

How to use this 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.
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How to use this manual

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.

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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.

How to use this manual

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

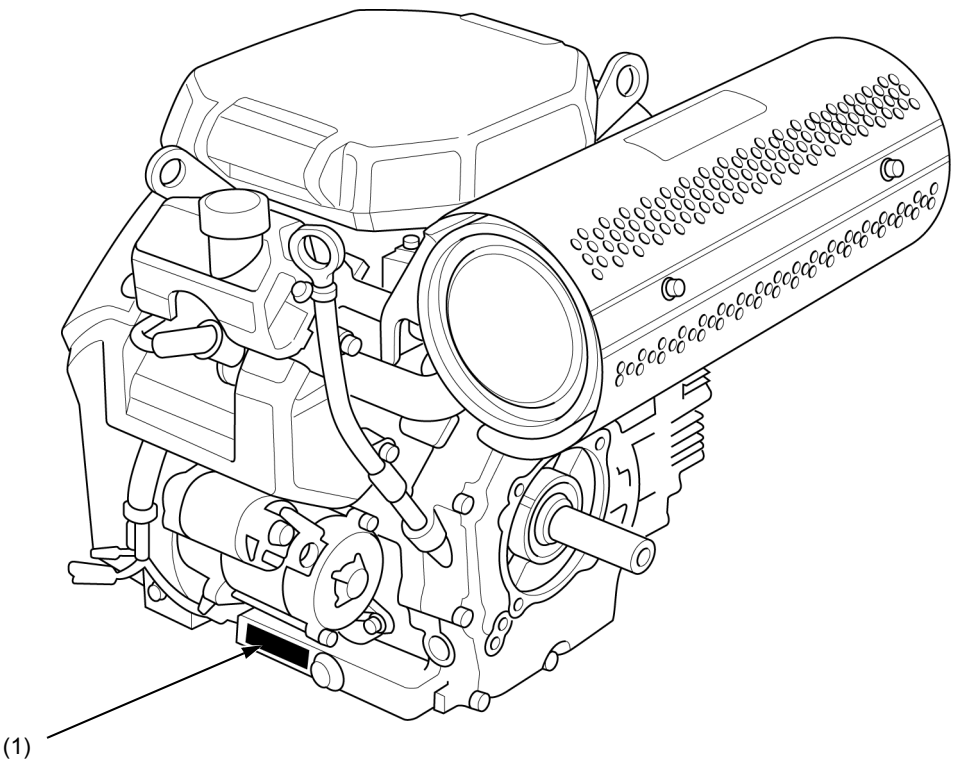
Bl	Black	G	Green	Br	Brown	Lg	Light green
Y	Yellow	R	Red	O	Orange	P	Pink
BU	Blue	W	White	Lb	Light blue	Gr	Gray

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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°					

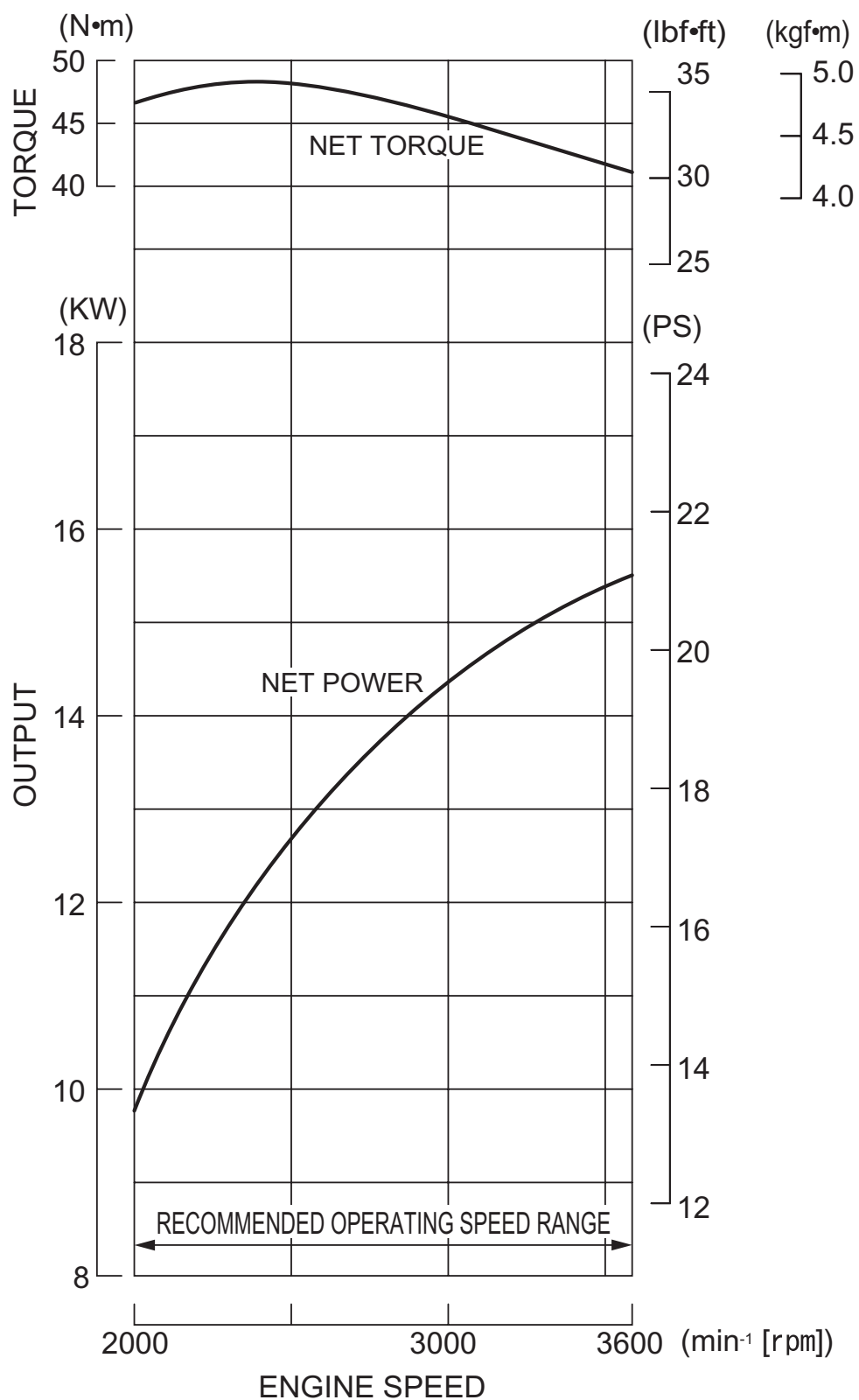
ENGINE SPECIFICATIONS

Model	GX630	GX630R	GX660	GX660R	GX690	GX690R
Description code	GCBBK	GCBK	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					

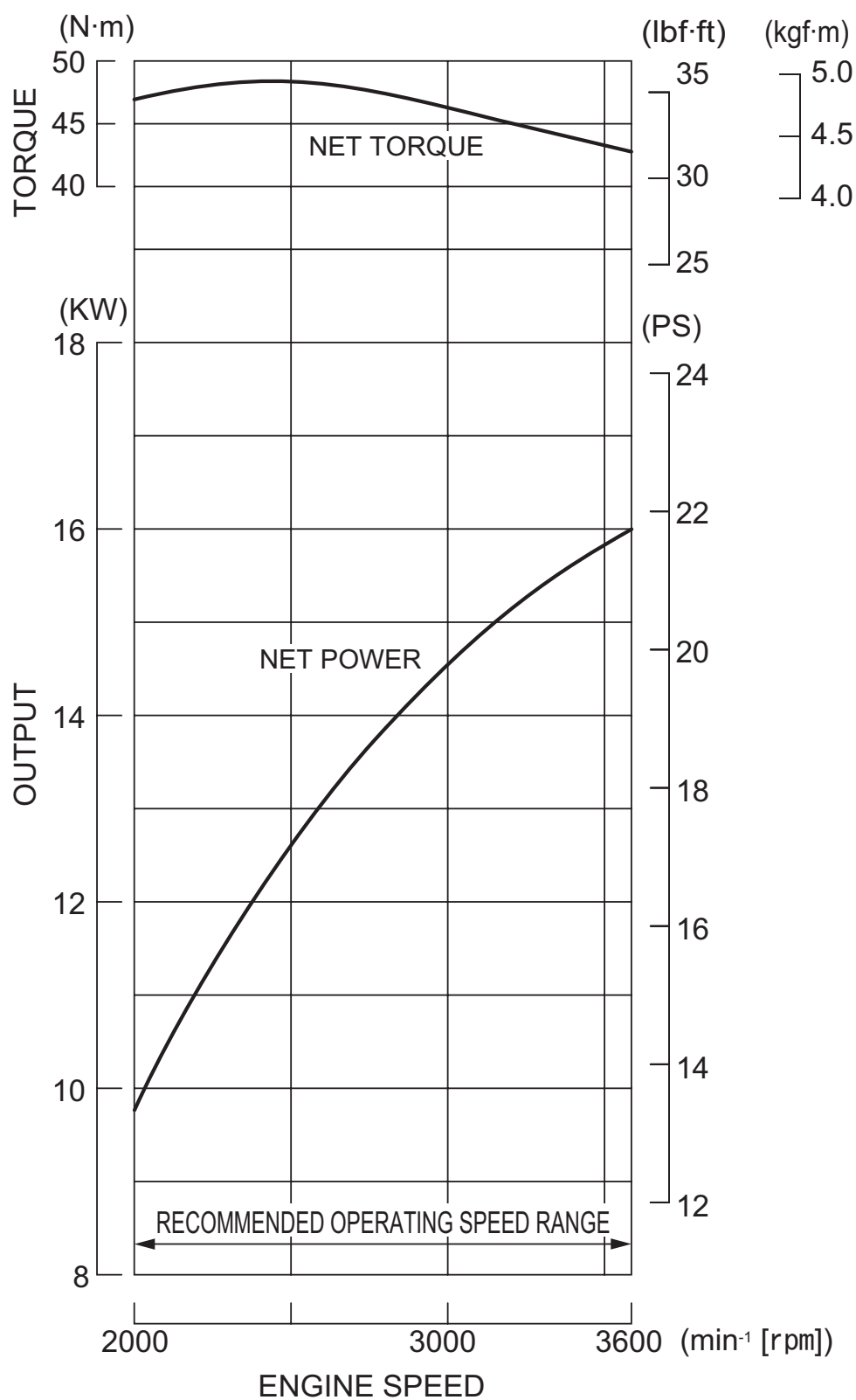
*: The power rating of the engine indicated in this document is the net power output tested on a production engine for the engine model and measured in accordance with SAE J1349 at 3,600 rpm (net power) and at 2,500 rpm (max net torque). Mass production engines may vary from this value. Actual power 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

