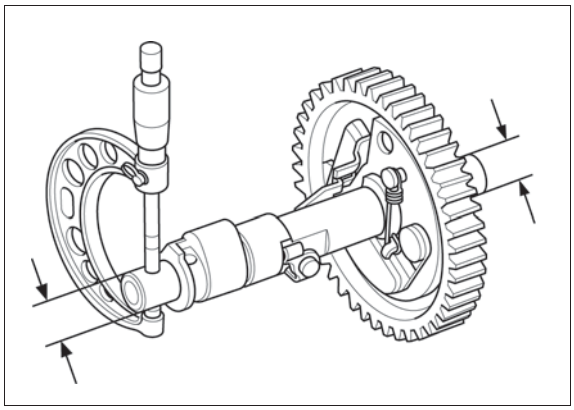


CAMSHAFT O.D.

Measure the camshaft O.D. of the camshaft.

STANDARD: 16.982 – 17.000 mm (0.6686 – 0.6693 in)
SERVICE LIMIT: 17.100 mm (0.6732 in)

If the measurement is less than the service limit, replace the camshaft (page 15-5).



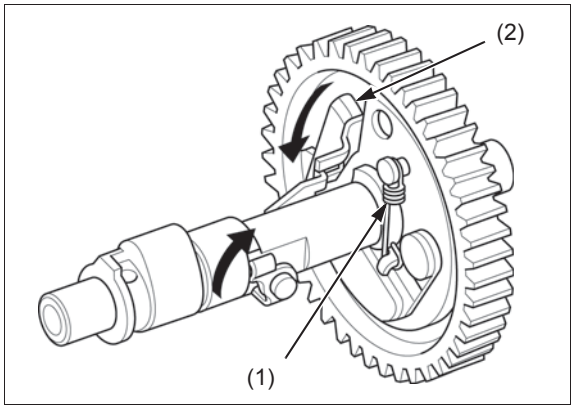
DECOMPRESSOR WEIGHT

Check for worn and weakened weight return spring (1).

If the spring is worn or weakened, replace the weight return spring.

Check that the decompressor weight (2) moves smoothly.

If the decompressor weight does not move correctly, replace the camshaft (page 15-5).

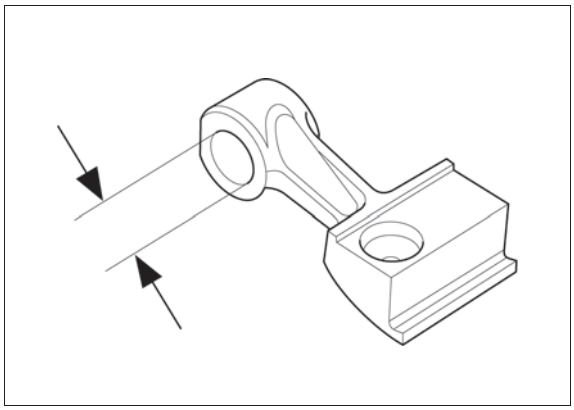


VALVE LIFTER I.D.

Measure the valve lifter I.D.

STANDARD: 6.010 – 6.040 mm (0.2366 – 0.2378 in)
SERVICE LIMIT: 6.070 mm (0.2390 in)

If the measurement is more than the service limit, replace the valve lifter (page 15-8).

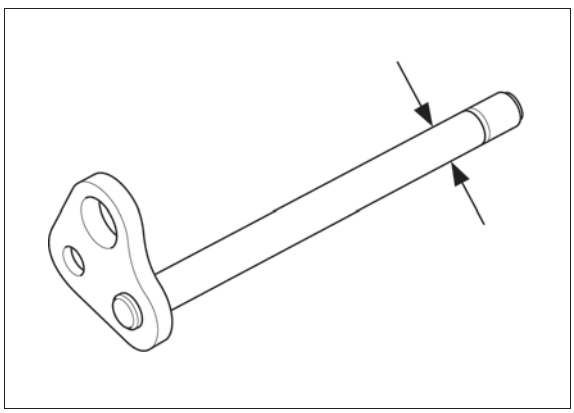


VALVE LIFTER SHAFT O.D.

Measure the valve lifter shaft O.D.

