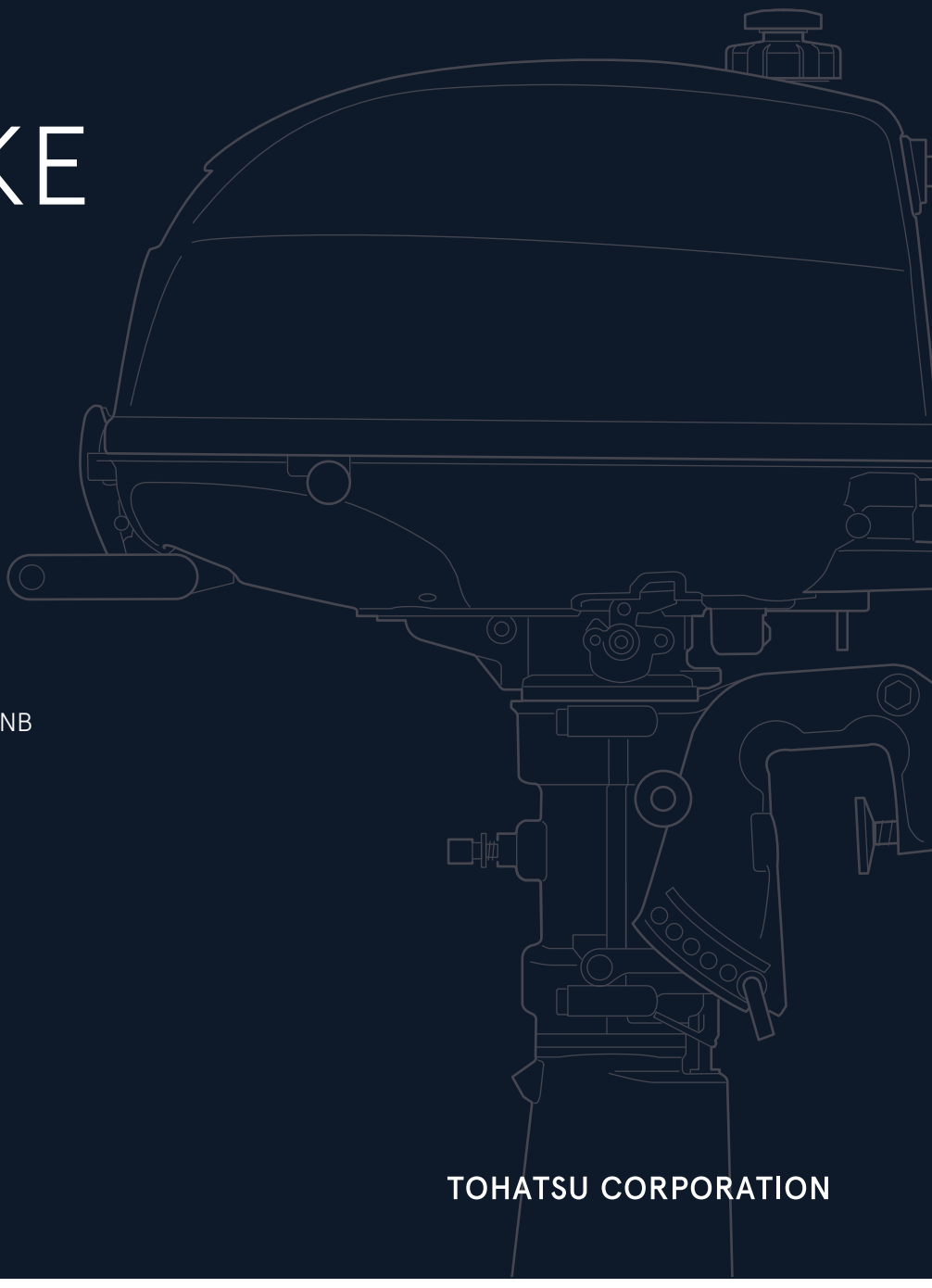
SERVICE MANUAL

TOHATSU
Feel the Wind™

4 STROKE
MFS 4D
MFS 5D
MFS 6D
Models

OB No.003-21034-4BA1 | 04-21 NB



BACKS YOU UP™

TOHATSU CORPORATION

Introduction

Before reading this manual

This service manual provides information that is needed for inspection, service and repair of applicable outboard motors. For information about operation of the products that are not described in this document, refer to the owners manual. For our customers' safe and dependable use of the product for long term, it is essential to maintain the performance and quality of the outboard. To ensure this, the maintenance and service have to be done properly by service technicians with fundamental knowledge and skills. This manual is utilized so that our customers can always use their outboard motor with full satisfaction.

Safety Information

Safety Statements

The following safety statements are found throughout this manual and indicate information which, if ignored, could result in fatal safety hazards or property damage:

⚠ DANGER

Indicates the presence of a hazard which, if ignored, will result in severe injury or death.

⚠ WARNING

Indicates the presence of a hazard or an unsafe activity which, if ignored, could result in severe injury or death.

⚠ CAUTION

Indicates the presence of a hazard or an unsafe activity which, if ignored, could result in minor personal injury or damage to the products or facilities.

Attention:

About this manual

This service manual is designed so that service persons are able to perform their work correctly.
Understand the following matters well for efficient repairs.

① Each chapter begins with the introduction of special tools that are used for the work described in the chapter so that the service persons are able to understand the tools needed.

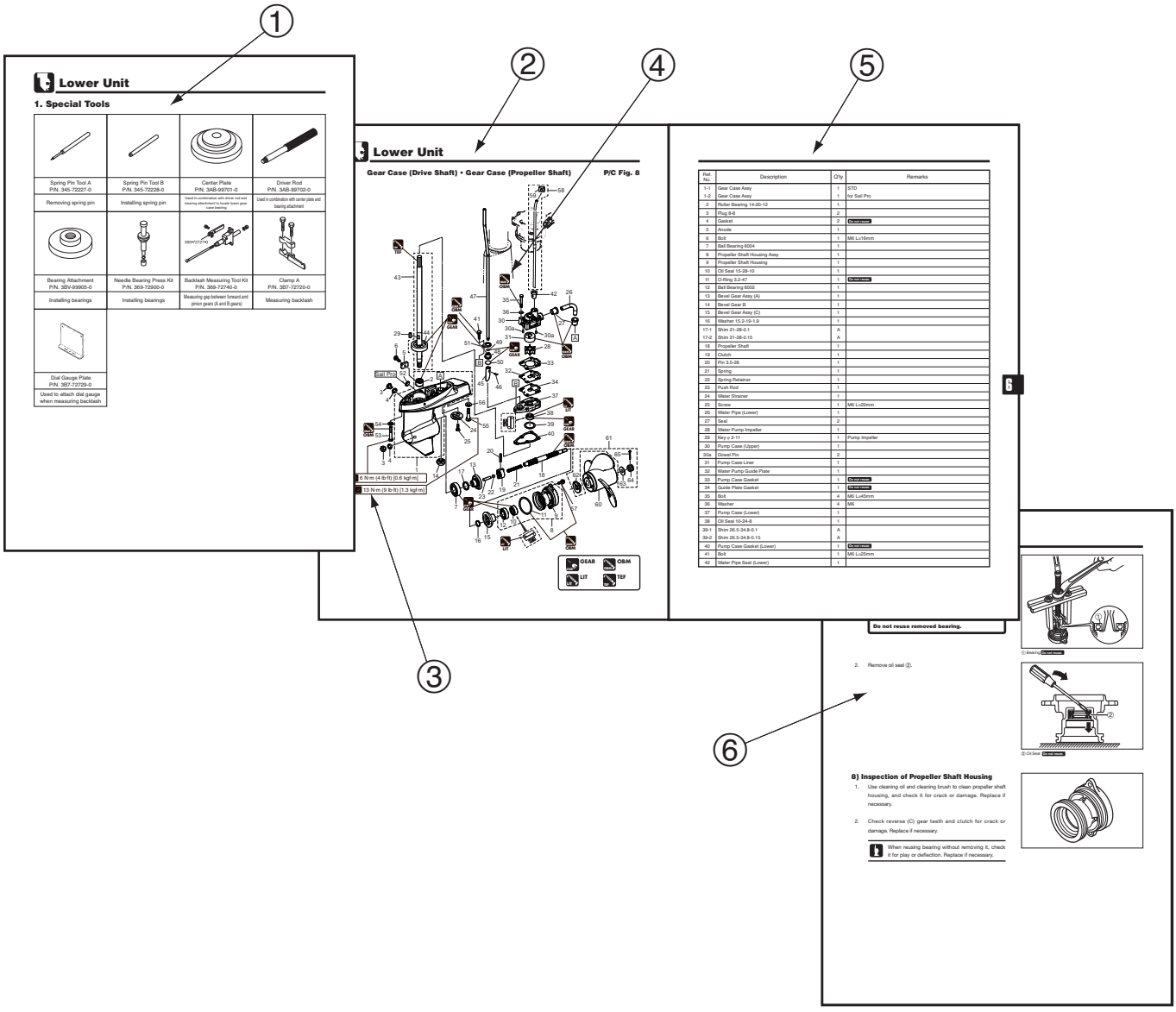
② Parts that are serviced in each chapter and their details are presented by using a component composition diagram.

③ Fastening torques are described in the component composition diagram and in the body text and are critical points of the applicable repair.

④ Pictograms indicate that there is an important instruction for the relevant parts. It also shows the type of lubricant and its application point(s).

⑤ The component composition diagrams describe the names of the parts, the quantity of the parts used, size of fasteners and special notes.

⑥ Specific works are described in detail by using illustrations and adding advice on the work.



This manual uses SI unit system (International System of Units) for pressure, force (load), torque and stress. In this manual, the main units are as follows.

Example : <Pressure>

0.90 MPa (128 psi) [9.0 kgf/cm²]

- [9.0 kgf/cm²] — Conventional system (kilo-gram meter unit)
- (128 psi) — Conventional system (US pound inch unit)
- 0.90 MPa — SI unit (1 kgf/cm² = 0.0980665 MPa)

* Measurements are shown using SI unit followed by conventional units (US unit) and [Japanese domestic unit].

Example : <Torque>

18 N·m (13lb·ft) [1.8 kgf·m]

* The conventional unit for measurement of force uses "kgf (kilogram force)" to discriminate it from "kg (mass kilogram)" of SI unit system.

Example : <Volume>

900 mL (30.4 fl.oz)

Example : <Length>

10 mm (0.39 in)

<Reference>

What is the SI unit system?

Although the measurement unit is standardized mostly with metric system in the world, the metric system includes different kinds of unit systems.

Though the metric system was established expecting that a single unit system would be used in the world, various physical units were established later, resulting in branching the metric system in different unit systems.

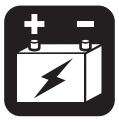
The new unit system is called "International System of Units" because it was established for the purpose of unifying the different unit systems.

Since the metric system was initially established in France, and International Bureau of Weights and Measures (IBWM) is located in Paris, General Conference of Weights and Measures (GCWM) passed a resolution of the international unit system as "Systéme International d'Unités (French)" that is abbreviated as "SI unit".

For example, conventional metric system uses the unit of mass (kg) and unit of force (kg or kgf) without discriminating them, but the SI unit system uses, for example, "kg" as the unit of mass, and "N" as the unit of force, aiming to apply a kind of unit for a kind of physical quantity.

Description of Pictograph

The following symbols represent the contents of individual chapters.

Service Information 	Service Data 	Maintenance 	Fuel System (Carburetor) 
Power Unit 	Lower Unit 	Bracket 	Electrical System 
Troubleshooting 	Accessories 	Wiring Diagrams 	

The following symbols indicate items needed for the service.

Special Tool 	Lubrication Oil 	Engine RPM 	Tightening Torque 
Specified Electrical Value 	Specified Measurement Value 	Use Limit 	Test Run Adjustment 
Specified Part 			

The following symbols indicate a point to which lubrication oil, sealing agent or screw-locking agent is to be applied.

4 stroke Engine Oil 	Gear Oil 	Waterproof Grease 	Low Temperature Resistant Lithium Grease 
Teflon® Grease TEFLON 	Rubber Grease RUB 	Oil Compound [Shinetsu Silicon] S.O.C 	[Konishi Bond] • G17 
[Konishi Bond] • G103 	Instant Adhesive [Three Bond®] • 1741 	Screw Lock Agent [Three Bond®] • 1342 	

1.Service Information

2.Service Data

3.Maintenance

4.Fuel System

5.Power Unit

6.Lower Unit

7.Bracket

8.Electrical System

9.Troubleshooting

10.Wiring Diagram

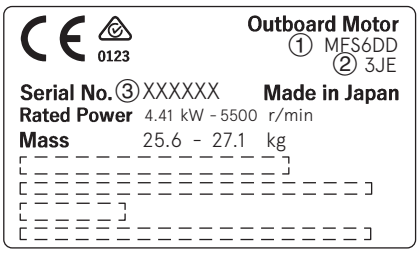
INDEX

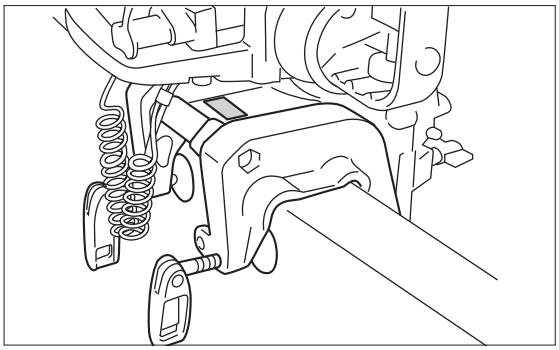
1
Service Information

1. Identification (Engine Serial Number)

Engine serial number is located on the swivel bracket.

① Model Name
② Model Type
③ Serial Number

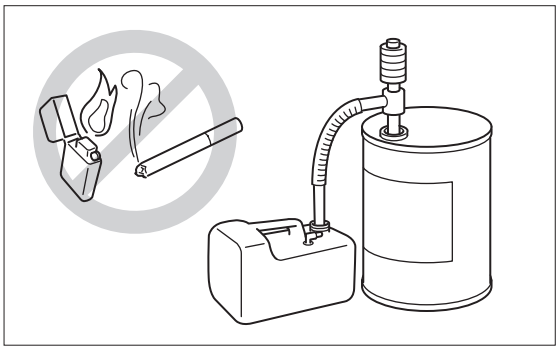




2. Work Safety

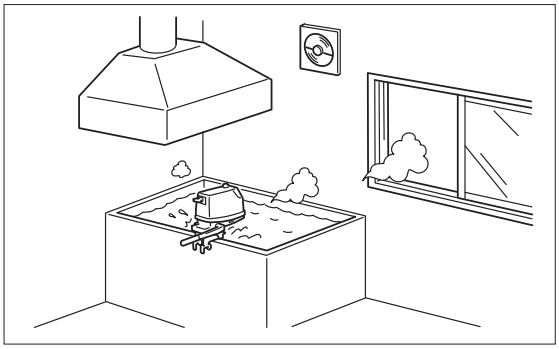
1) Fire Prevention

Gasoline is hazardous material and very flammable. Do not handle gasoline near ignition source such as spark or static electricity.



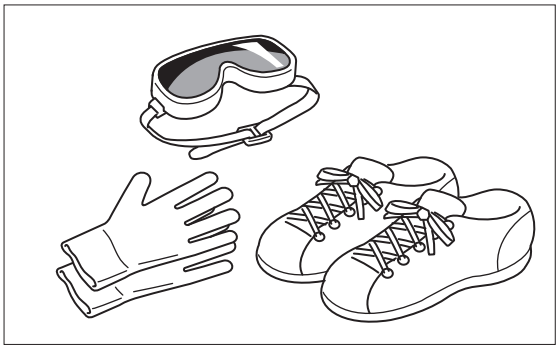
2) Ventilation

Exhaust gas or gasoline vapor is hazardous. Be sure to ventilate well when working indoors.



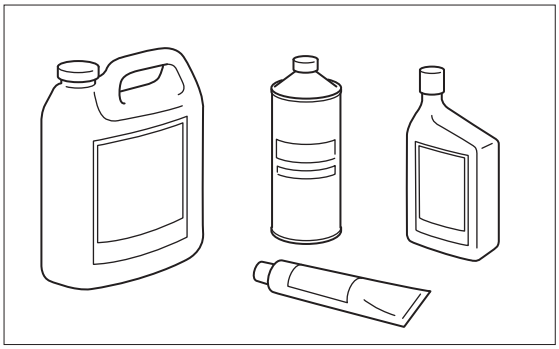
3) Protection

Wear a pair of goggles, working gloves and safety shoes to protect skin from chemicals and oil and your eyes from particles generated by grinding or polishing. Avoid contact of oil, grease or sealing agent to the skin. In case of exposure to such matters, wash away with soap or warm water immediately.



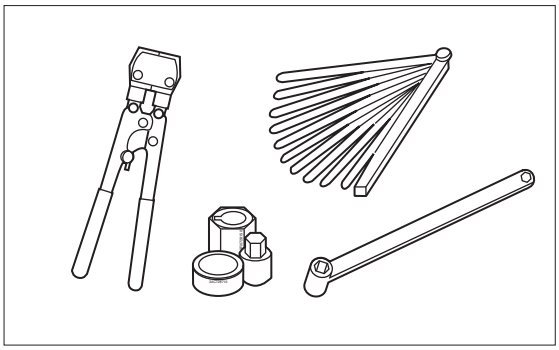
4) Genuine Parts

Use parts and/or chemicals that are genuine items or recommended.



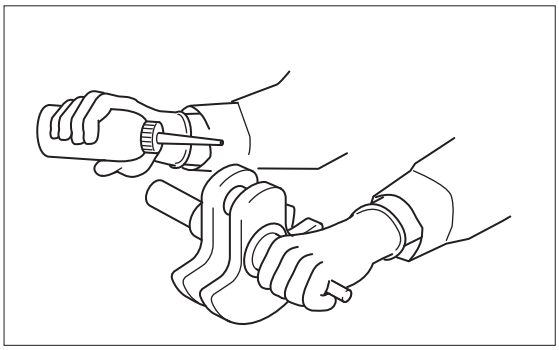
5) Tools

Use specified special tools to prevent damaging to parts and to perform work safely and surely. Be sure to follow installation procedures and specified torque described in this manual.



6) Recommendations on Service

Remove foreign substances and dirt from outboard motor and individual parts by cleaning. Apply recommended oil or grease to rotating areas and sliding surfaces. After carrying out each work, always conduct a check to ensure smooth movement and sealing.



7) Cautions in Disassembling and Assembling Components

(1) Secure outboard motor to a dedicated stand.

(2) Replace parts that cannot be reused such as packings, gaskets, O-rings, oil seals, spring pins or split pins with new ones after disassembly. Replace deformed snap rings with new ones.

(3) Replace parts such as packings, gaskets, O rings, oil seals, spring pins or split pins with new ones after they are removed. Replace deformed snap rings with new ones.

(4) When replacing parts, be sure to use genuine parts. For fluids such as gear oil, use genuine product.

(5) Be sure to use special service tools, and perform the work properly.

(6) When reassembling parts, use their mating marks. For parts without mating marks, simple marking makes reassembling easier. Use applicable parts list for reference.

(7) Clean individual parts that have been removed, and check their condition.

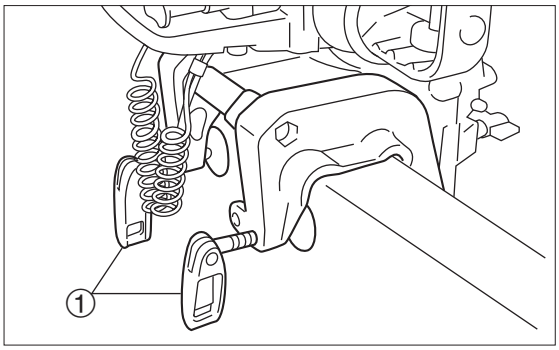
(8) When reassembling parts, pay extra attention to details such as the fitting of each part, repair limits, air tightness, clogging of oil holes for lubrication and greasing, packings, wiring, piping and so on. For components which use a lot of bolts and nuts for assembly, such as the cylinder head and crankcase, tighten all the fasteners uniformly to their specified torques clockwise in two or three stages, starting with the inner ones first followed by the outer ones.
(Reverse the order when disassembling.)

(9) When installing bearings, the flat (numbered) side should be the side in contact with the special assembly tool.

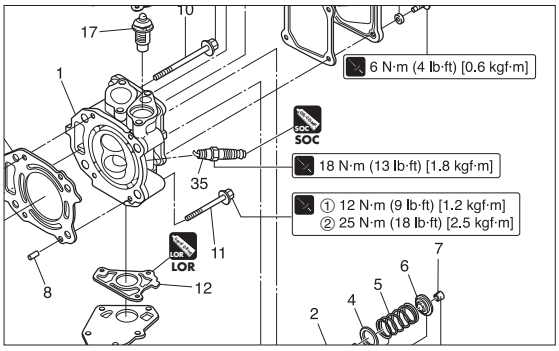
(10) When installing oil seals, be careful not to scratch the surface of the lip that contacts with the shaft, and install them in correct direction. Apply recommended grease to the lip before installation.

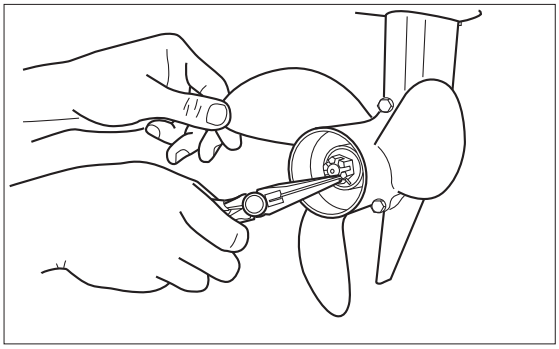
(11) When applying liquid packing, be extra careful of the thickness and quantity. Excess liquid may ooze out if too much liquid is applied, adversely affecting the interior of the crankcase. Use adhesives after thoroughly reading the instructions.

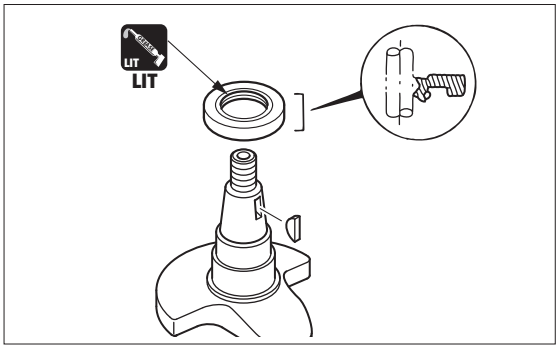
(12) When servicing power unit, use of wood work board makes the work easier.

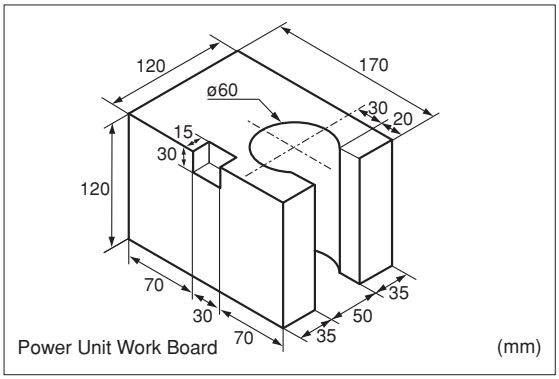


① Clamp screw









Power Unit Work Board (mm)

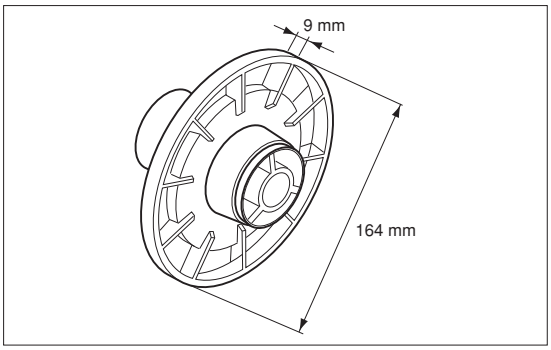
3. Tools and Instruments

1) Test Propeller

P/N. 3B2-64110-1

Outer diameter : 164mm

Width : 12mm



(Reference value)

Model	Speed at WOT (Wide Open Throttle) min^{-1} (rpm)
MFS 4D/5D	4,500 – 5,500
MFS 6D	5,000 – 6,000

This test propeller has been designed for break-in operation and load test operation.
The engine speed at WOT varies depending on the conditions such as the level or water of air temperature, and this measurement is not the confirmation of output.

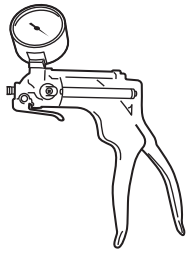
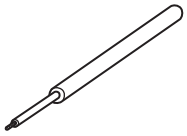
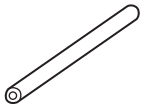
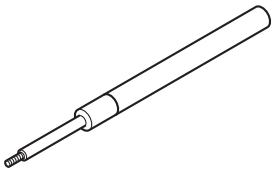
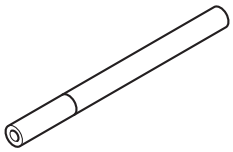
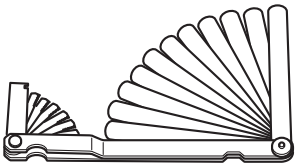
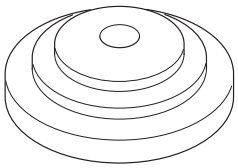
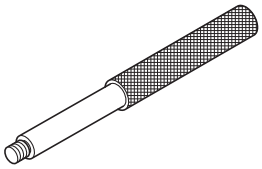
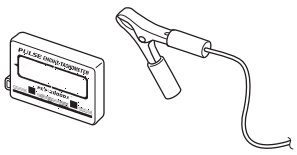
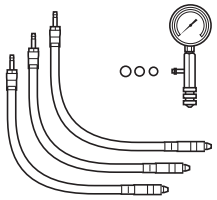
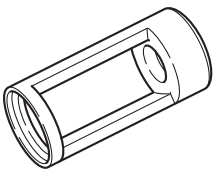
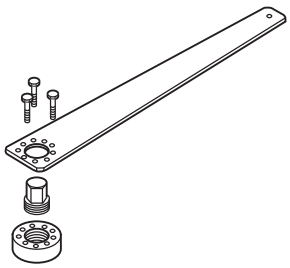
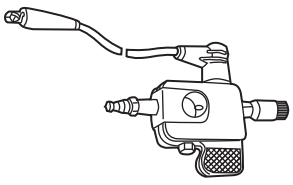
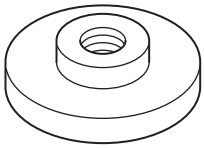
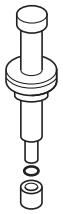
2) Instruments

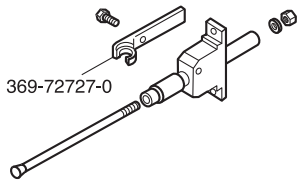
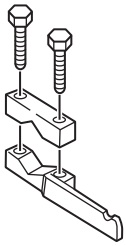
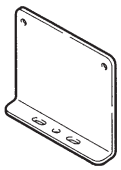
For the following measuring instruments, use commercially available ones.

Multimeter	(HIOKI 3000 Serise : Resistance : 1Ω, 10Ω, 10 kΩ, AC voltage : 30 to 300V, DC voltage : 30V)
Vernier calipers	(M1 type, 300 mm)
Micrometer	(minimum graduation of 0.01, outer, 0 to 25 mm, 25 to 50 mm, 50 to 75 mm)
Cylinder gauge	(4 to 6 mm, 10 to 25 mm, 25 to 50 mm, 50 to 75 mm)
Ring gauge	(ø5.5, ø16, ø30, ø59)
Dial gauge	(minimum graduation of 0.01)
Thickness gauge	(0.03 to 0.3 mm)
V block	
Surface plate	(500 mm x 500 mm)

Dial gauge magnet base or dial gauge stand

3) Special Tools

			
Vacuum/Pressure Gauge P/N. 3AC-99020-1	Spring Pin Tool A P/N. 345-72227-0	Spring Pin Tool B P/N. 345-72228-0	Spring Pin Tool A P/N. 369-72217-0
Inspecting pressure	Removing spring pin (φ 3.0)	Installing spring pin (φ 3.0)	Removing spring pin (φ 3.5)
			
Spring Pin Tool B P/N. 369-72218-0	Thickness Gauge P/N. 353-72251-1	Center Plate P/N. 3AB-99701-0	Driver Rod P/N. 3AB-99702-0
Installing spring pin (φ 3.5)	Measuring gaps	Used in combination with driver rod and bearing attachment to locate lower gear case bearing	Used in combination with center plate and bearing attachment
			
Tachometer P/N. 3AC-99010-0	Compression Gauge P/N. 3AC-99030-0	Valve Spring Compressor Attachment P/N. 3AB-99076-0	Flywheel Puller Kit P/N. 369-72211-0
Measuring engine revolution speed	Measuring compression pressure	Removing or installing valve springs	Removing/installing flywheel
			
Spring Tester P/N. 3F3-72540-0	Piston Slider P/N. 3H6-72871-0	Bearing Attachment P/N. 3BV-99905-0	Needle Bearing Press Kit P/N. 369-72900-0
Inspecting spark	Installing piston	Installing bearings	Installing bearings

		
Backlash Measuring Tool Kit P/N. 369-72740-0	Clamp A P/N. 3B7-72720-0	Dial Gauge Plate P/N. 3B7-72729-0
Measuring gap between forward and pinion gears (A and B gears)	Measuring backlash	Used to attach dial gauge when measuring backlash

4. Pre-delivery Inspection

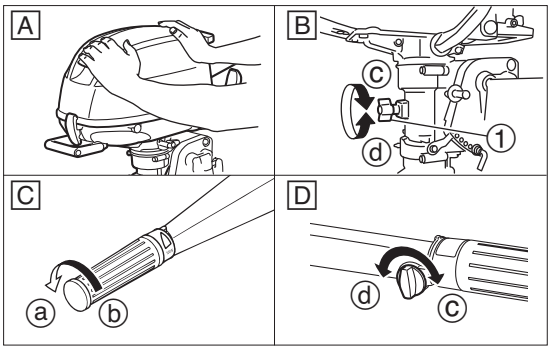
1) Steering Handle

A Check installations for clattering and play.

B Adjust steering friction.

C Check throttle grip for movement. (Fully Open/Fully Close).

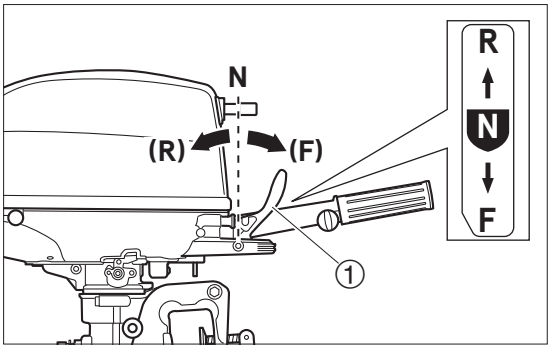
D Adjust throttle friction.



① Steering Adjust Screw ⓒ Heavier ⓓ Lighter

2) Gear Shift

1. Check that shift lever ① moves from neutral (N) to forward (F)and reverse (R) smoothly.



3) Engine Oil

1. Set outboard motor upright.

2. Fill with Engine Oil.

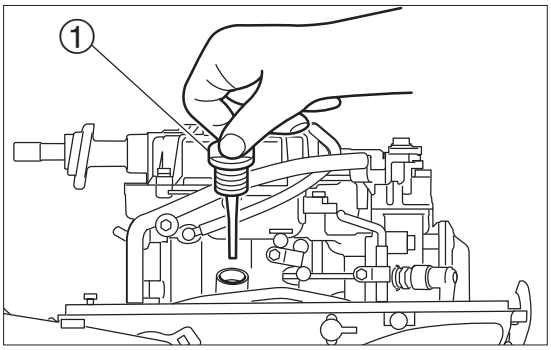
4 Stroke Engine Oil :
450 mL (15.2 fl.oz)

3. Use oil level gauge ① to check oil quantity.

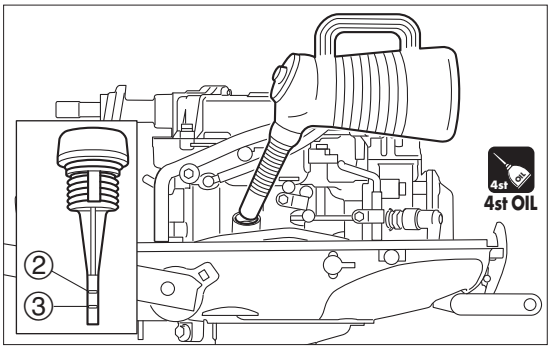
⚠ CAUTION

Engine oil is removed before shipment to prevent leakage during transportation.

When checking the oil level, screw in the oil level gauge fully.



① Oil Level Gauge



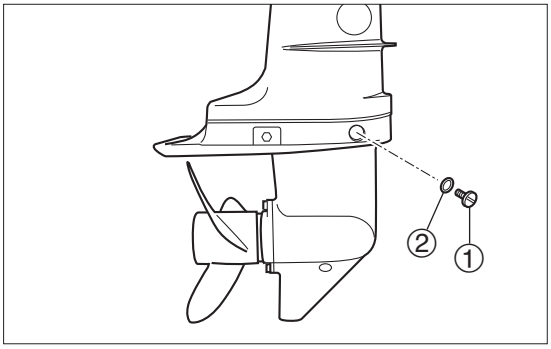
② Upper limit ③ Lower limit

4) Gear Oil

1. Check quantity of gear oil.

Gear Oil :
195 mL (6.6 fl.oz)

Fill with gear oil until some of the oil spills out of the plug hole when the upper oil plug is removed.



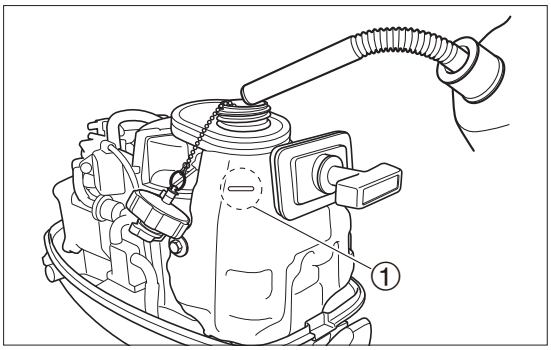
① Oil Plug ② Gasket **Do not reuse.**

5) Fuel Tank Line

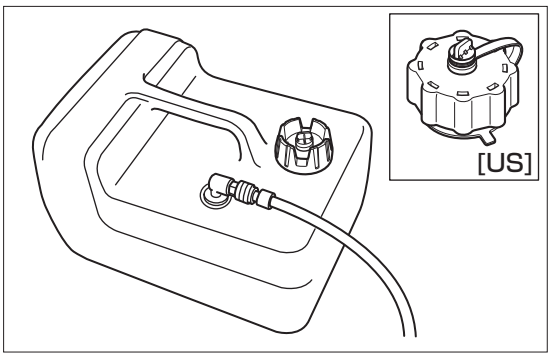
1. Check that fuel tank contains sufficient amount of gasoline, fuel line is connected and is free of leak.

⚠ CAUTION

Since this is a four stroke engine model, do not use fuel mixed with engine oil. Use of fuel mixed with engine oil will cause engine trouble.



Dual Tank model
① "FULL" mark



Separate Tank model

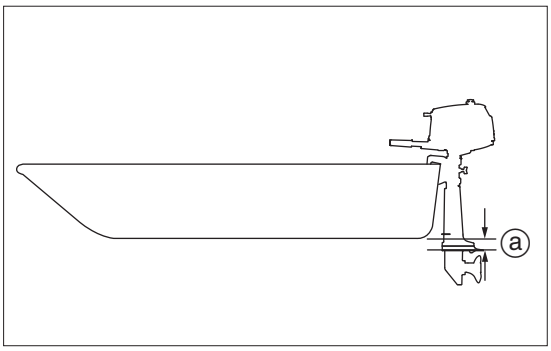
6) Rigging

1. Check that clamp bracket is fixed securely to hull.

2. Inspect boat bottom and atnti-ventilation plate to prevent the engine from overheating or decreasing in propulsive force, and, if necessary, adjust to prevent decrease in propulsive force and engine overheating.

Conduct a test run to determine the best installation height.

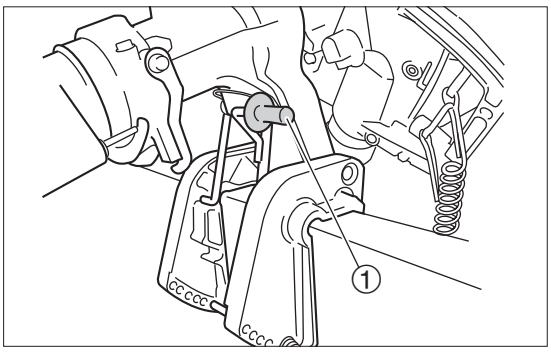
Anti-ventilation plate standard position ⓐ :
Anti-ventilation plate located 5 - 25 mm (0.2 - 1.0 in) below boat bottom



ⓐ 5 - 25 mm (0.2 - 1.0 in)

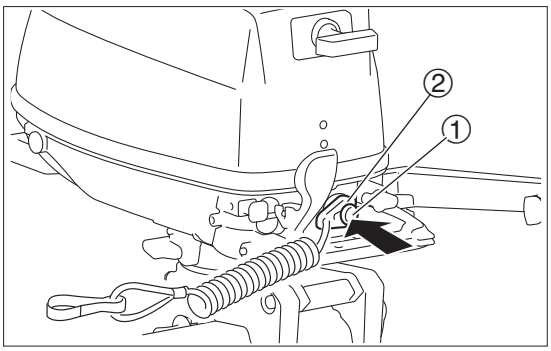
7) Inspection of Tilt Stopper

1. Fully tilt up the outboard motor, lock with the tilt stopper ①, and then check that the holding mechanism functions normally.

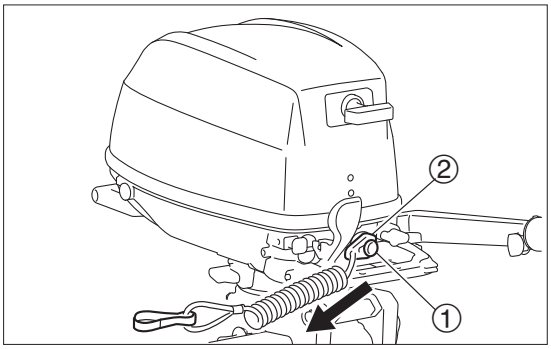


8) Inspection of Stop Switch

1. Press stop switch ① hard or pull out lock ② from stop switch ① to check that engine stops.



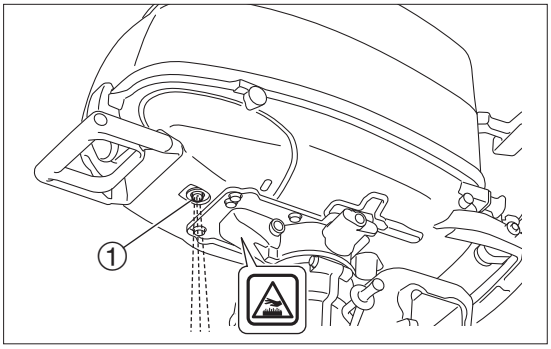
① Stop Switch ② Stop Switch Lock



① Stop Switch ② Stop Switch Lock

9) Cooling Water Check Port

1. Check that cooling water check port ① discharges water while the engine is running.

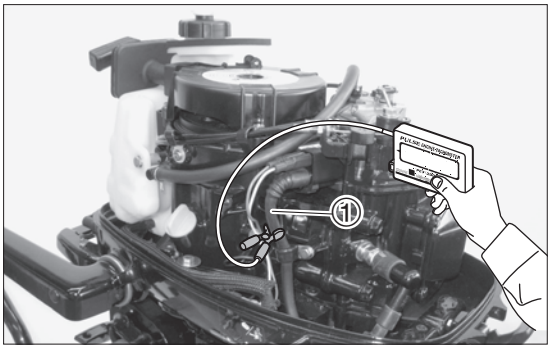


10) Idle Operation

1. After engine has warmed up in neutral, use tachometer to check idle engine speed is as specified.

Idle Engine Speed :
1,300 min^{-1} (rpm)

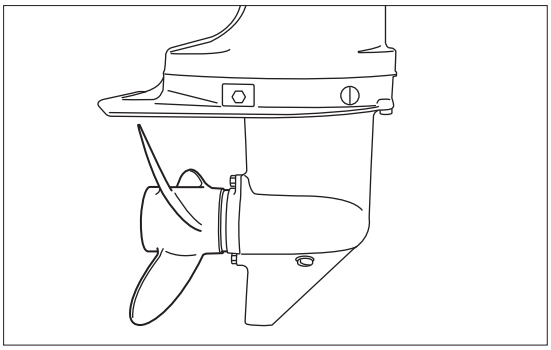
Tachometer :
P/N. 3AC-99010-0



① High Tension Cord

11) Propeller Selection

1. Select a propeller that is most suitable for the type of boat and application.



Range of operating engine revolution at WOT
4D/5D : 4,500 - 5,500 min^{-1} (rpm)
6D : 5,000 - 6,000 min^{-1} (rpm)

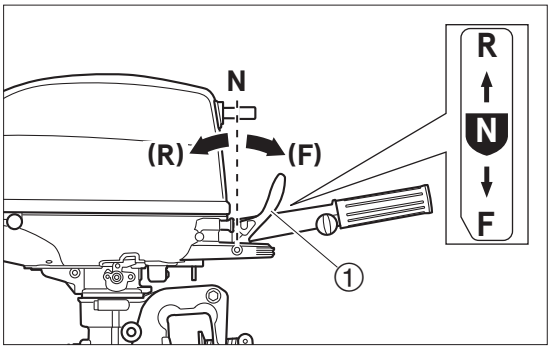
⚠ CAUTION

Selecting a wrong propeller may cause adverse effects on the engine life , fuel consumption, etc. as well as the performance.

Propeller [Marking] No. of Blades x Diameter x Pitch mm (in)	[Y6]	3 x 212 x 160	(3 x 8.3" x 6.3") (Sail Pro)
	[6"]	3 x 200 x 152	(3 x 7.9" x 6.0")
	[7"]	3 x 198 x 178	(3 x 7.8" x 7.0")
	[8"]	3 x 198 x 203	(3 x 7.8" x 8.0")
	[9"]	3 x 200 x 229	(3 x 7.9" x 9.0")

12) Inspection of Forward and Reverse Shifts

Use shift lever ① to shift the gear to forward (F), Neutral (N) and Reverse (R).



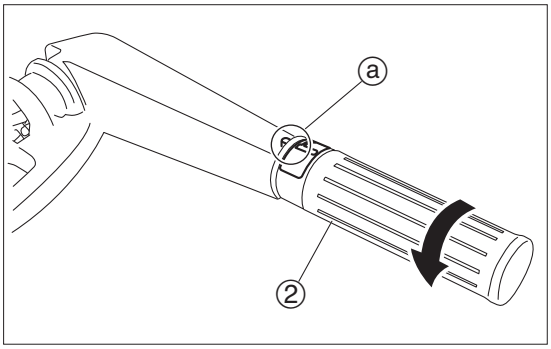
① Shift Lever

1. Forward
Return handle grip ② to idle speed ⓐ, and then, move shift lever ① toward the operator (F) quickly.

2. Reverse
Return handle grip ② to slow side ⓐ, and then, when the engine reached the lowest speed, set shift lever ① toward the reverse side (R) quickly.

3. Shallow water run
In shallow water, run at the lowest possible speed while watching the depth and obstacles.

In reverse operation, run at low speed, and do not increase the engine speed unnecessarily.



② Handle grip

⚠ WARNING

Shifting at high engine speed may cause fall of passenger due to abrupt acceleration and damage to gear, clutch and other components of the outboard motor. Shift at the lowest engine speed.

5. Break-in Operation

1. Break-in operation is needed for the purpose of smoothening sliding surfaces (Includes lower unit gears, etc.) between components such as pistons and cylinder, piston rings, piston pins, crank shaft, connecting rods, and intake and exhaust valves.

Break-in Operation…10 hours

Time	0	10 minutes	2 hours	3 hours	10 hours
Operation	Dead Slow or Idling	1/2 of WOT or less at approximately 3,000 min^{-1} (rpm)	3/4 of WOT or less at approximately 4,000 min^{-1} (rpm)	3/4 of WOT at approximately 4,000 min^{-1} (rpm)	Regular Operation
	Running at the slowest possible speed		WOT run for approximately 1 minute can be included every 10 minutes of run.	Short period WOT run can be included.	

- It is best to fluctuate the engine RPM (Target RPM or less) every 15-30 mins at each stage during the break in procedure to allow for complete break in of outboard engine.
- Running the outboard at for prolonged periods such as idling or one specific RPM is detrimental to the outboard and could affect engine reliability and performance.

6. Test Run

1. Start the engine and check if gear shift lever moves smoothly.

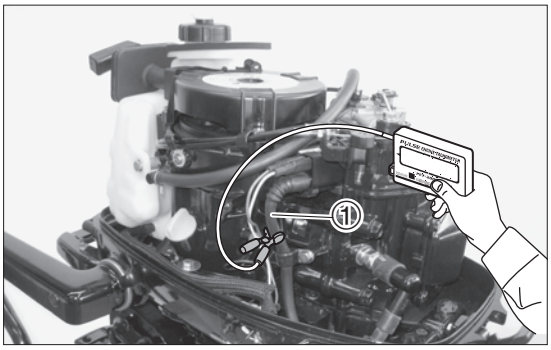
2. After completing warm-up operation, check idling revolution speed.

Idling Revolution Speed : - Neutral
1,300 min^{-1} (rpm)

Tachometer :
P/N. 3AC-99010-0

3. Shift gear into forward (F) and run dead slow for approximately 10 minutes.

Dead Slow Revolution Speed :
1,150 min^{-1} (rpm)



① High Tension Cord

4. Run at 2,000 min^{-1} (rpm) or 1/2 of WOT or less for initial 2 hours, then at 3,000 min^{-1} (rpm) or 3/4 of WOT or less for 1 hour.

5. Check that the outboard motor is not tilted up and that water does not infiltrate the boat when the gear is shifted to the Reverse (R) position.

Complete test run during break-in operation.

7. Checks After Test Run

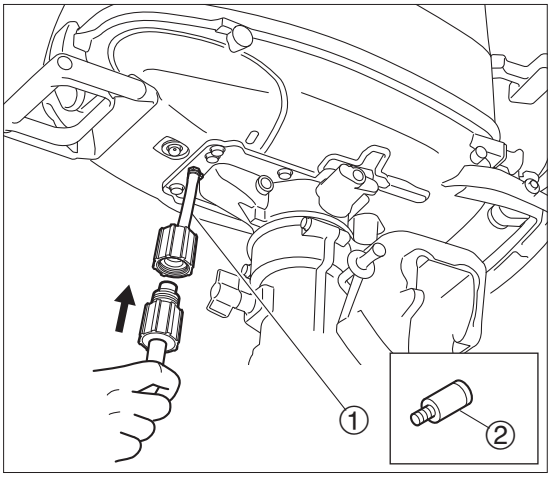
1. Check that power unit, lower unit and bracket are free of looseness or play.

2. Check that no water is present in gear oil.

3. Check that no fuel leakage exists in the cowl.

4. Check that no oil and water leak in the cowl and no water is present in engine oil.

5. After test run in salt water, use flushing attachment ①, ② (optional) and fresh water to wash cooling water passage with engine stopped.



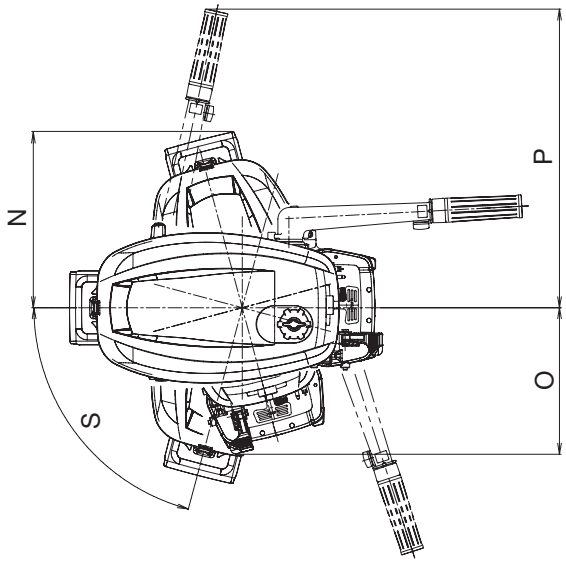
① Flushing Attachment (optional) For USA
② Flushing Attachment (optional) Except for USA

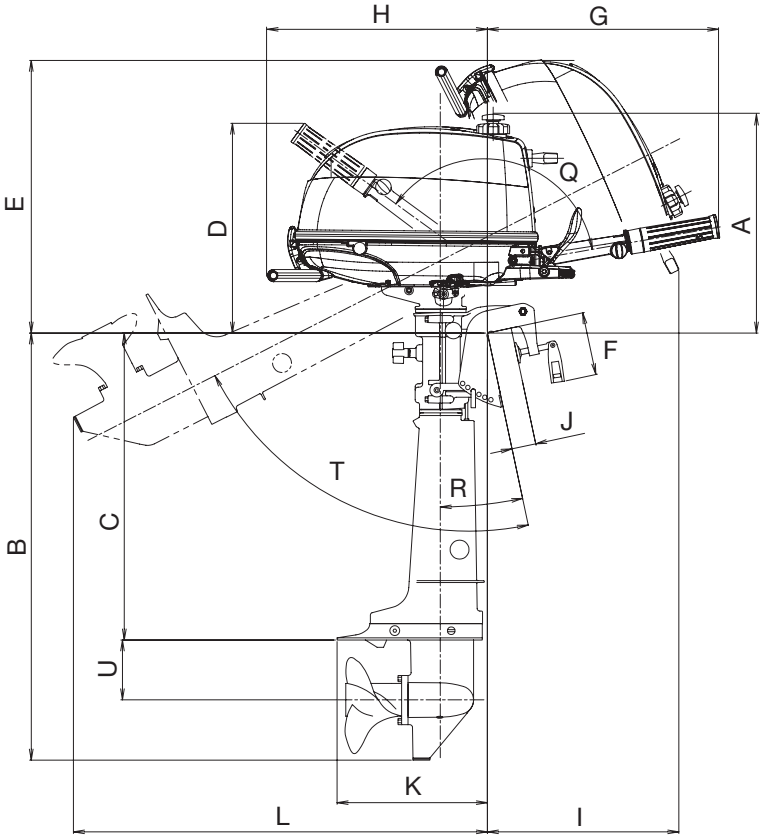
2
Service Data

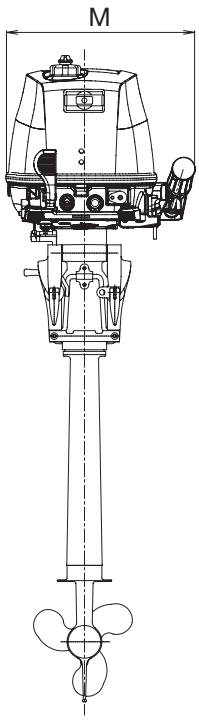
1.Outline Dimensions

1) Engine Dimensions

<Dual Tank model>





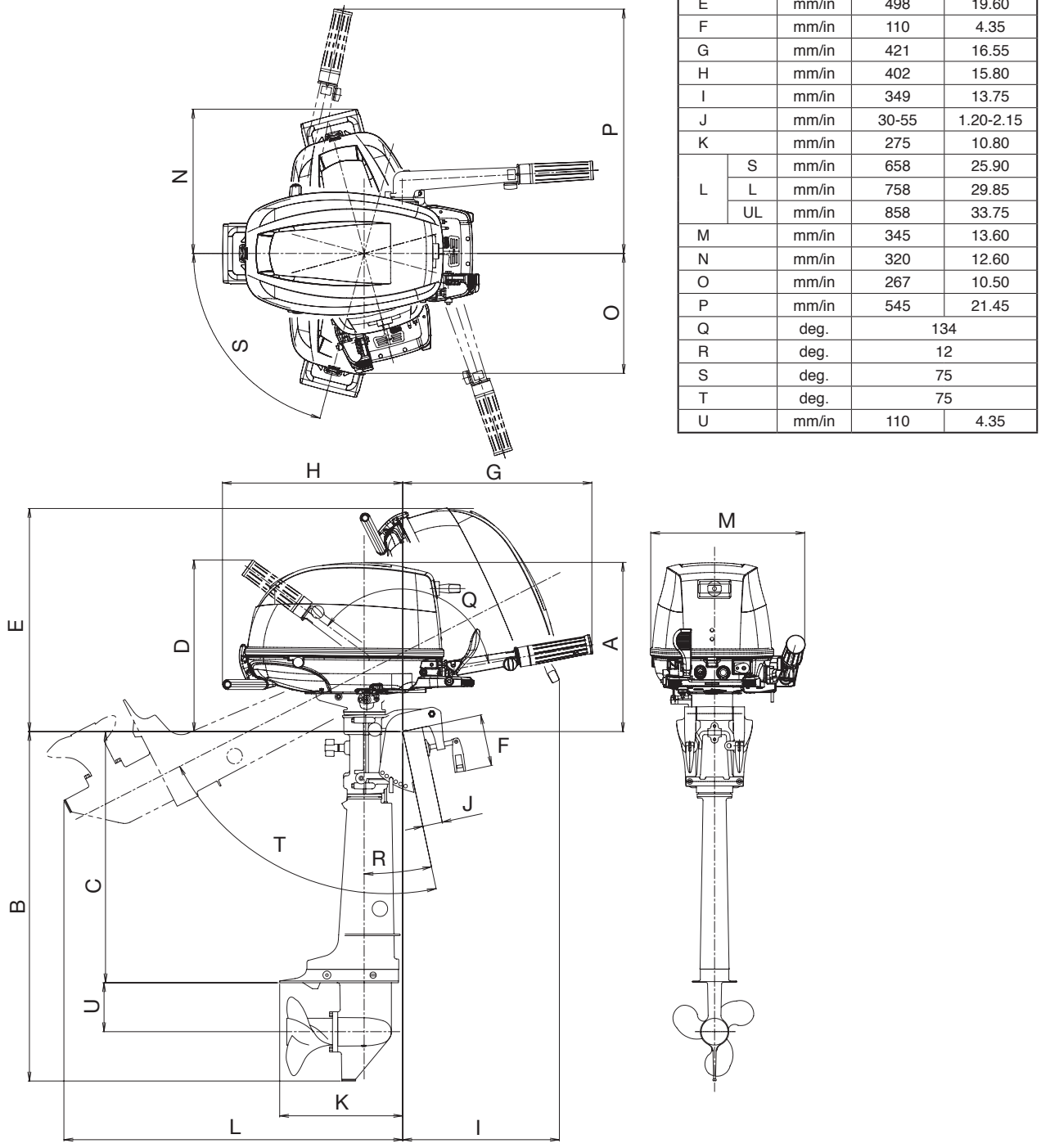


Item	Type	Unit	mm	in
A	*EPA	mm/in	410	16.15
	*EU	mm/in	396	15.60
B	S	mm/in	655	25.80
	L	mm/in	782	30.80
	UL	mm/in	909	35.80
C	S	mm/in	436	17.15
	L	mm/in	563	22.15
	UL	mm/in	690	27.15
D		mm/in	383	15.05
E		mm/in	498	19.60
F		mm/in	110	4.35
G		mm/in	421	16.55
H		mm/in	402	15.80
I		mm/in	349	13.75
J		mm/in	30-55	1.20-2.15
K		mm/in	275	10.80
L	S	mm/in	658	25.90
	L	mm/in	758	29.85
	UL	mm/in	858	33.75
M		mm/in	345	13.60
N		mm/in	320	12.60
O		mm/in	267	10.50
P		mm/in	545	21.45
Q		deg.	134	
R		deg.	12	
S		deg.	75	
T		deg.	75	
U		mm/in	110	4.35

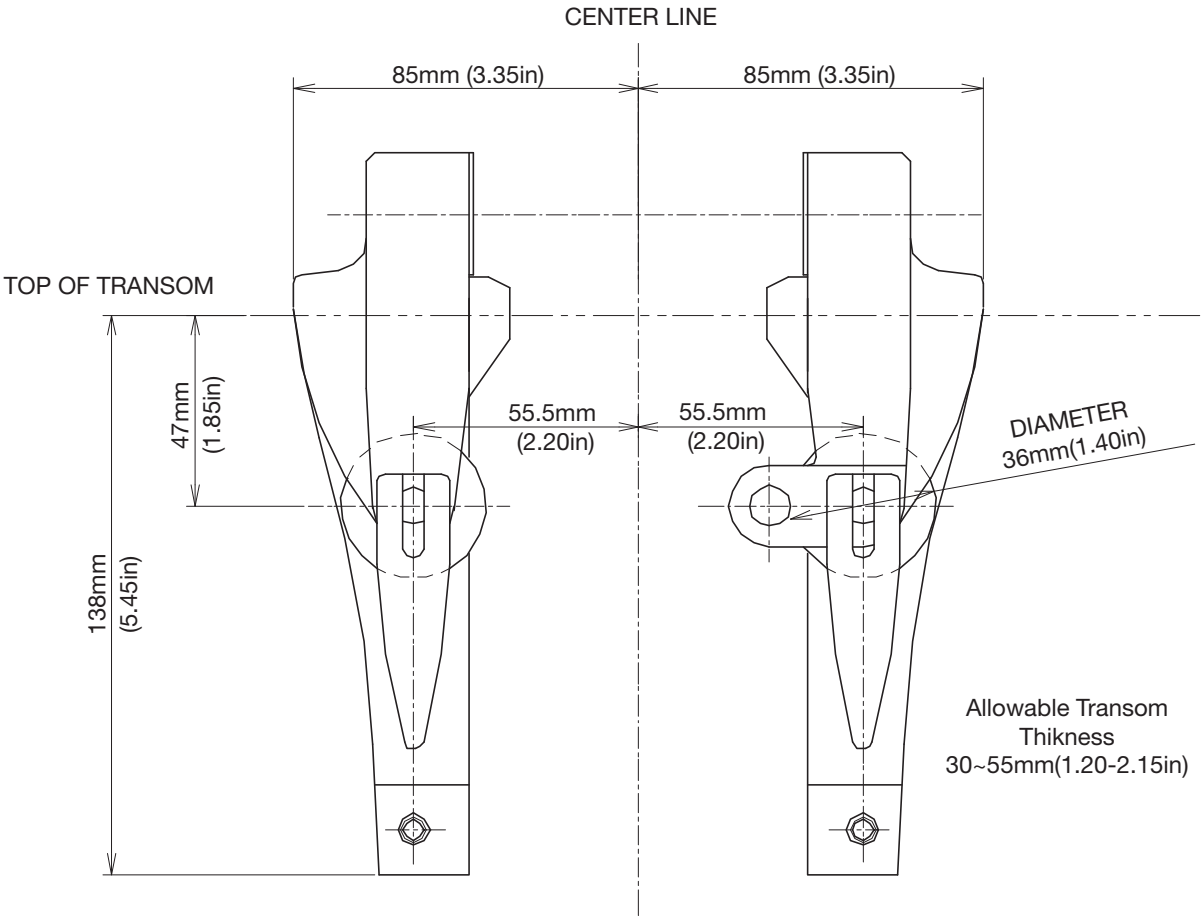
*EPA for EPA
*EU for EU and Japan

<Separate Tank model>

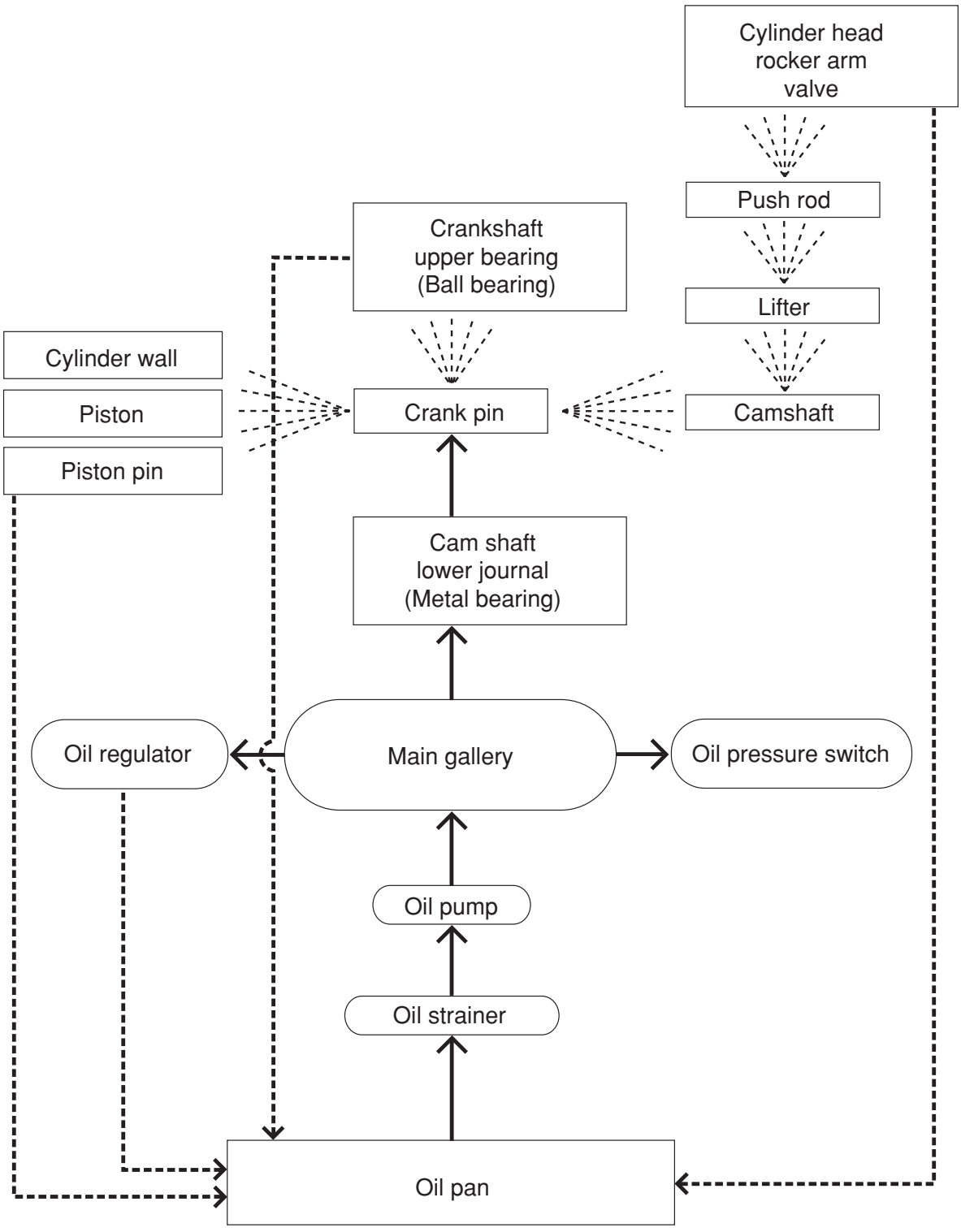
Item	Type	Unit	mm	in
A		mm/in	375	14.75
B	S	mm/in	655	25.80
	L	mm/in	782	30.80
	UL	mm/in	909	35.80
C	S	mm/in	436	17.15
	L	mm/in	563	22.15
	UL	mm/in	690	27.15
D		mm/in	383	15.05
E		mm/in	498	19.60
F		mm/in	110	4.35
G		mm/in	421	16.55
H		mm/in	402	15.80
I		mm/in	349	13.75
J		mm/in	30-55	1.20-2.15
K		mm/in	275	10.80
L	S	mm/in	658	25.90
	L	mm/in	758	29.85
	UL	mm/in	858	33.75
M		mm/in	345	13.60
N		mm/in	320	12.60
O		mm/in	267	10.50
P		mm/in	545	21.45
Q		deg.	134	
R		deg.	12	
S		deg.	75	
T		deg.	75	
U		mm/in	110	4.35



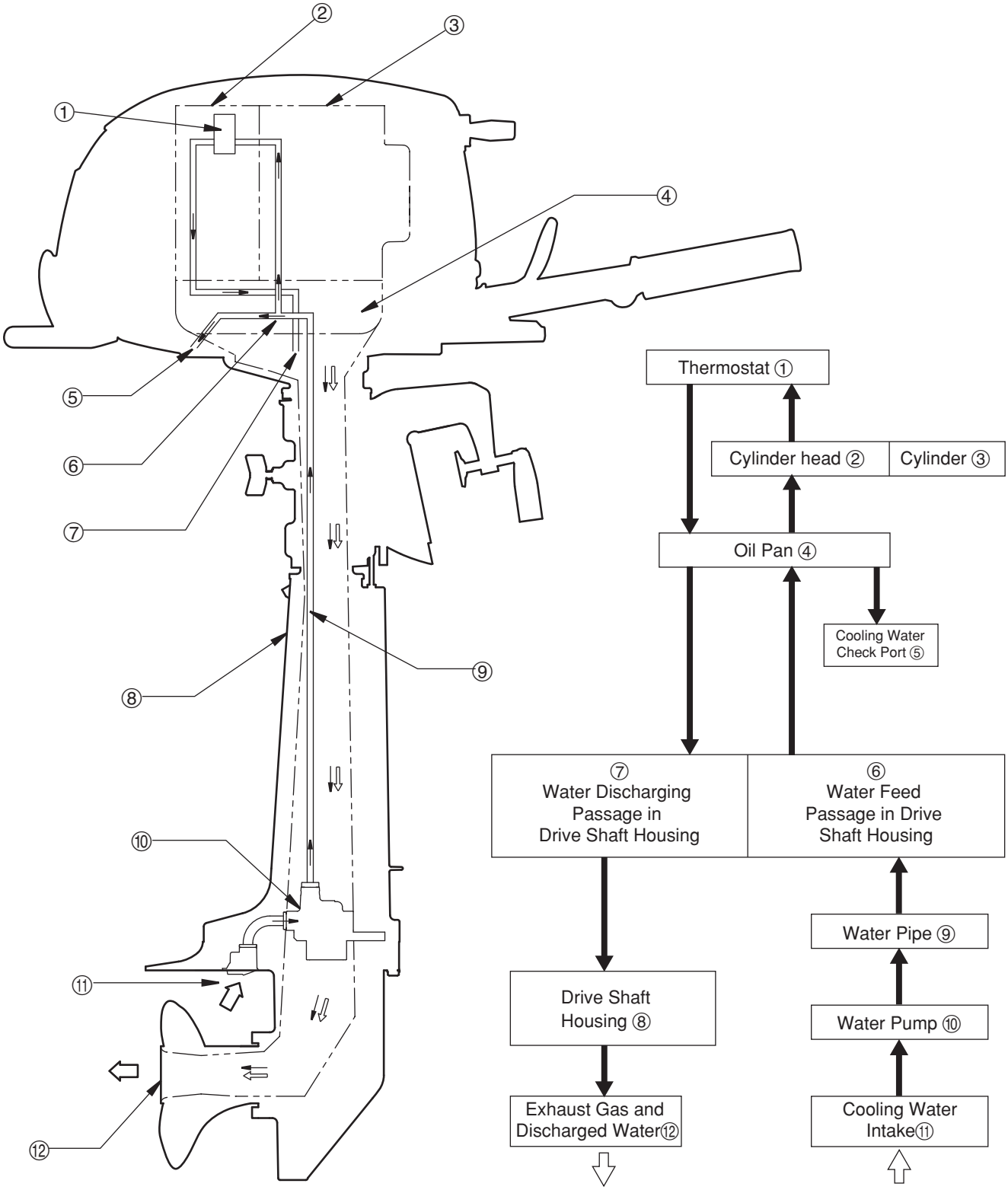
2) Clamp Dimensions



2. Engine Lubrication System Diagram



3. Cooling Water System Diagram



①Thermostat
②Cylinder Head
③Cylinder
④Oil Pan
⑤Cooling Water Check Port
⑥Water Feed Passage in Drive Shaft Housing)
⑦Water Discharging Passage in Drive Shaft Housing)
⑧Drive Shaft Housing
⑨Water Pipe
⑩Water Pump
⑪Exhaust Gas and Discharged Water
⑫Cooling Water Intake

4. Specifications

Item		Unit	Model		
			Dual Tank Model	Sepalate Tank Model	Sail Pro
			4/5/6D	4/5/6D	6D
Dimensions					
Overall length		mm	823		
Overall width		mm	345		
Overall height	S	mm	1051	1030	—
	L	mm	1178	1157	
	UL	mm	—	1284	
Transom height	S	mm	436		—
	L	mm	563		
	UL	mm	690		
Weight					
	S	kg	26.0	25.5	—
	L	kg	26.5	26.0	
	UL	kg	—	26.5	
Performance					
Maximum output		kW [Hp]	4D : 2.9 (5,000 min^{-1}(rpm)) [4] 5D : 3.7 (5,000 min^{-1}(rpm)) [5] 6D : 4.4 (5,500 min^{-1}(rpm)) [6]		4.4 (5,500 min^{-1}(rpm)) [6]
Maximum fuel consumption		L/hr	4D : 1.5 (5,000 min^{-1}(rpm)) 5D : 1.7 (5,000 min^{-1}(rpm)) 6D : 2.0 (5,500 min^{-1}(rpm))		2.0 (5,500 min^{-1}(rpm))
Wide open throttle operating r/min range		min^{-1} (rpm)	4D : 4,500 – 5,500 5D : 4,500 – 5,500 6D : 5,000 – 6,000		5,000 – 6,000
Idling (Neutral: [N])		min^{-1} (rpm)	1,300		
Trolling (Forward: [F])		min^{-1} (rpm)	1,150		
Power unit					
Engine type			4 stroke		
No. of cylinders			1		
Total displacement		mL (cu.in)	123 (7.5)		
Valve system			OHV Crossflow		
Bore x Stroke		mm (in)	59×45 (2.30×1.75)		
Compression ratio			9.6		
Shift operation			Manual		
Starting system			Recoil starter and rope		
Lubrication system			Wet sump (trochoid pump)		
Cooling system			Cooling water (rubber impeller)		
Exhaust system			Thru-hub exhaust system		
Ignition system			Flywheel magneto (CD ignition)		
Ignition timing		degree	BTDC3°–BTDC25°		
Spark plug			NGK DCPR6E		
Alternator output			(Option : 12V 60W)		12V 60W
Fuel feed system			Carburetor (Vertical butterfly system)		

Item			Unit	Model		
				Dual Tank Model	Sepalate Tank Model	Sail Pro
				4/5/6D	4/5/6D	6D

Fuel and oil

Type of fuel				Unleaded regular octane gasoline (Research octane number 91 or more)	
Fuel tank capacity			L	1.2	12
Starting fuel enrichment system				Choke valve	
Fuel pump				Mechanical (plunger pump)	
Engine oil	Type			4 stroke engine (motor) oil	
	Grade		API	SH, SJ, SL	
			SAE	10W-30/40	
			NMMA	FC-W certification 10W-30	
	Amount of oil		mL (fl.oz)	450 (15.2)	
Gear oil	Type			Hypoid gear oil	
	Grade	*1	API	GL-5	
		*1	SAE	#80-90	
	Amount of oil		mL (fl.oz)	195 (6.6)	

*1 Both API and SAE requirements should be met.