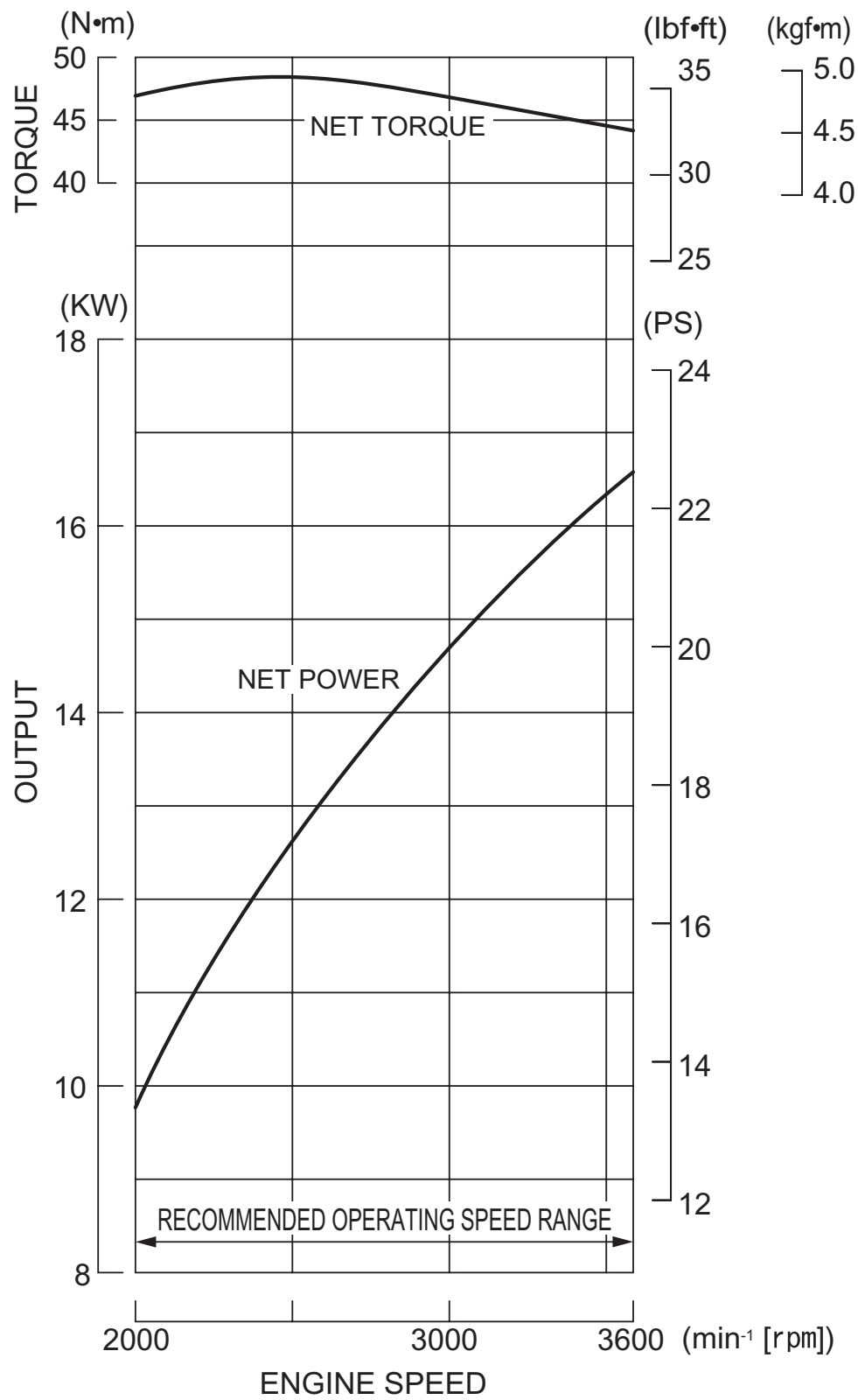


GX660/GX660R



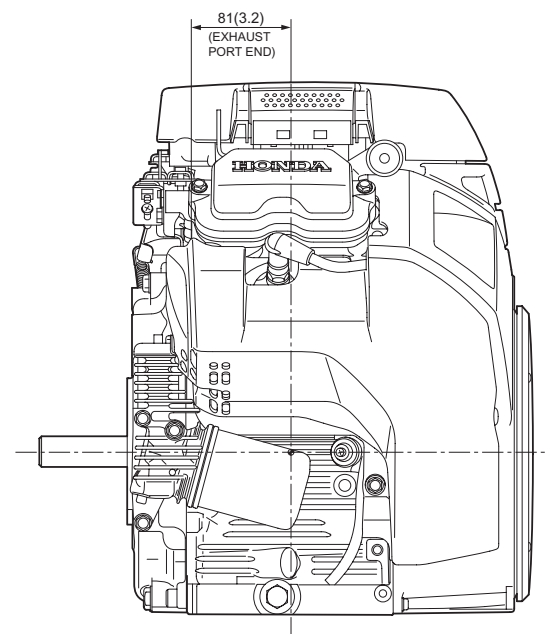
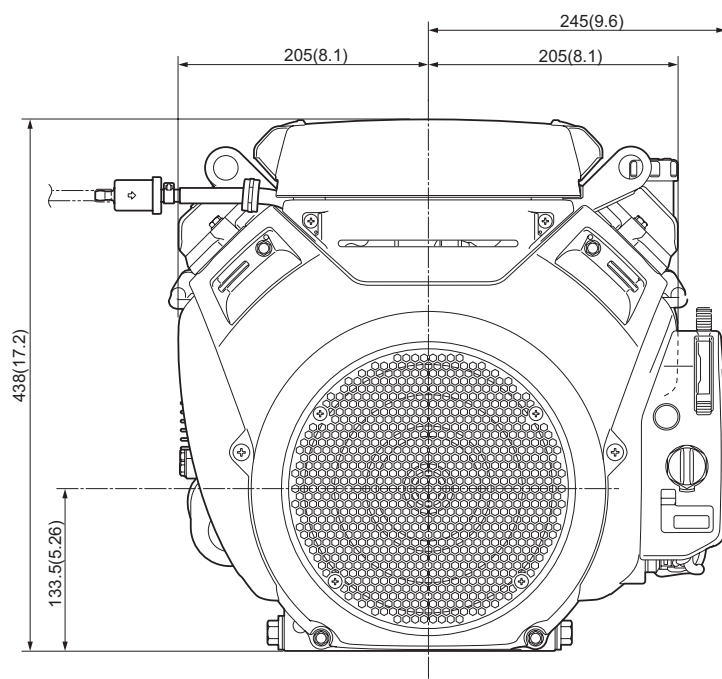
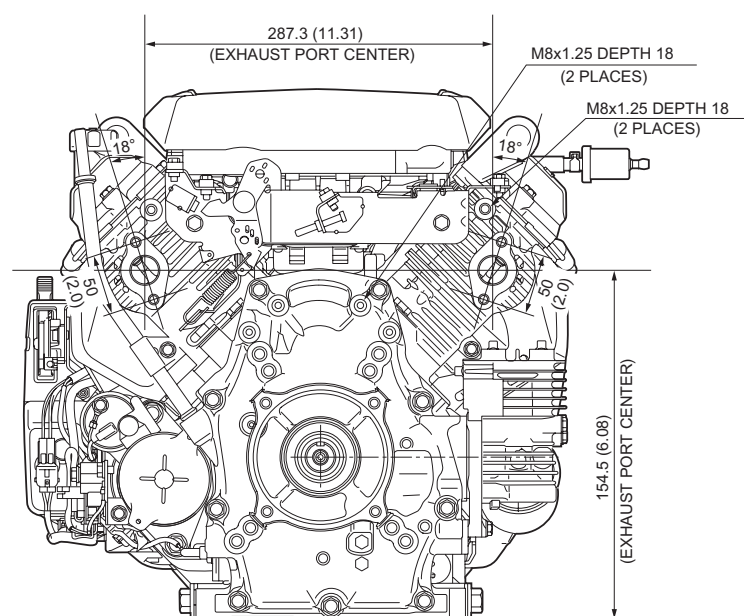
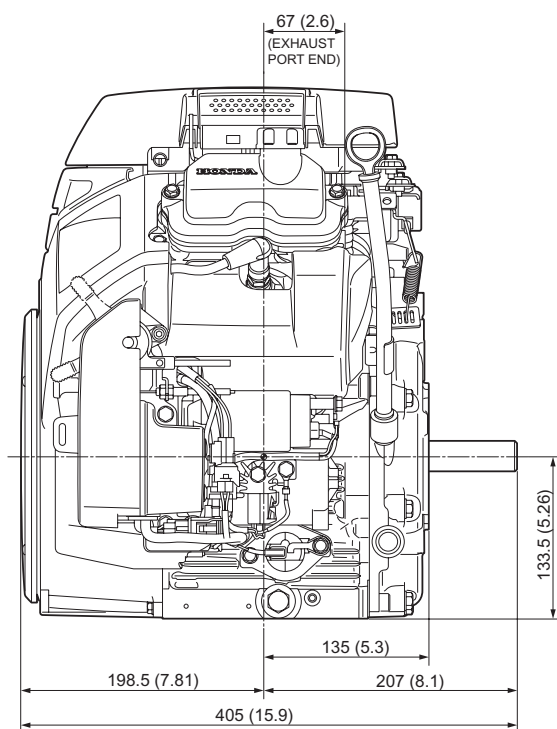
SPECIFICATIONS

GX690/GX690R



DIMENSIONAL DRAWINGS

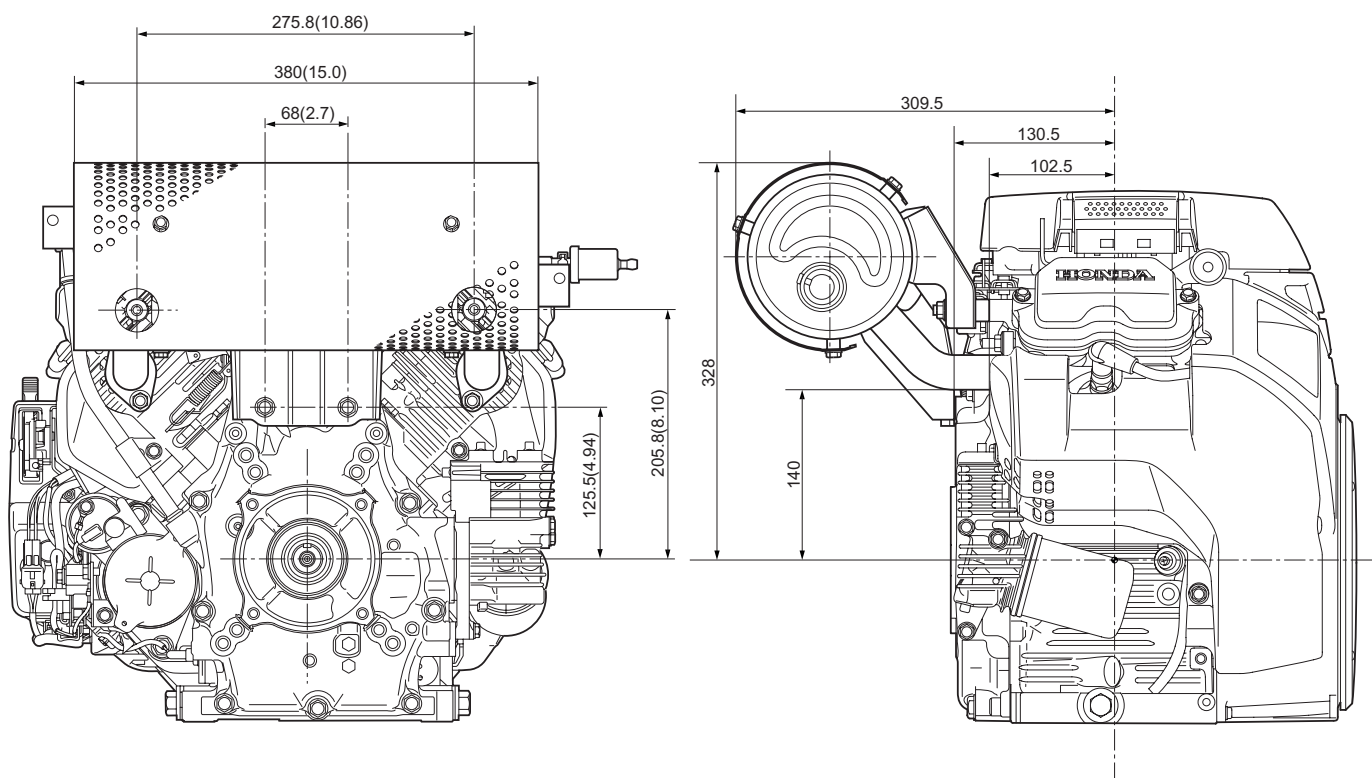
Unit: mm (in)