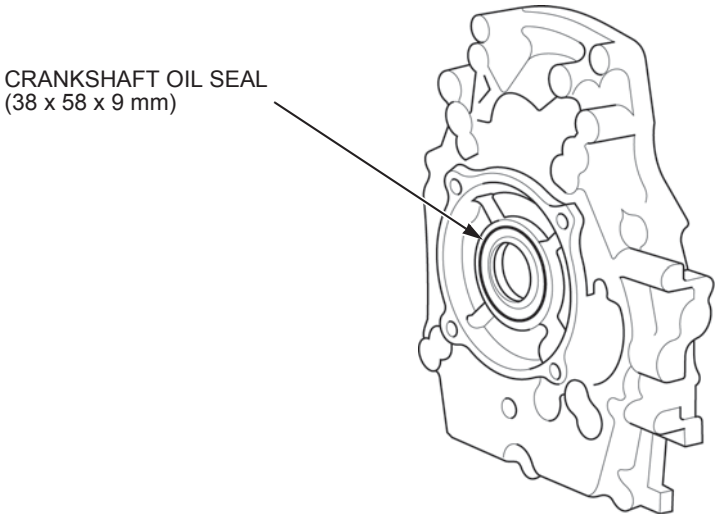
STANDARD: 5.970 – 6.000 mm (0.2350 – 0.2362 in)
SERVICE LIMIT: 5.940 mm (0.2339 in)

If the measurement is less than the service limit, replace the valve lifter shaft (page 15-8).



CRANKSHAFT OIL SEAL REPLACEMENT (CRANKCASE COVER SIDE)

LOCATION



CRANKSHAFT OIL SEAL (38 x 58 x 9 mm)

Remove the crankcase cover (page 15-2).

Remove the oil seal (1) from the crankcase cover (2).

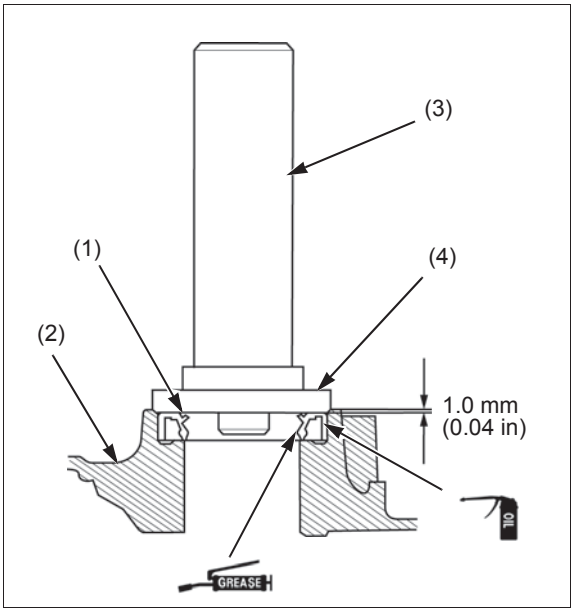
Apply oil to the outer surface of a new oil seal.

Drive the new oil seal in the position as shown using the special tools.

TOOLS:

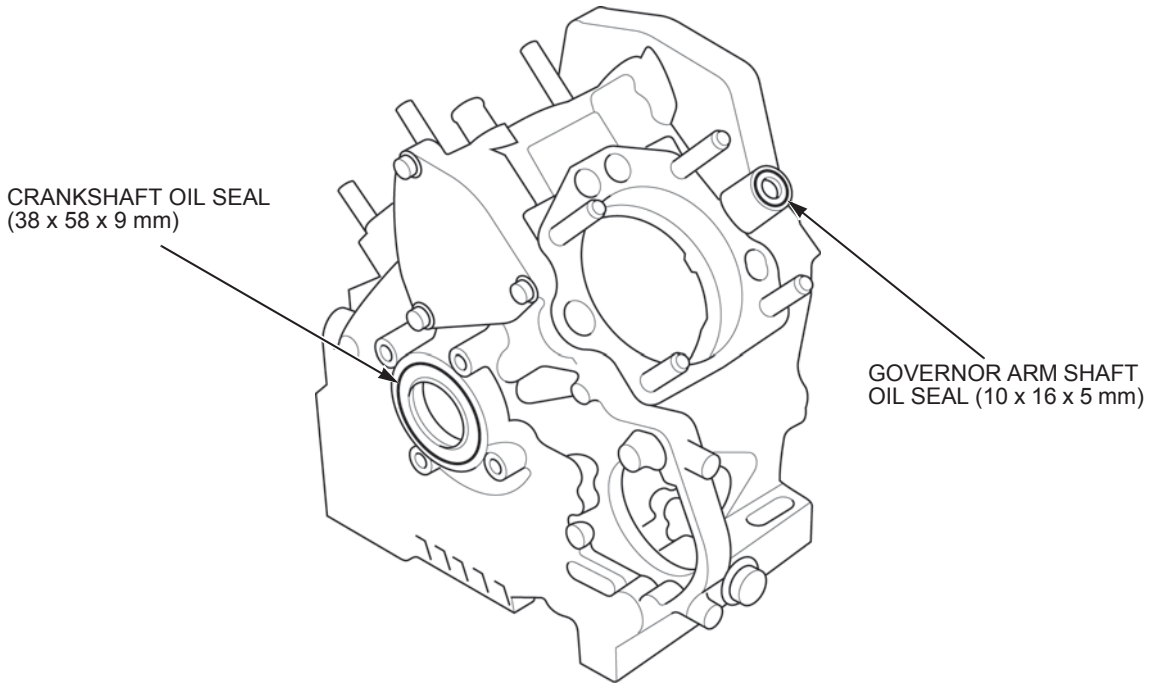
Driver handle 15 x 135L (3)	**07749-0010000**
Oil seal driver attachment 60 mm (4)	**07GAD-PG40100**

Apply grease to the lip of a new oil seal.



CRANKSHAFT/GOVERNOR ARM SHAFT OIL SEAL REPLACEMENT (CRANKCASE SIDE)

LOCATION



CRANKSHAFT OIL SEAL (38 x 58 x 9 mm)

Remove the crankshaft (page 15-4).

Remove the oil seal (1) from the crankcase (2).

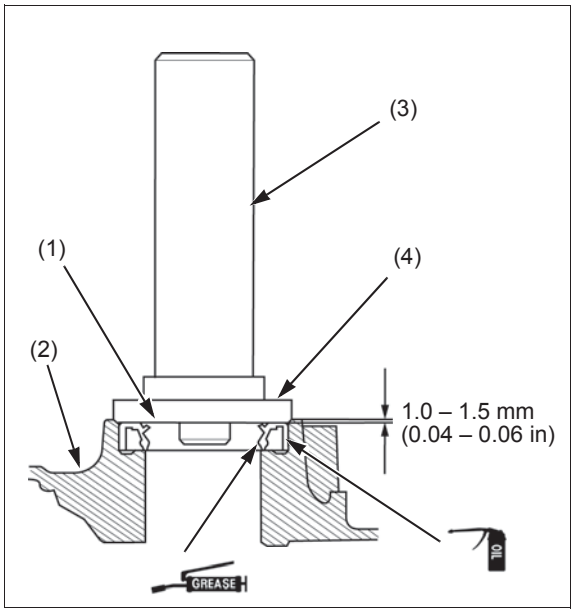
Apply oil to the outer surface of a new oil seal.

Drive the new oil seal in the position as shown using the special tools.

TOOLS:

Driver handle 15 x 135L (3)	**07749-0010000**
Oil seal driver attachment 60 mm (4)	**07GAD-PG40100**

Apply grease to the lip of a new oil seal.



GOVERNOR ARM SHAFT OIL SEAL (10 x 16 x 5 mm)

Remove the governor arm shaft (page 15-4).

Remove the oil seal (1) from the crankcase (2).