Lower unit

Gear shift			F–N–R (Front shift)	
Gear ratio			2.15 (28 : 13)	
Type of gear			Spiral bevel gear	
Type of clutch			Dog clutch	
Propeller shaft driving			Spline	
Propeller rotation (direction)			Clockwise as viewed from stern at forward shift (F)	
Propeller [mark](standard)		in (Blade x Dia. x Pitch mm)	4 : 7" (3×198×178)	6" (3×212×160)
			5, 6 : 8" (3×198×203)	

Bracket

No. of trim steps			6
Trim angle (transom 12°)		Degrees	4 – 24
Shallow water drive angle (transom 12°)		Degrees	32.5
Maximum tilt angle	*2	Degrees	75
Steering angle	*3	Degrees	150
Maximum allowable transomboard thickness		mm (in)	30 – 55 (1.20 – 2.15)

*2 Tilt operating range
*3 Steering right-left operating range

Warning system

Engine over-rev protection	min^{-1} (rpm)	6,300 ± 100
Engine oil pressure reduction protection		Oil pressure indicator (Red - Warning lamp)

Optional parts

Propeller [mark]	in (Blade x Dia. x Pitch mm)	6" (3×200×152) 7" (3×198×178) 8" (3×198×203) 9" (3×200×229)	
Lighting coil (for light)		12V60W	—
Rectifier (for charge)		12V60W	—
Remote control		Cable length : 2m – 6m	

5. Maintenance Data

	Part Name	Item	Standard Value
Engine Parts	Cylinder Head	Carbon deposition on combustion chamber wall	
		Deformation of mating surface and flaws	
		Corrosion of mating surface	
		Plugging of cooling water passages	
	Cylinder	Deposition on water jacket interior walls	
		Wear of bore : Measure bore by using cylinder gauge	59.00 mm (2.3228 in)
		Seizure, cylinder liner damage, or wear	
		Taper	
		Out-of roundness	
		Deformation and damage of cylinder head mating faces	
	Piston	Outer diameter	58.96 mm (2.3213 in)
		· Measure outer diameter at 7 mm (0.28 in) above lower end of piston skirt	
		· Piston clearance	0.020 – 0.055 mm (0.00079 – 0.00217 in)
		Carbon deposition on piston crown and in ring grooves	
		Flaws on sliding surface	
		Measure side clearance between piston 0.0031 in)ring and ring groove.	Top ring 0.04 – 0.08 mm (0.0016 – 0.0031 in)
			Second ring 0.03 – 0.07 mm (0.0012 – 0.0028 in)
			Oil ring 0.01 – 0.18 mm (0.0004 – 0.0071 in)
		Measure piston pin bore. Piston pin clearance	0.002 – 0.012 mm (0.00008 – 0.00047 in)
	Piston pin	Outer diameter	16.00 mm (0.6299 in)
	Piston rings	Ring end gap (Note : Measure ring end gap at the top or bottom cylinder bore that is worn little if ring gauge is not available.)	
		Top ring	Top ring 0.15 – 0.35 mm (0.0059 – 0.0138 in)
		Second ring	Second ring 0.30 – 0.50 mm (0.0118 – 0.0197 in)
		Oil ring	Oil ring 0.20 – 0.40 mm (0.0079 – 0.0157 in)
	Connecting rod	Small end bore	16.01 mm (0.6303 in)
		Big end oil clearance	0.040 – 0.066 mm (0.00157 – 0.00260 in)
		Big end side clearance	0.20 – 0.40 mm (0.0079 – 0.0157 in)
	Crankshaft	Crank pin outer diameter	29.95 mm (1.1791 in)
		Crankshaft runout : Support crankshaft at journals of both ends by using V block	To be less than 0.05 mm (0.0020 in) at both ends.
	Intake valve Exhaust valve	Valve clearance IN : Intake	0.06 – 0.14 mm (0.0024 – 0.0055 in)
		EX : Exhaust	0.11 – 0.19 mm (0.0043 – 0.0075 in)
		Valve stem outer diameter IN : Intake	5.47 mm (0.2154 in)
		EX : Exhaust	5.44 mm (0.2142 in)
		Valve guide inner diameter IN : Intake	5.50 mm (0.2165 in)
		EX : Exhaust	5.50 mm (0.2165 in)
		Clearance between valve guide and valve stem IN : Intake	0.020 – 0.044 mm (0.00079 – 0.00173 in)
		EX : Exhaust	0.045 – 0.072 mm (0.00177 – 0.00283 in)
		Width of area contacting with valve seat IN : Intake	0.8 mm (0.0315 in)
		EX : Exhaust	0.8 mm (0.0315 in)
	Valve spring	Free length	35.0 mm (1.38 in)
	Cam shaft	Cam height (both IN and EX)	28.33 mm (1.1154 in)
		Journal outer diameter Flywheel side	13.98 mm (0.5504 in)
		Camshaft runout	
	Engine block	Compression pressure (Reference value) at 500 min^{-1} (rpm) with de-comp.	0.34 MPa (49.3 psi) [3.5 kgf/cm^2] ±10%
		without de-comp.	0.93 MPa (137.8 psi) [9.5 kgf/cm^2] ±10%

Functional Limit	Action to be taken
	Clean to remove.
0.03 mm (0.0012 in)	Correct. (Use #240 to 400 waterproof sand paper and put on the surface plate to correct. Use #600 to finish.)
	Correct or replace if possible.
	Clean to remove.
	Clean to remove.
59.07 mm (2.3256 in)	Replace if severely damaged on the piston sliding surface, which cannot be repaired with sand paper of #400 to 600, or if damaged over specified limit.
0.06 mm (0.0024 in)	
0.06 mm (0.0024 in)	
0.03 mm (0.0012 in)	Correct. (Use #240 to 400 waterproof sand paper and put on the surface plate to correct. Use #600 to finish.)
58.90 mm (2.3189 in)	Replace if under lower limit.
0.150 mm (0.00591 in)	Replace if over upper limit
	Clean to remove.
	Use waterproof sand paper of #400 to 600 to correct if possible, or replace.
Top ring 0.10 mm (0.0039 in)	Replace if over upper limit. Replace oil ring when top ring or second ring is replaced.
Second ring 0.09 mm (0.0035 in)	
Oil ring 0.21 mm (0.0083 in)	
0.04 mm (0.00157 in)	Replace if over upper limit.
15.97 mm (0.6287 in)	Replace if under lower limit.
Top ring 0.50 mm (0.0197 in)	Replace if the gap is over specified limit only if cylinder liner wear is less than specified limit. Replace oil ring when top ring or second ring is replaced.
Second ring 0.70 mm (0.0276 in)	
16.04 mm (0.63148 in)	Replace if over upper limit.
0.080 mm (0.00315 in)	Replace if over upper limit.
0.70 mm (0.0276 in)	Replace if over upper limit.
29.92 mm (1.1780 in)	Replace if under lower limit.
0.05 mm (0.0020 in)	Replace if over upper limit.
	Adjust to specified range
5.45 mm (0.2146 in) 5.41 mm (0.2130 in)	Replace if under lower limit.
5.54 mm (0.2181 in) 5.57 mm (0.2193 in)	Replace if over upper limit.
0.070 mm (0.00276 in) 0.100 mm (0.00394 in)	Replace if over upper limit.
1.8 mm (0.0709 in) 1.8 mm (0.0709 in)	Correct or replace if over upper limit.
33.2 mm (1.31 in)	Replace if under lower limit.
28.07 mm (1.1051 in)	Replace if under lower limit.
13.950 mm (0.5493 in)	Replace if under lower limit.
0.03 mm (0.0012 in)	Replace if over upper limit.
	Check that no pressure leaks through rotating parts, sliding parts and sealing parts.

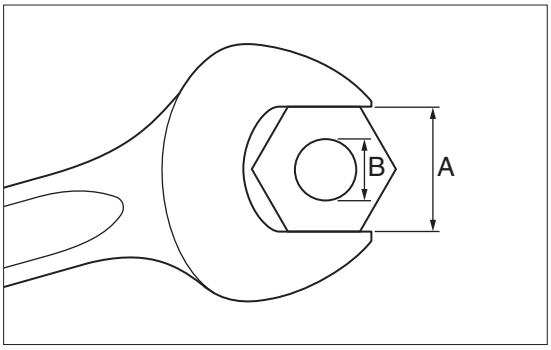
	Part name	Item	Standard value			
			4D	5D	6D	Sail Pro
Fuel and lubrication parts	Carburetor (refer to Chapter 4)	Setting mark	3JDA	3GRA	3JEA	
		Venturi bore	φ10	φ13	φ15	φ15
		Throttle bore	φ19	φ19	φ21	φ21
		Main jet (MJ)	#62	#68	#70	#70
		Main air jet (MAJ)	#135	#150	#155	#155
		Main nozzle bore (MN)	φ1.6	φ2.0	φ2.2	φ2.2
		Pilot jet (PJ)	#38	#38	#38	#38
		Pilot air jet (PAJ)	#125	#115	#110	#110
		Throttle opening (at WOT)	76°30"	75°	78°	78°
		Fuel level (from flange face to float bottom)	10.0 mm			
		Idling speed	1,300 rpm			
	Oil pump	Pump body bore	23.09 mm (0.9091 in)			
		Clearance between outer rotor and body	0.12 – 0.20 mm (0.0047 – 0.0079 in)			
		Height of outer rotor	5.99 mm (0.2358 in)			
		Side clearance between rotor and body	0.02 – 0.07 mm (0.0008 – 0.0028 in)			
Electrical parts	Magneto/ Ignitor	Ignition timing	BTDC3° – BTDC25°			
		Spark performance (@500 min^{-1} (rpm))	10 mm (0.4 in) or over			
		Airgap	0.3 mm (0.012 in)			
		Alternator output (OP)	12V60W			
		Lighting coil resistance [@20°C] ·Yellow (Y) – Yellow (Y)	0.46 – 0.68 Ω			
		Ingnitor resistance	Refer to chapter 8			
	Plug cap	Terminal-Terminal resistance [@20°C] [kΩ range]	3.0 – 7.0 kΩ			
	Spark plug	Plug type	DCPR6E [NGK]			
		Spark gap	0.8 – 0.9 mm (0.031 – 0.035 in)			
	Rectifier	Resistance	Refer to chapter 8			
Cooling system parts	Thermostat	Valve operation starting temperature (submerged)	50 – 54°C (121 – 129°F)			
		Valve full open temperature (submerged)	63 – 67°C (146 – 154°F)			
		Valve full open lift (submerged)	3.0 mm (0.12 in) or over			
	Pump impeller	Wear, crack				
	Pump case (liner)	Wear				
	Guide plate	Wear				
Lower unit parts	Anode	Eroded				
	Propeller shaft	Wear and damage of bearing				
		Wear of oil seal				
		Propeller shaft runout				
	Bevel gear	Backlash between forward gear (A) and pinion (B)	0.05 – 0.15 mm (0.0020 – 0.0059 in) Dial gauge reading : 0.16 – 0.49 mm (0.0063 – 0.0193 in)			
		Gap between forward gear bushing (A) and propeller shaft	0.030 – 0.058 mm (0.0012 – 0.0023 in)			
		Gap between reverse gear bushing (C) and propeller shaft	0.040 – 0.070 mm (0.0016 – 0.0028 in)			
	Propeller	Wear, bend, crack, nick	4 :198×178 mm (7.9×7.0 in) 5, 6 :198×203 mm (7.9×8.0 in)			6 (Sail Pro) : 212×160 mm (8.3×6.3 in)
	Drive shaft	Spline (upper) base tangent length	3.67 mm (0.1445 in)			
		Bearing Wear and Damage				
		Oil Seal Lip Wear				
		Drive Shaft Runout				
	Drive shaft bushing	Gap between the bushing and drive shaft	0.016 – 0.073 mm (0.00062 – 0.00287 in)			
Other parts	Oil seals	Wear, damage				

Functional Limit	Action to be taken
23.13 mm (0.9106 in)	Replace if over upper limit.
0.25 mm (0.0100 in)	Replace if over upper limit.
5.96 mm (0.2346 in)	Replace if under lower limit.
0.10 mm (0.0039 in) Wear of oil pump cover is included.	Replace if over upper limit.
10 mm (0.4in)	Replace if under lower limit.
	Adjust into specified range.
	Replace if out of specified range.
	Replace if out of specified range.
	Replace if out of specified range.
	Replace if out of specified range.
1.2 mm (0.047 in)	Clean to remove carbon deposit and dirt. Adjust gap by moving side electrode. Replace if electrode is severely eroded.
	Replace if out of specified range.
Open even a little at ambient temperature	
Because thermostat operates with some time lag, measure the lift of open valve after maintaining at around 65°C (150°F) for approximately 5 minutes.	Replace if out of specified range.
3.0 mm (0.12in)	
If the part is worn, cracked or damaged at the outer ends or at upper of lower lip	Replace if under lower limit.
	Replace pump case liner and guide plate as a set.
	Replace if severely worn
	Replace if severely worn
	Replace if severely worn
	Replace if severely worn
0.05mm (0.0020in)	Replace if necessary.
0.30mm (0.0118in) or over 0.98mm (0.0386in) or over	
0.1mm (0.0039in) or over	Replace if over upper limit.
0.1mm (0.0039in) or over	Replace if over upper limit.
State of outer diameter reduction, blade bend or damage	Replace if necessary.
3.70mm (0.1457in)	Replace if under lower limit.
	Replace if necessary.
	Replace if over upper limit.
0.2mm (0.008in)	Replace if over upper limit.
0.5mm (0.020in)	Replace if severely worn
Lip is deteriorated, degraded, or damaged, or the tightening margin is reduced to 0.5mm (0.020in) or less by wear.	Replace if out of specified range.

6. Tightening Torque Specifications

	Tightening location	Wrench A	Thread B x Pitch	Type of fastener	Tightening torque		
					N·m	lb·ft	kgf·m
Engine	Connecting rod	10	M7×1.0	Bolt	1st		
					6	4	0.6
					2nd		
					12	9	1.2
	Cylinder head	13	M8×1.25	Bolt	1st		
					12	9	1.2
					2nd		
					25	18	2.5
	Oil pan	13	M8×1.25	Bolt	1st		
					12	9	1.2
					2nd		
					25	18	2.5
		10	M6×1.0	Bolt	1st		
					5	4	0.5
					2nd		
					9	7	0.9
	Exhaust cover	10	M6×1.0	Bolt	9	7	0.9
	Oil drain bolt	10	M10×1.25	Bolt	18	13	1.8
	Pivot bolt	13	M8×1.25	Bolt	25	18	2.5
	Pivot adjust nut	10	M6×0.5	Nut	10	7	1.0
	Oil pressure switch	10	R (PT)1/8	Bolt	9	7	0.9
	Flywheel	19	M12×1.25	Nut	50	37	5.0
	Spark plug	16	M12×1.25	–	18	13	1.8
	Recoil starter shaft bolt	10	M5×0.8	Bolt	4	3	0.4
	Power unit mounting bolt	10	M6×1.0	Bolt	7	5	0.7
Lower unit	Stern bracket	13	M8×1.25	Bolt	13	9	1.3
	Grease nipple	–	M6×1.0	Grease Nipple	3	2	0.3
	Extension housing bolt	10	M6×1.0	Bolt	6	4	0.6
	Lower unit installation bolt	13	M8×1.25	Bolt, Nut	13	9	1.3
	Oil plug (gear oil)	–	M8×1.25	Bolt	4	3	0.4

Specified torque	M5 Bolt, Nut	8	M5×0.8	Bolt, Nut	4	3	0.4
	M6 Bolt, Nut	10	M6×1.0	Bolt, Nut	6	4	0.6
	M8 Bolt, Nut	13	M8×1.25	Bolt, Nut	13	9	1.3
	M10 Bolt, Nut	17	M10×1.25	Bolt, Nut	27	20	2.7



7. Sealant and Lubricant

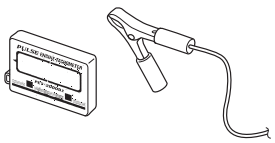
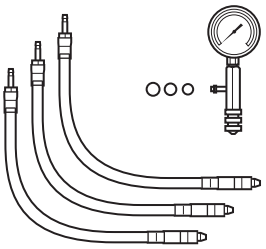
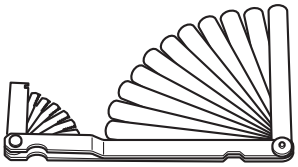
Apply to			Screw locking agent	Adhesive		Instantaneous adhesive	Cold resistant lithium grease LIT	Water resistant grease OBM	Rubber grease RUB	Teflon grease TEF	Silicone grease SOC	4 stroke engine oil	Tohatsu genuine gear oil	Remarks
			Three Bond	Konishi		Three Bond	Chuoh Yuka				Shin-Etsu Chemical			
			1342	G17	G103	1741	Centax L2	FM-531	Bentax 2	LM-902	KS-64			
Engine block	Cylinder Head	Camshaft										●		Bearings and cams
		Rocker arm										●		Sliding surface
		Valve (IN, EX)										●		Stem and stem end
		Valve spring										●		Whole area
		Valve spring seat										●		Whole area
		Retainer cotter										●		Whole area
		Pivot										●		Whole area
	Cylinder & Oil pan	Cylinder liner										●		Inner wall
		Piston										●		Ring grooves and periphery
		Piston ring										●		Whole area
		Piston pin										●		Periphery
		Connecting rod										●		Big and small end bores
		Crankshaft										●		Sliding surface, Bearing and Gear
		Ball bearing (crankshaft)										●		Sliding surface, Outer surface
		Bush (crankshaft)										●		Inside and outside
		Oil seal (crankshaft)					●							Lip
												●		Outer surface (at press fitting)
		Plunger										●		Spring and O rings
		Oil pump										●		Outer and Inner rotor
		Fuel pump										●		Plunger top surface
		O ring (fuel pump)										●		
		O ring (filler cap)										●		
		Oil seal (crankcase)								●				Lip
												●		Outer surface (at press fitting)
		Screw (oil strainer)	●											Thread
		Oil strainer pipe			●									Seal rubber
	Recoil starter	Starter case					●							Sliding surface
		Starter spring					●							Whole area
		Ratchet					●							Sliding surface
		Friction plate					●							Sliding surface
		Reel					●							Sliding surface
		Starter shaft (bolt)	●											at reusing bolt
							●							Frange surface
	Electrical components	Plug cap									●			Spark plug bore
				●										High tension cord bore
		Oil pressure switch	●											Thread
											●			Terminal

Apply to			Screw locking agent	Adhesive		Instantaneous adhesive	Cold resistant lithium grease LIT	Water resistant grease OBM	Rubber grease RUB	Teflon grease TEF	Silicone grease SOC	4 stroke engine oil	Tohatsu genuine gear oil	Remarks
			Three Bond	Konishi		Three Bond	Chuoh Yuka				Shin-Etsu Chemical			
			1342	G17	G103	1741	Centax L2	FM-531	Bentax 2	LM-902	KS-64			
Lower unit	Shift	O ring (shift lever)						●						
		Shift lever						●						Sliding surface
	Drive shaft	Drive shaft (spline)								●				Crankshaft spline
		Ball bearing											●	at press fitting
		Needle bearing inner											●	at press fitting
		Bushing								●				Bearings
	Gear case	Bolt (gear case)						●						Thread
		Oil seal (pump case lower)					●							Lip
													●	Outer surface, at press fitting
		Pump case liner						●						Impeller sliding surface
		O ring (cam rod bushing)											●	
		Bolt (cam rod bushing)						●						Thread
		Bolt (pump case)						●						Thread
		Ball bearing											●	at press fitting
		Needle bearing											●	at press fitting
	Propeller shaft housing	Bolt (propeller shaft housing)						●						Thread
		O ring											●	
		Oil seal					●							Lip
													●	Outer surface, at press fitting
		Propeller shaft						●						Spline
		Ball bearing											●	at press fitting
	Bracket	Clamp screw						●						Thread
		Swivel bracket (bracket bolt)						●						Sliding surface
		Swivel bracket (tilt stopper mount)						●						Sliding surface
		Steering bush							●					all area
		Thrust plate							●					all area
	Tiller handle	Bushing (tiller handle)						●						Grip sliding face
		Throttle shaft						●						Sliding face (except slide adjusting section)
		Throttle wire						●						Wire
Cowl		Choke rod grommet						●						Inner
		Starter seal rubber				●								
		Nipples	●											Press fit section
		Amount of engine oil										●		450 ml when replaced
		Gear oil											●	Oil capacity 195 ml

3

Maintenance

1. Special Tools

		
Tachometer P/N. 3AC-99010-0	Compression Gauge P/N. 3AC-99030-0	Thickness Gauge P/N. 353-72251-1
Measuring engine revolution speed	Measuring compression pressure	Measuring gaps

2. Inspection Schedule

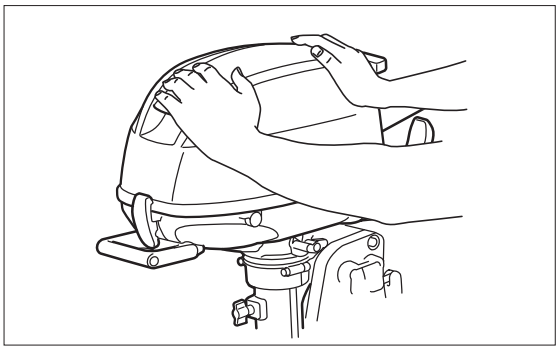
		Inspection period				Inspection item	Remarks
		Initial 20 hours or 1 month	50 hours or 3 months	100 hours or 6 months	200 hours or 1 year		
Fuel System	Carburetor			○	○	Disassembly, cleaning and inspection	
	Fuel Filter	○	○	○	○	Inspection and filter cleaning	
	Piping	○	○	○	○	Damage and leak from connections	
	Fuel Tank	○	○	○	○	Cleaning	
	Fuel Tank Cap	○	○	○	○	Check and clean or Replace if necessary.	
	Fuel Pump	○	○	○	○	Check and clean or Replace if necessary.	
Ignition Syatem	Spark Plugs	○		○	○	Spark gap, cleaning	0.8 – 0.9mm (0.031in – 0.035in)
Starting Syatem	Starter Rope	○	○	○	○	Wear	
Engine	Engine oil	○ Replacemnt		○ Replacemnt	○ Replacemnt		450mL (10W-30, 10W-40)
	Valve Clearance	○		○	○	Inspection, Adjustment	
	Compression Pressure				○	Inspection	
	Thermostat				○	Check and Replace if necessary.	
Lower System	Propeller	○	○	○	○	Bend, damage, wear of blades	
	Split Pin	○	○	○	○	Check and Replace if necessary.	
	Gear Oil	○ Replacemnt	○	○ Replacemnt	○ Replacemnt	Replacement or replenishment of oil, leak of water.	Genuine gear oil GL5,SAE80 to 90 195mL (6.6fl.oz)
	Anode		○	○	○	Corrosion, Wear	
	Water Inlet	○	○	○	○	Check and clean	
	Water Pump Impeller		○	○	○	Wear, Crack	
Bolts and Nuts		○	○		○	Retighten	
Throttle Cable				○	○	Stretch, Wear	
Sliding areas, rotating part, grease nipple		○	○	○	○	Applying grease, injecting grease	

3

3. Inspection Items

1) Inspection of Top Cowl

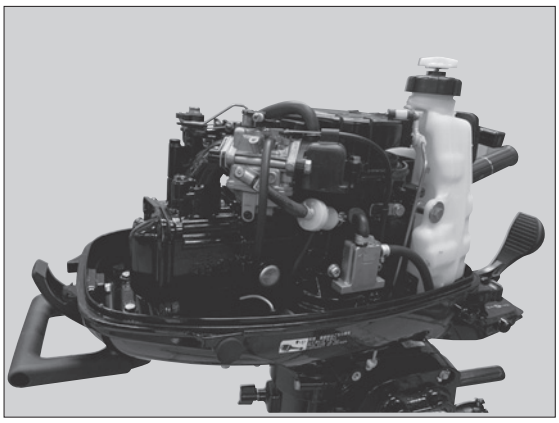
Push top cowl using both hands to check for looseness and seal when cowl latched.

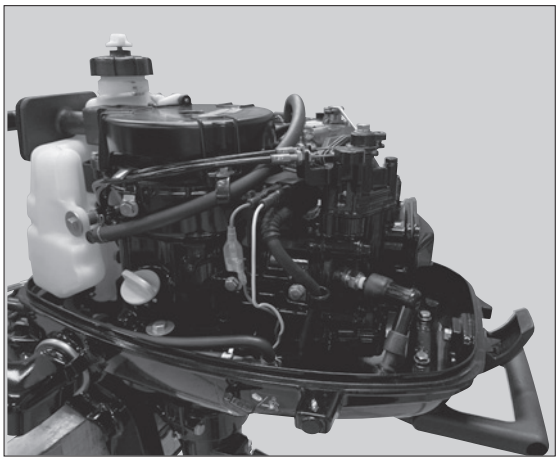


2) Fuel System

Check piping

Remove top cowl and check each section for fuel leak, dirt, deterioration and damage. Clean or replace parts if necessary.

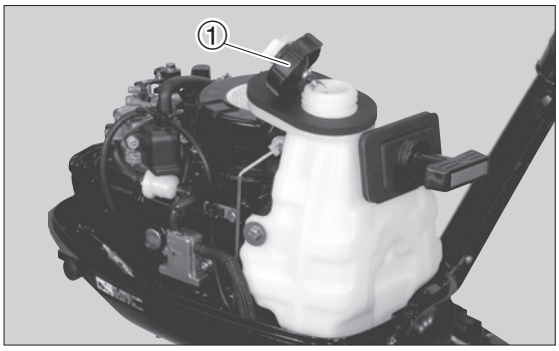




3) Inspection of Fuel Tank

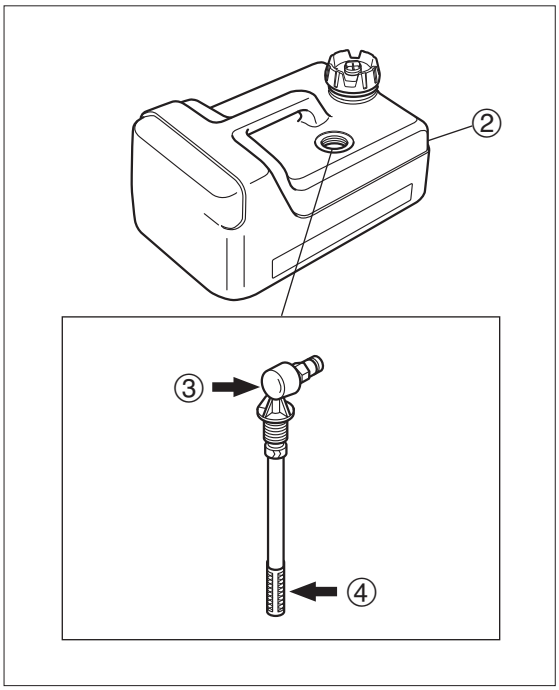
< For Dual Fuel Tank model >

Remove dirt and water from fuel tank ① if necessary.



< For separate Fuel Tank model >

Turn fuel pick up elbow ③ of fuel tank ② counterclockwise to remove the part, and clean the filter ④. Remove dirt and water from fuel tank ② if necessary.

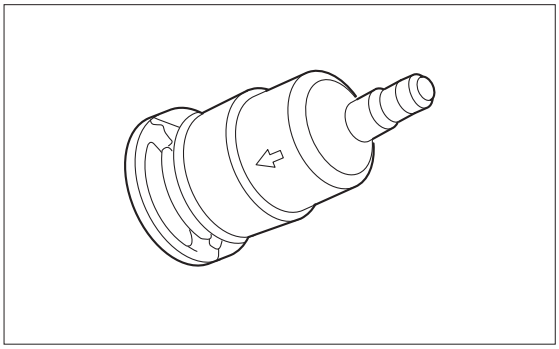


③ Fuel Pickup Elbow
④ Filter

4) Inspection of Fuel Filter

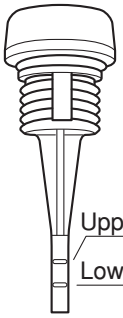
Check fuel filter for dirt, buildup of fuel residue, and fuel filter for invasion of foreign matter and cracks. Replace fuel filter if necessary.

- Do not spill fuel when removing fuel filter.
- Be careful of the installation direction. Fuel flows in the direction of the arrow mark.



5) Replacement of Engine Oil

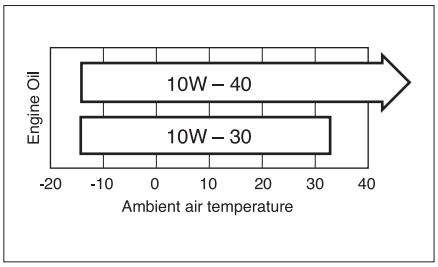
1. Oil Level



	Quantity of Oil for Full Replacement
Upper Limit	450 mL
Lower Limit	350 mL

2. Oil Specification

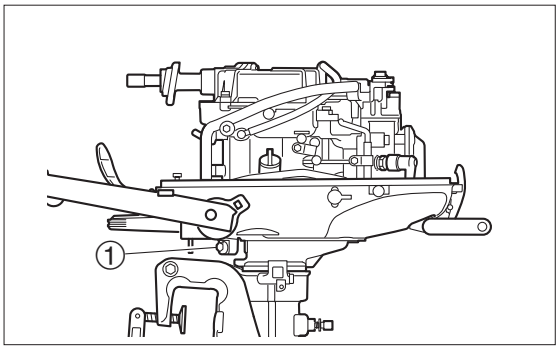
Engine Oil :
4 Stroke Engine Oil
API: SH, SJ, SL
SAE: 10W-30, 10W-40
NMMA : FC-W Certified 10W-30/40
Quantity of Engine Oil :
450 mL (15.2 fl.oz)



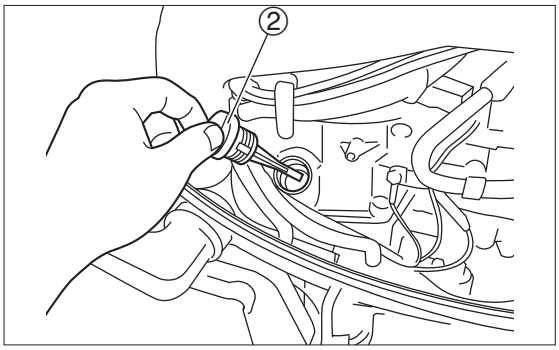
Use oil with a viscosity that is suitable for the ambient air temperature of the operating region.

3. Engine Oil Change Procedure

1. Stop and leave the engine untill it cools down. Position outboard motor so that drain bolt ① is facing downward.

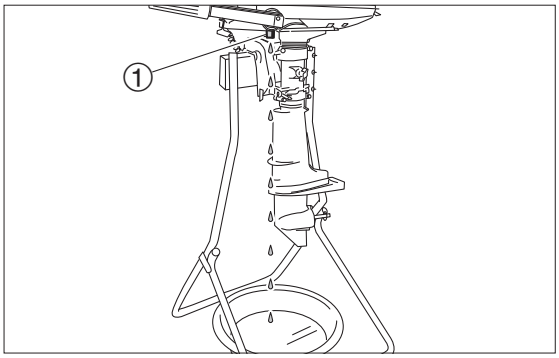


2. Remove oil level gauge ②.



3. Place a container below drain bolt ①.

4. Remove drain bolt ① to drain oil.

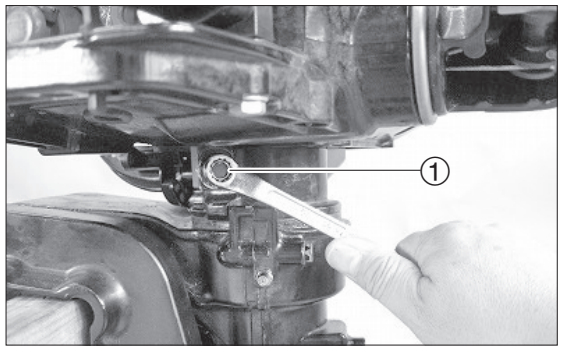


5. Tighten drain bolt ①.

6. Pour new oil through oil inlet until oil level reaches between upper limit and lower limit mark of oil level gauge.

7. Start and run the engine for 5 minutes to warm up.

8. 5 minutes after stopping the engine, check oil level and leakage.

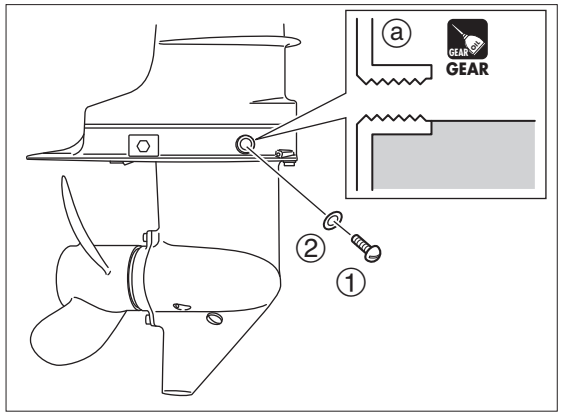


When checking the oil level, screw in the oil level gauge fully.

6) Inspection of Gear Oil Quantity

1. Tilt down outboard motor in a vertical position.

2. Remove upper oil plug ① and check level of gear oil in the gear case.



② Gasket **Do not reuse.**

Spill of some oil from plug hole ⓐ indicates that gear case is filled with specified quantity of gear oil.

3. Add recommended gear oil to specified level if it is low.

Gear Oil :
Hypoid Gear Oil
API : GL-5
SAE : #80 – 90

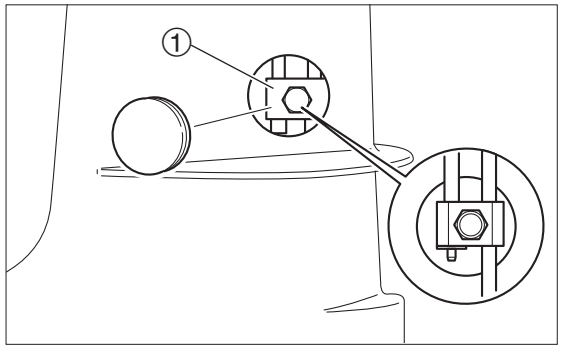
If the oil is low, add through lower oil plug hole.

4. Attach upper oil plug ①.

Oil Plug :
4 N · m (3 lb · ft) [0.4 kgf · m]

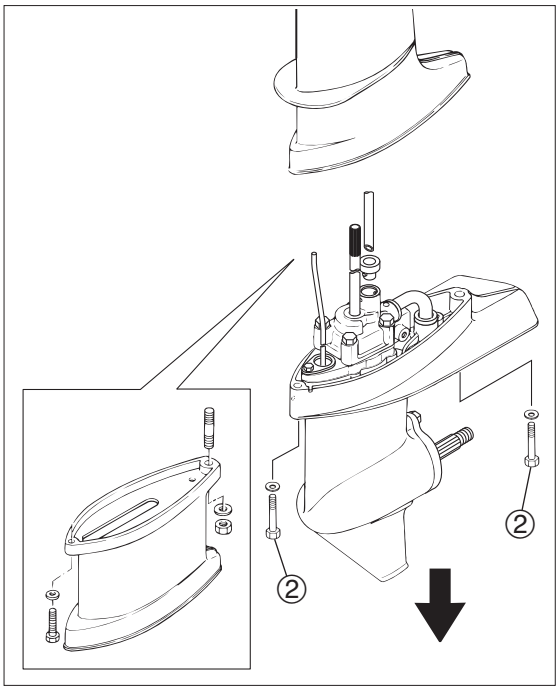
7) Inspection of Water Pump

1. Shift gear into reverse (R), and then loosen shift rod joint bolt and disconnect shift rods.
(Disconnect shift rod at lower side of shift rod joint ①.)



Be careful not to drop shift rod joint and bolt when they are removed.

2. Remove lower unit ass'y installation bolts ②, and pull lower unit ass'y downward to remove.

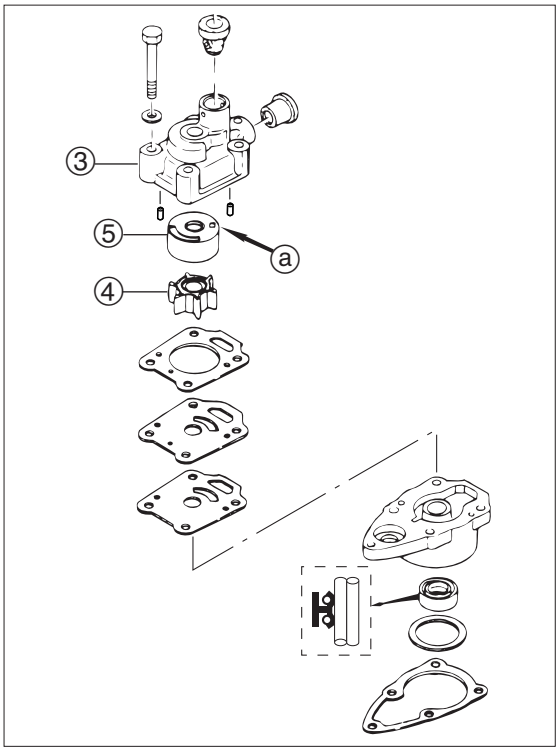


3. Remove pump case (Upper) ③.

4. Remove impeller ④ and check it.

5. Check pump case for deformation. Replace if necessary.

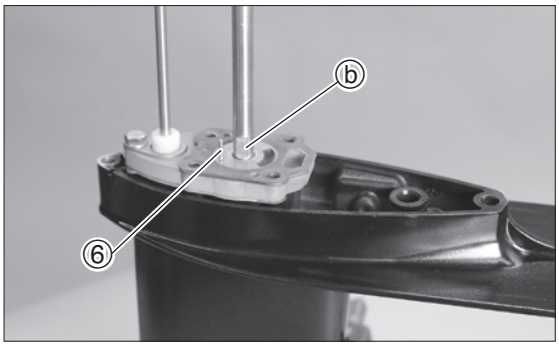
6. Check impeller ④ and pump case liner ⑤ for cracks and wear. Replace if necessary.



ⓐ Projection

7. Check pin ⑥ and drive shaft groove ⓑ for wear. Replace if necessary.

8. Reassemble the parts. Refer to Chapter 6.



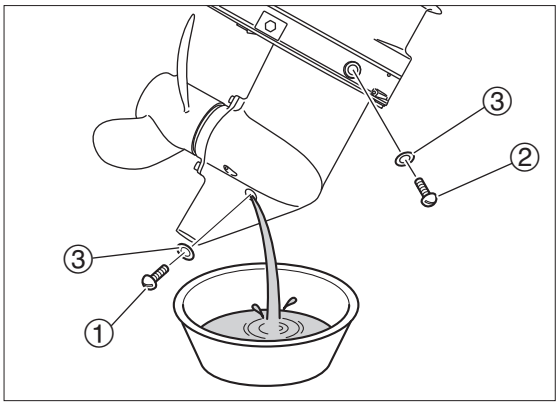
8) Replacement of Gear Oil

1. Tilt up outboard motor a little as shown.

2. Place the drain pan below oil plug ①, remove lower oil plug ① and then upper oil plug ② to drain oil.

   Remove lower oil plug first when draining.

3. Check gear oil for presence of metal particles, change of color (abnormal if clouded), and viscosity.

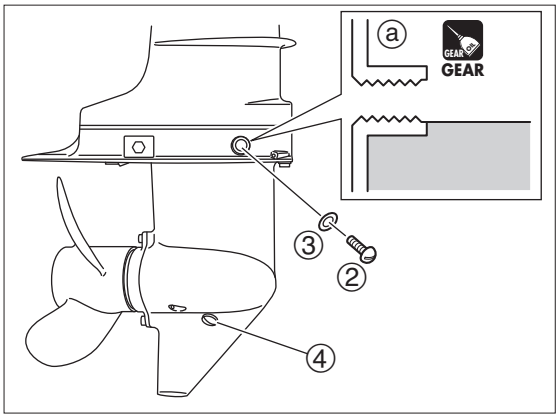


③ Gasket **Do not reuse.**

4. Fill with gear oil (from oil tube or pump) through lower plug hole ④ until gear oil starts to spill from upper oil plug hole ⓐ without air bubbles.

   Gear Oil :
   Hypoid Gear Oil
   API : GL-5 SAE : #80W – 90
   Quantity of Gear Oil :
   195 mL (6.6fl.oz)

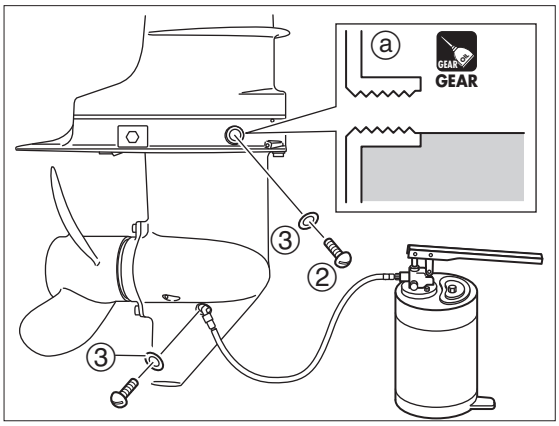
   Use lower plug hole when filling with gear oil. The upper hole cannot be used because air cannot be purged and oil cannot be supplied.



③ Gasket **Do not reuse.**

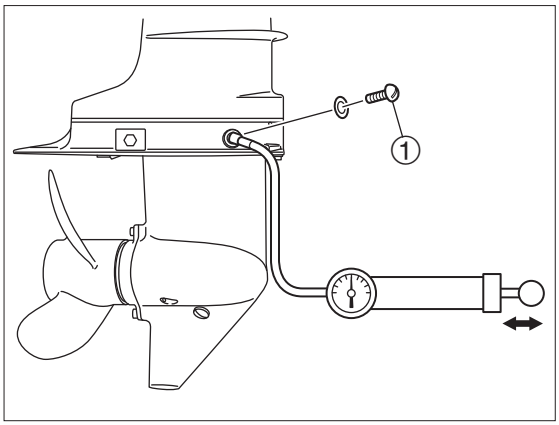
5. Attach new gasket and upper oil plug ②, and then new gasket and lower oil plug ① immediately.

   When fully filled with oil, attach upper oil plug first.



③ Gasket **Do not reuse.**

9) Inspection of Gear Case (for leakage)



1. Drain gear oil.

2. Remove upper oil plug ① and connect a commercially available leakage tester to this hole.

3. Apply specified pressure to gear case, and check if the pressure is maintained without further compression for 10 seconds.

Specified Gear Case Maintained Pressure :
0.049 MPa (7 psi) [0.5 kgf/cm²]

- When the propeller shaft is rotated while maintaining the pressure, it is easier to locate air leaks due to the oil seal lip being worn out.
- Depressurize gear case and cover oil plug area with a piece of rag before disconnecting leakage tester.

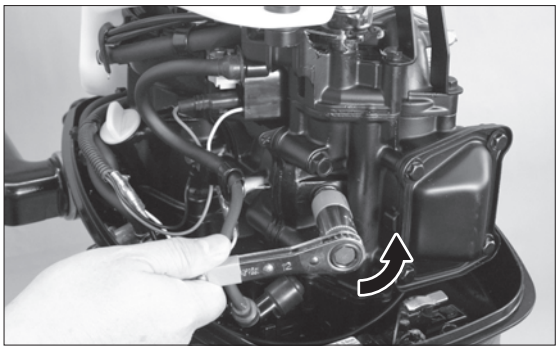
⚠ CAUTION

Do not apply pressure to gear case over specified value.
Doing so can cause damage to oil seal.

4. If the specified pressure cannot be maintained, check oil seals of drive shaft and propeller shaft and O ring of shift shaft, and propeller shaft housing and water pump case lower for damages.

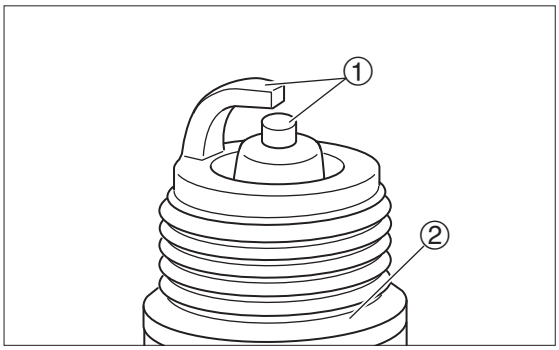
10) Inspection of Spark Plug

1. Remove plug cap and then spark plug.



2. Use spark plug cleaner or nyron brush to clean spark plug electrodes ①. Replace if necessary.

3. Check electrodes ① for corrosion or excessive buildup of carbon, and washer ② for damage. Replace if necessary.

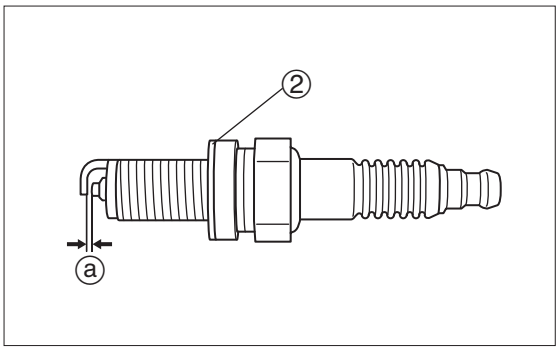


4. Check spark plug gap ⓐ. Replace if it is over specified value. Adjust gap if it is out of specified range.

Spark Plug Gap ⓐ : Standard value
0.8 - 0.9 mm (0.031 - 0.035 in)

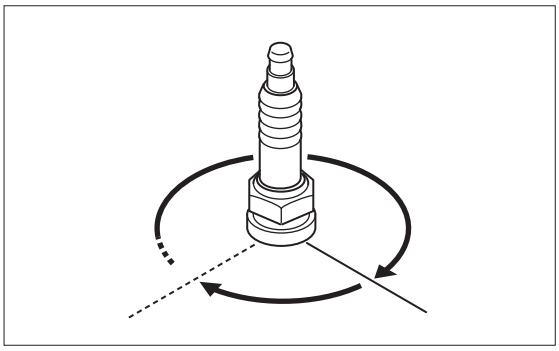
Functional Limit :
1.2 mm (0.047 in)

Specified Spark Plug :
DCPR6E [NGK]



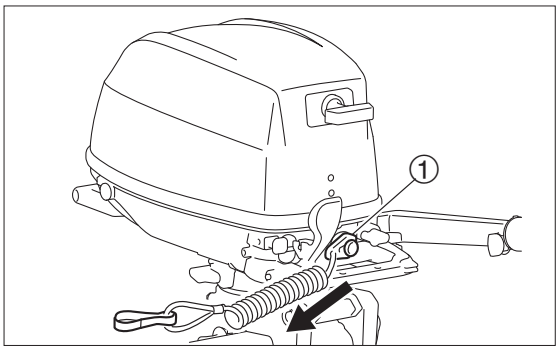
5. Install spark plug, fully hand-tighten, and then use plug wrench to tighten to specified torque.

Spark Plug :
18 N · m (13 lb · ft) [1.8 kgf · m]



11) Inspection of Compression Pressure

1. Start the engine to warm up for 5 minutes, then stop the engine.



2. Shift gear into neutral (N).

3. Remove lock plate ① (of stop switch lanyard) from stop switch.

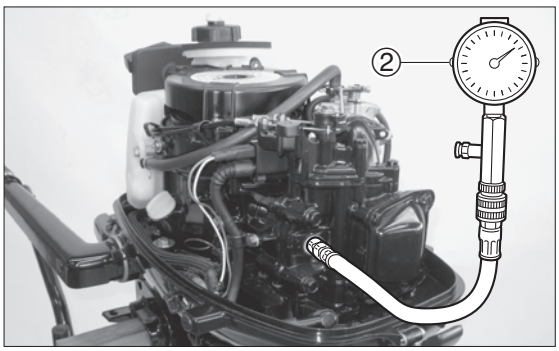
⚠ CAUTION

Remove lock plate (of stop switch lanyard) from stop switch before measuring compression pressure. This will prevent engine from accidental starting.

4. Remove plug cap and then spark plug.

⚠ CAUTION

Clean areas around spark plug on the cylinder before removing spark plug to prevent dirt from entering cylinder.

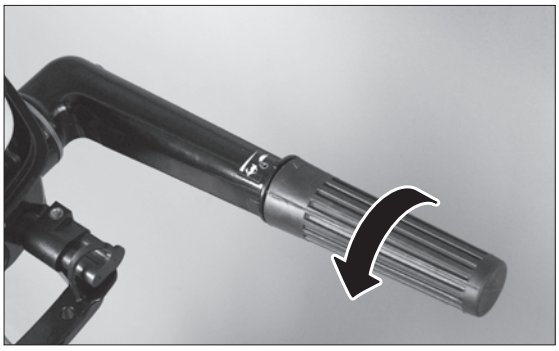


5. Install the compression gauge ② to plug hole.

Compression Gauge ② :
P/N. 3AC-99030-0

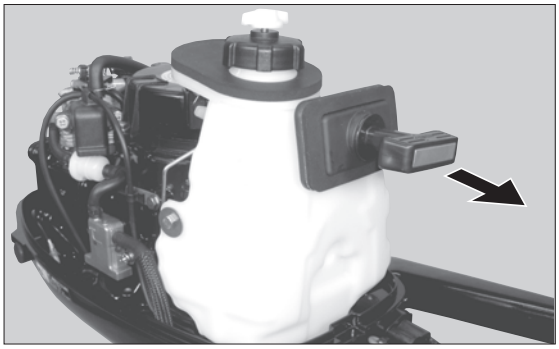
6. Fully open throttle, crank the engine until compression gauge ② indication stabilizes, and then measure compression pressure.

Compression Pressure (Reference) :500 min^{-1} (rpm)
With decompressor operate :
0.34 MPa (49.3 psi) [3.5 kgf/cm^2]
Without decompressor operate :
0.93 MPa (137.8 psi) [9.5 kgf/cm^2]
(*Remove Exhaust rocker arm)



- Compression pressure is affected much by cranking speed, and normally changes approximately 10 – 20 %.
- Do not pull choke knob when measuring compression pressure.

7. If compression pressure is below specified value, put small amount of engine oil into cylinder, and perform the test again.

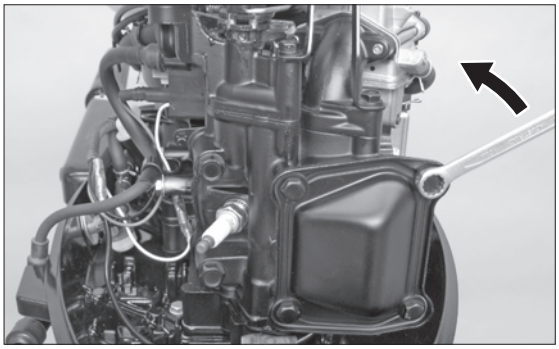


- If compression pressure increases after the above measure, check piston and piston rings for wear. Replace if necessary.
- If compression pressure does not increase after the above measure, check valve clearances, valves, valve seats and cylinder head. Adjust or replace if necessary.

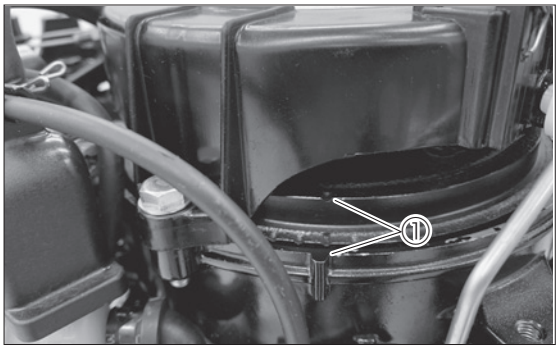
12) Inspection and Adjustment of Valve Clearance

Perform inspection and adjustment of valve clearances when engine is cold.

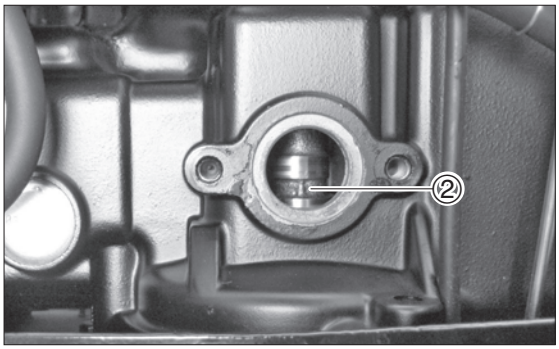
1. Remove cylinder head cover, fuel pump and spark plug.



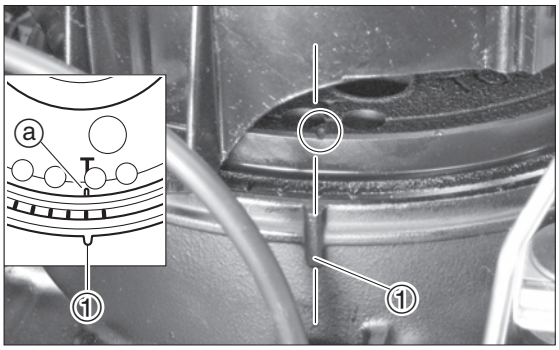
2. Align locating marks ① of flywheel and camshaft with each other.



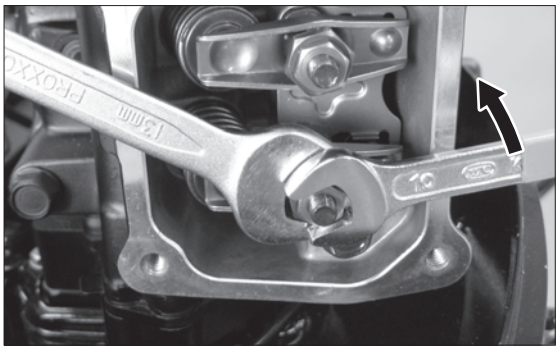
3. When fuel pump is removed, camshaft can be seen. If projection ② of camshaft can be seen, the piston is at top dead center.



4. The piston is at top dead center of compression stroke when locating marks ① of flywheel ⓐ and cylinder that are found on the starboard side of crank case are aligned with each other.
   Top dead center is where locating mark ① is aligned with flywheel ⓐ on the starboard side.

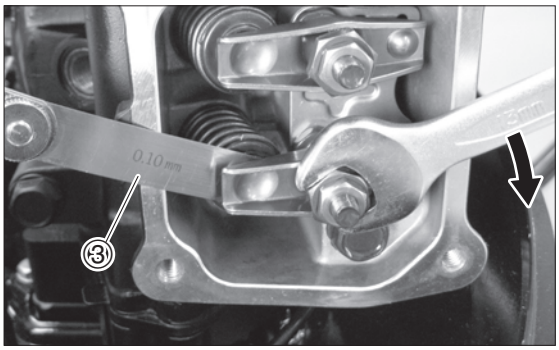


5. Hold pivot and loosen lock nut.



6. Put thickness gauge ③ in the gap between rocker arm and valve, measure the gap between rocker arm and valve with thickness gauge ③.

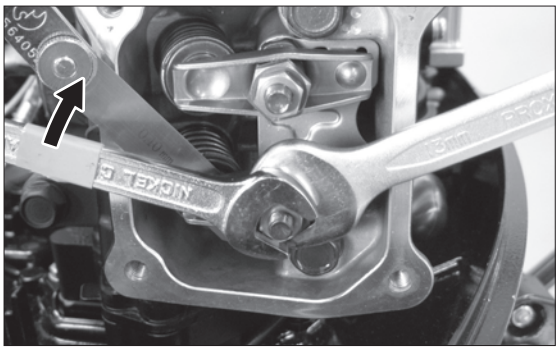
Valve Clearance (when engine is cold) :
(IN) intake side : 0.06 - 0.14mm (0.0025 - 0.0055in)
(EX) exhaust side : 0.11 - 0.19mm (0.0045 - 0.0075in)



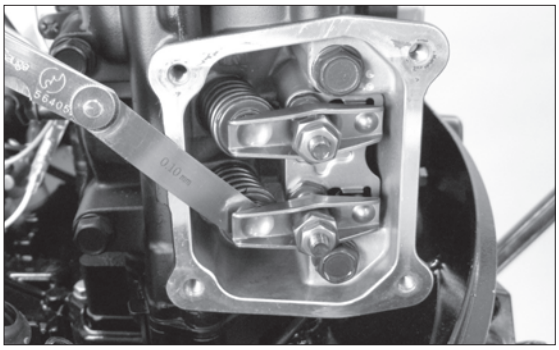
7. Rotate pivot to adjust valve clearance, and then, tighten lock nut.

Pivot Adjust Nut :
10 N · m (7 lb · ft) [1.0 kgf · m]

Torque Wrench :
Use commercially available item.
Thickness Gauge :
Use commercially available item.



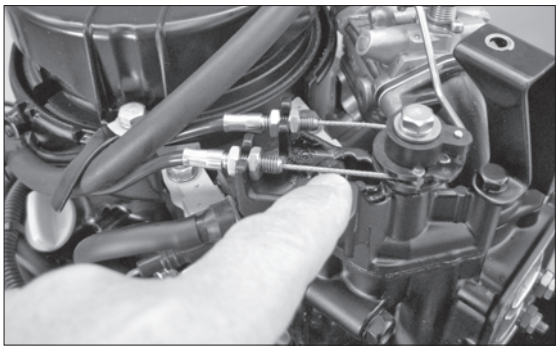
8. Check valve clearance again.



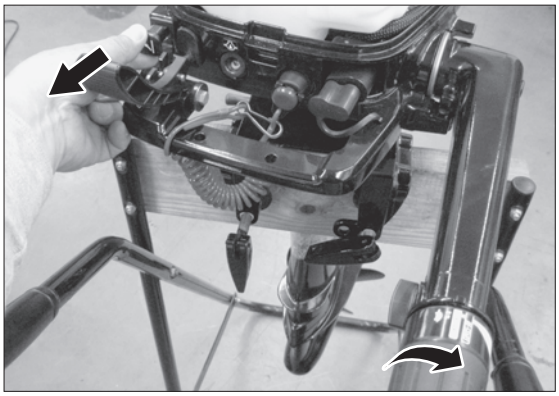
13) Throttle Cable

Adjustment of Throttle Cable

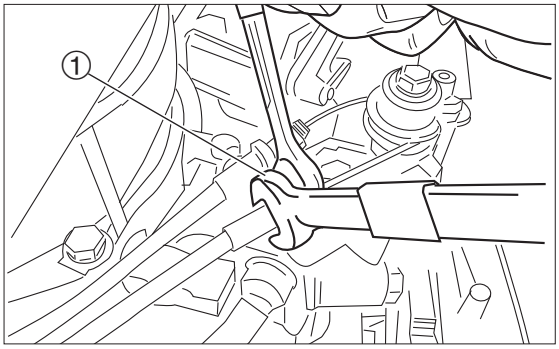
1. Check position of cable on low speed and high speed sides.



2. Set throttle grip to slowest position, and fully pull choke knob to close choke valve.

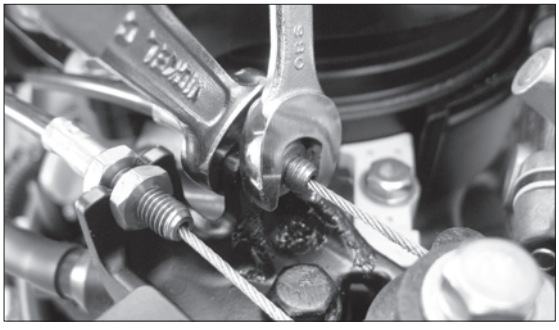


3. Lock nut ① while applying tension to outer wire by pulling it with a hand to fix low speed side wire.

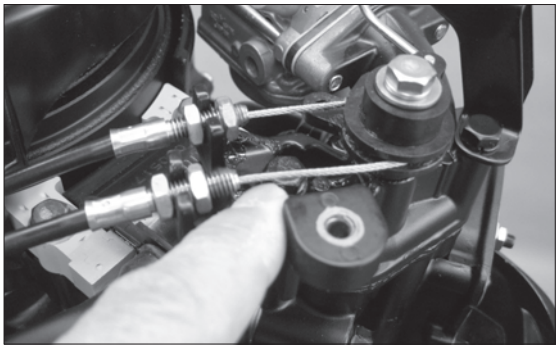


> The wire is in proper state if pushing inner wire at the center makes deflection of about 1mm.

4. Repeat above steps for high speed side wire, and fix it.

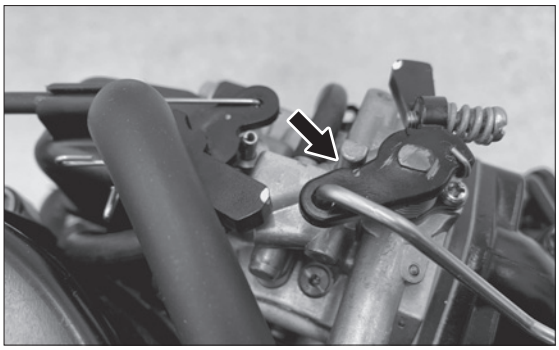


5. Return the choke knob to full open position.
   To confirm the slowest position of throttle grip, check gap between projection of throttle drum and dent of opener section. The gap is acceptable if it is in the range between 0.5mm and 1mm.

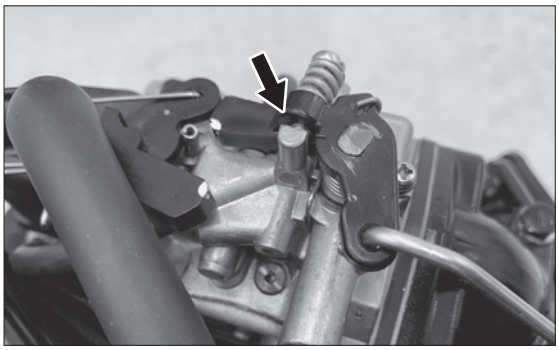


> Repeat steps 2. to 4. if necessary.

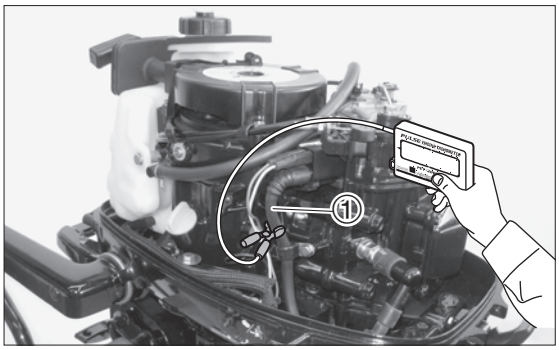
6. Set throttle grip to full-open position, and check if throttle lever of carburetor contacts with stopper.



7. Set throttle grip to full-close position, and check if throttle lever of carburetor contacts with stopper.



14) Inspection of Idle Engine Speed



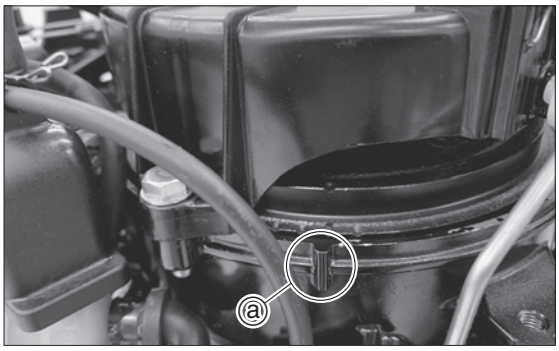
1. Start the engine to warm up for 5 minutes.

2. Attach tachometer to spark plug high tension cord ① to check idle speed.

Tachometer :
P/N. 3AC-99010-0

Idle Speed :
1300 min^{-1} (rpm)

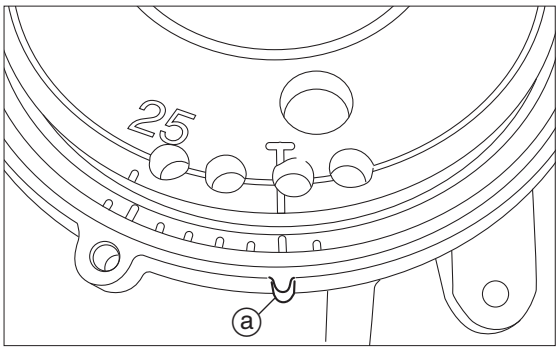
15) Inspection of Ignition Timing



Adjusting system : Automatic control, no adjustment required.

Run the engine and use timing light to check ignition timing.

8 timings marks are found on the side of flywheel (TDC0°, ATDC5°, BTDC5°, 10°, 15°, 20°, 25°, 30°), and ignition timing is read with mark on the center of starter case ⓐ window.



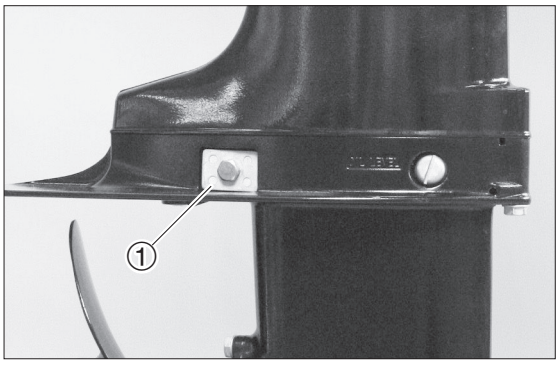
Model	Range of Ignition Angle	Engine Starting	Idling	Accelerating
MFS 4/5/6D	TDC 0° — BTDC 25°	TDC 0°	TDC 0°	BTDC 25°

16) Inspection of Anode

⚠ CAUTION

Do not coat anode with oil, grease or paint, or the anti-corrosion function does not work normally.

Since periphery of anode installation bolt is corroded more than other areas, be sure to retighten bolt on every inspection.



Inspection of Exterior

1. Check the anode ① for buildup of scale and staining by grease and oil. Clean or replace if necessary.
2. Replace the anode if volume is eroded to 2/3 of the original size.

Check the Continuity

If the anode is not eroding, it may not be properly grounded.

Follow the procedure below to check the anode.

1. Check the continuity between the engine ground and anode surface with a multimeter.
2. If the resistance is very small or none at all, it means that the anode is installed correctly. If the resistance is large, remove the mounting bolt and after cleaning the screw thread, install and inspect the anode again.

17) Replacement of Anode

1. Anode protects outboard motor from galvanic corrosion (corrosion of metal due to very weak electric current).

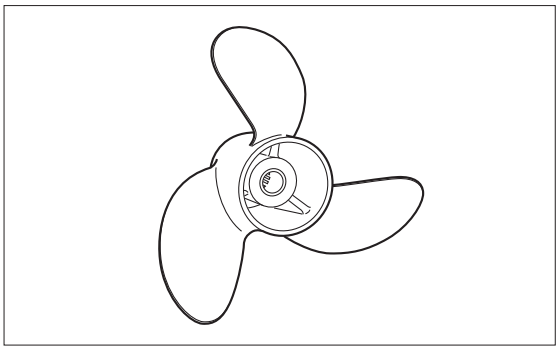
   Anode is used in the gear case.

   Replace anode if volume is reduced to 2/3 of new part.

- Do not coat anode with oil or paint.
- Since periphery of anode installation bolt is corroded more than other areas, be sure to retighten bolt on every inspection.

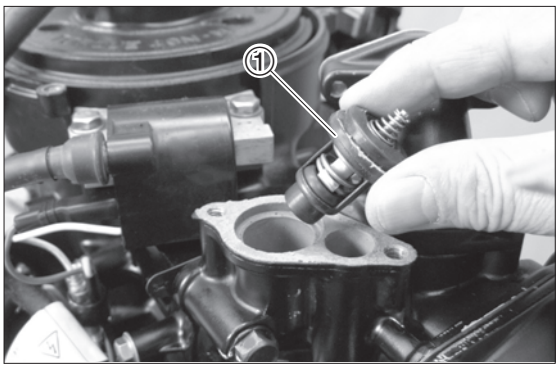
18) Inspection of Propeller

1. Check propeller blades and spline for cracks, damage, wear and corrosion. Replace if necessary.



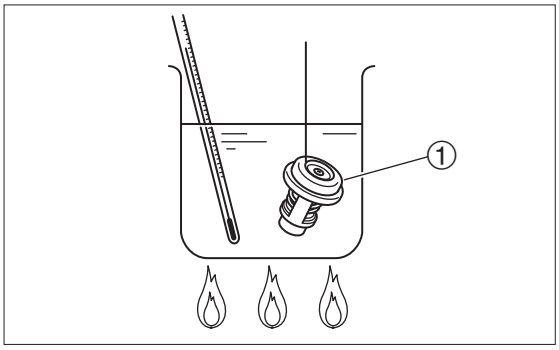
19) Inspection of Thermostat

1. Loosen thermostat cover and thermostat cover bolts, and remove thermostat ①.



2. Hang thermostat ① and put it into the water container.

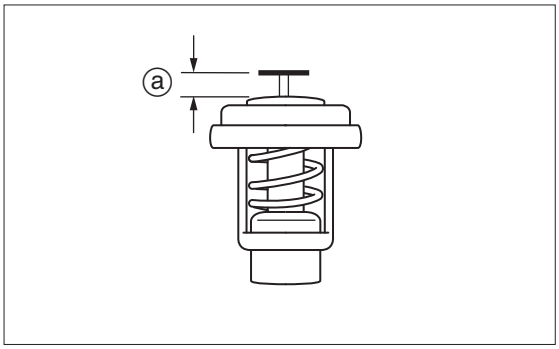
3. Put thermometer in the water, and warm up water to measure valve opening temperature.



> Put a piece of thread in the closed valve gap and hang it in the water. Valve opening moment can be determined when thermostat is released to drop due to opening with rise of temperature.

Valve Opening Temperature :
50 - 54°C (121 - 129°F)
(Valve starts to open at this temperature.)

4. Measure valve lift of thermostat when prescribed temperature has been reached. Replace if the length is less than specified value.



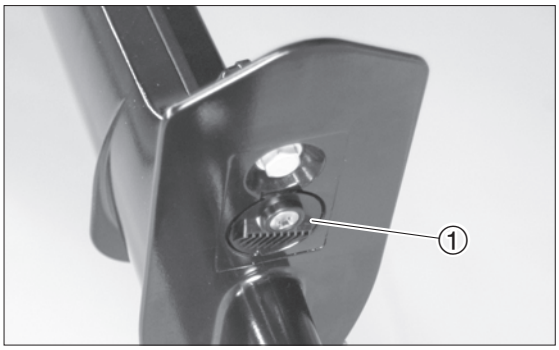
Water Temperature :
63 - 67°C (146 - 154°F)
Valve lift ⓐ :
3.0mm (0.12in) or over

5. Install thermostat, new gasket and cover.

Thermostat Cover Bolt :
6 N · m (4 lb · ft) [0.6 kgf · m]

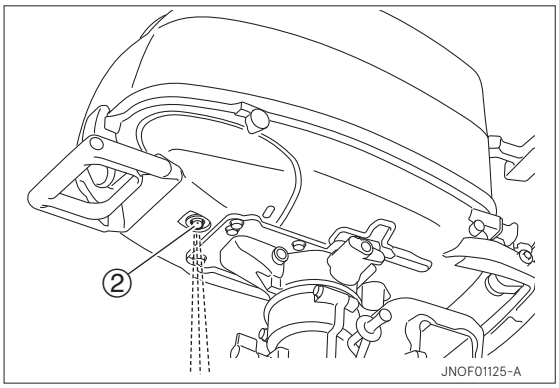
20) Inspection of Cooling Water Passage

1. Check water strainer ① for clogging. Clean if necessary.



2. Place the outboard motor in the water and start the engine.

3. Check that cooling water is discharged from cooling water check port ②. If not, check water pump and cooling water passage in the engine.



21) Flushing with Water

⚠ CAUTION

Touching rotating propeller could lead to injury. Be sure to remove propeller before running engine on the land.

⚠ WARNING

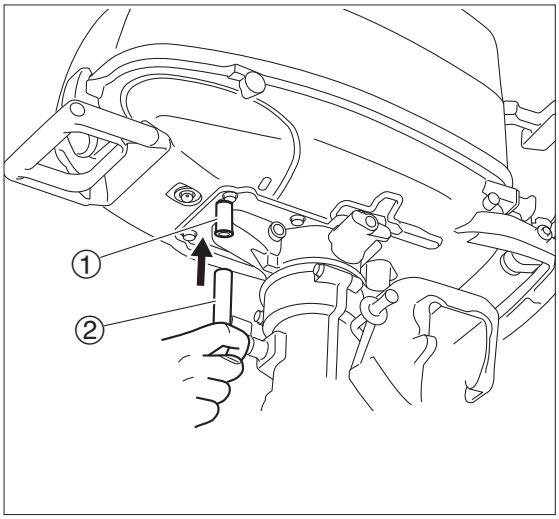
Exhaust gas contains carbon monoxide, which will cause gas poisoning. Do not start engine with outboard motor placed in a closed area such as boat house.

Flushing with flushing attachment

⚠ WARNING

- **When flushing, be sure to stop the engine. The water pump may be damaged.**
- **Remove the stop switch lock to prevent accidental starting of the engine.**

1. Tilt down the outboard motor.
2. Remove the water plug from the outboard motor, and screw in the flushing attachment ①, ② (optional).
3. Connect a water hose to the flushing attachment ①, ② and turn on the water.
4. Adjust the water flow from cooling water check port (Be sure to seal the water inlet, located in the gear case with tape) and continue flushing the outboard motor for 3 to 5 minutes.
5. Remove the flushing attachment ①, ② (optional) and tape. After the flushing, be sure to reattach the water plug.

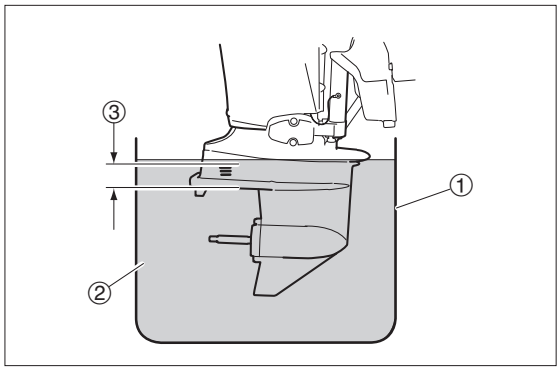


① Flushing Attachment (optional) For USA
② Flushing Attachment (optional) Except for USA

Flushing with test tank

⚠ WARNING

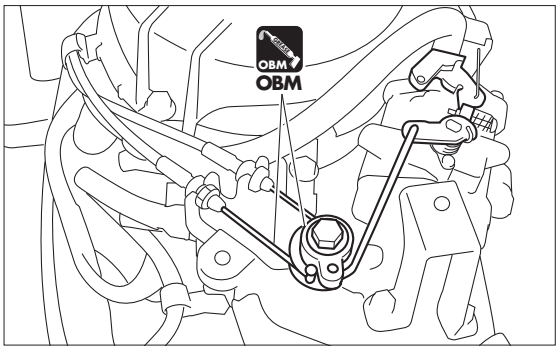
When the engine is started in the test tank, to avoid over heating and water pump damage, be sure the water level is at least 10 cm (4 in.) above the anti ventilation plate.
And be sure to remove the propeller, when starting the engine in the test tank.
Run the engine only at idling.