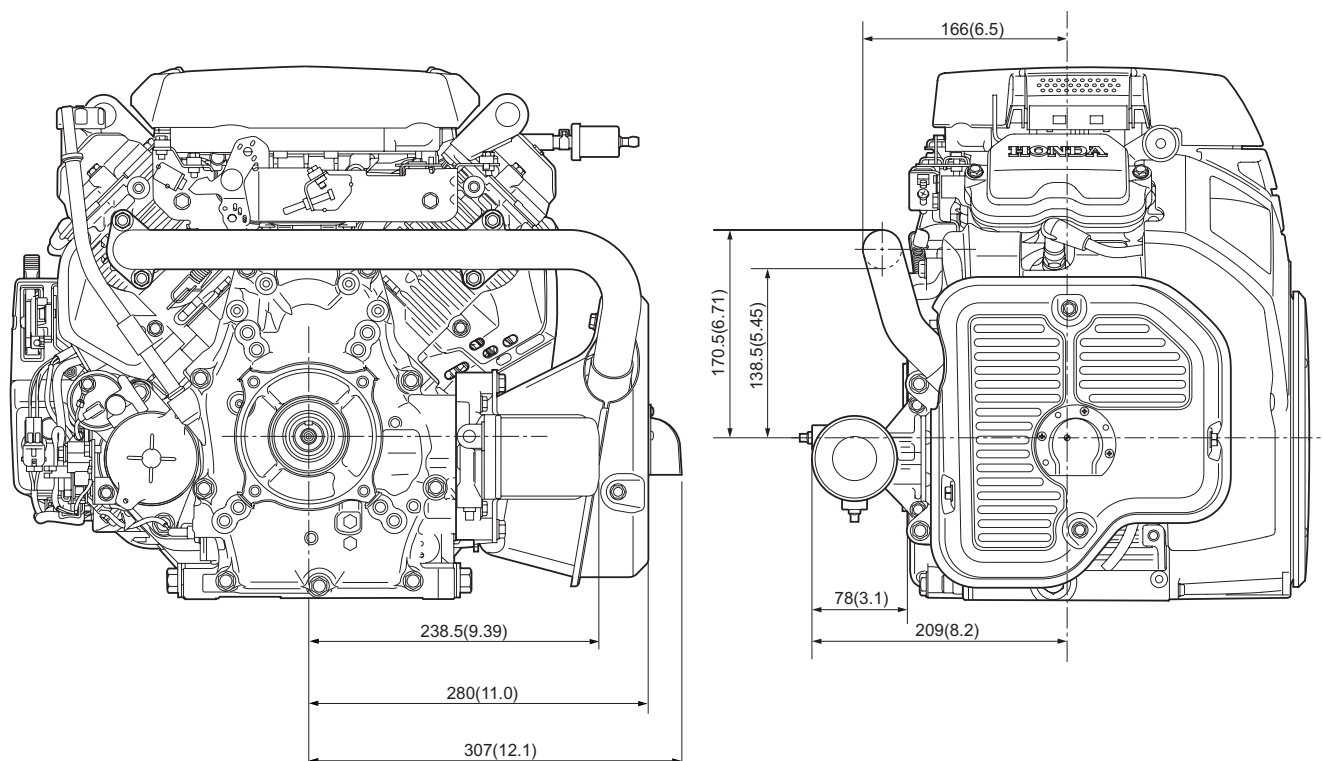
SPECIFICATIONS

HIGH MOUNT MUFFLER TYPE

Unit: mm (in)



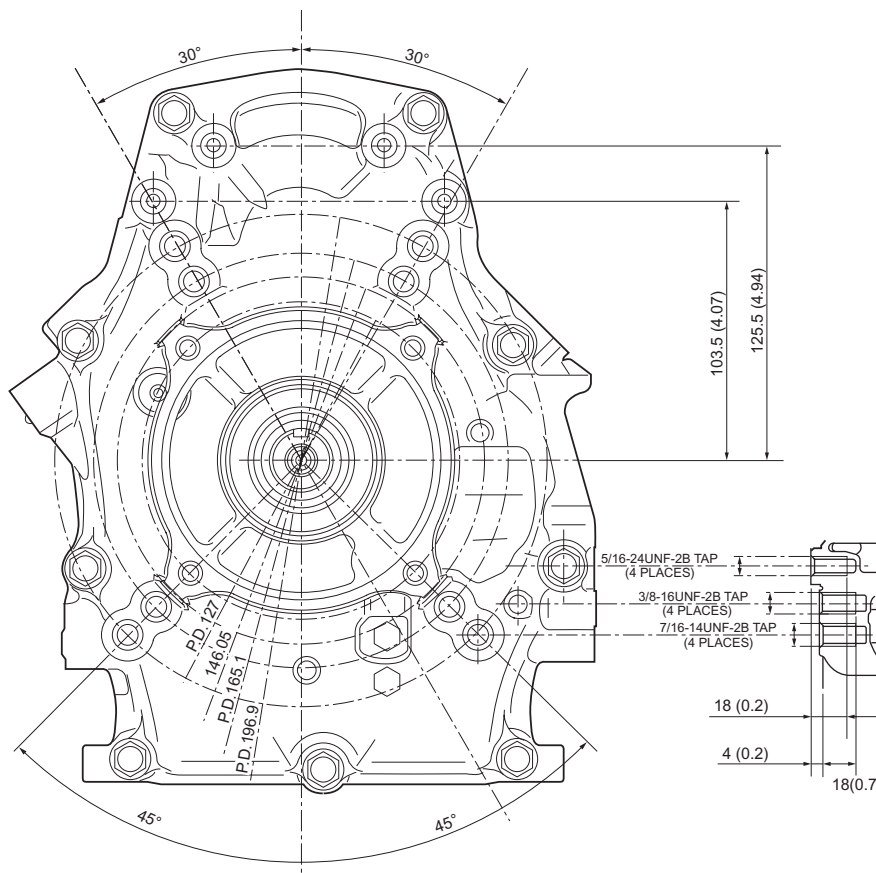
SIDE MOUNT MUFFLER TYPE



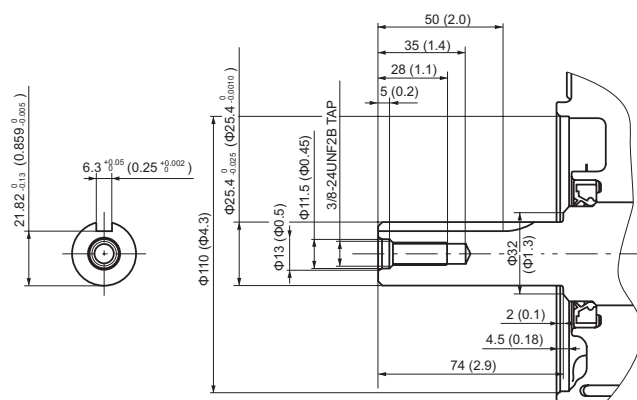
PTO DIMENSIONAL DRAWINGS

MOUNT PART

Unit: mm (in)



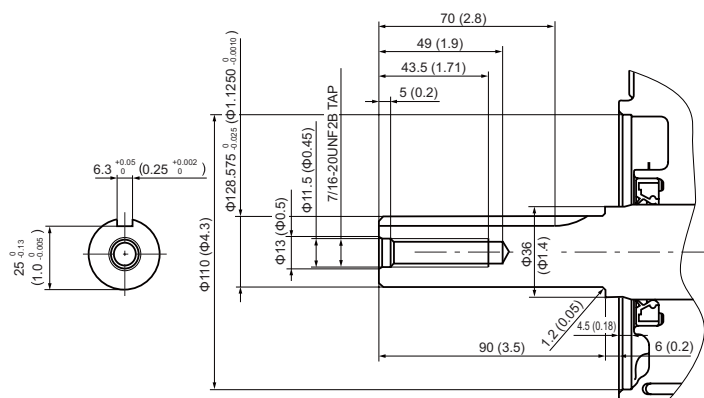
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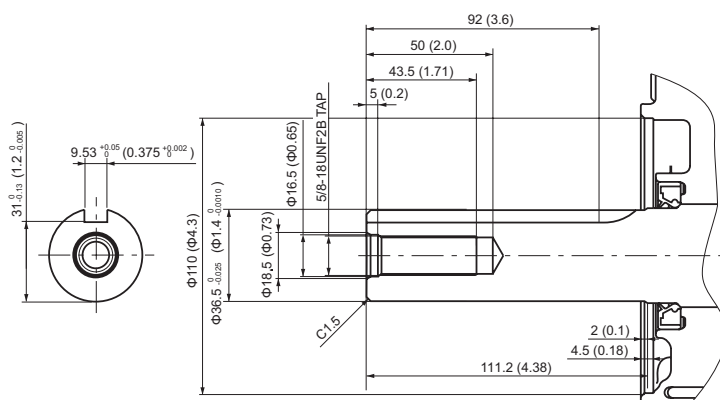
SPECIFICATIONS

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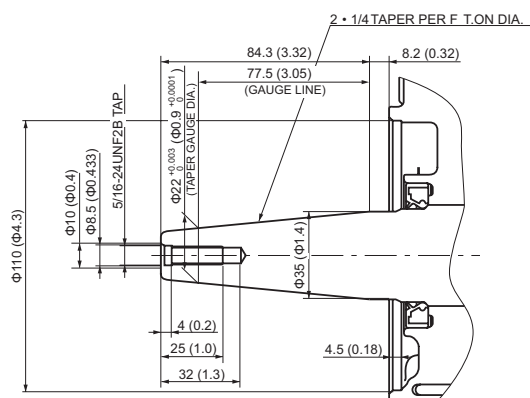
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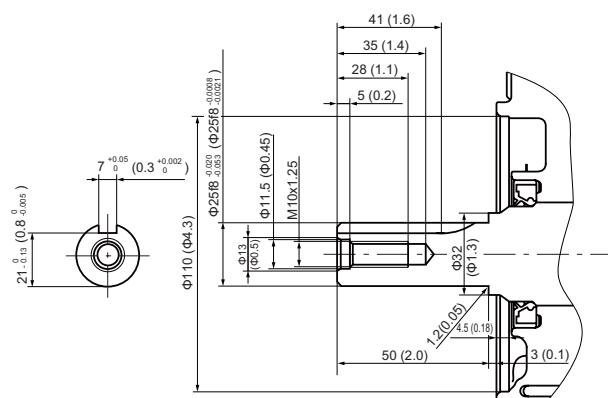


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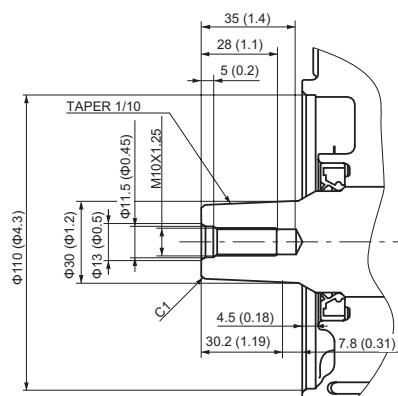


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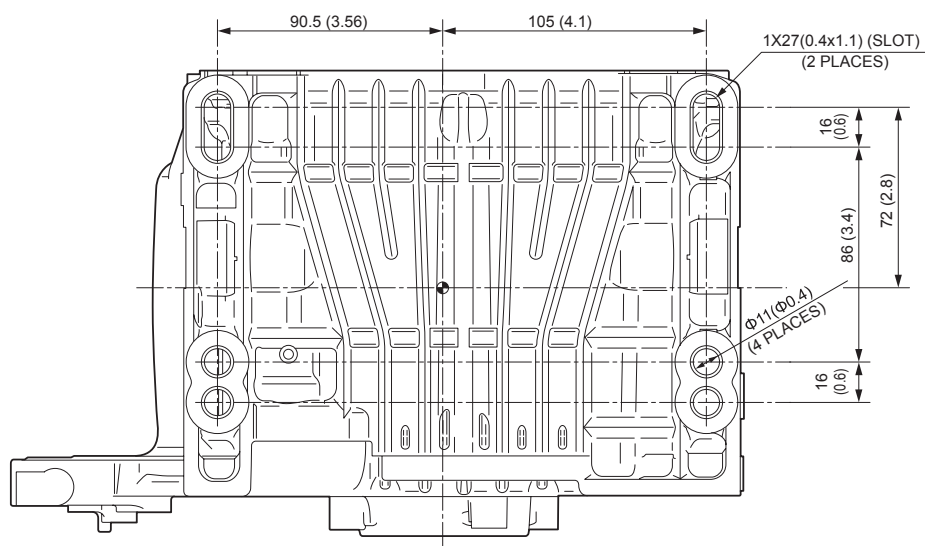
Unit: mm (in)



DEN TYPE



ENGINE MOUNT DIMENSIONAL DRAWING



MEMO

2. SERVICE INFORMATION

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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)

SERVICE INFORMATION

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)	—
	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

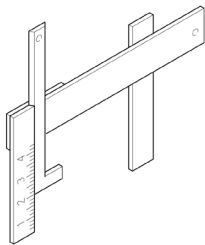
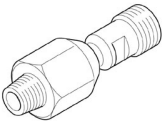
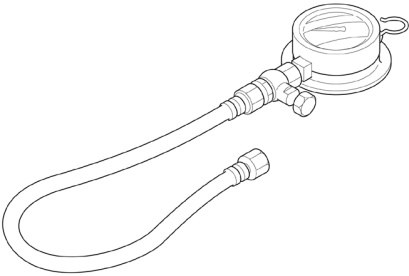
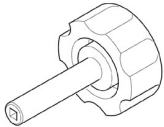

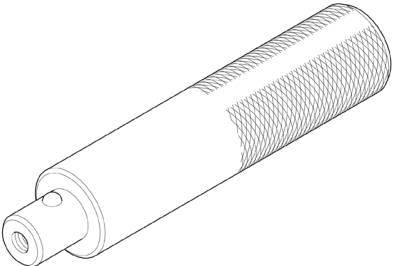

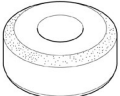
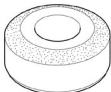
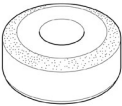