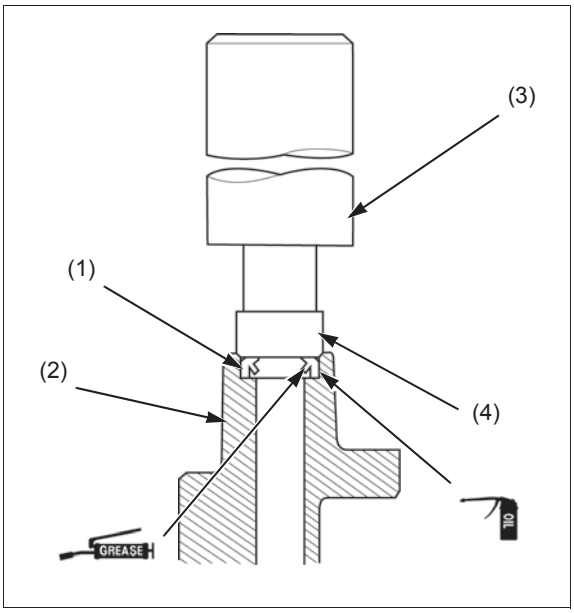
Apply oil to the outer surface of a new oil seal.

Drive the new oil seal until it is fully seated on the end using the special tools.

TOOLS:

Driver handle 15 x 135L (3)	**07749-0010000**
Pilot 17 mm (4)	**07746-0040400**

Apply grease to the lip of a new oil seal.



MEMO

16. TECHNICAL FEATURES

HIGH-COMPRESSION ENGINE

OUTLINE

The GX630/GX630R/GX660/GX660R/GX690/GX690R engines have more combustion efficiency and cylinder cooling capability than previous models. This results in increased the compression (increased to 9.3 from 8.3) and higher engine output.

FEATURE

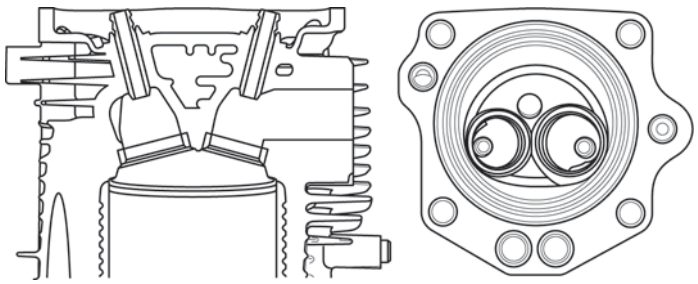
Combustion efficiency and intake/exhaust efficiency improvement

Combustion efficiency improvement: The S/V ratio (Surface Volume ratio of the combustion chamber) and resulting thermal efficiency have been increased by making the combustion chamber hemispherical.

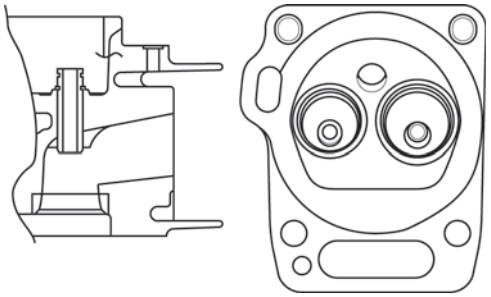
The offset distance of the spark plug position has been decreased and the equality of the flame propagation has been increased by moving the spark plug closer to the center of the combustion chamber.

Intake/exhaust efficiency improvement: Arranging the valves in a radial pattern allows the cylinder to have smoother intake and exhaust ports, and the port angle has been narrowed.

NEW GX630/GX630R/GX660/GX660R/GX690/GX690R:



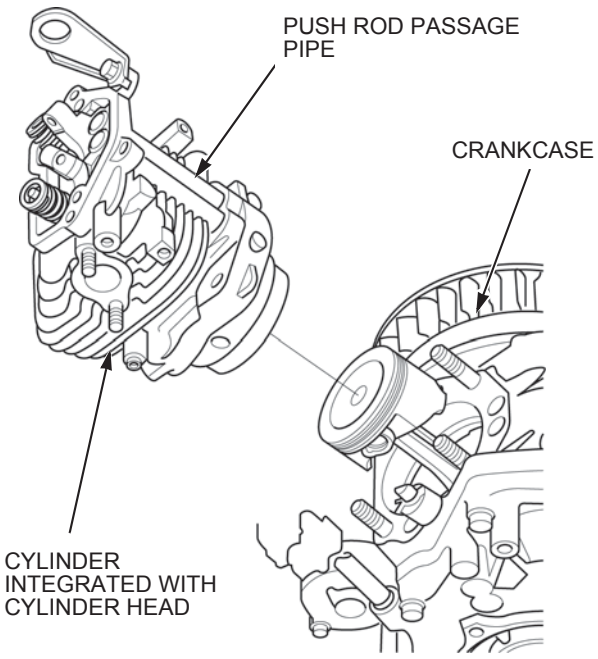
PREVIOUS MODEL:



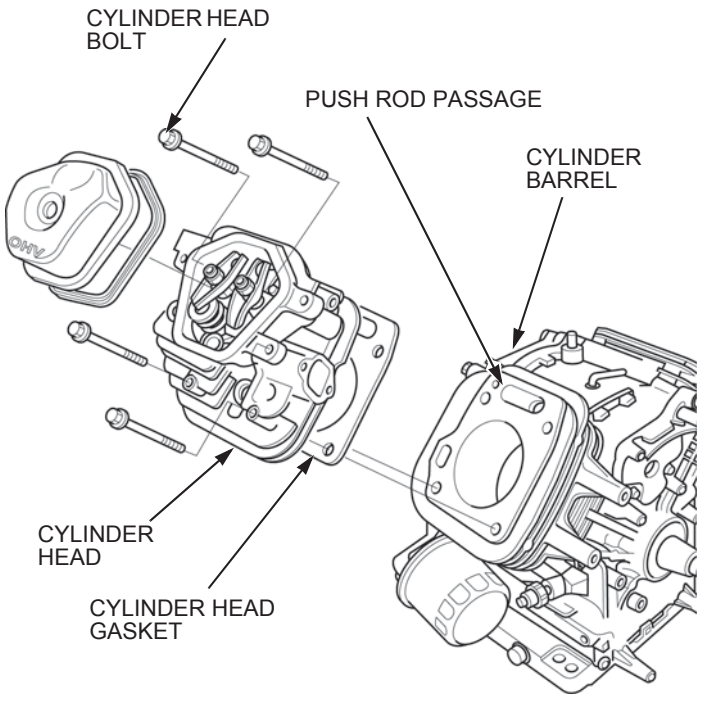
Cooling efficiency improvement

The cylinder block has been integrated with the cylinder head. It eliminates the use of the low thermal conductivity steel cylinder head bolts and stainless-steel cylinder head gaskets. Tubes are placed on the outside of the cylinder for push rod passages, allowing the cylinder block to be thinner and increase cooling efficiency.

NEW GX630/GX630R/GX660/GX660R/GX690/GX690R:



PREVIOUS MODEL:



Knocking avoidance

Knocking tends to occur when the compression ratio is increased, and the engine can be damaged by gas vibration and high temperature in the combustion chamber.

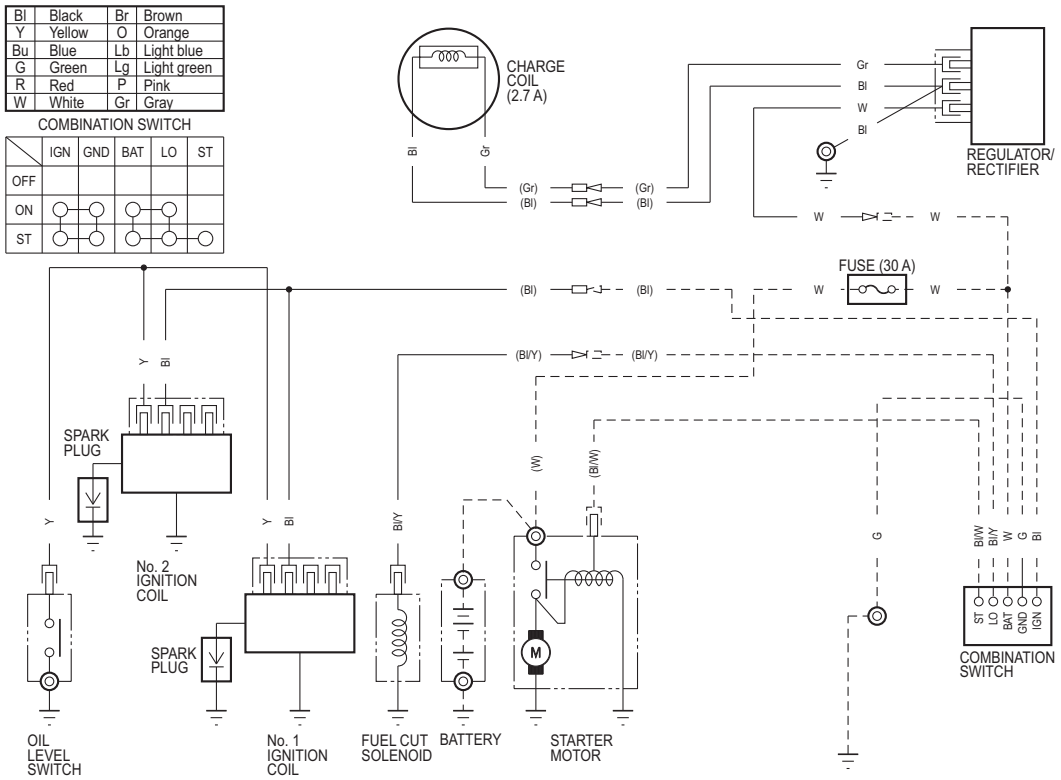
The GX630/GX630R/GX660/GX660R/GX690/GX690R engines are equipped with the C.D.I ignition coil that sets the optimum ignition timing in accordance with the engine speed to prevent knocking.