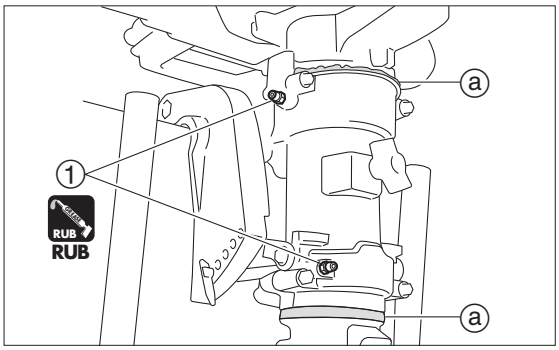
① Test Tank ② Water ③ Over 10 cm (4 in).

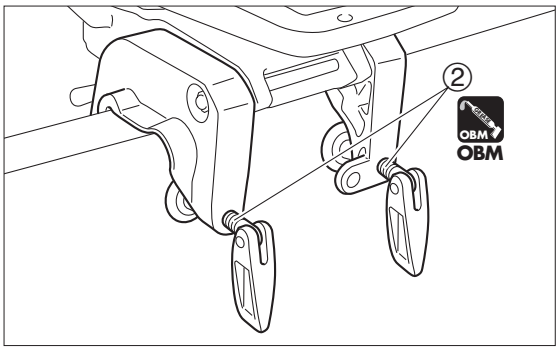
22) Greasing Points

1. Apply grease to throttle cable and sliding areas.



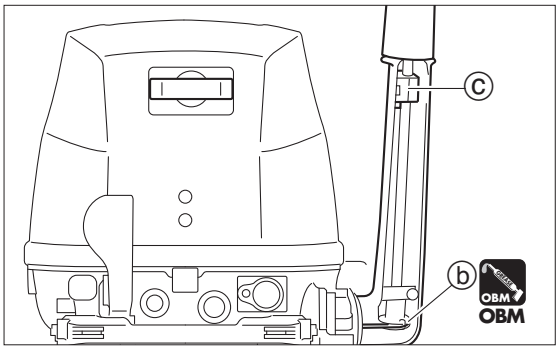
2. Apply grease through grease nipples ① until excessive grease appears from bushing ⓐ.
   Apply grease to thread of clamp screws ②.



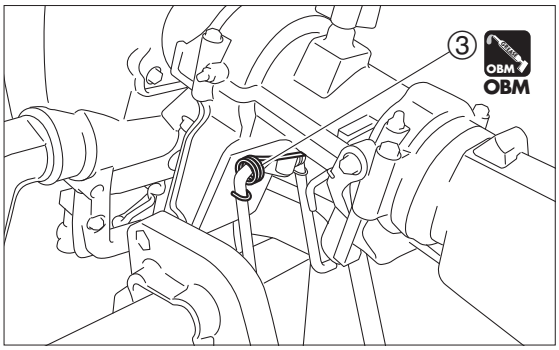


3. Apply grease to throttle cable ⓑ and sliding areas.

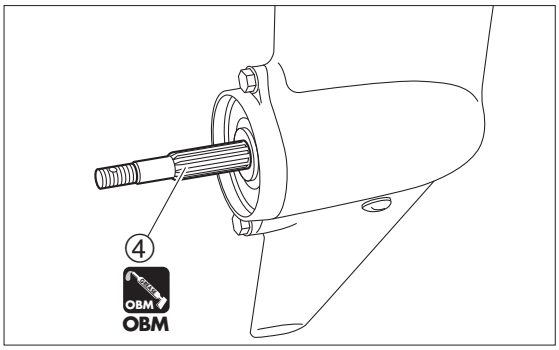
> Do not apply oil or grease to the friction piece ⓒ as it will not function.



4. Thinly apply grease to spring ③ of tilt stopper.



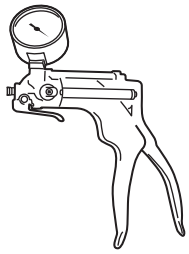
5. Apply grease to propeller shaft spline ④.



4

Fuel System

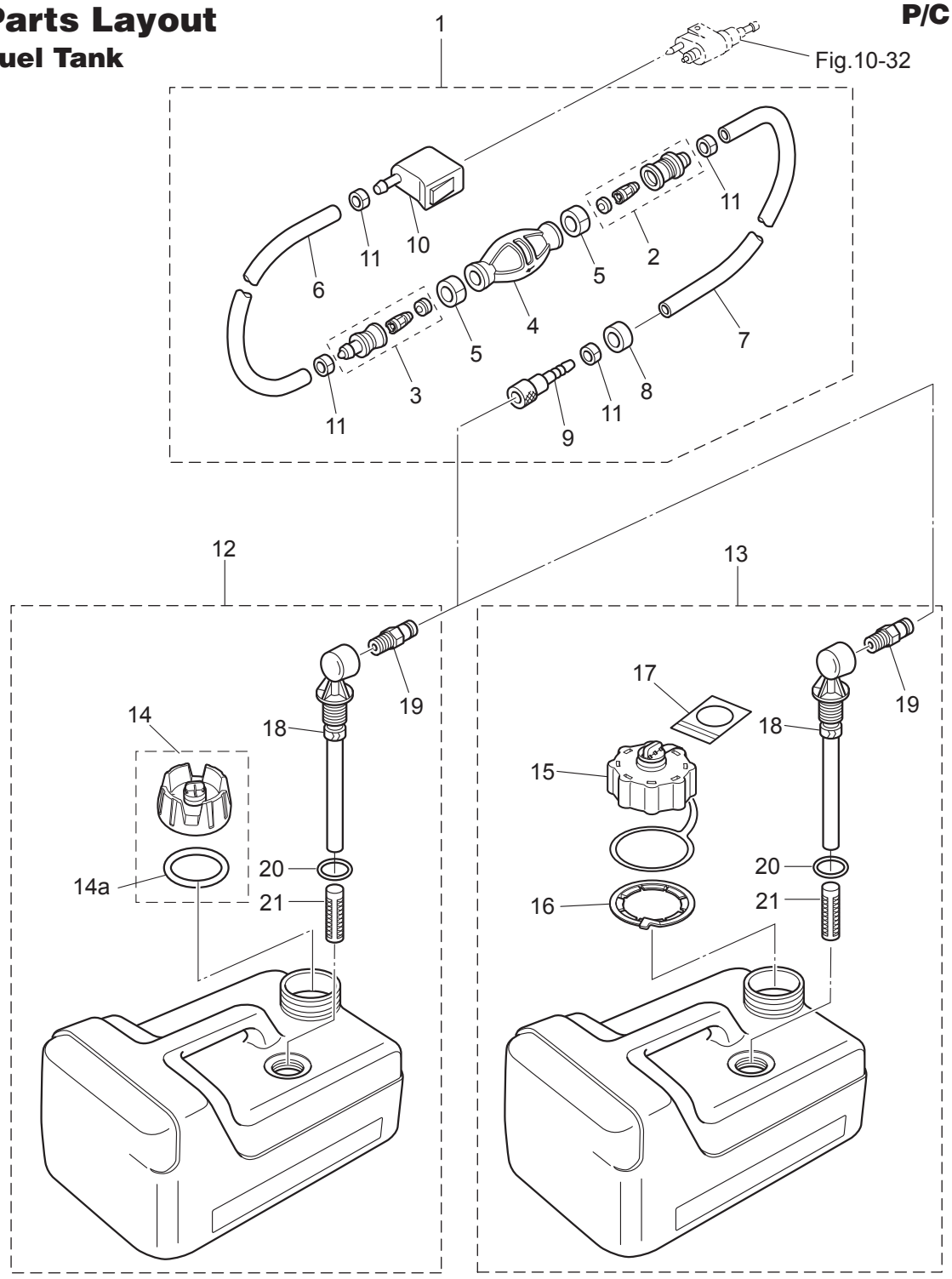
1. Special Tools

	
Vacuum/Pressure Gauge P/N. 3AC-99020-1	
Inspecting pressure	

2. Parts Layout

Fuel Tank

P/C Fig. 12

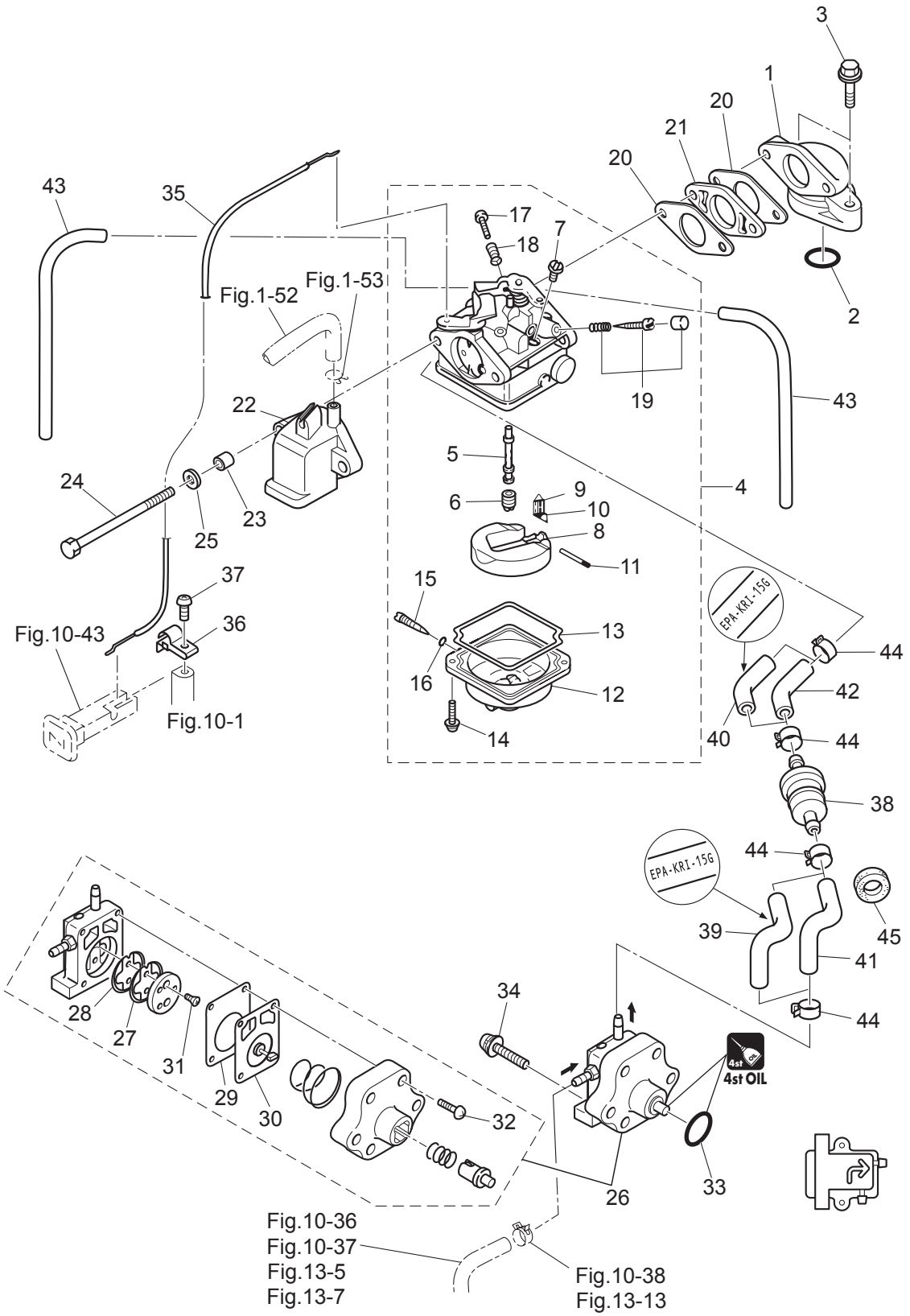


Ref. No.	Description	Q'ty	Remarks
1-1	Primer Bulb Assy	1	STD
1-2	Primer Bulb Assy	1	for USA Model
2	Joint Assy (Inlet)	1	
3	Joint Assy (Outlet)	1	
4-1	Primer Bulb	1	STD
4-2	Primer Bulb	1	for USA Model
5	Clamp	2	
6-1	Hose	1	STD 98AB-701000
6-2	Low Permeation Hose L=700	1	for USA Model
7-1	Hose	1	STD 98AB-701000 x2
7-2	Low Permeation Hose L=1600	1	for USA Model
8	Fuel Connector Mark	1	
9	Fuel Connector	1	
10	Fuel Connector	1	

Ref. No.	Description	Q'ty	Remarks
11	Clamp	4	
12	Fuel Tank Assy 12L	1	STD
13	Fuel Tank Assy 12L	1	for USA Model
14	Fuel Tank Cap Assy	1	
14a	Tank Filler Cap Gasket	1	
15	Fuel Tank Cap Assy	1	for USA Model
16	Retaining Ring	1	for USA Model
17	Instruction Tag	1	for USA Model
18	Pick-Up Elbow Assy (12L)	1	STD
19	Quick-Connector (Male)	1	
20	O-Ring	1	STD Do not reuse.
21	Filter	1	STD

Carburetor • Fuel Pump

P/C Fig. 4

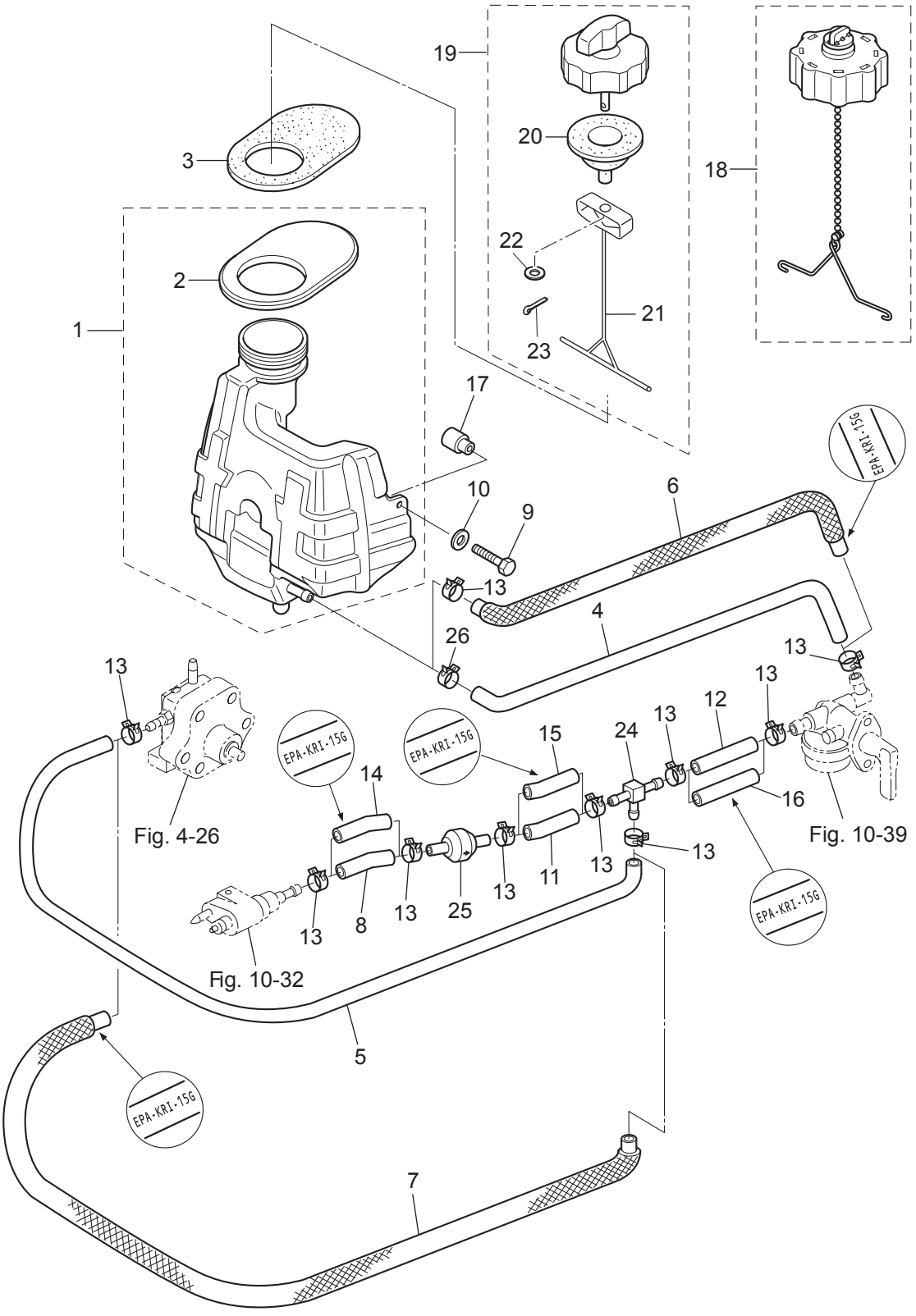


4st OIL

Ref. No.	Description	Q'ty	Remarks
1	Intake Manifold Assy	1	
2	Intake Manifold Gasket 2-33.5	1	
3	Bolt	2	M6 L=25mm
4-1	Carburetor Assy	1	4ps
4-2	Carburetor Assy	1	5ps
4-3	Carburetor Assy	1	6ps
5-1	Main Nozzle	1	4ps
5-2	Main Nozzle	1	5ps
5-3	Main Nozzle	1	6ps
6-1	Main Jet (#62)	1	4ps
6-2	Main Jet (#68)	1	5ps
6-3	Main Jet (#70)	1	6ps
7	Slow Jet (#38)	1	4/5/6ps
8	Float	1	
9	Float Valve	1	
10	Clip	1	
11	Float Arm Pin	1	
12	Float Chamber	1	
13	Float Chamber O-Ring	1	Do not reuse.
14	Screw	2	M4 L=12mm
15	Drain Screw	1	
16	O-Ring	1	Do not reuse.
17	Stop Screw	1	
18	Spring	1	
19-1	Pilot Screw	1	5/6ps
19-2	Pilot Screw	1	4ps
20	Carburetor Gasket	2	Do not reuse.
21	Insulator	1	
22	Intake Silencer Assy	1	
23	Collar 6.2-9-7.4	2	
24	Bolt	2	M6 L=85mm
25	Washer	2	M6
26	Fuel Pump Assy	1	
27	Check Valve	1	Black
28	Check Valve	1	White
29	Pump Body Gasket	1	
30	Pump Diaphragm	1	
31	Screw	2	M3 L=8mm
32	Screw	4	M4 L=18mm
33	O-Ring 2.6-18.7	1	Do not reuse.
34	Screw	2	M6 L=30mm
35	Choke Wire	1	
36	Cable Holder	1	
37	Screw	1	M5 L=10mm
38	Fuel Filter Assy	1	
39	Low Permeation Hose 24-29-24	1	USA
40	Low Permeation Hose L=60	1	USA
41	Fuel Hose 24-29-24	1	STD
42	Fuel Hose L=60	1	STD
43	Hose	2	L=270mm
44	Clip Φ 9.4	4	
45	Rubber Mount 9-16-4.3	1	

Integral Fuel Tank

P/C Fig. 13

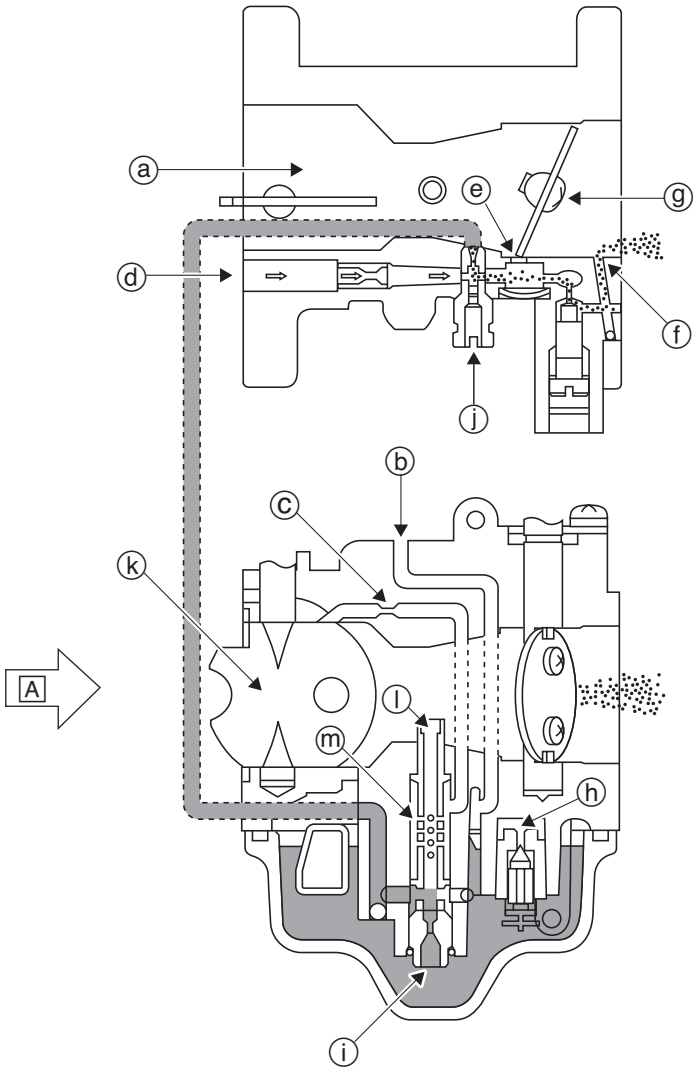


Ref. No.	Description	Q'ty	Remarks
1-1	Fuel Tank Assy	1	STD
1-2	Fuel Tank Assy	1	for USA Model
2	Sealing Plate	1	
3	Fuel Tank Seal	1	
4	Fuel Hose 275-20	1	STD
5	Fuel Hose 455-25	1	STD
6	Fuel Hose W/Protector 275-20	1	for USA Model
7	Fuel Hose W/Protector 455-25	1	for USA Model
8	Fuel Hose 30-25	1	STD
9	Bolt	2	M6 L=30mm
10	Washer 6.5-23-1.5	2	
11	Fuel Hose L=35	1	STD
12	Fuel Hose L=90	1	STD
13-1	Clip Φ9.4	10	for USA Model
13-2	Clip Φ9.4	9	STD
14	Low Permeation Hose 30-25	1	for USA Model
15	Low Permeation Hose L=35	1	for USA Model
16	Low Permeation Hose L=90	1	for USA Model
17	Spacer 7.2-10-6	2	
18	Fuel Tank Cap Assy	1	Low Permeation Parts for USA Model
19	Fuel Tank Cap Assy	1	STD
20	Tank Filler Cap Gasket	1	**Do not reuse.**
21	Hook	1	
22	Washer	1	
23	Split Pin 1.6-10	1	
24	Pipe Joint 4-4	1	
25	Non-Return Valve	1	
26	Clip Φ10.0	1	STD

3. Carburetor Inner Passages

1) Idling Passage

ⓐ - Air intake
ⓑ - Air vent inlet
ⓒ - Main air jet
ⓓ - Pilot air jet
ⓔ - Bypass port
ⓕ - Pilot outlet
ⓖ - Throttle valve
ⓗ - Fuel inlet
ⓘ - Main jet
ⓙ - Pilot jet
ⓚ - Choke valve
ⓛ - Main nozzle
ⓜ - Air bleed
[A] Air
[B] Air-fuel mixture



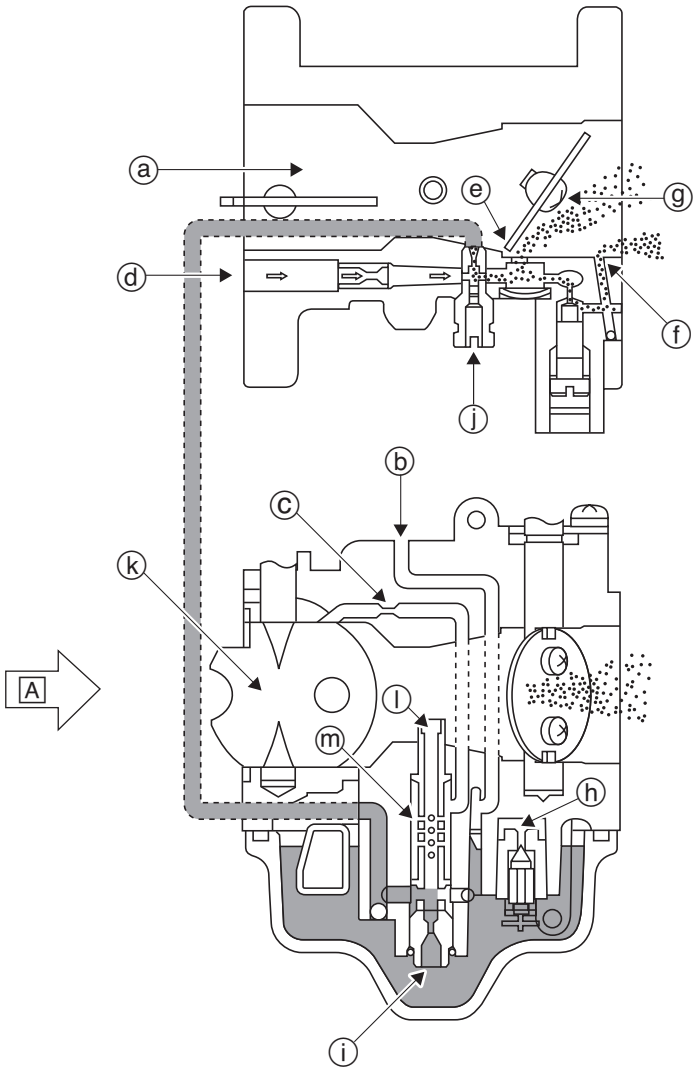
As engine rotates, intake valve opens and piston moves from top dead center toward bottom dead center, the piston movement causes vacuum or low pressure area to occur in the back of throttle valve.

Then, the air enters carburetor through air intake port, runs through throat venturi and throttle valve, and then is sucked into the combustion chamber area in the cylinder that is in air intake stroke.

The float chamber receives atmospheric pressure through air vent. This pressure causes fuel to be sucked into low pressure area in the back of throttle valve. The fuel is sent to main fuel well through main jet, runs through idle passage and pilot jet bypass (off idle) port, and then is ejected from pilot outlet. When this fuel goes through bypass port, it is mixed with air in the carburetor bore to be air-fuel mixture which is sucked into the cylinder.

2) Off-Idle Passage

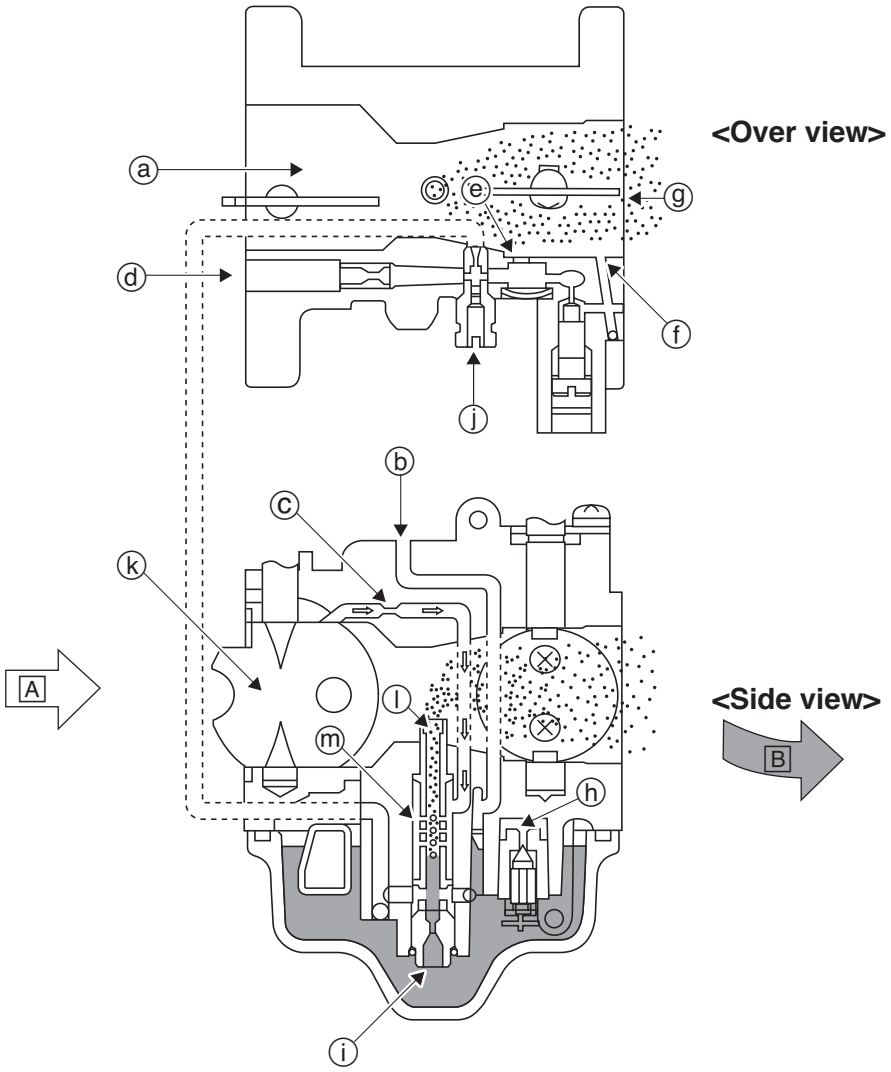
ⓐ - Air intake
ⓑ - Air vent inlet
ⓒ - Main air jet
ⓓ - Pilot air jet
ⓔ - Bypass port
ⓕ - Pilot outlet
ⓖ - Throttle valve
ⓗ - Fuel inlet
ⓘ - Main jet
ⓙ - Pilot jet
ⓚ - Choke valve
ⓛ - Main nozzle
ⓜ - Air bleed
[A] Air
[B] Air-fuel mixture



When throttle valve is turned to a position over bypass port, the bypass port is exposed to low pressure existing in the back of throttle valve. The low pressure causes the fuel to be ejected from bypass port and idle port.

3) High Speed Passage

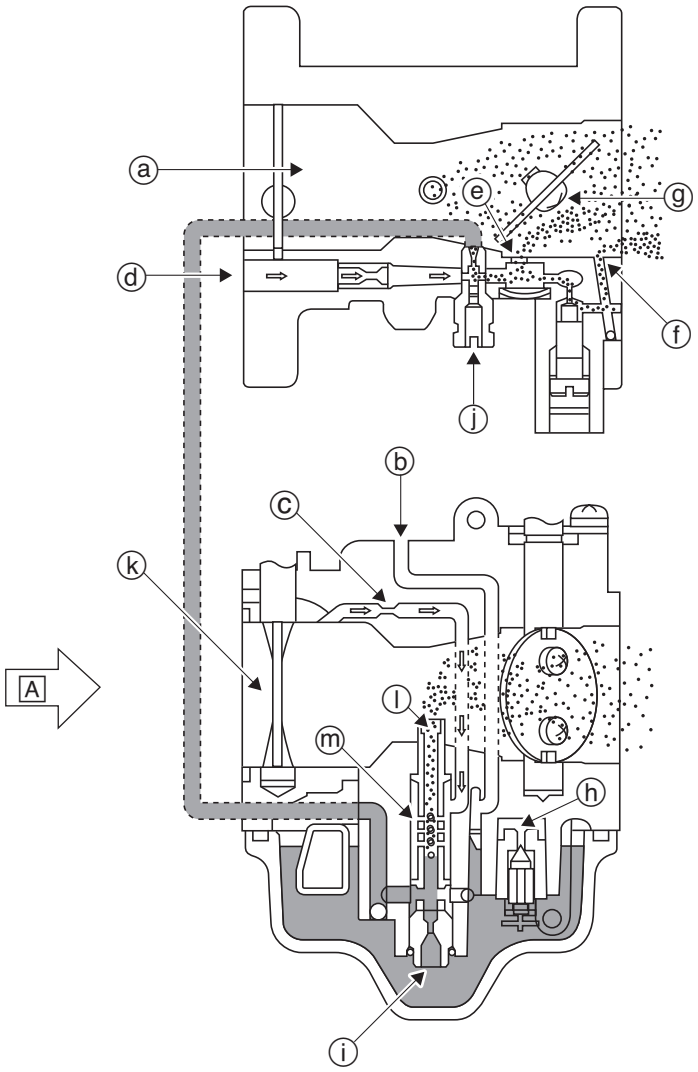
ⓐ - Air intake
ⓑ - Air vent inlet
ⓒ - Main air jet
ⓓ - Pilot air jet
ⓔ - Bypass port
ⓕ - Pilot outlet
ⓖ - Throttle valve
ⓗ - Fuel inlet
ⓘ - Main jet
ⓙ - Pilot jet
ⓚ - Choke valve
ⓛ - Main nozzle
ⓜ - Air bleed
[A] Air
[B] Air-fuel mixture



As throttle valve is turned to a position over bypass port, the low pressure produced in the back of throttle valve extends to an area near main nozzle. At the same time, as flow of air that runs through carburetor bore increase, the whole space in the venturi becomes low pressure. The low pressure in this venturi causes large suction force in the main nozzle. The fuel goes through main jet, flows into main fuel well, goes through main nozzle, and ejects from venturi.
The fuel that runs through main nozzle is mixed with air that comes from air bleed hole made on the side of main nozzle to make the fuel/air (atomized). When throttle valve is fully open, the amount of fuel is determined by the size of main jet.
The idle and off-idle passages keep feeding fuel as well as air to the engine.

4) Choking Passage

ⓐ - Air intake
ⓑ - Air vent inlet
ⓒ - Main air jet
ⓓ - Pilot air jet
ⓔ - Bypass port
ⓕ - Pilot outlet
ⓖ - Throttle valve
ⓗ - Fuel inlet
ⓘ - Main jet
ⓙ - Pilot jet
ⓚ - Choke valve
ⓛ - Main nozzle
ⓜ - Air bleed
[A] Air
[B] Air-fuel mixture



Choke system consists of choke valve, detent and push-pull cable. When starting cold engine, the operator should judge whether it is necessary to operate the choke to make engine starting easier, and if necessary, to operate the handle of choke cable manually to set it to a proper position.

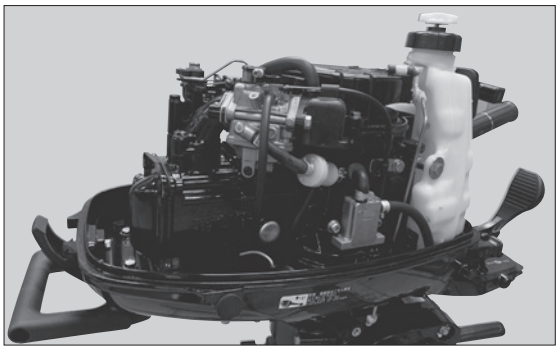
When engine is cold, pull choke lever to close choke valve. When engine starts, low pressure (vacuum) area is formed in the venturi on the back of choke valve. Then, the fuel goes through main nozzle, bypass port and pilot outlet, and sucked into carburetor bore, where it is mixed with air that runs in from opening of the choke valve to form thick air-fuel mixture.

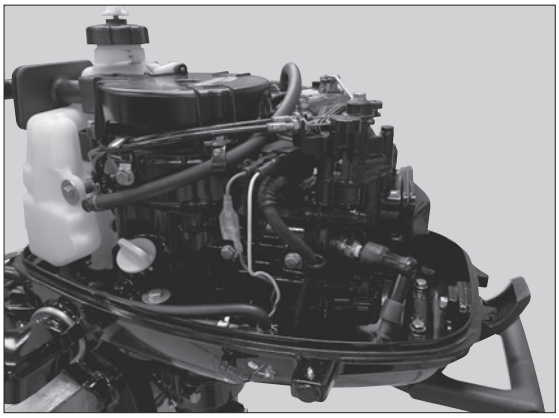
When engine warms up, set choke lever to home position.

4. Inspection Items

1) Inspection of Fuel Feed System Piping

1. Remove top cowl and check each section for fuel leak, dirt, deterioration and damage. Clean or replace parts if necessary.

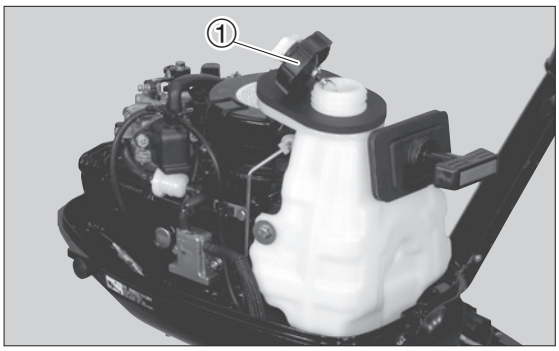




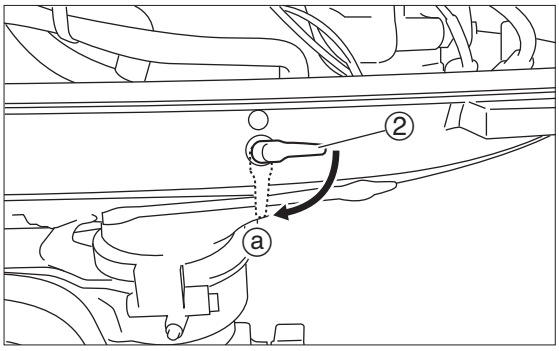
2) Draining Fuel

⚠ WARNING

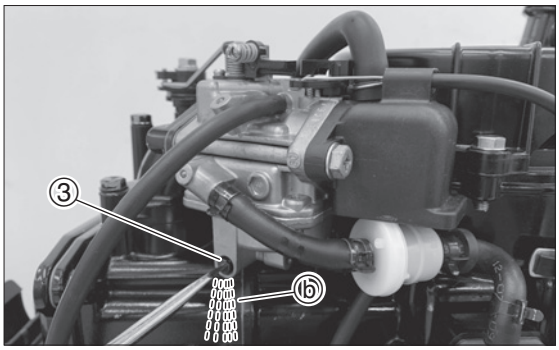
Remove fuel tank, fuel hose and carburetor after fully drain the fuel from these parts.



1. Remove fuel tank cap ① and use fuel pump to remove fuel.



2. Set fuel cock knob ② to full open position ⓐ.

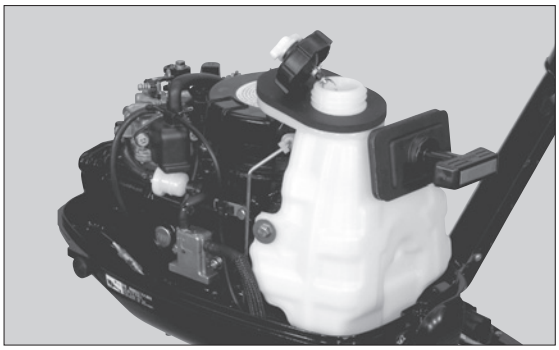


3. Place a piece of rag below the carburetor, and loosen drain screw ③ to drain all fuel ⓑ.

4. Retighten drain screw ③.

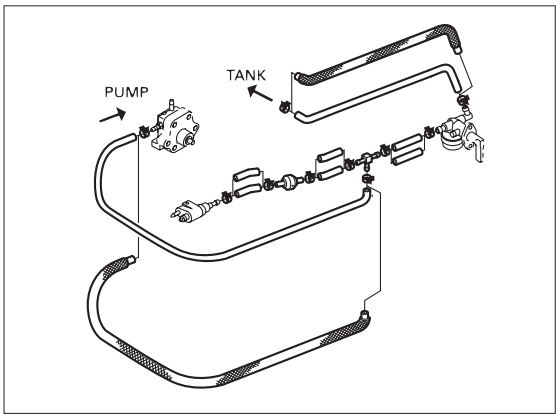
3) Inspection of Fuel Tank and Fuel Tank Cap

1. Check fuel tank and fuel tank cap for crack, leakage and damage. Replace if necessary.



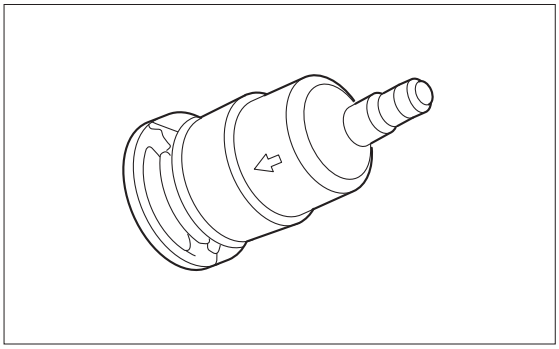
4) Inspection of Fuel Cock

1. Check fuel cock for leakage.



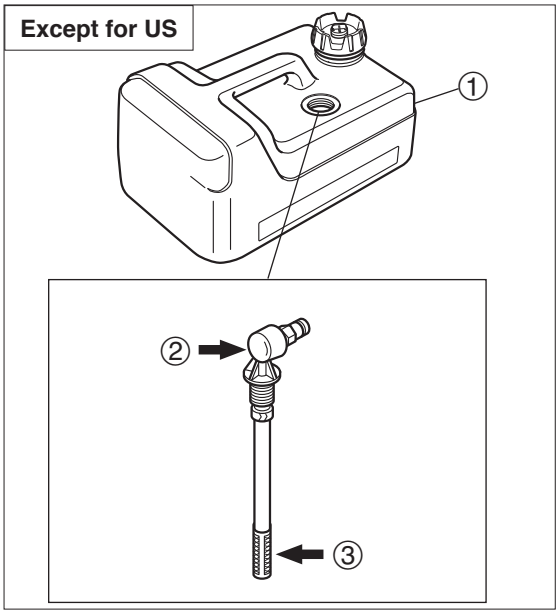
5) Inspection of Fuel Filter

1. Check fuel filter (in-line) for dirt and clogging, and clean if necessary.



2. Cleaning Fuel Tank Filter (Except for US)
   Remove fuel pick up elbow ② of fuel tank ① counterclockwise to remove the part, and clean the filter ③.

3. Cleaning Fuel Tank
   Remove dirt and water from fuel tank ① if necessary.



① Fuel Tank ② Fuel Pick Up Elbow
③ Filter

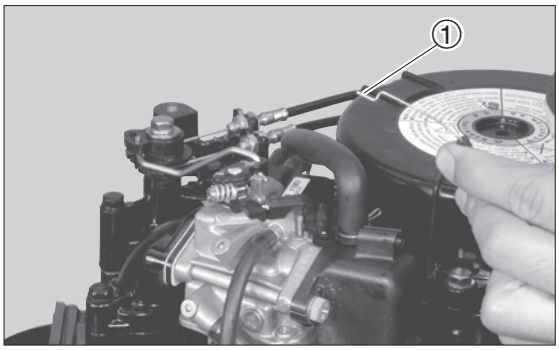
6) Removing Carburetor

⚠ WARNING

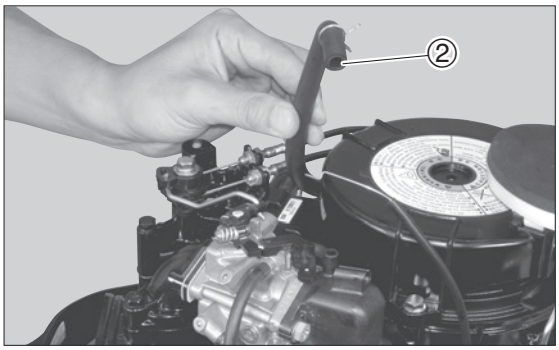
Before working on fuel system, make sure to disconnect battery cables from the battery, or electric sparks can occur, possibly igniting fuel or causing fuel to explode.

1. Disconnect choke link wire.

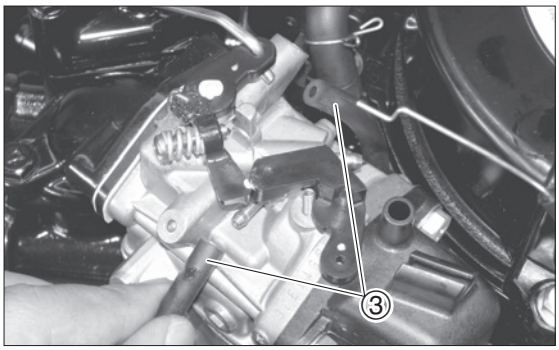
Be careful not to bend wire tip ① when disconnecting.



2. Disconnect breather hose ② from intake silencer.

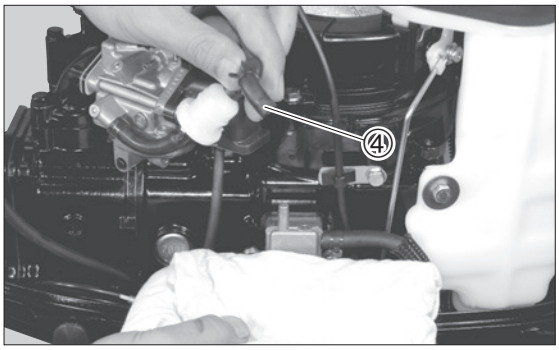


3. Remove two air vent hoses ③ from carburetor.



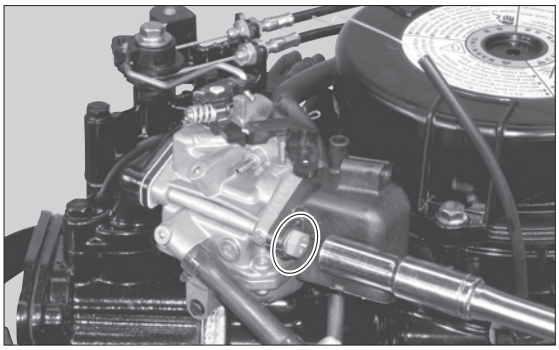
4. Remove fuel hose ④ from fuel pump.

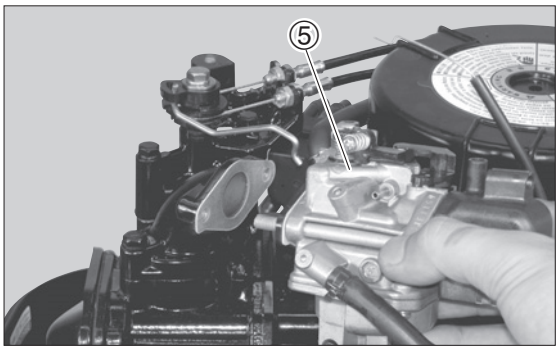
Before disconnecting fuel hose, place a piece of cloth below fuel pump to absorb leaking fuel.



5. Loosen carburetor mounting bolts and remove carburetor ⑤.

Be careful not to bend throttle rod when removing the rod and carburetor.



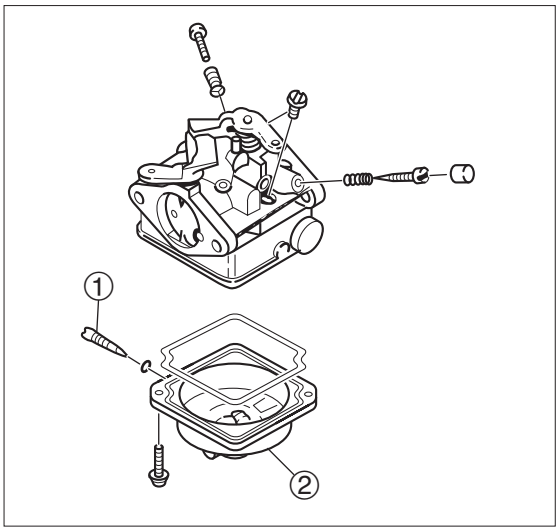


4

7) Disassembling Carburetor

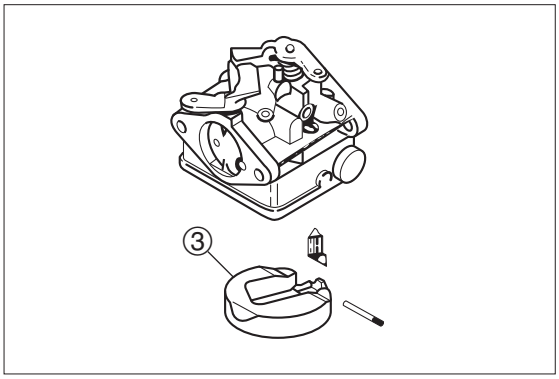
1. Remove drain screw ① to drain fuel.

> **⚠ CAUTION**
>
> **Use rag to absorb fuel flowing out from hose.**



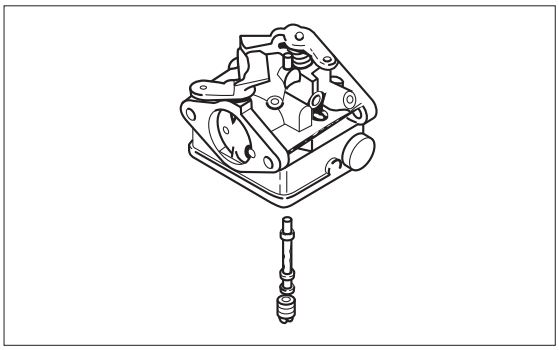
2. Remove float bowl ②.

3. Remove float ass'y ③ using commercially available pin tool.



4. Remove jets and nozzle.

> **⚠ CAUTION**
>
> **When removing any jets, be careful not to damage or distort jet surface.**



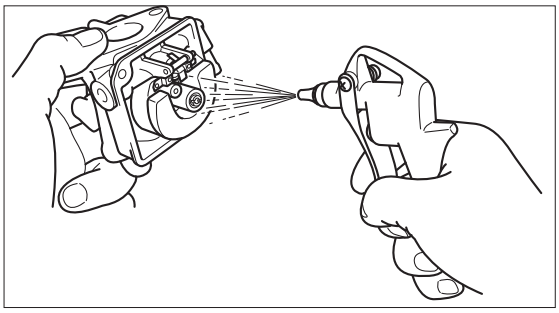
8) Inspection and clean of Carburetor

1. Check air and fuel passages for dirt in the jet and foreign substances. Clean carburetor body with cleaning fluid.

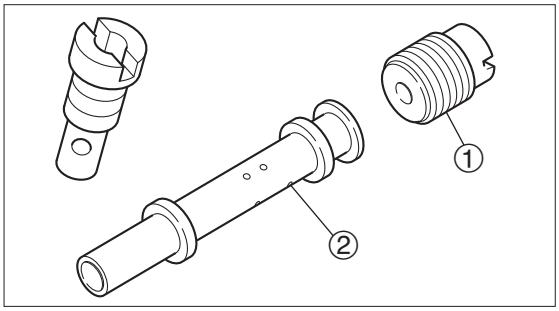
2. Squirt all passages and jet passages with compressed air.

⚠ CAUTION

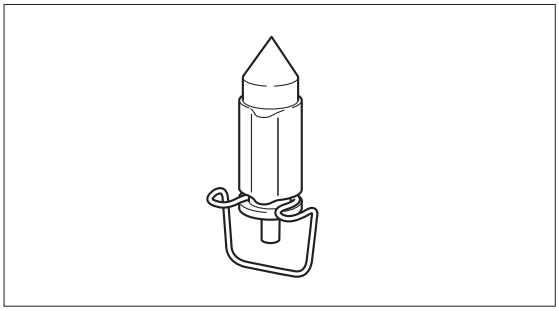
- **Point the compressed air downward, taking care that detergent and dust do not enter the eyes and do not damage small parts of the carburetor.**
- **Do not use wire to clean the jet. Doing so may enlarge the jet hole, resulting in significantly reducing the performance.**



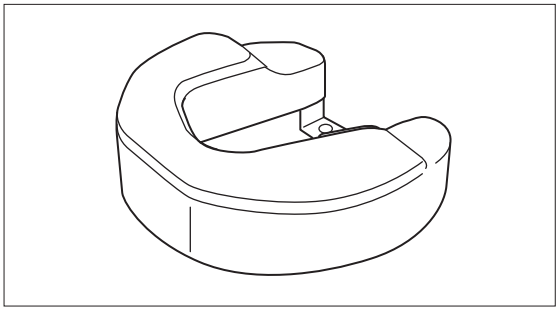
3. Check main jet ① and main nozzle ② for dirt. Clean or replace if necessary.



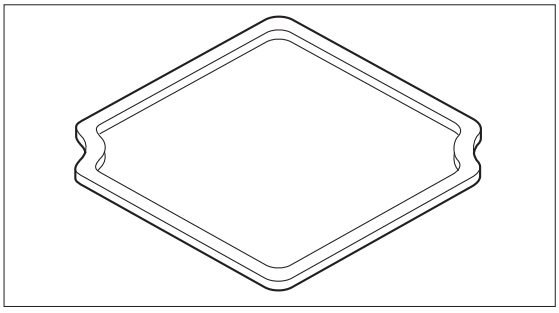
4. Check float valve for bend and wear. Replace if necessary.



5. Check float for deformation. Replace if necessary.



6. Check float bowl's O ring for damage, and replace if necessary.



9) Inspection of Fuel Connector

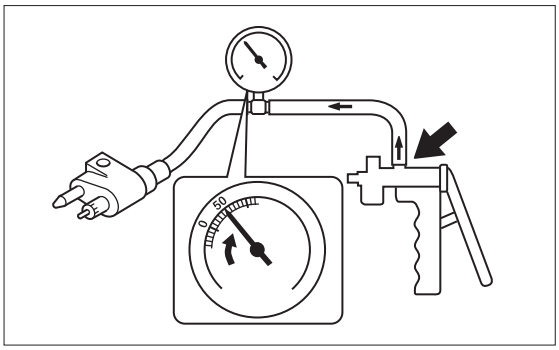
1. Check fuel connector for crack and damage.

2. Connect vacuum/pressure gauge to outlet of fuel connector.

3. Apply specified pressure, and check if the pressure is maintained for 10 seconds. Replace if necessary.

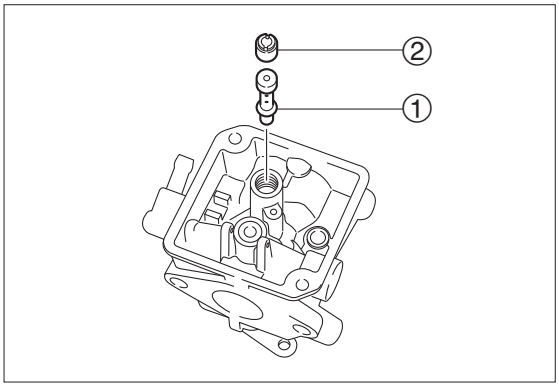
Vacuum/Pressure Gauge :
P/N. 3AC-99020-1

Specified Pressure :
0.029 MPa (4 psi) [0.3 kgf/cm²]

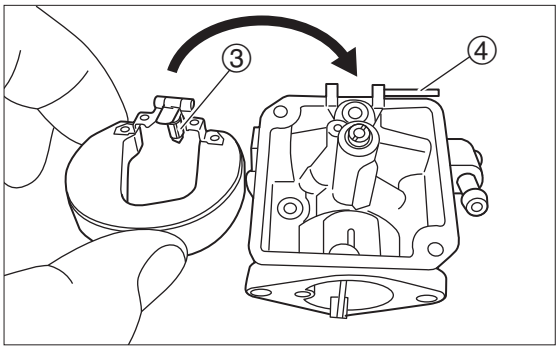


10) Assembling of Carburetor

1. Attach main nozzle ① and main jet ② to carburetor body as shown.



2. Attach float valvet ③,float and float arm pin ④ firmly as shown, and check if float moves smoothly.

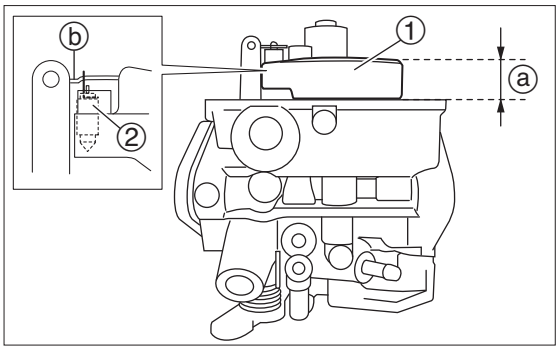


11) Adjustment of Float Height

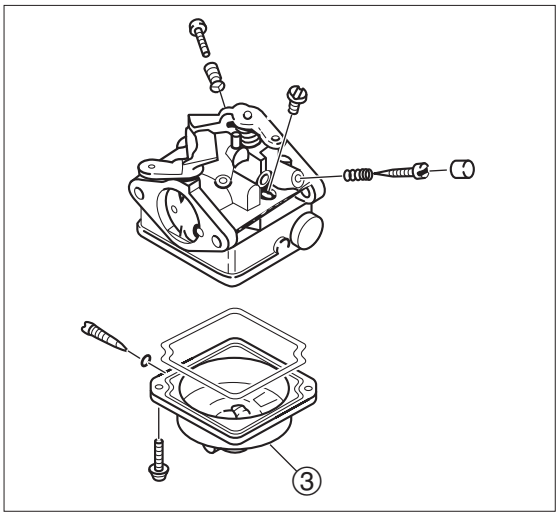
1. Measure height ⓐ of float ①. Adjust height ⓐ of float ① by bending tab ⓑ if the height is out of specified range.

Float Height ⓐ :
9.0 - 10.0 mm (0.354 - 0.394 in)

Make tab ⓑ of folat ① contacts top of float valve ② lightly.

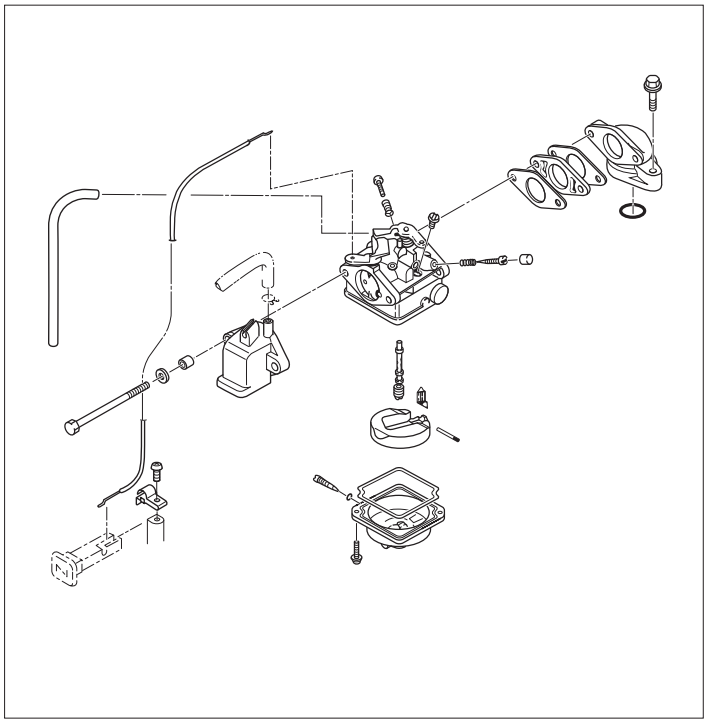


2. Attach drain screw to float bowl ③.



12) Installing Carburetor

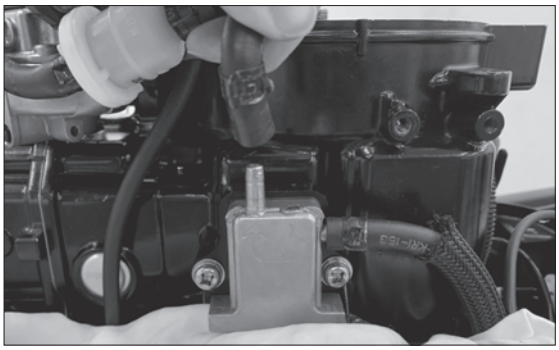
1. Reverse the sequence of disassembling the carburetor.



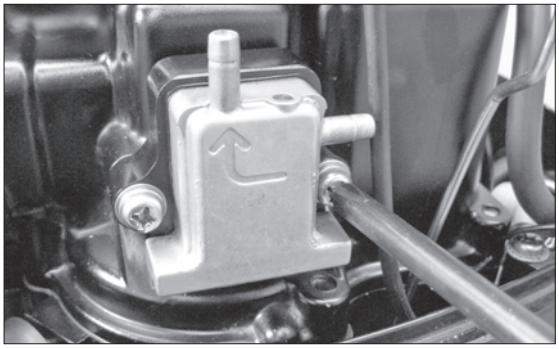
13) Removing Fuel Pump

1. Remove fuel hose from fuel pump.

Place a piece of cloth below fuel pump to prevent fuel leaking..



2. Loose fuel pump mounting screw and remove fuel pump.

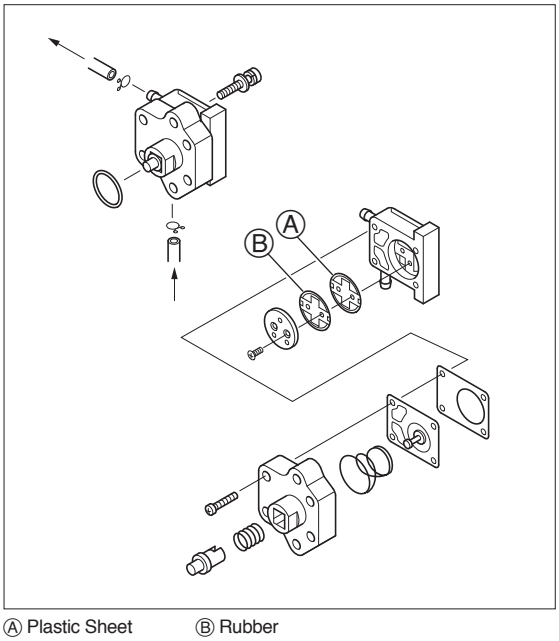


14) Disassembly and Inspection of Fuel Pump

⚠ CAUTION

To prevent fuel from dripping on the floor, use a cloth to catch the fuel.

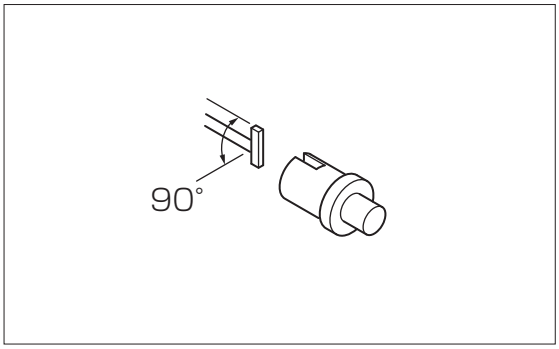
1. Remove 4 screws to disassemble fuel pump body.



Ⓐ Plastic Sheet Ⓑ Rubber

2. Remove diaphragm from fuel pump body by unlocking push rod.

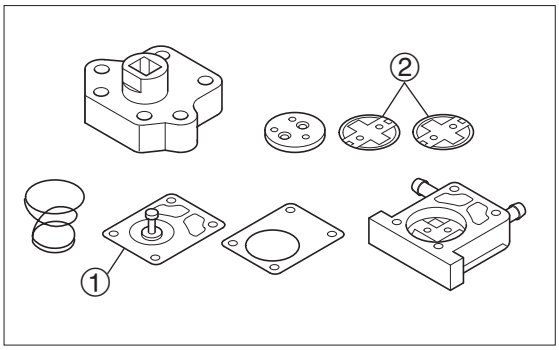
While holding push rod, turn diaphragm approximately 90 degrees to left or right while pushing it using a finger to remove it from push rod.



3. Check diaphragm ① for break, crack and damage, and replace if necessary.

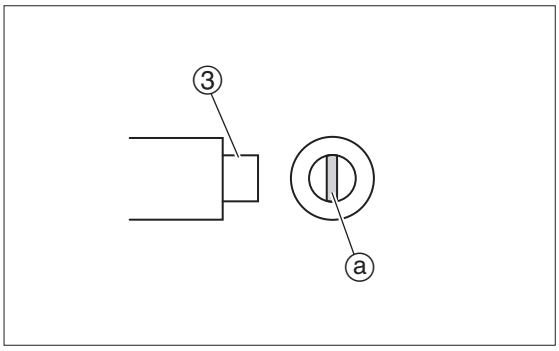
4. Check check valve ② for damage and deterioration, and replace if necessary.

5. Check fuel pump body for crack and damage, and replace if necessary.



6. Check push rod ③ for wear on the slipper surface ⓐ, and replace if severely worn.

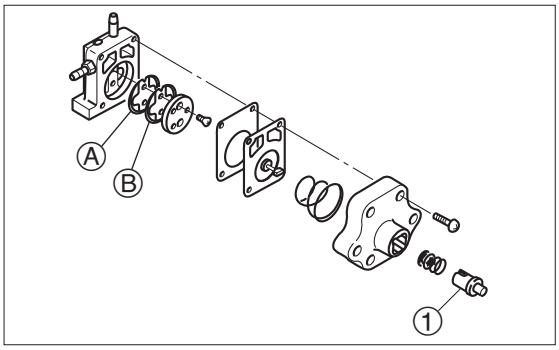
7. Clean fuel pump body.



4

15) Assembly of Fuel Pump

1. Reverse the sequence of disassembling.
   After assembling, check movement of push rod ① by pushing it with a finger.

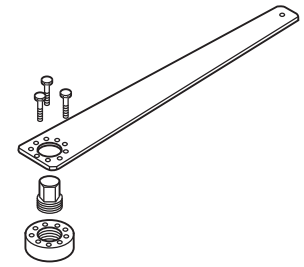
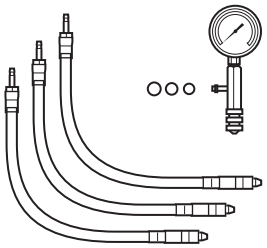
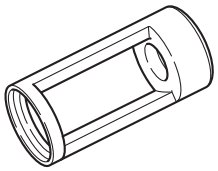


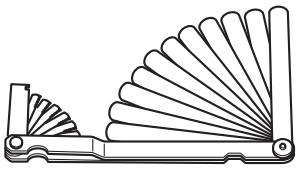
Ⓐ Plastic Sheet Ⓑ Rubber

5

Power Unit

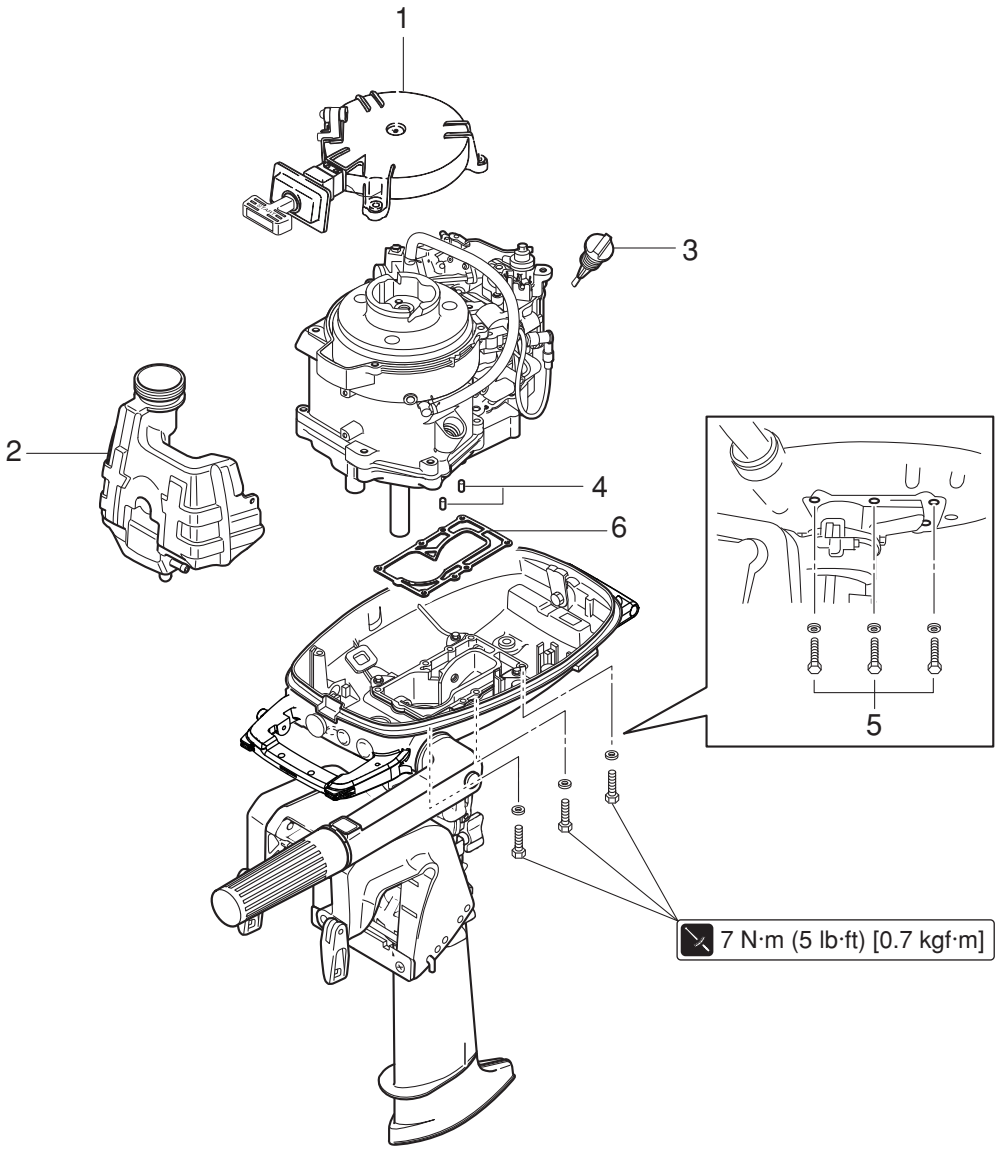
1.Special Tools

			
Flywheel Puller Kit P/N. 369-72211-0	Piston Slider P/N. 3H6-72871-0	Compression Gauge P/N. 3AC-99030-0	Valve Spring Compressor Attachment P/N. 3AB-99076-0
Removing/installing flywheel	Installing piston	Measuring compression pressure	Removing or installing valve springs


Thickness Gauge P/N. 353-72251-1
Measuring gaps

2.Parts Layout

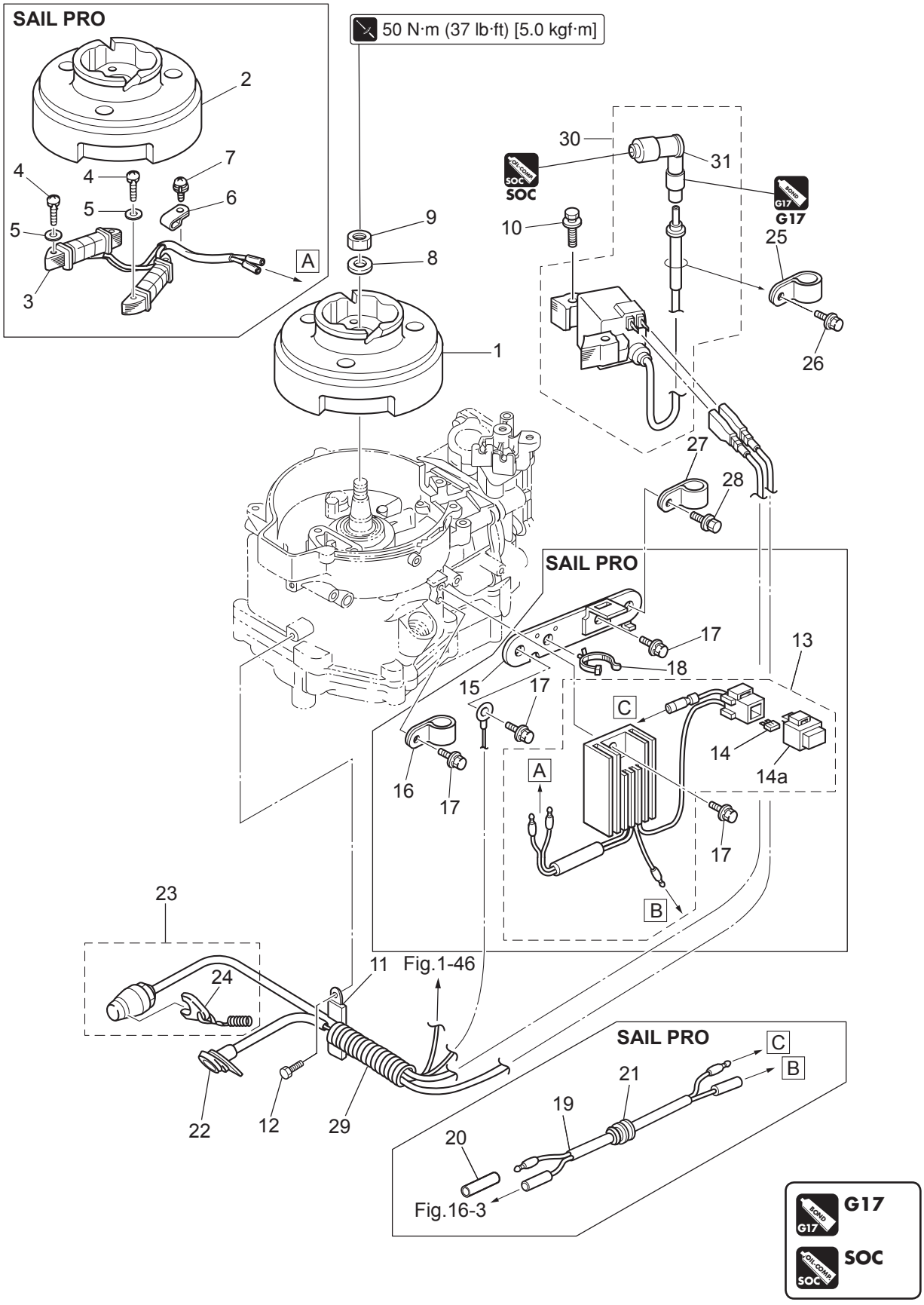
Engine



Ref. No.	Description	Q'ty	Remarks
1	Ricoil Starter	1	
2	Fuel Tank	1	
3	Oil Level Gauge	1	
4	Dowel Pin	2	
5	Bolt	6	M6 L=30mm
6	Gasket	1	Do not reuse.