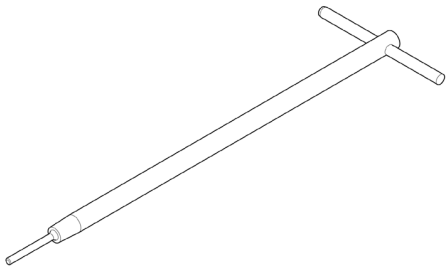
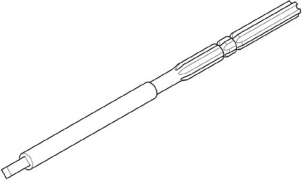
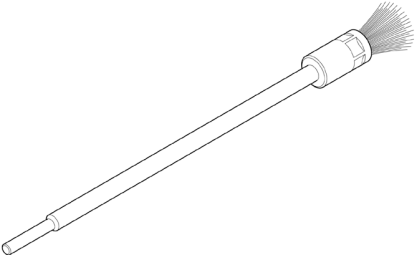
Item	Tread Dia. (mm)	Torque values		
		N·m	kgf·m	lbf·ft
Screw	4 mm	2	0.2	1.5
	5 mm	4	0.4	3.1
	6 mm	9	0.9	6.6
Bolt and nut	4 mm	3	0.4	2.5
	5 mm	5	0.5	3.8
	6 mm	10	1.0	7
	8 mm	22	2.2	16
	10 mm	34	3.5	25
	12 mm	54	5.5	40
Flange bolt and nut	5 mm	5	0.5	3.9
	6 mm	12	1.2	9
	8 mm	27	2.7	20
	10 mm	39	4.0	29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

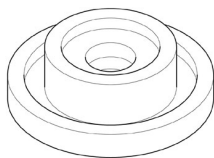
SERVICE INFORMATION

TOOLS

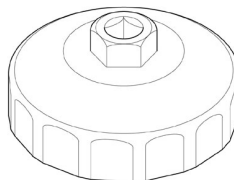
<p>Float level gauge 07401-0010000</p> 	<p>Oil pressure gauge attachment 07406-0030000</p> 	<p>Oil pressure gauge set 07506-3000000</p> 
<p>Tappet adjusting wrench 3 mm 07708-0030400</p> 	<p>Pilot 17 mm 07746-0040400</p> 	<p>Driver handle 15 x 135L 07749-0010000</p> 
<p>Seat cutter 27.5 mm 07780-0010200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

SERVICE INFORMATION

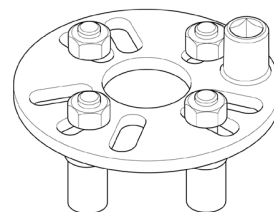
Oil seal driver attachment 60 mm
07GAD-PG40100



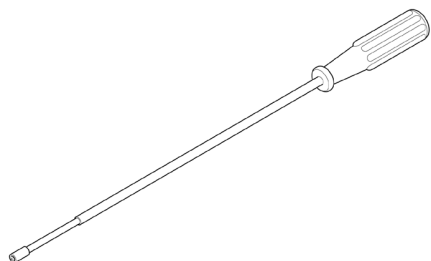
Oil filter wrench 64 mm
07HAA-PJ70100



Clutch center holder
07JMB-MN50301



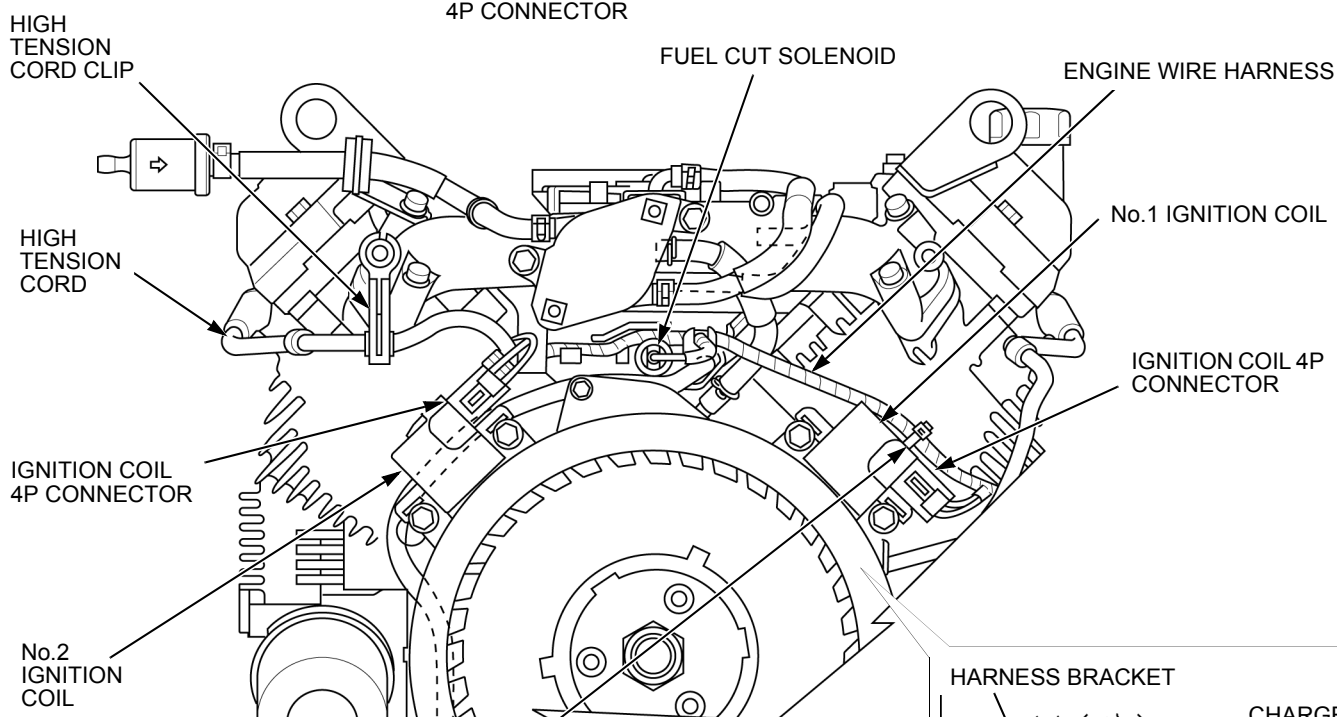
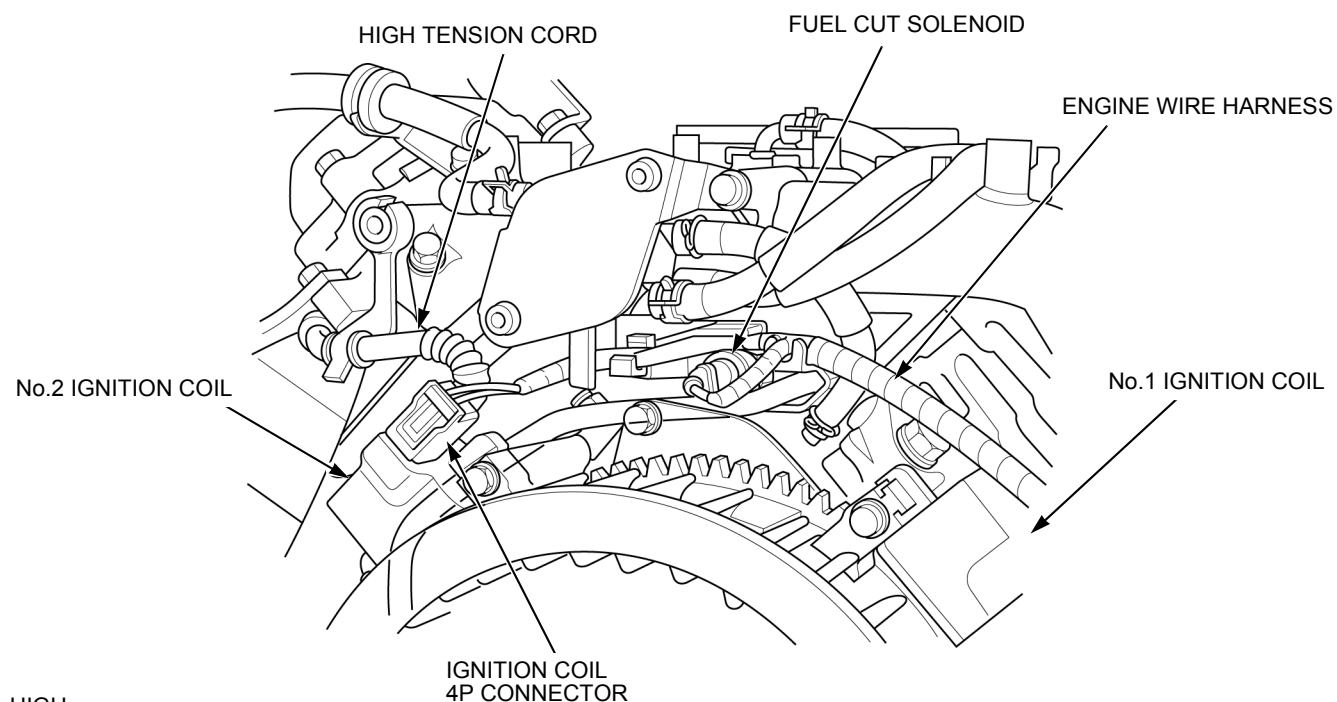
Pilot screw wrench (D)
07KMA-MS60101



SERVICE INFORMATION

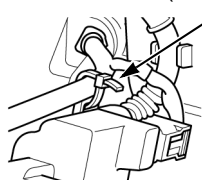
HARNESS ROUTING

FRONT VIEW



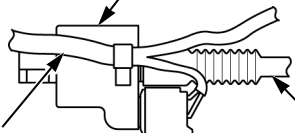
WIRE BAND

Cut the band end so its length is 10 – 15 mm (0.4 – 0.6 in).