The ignition coil also is equipped with the engine speed limiter and an oil alert function that shuts down the engine if it senses signal from the oil level switch.

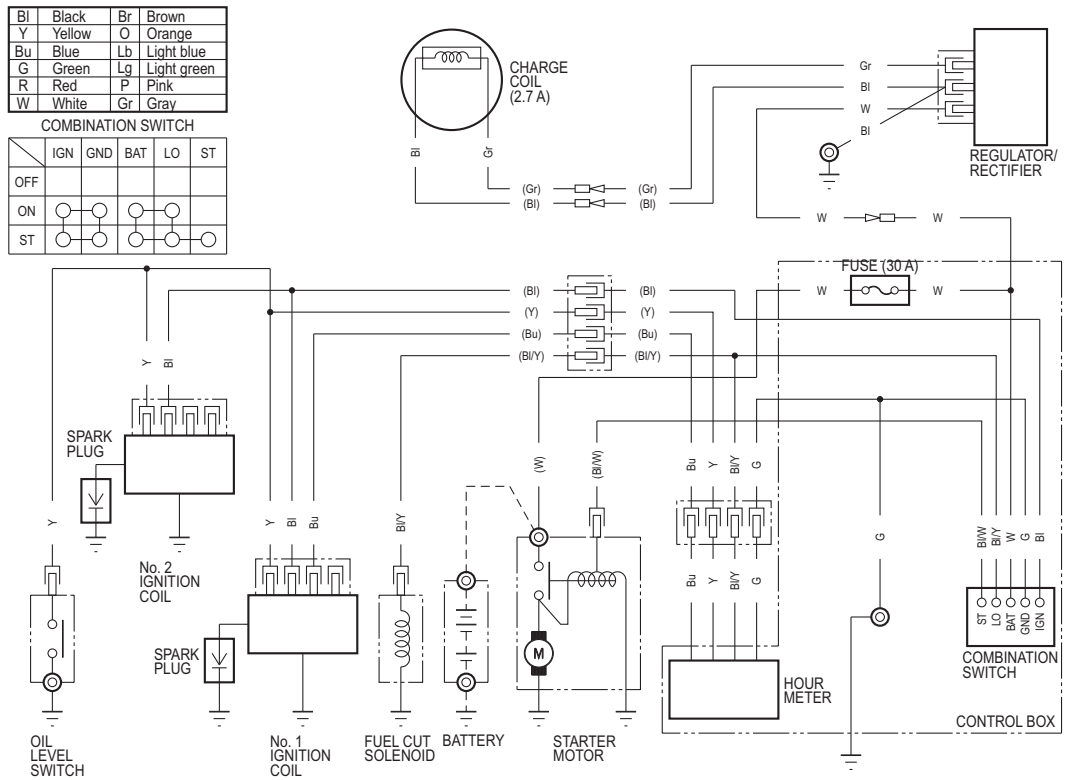