Magneto

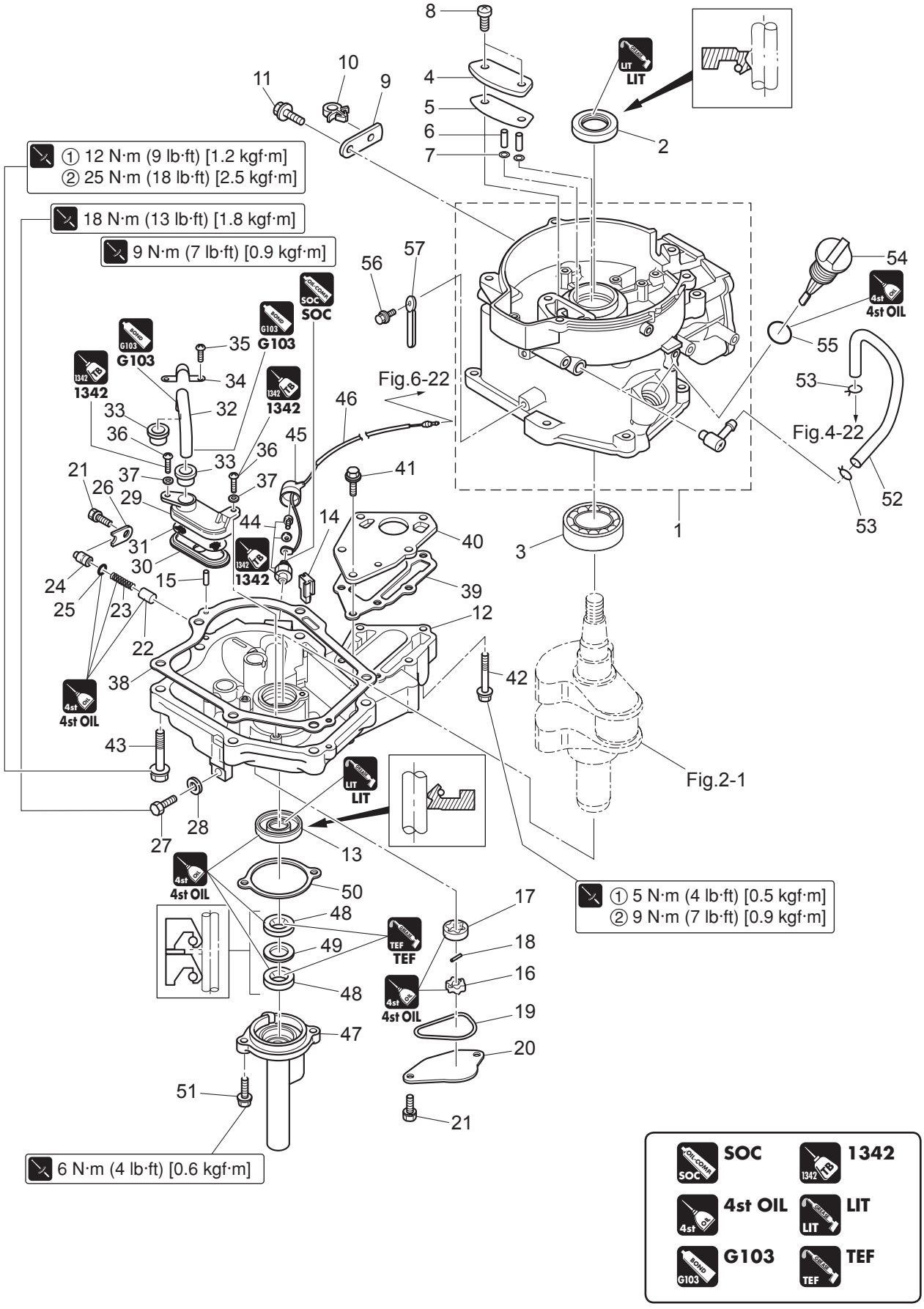
P/C Fig. 6



Ref. No.	Description	Q'ty	Remarks
1	Flywheel	1	STD with out Alternator
2	Flywheel	1	for Sail Pro (with Alternater)
3	Alternator Assy	1	for Sail Pro 12V60W (with Alternater)
4	Screw	4	for Sail Pro (with Alternater) M5 L=25mm
5	Washer	4	for Sail Pro (with Alternater) M5
6	Clamp 4.2-3-8	1	for Sail Pro (with Alternater)
7	Screw	1	for Sail Pro (with Alternater) M4 L=8mm
8	Washer	1	M12
9	Nut 12-P1.25	1	
10	Bolt	2	M6 L=30mm
11	Clamp 6.5-47.5P	1	
12	Bolt	1	M6 L=12mm
13	Rectifier Complete	1	for Sail Pro or OPT
14	Fuse 10A	2	for Sail Pro
14a	Cap	1	for Sail Pro
15	Electric Bracket Assy	1	for Sail Pro
16	Clamp 6.5-14L	1	for Sail Pro
17	Bolt	4	for Sail Pro M6 L=14mm
18	Band 135	1	for Sail Pro
19	Battery Cable L=494	1	with Alternator Sail Pro Only
20	Cable Terminal Plug	1	with Alternator Sail Pro Only
21	Grommet 17-3	1	for Sail Pro
22	Pilot Lamp Assy	1	
23	Stop Switch Assy	1	
24	Stop Switch Lanyard Assy	1	
25	Clamp 6.5-14L	1	
26	Bolt	1	M6 L=12mm
27	Clamp 6.5-14L	1	
28	Bolt	1	M6 L=12mm
29	Protector Φ 10.7-180	1	
30	Igniter W/R-Cap	1	
31	Plug Cap W/Resistance	1	

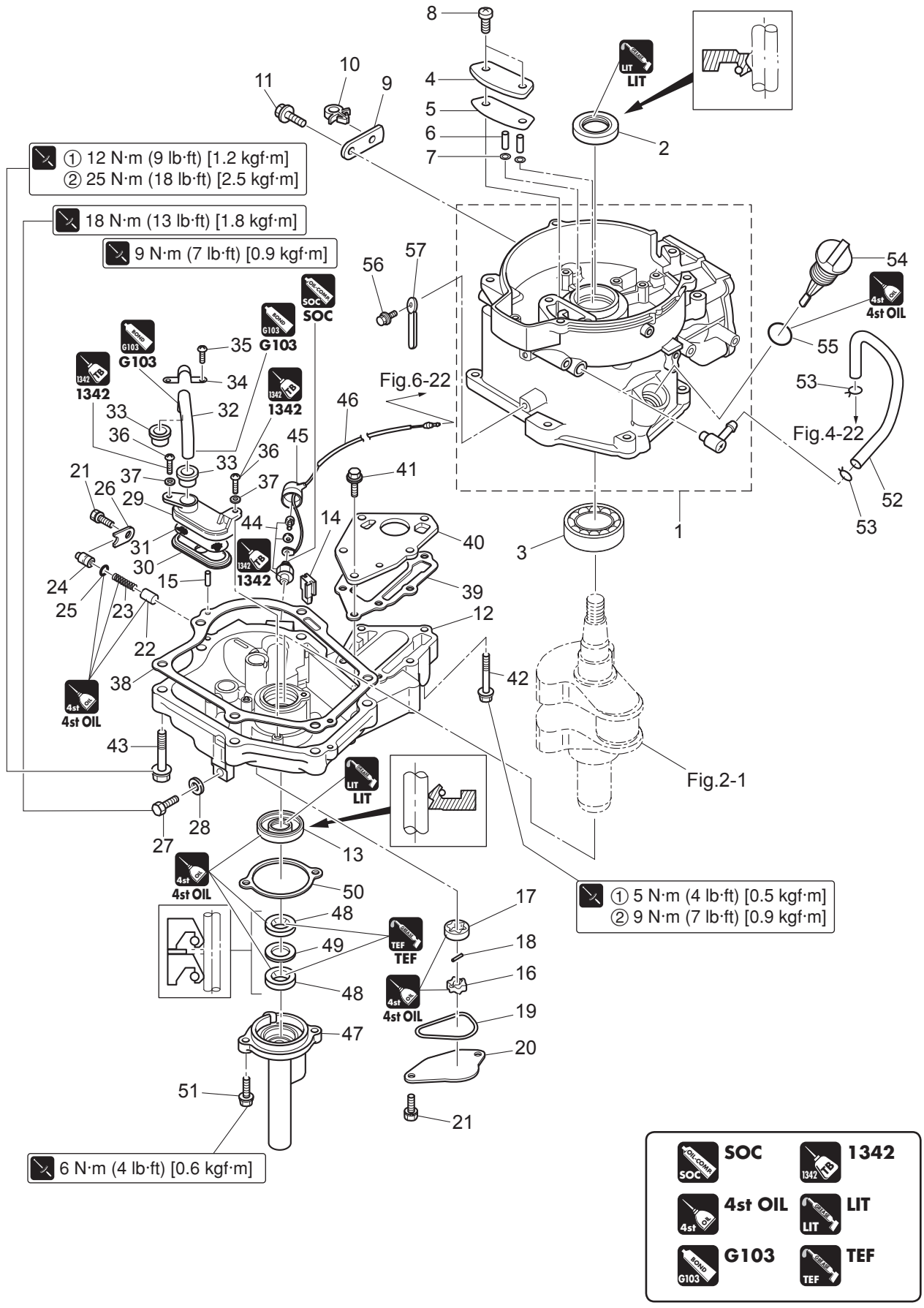
Cylinder & Oil Pan

P/C Fig. 1



Ref. No.	Description	Q'ty	Remarks
1	Cylinder Block	1	
2	Oil Seal 20-35-7	1	
3	Ball Bearing 6205	1	
4	Breather Chamber Cover	1	
5	Gasket	1	
6	Collar 8-10-20.1	2	
7	Wave Washer D=5	2	
8	Screw	2	M6 L=16mm
9	Cable Holder	1	
10	Clamp 6-9.5L	1	
11	Bolt	1	M6 L=12mm
12	Oilpan Sub-Assy	1	
13	Oil Seal 25-40-8	1	
14	Grommet	1	
15	Dowel Pin 6-12	2	
16	Oil Pump Rotor (Inner)	1	
17	Oil Pump Rotor (Outer)	1	
18	Pin	1	
19	O-Ring Φ 3.1	1	Do not reuse.
20	Oil Pump Cover	1	
21	Bolt	3	M6 L=16mm
22	Plunger Control	1	
23	Spring	1	
24	Seat	1	
25	O-Ring 1.9-6.8	1	Do not reuse.
26	Plunger Cover	1	
27	Drain Bolt 10-14 P1.25	1	
28	Washer 10.2-19-1	1	
29	Strainer Body	1	
30	Strainer Cap	1	
31	Mesh	1	
32	Pipe	1	
33	Seal	2	
34	Strainer Stopper	1	
35	Screw	1	M5 L=12mm
36	Bolt 5-16	2	
37	Washer	2	M5
38	Oilpan Gasket	1	Do not reuse.
39	Exhaust Cover Gasket	1	Do not reuse.
40	Exhaust Cover (Inner)	1	
41	Bolt	3	M6 L=20mm
42	Bolt	3	M6 L=40mm
43	Bolt	6	M8 L=40mm
44	Oil Pressure Switch	1	
45	Grommet	1	
46	Oil Pressure Switch Lead Wire L=240	1	
47	Crankcase Head	1	
48	Oil Seal 10.1-25-7	2	
49	Spacer 19-24.8-1	1	

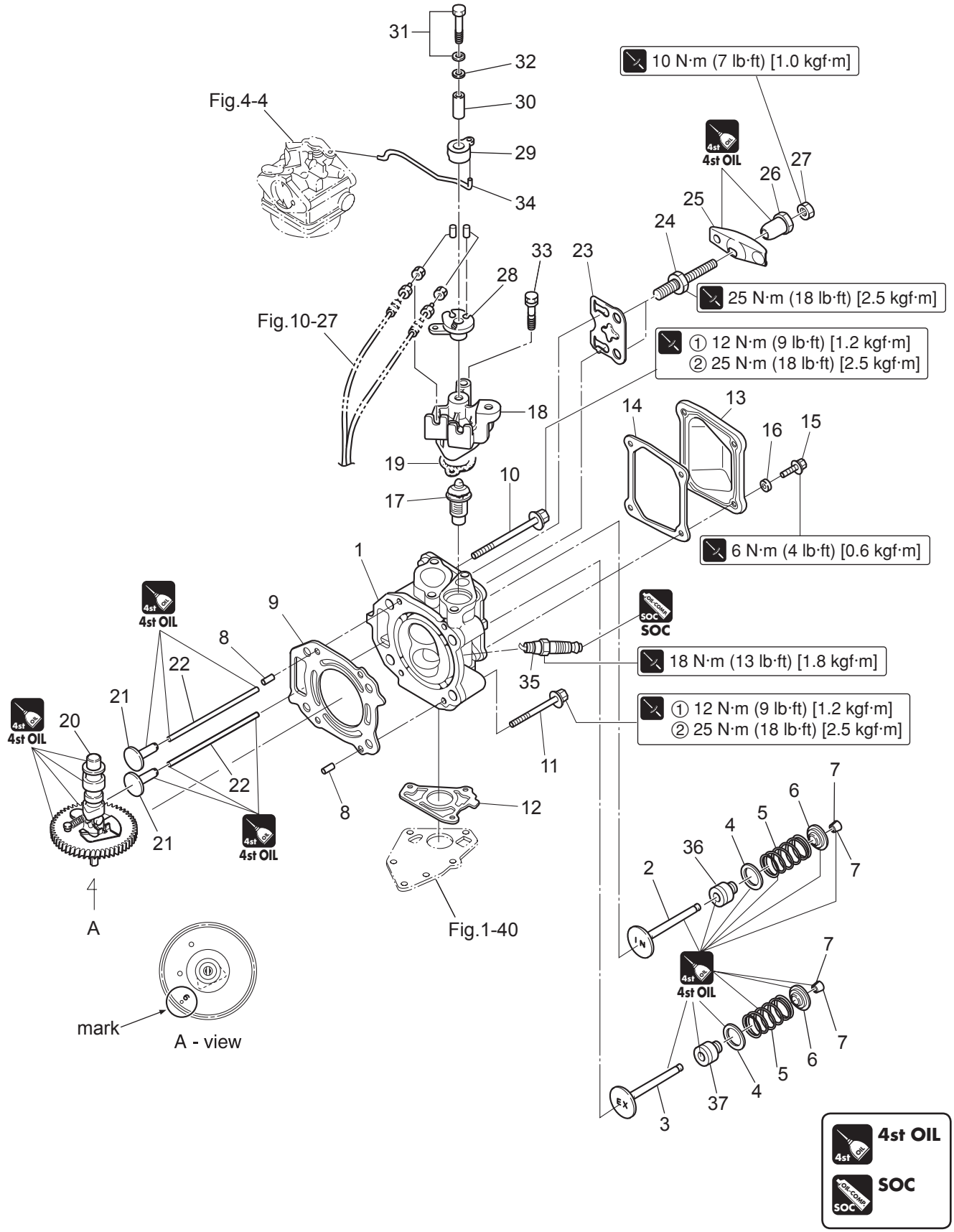
P/C Fig. 1


① 12 N·m (9 lb·ft) [1.2 kgf·m]
② 25 N·m (18 lb·ft) [2.5 kgf·m]
18 N·m (13 lb·ft) [1.8 kgf·m]
9 N·m (7 lb·ft) [0.9 kgf·m]
① 5 N·m (4 lb·ft) [0.5 kgf·m]
② 9 N·m (7 lb·ft) [0.9 kgf·m]
6 N·m (4 lb·ft) [0.6 kgf·m]
Fig.6-22
Fig.4-22
Fig.2-1
SOC
1342
4st OIL
LIT
G103
TEF

Ref. No.	Description	Q'ty	Remarks
50	Crankcase Head Gasket	1	Do not reuse.
51	Bolt	2	M6 L=20mm
52	Breather Hose	1	
53	Clip Φ 12	2	
54	Oil Level Gauge	1	
55	O-Ring 2.6-18.7	1	Do not reuse.
56	Bolt	1	M6 L=12mm
57	Clamp 6.5-47.5P	1	

Cylinder Head & Valve & Camshaft

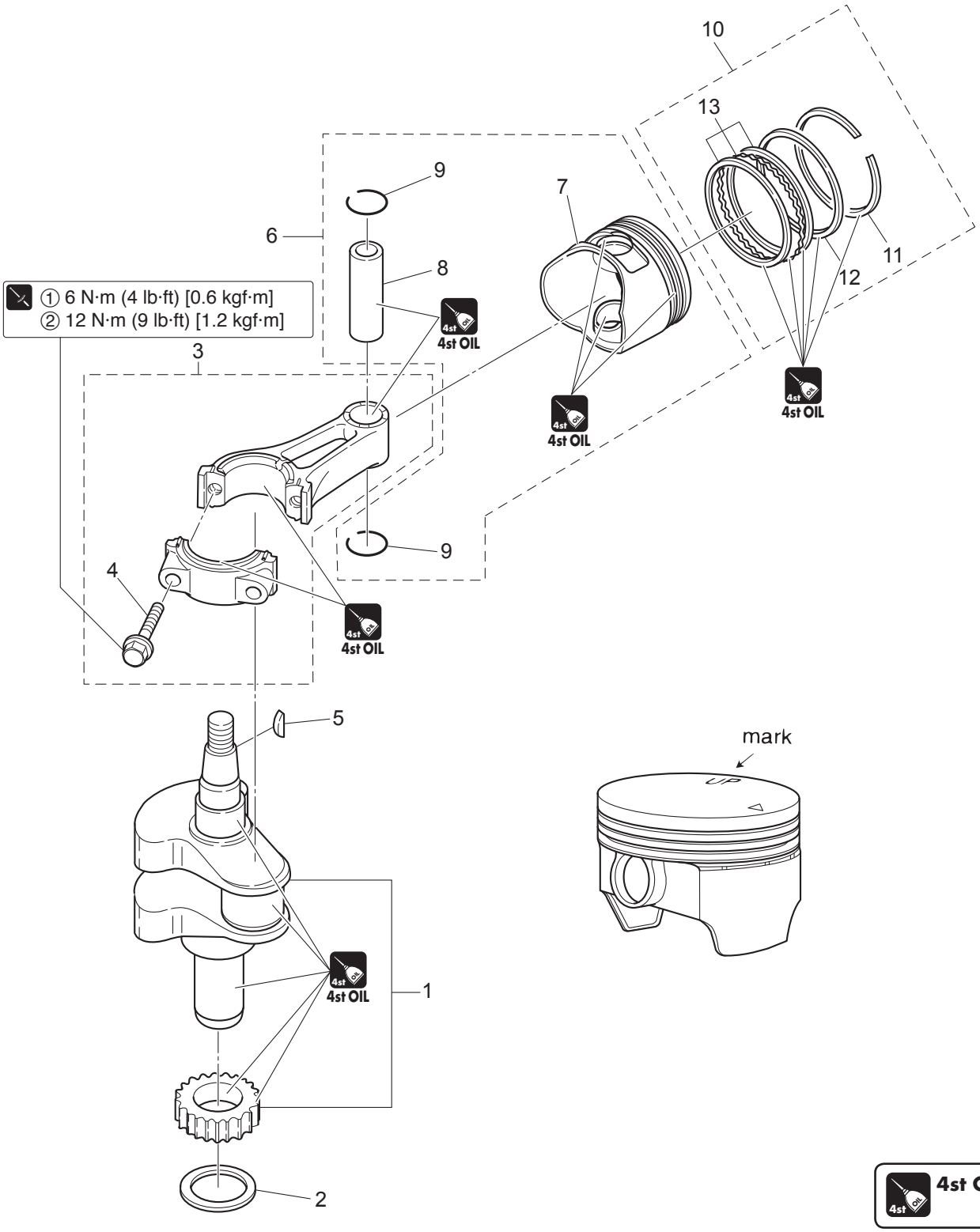
P/C Fig. 3



Ref. No.	Description	Q'ty	Remarks
1	Cylinder Head Assy	1	
2	Intake Valve	1	
3	Exhaust Valve	1	
4	Valve Spring Seat	2	
5	Valve Spring L=35	2	
6	Retainer	2	
7	Cotter	4	
8	Dowel Pin 6-12	2	
9	Cylinder Head Gasket	1	Do not reuse.
10	Bolt 8-90	2	
11	Cylinder Head Bolt 8-60	2	
12	Exhaust Cover Gasket	1	Do not reuse.
13	Cylinder Head Cover	1	
14	Cylinder Head Cover Gasket	1	Do not reuse.
15	Bolt	4	M6 L=16mm
16	Washer 6-16-1.5	4	
17	Thermostat	1	Mark 52B PRV
18	Thermostat Cap	1	
19	Thermostat Cap Gasket	1	Do not reuse.
20	Camshaft Assy (F6a)	1	Mark 6
21	Lifter	2	
22	Push Rod	2	
23	Plate	1	
24	Pivot Bolt	2	
25	Rocker Arm	2	
26	Pivot	2	
27	Adjusting Nut	2	
28	Throttle Drum	1	
29	Throttle Opener	1	
30	Collar 6.5-10.5-22.6	1	
31	Bolt	1	M6 L=35mm
32	Washer 6-16-1.5	1	
33	Bolt	2	M6 L=45mm
34	Throttle Rod	1	
35	Spark Plug(Dcpr6e)	1	
36	Intake Valve Stem Seal	1	
37	Exhaust Valve Stem Seal	1	

Piston & Crankshaft

P/C Fig. 2



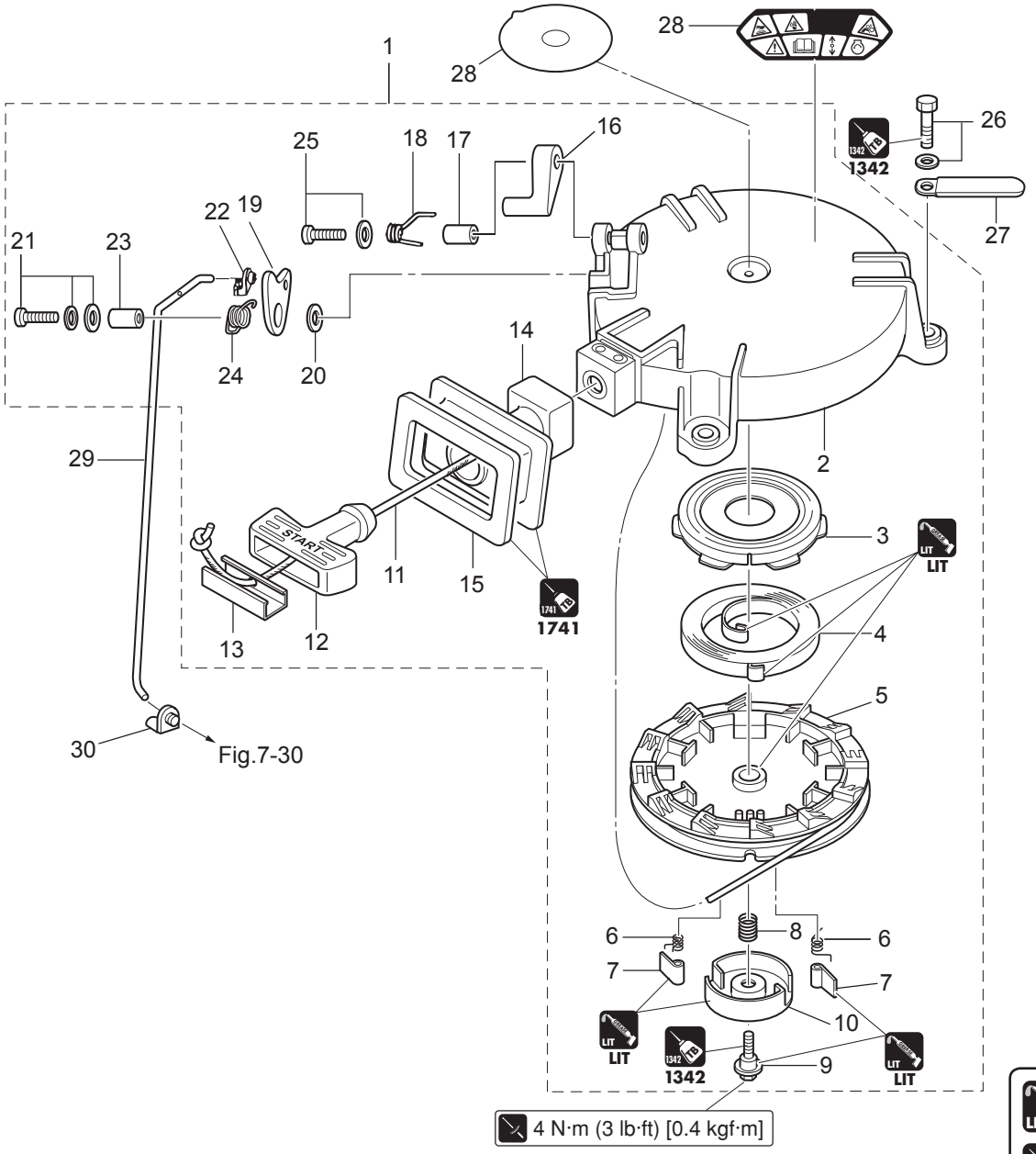
4st OIL

Ref. No.	Description	Q'ty	Remarks
1	Crankshaft Assy	1	
2	Thrust Plate	1	
3	Connecting Rod Assy	1	
4	Connecting Rod Bolt	2	
5	Key 16-5.7-4	1	
6-1	Piston Repair Kit	1	STD
6-2	Piston Repair Kit (0.5 O/S)	1	OPT
7-1	Piston	1	STD
7-2	Piston (0.5 O/S)	1	OPT
8	Piston Pin	1	

Ref. No.	Description	Q'ty	Remarks
9	Piston Pin Clip	2	
10-1	Piston Ring Set	1	STD
10-2	Piston Ring Set (0.5 O/S)	1	OPT
11-1	Piston Ring	1	STD 1st
11-2	Piston Ring (0.5 O/S)	1	OPT 1st
12-1	Piston Ring	1	STD 2nd
12-2	Piston Ring (0.5 O/S)	1	OPT 2nd
13-1	Piston Ring-Oil	1	STD Oil
13-2	Piston Ring-Oil (0.5 O/S)	1	OPT Oil

Recoil Starter

P/C Fig. 5



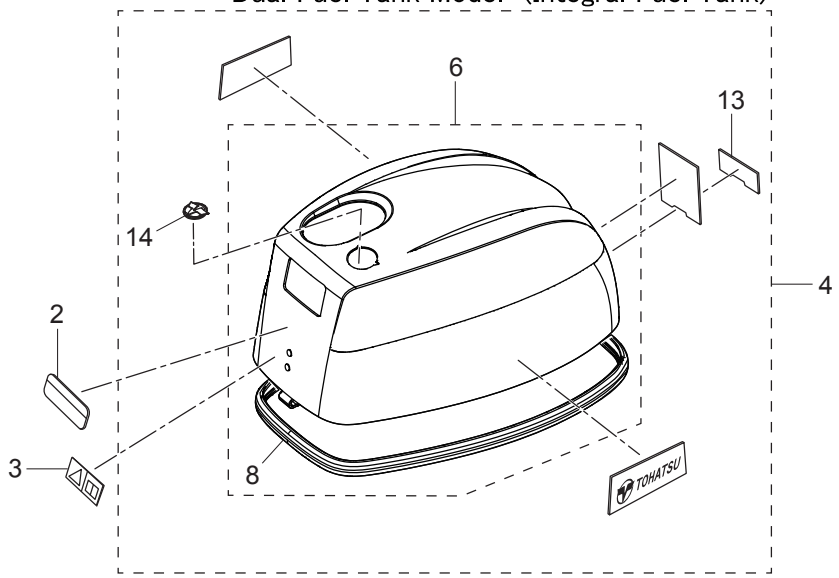
Ref. No.	Description	Q'ty	Remarks
1	Recoil Starter Assy	1	
2	Starter Case	1	
3	Starter Spring Case	1	
4	Starter Spring	1	
5	Reel	1	
6	Return Spring	2	
7	Ratchet	2	
8	Friction Spring	1	
9	Bolt 5-10-6.8-7.8	1	
10	Friction Plate	1	
11	Starter Rope Φ 4.5-1620	1	
12	Starter Handle	1	
13	Rope Anchor	1	
14	Sealing Plate	1	
15	Starter Seal	1	
16	Starter Lock	1	

Ref. No.	Description	Q'ty	Remarks
17	Collar 4-6-21	1	
18	Starter Lock Spring	1	
19	Starter Lock Cam	1	
20	Washer	1	M6
21	Screw	1	M6 L=16mm
22	Rod Snap 3.5-2	1	
23	Collar 6.1-8-6.5	1	
24	Starter Lock Cam Spring	1	
25	Screw	1	M4 L=30mm
26	Pre-Coated Bolt 6-25	3	
27	Clamp 6.5-47.5P	1	
28-1	Caution Decal (B)	1	for EU Model
28-2	Caution Decal (B)	1	STD
29	Starter Lock Rod	1	
30	Rod Snap 3.5-2	1	

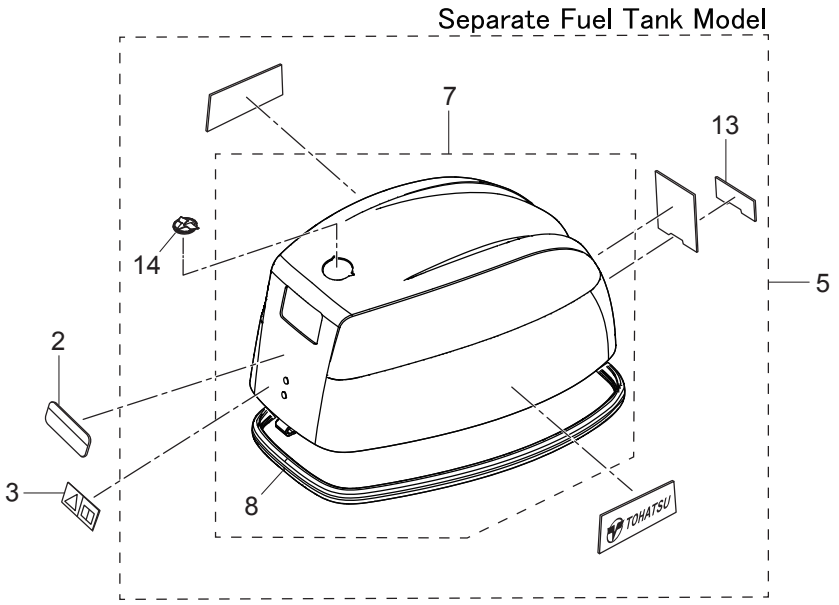
Top Cowl

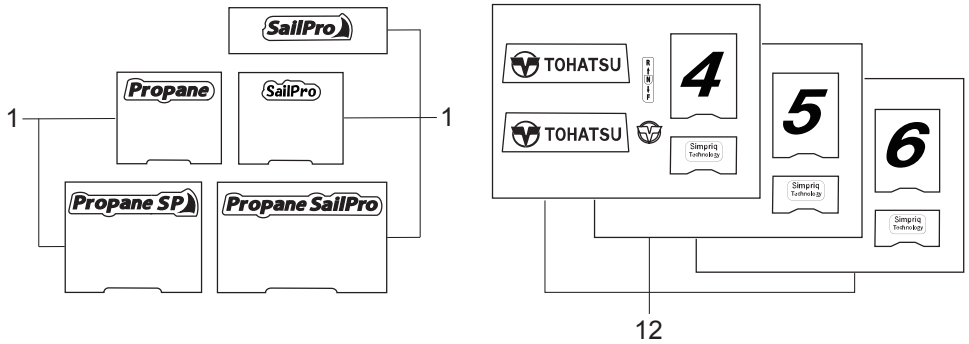
P/C Fig. 11

Dual Fuel Tank Model (Integral Fuel Tank)



Separate Fuel Tank Model





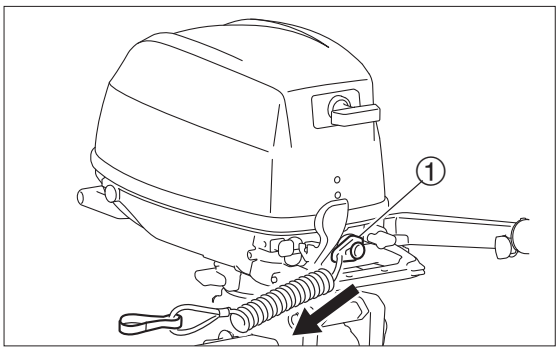
Ref. No.	Description	Q'ty	Remarks
1-1	Sail Pro Decal	1	for Sail Pro (USA)
1-2	Sp Decal	1	for Sail Pro (EU)
2	Caution Decal (A)	1	
3	Caution Decal	1	for EU Model
4	Top Cowl Assy	1	Dual Fuel Tank Model (Integral Fuel Tank)
5	Top Cowl Assy	1	Separate Fuel Tank Model
6	Top Cowl Sub-Assy	1	Dual Fuel Tank Model (Integral Fuel Tank)

Ref. No.	Description	Q'ty	Remarks
7	Top Cowl Sub-Assy	1	Separate Fuel Tank Model
8	Top Cowl Seal	1	
12-1	Decal Set (MFS4D)	1	4ps
12-2	Decal Set (MFS5D)	1	5ps
12-3	Decal Set (MFS6D)	1	6ps
13	Simpliq Decal	1	
14	Logo Decal	1	

3. Inspection Items

1) Inspection of Compression Pressure

1. Run the engine to warm up for 5 minutes, and then stop.



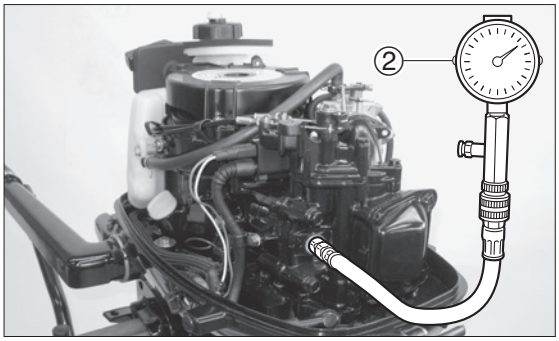
2. Shift gear into neutral (N).

3. Remove lock plate ① (of stop switch lanyard) from stop switch.

> **⚠ CAUTION**
>
> **Remove lock plate (of stop switch lanyard) from stop switch before measuring compression pressure. This will prevent engine from accidental starting.**

4. Remove plug cap and then spark plug.

> **⚠ CAUTION**
>
> **Clean areas around spark plug on the cylinder before removing spark plug to prevent dirt from entering cylinder.**

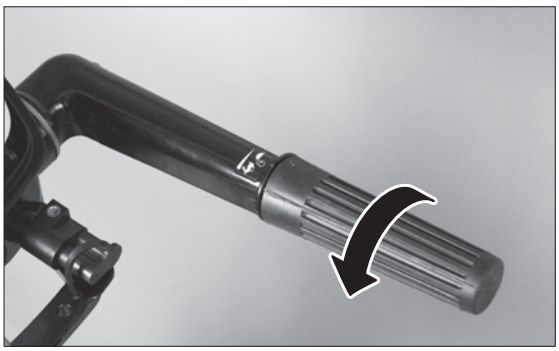


5. Install compression gauge ② to plug hole.

> **Compression gauge ② :**
> P/N. 3AC-99030-0

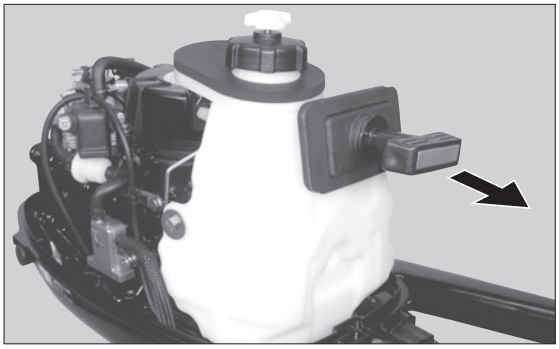
6. Fully open throttle, crank engine until compression gauge ② indication stabilizes, and then read compression pressure.

> **Compression Pressure (Reference) :500 min^{-1} (rpm)**
> With decompressor operate :
> 0.34 MPa (49.3 psi) [3.5 kgf/cm^2]
> Without decompressor operate :
> 0.93 MPa (137.8 psi) [9.5 kgf/cm^2]
> (*Remove Exhaust rocker arm)



- Compression pressure is affected much by cranking speed, and normally changes approximately 10% to 20%.
- Do not pull choke knob when measuring compression pressure.

7. If compression pressure is below specified value, put small amount of engine oil into cylinder, and perform the test again.

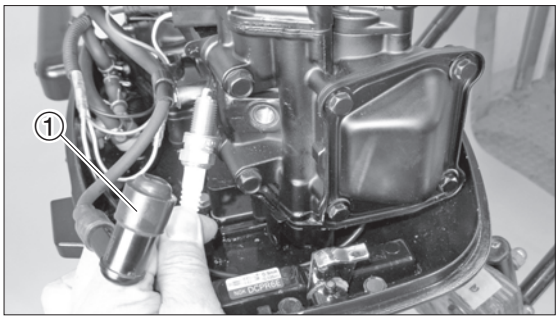


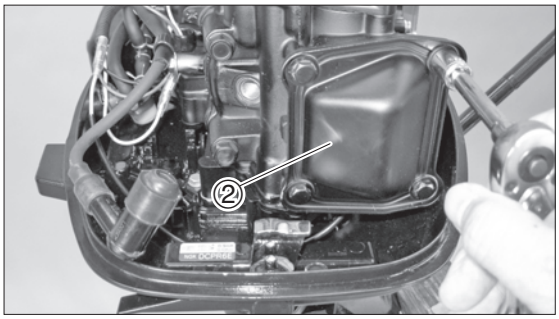
- If compression pressure increases after the above measure, check piston and piston rings for wear. Replace if necessary.
- If compression pressure does not increase after the above measure, check valve clearances, valves, valve seats and cylinder head. Adjust or replace if necessary.

5

2) Inspection of Valve Clearance

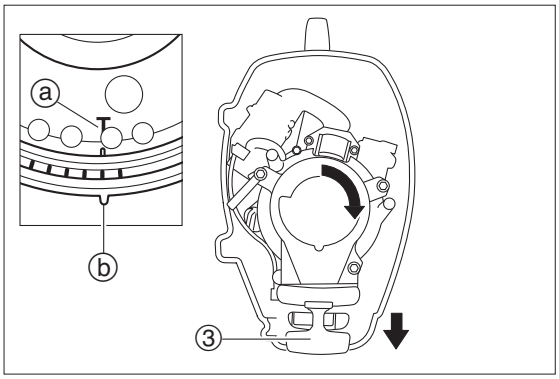
1. Disconnect plug cap ① and then, remove spark plug and cylinder head cover ②.

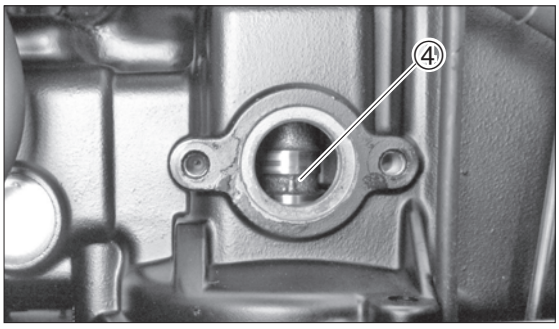




2. Pull recoil starter ③ to turn flywheel clockwise until flywheel "T" mark ⓐ comes cylinder mark ⓑ.

- This step brings piston to top dead center of compression stroke.
- The compression stroke can be known visually when fuel pump is removed. Projection mark ④ on the camshaft is seen in this stroke.
- The piston is at top dead center of compression stroke when flywheel mark and cylinder mark "T" are aligned with each other.

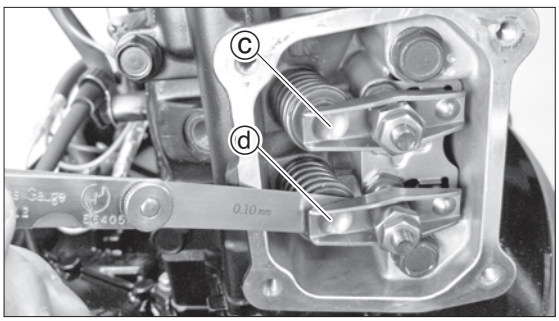




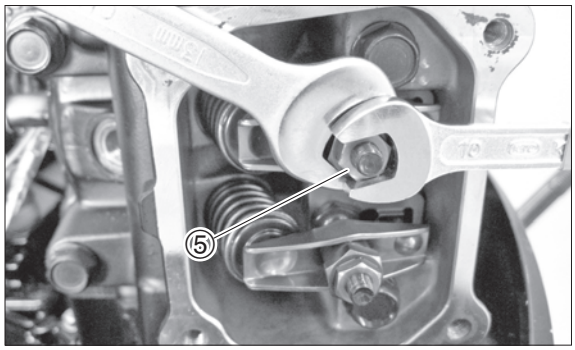
3. Check clearances of intake valve ⓒ and exhaust valve ⓓ. Adjust gap if it is out of specified range.

Perform inspection and adjustment of valve clearances when engine is cold.

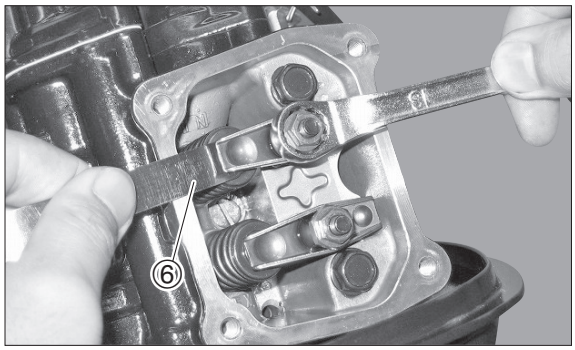
Valve Clearance (when engine is cold) :
(IN) Intake Side ⓒ : 0.06 - 0.14 mm (0.0024 - 0.0055 in)
(EX) Exhaust Side ⓓ : 0.11 - 0.19mm (0.0043 - 0.0075 in)



4. Loosen adjust nut ⑤ and then pivot nut.



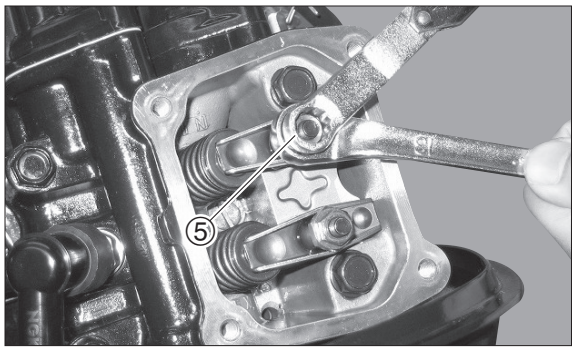
5. Put thickness gauge ⑥ into valve clearance, and then, tighten pivot nut temporarily.



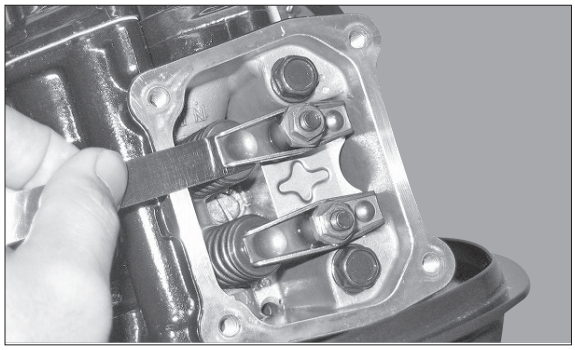
6. Tighten Adjust nut ⑤ to specified torque, and check valve clearance again.

Adjust Nut ⑤ :
10 N · m (7 lb · ft) [1.0 kgf · m]

Torque Wrench :
P/N. 3AC-99070-0
Thickness Gauge :
Use commercially available item.



· Perform inspection and adjustment of valve clearances when engine is cold.
· After the adjustment, turn flywheel twice (top dead center in compression stroke) to check the clearance again.

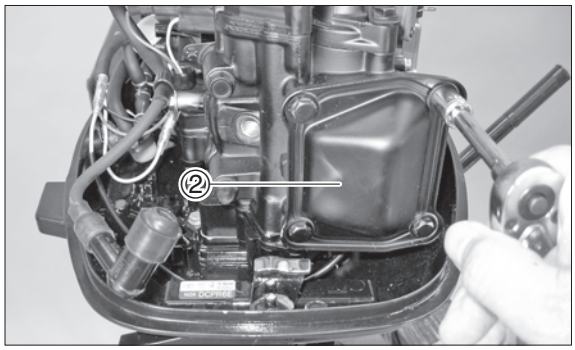


Valve Clearance (when engine is cold) :
(IN) Intake Side ⓒ : 0.06 - 0.14 mm (0.0024 - 0.0055 in)
(EX) Exhaust Side ⓓ : 0.11 - 0.19mm (0.0043 - 0.0075 in)

7. Install cylinder head cover ②, and then, spark plug.

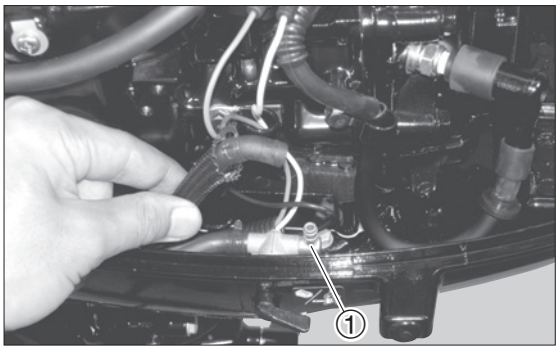
Cylinder Head Cover② :
6 N · m (4 lb · ft) [0.6 kgf · m]

Spark Plug :
18 N · m (13 lb · ft) [1.8 kgf · m]

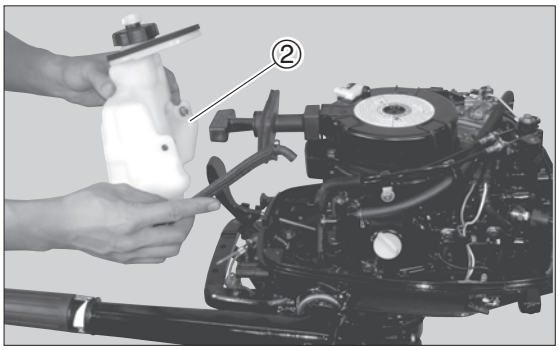


3) Removing Power Unit

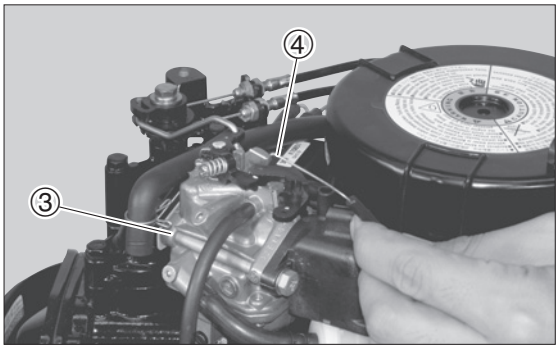
1. Remove fuel from fuel tank before disconnecting fuel hose from fuel cock ① on fuel tank side.



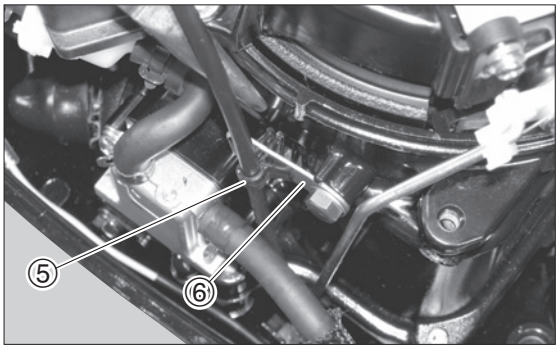
2. Remove fuel tank mounting bolts and then remove fuel tank ②.



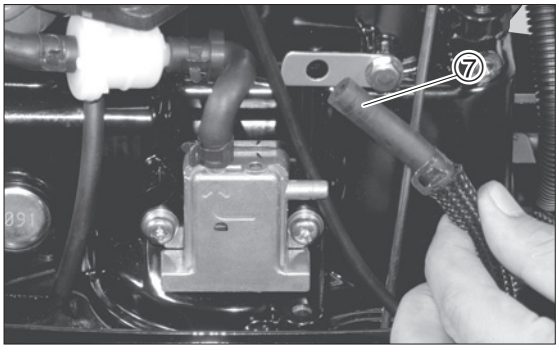
3. Disconnect choke wire ④ from carburetor ③.



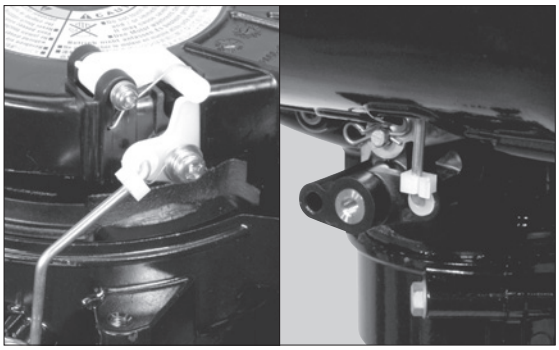
4. Remove choke wire fixing bracket ⑤ from stay ⑥.



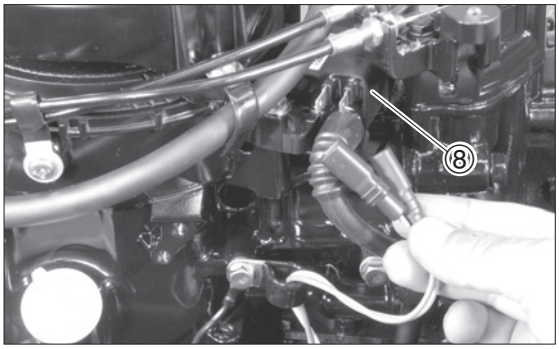
5. Remove fuel hose ⑦ from fuel pump.



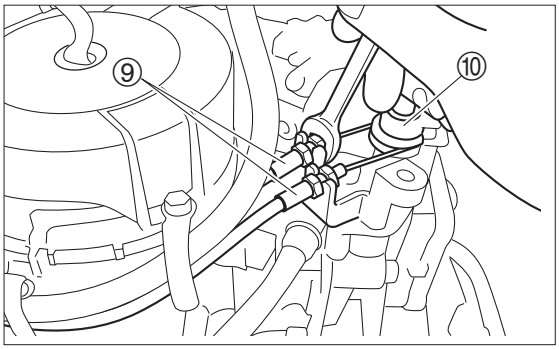
6. Disconnect rod snap lower and upper, and remove starter lock rod.



7. Disconnect wires from igniter ⑧.
   Disconnect ground wire from cylinder.

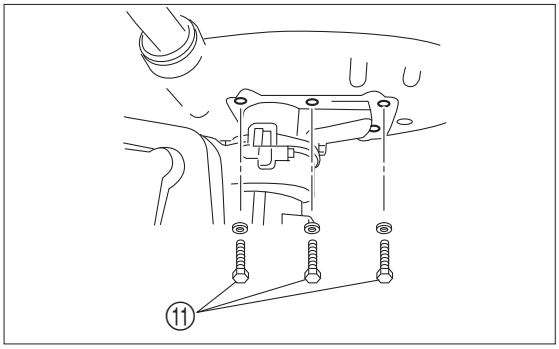


8. Turn throttle grip to full close position, and disconnect throttle cables ⑨ (2 pcs.) from throttle drum ⑩.



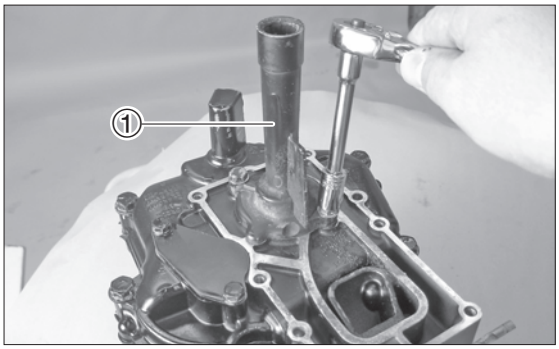
9. Remove bolts ⑪ (6 pcs.), and then, lift power unit to remove.

> When lifting power unit, perform the work carefully and check if cables and hoses are not jammed by other components.

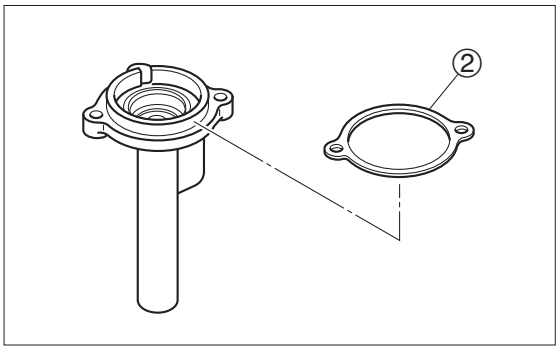


4) Removal and Disassembly of Crank Case Head

1. Remove bolts and remove crank case head ass'y ①.

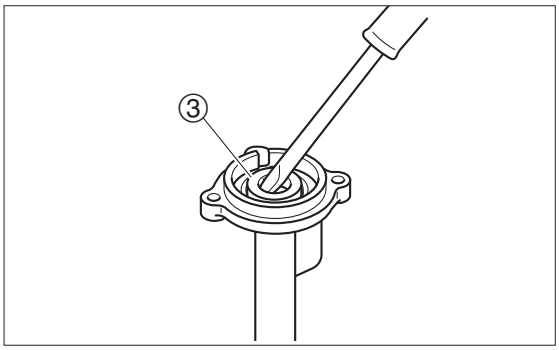


2. Remove gasket ②.



② Do not reuse.

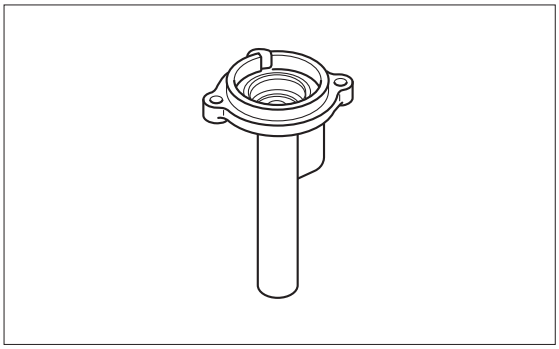
3. Remove two oil seals ③.



③ Do not reuse.

5) Inspection of Crank Case Head

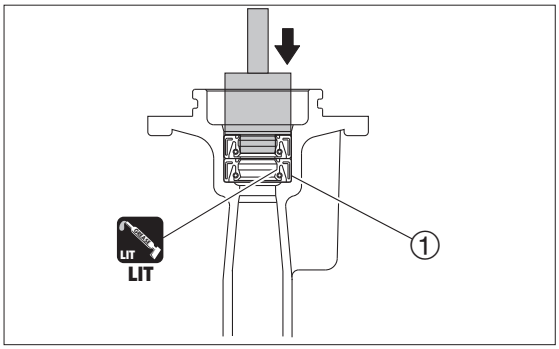
1. Check crank case head for crack, damage and corrosion. Replace if necessary.



6) Assembly of Crank Case Head

1. Attach new oil seal ① to crank case head by using a commercially available mandrel. Apply lithium grease to the lip of oil seal.

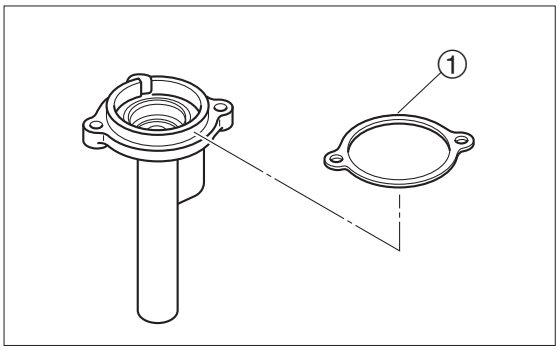
LIT



① Do not reuse.

7) Installation of Crank Case Head

1. Attach a new Gasket ①.



① Do not reuse.

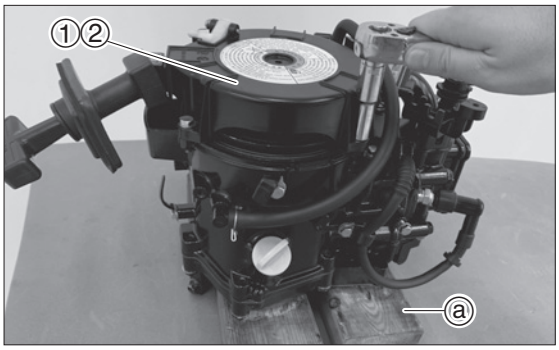
2. Install crank case head ass'y to cylinder block ass'y.

Crank Case Head Bolt :
6 N · m (4 lb · ft) [0.6 kgf · m]

8) Disassembly of Power Unit

1. Place power unit on the work bench ⓐ.

2. Remove recoil starter ① (flywheel cover ②).

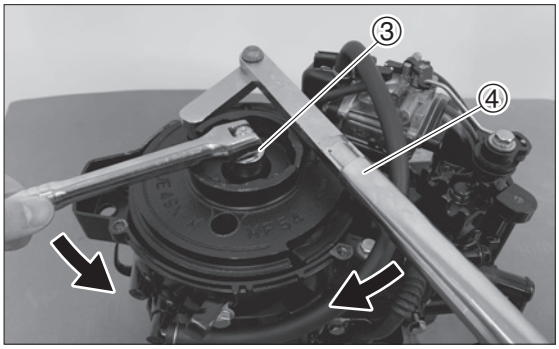


3. Remove flywheel nut ③.

Flywheel Holder ④ : (Commercially available)

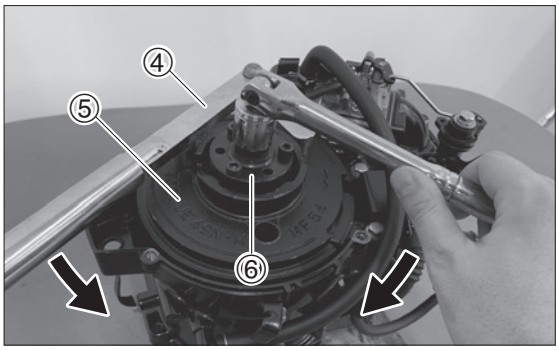
⚠ CAUTION

Apply forces to tools toward directions as shown, and perform work taking care not to allow flywheel holder to slip.



4. Remove flywheel ⑤ and key.

Flywheel Holder ④ : (Commercially available)
Flywheel Puller Kit ⑥ :
P/N. 369-72211-0



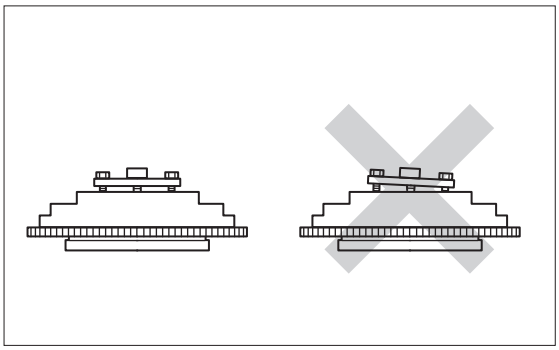
⚠ CAUTION

Apply forces to tools toward directions as shown, and perform work taking care not to allow flywheel holder to slip.

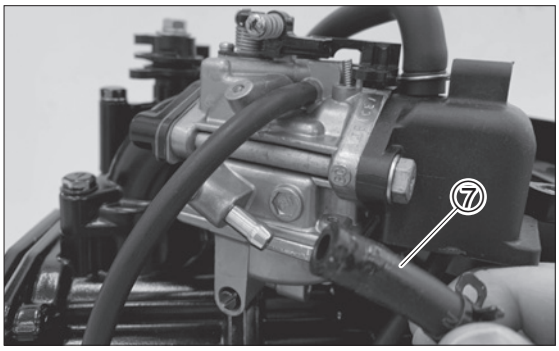
Screw the puller onto crankshaft end until flywheel is disengaged from tapered section of crankshaft.

⚠ CAUTION

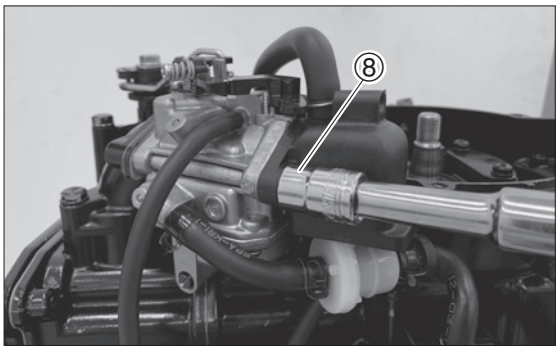
To prevent damages to engine and special tools, tighten flywheel puller set bolts evenly and keep flywheel puller parallel to flywheel while working.



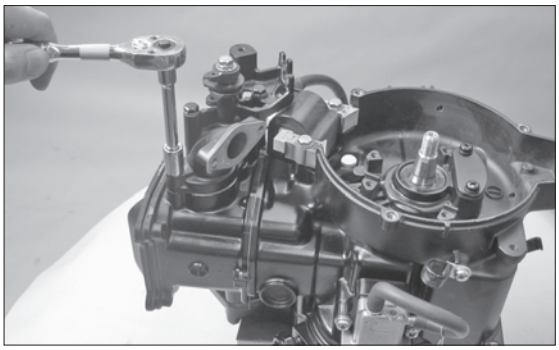
5. Remove fuel hose ⑦ from carburetor.

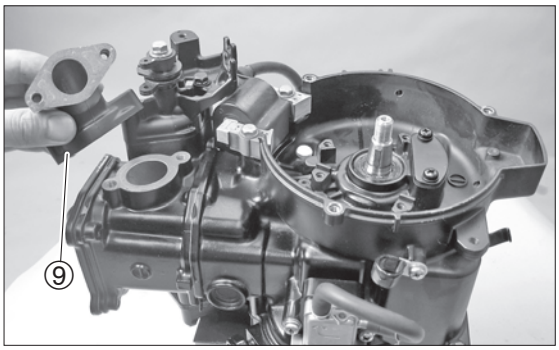


6. Loosen carburetor mounting bolts ⑧ remove with throttle drum link, and remove carburetor.

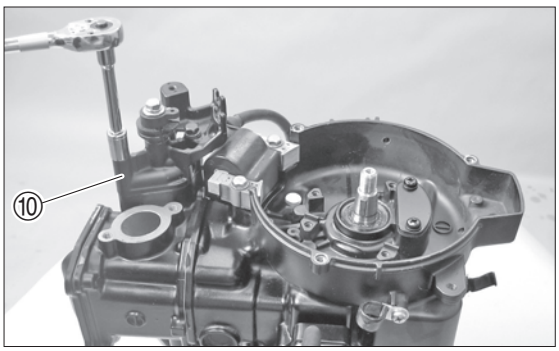


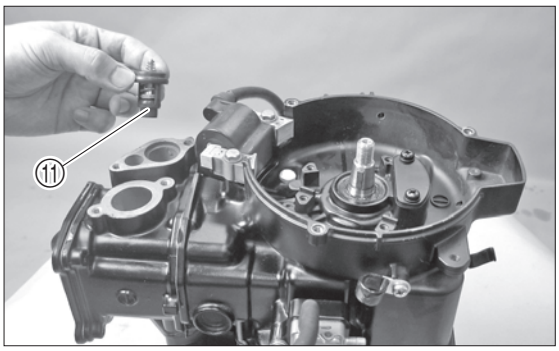
7. Loosen intake manifold mounting bolts and then remove manifold ⑨.





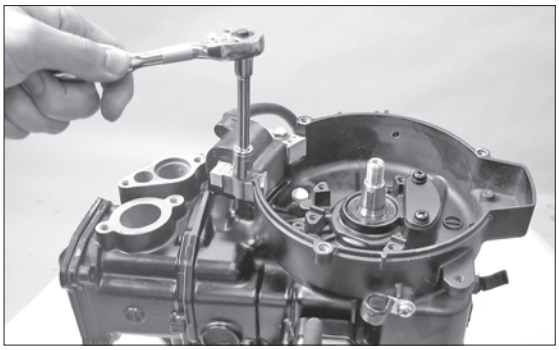
8. Loosen thermostat cap mounting bolts, remove cap ⑩ and then thermostat ⑪.

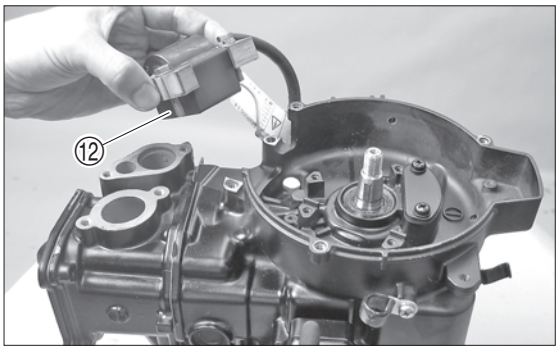




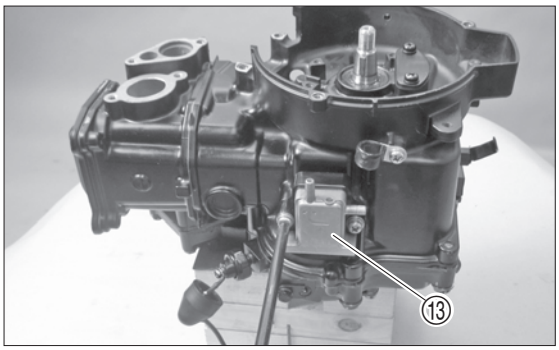
5

9. Loosen igniter mounting bolts and then remove igniter ⑫.



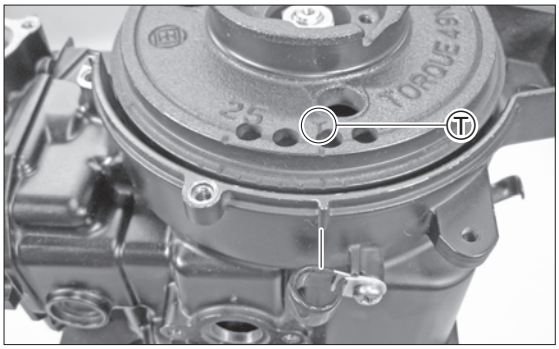


10. Loosen fuel pump mounting screws and then remove fuel pump ⑬.



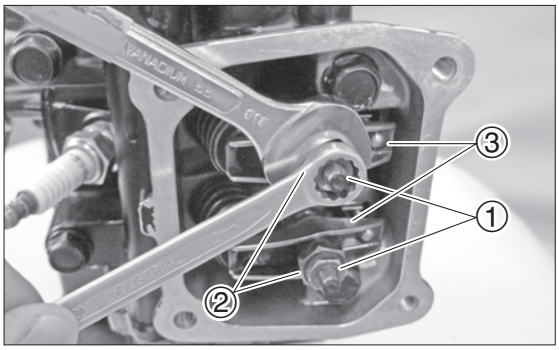
9) Removal of Rocker Arm

1. Check position of flywheel marking Ⓣ to confirm that piston is at top dead center.



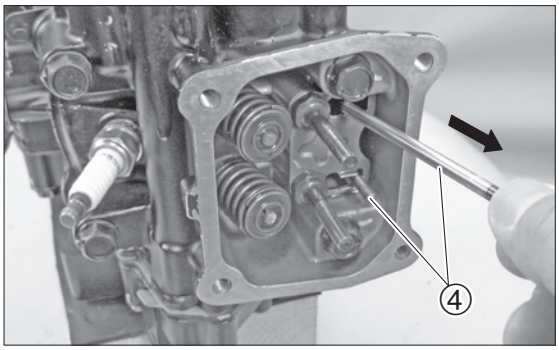
2. Remove bolts and then cylinder head cover.

3. Remove adjust nut ①, and then pivot ② and rocker arm ③.

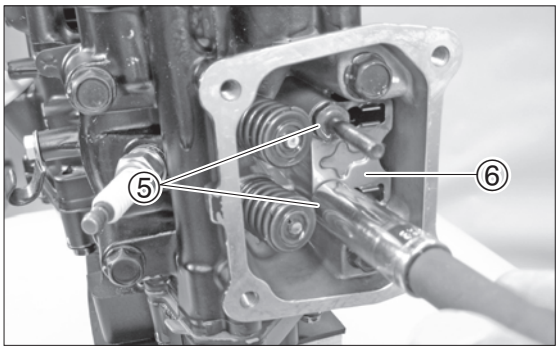


4. Remove push rod ④.

Store “IN” side and “EX” side rocker arms and push rods separately.

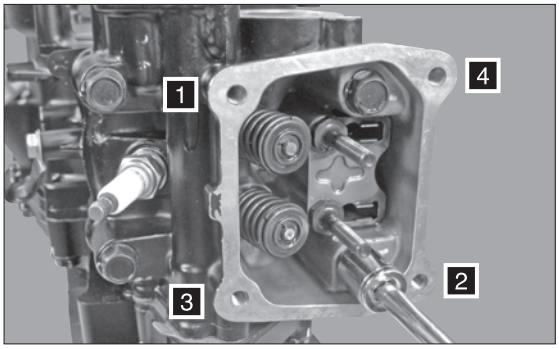


5. Remove pivot bolt ⑤, and then push rod plate ⑥.



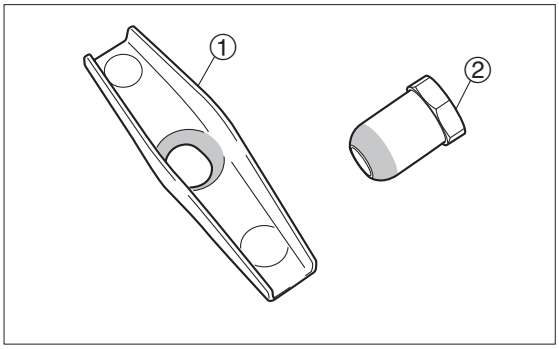
10) Removing Cylinder Head

1. Remove cylinder head bolts in the order shown, and then, remove cylinder head.



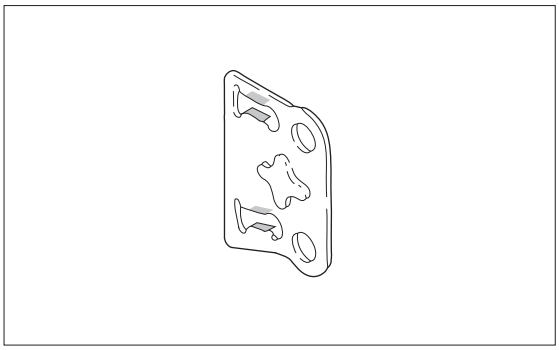
11) Inspection of Rocker Arm and Pivot

1. Check rocker arm ① and pivot ② for crack, wear and damage. Replace if necessary.



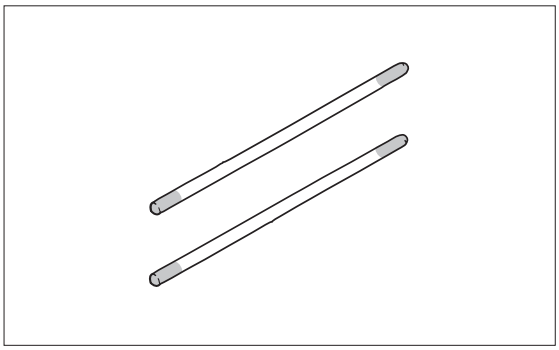
12) Inspection of Push Rod Plate

1. Check push rod plate for crack and damage. Replace if necessary.



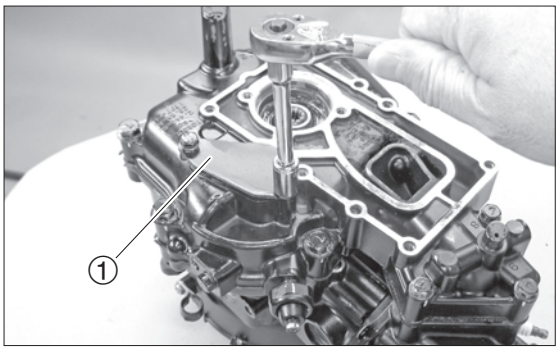
13) Inspection of Push Rod

1. Check push rod for bend, wear and damage. Replace if necessary.

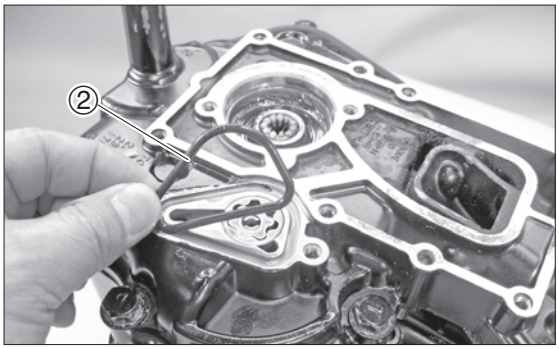


14) Disassembly and Inspection of Oil Pump

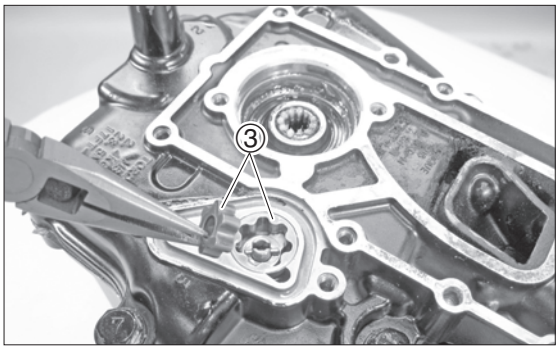
1. Loosen oil pump cover mounting bolts and then pump cover ①.