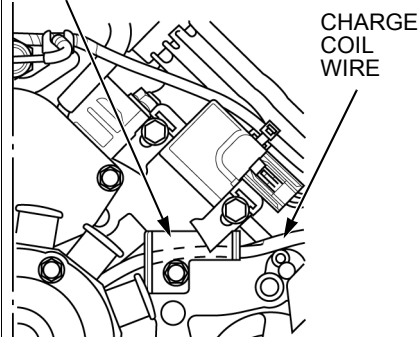
ENGINE WIRE HARNESS

No.1 IGNITION COIL



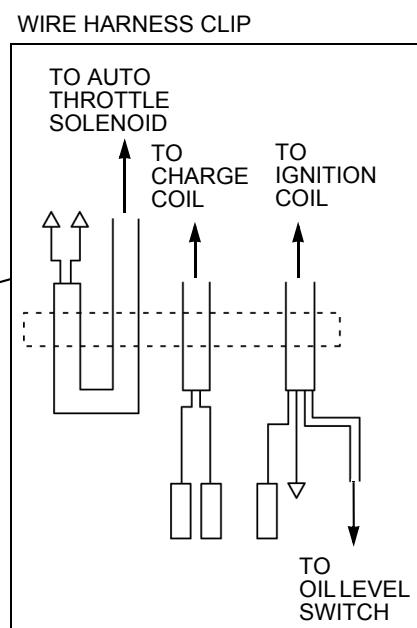
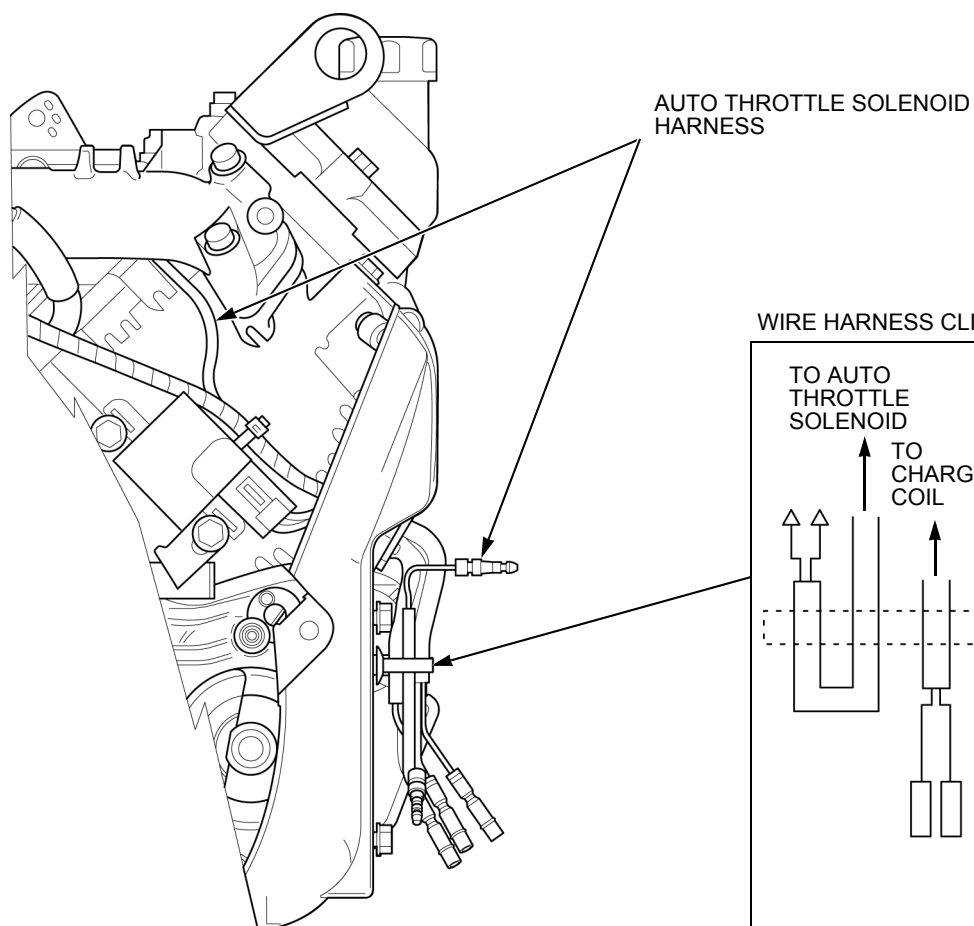
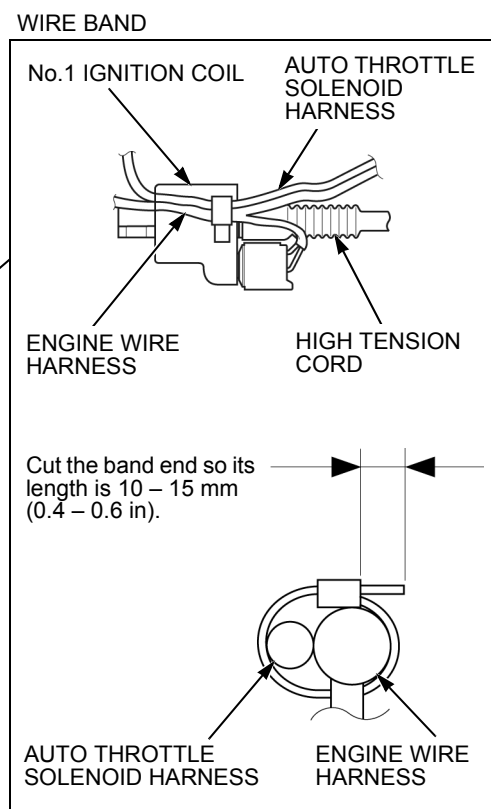
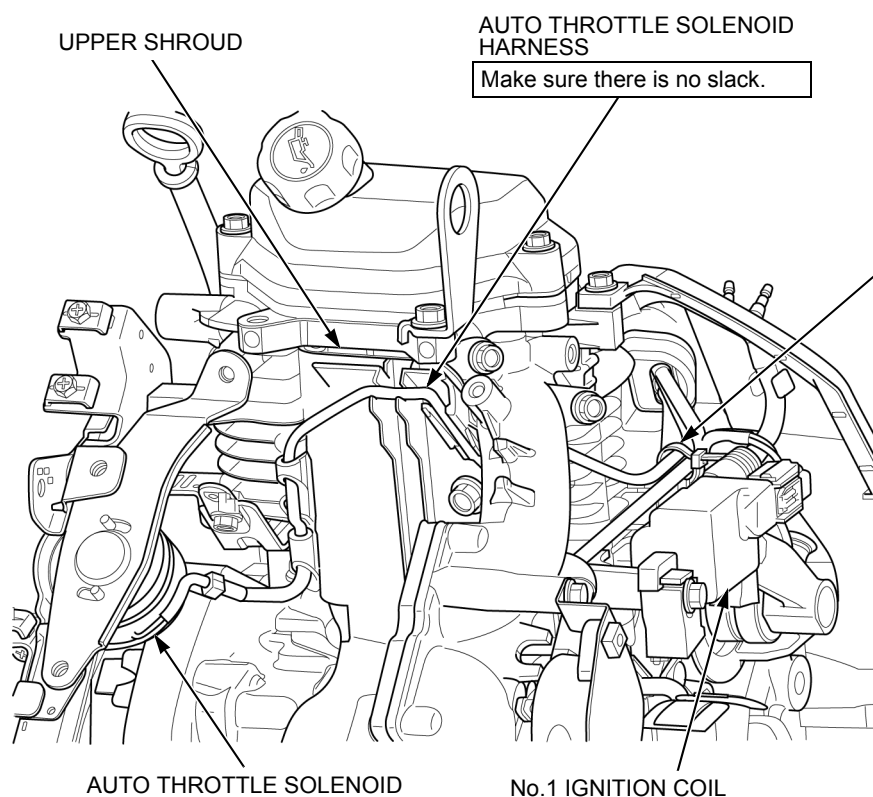
HIGH TENSION CORD

HARNESS BRACKET



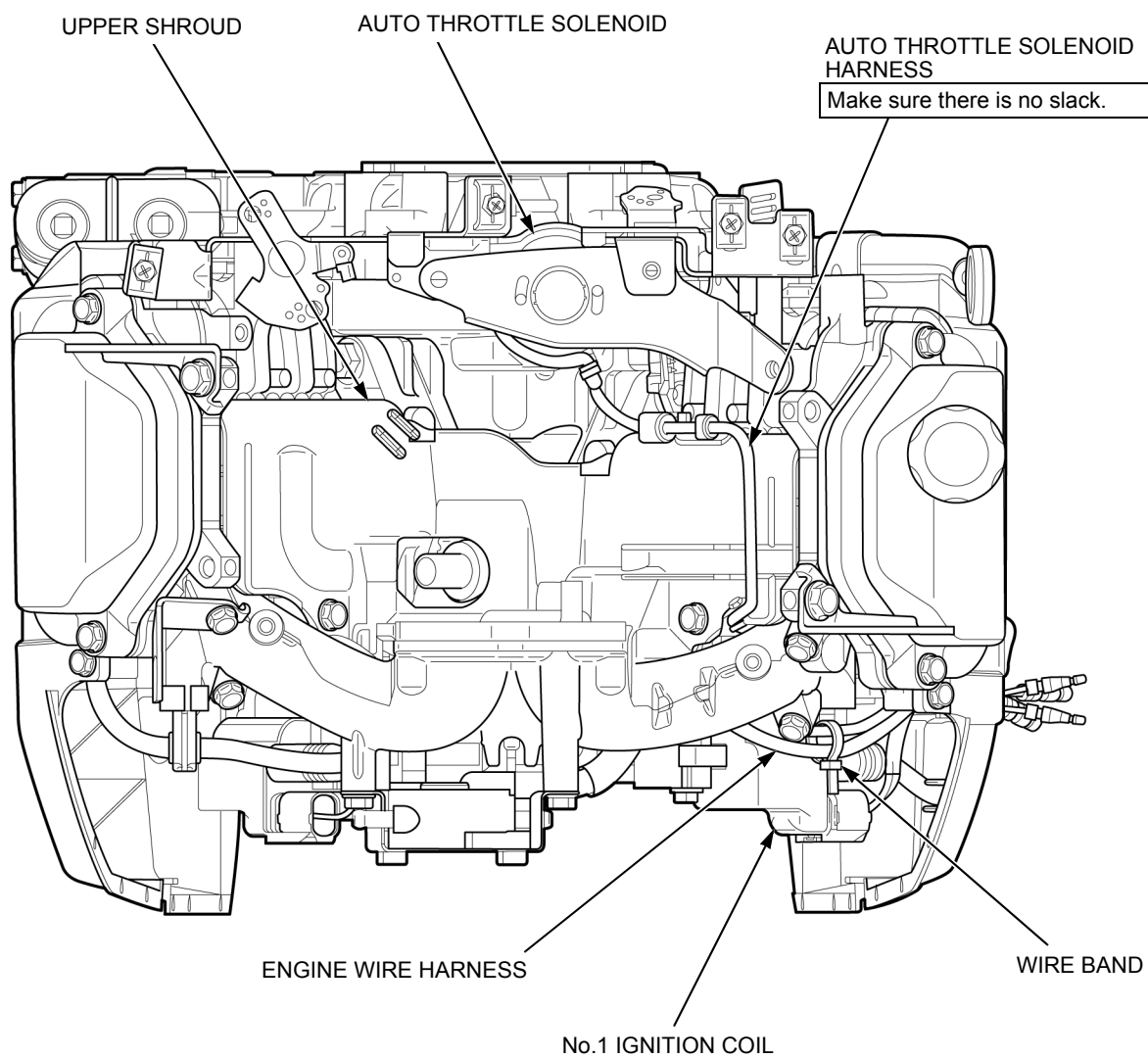
CHARGE COIL WIRE

FRONT VIEW (AUTO THROTTLE TYPE)

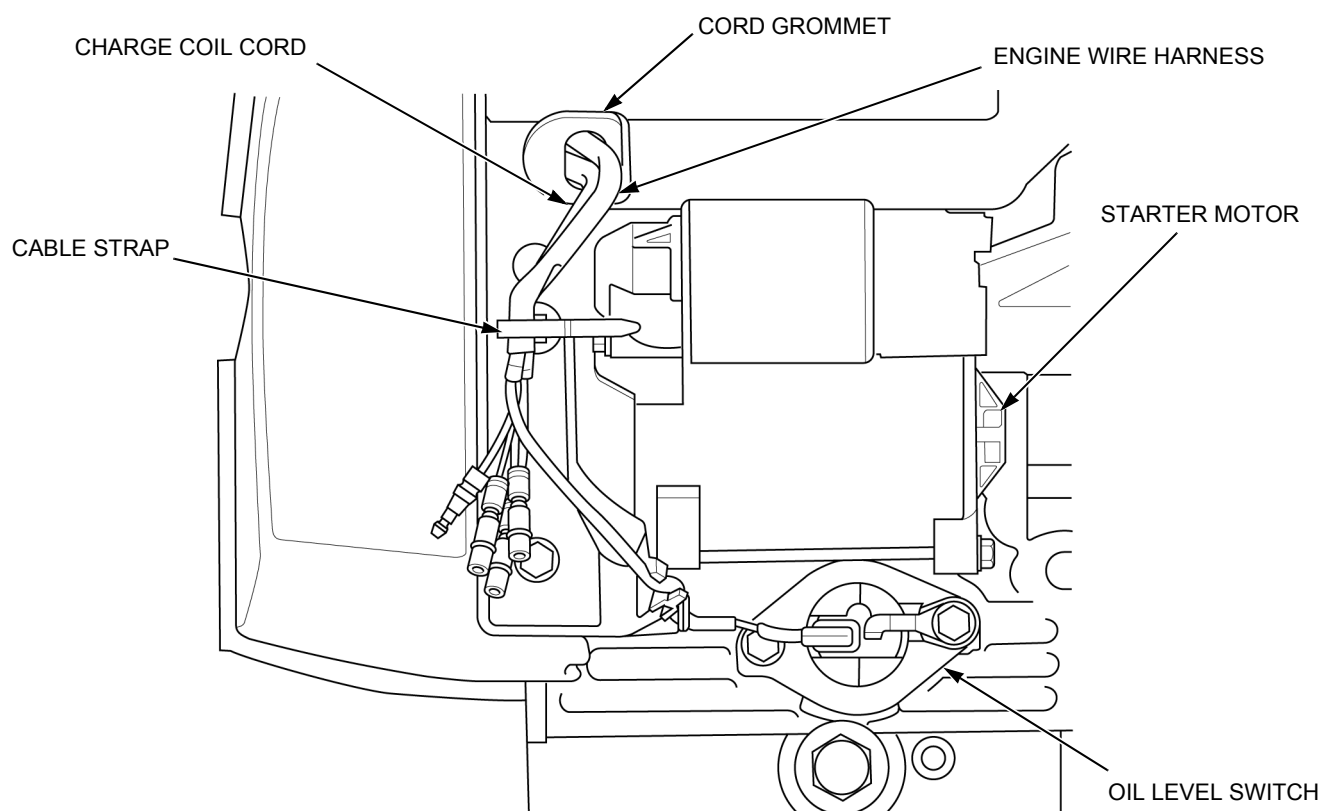


SERVICE INFORMATION

TOP VIEW (AUTO THROTTLE TYPE)