MEMO

17. WIRING DIAGRAMS

2.7A CHARGE COIL / REMOTE CONTROL TYPE



2.7A CHARGE COIL / CONTROL BOX TYPE



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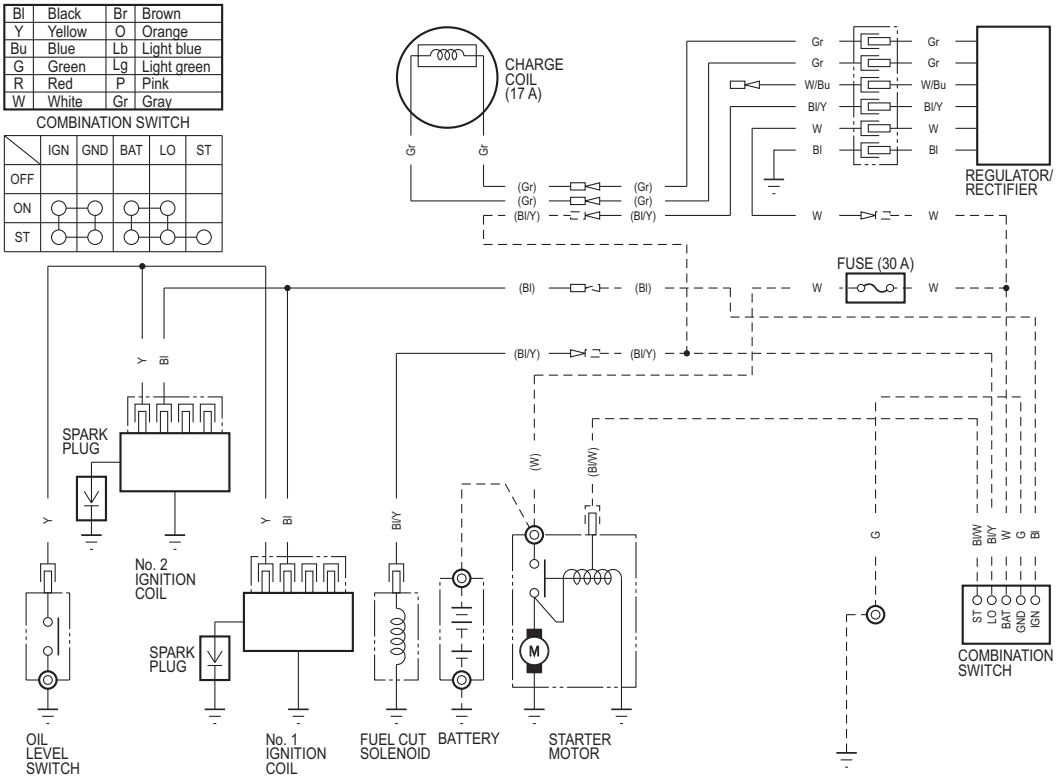