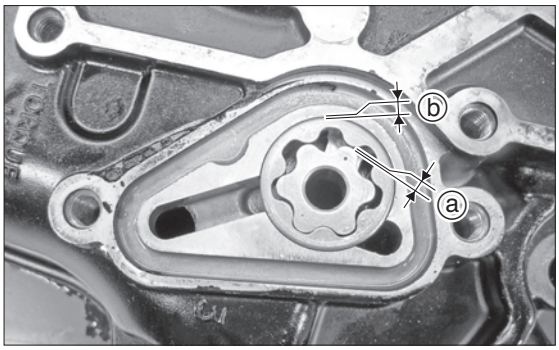
2 Remove oil pump cover O ring ② carefully.



3. Remove oil pump rotors (inner and outer) and oil pump pin, check rotors ③ for damage, and replace if necessary.



4. Check gap ⓐ between inner and outer rotors. Replace outer or inner rotor if the gap is over specified value.

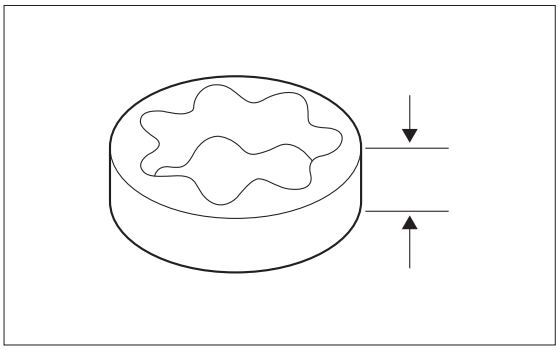


Standard Value:	0.15 mm (0.0059 in)
Functional Limit :	0.2 mm (0.0078 in)

Check gap ⓑ between outer rotor and body. Replace outer rotor or crank case if the gap is over specified value.

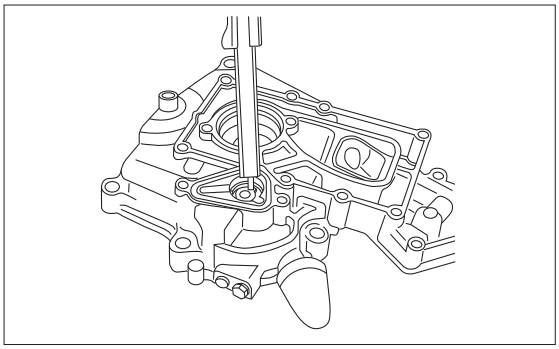
Standard Value:	0.12 - 0.20 mm (0.0047 - 0.0079 in)
Functional Limit :	0.25 mm (0.0098 in)

5. Measure oil pump outer rotor height. Replace outer rotor if the height is less than specified value.



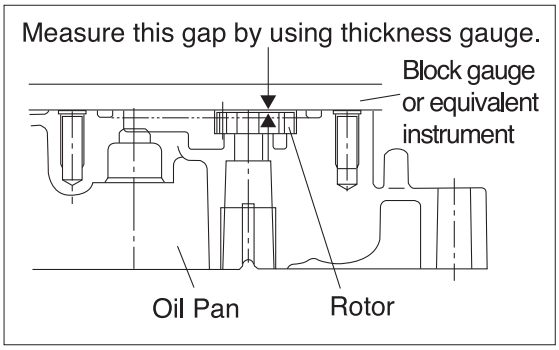
Standard Value:	5.99 mm (0.2358 in)
Functional Limit :	5.96 mm (0.2346 in)

6. Measure pump body depth by using depth gauge or vernier caliper. Replace if over specified limit.



Standard Value:	6.00mm (0.2362 in)
Functional Limit :	6.06 mm (0.2386 in)

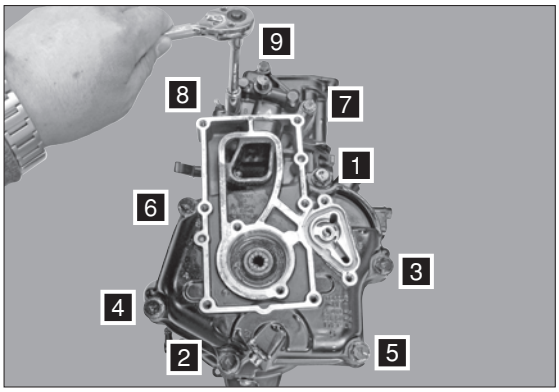
7. Measure side clearance between pump rotor and body by using thickness gauge. Replace if over specified limit.



Standard Value:	0.02 - 0.07 mm (0.0008 - 0.0028 in)
Functional Limit :	Replace if 0.10 mm (0.0039 in)

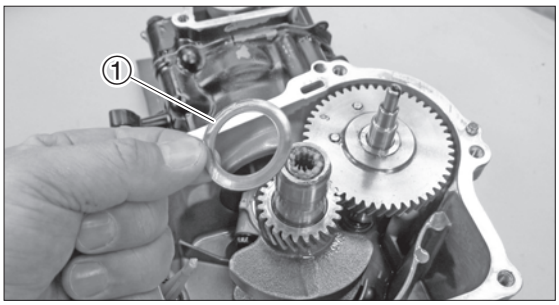
15) Disassembly of Cylinder and Oil Pan

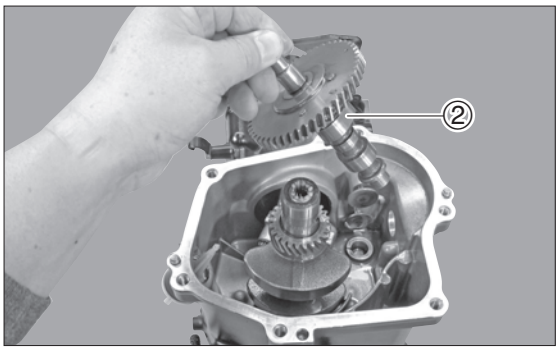
1. Loosen oil pan bolts in the reverse order with referring to the numbers shown, and remove oil pan [9] — [1].



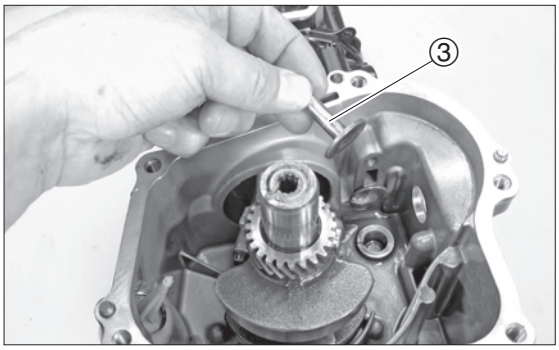
- Wipe off spilt oil completely.
- When tightening bolts, follow the numbers shown.

2. Remove crankshaft washer ① and then camshaft ②.



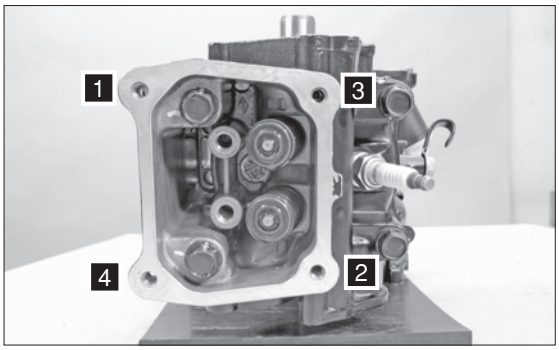


3. Remove lifter ③.

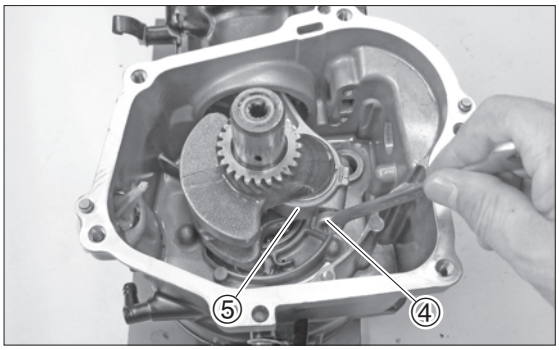


Store “IN” side and “EX” side parts identifiably.

4. Loosen cylinder head mounting bolts, and then remove cylinder head.

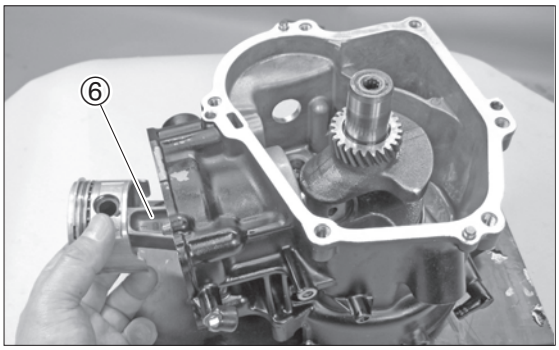


5. Turn crankshaft to a position where connecting rod bolts ④ and connecting rod cap ⑤ can be removed, remove the bolts, and then remove the cap.

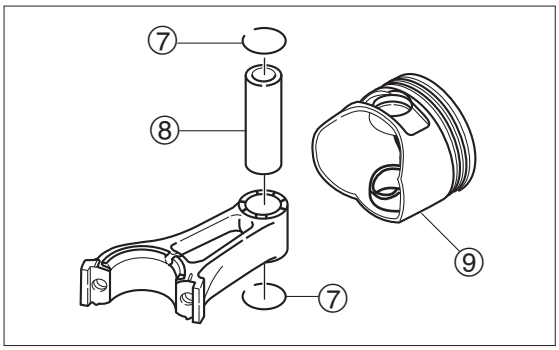


6. Remove connecting rod ⑥ and piston ass'y from cylinder block.

- Removed bearings should be arranged in the order they are removed.
- Do not reuse piston pin clips. Be sure to replace with new ones.

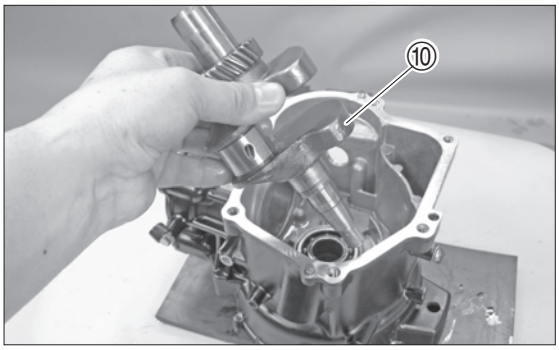


7. Remove piston pin clip ⑦ and piston pin from piston ⑧ and connecting rod ass'y, and then remove piston ⑨.

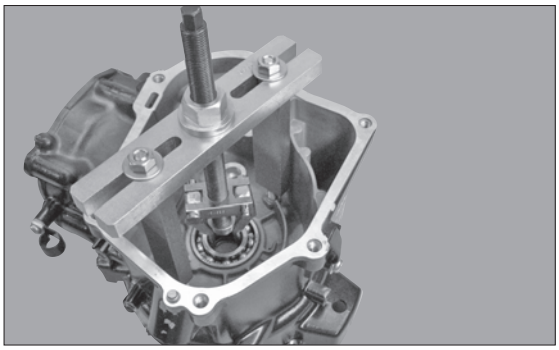


⑦ Piston Pin Clip **Do not reuse.**

8. Take out crankshaft ⑩ from crankcase.



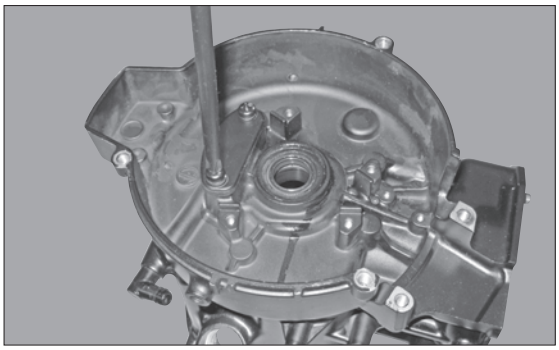
9. Remove bearing from crankcase by using a commercially available bearing puller.



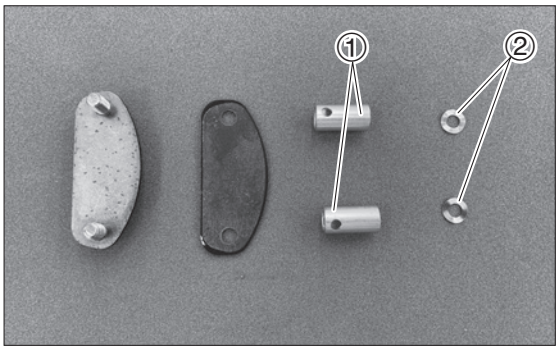
5

16) Disassembly and Inspection of Breather Chamber

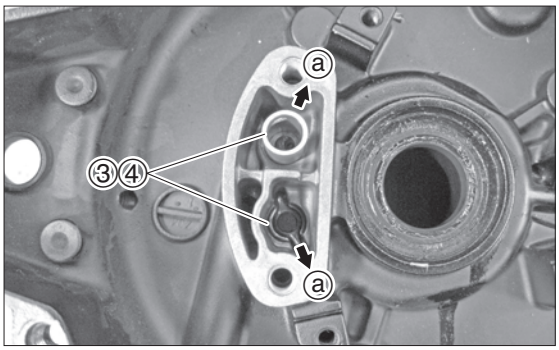
1. Loosen breather cover mounting screws and then remove the cover.



2. Remove two breather collars ① and two wave washers ②, check the parts, and replace if necessary.

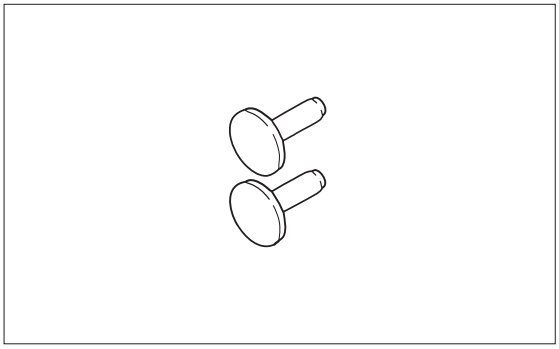


3. Attach breather collars ③ and wave washers ④.
   Position breather collar so that the hole ⓐ is directed as shown.



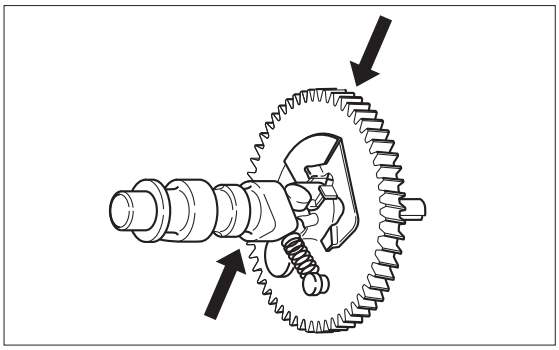
17) Inspection of Lifter

1. Check lifter for bend and wear. Replace if necessary.



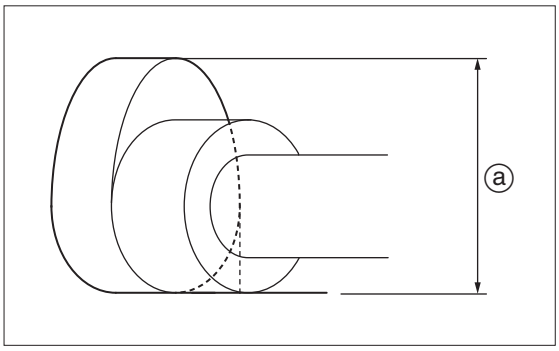
18) Inspection of Camshaft

1. Check camshaft gear and decompressor for damage and wear. Replace if necessary.



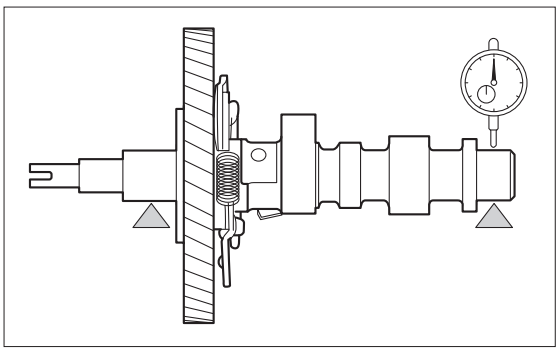
2. Measure cam height. Replace if the diameter is less than specified value.

Cam Height ⓐ, both intake and exhaust : Standard value 28.33 mm (1.1154 in)
Functional Limit : 28.07 mm (1.1051 in)



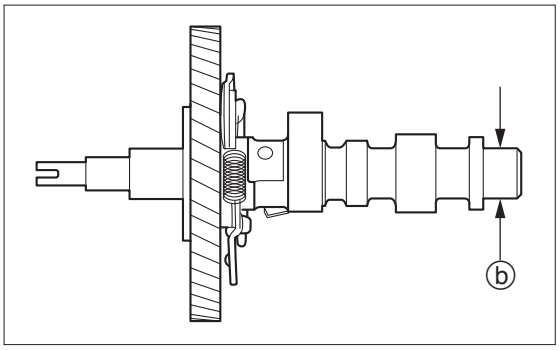
3. Measure camshaft run out. Replace if it is over specified value.

Camshaft Runout Limit : 0.03 mm (0.0012 in)



4. Measure camshaft journal outer diameter ⓑ. Replace if it is less than specified value.

Camshaft Journal Outer Diameter ⓑ : Standard value 13.98 mm (0.5504 in)
Functional Limit ⓑ : 13.95 mm (0.5492 in)

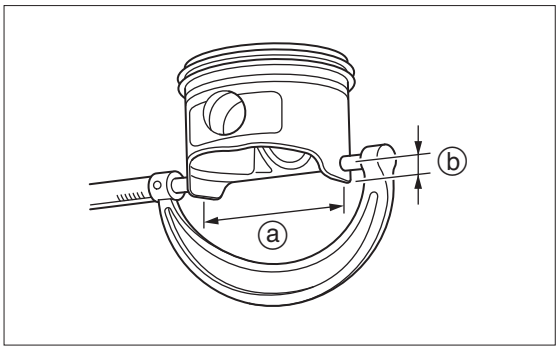


19) Inspection of Piston Outer Diameter

1. Measure piston outer diameter between points specified. Replace if it is less than specified value.

Piston Outer Diameter ⓐ : Standard value
58.96 mm (2.3213 in)
Measuring Point ⓑ :
7mm (0.28 in) upward from the bottom of piston skirt

Functional Limit :
58.90 mm (2.3189 in)



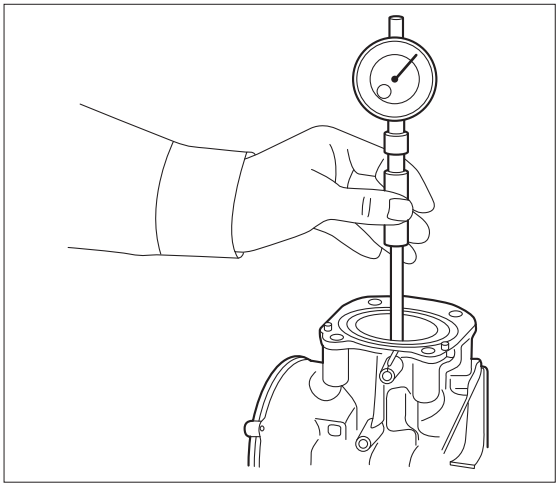
20) Inspection of Cylinder Inner Diameter

1. Measure cylinder inner diameters (D1 - D6) at ⓐ, ⓑ and ⓒ in crankshaft directions ⓓ (D1, D3 and D5 respectively), and in crank web directions ⓔ (D2, D4 and D6 respectively). Replace cylinder block if the inner diameters are over specified value.

Cylinder Inner Diameter (D1 - D6) : Standard value
59.00 mm (2.3228 in)

Functional Limit :
59.07 mm (2.3256 in)

Note : Measure at the maximum wear points.



2. Obtain taper through calculation described below. Replace cylinder block if taper is over specified value.

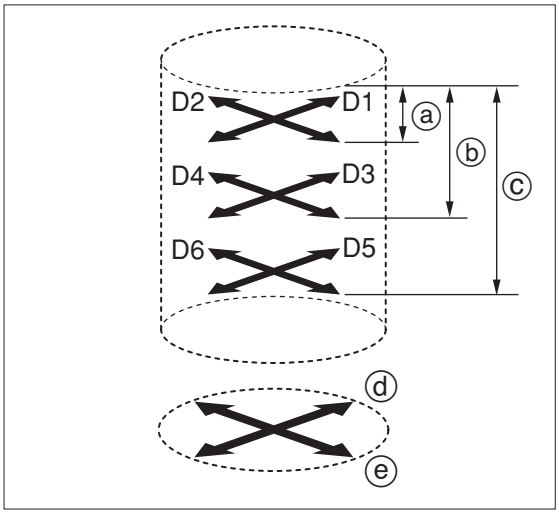
Taper Limit :
D1—D5 (Direction ⓓ)
D2—D6 (Direction ⓔ)

Functional Limit :
0.06 mm (0.0024 in)

3. Obtain out-of-roundness through calculation described below. Replace cylinder block if out-of-roundness is over specified value.

Out-Of-Roundness :
D2—D1 (Measuring Point ⓐ)
D6—D5 (Measuring Point ⓒ)

Functional Limit :
0.06 mm (0.0024 in)



ⓐ 5mm (0.2in) ⓓ Crankshaft Direction
ⓑ 30mm (1.2in) ⓔ Crank Web Direction
ⓒ 60mm (2.4in)

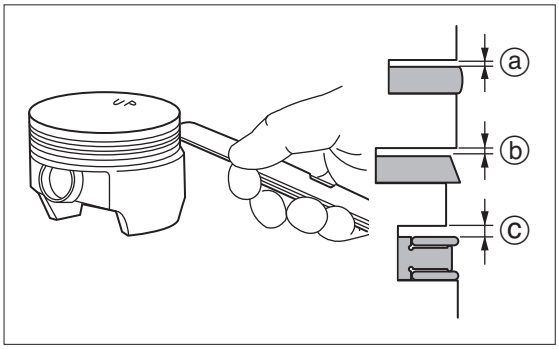
21) Inspection of Piston Clearance

1. If piston clearance is over specified limit, replace cylinder block, piston and piston rings as a set, or both.

Piston Clearance :
0.020 - 0.055 mm (0.00079 - 0.00217 in)

Functional Limit :
0.150 mm (0.00591 in)

22) Inspection of Piston Ring Side Clearance

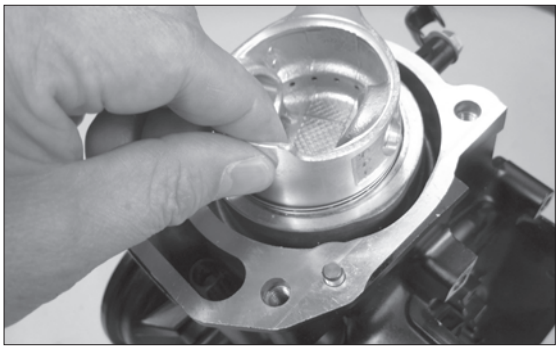


1. Measure piston ring side clearance. Replace piston and piston rings as a set if the clearance is over specified value.

Piston Ring Side Clearance :
Top Ring ⓐ : 0.04 - 0.08mm (0.0016 - 0.0031 in)
Second Ring ⓑ : 0.03 - 0.07mm (0.0012 - 0.0028 in)
Oil Ring ⓒ : 0.01 - 0.18mm (0.0004 - 0.0071 in)

Functional Limit
Top Ring ⓐ : 0.10 mm (0.0039 in)
Second Ring ⓑ : 0.09 mm (0.0035 in)
Oil Ring ⓒ : 0.21 mm (0.0083 in)

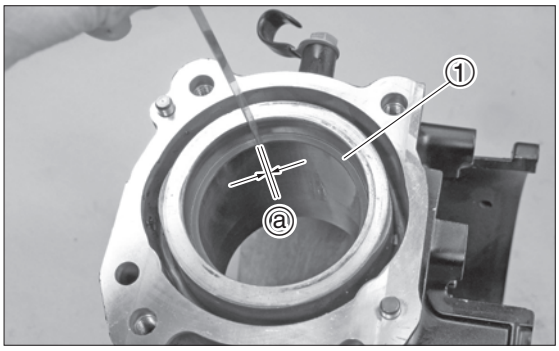
23) Inspection of Piston Rings



1. Push piston ring ① into ring gauge 55.000mm (2.16535in) parallel to top edge. If the gauge is not available, measure at the top or bottom of cylinder bore with no wear.

2. When ring gauge is not available, use piston crown to push piston ring ① into to cylinder parallel to top edge.

Measure at the top or bottom of cylinder bore with no wear.



3. Measure piston ring closed gap ⓐ. Replace if it is over specified value.

Piston Ring Closed Gap ⓐ :
Top Ring : 0.15 - 0.30 mm (0.0059 - 0.0138 in)
Second Ring : 0.30 - 0.50 mm (0.0118 - 0.0197 in)
Oil Ring : 0.20 - 0.40 mm (0.0079 - 0.0157 in)

Functional Limit :
Top Ring : 0.50 mm (0.0197 in)
Second Ring : 0.70 mm (0.0276 in)

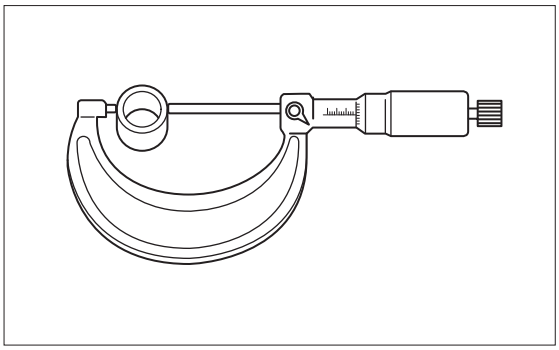
Replace oil ring together with top ring or second ring when the ring is replaced.

5

24) Inspection of Piston Pin

1. Measure piston pin outer diameter. Replace if it is less than specified value.

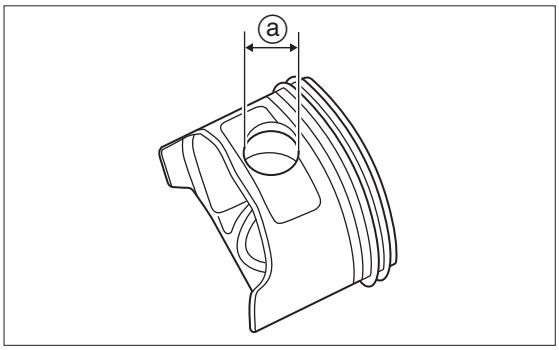
Piston Pin Outer Diameter : Standard value 16.00 mm (0.6299in)
Functional Limit : 15.97 mm (0.6287 in)



2. Measure piston pin boss hole inner diameter ⓐ.

3. Obtain clearance between piston pin and pin boss. Replace piston pin or piston if the clearance is over specified value.

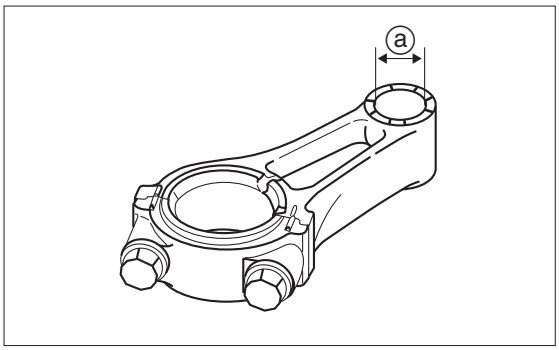
Clearance between Piston Pin and Pin Hole : 0.002 - 0.012 mm (0.00008 - 0.00047 in)
Functional Limit : 0.040 mm (0.00157 in)



25) Inspection Connecting Rod Small End Inner Diameter

1. Measure connecting rod small end inner diameter ⓐ. Replace if it is over specified value.

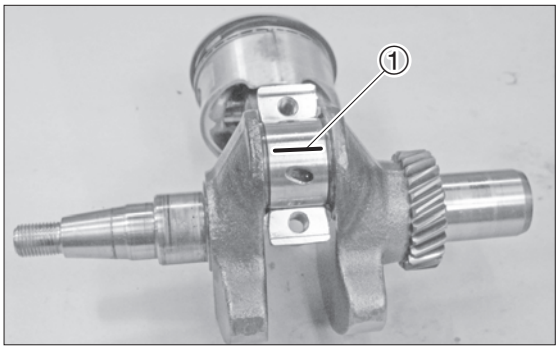
Connecting Rod Small End Inner Diameter ⓐ : Standard value 14.01 mm (0.5516 in)
Functional Limit : 14.04 mm (0.5528 in)



26) Inspection of Connecting Rod Big End Inner Diameter

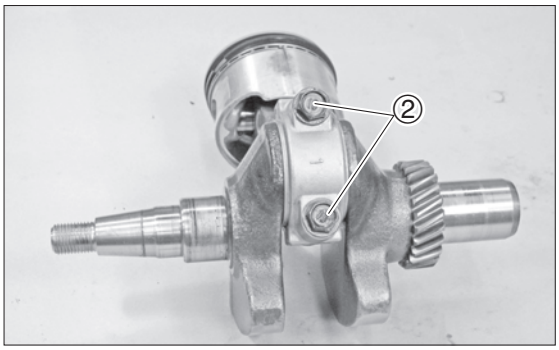
1. Wipe off oil from crankshaft and connecting rod big end bearing.

2. Set plastic gauge ① on the crank pin.

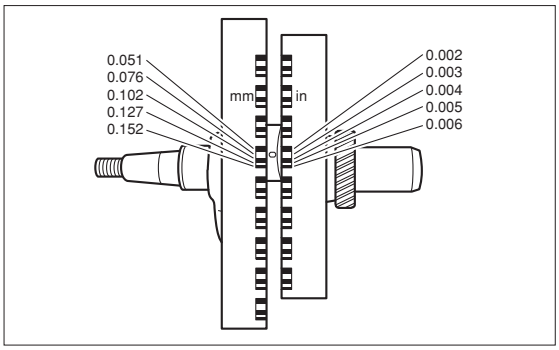


3. Install connecting rod and tighten bolts to specified torque.

Connecting Rod Bolts ② : 1st tightening torque : 6 N · m (4 lb · ft) [0.6 kgf · m] 2nd tightening torque : 12 N · m (9 lb · ft) [1.2 kgf · m]



4. Remove connecting rod and measure crashed width of plastic gauge.

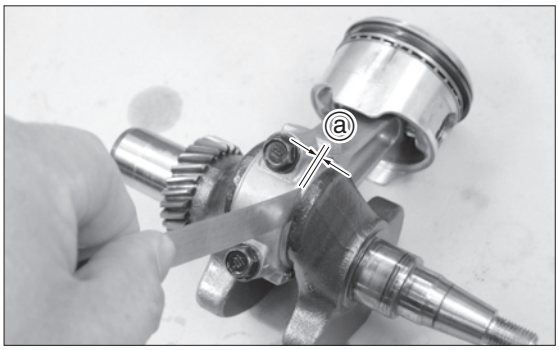


Connecting rod big end and crankshaft clearance: corresponding value
0.040 - 0.066 mm (0.00157 - 0.00260 in)

Functional Limit :
0.080 mm (0.00315 in)

27) Inspection of Connecting Rod Big End Side Clearance

1. Measure connecting rod big end side clearance ⓐ by using a commercially available thickness gauge. Replace connecting rod and/or crankshaft if the clearance is over specified value.

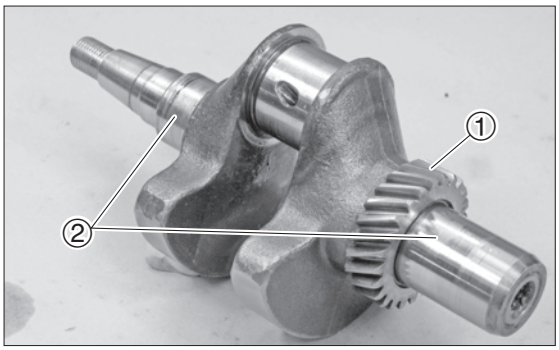


Connecting Rod Big End Side Clearance ⓐ :
0.20 - 0.40 mm (0.0079 - 0.0157 in)

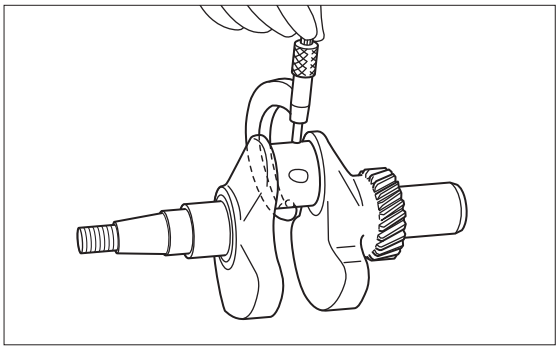
Functional Limit :
0.70 mm (0.0276 in)

28) Inspection of Crankshaft

1. Check crankshaft gear ① and bearing ② for damage and wear. Replace crankshaft ass'y or bearing if necessary.



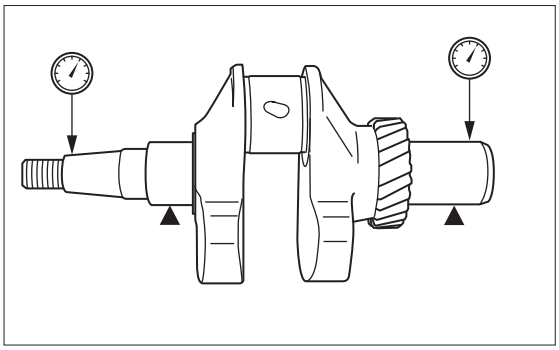
2. Measure crank pin outer diameter. Replace crankshaft if outer diameter is less than specified value.



Crank Pin Outer Diameter : Standard value
29.95 mm (1.1791 in)

Functional Limit :
29.92 mm (1.1780 in)

3. Measure crankshaft runout. Replace crankshaft or bearing if outer diameter is less than specified value.

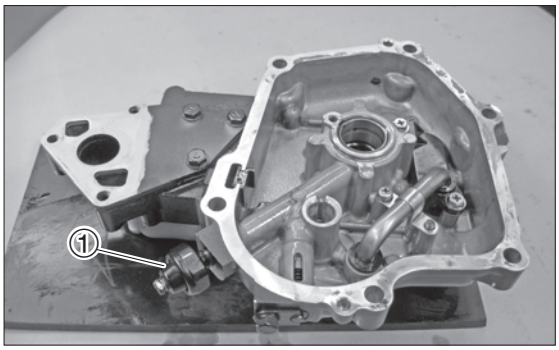


Crankshaft Runout Limit :
0.05 mm (0.0020 in)

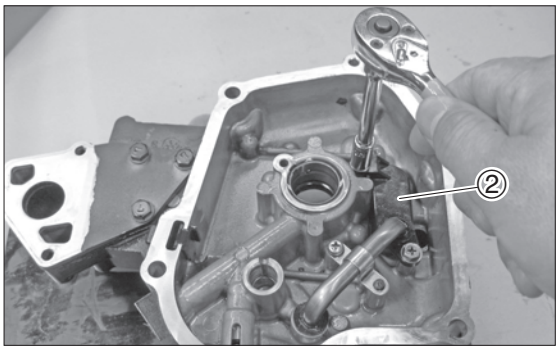
Use V blocks to support crankshaft at bearing part.

29) Disassembly and Inspection of Oil Pan

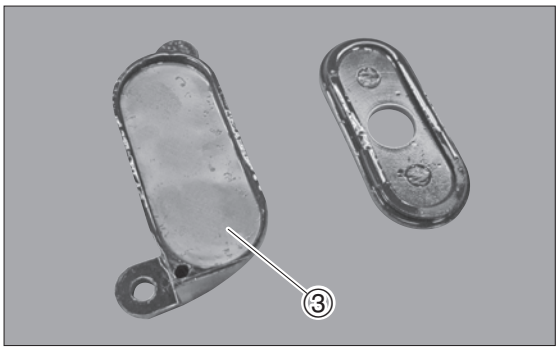
1. Remove oil pressure switch ① from oil pan.



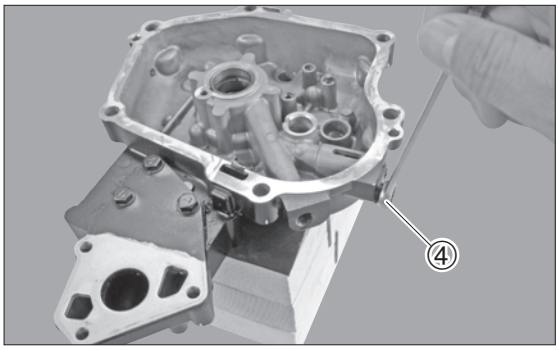
2. Loosen oil strainer cover mounting bolts and strainer pipe mounting bolts, and then remove cover ②.



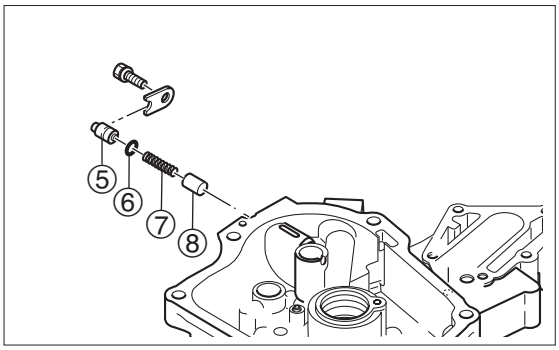
3. Check oil strainer cover screen mesh ③ for dirt and clogging.
   Clean, or replace if necessary.



4. Disassemble oil pressure control valve. Loosen plunger cover mounting bolt ④ and remove the cover.

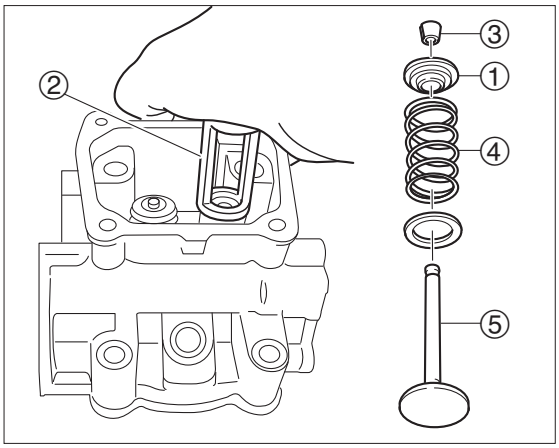


5. Remove spring seat ⑤, O ring ⑥, pressure spring ⑦ and plunger control ⑧ and check the parts.
   Replace if necessary.



30) Removal of Valves and Springs

1. Place cylinder head on the work bench. Push in valve spring retainer ① by using valve spring compressor attachment ②, remove cotter pin ③, and then, remove spring ④ and valve ⑤.



- Place a piece of cloth below cylinder head to prevent valves from moving downward.
- Valves, springs and other related parts should be arranged in the order they are removed.

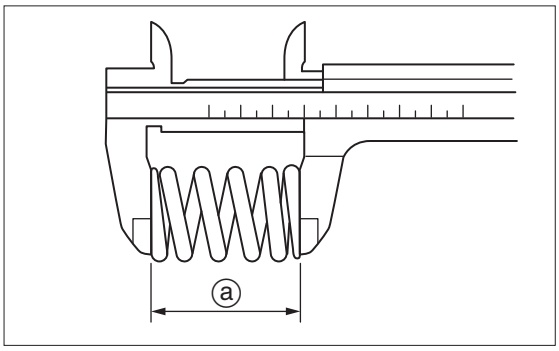
Valve Spring Compressor Attachment ② :
P/N. 3AB-99076-0

31) Inspection of Valve Springs

1. Measure valve spring free length ⓐ. Replace if the length is less than functional limit.

Valve Spring Free Length ⓐ : Standard value
35.0 mm (1.38 in)

Functional Limit :
33.2 mm (1.31 in)



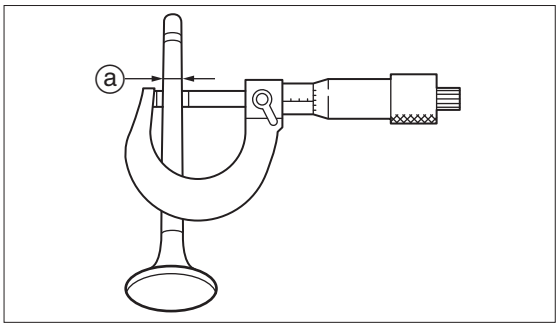
32) Inspection of Valve

1. Check valve for dent and wear on the face. Replace if necessary.

2. Measure valve stem outer diameter ⓐ. Replace if it is less than specified value.

Valve Stem Outer Diameter ⓐ : Standard value
Intake Side (IN) : 5.47 mm (0.2154 in)
Exhaust Side (EX) : 5.44 mm (0.2142 in)

Functional Limit :
Intake Side (IN) : 5.45 mm (0.2146 in)
Exhaust Side (EX) : 5.41 mm (0.2130 in)



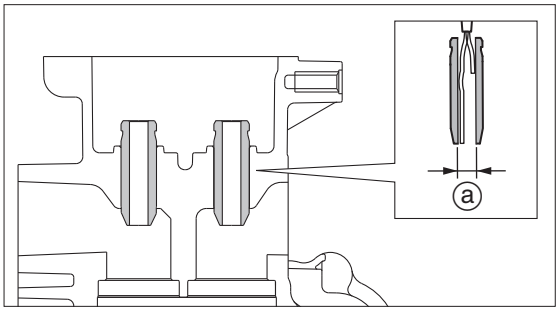
33) Inspection of Valve Guide

Before inspecting valve guide, check that valve stem outer diameter is within functional limit.

1. Measure valve guide inner diameter ⓐ. Replace cylinder block if it is over specified value.

Valve Guide Inner Diameter ⓐ : Standard value
Intake and Exhaust Sides : 5.51 mm (0.2169 in)

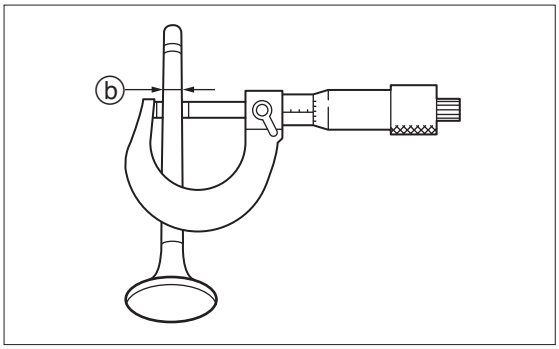
Functional Limit :
Intake Side (IN) : 5.54 mm (0.2181 in)
Exhaust Side (EX) : 5.57 mm (0.2193 in)



2. Obtain clearance between valve guide and valve stem by calculating as described below. Replace cylinder head and/or valve if the clearance is over specified value.

Clearance between Valve Guide and Valve Stem =
Valve Guide Inner Diameter ⓐ - Valve Stem Outer Diameter ⓑ :
Intake Side (IN) : 0.024 - 0.044 mm (0.00079 - 0.00173 in)
Exhaust Side (EX) : 0.045 - 0.072 mm (0.00177 - 0.00283 in)

Functional Limit
Intake Side (IN) : 0.070 mm (0.00276 in)
Exhaust Side (EX) : 0.100 mm (0.00394 in)



34) Inspection of Valve Seat

1. Remove carbon built up on the valve.

2. Apply thin coat of red lead on the valve seat.

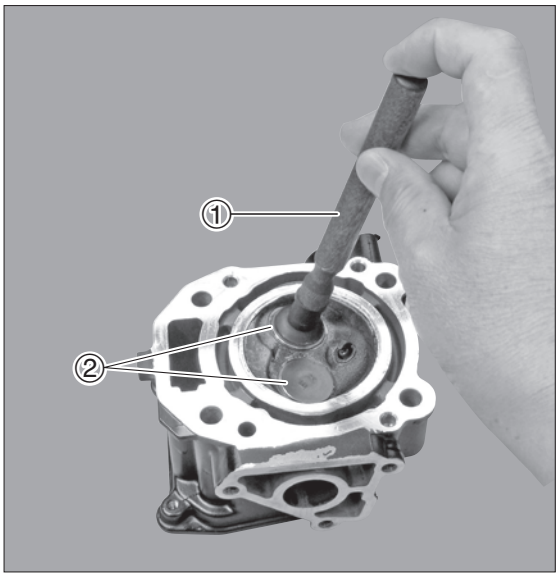
3. Use valve lapper ① (commercially available item) as shown to push valve ② onto valve seat lightly.

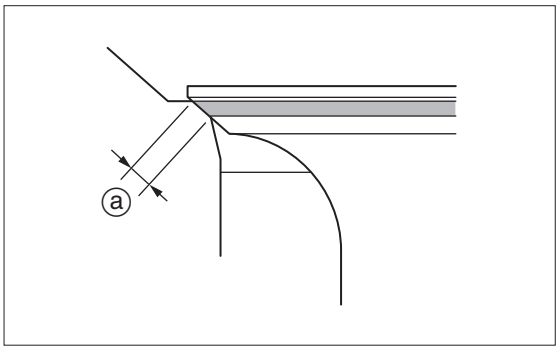
4. Measure width of area where valve face contacted with valve seat ⓐ that can be identified with red lead adhered to valve face. Correct valve seat if contact area is above or below the center or contact area of valve seat is over specified limit.

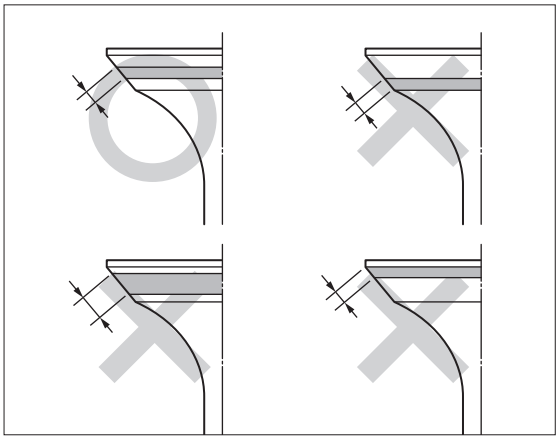
Valve Seat Contact Width ⓐ : Standard value
Intake and Exhaust Sides : 0.8 mm (0.0315 in)

Functional Limit :
Intake and Exhaust Sides : 1.8 mm (0.0709 in)

- Thinly apply lapping compound on the valve seat, and perform lapping by rotating and tapping valve lapping tool.
- Use coarse lapping compound first, then medium and fine in this order.
- When changing abrasive compound to finer one, remove present one completely.
- After completing lapping, wipe off compound and then clean the parts.



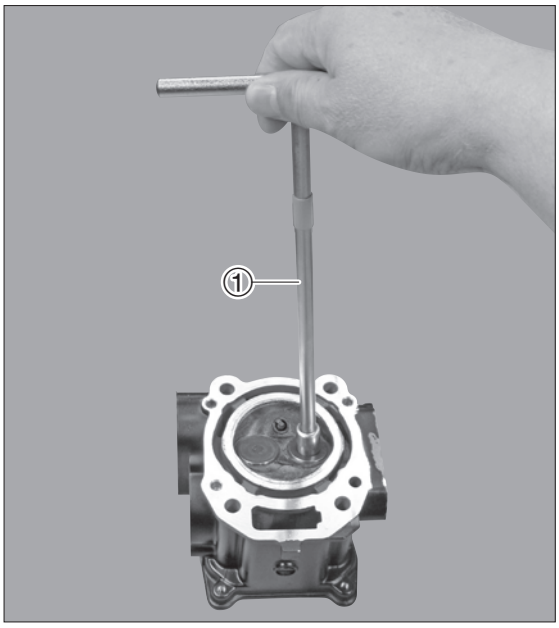


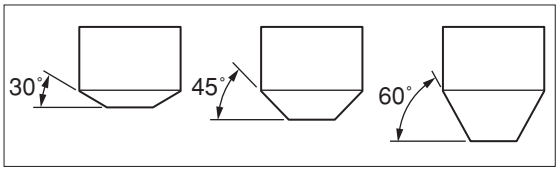


5

35) Correction of Valve Seat

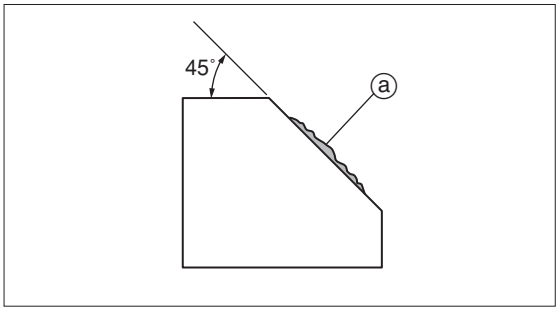
1. Use valve seat cutter ① (commercially available item) to correct valve seat.





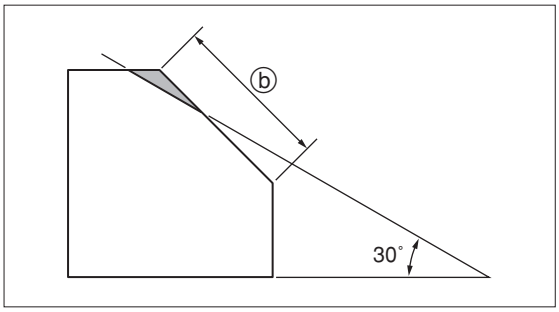
2. Turn 45 degree cutter clockwise to cut valve seat surface to make it smooth.

> Be careful not to over-cut valve seat. Turn valve seat cutter while pushing down evenly.



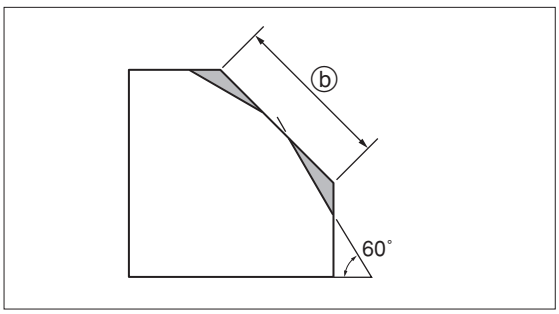
ⓐ Carbon build-up or uneven surface.

3. Use 30 degree cutter to adjust contact position of valve seat upper end.



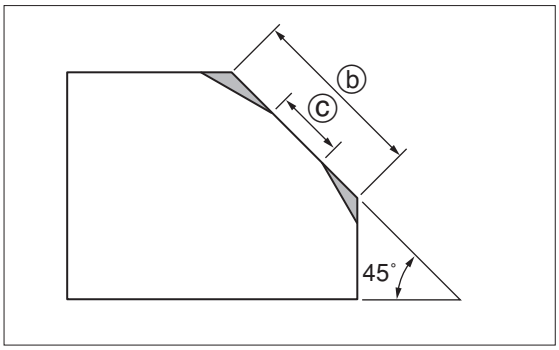
ⓑ Width before correction

4. Use 60 degree cutter to adjust contact position of valve seat lower end.



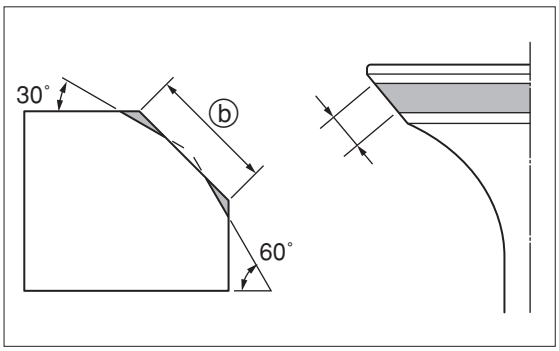
ⓑ Width before correction

5. Use 45 degree cutter to adjust contact width of valve seat ⓒ to specified value.



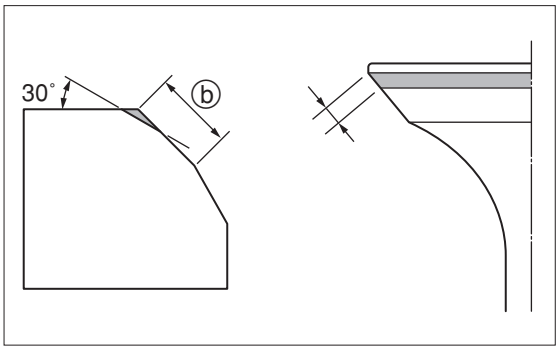
ⓑ Width before correction
ⓒ Specified width

6. Valve seat contact area is located on the center, which should be adjusted to specified value by cutting upper and lower ends by using 30 degree and 60 degree seat cutters respectively if the area is too wide.



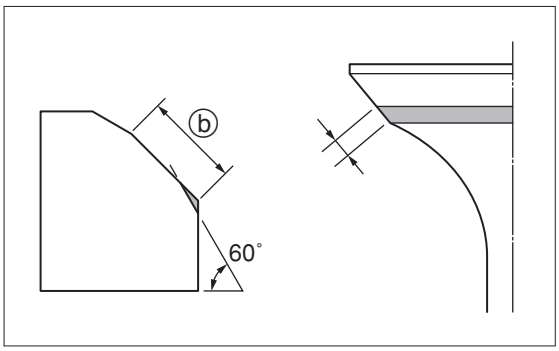
ⓑ Width before correction

7. If valve seat contact area is narrow and is located nearer to valve face upper end, use 30 degree seat cutter to cut upper end. If necessary, use 45 degree cutter to adjust contact width of valve seat to specified value.



ⓑ Width before correction

8. If valve seat contact area is narrow and is located nearer to valve face lower end, use 60 degree seat cutter to cut lower end. If necessary, use 45 degree cutter to adjust contact width of valve seat to specified value.



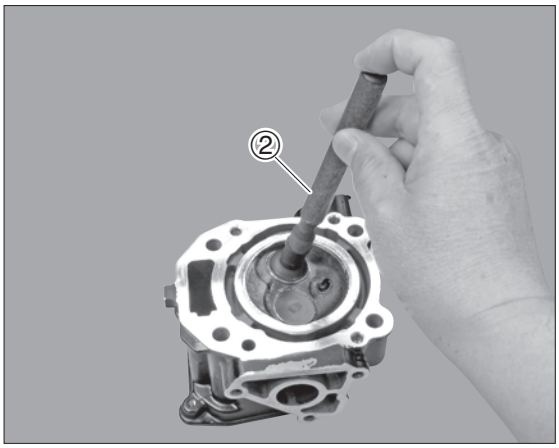
ⓑ Width before correction

9. Apply thin coat of abrasive compound on the overall valve seat contact area, and turn valve lapper ② (commercially available item) while tapping valve.

⚠ CAUTION

Perform the work by taking care not to allow abrasive compound to adhere to valve stem and valve guide.

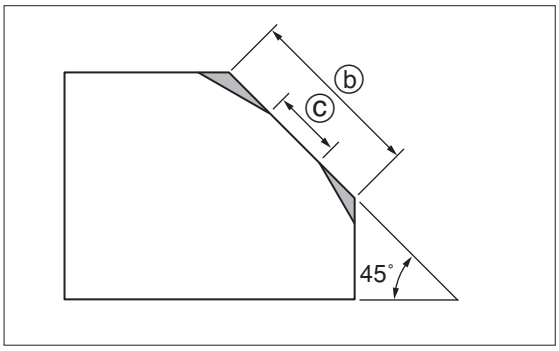
- Use finer abrasive compound to finish.
- When changing abrasive compound to finer one, remove present one completely.
- After completion of lapping, wipe off the compound and then clean.



10. After ending the work, remove the compound completely from cylinder head and valve.

11. Check valve seat contact width ⓒ.

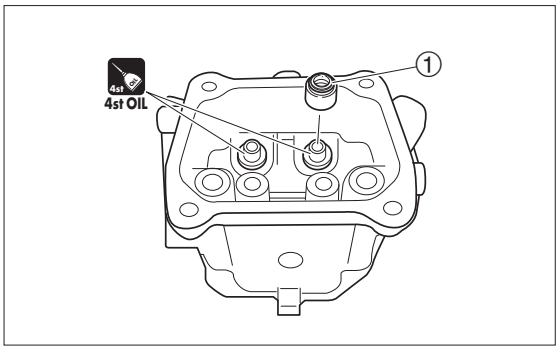
Valve Seat Contact Width ⓒ : Standard value
0.8 mm (0.0315 in)



ⓑ Width before correction
ⓒ Specified width

36) Installation of Valves

1. Apply oil to valve guide and attach new valve stem seal ①.

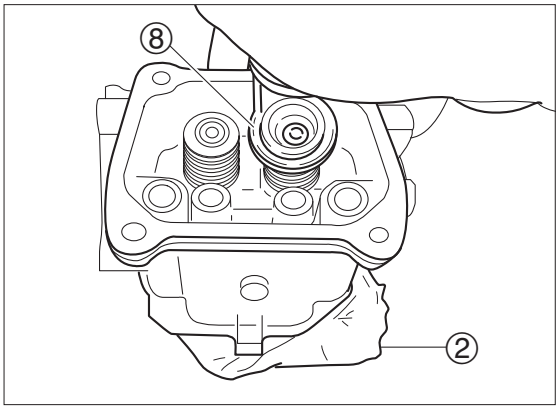


Intake Side : Black
Exhaust Side : Green
Do not reuse the seal. Use new one.

4st OIL

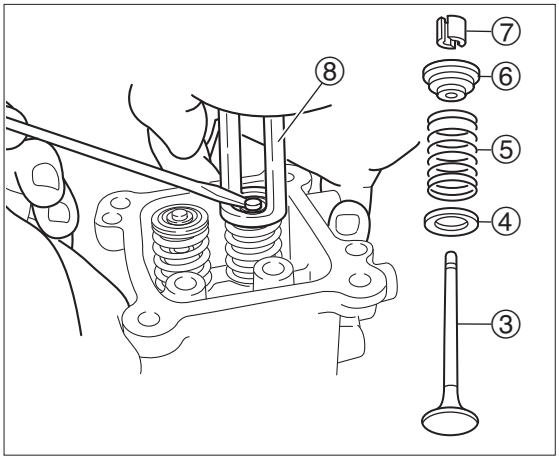
2. Assemble valve ③, valve spring seat ④, valve spring ⑤ and retainer ⑥ in this order, and then, push in the assembly by using valve spring compressor attachment ⑧.

Valve Spring Compressor Attachment ⑧ :
P/N. 3AB-99076-0

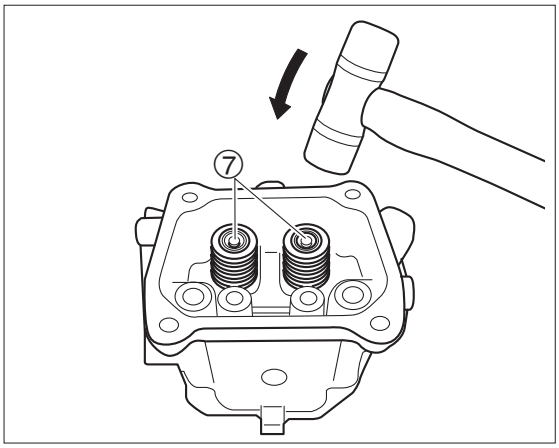


- Valve spring can be put from any end.
- Place a piece of cloth ② below cylinder head to prevent valve from lowering.

3. With valve spring ⑤ being pushed in, use small screw driver with small amount of grease at the tip to put cotter ⑦.



4. Remove cylinder block from work bench. Tap valve ③ with plastic hammer to fix cotter ⑦ securely.

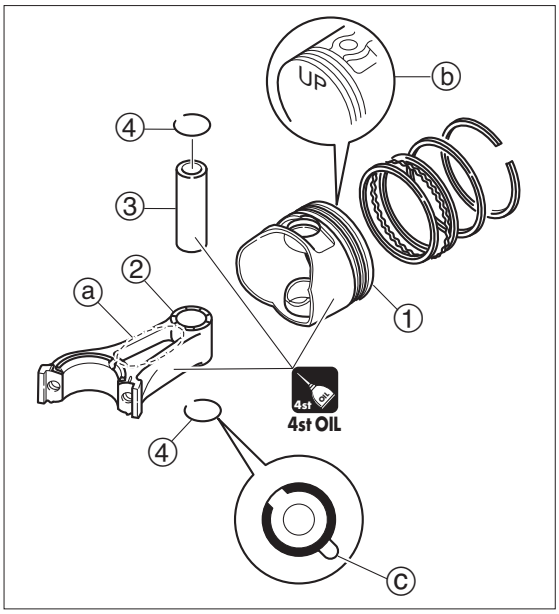


37) Installation of Piston and Connecting Rod

1. Install connecting rod ②, piston pin ③, and piston pin clip ④ to piston ①.

- Point "3AB-UP" mark ⓐ of connecting rod and "UP" mark ⓑ of piston to the same direction.
- Be sure to use new piston pin clip, and place clip gap away from piston pin groove ⓒ as shown.
- Be sure to install the connecting rod cap in original position (direction).

4st OIL

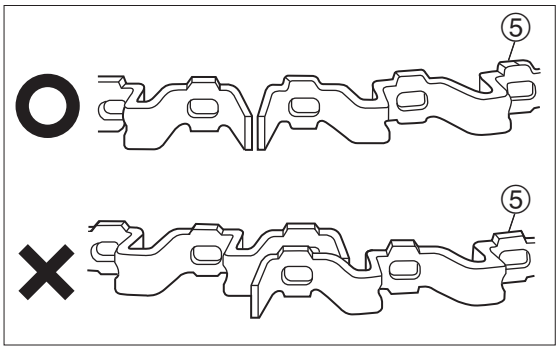


④ Do not reuse.

2. Put expander ⑤ (#4) in the oil ring groove, and check that ring end makes gap as shown.

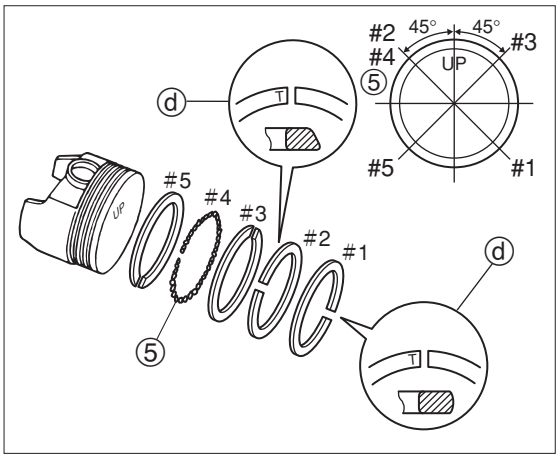
3. While holding expander ⑤ (#4) gap with thumb, put upper side rail (#3) into the groove so that the gap is away from gap of expander ⑤ (#4) to the left by 90 degrees.

4. In similar way, put lower side rail (#5) into the groove so that the gap is away from gap of expander ⑤ (#4) to the right by 90 degrees.



5. Install second ring (#2 taper) and top ring (#1) to piston. Install top Ring (#1) and Second Ring (#2) so that their side with manufacturer's identification ⓓ (T) faces upward (valve side).

6. Bring their gaps are away from each other as shown.



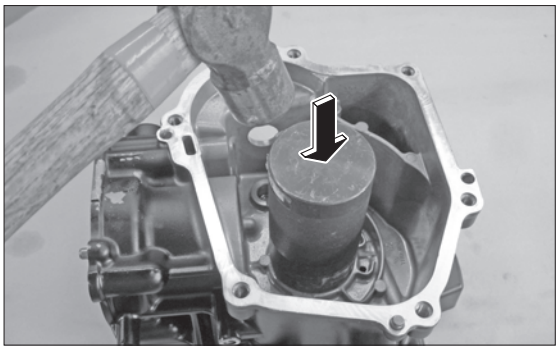
⚠ CAUTION

Be careful not to scratch piston surface and damage rings.

- Install piston rings so that their gaps are away also from thrust direction of piston and direction piston pin.
- After installing piston rings, check that they move smoothly.

38) Assembly of Cylinder Oil Pan

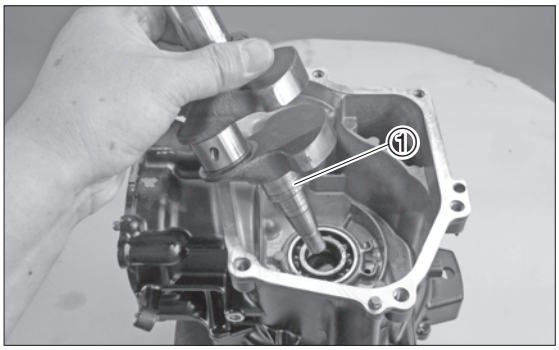
1. Press fit bearing into cylinder block, use with proper mandrel.



2. Install crankshaft ① on the cylinder block.

Before installing, apply engine oil to mating surface between bearing and crankshaft.

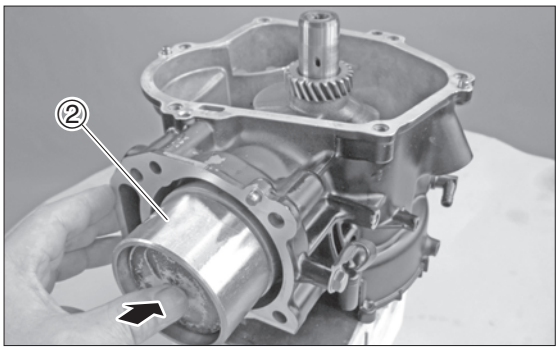
4st OIL

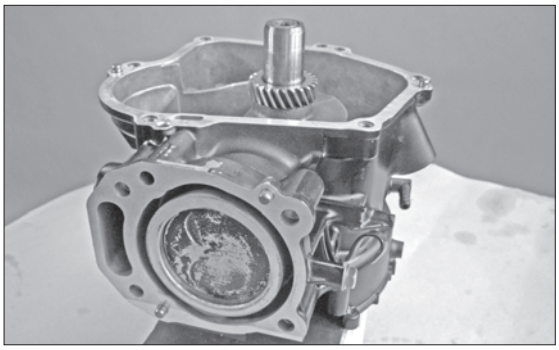


3. Use piston slider ② as shown to install piston ass'y into cylinder block.

- Before assembling, apply engine oil to piston pin, piston rings, outer surface of piston, and inner surface of cylinder liner.
- Be sure that piston is installed with "UP" mark side up.
- When assembling, take care that connecting rod big end does not touch crankshaft.

Piston Slider②:
P/N. 3H6-72871-0

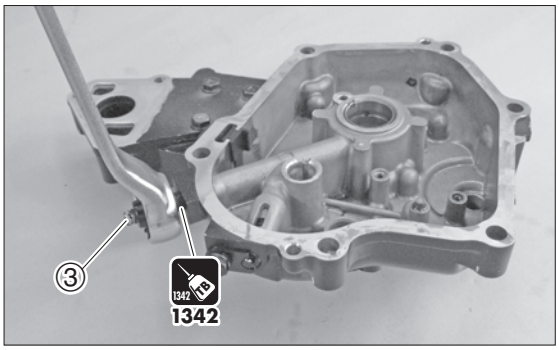




4. Install oil pressure switch ③ to oil pan and tighten to specified torque.

Oil Pressure Switch:
9 N · m (7 lb · ft) [0.9 kgf · m]

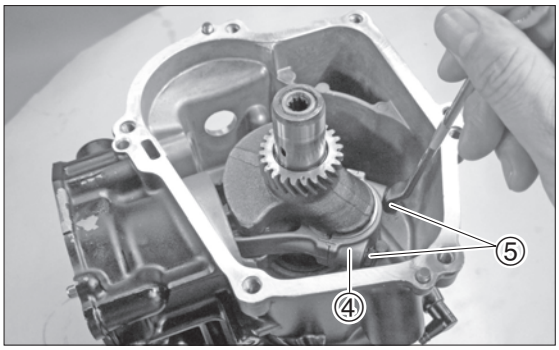
1342

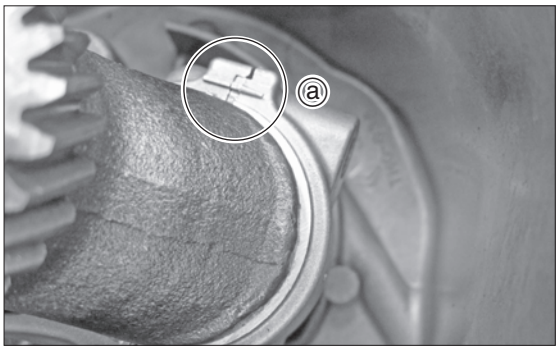


5. Attach connecting rod cap ④ to connecting rod, and tightening connecting rod bolts ⑤ in two steps to specified torque.

· Install connecting rod cap ④ after applying engine oil to inside of the part.
· Bring locating marks ⓐ of connecting rod cap ④ and connecting rod, and install in original position (direction).

Connecting Rod Bolts ⑤ :
1st tightening torque : 6 N · m (4 lb · ft) [0.6 kgf · m]
2nd tightening torque : 12 N · m (9 lb · ft) [1.2 kgf · m]

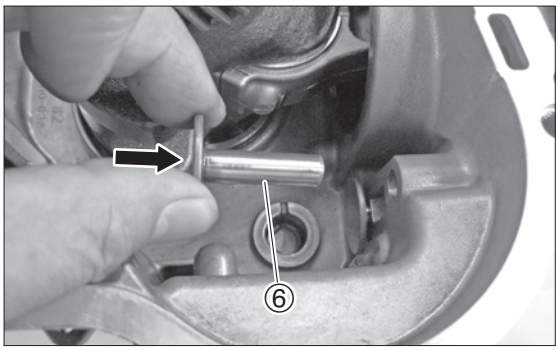




6. Install lifter ⑥ to cylinder block.

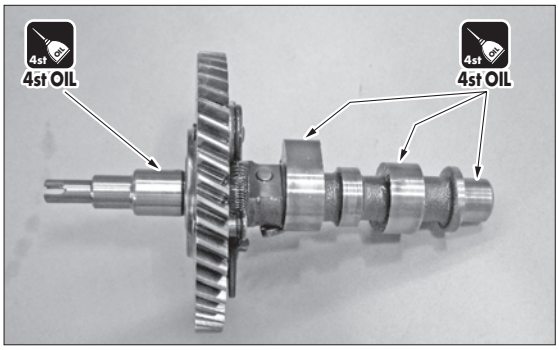
Apply much engine oil to face of valve lifter that contacts camshaft.

4st OIL



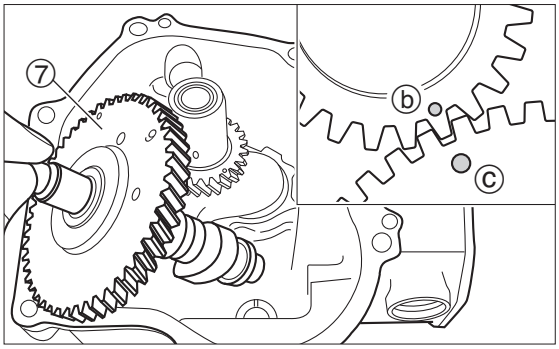
7. Apply much engine oil to faces of camshaft ⑦ that contacts valve lifter and bearing.

4st OIL



8. Install camshaft to cylinder block as shown.

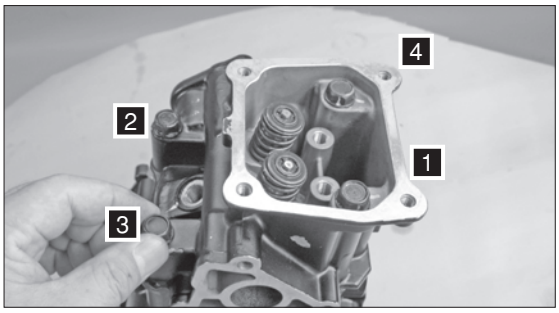
Bring crankshaft mark ⓓ to camshaft ⑫ mark ⓔ.



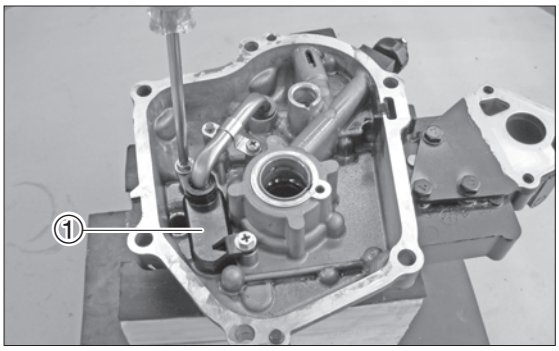
39) Installation of Cylinder Head

1. Attach gasket and cylinder head ass'y to cylinder block, and then, tighten bolts to specified torque in two steps in the order as shown.