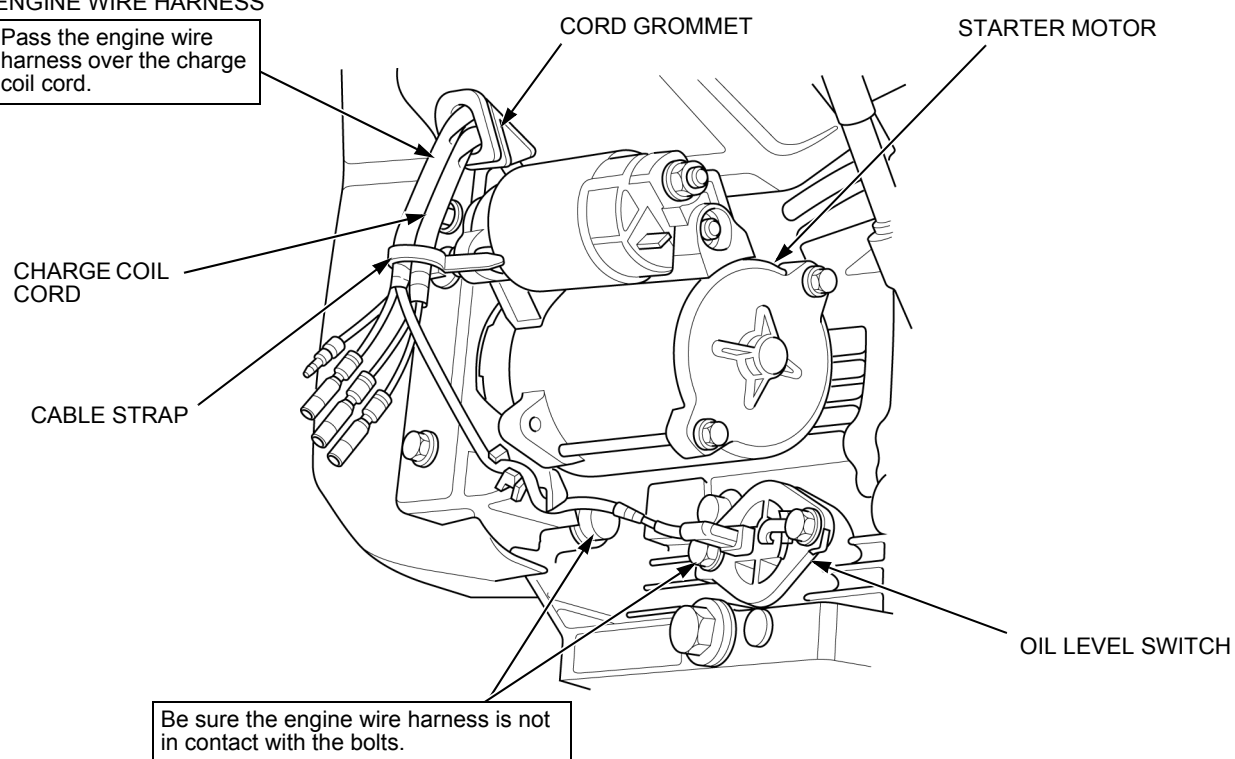


SIDE VIEW (REMOTE CONTROL TYPE)



ENGINE WIRE HARNESS

Pass the engine wire harness over the charge coil cord.

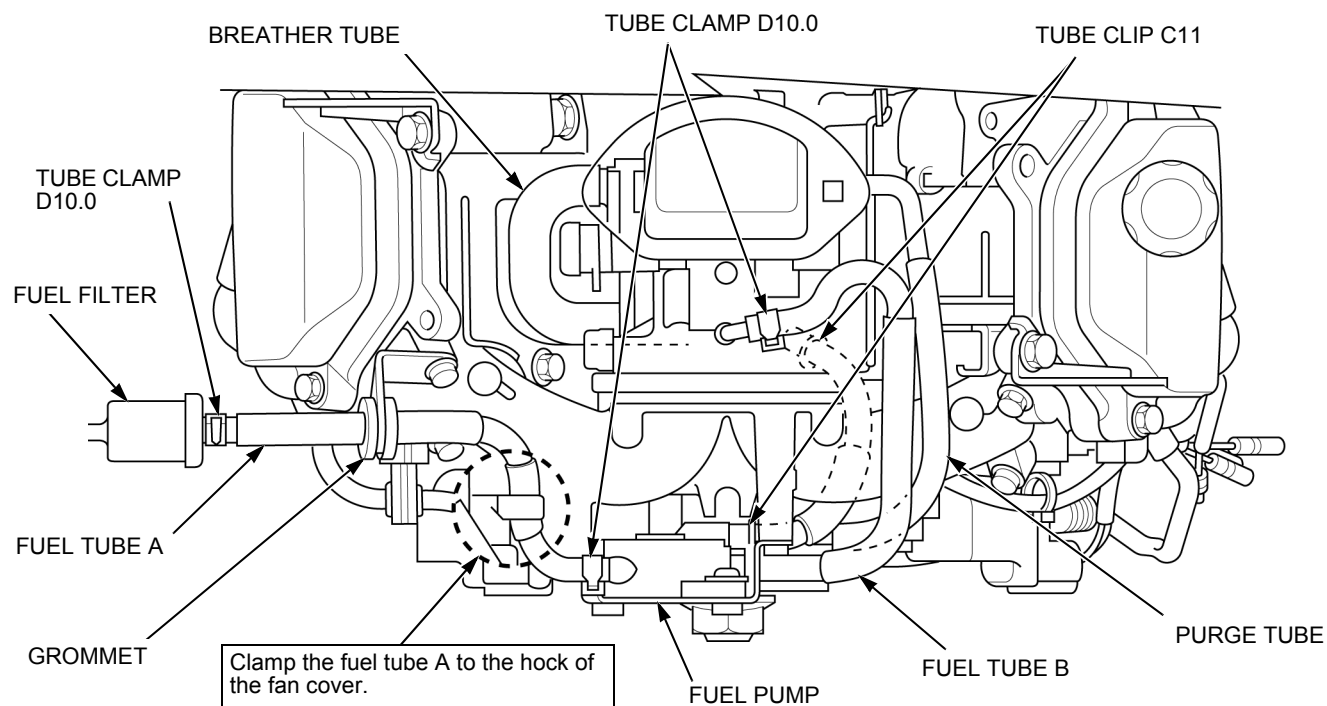


SIDE VIEW (WITH CONTROL BOX TYPE)