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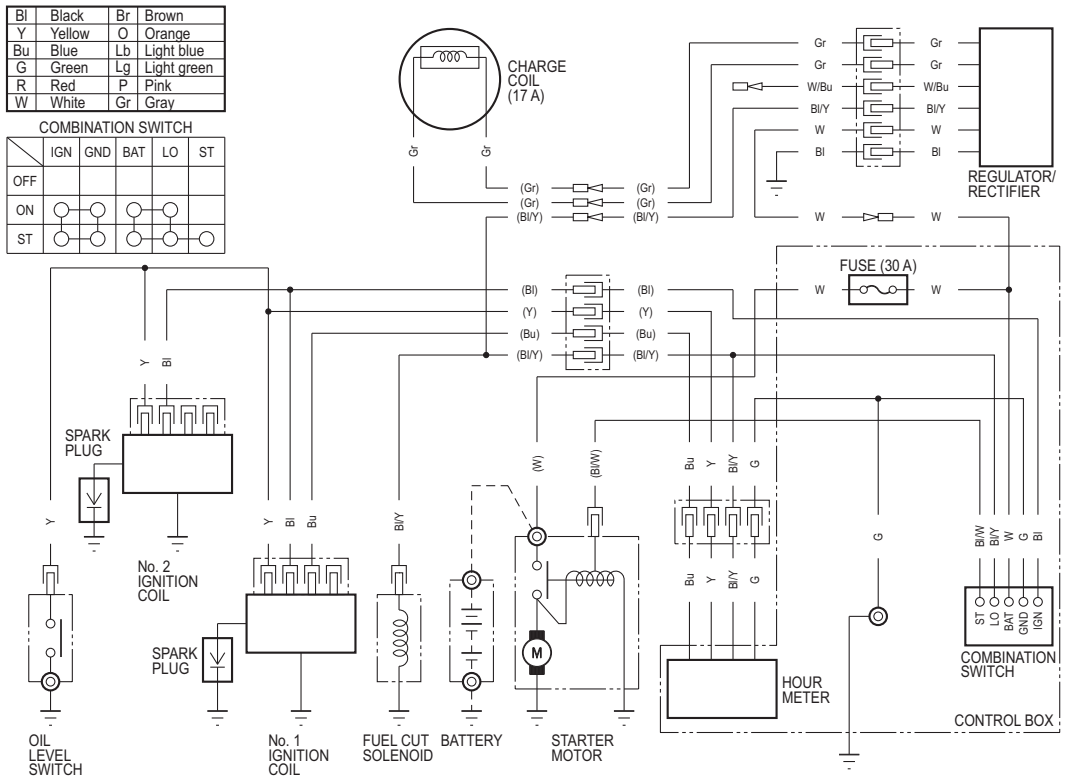
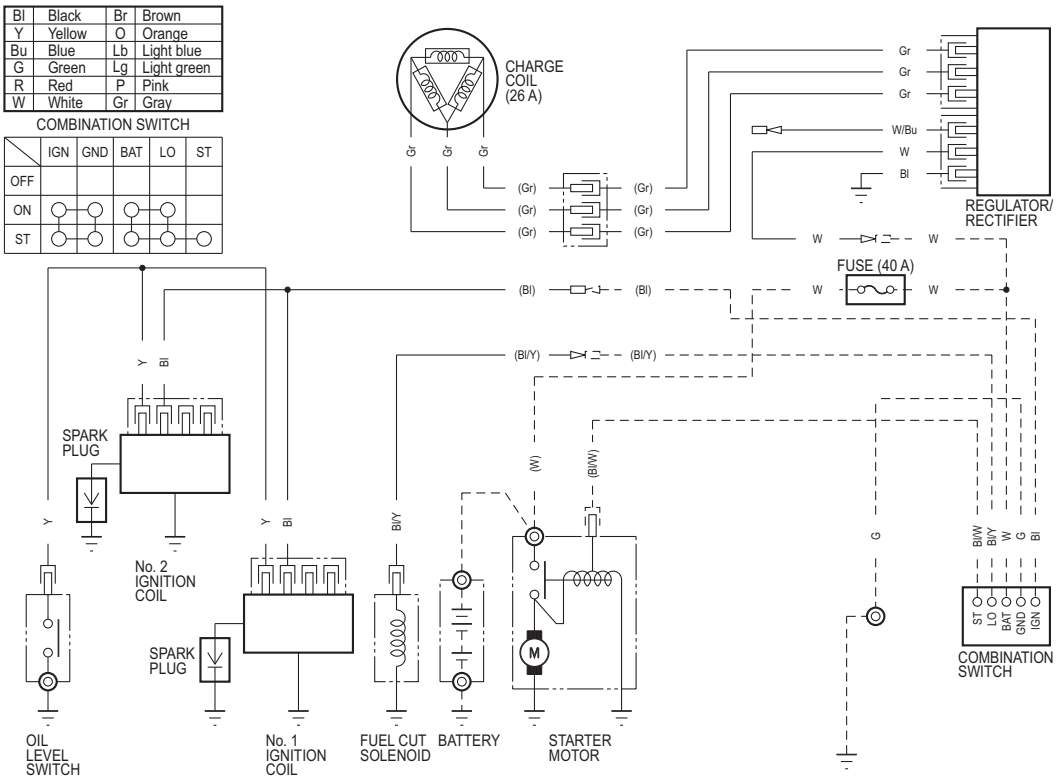


26A CHARGE COIL / REMOTE CONTROL TYPE



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