Cylinder head installation bolts:
1st tightening torque : 12 N • m (9 lb • ft)[1.2 kgf • m]
2nd tightening torque : 25 N • m (18lb • ft)[2.5 kgf • m]



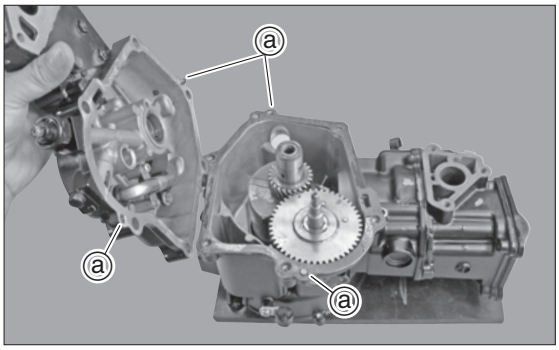
2 Install strainer cover ① and secure with bolts.

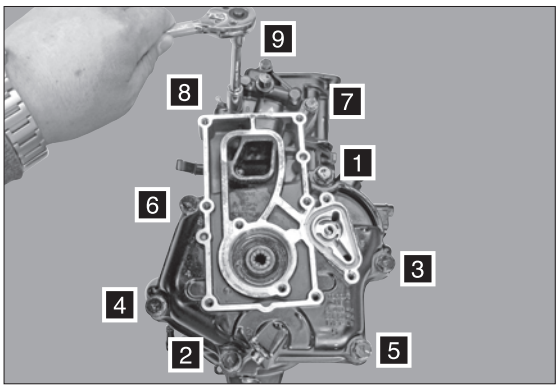


3. Attach gasket and oil pan to cylinder block, and then, tighten bolts to specified torque in two steps in the order as shown.

M8 : 1st Tightening Torque :
12 N · m (9 lb · ft) [1.2 kgf · m]
2nd Tightening Torque :
25 N · m (18 lb · ft) [2.5 kgf · m]
M6 : 1st Tightening Torque :
5 N · m (4 lb · ft) [0.5 kgf · m]
2nd Tightening Torque :
9 N · m (7 lb · ft) [0.9 kgf · m]

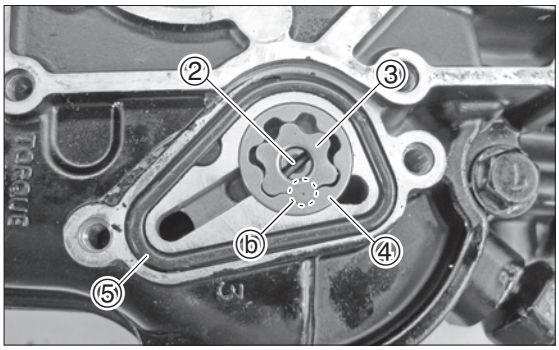
When positioning oil pan on the cylinder block, use dowel pins ⓐ.





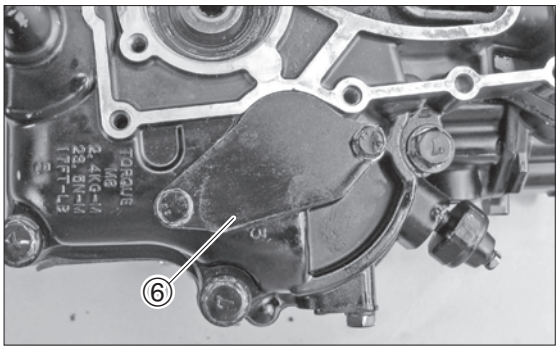
4. Attach oil pump parts including oil pump pin ②, oil pump rotor (inner) ③ and oil pump rotor (outer) ④ to oil pan.

Attach oil pump (inner) so that ● mark ⓑ can be seen.



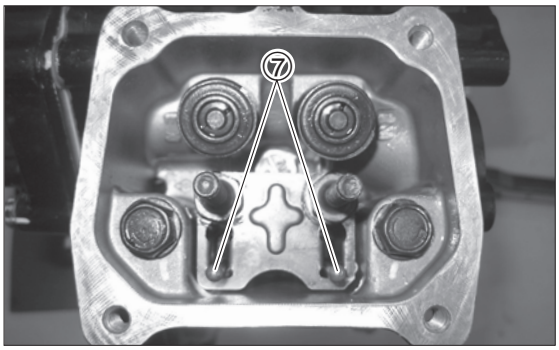
5. Attach O ring ⑤ and oil pump cover ⑥ and secure with bolts.

Apply much engine oil to oil pump and rotors (outer and inner).

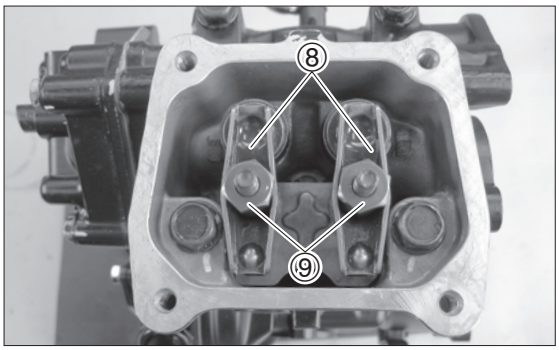


6. Attach push rods ⑦, rocker arms ⑧, rocker arm pivots and adjusting nuts ⑨ to cylinder head.

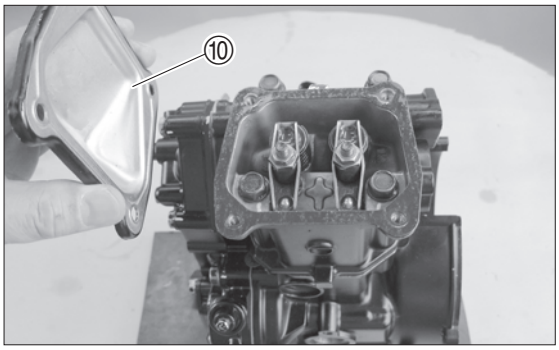
Ensure that push rods ⑦ are engaged with valve lifters.



Perform tappet adjustment.
Refer to "5-16".

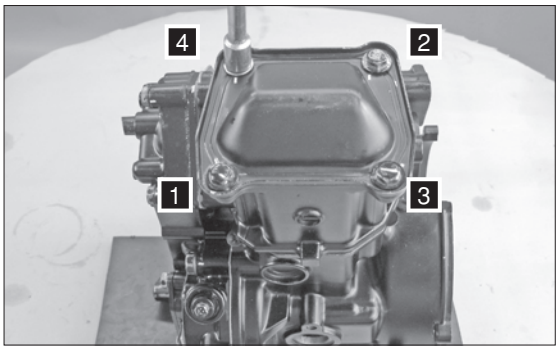


7. Attach cylinder head cover ⑩.



8. Attach cylinder head cover, and tighten bolts to specified torque in the order shown.

Cylinder Head Cover Bolts :
6 N · m (4 lb · ft) [0.6 kgf · m]

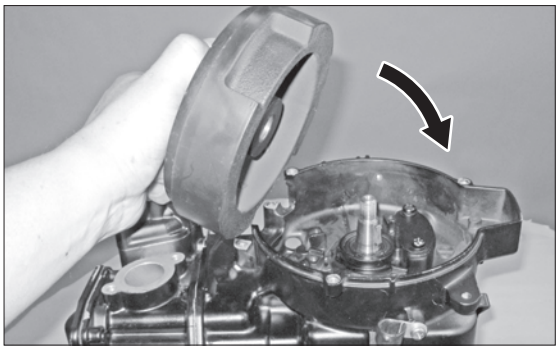


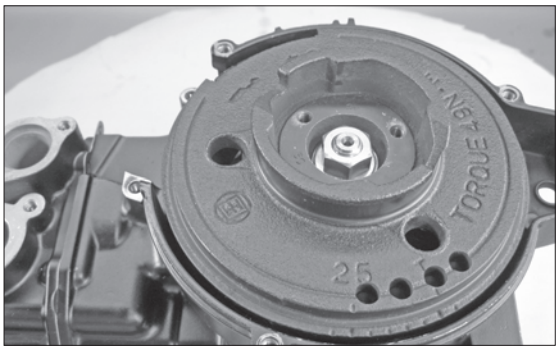
40) Installing Flywheel

1. Attach key to crankshaft and install flywheel. Tighten flywheel nut to specified torque.

Flywheel puller kit :
P/N. 369-72211-0

Flywheel Nut :
50 N · m (37 lb · ft) [5.0 kgf · m]



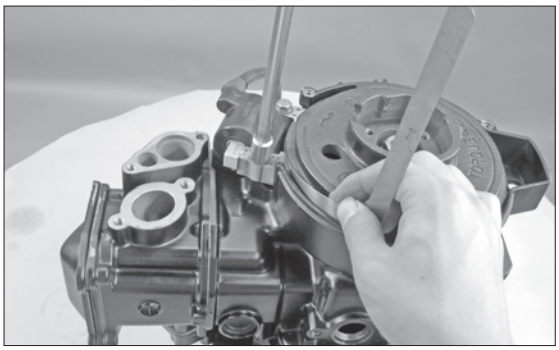


2. Attach igniter.

Thickness Gauge:
P/N. 353-72251-1

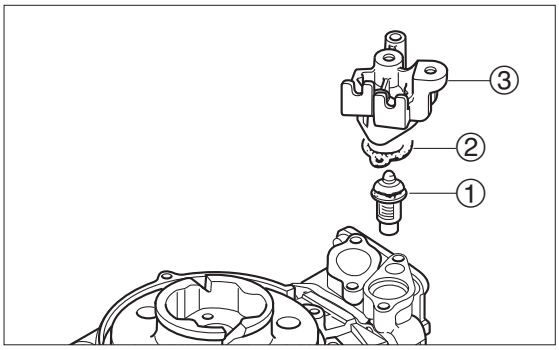
Igniter clearance:
0.3 mm (0.012 in)

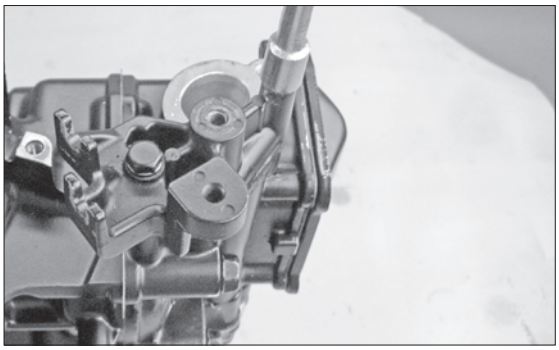
Be careful not to scratch periphery of flywheel, or sparking performance may be deteriorated.



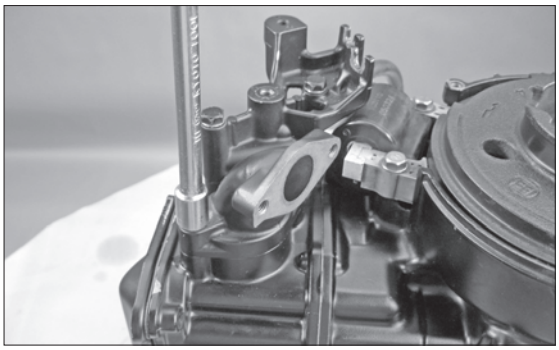
3. Attach thermostat ①, gasket ② and thermostat cap ③, and tighten bolts to specified torque.

Thermostat cap mounting bolts:
6 N · m (4 lb · ft) [0.6 kgf · m]





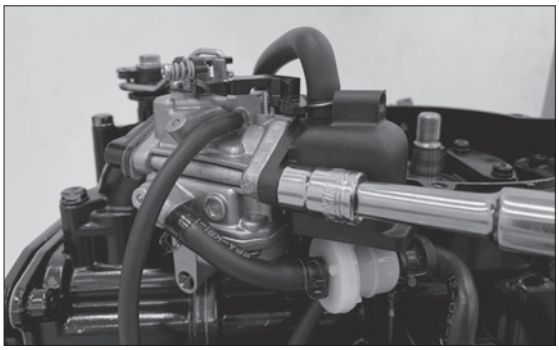
4. Attach intake manifold to cylinder and tighten bolts to specified torque.



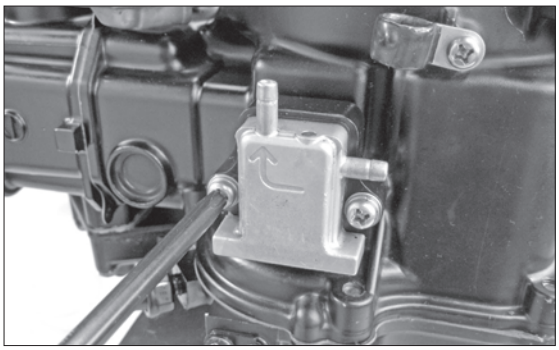
Ensure that O ring is attached properly.

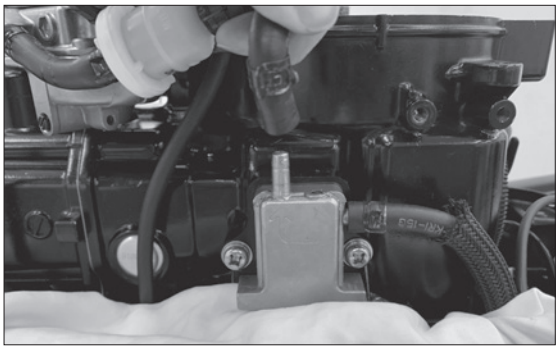
Intake manifold installation bolt:
6 N · m (4 lb · ft) [0.6 kgf · m]

5. Install carburetor.

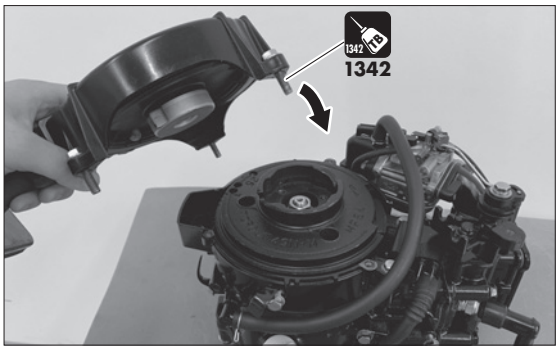


6. Install fuel pump and connect fuel hose.

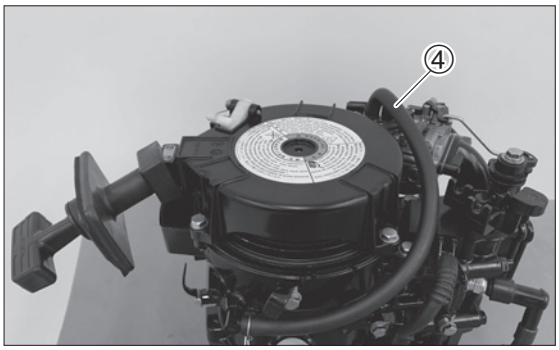




7. Install recoil starter.

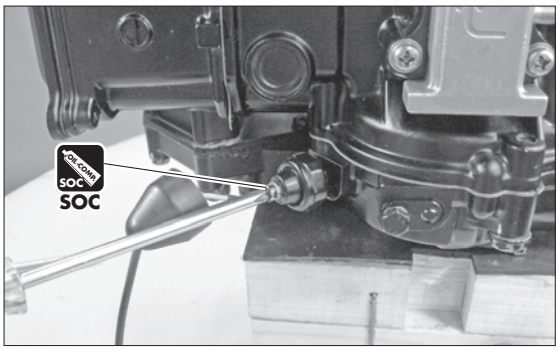


8. Attach breather hose ④.

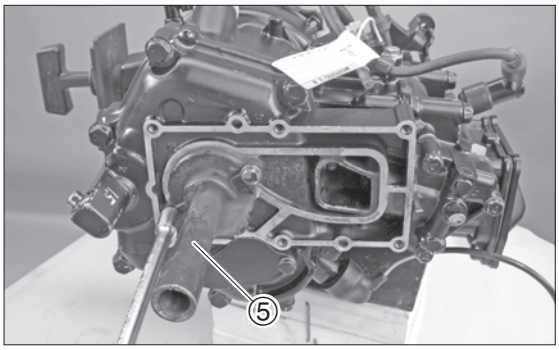


9. Apply SOC grease to attach oil pressure switch terminal and then attach pressure switch code.

SOC



10. Attach crankcase head ⑤.



5

41) Installation of Power Unit

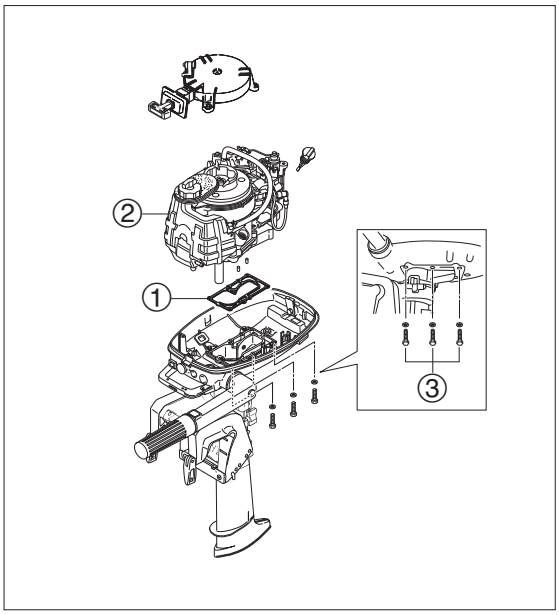
1. Clean mating surface of power unit and attach new gasket ①.

2. Install power unit ②.

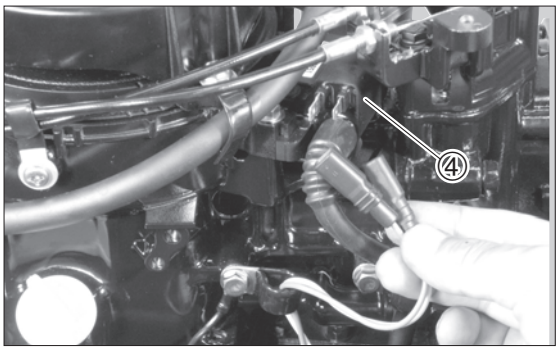
3. Tighten power unit installation bolts ③ in two or three steps to specified torque.

Power Unit Installation Bolt :
7 N · m (5 lb · ft) [0.7 kgf · m]

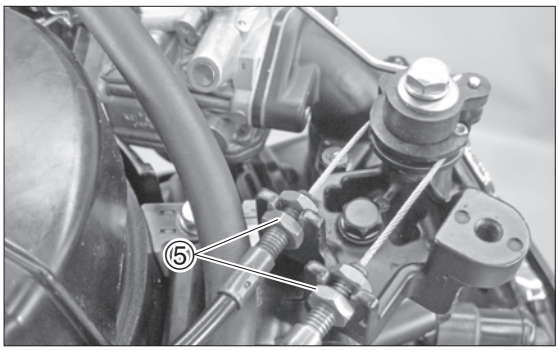
Be careful not to catch wires and hoses and other parts between power unit and engine base.



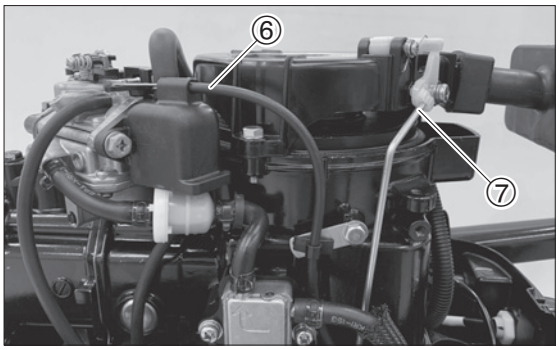
4. Connect lead wires ④ of igniter and stop switch.



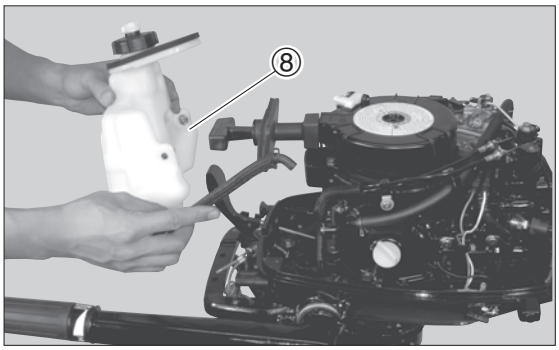
5. Connect throttle wire ⑤. Refer to "3-15".



6. Connect rod ⑥ and choke wire ⑦.



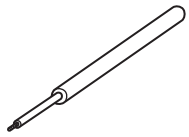
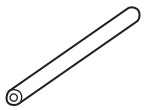
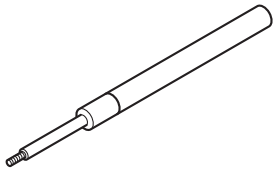
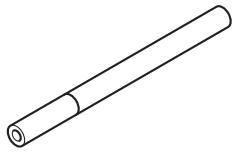
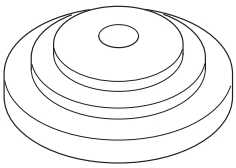
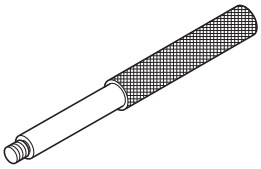
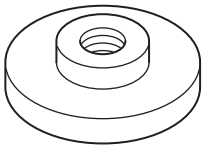
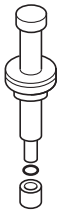
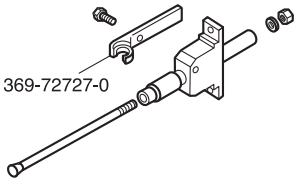
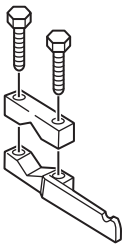
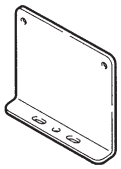
7. Install fuel tank ⑧ and connect pipe.



6

Lower Unit

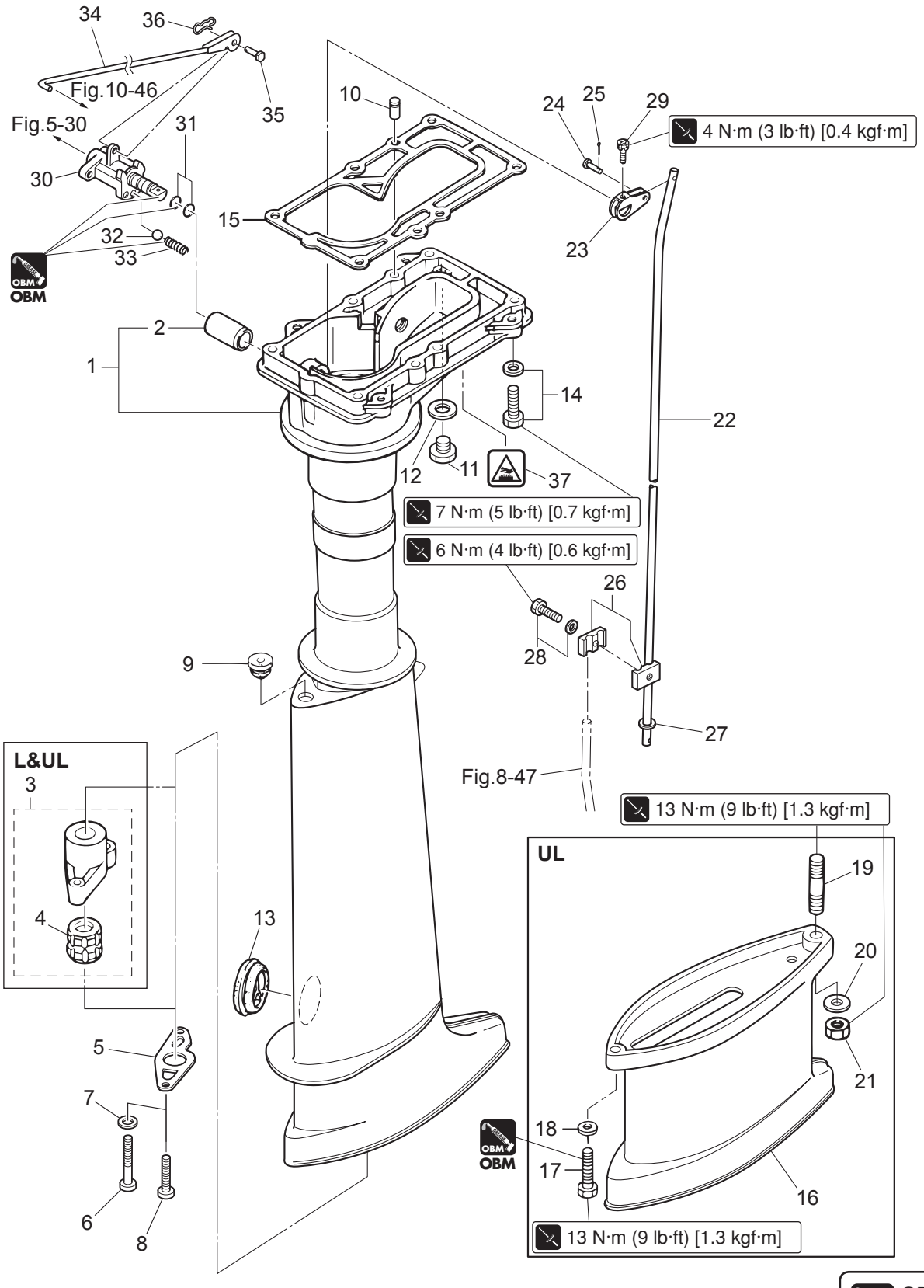
1. Special Tools

			
Spring Pin Tool A P/N. 345-72227-0	Spring Pin Tool B P/N. 345-72228-0	Spring Pin Tool A P/N. 369-72217-0	Spring Pin Tool B P/N. 369-72218-0
Removing spring pin (φ3.0)	Installing spring pin (φ3.0)	Removing spring pin (φ3.5)	Installing spring pin (φ3.5)
			
Center Plate P/N. 3AB-99701-0	Driver Rod P/N. 3AB-99702-0	Bearing Attachment P/N. 3BV-99905-0	Needle Bearing Press Kit P/N. 369-72900-0
Used in combination with driver rod and bearing attachment to locate lower gear case bearing	Used in combination with center plate and bearing attachment	Installing bearings	Installing bearings
			
Backlash Measuring Tool Kit P/N. 369-72740-0	Clamp A P/N. 3B7-72720-0	Dial Gauge Plate P/N. 3B7-72729-0	
Measuring gap between forward and pinion gears (A and B gears)	Measuring backlash	Used to attach dial gauge when measuring backlash	

2. Parts Layout

P/C Fig. 7

Drive Shaft Housing

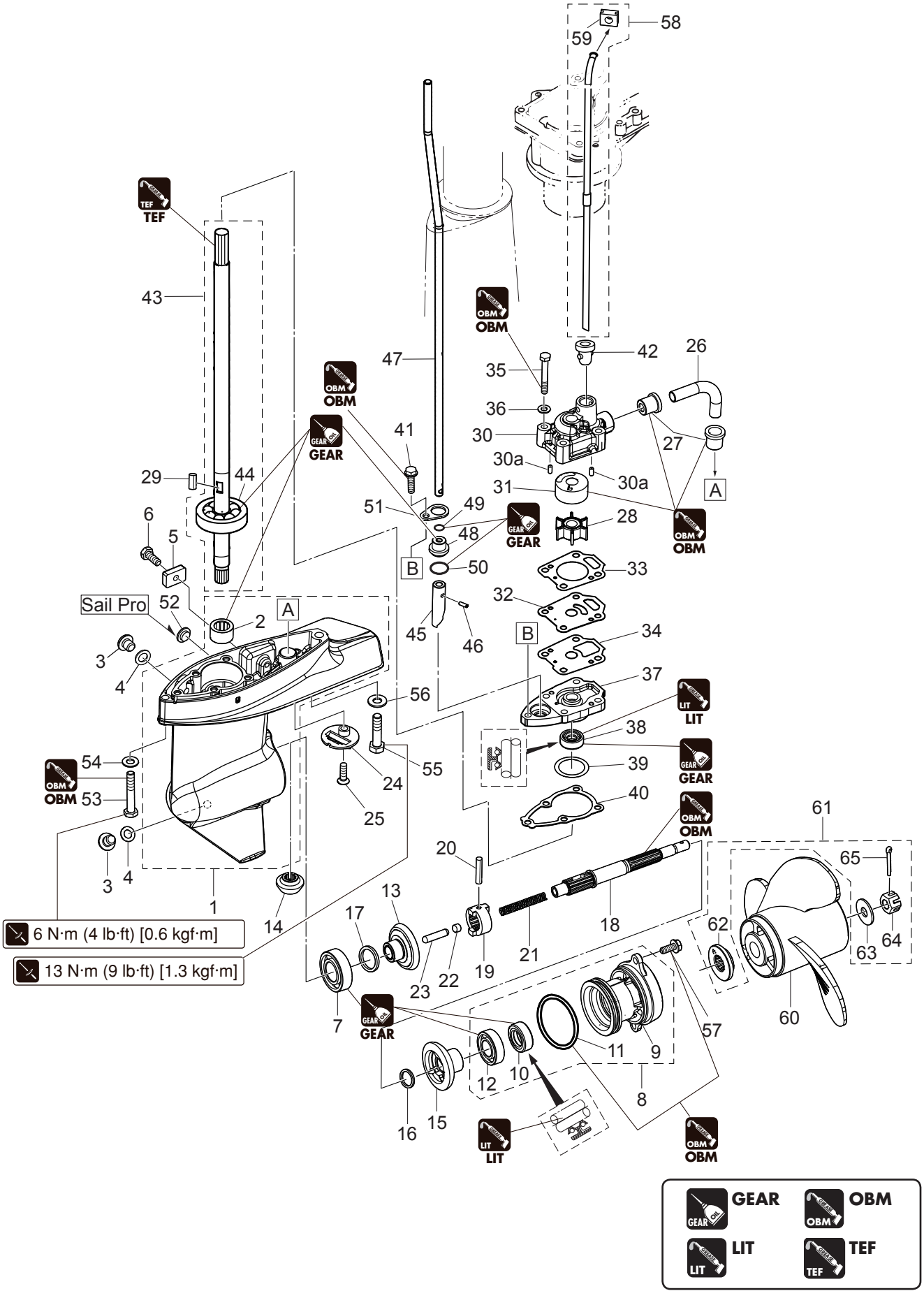


OBM

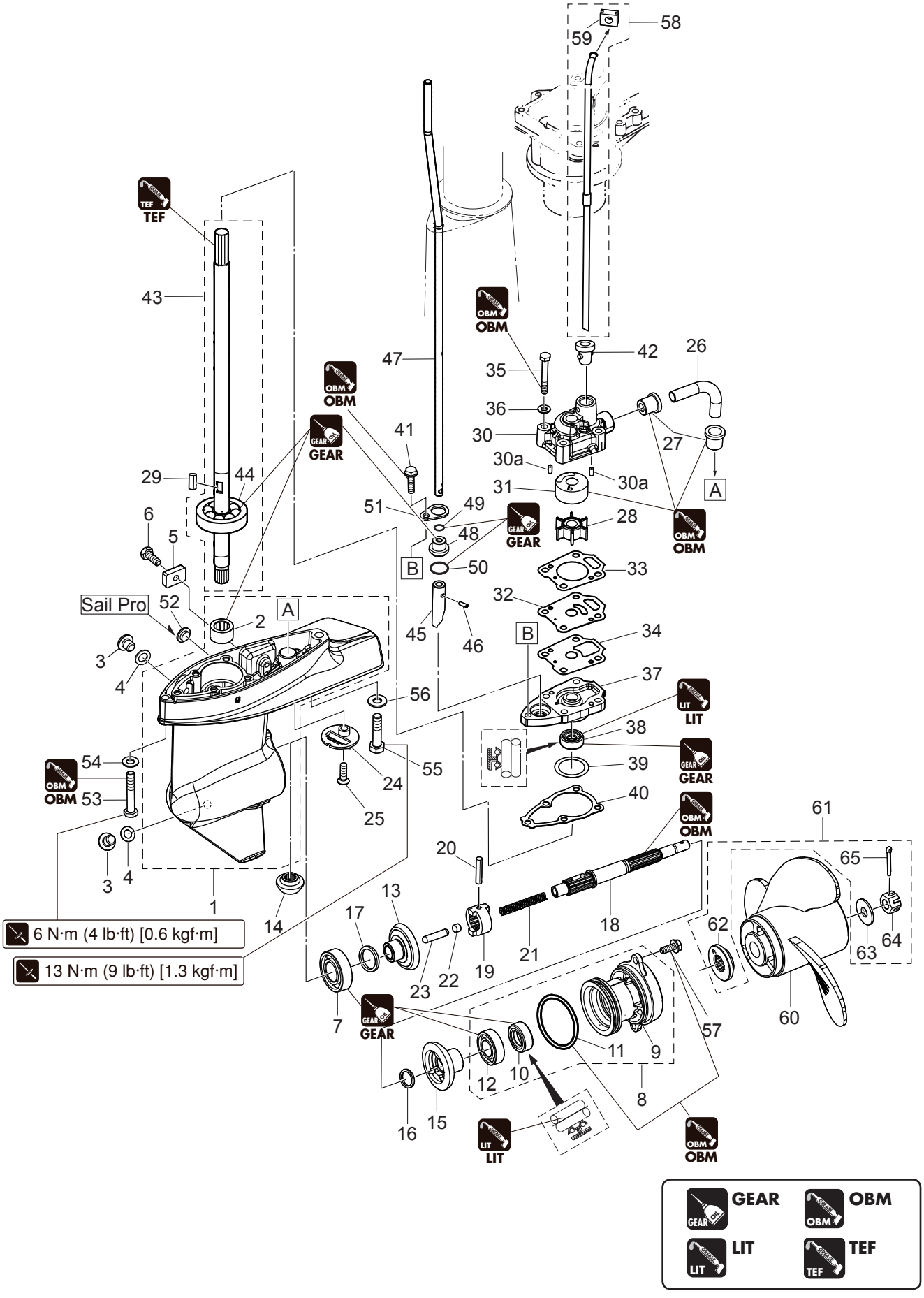
1342

Ref. No.	Description	Q'ty	Remarks
1-1	Drive Shaft Housing Assy (S)	1	for Transom "S"
1-2	Drive Shaft Housing Assy (L)	1	for Transom "L" use Slate Color Bushing
1-3	Drive Shaft Housing Assy (Ul)	1	for Transom "UL" use Dark Brown Bushing
2	Bushing	1	
3-1	Drive Shaft Bushing Assy	1	Slate Color Bushing for Transom "L"
3-2	Drive Shaft Bushing Assy	1	Dark Brown Bushing for Transom "UL"
4-1	Drive Shaft Bushing	1	Slate Color for Transom "L"
4-2	Drive Shaft Bushing	1	Dark Brown for Transom "UL"
5	Stopper	1	
6	Pre-Coated Screw 5-25	2	for Transom "L"&"UL"
7	Washer	2	M5
8	Screw	2	for Transom "S" M5 L=10mm
9	Grommet 10.7-3.5	1	
10	Dowel Pin 6-12	2	
11	Bolt	1	M8 L=8mm
12	Gasket	1	Do not reuse.
13	Grommet 29-3	1	
14	Bolt	6	M6 L=30mm
15	Drive Shaft Housing Gasket	1	Do not reuse.
16	Extension Housing	1	for Transom "UL"
17	Bolt	1	for Transom "UL" M6 L=25mm
18	Washer	1	for Transom "UL" M6
19	Stud	1	for Transom "UL" M8 L=25mm
20	Washer	1	for Transom "UL" M8
21	Nut	1	for Transom "UL" M8
22-1	Shift Rod (S)	1	for Transom "S"
22-2	Shift Rod (L)	1	for Transom "L"&"UL"
23	Shift Rod Lever	1	
24	Pin	1	
25	Split Pin	1	
26	Shift Rod Joint Assy	1	
27	Washer	1	M6
28	Bolt	1	M6 L=16mm
29	Bolt	1	M4 L=16mm
30	Shift Lever Shaft Assy	1	
31	O-Ring 1.9-8.8	2	Do not reuse.
32	Ceramic Ball 7.7	1	
33	Spring	1	
34	Shift Lever Rod	1	
35	Pin	1	
36	Snap Pin	1	
37	High Temperature Caution Decal	1	

Gear Case (Drive Shaft) • Gear Case (Propeller Shaft) P/C Fig. 8



Ref. No.	Description	Q'ty	Remarks
1-1	Gear Case Assy	1	STD
1-2	Gear Case Assy	1	for Sail Pro
2	Roller Bearing 14-20-12	1	
3	Plug 8-8	2	
4	Gasket	2	Do not reuse.
5	Anode	1	
6	Bolt	1	M6 L=16mm
7	Ball Bearing 6004	1	
8	Propeller Shaft Housing Assy	1	
9	Propeller Shaft Housing	1	
10	Oil Seal 15-28-10	1	
11	O-Ring 3.2-47	1	Do not reuse.
12	Ball Bearing 6002	1	
13	Bevel Gear Assy (A)	1	
14	Bevel Gear B	1	
15	Bevel Gear Assy (C)	1	
16	Washer 15.2-19-1.9	1	
17-1	Shim 21-28-0.1	A	
17-2	Shim 21-28-0.15	A	
18	Propeller Shaft	1	
19	Clutch	1	
20	Pin 3.5-28	1	
21	Spring	1	
22	Spring Retainer	1	
23	Push Rod	1	
24	Water Strainer	1	
25	Screw	1	M6 L=20mm
26	Water Pipe (Lower)	1	
27	Seal	2	
28	Water Pump Impeller	1	
29	Key φ 2-11	1	Pump Impeller
30	Pump Case (Upper)	1	
30a	Dowel Pin	2	
31	Pump Case Liner	1	
32	Water Pump Guide Plate	1	
33	Pump Case Gasket	1	Do not reuse.
34	Guide Plate Gasket	1	Do not reuse.
35	Bolt	4	M6 L=45mm
36	Washer	4	M6
37	Pump Case (Lower)	1	
38	Oil Seal 10-24-8	1	
39-1	Shim 26.5-34.8-0.1	A	
39-2	Shim 26.5-34.8-0.15	A	
40	Pump Case Gasket (Lower)	1	Do not reuse.
41	Bolt	1	M6 L=25mm
42	Water Pipe Seal (Lower)	1	


TEF
OBM
GEAR
LIT
Sail Pro
A
B
6 N·m (4 lb·ft) [0.6 kgf·m]
13 N·m (9 lb·ft) [1.3 kgf·m]
GEAR
OBM
LIT
TEF

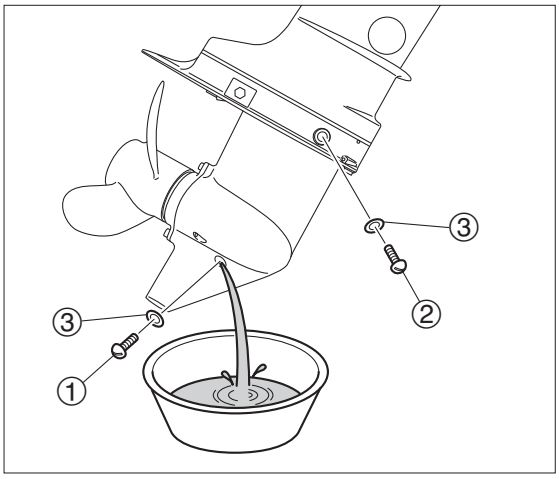
Ref. No.	Description	Q'ty	Remarks
43-1	Drive Shaft Assy (S)	1	For Transom "S"
43-2	Drive Shaft Assy (L)	1	For Transom "L"
43-3	Drive Shaft Assy (Ul)	1	For Transom "UL"
44	Ball Bearing 6300	1	
45	Clutch Cam	1	
46	Spring Pin 3-10	1	
47-1	Cam Rod (S)	1	For Transom "S"
47-2	Cam Rod (L)	1	For Transom "L"
47-3	Cam Rod (Ul)	1	For Transom "UL"
48	Cam Rod Bushing	1	
49	O-Ring 2.5-4.9	2	Do not reuse.
50	O-Ring 2.4-15.4	1	Do not reuse.
51	Stopper	1	
52	Grommet 12-3	2	Sail Pro
53	Bolt	1	M6 L=45mm
54	Washer	1	
55	Bolt	1	M8 L=35mm
56	Washer	1	
57	Bolt	2	M6 L=16mm
58-1	Water Pipe Assy (S)	1	For Transom "S"
58-2	Water Pipe Assy (L)	1	For Transom "L"
58-3	Water Pipe Assy (Ul)	1	For Transom "UL"
59	Grommet 10-2	1	
60-1	Propeller Assy (6")	1	Sail Pro STD
60-2	Propeller Assy (7)	1	4ps STD
60-3	Propeller Assy (8)	1	5/6ps STD
60-4	Propeller Assy (9")	1	OPT
60-5	Propeller Assy (6")	1	OPT
61	Propeller Hardware Kit	1	
62	Thrust Holder Assy	1	
63	Washer 10.5-28-2	1	
64	Propeller Nut	1	
65	Split Pin 3-18	1	

3. Inspection Item

1) Draining Gear Oil

1. Remove oil plugs ② and then ① to drain gear oil. Refer to "Replacement of Gear Oil" in Chapter 3.

Remove lower oil plug ① first.



③ Gasket **Do not reuse.**

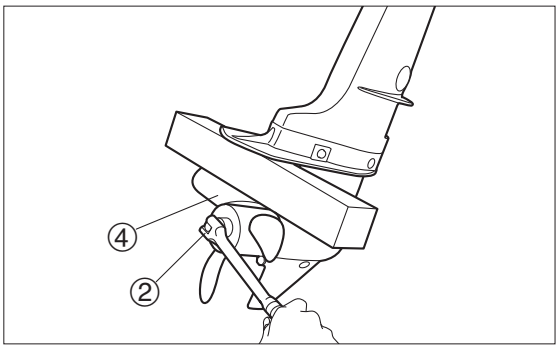
2) Removing Propeller

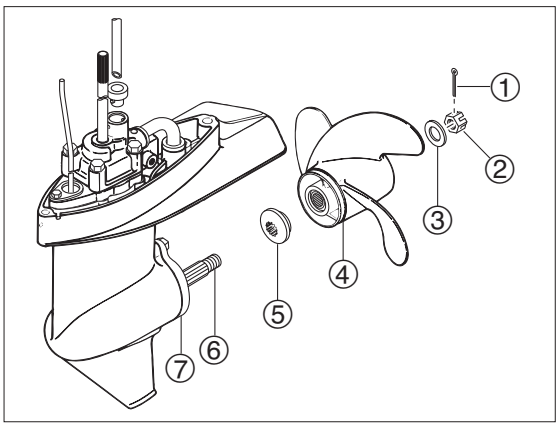
1. Shift into reverse (R).

2. Put a piece of wooden block between anti-ventilation plate and propeller ④ to prevent rotation of propeller ④, and then remove propeller nut ② and then propeller ④.

⚠ WARNING

- **Before removing or installing propeller, be sure to disconnect spark plug cap and remove stop switch lock plate.**
- **When removing or installing propeller, do not handle propeller with bare hands.**
- **Put a piece of wooden block between anti-ventilation plate and propeller to prevent rotation of propeller.**





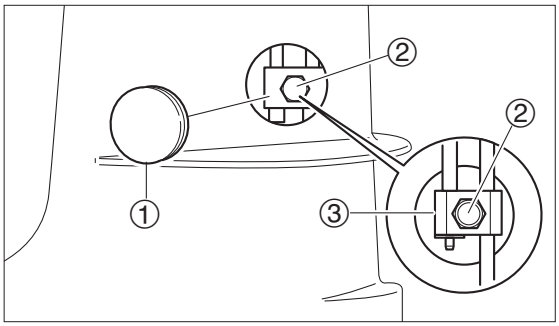
① Split Pin
② Propeller Nut
③ Washer
④ Propeller
⑤ Thrust Holder
⑥ Propeller Shaft
⑦ Propeller Shaft Housing

3) Removing Lower Unit Ass'y

Removal of lower unit ass'y does not require removal of power unit from outboard motor body. Tilt up and lock with tilt stopper. Shift in reverse.

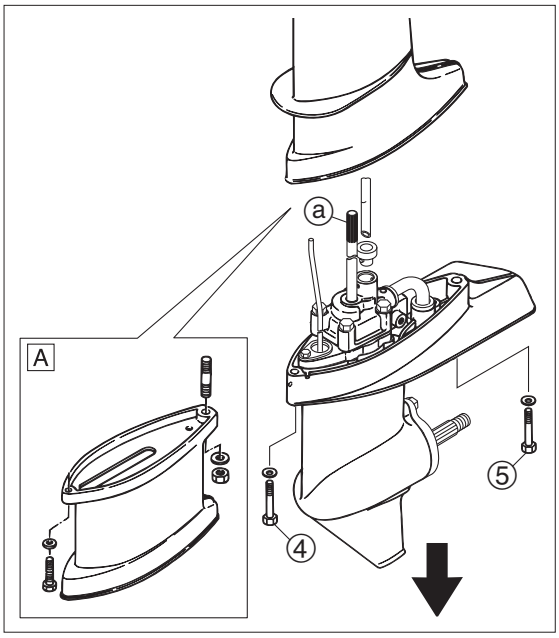
1. Remove grommet ① and loosen bolt ②.

Bolt ② should be loosened, not removed from joint ③.



2. Remove lower unit ass'y installation bolts ④⑤, and pull lower unit ass'y downward to remove.

Check drive shaft spline ⓐ for adhesion of oil, rust and wear.

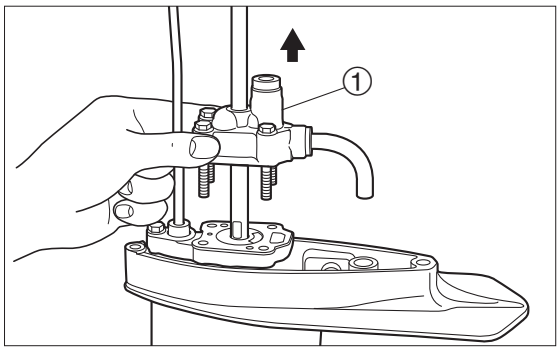


A UL-Transom Model

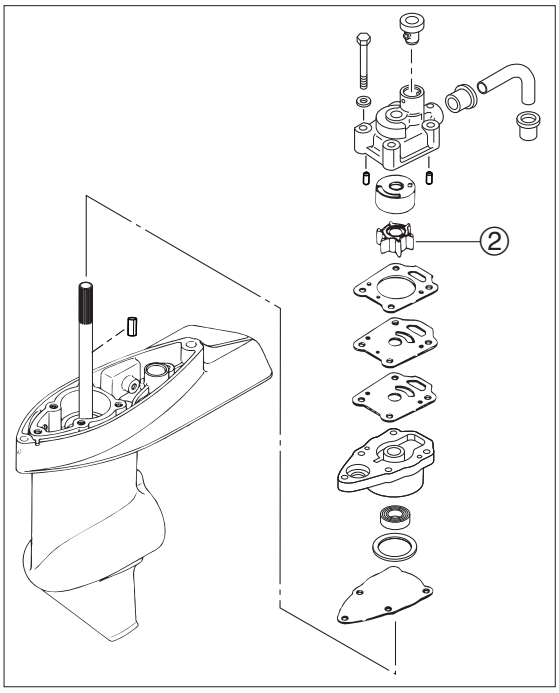
4) Disassembly of Water Pump

1. Remove bolts, then remove pump case (upper) ①.

When removing or attaching water pump and pump case (lower), be careful that the drive shaft is not pushed up.
Pushing up the drive shaft causes pinion (B) to drop into the gear case.

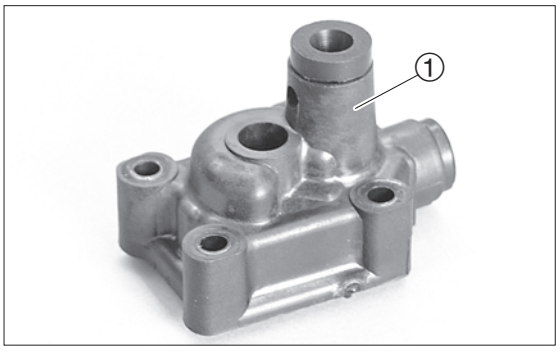


2. Remove impeller ②.

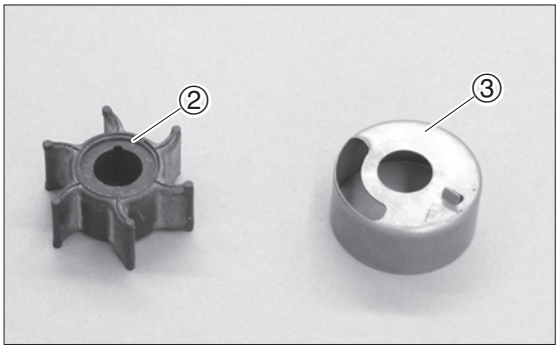


5) Inspection of Water Pump

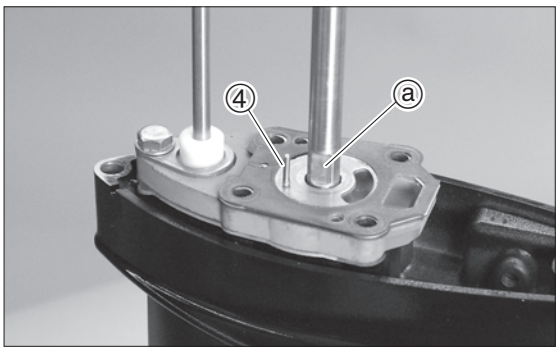
1. Check pump case (upper) ① for deformation. Replace if necessary.



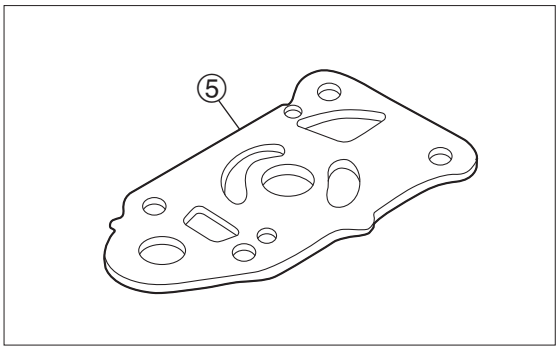
2. Check impeller ② and pump case liner ③ for crack and wear. Replace if necessary.



3. Check key ④ and drive shaft installation face ⓐ for wear. Replace if necessary.



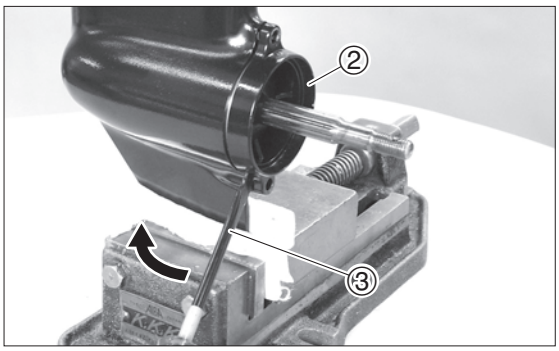
4. Check water pump guide plate ⑤ for cracks and wear. Replace if necessary.



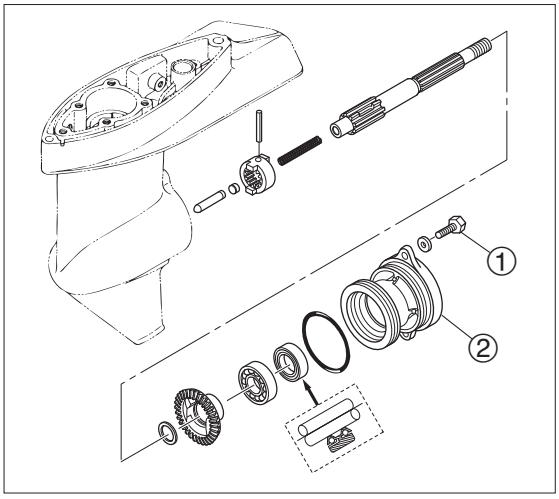
6) Removing Propeller Shaft Housing Ass'y

1. Remove bolts ① and pull out propeller shaft housing ass'y ②.

When the ass'y is pulled out a little, put bladed screw driver ③ in the mating surface of lower gear case to separate it from the case.



2. Remove propeller shaft ass'y.



6

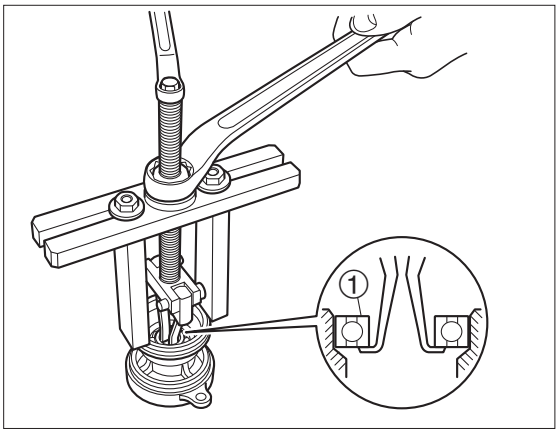
7) Disassembly of Propeller Shaft Housing Ass'y

1. Remove bearing ① by using commercially available bearing puller.

Before removing, check bearing for play or deflection. Replace if necessary.

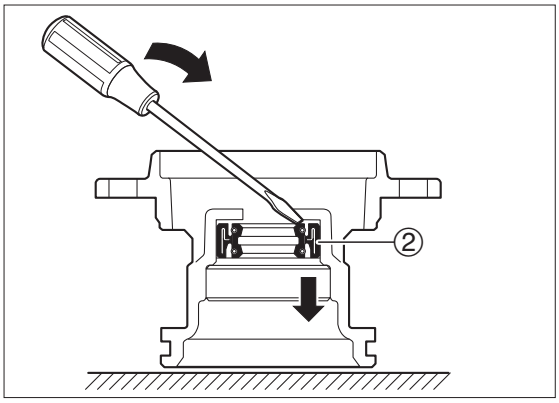
⚠ CAUTION

Do not reuse removed bearing.



① Bearing **Do not reuse.**

2. Remove oil seal ②.



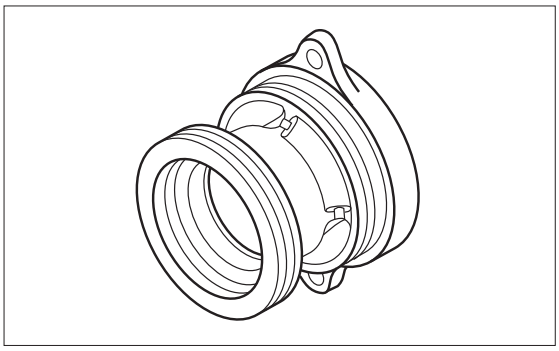
② Oil Seal **Do not reuse.**

8) Inspection of Propeller Shaft Housing

1. Use cleaning oil and cleaning brush to clean propeller shaft housing, and check it for crack or damage. Replace if necessary.

2. Check reverse (C) gear teeth and clutch for crack or damage. Replace if necessary.

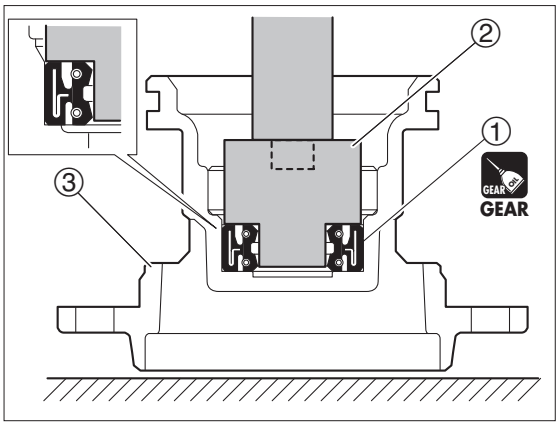
When reusing bearing without removing it, check it for play or deflection. Replace if necessary.



9) Assembly of Propeller Shaft Housing Ass'y

1. Apply gear oil to outside of new oil seal ①, and attach it to propeller shaft housing ③ by using a commercially available mandrel ②.

GEAR



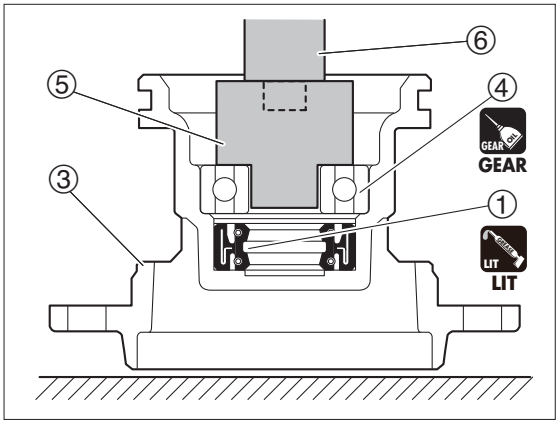
① Oil Seal **Do not reuse.**

2. Install new bearing ④ to propeller shaft housing ③.

Do not reuse removed bearing.

Bearing Attachment ⑤ :
P/N. 3BV-99905-0
Driver Rod ⑥ :
P/N. 3AB-99702-0

GEAR



④ Oil Seal **Do not reuse.**

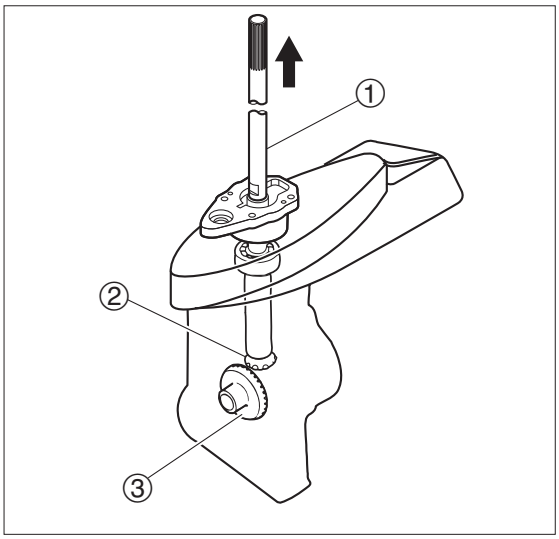
3. Apply LIT grease to lip of oil seal ①.

LIT

10) Removing Drive Shaft Ass'y

1. Pull up pump case (lower) and drive shaft ass'y ①, remove pinion (B) gear ②, and then pull out forward (A) gear ③.

- When removing forward (A) gear ③, be careful not to damage the existing shims or lose them. Shim is reusable.
- Replace shim with new one of the same thickness if any deformation or damage is found on it.

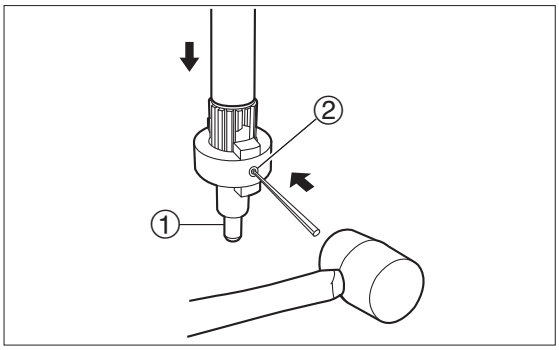


11) Disassembly of Propeller Shaft Ass'y

1. Pull out clutch pin ② while pushing push rod ①. Remove clutch ③, push rod ①, spring retainer ④, and spring ⑤.

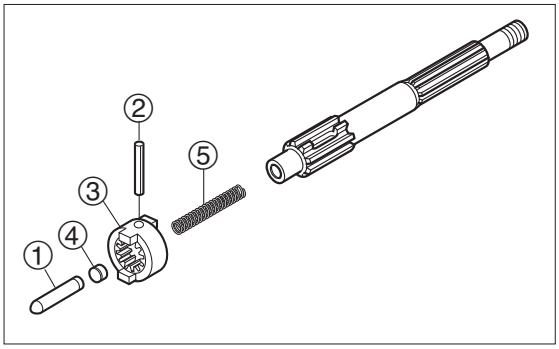
· Take care not to allow parts to fly out by easing spring tension gradually.
· Do not reuse removed clutch pin.

Spring Pin Tool A (φ3.5):
P/N. 369-72217-0



② Spring Pin **Do not reuse.**

2. Check clutch ③, spring retainer ④, ball, and push rod ① for crack and wear. Replace if necessary.



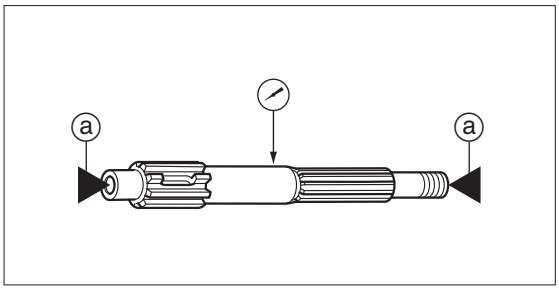
② Clutch Pin **Do not reuse.**

12) Inspection of Propeller Shaft

1. Check propeller shaft for bend and wear. Replace if necessary.

2. Measure propeller shaft runout.

Runout Limit ⓐ (Max) :
0.05 mm (0.0020 in)

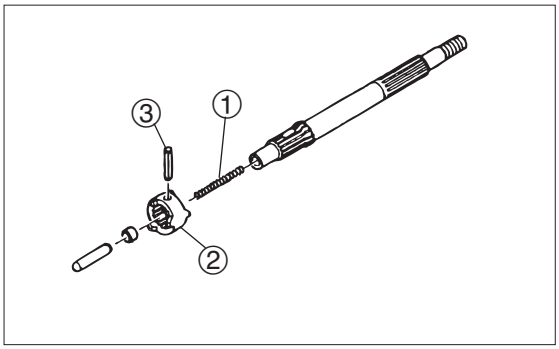


ⓐ Support point

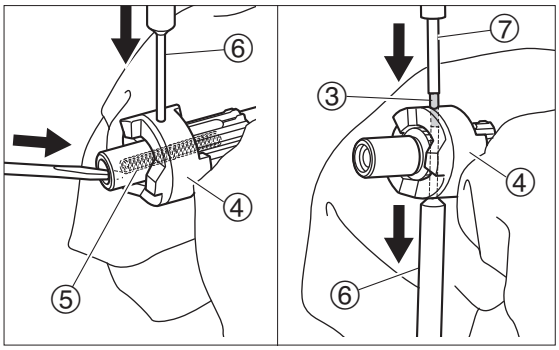
13) Assembly of Propeller Shaft Ass'y

1. Fix propeller shaft with vice, and install spring ① and clutch ②.

· Assemble parts with clutch and propeller shaft holes aligned with each other.
· Set spring pin with groove directing 90 degrees from axial direction of propeller shaft.
· Apply gear oil before assembling.
· Use vice jaw protectors or wood to protect propeller shaft from damage from vice.



2. Using bladed screw driver, shorten spring ① by referring to illustration, insert spring pin tool A ④ into hole of clutch ② to secure spring. Slowly press fit new spring pin ③ from the other side, putting it on the spring pin tool A and by using spring pin tool B ⑤.



⚠ CAUTION

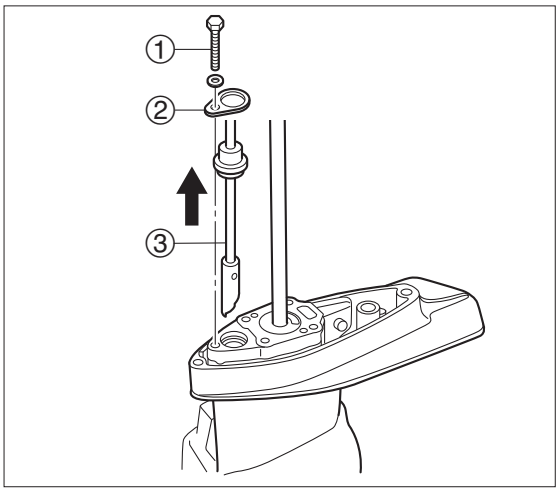
Do not reuse removed spring pin.

- Drive spring pin into clutch hole to depth of approximately 0.5mm from the surface.
- After setting spring pin, check operations of clutch.

Spring Pin Tool A (φ3.5) ④:
P/N. 369-72217-0
Spring Pin Tool B (φ3.5) ⑤:
P/N. 369-72218-0

14) Removing Clutch Cam and Cam Rod Ass'y

1. Remove bolt ①, stopper ②, and then pull cam rod ass'y ③ upward to remove.

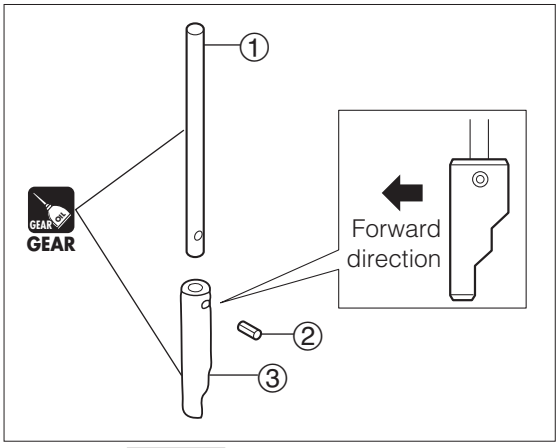


15) Disassembly of Clutch Cam and Cam Rod Ass'y

1. Remove spring pins ② and clutch cam ③ from cam rod ①.

- Use spring pin tool A to remove spring pins.
- Do not reuse removed spring pins.

Spring Pin Tool A (φ3.0):
P/N. 345-72227-0



② Spring Pin **Do not reuse.**

16) Inspection of Clutch Cam and Cam Rod

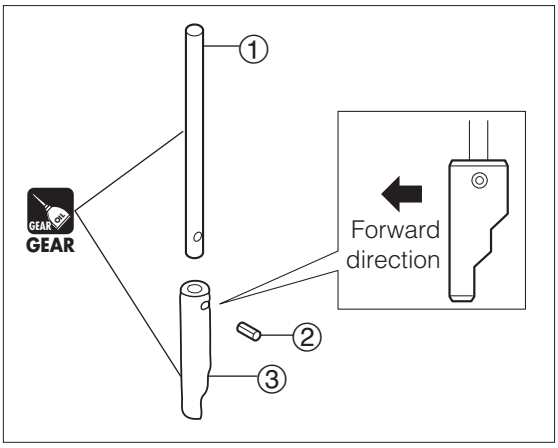
1. Check cam rod ① and clutch cam ③ for crack and wear. Replace if necessary.

17) Assembly of Clutch Cam and Cam Rod

1. Install clutch cam ③ and spring pin ② to cam rod ①.

Spring Pin Tool B (φ3.0):
P/N. 345-72228-0

Be careful of direction of cam rod.

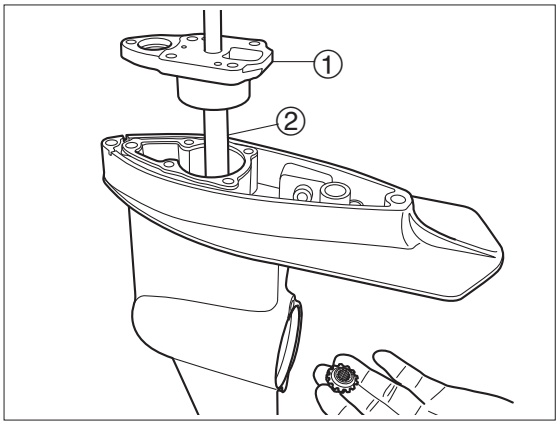


② Spring Pin **Do not reuse.**

18) Removing Pump Case (Lower)

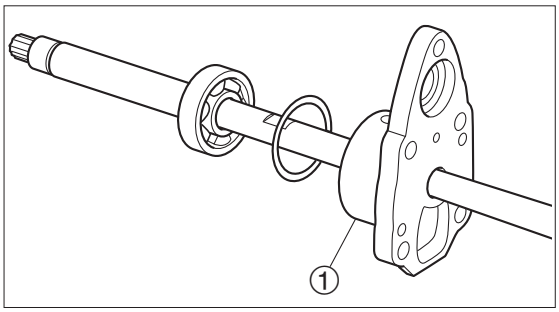
1. Remove pump case (lower) ① and drive shaft ass'y ② while holding pinion (B) gear with hand.

Pinion gear (B) will drop into gear case when pump case (lower) is removed.



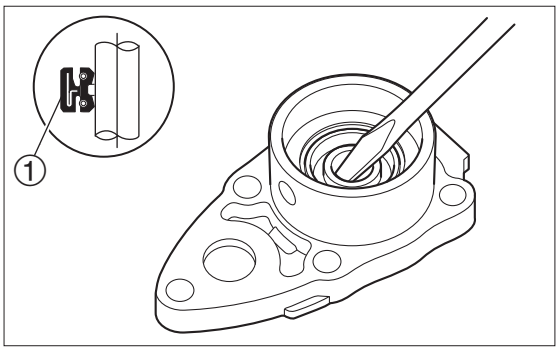
2. Remove forward (A) gear from gear case.

3. Remove pump case (lower) ① from drive shaft ass'y.



19) Disassembly of Pump Case (Lower)

1. Use bladed screw driver to remove oil seal ①.



① Oil Seal **Do not reuse.**

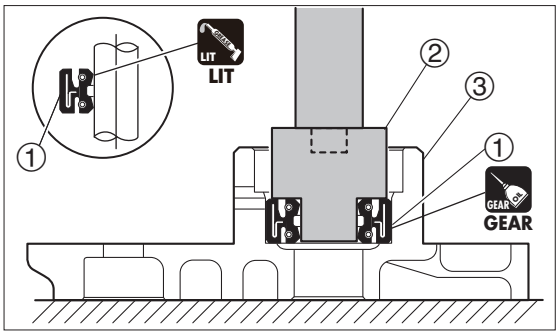
20) Assembly of Pump Case (Lower)

1. Apply gear oil to outside of new oil seal ①, and attach it to pump case (lower) ③ with numbered side down by using a commercially available mandrel ②.

GEAR

2. Apply LIT grease to lip of oil seal ①.

LIT



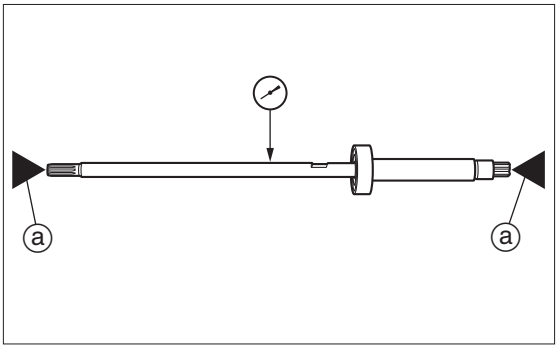
① Oil Seal **Do not reuse.**

21) Inspection of Drive Shaft

1. Check drive shaft for bend and wear or twisted splines. Replace if necessary.

2. Measure drive shaft runout.

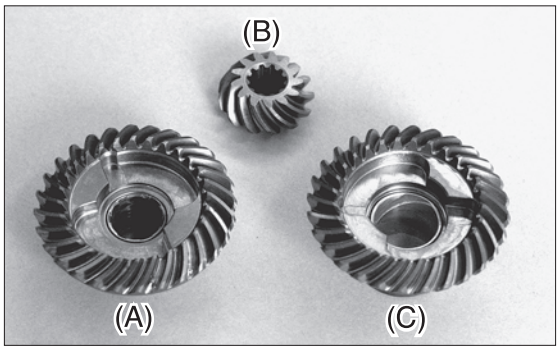
Runout Limit (Max) :
0.2 mm (0.008 in)



ⓐ Supporting Points

22) Inspection of Pinion (B) Gear and Forward (A) Gear

1. Check pinion (B) gear, forward (A) gear, reverse (C) gear teeth and clutch for crack and wear. Replace if necessary.



6

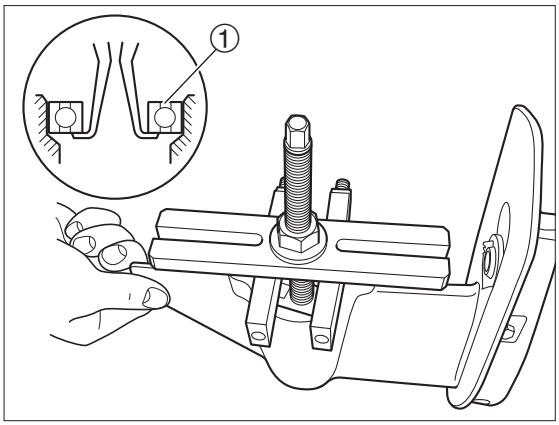
23) Disassembly of Gear Case Ass'y

1. Check bearings ① for cracks and generation of abnormal noise. Replace if necessary.

⚠ CAUTION

Do not reuse removed bearing.

- Do not remove bearing unless it is replaced with new one.
- Before removing, check bearing for play or deflection. Replace if necessary.