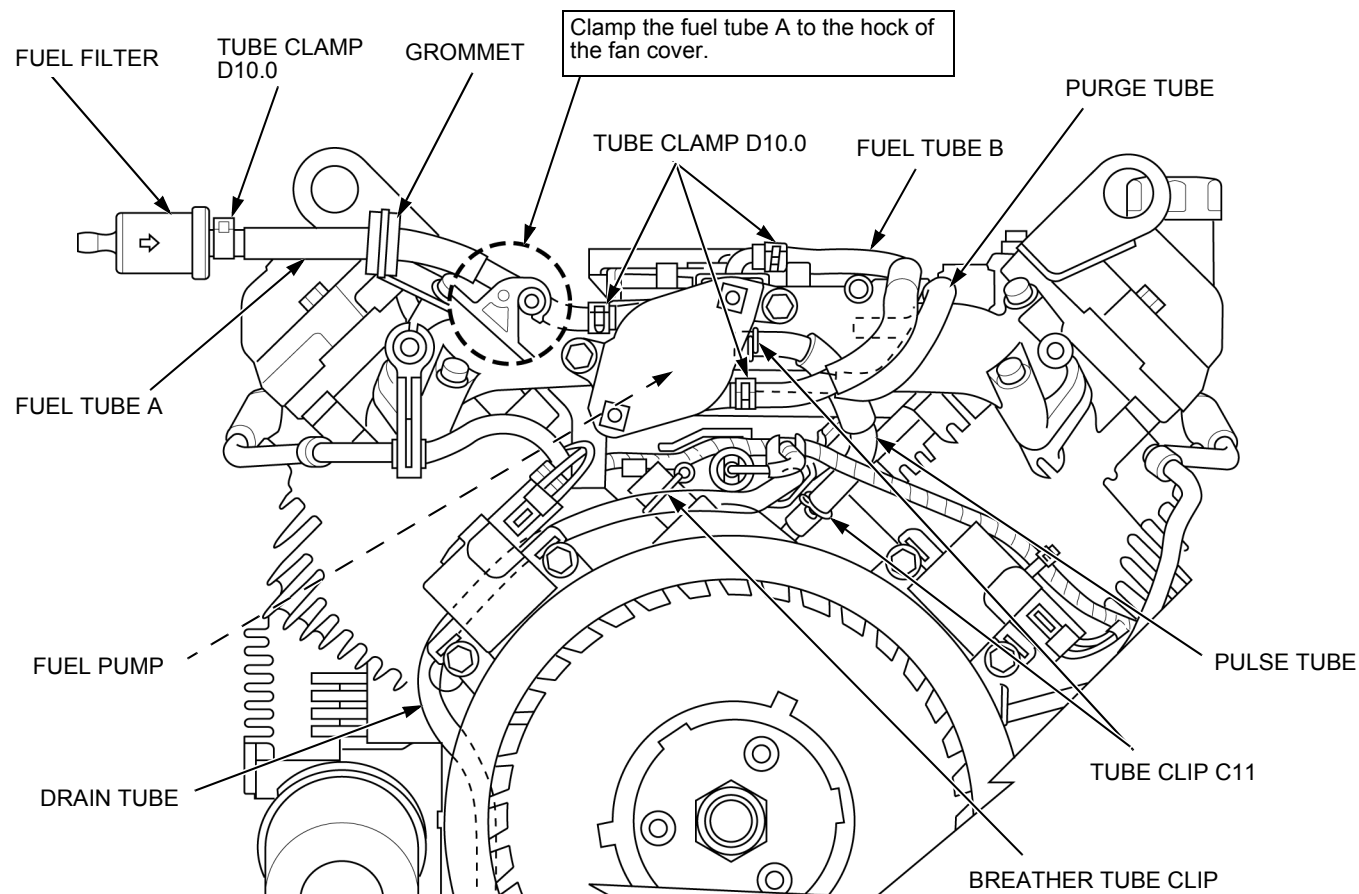


TUBE ROUTING

TOP VIEW

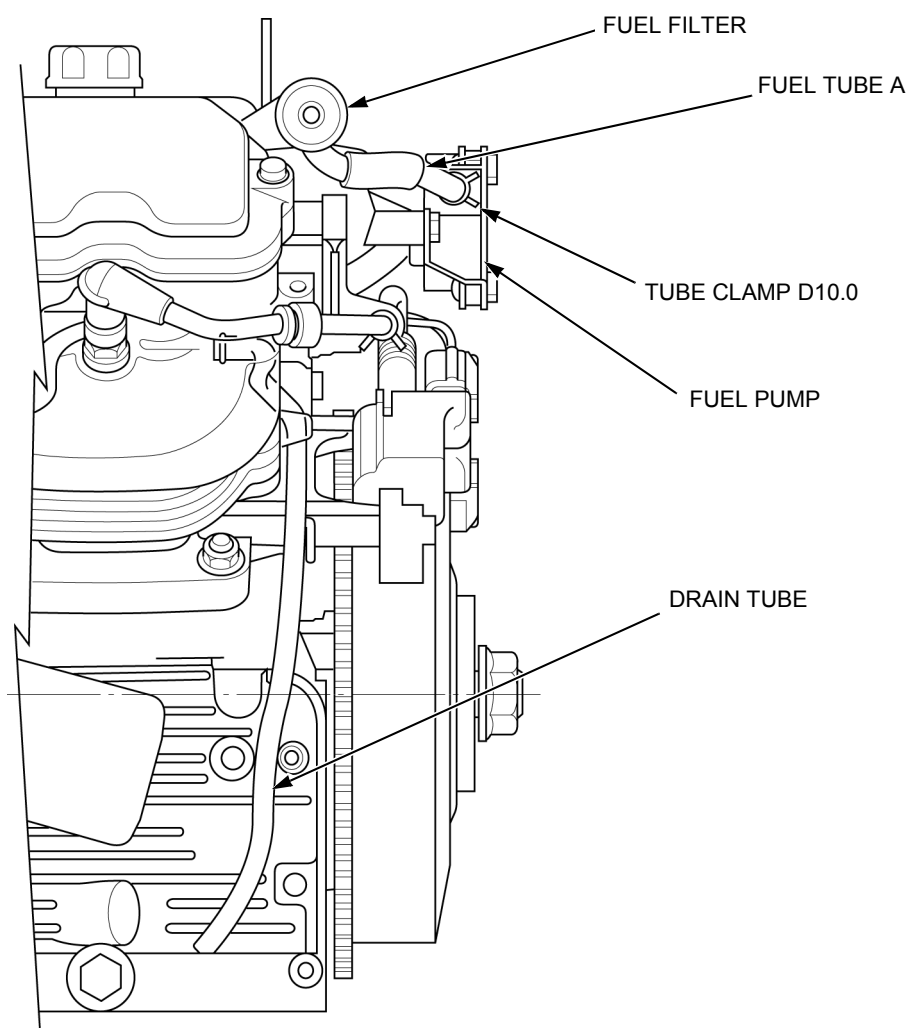


FRONT VIEW



SERVICE INFORMATION

RIGHT SIDE VIEW



MAINTENANCE SCHEDULE.....	3-2	SPARK PLUG REPLACEMENT	3-7
ENGINE OIL LEVEL CHECK.....	3-3	SPARK ARRESTER CLEANING.....	3-7
ENGINE OIL CHANGE.....	3-4	IDLE SPEED CHECK/ADJUSTMENT	3-8
OIL FILTER REPLACEMENT	3-4	VALVE CLEARANCE CHECK/ ADJUSTMENT	3-8
AIR CLEANER CHECK/CLEANING.....	3-5	COMBUSTION CHAMBER CLEANING	3-10
AIR CLEANER REPLACEMENT	3-6	FUEL FILTER REPLACEMENT.....	3-10
SPARK PLUG CHECK/ADJUSTMENT	3-6	FUEL TUBE CHECK.....	3-11

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.

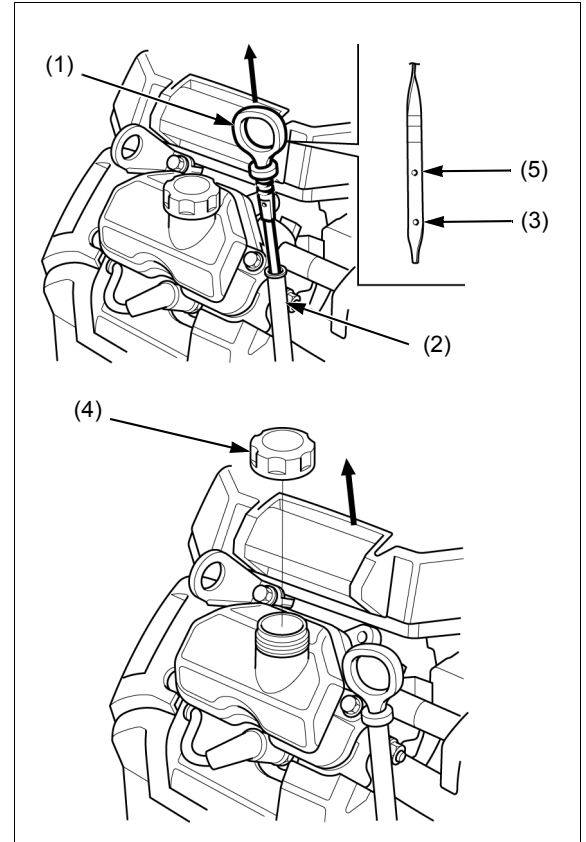
Start the engine and allow it to warm up for 1 to 2 minutes.

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.



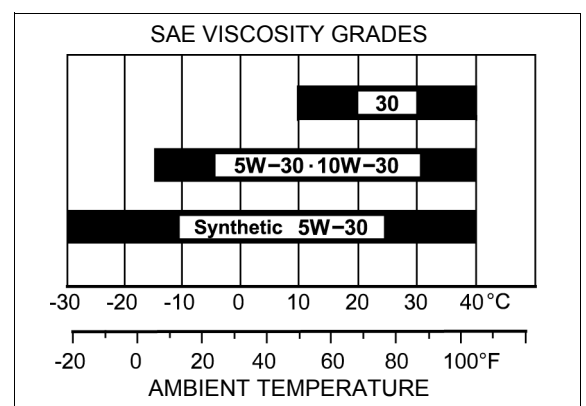
Oil is a major factor affecting performance and service life. Use 4 - stroke automotive detergent oil.

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

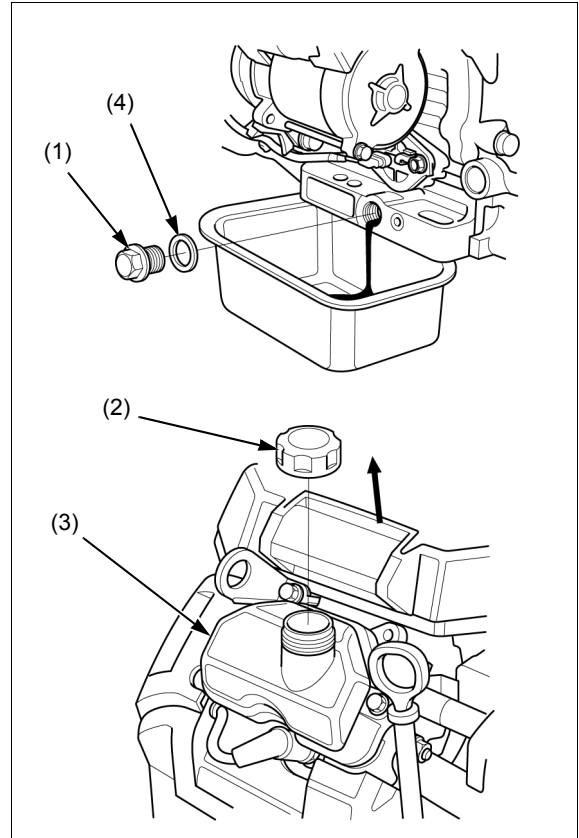
Used engine oil contains substances that have been identified as carcinogenic. If repeatedly left in contact with the skin for prolonged periods, it may cause skin cancer. Wash your hands thoroughly with soap and water as soon as possible after contact with used engine oil.

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.

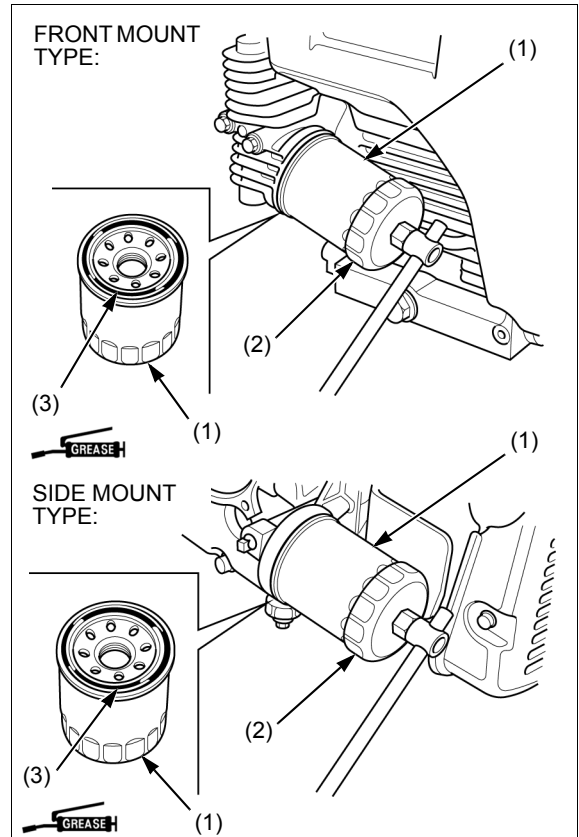
Install the new oil filter and tighten to the specified torque.

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

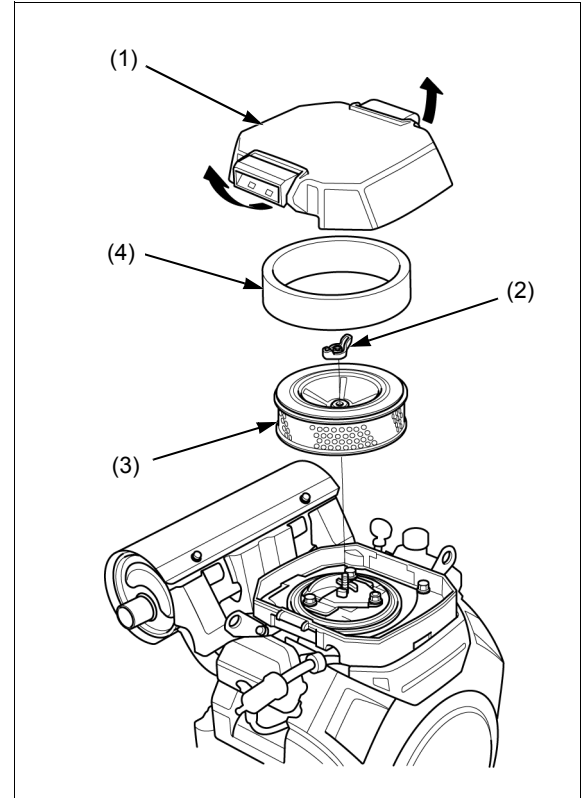
Operating the engine without the air filters or with the filter installed loosely will allow dirt to enter the engine, causing rapid engine wear. Install the air filters securely.

Remove the air cleaner cover (1).

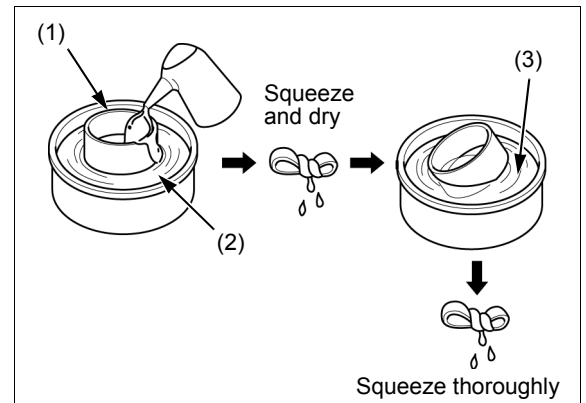
Remove the wing nut (2) and air filter assembly (3)(4).

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/cm², 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.

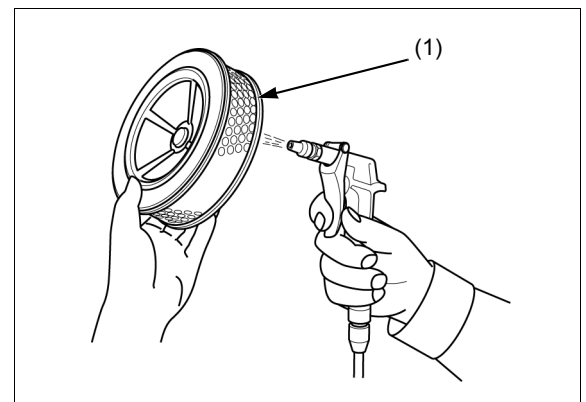
Wipe dirt from the inside of the air cleaner case and the air cleaner cover, using a rag.

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)

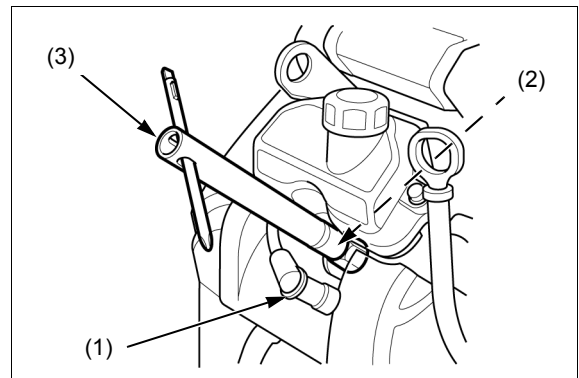
Install the air cleaner cover.

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).