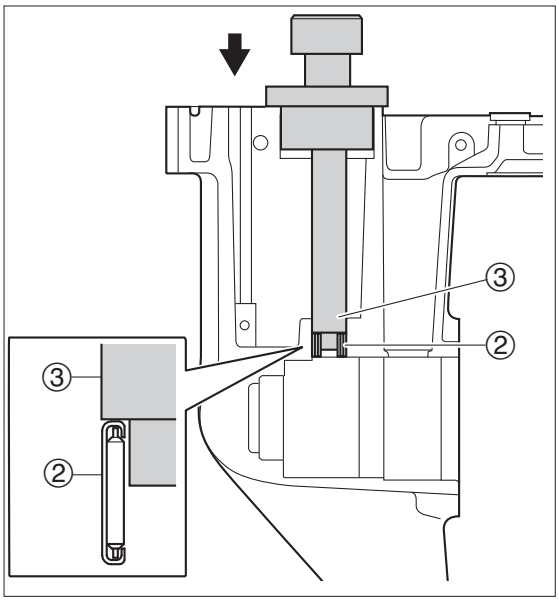


① Bearing **Do not reuse.**

2. Remove bearing ① by using commercially available bearing puller.

3. Remove bearing ② using needle bearing press ass'y ③.

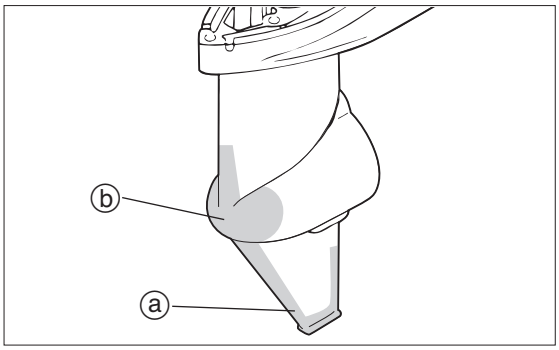
Needle bearing press Ass'y ③ :
P/N. 369-72900-0



② Needle Bearing **Do not reuse.**

24) Inspection of Gear Case

1. Check skeg area ⓐ and torpedo-like front area ⓑ for cracks and damage. Replace if necessary.



25) Assembly of Gear Case Ass'y

Do not reuse removed bearing.

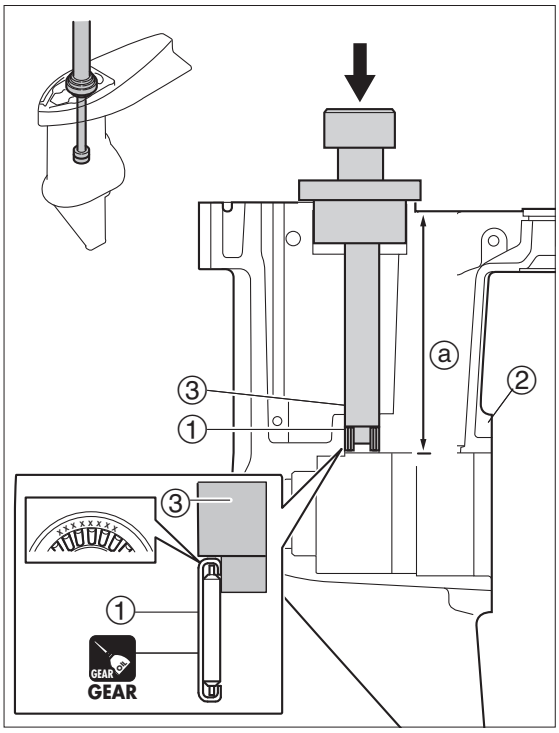
1. Install bearing ① with numbered side up to gear case ② to specified depth.

Installation Depth ⓐ :
100 mm ± 0.15 mm (3.9370 in ± 0.0059 in)

If a special tool is not available and thus the above depth cannot be maintained, order gear case ass'y.

GEAR

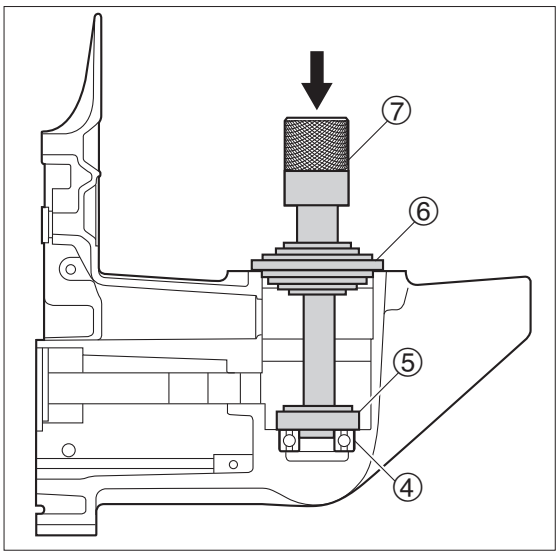
Needle bearing press Ass'y ③ :
P/N. 369-72900-0



① Needle Bearing **Do not reuse.**

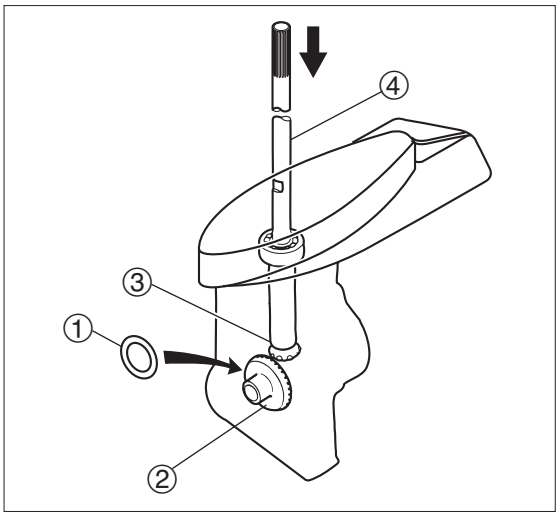
2. Install new bearing ④ with numbered side up.

Bearing Attachment ⑤ :
P/N. 3BV-99905-0
Center Plate ⑥ :
P/N. 3AB-99701-0
Driver Rod ⑦ :
P/N. 3AB-99902-0



⑥ Center Plate **Do not reuse.**

26) Installation of Forward Gear and Pinion Gear (A and B Gears)



1. Install shim ① and forward (A) gear ② that were removed previously.

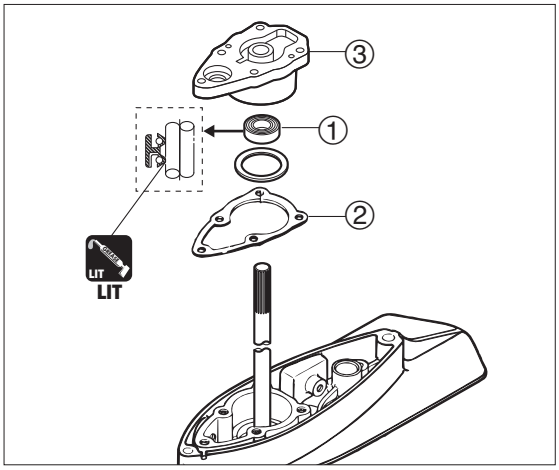
2. Install pinion (B) gear ③ and drive shaft ass'y ④.

Replace shim with new one of the same thickness if any deformation or damage is found on removed shim.

3. When replacing shims placed between forward (A) gear and bearing, measure thickness of original shims and use shims with the same thickness.

Sizes of Adjusting Shims :
For pinion (A) gear side : 0.1, 0.15mm
Since the shims are for canceling machining error, use the ones with thickness of original parts.

27) Reassembly of Pump Case (Lower)



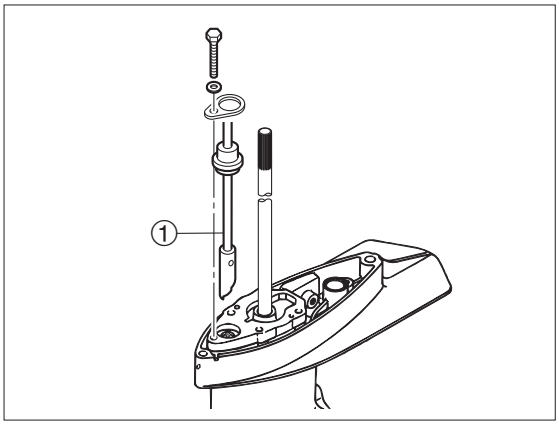
② Do not reuse.

1. Apply grease to lip of oil seal ① after installing it.

LIT

2. Attach new O-ring ② and pump case (lower) ③.

28) Installation of Clutch Cam and Cam Rod Ass'y



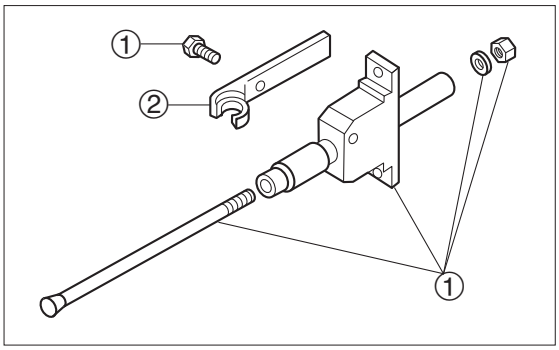
1. Install cam rod ass'y ① to gear case as shown.

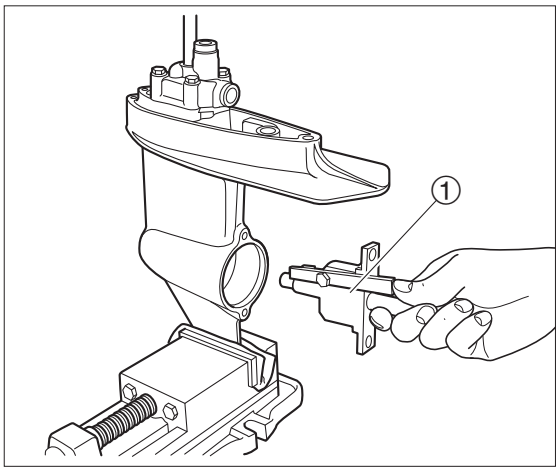
Be careful of the direction of cam rod ass'y.

29) Determination of forward (A) gear backlash

Backlash Measuring Tool Kit :
P/N. 369-72740-0
Backlash Measuring Tool Ass'y ① :
P/N. 369-72730-0
Measuring Tool Set Piece ② :
P/N. 369-72727-0
Clamp A :
P/N. 3B7-72720-0
Dial Gauge Plate :
P/N. 3B7-72729-0

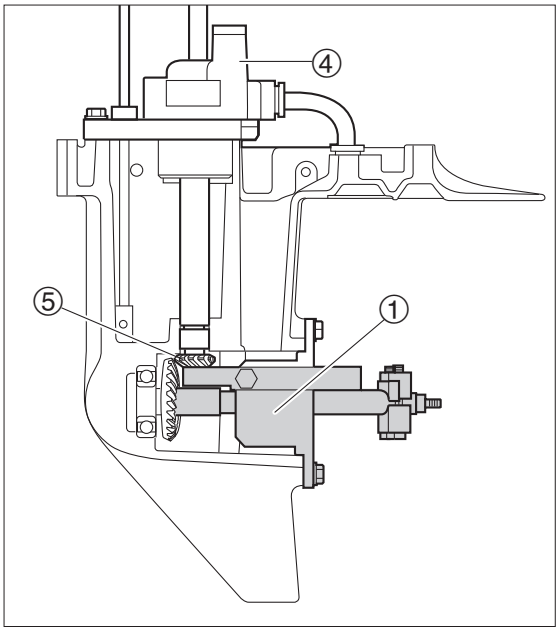
Perform measurement of backlash between forward (A) gear and pinion (B) gear with propeller shaft housing, propeller shaft and reverse (C) gear removed from gear case.





1. Install pump case ④ to gear case, and assemble backlash measuring tool ① as illustrated.

- Fix gear case with vice.
- Clean drive shaft with new rag before assembling the tool.
- Assemble all parts of pump case except impeller and key, and tighten to specified torque.
- Perform measurement of backlash between forward (A) gear and pinion (B) gear with propeller shaft housing, propeller shaft and reverse (C) gear removed from gear case.

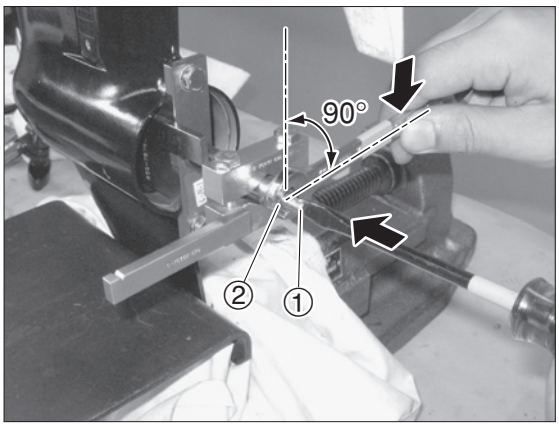


Proper Backlash Obtained from Gauge Reading :
0.16 - 0.49mm (0.0063 - 0.0193 in)

Sizes of Adjusting Shims :
For Pinion (B) Gear Side : 0.1, 0.15mm

2. First, pull up drive shaft by using hand.
Fix shaft B ① with bladed screw driver, and tighten nut ② while pushing the shaft. At this time, be careful not to overtighten the nut, or shaft B is locked.

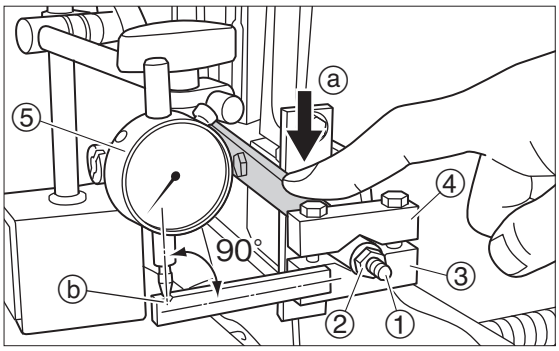
Tighten nut ② fully by using fingers, and then, additionally tighten approximately 90 degrees by using spanner wrench. During the work, fix shaft B ① by using bladed screw driver.



3. Secure clamp halves A ③ and B ④ to shaft B using bolts. Move clamp A while pushing arm in direction ⓐ, and read dial gauge ⑤ at notch groove ⓑ position.

Proper Backlash Obtained from Gauge Reading :
0.16 - 0.49mm (0.0063 - 0.0193 in)

Sizes of Adjusting Shims :
For Pinion (B) Gear Side : 0.1, 0.15mm



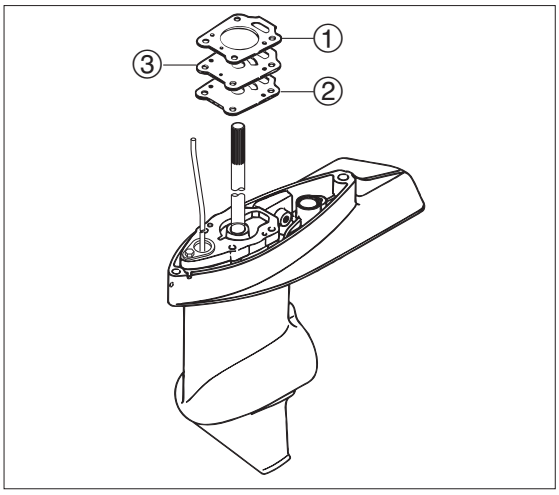
4. Perform shim adjustment at pinion (B) gear side as necessary based on the gauge ⑤ value obtained. The table shows relation between dial gauge readings and shim adjustments.

1.Values in this table indicate dial gauge readings that are obtained when using special tool.
2.Change gear engagement position and measure backlash again for check.

Gauge Reading mm	Shim Adjustment mm
0.00 ~ 0.15	– 0.10
0.16 ~ 0.49	0
0.50 ~ 0.52	+ 0.25
0.53 ~ 0.59	+ 0.30
0.60 ~ 0.65	+ 0.35
0.65 ~ 0.71	+ 0.40
0.72 ~ 0.77	+ 0.45

30) Installation of Water Pump

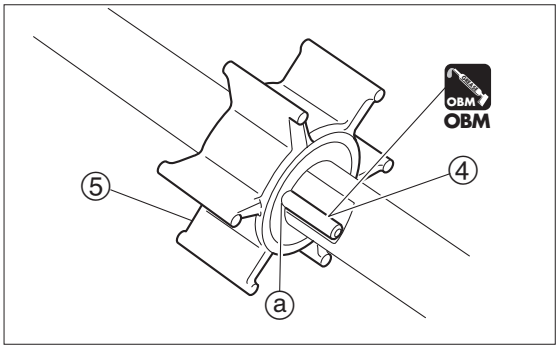
1. Attach new gaskets ① and ②, water pump guide plate ③ and dowel pin.



①② Gasket **Do not reuse.**

2. Attach key ④ to drive shaft.

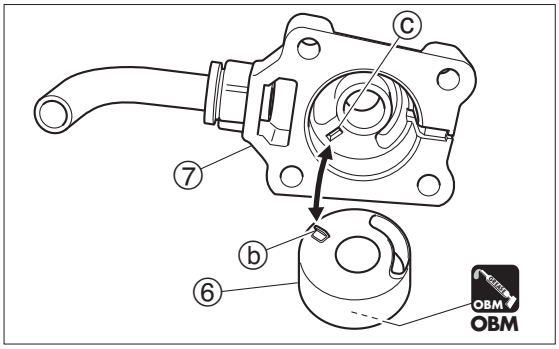
3. Bring impeller ⑤ groove ⓐ to key ④ and install impeller to drive shaft.



- When reusing impeller, install it so that it rotates in original direction.
- Apply grease to the key to prevent it from dropping when attaching.

OBM

4. Attach pump case liner ⑥ to pump case (upper) ⑦, and apply grease to interior of pump case liner ⑥.



Bring pump case liner protrusion ⓑ to pump case (upper) groove ⓒ.

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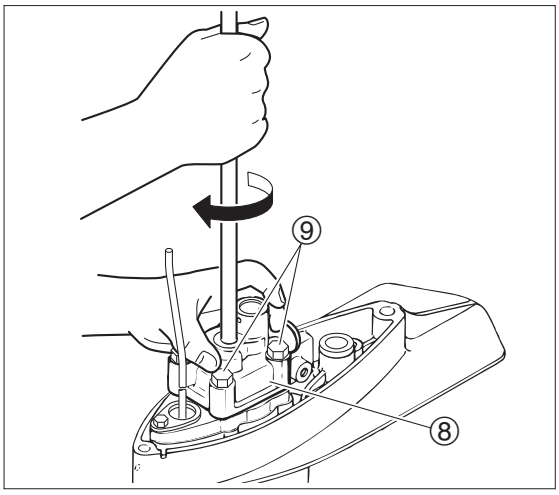
5. Install pump case (upper) ass'y ⑧ on the gear case, and tighten bolts ⑨ in two or three steps to specified torque.

Apply grease to interior of pump case liner, and install pump case (upper) by pushing it down with hand while turning drive shaft clockwise.

Pump Case (Upper) Bolts ⑨ :
6 N · m (4 lb · ft) [0.6 kgf · m]

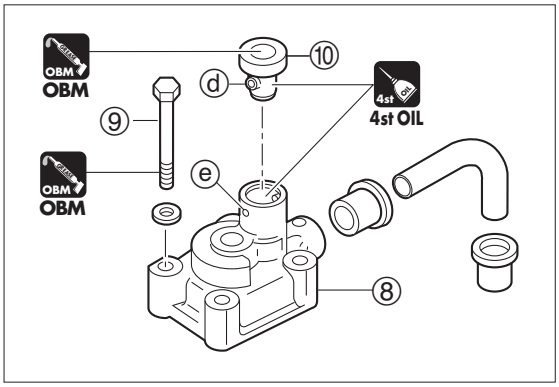
OBM



6. Bring grommet ⑩ protrusion ⓓ to hole ⓔ, and install it to pump case (upper) ass'y ⑧.

4st OIL

OBM



31) Installation of Propeller Shaft Housing Ass'y

1. Check that OBM grease is applied to lip of oil seal of propeller shaft housing ass'y ①.

2. Install propeller shaft ass'y ② to propeller shaft housing ass'y ①.

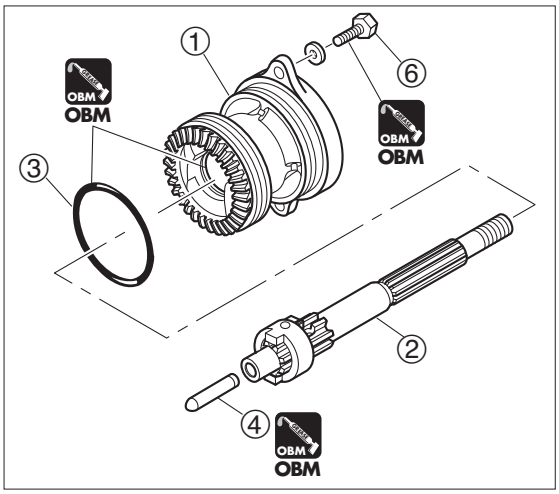
3. Apply grease to new O-ring ③ and install it.

4. Apply grease to clutch push rod ④ and install it to propeller shaft ass'y ②.

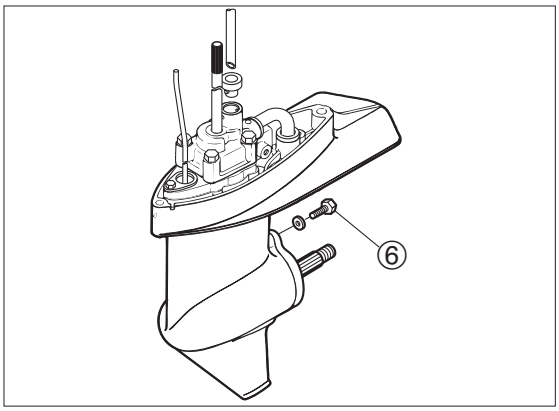
5. Attach propeller shaft housing ass'y ① to gear case, and tighten bolts ⑥ to specified torque.

Propeller Shaft Housing Bolts ⑥ :
6 N · m (4 lb · ft) [0.6 kgf · m]

OBM



- Apply grease to clutch push rod to prevent it from dropping when attaching.
- When installing propeller shaft housing ass'y to gear case, tighten upper and lower bolts in 2 or 3 steps evenly to specified torque.

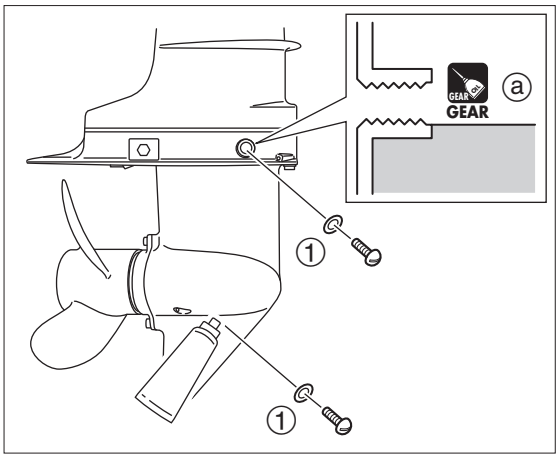


32) Filling with Gear Oil

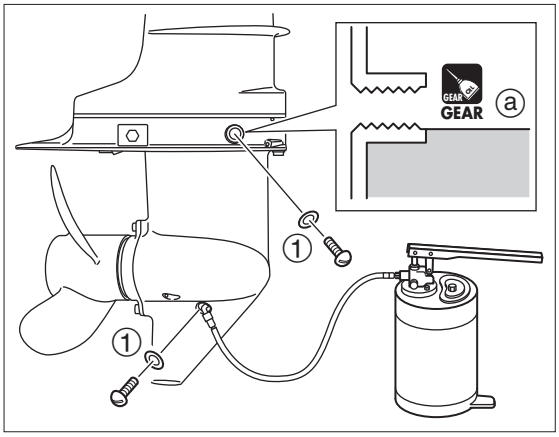
1. Fill gear case with specified quantity ⓐ of gear oil. "Refer to Chapter 3."

Perform "Inspection of Gear Case (Leakage)" in Chapter 3 if necessary.

GEAR



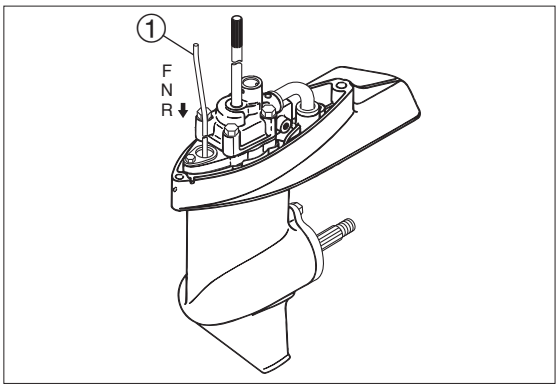
① Gasket **Do not reuse.**



① Gasket **Do not reuse.**

33) Installation of Lower Unit Ass'y

1. Set cam rod ① to reverse (R) position.

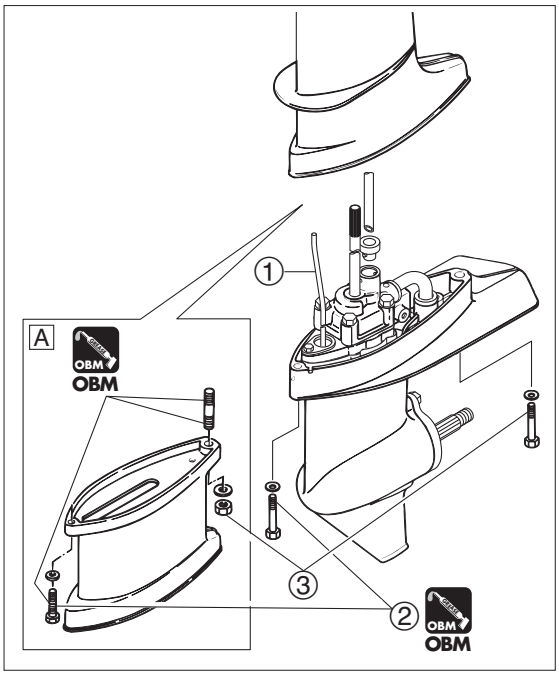


2. Attach lower unit ass'y to drive shaft housing, and tighten lower unit ass'y installation bolts ② (nut ③) to specified torque.

Connect water pipe securely. Move flywheel a little to align the drive shaft spline to crank shaft spline.

Lower Unit Ass'y Installation Bolts (M6)② :
6 N · m (4 lb · ft) [0.6 kgf · m]
Lower Unit Ass'y Installation Bolt, Nut (M8)③ :
13 N · m (9 lb · ft) [1.3 kgf · m]

OBM

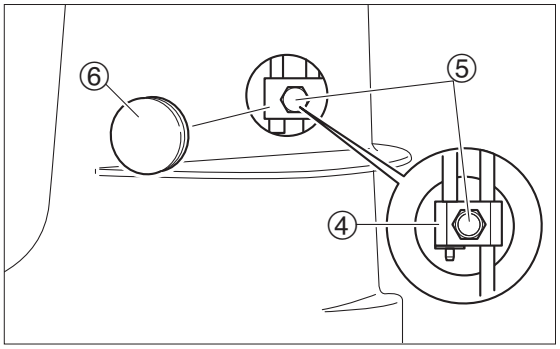


A UL-Transom Model

3. Install cam rod ① to joint ④ and tighten bolt ⑤ to specified torque.

Joint Bolt ⑤ :
6 N · m (4 lb · ft) [0.6 kgf · m]

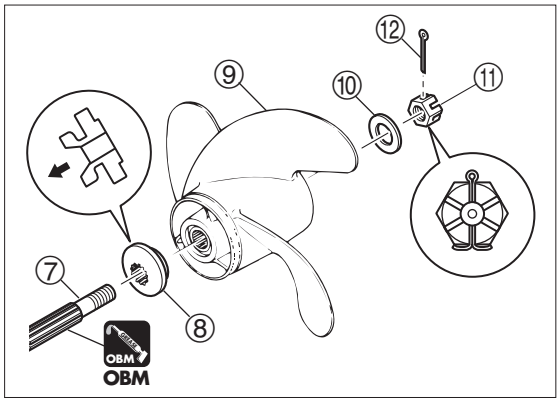
4. Attach grommet ⑥ to drive shaft housing.



5. Apply OBM grease to propeller shaft ⑦.

OBM

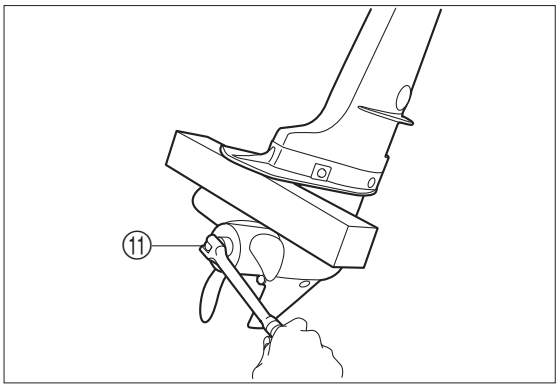
6. Attach thrust holder ⑧, propeller ⑨, washer ⑩ and propeller nut ⑪ to propeller shaft. Put a piece of wooden block between anti-ventilation plate and propeller to prevent rotation of propeller, and tighten propeller nut to specified torque.



⚠ WARNING

Before removing or installing propeller, be sure to disconnect spark plug cap and remove stop switch lock plate.

7. Turn propeller nut ⑪ to tightening direction to align one of grooves to propeller shaft hole, and attach split pin ⑫.



If propeller nut groove cannot be aligned with split pin hole, loosen nut and repeat steps 6 and 7.

8. Check gear oil level. "Refer to Chapter 3."

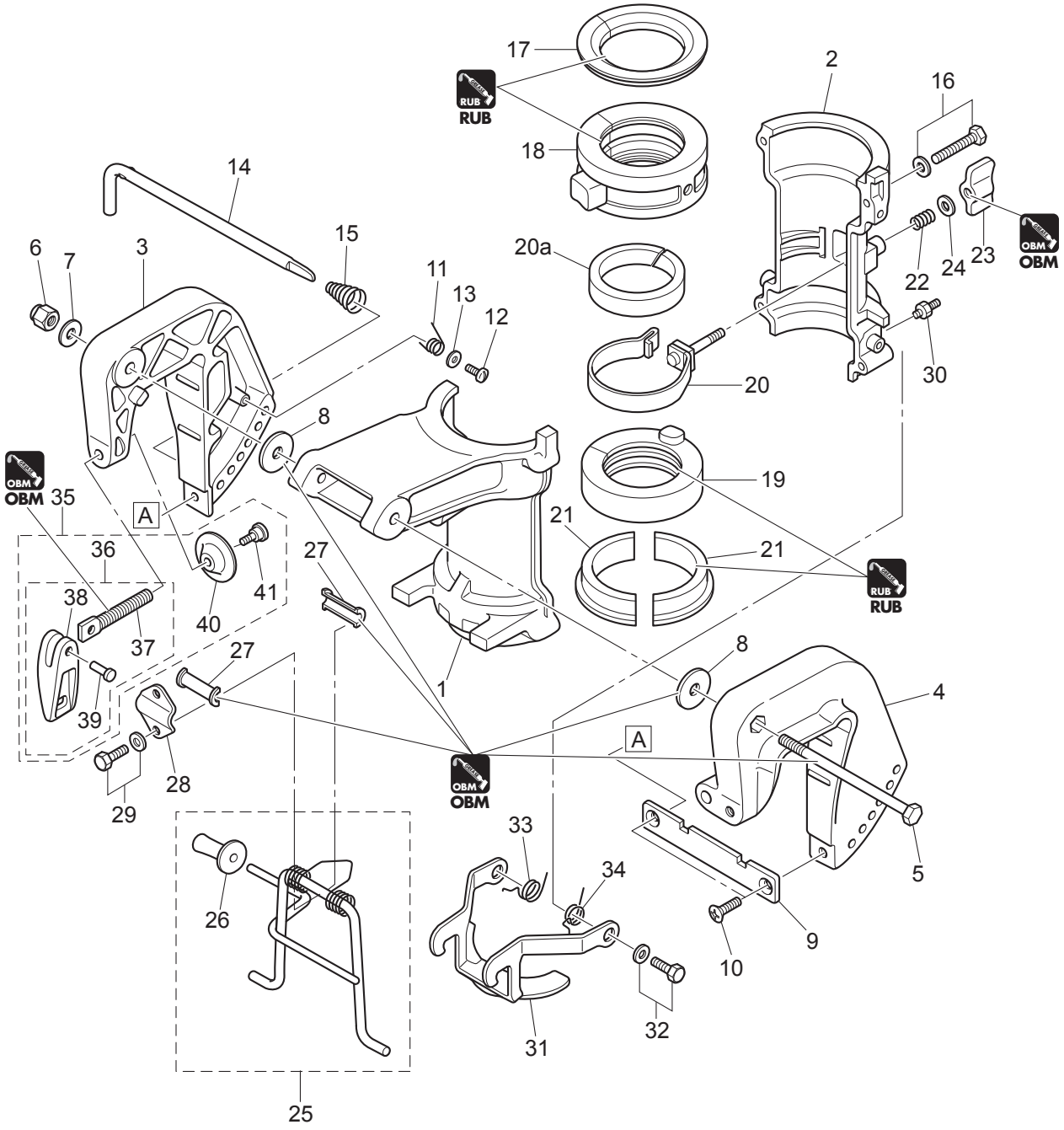
Perform "Inspection of Lower Unit (Air Leakage)" in Chapter 3 if necessary.

7
Bracket

1. Parts Layout

P/C Fig. 9

Bracket • Reverse Lock

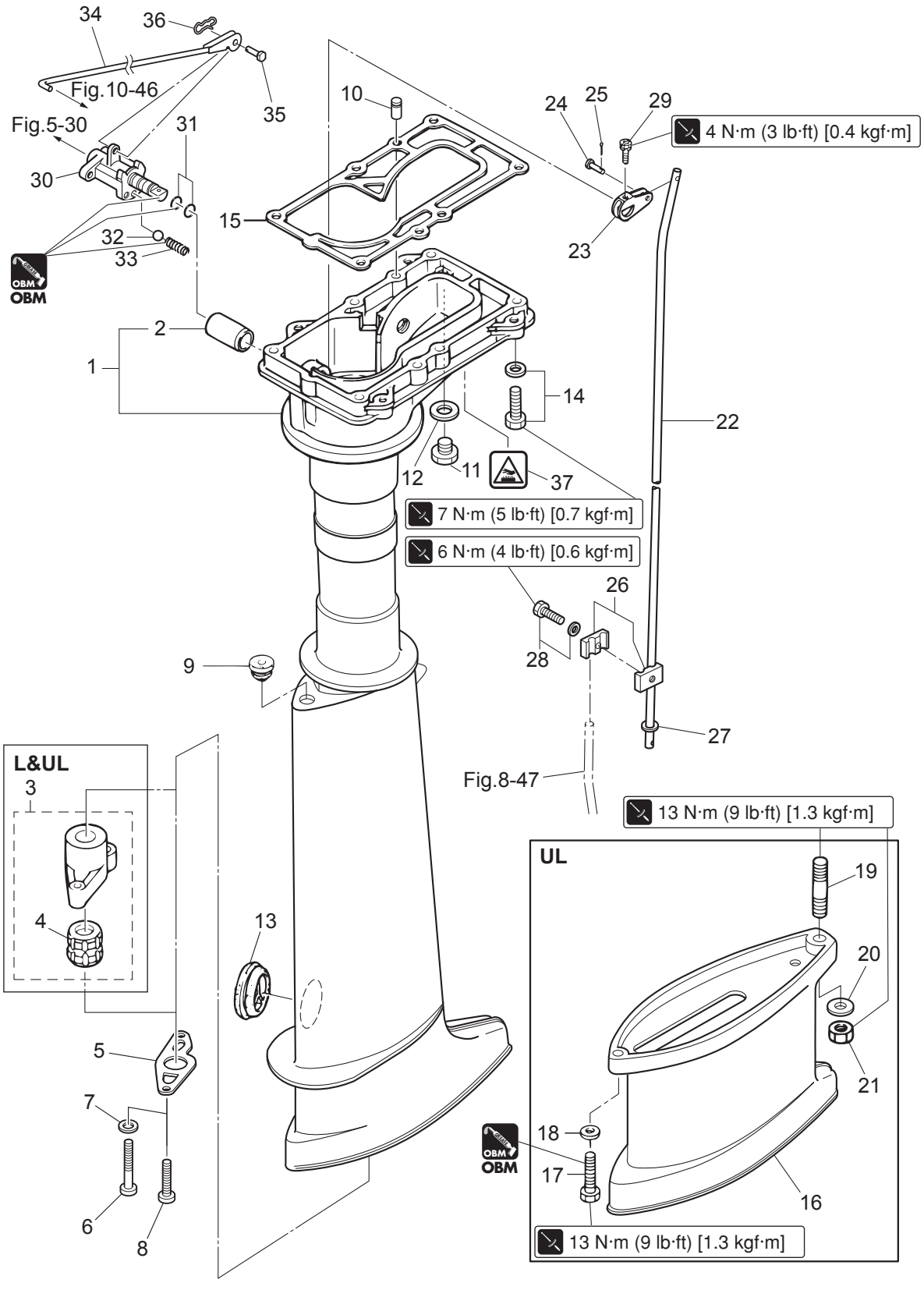


OBM
RUB

Ref. No.	Description	Q'ty	Remarks
1	Swivel Bracket	1	
2	Swivel Bracket	1	
3	Clamp Bracket (R)	1	Stern Bracket Right Starboard Side
4	Clamp Bracket (L)	1	Stern Bracket Left Port Side
5	Bolt 8-122	1	
6	Nylon Nut 8-P1.25	1	M8
7	Washer	1	M8
8	Washer 8.5-28-1	2	
9	Distance Plate	1	
10	Screw	2	M6 L=12mm
11	Stern Bracket Spring	1	
12	Screw	1	M4 L=6mm
13	Washer 4.3-16-1.5	1	
14	Thrust Rod	1	
15	Thrust Rod Spring	1	
16	Bolt	4	M6 L=40mm
17	Thrust Bushing	1	
18	Bushing	1	
19	Bushing	1	
20	Friction Band Assy	1	
20a	Bushing	1	
21	Thrust Plate (Lower)	2	
22	Spring	1	
23	Friction Knob	1	
24	Washer 6-16-1.5	1	
25	Tilt Stopper Assy	1	
26	Tilt Stopper Grip	1	
27	Bushing	2	
28	Setting Plate	1	
29	Bolt	2	M6 L=12mm
30	Grease Fitting	2	
31	Reverse Lock Arm	1	
32	Bolt	2	M6 L=14mm
33	Reverse Lock Spring (R)	1	
34	Reverse Lock Spring (L)	1	
35	Clamp Screw Kit	2	
36	Clamp Screw Assy	1	
37	Clamp Screw	1	
38	Clamp Screw Handle	1	
39	Rivet 3-22	1	
40	Clamp Screw Pad	1	
41	Shoulder Bolt	1	

Drive Shaft Housing • Shift

P/C Fig. 7

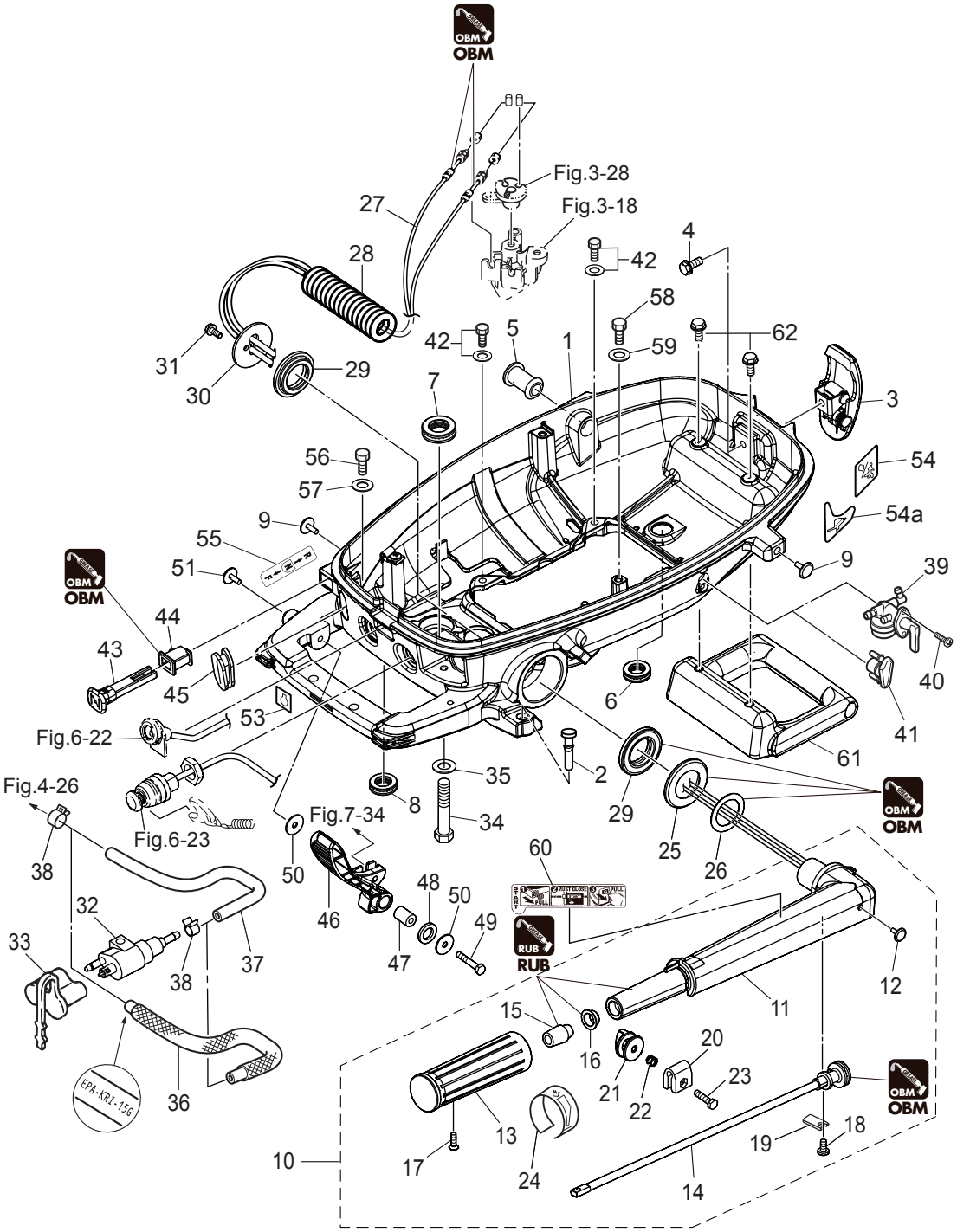


OBM

Ref. No.	Description	Q'ty	Remarks
1-1	Drive Shaft Housing Assy (S)	1	for Transom "S"
1-2	Drive Shaft Housing Assy (L)	1	for Transom "L" use Slate Color Bushing
1-3	Drive Shaft Housing Assy (Ul)	1	for Transom "UL" use Dark Brown Bushing
2	Bushing	1	
3-1	Drive Shaft Bushing Assy	1	Slate Color Bushing for Transom "L"
3-2	Drive Shaft Bushing Assy	1	Dark Brown Bushing for Transom "UL"
4-1	Drive Shaft Bushing	1	Slate Color for Transom "L"
4-2	Drive Shaft Bushing	1	Dark Brown for Transom "UL"
5	Stopper	1	
6	Pre-Coated Screw 5-25	2	for Transom "L"&"UL"
7	Washer	2	M5
8	Screw	2	for Transom "S" M5 L=10mm
9	Grommet 10.7-3.5	1	
10	Dowel Pin 6-12	2	
11	Bolt	1	M8 L=8mm
12	Gasket	1	Do not reuse.
13	Grommet 29-3	1	
14	Bolt	6	M6 L=30mm
15	Drive Shaft Housing Gasket	1	Do not reuse.
16	Extension Housing	1	for Transom "UL"
17	Bolt	1	for Transom "UL" M6 L=25mm
18	Washer	1	for Transom "UL" M6
19	Stud	1	for Transom "UL" M8 L=25mm
20	Washer	1	for Transom "UL" M8
21	Nut	1	for Transom "UL" M8
22-1	Shift Rod (S)	1	for Transom "S"
22-2	Shift Rod (L)	1	for Transom "L"&"UL"
23	Shift Rod Lever	1	
24	Pin	1	
25	Split Pin	1	
26	Shift Rod Joint Assy	1	
27	Washer	1	M6
28	Bolt	1	M6 L=16mm
29	Bolt	1	M4 L=16mm
30	Shift Lever Shaft Assy	1	
31	O-Ring 1.9-8.8	2	Do not reuse.
32	Ceramic Ball 7.7	1	
33	Spring	1	
34	Shift Lever Rod	1	
35	Pin	1	
36	Snap Pin	1	
37	High Temperature Caution Decal	1	

Bottom Cowl • Tiller Handle

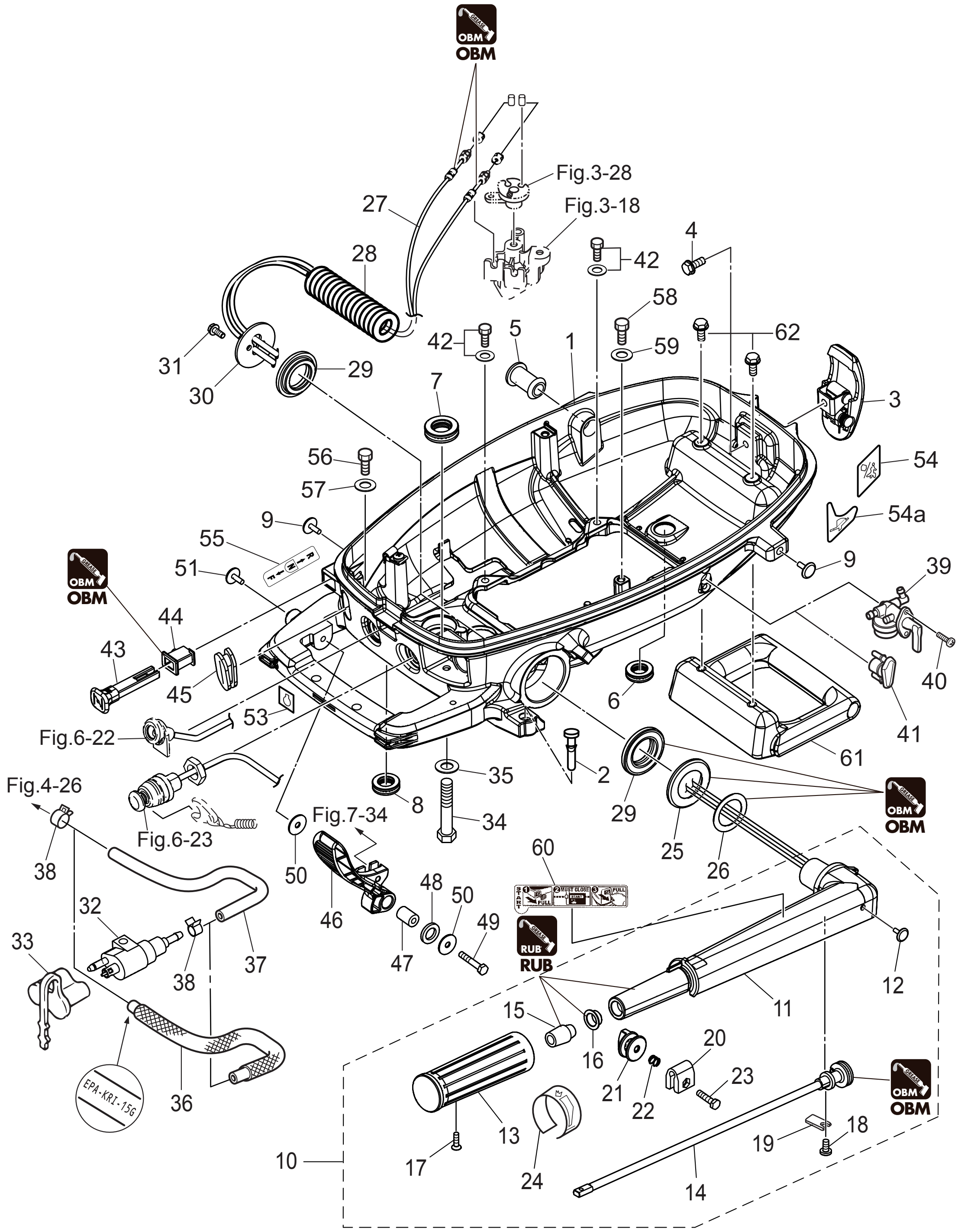
P/C Fig. 10



OBM

Ref. No.	Description	Q'ty	Remarks
1	Bottom Cowl	1	
2	Grommet 22-3	1	
3	Cowl Latch Assy	1	
4	Bolt	1	M6 L=16mm
5	Grommet 15.5-27	1	
6	Grommet 18-2.5	1	
7	Grommet 25-5	1	
8	Grommet 17-2.7	1	
9	Plastic Rivet 6.5	2	
10	Tiller Handle Assy	1	
11	Tiller Handle	1	
12	Plastic Rivet 6.5	1	
13	Grip	1	
14	Throttle Shaft	1	
15	Throttle Shaft Damper	1	
16	Bushing 14-15.8-7	1	
17	Screw	1	
18	Screw	1	
19	Throttle Shaft Support	1	
20	Friction Piece	1	
21	Adjusting Nut	1	
22	Spring	1	
23	Bolt	1	
24	Throttle Decal	1	
25	Spacer 33.5-55-3.3	1	
26	Washer 30-45-1	1	
27	Throttle Wire	2	
28	Protector φ 10.7-180	1	
29	Bushing	2	
30	Cover	1	
31	Bolt	2	
32	Fuel Connector (Male)	1	
33	Fuel Connector Protector	1	
34	Bolt	1	M6 L=25mm
35	Washer	1	M6
36	Fuel Hose W/Protector 353-40-30	1	USA/Separate Fuel Tank Model
37	Fuel Hose 353-40-30	1	STD/Separate Fuel Tank Model
38	Clip φ 9.4	2	Separate Fuel Tank Model
39	Fuel Cock Assy	1	Dual Fuel Tank Model
40	Screw M4-10	2	Dual Fuel Tank Model
41	Grommet	1	Separate Fuel Tank Model
42	Bolt	4	M6 L=16mm
43	Choke Rod	1	
44	Choke Rod Bushing	1	
45	Grommet 30.2-12.7	1	
46	Shift Lever	1	
47	Collar 15.9-17-9	1	
48	Washer 30-45-1	1	

P/C Fig. 10



OBM
Fig.3-28
Fig.3-18
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Fig.6-22
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Fig.4-26
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Fig.7-34
Fig.6-23
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RUB
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EPA-KRT-15G
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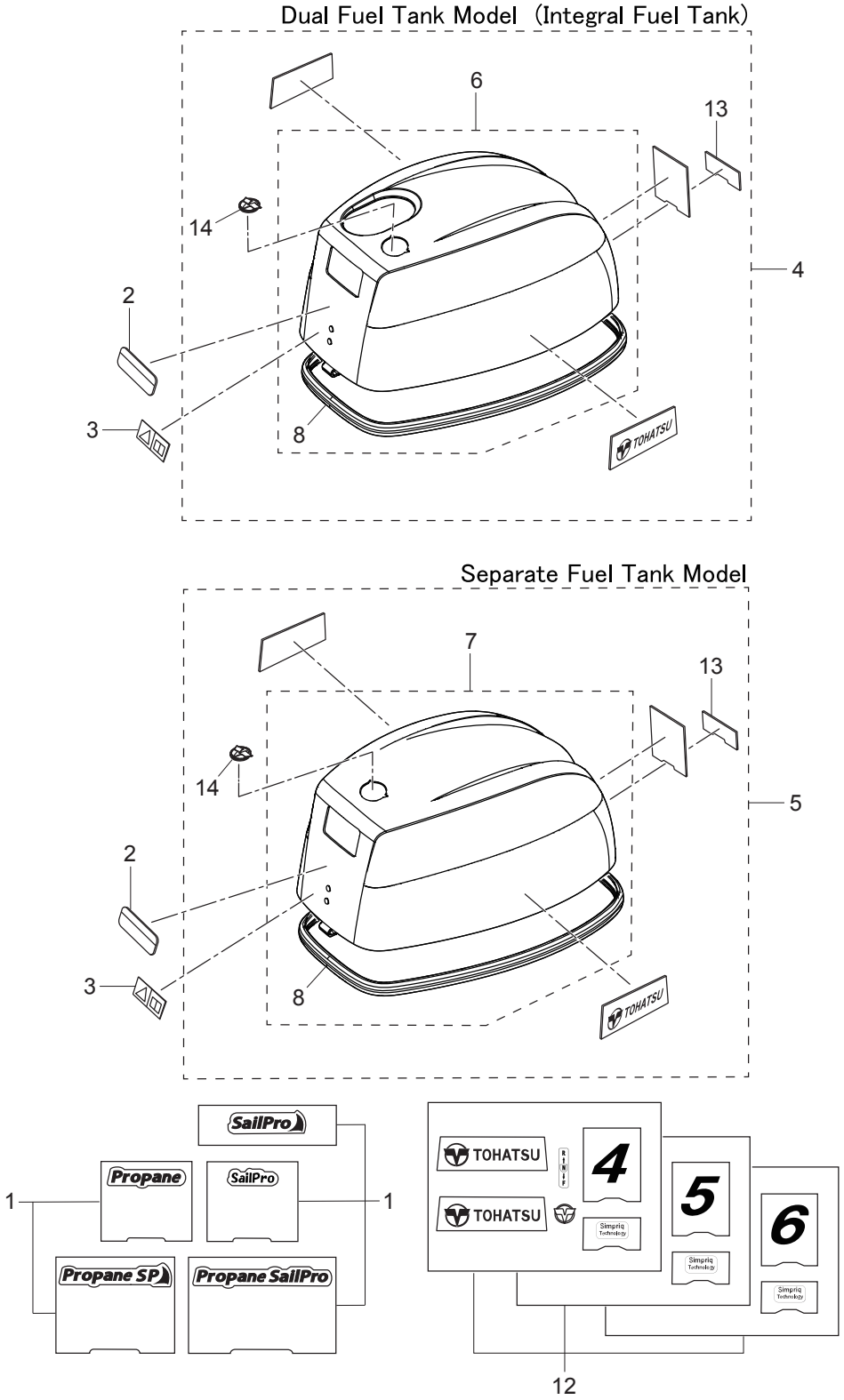
14

OBM

Ref. No.	Description	Q'ty	Remarks
49	Bolt 6-35	1	
50	Washer 6.5-23-1.5	2	
51	Cable Terminal Plug	1	
53	Oil Pressure Decal	1	
54	Fuel Lever Decal	1	
54a	Fuel Lever Decal	1	
55	Shift Decal	1	
56	Bolt	2	Dual Fuel Tank Model M6 L=12mm
57	Washer 6.5-23-1.5	2	Dual Fuel Tank Model
58	Bolt	1	Separate Fuel Tank Model M6 L=12mm
59	Washer 6.5-23-1.5	1	Separate Fuel Tank Model
61	Carrying Handle	1	
62	Pre-Coated Bolt 6-16	2	

Top Cowl

P/C Fig. 11



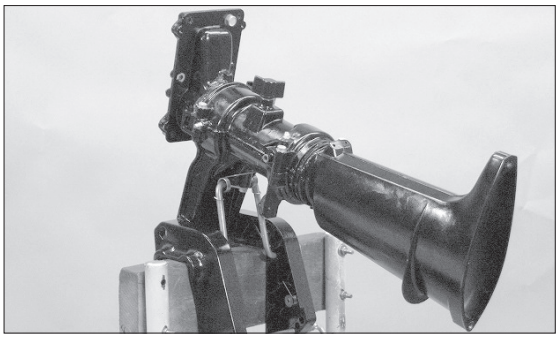
Ref. No.	Description	Q'ty	Remarks
1-1	Sail Pro Decal	1	for Sail Pro (USA)
1-2	Sp Decal	1	for Sail Pro (EU)
2	Caution Decal (A)	1	
3	Caution Decal	1	for EU Model
4	Top Cowl Assy	1	Dual Fuel Tank Model (Integral Fuel Tank)
5	Top Cowl Assy	1	Separate Fuel Tank Model
6	Top Cowl Sub-Assy	1	Dual Fuel Tank Model (Integral Fuel Tank)

Ref. No.	Description	Q'ty	Remarks
7	Top Cowl Sub-Assy	1	Separate Fuel Tank Model
8	Top Cowl Seal	1	
12-1	Decal Set (MFS4D)	1	4ps
12-2	Decal Set (MFS5D)	1	5ps
12-3	Decal Set (MFS6D)	1	6ps
13	Simpliq Decal	1	
14	Logo Decal	1	

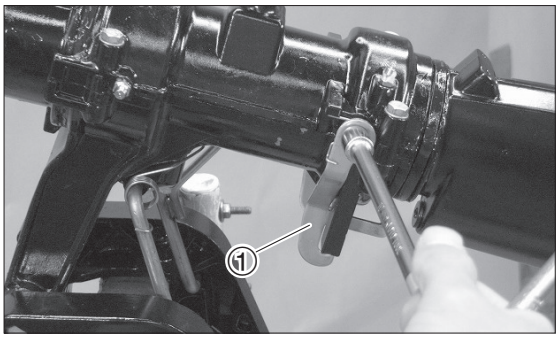
2. Disassembling and Assembling Procedure

1) Removal and Inspection of Drive Shaft Housing

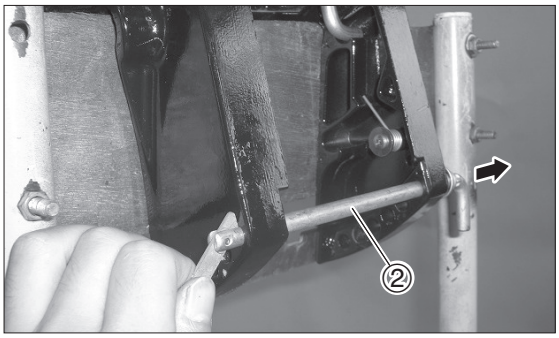
1. Tilt up drive shaft housing.



2. Remove reverse lock arm ①.

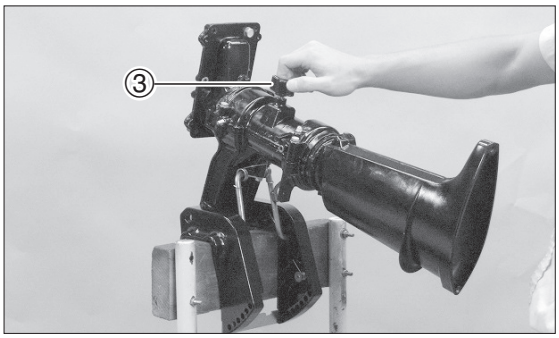


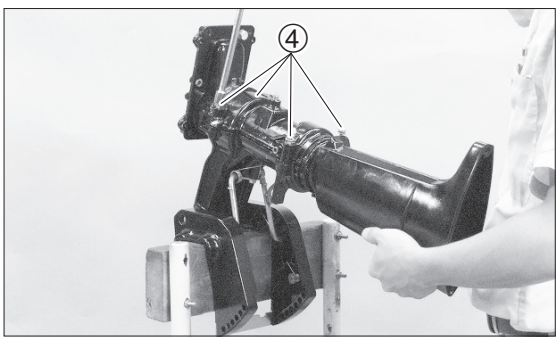
3. Remove thrust rod ②.



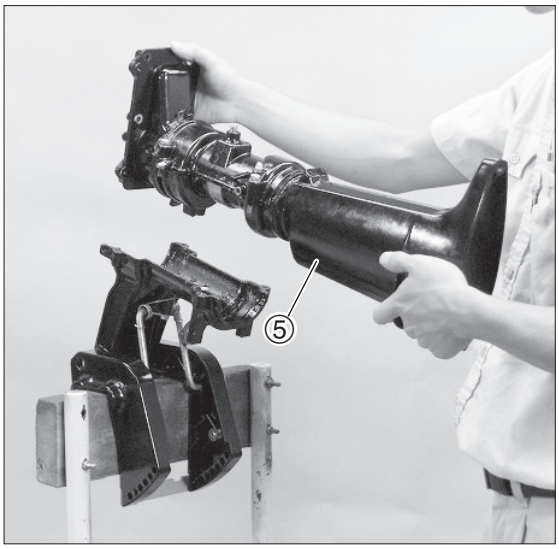
4. Remove wing nut ③ for co-pilot.
   Loosen four swivel bracket (B) bolts ④.

> Hold drive shaft housing to prevent it from dropping.

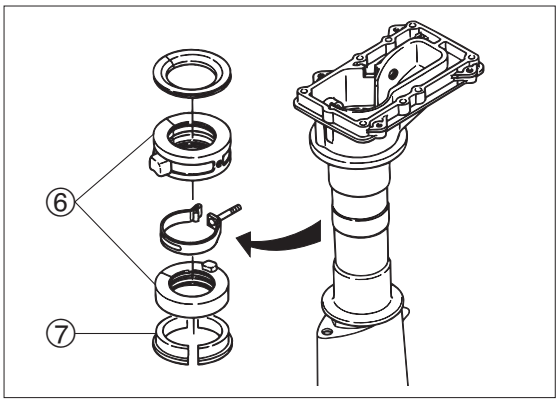




5. Remove drive shaft housing ⑤.

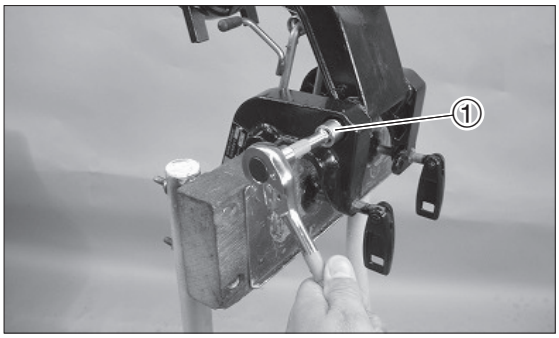


6. Check steering bushing ⑥ and thrust place ⑦ for wear and damage, and replace if necessary.

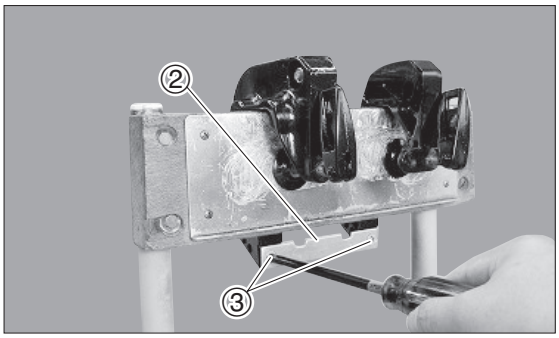


2) Removal and Inspection of Clamp Bracket

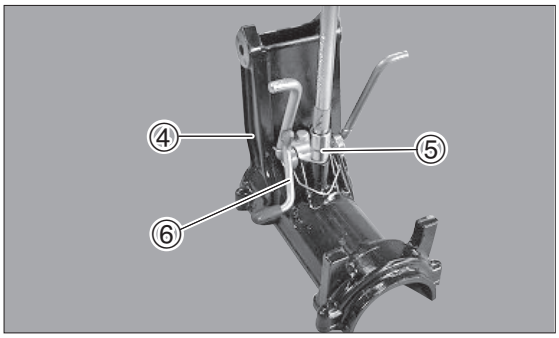
1. Loosen clamp bracket mounting nut ① and remove bolt, then remove swivel bracket.



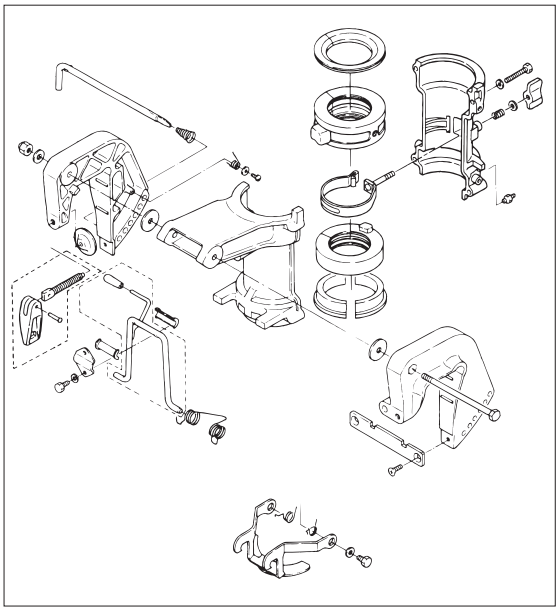
2. Remove mounting screws ③ of bracket distance plate ②.



3. Remove tilt stopper ⑤ mounting bolt ⑥ from swivel bracket ④, and then remove tilt stopper ⑤.



4. Check tilt stopper and bracket for damage.
   Replace if damaged.

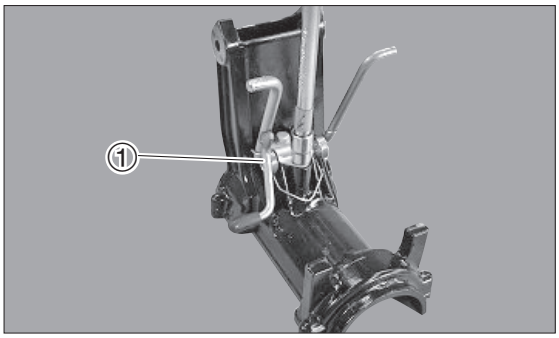


7

3) Installation of Clamp Bracket and Drive Shaft Housing

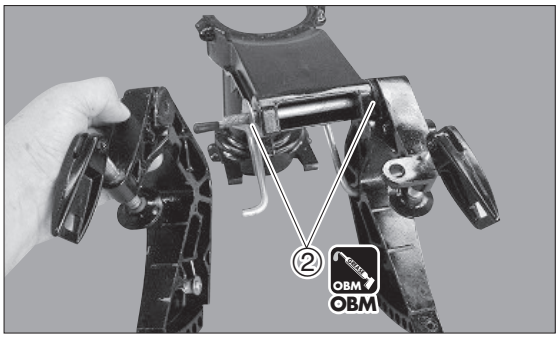
1. Install tilt stopper ① to swivel bracket (A).

   Apply grease to sliding areas of tilt stopper.

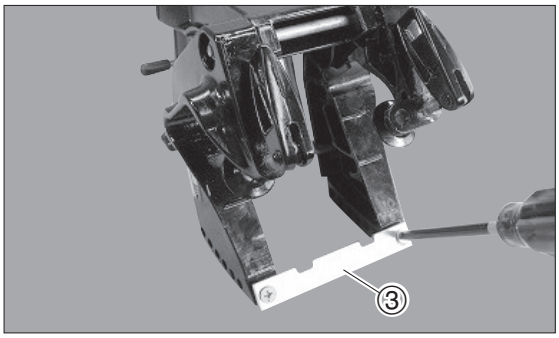


2. Install clamp bracket to swivel bracket (A).
   Apply grease to both sides of washer ②.

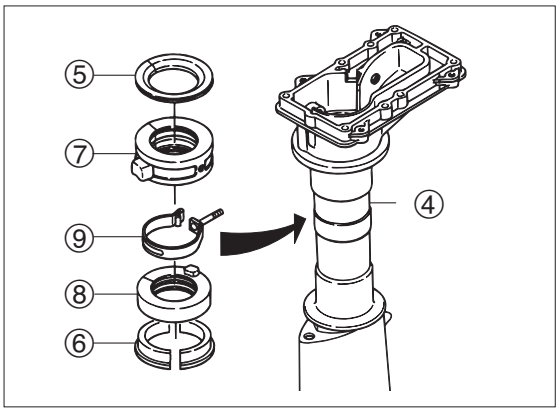
   OBM



3. Install distance plate ③ to clamp bracket.

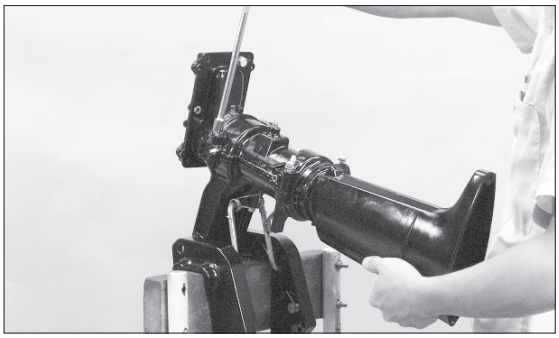


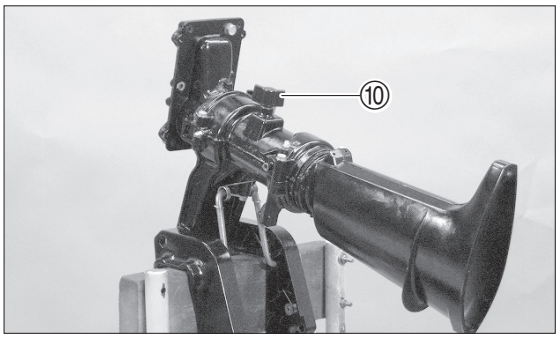
4. Install thrust bushing ⑤, thrust place ⑥, steering bushings ⑦ and ⑧ and friction plate ⑨ on the drive shaft housing ④.



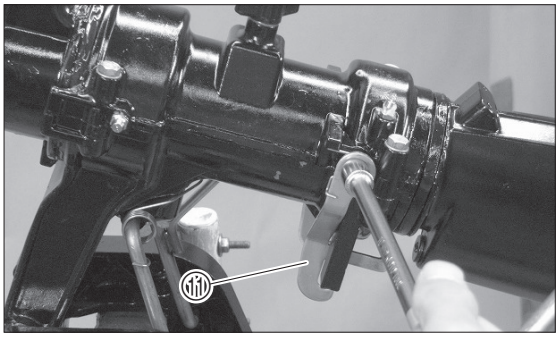
5. Install drive shaft housing and swivel bracket (B) to swivel bracket.

Attach wing nut ⑩, and check operation of steering friction.





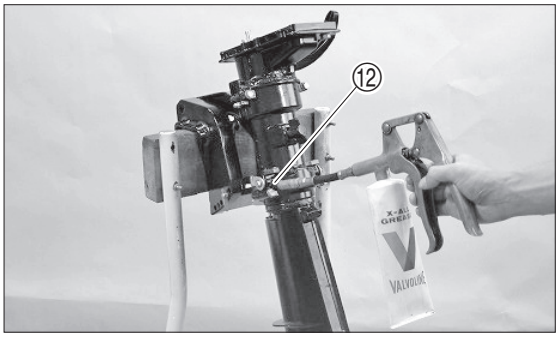
6. Install reverse lock arm ⑪ on the swivel bracket.

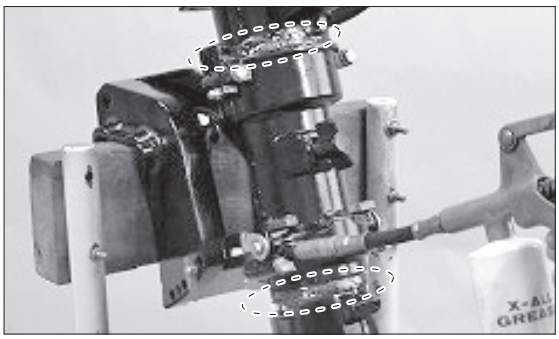


7. Check operation of each part, and put grease through swivel bracket grease nipple ⑫.

Keep putting grease until excessive grease appears from thrust bushing.

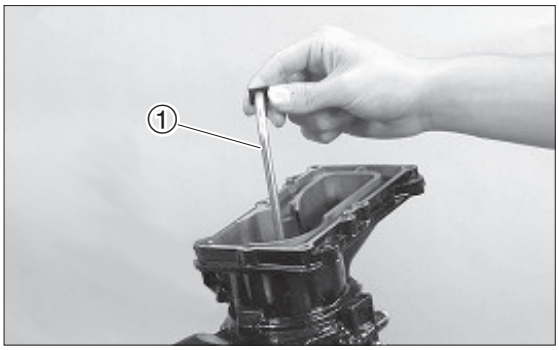
RUB





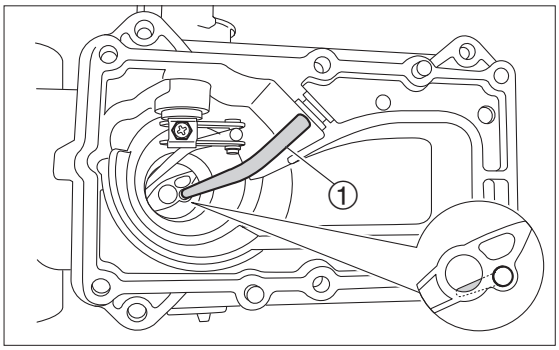
4) Removal, Inspection and Installation of Water Pipe

1. Remove water pipe ① from drive shaft housing ②.



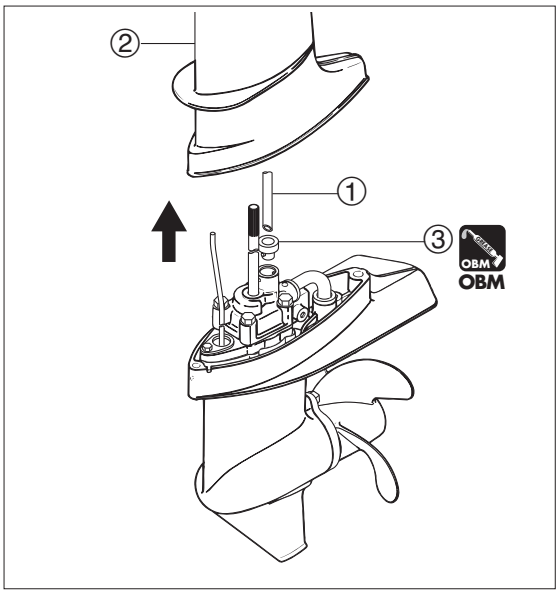
2. Check water pipe for crack and damage.

3. Install water pipe ① into drive shaft housing ②.



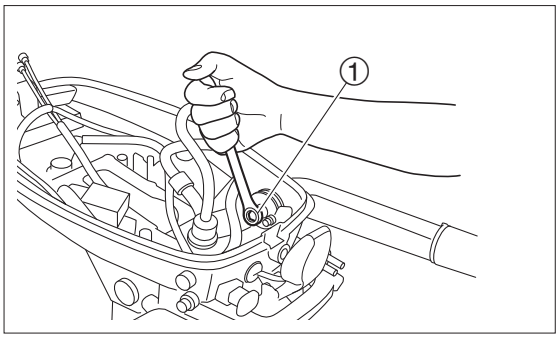
- Apply grease to water pipe seal ③ before installation.
- Attach water pipe surely to drive shaft bushing.

OBM

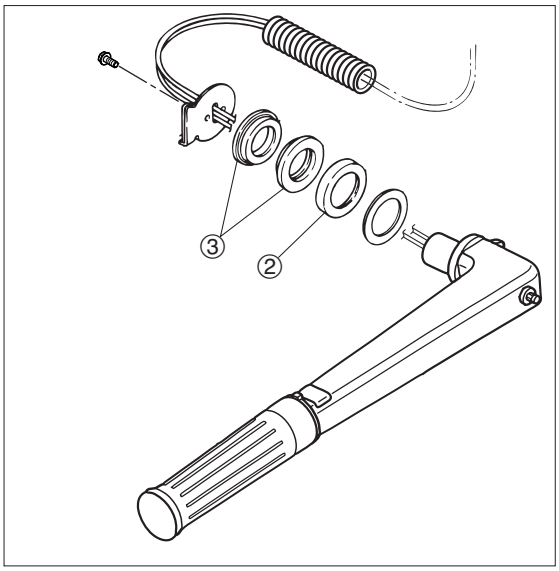


5) Remove, Inspection and Installation of Tiller Handle

1. Loosen stud bolt ① of tiller handle, and remove tiller handle from bottom cowl.

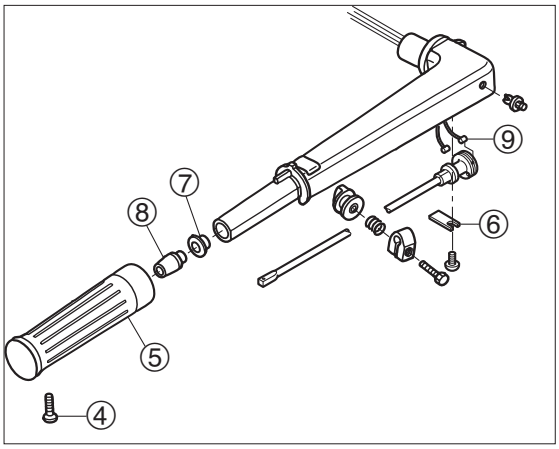


2. Check tiller handle spacer ② and bushings ③ for wear and damage.



3. Loosen throttle grip screw ④ and remove the grip ⑤.
   Remove throttle shaft supporter ⑥ screw.
   Check bushing ⑦ and throttle shaft damper ⑧ for damage.

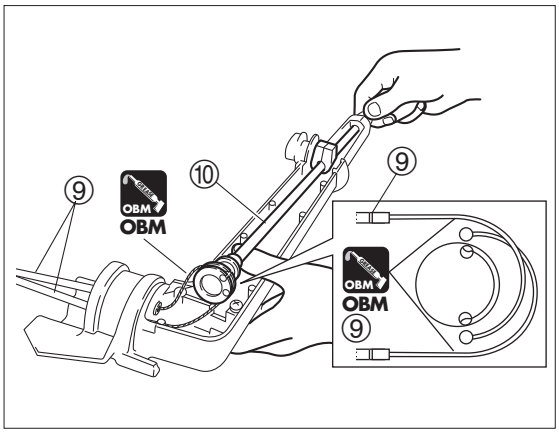
4. Check throttle wire ⑨ for break, bend and crack, and replace if necessary.



7

5. Attach throttle wire ⑨ to throttle shaft ⑩ as shown.

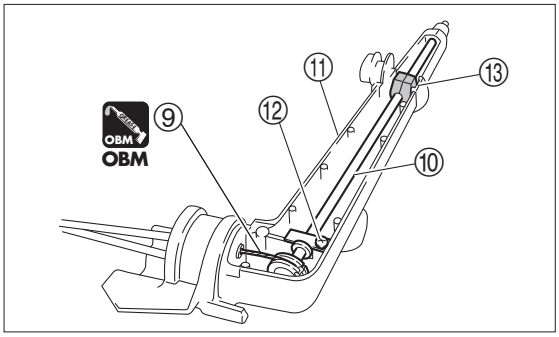
OBM



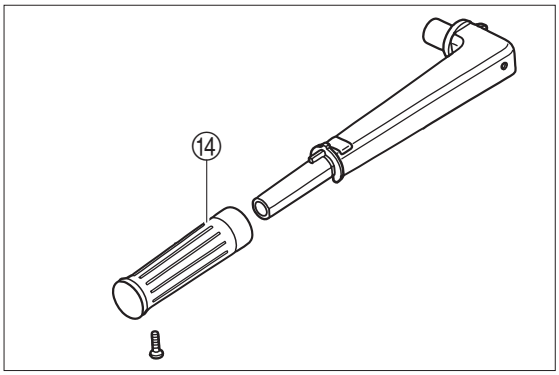
6. Attach throttle shaft ⑩ with throttle wire ⑨ to tiller handle ⑪, and tighten adjusting screw ⑫ securely.
Tighten throttle supporter.

Be careful of the location of throttle friction ⑬.

OBM



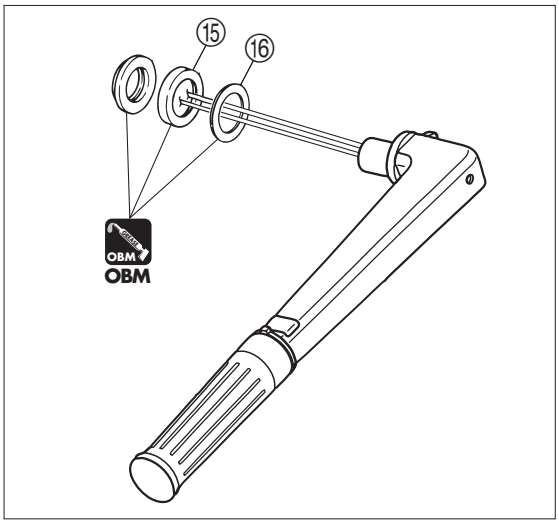
7. Install throttle grip ⑭ to tiller handle, and secure with screw.



8. Install tiller handle bushing ⑮ and spacer ⑯ to tiller handle.

Apply grease to tiller handle bushing ⑮ and spacer ⑯.

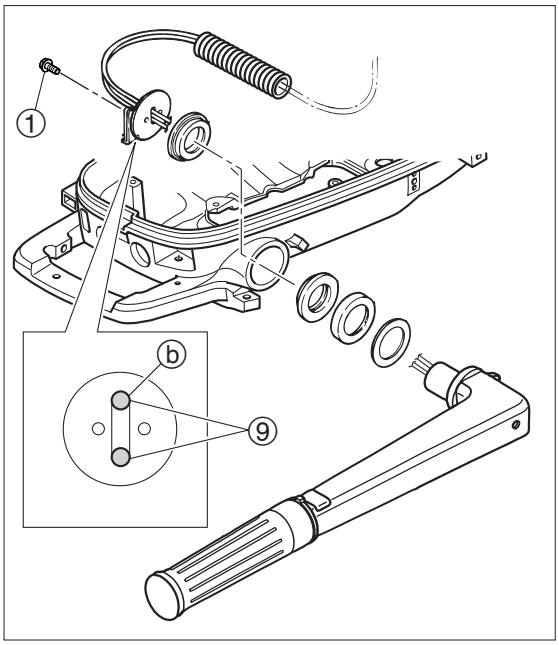
OBM



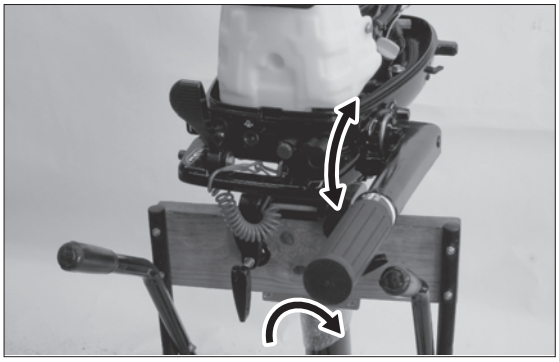
9. Install tiller handle to bottom cowl.
Tighten bolt ① to specified torque.

Tiller handle securing bolt ① :
6 N · m (4 lb · ft) [0.6 kgf · m]

Arrange throttle cable ⑨ as shown.
ⓐ<High speed side>, ⓑ<Low speed side>



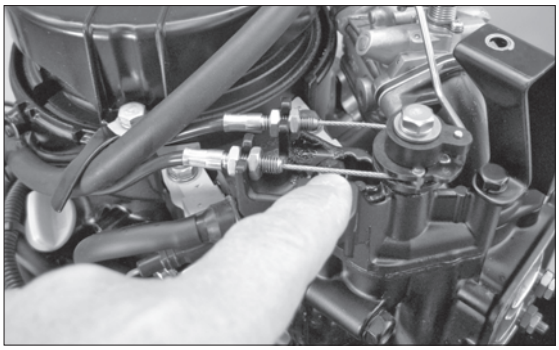
10. Check operations of tiller handle and throttle grip.



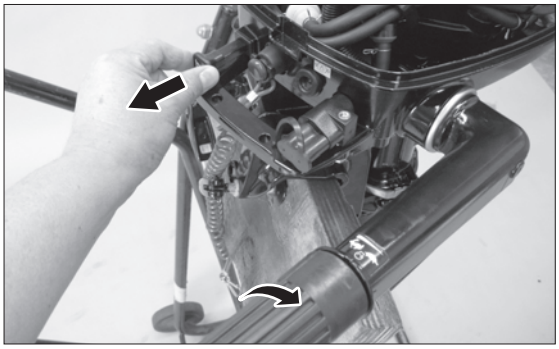
7

6) Adjustment of Throttle Cable

1. Check position of cable on low speed side and high speed side.

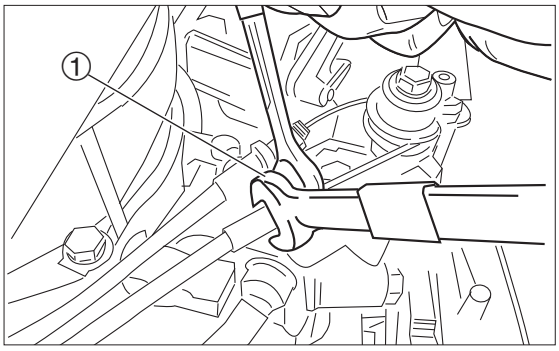


2. Set throttle grip to the slowest position, and fully pull choke knob to close choke valve.

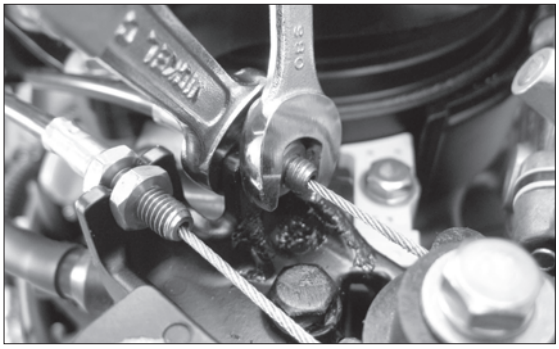


3. Adjust lock nut ① while applying tension to outer wire by pulling it with a hand to fix low speed side wire.

> The wire is in proper state if pushing inner wire at the center makes deflection of about 1 mm.

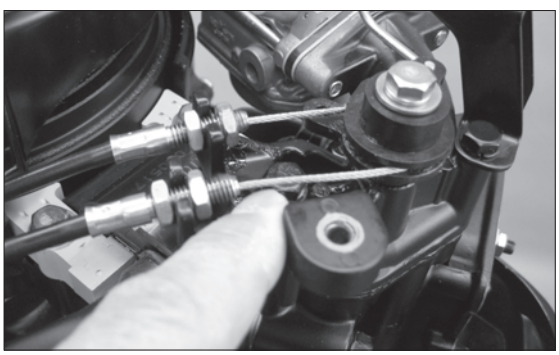


4. Repeat above steps for high speed side wire, and fix it.

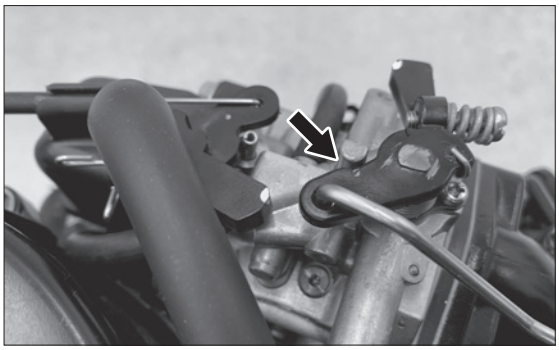


5. Return choke knob to the original position to fully open choke valve.
   To confirm the slowest position of throttle grip, check gap between projection of throttle drum and dent of opener section. The gap is acceptable if it is in the range between 0.5 mm and 1 mm.

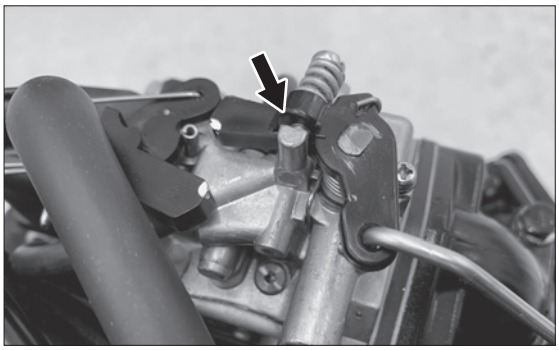
> Repeat steps 2. to 4. if necessary.



6. Set throttle grip to full-open position, and check if throttle lever of carburetor contacts stopper.

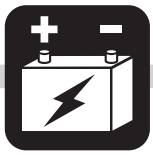


7. Set throttle grip to full-close position, and check if throttle lever of carburetor contacts stopper.

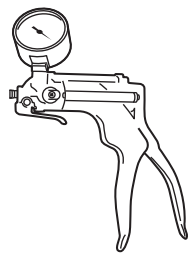
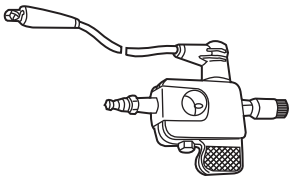
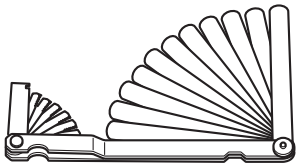


8

Electrical System



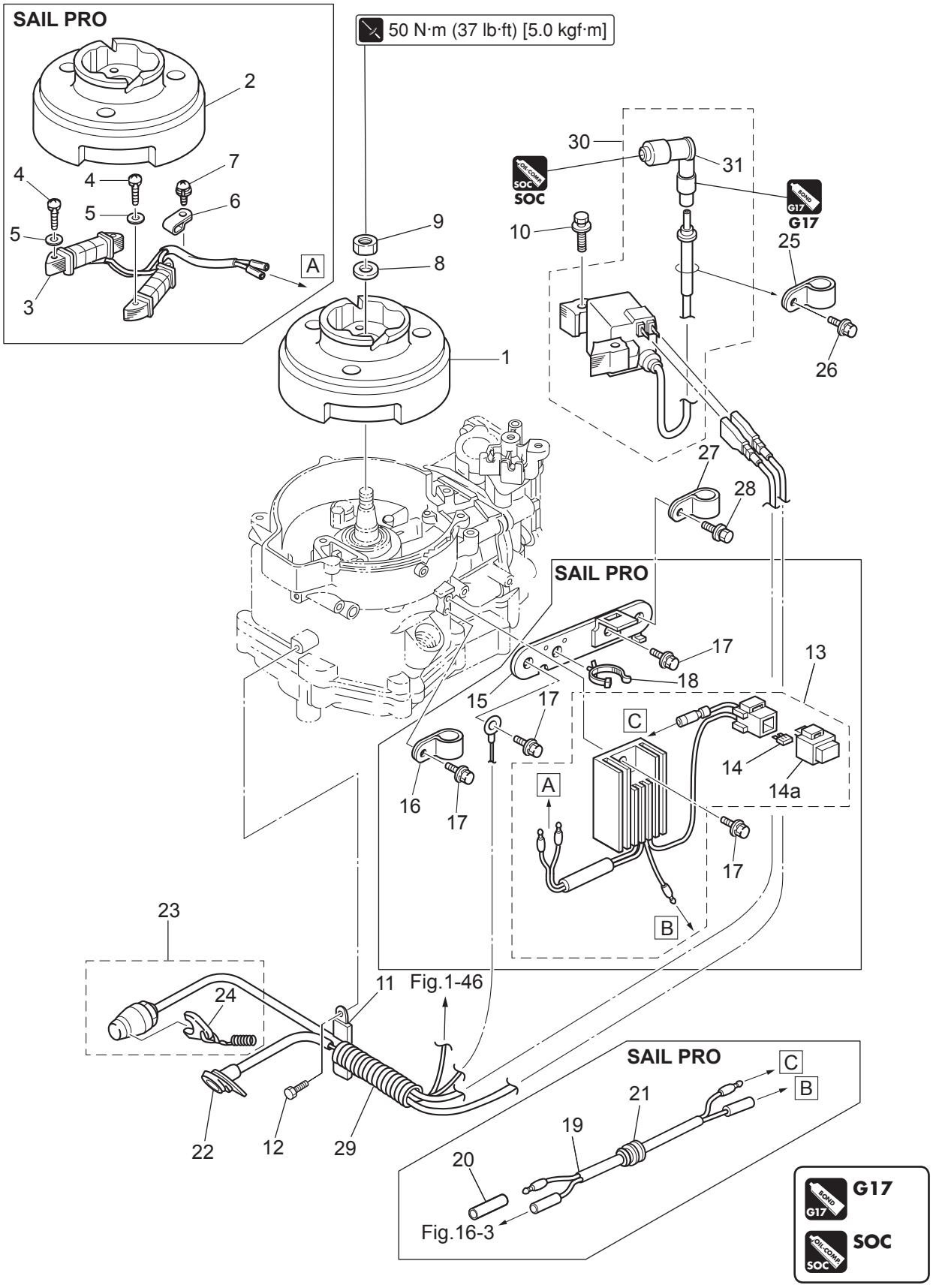
1. Special Tools

		
Vacuum/Pressure Gauge P/N. 3AC-99020-1	Spark Tester P/N. 3F3-72540-0	Thickness Gauge P/N. 353-72251-1
Inspecting pressure	Inspecting spark	Measuring gaps

2. Parts Layout

P/C Fig. 6

Magneto



Ref. No.	Description	Q'ty	Remarks
1	Flywheel	1	STD with out Alternator
2	Flywheel	1	for Sail Pro (with Alternater)
3	Alternator Assy	1	for Sail Pro 12V60W (with Alternater)
4	Screw	4	for Sail Pro (with Alternater) M5 L=25mm
5	Washer	4	for Sail Pro (with Alternater) M5
6	Clamp 4.2-3-8	1	for Sail Pro (with Alternater)
7	Screw	1	for Sail Pro (with Alternater) M4 L=8mm
8	Washer	1	M12
9	Nut 12-P1.25	1	
10	Bolt	2	M6 L=30mm
11	Clamp 6.5-47.5P	1	
12	Bolt	1	M6 L=12mm
13	Rectifier Complete	1	for Sail Pro or OPT
14	Fuse 10A	2	for Sail Pro
14a	Cap	1	for Sail Pro
15	Electric Bracket Assy	1	for Sail Pro
16	Clamp 6.5-14L	1	for Sail Pro
17	Bolt	4	for Sail Pro M6 L=14mm
18	Band 135	1	for Sail Pro
19	Battery Cable L=494	1	with Alternator Sail Pro Only
20	Cable Terminal Plug	1	with Alternator Sail Pro Only
21	Grommet 17-3	1	for Sail Pro
22	Pilot Lamp Assy	1	
23	Stop Switch Assy	1	
24	Stop Switch Lanyard Assy	1	
25	Clamp 6.5-14L	1	
26	Bolt	1	M6 L=12mm
27	Clamp 6.5-14L	1	
28	Bolt	1	M6 L=12mm
29	Protector φ 10.7-180	1	
30	Igniter W/R-Cap	1	
31	Plug Cap W/Resistance	1	

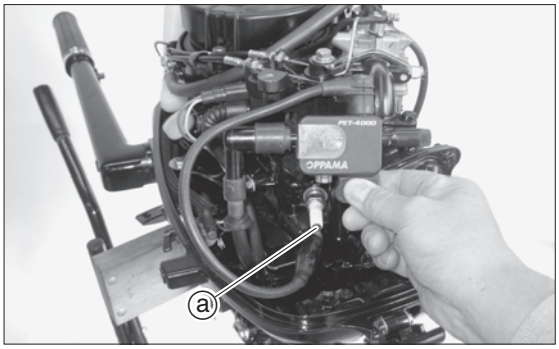
3. Ignition System and Ignition Control System

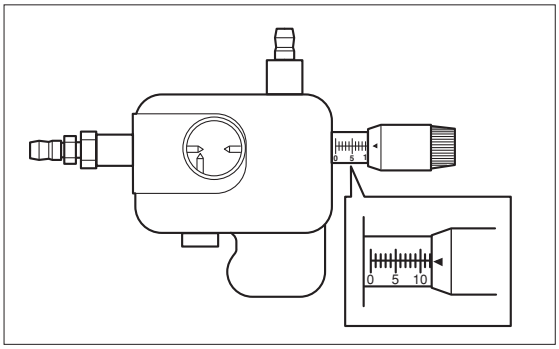
1) Inspection of Ignition Spark

1. Disconnect the plug cap from the spark plug.
2. Connect the plug cap to the spark tester.
3. Connect the spark tester clip to the spark plug tip ⓐ electrode.

Spark Tester:
P/N. 3F3-72540-0

Spark Performance:
10 mm (0.4 in) or over



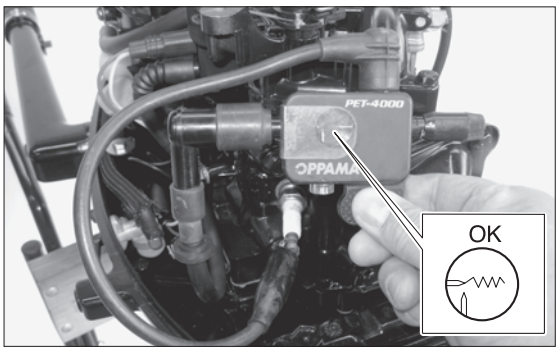


4. Start engine and check spark. If spark is weak, check igniter (including igniter clearance) and/or plug cap.

This test can be made without removing parts.

⚠ WARNING

- **When testing, put electrode cap assuredly to prevent direct contact with spark tester wiring and leak of electrical current, and perform test carefully.**
- **Keep flammable gas, fuel and oil away from tester to prevent them from catching sparks.**

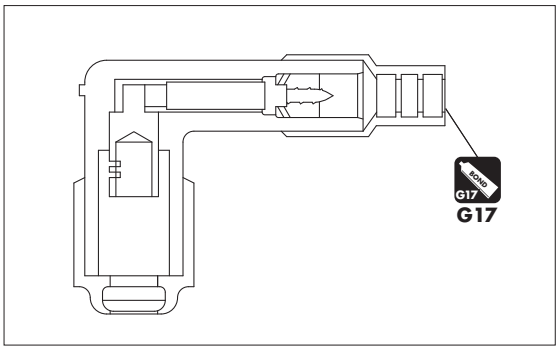


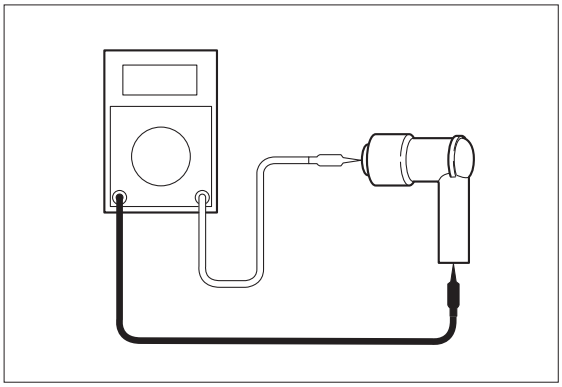
2) Inspection of Plug Cap

Remove the part and test it as a separate unit.

1. Disconnect plug cap from spark plug.
2. Remove plug cap from high tension cable.
3. Measure plug cap resistance. Replace if other than specified value.

Plug Cap Resistance (at 20˚C) :
3.0 - 7.0 kΩ



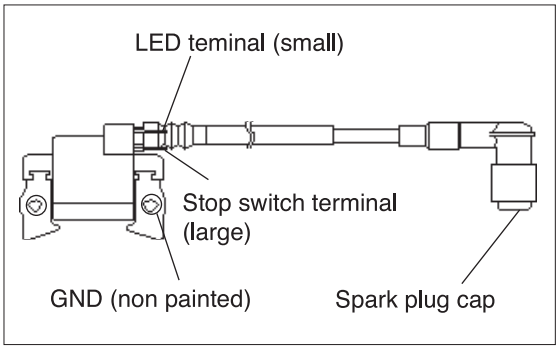


8

3) Inspection of Igniter

1. Measure igniter resistance. Replace if other than specified value.

Remove the part and test it as a separate unit.



Igniter tester check chart (3GR-06041-0)

		Tester "+" terminal			
		Stop terminal	Spark plug cap	GND	LED terminal
Tester "—" terminal	Stop terminal		CON ∞	CON ∞	CON ∞
	Spark plug cap	ON (33 kΩ)		ON (13 kΩ)	ON (33 kΩ)
	GND	ON (13 kΩ)	ON (13 kΩ)		ON (13 kΩ)
	LED terminal	CON (∞)	CON (∞)	CON (∞)	

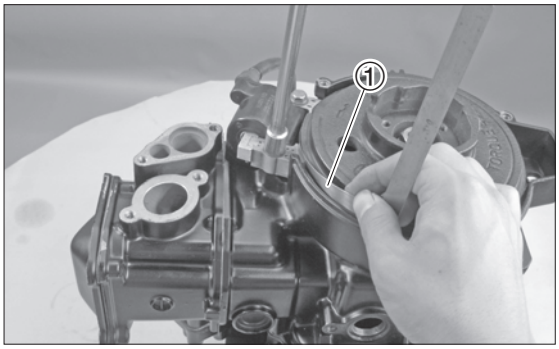
·"ON"means Conductive.
·"CON"means that pointer of cirecuit tester moves once and then returns to the range shown in ( )
· Circuit tester: HIOKI3030 (Measurement range:1kΩ)
· The measurement varies depending on the measurement range of the circuit tester or voltage due to diode used in the unit.
· This check provide only a reference, and it is impossible to perform perfect check.

2. Install igniter so that specified clearance is achieved, and connect plug cap to spark plug.

Thickness Gauge ① :
P/N. 353-72251-1

Igniter Clearance :
0.3 mm (0.012 in)

Igniter Bolts :
9 N · m (7 lb · ft) [0.9 kgf · m]



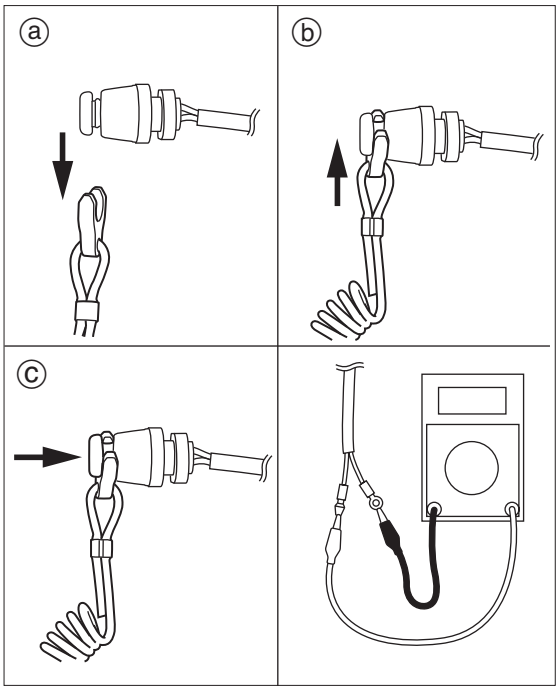
3. Connect stop switch lead and warning lamp lead to igniter.

4) Inspection of Stop Switch

1. Check conduction of stop switch, and replace if not conductive.

This test can be made without removing parts.

Switch Position	Lead Wire Color	
	Brown (Br)	Black (B)
Remove lock plate. ⓐ	○	○
Attach lock plate. ⓑ		
Press switch. ⓒ	○	○



5) Inspection of Oil Pressure Switch

Remove the part and test it as a separate unit.

1. Check electrical conductivity of oil pressure switch. Replace if no conductivity.

2. Connect vacuum/pressure gauge to oil pressure switch.

Vacuum/Pressure Gauge :
P/N. 3AC-99020-1

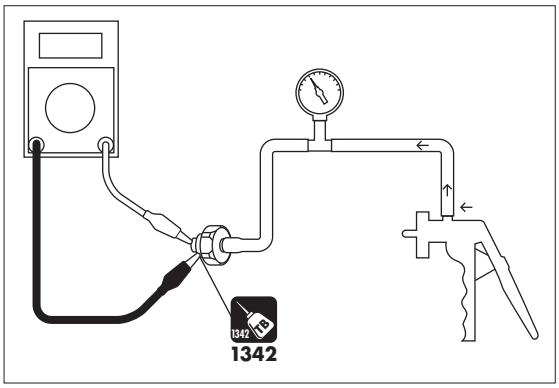
3. Apply pressure slowly with vacuum/pressure gauge.

4. Check that oil pressure switch is not conductive with specified pressure applied. Replace if conductive.

Specified Pressure :
0.020 - 0.029 MPa (2.8 - 4.0 psi) [0.2 - 0.3 kgf/cm²]

5. Reinstall the part.

Oil Pressure Switch :
8 N · m (6 lb · ft) [0.8 kgf · m]



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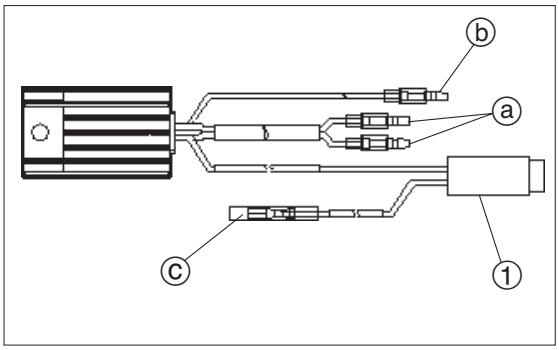
6) Inspection of Rectifier

1. Check conduction of fuse (10 A) contained in the fuse box ①. Replace if non-conductive.

2. Check conduction between rectifier terminals. Replace if out of specification.



Rectifier tester check chart (3GR-76060-0)

		Tester "+" terminal			
		Yellow ⓐ	Yellow ⓐ	Black ⓑ	Red ⓒ
Tester "—" terminal	Yellow ⓐ		(∞)	ON (7 kΩ)	(∞)
	Yellow ⓐ	(∞)		ON (7 kΩ)	(∞)
	Black ⓑ	(∞)	ON (8 kΩ)		(∞)
	Red ⓒ	ON (7 kΩ)	ON (7 kΩ)	ON (7 kΩ)	

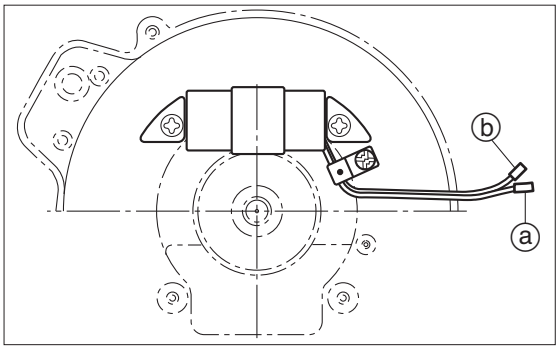
· Circuit tester: HIOKI3030 (Measurement range:1kΩ)
· The measurement varies depending on the measurement range of the circuit tester or voltage due to diode used in the unit.
· This check provide only a reference, and it is impossible to perform perfect check.

7) Inspection of Lighting Coil

1. Measure resistance between lighting coil terminals ⓐ and ⓑ. Replace if out of specification.

This test can be made without removing parts.

Range of normal lighting coil resistance :
0.46 - 0.68 kΩ



9

Troubleshooting

1. Troubleshooting List

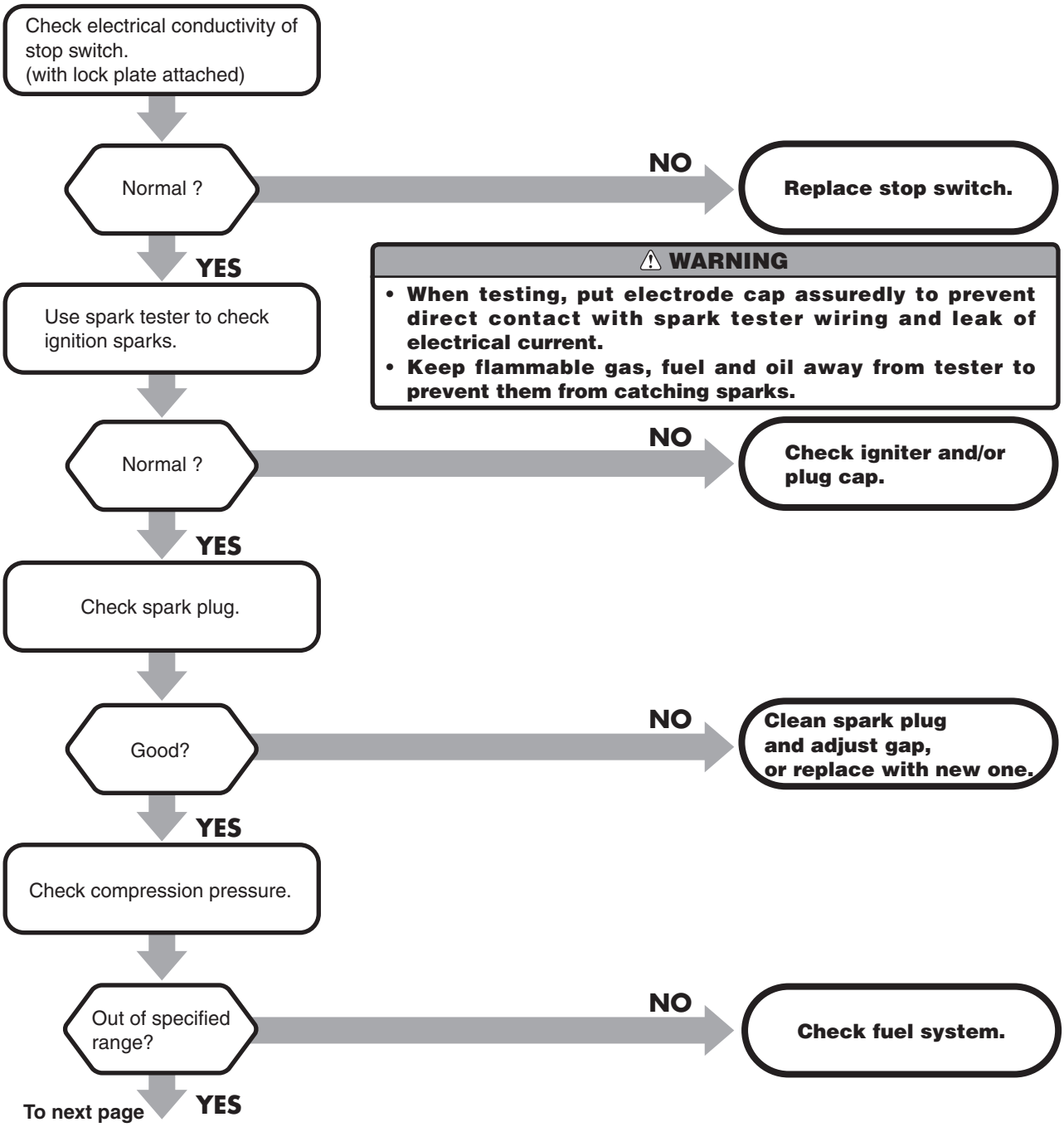
	Engine will not start.	Engine stalls immediately after starting.	Idles abnormally.	Defective acceleration.	Engine speed is very high causing high speed ESG to operate.	Engine speed is low.	Boat speed is insuffient.	Engine is overheated.	Probable Cause
Fuel & Lubrication System	○	○							Fuel level is low in the tank.
	○	○	○	○		○	○	○	Fuel system connection is incomplete.
	○	○	○	○		○	○	○	Air suctioned through fuel system.
	○	○	○	○		○	○	○	Fuel pipe is twisted.
	○	○	○	○		○	○	○	Air vent screw is closed.
	○	○	○	○		○	○	○	Fuel filter, fuel pump or carburetor is clogged.
			○	○		○	○	○	Low quality engine oil
	○	○	○	○		○	○	○	Low quality gasoline
			○	○		○	○		Engine oil level is too high.
						○		○	Engine oil lacks. (Oil warning lamp is lit.)
	○	○	○	○					Fuel is fed excessively.
	○	○	○	○		○	○	○	Carburetor is maintained poorly.
						○		○	Oil pump malfunction.
Ignition System	○	○	○	○		○	○	○	Use of spark plugs not specified
	○	○	○	○		○	○		Spark plug carbon deposit or bridge
	○	○	○	○		○	○		No sparks or weak spark
	○								Stop switch short-circuited
	○	○	○	○		○	○		Ignition timing is not properly adjusted. (Igniter, valve timing)
	○								Stop switch lock is not in place.
	○								Disconnection of lead wires or loose earth wire.
Compression	○	○	○	○		○	○		Valve clearance is wrong.
		○	○	○			○		Cylinderhead sealing is defective.
	○	○	○	○		○	○		Valve seat sealing is defective. (Intake and exhaust)
	○	○	○	○		○	○		Piston, piston ring and/or cylinder is worn excessively.
			○					○	Combustion chamber excessive carbon.
			○	○			○	○	Spark plug is loose.
Others							○	○	Insufficient cooling water, defective pump or clogging by dirt.
			○				○	○	Thermostat operation is defective.
				○	○		○	○	Anti-cavitation plate is damaged.
				○	○	○	○	○	Use of mismatched propeller.
			○	○	○	○	○	○	Propeller is damaged or deformed.
				○	○		○	○	Thrust rod position is not correct.
				○	○	○	○	○	Boat is unbalanced by load position.
				○	○	○	○	○	Transom installation height is too high or too low.
	○	○	○	○		○	○		Throttle link adjustment is defective.

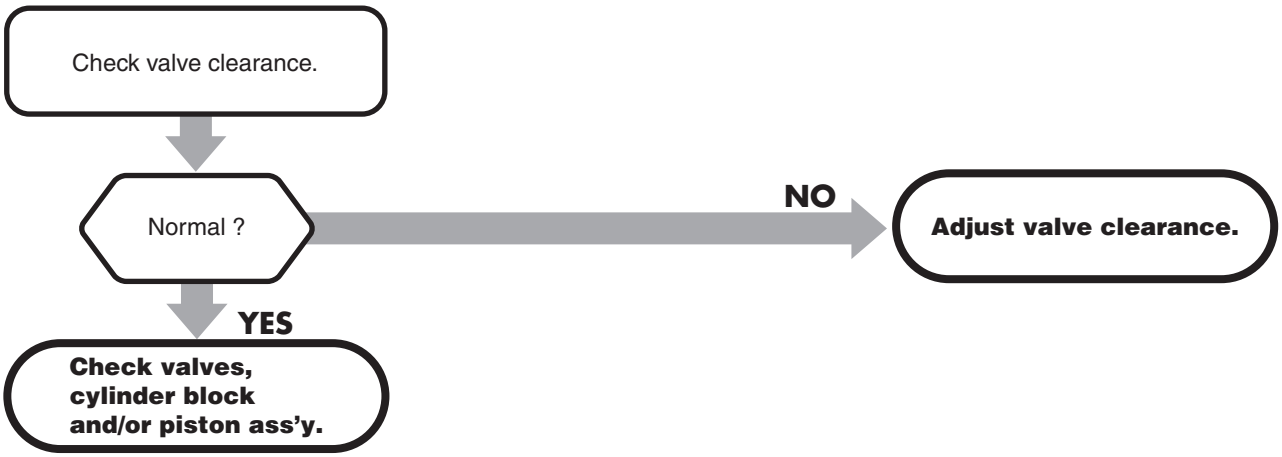
Before working on the outboard motor, check the hull, rigging, installation of outboard motor, fuel level, and wire connections. For mechanical troubleshooting, refer to relevant troubleshooting section in this chapter. For checking and servicing outboard motor, refer to service procedures described in this manual to perform the work safely.

2. Power Unit

Trouble 1 **Engine will not start or is a little hard to start. (Recoil starter operates normally.)**

• Inspection of Ignition System, Fuel System and Compression Pressure

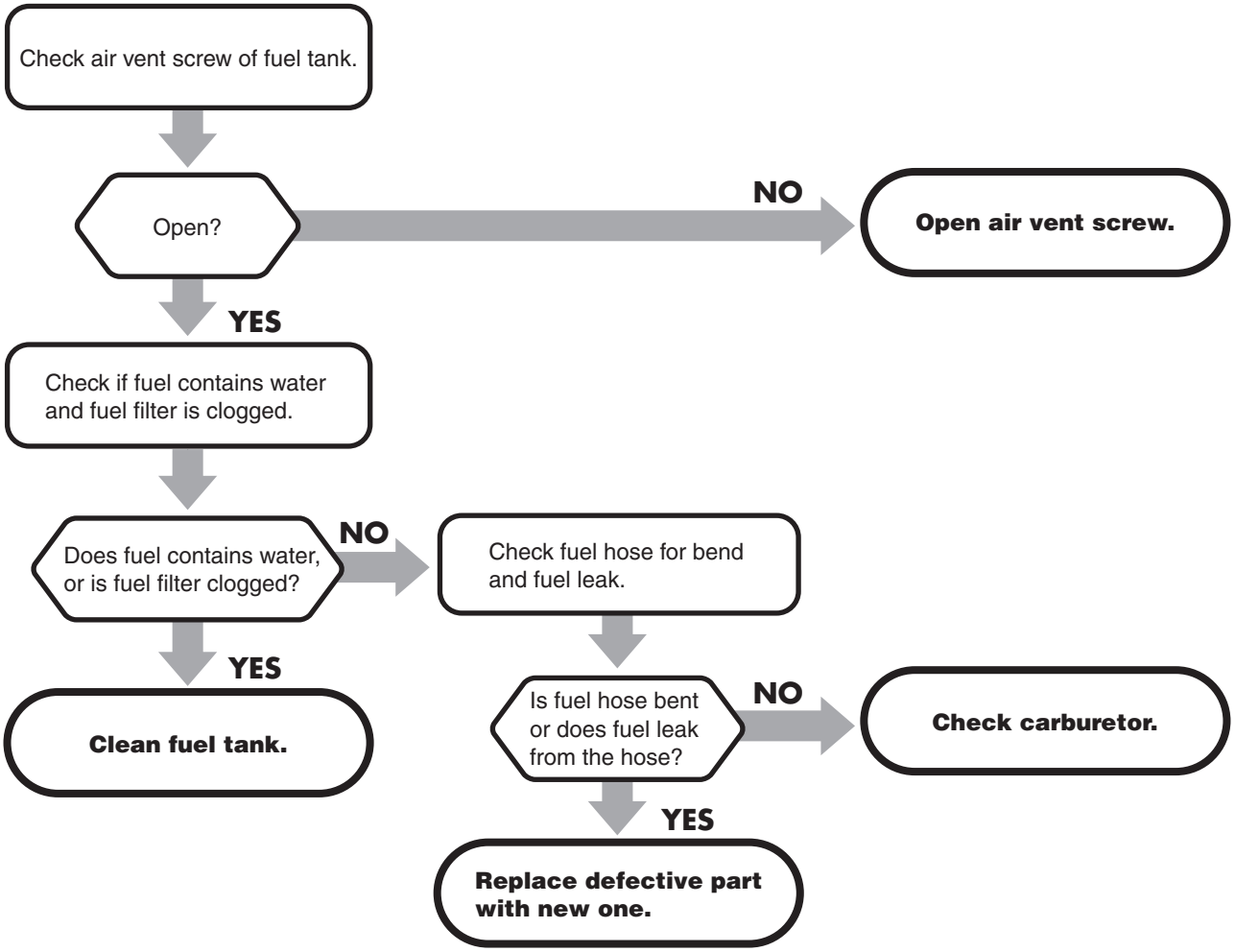



Check valve clearance.
Normal ?
NO
Adjust valve clearance.
YES
Check valves,
cylinder block
and/or piston ass'y.

Trouble 2 **Engine starts but stalls soon.**

- **Inspection of Fuel System, Ignition System, Compression Pressure**

Fuel System



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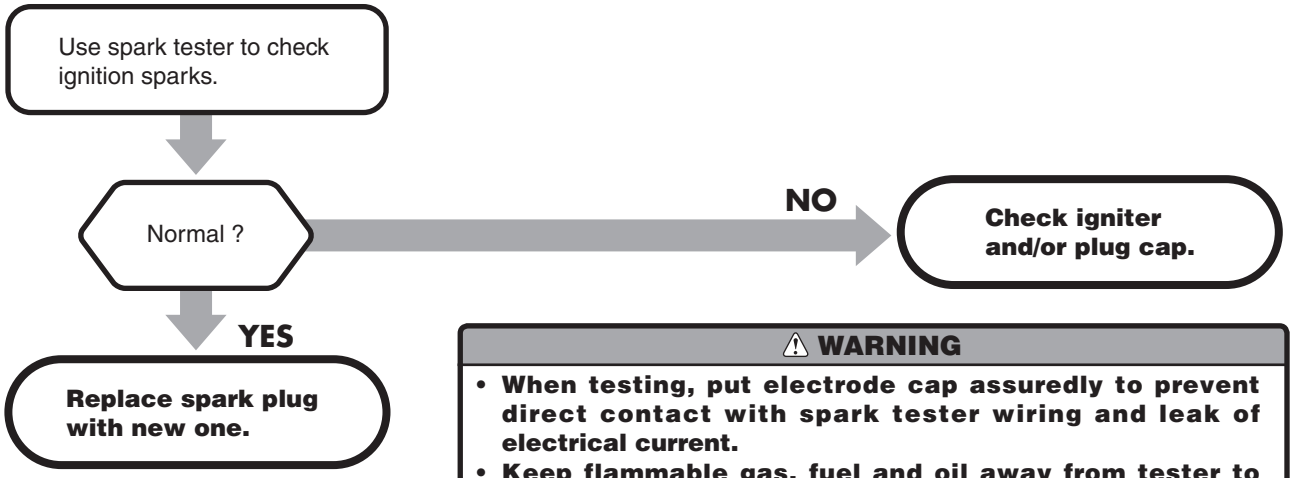
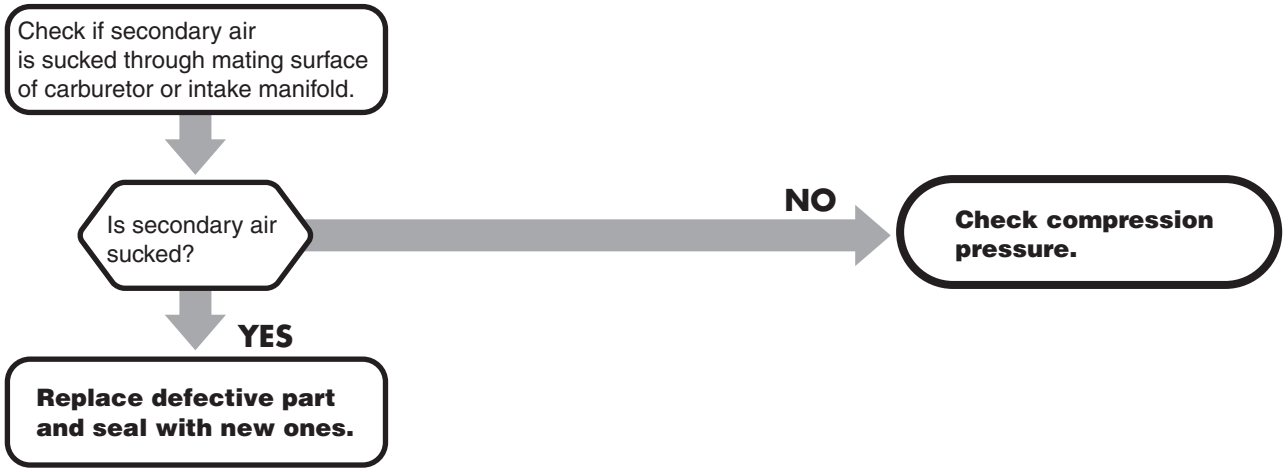
Ignition System



⚠ WARNING

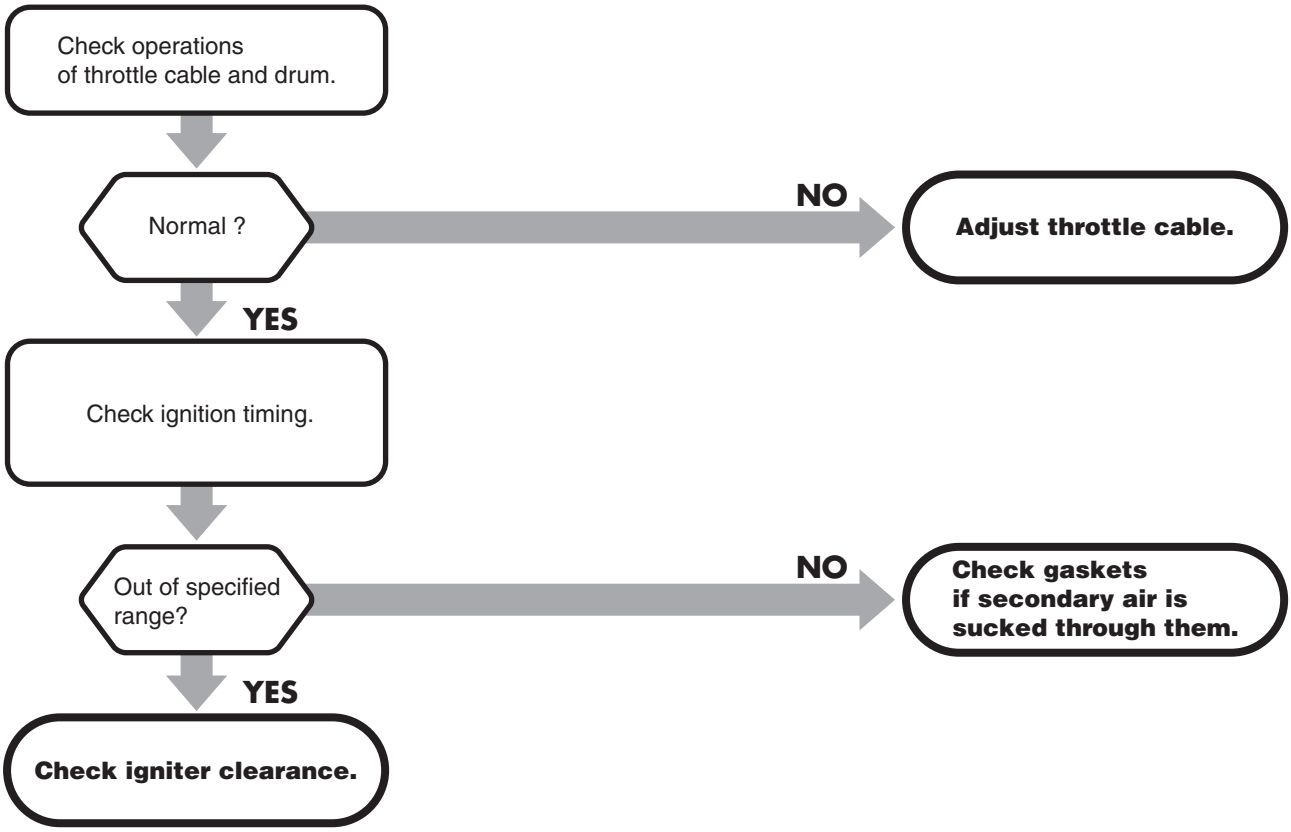
- **When testing, put electrode cap assuredly to prevent direct contact with spark tester wiring and leak of electrical current.**
- **Keep flammable gas, fuel and oil away from tester to prevent them from catching sparks.**

Intake • Compression Pressure



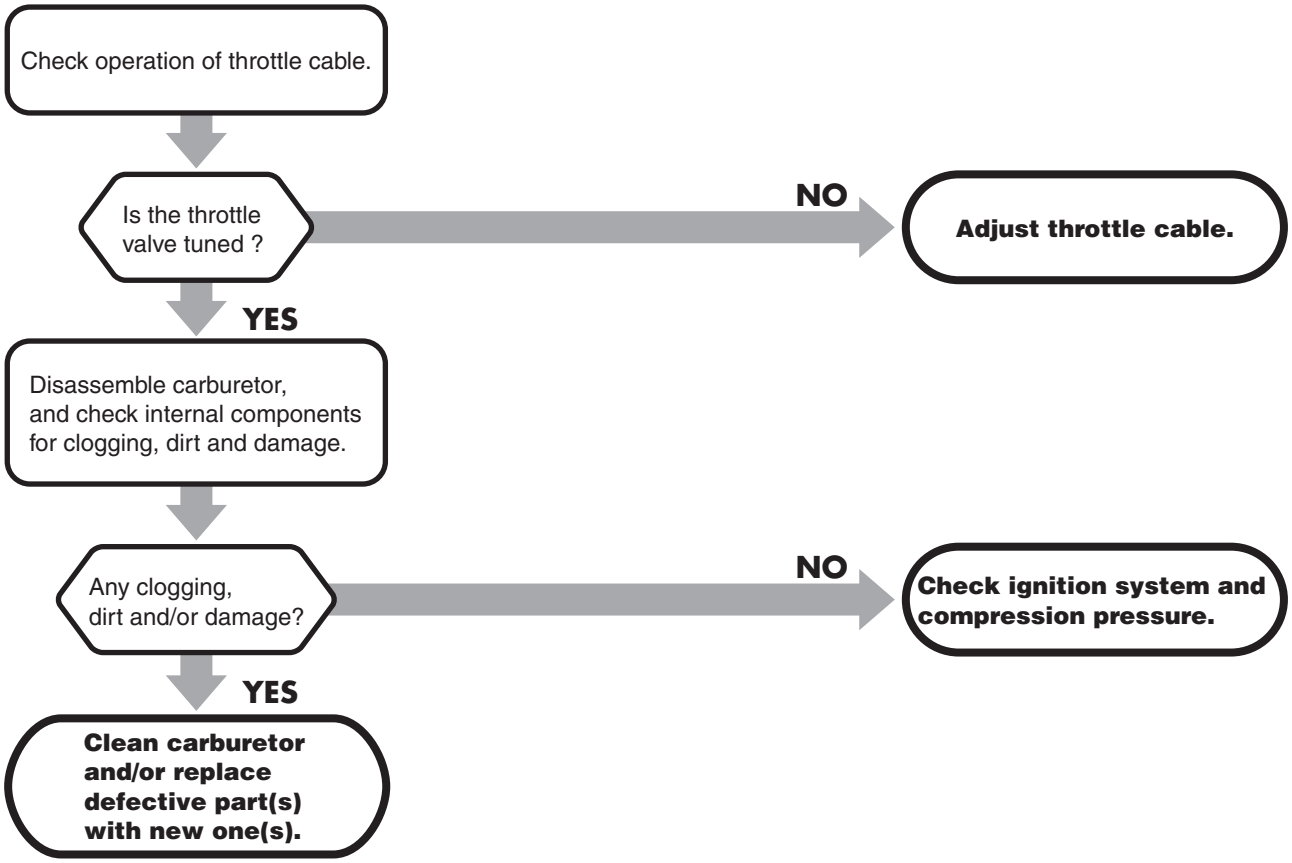
Trouble 3 **Idle engine speed will not stabilize.**

- **Inspection of Intake Manifold, Air Intake System and Ignition System**

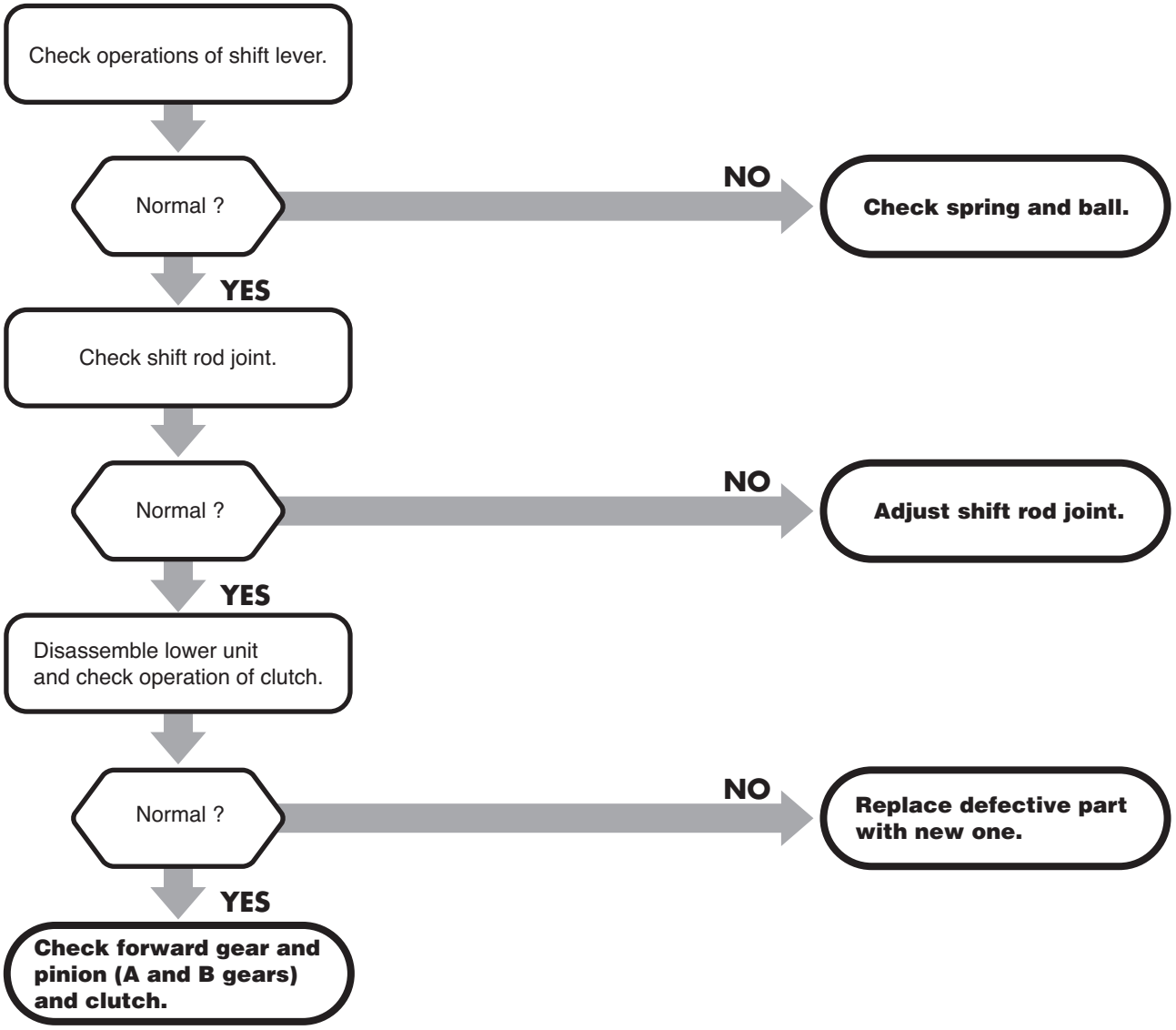


Trouble 4 Rough acceleration.

Rapid opening of throttle causes engine to stall.
Acceleration is not smooth.
· Inspection of Carburetor, Ignition System and Compression Pressure



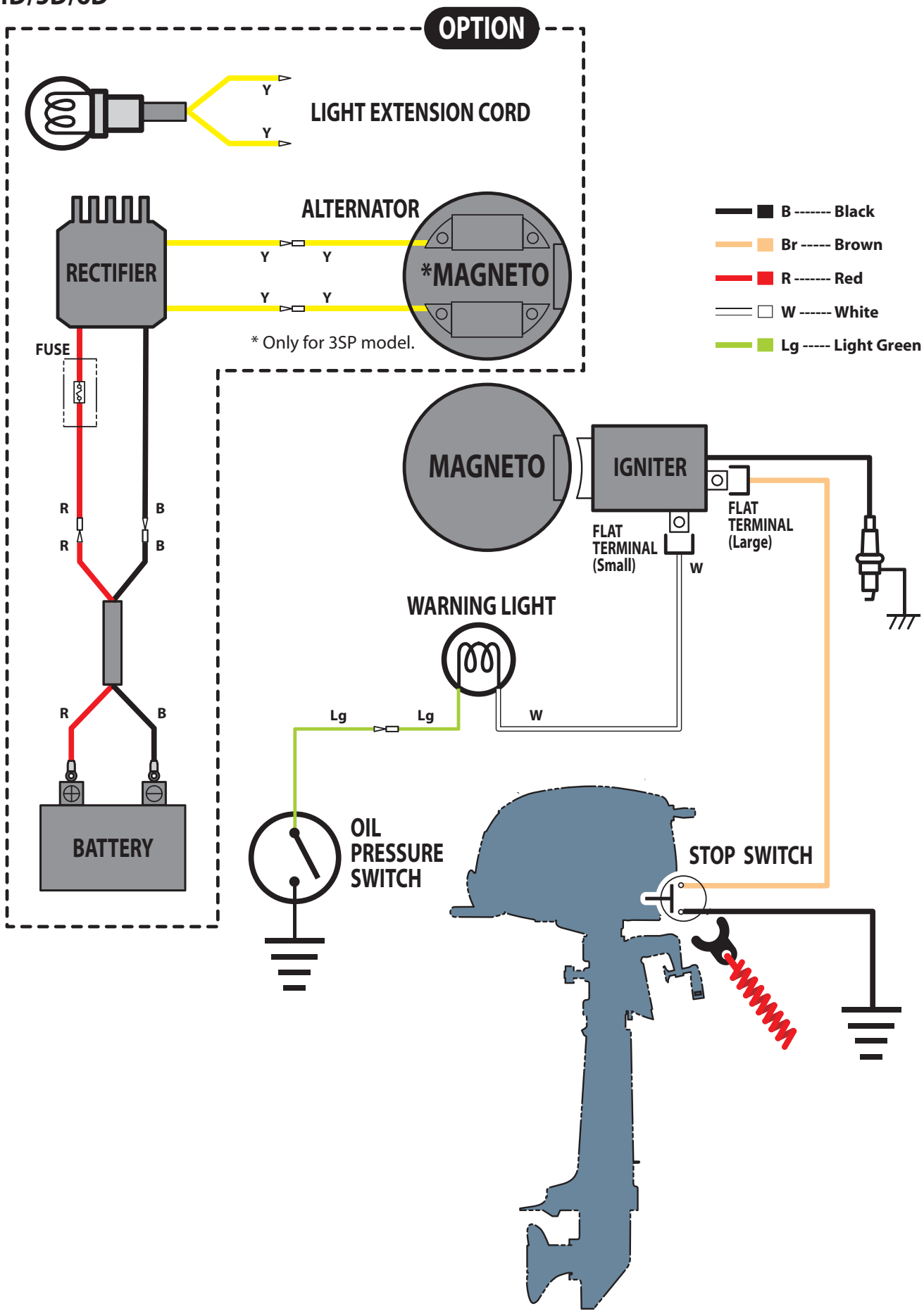
Trouble 5 **Gear shifting cannot be made normally.**

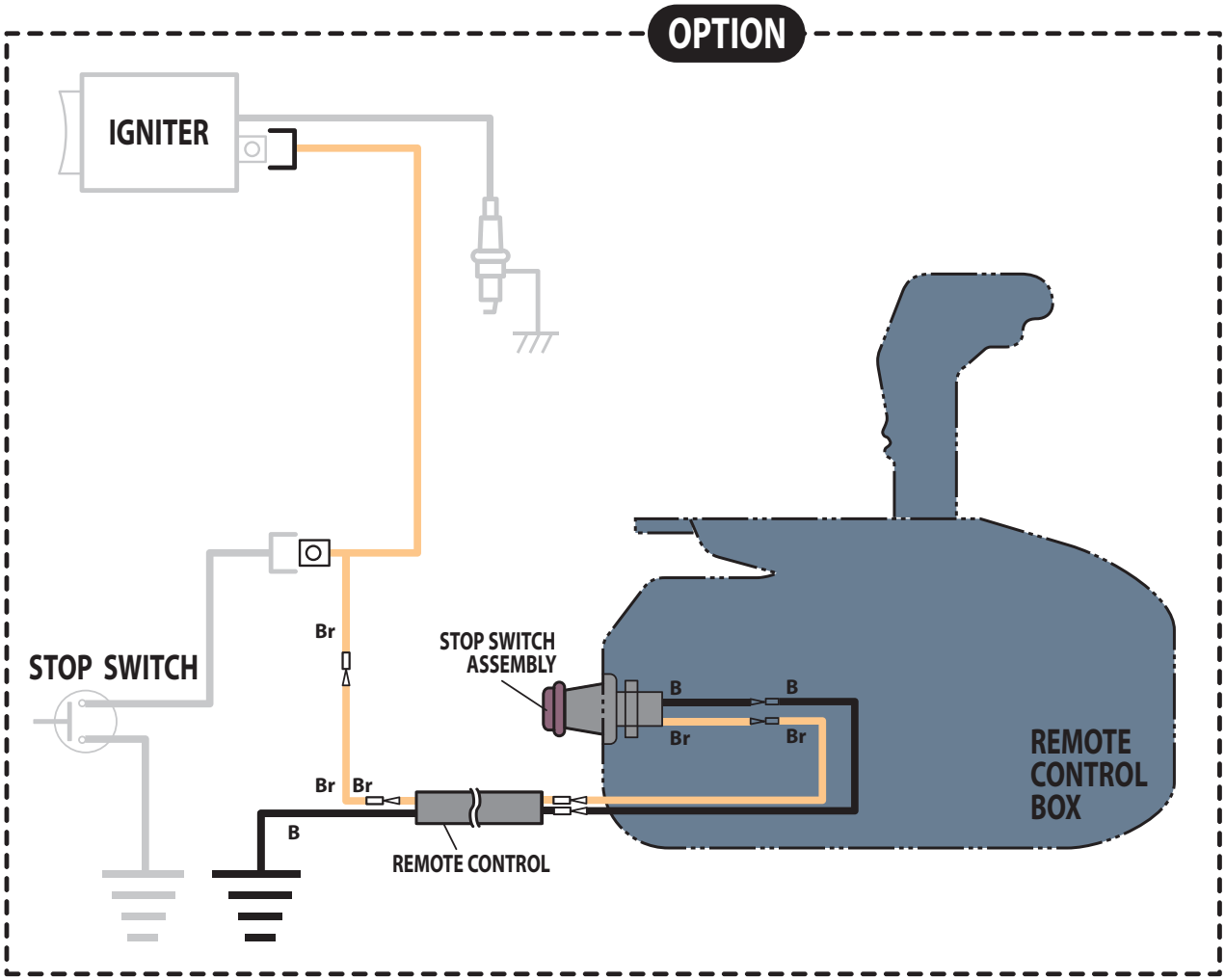


10

Wiring Diagram

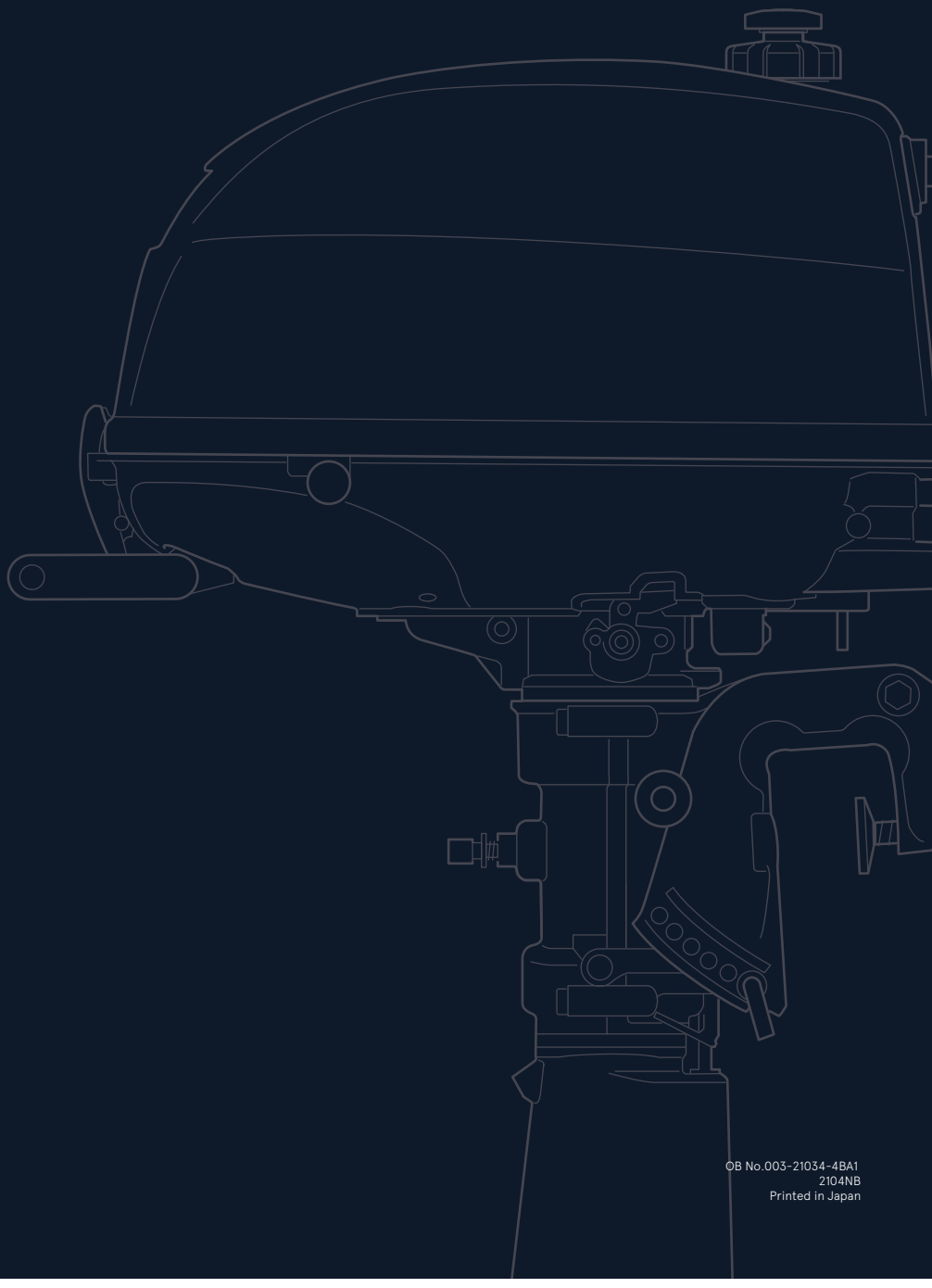
F 4D/5D/6D


OPTION
LIGHT EXTENSION CORD
Y
Y
ALTERNATOR
RECTIFIER
*MAGNETO
Y
Y
Y
Y
* Only for 3SP model.
FUSE
R
R
B
B
R
B
BATTERY
MAGNETO
IGNITER
FLAT TERMINAL (Small)
W
FLAT TERMINAL (Large)
WARNING LIGHT
Lg
Lg
W
OIL PRESSURE SWITCH
STOP SWITCH
B ------- Black
Br ----- Brown
R ------- Red
W ------ White
Lg ----- Light Green


OPTION
IGNITER
STOP SWITCH
Br
STOP SWITCH
ASSEMBLY
B
B
Br
Br
Br
Br
B
REMOTE CONTROL
REMOTE
CONTROL
BOX

SERVICE MANUAL

4 STROKE
MFS 4D
MFS 5D
MFS 6D
Models



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