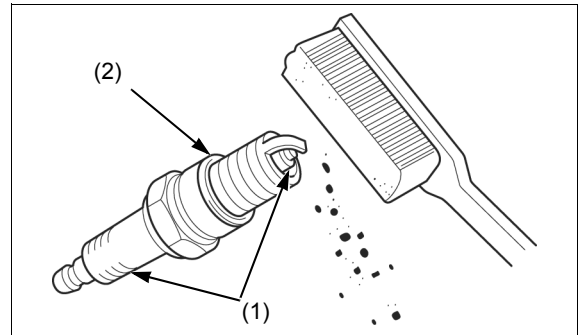


Visually check the spark plug. Replace the plug if the insulator (1) is cracked or chipped.

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.

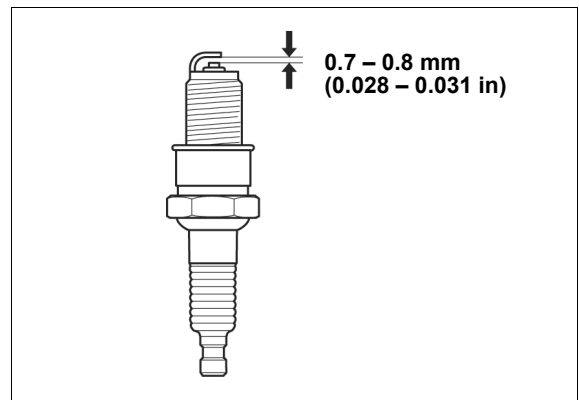
PLUG GAP: 0.7 – 0.8 mm (0.028 – 0.031 in)

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

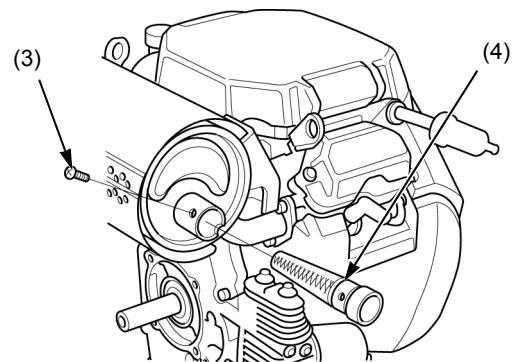
⚠ CAUTION

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.

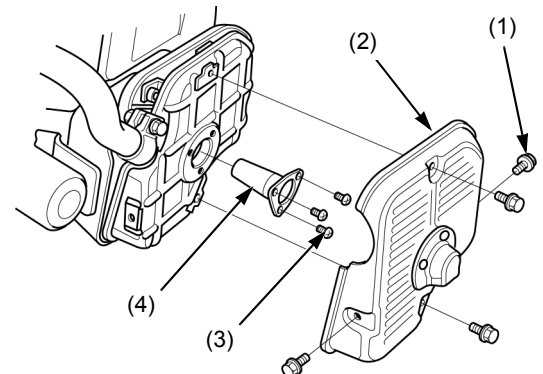
Remove the flange bolts (1) and muffler protector (2) (side mount type only).

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

HIGH MOUNT TYPE:



SIDE MOUNT TYPE:



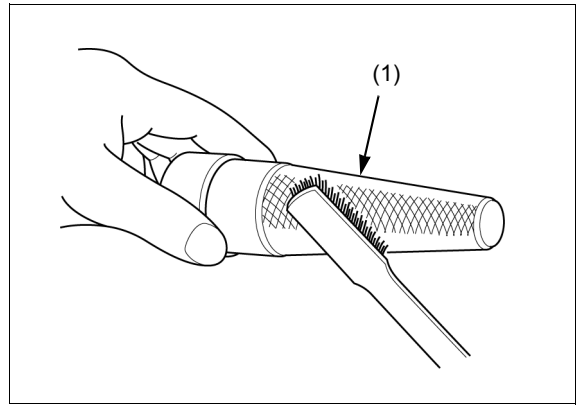
MAINTENANCE

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).

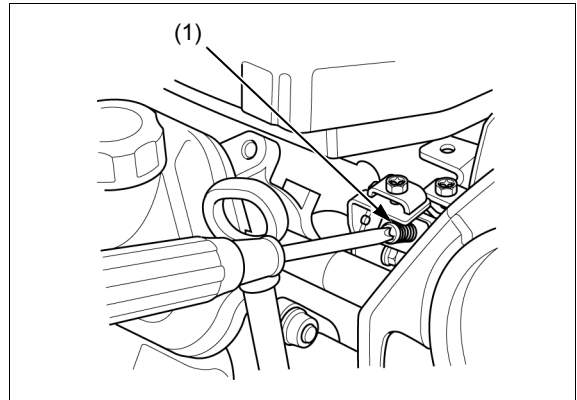


IDLE SPEED CHECK/ADJUSTMENT

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: $1,400 \pm 150 \text{ min}^{-1} \text{ (rpm)}$

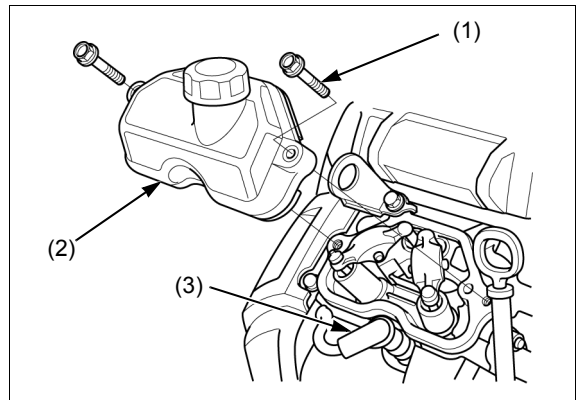


VALVE CLEARANCE CHECK/ADJUSTMENT

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

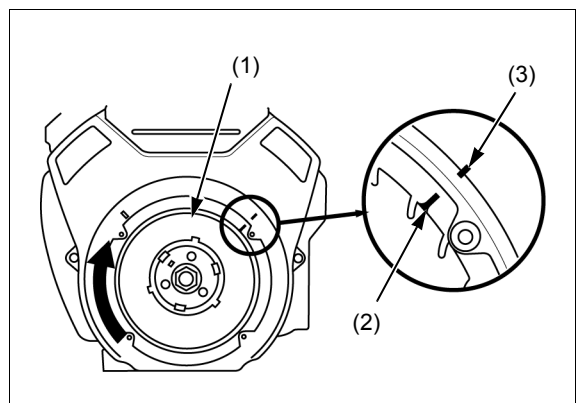
Remove the fan cover protector or screen grid (page 5-2).

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.

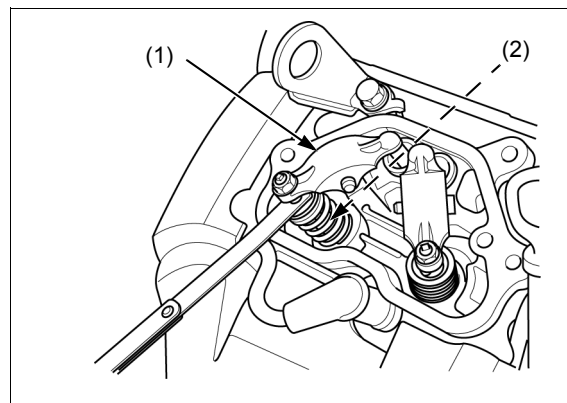


Insert a thickness gauge between the valve rocker arm (1) and valve stem (2) to measure the valve clearance.

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

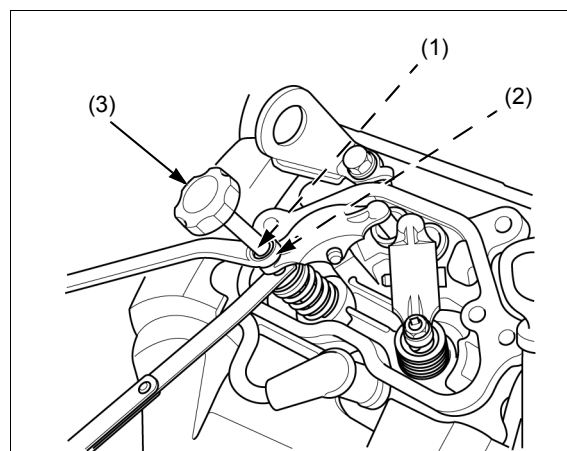
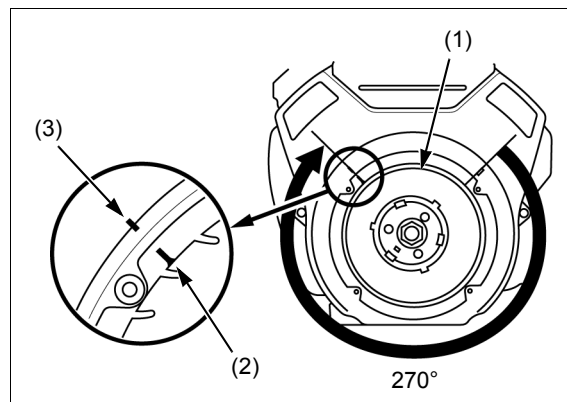
Hold the tappet adjusting screw and retighten the tappet adjusting nut to the specified torque.

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

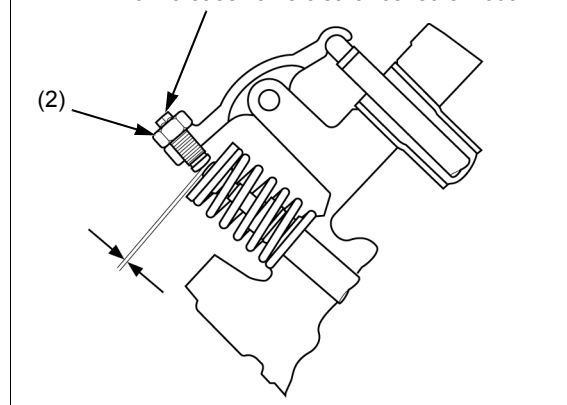
Recheck the valve clearance, and if necessary, readjust the clearance.

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.



(1)
To decrease valve clearance: screw in.
To increase valve clearance: screw out.



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.

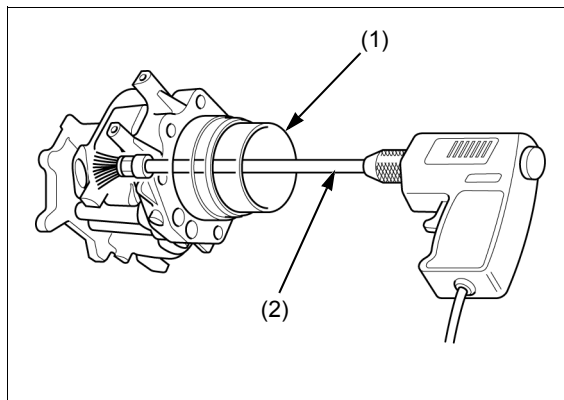
TOOL:

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.



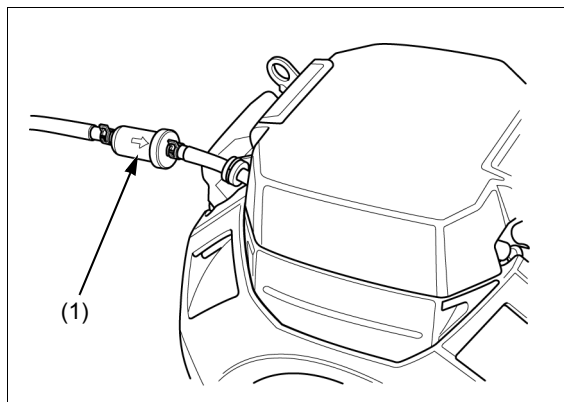
FUEL FILTER REPLACEMENT

⚠ 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.

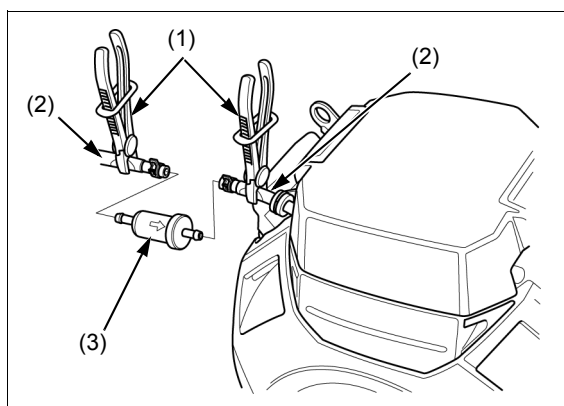


Install the commercially available tube clamps (1) on the fuel tubes (2) on both sides of the fuel filter (3).

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).

